REV 60

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St. Charles , MO 63304

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▶AUTHOR OAKS, MARJ ▶TO THOMPSON, PAM ▶DATE 01/28/04

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94479

Stoller

Weldon Spring Site

established 1959

January 28, 2004

Ms. Pamela Thompson
U.S. Department of Energy
Weldon Spring Site
Remedial Action Project
7295 Highway 94 South
St. Charles, MO 63304

RE: STOLLER CONTRACT #29329
**COMPLETION REPORT FOR THE RAFFINATE PIT AREA GROUNDWATER INVESTIGATION**

Dear Ms. Thompson:

Enclosed are 5 copies of the subject document as requested. This report summarizes the sampling activities performed to further delineate TCE impact in groundwater in the vicinity of the raffinate pits.

If there are any further questions or comments regarding this report, please contact Rebecca Cato of S.M. Stoller, at (636) 926-7038.

Sincerely,

Marjorie L. Oaks

Marjorie L. Oaks
Site Project Manager

Enclosures as noted

cc: S. Marutzky
M. Butherus

MO/rc/cju

The S.M. Stoller Corporation 7295 Highway 94 South St. Charles, Missouri 63304 (636) 441-8086 Fax: (636) 447-0739

DOE/GJ/79491-941
CONTRACT NO. DE-AC01-02GJ79491

# COMPLETION REPORT FOR THE RAFFINATE PIT AREA GROUNDWATER INVESTIGATION

WELDON SPRING SITE REMEDIAL ACTION PROJECT
WELDON SPRING, MISSOURI

**JANUARY 2004** **REV. 0**

U.S. Department of Energy
Grand Junction Office
Weldon Spring Site Remedial Action Project

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*Weldon Spring Site Remedial Action Project*

# Completion Report for the Raffinate Pit Area Groundwater Investigation

Revision 0

January, 2004

Prepared by

S. M. STOLLER CORPORATION
7295 Highway 94 South
St. Charles, MO 63304

for the

U.S. DEPARTMENT OF ENERGY
Grand Junction Office
Under Contract DE-AC01-02GJ79491

STATE OF MISSOURI
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REGISTERED GEOLOGIST

1-27-04

DOE/GJ/79491-941, Rev. 0

| Weldon Spring Site Remedial Action Project<br>Contract No. DE-AC01-02GJ79491 | Rev. No. 0 |
|---|---|
| PLAN TITLE: Completion Report for the Raffinate Pit Area Groundwater Investigation | |

**APPROVALS**

Groundwater Manager — Date: 1/27/04

Project Manager — Date: 1-28-04

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# 1.0 INTRODUCTION

The selected remedy in the *Interim Record of Decision for Remedial Action for the Groundwater Operable Unit at the Chemical Plant Area of the Weldon Spring Site* (Ref. 1) specifies active remediation of groundwater impacted with trichloroethylene (TCE) using an in-situ chemical oxidation (ICO) process. In order to facilitate this process, groundwater conditions and the extent of contamination in the uppermost bedrock unit beneath the Raffinate Pit Area were further investigated during 2001. The investigations included well drilling and installation, coring, soil and groundwater sampling, packer testing, and data analysis and interpretation. The results of the investigations as well as the findings and conclusions are summarized in the following sections.

## 1.1 Purpose and Objectives

The purpose and objectives of this study as defined in the *Raffinate Pit Area Groundwater Investigation Sampling Plan* (Ref. 2) including *Addendum 1: Off-site Groundwater Investigation* and *Addendum 2: Additional TCE Delineation* were to:

- Determine the areal extent of TCE impact south and southwest of the Raffinate Pit Area.
- Provide a better understanding of the contaminant migration pathways in this part of the site.

A series of field investigations were performed and data were collected to better understand the hydrogeological and geochemical conditions within the shallow aquifer that control the distribution and fate of TCE in groundwater.

## 1.2 Background

A shallow aquifer is present in the Burlington Keokuk Limestone, the uppermost bedrock unit beneath the chemical plan area of the Weldon Spring Site. The Burlington Keokuk Limestone has two zones: the upper, weathered unit and the lower, unweathered unit. The weathered unit is identified by physical properties of the rock such as alteration, color (staining), fracturing, solution features, and secondary mineralization. A strongly weathered subunit is also present within the weathered Burlington Keokuk Limestone. Shallow groundwater, including the plume of TCE contamination, occurs primarily within the strongly weathered subunit.

Paleochannels have been eroded into the surface of the Burlington Keokuk Limestone by glacial outwash creating depressions or "bedrock lows". Aquifer tests performed in wells completed in the weathered subunit beneath bedrock lows indicate relatively higher hydraulic conductivities than in surrounding areas. A higher degree of fracturing and subsequent solutioning in the limestone underlying bedrock lows has enhanced the permeability and explains the test results.

# 2.0 WELL DRILLING AND INSTALLATION

Drilling and installation of the trichloroethylene (TCE) delineation wells commenced on Jan 2, 2001 and was completed on October 26, 2001. A total of thirteen monitoring wells were installed in three stages, both on the chemical plant and on the adjacent Weldon Spring Training Area (WSTA). Each stage was required to investigate areas both on and off site that lacked groundwater quality data. Drilling was subcontracted to Layne-Christensen of St. Louis, Mo. under Work Package 487A *Subsurface Drilling Services*, (Tasks 8, 10 & 11 Rev. 0). All drilling locations were initially surveyed and staked. After reviewing the staked locations in the field, some locations were slightly moved to accommodate the drilling rig.

## 2.1 Location Selection

The investigation monitoring wells were drilled and installed at the locations identified in the *Sampling Plan* and *Addendums* (Ref. 2). In general, the locations were selected to provide additional wells in the TCE-impacted area of the site (Raffinate Pit Area and south). The first four wells (Stage 1) were installed at locations within bedrock lows or in areas of strongly weathered limestone where preferential groundwater flow was anticipated. After installing the first four wells, other sampling activities provided new data regarding a bedrock low at the southwestern edge of the site that indicated that a bedrock paleochannel sloped to the north instead of to the south as previously thought (Ref. 2).

Soil and groundwater contamination data were evaluated, and a decision was made to install three wells (Stage 2) south of the known area of impact to characterize potential migration pathways to the north possibly contributing to TCE levels near the raffinate pits. During Stage 3, three monitoring wells were placed in areas lacking characterization data on the WSTA property southwest and west of the chemical plant boundary, and three were located within the site itself in areas not sufficiently characterized. Each stage of well installation is summarized below.

| | | |
|---|---|---|
| | MW-3030 | MW-3032 |
| Stage 1 | MW-3031 | MW-4031 |
| | MW-4033 | MW-4035 |
| Stage 2 | MW-4034 | |
| | MW-3037 | MW-4036 |
| Stage 3 | MW-3038 | MW-4037 |
| | MW-3039 | MW-4038 |

## 2.2 Drilling and Sampling Activities

The drilling and sampling were performed using a CME-750 all terrain drill rig. Hollow-stem augers with an outside diameter (OD) of 8-1/4-inch (9-inch hole) and an inside diameter (ID) of 4-1/4 -inches were used to penetrate the soil. Sampling was performed in overburden soils using a Standard Penetration sampler in approximately half of the boreholes. In the remaining holes, soil sampling was only performed near the bottom of the overburden

in order to identify the top of the bedrock. Soil and rock were described by a field geologist using the Unified Soil Classification System in accordance with the sampling plan. The wells were drilled, tested, and constructed at locations summarized in Table 2-1 below and shown on Figure 2-1.

TABLE 2-1 Monitoring Well Summary Table

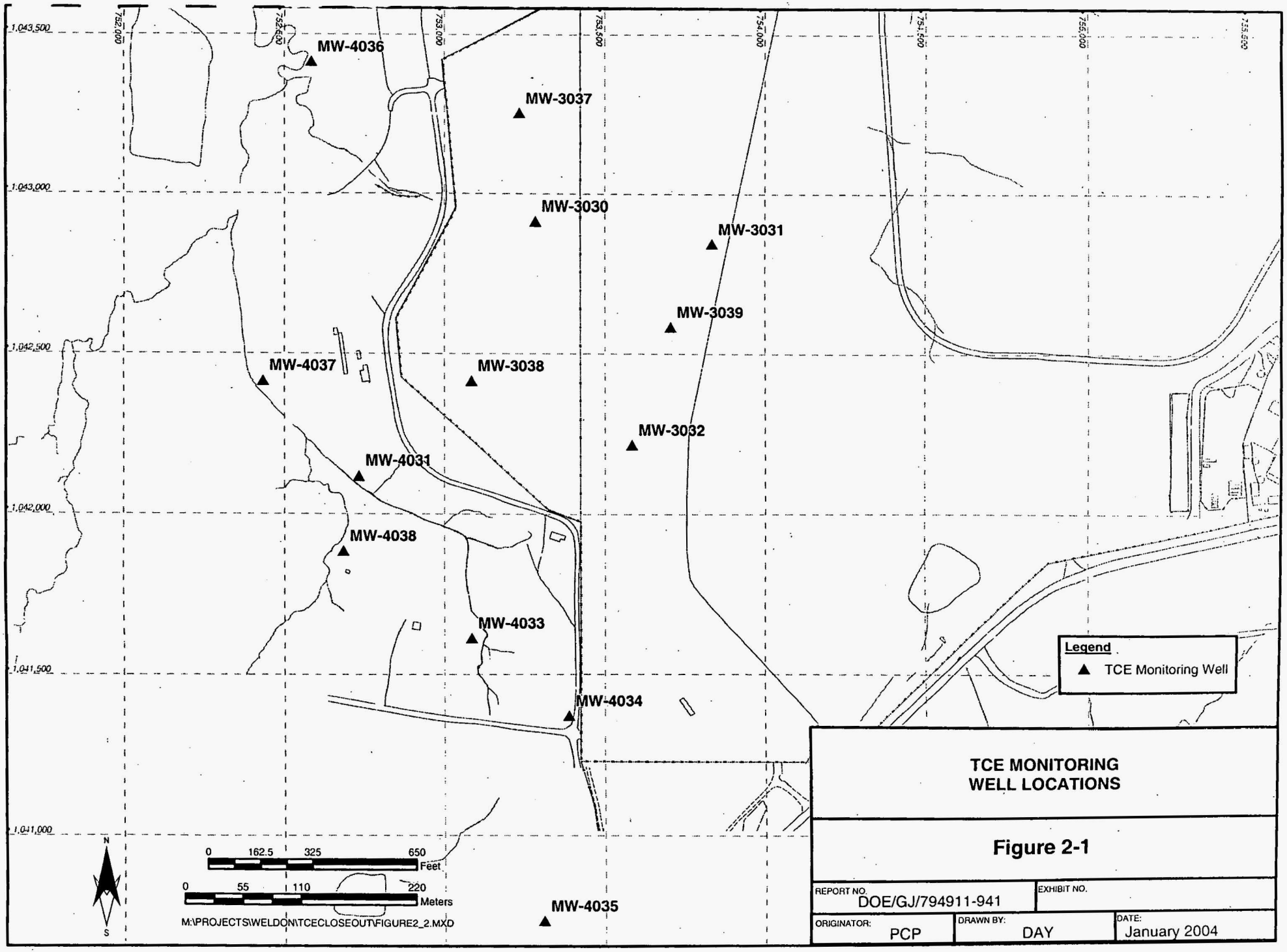
| WELL NUMBER | COORDINATES [1] | | ELEVATION | | SCREENED INTERVAL (ft bgs) [2] | TOTAL DEPTH [3] (ft) |
|---|---|---|---|---|---|---|
| | NORTHING | EASTING | GROUND | TOP OF CASING | | |
| MW-3030 | 1042899.86 | 753299.93 | 631.84 | 634.32 | 33.0 – 37.8 | 41.0 |
| MW-3031 | 1042830.41 | 753849.93 | 643.72 | 646.48 | 32.0 – 36.8 | 46.0 |
| MW-3032 | 1042199.79 | 753599.64 | 660.07 | 662.65 | 55.0 – 60.0 | 62.0 |
| MW-3037 | 1043247.53 | 753253.57 | 637.60 | 640.25 | 35.0 – 45.0 | 51.3 |
| MW-3038 | 1042398.61 | 753100.40 | 651.70 | 654.51 | 47.5 – 57.3 | 58.2 |
| MW-3039 | 1042571.66 | 753719.91 | 646.69 | 649.46 | 42.5 – 52.3 | 52.5 |
| MW-4031 | 1042104.37 | 752748.23 | 631.80 | 634.55 | 28.0 – 33.0 | 34.0 |
| MW-4033 | 1041600.21 | 753099.98 | 643.44 | 645.40 | 37.0 – 46.8 | 47.0 |
| MW-4034 | 1041354.78 | 753404.87 | 654.15 | 656.89 | 45.0 – 54.8 | 55.0 |
| MW-4035 | 1040720.96 | 753325.41 | 666.58 | 669.37 | 47.0 – 57.0 | 57.5 |
| MW-4036 | 1043374.50 | 752600.76 | 612.50 | 615.22 | 26.0 – 35.8 | 36.0 |
| MW-4037 | 1042398.61 | 752450.11 | 627.40 | 630.13 | 25.5 – 35.5 | 35.5 |
| MW-4038 | 1041872.30 | 752716.70 | 636.00 | 638.07 | 31.5 – 41.5 | 41.9 |

1 NAD 83 Coordinates
2 Feet below ground surface.
3 Total depth of deepest advancement of borehole irrespective of well construction.

Core drilling was performed once the top of rock was identified, usually by auger refusal. Temporary casing with an ID of 3-1/8-inches was placed to the top of the rock. An NQ wireline core barrel with a split inner barrel was used to obtain nominal 1.8-inch diameter core producing a 3-inch diameter borehole. Coring at each location was continued until the field geologist determined that the depth was sufficient to install the monitoring well. Typically, coring was stopped approximately 15-feet below the static ground-water level.

During coring, the penetration rate and water circulation were monitored by the field geologist and recorded on the borehole log. Upon completion of a given core run, the core barrel was brought to the surface using a wireline through the drill pipe, the core was extracted from the barrel and placed in a tray for logging. It was then logged by the field geologist and included marking footages directly on the core and recording the recovered length of core and any core loss, rock quality designation (RQD), lithology, mineralogy, weathering and fracture frequency. Fractures were generally described by depth and type. At the completion of core logging, the core was placed in wooden core boxes, which were labeled by project, well number, depth and box number.

Once the final coring depth was achieved, the soil portion of the hole was reamed with 6-1/4-inch ID augers, resulting in an 11-inch diameter hole. The bedrock portion of the borehole was then reamed to a diameter of 6-inches in order to construct the 2-inch diameter well. Reaming was performed using an Ingersoll-Rand TH-60 air rotary drill equipped with a tricone bit. The hollow-stem augers were left in the hole during the reaming and well construction to serve as casing through the soil zone.


MW-4036
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TCE MONITORING WELL LOCATIONS
Figure 2-1
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EXHIBIT NO.
ORIGINATOR: PCP
DRAWN BY: DAY
DATE: January 2004

## 2.3 Constant Head Hydraulic Conductivity (Packer) Testing

The boreholes were pressure tested (packer tested) using methods described in the *Groundwater Manual* (Ref. 3) at 10-ft intervals (approximately) as coring progressed. At the completion of a core run, the inner core barrel was removed and the hole was flushed with water to remove drill cuttings. The drilling pipe and outer core barrel were then pulled out of the borehole. A single packer assembly was installed in the borehole through the casing and inflated at the top of the test interval. The open hole below was then pressurized by pumping water directly into the boring through a water pipe extending through the packer. Test pressure and flow rates were measured with a pressure gauge and water meter respectively and recorded.

Packer tests were performed in each of the boreholes prior to installation of the well materials. Well MW-3032 experienced technical difficulties during packer testing resulting in invalid test results. To obtain hydraulic conductivity data for the well, it was later tested using the slug method. Results from the packer testing (and slug test) are presented in Section 3.

## 2.4 Well Installations and Development

Final screen placement was determined in the field for each well depending on the measured static water level and results from packer tests. A 2-in ID 316 stainless steel well screen with threaded bottom cap and blank riser casing with threaded top cap were installed in the boreholes. The screen was machine-cut at 0.010-inch slot size and ranged from 5 to 10 ft in length. Annulus materials were placed through the augers as follows: (1) silica sand (gradation 20-40) to approximately 2 to 3 ft above the screen top; (2) bentonite pellet seal (Peltonite® 3/8-in) to 3 to 5 ft above the top of sand pack; and (3) bentonite grout to approximately 3-ft below ground surface. During filter pack placement, the well was surged to compact the sand prior to topping off. The bentonite pellet seal was hydrated with potable water. The well construction data for each well installed during this program are summarized in Table 2-1. As-built well construction diagrams are provided in Appendix A.

Following a minimum of 24 hours after well completion, all wells were developed using a pump and surge technique combined with over-pumping. Initially, water and sediment were removed from the wells by hand bailing. The bailer was then raised and lowered several times within the water to provide a surging action to break down skin effects on the borehole caused by the drilling process.

After surging, the well was pumped using a 2-in Grundfos Redi-Flow® submersible pump to remove the sediment-laden groundwater. Physical parameters including temperature, conductivity, pH and turbidity were measured generally for every 1 to 2 gal of water removed. Measurements were usually begun after first removing three well volumes of water. The parameters were allowed to stabilize before accepting the well as fully developed. In most cases, approximately two times the required amount of water was removed during the development process. Well development forms were completed and are included in Appendix A.

All wells were completed at the surface by imbedding a 6-inch locking protective casing in a 6 in thick, 36-in diameter surface concrete pad. Continuous placement of concrete from the top of the well annulus grout (generally 3 feet below ground surface) to approximately 6 in above ground surface was performed to provide protection against frost heaving. Four concrete-filled pipe bollards (4-in diameter, 6-ft long) were also placed approximately 4 ft from the well casing to protect the well from vehicular/construction traffic. The bollards and the protective casing were painted yellow to enhance visibility. All wells were surveyed for location and elevation (ground surface and well casing top), and the survey data are provided in Table 2-1 and on the borehole logs in Appendix A. All protective casings were locked upon completion.

## 2.5 Soil Sampling

Sampling of overburden soil for volatile organic compounds was performed during the drilling of well MW-4035, to investigate an area where possible underground storage tank leakage may have occurred near industrial buildings on the WSTA south of the site (Ref.2). Samples were collected at approximately 2-1/2 ft intervals using a split spoon and placed in wide-mouth jars with no headspace as specified in the sampling plan (Ref. 2). Each sample was screened for volatile organic compounds with a photoionization detector (PID) using a lamp suitable for detection of TCE, and then placed in coolers and kept at 4°C during shipment.

## 2.6 Groundwater Sampling

Groundwater samples were collected from the monitoring wells following completion and development in the TCE impacted area and in preparation for the *Additional Groundwater Field Studies*, which involved the relatively long-term testing of a pump and treat system (Ref. 4). Sampling was also performed during and following the pump and treat effort. Groundwater samples were collected in accordance with the sampling plan. As part of the sampling, field parameters (pH, Eh, dissolved oxygen, and conductivity) were measured.

Samples were analyzed for volatile organic compounds including TCE, tetrachloroethylene (PCE), 1,2-dichloroethylene (DCE) according to EPA SW-846 methods. Baseline sampling was also performed in these wells for other analytes including uranium, anions, metals and nitroaromatic compounds, which are not detailed in this report.

# 3.0 HYDROGEOLOGIC DATA ANALYSIS

Each borehole drilled during this program supplied considerable hydrogeologic data to further refine the conceptual hydrogeologic model beneath the trichloroethylene (TCE)-impacted area.

## 3.1 Bedrock Stratigraphy and Structure

The permeability and direction of groundwater flow in the shallow aquifer beneath the TCE-impacted area of the chemical plant is partially controlled by the stratigraphy and structure of the uppermost bedrock formation, the Burlington Keokuk Limestone. Geologic data obtained during this drilling program confirmed earlier interpretation as to the stratigraphy and structure of this unit beneath the Raffinate Pit area.

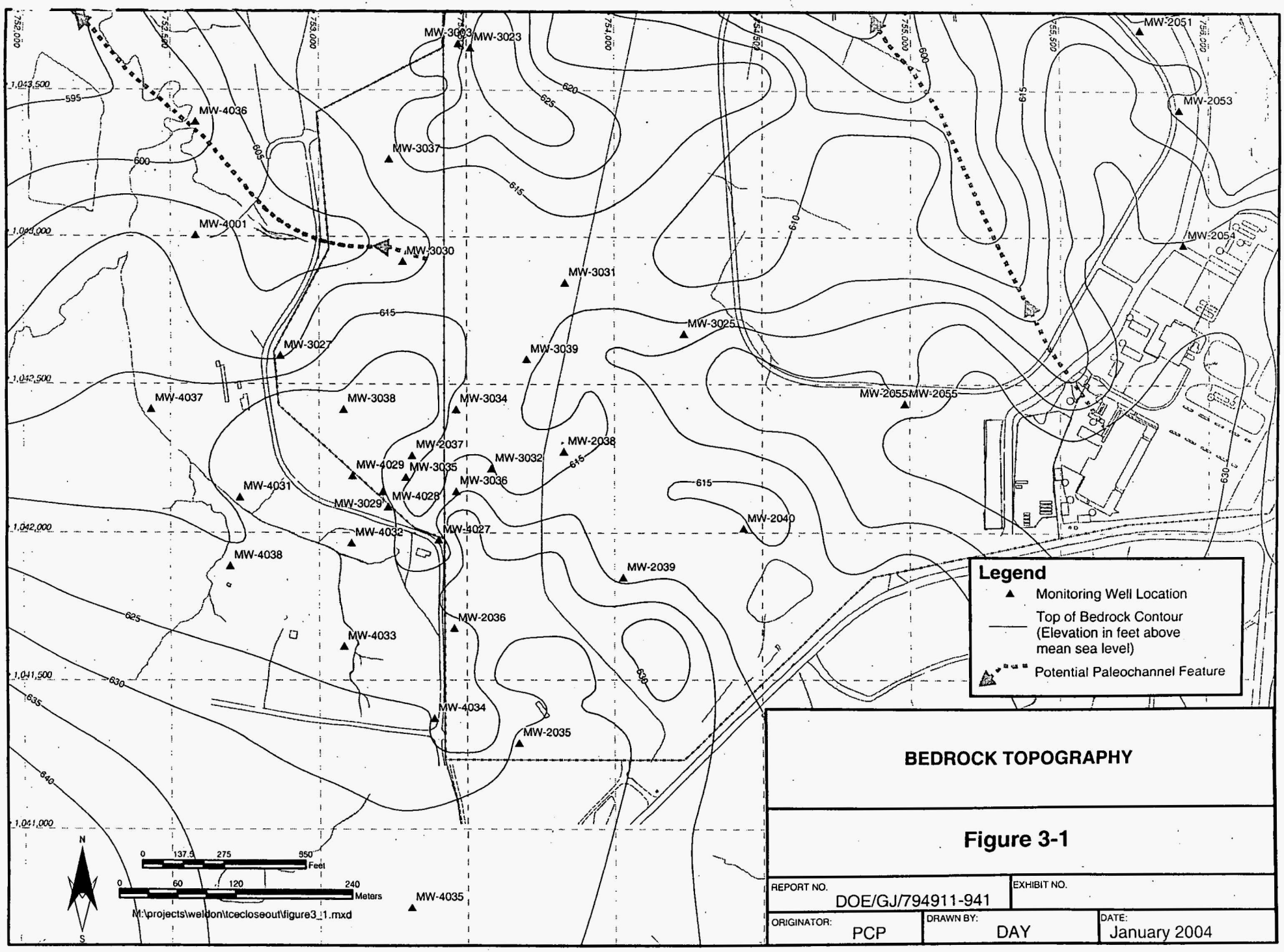
## 3.2 Stratigraphy

Previous subsurface investigations have divided the limestone bedrock into two units based primarily on the degree of weathering: the upper weathered unit and the lower unweathered unit. The weathered unit typically exhibits a strongly weathered subzone that shows a considerably higher degree of weathering and is commonly characterized by vuggy, weakly cemented chert breccia with minor limestone fragments in a sandy, clayey matrix (Ref. 5). This zone is qualitatively recognized as the strongly weathered subunit in this portion of the site and is generally found at the top of the weathered unit, but is sometimes evident deeper into the weathered unit. The strongly weathered unit is relatively discontinuous across the site and is very common in the bedrock lows, which generally exhibit a greater degree of weathering.

Hydrologic testing in the weathered and unweathered Burlington Keokuk generally shows higher hydraulic conductivity values in the weathered unit (Ref. 6). The strongly weathered subunit averaged still higher results than the weathered unit (Ref. 5). Decreased weathering, solution features, and fracture frequencies with depth support the hydraulic conductivity results.

## 3.3 Bedrock Structure

Drilling performed previously at the chemical plant and adjacent Weldon Spring Training Area (WSTA) has identified linear bedrock lows on the surface of the Burlington Keokuk Limestone (Ref. 6). These linear lows likely represent areas where greater erosion occurred on the ancient land surface forming drainages or paleochannels. The formation of the linear features is likely somewhat controlled by jointing and fracturing which allows the limestone rock to solution out. The TCE delineation boreholes supplied additional bedrock intercepts to refine the geomorphology of this surface. Figure 3-1 shows the latest bedrock topography in the vicinity of the TCE impacted area, incorporating all bedrock drilling to date. This surface was constructed using approximately 290 data points in the vicinity of the chemical plant.




**BEDROCK TOPOGRAPHY**

**Figure 3-1**

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| DOE/GJ/794911-941 | | |
| ORIGINATOR: PCP | DRAWN BY: DAY | DATE: January 2004 |

The north-oriented paleochannel in the raffinate pit area that has been the focus of attention in previous studies in this area is evident in the vicinity of MW-4027 and extends southward to well MW-4034 with a slope that flattens out between the two wells. A broader channel can be seen branching to the west- northwest from this north-oriented channel in the vicinity of well MW-4038.

Further north on the chemical plant site, well MW-3030 appears to be located at the head of a relatively significant paleochannel that continues to the northwest onto the WSTA. Well MW-4036 added greater definition to this bedrock low, which is roughly coincidental with the surface drainage in the same area.

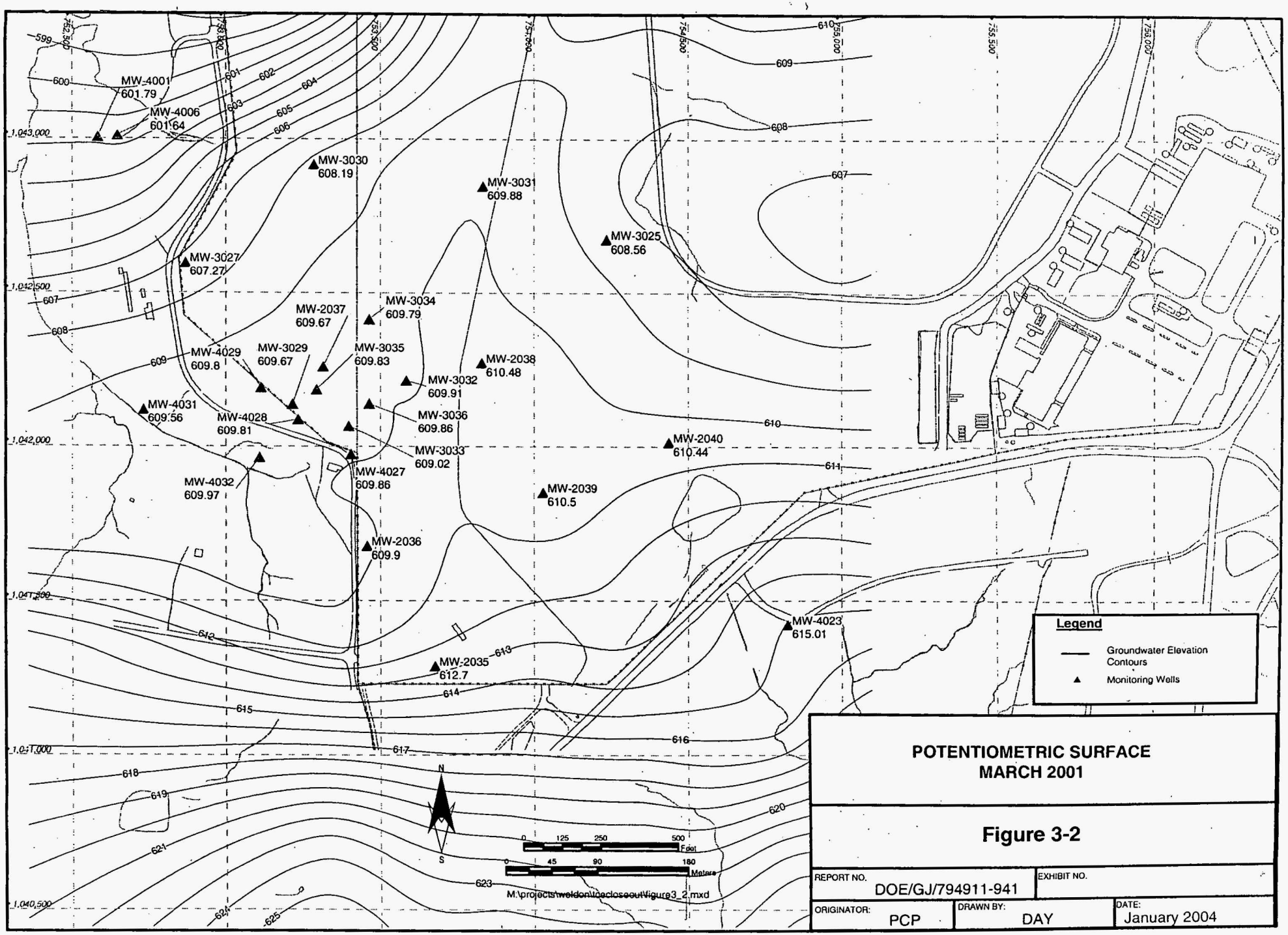
## 3.4 Water Levels

Water levels were measured in the TCE-impacted area in monitoring wells that were installed and available prior to the pumping test performed as part of the *Additional Groundwater Field Studies* (Ref. 4). Pre-pumping water levels were measured in wells installed as part of this effort in addition to previous wells, and are mapped on Figure 3-2. The general north to northwest flow direction is evident on the groundwater surface. Although not completely evident on the map, the data suggests control on the groundwater flow direction by the surface of the bedrock and the orientation of the paleochannels.

Figure 3-3 represents the combined water levels measured at the beginning of 2002. All of the TCE delineation wells installed during the field effort were included in the measurements reflected on the map, which represents the groundwater surface approximately a month after the recovery period for the pumping test ended. The flow direction and gradient is similar to the earlier map (Figure 3-2) although the water level elevations are almost uniformly lower for the latter period, by at least 0.5 ft. This may be the result of the extended pumping and groundwater withdrawal in the area and the limited recharge available. Water level data covering most of 2001 is provided in Appendix B for the wells installed during this project.

## 3.5 Packer Testing Results

During the drilling of each monitoring well, packer testing was performed in the limestone bedrock as the borehole advanced. Technical difficulties during testing invalidated the results in MW-3032; therefore, a rising and falling head test (slug test) was performed in the completed well. The calculated hydraulic conductivity (K) results from the testing are given below in Table 3-1. Hydraulic conductivity calculation sheets are also provided in Appendix A.




**POTENTIOMETRIC SURFACE**
**MARCH 2001**

**Figure 3-2**

| REPORT NO. | EXHIBIT NO. | |
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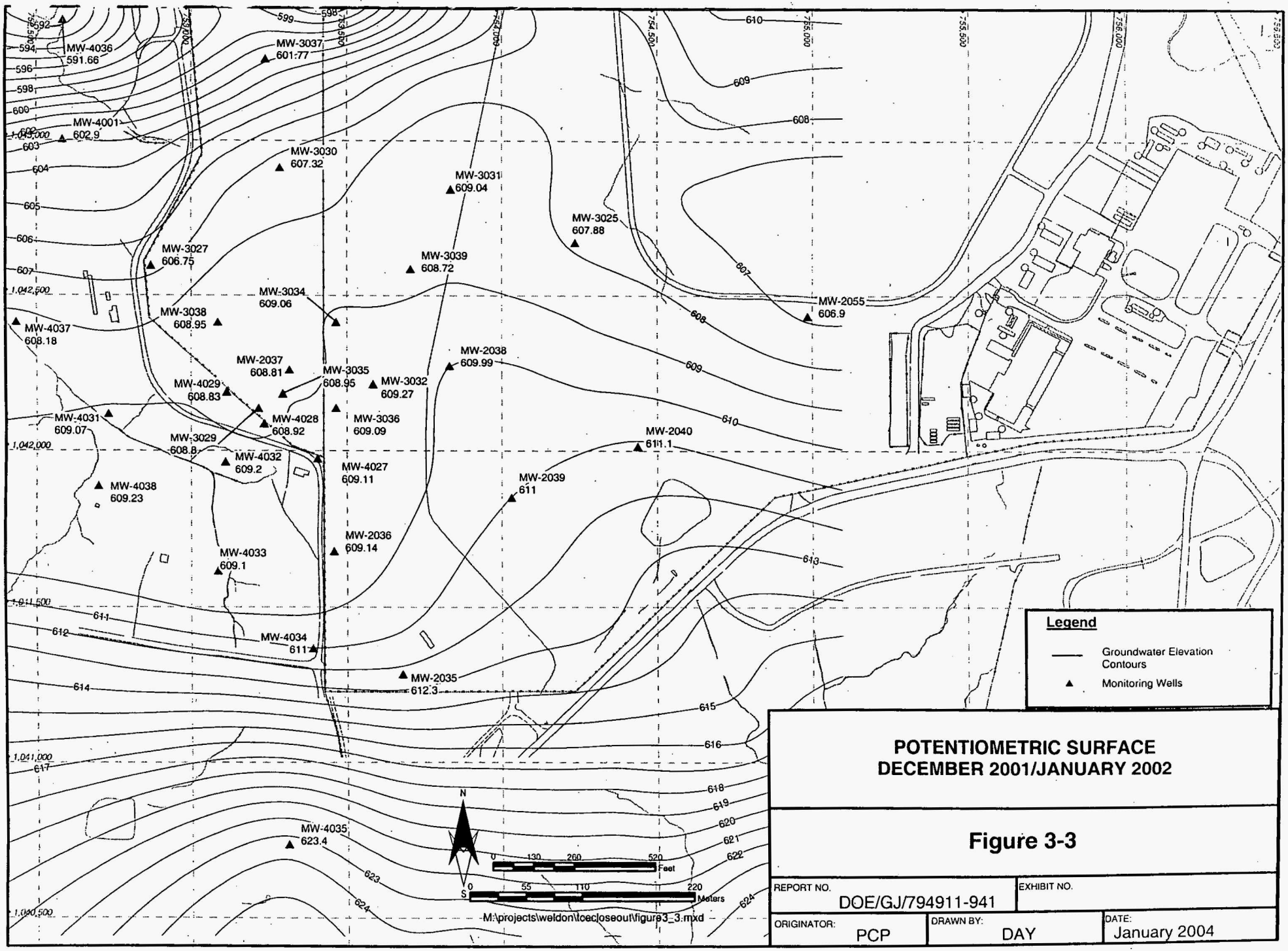
| ORIGINATOR: PCP | DRAWN BY: DAY | DATE: January 2004 |




**POTENTIOMETRIC SURFACE**
**DECEMBER 2001/JANUARY 2002**

**Figure 3-3**

| REPORT NO. | EXHIBIT NO. | |
|---|---|---|
| DOE/GJ/794911-941 | | |
| ORIGINATOR: PCP | DRAWN BY: DAY | DATE: January 2004 |

TABLE 3-1 SUMMARY OF PACKER TESTING RESULTS

| Well | Test Interval (ft. bgs) | Test Number | Test Pressure (psi) | K (cm/sec) | Average K (cm/sec) |
|---|---|---|---|---|---|
| MW-3030 | 35.5 – 41.0 | 1 | 10 | $1.6 \times 10^{-3}$ | $1.2 \times 10^{-3}$ |
| | | 2 | 20 | $1.0 \times 10^{-3}$ | |
| | | 3 | 35 | $5.9 \times 10^{-4}$ | |
| | | 4 | 10 | $1.7 \times 10^{-3}$ | |
| MW-3031 | 35.0-41.0 | 1 | 40 | 0.0 | No Take |
| | 39.0-46.0 | 1 | 45 | 0.0 | No Take |
| MW-3032 | Rising and Falling Head Test (Slug Test) | | | | $5.0 \times 10^{-4}$ |
| MW-3037 | 27.0-37.0 | 1 | 10 | $2.6 \times 10^{-5}$ | $1.2 \times 10^{-4}$ |
| | | 2 | 20 | $1.1 \times 10^{-4}$ | |
| | | 3 | 30 | $1.7 \times 10^{-4}$ | |
| | | 4 | 10 | $1.7 \times 10^{-4}$ | |
| | 34.0-44.0 | 1 | 15 | Unreliable | $1.1 \times 10^{-4}$ |
| | | 2 | 30 | $9.6 \times 10^{-5}$ | |
| | | 3 | 45 | $1.5 \times 10^{-4}$ | |
| | | 4 | 20 | $9.1 \times 10^{-5}$ | |
| | 44.0-51.0 | 1 | 20 | $6.3 \times 10^{-5}$ | $7.9 \times 10^{-5}$ |
| | | 2 | 30 | $6.5 \times 10^{-5}$ | |
| | | 3 | 45 | $1.1 \times 10^{-4}$ | |
| | | 4 | 20 | No take | |
| MW-3038 | 36.0-44.2 | 1 | 10 | $2.8 \times 10^{-5}$ | $1.6 \times 10^{-5}$ |
| | | 2 | 20 | $1.1 \times 10^{-5}$ | |
| | | 3 | 30 | $1.7 \times 10^{-5}$ | |
| | | 4 | 10 | $8.9 \times 10^{-6}$ | |
| | 44.0-58.2 | 1 | 20 | $2.2 \times 10^{-5}$ | $2.5 \times 10^{-5}$ |
| | | 2 | 30 | $2.7 \times 10^{-5}$ | |
| | | 3 | 40 | $2.9 \times 10^{-5}$ | |
| | | 4 | 20 | $2.0 \times 10^{-5}$ | |
| MW-3039 | 36.0-43.3 | 1 | 15 | $2.6 \times 10^{-4}$ | $4.7 \times 10^{-4}$ |
| | | 2 | 25 | $4.4 \times 10^{-4}$ | |
| | | 3 | 35 | $5.6 \times 10^{-4}$ | |
| | | 4 | 15 | $6.3 \times 10^{-4}$ | |
| | 43.0-52.0 | 1 | 15 | $1.1 \times 10^{-5}$ | $3.0 \times 10^{-5}$ |
| | | 2 | 30 | $2.1 \times 10^{-5}$ | |
| | | 3 | 50 | $5.0 \times 10^{-5}$ | |
| | | 4 | 15 | $3.6 \times 10^{-5}$ | |
| MW-4031 | 19.0-29.0 | 1 | 15 | $5.6 \times 10^{-4}$ | $6.7 \times 10^{-4}$ |
| | | 2 | 25 | $6.9 \times 10^{-4}$ | |
| | | 3 | 35 | $6.7 \times 10^{-4}$ | |
| | | 4 | 15 | $7.5 \times 10^{-4}$ | |
| | 24.0-34.0 | 1 | 50 | 0.0 | No Take |
| MW-4033 | 36.0-47.0 | 1 | 10 | $1.5 \times 10^{-4}$ | $1.3 \times 10^{-4}$ |
| | | 2 | 20 | $1.2 \times 10^{-4}$ | |
| | | 3 | 30 | $1.1 \times 10^{-4}$ | |
| | | 4 | 10 | $1.5 \times 10^{-4}$ | |
| MW-4034 | 40.0-52.0 | 1 | 10 | $4.3 \times 10^{-6}$ | $1.6 \times 10^{-6}$ |
| | | 2 | 20 | $5.6 \times 10^{-7}$ | |
| | | 3 | 30 | $7.0 \times 10^{-7}$ | |
| | | 4 | 10 | $6.9 \times 10^{-7}$ | |
| MW-4035 | 44.3-57.3 | 1 | 20 | $5.8 \times 10^{-5}$ | $6.6 \times 10^{-5}$ |
| | | 2 | 30 | $6.0 \times 10^{-5}$ | |
| | | 3 | 45 | $6.7 \times 10^{-5}$ | |
| | | 4 | 20 | $8.0 \times 10^{-5}$ | |

| Well | Test Interval (ft. bgs) | Test Number | Test Pressure (psi) | K (cm/sec) | Average K (cm/sec) |
|---|---|---|---|---|---|
| MW-4036 | 26.0-36.0 | 1 | 10 | 0.0 | No take |
| | | 2 | 20 | 0.0 | |
| | | 3 | 25 | 0.0 | |
| MW-4037 | 17.0-24.5 | 1 | 10 | $1.3 \times 10^{-3}$ | $1.8 \times 10^{-3}$ |
| | | 2 | 15 | $2.0 \times 10^{-3}$ | |
| | | 3 | 20 | $1.9 \times 10^{-3}$ | |
| | | 4 | 10 | $1.9 \times 10^{-3}$ | |
| | 24.0-31.0 | 1 | 10 | $2.2 \times 10^{-3}$ | $1.9 \times 10^{-3}$ |
| | | 2 | 20 | $1.8 \times 10^{-3}$ | |
| | | 3 | 25 | $1.7 \times 10^{-3}$ | |
| | | 4 | 10 | $1.8 \times 10^{-3}$ | |
| MW-4038 | 19.0-29.2 | 1 | 10 | Not reliable | $2.3 \times 10^{-3}$ |
| | | 2 | 15 | $2.2 \times 10^{-3}$ | |
| | | 3 | 20 | $2.2 \times 10^{-3}$ | |
| | | 4 | 10 | $2.4 \times 10^{-3}$ | |
| | 29.0-39.2 | 1 | 20 | 0.0 | No take |
| | | 2 | 30 | 0.0 | |
| | | 3 | 40 | 0.0 | |
| | | 4 | 50 | 0.0 | |

Note: bgs = below ground surface

The results from the packer testing followed trends noted from previous testing at the site such as decreasing permeability with depth and the highest permeability resident in the strongly weathered portion of the Burlington Keokuk Limestone. The 19.0 to 29.2 ft test interval in MW-4038 exhibited the highest measured hydraulic conductivity (K) of the packer testing with an average K of $2.3 \times 10^{-3}$ cm/sec. This well is located southwest of the site boundary in the WSTA in a surface drainage. The strongly weathered unit of the Burlington Keokuk Limestone was interpreted to be from 27.1 ft to the bottom of this well, with the weathered portion located higher in the section. It is interesting that the second tested interval (in the strongly weathered subunit) from 29.0 to 39.2 ft. had no take at all, showing a somewhat atypical correlation of the unit and it's permeability. Well MW-4037 further down the drainage also exhibited high hydraulic conductivity results from the packer testing throughout the borehole.

In addition to the lower tested zone in MW-4038, three other wells (MW-3031, MW-4031, and MW-4036) had zones that would not take any injected water at test pressures below that which would hydro-fracture the rock. This indicates a K less than $10^{-7}$ cm/sec in these sections. The lowest measured K was in the 40 to 52 ft. interval in well MW-4034 with an average K of $1.6 \times 10^{-6}$ cm/sec measured in what appeared to be a strongly weathered portion of the bedrock. At this well the zone may have exhibited a clay-rich matrix in the chert breccia which can result in a low measured hydraulic conductivity even though the bedrock is strongly weathered. This same phenomenon has been previously observed in other wells in the raffinate pit area.

# 4.0 ANALYTICAL DATA

## 4.1 Soil

Analytical results from soil sampling during the drilling of monitoring well MW-4035 revealed only low detections of two volatile organic compounds, acetone and methylene chloride. One sample at 0 to 2 ft below ground surface exhibited 11-µg/kg acetone. Methylene chloride however, was detected in low concentrations in most of the soil samples, at concentrations ranging from 5 to 23 µg/kg. This may indicate that there were historically industrial uses of solvents in this area that were either leaked or spilled, but does not constitute a source for groundwater contamination. Alternatively, both of these compounds are common laboratory contaminants and may indicate laboratory contamination of the samples. No detectable concentrations of trichloroethylene (TCE), tetrachloroethylene (PCE), or 1,2-dichloroethylene (DCE) were observed in the soil samples. Results for only detected parameters are presented at the beginning of Appendix C.

## 4.2 Groundwater

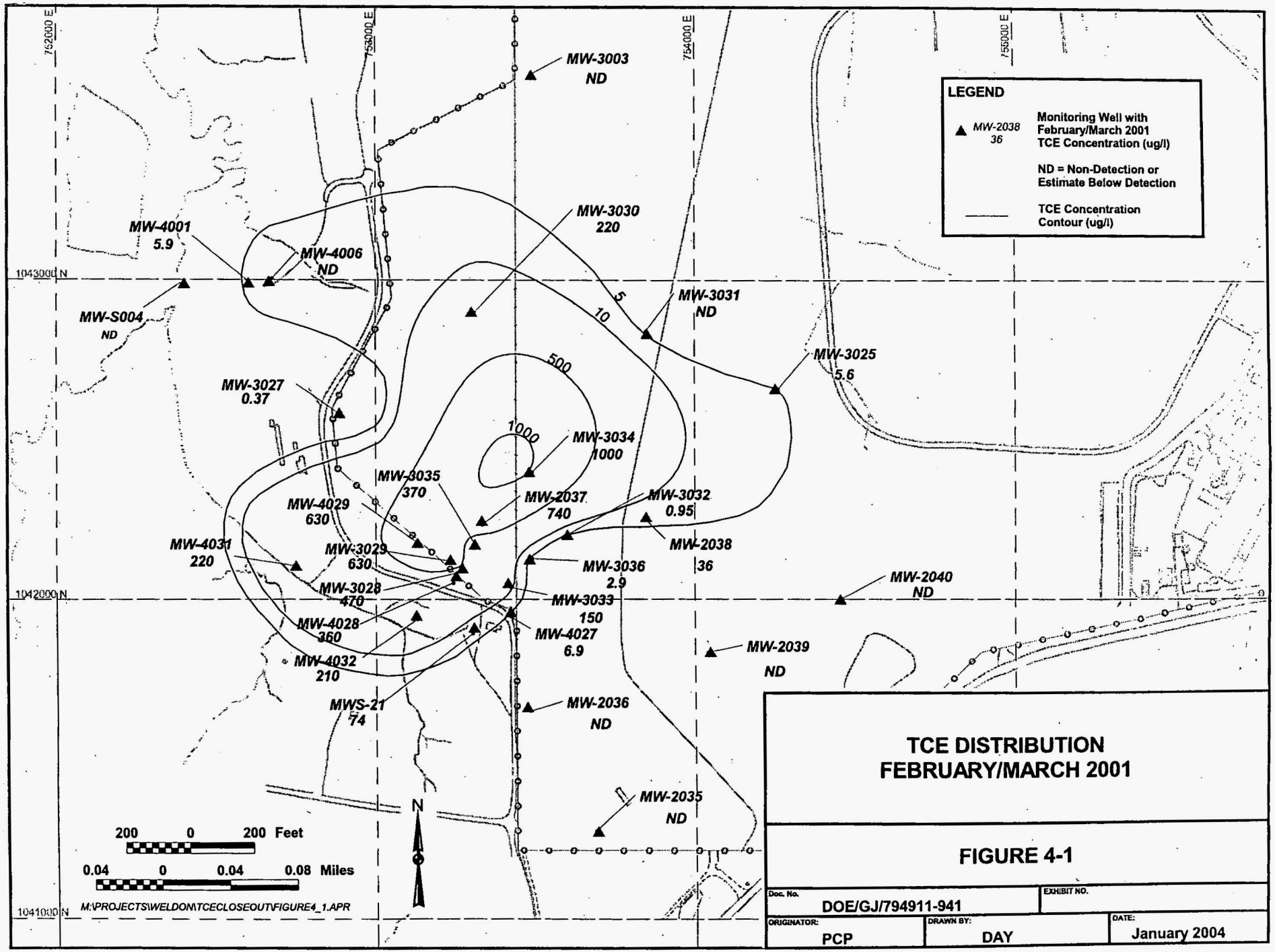
Sampling was performed in the TCE impacted area in March 2001 utilizing some of the first wells installed as part of this study. As the wells were installed and brought online, they were added to the sampling program in the TCE impact area. They were also sampled as part of the additional groundwater field studies conducted from early March to November 2001 (Ref. 6). Sampling was again conducted after the pumping test was completed and the groundwater had approached pre-pumping levels. More wells were available for the later sampling event. Although the wells were sampled for many organic and inorganic constituents, results for volatile organic compounds, particularly TCE, are presented and discussed in this report.

Wells were sampled for volatile organics including TCE, PCE, and 1,2-DCE. For the sampling period of February 2001 through March 2002, TCE concentrations ranged from detection to 1000 µg/L. This high concentration was exhibited briefly in well MW-3034 in March 2001. PCE concentrations ranged up to 12.5 µg/L also in well MW-3034. DCE occurrences ranged from detection to 18 µg/L in well MW-3030 in January 2002. Analytical results from sampling groundwater for volatile organic compounds are provided in Appendix C.

## 4.3 TCE Distribution

The distribution of TCE in groundwater in the impacted area was further defined as a result of this study. The additional wells accomplished the goal of monitoring areas both on and off site that were lacking coverage.

Figure 4-1 illustrates the TCE distribution interpreted from monitoring well sampling performed in February and March 2001. The area of greatest concentration is in well MW-3034 that was installed for the additional groundwater field studies (Ref. 4). This well showed significant permeability during drilling and also produced water during development. The



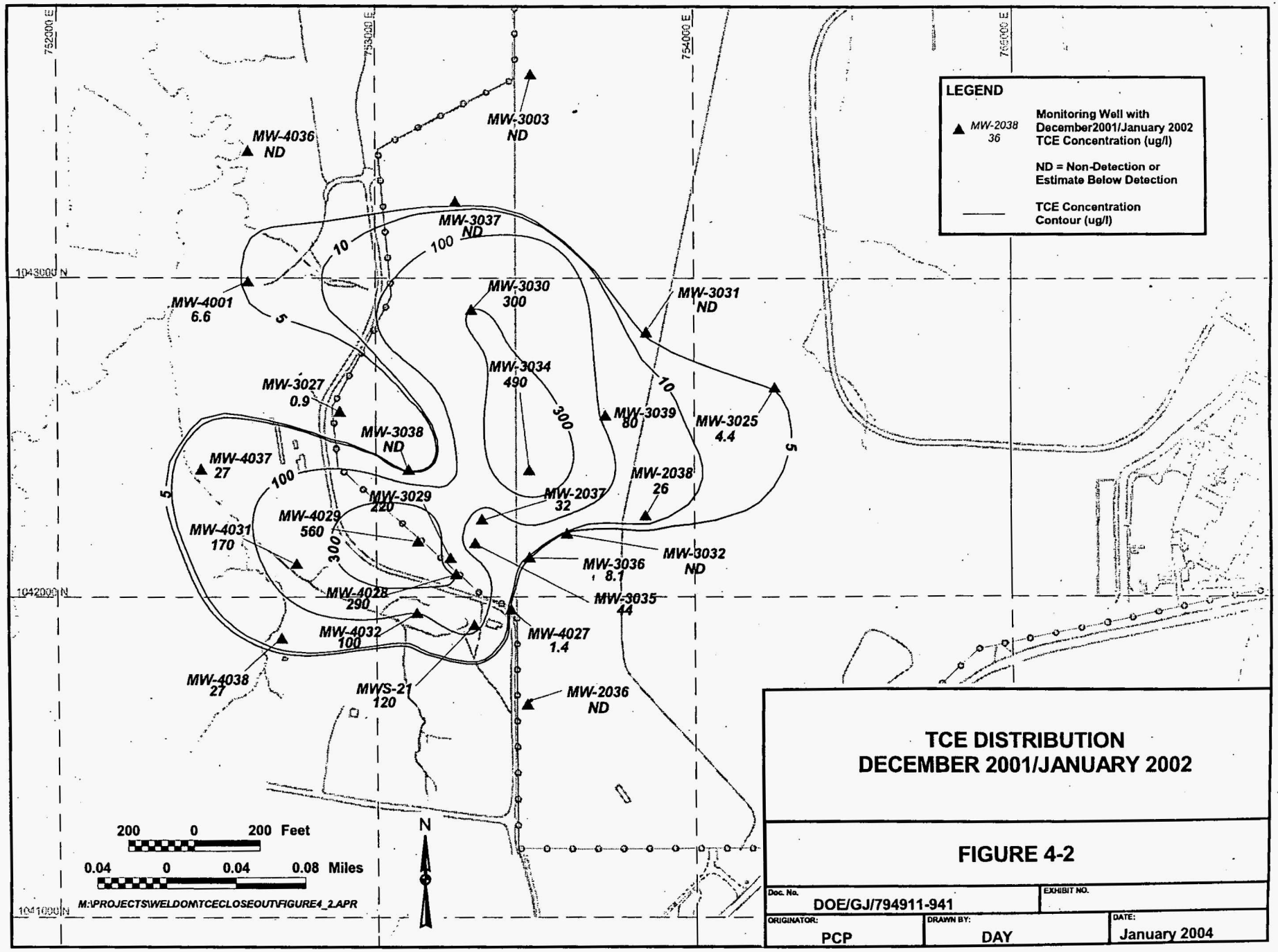

# TCE DISTRIBUTION FEBRUARY/MARCH 2001

## FIGURE 4-1

| Doc. No. | EXHIBIT NO. | |
|---|---|---|
| DOE/GJ/794911-941 | | |
| ORIGINATOR: PCP | DRAWN BY: DAY | DATE: January 2004 |

TCE plume is centered on what was historically the southwest end of Raffinate Pit 4, and the higher concentrations are primarily resident in the bedrock lows within this area.

The effects of groundwater pumping during the *Additional Groundwater Field Studies* (Ref. 4) can be seen in the TCE distribution mapped from data collected from December 2001 through January 2002 (Figure 4-2). Overall, the concentrations are lower in the wells and show a northeast-southwest oriented split in the highest concentration contour area, which is the result of injecting potable water into MW-2037 and MW-3032 during the field studies. The overall shape of the plume is similar to the March 2001 plume; however, the addition of the last six wells installed in support of this investigation has provided a better control on the lateral delineation to the south and west. The highest concentration has shifted southwest from MW-3034 to MW-4029.




# TCE DISTRIBUTION DECEMBER 2001/JANUARY 2002

## FIGURE 4-2

| Doc. No. | EXHIBIT NO. | |
|---|---|---|
| DOE/GJ/794911-941 | | |
| ORIGINATOR: PCP | DRAWN BY: DAY | DATE: January 2004 |

# 5.0 QUALITY CONTROL

Data evaluation was performed on the analytical data generated from this field study to determine whether Weldon Spring Site Remedial Action Project (WSSRAP) data quality objectives were met and to ensure overall data quality results were generated. Data evaluation was performed in accordance with *Environmental Quality Assurance Project Plan* (Ref. 7). The data evaluation process was completed through data verification, data review, data validation, and data management activities.

## 5.1 Data Evaluation

Data verification was conducted in accordance with the sampling plans (Ref. 2), to ensure that documentation and data were reported in compliance with established reporting requirements and standard operating procedures, and to ensure that all analyses were performed. Analytical results received from the laboratory were reviewed to verify samples were properly handled according to WSSRAP protocol. The following factors were reviewed and evaluated: sample identification, chain-of-custody, holding times, sample preservation requirements, sample analysis request forms, laboratory tracking, data reporting requirements, and the database transfer.

Data packages were reviewed to ensure the final data were properly identified, analyzed, reported, and met data quality requirements. The data were also reviewed to check for inconsistencies with the field quality control samples. Final analytical results were compared to the preliminary analytical results to identify any changes in data.

## 5.2 Quality Control Analyses

The *Raffinate Pit Area Groundwater Investigation Sampling Plan* (Ref. 2) indicated that quality control samples would be taken at a frequency of 1 per 20 samples or 5%. Quality control samples included field replicates (FR), matrix spikes (MS), and matrix spike duplicates (MD). These QC samples were analyzed for volatile organic compounds. Although the quality analyses were not run on separate samples, the quality control sample frequency requirement (5%) was satisfied.

Field replicates are split from the parent sample in the field and submitted to the same laboratory as the parent sample. The field replicate results are compared to the parent sample and the relative percent difference (RPD) is calculated. The recommended RPD for chemical parameters is less than or equal to 35%. RPDs are not calculated for "non-detect" results. Also, if one or both of the results are less than five times the detection limit, the RPD value is considered of limited value due to higher tolerance limits near the analytical detection limit. Sixteen (16) field replicates were analyzed for volatile organics during this study. Recoveries and RPD values for these samples are provided in Appendix D.

Matrix spikes are sample aliquots split by the laboratory that are treated in the same manner as the parent samples except these samples have been spiked with a known amount of the target analytes to determine the precision of the method in a given sample type or matrix.

The samples are processed as regular samples and a percent recovery is determined after analysis. Matrix spike duplicates are split samples of the matrix spike samples that are treated in the same manner as the matrix spike parent samples. A percent recovery is determined after the analysis as well as the RPD between the MS and MD. One hundred and seventy (170) matrix spike and matrix spike duplicate samples were analyzed for volatile organic compounds for this study. The percent recovery values are provided in Appendix D.

# 6.0 SUMMARY AND CONCLUSIONS

## 6.1 Summary

Core drilling, well installation, hydraulic conductivity testing, and groundwater sampling were conducted in the Raffinate Pit Area where trichloroethene (TCE) has impacted the groundwater. The installation of thirteen TCE delineation wells commenced on Jan 2, 2001 and was completed on October 26, 2001. The wells were installed in three stages, both on the chemical plant site and on the adjacent Weldon Spring Training Area (WSTA) property. Each stage was required to provide additional monitoring in areas both on and off site that lacked groundwater quality data.

Groundwater sampling was performed as the monitoring wells were completed and developed. Analytical results showed TCE concentrations up to 1000 μg/L in the raffinate pit area. Analytical results from wells installed during this program were also used to evaluate the effectiveness of a groundwater extraction system that was tested coincidental with the well installations.

The distribution of TCE in groundwater in the impacted area was further defined as a result of this study. The TCE plume is centered on what was historically the southwest end of Raffinate Pit 4, and the higher concentrations are primarily resident in the bedrock lows within this area. The horizontal extent of TCE impact in the weathered Burlington-Keokuk has been better defined through the installation of these wells. The effects of potable water injection during the *Additional Groundwater Field Studies* (Ref. 4) were evident in the TCE plume following the field studies.

## 6.2 Conclusions

The objectives for the Raffinate Pit Area groundwater investigation program were accomplished. The program provided significant additional geologic, hydrologic, and water quality data in the vicinity of the site impacted by TCE in groundwater. The areal extent of TCE impact on the groundwater south and southwest of the Raffinate Pit Area was better defined through the installation and sampling of the additional monitoring wells. Furthermore, the hydrogeologic and analytical data has provided an increased understanding of how the natural setting beneath the site controls the contaminant migration and fate.

## 7.0 REFERENCES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2. MK-Ferguson Company and Jacobs Engineering Group. *Raffinate Pit Area Groundwater Investigation Plan.* Rev. 0, *Addendum 1: Off-Site Groundwater Investigation, and Addendum 2: Additional TCE Delineation.* DOE/OR/21548-881. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles MO. February 2001.

3. U.S. Department of the Interior, Bureau of Reclamation. Ground Water Manual, A Water Resources Technical Publication, 1977.

4. MK-Ferguson and Jacobs Engineering Group. *Completion Report for the Additional Groundwater Field Studies in Support of the Groundwater Operable Unit,* Rev. 0. DOE/OR/21548-920. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office, St. Charles, MO, March 2002.

5. Mugel, D.N., *Geohydrology of the Weldon Spring Ordnance Works, St. Charles County, Missouri,* USGS Water-Resources Investigations Report 96-4171, prepared in cooperation with the U.S. Army Corps of Engineers, Rolla, Mo.

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7. MK-Ferguson Company and Jacobs Engineering Group. *Environmental Quality Assurance Project Plan.* Rev. 5. DOE/OR/21548-352. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office, St. Charles, MO. November 2000.

# APPENDIX A

Borehole Logs
Monitoring Well Details
Packer Test Field Sheets
Monitoring Well Development Forms

# WELDON SPRING SITE REMEDIAL ACTION PROJECT

# BOREHOLE AND WELL COMPLETION LOG

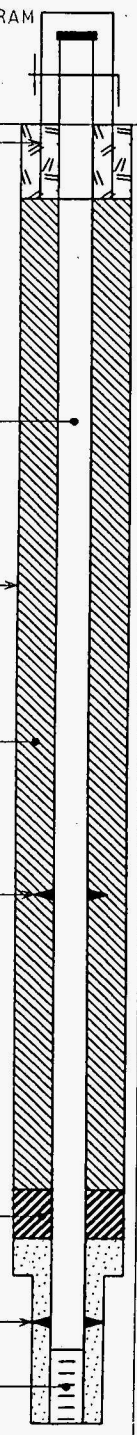
WSWLOG-C

| | | | |
|---|---|---|---|
| HOLE NUMBER | MW-3030 | | |
| SHEET 1 OF 2 | | | |
| NORTH (Y): | 1042899.86 | | |
| EAST (X): | 753299.93 | | |
| TOC ELEVATION | 634.32 | | |
| GROUND ELEVATION | 631.84 | | |
| STICKUP | 2.48 | | |
| HYDR CONDUCTIVITY (cm/sec) | K= 1.6E-3 | | |
| WELL STATUS/COMMENTS | ACTIVE | LOCATION | WEST OF THE DISPOSAL CELL |
| DRILLING CONTRACTOR | LAYNE WESTERN Inc. | DRILL RIG MAKE & MODEL | CME-750 HSA/NXWL; I-R TH-60 AIR ROTARY |
| HOLE SIZE & METHOD | 11" HSA-31; NX-41; 6" AIR-38 | ANGLE FROM HORIZONTAL & BEARING | Vertical |
| DRILL FLUIDS & ADDITIVES | Water core; Air ream | CASING TYPE, DEPTH, SIZE | 2" 316 SS Mon. Well |
| DATE START | 1-11-01 | DATE FINISH | 1-13-01, Mon. Well |
| DEPTH (FT.) FROM GROUND ELEV. TO: BOTTOM OF HOLE (TD) | 41.0 | BEDROCK | 24.0 |
| WATER LEVELS & DATES | | | |

LITHOLOGY BY ALAN BENFER

| DEPTH feet | SAMPLE/RUN Number | PERCENT Recovery | N# or RQD | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT |
|---|---|---|---|---|---|---|
| | SPT-1 | | 18 | FILL | CLAY, medium to high plasticity, trace fine gravel, some roots, tan to dark gray, moist, hard, CL-CH. Fill | Fill |
| | SPT-2 | | 9 | | CLAY as above, minor fine gravel, mostly dark brown, firm. Fill | |
| | SPT-3 | | 9 | | FILL as above. | |
| 5 | SPT-4 | | 8 | | | |
| | SPT-5 | | 7 | CH | CLAY, high plasticity, trace fine sand, mottled dark yellow brown and light gray, moist, soft, CH. Ferrelview Clay. | Qfv |
| 10 | SPT-6 | | 10 | | @ 8.0'-10.0'. CH as above, with abundant carbonized organics, mostly yellow brown. | |
| | SPT-7 | | 12 | CH | CH as above, with carbonized organics and MmOx. Ferrelview Clay. | |
| | SPT-8 | | 12 | | CLAY, high plasticity, minor fine sand, trace fine gravel, with black MnOx, yellow brown and light gray, moist, firm, CH. Clay Till. | Qct |
| 15 | SPT-9 | | 19 | | CH as above, ~10% fine sand, trace fine gravel, MnOx, light gray, vertical fracture. | |
| | SPT-10 | | 10 | CH | No recovery. | |
| 20 | SPT-11 | | 10 | CL | CLAY, high plasticity, some MnOx, no sand or gravel, mottled light gray and yellow brown, moist, firm, CH. Clay Till. | |
| | SPT-12 | | 70 | CH | CLAY, silty, low plasticity, trace fine sand, mottled yellow, orange brown and light gray, moist, firm, CL. Clay Till. | |
| | SPT-13 | | 50+ | LMS CHRT | CLAY, high plasticity, ~40% chert and weathered limestone gravel, light gray to orange brown, moist, very hard, CH. Probable Residuum. | pPr |
| 25 | SPT-14 | | 57 | | CHERT, and highly weathered limestone, light gray and strong yellow brown. | |
| | SPT-15 | | 41 | | Chert and limestone as above. | |
| | SPT-16 | | 50+ | | LIMESTONE, highly weathered, dark yellow brown, some chert, highly broken, WET, hard. | |
| 30 | NX-1 | 32/60" | 32 | LMS CHRT | LIMESTONE AND CHERT as above, totally fractured and weathered, light gray and pretty yellow brown, WET. | Mbksw |
| | | | | | At 31.0', switched to NX core, not auger refusal. | |
| 35 | | | | | LIMESTONE AND CHERT, ~ 50% each, chert is disseminated throughout as irregular masses, light bluish gray (5B7/1), limestone is strongly weathered, contains abundant tiny specks of MnOx throughout, is dark yellowish orange (10YR6/6), moderately hard. 2 to 4 fractures per foot; open and eroded, ~75% fluid return, Strongly Weathered. Burlington-Keokuk Limestone. | |

WELL DIAGRAM




ELEVATION feet: 630, 625, 620, 615, 610, 605, 600

Sample Interval | No Sample Taken | minimum | maximum | average

# WELDON SPRING SITE REMEDIAL ACTION PROJECT

## BOREHOLE AND WELL COMPLETION LOG

WSWLOG-C

HOLE NUMBER: MW-3030

SHEET 2 OF 2

NORTH (Y): 1042899.86

EAST (X): 753299.93

WELL STATUS/COMMENTS: ACTIVE

LOCATION: WEST OF THE DISPOSAL CELL

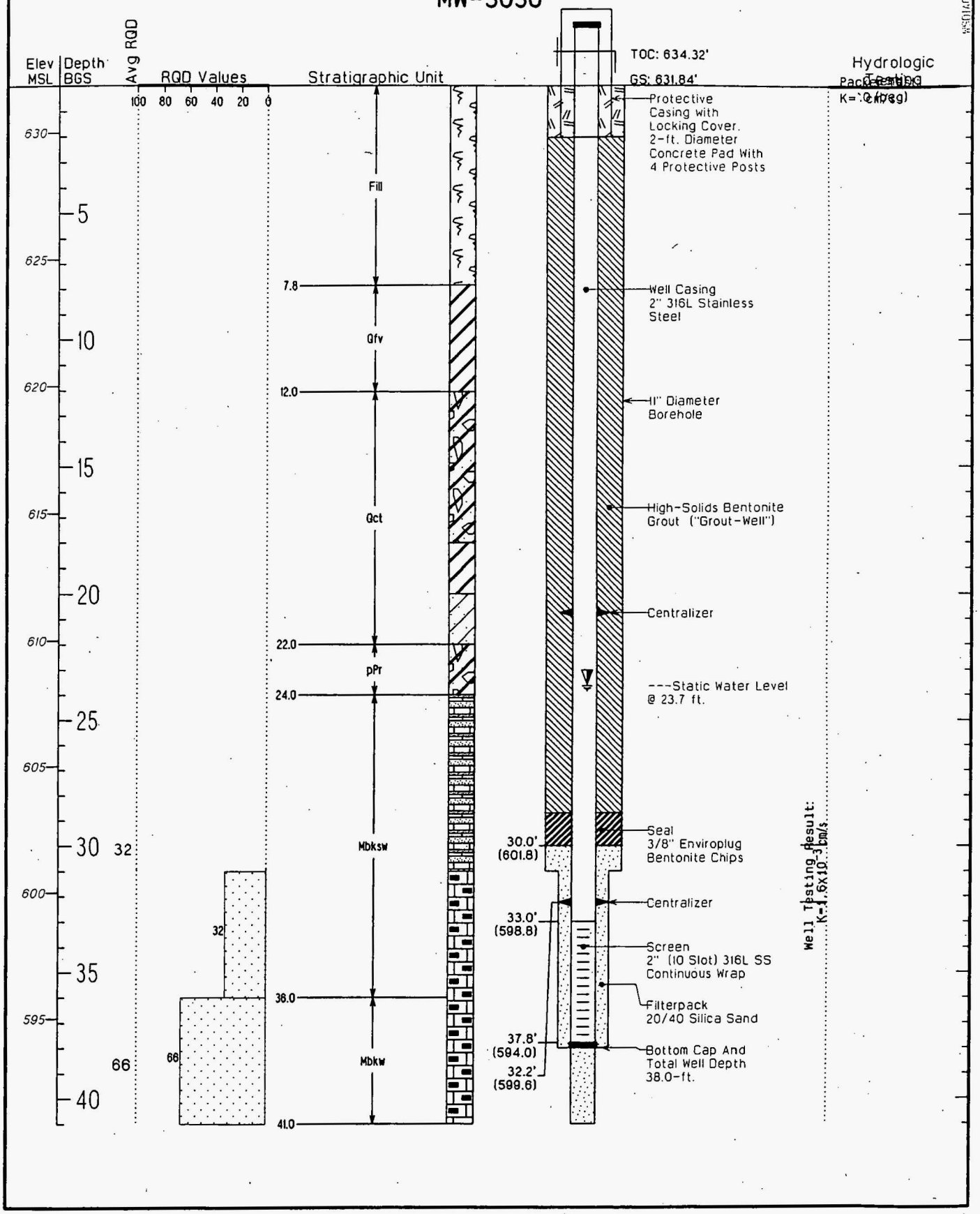
| DEPTH feet | SAMPLE | SAMPLE/RUN Number | PERCENT Recovery (0–100) | N# or ROD | GRAPHIC LOG | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT | WELL DIAGRAM | ELEVATION feet |
|---|---|---|---|---|---|---|---|---|---|---|
| 40 | | NX-2 | 56/60" | 66 | | LMS CHRT | LIMESTONE AND CHERT as above, limestone is moderately weathered, less than NX-1, MnOx specks decreasing with depth, a few zones of interbedded chert, 2-4 inches thick. Zero to 4+ fractures per foot, tighter than above. Nearly full fluid return. Weathered Burlington- Keokuk Limestone. | Mbksw, Mbkw | Filterpack 20/40 Silica Sand; Bottom Cap And Total Well Depth 38.0-ft. | 595 |
| | | | | | | | Total cored depth 41.0', 1-12-01. Hole reamed to 6" diameter to 38.0' and a 2" monitoring well was constructed. | | 3" Core Hole to 41.0 feet. | 590 |
| 45 | | | | | | | PACKER TEST RESULTS INVALID<br>ESTIMATED HYDRAULIC CONDUCTIVITY<br>1.6E-3 cm/sec, 31.0 to 41.0-ft. | | | 585 |
| 50 | | | | | | | | | | 580 |
| 55 | | | | | | | | | | 575 |
| 60 | | | | | | | | | | 570 |
| 65 | | | | | | | | | | 565 |
| 70 | | | | | | | | | | 560 |
| 75 | | | | | | | | | | |

Sample Interval ☐ No Sample Taken ▽minimum ▼maximum ▽average

# BOREHOLE DIAGRAM



## MW-3030




minimum maximum average

A1

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

# PRESSURE TEST RESULTS (FIELD)

$K = 1.2 \times 10^{-3}$

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| TCE G.W. - Contam. Near TSA | WP487A Task 8 | 35.5' to 41.0' | 3030 |

| Test Equipment Identification | BORE HOLE Orientation: | BORE HOLE Size: | Test By: |
|---|---|---|---|
| Carlon water flow meter<br>US Gauge | Vertical | 3.0" | A. Benfer<br>Date: 0915 1/13/01 |

| Packers | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| On Casing<br>Single/Double<br>Hydraulic/Inflatable | ~27' Ft. | 3.0' Ft. | Inlet 4.6'<br>27 + 4.6 = 31.6 Ft. |

1" exit hose length 5'
4.6' stickup - 1.6' above pressure gauge

**TEST 1** Inflow pressure ($H_P$) 10 psi × 2.31 = 23.1 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 331.0 | 342.6 | 354.3 | 366.2 | 378.0 | 390.8 | 401.9 | 413.6 | | | | 11.8 GPM<br>CFM |
| Take Per Min. | 11.6 | 11.7 | 11.9 | 11.8 | 12.0 | 11.9 | 11.7 | | | | | CFM × 7.48 – GPM |

378.0 ECC 1/13/01

| Total Head ($H_T$) | = | Gravity Head ($H_G$) | + | Pressure Head ($H_P$) | – | Head Losses ($H_L$) |
|---|---|---|---|---|---|---|
| 54.7 FT. | = | 31.6 FT. | + | 23.1 FT. | – | — FT. |

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{11.8}{54.7 \times 5.5} \times .011 \ln \frac{5.5}{0.125} = K, CM/SEC\ 1.63 \times 10^{-3}$$

0.0392 .04163 202.85

(Q/(H_T*L)) * (.011*(LN(L/r)))

**TEST 2** Inflow pressure ($H_P$) 20 psi × 2.31 = ____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 447.0 | 457.4 | 468.0 | 478.4 | 489.9 | 499.4 | | | | | | 10.48 GPM<br>CFM |
| Take Per Min. | 10.4 | 10.6 | 10.4 | 10.5 | 10.5 | | | | | | | |

| $H_T$ | = $H_G$ | + $H_P$ | – $H_L$ |
|---|---|---|---|
| 77.8 FT. | 31.6 FT. | 46.2 FT. | — FT. |

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{10.48}{77.8 \times 5.5} \times .011 \ln \frac{5.5}{.125} = K, CM/SEC\ 1.02 \times 10^{-3}$$

.0246 .04163

**TEST 3** Inflow pressure ($H_P$) 35 psi × 2.31 = ____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 511.0 | 519.9 | 528.6 | 537.2 | 546.1 | 554.9 | 563.8 | | | | | 8.8 GPM<br>CFM |
| Take Per Min. | 8.7 | 8.9 | 8.6 | 8.9 | 8.8 | 8.9 | | | | | | |

| $H_T$ | = $H_G$ | + $H_P$ | – $H_L$ |
|---|---|---|---|
| 112.45 FT. | 31.6 FT. | 80.85 FT. | — FT. |

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{8.8}{112.45 \times 5.5} \times .011 \ln \frac{5.5}{.125} = K, CM/SEC\ 5.92 \times 10^{-4}$$

.01423

A2

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| TCE G.W. contamination Near TSA | W.P. 4874, Task 8 | 35.5 to 41.0 | 30 30 |

| Test Equipment Identification | BORE HOLE Orientation: | BORE HOLE Size: | Test By: |
|---|---|---|---|
| Carlon flow meter U.S. Gauge. | Vertical | 3.0" | A. Benfer |
| | | | Date: 1/13/01 |

| Packers | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| On Casing Single/Double Hydraulic/Inflatable | ~ 27 Ft. | 3.0 Ft. | 31.6 Ft. |

**TEST ~~1~~ 4** Inflow pressure ($H_P$) 10 psi × 2.31 = 23.1 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 601.0 | 613.1 | 625.1 | 637.2 | 649.4 | | | | | | | 12.1 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | 12.1 | 12.0 | 12.1 | 12.2 | | | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

54.7 FT. = 31.6 FT. + 23.1 FT. – — FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{12.1}{53.1 \times 5.5} \times .011 \ln \frac{5.5}{.125} = K, CM/SEC\ 1.7 \times 10^{-3}$$

.04143

**TEST 2** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K, CM/SEC$$

**TEST 3** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K, CM/SEC$$

B1

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

# PRESSURE TEST RESULTS (FIELD)

K = 1.3 x 10^-3

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| TCE G.w. Contamination Near TSA | WP487A Task 8 | 36.0 to 41.0 | 3030 |

| Test Equipment Identification | BORE HOLE Orientation: | BORE HOLE Size: | Test By: |
|---|---|---|---|
| Carlon Flow Meter U.S. Gauge. | Vertical | 3.0" | A. Benfer Date: 2545 1/12/01 |

| Packers | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| On Casing Single/Double Hydraulic/Inflatable | ~27' Ft. | 3.0 ft. Ft. | 1" pipe (inlet) 7'3" above ground. 34.2 Ft. |

Exit hose length 30' 1.0" I.D. 1" steel pipe with meters 37" before flow meter, 34" after, then 30' hose. 7'3" 1" pipe stickup receiving 1", 30' hose.

## TEST 1

Inflow pressure (Hp) 10 psi x 2.31 = 23.1 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 860.0 | 872.2 | 884.3 | 896.5 | 908.8 | 920.9 | 933.0 | | | | | 12.2 GPM / CFM |
| Take Per Min. | | 12.2 | 12.1 | 12.2 | 12.3 | 12.1 | | | | | | CFM x 7.48 = GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) − Head Losses ($H_L$)

57.3 FT. = 34.2 FT. + 23.1 FT. − — FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{\quad}{\times} \times \quad = K, CM/SEC\ 1.7 \times 10^{-3}$$

## TEST 2

Inflow pressure (Hp) 20 psi x 2.31 = 46.2 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 953.0 | 964.0 | 975.0 | 986.0 | 997.0 | 008.0 | 019.0 | | | | | 11.0 GPM / CFM |
| Take Per Min. | | 11.0 | 11.0 | 11.0 | 11.0 | 11.0 | 11.0 | | | | | |

$H_T$ 80.4 FT. = $H_G$ 34.2 FT. + $H_P$ 46.2 FT. − $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K, CM/SEC\ 1.1 \times 10^{-3}$$

## TEST 3

Inflow pressure (Hp) 35 psi x 2.31 = 80.8 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 032.0 | 041.4 | 050.9 | [illegible] | 067.7 | 079.1 | 088.7 | 098.2 | 107.6 | | | 9.4 GPM / CFM |
| Take Per Min. | | 9.4 | 9.5 | | | | | | 9.4 | | | |

79.1

$H_T$ 115.0 FT. = $H_G$ 34.2 FT. + $H_P$ 80.8 FT. − $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K, CM/SEC\ 6.7 \times 10^{-4}$$

B2

MORRISON-KNUDSEN ENGINEERS, INC.

# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| TCE G.W. Contamination Near TSA | WP 487A Task 8 | 36.0 to 41.0 | 3030 |

| Test Equipment Identification | BORE HOLE Orientation: | BORE HOLE Size: | Test By: |
|---|---|---|---|
| Carlon Flow Meter U.S. Gauge | Vertical | 3.0" | A. Benfer |
| | | | Date: 1/12/01 |

| Packers | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| On Casing Single/Double Hydraulic/Inflatable | ~27' Ft. | 3.0' Ft. | Ft. |

**TEST 4** Inflow pressure ($H_P$) 10 psi × 2.31 = 23.1 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 144.0 | 156.4 | 168.6 | 181.0 | 193.2 | 205.5 | 217.6 | 230.0 | 242.4 | | | 12.3 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | 12.4 | 12.2 | 12.4 | 12.2 | 12.3 | 12.1 | 12.4 | 12.4 | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

57.3 FT. = 34.2 FT. + 23.1 FT. – — FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{\quad}{\times} \times \quad = K, CM/SEC\ 1.7 \times 10^{-3}$$

**TEST 2** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K, CM/SEC$$

**TEST 3** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K, CM/SEC$$

WELDON SPRING SITE REMEDIAL ACTION PROJECT

MONITORING WELL DEVELOPMENT FORM

ES&H 9.1.3. Rev. 0, 2/99

PROJECT NAME TCE G.W. Contam. Near TSA WORK PACKAGE NO. 487A, Task 8

SHEET 2 OF 2

DEVELOPED BY Layne-Western, Alan Benfer PMC.
1042900N. 753300 E.

Well Number: MW-3030 Well Locations: Near Raff. Pit #4

1/29/01

| Date/ Time | Hrs. Dev./ Cum. Hrs. Dev. | Gals. Purged/ Cum. Gals. Purged | pH | Temp. (°C) | Cond. (umhos) | Turb. (NTUs) | Remarks |
|---|---|---|---|---|---|---|---|
| 0912 | 22 mins. | 21 | 5.7 | 12.0 | 2.01 | 75.2 | Relatively Clear |
| 0918 | 28 | 23 | 5.7 | 12.9 | 1.88 | 12.7 | |
| 0922 | 32 | 25 | 5.7 | 13.3 | 2.00 | 18.2 | |
| 0927 | 37 | 27 | 5.6 | 13.5 | 1.86 | 9.99 | |
| 0931 | 41 | 29 | 5.7 | 13.7 | 1.99 | 7.29 | |
| 0935 | 44 | 31 | 5.7 | 13.7 | 2.02 | 5.74 | |
| 0939 | 48 | 33 | 5.9 | 13.3 | 1.96 | 4.66 | |
| 0945 | 54 | 35 | 5.7 | 13.5 | 2.02 | 4.84 | |
| 0950 | 59 | 37 | 5.6 | 13.6 | 2.04 | 5.21 | |
| 0954 | 63 | 39 | 5.7 | 13.5 | 1.95 | 5.40 | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Surged well and purged 20 gals prior to measuring G.W. field parameters. 3 well volumes = ~27 gals.

# WELDON SPRING SITE REMEDIAL ACTION PROJECT

# BOREHOLE AND WELL COMPLETION LOG

WSHLOG-C

| | |
|---|---|
| HOLE NUMBER | MW-3031 |
| SHEET 1 OF 2 | |
| NORTH (Y): | 1042830.41 |
| EAST (X): | 753849.93 |
| TOC ELEVATION | 646.48 |
| GROUND ELEVATION | 643.72 |
| STICKUP | 2.66 |
| HYDR CONDUCTIVITY (cm/sec) | K= no (Packer Test) |

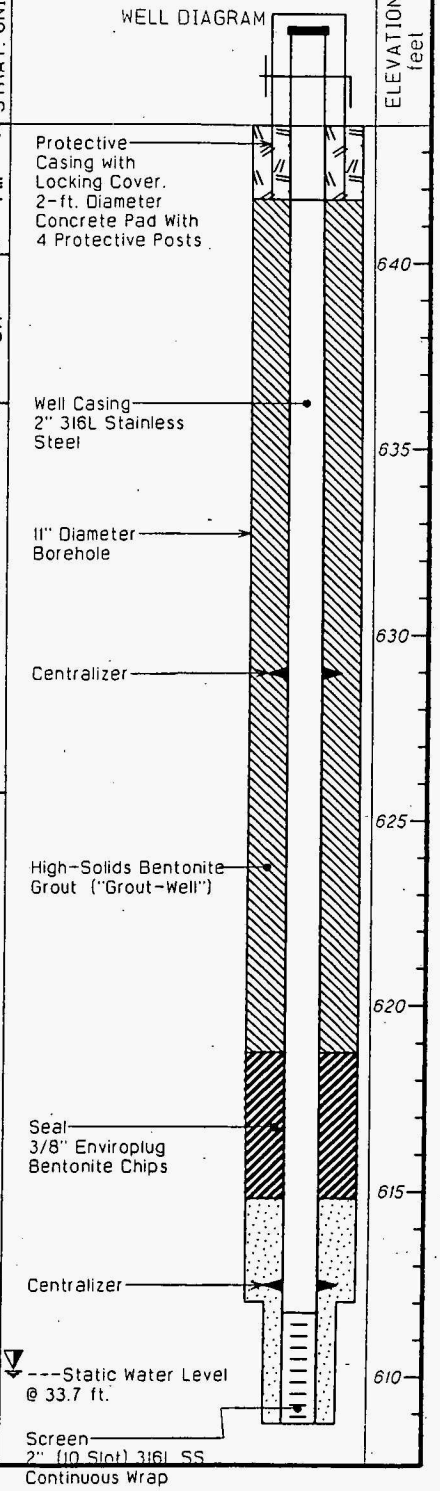
| | | | |
|---|---|---|---|
| WELL STATUS/COMMENTS: ACTIVE | LOCATION: W. OF DISPOSAL CELL, NEAR RAFF. PIT 3 | | |
| DRILLING CONTRACTOR: LAYNE WESTERN Inc. | DRILL RIG MAKE & MODEL: CME-750 HSA/NXWL; I-R TH-60 AIR ROTARY | | |
| HOLE SIZE & METHOD: 11" HSA-31.7; NX-46; 6" AIR-37 | ANGLE FROM HORIZONTAL & BEARING: Vertical | BOTTOM OF HOLE (TD): 46.0 | |
| DRILL FLUIDS & ADDITIVES: Water core; Air ream | CASING TYPE, DEPTH, SIZE: 2" 316 SS Mon. Well | BEDROCK: 23.0 | |
| DATE START: 1-15-01 | DATE FINISH: 1-15-01, Mon. Well | WATER LEVELS & DATES | |

DEPTH (FT.) FROM GROUND ELEV. TO:

LITHOLOGY BY ALAN BENFER

| DEPTH feet | SAMPLE/RUN Number | PERCENT Recovery (0–100) | N# or RQD | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT |
|---|---|---|---|---|---|---|
| | SPT-1 | | 11 | FILL | CLAY, high plasticity, mottled dark brown and light gray, moist, firm, CH. Fill. | Fill |
| | SPT-2 | | 4 | | | |
| 5 | SPT-3 | | 10 | CH | CLAY, high plasticity, some FeOx nodules, mottled yellow brown and light gray, moist, soft, CH. Ferrelview Clay. | Qfv |
| | SPT-4 | | 15 | | 4.0'– 6.0'. CH as above, trace fine white sand, some reddish brown clay. Basal Ferrelview Clay. | |
| | SPT-5 | | 5 | | CLAY, high plasticity, some fine sand, mottled yellow brown and light gray, moist, firm, CH. Poor recovery. Clay Till. | Qct |
| 10 | SPT-6 | | 8 | | @ 8.0'– 10.0'. No recovery. | |
| | | | | | CH as above, trace fine gravel, moist, soft. | |
| | SPT-7 | | 18 | CH | CLAY, high plasticity, some fine sand and gravel up to 1", abundant MnOx, mottled yellow brown, light gray and black, damp, hard, CH. Clay Till. | |
| | SPT-8 | | 24 | | | |
| 15 | | | | | CLAY, high plasticity with chert gravel, reddish brown, moist, hard, CH. Poor recovery. | |
| | SPT-9 | | – | | CLAY, high plasticity, yellow brown, some light gray, moist, hard, CH. Appears to be Clay Till. Reddish clay with chert gravel in tip. | |
| | SPT-10 | | 18 | | | |
| 20 | SPT-11 | | 23 | | CLAY, high plasticity, weathered limestone and chert gravel, red, black and brown, moist, hard, CH. Probable Residuum. | pPr/Mbksw |
| | | | | | Poor recovery, reddish CH with chert. Residuum. | |
| | SPT-12 | | 24 | | | |
| | SPT-13 | | 24 | LMS CH | LIMESTONE, extremely weathered, light gray and yellow brown, with some grayish chert, some clay, damp, hard drilling. | |
| 25 | | | | | Extremely weathered limestone with chert and clay as above. Poor recovery. | |
| | SPT-14 | | 18 | | As above. | |
| | SPT-15 | | 11 | | LIMESTONE AND CHERT, weathered with high plasticity clay, yellow brown. Poor recovery. Suspect alternating weather limestone and residuum from ~18-ft. | |
| 30 | SPT-16 | | 50+ | | Weathered limestone, clay and chert. | |
| | NX-1 | 42/60" | 50 | LMS CHRT | Auger refusal at 31.7'. | |
| | | | | | CHERT, hard, generally light bluish gray, with ~ 50% interbedded moderately weathered limestone, argillaceous, generally fine-grained, with abundant black MnOx specks, some styolites, dark orange brown. Zero to 4 fractures per foot, eroded, open. Weathered Burlington– Keokuk Limestone. | Mbkw |
| 35 | | | | | | |

WELL DIAGRAM




ELEVATION feet

Sample Interval | No Sample Taken | minimum | maximum | average

# WELDON SPRING SITE REMEDIAL ACTION PROJECT

# BOREHOLE AND WELL COMPLETION LOG

MSWLOG-C

HOLE NUMBER: MW-3031

SHEET 2 OF 2

NORTH (Y): 1042830.41

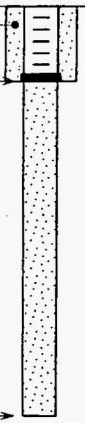
EAST (X): 753849.93

WELL STATUS/COMMENTS: ACTIVE

LOCATION: W. OF DISPOSAL CELL, NEAR RAFF. PIT 3

| DEPTH feet | SAMPLE | SAMPLE/RUN Number | PERCENT Recovery (0–100) | N# or RQD | GRAPHIC LOG | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT |
|---|---|---|---|---|---|---|---|---|
| | | | | | | LMS CHRT | No fluid return for the entire core, 31.0'-46.0' | MDKW |
| | | NX-2 | 57/60" | 33 | | | LIMESTONE AND CHERT, ~50% each, limestone as above, moderately weathered, dark orange brown. Chert as above, hard, with thin streaks of MnOx, light gray. ~3 fractures per foot, eroded, open ~3/4", some rubble zones. | |
| 40 | | | | | | | @ 37.8'- 38.0'. Claystone seam, dark gray. | |
| | | NX-3 | 40/60" | 0 | | | LIMESTONE AND CHERT as above. Limestone is moderately to slightly weathered, dark orange to ligh gray. Chert is hard, mostly bluish gray. 2+ to 5+ fractures per foot; eroded and open up to 3/4", some rubble zones. Weathered Burlington-Keokuk Limestone. | |
| 45 | | | | | | | @ 44.6'- 44.9'. Claystone seam, weak, gray. | |
| | | | | | | | Total cored depth 46', 1-17-01. Hole reamed to 6" diameter to 37.0' and a 2" monitoring well was constructed. | |
| 50 | | | | | | | CONSTANT HEAD SINGLE PACKER TEST RESULTS<br>35.0' - 41.0' No Take<br>39.0' - 46.0' No Take | |
| 55 | | | | | | | | |
| 60 | | | | | | | | |
| 65 | | | | | | | | |
| 70 | | | | | | | | |
| 75 | | | | | | | | |

WELL DIAGRAM



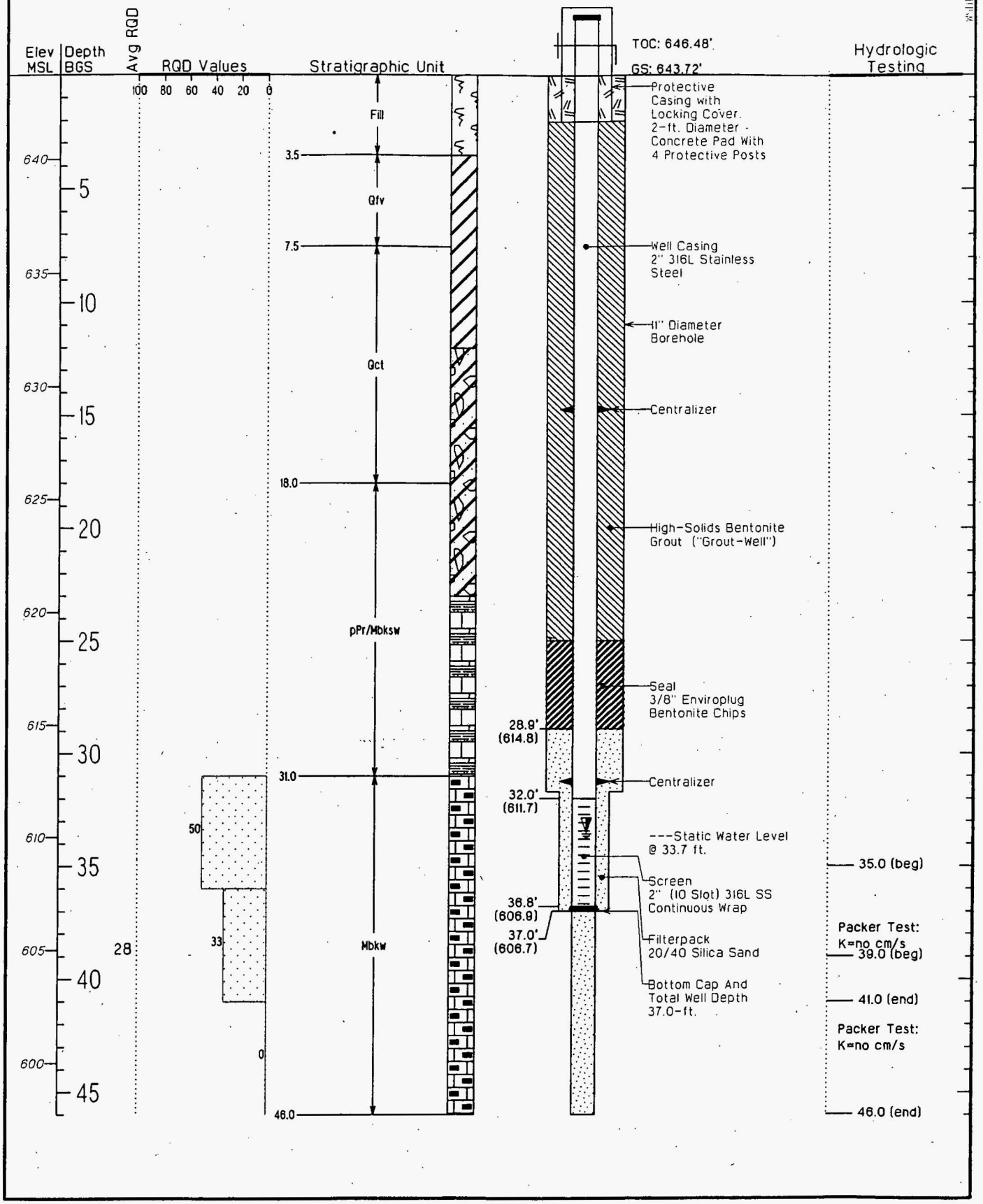

ELEVATION feet: 605, 600, 595, 590, 585, 580, 575, 570

Sample Interval ☐ No Sample Taken ▽minimum ▼maximum ▼average

# BOREHOLE DIAGRAM



## MW-3031




minimum maximum average

MORRISON-KNUDSEN ENGINEERS, INC.
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# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| TCE Groundwater Contamination Near TSA | W.P. 487 A Task B | 39' to 46.0' | 3031 |

| Test Equipment Identification | BORE HOLE Orientation: | BORE HOLE Size: | Test By: |
|---|---|---|---|
| Carlon Flow Meter U.S. Gauge | Vertical | 3.0" | Alan Benfer<br>Date: 1/17/01 |

| Packers | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| On Casing<br>Single/Double<br>Hydraulic/Inflatable | ~23' Ft. | 3.0' Ft. | ≈ 30' Ft. |

**TEST 1** No Take Inflow pressure ($H_P$) 45 psi × 2.31 = 104 feet Closed intake valve and pressure held.

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM<br>CFM |
| Take Per Min. | | | | | | | | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

134 FT. = 30' FT. + 104 FT. – FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{0}{\times} \times \quad = \text{K, CM/SEC: negligible}$$

**TEST 2** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM<br>CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{}{\times} \times \quad = \text{K, CM/SEC}$$

**TEST 3** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM<br>CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{}{\times} \times \quad = \text{K, CM/SEC}$$

28.5
31.5
34.5

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

# PRESSURE TEST RESULTS (FIELD)

| | | | |
|---|---|---|---|
| Project: TCE groundwater contamination Near T&A | Job Number: W.P. 487A, Task 8 | Test Section: 35.0 to 41.0 | Bore Hole: 3031 |
| Test Equipment Identification: Carlon Flow Meter U.S. Gauge | BORE HOLE — Orientation: vert. / Size: 3.0" | Test By: / Date: 1/17/01 | |
| Packers: On Casing; Single, Double; Hydraulic, Inflatable | Groundwater Depth: ~23' Ft. | Gauge Height Above Ground: 3.0' Ft. | Gravity Head: Ft. |

**TEST 1** No Take Inflow pressure ($H_P$) 40 psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

FT. = FT. + FT. – FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

**TEST 2** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

**TEST 3** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

WELDON SPRING SITE REMEDIAL ACTION PROJECT

MONITORING WELL DEVELOPMENT FORM

ES&H 9.1.3. Rev. 0, 2/99

PROJECT NAME TCE G.W. Contam. Near TSA WORK PACKAGE NO. 487A, Task 8

SHEET 2 OF 2

DEVELOPED BY Layne-Western, Alan Benfer PMC

1042830.3 N. 753849.9 E.

Well Number: MW-3031 Well Locations: Near Raff. Pit #3

| 1/25/01 Date/ Time | Hrs. Dev./ Cum. Hrs. Dev. | Gals. Purged/ Cum. Gals. Purged | pH | Temp. (°C) | Cond. (umhos) | Turb. (NTUs) | Remarks |
|---|---|---|---|---|---|---|---|
| 0850 | | 8 gal | 7.9 | 12.3 | 0.82 | 594 | |
| 1000 | 70 mins | ~ 8½ | 7.9 | 12.3 | 0.84 | 324 | |
| 1115 | 145 | ~ 9 | 8.0 | 14.7 | 0.84 | 204 | |
| 1200 | 250 | ~ 9½ | 7.9 | 12.1 | 0.88 | 331 | |
| 1400 | 310 | ~ 10 | 8.1 | 10.2 | 0.88 | 120 | |
| 1530 | 400 | ~ 10½ | 8.2 | 10.2 | 0.88 | 83.6 | |
| 1615 | 445 | ~ 11 | 8.1 | 10.1 | 0.87 | 44.4 | |
| 1/26/01 0905 | ~~0905~~ 445 | ~ 12 | 7.6 | 10.2 | 1.00 | 18.9 | |
| 1100 | 560 | ~ 12½ | 7.4 | 10.3 | 0.91 | 96.6 | |
| 1150 | 610 | ~ 13 | 7.4 | 11.7 | 0.96 | 79.0 | |
| 1/31/01 | | | | | | | |
| 0831 | 610 | ~ 14 | * 9.3 | 11.9 | 0.95 | 110 | |
| 0839 | 618 | ~ 14¾ | * 9.1 | 10.1 | 0.95 | 55.3 | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

initial surged well and pumped ~ 8-gals. Well is a low producer. 3 well volumes = ~ 12 gals.

* - Meter not reliable

# WELDON SPRING SITE REMEDIAL ACTION PROJECT

# BOREHOLE AND WELL COMPLETION LOG

WSWLOG-C

| | |
|---|---|
| HOLE NUMBER | MW-3032 |
| SHEET 1 OF 2 | |
| NORTH (Y): | 1042199.79 |
| EAST (X): | 753599.64 |
| TOC ELEVATION | 662.65 |
| GROUND ELEVATION | 660.07 |
| STICKUP | 2.58 |
| HYDR CONDUCTIVITY (cm/sec) | K= 5.0E-4 |

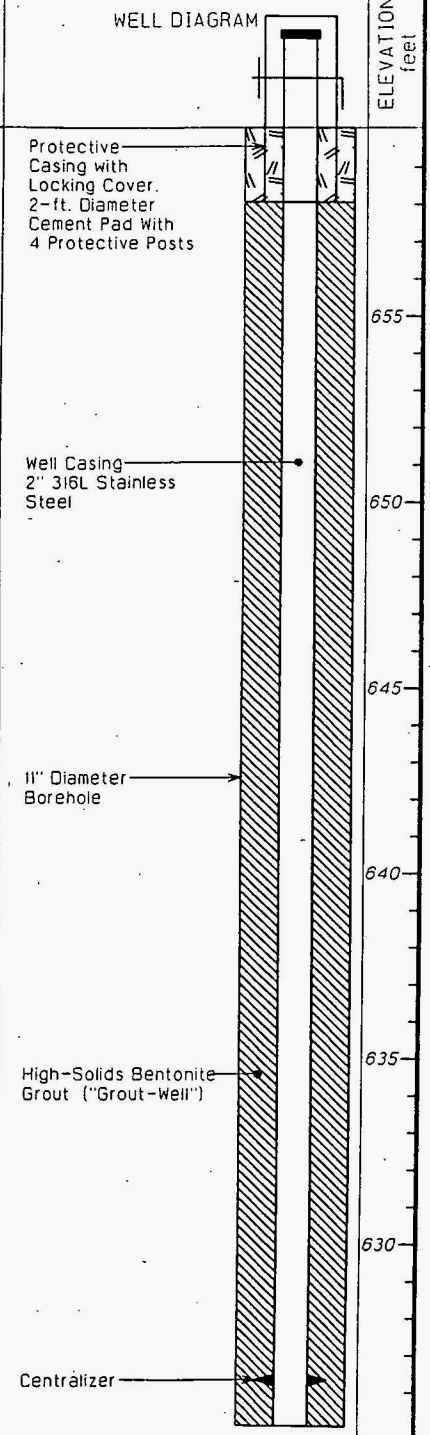
| | | | |
|---|---|---|---|
| WELL STATUS/COMMENTS: ACTIVE | LOCATION: NEAR NORTH END OF TSA | | |
| DRILLING CONTRACTOR: LAYNE WESTERN Inc. | DRILL RIG MAKE & MODEL: CME-750 HSA/NXWL; I-R TH-60 AIR ROTARY | | |
| HOLE SIZE & METHOD: 11" HSA-46.6; NX-62; 6" AIR-60 | ANGLE FROM HORIZONTAL & BEARING: Vertical | BOTTOM OF HOLE (TD): 62.0 | |
| DRILL FLUIDS & ADDITIVES: Water core; Air ream | CASING TYPE, DEPTH, SIZE: 2" 316 SS Mon. Well | BEDROCK: 44.0 | |
| DATE START: 1-2-01 | DATE FINISH: 1-10-01, Mon. Well | WATER LEVELS & DATES | |

DEPTH (Ft.) FROM GROUND ELEV. TO:

LITHOLOGY BY ALAN BENFER

| DEPTH feet | SAMPLE/RUN Number | PERCENT Recovery (0–100) | N# or RQD | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT |
|---|---|---|---|---|---|---|
| | | | | | Soil not sampled or logged from the surface to 14-ft. | Qfv |
| 5 | | | | | | |
| 10 | | | | | | |
| 15 | SPT-8 | | 11 | CH | CLAY, high plasticity, trace fine white sand, mostly pale yellow (5Y7/3), moist, firm, CH. Lower Ferrelview Clay. | |
| | SPT-9 | | 19 | CH | CLAY, high plasticity, ~15% fine to coarse angular limestone sand, minor fine gravel, mottled yellow brown and black, MnOx, FeOx nodules, moist, hard, CH. Clay Till. | Qct |
| | SPT-10 | | 17 | | CH as above, abundant MnOx, minor gravel up to 1/2". | |
| 20 | SPT-11 | | 16 | | CLAY, high plasticity, ~15% fine sand, no gravel, some MnOx, dark yellow brown and gray, moist, hard, CH. Clay Till. | |
| | SPT-12 | | 24 | CH | CH as above, with highly weathered limestone gravel, some chert, MnOx. | |
| | SPT-13 | | 21 | | CLAY, high plasticity, ~20% fine sand and fine gravel, mottled yellow brown, gray and black, MnOx, moist, hard, CH. Clay Till. | |
| 25 | SPT-14 | | 24 | | CH as above, trace gravel up to 1", mostly yellow brown, moist, hard. | |
| | SPT-15 | | 26 | | CH as above, minor limestone gravel up to 1", mostly dark brown. | |
| 30 | SPT-16 | | 22 | | CLAY, high plasticity, minor fine to coarse sand and minor fine gravel, some MnOx, moist, hard, CH. Clay Till. | |
| | SPT-17 | | 30 | | CH as above, ~20% sand, minor gravel, white and black-filled vertical fractures. | |
| | SPT-18 | | 29 | | CH as above, minor chert gravel, MnOx coating vertical fractures. | |
| 35 | | | | | | |

WELL DIAGRAM




ELEVATION feet

Sample Interval ☐ No Sample Taken ▽minimum ▼maximum ▽average

WELDON SPRING SITE REMEDIAL ACTION PROJECT

# BOREHOLE AND WELL COMPLETION LOG

HOLE NUMBER: MW-3032

SHEET 2 OF 2

NORTH (Y): 1042199.79

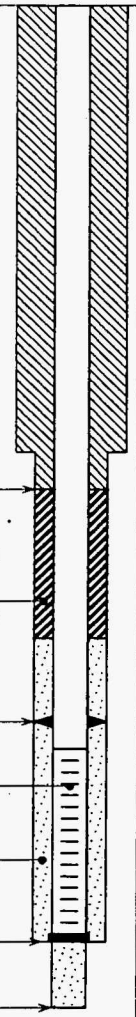
EAST (X): 753599.64

WELL STATUS/COMMENTS: ACTIVE

LOCATION: NEAR NORTH END OF TSA

| DEPTH feet | SAMPLE/RUN Number | PERCENT Recovery | N# or RQD | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT |
|---|---|---|---|---|---|---|
| | SPT-19 | | 23 | CH | CLAY, high plasticity, minor sand and gravel, black and white vertical fractures, mostly yellow brown, moist, hard, CH. Clay Till. | Qct |
| | SPT-20 | | 15 | | CH as above, trace sand and fine gravel, some FeOx nodules, yellow brown and gray, moist, firm. | |
| 40 | SPT-21 | | 17 | | CH as above, some MnOx, hard. | |
| | SPT-22 | | 20 | | @ 42.0'. Some chert gravel. | |
| | SPT-23 | | 74 | LMS | CLAY, high plasticity, with angular chert and some finely disseminated and strongly weathered limestone fragments, very light gray, moist, hard, CH. Clay Till. | |
| 45 | SPT-24 | | 56+ | | LIMESTONE, highly weathered, nearly soil-like, pale greenish gray, some yellow brown, damp, very hard. | Mbkwsw |
| | NX-1 | 13/60" | 0 | LMS CHRT | @ 46'. LIMESTONE, strongly weathered, dark yellow brown and light gray damp. LIMESTONE AND CHERT, rubble only, longest core piece ~2", light gray to yellow brown with some yellow brown clay. | Mbkw |
| 50 | | | | | No circulation from 47 to 50-ft. Minor and partial return from 50 to 62-ft. | |
| | NX-2 | 5/60" | 0 | | NX-2, 52 to 57-ft.. Recovered only 4-1/2" of chert and limestone rubble, no clay. | |
| 55 | | | | | | |
| | NX-3 | 2/60" | 0 | | NX-3, 57 to 62-ft.. Recovered only 2" of chert rubble. | |
| 60 | | | | | | |
| | | | | | Total cored depth, 62.0', 1-4-01. Hole reamed to 6" diameter to 60.0' and a 2" monitoring well monitoring well was constructed. | |
| 65 | | | | | HYDRAULIC CONDUCTIVITY TEST RESULTS<br>Falling Head K = 5.0E-4 cm/sec<br>Rising Head K = 5.0E-4 cm/sec | |
| 70 | | | | | | |
| 75 | | | | | | |

WELL DIAGRAM



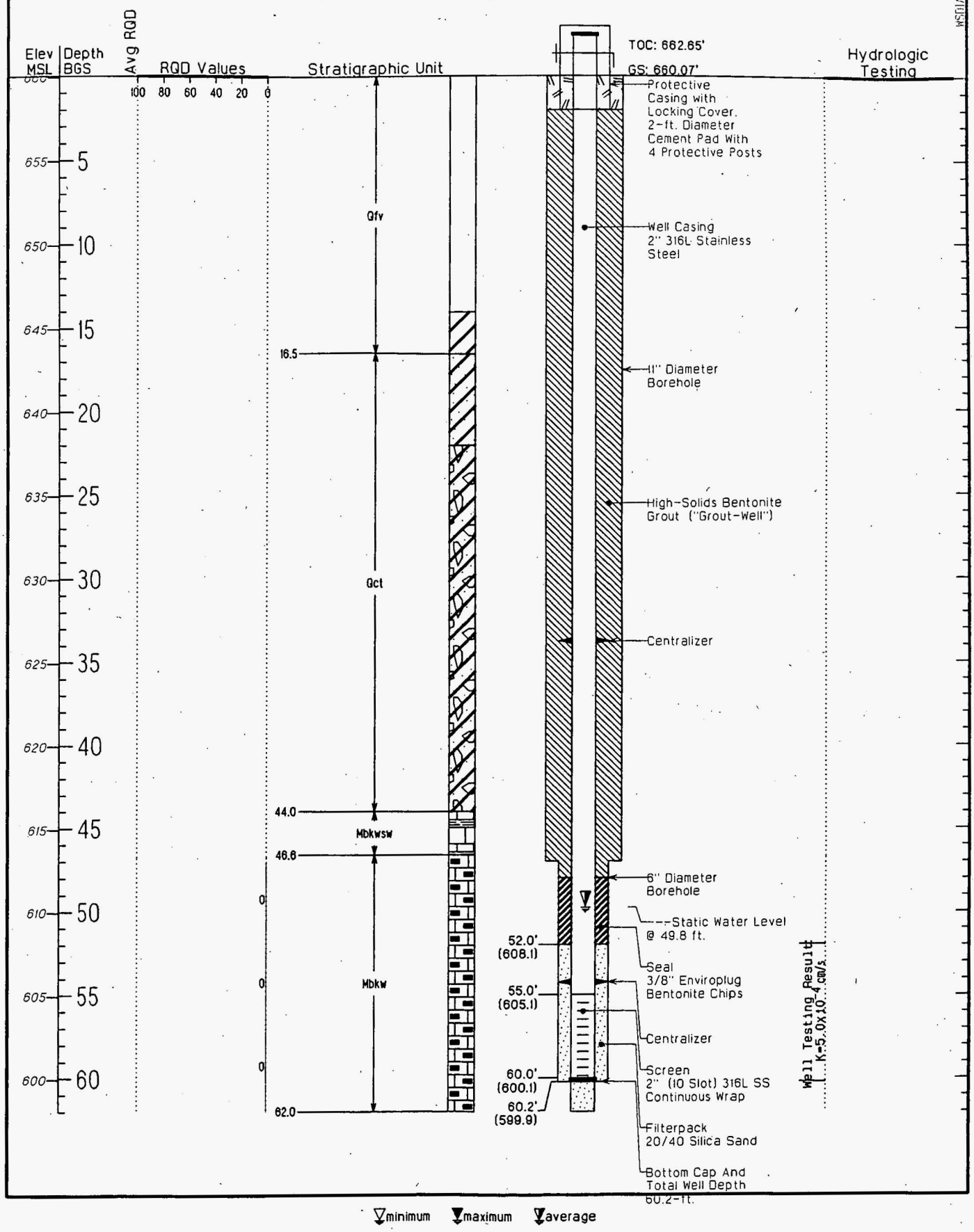

ELEVATION feet: 620, 615, 610, 605, 600, 595, 590

Sample Interval | No Sample Taken | minimum | maximum | average

# BOREHOLE DIAGRAM



## MW-3032



EQUIPMENT CONFIGURED WRONG

MORRISON-KNUDSEN ENGINEERS, INC.

# PRESSURE TEST RESULTS (FIELD) PAD TEST

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| TCE Contaminated G.W. Near T&A | WP487A. Task 8 | 50.5' to 60' | 3032 |

| Test Equipment Identification | BORE HOLE Orientation: | BORE HOLE Size: | Test By: |
|---|---|---|---|
| Neptune Flow Meter U.S. Gauge | Vert | 3.0" | A. Benfer |
| | | | Date: 1/8/01 |

| Packers: TAM SD. On Casing Single/Double Hydraulic/Inflatable | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| | 49.9' Ft. | 3.0' Ft. | Ft. |

## TEST 1

Inflow pressure ($H_P$) 10 psi × 2.31 = _____ feet

Steady pressure

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 011.5 | 013.7 | 015.8 | 017.9 | 020.1 | 022.2 | 024.4 | | | | | GPM / CFM |
| Take Per Min. | | 2.2 | 2.1 | 2.1 | 2.2 | 2.1 | 2.2 | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

FT. = FT. + FT. – FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

## TEST 2

Inflow pressure ($H_P$) 20 psi × 2.31 = _____ feet

Steady

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 056.5 | 062.1 | 067.8 | 073.4 | 079.4 | 085.2 | 091.0 | | | | | GPM / CFM |
| Take Per Min. | | 5.7 | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

## TEST 3

Inflow pressure ($H_P$) 40 psi × 2.31 = _____ feet

Steady

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 103.9 | 106.8 | 109.7 | 112.7 | 115.6 | 118.5 | 121.4 | | | | | GPM / CFM |
| Take Per Min. | | 2.9 | 2.9 | 3.0 | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

MORRISON-KNUDSEN ENGINEERS, INC.
A BOMBARDIER COMPANY

# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| TCE Contaminated G.W. Near TSA | W.P. 487 A Task 8 | 51' to 60' | 3032 |

| Test Equipment Identification | BORE HOLE Orientation: | BORE HOLE Size: | Test By: |
|---|---|---|---|
| Neptune Flow Meter U.S. Gauge | vert. | 3.00 | A. Benfer<br>Date: 1/8/01 |

| Packers (On Casing; Single/Double; Hydraulic/Inflatable) | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| | 49.9' Ft. | 3.0' Ft. | Ft. |

## TEST ~~1~~ 4

Inflow pressure ($H_P$) 10 psi × 2.31 = _____ feet

Steady pressure

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 141.0 | 148.2 | 155.4 | 162.7 | 170.0 | 177.2 | 184.4 | | | | | GPM / CFM |
| Take Per Min. | | 7.2 | 7.2 | 7.3 | | 7.2 | 7.2 | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

FT. = FT. + FT. – FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

## TEST ~~2~~ 5

Inflow pressure ($H_P$) 20 psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 202.0 | 207.6 | 213.4 | 219.0 | 224.8 | | | | | | | GPM / CFM |
| Take Per Min. | | 5.6 | | | 5.8 | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

## TEST 3

Inflow pressure ($H_P$) 40 psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 232.0 | 234.9 | 237.8 | 240.8 | – | 262.5 | | | | | | GPM / CFM |
| Take Per Min. | | 2.9 | 2.9 | 3.0 | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

EQUIPMENT CONFIGURED WRONG

MORRISON-KNUDSEN ENGINEERS, INC.

# PRESSURE TEST RESULTS (FIELD)

BAD TEST

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| G.W. contam. at TSA | MP 487A TASK 8 | 50' to 62' | 3032 |

| Test Equipment Identification | BORE HOLE Orientation: | BORE HOLE Size: | Test By: |
|---|---|---|---|
| Carlon, 1" flow meter U.S. Gauge | vert. | 3" | A. Benfer |
| | | | Date: 1/9/01 |

| Packers (On Casing; Single/Double; Hydraulic/Inflatable) | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| | 49.9 Ft. | 3.0 Ft. | Ft. |

**TEST 1** Inflow pressure ($H_P$) 10 psi × 2.31 = 23.1 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 360.0 | 376.0 | 392.5 | 409.1 | 425.6 | 442.2 | 458.5 | | | | | 16.5 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | 16.0 | 16.5 | 16.6 | 16.5 | 16.6 | 16.3 | | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

FT. = FT. + FT. – FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

**TEST 2** Inflow pressure ($H_P$) 20 psi × 2.31 = 46.2 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 493.0 | 508.2 | 523.8 | 539.4 | 554.9 | 570.4 | 586.0 | | | | | 15.6 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | 15.2 | 15.6 | 15.6 | 15.5 | 15.5 | 15.6 | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

**TEST 3** Inflow pressure ($H_P$) 40 psi × 2.31 = 92.4 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 621.0 | 633.8 | 646.5 | 659.5 | 672.4 | 685.2 | 698.0 | | | | | 12.8 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | 12.8 | 12.7 | 13.0 | 12.9 | 12.8 | 12.8 | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

1" pipe 2.6" includes joints flow meter, press. gauge

MORRISON-KNUDSEN ENGINEERS, INC.

# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| | WP 487 A TASK 8 | 51.0 to 62.0' | 3032 |

| Test Equipment Identification | BORE HOLE Orientation: | BORE HOLE Size: | Test By: |
|---|---|---|---|
| Carlon Flow Meter U.S. Gauge | Vertical | 3.0 in. | Date: 1/9/01 |

| Packers (On Casing; Single/Double; Hydraulic/Inflatable) | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| | 49.9' Ft. | 3.0 Ft. | Ft. |

**TEST 1** Inflow pressure ($H_P$) 10 psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 731.0 | 747.9 | 764.9 | 781.5 | 798.5 | 815.4 | 832.4 | | | | | 16.96 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | 16.9 | 17.0 | 16.6 | 17.0 | 16.9 | 17.0 | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

FT. = FT. + FT. – FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

**TEST 2** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

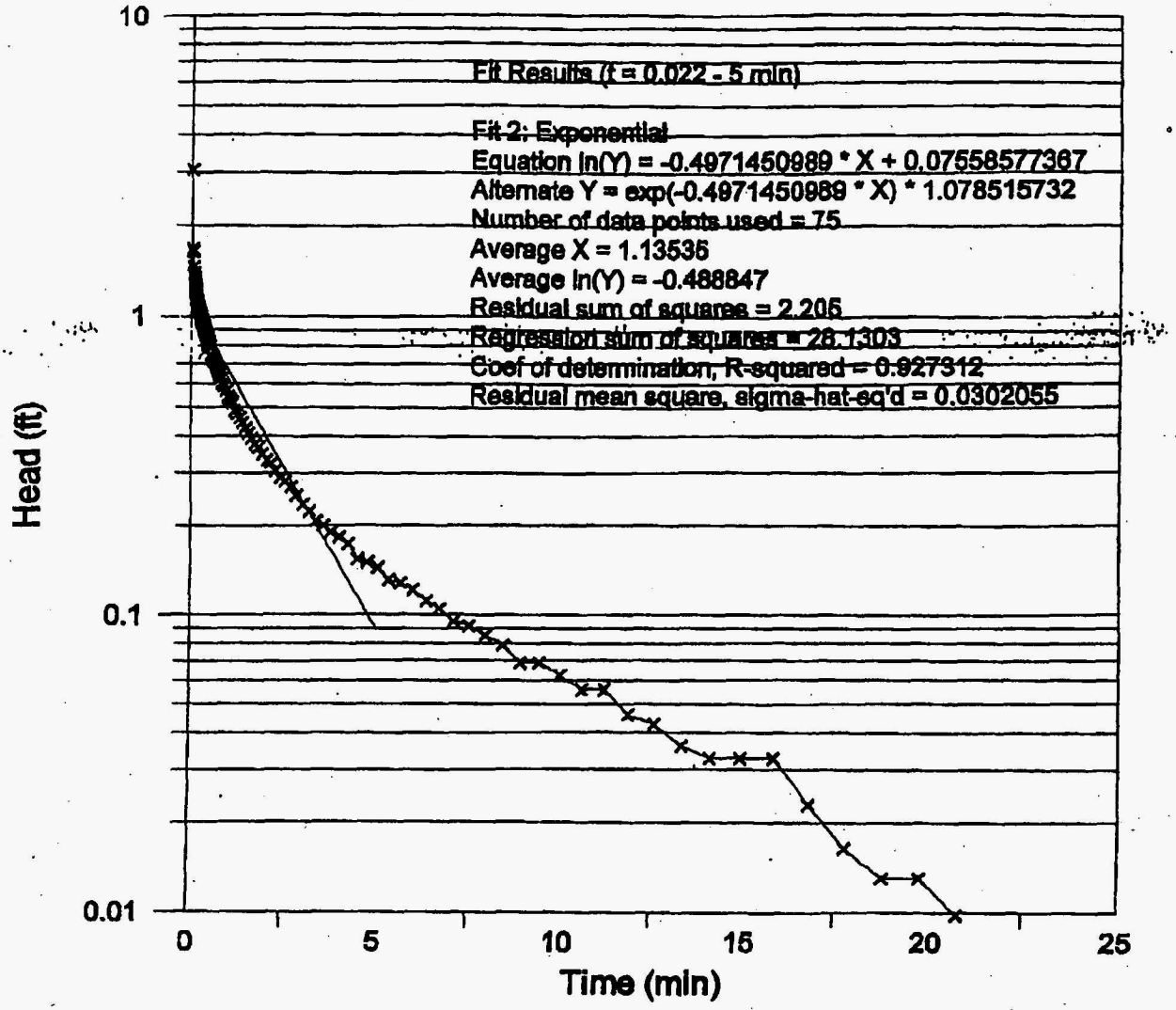
**TEST 3** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

# MW-3032 - Test 3 - rising



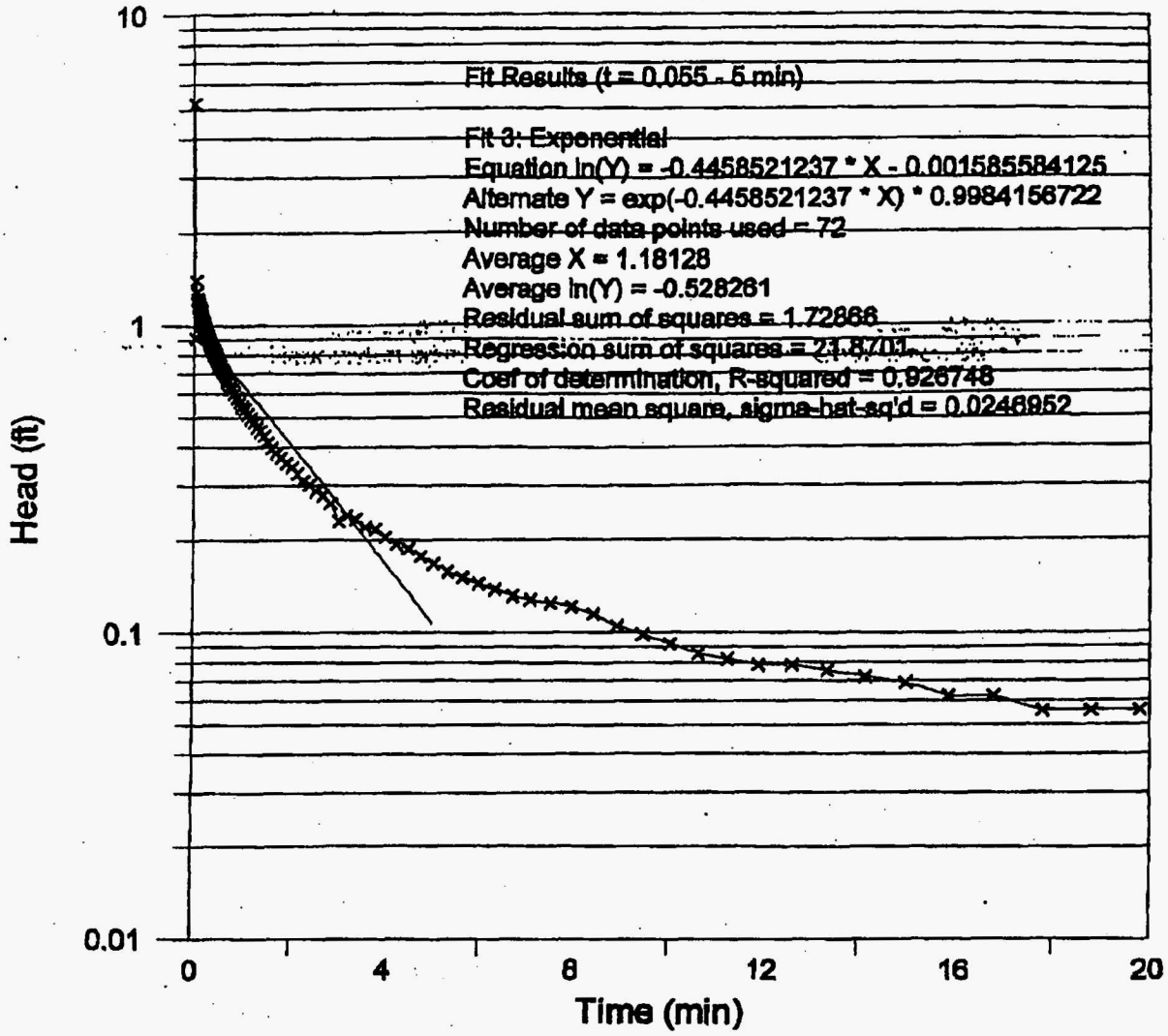

$r_c := \frac{2.245 \cdot in}{2}$ 2" Sch 5 SS (p. 977) $r_c = 0.094 \cdot ft$ $r_w := \frac{6.0}{2} \cdot in$ well radius $r_w = 0.25 \cdot ft$

$L := 5 \cdot ft$ screened interval $r_s := \frac{1.25 \cdot in}{2}$ slug radius $l := 5.05 \cdot ft$ slug length $H0 := \frac{r_s^2}{r_c^2} \cdot l$ displacement

$H0 = 1.560 \cdot ft$ $H := ((662.30 - 52.77) - 599.8) \cdot ft$ $H = 9.73 \cdot ft$ $S := .4971450989 min^{-1}$ slope $C := 2.260$ geometry coefficient

$lnRerw := \left[\frac{1.1}{\ln\left(\frac{H}{r_w}\right)} + \frac{C}{\left(\frac{L}{r_w}\right)}\right]^{-1}$ fully penetrating case $K := \frac{r_c^2 \cdot lnRerw}{2 \cdot L} \cdot S$ $K = 1 \cdot 10^{-3} \frac{ft}{min}$ $K = 5 \cdot 10^{-4} \frac{cm}{sec}$

# MW-3032 - Test 2 - falling



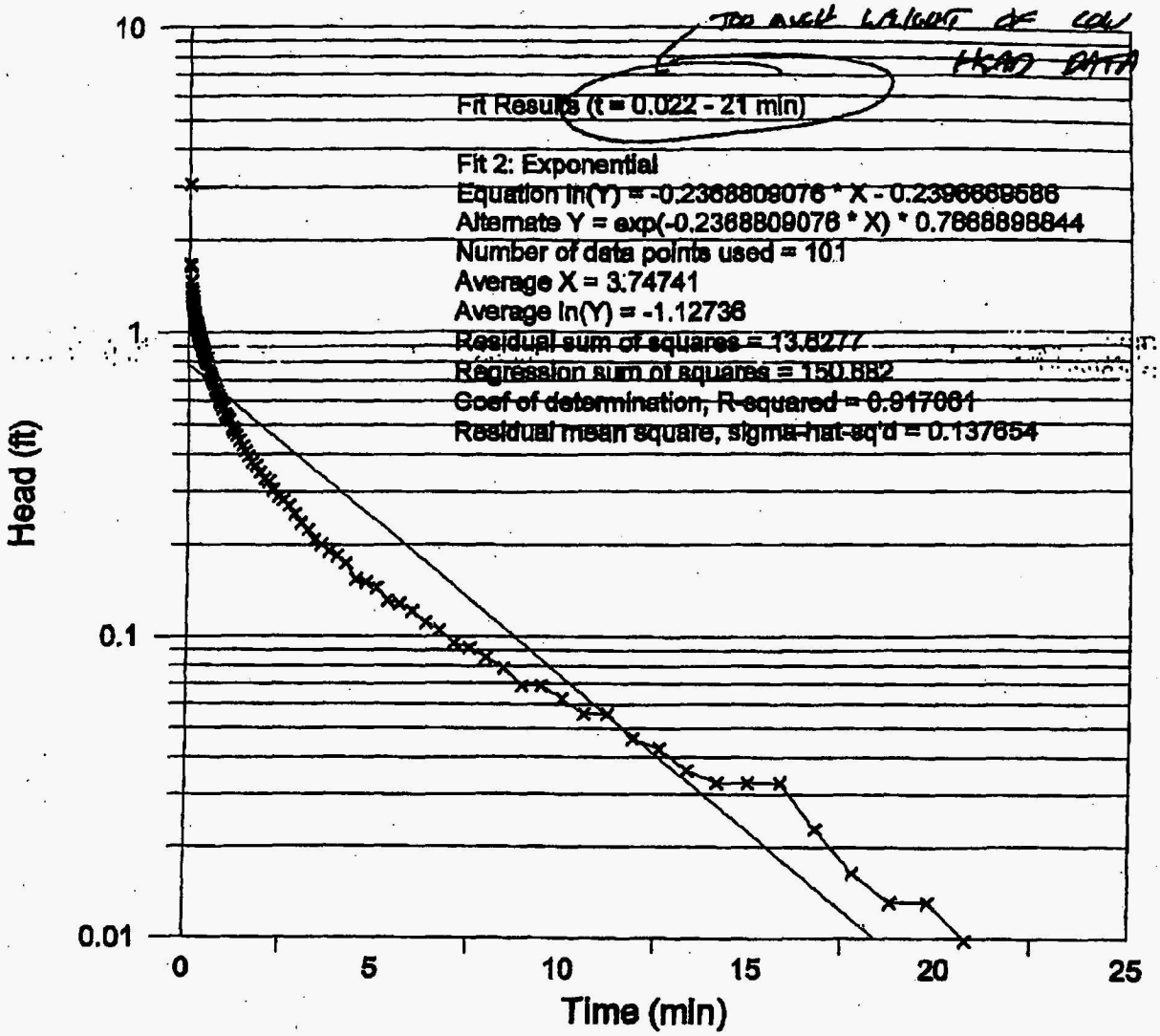

$r_c := \frac{2.245\,in}{2}$ 2" Sch 5 SS (p. 977) $r_c = 0.094\,ft$ $r_w := \frac{6.0}{2}\cdot in$ well radius $r_w = 0.25\,ft$

$L := 5\cdot ft$ screened interval $r_s := \frac{1.25\,in}{2}$ slug radius $l := 5.05\,ft$ slug length $H0 := \frac{r_s^2}{r_c^2}\cdot l$ displacement

$H0 = 1.566\,ft$ $H := ((662.30 - 52.77) - 599.8)\cdot ft$ $H = 9.73\,ft$ $S := .4458521237\,min^{-1}$ slope $C := 2.260$ geometry coefficient

$lnRcrw := \left[\frac{1.1}{\ln\left(\frac{H}{r_w}\right)} + \frac{C}{\left(\frac{L}{r_w}\right)}\right]^{-1}$ fully penetrating case $K := \frac{r_c^2\cdot lnRcrw}{2\cdot L}\cdot S$ $K = 9\cdot 10^{-4}\,\frac{ft}{min}$ $K = 5\cdot 10^{-4}\,\frac{cm}{sec}$

# MW-3032 - Test 3 - rising




$r_c := \frac{2.245\,in}{2}$ 2" Sch 5 SS (p. 977) $r_c = 0.094\,ft$ $r_w := \frac{6.0}{2}\cdot in$ well radius $r_w = 0.25\,ft$

$L := 5\cdot ft$ screened interval $r_s := \frac{1.25\,in}{2}$ slug radius $l := 5.05\,ft$ slug length $H0 := \frac{r_s^2}{r_c^2}\cdot l$ displacement

$H0 = 1.560\,ft$ $H := ((662.30 - 52.77) - 599.8)\cdot ft$ $H = 9.73\,ft$ $S := .2396669586\,min^{-1}$ slope $C := 2.260$ geometry coefficient

$lnRerw := \left[\frac{1.1}{\ln\left(\frac{H}{r_w}\right)} + \frac{C}{\left(\frac{L}{r_w}\right)}\right]^{-1}$ fully penetrating case $K := \frac{r_c^2\cdot lnRerw}{2\cdot L}\cdot S$ $K = 5\cdot 10^{-4}\,\frac{ft}{min}$ $K = 3\cdot 10^{-4}\,\frac{cm}{sec}$

WELDON SPRING SITE REMEDIAL ACTION PROJECT

MONITORING WELL DEVELOPMENT FORM

ES&H 9.1.3. Rev. 0, 2/99

PROJECT NAME TCE G.W. Contam. Near TSA WORK PACKAGE NO. 487A, Task 8

SHEET 2 OF 2

DEVELOPED BY Layne-Western, Alan Benfer PMC

1042200.06 N 753600 E

Well Number: MW-3032 Well Locations: Near North end TSA

1/26/01

| Date/ Time | Hrs. Dev./ Cum. Hrs. Dev. | Gals. Purged/ Cum. Gals. Purged | pH | Temp. (°C) | Cond. (umhos) | Turb. (NTUs) | Remarks |
|---|---|---|---|---|---|---|---|
| 1545 | 25 mins | 20 gal. | 7.6 | 11.7 | 0.76 | 957 | |
| 1548 | 28 | 22 | 7.8 | 13.0 | 0.61 | off-scale | |
| 1552 | 32 | 24 | 8.0 | 14.0 | 0.59 | off-scale | |
| 1556 | 36 | 26 | 7.7 | 12.9 | 0.64 | 742 | |
| 1601 | 41 | 28 | 7.8 | 12.8 | 0.58 | 562 | |
| 1605 | 45 | 30 | 7.7 | 13.0 | 0.63 | 561 | |
| 1610 | 50 | 32 | 7.8 | 12.6 | 0.58 | 400 | |
| 1614 | 54 | 34 | 7.7 | 12.5 | 0.59 | 366 | |
| 1617 | 57 | 35 | 7.7 | 13.0 | 0.64 | 357 | |
| 1620 | 60 | 36 | 7.7 | 12.6 | 0.55 | 264 | |
| 1624 | 64 | 37 | 7.7 | 12.7 | 0.64 | 150 | |
| 1628 | 68 | 38 | 7.7 | 12.9 | 0.65 | 116 | |
| 1632 | 72 | 39 | 7.7 | 13.1 | 0.66 | 81.5 | |
| 1635 | 75 | 40 | 7.7 | 13.1 | 0.67 | 87.2 | |
| 1638 | 78 | 41 | 7.7 | 13.2 | 0.64 | 68.4 | |
| | | | | | | | |

initially surged the well and bailed out 5-gal.
pumped out 15-gals. after bailing.
~~pumped an additional 10B~~
3 well vols (10.0' of water) is 17.8-gals.

# WELDON SPRING SITE REMEDIAL ACTION PROJECT

# BOREHOLE AND WELL COMPLETION LOG

MSWLOG-C

| | |
|---|---|
| HOLE NUMBER | MW-3037 |
| SHEET 1 OF 2 | |
| NORTH (Y): | 1043247.53 |
| EAST (X): | 753253.57 |
| TOC ELEVATION | 640.25 |
| GROUND ELEVATION | 637.60 |
| STICKUP | 2.65 |
| HYDR CONDUCTIVITY (cm/sec) | K= $1.3 \times 10^{-4}$ (Packer Test) |

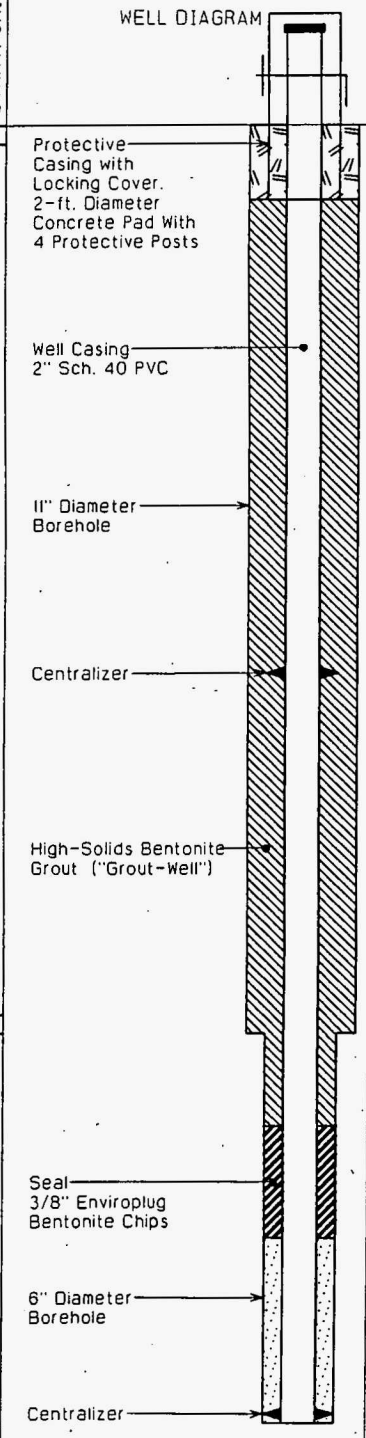
| | |
|---|---|
| WELL STATUS/COMMENTS | ACTIVE |
| LOCATION | WEST OF DISPOSAL CELL |
| DRILLING CONTRACTOR | LAYNE WESTERN Inc. |
| DRILL RIG MAKE & MODEL | CME-750 HSA/NXWL; I-R TH-60 AIR ROTARY |
| HOLE SIZE & METHOD | 11" HSA-24.5; NX-51.3; 6" AIR-45 |
| ANGLE FROM HORIZONTAL & BEARING | Vertical |
| BOTTOM OF HOLE (TD) | 51.3 |
| DRILL FLUIDS & ADDITIVES | Water core; Air ream |
| CASING TYPE, DEPTH, SIZE | 2" PVC Mon. Well |
| BEDROCK | 24.5 |
| DATE START | 9-12-01 |
| DATE FINISH | 10-9-01, Mon. Well |
| WATER LEVELS & DATES | |

DEPTH (FT.) FROM GROUND ELEV. TO:

LITHOLOGY BY ALAN BENFER

| DEPTH feet | SAMPLE/RUN Number | PERCENT Recovery | N# or RQD | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT |
|---|---|---|---|---|---|---|
| | SPT-1 | | 14 | FILL | CLAY, silty. Fill. | Fill |
| | | | | CH | CLAY, high plasticity, ~10% white fine to coarse sand, mostly yellow brown, damp, hard (3.5), CH. Clay Till. | Qct |
| | SPT-2 | | 18 | | CH as above, trace sand, mottled yellow brown, light gray and black (MnOx), damp, very hard (4.5+). | |
| 5 | SPT-3 | | 9 | | CH as above, with ~10% fine to coarse sand, trace fine gravel, moist, hard (2.5). | |
| | SPT-4 | | 16 | | CH as above, ~10% fine sand with minor pockets of clean fine sand, some MnOx following vertical fractures, moist, very hard (4.5+). | |
| 10 | SPT-5 | | 116 | | CLAY, high plasticity, ~10% find sand, trace gravel, mostly yellow brown, moist, hard (2.5), CH. Clay Till. | |
| | SPT-6 | | 22 | CH | CLAY, high plasticity, 2" lense of silt, mottled red brown, light gray, yellow brown and abundant black (MnOx), moist, very hard (4.5+), CH. | |
| 15 | SPT-7 | | 42 | CH | CLAY, high plasticity, trace angular weathered limestone gravel, minor FeOx nodules, some red brown clay, CH. | |
| | SPT-8 | | 29 | | Poor recovery, angular chert gravel. | |
| 20 | SPT-9 | | 59 | | CLAY, high plasticity, ~10% fine to coarse sand, some angular chert gravel, yellow brown, moist, hard (3.5), CH. Clay Till. | |
| | SPT-10 | | 25 | | CH as above. | |
| 25 | NX-1 | 42/78" | 7 | CHRT LMS | Shoe contains reddish brown CH with chert. Residuum. CHERT and LIMESTONE | pPr |
| | | | | | NX-1, Loss zones are unknown, spun ends suggest there are several; also many fractures. ~100% fluid return. | Mbkw |
| 30 | NX-2 | 66/72" | 53 | | 24.5'-30.0'. Predominantly chert, light gray, oxidized fractures; both iron and manganese, scattered patches of oxidized pyrite, hard. Approx. 40% limestone, moderately weathered, highly fractured, generlly coarse-grained, locally fossiliferous, some styolites, some solutioning. Weathered Burlington-Keokuk Limestone. | |
| 35 | | | | | 31.0'-37.0'. Mostly chert as above. Limestone is moderately weathered and hard, yellow brown, generally coarse-grained, some solutioning throughout, tiny specks of MnOx are scattered throughout. | |

WELL DIAGRAM




ELEVATION feet

Sample Interval ☐ No Sample Taken ▽minimum ▼maximum ▼average

# WELDON SPRING SITE REMEDIAL ACTION PROJECT

## BOREHOLE AND WELL COMPLETION LOG

HOLE NUMBER: MW-3037

SHEET 2 OF 2

NORTH (Y): 1043247.53

EAST (X): 753253.57

WSWLOG-C

WELL STATUS/COMMENTS: ACTIVE

LOCATION: WEST OF DISPOSAL CELL

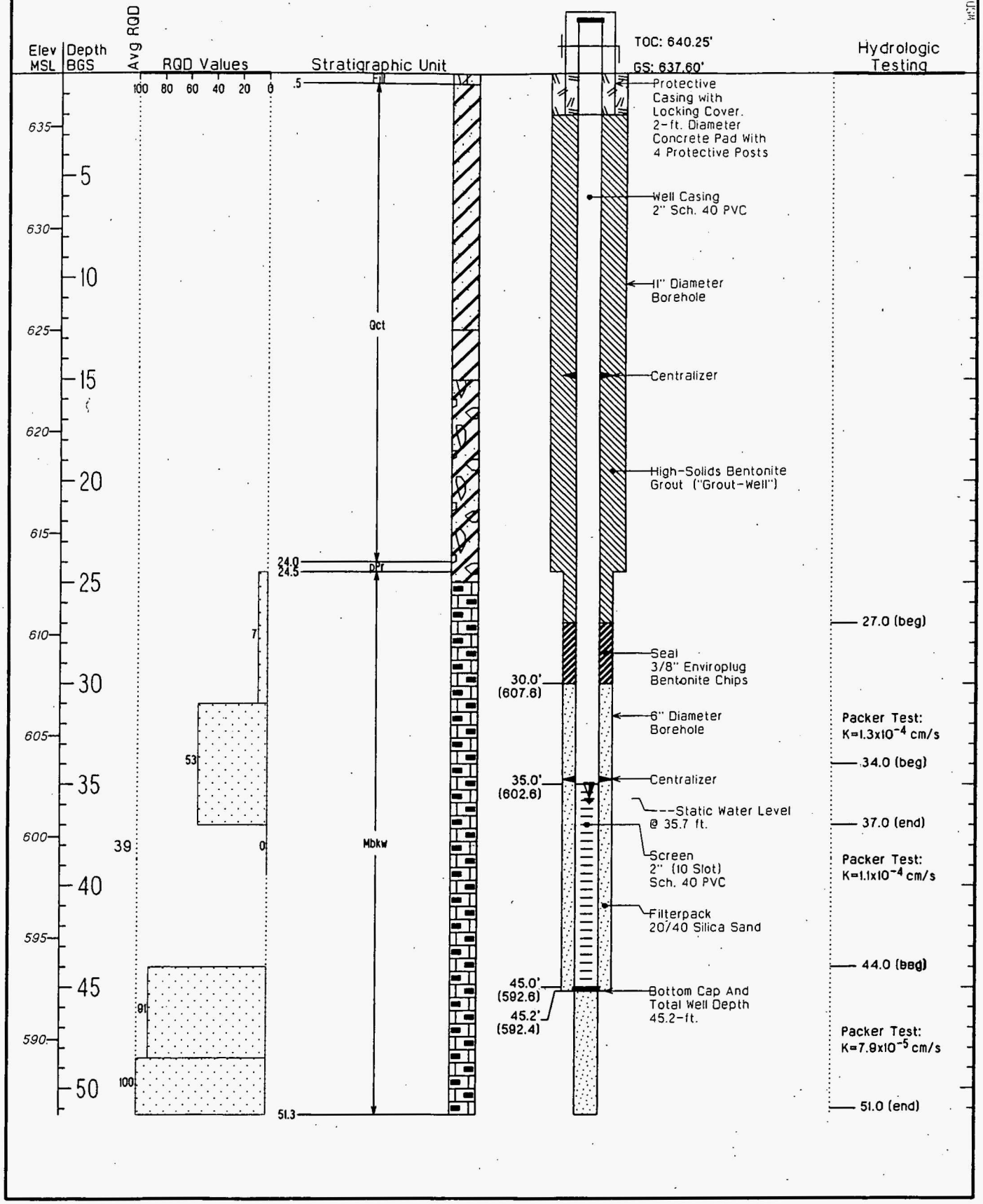
| DEPTH feet | SAMPLE | SAMPLE/RUN Number | PERCENT Recovery (0–100) | N# or RQD | GRAPHIC LOG | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT | WELL DIAGRAM | ELEVATION feet |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CHRT LMS | No obvious bedding other than horizontal fractures. | Mbkw | ---Static Water Level @ 35.7 ft. | |
| | | NX-3 | 9/30" | 0 | | | @ 36.4'. ~1/8" thick gray clay seam. | | Screen 2" (10 Slot) Sch. 40 PVC | 600 |
| | | | | | | | NX-2 Loss zones unknown, ~75% chert disseminated throughout, some appears to be brecciated. Drill cuttings contain considerable fines. | | | |
| 40 | | NX-4 | 54/54" | ? | | | 31.0'-53.3'. ~50-75% fluid return. | | Filterpack 20/40 Silica Sand | |
| | | | | | | | 41.5'. Silty, shaley seam. | | | 595 |
| | | NX-5 | 49/54" | 91 | | | 43.5'-44.5'. Chert rubble. | | | |
| 45 | | | | | | | | | Bottom Cap And Total Well Depth 45.2-ft. | 590 |
| | | NX-6 | 34/34" | 100 | | | 48.3'. Shale seam. | | | |
| 50 | | | | | | | | | 3" Hole To 51.3-ft. | |
| | | | | | | | Total cored depth 51.3', 9-27-01. Hole reamed to 6" diameter to 45' and a 2" monitoring well was constructed. | | | 585 |
| 55 | | | | | | | CONSTANT HEAD SINGLE PACKER TEST RESULTS<br>27.0 - 37.0 ft. k= 1.3E-4 cm/sec<br>34.0 - 44.0 ft. K= 1.1E-4 cm/sec<br>44.0 - 51.0 ft. K= 7.9E-5 cm/sec | | | 580 |
| 60 | | | | | | | | | | 575 |
| 65 | | | | | | | | | | 570 |
| 70 | | | | | | | | | | 565 |
| 75 | | | | | | | | | | |

Sample Interval ☐ No Sample Taken ▽minimum ▼maximum ▼average

# BOREHOLE DIAGRAM



## MW-3037




minimum maximum average

P 1/2
K = 1.5 x 10^-4

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| Additional TCE Delineation | 4B7A, Task 11 | 27.0 to 37.0 | MW-3037 |

| Test Equipment Identification | BORE HOLE Orientation: | BORE HOLE Size: | Test By: |
|---|---|---|---|
| Sensors Flow Meter U.S. Gauges | Vert. | 3.0" | A. Benfer |
| | | | Date: |

| Packers (On Casing, Single/Double, Hydraulic/Inflatable) | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| | ~29 Ft. | 3.2' Ft. | 32.2 Ft. |

**TEST 1** Inflow pressure ($H_P$) 10 psi x 2.31 = 23.1 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 843.6 | 843.42 | 844.9 | 845.6 | 846.3 | 847.1 | 847.7 | 848.5 | | | | 0.72 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | 0.7 | 0.7 | 0.8 | .6 | 0.8 | | | | | CFM x 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

55.3 FT. = 32.2 FT. + 23.1 FT. – — FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{0.72}{55.3 \times 10} \times \underset{(.048)}{.011 \ln \frac{10}{0.125}} = K,\ CM/SEC\ 6.2 \times 10^{-5}$$

**TEST 2** Inflow pressure ($H_P$) 20 psi x 2.31 = 46.2 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 851.8 | 853.8 | 855.2 | 857.1 | 859.1 | 860.9 | | | | | | 1.82 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | 1.7 | 1.7 | 1.9 | 2.0 | 1.8 | | | | | | | |

$H_T$ 78.4 FT. = $H_G$ 32.2 FT. + $H_P$ 46.2 FT. – $H_L$ — FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{1.82}{78.4 \times 10} \times .048 = K,\ CM/SEC\ 1.7 \times 10^{-4}$$

**TEST 3** Inflow pressure ($H_P$) 30 psi x 2.31 = 69.3 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 865 | 869.9 | 873.4 | 877.0 | 880.7 | 884.6 | | | | | | 3.62 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | 3.4 | 3.5 | 3.4 | 3.7 | 3.9 | | | | | | | |

$H_T$ 101.5 FT. = $H_G$ 32.2 FT. + $H_P$ 69.3 FT. – $H_L$ — FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{3.62}{101.5 \times 10} \times .048 = K,\ CM/SEC\ 1.7 \times 10^{-4}$$

MORRISON-KNUDSEN ENGINEERS, INC.

# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| Additional TCE Delineation | 487A, Task 11 | 22.0 to 32.0 | MW 3037 |

| Test Equipment Identification | BORE HOLE | | Test By: |
|---|---|---|---|
| Sensus Flow Meter U.S. Gauge | Orientation: Vertical | Size: 30" | A. Beafer<br>Date: |

| Packers | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| On Casing<br>Single Double<br>Hydraulic Inflatable | 30' Ft. | 3.2 Ft. | 33.2' Ft. |

**TEST 1** Inflow pressure ($H_P$) 10 psi × 2.31 = 23.1 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 88.0 | 89.8 | 91.8 | 93.8 | 95.8 | 97.7 | | | | | | 1.94 GPM<br>CFM |
| Take Per Min. | | 1.8 | 2.0 | 2.0 | 2.0 | 1.9 | | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

55.3 FT. = 32.2 FT. + 23.1 FT. – — FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{1.94}{55.3 \times 10} \times .048 = K,\ CM/SEC\ 1.7 \times 10^{-4}$$

**TEST 2** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM<br>CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ ____ FT. = $H_G$ ____ FT. + $H_P$ ____ FT. – $H_L$ ____ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K,\ CM/SEC$$

**TEST 3** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM<br>CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ ____ FT. = $H_G$ ____ FT. + $H_P$ ____ FT. – $H_L$ ____ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K,\ CM/SEC$$

Pg 1/2
K = 1.1 x 10^-4

MORRISON-KNUDSEN ENGINEERS, INC.

# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| Additional TCE Delineation | 487A, Task 11 | 34' to 44' | MW 3037 |

| Test Equipment Identification | BORE HOLE | | Test By: |
|---|---|---|---|
| Sensus Flow Meter<br>U.S. Gauge | Orientation: VERTICAL | Size: 3" | R. Gatto<br>Date: 9-27-01 |

| Packers | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| On Casing<br>Single/Double<br>Hydraulic/Inflatable | 30' Ft. | 3.0 Ft. | 33' Ft. |

D.T.W - 30'

**TEST 1** Inflow pressure (Hp) 15 psi x 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 921.0 | 924.4 | 927.1 | 929.7 | 932.3 | 934.8 | 937.4 | 939.9 | 942.4 | 944.8 | 947.3 | GPM / CFM |
| Take Per Min. | | 3.4 | 2.7 | 2.6 | 2.6 | 2.5 | 2.6 | 2.5 | 2.5 | 2.4 | 2.5 | CFM x 7.48 - GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head (Hp) - Head Losses ($H_L$)

[ ] FT. = [ ] FT. + [ ] FT. - [ ] FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{\quad}{\quad \times \quad} \times \quad = \text{K, CM/SEC}$$

Leaking Packer

**TEST 2** Inflow pressure (Hp) 30 psi x 2.31 = 69.3 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 66.0 | 70.7 | 75.3 | 79.4 | 82.5 | 85.2 | 87.4 | 89.4 | 91.4 | 93.4 | 95.4 | 2.04 GPM / CFM |
| Take Per Min. | | 4.7 | 4.6 | 4.1 | 3.1 | 3.2 | 2.2 | 2.0 | 2.0 | 2.0 | 2.0 | |

$H_T$ 102.3 FT. = $H_G$ 33 FT. + Hp 69.3 FT. - $H_L$ _____ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L^{10}}{r_{.125}} = \frac{2.04}{102.3' \times 10} \times 0.048 = \text{K, CM/SEC } 9.6 \times 10^{-5}$$

**TEST 3** Inflow pressure (Hp) 45 psi x 2.31 = 103.95 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 4.0 | 9.5 | 15.7 | 20.3 | 24.7 | 28.9 | 33.2 | 37.5 | 41.8 | 46.0 | 50.3 | 4.3 GPM / CFM |
| Take Per Min. | | 5.5 | 6.2 | 4.6 | 4.4 | 4.2 | 4.3 | 4.3 | 4.3 | 4.2 | 4.3 | |

$H_T$ 136.95 FT. = $H_G$ 33 FT. + Hp 103.95 FT. - $H_L$ _____ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{4.3}{136.95 \times 10} \times .048 = \text{K, CM/SEC } 1.5 \times 10^{-4}$$

MORRISON-KNUDSEN ENGINEERS, INC.

# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| Add. TCE Delineation | 4087A, Task 11 | 34 to 44 | MW 3037 |

| Test Equipment Identification | BORE HOLE Orientation: | BORE HOLE Size: | Test By: |
|---|---|---|---|
| Sensus Flow Meter<br>U.S. Gauge | Vertical | 3" | R. Cato<br>Date: 9-27-01 |

| Packers | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| On Casing<br>Single/Double<br>Hydraulic/Inflatable | ~30' Ft. | 3.0' Ft. | 33' Ft. |

**TEST 1** Inflow pressure ($H_P$) 20 psi × 2.31 = 46.2 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 52.0 | 53.5 | 55.0 | 56.5 | 58.0 | 59.5 | | | | | | 1.5 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

79.2 FT. = 33 FT. + 46.2 FT. – 0 FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{1.5}{79.2 \times 10} \times .048 = K,\ CM/SEC\ 9.1 \times 10^{-5}$$

**TEST 2** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ _____ FT. = $H_G$ _____ FT. + $H_P$ _____ FT. – $H_L$ _____ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K,\ CM/SEC$$

**TEST 3** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ _____ FT. = $H_G$ _____ FT. + $H_P$ _____ FT. – $H_L$ _____ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K,\ CM/SEC$$

MORRISON-KNUDSEN ENGINEERS, INC.

# PRESSURE TEST RESULTS (FIELD)

$K = 7.9 \times 10^{-5}$

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| Additional TCE Delineation | 487A, Task 11 | 44 to 51 (1) | MW 8037 |

| Test Equipment Identification | BORE HOLE Orientation: | BORE HOLE Size: | Test By: |
|---|---|---|---|
| Sensus Flow Meter U.S. Gauge | VERTICAL | 3" | R. CATO<br>Date: 9-30-01 |

| Packers (On Casing: Single/Double; Hydraulic/Inflatable) | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| | 26 FT Ft. | 3.0 Ft. | 29.0 Ft. |

**TEST 1** Inflow pressure ($H_P$) 20 psi × 2.31 = 46.2 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 65.0 | 66.4 | 67.4 | 68.5 | 69.2 | 70.0 | 70.7 | 71.4 | 72.1 | 72.0 | | 0.75 GPM<br>CFM |
| Take Per Min. | | 1.4 | 1.2 | 0.9 | 0.7 | 0.8 | 0.7 | 0.8 | 0.7 | 0.7 | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

75.2 FT. = 29.0 FT. + 46.2 FT. – 0 FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{0.75}{75.2 \times 7} \times 0.044 = K,\ CM/SEC\ 6.3 \times 10^{-5}$$

(r = .125)

**TEST 2** Inflow pressure ($H_P$) 30 psi × 2.31 = 69.3 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 78.0 | 79.2 | 80.2 | 81.2 | 82.2 | 83.1 | 84.1 | | | | | 1.02 GPM<br>CFM |
| Take Per Min. | | 1.2 | 1.0 | 1.0 | 1.0 | 0.9 | 1.0 | | | | | |

$H_T$ 98.3 FT. = $H_G$ 29.0 FT. + $H_P$ 69.3 FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{1.02}{98.3 \times 7} \times 0.044 = K,\ CM/SEC\ 6.5 \times 10^{-5}$$

**TEST 3** Inflow pressure ($H_P$) 45 psi × 2.31 = 103.95 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 95.5 | 97.4 | 99.2 | 101.1 | 102.9 | 104.9 | 106.7 | 108.5 | | | | 1.86 GPM<br>CFM |
| Take Per Min. | | 1.9 | 1.8 | 1.9 | 1.8 | 2.0 | 1.8 | 1.8 | | | | |

$H_T$ 103.95 FT. = $H_G$ 29.0 FT. + $H_P$ 132.95 FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{1.86}{103.95 \times 7} \times 0.044 = K,\ CM/SEC\ 1.1 \times 10^{-4}$$

PS 2/2

MORRISON-KNUDSEN ENGINEERS, INC.

# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: 44 to 57 | Bore Hole: MW 3037 |
|---|---|---|---|
| Test Equipment Identification | BORE HOLE — Orientation: / Size: | Test By: R. Cato / Date: 9-30-01 | |
| Packers: On Casing / Single/Double / Hydraulic/Inflatable | Groundwater Depth: Ft. | Gauge Height Above Ground: Ft. | Gravity Head: 2 Ft. |

**TEST 1** Inflow pressure ($H_P$) 20 psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | No Take | | | | | | | | | GPM / CFM |
| Take Per Min. | | | | | | | | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

FT. = FT. + FT. – FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

**TEST 2** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM / CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

**TEST 3** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM / CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = \text{K. CM/SEC}$$

WELDON SPRING SITE REMEDIAL ACTION PROJECT

MONITORING WELL DEVELOPMENT FORM

ES&H 4.4.8.2, Rev.0, 5/95

PROJECT NAME Additional TCE Delineation WORK PACKAGE NO. 487A, Task 11

SHEET 1 OF 2

DEVELOPED BY Layne Western / Alan Benfer, PMC

1. Well Number.: MW-3037 Well Location: 10432.39.63 / 7532.50.11

2. Date of Installation: 10/9/01

3. Date of Development: 10/15; 10/16/01

4. Static Water Level: Before Development 38.37 TOC ft.; At least 24 hrs. after _____ ft.

5. Organic Vapor: Before development NA ppm; After development NA ppm.

6. Quantity of water loss during drilling, if used: ___ gal. unknown

7. Quantity of standing water in well and annulus before development: 9.3 gal.

8. Depth from top of well casing to bottom of well: 47.5 ft. (from Well Installation Diagram)

9. Well diameter: 2.0 in.

10. Screen length: 10.0 ft.

11. Minimum quantity of water to be removed: 15.7 gal.

12. Depth to top of sediment: Before development None ft.; After development _____ ft.

13. Physical character of water (before/after development): Muddy / clear

14. Type and size of well development equipment: 1½" Grundfos Redi-Flo Submersible pump.

15. Description of surge technique: Raise and lower submersible pump

16. Height of well casing above ground surface: 2.5 ft. (from Well Installation Diagram).

Quantity of water removed: 32 gal. Time for removal: 2.3 hr./min.

WELDON SPRING SITE REMEDIAL ACTION PROJECT

MONITORING WELL DEVELOPMENT FORM

ES&H 9.1.3, Rev. 0, 2/99

PROJECT NAME Additional TCE Delineation WORK PACKAGE NO. 487A, Task 11

SHEET 2 OF 2

DEVELOPED BY Layne Western / Alan Beafer, PMC

Well Number: MW-3037 Well Locations: 1043239.63 / 753250.11

| Date/ Time | Hrs. Dev./ Cum. Hrs. Dev. | Gals. Purged/ Cum. Gals. Purged | pH | Temp. (°C) | Cond. (umhos) | Turb. (NTUs) | Remarks |
|---|---|---|---|---|---|---|---|
| 10/15/01 | | | | | | | |
| 1355 | | 19 | 6.9 | 15.8 | 1.22 | >1000 | |
| 1413 | | 20 | 7.2 | 15.8 | 1.14 | >1000 | |
| 1415 | | 21 | 6.9 | 17.1 | 1.08 | >1000 | |
| 1433 | | 23 | 6.8 | 15.2 | 1.13 | 979 | |
| 1456 | | 24 | 6.8 | 14.4 | 1.09 | 941 | |
| 1458 | | 25 | 6.8 | 15.3 | 1.16 | >1000 | |
| 10/16/01 0803 | | 26 | 6.8 | 15.6 | 0.93 | 309 | |
| 0808 | | 27 | 6.8 | 14.3 | 0.98 | 137 | |
| 0812 | | 28 | 6.8 | 14.0 | 1.05 | 65.6 | |
| 0817 | | 29 | 6.8 | 15.2 | 1.06 | 51.6 | |
| 0823 | | 30 | 6.8 | 15.3 | 1.09 | 30.8 | |
| 0828 | | 31 | 6.8 | 14.9 | 1.19 | 60.0 | |
| 0837 | | 32 | 6.9 | 15.1 | 1.05 | 90.1 | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

3 well volumes = 15.7 gals.

# WELDON SPRING SITE REMEDIAL ACTION PROJECT

# BOREHOLE AND WELL COMPLETION LOG

WSKLOG-C

| | |
|---|---|
| HOLE NUMBER | MW-3038 |
| SHEET 1 OF 2 | |
| NORTH (Y): | 1042398.61 |
| EAST (X): | 753100.40 |
| TOC ELEVATION | 654.51 |
| GROUND ELEVATION | 651.7 |
| STICKUP | 2.81 |
| HYDR CONDUCTIVITY (cm/sec) | K= 1.6x10$^{-5}$ (Packer Test) |

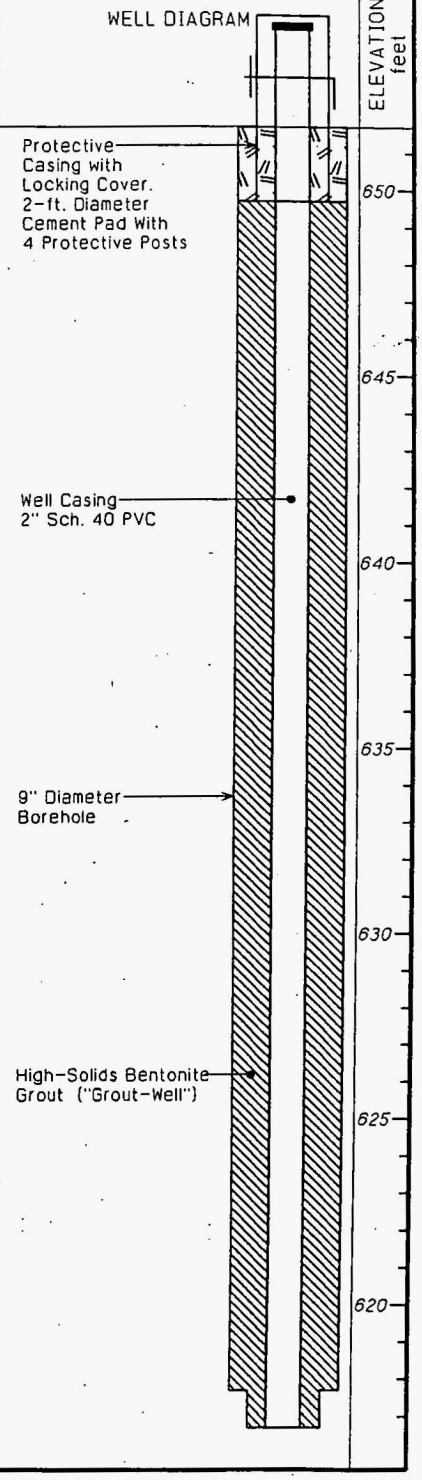
| | |
|---|---|
| WELL STATUS/COMMENTS | ACTIVE |
| LOCATION | VICINITY OF RAFFINATE PIT 4 |
| DRILLING CONTRACTOR | LAYNE WESTERN Inc. |
| DRILL RIG MAKE & MODEL | CME-750 HSA/NQWL; I-R TH-60 AIR ROTARY |
| HOLE SIZE & METHOD | 9" HSA-34; NQ-58.2; 6" AIR-57 |
| ANGLE FROM HORIZONTAL & BEARING | 5 Vertical |
| BOTTOM OF HOLE (TD) | 58.2 |
| DRILL FLUIDS & ADDITIVES | Water core; Air ream |
| CASING TYPE, DEPTH, SIZE | 2" PVC Mon. Well |
| BEDROCK | 31.0 |
| DATE START | 10-19-01 |
| DATE FINISH | 10-25-01, Mon. Well |
| WATER LEVELS & DATES | |

DEPTH (FT.) FROM GROUND ELEV. TO:

LITHOLOGY BY PAUL PATCHIN / ALAN BENFER

| DEPTH feet | SAMPLE | SAMPLE/RUN Number | PERCENT Recovery (0–100) | N# or RQD | GRAPHIC LOG | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CL CH | The overburden soil was not sampled or logged from the surface to 30.0-ft.. | pPr/Qct/Qfv Undiffer. |
| 30 | | SPT-1 | | 28 | | | | |
| | | | | | | LMS CHRT | LIMESTONE, highly weathered, clayey, light gray, moist, soft. | Mdksw |
| | | | | | | | Auger refusal at 34.0-ft. Begin NQWL core. | |
| 35 | | NQ-1 | 37/62" | 40 | | | @ 34.2'. Lost circulation to 47.8-ft. | |

WELL DIAGRAM




ELEVATION feet

Sample Interval ☐ No Sample Taken ▽minimum ▼maximum ▽average

# WELDON SPRING SITE REMEDIAL ACTION PROJECT

# BOREHOLE AND WELL COMPLETION LOG

HOLE NUMBER: MW-3038

SHEET 2 OF 2

NORTH (Y): 1042398.61

EAST (X): 753100.40

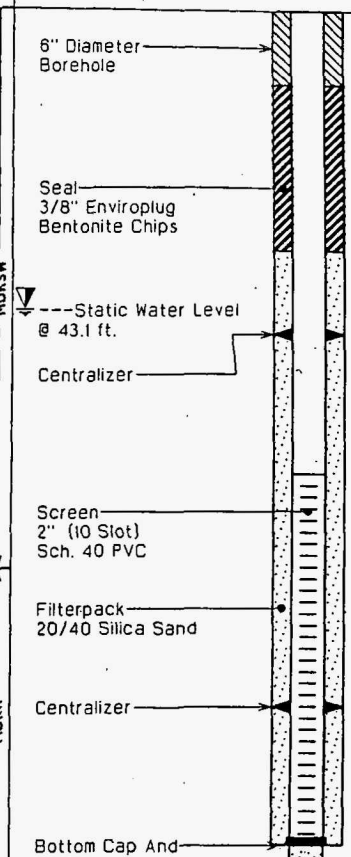
WSWLOG-C

WELL STATUS/COMMENTS: ACTIVE

LOCATION: VICINITY OF RAFFINATE PIT 4

| DEPTH feet | SAMPLE | SAMPLE/RUN Number | PERCENT Recovery (0–100) | N# or RQD | GRAPHIC LOG | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT |
|---|---|---|---|---|---|---|---|---|
| | | | | | | LMS CHRT | @ 34.0'– 43.6'. LIMESTONE AND CHERT, ~ 60/40%, interbedded. Limestone is very fine-grained, moderately to strongly weathered, thinly bedded, closely fractured, medium porosity, abundant FeOx throughout, zoned MnOx, fossiliferous, dark yellowish orange (10YR6/6), with abundant green clay fracture filling from 35.3' to 36.1'. Chert is mottled light bluish gray (5B7/1), very hard, commonly brecciated with limestone, or as nodules and thin beds, fossiliferous, MnOx commonly follows fractures. ~3 to >6 fractures per foot, some eroded and vuggy, open and rough. Strongly Weathered Burlington-Keokuk Limestone. | Mdksw |
| 40 | | NQ-2 | 10/34" | 14 | | | | |
| | | NQ-3 | 26/26" | 91 | | | NQ-2, 39.2'– 42.0'. Poor recovery, core loss zones unknown. | |
| 45 | | NQ-4 | 10/38" | 0 | | | @ 43.6'– 50.0'. CHERT, ~ 70%, brecciated along with limestone, ~ 30%. Limestone as above but much more brecciated, strongly weathered, very vuggy with some grayish yellow (5Y8/4) clay filling, FeOx and MnOx common. Fluid return ~80% at 47.8'. Strongly Weathered Burlington- Keokuk Limestone. | |
| | | NQ-5 | 22/22" | 61 | | | | |
| 50 | | NQ-6 | 2/8" | 0 | | | | |
| | | NQ-7 | 34/52" | 44 | | | @ 50.'– 57.4'. LIMESTONE AND CHERT, ~ 70/30%. Limestone is argillaceous and silty, fine-grained, moderately to strongly weathered with distinctive MnOx specks throughout, moderately hard, occasional vugs up to 1", moderate to high porosity, dark yellowish orange (10YR6/6), thinly bedded and brecciated with chert. Chert is very pale orange (10YR8/2), finely disseminated and brecciated with the limestone, very hard, some calcite-filled vugs, occasional 1/2" to 1" beds or nodules. ~1 to >6 fracture per foot, open and rough. ~75% fluid return. Weathered Burlington-Keokuk Limestone. | Mdkw |
| 55 | | NQ-8 | 46/48" | 48 | | | | |
| | | | | | | | @ 57.4'– 58.2'. Limestone and chert as above, light gray (N7) with abundant dark gray stringers. Less fractured, ~80% fluid return. Weathered Burlington-Keokuk Limestone. | |
| 60 | | | | | | | Total cored depth, 58.2', 10-23-01. Hole reamed to 6" in diameter to 57.5' and a 2" monitoring well was constructed. | |
| 65 | | | | | | | CONSTANT HEAD SINGLE PACKER TEST RESULTS<br>36.0 – 44.2-ft. K = 1.6E-5 cm/sec<br>44.0 – 58.2-ft. K = 2.4E-5 cm/sec | |
| 70 | | | | | | | | |
| 75 | | | | | | | | |

WELL DIAGRAM



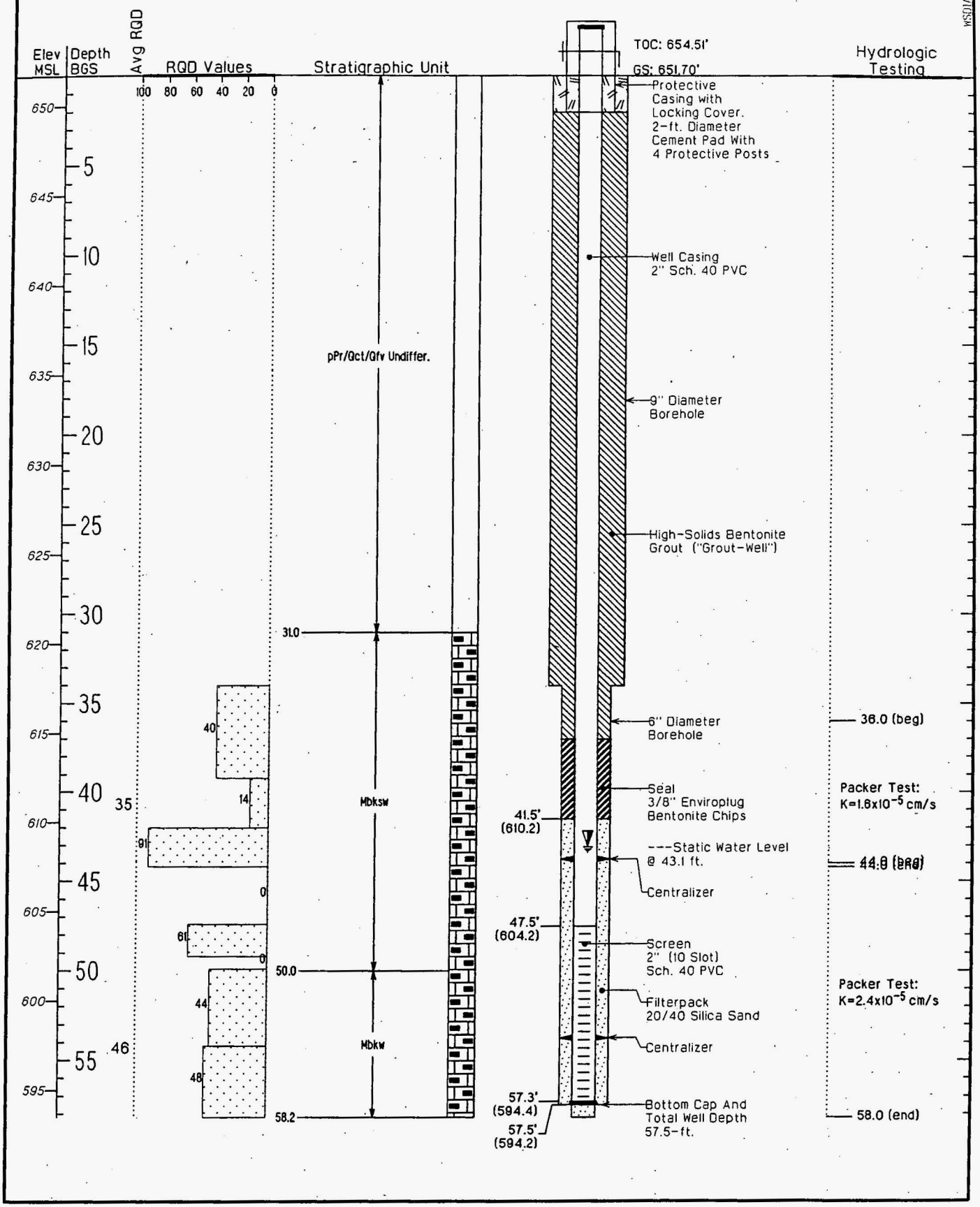

ELEVATION feet: 615, 610, 605, 600, 595, 590, 585, 580

Sample Interval | No Sample Taken | minimum | maximum | average

# BOREHOLE DIAGRAM



## MW-3038




minimum maximum average

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# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| WSSRAP Additional TCE Delineation | 13840 487A, Task 11 | 44.0 to 58.2 | MW-3038 |

| Test Equipment Identification | BORE HOLE Orientation: | BORE HOLE Size: | Test By: P. Patchin |
|---|---|---|---|
| | Vertical | 3" | Date: 10/23/01 |

| Packers On Casing Single/Double Hydraulic/Inflatable | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| | ~42.4 Ft. | 3.0 Ft. | 45.4' Ft. |

**TEST 1** Inflow pressure ($H_P$) 20 psi × 2.31 = 46.2 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 452 .00 | 2 .60 | 3 .12 | 3 .72 | 4 .30 | 4 .82 | 5 .36 | 5 .90 | | | | 0.56 GPM / CFM |
| Take Per Min. | | .60 | .52 | .60 | .58 | .52 | .54 | .54 | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

93.6 FT. = 45.4 FT. + 46.2 FT. – 0 FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{0.56}{93.6 \times 14.2} \times \frac{.011 \ln \frac{14.2}{.125}}{0.052} = K, CM/SEC\ 2.2 \times 10^{-5}$$

**TEST 2** Inflow pressure ($H_P$) 30 psi × 2.31 = 69.3 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 58 .50 | 59 .39 | 60 .26 | 61 .13 | 62 .01 | 62 .88 | | | | | | 0.87 GPM / CFM |
| Take Per Min. | | .89 | .87 | .85 | .88 | .87 | | | | | | |

$H_T$ 116.7 FT. = $H_G$ 45.4 FT. + $H_P$ 69.3 FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{0.87}{116.7 \times 14.2} \times 0.052 = K, CM/SEC\ 2.7 \times 10^{-5}$$

**TEST 3** Inflow pressure ($H_P$) 40 psi × 2.31 = 92.4 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 65 .50 | 66 .57 | 67 .68 | 68 .75 | 69 .86 | 70 .94 | 72 .03 | | | | | 1.09 GPM / CFM |
| Take Per Min. | | 1.07 | 1.11 | 1.07 | 1.11 | 1.08 | 1.09 | | | | | |

$H_T$ 139.8 FT. = $H_G$ 45.4 FT. + $H_P$ 92.4 FT. – $H_L$ 0 FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{1.09}{139.8 \times 14.2} \times 0.052 = K, CM/SEC\ 2.9 \times 10^{-5}$$

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# PRESSURE TEST RESULTS (FIELD)

| | | | |
|---|---|---|---|
| Project: WSSRAP ADDITIONAL TCE DELINEATION | Job Number: 13840 487A, TASK 11 | Test Section: 44.0 to 58.2 | Bore Hole: MW-3038 |
| Test Equipment Identification | BORE HOLE Orientation: VERT. Size: 3" | Test By: P. Patchin Date: 10/23/01 | |
| Packers On Casing Single/Double Hydraulic/Inflatable | Groundwater Depth: ~42.4 Ft. | Gauge Height Above Ground: 3.0 Ft. | Gravity Head: 45.4 Ft. |

**TEST 1** Inflow pressure ($H_P$) 20 psi × 2.31 = 46.2 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 73.50 | 73.90 | 74.50 | 75.00 | 75.47 | 75.99 | 76.49 | 76.99 | | | | 0.50 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | .40 | .60 | .50 | .47 | .52 | .50 | .50 | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

93.6 FT. = 45.4 FT. + 46.2 FT. – 0 FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{0.50}{93.6 \times 14.2} \times .052 = K,\ CM/SEC\ 2.0 \times 10^{-5}$$

**TEST 2** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet $\bar{X} = 2.4 \times 10^{-5}$

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ _____ FT. = $H_G$ _____ FT. + $H_P$ _____ FT. – $H_L$ _____ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K,\ CM/SEC$$

**TEST 3** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ _____ FT. = $H_G$ _____ FT. + $H_P$ _____ FT. – $H_L$ _____ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K,\ CM/SEC$$

MORRISON-KNUDSEN ENGINEERS, INC.

# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| WSSRAP ADDITIONAL TCE DELINEATION | 13840 WP 487A, TASK 11 | 36.0 to 44.2 | MW-3038 |

| Test Equipment Identification | BORE HOLE Orientation: | BORE HOLE Size: | Test By: |
|---|---|---|---|
| Sensus Flow Meter U.S. Gauge | VERTICAL | 3" | P. Patchin |
| | | | Date: 10/22/01 |

| Packers (On Casing, Single/Double, Hydraulic/Inflatable) | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| | ~ 43.0' Ft. | 3.0' Ft. | 46.0 Ft. |

**TEST 1** Inflow pressure ($H_P$) 10 psi × 2.31 = 23.1 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 8442 .10 | 4412 .14 | 2 .14 | 2 .15 | 2 .20 | .20 | .20 | .20 | .20 | .23 | .27 | 0.34 GPM; CFM |
| Take Per Min. | | .04 | .00 | .01 | .05 | .00 | .00 | .00 | .00 | .03 | .04 | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

69.1 FT. = 46.0 FT. + 23.1 FT. – 0 FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{0.34}{69.1 \times 8.2} \times .046 \ln \frac{8.2}{.125} = K,\ CM/SEC\ 2.0 \times 10^{-5}$$

**TEST 2** Inflow pressure ($H_P$) 20 psi × 2.31 = 46.2 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 43 .20 | .35 | .53 | .71 | .89 | 4 .07 | .24 | | | | | 0.18 GPM; CFM |
| Take Per Min. | | .15 | .18 | .18 | .18 | .18 | .17 | | | | | |

$H_T$ 92.2 FT. = $H_G$ 46.0 FT. + $H_P$ 46.2 FT. – $H_L$ 0 FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{0.18}{92.2 \times 8.2} \times .046 = K,\ CM/SEC\ 1.1 \times 10^{-5}$$

**TEST 3** Inflow pressure ($H_P$) 30 psi × 2.31 = 69.3 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 5 .80 | 6 .18 | .54 | .90 | 7 .26 | .58 | .91 | | | | | 0.35 GPM; CFM |
| Take Per Min. | | .38 | .32 | .36 | .36 | .32 | .33 | | | | | |

$H_T$ 115.3 FT. = $H_G$ 46.0 FT. + $H_P$ 69.3 FT. – $H_L$ 0 FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{0.35}{115.3 \times 8.2} \times .046 = K,\ CM/SEC\ 1.7 \times 10^{-5}$$

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

# PRESSURE TEST RESULTS (FIELD)



| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| | | 36.0 to 44.2 | MW-3038 |

| Test Equipment Identification | BORE HOLE | | Test By: P. Patchin |
|---|---|---|---|
| | Orientation: VERTICAL | Size: 3" | Date: 10/22/01 |

| Packers On Casing Single/Double Hydraulic/Inflatable | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| | ~ 43 Ft. | 3.0 Ft. | 46.0 Ft. |

**TEST 1** Inflow pressure ($H_P$) 10 psi × 2.31 = 23.1 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 7 .60 | .65 | .72 | .83 | .95 | 8 .04 | .16 | .27 | | | | 0.11 GPM / CFM |
| Take Per Min. | .05 | .07 | .11 | .12 | .09 | .12 | .11 | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

69.1 FT. = 46.0 FT. + 23.1 FT. – 0 FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{0.11}{69.1 \times 8.2} \times .0446 = K, CM/SEC\ 8.9 \times 10^{-6}$$

$\bar{X} = 1.6 \times 10^{-5}$

**TEST 2** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM / CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ ____ FT. = $H_G$ ____ FT. + $H_P$ ____ FT. – $H_L$ ____ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K, CM/SEC$$

**TEST 3** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM / CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ ____ FT. = $H_G$ ____ FT. + $H_P$ ____ FT. – $H_L$ ____ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K, CM/SEC$$

WELDON SPRING SITE REMEDIAL ACTION PROJECT

MONITORING WELL DEVELOPMENT FORM

ES&H 9.1.3, Rev. 0, 2/99

PROJECT NAME Additional TCE Delineation WORK PACKAGE NO. 487A, Task 11

SHEET 2 OF 2

DEVELOPED BY Layne-Western / Alan Beaufer PMC

Well Number: MW-3038 Well Locations: 1042400.15 753099.50

| Date/ Time | Hrs. Dev./ Cum. Hrs. Dev. | Gals. Purged/ Cum. Gals. Purged | pH | Temp. (°C) | Cond. (umhos) | Turb. (NTUs) | Remarks |
|---|---|---|---|---|---|---|---|
| 10/30/01 1353 | | 18 | 7.5 | 21.1 | 0.55 | >1000 | |
| 10/31/01 0732 | | JAB ~~19~~ 22 | 7.7 | 13.4 | 0.49 | 92.8 | |
| 0734 | | JAB ~~20~~ 23 | 7.6 | 14.6 | 0.45 | 48.2 | |
| 0740 | | JAB ~~21~~ 24 | 7.2 | 15.8 | 0.42 | 117 | |
| 0744 | | JAB ~~22~~ 25 | 7.2 | 16.0 | 0.45 | 147 | 0747. went dry |
| 0847 | | 26 | 7.2 | 13.5 | 0.44 | 69.5 | |
| 0853 | | 27 | 7.2 | 15.3 | 0.45 | 49.2 | |
| 0858 | | 28 | 7.2 | 16.4 | 0.45 | 101 | |
| 0903 | | 29 | 7.2 | 17.3 | 0.45 | 132 | |
| 0908 | | 30 | 7.2 | 17.5 | 0.45 | 90.3 | |
| 0915 | | 31 | 7.1 | 19.5 | 0.44 | 86.7 | |
| 0932 | | 32 | 7.2 | 18.7 | 0.44 | 171 | |
| 0945 | | 33 | 7.2 | 19.5 | 0.44 | 44.8 | 0950. went dry |
| 1036 | | 34 | 7.2 | 17.5 | 0.44 | 57.3 | went dry |
| 1115 | | 35 | 6.5 | 17.2 | 0.44 | 38.9 | |
| 1120 | | 36 | 6.2 | 18.0 | 0.44 | 118 | |
| 1125 | | 37 | 6.1 | 19.0 | 0.44 | 77.8 | |
| 1242 | | 38 | 6.4 | 18.1 | 0.45 | 36.2 | |
| 1300 | | 39 | 6.3 | 18.3 | 0.44 | 79.9 | pumped 2 more gallons. 41 gal. total. |

3 well volumes = 22 gal.

WELDON SPRING SITE REMEDIAL ACTION PROJECT

MONITORING WELL DEVELOPMENT FORM

ES&H 4.4.8.2, Rev.0, 5/95

PROJECT NAME Additional TCE Delineation WORK PACKAGE NO. 487A, Task 11

SHEET 1 OF 2

DEVELOPED BY Layne Western / Alan Benfer, PMC.

1. Well Number.: MW-3038 Well Location: _____

2. Date of Installation: 10/25/01

3. Date of Development: 10/30, 10/31/01

4. Static Water Level: Before Development 45.88 T.O.C. ft.; At least 24 hrs. after _____ ft.

5. Organic Vapor: Before development NA ppm; After development NA ppm.

6. Quantity of water loss during drilling, if used: unknown gal.

7. Quantity of standing water in well and annulus before development: ~7.3 gal.

8. Depth from top of well casing to bottom of well: 60.0 ft. (from Well Installation Diagram)

9. Well diameter: 2.0 in.

10. Screen length: 10.0 ft.

11. Minimum quantity of water to be removed 22 gal.

12. Depth to top of sediment: Before development None ft.; After development _____ ft.

13. Physical character of water (before/after development): Muddy / Clear

14. Type and size of well development equipment: 1½" Grundfos Redi-Flo submersible pump.

15. Description of surge technique: Raise and lower pump.

16. Height of well casing above ground surface: 2.5 ft. (from Well Installation Diagram).

Quantity of water removed: 39 gal. Time for removal: 8 hr./min.

Low producer

# WELDON SPRING SITE REMEDIAL ACTION PROJECT

# BOREHOLE AND WELL COMPLETION LOG

WSMLOG-C

| | |
|---|---|
| HOLE NUMBER | MW-3039 |
| SHEET 1 OF 2 | |
| NORTH (Y): | 1042571.66 |
| EAST (X): | 753719.91 |
| TOC ELEVATION | 649.46 |
| GROUND ELEVATION | 646.69 |
| STICKUP | 2.77 |
| HYDR CONDUCTIVITY (cm/sec) | K= 4.7x10$^{-4}$ (Packer Test) |

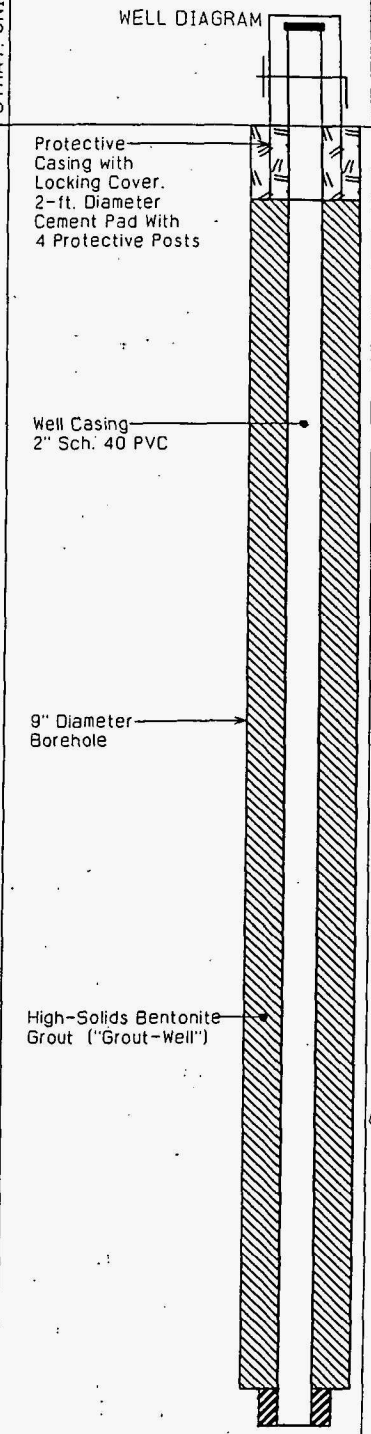
| | |
|---|---|
| WELL STATUS/COMMENTS | ACTIVE |
| LOCATION | NEAR SW CORNER OF DISPOSAL CELL |
| DRILLING CONTRACTOR | LAYNE WESTERN Inc. |
| DRILL RIG MAKE & MODEL | CME-750 HSA/NQWL; I-R TH-60 AIR ROTARY |
| HOLE SIZE & METHOD | 9" HSA-34.5; NQ-52; 6" AIR-52 |
| ANGLE FROM HORIZONTAL & BEARING | 5 Vertical |
| DEPTH (FT.) FROM GROUND ELEV. TO: BOTTOM OF HOLE (TD) | 52.5 |
| DRILL FLUIDS & ADDITIVES | Water core; Air ream |
| CASING TYPE, DEPTH, SIZE | 2" PVC Mon. Well |
| BEDROCK | 34.5 |
| DATE START | 10-12-01 |
| DATE FINISH | 10-25-01, Mon. Well |
| WATER LEVELS & DATES | |

LITHOLOGY BY ALAN BENFER

| DEPTH feet | SAMPLE | SAMPLE/RUN Number | PERCENT Recovery (0–100) | N# or RQD | GRAPHIC LOG | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CL CH | The overburden soil was not sampled or logged from the surface to 32.5-ft.. | Qct/Qfv undiff. |
| 5 | | | | | | | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |
| 30 | | | | | | | | |
| 35 | SPT-1 | | | 80+ | | CH | LIMESTONE AND CHERT, highly weathered, with light yellow highly plastic clay. Probable Residuum. | |
| | SPT-2 | NQ-1 | 9/62" | 100 | | LMS CHRT | Auger refusal 34.0-ft.. Continued with NQ core. NQ-1, 34.0'– 39.2'. Poor recovery, core loss zones unknown. Longest piece recovered, ~4". Mostly light gray chert with strongly weathered | pPr |

Mbksw

WELL DIAGRAM




ELEVATION feet

Sample Interval ☐ No Sample Taken ▽minimum ▼maximum ▽average

# WELDON SPRING SITE REMEDIAL ACTION PROJECT

# BOREHOLE AND WELL COMPLETION LOG

WSWLOG-C

HOLE NUMBER: MW-3039

SHEET 2 OF 2

NORTH (Y): 1042571.66

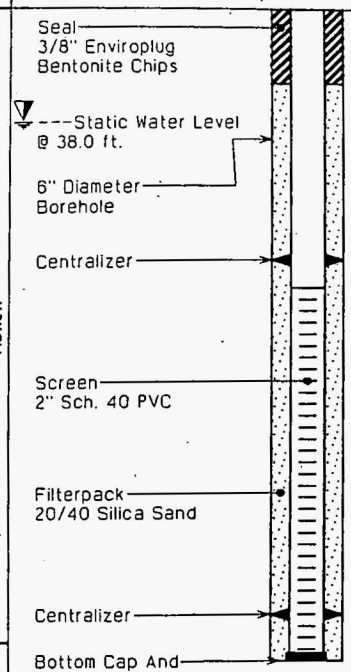
EAST (X): 753719.91

WELL STATUS/COMMENTS: ACTIVE

LOCATION: NEAR SW CORNER OF DISPOSAL CELL

| DEPTH feet | SAMPLE | SAMPLE/RUN Number | PERCENT Recovery (0–100) | N# or RQD | GRAPHIC LOG | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT |
|---|---|---|---|---|---|---|---|---|
| | | | | | | LMS CHRT | limestone, orange brown, solutioned. Fluid return varies from ~25% to ~100%. | Mdksw |
| 40 | | NQ-2 | 19/35" | 14 | | | NQ-2, 39.2'- 42.1'. Poor recovery, loss zones unknown. Mostly chert, with strongly weathered and highly solutioned limestone; 2" zone of oxidized pyrite. ~40% fluid return. Likely, Strongly Weathered Burlington-Keokuk Limestone. | |
| | | NQ-3 | 14/14" | 92 | | | @ 41.5'. Return water color change to chocolate brown. | |
| | | NQ-4 | | 0 | | | CHERT AND LIMESTONE, mostly chert, hard, light bluish gray. Limestone is weathered, argillaceous, solutioned, some calcite, yellow brown. Light gray, high plasticity clay at 43.2'. ~25% fluid return, light brown color. | |
| 45 | | | | | | | NQ-3, 43.3'- 46.5'. Recovered only 4" of chert rubble. Fluid return has increased to ~75%. | |
| | | NQ-5 | 30/34" | 36 | | | CHERT AND LIMESTONE as above, mostly chert. Limestone is strongly weathered, vuggy, highly eroded by the drill water. ~3 fractures per foot, rough, eroded, open up to 2". ~75% fluid return. Strongly Weathered Burlington-Keokuk Limestone. | |
| | | NQ-6 | 26/32" | 22 | | | | |
| 50 | | | | | | | @ 47.7'- 48.6'. Voids up to 1". | |
| | | | | | | | @ ~50.5'. Bit dropped. | |
| | | | | | | | Total cored depth 52.0', 10-18-01. Hole reamed to 6" diameter to 52.5' and a 2" monitoring well was constructed. | |
| 55 | | | | | | | CONSTANT HEAD SINGLE PACKER TEST RESULTS<br>36.0 - 43.3-ft. K = 4.7E-4 cm/sec<br>43.0 - 52.0-ft. K = 2.9E-5 cm/sec | |
| 60 | | | | | | | | |
| 65 | | | | | | | | |
| 70 | | | | | | | | |
| 75 | | | | | | | | |

WELL DIAGRAM



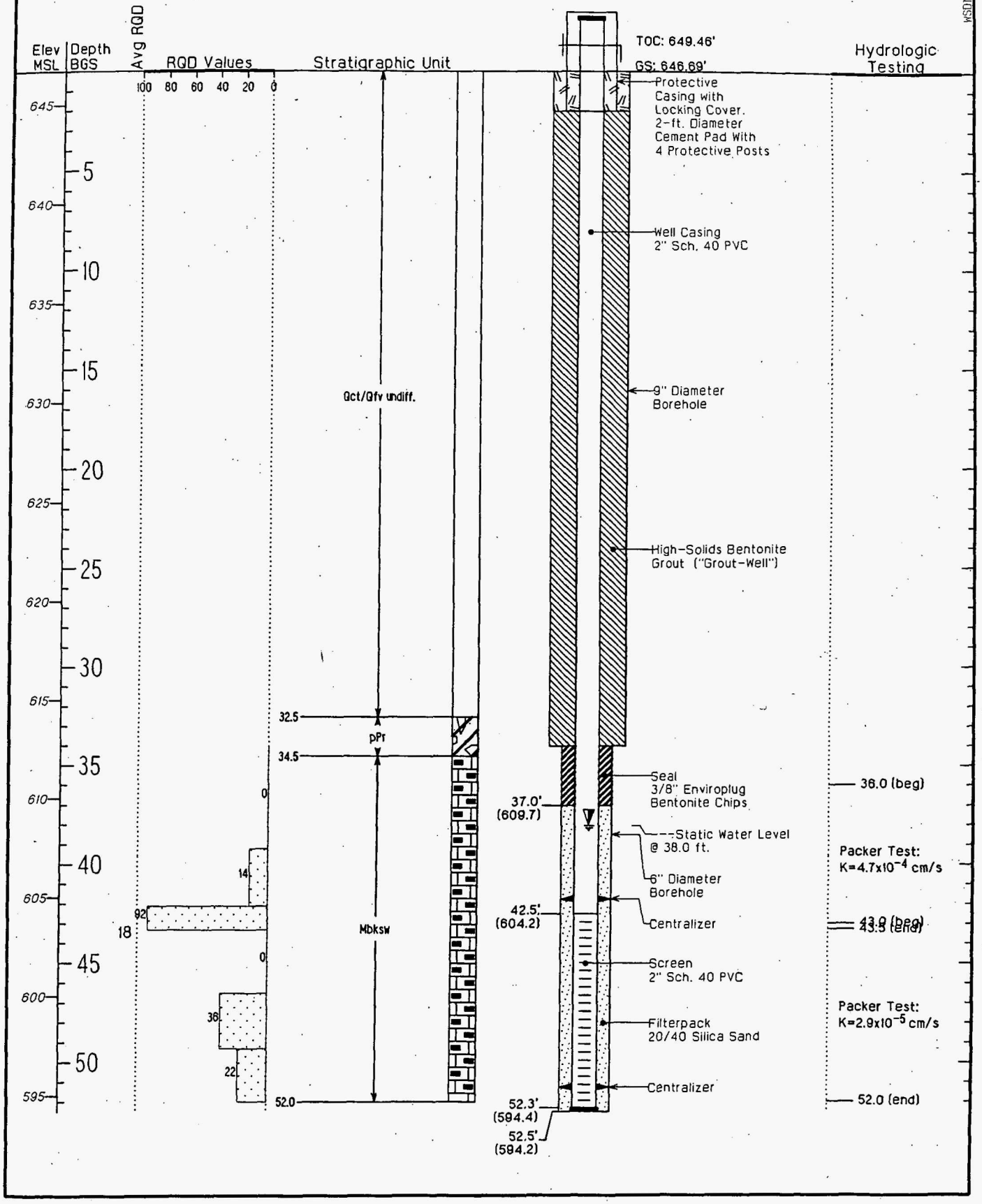

ELEVATION feet: 610, 605, 600, 595, 590, 585, 580, 575

Sample Interval ☐ No Sample Taken ▽minimum ▼maximum ▼average

# BOREHOLE DIAGRAM



## MW-3039




minimum maximum average

MORRISON-KNUDSEN ENGINEERS, INC.

# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| Additional TCE Delineation | 487A, Task 11 | 43.0 to 52.0 | MW 3039 |

| Test Equipment Identification | BORE HOLE Orientation: | BORE HOLE Size: | Test By: |
|---|---|---|---|
| Sensus Flow Meter | Vertical | 3.0" | A. Benfer<br>Date: 10/18/01 |

| Packers | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| On Casing<br>Single/Double<br>Hydraulic/Inflatable | 37.3 Ft. | 2.7 Ft. | 40.0 Ft. |

1245

## TEST 1

Inflow pressure ($H_P$) 15 psi × 2.31 = 34.7 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 15.90 | 16.10 | 16.18 | 16.35 | 16.51 | 16.67 | 16.70 | 16.70 | | | | 0.16 GPM<br>CFM |
| Take Per Min. | -.14 | .08 | 0.17 | 0.14 | 0.16 | 0.03 | 0 | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

74.7 FT. = 40.0 FT. + 34.7 FT. – 0 FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{0.16}{74.7 \times 9.0} \times .011 \ln \frac{9.0}{.125} = K, CM/SEC\ 1.1 \times 10^{-5}$$

.047

## TEST 2

Inflow pressure ($H_P$) 30 psi × 2.31 = 69.3 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 18.00 | 18.46 | 18.88 | 19.32 | 19.77 | 20.20 | 20.62 | 21.07 | 21.48 | 21 | | 0.44 GPM<br>CFM |
| Take Per Min. | .46 | .42 | .44 | .45 | .43 | .32 | 0.45 | 0.41 | | | | |

12
32
44

23
20
63

$H_T$ 109.3 FT. = $H_G$ 40.0 FT. + $H_P$ 69.3 FT. – $H_L$ 0 FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{0.44}{109.3 \times 9.0} \times .047 = K, CM/SEC\ 2.1 \times 10^{-5}$$

## TEST 3

Inflow pressure ($H_P$) 50 psi × 2.31 = 115.5 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 24.60 | 25.51 | 27.00 | 28.90 | 30.35 | 31.85 | 33.35 | 34.74 | | | | 1.5 GPM<br>CFM |
| Take Per Min. | 0.91 | 1.81 | 1.5 | 1.45 | 1.5 | 1.5 | 1.39 | | | | | |

.59
40
.99

$H_T$ 155.5 FT. = $H_G$ 40.0 FT. + $H_P$ 115.5 FT. – $H_L$ 0 FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{1.5}{155.5 \times 9.0} \times .047 = K, CM/SEC\ 5.0 \times 10^{-5}$$

MORRISON-KNUDSEN ENGINEERS, INC.
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# PRESSURE TEST RESULTS (FIELD)

| | | | |
|---|---|---|---|
| Project: Additional TCE Delineation | Job Number: 487A, Task 11 | Test Section: 36.0 to 43.3 | Bore Hole: MW 3039 |
| Test Equipment Identification: Sensors Flow Meter, H.S. Gauge | BORE HOLE — Orientation: Vertical; Size: 3.0" | Test By: A. Berofer; Date: 10/17/01 | |
| Packers: On Casing; Single/Double; Hydraulic/Inflatable | Groundwater Depth: ? 37.0 Ft. | Gauge Height Above Ground: 2.7' Ft. | Gravity Head: 39.7 Ft. |

## TEST 1

Inflow pressure ($H_P$) 15 psi × 2.31 = 34.7 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 355.0 | 362.7 | 370.4 | 378.1 | 385.8 | 393.3 | 400.9 | | | | | 7.7 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | 7.7 | 7.7 | 7.7 | 7.7 | 7.5 | 7.6 | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

74.4 FT. = 39.7 FT. + 34.7 FT. – FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{7.7}{74.4 \times 7.3} \times .0447 = K, CM/SEC\ 6.3 \times 10^{-4}$$

## TEST 2

Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet $\bar{X} = 4.7 \times 10^{-4}$

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\quad \times \quad} \times \quad = K, CM/SEC$$

## TEST 3

Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\quad \times \quad} \times \quad = K, CM/SEC$$

WELDON SPRING SITE REMEDIAL ACTION PROJECT

MONITORING WELL DEVELOPMENT FORM

ES&H 9.1.3; Rev. 0, 2/99

PROJECT NAME [redacted] WORK PACKAGE NO. 487A, Task 11

SHEET 2 OF 2

DEVELOPED BY [redacted] / Alan Beafer, PMC

Well Number: MW-3039 Well Locations:

| Date/ Time | Hrs. Dev./ Cum. Hrs. Dev. | Gals. Purged/ Cum. Gals. Purged | pH | Temp. (°C) | Cond. (umhos) | Turb. (NTUs) | Remarks |
|---|---|---|---|---|---|---|---|
| 10/30/01 0857 | | 17 | 6.8 | 17.5 | 3.13 | 451 | Fairly clear |
| 0902 | | 19 | 6.8 | 16.9 | 1.63 | 343 | |
| 0907 | | 21 | 6.7 | 17.3 | 3.21 | 487 | |
| 0913 | | 23 | 6.7 | 17.3 | 3.25 | 333 | |
| 0918 | | 25 | 6.7 | 17.2 | 3.27 | 289 | |
| 0925 | | 27 | 6.7 | 17.1 | 3.29 | 267 | |
| 0929 | | 29 | 6.8 | 17.0 | 3.26 | 494 | |
| 0935 | | 31 | 6.9 | 17.3 | 3.29 | 162 | |
| 0940 | | 33 | 6.9 | 17.4 | 2.96 | 202 | |
| 0945 | | 35 | 7.1 | 17.5 | 3.33 | 152 | |
| 0947 | | 37 | 6.8 | 17.1 | 3.19 | >1000 | increased Flow |
| 1008 | | 43 | 6.8 | 16.6 | 3.44 | 175 | |
| 1013 | | 45 | 6.8 | 17.0 | 3.52 | 193 | |
| 1017 | | 47 | 6.9 | 16.9 | 3.49 | 127 | |
| 1022 | | 49 | 6.9 | 16.9 | 3.45 | 66.9 | |
| 1027 | | 51 | 6.8 | 17.0 | 3.44 | 39.7 | |
| 1032 | | 53 | 6.9 | 17.0 | 3.46 | 36.6 | |

3 well volumes = 22 gal.

# WELDON SPRING SITE REMEDIAL ACTION PROJECT

# BOREHOLE AND WELL COMPLETION LOG

WSWLOG-C

| | |
|---|---|
| HOLE NUMBER | MW-4031 |
| SHEET 1 OF 1 | |
| NORTH (Y): | 1042104.37 |
| EAST (X): | 752748.23 |
| TOC ELEVATION | 634.55 |
| GROUND ELEVATION | 631.80 |
| STICKUP | 2.75 |
| HYDR CONDUCTIVITY (cm/sec) | K= 6.7x10$^{-4}$ (Packer Test) |

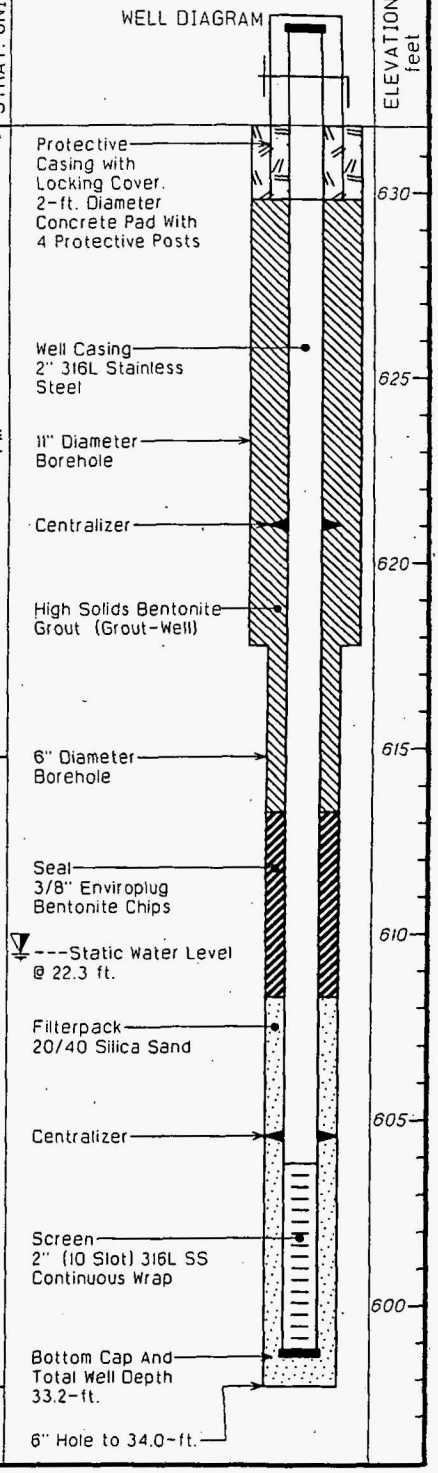
| | | | |
|---|---|---|---|
| WELL STATUS/COMMENTS: ACTIVE | LOCATION: EAST SIDE OF ARMY PROPERTY | | |
| DRILLING CONTRACTOR: LAYNE WESTERN Inc. | DRILL RIG MAKE & MODEL: CME-750 HSA/NXWL; I-R TH-60 AIR ROTARY | | |
| HOLE SIZE & METHOD: 11" HSA-14.1; NX-34; 6" AIR-34 | ANGLE FROM HORIZONTAL & BEARING: Vertical | BOTTOM OF HOLE (TD): 34 | |
| DRILL FLUIDS & ADDITIVES: Water core; Air ream | CASING TYPE, DEPTH, SIZE: 2" 316 SS Mon. Well | BEDROCK: ~17 | |
| DATE START: 1-19-01 | DATE FINISH: 1-23-01, Mon. Well | WATER LEVELS & DATES | |

DEPTH (FT.) FROM GROUND ELEV. TO:

LITHOLOGY BY ALAN BENFER / BECKY CATO

| DEPTH feet | SAMPLE/RUN Number | PERCENT Recovery | N# or RQD | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT |
|---|---|---|---|---|---|---|
| | SPT-1 | | 6 | FILL/CL CH | CLAY, silty, low plasticity, with organics, dark brown, moist, soft, CL. Fill or Topsoil. | Fill |
| | SPT-2 | | 6 | | CLAY, silty, medium plasticity, with hair roots and FeOx, moist, soft, CL. Appears to be Roxanna-like Ferrelview Clay. | |
| | SPT-3 | | 9 | | CLAY, silty, low plasticity, with some organics, dark brown moist, soft, CL. Appears to be Fill. | |
| 5 | | | | | @ 3.5'. CLAY, high plasticity, with some gravel, light brown, moist, firm, CL. Fill. | |
| | SPT-4 | | 22 | | CLAY, silty, low plasticity, with some organics, dark brown, moist, soft, CL. Fill. | |
| | SPT-5 | | 21 | | @ 7.5'. Limestone and chert rock fragments. | |
| 10 | SPT-6 | | 25 | | CLAY, silty, low plasticity, with organics and limestone rock fragments, dark and light brown, moist, soft, CL. Fill. | |
| | SPT-7 | | 68 | | Limestone and Chert, highly weathered, white to yellow brown, damp, hard. | |
| | | | | | @ 12.0'-13.5'. Weathered limestone and chert as above. Possibly Fill. | |
| | NX-1 | 22/57" | 50 | | Auger refusal at 14.0' | |
| 15 | | | | | NX-1, 14.0'-14.5'. Poor recovery. CLAY, silty, organics, including wood, chert fragments, dark and light brown. Likely Fill. | |
| | | | | LMS CHRT | Poor recovery, partial fluid return. | Mdksw/Mdkw |
| | | | | | @ 17.0'-18.75'. CHERT, brecciated, light bluish gray with abundant oxide stain. | |
| | NX-2 | | 0 | | NX-2, 18.75'-24.75'. Total core loss other than 6" of chert rubble. Partial fluid return. | |
| 20 | | | | | | |
| 25 | NX-3 | 15/51" | 7.8 | | NX-3, 24.75'-29.0'. Poor recovery. CHERT and chert rubble, white to light gray, broken, vuggy, oxide stain. Partial fluid return. | |
| | NX-4 | 3/60" | 0 | | | |
| 30 | | | | | @ 30.75'-33.5'. Lost circulation. Bit dropped; probable void. | |
| | | | | | @ 33.75'-34.0'. LIMESTONE, weathered, dark orange brown, ~20% chert. | |
| 35 | | | | | | |

WELL DIAGRAM



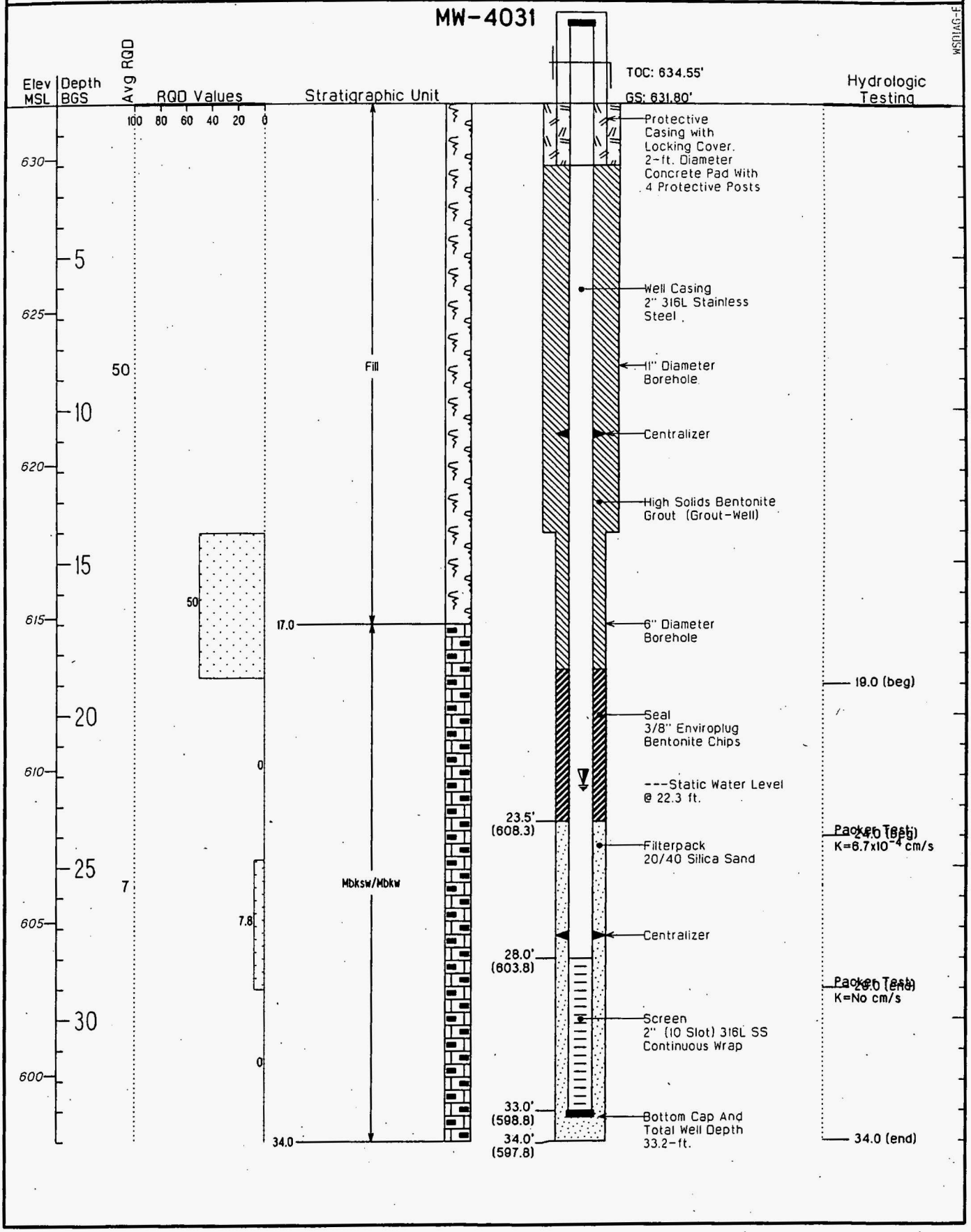

ELEVATION feet

Sample Interval ☐ No Sample Taken ▽minimum ▼maximum ▽average

# BOREHOLE DIAGRAM



## MW-4031




minimum maximum average

MORRISON-KNUDSEN ENGINEERS, INC.

# PRESSURE TEST RESULTS (FIELD)

K = 7x10^-4 1/2

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| TCE GW INVESTIGATION | WP 487A Task 8 | 19 to 29 | 4031 |

| Test Equipment Identification | BORE HOLE | | Test By: |
|---|---|---|---|
| Carlon Flow Meter<br>U.S. Gauge | Orientation: VERT. | Size: 3" | R CATO<br>Date: 22JAN01 |

| Packers | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| On Casing<br>Single Double<br>Hydraulic Inflatable | 22.8' Ft. | Stick-up 3.5' Ft. | 26.3 Ft. |

**TEST 1** Inflow pressure (Hp) 15 psi x 2.31 = 34.6 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 60.0 | 67.3 | 74.5 | 81.4 | 88.4 | 95.3 | 102.4 | 109.4 | | | | 21 GPM<br>CFM |
| Take Per Min. | 7.3 | 7.2 | 6.9 | 7.0 | 6.9 | 7.1 | 7.0 | | | | | CFM x 7.48 – GPM |

81.4 / 74.5 / 6

95.3 / 88.4 / 6

102.4 / 95.3 / 7.1

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head (Hp) – Head Losses ($H_L$)

60.9 FT. = 26.3 FT. + 34.6 FT. – — FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{\quad}{\times} \times \quad = K, CM/SEC\ 5.6 \times 10^{-4}$$

**TEST 2** Inflow pressure (Hp) 25 psi x 2.31 = 57.8 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 130.0 | 142.2 | 154.2 | 166.2 | 178.2 | | | | | | | 12.0 GPM<br>CFM |
| Take Per Min. | 12.2 | 12.0 | 12.0 | 12.0 | | | | | | | | |

$H_T$ 84.1 FT. = $H_G$ 26.3 FT. + Hp 57.8 FT. – $H_L$ — FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K, CM/SEC\ 6.9 \times 10^{-4}$$

**TEST 3** Inflow pressure (Hp) 35 psi x 2.31 = ____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 190.0 | 205.0 | 220.0 | 235.0 | 250.0 | | | | | | | 15.0 GPM<br>CFM |
| Take Per Min. | 15.0 | 15.0 | 15.0 | 15.0 | | | | | | | | |

$H_T$ 107.1 FT. = $H_G$ 26.3 FT. + Hp 80.8 FT. – $H_L$ ____ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K, CM/SEC\ 6.8 \times 10^{-4}$$

MORRISON-KNUDSEN ENGINEERS, INC.
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# PRESSURE TEST RESULTS (FIELD)

2/2

| Project: TCE Groundwater Contamination Near TSA | Job Number: W.P. 487A, Task 8 | Test Section: 19 to 29 | Bore Hole: 4031 |
|---|---|---|---|
| Test Equipment Identification: Carlon Flow Meter, U.S. Gauge | BORE HOLE — Orientation: Vertical; Size: 3.0" | Test By: R. Cato; Date: 1/22/01 | |
| Packers: On Casing, Single/Double, Hydraulic/Inflatable | Groundwater Depth: ~23' Ft. | Gauge Height Above Ground: 3.0' Ft. | Gravity Head: Ft. |

**TEST** x4 Inflow pressure ($H_P$) 15 psi × 2.31 = 34.6 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 260.0 | 269.5 | 279.0 | 288.5 | 298.0 | | | | | | | 9.5 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | 9.5 | 9.5 | 9.5 | 9.5 | | | | | | | CFM × 7.48 – GPM |

79.10
− 9.5
9.5

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) − Head Losses ($H_L$)

60.9 FT. = 26.3 FT. + 34.6 FT. − — FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

$7.5 \times 10^{-4}$

**TEST 2** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. − $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

**TEST 3** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. − $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

MORRISON-KNUDSEN ENGINEERS, INC.
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# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| TCE Groundwater Contamination Near TSA | W.P. 487A, Task 8 | 24 to 34' | 4031 |

| Test Equipment Identification | BORE HOLE | | Test By: |
|---|---|---|---|
| Carlon Flow Meter U.S. Gauge | Orientation: Vertical | Size: 3.0" | R. Cato |
| | | | Date: 1/22/01 |

| Packers | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| On Casing<br>Single/Double<br>Hydraulic/Inflatable | ~23' Ft. | 3.0' Ft. | Ft. |

**TEST 1** Inflow pressure ($H_P$) 50 psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | No Take | | | | Held Pressure after closing valve. | | | | | | | GPM / CFM |
| Take Per Min. | | | | | | | | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

FT. = FT. + FT. – FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

Negligible

**TEST 2** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM / CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

**TEST 3** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM / CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

WELDON SPRING SITE REMEDIAL ACTION PROJECT

MONITORING WELL DEVELOPMENT FORM

ES&H 9.1.3, Rev. 0, 2/99

PROJECT NAME TCE G.W. Contam. Near TSA WORK PACKAGE NO. 487A, Task 8

SHEET 2 OF 2

DEVELOPED BY Layne-Western, Alan Benfer PMC

1042104.3 N 752748.6 E.

Well Number: MW-4031 Well Locations: Army property

1/26/01

| Date/ Time | Hrs. Dev./ Cum. Hrs. Dev. | Gals. Purged/ Cum. Gals. Purged | pH | Temp. (°C) | Cond. (umhos) | Turb. (NTUs) | Remarks |
|---|---|---|---|---|---|---|---|
| 1405 | 20 mins + bail | 25-gals | 7.9 | 12.4 | 2.37 | off-scale | |
| 1406 | 21 | 27 | 7.9 | 12.7 | 2.27 | 552 | |
| 1411 | 26 | 29 | 7.9 | 12.5 | 2.24 | 94.6 | |
| 1413 | 28 | 30 | 7.8 | 13.5 | 2.50 | 35.0 | |
| 1417 | 32 | 31 | 7.8 | 12.6 | 2.52 | 19.0 | |
| 1422 | 37 | 33 | 7.6 | 12.4 | 2.53 | 10.7 | |
| 1424 | 39 | 34 | 7.6 | 12.9 | 2.53 | 8.35 | |
| 1427 | 42 | 35 | 7.6 | 13.1 | 2.53 | 7.51 | |
| 1430 | 45 | 36 | 7.6 | 12.9 | 2.50 | 5.05 | |
| 1433 | 48 | 37 | 7.5 | 13.0 | 2.53 | 5.99 | |
| 1436 | 51 | 38 | 7.5 | 12.7 | 2.37 | 4.75 | |
| 1438 | 53 | 39 | 7.5 | 12.6 | 2.56 | 4.63 | |
| 1441 | 56 | 40 | 7.5 | 12.7 | 2.47 | 4.20 | |
| 1444 | 59 | 41 | 7.5 | 12.8 | 2.57 | 5.13 | |
| 1446 | 61 | 42 | 7.5 | 12.8 | 2.57 | 3.60 | |
| 1448 | 63 | 43 | 7.5 | 12.6 | 2.55 | 3.29 | |

initially surged and bailed 20-gals on 1/25/01
pumped 5-gals on 1/26/01 prior to measuring field parameters. After measurements, pumped and surged another 9-gals. Removed 52-gals total.
3 well vols = 18.7 gals.

# WELDON SPRING SITE REMEDIAL ACTION PROJECT

# BOREHOLE AND WELL COMPLETION LOG

WSHLOG-C

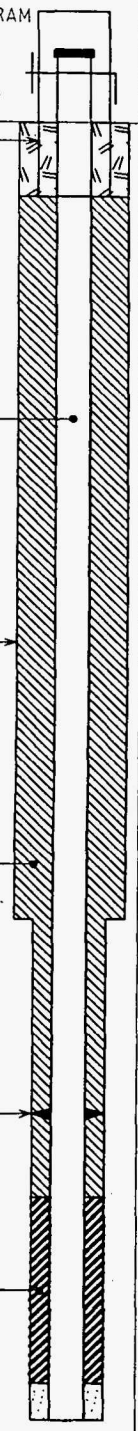
| | |
|---|---|
| HOLE NUMBER | MW-4033 |
| SHEET 1 OF 2 | |
| NORTH (Y): | 1041600.21 |
| EAST (X): | 753099.98 |
| TOC ELEVATION | 645.40 |
| GROUND ELEVATION | 643.44 |
| STICKUP | 1.96 |
| HYDR CONDUCTIVITY (cm/sec) | K= 1.3x10$^{-4}$ (Packer Test) |

| | |
|---|---|
| WELL STATUS/COMMENTS | ACTIVE |
| LOCATION | EAST SIDE OF ARMY PROPERTY |
| DRILLING CONTRACTOR | LAYNE WESTERN Inc. |
| DRILL RIG MAKE & MODEL | CME-750 HSA/NXWL; I-R TH-60 AIR ROTARY |
| HOLE SIZE & METHOD | 11" HSA-21.5; NX-47; 6" AIR-47 |
| ANGLE FROM HORIZONTAL & BEARING | Vertical |
| BOTTOM OF HOLE (TD) (DEPTH (FT.) FROM GROUND ELEV. TO:) | 47.0 |
| DRILL FLUIDS & ADDITIVES | Water core; Air ream |
| CASING TYPE, DEPTH, SIZE | 2" 316 SS Mon. Well |
| BEDROCK | 21.5 |
| DATE START | 5-7-01 |
| DATE FINISH | 5-9-01, Mon. Well |
| WATER LEVELS & DATES | |

LITHOLOGY BY ALAN BENFER

| DEPTH feet | SAMPLE/RUN Number | PERCENT Recovery (0–100) | N# or RQD | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT |
|---|---|---|---|---|---|---|
| | SPT-1 | | 4 | ML | SILT, low plasticity, with hair roots, dark brown, moist soft, ML. Possibly Peoria Loess. | Qpl |
| | SPT-2 | | 5 | | | |
| | SPT-3 | | 13 | CL | CLAY, silty, low plasticity, some FeOx, some roots, mottled light and reddish brown, moist, soft, CL. Roxanna-like Ferrelview Clay. | Qfv |
| 5 | | | | | CL as above, with MnOx and FeOx, mostly light gray. Roxanna-like Ferrelview Clay. | |
| | SPT-4 | | 18 | | CL as above, light gray to light brown, dry, hard. Ferrelview Clay. | |
| | SPT-5 | | 11 | | CL as above. | |
| 10 | SPT-6 | | 15 | | CL as above, still dry. Ferrelview Clay. | |
| | SPT-7 | | 27 | CH | CLAY, high plasticity, minor sand, carbonized roots, mottled light gray and yellow brown, moist, firm, CH. Clay Till. Fine gravel at 12'. | Qct |
| | | | | | CH as above, with gravel, hard. | |
| | SPT-8 | | 19 | | CH as above, with gravel, damp, hard. | |
| 15 | | | | | | |
| | SPT-9 | | 40 | | CLAY, high plasticity, with ~40% chert and weathered limestone gravel, angular, mottled gray and yellow brown, damp, hard, CH. Clay Till. | |
| | SPT-10 | | 32 | | CH as above, ~25% sand and fine gravel. Clay Till. | |
| 20 | SPT-11 | | 35 | | CH with sand and gravel. Possible limestone/chert bedrock in tip at 21.5'. | |
| | NX-1 | 6/72" | 0 | CHRT LMS | Auger refusal at 21.5'. NX-1, 21.5'-27.5'. Recovered only 6" of chert rubble. Loss zones unknown. Approximately full fluid return. | |
| 25 | | | | | | |
| | NX-2 | 25/78" | 0 | | NX-2, 27.5'-34.0'. Loss zones unknown. Longest core piece is 3". Upper 3" is predominantly chert rubble. Then 6" of moderately weathered limestone, argillaceous, very light gray (N8). Next 8" is moderately strongly weathered limestone, light brown (5YR5/6) to yellow brown (10YR5/4) with minor flecks of chert; followed by 4" of highly broken chert. Bottom 6" is a mixture of yellowish, moderately strongly weathered limestone and light colored chert. Nearly full fluid return. Weathered Burlington-Keokuk Limestone. | Mdkw |
| 30 | | | | | | |
| 35 | NX-3 | 36/84" | 3 | | NX-3, 34.0'-41.0'. Loss zones are unknown. Longest core piece recovered is 3 1/2". Predominantly strongly weathered limestone, | Mdkw |

WELL DIAGRAM




ELEVATION feet

Sample Interval ☐ No Sample Taken ▽minimum ▼maximum ▽average

WELDON SPRING SITE REMEDIAL ACTION PROJECT

# BOREHOLE AND WELL COMPLETION LOG

HOLE NUMBER: MW-4033

SHEET 2 OF 2

NORTH (Y): 1041600.21

EAST (X): 753099.98

WSLOG-C

WELL STATUS/COMMENTS: ACTIVE

LOCATION: EAST SIDE OF ARMY PROPERTY

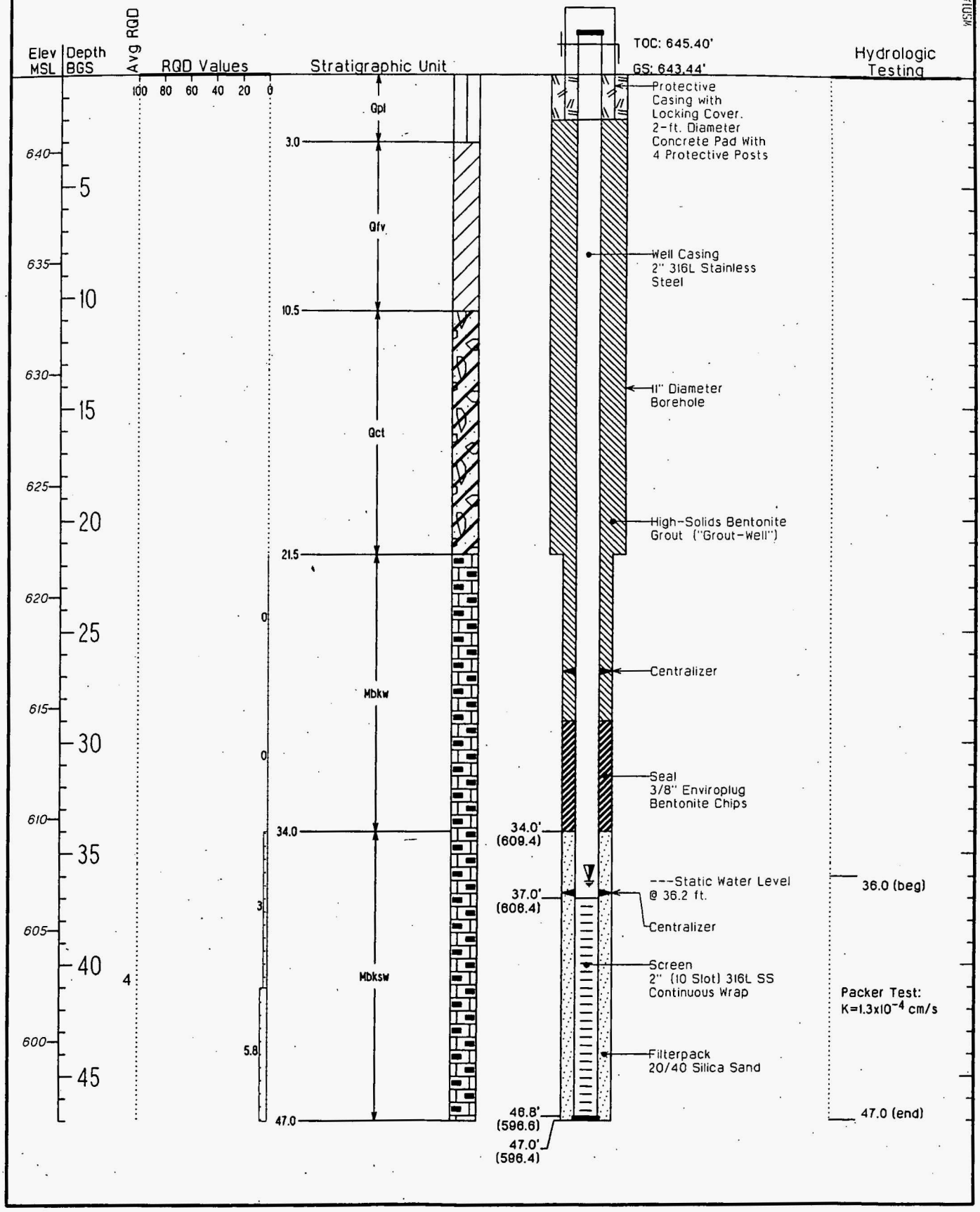
| DEPTH feet | SAMPLE | SAMPLE/RUN Number | PERCENT Recovery (0–100) | N# or RQD | GRAPHIC LOG | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT | WELL DIAGRAM | ELEVATION feet |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CHRT LMS | broken, eroded and vuggy, mostly dark yellowish orange (10YR6/6), with ~25% interspersed chert. Minor chert/limestone breccia near the top of the core. Appears to be water-bearing. Strongly Weathered Burlington-Keokuk Limestone. | Mbksw | ---Static Water Level @ 36.2 ft. | |
| | | | | | | | @ 36'. Lost circulation permanently. | | Centralizer | 605 |
| 40 | | NX-4 | 36/72" | 5.8 | | | NX-4, 41.0'-47.0'. Loss zones are unknown. Mostly strongly weathered limestone, dark yellowish brown (10YR6/6), eroded, vuggy, locally can be scratched with fingernail, breaks into coarse sand-size particles, abundant tiny specks of MnOx with MnOx also following microfractures, some calcite, minor chert. Bottom 3" is vuggy calcite. Strongly Weathered Burlington-Keokuk Limestone. | | Screen 2" (10 Slot) 316L SS Continuous Wrap | |
| 45 | | | | | | | | | Filterpack 20/40 Silica Sand | 600 |
| | | | | | | | Total cored depth, 47.0', 5-8-01. Hole reamed to 6" diameter to 47.0' and a 2" monitoring well was constructed. | | Bottom Cap And Total Well Depth 47.0-ft. | 595 |
| 50 | | | | | | | CONSTANT HEAD SINGLE PACKER TEST RESULTS 36.0 - 47.0-ft. K = 1.3E-4 cm/sec | | | 590 |
| 55 | | | | | | | | | | 585 |
| 60 | | | | | | | | | | 580 |
| 65 | | | | | | | | | | 575 |
| 70 | | | | | | | | | | 570 |
| 75 | | | | | | | | | | |

Sample Interval  No Sample Taken  minimum  maximum  average

# BOREHOLE DIAGRAM



## MW-4033




minimum maximum average

Sheet 1 of 2

MORRISON-KNUDSEN ENGINEERS, INC.
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# PRESSURE TEST RESULTS (FIELD)

$1.3 \times 10^{-4}$

| | | | |
|---|---|---|---|
| Project: GWOU Additional Field Studies | Job Number: Task 487A | Test Section: 36.0 to 47.0 | Bore Hole: MW 4033 |
| Test Equipment Identification: Sensus Flowmeter, Valley Instrument Pressure gauge | BORE HOLE — Orientation: Vert. / Size: 3.0" | Test By: A. Barfer / Date: 5/8/01 | |
| Packers: On Casing; Single/Double; Hydraulic/Inflatable | Groundwater Depth: ~36' Ft. | Gauge Height Above Ground: 3.0' Ft. | Gravity Head: 39 Ft. |

1415

## TEST 1

Inflow pressure ($H_P$) 10 psi × 2.31 = 23.1 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 90.30 | 93.39 | 94.48 | 96.56 | | | | | | | | 2.09 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | 2.09 | 2.09 | 2.08 | | | | | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

62.1 FT. = 39 FT. + 23.1 FT. – FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{\quad}{\times} \times \quad = K, CM/SEC\ 1.5 \times 10^{-4}$$

## TEST 2

Inflow pressure ($H_P$) 20 psi × 2.31 = 46.2 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 5.10 | 7.47 | 9.80 | 12.18 | 14.45 | | | | | | | 2.3 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | 2.37 | 2.33 | 2.32 | 2.33 | | | | | | | | |

$H_T$ 85.2 FT. = $H_G$ 39 FT. + $H_P$ 46.2 FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K, CM/SEC\ 1.2 \times 10^{-4}$$

## TEST 3

Inflow pressure ($H_P$) 30 psi × 2.31 = 69.3 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 17.30 | 19.93 | 22.60 | 25.23 | 27.88 | | | | | | | 2.6 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | 2.63 | 2.67 | 2.63 | 2.65 | | | | | | | | |

$H_T$ 108.3 FT. = $H_G$ 39 FT. + $H_P$ 69.3 FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K, CM/SEC\ 1.1 \times 10^{-4}$$

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# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| Cavecc Additional Field Studies | Task 487A | 36.0 to 47.0' | MW 4033 |

| Test Equipment Identification | BORE HOLE Orientation: | BORE HOLE Size: | Test By: |
|---|---|---|---|
| Sensus Flow Meter, Valley Instrument Pressure gauge | Vert. | 3.0" | Date: 5/8/01 |

| Packers (On Casing, Single/Double, Hydraulic/Inflatable) | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| | ~36' Ft. | 3.0' Ft. | 39.0 Ft. |

**TEST 1** Inflow pressure ($H_P$) 10 psi × 2.31 = 23.1 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 29.40 | 31.46 | 33.48 | 35.53 | 37.57 | | | | | | | 2.0 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | 2.06 | 2.03 | 2.04 | 2.04 | | | | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

62.1 FT. = 39 FT. + 23.1 FT. – FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC } 1.5 \times 10^{-4}$$

**TEST 2** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ 39 FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

**TEST 3** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ 39 FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

WELDON SPRING SITE REMEDIAL ACTION PROJECT

MONITORING WELL DEVELOPMENT FORM

ES&H 4.4.8.2, Rev.0, 5/95

PROJECT NAME Offsite TCE Investigation WORK PACKAGE NO. Task 487A

SHEET 2 OF 2

DEVELOPED BY Layne West[redacted] / John Phillips, Alan B[redacted]fer

Well Number: MW-4033 Well Locations: Army Propert[redacted]

| Date/ Time | Hrs. Dev./ Cum. Hrs. Dev. | Gals. Purged/ Cum. Gals. Purged | pH | Temp. | Cond. | Remarks Turbid[redacted] |
|---|---|---|---|---|---|---|
| 5/18/01 1045 | | 16 | 7.7 | 17.9 | 0.6[redacted] | 52.3 |
| 1047 | | 18 | 7.5 | 17.3 | 0.7[redacted] | [redacted]2 |
| 1049 | | 20 | 7.5 | 16.6 | 0.66 | 24.9 |
| 1052 | | 22 | 7.4 | 16.4 | 0.67 | 20.1 |
| 1055 | | 24 | 7.4 | 16.5 | 0.68 | 17.0 |
| 1058 | | 26 | 7.4 | 16.4 | 0.69 | 16.1 |
| 1101 | | 28 | 7.4 | 16.4 | 0.72 | 13.0 |
| 1104 | | 30 | 7.4 | 16.2 | 0.72 | 10.8 |
| 1107 | | 32 | 7.4 | 16.2 | 0.73 | 9.10 |
| 1110 | | 34 | 7.4 | 16.2 | 0.72 | 8.17 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

3 well vols = 17 gals.

WELDON SPRING SITE REMEDIAL ACTION PROJECT

MONITORING WELL DEVELOPMENT FORM

ES&H 4.4.8.2, Rev.0, 5/95

PROJECT NAME offsite TCE Invest. WORK PACKAGE NO. Task 487A

SHEET 1 OF 2

DEVELOPED BY Layne-Western / Alan Benfer PMC.

1. Well Number.: MW-4033 Well Location: 1042600.2 753100.1 Army property
2. Date of Installation: 5/9/01
3. Date of Development: 5/18/01
4. Static Water Level: Before Development 35.7' ft.; At least 24 hrs. after 36.1 ft.
5. Organic Vapor: Before development NA ppm; After development _____ ppm.
6. Quantity of water loss during drilling, if used: ____ gal. unknown
7. Quantity of standing water in well and annulus before development: 5.6 gal.
8. Depth from top of well casing to bottom of well: 49.5 ft. (from Well Installation Diagram)
9. Well diameter: 2 in.
10. Screen length: 10 ft.
11. Minimum quantity of water to be removed: 17 gal.
12. Depth to top of sediment: Before development None ft.; After development None ft.
13. Physical character of water (before/after development): yellow brown / clear
14. Type and size of well development equipment: 2" Grundfos Redi-Flo
15. Description of surge technique: Raise and lower pump
16. Height of well casing above ground surface: 2.5 ft. (from Well Installation Diagram).

Quantity of water removed: 34 gal. Time for removal: _____ hr./min.

# WELDON SPRING SITE REMEDIAL ACTION PROJECT

# BOREHOLE AND WELL COMPLETION LOG

MWSWLOG-C

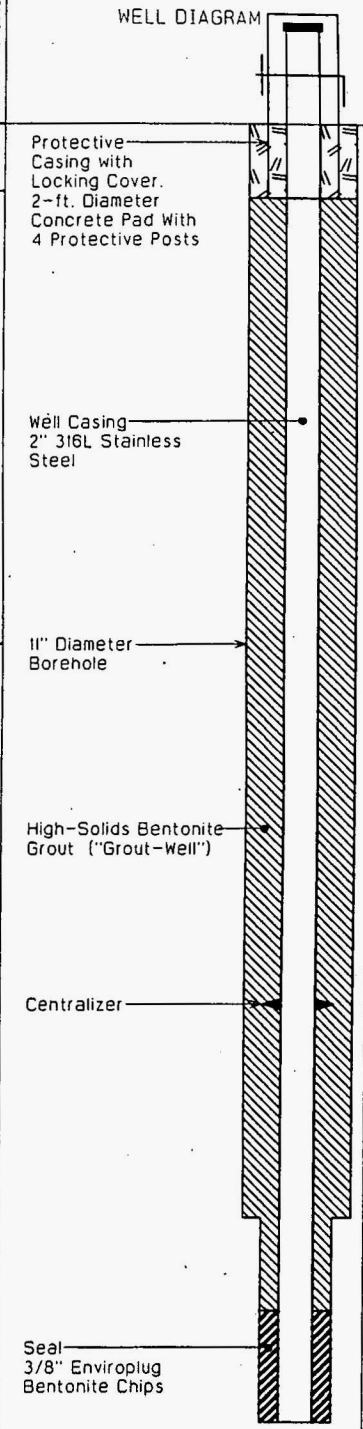
| | |
|---|---|
| HOLE NUMBER | MW-4034 |
| SHEET 1 OF 2 | |
| NORTH (Y): | 1041354.78 |
| EAST (X): | 753404.87 |
| TOC ELEVATION | 656.89 |
| GROUND ELEVATION | 654.15 |
| STICKUP | 2.74 |
| HYDR CONDUCTIVITY (cm/sec) | K= 1.6x10$^{-7}$ (Packer Test) |

| | |
|---|---|
| WELL STATUS/COMMENTS | ACTIVE |
| LOCATION | E.EDGE OF ARMY PROP., SW CORNER CHEM SITE |
| DRILLING CONTRACTOR | LAYNE WESTERN Inc. |
| DRILL RIG MAKE & MODEL | CME-750 HSA/NXWL; I-R TH-60 AIR ROTARY |
| HOLE SIZE & METHOD | 11" HSA-29.5; NX-52; 6" AIR-55 |
| ANGLE FROM HORIZONTAL & BEARING | Vertical |
| BOTTOM OF HOLE (TO) (DEPTH (Ft.) FROM GROUND ELEV. TO:) | 55.0 |
| DRILL FLUIDS & ADDITIVES | Water core; Air ream |
| CASING TYPE, DEPTH, SIZE | 2" 316 SS Mon. Well |
| BEDROCK | 29.5 |
| DATE START | 4-27-01 |
| DATE FINISH | 5-4-01, Mon. Well |
| WATER LEVELS & DATES | ▽ ▼ |

LITHOLOGY BY ALAN BENFER

| DEPTH feet | SAMPLE/RUN Number | PERCENT Recovery (0–100) | N# or RQD | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT |
|---|---|---|---|---|---|---|
| | SPT-1 | | 5 | FILL | CLAY, silty, medium plasticity, with hair roots, trace fine gravel, dark grayish brown, moist, soft, CL. Fill. | Fill |
| | SPT-2 | | 5 | CL | CLAY, medium plasticity, mottled black, yellow brown and light brown, moist, soft, CL. Roxanna-like Ferrelview Clay. | Qfv |
| 5 | SPT-3 | | 7 | | CL as above, mottled light gray and light brown. | |
| | SPT-4 | | 8 | CH | CLAY, high plasticity, some MnOx, mottled light gray and yellow brown, moist, soft to firm, CH. Ferrelview Clay. | |
| | SPT-5 | | 8 | | CH as above, mostly yellow brown. | |
| 10 | SPT-6 | | 8 | | CH as above, some slickensides, some carbonized roots. | |
| | SPT-7 | | 10 | | CLAY, high plasticity, some FeOx and MnOx, mottled light gray, yellow brown and black, moist, firm, CH. Ferrelview Clay. | |
| | SPT-8 | | 11 | CH | No recovery, gravel up to 1.5". | Qct |
| 15 | SPT-9 | | 16 | | CLAY, high plasticity, trace fine sand, some MnOx, slickensided, moist, hard, CH. Clay Till. | |
| | SPT-10 | | 16 | | CH as above, considerable MnOx. | |
| 20 | SPT-11 | | 9 | | CLAY, high plasticity, trace fine to medium sand, MnOx, orange brown with black, moist, firm, CH. Clay Till. | |
| | SPT-12 | | 15 | | Poor recovery, CH with chert and weathered limestone gravel, brown and yellow brown, moist, hard. | |
| | SPT-13 | | 51 | | CLAY, high plasticity with ~40% highly weathered limestone gravel, yellow brown, moist, hard, CH. Clay Till. | |
| 25 | SPT-14 | | 32 | | CH as above. | |
| | SPT-15 | | 70+ | | As above. Clay Till. | |
| 30 | NX-1 | 22/68" | 7.5 | LMS CHRT | Poor recovery. Loss zones unknown. LIMESTONE, moderately weathered with oxidized sulfides, highly fractured with rubble, mostly light gray to yellow brown, some styolites, 2" high plastic clay seam, light gray. Chert in bit. Partial fluid return. | Mdksw/Mdkw |
| 35 | | | | | | |

WELL DIAGRAM




Sample Interval ☐ No Sample Taken ▽minimum ▼maximum ▼average

WELDON SPRING SITE REMEDIAL ACTION PROJECT

# BOREHOLE AND WELL COMPLETION LOG

HOLE NUMBER MW-4034

SHEET 2 OF 2

NORTH (Y): 1041354.78

EAST (X): 753404.87

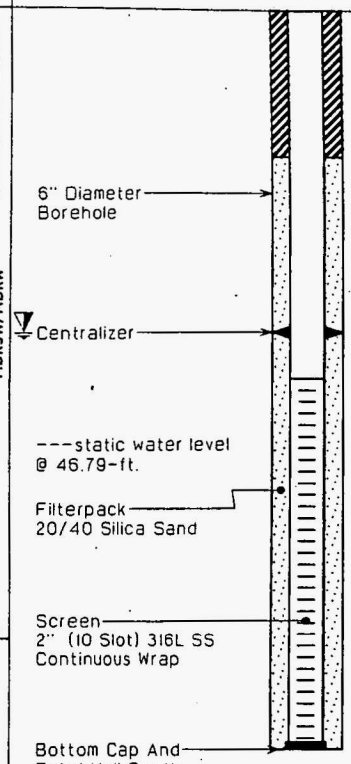
WSWLOG-C

WELL STATUS/COMMENTS: ACTIVE

LOCATION: E.EDGE OF ARMY PROP., SW CORNER CHEM SITE

| DEPTH feet | SAMPLE | SAMPLE/RUN Number | PERCENT Recovery (0–100) | N# or RQD | GRAPHIC LOG | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT |
|---|---|---|---|---|---|---|---|---|
| | | NX-2 | 16/82" | 0 | | LMS CHRT | Poor recovery. Loss zones unknown. CHERT, with some oxidized sulfides and oxidized fracture surfaces, light bluish gray, traces of highly weathered limestone. Possibly water-bearing. Nearly full fluid return. | Mdksw/Mdkw |
| 40 | | | | | | | | |
| | | NX-3 | 14/58" | 0 | | | Recovered only 1.2-ft. of chert rubble, light bluish gray, some speckled, fractures are dendritic. Nearly full fluid return. | |
| 45 | | | | | | | | |
| | | NX-4 | | 0 | | | Total core loss. Recovered only 0.9-ft of chert rubble, trace of highly weathered limestone. Full fluid return. | |
| 50 | | | | | | | | |
| | | | | | | | Total cored depth 52.0', 5-2-01. Hole reamed to 6" diameter to 55' and a 2" monitoring well was constructed. | |
| 55 | | | | | | | CONSTANT HEAD SINGLE PACKER TEST RESULTS 40.0 - 52.0-ft. K = 1.6E-7 cm/sec | |
| 60 | | | | | | | | |
| 65 | | | | | | | | |
| 70 | | | | | | | | |
| 75 | | | | | | | | |

WELL DIAGRAM



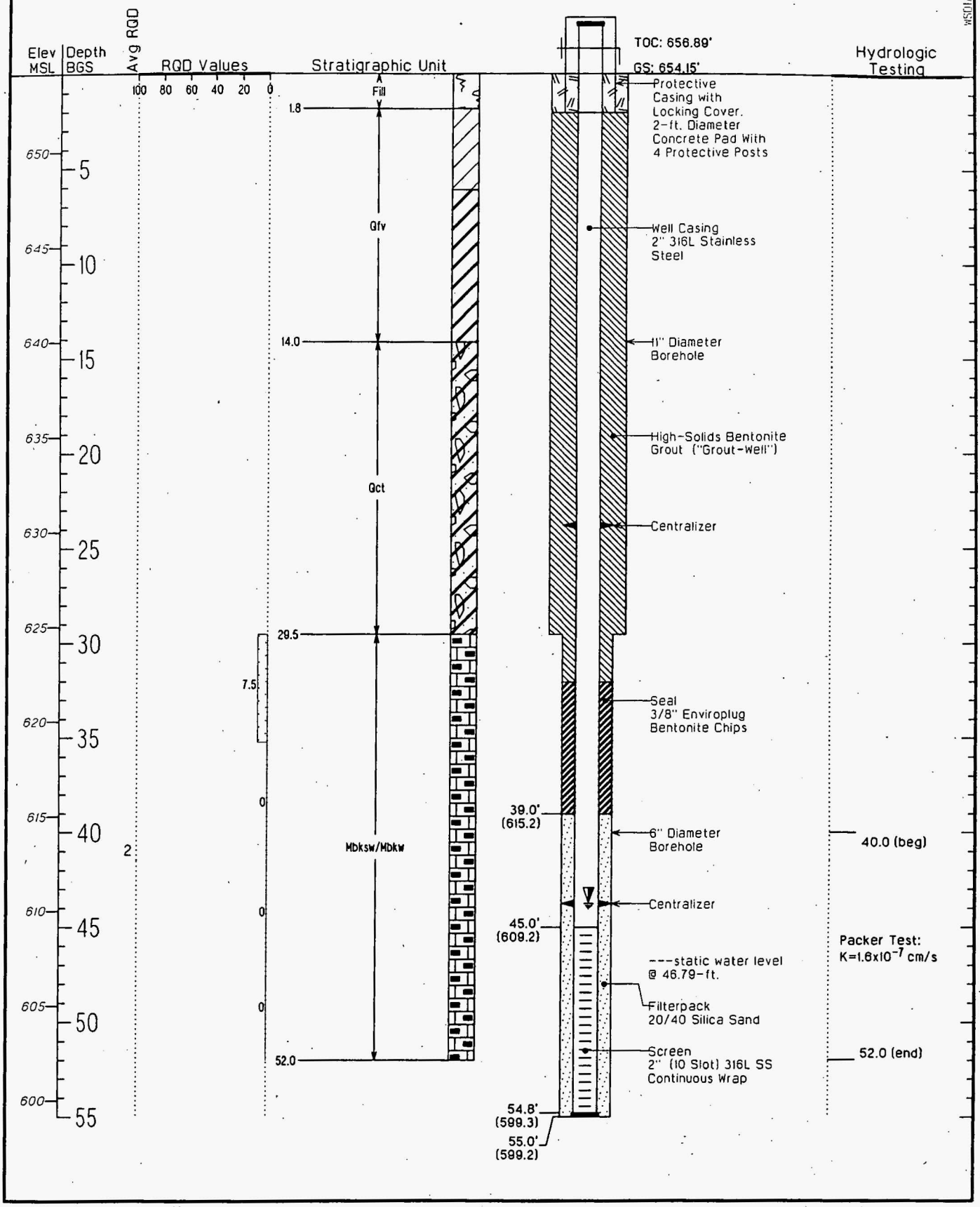

ELEVATION feet: 615, 610, 605, 600, 595, 590, 585, 580

Sample Interval ☐ No Sample Taken ▽minimum ▼maximum ▼average

# BOREHOLE DIAGRAM



## MW-4034




minimum maximum average

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

# PRESSURE TEST RESULTS (FIELD)

$6 \times 10^{-7}$

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| Offsite TCE Investigation | Task 487A | 40.0 to 52.0 | MW 4034 |

| Test Equipment Identification | BORE HOLE Orientation: | BORE HOLE Size: | Test By: |
|---|---|---|---|
| Sensus Flow meter, Valley Instrument pressure gauge | Vertical | 3.0" | A. Barfer, Date: 1030 5/3/01 |

| Packers | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| On Casing, Single/Double, Hydraulic/Inflatable 200 PSI | 43.6 RCE ~~40'~~ 8/18/02 Ft. | 3.0' Ft. | 49.0 Ft. |

**TEST 1** Steady Inflow pressure (Hp) 10 psi × 2.31 = 23.1 feet Packer Seated

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 7.130 | 7.138 | 7.1449 | 7.155 | 7.163 | 7.171 | 7.181 | | | | | 0.008 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | 0.08 | 0.08 | .07 | .08 | .09 | .010 | | | | | | CFM × 7.48 – GPM |

0.
155
148
07

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

69.7 FT. = 46.6 FT. + 23.1 FT. – — FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{\quad}{\times} \times \quad = K, CM/SEC\ 5 \times 10^{-7}$$

**TEST 2** Inflow pressure (Hp) 20 psi × 2.31 = 46.2 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 7.220 | 7.230 | 7.242 | 7.257 | 7.269 | 7.281 | | | | | | 0.012 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | .010 | .012 | .015 | .012 | .012 | | | | | | | |

$H_T$ 92.8 FT. = $H_G$ 46.6 FT. + $H_P$ 46.2 FT. – $H_L$ — FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K, CM/SEC\ 6 \times 10^{-7}$$

**TEST 3** Inflow pressure (Hp) 30 psi × 2.31 = 69.3 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 7.310 | 7.329 | 7.349 | 7.367 | 7.387 | | | | | | | 0.02 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | .019 | .020 | .018 | .020 | | | | | | | | |

$H_T$ 115.9 FT. = $H_G$ 46.6 FT. + $H_P$ 69.3 FT. – $H_L$ — FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K, CM/SEC\ 7 \times 10^{-7}$$

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| Offsite TCE invest. | Task 487A | 40.0 to 52.0 | MW 4034 |

| Test Equipment Identification | BORE HOLE | | Test By: |
|---|---|---|---|
| Sensus Flow Meter<br>Valley Instrument pressure gauge | Orientation: Vert. | Size: 3.0" | A. Benfer<br>Date: 5/3/01 |

| Packers | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| On Casing<br>Single/Double<br>Hydraulic/Inflatable | ~40' Ft. | 3.0' Ft. | Ft. |

**TEST 1** Inflow pressure ($H_P$) 10 psi × 2.31 = 23.1 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 7.420 | 7.432 | 7.442 | 7.453 | 7.465 | | | | | | | 0.011 GPM<br>CFM |
| Take Per Min. | .012 | .010 | .011 | .012 | | | | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

69.7 FT. = 46.6 FT. + 23.1 FT. – FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{\quad}{\times} \times \quad = K, CM/SEC$$

$7 \times 10^{-7}$

**TEST 2** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM<br>CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K, CM/SEC$$

**TEST 3** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM<br>CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K, CM/SEC$$

WELDON SPRING SITE REMEDIAL ACTION PROJECT

MONITORING WELL DEVELOPMENT FORM

ES&H 4.4.8.2, Rev.0, 5/95

PROJECT NAME Offsite TCE Invest. WORK PACKAGE NO. 487A

SHEET 1 OF 2

DEVELOPED BY Layne · Western / Alan Benfer

1. Well Number.: MW 4034 Well Location: 1041355.0 / 753405.0 Army Property

2. Date of Installation: 5/4/01

3. Date of Development: 5/16/01 - 5/22/01

4. Static Water Level: Before Development 43.6 bgs ft.; At least 24 hrs. after 43.5 bgs ft.

5. Organic Vapor: Before development N/A ppm; After development _____ ppm.

6. Quantity of water loss during drilling, if used: ____ gal. unknown

7. Quantity of standing water in well and annulus before development: 11.5', 5.6 gal.

8. Depth from top of well casing to bottom of well: 57.5 ft. (from Well Installation Diagram)

9. Well diameter: 2.0 in.

10. Screen length: 10.0 ft.

11. Minimum quantity of water to be removed: 17 gal.

12. Depth to top of sediment: Before development None ft.; After development None ft.

13. Physical character of water (before/after development): yellow brown / clear

14. Type and size of well development equipment: 2.0" Grundfos Redi-Flo

15. Description of surge technique: raising and lowering pump during pumping to stir up sediment

16. Height of well casing above ground surface: ~2½' ft. (from Well Installation Diagram).

17. Quantity of water removed: 34 gal. Time for removal: _____ hr./min.

WELDON SPRING SITE REMEDIAL ACTION PROJECT

MONITORING WELL DEVELOPMENT FORM

ES&H 4.4.8.2, Rev.0, 5/95

PROJECT NAME Offsite TCE Invest. WORK PACKAGE NO. Task 487A

SHEET 2 OF 2

DEVELOPED BY Layne Western / John Phillips, Alan Benfer

Well Number: M[redacted]4034 Well Locations: Army Property

| Date/ Time | Hrs. Dev./ Cum. Hrs. Dev. | Gals. Purged/ Cum. Gals. Purged | pH | Temp. | Cond. | Remarks Turbidity |
|---|---|---|---|---|---|---|
| 5/16/01 1310 | | 7 | 8.6 | 20.0 | [redacted].53 | 290 |
| 1415 | | 9 | 7.7 | 19.5 | 0.51 | 120 |
| 5/17/01 0810 | | 11 | 8.3 | 16.3 | 0.52 | 114 |
| 0815 | | 13 | 7.8 | 16.7 | 0.51 | 577 |
| 0818 | | 15 | 7.8 | 16.8 | 0.50 | 188 |
| 1308 | | 17 | ~~8.1~~ 7.9 | 17.6 | 0.50 | 188 |
| 1310 | | 18 | 7.7 | 17.3 | 0.51 | 434 |
| 1314 | | 19 | 7.9 | 17.4 | 0.49 | 323 |
| 5/18/01 0900 | | 21 | 8.0 | 17.4 | 0.49 | 759 |
| 0905 | | 22 | 7.8 | 17.0 | 0.45 | 132 |
| 0908 | | 23 | 7.7 | 17.3 | 0.46 | 142 |
| 0912 | | 24 | 7.7 | 17.6 | 0.45 | 84.6 |
| 5/21/01 0800 | | 24 | 7.9 | 16.0 | 0.48 | 854 |
| 0808 | | 25 | 7.7 | 16.4 | 0.48 | 148 |
| 0815 | | 26 | 7.7 | 17.3 | 0.48 | 70.3 |
| 0819 | | 27 | 7.7 | 17.4 | 0.48 | 89.1 |
| 0826 | | 28 | 7.7 | 17.9 | 0.48 | 132 |
| 3 well vols = 17.9 gals. | | | | | | |
| 0831 | | 29 | 7.7 | 17.5 | 0.47 | 140 |
| 5/22/01 0857 | | 30 | 7.9 | 17.0 | 0.52 | 150 |
| 0901 | | 31 | 7.9 | 16.1 | 0.48 | 696 |
| 0906 | | 32 | 7.7 | 16.6 | 0.48 | 892 |
| 0910 | | 33 | 7.9 | 17.7 | 0.47 | 43.1 |
| 0915 | | 34 | 8.0 | 17.9 | 0.46 | 41.3 |

# WELDON SPRING SITE REMEDIAL ACTION PROJECT

# BOREHOLE AND WELL COMPLETION LOG

WSHLOG-C

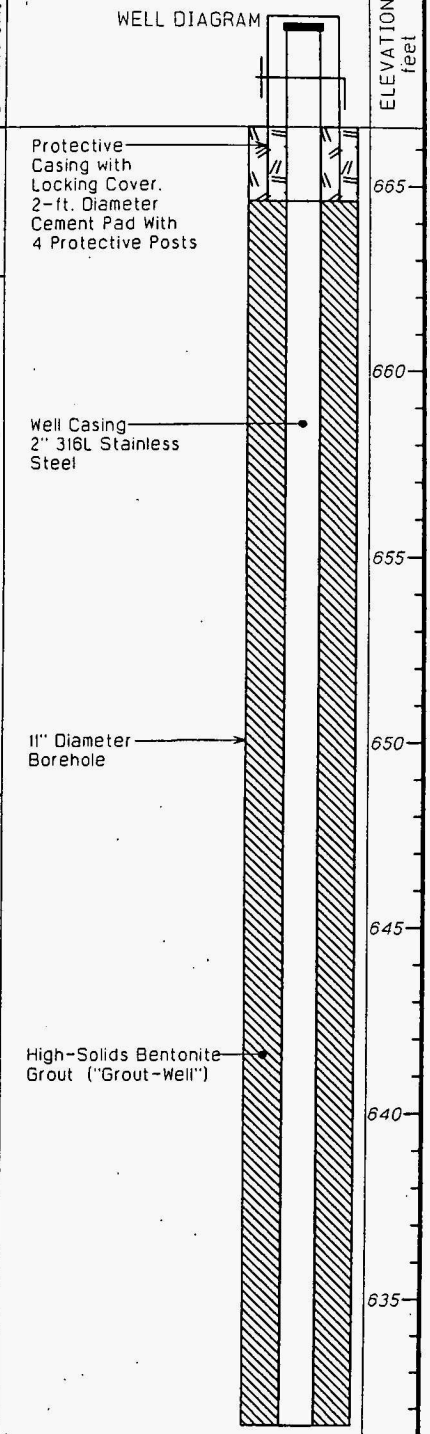
| | |
|---|---|
| HOLE NUMBER | MW-4035 |
| SHEET 1 OF 2 | |
| NORTH (Y): | 1040720.96 |
| EAST (X): | 753325.41 |
| TOC ELEVATION | 669.37 |
| GROUND ELEVATION | 666.58 |
| STICKUP | 2.79 |
| HYDR CONDUCTIVITY (cm/sec) | K= 6.6x10$^{-5}$ (Packer Test) |

| | | | |
|---|---|---|---|
| WELL STATUS/COMMENTS: ACTIVE | LOCATION: ARMY PROP. AT OLD LOCO. MAINT. BLDG. | | |
| DRILLING CONTRACTOR: LAYNE WESTERN Inc. | DRILL RIG MAKE & MODEL: CME-750 HSA/NXWL; I-R TH-60 AIR ROTARY | | |
| HOLE SIZE & METHOD: 11" HSA-36.5; NX-57.3; 6" AIR-57.5 | ANGLE FROM HORIZONTAL & BEARING: Vertical | DEPTH (FT.) FROM GROUND ELEV. TO: BOTTOM OF HOLE (TD): 57.5 | |
| DRILL FLUIDS & ADDITIVES: Water core; Air ream | CASING TYPE, DEPTH, SIZE: 2" 316 SS Mon. Well | BEDROCK: 36.0 | |
| DATE START: 5-10-01 | DATE FINISH: 5-15-01, Mon. Well | WATER LEVELS & DATES | |

LITHOLOGY BY ALAN BENFER

| DEPTH feet | SAMPLE/RUN Number | N# or RQD | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT |
|---|---|---|---|---|---|
| | SPT-1 | 13 | FILL | GRAVEL, angular. Road base material. | Fill |
| | SPT-2 | 5 | | @ 2.0'. Coarse sand-size asphalt fragments. Fill. | |
| | SPT-3 | 4 | CL | CLAY, silty, medium plasticity, mottled light and reddish brown, moist, firm, CL. Ferrelview Clay. | Qfy |
| 5 | SPT-4 | 9 | | CL as above. | |
| | SPT-5 | 5 | CH | CLAY, high plasticity, mottled light and reddish brown, moist, firm, CH. Ferrelview Clay. | |
| 10 | SPT-6 | 11 | | CLAY, high plasticity, with MnOx, mottled light gray, yellow brown and black, moist, firm, CH. Ferrelview Clay. | |
| | SPT-7 | 18 | | CH as above. | |
| | SPT-8 | 15 | | CH as above. | |
| 15 | SPT-9 | 20 | | CLAY, high plasticity, mostly yellow brown, moist, hard, CH. Ferrelview Clay. | |
| | SPT-10 | 26 | CH | CLAY, high plasticity, with ~10% sand to fine gravel, FeOx nodules and MnOx, mottled light gray, yellow brown and black, moist, hard, CH. Clay Till. | Qct |
| 20 | SPT-11 | 25 | | CH as above with minor sand. | |
| | SPT-12 | 23 | | CH as above, with gravel up to 1-1/2". | |
| | SPT-13 | 27 | | CLAY, high plasticity, with minor gravel up to 2", some MnOx, mottled yellow brown and black, moist, hard, CH. | |
| 25 | SPT-14 | 38 | | @ 25.5'. CH as above, light gray. | |
| | | | | @ 26.0'. CH as above, increase in gravel, mostly light gray and buff. | |
| | SPT-15 | 32+ | | | |
| 30 | SPT-16 | 33 | | CLAY, high plasticity, minor gravel, mottled light gray and yellow brown, dry, hard, CH. Clay Till. | |
| | SPT-17 | 50+ | | CLAY, high plasticity, with ~40% angular chert fragments, mottled dark brown and reddish brown, damp, hard, CH. Residuum. | Ppr |
| 35 | SPT-18 | 66 | | | |

WELL DIAGRAM




Sample Interval  No Sample Taken  minimum  maximum  average

# WELDON SPRING SITE REMEDIAL ACTION PROJECT

## BOREHOLE AND WELL COMPLETION LOG

HOLE NUMBER: MW-4035

SHEET 2 OF 2

NORTH (Y): 1040720.96

EAST (X): 753325.41

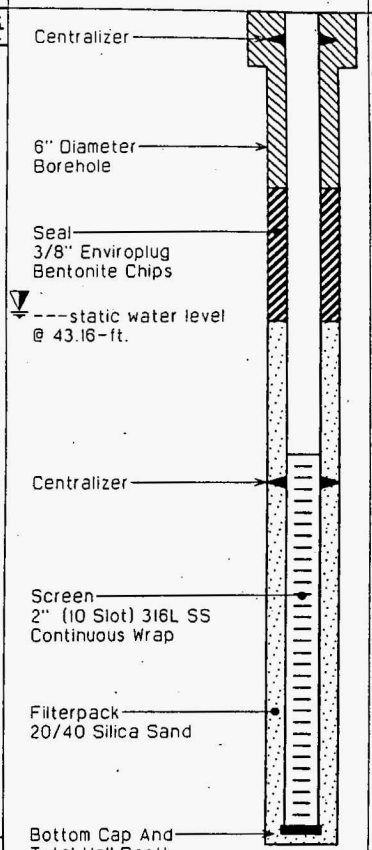
WSWLOG-C

WELL STATUS/COMMENTS: ACTIVE

LOCATION: ARMY PROP. AT OLD LOCO. MAINT. BLDG.

| DEPTH feet | SAMPLE | SAMPLE/RUN Number | PERCENT Recovery (0–100) | N# or RQD | GRAPHIC LOG | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CH | CH as above. Residuum. | Ppr |
| | | NX-1 | 22/72" | 0 | | LMS CHRT | Auger refusal at 36-ft. Begin NXWL core. | |
| | | | | | | | LIMESTONE, severely weathered, with chert and clay, dark yellow brown, moist, hard. | |
| 40 | | | | | | | LIMESTONE AND CHERT, poor recovery, loss zones unknown. Upper 12" is broken chert, longest piece ~2", brown and light gray, oxidized fracture surfaces. Bottom 6" is strongly weathered limestone, mostly light gray, intermixed with chert, light bluish gray. Approximately full fluid return. Prabably Strongly Weathered Burlington-Keokuk Limestone. | |
| | | NX-2 | 10/72" | 0 | | | NX-2, 42.0'- 48.0'. Poor recovery; chert rubble only | |
| 45 | | | | | | | | Mdksw/Mdkw |
| | | NX-3 | 24/72" | 0 | | | NX-3, 48.0'- 54.0'. Poor recovery, longest piece 3.5". ~8" of highly broken chert fragments, light bluish gray. ~7" of strongly weathered limestone, dark yellowish brown, ~6" of mixed weathered limestone and chert. Loss zones unknown. Approximately full fluid return. Strongly Weathered Burlington-Keokuk Limestone. | |
| 50 | | | | | | | | |
| | | NX-4 | 8/40" | 0 | | | NX-4. 54.0'- 57.3'. Recovered only fragments of strongly weathered, dark yellow brown limestone with some chert fragments. Approximately full fluid return. Probably Strongly Weathered Burlington-Keokuk Limestone. | |
| 55 | | | | | | | | |
| | | | | | | | Total cored depth 57.3', 5-11-01. Hole reamed to 6" in diameter to 57.5' and a 2" monitoring well was constructed. | |
| 60 | | | | | | | CONSTANT HEAD SINGLE PACKER TEST RESULTS 44.3 - 57.3-ft. K = 6.6E-5 cm/sec | |
| 65 | | | | | | | NOTE: Analytical soil samples were collected from each SPT. | |
| 70 | | | | | | | | |
| 75 | | | | | | | | |

WELL DIAGRAM




ELEVATION feet: 630, 625, 620, 615, 610, 605, 600, 595

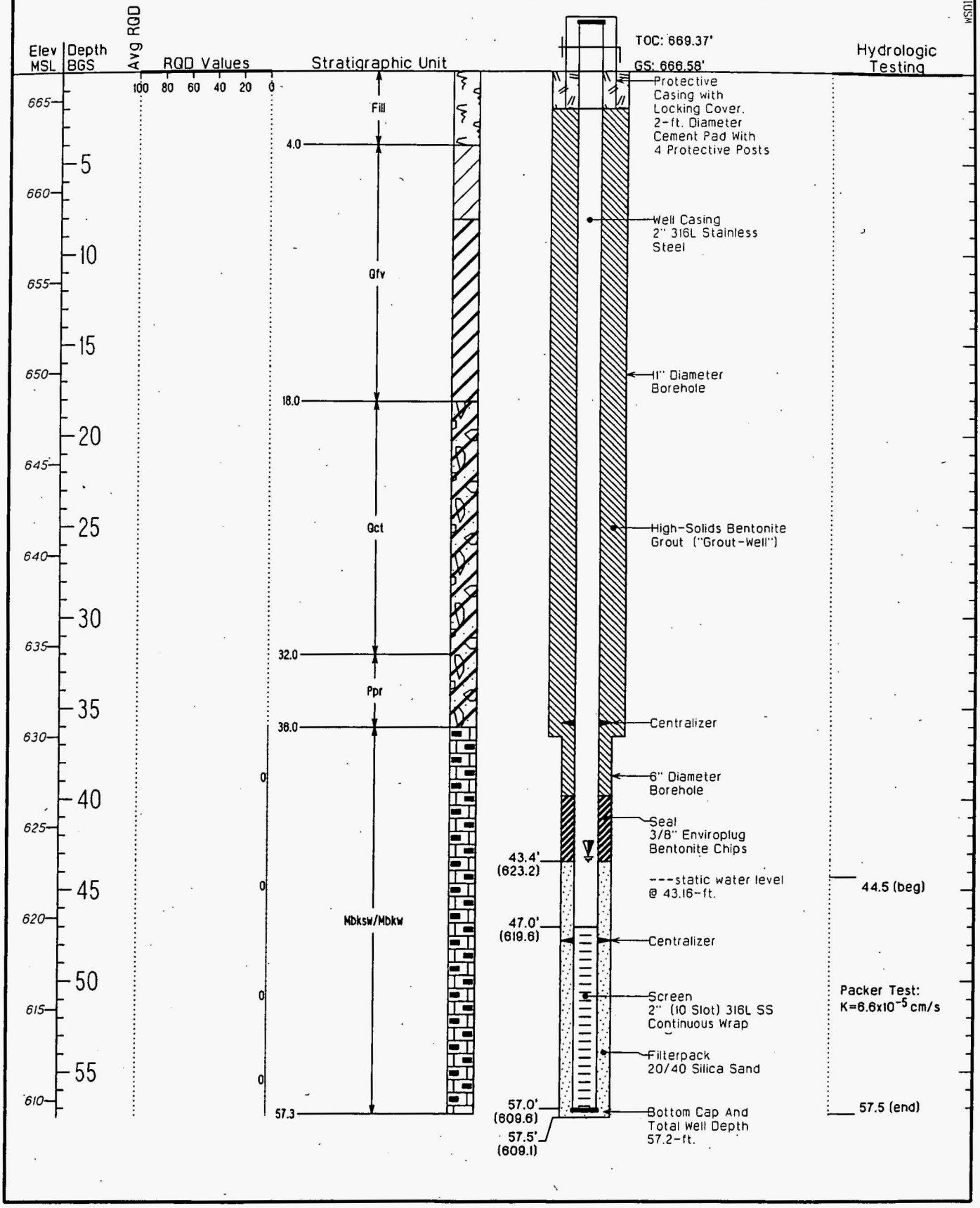
Sample Interval ☐ No Sample Taken ▽minimum ▼maximum ▼average

# BOREHOLE DIAGRAM



## MW-4035

WSD1A6-F




minimum maximum average

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

# PRESSURE TEST RESULTS (FIELD) 7x10-5

Sheet 1 of 2

| | | | |
|---|---|---|---|
| Project: offsite TCE Investigation | Job Number: Task 487A | Test Section: 44.3 to 57.3 | Bore Hole: MW 4035 |
| Test Equipment Identification: Sensus Flow Meter, Valley Instrument Pressure Meter | BORE HOLE — Orientation: Vertical; Size: 3.0" | Test By: B. Cato; Date: 5-14-01 (0915) | |
| Packers: On Casing; Single/Double; Hydraulic/Inflatable | Groundwater Depth: ~39.5' Ft. | Gauge Height Above Ground: 3.0' Ft. | Gravity Head: 42.5 Ft. |

**TEST 1** Inflow pressure ($H_P$) 20 psi x 2.31 = 46.2 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 395.5 | 396.7 | 398.0 | 399.3 | 400.7 | 401.9 | 403.2 | 404.5 | 405.8 | | | 1.3 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | 1.2 | 1.3 | 1.3 | 1.4 | 1.2 | 1.3 | 1.3 | 1.3 | | | CFM x 7.48 - GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) − Head Losses ($H_L$)

88.7 FT. = 42.5 FT. + 46.2 FT. − — FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{\quad}{\times} \times \quad = K, CM/SEC\ 6 \times 10^{-5}$$

**TEST 2** Inflow pressure ($H_P$) 30 psi x 2.31 = 69.3 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 408.5 | 410.3 | 412.0 | 413.7 | 415.4 | 417.2 | | | | | | 1.7 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | 1.8 | 1.7 | 1.7 | 1.7 | 1.8 | | | | | | |

$H_T$ 111.8 FT. = $H_G$ 42.5 FT. + $H_P$ 69.3 FT. − $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K, CM/SEC\ 6 \times 10^{-5}$$

**TEST 3** Inflow pressure ($H_P$) 45 psi x 2.31 = ____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 419.0 | 421.4 | 423.9 | 426.3 | 428.7 | 431.3 | 433.9 | 436.5 | 439.1 | | | 2.5 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | 2.4 | 2.5 | 2.4 | 2.4 | 2.6 | 2.6 | 2.6 | 2.6 | | | |

$H_T$ 146.4 FT. = $H_G$ 42.5 FT. + $H_P$ 103.9 FT. − $H_L$ — FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K, CM/SEC\ 7 \times 10^{-5}$$

Sheet 2 of 2

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| Offsite TCE Investigation | Task 487A | 44.3 to 57.3 | MW 4035 |

| Test Equipment Identification | BORE HOLE Orientation: | BORE HOLE Size: | Test By: |
|---|---|---|---|
| Sensus Flow Meter<br>Valley Instrument Pressure Meter | Vert. | 3.0" | B. Cato<br>Date: 5/14/01 |

| Packers | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| On Casing<br>(Single) Double<br>Hydraulic (Inflatable) | ~39.5' Ft. | 3.0' Ft. | Ft. |

**TEST 1** Inflow pressure ($H_P$) 20 psi × 2.31 = 46.2 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 441.2 | 443.0 | 444.9 | 446.4 | 448.2 | 449.9 | 451.7 | | | | | GPM / CFM |
| Take Per Min. | 1.8 | 1.7 | 1.7 | 1.8 | 1.7 | 1.8 | | | | | | CFM × 7.48 - GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) − Head Losses ($H_L$)

88.7 FT. = 42.5 FT. + 46.2 FT. − — FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{\quad}{\times} \times \quad = K, CM/SEC\ 8 \times 10^{-5}$$

**TEST 2** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM / CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. − $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K, CM/SEC$$

**TEST 3** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM / CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. − $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K, CM/SEC$$

WELDON SPRING SITE REMEDIAL ACTION PROJECT

MONITORING WELL DEVELOPMENT FORM

ES&H 4.4.8.2, Rev.0, 5/95

PROJECT NAME offsite TCE Invest. WORK PACKAGE NO. 487A

SHEET 2 OF 2

DEVELOPED BY Layne Western John Phillips, Alan Benfer

Well Number: MW 4035 Well Locations:

| Date/ Time | Hrs. Dev./ Cum. Hrs. Dev. | Gals. Purged/ Cum. Gals. Purged | pH | Temp. | Cond. | Remarks Turbidity |
|---|---|---|---|---|---|---|
| 5/18/01 1418 | | 21 | 7.6 | 19.9 | 0.70 | 935 |
| 1423 | | 23 | 7.2 | 18.6 | 0.82 | 518 |
| 1428 | | 25 | 7.1 | 18.4 | 0.84 | 125 |
| 1437 | | 27 | 7.1 | 18.5 | 0.78 | 155 |
| 1440 | | 29 | 7.1 | 17.7 | 0.86 | 82.3 |
| 1444 | | 31 | 7.1 | 17.5 | 0.85 | 54.5 |
| 1448 | | 33 | 7.1 | 17.6 | 0.84 | 44.0 |
| 1454 | | 35 | 7.1 | 17.8 | 0.86 | 31.3 |
| 1458 | | 37 | 7.1 | 17.8 | 0.80 | 28.7 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

3 well vols = 17 gals

WELDON SPRING SITE REMEDIAL ACTION PROJECT

MONITORING WELL DEVELOPMENT FORM

ES&H 4.4.8.2, Rev.0, 5/95

PROJECT NAME Offsite TCE Investigation WORK PACKAGE NO. Task 487A

SHEET 1 OF 2

DEVELOPED BY Layne Western / Alan Beafer PMC

1. Well Number.: MW-4035 Well Location: 1040720 753325 Locomotive Shop. Army Prop.
2. Date of Installation: 5/15/01
3. Date of Development: 5/18/01
4. Static Water Level: Before Development 42' bgs ft.; At least 24 hrs. after _____ ft.
5. Organic Vapor: Before development N/A ppm; After development _____ ppm.
6. Quantity of water loss during drilling, if used: ___ gal. unknown
7. Quantity of standing water in well and annulus before development: ~5.6 gal.
8. Depth from top of well casing to bottom of well: ~~57~~ 58 59.5 ft. (from Well Installation Diagram)
9. Well diameter: 2.0" in.
10. Screen length: 10' ft.
11. Minimum quantity of water to be removed: 17 gal.
12. Depth to top of sediment: Before development None ft.; After development None ft.
13. Physical character of water (before/after development): yellow brown / clear
14. Type and size of well development equipment: 2" Grundfos Redi-Flo
15. Description of surge technique: Raising and lowering pump during pumping to stir up sediment.
16. Height of well casing above ground surface: ~2½' ft. (from Well Installation Diagram).
17. Quantity of water removed: 37 gal. Time for removal: _____ hr./min.

# WELDON SPRING SITE REMEDIAL ACTION PROJECT

# BOREHOLE AND WELL COMPLETION LOG

WSWLOG-C

| | |
|---|---|
| HOLE NUMBER | MW-4036 |
| SHEET 1 OF 1 | |
| NORTH (Y): | 1043374.50 |
| EAST (X): | 752600.76 |
| TOC ELEVATION | 615.22 |
| GROUND ELEVATION | 612.50 |
| STICKUP | 2.72 |
| HYDR CONDUCTIVITY (cm/sec) | K= No (Packer Test) |

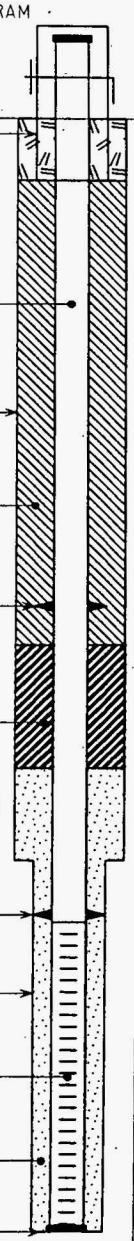
| | |
|---|---|
| WELL STATUS/COMMENTS | ACTIVE |
| LOCATION | EAST EDGE OF ARMY PROPERTY |
| DRILLING CONTRACTOR | LAYNE WESTERN Inc. |
| DRILL RIG MAKE & MODEL | CME-750 HSA/NQWL; I-R TH-60 AIR ROTARY |
| HOLE SIZE & METHOD | 9" HSA-24; NQ-36; 6" AIR-36 |
| ANGLE FROM HORIZONTAL & BEARING | Vertical |
| BOTTOM OF HOLE (TD) | 36.0 |
| DRILL FLUIDS & ADDITIVES | Water core; Air ream |
| CASING TYPE, DEPTH, SIZE | 2" PVC Mon. Well |
| BEDROCK | 15.5 |
| DATE START | 9-28-01 |
| DATE FINISH | 10-9-01, Mon. Well |
| WATER LEVELS & DATES | |

DEPTH (FT.) FROM GROUND ELEV. TO:

LITHOLOGY BY ALAN BENFER

| DEPTH feet | SAMPLE/RUN Number | PERCENT Recovery | N# or RQD | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT |
|---|---|---|---|---|---|---|
| | | | | CL CH | The overburden soil was not sampled or logged from the surface to 8.0-ft.. | Qct/Qfv |
| 5 | | | | | | |
| | SPT-1 | | 14 | CH | CLAY, high plasticity, trace fine gravel, some MnOx, mottled yellow brown, light gray and black, damp, hard. CH. Clay Till. | |
| 10 | SPT-2 | | 50+ | | CH as above, increase in gravel. | |
| | SPT-3 | | 88 | | CLAY, high plasticity, with chert gravel, mottled brown and yellow brown, moist, hard, CH. Residuum. | pPr |
| 15 | SPT-4 | | 98 | LMS CHRT | LIMESTONE AND CHERT, highly weathered bedrock. | Mdksw |
| 20 | | | | | | |
| | NQ-1 | 67/70" | 68 | | Auger refusal at 24.0-ft., continue with NQWL core. | |
| 25 | | | | | LIMESTONE, moderately to strongly weathered, argillaceous, generally coarse-grained, thin streaks of MnOx, some solutioning, mostly orange brown, ~30% chert scattered throughout, light gray. Zero to 5+ fractures per foot, some broken, RQD fair. Strongly weathered Burlington-Keokuk Limestone. | |
| | | | | | @ 27.0'- 27.5'. Wavy bedding. | |
| 30 | NQ-2 | 74/74" | 91 | | @ 27.5'- 28.4'. Mostly chert. | |
| | | | | | @ 28.5'. LIMESTONE, moderately weathered, gray. Occasional MnOx coated styolite. Weathered Burlington-Keokuk Limestone. | Mdkw |
| | | | | | @ 29.3'- 29.8'. Bluish gray chert breccia. | |
| 35 | | | | | @ 31.0'- 32.5', Limestone, only slightly weathered, fine-grained, light gray, cherty. Zero to 1 fracture per foot. High RQD. | Mdk |
| | | | | | @ 32.5'- 33.6'. Mostly bluish gray chert. | |
| | | | | | @ 33.6'- 36.0'. Limestone, fresh, hard, crystalline, light gray Burlington-Keokuk Limestone. | |
| 40 | | | | | Total cored depth 36.0', 10-1-01. Hole reamed to 6" diameter to 36.0' and a 2" monitoring well was constructed. | |
| | | | | | CONSTANT HEAD SINGLE PACKER TEST RESULTS 26.0 - 36.0-ft. No Water Take | |

WELL DIAGRAM



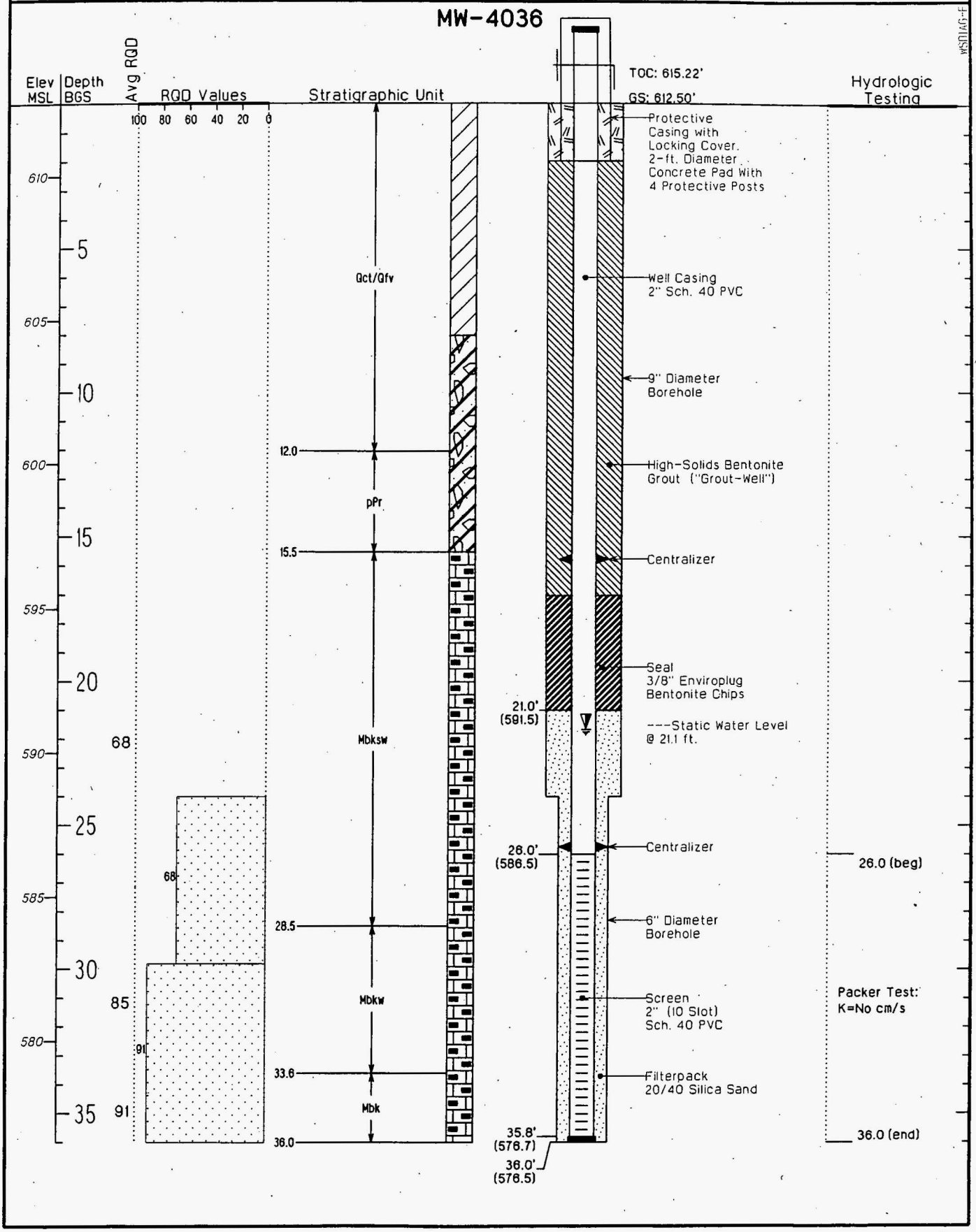

ELEVATION feet

Sample Interval ☐ No Sample Taken ▽minimum ▼maximum ▼average

# BOREHOLE DIAGRAM



## MW-4036




minimum maximum average

MORRISON-KNUDSEN ENGINEERS, INC.

# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| Additional TCE Delineation | 4B7A, Task 11 | 26.0 to 36.0 | MW-403B |

| Test Equipment Identification | BORE HOLE Orientation: | BORE HOLE Size: | Test By: |
|---|---|---|---|
| Sensus Flow Meter<br>U.S. Gauge | Vert. | 3.0" | A. Benfer<br>Date: 10/1/01 |

| Packers | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| On Casing<br>Single/Double<br>Hydraulic/Inflatable | ? Ft. | 3.2 Ft. | Ft. |

zero take at 10, 20, 25 PSI

**TEST 1** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM<br>CFM |
| Take Per Min. | | | | | | | | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

FT. = FT. + FT. – FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

**TEST 2** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM<br>CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

**TEST 3** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM<br>CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

WELDON SPRING SITE REMEDIAL ACTION PROJECT

MONITORING WELL DEVELOPMENT FORM

PROJECT NAME Additional TCE Delineation Layne Western WORK PACKAGE NO. 487A, Task II

DEVELOPED BY A. Benfer PMC CHECKED BY _____ SHEET 1 OF 2

1. Well No.: MW - 4036 Well Locations: 1043399.50 752600.34

2. Date of Installation: 10/9/01

3. Date of Development: 10/16/01

4. Static Water Level: Before Development 23.8' T.O.C. ft.; At least 24 hrs. after _____ ft.

5. Organic Vapor: Before development NA ppm; After development NA ppm.

6. Quantity of wate loss during drilling, if used: 1000 + gal.

7. Quantity of standing water in well and annulus before development: ~~22~~ JAB 7 gal.

8. Depth from top of well casing to bottom of well: 38.5 ft. (from Well Installation Diagram)

9. Well diameter: 2.0 in.

10. Screen length: 10.0 ft.

11. Minimum quantity of water to be removed: ~22 gal.

12. Depth to top of sediment: Before development 0 ft.; After development 0 ft.

13. Physical character of water (before/after development): Cloudy / clear

14. Type and size of well development equipment: 1½" Grundfos Redi-Flo submersible

15. Decription of surge technique, if used: Raising and lowering pump rapidly

16. Height of well casing above ground surface: 2½ ft. (from Well Installation Diagram).

17. Quantity of water removed: 60 gal. Time for removal: ~2/25 hr./min.

m:\users\rogersp\document\wellform.Nb

WELDON SPRING SITE REMEDIAL ACTION PROJECT

MONITORING WELL DEVELOPMENT FORM

ES&H 9.1.3, Rev. 0, 2/99

PROJECT NAME Additional TCE Delineation WORK PACKAGE NO. 487A, Task 11

SHEET 2 OF 2

DEVELOPED BY Layne-Western / Alan Benfer PMC

Well Number: MW-4036 Well Locations: 1043399.50 752600.34

| Date/ Time 10/16/01 | Hrs. Dev./ Cum. Hrs. Dev. | Gals. Purged/ Cum. Gals. Purged | pH | Temp. (°C) | Cond. (umhos) | Turb. (NTUs) | Remarks |
|---|---|---|---|---|---|---|---|
| 1053 | | 36 | 6.9 | 12.1 | 0.86 | 876 | |
| 1056 | | 39 | 6.9 | 13.6 | 0.82 | 222 | |
| 1059 | | 41 | 6.9 | 14.4 | 0.82 | 124 | |
| 1102 | | 43 | 6.9 | 14.6 | 0.82 | 85.8 | |
| 1105 | | 45 | 6.9 | 13.6 | 0.81 | 86.5 | |
| 1110 | | 47 | 6.8 | 14.2 | 0.81 | 200 | |
| 1114 | | 49 | 6.8 | 14.3 | 0.79 | >1000 | |
| 1242 | | 50 | 7.0 | 16.4 | 0.78 | 365 | |
| 1246 | | 51 | 6.8 | 15.7 | 0.81 | 252 | |
| 1249 | | 52 | 6.6 | 15.2 | 0.67 | >1000 | |
| 1253 | | 53 | 6.6 | 14.4 | 0.76 | 244 | |
| 1257 | | 54 | 6.5 | 14.6 | 0.82 | 80.4 | |
| 1304 | | 56 | 6.8 | 14.4 | 0.80 | 28.5 | |
| 1307 | | 57 | 6.8 | 14.4 | 0.82 | 25.9 | |
| 1311 | | 58 | 6.8 | 14.6 | 0.78 | 23.3 | |
| 1314 | | 59 | 6.9 | 14.4 | 0.74 | 16.3 | |
| 1318 | | 60 | 6.5 | 14.8 | 0.80 | 12.2 | |

3 well volumes = 22 gal.

# WELDON SPRING SITE REMEDIAL ACTION PROJECT

# BOREHOLE AND WELL COMPLETION LOG

WSWLOG-C

| | |
|---|---|
| HOLE NUMBER | MW-4037 |
| SHEET 1 OF 1 | |
| NORTH (Y): | 1042398.61 |
| EAST (X): | 752450.11 |
| TOC ELEVATION | 630.13 |
| GROUND ELEVATION | 627.4 |
| STICKUP | 2.33 |
| HYDR CONDUCTIVITY (cm/sec) | K= 1.8x10$^{-3}$ (Packer Test) |

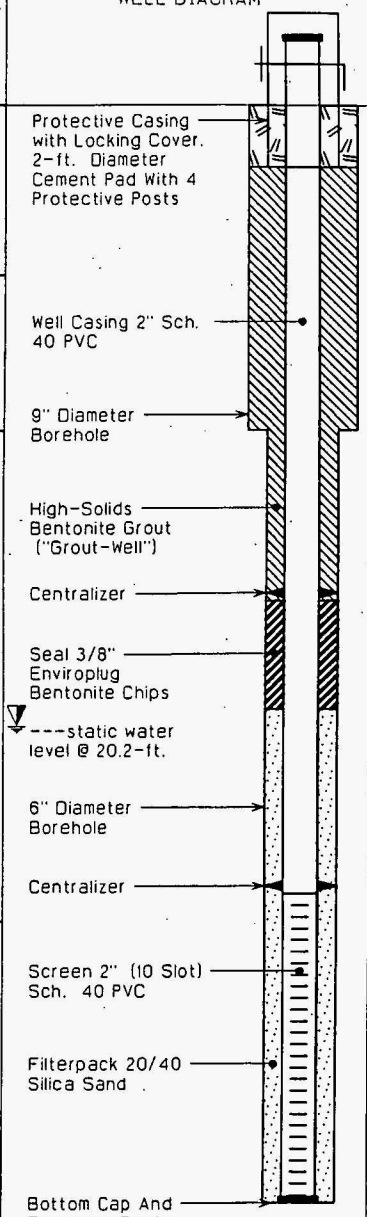
| | | | |
|---|---|---|---|
| WELL STATUS/COMMENTS: ACTIVE | LOCATION: EAST EDGE OF ARMY PROPERTY | | |
| DRILLING CONTRACTOR: LAYNE WESTERN Inc. | DRILL RIG MAKE & MODEL: CME-750 HSA/NQWL; I-R TH-60 AIR ROTARY | | |
| HOLE SIZE & METHOD: 9" HSA-10.5; NQ-34.5; 6" AIR-35.5 | ANGLE FROM HORIZONTAL & BEARING: Vertical | DEPTH (FT.) FROM GROUND ELEV. TO: BOTTOM OF HOLE (TD): 35.5 | |
| DRILL FLUIDS & ADDITIVES: Water core; Air ream | CASING TYPE, DEPTH, SIZE: 2" PVC Mon. Well | BEDROCK: 5.5 | |
| DATE START: 10-3-01 | DATE FINISH: 10-12-01, Mon. Well | WATER LEVELS & DATES | |

LITHOLOGY BY ALAN BENFER

| DEPTH feet | SAMPLE/RUN Number | PERCENT Recovery | N# or RQD | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT |
|---|---|---|---|---|---|---|
| | | | | CL CH | The overburden soil was not sampled or logged from the surface to 5.0-ft.. | Qct/Qfv |
| 5 | SPT-1 | | 62+ | | | |
| | | | | LMS CHRT | LIMESTONE AND CHERT, highly weathered. | Mdksw |
| 10 | NQ-1 | 3/112" | 0 | | Auger refusal at 10.5 ft. Continued with NQWL core. | |
| | | | | LMS CHRT | NQ-1, 10.2'- 19.5'. Recovered only 4" of chert rubble, yellow brown. Approximately 75% fluid return. | Mdkw |
| 15 | | | | | @ 17.5'- 18.5'. Drilled fast. | |
| 20 | NQ-2 | 50/60" | 62 | | @ 20.2'- 21.0'. Drilled fast, lost circulation at ~21'. | |
| | | | | | @ ~21.2'- 21.5'. Chert breccia. | |
| | | | | | @ 21.5'. ~20% of the circulation returned. | |
| 25 | NQ-3 | 42/60" | 28 | | LIMESTONE AND CHERT, ~50% each. Limestone is moderately weathered, argillaceous, varies from fine to coarse-grained, locally fossiliferous, contains black MnOx streaks, is yellow brown. Chert is bedded and disseminated throughout the limestone, hard, light gray. Fractures are rough and open up to 3/4", greater than 4 per foot. Weathered Burlington-Keokuk Limestone to 26.4'. | |
| | | | | | @ ~24.7'. Lost circulation permanently. Bit dropped from ~25' to 25.5'. | |
| 30 | NQ-4 | 51/60" | 48 | | @ 25.5'- 26.7'. Chert, light gray. | Mdksw |
| | | | | | @ 26.4'. LIMESTONE, strongly weathered, argillaceous, soft, with solutioning, MnOx specks, orange brown. Fractures are mostly horizontal, oxidized, rough, eroded, broken, and open up to 1". ~3 to 6+ fractures per foot. Strongly Weathered Burlington-Keokuk Limestone. | |
| 35 | | | | | @ ~29'-29.5'. Bit dropped. | |
| | | | | | @ 30.5'- 33.0'. ~20% chert scattered througout, some bedded. | |
| | | | | | @ 34.3'. Clayey fractures to 34.5'. | |
| 40 | | | | | Total cored depth. 34.5', 10-4-01. Hole reamed to 6" diameter to 35.5' and a 2" monitoring well was constructed. | |

CONSTANT HEAD SINGLE PACKER TEST RESULTS
17.0 - 24.5-ft. K = 1.8E-3 cm/sec
24.0 - 31.0-ft. K = 1.9E-3 cm/sec

WELL DIAGRAM



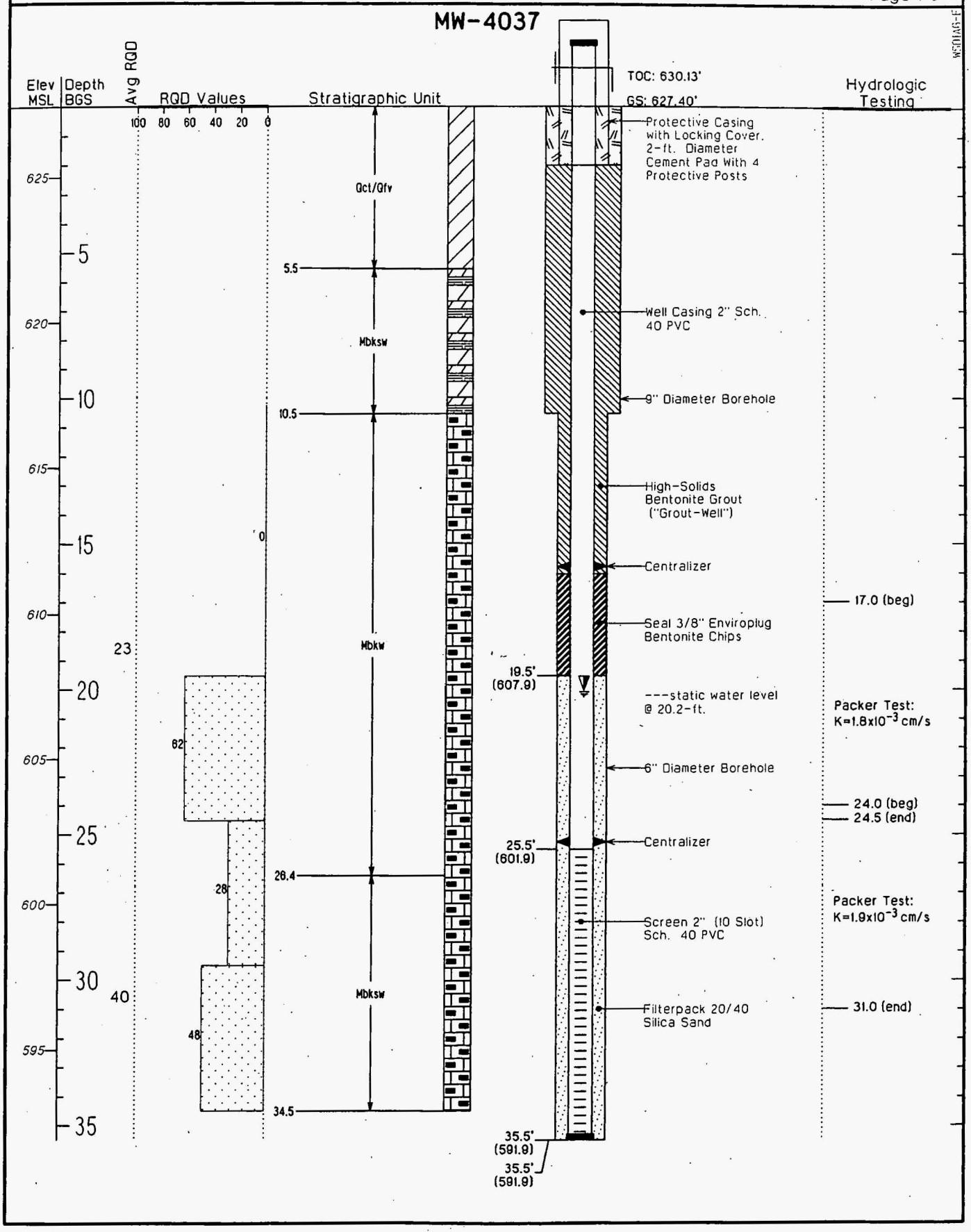

ELEVATION feet

Sample Interval ☐ No Sample Taken ▽minimum ▼maximum ▼average

# BOREHOLE DIAGRAM



## MW-4037




minimum maximum average

Pg 1/2
K = 1.8 x 10^-3

MORRISON-KNUDSEN ENGINEERS, INC.

# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| Additional TCE Delineation | 487A, Task 11 | 17.0 to 24.5 | MW 4037 |

| Test Equipment Identification | BORE HOLE | | Test By: |
|---|---|---|---|
| Sensas Flow Meter | Orientation: Vert. | Size: 3.0" | A. Beufer |
| U.S. Gauge | | | Date: 10/4/01 |

| Packers | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| On Casing Single/Double Hydraulic/Inflatable | ≈ 20.5 Ft. | 2.7 Ft. | 23.2 Ft. |

## TEST 1

Inflow pressure ($H_P$) 10 psi x 2.31 = 23.1 feet

Packer 150 PSI 0820

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 151.0 | 162.1 | 172.8 | 183.0 | 193.2 | 203.3 | 213.4 | | | | | 10.2 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | 11.1 | 10.7 | 10.2 | 10.2 | 10.1 | 10.1 | | | | | | CFM x 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

46.3 FT. = 23.2 FT. + 23.1 FT. – — FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{10.2}{46.3 \times 7.5} \times \overset{0.045}{.011 \ln \frac{7.5}{.125}} = K, CM/SEC\ 1.3 \times 10^{-3}$$

## TEST 2

Inflow pressure ($H_P$) 15 psi x 2.31 = 34.65 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 243.0 | 262.3 | 281.8 | 301.3 | 320.5 | 340.0 | 359.3 | | | — | — | 19.4 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | 19.5 | 19.3 | 19.5 | 19.2 | 19.6 | 19.3 | | | | | | |

$H_T$ 57.85 FT. = $H_G$ 23.2 FT. + $H_P$ 34.65 FT. – $H_L$ — FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{19.4}{57.85 \times 7.5} \times .045 = K, CM/SEC\ 2.0 \times 10^{-3}$$

## TEST 3

Inflow pressure ($H_P$) 20 psi x 2.31 = 46.2 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 380.0 | 402.0 | 424.1 | 446.3 | 468.3 | 490.4 | | | | | | 22.1 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | 22.0 | 22.1 | 22.2 | 22.0 | 22.1 | | | | | | | |

$H_T$ 69.4 FT. = $H_G$ 23.2 FT. + $H_P$ 46.2 FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{22.1}{69.4 \times 7.5} \times .045 = K, CM/SEC\ 1.9 \times 10^{-3}$$

Pg 2/2

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| Additional TCE Delineation | 4874, Task 11 | 17.0 to 24.5 | MW 4037 |

| Test Equipment Identification | BORE HOLE Orientation: | BORE HOLE Size: | Test By: |
|---|---|---|---|
| Seasus Flow Meter U.S. Gauge | Vertical | 3.0" | A. Beufer |
| | | | Date: 10/4/01 |

| Packers (On Casing; Single/Double; Hydraulic/Inflatable) | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| | ~ 20.5 Ft. | 2.7 Ft. | 23.2 Ft. |

**TEST 1** Inflow pressure ($H_P$) 10 psi × 2.31 = 23.1 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 512.0 | 525.5 | 539.8 | 554.0 | 568.4 | 582.8 | | | | | | 14.4 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | 13.5 | 14.3 | 14.4 | 14.4 | 14.4 | | | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

46.3 FT. = 23.2 FT. + 23.1 FT. – FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{14.4}{46.3 \times 7.5} \times .045 = K,\ CM/SEC\ 1.9 \times 10^{-3}$$

**TEST 2** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet $\bar{X} = 1.5 \times 10^{-3}$

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K,\ CM/SEC$$

**TEST 3** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K,\ CM/SEC$$

Sheet 1 of 2 T.D. 34.5'
Cuttings to 31

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| Additional TCE Delineation | 487A, Task 4 | 24.0 to 31.0 | MW-4037 |

| Test Equipment Identification | BORE HOLE Orientation: | BORE HOLE Size: | Test By: |
|---|---|---|---|
| Seasus Flow Meter U.S. Gauge | Vertical | 3.0" | A. Beafer |
| | | | Date: 10/8/01 |

| Packers (On Casing; Single/Double; Hydraulic/Inflatable) | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| | ~20.5' Ft. | 2.9 Ft. | 23.4 Ft. |

1205
**TEST 1** Inflow pressure ($H_P$) 10 psi × 2.31 = 23.1 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 613.0 | 629.7 | 646.0 | 661.8 | 677.5 | 692.8 | 708.0 | | | | | 16.0 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | 16.7 | 16.3 | 15.8 | 15.7 | 15.3 | | | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

46.5 FT. = 23.4 FT. + 23.1 FT. – 0 FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{16.0}{46.5 \times 7.0} \times .011 \ln \frac{7.0}{.125} = K, CM/SEC\ 2.2 \times 10^{-3}$$

(L = 7.0, r = .125, .044)

**TEST 2** Inflow pressure ($H_P$) 20 psi × 2.31 = 46.2 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 748.0 | 768.0 | 790.3 | 808.8 | 829.7 | 849.5 | 869.3 | | | | | 19.7 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | 20.0 | 19.5 | 19.5 | 20.1 | 19.8 | 19.8 | | | | | | |

$H_T$ 69.6 FT. = $H_G$ 23.4 FT. + $H_P$ 46.2 FT. – $H_L$ 0 FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{19.7}{69.6 \times 7.0} \times .044 = K, CM/SEC\ 1.8 \times 10^{-3}$$

**TEST 3** Inflow pressure ($H_P$) 25 psi × 2.31 = 57.75 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 886.0 | 908.3 | 930.3 | 952.4 | 974.7 | 996.8 | | | | | | 22.2 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | 22.3 | 22.0 | 22.1 | 22.3 | 22.1 | | | | | | | |

$H_T$ 81.2 FT. = $H_G$ 23.4 FT. + $H_P$ 57.75 FT. – $H_L$ 0 FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{22.2}{81.2 \times 7.0} \times .044 = K, CM/SEC\ 1.7 \times 10^{-3}$$

MORRISON-KNUDSEN ENGINEERS, INC.
A MORRISON KNUDSEN COMPANY

# PRESSURE TEST RESULTS (FIELD)

| | | | |
|---|---|---|---|
| Project: Additional TCE Delineation | Job Number: 487A, Task 11 | Test Section: 24.0 to 31.0 | Bore Hole: MW 4037 |
| Test Equipment Identification: Sensus Flow Meter, U.S. Gauge | BORE HOLE — Orientation: Vertical; Size: 3.0" | Test By: A. Benfer; Date: 10/8/01 | |
| Packers: On Casing; (Single) Double; Hydraulic (Inflatable) | Groundwater Depth: ~20.5 Ft. | Gauge Height Above Ground: 2.9 Ft. | Gravity Head: 23.4 Ft. |

**TEST 1** Inflow pressure ($H_P$) 10 psi × 2.31 = 23.1 feet

Pressure steady

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 025.0 | 37.8 | 51.2 | 64.3 | 77.7 | 91.0 | 104.4 | 117.7 | 130.8 | | | 13.3 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | 12.8 | 13.4 | 13.1 | 13.4 | 13.3 | 13.4 | 13.3 | 13.1 | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

46.5 FT. = 23.4 FT. + 23.1 FT. – 0 FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{13.3}{46.5 \times 7.0} \times .044 = K, CM/SEC\ 1.0 \times 10^{-3}$$

**TEST 2** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet $\bar{X} = 1.9 \times 10^{-3}$

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ ____ FT. = $H_G$ ____ FT. + $H_P$ ____ FT. – $H_L$ ____ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\quad \times \quad} \times \quad = K, CM/SEC$$

**TEST 3** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ ____ FT. = $H_G$ ____ FT. + $H_P$ ____ FT. – $H_L$ ____ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\quad \times \quad} \times \quad = K, CM/SEC$$

WELDON SPRING SITE REMEDIAL ACTION PROJECT

MONITORING WELL DEVELOPMENT FORM

PROJECT NAME Additional TCE Delineation WORK PACKAGE NO. 487A, Task 11

DEVELOPED BY Alan Benfer, PM Layne Western CHECKED BY _____ SHEET 1 OF 2

1. Well No.: MW-4037 Well Locations: 1042400.17 752449.69

2. Date of Installation: 10/12/01

3. Date of Development: 10/16/01

4. Static Water Level: Before Development 22.53 T.O.C. ft.; At least 24 hrs. after _____ ft.

5. Organic Vapor: Before development NA ppm; After development NA ppm.

6. Quantity of wate loss during drilling, if used: unknown gal.

7. Quantity of standing water in well and annulus before development: ~7.3 gal.

8. Depth from top of well casing to bottom of well: 38 ft. (from Well Installation Diagram)

9. Well diameter: 2.0 in.

10. Screen length: 10.0 ft.

11. Minimum quantity of water to be removed: 22 gal.

12. Depth to top of sediment: Before development None ft.; After development _____ ft.

13. Physical character of water (before/after development): Muddy / Clear

14. Type and size of well development equipment: 1½" Grundfos Redi-Flo Submersible pump.

15. Decription of surge technique, if used: Raised and lowered the pump.

16. Height of well casing above ground surface: 2½ ft. (from Well Installation Diagram).

17. Quantity of water removed: 44 gal. Time for removal: 56 min. hr./min.

m:\users\rogersp\document\wellform.Nb

WELDON SPRING SITE REMEDIAL ACTION PROJECT 10/16/01

MONITORING WELL DEVELOPMENT FORM

ES&H 9.1.3, Rev. 0, 2/99

PROJECT NAME Additional TCE Delineation WORK PACKAGE NO. 487A, Task 11

SHEET 2 OF 2

DEVELOPED BY Layne-Western / Alan Benfer, PMC

Well Number: MW-4037 Well Locations: 1042400.17 752449.69

| Date/ Time 10/16/01 | Hrs. Dev./ Cum. Hrs. Dev. | Gals. Purged/ Cum. Gals. Purged | pH | Temp. (°C) | Cond. (umhos) | Turb. (NTUs) | Remarks |
|---|---|---|---|---|---|---|---|
| 1445 | ~~33~~ JAB | 32 | 6.9 | 12.9 | 0.90 | 9.37 | |
| 1447 | | 34 | 6.7 | 13.7 | 0.92 | 5.48 | |
| 1450 | | 36 | 6.7 | 13.9 | 0.93 | 4.19 | |
| 1453 | | 38 | 6.7 | 13.9 | 0.94 | 3.70 | |
| 1456 | | 40 | 6.6 | 13.9 | 0.96 | 3.72 | |
| 1458 | | 42 | 6.6 | 14.0 | 0.96 | 3.46 | |
| ~~1401~~ | JAB 1501 | 44 | 6.6 | 14.1 | 0.96 | 3.08 | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
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| | | | | | | | |

# WELDON SPRING SITE REMEDIAL ACTION PROJECT

# BOREHOLE AND WELL COMPLETION LOG

WSHLOG-C

| | |
|---|---|
| HOLE NUMBER | MW-4038 |
| SHEET 1 OF 2 | |
| NORTH (Y): | 1041872.3 |
| EAST (X): | 752716.7 |
| TOC ELEVATION | 638.07 |
| GROUND ELEVATION | 636.0 |
| STICKUP | 2.07 |
| HYDR CONDUCTIVITY (cm/sec) | K= 2.3x10$^{-3}$ (Packer Test) |

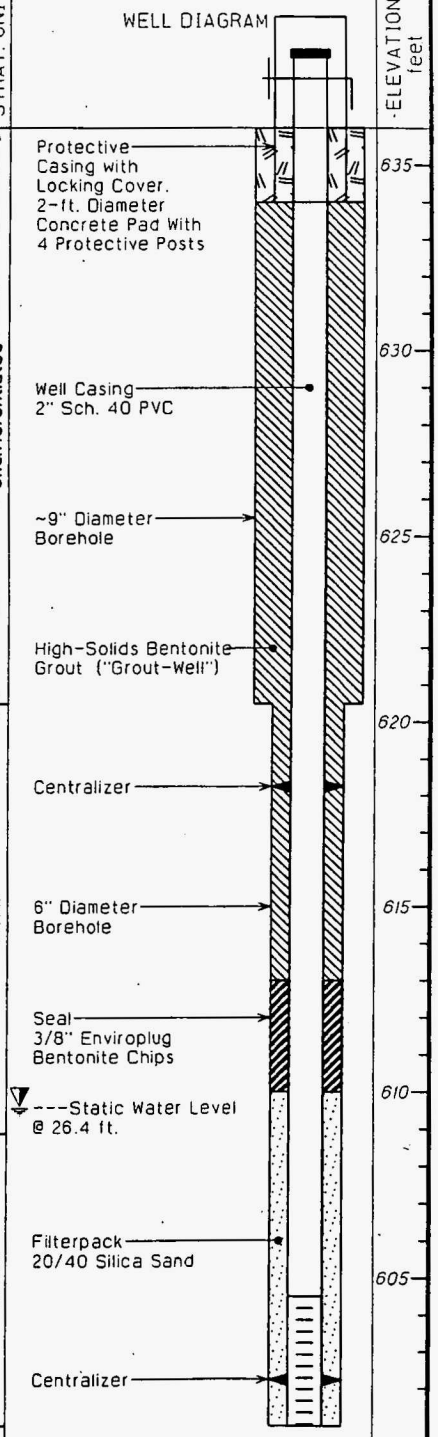
| | | | |
|---|---|---|---|
| WELL STATUS/COMMENTS: ACTIVE | LOCATION: EAST EDGE OF ARMY PROPERTY | | |
| DRILLING CONTRACTOR: LAYNE WESTERN Inc. | DRILL RIG MAKE & MODEL: CME-750 HSA/NQWL; I-R TH-60 AIR ROTARY | | |
| HOLE SIZE & METHOD: 9" HSA-15.5, NQ-39.2; 6" AIR-41.5 | ANGLE FROM HORIZONTAL & BEARING: Vertical | BOTTOM OF HOLE (TD): 41.9 | |
| DRILL FLUIDS & ADDITIVES: Water core; Air ream | CASING TYPE, DEPTH, SIZE: 2" PVC Mon. Well | BEDROCK: 15.5 | |
| DATE START: 10-8-01 | DATE FINISH: 10-11-01, Mon. Well | WATER LEVELS & DATES | |

DEPTH (FT.) FROM GROUND ELEV. TO:

LITHOLOGY BY ALAN BENFER

| DEPTH feet | SAMPLE/RUN Number | PERCENT Recovery (0–100) | N# or RQD | GRAPHIC LOG | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT |
|---|---|---|---|---|---|---|---|
| | | | | | | The overburden soil was not sampled or logged from the surface to 15.5-ft. | Undifferentiated |
| 5 | | | | | | | |
| 10 | | | | | | | |
| 15 | | | | | | Auger refusal at 15.5-ft. Continued with NQ core. | |
| | NQ-1 | 19/20" | 76 | | CHRT LMS | CHERT AND LIMESTONE, Thinly interbedded (wavy), mostly chert, blue gray, with yellow brown weathered limestone. Weathered Burlington-Keokuk Limestone. Loss at ~16.5', 1+ fractures per foot. | Mdkw |
| | NQ-2 | 36/42" | 54 | | | @ 16.5'. Lost circulation. | |
| | | | | | | @ 16.9'-17.3'. Mostly chert. | |
| 20 | | | | | | @ 17.4'. Partial fluid return. Patch of oxidized pyrite. | |
| | NQ-3 | 58/101" | 37 | | | NQ-2, 17.3'-20.8'. Predominantly blue gray chert with minor yellow brown weathered limestone, some solutioning. Zero to 4+ fractures per foot, surfaces are rough, oxidized, open; some broken zones. 50%-75% fluid return. | |
| 25 | | | | | | NQ-3, 20.8'-29.2'. Poor recovery, loss zones unknown. Possibly 8 loss zones based on the number of spun core ends. Considerable solutioning. Fractures are oxidized. | |
| | | | | | | bit dropped at ~23.5'. Lost circulation, did not return. | |
| | | | | | | Predominantly chert to 27.1', having thin streaks of MnOx, with lesser amounts of yellow brown strongly weathered limestone, argillaceous. Strongly Weathered Burlington-Keokuk Limestone. | Mdksw |
| 30 | NQ-4 | 60/60" | 78 | | | 27.1'-29.2'. No loss, mostly strongly weathered limestone, yellow brown, argillaceous, with abundant tiny specks of MnOx; minor chert. | |
| | | | | | | Predominantly strongly weathered limestone, yellow brown, argillaceous with abundant tiny specks of MnOx throughout, minor solutioning, some oxidized pyrite, light gray chert scattered throughout with thin streaks of MnOx. Zero to 4+ fractures per foot, mostly rough and open up to 1", some broken | |
| 35 | NQ-5 | 60/60" | 46 | | | | |

WELL DIAGRAM




ELEVATION feet

Sample Interval ☐ No Sample Taken ▽minimum ▼maximum ▽average

WELDON SPRING SITE REMEDIAL ACTION PROJECT

# BOREHOLE AND WELL COMPLETION LOG

HOLE NUMBER: MW-4038

SHEET 2 OF 2

WSWLOG-C

NORTH (Y): 1041872.3

EAST (X): 752716.7

WELL STATUS/COMMENTS: ACTIVE

LOCATION: EAST EDGE OF ARMY PROPERTY

| DEPTH feet | SAMPLE | SAMPLE/RUN Number | PERCENT Recovery (0 100) | N# or RQD | GRAPHIC LOG | SOIL/ROCK class | DESCRIPTION AND REMARKS | STRAT. UNIT | WELL DIAGRAM | ELEVATION feet |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CHRT LMS | Predominantly strongly weathered limestone as above. | Mbksw | | |
| | | | | | | | @ 37.0'-37.5'. Considerable solutioning. | | Screen 2" (10 Slot) PVC | |
| | | | | | | | @ 37.5'-37.7'. Light brown chert. | | | |
| | | | | | | | @ 38'. Thinly bedded. | | | |
| 40 | | | | | | | Total depth, 39.2', 10-11-01. Hole reamed to 6" diameter to 41.5' and a 2" diameter monitoring well was constructed. | | Bottom Cap And Total Well Depth 41.5-ft. | 595 |
| 45 | | | | | | | CONSTANT HEAD SINGLE PACKER TEST RESULTS<br>19.0 - 29.2 ft. K = 2.3E-3 cm/sec<br>29.0 - 39.2 ft. K = < E-4 cm/sec | | | 590 |
| 50 | | | | | | | | | | 585 |
| 55 | | | | | | | | | | 580 |
| 60 | | | | | | | | | | 575 |
| 65 | | | | | | | | | | 570 |
| 70 | | | | | | | | | | 565 |
| 75 | | | | | | | | | | |

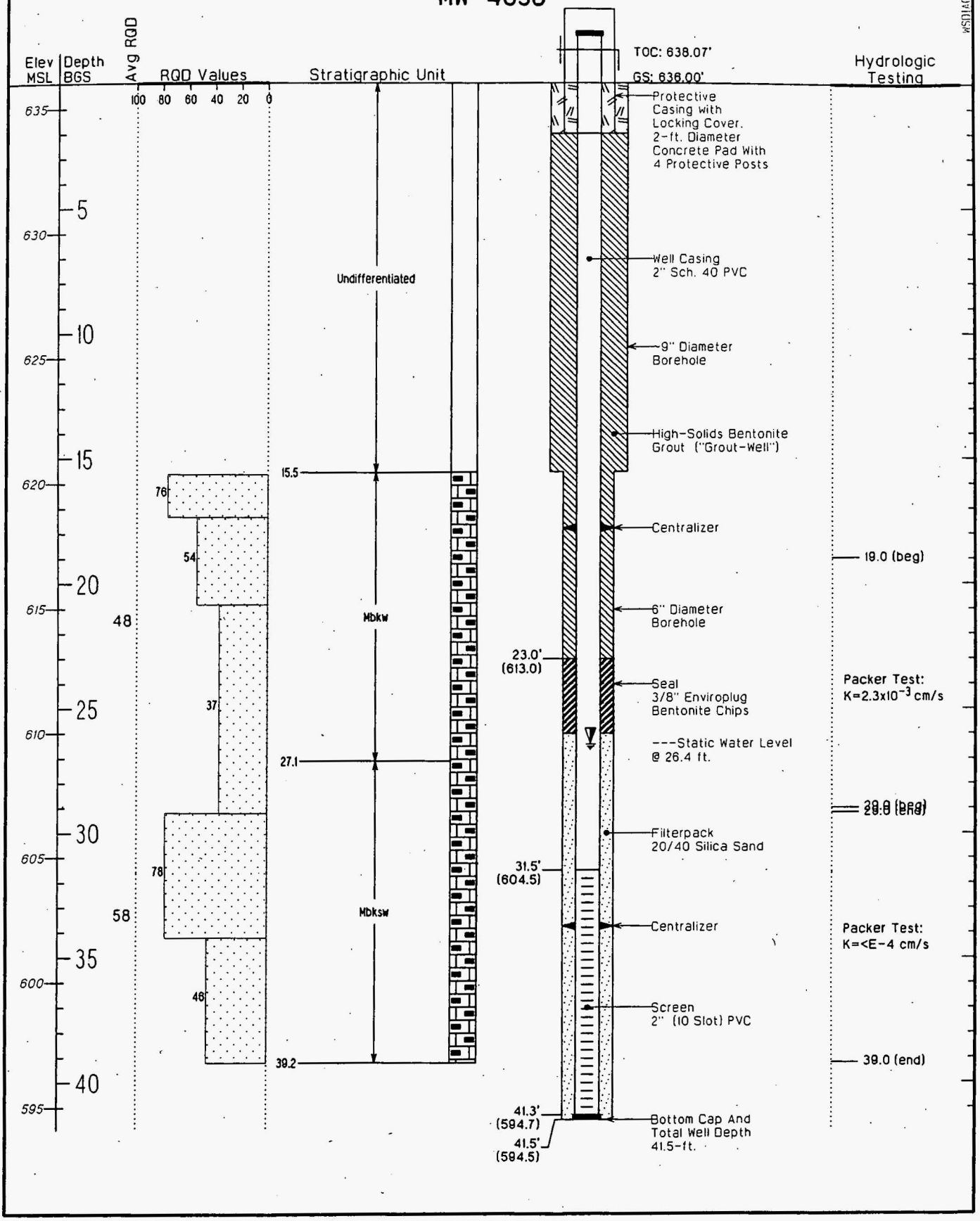
600

Sample Interval ☐ No Sample Taken minimum maximum average

# BOREHOLE DIAGRAM



## MW-4038




minimum maximum average

MORRISON-KNUDSEN ENGINEERS, INC.

# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| Additional TCE Delineation | 487A Task 11 | 19.0 to 29.2 | MW 403B |

| Test Equipment Identification | BORE HOLE Orientation: | BORE HOLE Size: | Test By: |
|---|---|---|---|
| Sensus Flow meter U.S. Gauge | vertical | 3.0" | A. Barfer |
| | | | Date: 10/9/01 |

| Packers | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| On Casing; Single/Double; Hydraulic/Inflatable | 26.4 Ft. | 3.0' Ft. | 29.4 Ft. |

## TEST 1

Inflow pressure ($H_P$) 10 psi × 2.31 = 23.1 feet

Not Reliable

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 161.0 | 174.8 | 189.0 | 203.5 | 218.3 | 233.0 | 247.9 | 262.5 | | | | GPM / CFM |
| Take Per Min. | | 13.8 | 14.2 | 14.0 | 1' | | 14.9 | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

| FT. | = | 29.4 FT. | + | 23.1 FT. | – | FT. |
|---|---|---|---|---|---|---|

Sink in hose

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

## TEST 2

Inflow pressure ($H_P$) 15 psi × 2.31 = 34.65 feet

OK

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 363.0 | 393.3 | 423.6 | 453.7 | 484.0 | 514.0 | 543.8 | | | | | 30.2 GPM / CFM |
| Take Per Min. | | 30.3 | 30.3 | 30.1 | 30.3 | 30.0 | 29.8 | | | | | |

| $H_T$ | = $H_G$ | + $H_P$ | – $H_L$ |
|---|---|---|---|
| 64.1 FT. | 29.4 FT. | 34.65 FT. | 0 FT. |

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{30.2}{64.1 \times 10.2} \times .011 \ln \frac{10.2}{.125} = 2.2 \times 10^{-3}$$

.048

## TEST 3

Inflow pressure ($H_P$) 20 psi × 2.31 = 46.2 feet

OK

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 678.0 | 722.5 | 747.3 | 781.5 | 816.4 | 851.5 | 886.8 | | | | | 34.9 GPM / CFM |
| Take Per Min. | | 44.5 | 24.8 | 34.2 | 34.9 | 35.1 | 35.3 | | | | | |

| $H_T$ | = $H_G$ | + $H_P$ | – $H_L$ |
|---|---|---|---|
| 75.6 FT. | 29.4 FT. | 46.2 FT. | 0 FT. |

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{34.9}{75.6 \times 10.2} \times .048 = 2.2 \times 10^{-3}$$

.048

MORRISON-KNUDSEN ENGINEERS, INC.

# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| Additional TCE Delineation | 487A, Task 11 | 19.0 to 29.2 | MW 403B |

| Test Equipment Identification | BORE HOLE | | Test By: |
|---|---|---|---|
| Sensus Flow meter U.S. Gauge | Orientation: vertical | Size: 3.0" | A. Benfer |
| | | | Date: 10/9/01 |

| Packers | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| On Casing / Single/Double / Hydraulic/Inflatable | 26.4 Ft. | 3.0 Ft. | 29.4 Ft. |

**TEST 1** Inflow pressure ($H_P$) 10 psi × 2.31 = 23.1 feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | 923.0 | 949.7 | 976.5 | 003.5 | 030.5 | 057.5 | | | | | | 26.9 GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | 26.7 | 26.8 | 27.0 | 27.0 | 27.0 | | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

52.5 FT. = 29.4 FT. + 23.1 FT. – FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{26.9}{52.5 \times 10.2} \times .048 = K, CM/SEC\ 2.4 \times 10^{-3}$$

$= 2.3 \times 10^{-3}$

**TEST 2** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K, CM/SEC$$

**TEST 3** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = K, CM/SEC$$

MORRISON-KNUDSEN ENGINEERS, INC.
A BOMBOSON KNUDSEN COMPANY

# PRESSURE TEST RESULTS (FIELD)

| Project: | Job Number: | Test Section: | Bore Hole: |
|---|---|---|---|
| Additional TCE Delineation | 4B7A Task 11 | 29.0 to 39.2 | MW 4038 |

| Test Equipment Identification | BORE HOLE | | Test By: |
|---|---|---|---|
| Sensus Flow Meter U.S. Gauge | Orientation: Vert. | Size: 3.0" | A. Benfer |
| | | | Date: 10/11/01 |

| Packers On Casing Single/Double Hydraulic/Inflatable | Groundwater Depth: | Gauge Height Above Ground: | Gravity Head: |
|---|---|---|---|
| | 26.4 Ft. | 3.0 Ft. | 29.4 Ft. |

No ~~take~~ at 20, 30, 40 or 50 PSI

**TEST 1** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet $K \approx 10^{-4}$ cm/s

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | CFM × 7.48 – GPM |

Total Head ($H_T$) = Gravity Head ($H_G$) + Pressure Head ($H_P$) – Head Losses ($H_L$)

FT. = FT. + FT. – FT.

$$K = \frac{Q\ (gpm)}{H_T\ (ft) \times L\ (ft)} \times .011 \ln. \frac{L\ (ft)}{r\ (ft)} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

**TEST 2** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

**TEST 3** Inflow pressure ($H_P$) _____ psi × 2.31 = _____ feet

| TIME, MIN. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Q AVERAGE FLOW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meter Reading Gallons or Cu. Ft. | | | | | | | | | | | | GPM |
| | | | | | | | | | | | | CFM |
| Take Per Min. | | | | | | | | | | | | |

$H_T$ FT. = $H_G$ FT. + $H_P$ FT. – $H_L$ FT.

$$K = \frac{Q}{H_T \times L} \times .011 \ln. \frac{L}{r} = \frac{\quad}{\times} \times \quad = \text{K, CM/SEC}$$

WELDON SPRING SITE REMEDIAL ACTION PROJECT

MONITORING WELL DEVELOPMENT FORM

ES&H 4.4.8.2, Rev.0, 5/95

PROJECT NAME Additional TCE Delineation WORK PACKAGE NO. 487A, Task 11

SHEET 1 OF 2

DEVELOPED BY Layne Western / Dean Benfer, PMC

1. Well Number.: MW-4038 Well Location: 1041869.45 / 752700.17

2. Date of Installation: 10/26/01

3. Date of Development: 10/31 - 11/1/01

4. Static Water Level: Before Development 26.76 b.g.s. ft.; At least 24 hrs. after _____ ft.

5. Organic Vapor: Before development N.A. ppm; After development N.A. ppm.

6. Quantity of water loss during drilling, if used: unknown gal.

7. Quantity of standing water in well and annulus before development: 15', ~~32~~ 7.3 gals gal.

8. Depth from top of well casing to bottom of well: 44.0 ft. (from Well Installation Diagram)

9. Well diameter: 2" in.

10. Screen length: 10 ft.

11. Minimum quantity of water to be removed: 22 gal.

12. Depth to top of sediment: Before development None ft.; After development _____ ft.

13. Physical character of water (before/after development): Muddy / Clear

14. Type and size of well development equipment: 1½" Grundfos Red-Flo pump.

15. Description of surge technique: Raising and lowering the pump to agitate the water

16. Height of well casing above ground surface: 2.5 ft. (from Well Installation Diagram).

Quantity of water removed: 30 gal. Time for removal: 2/10 hr./min.

WELDON SPRING SITE REMEDIAL ACTION PROJECT

MONITORING WELL DEVELOPMENT FORM

ES&H 9.1.3, Rev. 0, 2/99

PROJECT NAME WSSRAP TASK #1 WORK PACKAGE NO. 487

SHEET 2 OF 2

DEVELOPED BY MARK McNAMARA

Well Number: MW-4038 Well Locations: Army property

| Date/ Time | Hrs. Dev./ Cum. Hrs. Dev. | Gals. Purged/ Cum. Gals. Purged | pH | Temp. (°C) | Cond. (umhos) | Turb. (NTUs) | Remarks |
|---|---|---|---|---|---|---|---|
| 10/31/01 1630 11-1-01 | | 22 | 7.2 | 15.7 | 1.11 | 139.0 | |
| 45 | | 24 | 7.1 | 15.4 | 1.02 | 73.5 | |
| 1900 | | 26 | 7.2 | 16.2 | 1.15 | 31.40 | |
| 1915 | | 28 | 7.0 | 16.5 | 1.15 | 12.70 | |
| 1930 | | 30 | 7.1 | 16.4 | 1.16 | 10.80 | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

3 well vols = 22 gals

# APPENDIX B

Water Level Data

| LOCATION_CODE | LOG_DATE | TOC_ELEVATION | WATER_ELEVATION | DEPTH_FROM_TOC | DEPTH_FROM_SURFACE |
|---|---|---|---|---|---|
| MW-4013 | 1/28/00 | 608.73 | 563.2 | 45.53 | 43.53 |
| MW-4022 | 1/28/00 | 667.98 | 594.67 | 73.31 | 71.59 |
| MW-4024 | 1/28/00 | 654.83 | 604.08 | 53.45 | 51.15 |
| MW-2014 | 1/28/00 | 649.37 | 602.71 | 46.66 | 44.87 |
| MW-4020 | 1/28/00 | 659.17 | 604.15 | 55.02 | 53.75 |
| MW-4015 | 1/28/00 | 619.58 | 580.64 | 38.94 | 37.14 |
| MW-4014 | 1/28/00 | 609.3 | 560.35 | 48.95 | 46.84 |
| MW-4023 | 1/28/00 | 648.53 | 614.68 | 33.85 | 31.96 |
| MW-2017 | 1/28/00 | 659.84 | 604.32 | 55.52 | 53.54 |
| MW-2034 | 1/28/00 | 660.83 | 605.41 | 55.42 | 52.76 |
| MW-2013 | 1/31/00 | 647.13 | 602.73 | 44.4 | 42.65 |
| MW-2040 | 1/31/00 | 662.39 | 611.91 | 50.48 | 50.49 |
| MW-4029 | 1/31/00 | 651.28 | 610.19 | 41.09 | 38.13 |
| MW-2023 | 1/31/00 | 637.29 | 583.08 | 54.21 | 52.75 |
| MW-2001 | 1/31/00 | 613.29 | 587.74 | 25.55 | 24.01 |
| MW-4007 | 1/31/00 | 624.13 | 595.01 | 29.12 | 26.49 |
| MW-2039 | 1/31/00 | 665.25 | 612.45 | 52.8 | 50.95 |
| MW-2042 | 1/31/00 | 662.68 | 613.28 | 49.4 | 49.42 |
| MW-3029 | 1/31/00 | 653.33 | 610.04 | 43.29 | 39.45 |
| MW-2036 | 1/31/00 | 658.01 | 609.42 | 48.59 | 46.48 |
| MW-2012 | 1/31/00 | 636.61 | 600.72 | 35.89 | 34.12 |
| MW-3025 | 1/31/00 | 655.32 | 609.52 | 45.8 | 35.37 |
| MW-4028 | 1/31/00 | 650.35 | 609.2 | 41.15 | 37.51 |
| MW-2043 | 1/31/00 | 662.3 | 613.09 | 49.21 | 49.51 |
| MW-2047 | 1/31/00 | 640.3 | 591.05 | 49.25 | 46.43 |
| MW-3024 | 1/31/00 | 654.87 | 600.66 | 54.21 | 45.1 |
| MW-2024 | 1/31/00 | 636.7 | 566.49 | 70.21 | 68.46 |
| MW-4027 | 1/31/00 | 647.77 | 610.22 | 37.55 | 34.52 |
| MW-4026 | 1/31/00 | 463.27 | 459.38 | 3.89 | 2.65 |
| MW-3028 | 1/31/00 | 651.92 | 610.19 | 41.73 | 39.12 |

| LOCATION_CODE | LOG_DATE | TOC_ELEVATION | WATER_ELEVATION | DEPTH_FROM_TOC | DEPTH_FROM_SURFACE |
|---|---|---|---|---|---|
| MW-2041 | 1/31/00 | 661.59 | 616.06 | 45.53 | 45.44 |
| MW-4011 | 1/31/00 | 628.16 | 591.17 | 36.99 | 35.79 |
| MW-2038 | 1/31/00 | 667.19 | 619.63 | 47.56 | 45.37 |
| MW-3003 | 1/31/00 | 646.96 | 598.11 | 48.85 | 46.54 |
| MW-2035 | 1/31/00 | 668.4 | 613.36 | 55.04 | 53.64 |
| MW-2037 | 1/31/00 | 659.08 | 610.38 | 48.7 | 46.69 |
| MW-2002 | 1/31/00 | 625.51 | 594.3 | 31.21 | 29.53 |
| MW-4001 | 1/31/00 | 622.83 | 601.28 | 21.55 | 19.85 |
| MW-3006 | 1/31/00 | 647.13 | 592.74 | 54.39 | 53.16 |
| MW-2021 | 1/31/00 | 626.19 | 588.48 | 37.71 | 36.09 |
| MW-3026 | 1/31/00 | 646.77 | 605.05 | 41.72 | 39.25 |
| MW-2022 | 1/31/00 | 637.24 | 584.71 | 52.53 | 51.36 |
| MW-2032 | 1/31/00 | 638.09 | 582.82 | 55.27 | 52.82 |
| MW-4002 | 1/31/00 | 635.2 | 568.71 | 66.49 | 63.79 |
| MW-2048 | 1/31/00 | 662.14 | 607.64 | 54.5 | 50.08 |
| MW-3023 | 1/31/00 | 648.07 | 592.58 | 55.49 | 53.28 |
| MW-2046 | 1/31/00 | 653.6 | 589.05 | 64.55 | 60.72 |
| MW-4006 | 1/31/00 | 622.95 | 601.4 | 21.55 | 20.27 |
| MW-3027 | 1/31/00 | 647.11 | 607.62 | 39.49 | 36.61 |
| MW-2045 | 1/31/00 | 641.85 | 596.6 | 45.25 | 43.95 |
| MW-2006 | 1/31/00 | 635.92 | 597.93 | 37.99 | 36.24 |
| MW-2003 | 1/31/00 | 638.78 | 596.33 | 42.45 | 40.74 |
| MW-2033 | 1/31/00 | 647.51 | 604.27 | 43.24 | 40.57 |
| MW-2005 | 1/31/00 | 637.38 | 587.47 | 49.91 | 48.22 |
| MW-4007 | 4/26/00 | 624.13 | 594.88 | 29.25 | 26.62 |
| MW-4001 | 4/28/00 | 622.83 | 601.72 | 21.11 | 19.41 |
| MW-3027 | 5/2/00 | 647.11 | 609.46 | 37.65 | 34.77 |
| MW-4015 | 5/2/00 | 619.58 | 580.77 | 38.81 | 37.01 |
| MW-4014 | 5/2/00 | 609.3 | 560.07 | 49.23 | 47.12 |
| MW-2046 | 5/2/00 | 653.6 | 589.02 | 64.58 | 60.75 |

| LOCATION CODE | LOG DATE | TOC ELEVATION | WATER ELEVATION | DEPTH FROM TOC | DEPTH FROM SURFACE |
|---|---|---|---|---|---|
| MW-2023 | 5/2/00 | 637.29 | 583.08 | 54.21 | 52.75 |
| MW-3026 | 5/2/00 | 646.77 | 606.17 | 40.6 | 38.13 |
| MW-2022 | 5/2/00 | 637.24 | 584.99 | 52.25 | 51.08 |
| MW-2032 | 5/2/00 | 638.09 | 582.88 | 55.21 | 52.76 |
| MW-2045 | 5/2/00 | 641.85 | 596.4 | 45.45 | 44.15 |
| MW-2021 | 5/2/00 | 626.19 | 591.44 | 34.75 | 33.13 |
| MW-2033 | 5/2/00 | 647.51 | 604.45 | 43.06 | 40.39 |
| MW-2001 | 5/2/00 | 613.29 | 587.84 | 25.45 | 23.91 |
| MW-2036 | 5/2/00 | 658.01 | 610.21 | 47.8 | 45.69 |
| MW-3003 | 5/2/00 | 646.96 | 597.96 | 49 | 46.69 |
| MW-2035 | 5/2/00 | 668.4 | 613.25 | 55.15 | 53.75 |
| MW-2002 | 5/2/00 | 625.51 | 593.41 | 32.1 | 30.42 |
| MW-2037 | 5/2/00 | 659.08 | 610.13 | 48.95 | 46.94 |
| MW-3006 | 5/2/00 | 647.13 | 591.72 | 55.41 | 54.18 |
| MW-2003 | 5/2/00 | 638.78 | 597.33 | 41.45 | 39.74 |
| MW-4002 | 5/2/00 | 635.2 | 569.15 | 66.05 | 63.35 |
| MW-2038 | 5/2/00 | 667.19 | 610.94 | 56.25 | 54.06 |
| MW-3028 | 5/2/00 | 651.92 | 610.01 | 41.91 | 39.3 |
| MW-4029 | 5/2/00 | 651.28 | 610.03 | 41.25 | 38.29 |
| MW-4027 | 5/2/00 | 647.77 | 610.12 | 37.65 | 34.62 |
| MW-4013 | 5/2/00 | 608.73 | 560.22 | 48.51 | 46.51 |
| MW-2024 | 5/2/00 | 636.7 | 566.6 | 70.1 | 68.35 |
| MW-4028 | 5/2/00 | 650.35 | 610.01 | 40.34 | 36.7 |
| MW-2005 | 5/2/00 | 637.38 | 587.38 | 50 | 48.31 |
| MW-2013 | 5/2/00 | 647.13 | 603.03 | 44.1 | 42.35 |
| MW-2006 | 5/2/00 | 635.92 | 597.22 | 38.7 | 36.95 |
| MW-3029 | 5/2/00 | 653.33 | 609.94 | 43.39 | 39.55 |
| MW-2012 | 5/2/00 | 639.45 | 600.55 | 38.9 | 34.29 |
| MW-4006 | 5/2/00 | 622.95 | 601.7 | 21.25 | 19.97 |
| MW-3023 | 5/2/00 | 648.07 | 600.34 | 47.73 | 45.52 |

| LOCATION_CODE | LOG_DATE | TOC_ELEVATION | WATER_ELEVATION | DEPTH_FROM_TOC | DEPTH_FROM_SURFACE |
|---|---|---|---|---|---|
| MW-4011 | 5/2/00 | 628.16 | 591.56 | 36.6 | 35.4 |
| MW-2034 | 5/3/00 | 660.83 | 605.67 | 55.16 | 52.5 |
| MW-2040 | 5/3/00 | 662.39 | 612.18 | 50.21 | 50.22 |
| MW-4020 | 5/3/00 | 659.17 | 604.43 | 54.74 | 53.47 |
| MW-2014 | 5/3/00 | 649.37 | 603.33 | 46.04 | 44.25 |
| MW-4024 | 5/3/00 | 654.83 | 604.38 | 53.15 | 50.85 |
| MW-4022 | 5/3/00 | 667.98 | 594.08 | 73.9 | 72.18 |
| MW-2017 | 5/3/00 | 659.84 | 604.69 | 55.15 | 53.17 |
| MW-3024 | 5/3/00 | 654.87 | 600.68 | 54.19 | 45.08 |
| MW-4023 | 5/3/00 | 648.53 | 614.94 | 33.59 | 31.7 |
| MW-3025 | 5/3/00 | 655.32 | 609.42 | 45.9 | 35.47 |
| MW-2048 | 5/3/00 | 662.14 | 607.45 | 54.69 | 50.27 |
| MW-2047 | 5/3/00 | 640.3 | 604.91 | 35.39 | 32.57 |
| MW-4002 | 7/31/00 | 635.2 | 568.79 | 66.41 | 63.71 |
| MW-2005 | 7/31/00 | 637.38 | 587.4 | 49.98 | 48.29 |
| MW-2023 | 7/31/00 | 637.29 | 582.96 | 54.33 | 52.87 |
| MW-2006 | 7/31/00 | 635.92 | 597.71 | 38.21 | 36.46 |
| MW-3023 | 7/31/00 | 648.07 | 600.34 | 47.73 | 45.52 |
| MW-2012 | 7/31/00 | 639.45 | 600.51 | 38.94 | 34.33 |
| MW-2032 | 7/31/00 | 638.09 | 582.87 | 55.22 | 52.77 |
| MW-4007 | 7/31/00 | 624.13 | 594.99 | 29.14 | 26.51 |
| MW-2047 | 7/31/00 | 640.3 | 590.97 | 49.33 | 46.51 |
| MW-4022 | 7/31/00 | 667.98 | 594.19 | 73.79 | 72.07 |
| MW-4011 | 7/31/00 | 628.16 | 592.93 | 35.23 | 34.03 |
| MW-4006 | 7/31/00 | 622.95 | 601.84 | 21.11 | 19.83 |
| MW-2022 | 7/31/00 | 637.24 | 585.14 | 52.1 | 50.93 |
| MW-2001 | 7/31/00 | 613.29 | 588.48 | 24.81 | 23.27 |
| MW-2035 | 7/31/00 | 668.4 | 613.19 | 55.21 | 53.81 |
| MW-3003 | 7/31/00 | 646.96 | 598.09 | 48.87 | 46.56 |
| MW-4020 | 7/31/00 | 659.17 | 604.39 | 54.78 | 53.51 |

| LOCATION_CODE | LOG_DATE | TOC_ELEVATION | WATER_ELEVATION | DEPTH_FROM_TOC | DEPTH_FROM_SURFACE |
|---|---|---|---|---|---|
| MW-2021 | 7/31/00 | 626.19 | 588.78 | 37.41 | 35.79 |
| MW-2046 | 7/31/00 | 653.6 | 589.22 | 64.38 | 60.55 |
| MW-4023 | 7/31/00 | 648.53 | 614.89 | 33.64 | 31.75 |
| MW-2048 | 7/31/00 | 662.14 | 607.43 | 54.71 | 50.29 |
| MW-2002 | 7/31/00 | 625.51 | 593.71 | 31.8 | 30.12 |
| MW-4001 | 7/31/00 | 622.83 | 601.89 | 20.94 | 19.24 |
| MW-3006 | 7/31/00 | 647.13 | 592.24 | 54.89 | 53.66 |
| MW-2003 | 7/31/00 | 638.78 | 597.6 | 41.18 | 39.47 |
| MW-4024 | 7/31/00 | 654.83 | 604.33 | 53.2 | 50.9 |
| MW-2037 | 8/1/00 | 659.08 | 610.16 | 48.92 | 46.91 |
| MW-2033 | 8/1/00 | 647.51 | 604.65 | 42.86 | 40.19 |
| MW-3029 | 8/1/00 | 653.33 | 609.85 | 43.48 | 39.64 |
| MW-2036 | 8/1/00 | 658.01 | 610.17 | 47.84 | 45.73 |
| MW-2038 | 8/1/00 | 667.19 | 610.87 | 56.32 | 54.13 |
| MW-4029 | 8/1/00 | 651.28 | 610 | 41.28 | 38.32 |
| MW-2013 | 8/1/00 | 647.13 | 603.32 | 43.81 | 42.06 |
| MW-2034 | 8/1/00 | 660.83 | 605.68 | 55.15 | 52.49 |
| MW-3026 | 8/1/00 | 646.77 | 606.27 | 40.5 | 38.03 |
| MW-2014 | 8/1/00 | 649.37 | 603.46 | 45.91 | 44.12 |
| MW-4028 | 8/1/00 | 650.35 | 610.03 | 40.32 | 36.68 |
| MW-3024 | 8/1/00 | 654.87 | 597.49 | 57.38 | 48.27 |
| MW-3028 | 8/1/00 | 651.92 | 610.07 | 41.85 | 39.24 |
| MW-3027 | 8/1/00 | 647.11 | 607.46 | 39.65 | 36.77 |
| MW-2017 | 8/1/00 | 659.84 | 604.84 | 55 | 53.02 |
| MW-4027 | 8/1/00 | 647.77 | 609.96 | 37.81 | 34.78 |
| MW-3025 | 8/1/00 | 655.32 | 609.12 | 46.2 | 35.77 |
| MW-4026 | 8/2/00 | 463.27 | 459.82 | 3.45 | 2.21 |
| MW-4015 | 8/2/00 | 619.58 | 580.98 | 38.6 | 36.8 |
| MW-4013 | 8/2/00 | 608.73 | 560.31 | 48.42 | 46.42 |
| MW-2024 | 8/2/00 | 636.7 | 567 | 69.7 | 67.95 |

| LOCATION_CODE | LOG_DATE | TOC_ELEVATION | WATER_ELEVATION | DEPTH_FROM_TOC | DEPTH_FROM_SURFACE |
|---|---|---|---|---|---|
| MW-4014 | 8/2/00 | 609.3 | 561.05 | 48.25 | 46.14 |
| MW-2045 | 8/2/00 | 641.85 | 596.46 | 45.39 | 44.09 |
| MW-2002 | 11/1/00 | 625.51 | 592.22 | 33.29 | 31.61 |
| MW-2037 | 11/1/00 | 659.08 | 610.09 | 48.99 | 46.98 |
| MW-2003 | 11/1/00 | 638.78 | 597.13 | 41.65 | 39.94 |
| MW-2048 | 11/1/00 | 662.14 | 607.42 | 54.72 | 50.3 |
| MW-2033 | 11/1/00 | 647.51 | 604.71 | 42.8 | 40.13 |
| MW-2022 | 11/1/00 | 637.24 | 585.12 | 52.12 | 50.95 |
| MW-3003 | 11/1/00 | 645.82 | 598.04 | 47.78 | 46.61 |
| MW-2036 | 11/1/00 | 658.01 | 610.15 | 47.86 | 45.75 |
| MW-2001 | 11/1/00 | 613.29 | 587.73 | 25.56 | 24.02 |
| MW-2045 | 11/1/00 | 639.82 | 596.46 | 43.36 | 44.09 |
| MW-2035 | 11/1/00 | 668.4 | 613.19 | 55.21 | 53.81 |
| MW-3026 | 11/1/00 | 646.77 | 606 | 40.77 | 38.3 |
| MW-3025 | 11/1/00 | 655.32 | 608.88 | 46.44 | 36.01 |
| MW-3029 | 11/1/00 | 653.33 | 609.77 | 43.56 | 39.72 |
| MW-2021 | 11/1/00 | 626.19 | 588.51 | 37.68 | 36.06 |
| MW-3028 | 11/1/00 | 651.92 | 609.95 | 41.97 | 39.36 |
| MW-2024 | 11/1/00 | 636.7 | 566.59 | 70.11 | 68.36 |
| MW-4029 | 11/1/00 | 651.28 | 609.87 | 41.41 | 38.45 |
| MW-3023 | 11/1/00 | 645.71 | 600.03 | 45.68 | 45.83 |
| MW-2012 | 11/1/00 | 639.45 | 600.59 | 38.86 | 34.25 |
| MW-2045 | 1/30/01 | 639.82 | 605.88 | 33.94 | 34.67 |
| MW-2050 | 1/30/01 | 640.11 | 601.35 | 38.76 | 35.27 |
| MWS-4 | 1/30/01 | 623.68 | 601.61 | 22.07 | 19.57 |
| MW-3027 | 1/30/01 | 647.11 | 607.41 | 39.7 | 36.82 |
| MW-2034 | 1/30/01 | 660.83 | 606.6 | 54.23 | 51.57 |
| MW-4015 | 1/30/01 | 619.58 | 581.66 | 37.92 | 36.12 |
| MW-4027 | 1/30/01 | 647.77 | 609.97 | 37.8 | 34.77 |
| MW-2013 | 1/30/01 | 647.13 | 604.11 | 43.02 | 41.27 |

| LOCATION_CODE | LOG_DATE | TOC_ELEVATION | WATER_ELEVATION | DEPTH_FROM_TOC | DEPTH_FROM_SURFACE |
|---|---|---|---|---|---|
| MW-2036 | 1/30/01 | 658.01 | 610.21 | 47.8 | 45.69 |
| MW-4001 | 1/30/01 | 622.83 | 601.53 | 21.3 | 19.6 |
| MW-4011 | 1/30/01 | 628.16 | 591.86 | 36.3 | 35.1 |
| MW-2017 | 1/30/01 | 659.84 | 605.3 | 54.54 | 52.56 |
| MW-2014 | 1/30/01 | 649.37 | 604.05 | 45.32 | 43.53 |
| MW-4007 | 1/30/01 | 624.13 | 594.91 | 29.22 | 26.59 |
| MW-2049 | 1/30/01 | 637.02 | 599.5 | 37.52 | 34.62 |
| MW-2006 | 1/30/01 | 634.36 | 598.58 | 35.78 | 35.59 |
| MW-2033 | 1/30/01 | 647.51 | 604.82 | 42.69 | 40.02 |
| MW-3026 | 1/30/01 | 646.77 | 605.36 | 41.41 | 38.94 |
| MW-2046 | 1/30/01 | 653.6 | 589.18 | 64.42 | 60.59 |
| MW-4002 | 1/30/01 | 635.2 | 573.8 | 61.4 | 58.7 |
| MW-2012 | 1/30/01 | 639.45 | 600.87 | 38.58 | 33.97 |
| MW-4006 | 1/30/01 | 622.95 | 601.58 | 21.37 | 20.09 |
| MWS-21 | 1/30/01 | 641.78 | 610.28 | 31.5 | 29.78 |
| MW-4024 | 1/31/01 | 654.83 | 604.18 | 53.35 | 51.05 |
| MW-3025 | 1/31/01 | 655.32 | 608.78 | 46.54 | 36.11 |
| MW-3024 | 1/31/01 | 654.87 | 600.95 | 53.92 | 44.81 |
| MW-4026 | 1/31/01 | 463.27 | 459.83 | 3.44 | 2.2 |
| MW-4028 | 1/31/01 | 650.35 | 609.72 | 40.63 | 36.99 |
| MW-2047 | 1/31/01 | 642.85 | 590.9 | 51.95 | 46.58 |
| MW-4030 | 1/31/01 | 645.04 | 597.07 | 47.97 | 45.47 |
| MW-2005 | 1/31/01 | 637.38 | 587.21 | 50.17 | 48.48 |
| MW-3006 | 1/31/01 | 645.95 | 591.45 | 54.5 | 54.45 |
| MW-2003 | 1/31/01 | 638.78 | 596.83 | 41.95 | 40.24 |
| MW-2002 | 1/31/01 | 625.51 | 591.62 | 33.89 | 32.21 |
| MW-2048 | 1/31/01 | 662.14 | 607.34 | 54.8 | 50.38 |
| MW-3003 | 1/31/01 | 645.82 | 597.86 | 47.96 | 46.79 |
| MW-2001 | 1/31/01 | 613.29 | 587.69 | 25.6 | 24.06 |
| MW-4029 | 1/31/01 | 651.28 | 609.7 | 41.58 | 38.62 |

| LOCATION CODE | LOG DATE | TOC ELEVATION | WATER ELEVATION | DEPTH FROM TOC | DEPTH FROM SURFACE |
|---|---|---|---|---|---|
| MW-4014 | 1/31/01 | 609.3 | 560.8 | 48.5 | 46.39 |
| MW-2032 | 1/31/01 | 638.09 | | | |
| MW-4023 | 1/31/01 | 648.53 | 614.72 | 33.81 | 31.92 |
| MW-2024 | 1/31/01 | 636.7 | 566.88 | 69.82 | 68.07 |
| MW-2040 | 1/31/01 | 656.12 | 611.53 | 44.59 | 50.87 |
| MW-3028 | 1/31/01 | 651.92 | 609.72 | 42.2 | 39.59 |
| MW-4013 | 1/31/01 | 608.73 | 560.29 | 48.44 | 46.44 |
| MW-3029 | 1/31/01 | 653.33 | 609.59 | 43.74 | 39.9 |
| MW-2023 | 1/31/01 | 637.29 | 583.14 | 54.15 | 52.69 |
| MW-3023 | 1/31/01 | 645.71 | 599.76 | 45.95 | 46.1 |
| MW-2037 | 1/31/01 | 659.08 | 609.86 | 49.22 | 47.21 |
| MW-2022 | 1/31/01 | 637.24 | 585.04 | 52.2 | 51.03 |
| MW-4020 | 1/31/01 | 659.17 | 604.32 | 54.85 | 53.58 |
| MW-2021 | 1/31/01 | 626.19 | 588.38 | 37.81 | 36.19 |
| MW-4022 | 1/31/01 | 667.98 | 593.49 | 74.49 | 72.77 |
| MW-2035 | 1/31/01 | 668.4 | 612.91 | 55.49 | 54.09 |
| MW-2038 | 1/31/01 | 663.55 | 610.28 | 53.27 | 54.72 |
| MW-2001 | 4/27/01 | 613.29 | 587.67 | 25.62 | 24.08 |
| MW-2050 | 4/27/01 | 640.11 | 601.23 | 38.88 | 35.39 |
| MW-2002 | 4/27/01 | 625.51 | 592.68 | 32.83 | 31.15 |
| MW-2033 | 4/27/01 | 647.51 | 605.27 | 42.24 | 39.57 |
| MW-2032 | 4/27/01 | 638.09 | | | |
| MW-2034 | 4/27/01 | 660.83 | 605.64 | 55.19 | 52.53 |
| MW-2049 | 4/27/01 | 637.02 | 599.56 | 37.46 | 34.56 |
| MW-2003 | 4/27/01 | 638.78 | 596.99 | 41.79 | 40.08 |
| MW-2023 | 4/27/01 | 637.29 | 583.2 | 54.09 | 52.63 |
| MW-2045 | 4/27/01 | 639.82 | 597.19 | 42.63 | 43.36 |
| MW-2017 | 4/27/01 | 659.84 | 604.68 | 55.16 | 53.18 |
| MW-2024 | 4/27/01 | 636.7 | 566.94 | 69.76 | 68.01 |
| MW-2012 | 4/27/01 | 639.45 | 600.99 | 38.46 | 33.85 |

| LOCATION_CODE | LOG_DATE | TOC_ELEVATION | WATER_ELEVATION | DEPTH_FROM_TOC | DEPTH_FROM_SURFACE |
|---|---|---|---|---|---|
| MW-2013 | 4/27/01 | 647.13 | 604.29 | 42.84 | 41.09 |
| MW-2021 | 4/27/01 | 626.19 | 588.5 | 37.69 | 36.07 |
| MW-2005 | 4/27/01 | 637.38 | 587.33 | 50.05 | 48.36 |
| MW-2014 | 4/27/01 | 649.37 | 603.89 | 45.48 | 43.69 |
| MW-2006 | 4/27/01 | 634.36 | 598.67 | 35.69 | 35.5 |
| MW-2022 | 4/27/01 | 637.24 | 603.07 | 34.17 | 33 |
| MW-2046 | 4/27/01 | 653.6 | 589.06 | 64.54 | 60.71 |
| MW-2035 | 4/30/01 | 668.4 | 612.49 | 55.91 | 54.51 |
| MW-2036 | 4/30/01 | 658.01 | 607.43 | 50.58 | 48.47 |
| MW-2048 | 4/30/01 | 662.14 | 607.39 | 54.75 | 50.33 |
| MW-2038 | 4/30/01 | 663.55 | 609.02 | 54.53 | 55.98 |
| MW-2039 | 4/30/01 | 665.25 | 615.13 | 50.12 | 48.27 |
| MW-2040 | 4/30/01 | 656.12 | 611.2 | 44.92 | 51.2 |
| MW-2047 | 4/30/01 | 642.85 | 590.97 | 51.88 | 46.51 |
| MW-2037 | 4/30/01 | 659.08 | | | |
| MW-4002 | 4/30/01 | 635.2 | | | |
| MW-4022 | 4/30/01 | 667.98 | 593.44 | 74.54 | 72.82 |
| MW-4020 | 4/30/01 | 659.17 | 604.27 | 54.9 | 53.63 |
| MW-3024 | 4/30/01 | 654.87 | 600.33 | 54.54 | 45.43 |
| MW-4015 | 4/30/01 | 619.58 | 581.98 | 37.6 | 35.8 |
| MW-4014 | 4/30/01 | 609.3 | 561.1 | 48.2 | 46.09 |
| MW-4013 | 4/30/01 | 608.73 | 563.35 | 45.38 | 43.38 |
| MW-4007 | 4/30/01 | 624.13 | 594.61 | 29.52 | 26.89 |
| MW-4011 | 4/30/01 | 628.16 | 591.66 | 36.5 | 35.3 |
| MW-3031 | 4/30/01 | 646.48 | 608.93 | 37.55 | 34.79 |
| MW-4023 | 4/30/01 | 648.53 | 615.08 | 33.45 | 31.56 |
| MW-4006 | 4/30/01 | 622.95 | 601.75 | 21.2 | 19.92 |
| MW-3025 | 4/30/01 | 655.32 | 608.19 | 47.13 | 36.7 |
| MW-3027 | 4/30/01 | 647.11 | 606.51 | 40.6 | 37.72 |
| MW-4001 | 4/30/01 | 622.83 | 602.85 | 19.98 | 18.28 |

| LOCATION_CODE | LOG_DATE | TOC_ELEVATION | WATER_ELEVATION | DEPTH_FROM_TOC | DEPTH_FROM_SURFACE |
|---|---|---|---|---|---|
| MW-3036 | 4/30/01 | 658.96 | 605.54 | 53.42 | 50.77 |
| MW-3028 | 4/30/01 | 651.92 | 597.47 | 54.45 | 51.84 |
| MW-3035 | 4/30/01 | 657.04 | 605.59 | 51.45 | 48.33 |
| MW-3029 | 4/30/01 | 653.33 | 604.89 | 48.44 | 44.6 |
| MW-3034 | 4/30/01 | 658.17 | 606.07 | 52.1 | 49.69 |
| MW-3033 | 4/30/01 | 655.53 | 582.38 | 73.15 | 70.14 |
| MW-3032 | 4/30/01 | 662.65 | | | |
| MW-3030 | 4/30/01 | 634.32 | 606.87 | 27.45 | 24.97 |
| MW-3026 | 4/30/01 | 646.77 | 605.24 | 41.53 | 39.06 |
| MW-4028 | 4/30/01 | 650.35 | 605.22 | 45.13 | 41.49 |
| MW-3003 | 4/30/01 | 645.82 | 597.64 | 48.18 | 47.01 |
| MW-4024 | 4/30/01 | 654.83 | | | |
| MWS-21 | 4/30/01 | 641.78 | 606.6 | 35.18 | 33.46 |
| MW-4030 | 4/30/01 | 645.04 | 597.29 | 47.75 | 45.25 |
| MW-4031 | 4/30/01 | 634.55 | 608.03 | 26.52 | 23.77 |
| MW-4029 | 4/30/01 | 651.28 | 605.85 | 45.43 | 42.47 |
| MW-4027 | 4/30/01 | 647.77 | | | |
| MWS-4 | 4/30/01 | 623.68 | 601.94 | 21.74 | 19.24 |
| MW-4026 | 4/30/01 | 463.27 | | | |
| MW-3023 | 4/30/01 | 645.71 | 598.23 | 47.48 | 47.63 |
| MW-3006 | 4/30/01 | 645.95 | 591.35 | 54.6 | 54.55 |
| MW-4032 | 7/26/01 | 641.61 | 608.2 | 33.41 | 31.09 |
| MW-3035 | 7/26/01 | 657.04 | 608.97 | 48.07 | 44.95 |
| MW-3034 | 7/26/01 | 658.17 | 610.1 | 48.07 | 45.66 |
| MW-4033 | 7/26/01 | 645.4 | 608.28 | 37.12 | 35.16 |
| MW-4031 | 7/26/01 | 634.55 | 608.41 | 26.14 | 23.39 |
| MW-3029 | 7/26/01 | 653.33 | 606.93 | 46.4 | 42.56 |
| MW-4029 | 7/26/01 | 651.28 | 608.03 | 43.25 | 40.29 |
| MW-3028 | 7/26/01 | 651.92 | 593.11 | 58.81 | 56.2 |
| MW-3033 | 7/26/01 | 655.53 | 586.08 | 69.45 | 66.44 |

| LOCATION_CODE | LOG_DATE | TOC_ELEVATION | WATER_ELEVATION | DEPTH_FROM_TOC | DEPTH_FROM_SURFACE |
|---|---|---|---|---|---|
| MW-2038 | 7/26/01 | 663.55 | 611.1 | 52.45 | 53.9 |
| MWS-21 | 7/26/01 | 641.78 | 608.02 | 33.76 | 32.04 |
| MW-4028 | 7/26/01 | 650.35 | 606.96 | 43.39 | 39.75 |
| MW-3030 | 7/26/01 | 634.32 | 607.29 | 27.03 | 24.55 |
| MW-3031 | 7/26/01 | 646.48 | 608.84 | 37.64 | 34.88 |
| MW-2033 | 7/27/01 | 647.51 | 605.26 | 42.25 | 39.58 |
| MW-4035 | 7/27/01 | 669.37 | 623.42 | 45.95 | 43.16 |
| MW-2034 | 7/27/01 | 660.83 | 605.51 | 55.32 | 52.66 |
| MW-3036 | 7/27/01 | 658.96 | 609.61 | 49.35 | 46.7 |
| MW-4011 | 7/27/01 | 628.16 | 591.56 | 36.6 | 35.4 |
| MW-4001 | 7/27/01 | 622.83 | 601.61 | 21.22 | 19.52 |
| MW-4002 | 7/27/01 | 635.2 | 568.75 | 66.45 | 63.75 |
| MW-4006 | 7/27/01 | 622.95 | 601.54 | 21.41 | 20.13 |
| MW-2051 | 7/27/01 | 639.77 | 598.95 | 40.82 | 37.98 |
| MW-4007 | 7/27/01 | 624.13 | 594.4 | 29.73 | 27.1 |
| MW-3023 | 7/27/01 | 645.71 | 599.96 | 45.75 | 45.9 |
| MW-2012 | 7/27/01 | 639.45 | 601.07 | 38.38 | 33.77 |
| MW-2013 | 7/27/01 | 647.13 | 604.81 | 42.32 | 40.57 |
| MW-2014 | 7/27/01 | 649.37 | 603.79 | 45.58 | 43.79 |
| MW-2017 | 7/27/01 | 659.84 | 604.66 | 55.18 | 53.2 |
| MW-2006 | 7/27/01 | 634.36 | 598.64 | 35.72 | 35.53 |
| MW-3006 | 7/27/01 | 645.95 | 591.19 | 54.76 | 54.71 |
| MW-2045 | 7/27/01 | 639.82 | 597.27 | 42.55 | 43.28 |
| MW-2049 | 7/27/01 | 637.02 | 599.6 | 37.42 | 34.52 |
| MW-2047 | 7/27/01 | 642.85 | 590.95 | 51.9 | 46.53 |
| MW-3003 | 7/27/01 | 645.82 | 597.44 | 48.38 | 47.21 |
| MW-2046 | 7/27/01 | 653.6 | 589.02 | 64.58 | 60.75 |
| MW-2050 | 7/27/01 | 640.11 | 601.16 | 38.95 | 35.46 |
| MW-4013 | 7/30/01 | 608.73 | 560.32 | 48.41 | 46.41 |
| MW-4034 | 7/30/01 | 656.89 | 610.64 | 46.25 | 43.51 |

| LOCATION_CODE | LOG_DATE | TOC_ELEVATION | WATER_ELEVATION | DEPTH_FROM_TOC | DEPTH_FROM_SURFACE |
|---|---|---|---|---|---|
| MW-2040 | 7/30/01 | 656.12 | 611.2 | 44.92 | 51.2 |
| MW-2024 | 7/30/01 | 636.7 | 566.79 | 69.91 | 68.16 |
| MW-2022 | 7/30/01 | 637.24 | 584.74 | 52.5 | 51.33 |
| MW-2003 | 7/30/01 | 638.78 | 596.77 | 42.01 | 40.3 |
| MW-4015 | 7/30/01 | 619.58 | 581.81 | 37.77 | 35.97 |
| MW-3027 | 7/30/01 | 647.11 | 606.45 | 40.66 | 37.78 |
| MW-3024 | 7/30/01 | 654.87 | 600.65 | 54.22 | 45.11 |
| MW-2005 | 7/30/01 | 637.38 | 587.16 | 50.22 | 48.53 |
| MW-2023 | 7/30/01 | 637.29 | 583.08 | 54.21 | 52.75 |
| MW-2032 | 7/30/01 | 638.09 | | | |
| MW-3026 | 7/30/01 | 646.77 | 605.3 | 41.47 | 39 |
| MW-2048 | 7/30/01 | 662.14 | 607.3 | 54.84 | 50.42 |
| MW-3025 | 7/30/01 | 655.32 | 608.29 | 47.03 | 36.6 |
| MW-4030 | 7/30/01 | 645.04 | 597.23 | 47.81 | 45.31 |
| MW-4014 | 7/30/01 | 609.3 | 561.08 | 48.22 | 46.11 |
| MW-4022 | 7/30/01 | 667.98 | 593.41 | 74.57 | 72.85 |
| MW-4024 | 7/30/01 | 654.83 | 604.16 | 53.37 | 51.07 |
| MW-4023 | 7/30/01 | 648.53 | 614.64 | 33.89 | 32 |
| MW-2001 | 7/30/01 | 613.29 | 587.48 | 25.81 | 24.27 |
| MW-2036 | 7/30/01 | 658.01 | 608.59 | 49.42 | 47.31 |
| MW-2002 | 7/30/01 | 625.51 | 591.6 | 33.91 | 32.23 |
| MW-2021 | 7/30/01 | 626.19 | 588.22 | 37.97 | 36.35 |
| MW-2035 | 7/30/01 | 668.4 | 612.51 | 55.89 | 54.49 |
| MW-4007 | 10/29/01 | 624.13 | 593.93 | 30.2 | 27.57 |
| MW-3006 | 10/29/01 | 645.95 | 590.78 | 55.17 | 55.12 |
| MW-2006 | 10/29/01 | 634.36 | 598.29 | 36.07 | 35.88 |
| MW-4024 | 10/29/01 | 654.83 | 603.34 | 54.19 | 51.89 |
| MW-4011 | 10/29/01 | 628.16 | 591.27 | 36.89 | 35.69 |
| MW-4023 | 10/29/01 | 648.53 | 613.87 | 34.66 | 32.77 |
| MW-2021 | 10/29/01 | 626.19 | 587.98 | 38.21 | 36.59 |

| LOCATION CODE | LOG DATE | TOC ELEVATION | WATER ELEVATION | DEPTH FROM TOC | DEPTH FROM SURFACE |
|---|---|---|---|---|---|
| MW-3023 | 10/29/01 | 645.71 | 599.8 | 45.91 | 46.06 |
| MW-2017 | 10/29/01 | 659.84 | 604.06 | 55.78 | 53.8 |
| MW-4022 | 10/29/01 | 667.98 | 592.95 | 75.03 | 73.31 |
| MW-2023 | 10/29/01 | 637.29 | 582.99 | 54.3 | 52.84 |
| MW-4014 | 10/29/01 | 609.3 | 560.95 | 48.35 | 46.24 |
| MW-4028 | 10/29/01 | 650.35 | 608.75 | 41.6 | 37.96 |
| MW-4015 | 10/29/01 | 619.58 | 581.51 | 38.07 | 36.27 |
| MW-4013 | 10/29/01 | 608.73 | 560.29 | 48.44 | 46.44 |
| MW-2013 | 10/29/01 | 647.13 | 604.03 | 43.1 | 41.35 |
| MW-3003 | 10/29/01 | 645.82 | 597.17 | 48.65 | 47.48 |
| MW-3024 | 10/29/01 | 654.87 | 600.24 | 54.63 | 45.52 |
| MW-2047 | 10/29/01 | 642.85 | 590.89 | 51.96 | 46.59 |
| MW-2012 | 10/29/01 | 639.45 | 600.82 | 38.63 | 34.02 |
| MW-4027 | 10/29/01 | 647.77 | 608.79 | 38.98 | 35.95 |
| MW-4029 | 10/29/01 | 651.28 | 608.73 | 42.55 | 39.59 |
| MW-2001 | 10/29/01 | 613.29 | 587.41 | 25.88 | 24.34 |
| MW-3035 | 10/29/01 | 657.04 | 608.76 | 48.28 | 45.16 |
| MW-3025 | 10/29/01 | 655.32 | 607.33 | 47.99 | 37.56 |
| MW-2051 | 10/29/01 | 639.77 | 598.93 | 40.84 | 38 |
| MW-2002 | 10/29/01 | 625.51 | 591.36 | 34.15 | 32.47 |
| MW-3034 | 10/29/01 | 658.17 | 608.77 | 49.4 | 46.99 |
| MW-4035 | 10/29/01 | 669.37 | 623.06 | 46.31 | 43.52 |
| MW-3033 | 10/29/01 | 655.53 | 587.7 | 67.83 | 64.82 |
| MW-2024 | 10/29/01 | 636.7 | 566.16 | 70.54 | 68.79 |
| MW-3029 | 10/29/01 | 653.33 | 608.65 | 44.68 | 40.84 |
| MW-4034 | 10/29/01 | 656.89 | 610.78 | 46.11 | 43.37 |
| MW-2036 | 10/29/01 | 658.01 | 608.96 | 49.05 | 46.94 |
| MW-3032 | 10/29/01 | 662.65 | 608.93 | 53.72 | 51.14 |
| MW-2050 | 10/29/01 | 640.11 | 600.99 | 39.12 | 35.63 |
| MW-3031 | 10/29/01 | 646.48 | 608.51 | 37.97 | 35.21 |

| LOCATION_CODE | LOG_DATE | TOC_ELEVATION | WATER_ELEVATION | DEPTH_FROM_TOC | DEPTH_FROM_SURFACE |
|---|---|---|---|---|---|
| MW-3030 | 10/29/01 | 634.32 | 607.15 | 27.17 | 24.69 |
| MWS-4 | 10/29/01 | 623.68 | 601.12 | 22.56 | 20.06 |
| MW-2037 | 10/29/01 | 659.08 | 608.98 | 50.1 | 48.09 |
| MW-2038 | 10/29/01 | 663.55 | 609.87 | 53.68 | 55.13 |
| MW-4002 | 10/29/01 | 635.2 | 568.76 | 66.44 | 63.74 |
| MW-4030 | 10/29/01 | 645.04 | 597.06 | 47.98 | 45.48 |
| MW-2045 | 10/29/01 | 639.82 | 597.08 | 42.74 | 43.47 |
| MW-2014 | 10/29/01 | 649.37 | 603.4 | 45.97 | 44.18 |
| MW-4006 | 10/29/01 | 622.95 | 601.14 | 21.81 | 20.53 |
| MW-4020 | 10/29/01 | 659.17 | 603.59 | 55.58 | 54.31 |
| MW-2032 | 10/29/01 | 638.09 | 582.09 | 56 | 53.55 |
| MW-3028 | 10/29/01 | 651.92 | 608.75 | 43.17 | 40.56 |
| MW-2049 | 10/29/01 | 637.02 | 599.43 | 37.59 | 34.69 |
| MW-2034 | 10/29/01 | 660.83 | 604.77 | 56.06 | 53.4 |
| MW-3026 | 10/29/01 | 646.77 | 605.14 | 41.63 | 39.16 |
| MW-4031 | 10/29/01 | 634.55 | 608.66 | 25.89 | 23.14 |
| MW-4001 | 10/29/01 | 622.83 | 601.1 | 21.73 | 20.03 |
| MW-2033 | 10/29/01 | 647.51 | 604.97 | 42.54 | 39.87 |
| MW-4032 | 10/29/01 | 641.61 | 608.88 | 32.73 | 30.41 |
| MW-3027 | 10/29/01 | 647.11 | 606.36 | 40.75 | 37.87 |
| MW-2003 | 10/29/01 | 638.78 | 596.47 | 42.31 | 40.6 |
| MW-3036 | 10/29/01 | 658.96 | 608.78 | 50.18 | 47.53 |
| MW-2040 | 10/29/01 | 656.12 | 610.74 | 45.38 | 51.66 |
| MW-4033 | 10/29/01 | 645.4 | 608.72 | 36.68 | 34.72 |
| MW-4026 | 10/30/01 | 463.27 | 459.53 | 3.74 | 2.5 |
| MWS-21 | 10/30/01 | 641.78 | 608.86 | 32.92 | 31.2 |
| MW-4024 | 1/28/02 | 654.83 | 604.04 | 53.49 | 51.19 |
| MW-4026 | 1/28/02 | 463.27 | 459.78 | 3.49 | 2.25 |
| MW-4020 | 1/28/02 | 659.17 | 604.24 | 54.93 | 53.66 |
| MW-3028 | 1/31/02 | 651.92 | 608.98 | 42.94 | 40.33 |

| LOCATION_CODE | LOG_DATE | TOC_ELEVATION | WATER_ELEVATION | DEPTH_FROM_TOC | DEPTH_FROM_SURFACE |
|---|---|---|---|---|---|
| MW-4034 | 1/31/02 | 656.89 | 611.02 | 45.87 | 43.13 |
| MW-3035 | 1/31/02 | 657.04 | 608.99 | 48.05 | 44.93 |
| MW-2034 | 1/31/02 | 660.83 | 605.63 | 55.2 | 52.54 |
| MW-4033 | 1/31/02 | 645.4 | 609.06 | 36.34 | 34.38 |
| MW-3027 | 1/31/02 | 647.11 | 606.7 | 40.41 | 37.53 |
| MW-2046 | 1/31/02 | 647.37 | 589.05 | 58.32 | 60.72 |
| MW-2040 | 1/31/02 | 656.12 | 611.09 | 45.03 | 51.31 |
| MW-2035 | 1/31/02 | 668.4 | 615.59 | 52.81 | 51.41 |
| MW-2003 | 1/31/02 | 638.78 | 596.79 | 41.99 | 40.28 |
| MW-2051 | 1/31/02 | 639.77 | 598.99 | 40.78 | 37.94 |
| MW-4032 | 1/31/02 | 641.61 | 609.25 | 32.36 | 30.04 |
| MW-2033 | 1/31/02 | 647.51 | 604.65 | 42.86 | 40.19 |
| MW-2049 | 1/31/02 | 637.02 | 599.42 | 37.6 | 34.7 |
| MW-4031 | 1/31/02 | 634.55 | 609.24 | 25.31 | 22.56 |
| MW-3036 | 1/31/02 | 658.96 | 609.01 | 49.95 | 47.3 |
| MW-2038 | 1/31/02 | 663.55 | 609.81 | 53.74 | 55.19 |
| MW-3030 | 1/31/02 | 634.32 | 607.3 | 27.02 | 24.54 |
| MW-2050 | 1/31/02 | 640.11 | 601.09 | 39.02 | 35.53 |
| MWS-21 | 1/31/02 | 641.78 | 609.19 | 32.59 | 30.87 |
| MW-3031 | 1/31/02 | 646.48 | 609.01 | 37.47 | 34.71 |
| MW-3029 | 1/31/02 | 653.33 | 608.84 | 44.49 | 40.65 |
| MW-2036 | 1/31/02 | 658.01 | 609.22 | 48.79 | 46.68 |
| MW-2002 | 1/31/02 | 625.51 | 591.61 | 33.9 | 32.22 |
| MW-2001 | 1/31/02 | 613.29 | 588.16 | 25.13 | 23.59 |
| MW-3034 | 1/31/02 | 658.17 | 608.96 | 49.21 | 46.8 |
| MW-4038 | 1/31/02 | 638.07 | 609.23 | 28.84 | 27.27 |
| MW-4037 | 1/31/02 | 630.13 | 608.68 | 21.45 | 19.87 |
| MW-4036 | 1/31/02 | 615.22 | 591.63 | 23.59 | 21.9 |
| MW-4035 | 1/31/02 | 669.37 | 623.43 | 45.94 | 43.15 |
| MW-2039 | 1/31/02 | 665.25 | 611.32 | 53.93 | 52.08 |

| LOCATION_CODE | LOG_DATE | TOC_ELEVATION | WATER_ELEVATION | DEPTH_FROM_TOC | DEPTH_FROM_SURFACE |
|---|---|---|---|---|---|
| MW-2005 | 1/31/02 | 637.38 | 612.25 | 25.13 | 23.44 |
| MW-3032 | 1/31/02 | 662.65 | 609.11 | 53.54 | 50.96 |
| MW-2013 | 1/31/02 | 647.13 | 603.71 | 43.42 | 41.67 |
| MW-4014 | 1/31/02 | 609.3 | 561.08 | 48.22 | 46.11 |
| MW-4015 | 1/31/02 | 619.58 | 581.86 | 37.72 | 35.92 |
| MW-2021 | 1/31/02 | 626.19 | 588.29 | 37.9 | 36.28 |
| MW-4027 | 1/31/02 | 647.77 | 609.03 | 38.74 | 35.71 |
| MW-2037 | 1/31/02 | 659.08 | 609.17 | 49.91 | 47.9 |
| MW-4001 | 1/31/02 | 622.83 | 601.9 | 20.93 | 19.23 |
| MW-4006 | 1/31/02 | 622.95 | 601.66 | 21.29 | 20.01 |
| MW-3003 | 1/31/02 | 645.82 | 597.43 | 48.39 | 47.22 |
| MW-2017 | 1/31/02 | 659.84 | 604.61 | 55.23 | 53.25 |
| MW-3023 | 1/31/02 | 645.71 | 599.83 | 45.88 | 46.03 |
| MW-4022 | 1/31/02 | 667.98 | 592.81 | 75.17 | 73.45 |
| MW-4023 | 1/31/02 | 648.53 | 614.37 | 34.16 | 32.27 |
| MWS-4 | 1/31/02 | 623.68 | 602.33 | 21.35 | 18.85 |
| MW-2014 | 1/31/02 | 649.37 | 603.63 | 45.74 | 43.95 |
| MW-2047 | 1/31/02 | 642.85 | 591.05 | 51.8 | 46.43 |
| MW-4011 | 1/31/02 | 628.16 | 591.76 | 36.4 | 35.2 |
| MW-3006 | 1/31/02 | 645.95 | 591.22 | 54.73 | 54.68 |
| MW-4002 | 1/31/02 | 635.2 | 579.69 | 55.51 | 52.81 |
| MW-3025 | 1/31/02 | 655.32 | 608.06 | 47.26 | 36.83 |
| MW-4030 | 1/31/02 | 645.04 | 597.21 | 47.83 | 45.33 |
| MW-2024 | 1/31/02 | 636.7 | 566.83 | 69.87 | 68.12 |
| MW-4007 | 1/31/02 | 624.13 | 594.48 | 29.65 | 27.02 |
| MW-2012 | 1/31/02 | 639.45 | 600.8 | 38.65 | 34.04 |
| MW-2045 | 1/31/02 | 639.82 | 596.94 | 42.88 | 43.61 |
| MW-2022 | 1/31/02 | 637.24 | 586.02 | 51.22 | 50.05 |
| MW-4029 | 1/31/02 | 651.28 | 608.95 | 42.33 | 39.37 |
| MW-2023 | 1/31/02 | 637.29 | 583.16 | 54.13 | 52.67 |

| LOCATION_CODE | LOG_DATE | TOC_ELEVATION | WATER_ELEVATION | DEPTH_FROM_TOC | DEPTH_FROM_SURFACE |
|---|---|---|---|---|---|
| MW-3024 | 1/31/02 | 654.87 | 601.65 | 53.22 | 44.11 |
| MW-4013 | 1/31/02 | 608.73 | 560.4 | 48.33 | 46.33 |
| MW-4028 | 1/31/02 | 650.35 | 608.98 | 41.37 | 37.73 |
| MW-3026 | 1/31/02 | 646.77 | 605.67 | 41.1 | 38.63 |
| MW-2055 | 1/31/02 | 662.62 | 606.9 | 55.72 | 52.96 |

# APPENDIX C

Analytical Data

## Soil Sampling Results from Well MW-4035 - Detections

| WSSRAP_ID | Depth Interval (ft. bgs) | LOCATION | DATE_SAM | PARAMETER | CONC | ERR | DL | UNITS | CATEGORY |
|---|---|---|---|---|---|---|---|---|---|
| SO-401001-01 | 0.0 - 2.0 | 401001 | 5/10/2001 | ACETONE | 11 | | 10 | UG/KG | VOLATILES |
| SO-401001-06 | 10.0 - 12.0 | 401001 | 5/10/2001 | METHYLENE CHLORIDE | 14 | | 6 | UG/KG | VOLATILES |
| SO-401001-12 | 22.0 - 24.0 | 401001 | 5/10/2001 | METHYLENE CHLORIDE | 22 | | 7.5 | UG/KG | VOLATILES |
| SO-401001-13 | 24.0 - 26.0 | 401001 | 5/10/2001 | METHYLENE CHLORIDE | 17 | | 7.5 | UG/KG | VOLATILES |
| SO-401001-01 | 0.0 - 2.0 | 401001 | 5/10/2001 | METHYLENE CHLORIDE | 5 | | 5 | UG/KG | VOLATILES |
| SO-401001-07 | 12.0 - 14.0 | 401001 | 5/10/2001 | METHYLENE CHLORIDE | 16 | | 6 | UG/KG | VOLATILES |
| SO-401001-08 | 14.0 - 16.0 | 401001 | 5/10/2001 | METHYLENE CHLORIDE | 19 | | 6.5 | UG/KG | VOLATILES |
| SO-401001-11 | 20.0 - 22.0 | 401001 | 5/10/2001 | METHYLENE CHLORIDE | 16 | | 6.5 | UG/KG | VOLATILES |
| SO-401001-09 | 16.0 - 18.0 | 401001 | 5/10/2001 | METHYLENE CHLORIDE | 22 | | 7 | UG/KG | VOLATILES |
| SO-401001-15 | 28.0 - 30.0 | 401001 | 5/10/2001 | METHYLENE CHLORIDE | 20 | | 6 | UG/KG | VOLATILES |
| SO-401001-10 | 18.0 - 20.0 | 401001 | 5/10/2001 | METHYLENE CHLORIDE | 18 | | 6.5 | UG/KG | VOLATILES |
| SO-401001-14 | 26.0 - 28.0 | 401001 | 5/10/2001 | METHYLENE CHLORIDE | 23 | | 7 | UG/KG | VOLATILES |
| SO-401001-16 | 30.0 - 31.5 | 401001 | 5/10/2001 | METHYLENE CHLORIDE | 14 | | 5.5 | UG/KG | VOLATILES |
| SO-401001-17 | 32.0 - 33.3 | 401001 | 5/10/2001 | METHYLENE CHLORIDE | 6 | | 6 | UG/KG | VOLATILES |
| SO-401001-18 | 35.0 - 36.0 | 401001 | 5/11/2001 | METHYLENE CHLORIDE | 8 | | 6 | UG/KG | VOLATILES |

| WSSRAP_ID | LOCATION | DATE_SAM | PARAMETER | CONC | ERR | DL | UNITS | VER_QUAL | VAL_QUAL |
|---|---|---|---|---|---|---|---|---|---|
| GW-3030-Q101 | 3030 | 2/12/01 | 1,2-DICHLOROETHENE (DCE) | 9.3 | | 1 | UG/L | | * |
| GW-3030-032802 | 3030 | 3/28/02 | 1,2-DICHLOROETHENE (DCE) | 12 | | 20 | UG/L | | * |
| GW-3030-022801 | 3030 | 2/28/01 | 1,2-DICHLOROETHENE (DCE) | 12 | | 1 | UG/L | | * |
| GW-3030-Q102 | 3030 | 1/9/02 | 1,2-DICHLOROETHENE (DCE) | 18 | | 20 | UG/L | | * |
| GW-3030-Q102 | 3030 | 1/9/02 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-3030-022801 | 3030 | 2/28/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-3030-032802 | 3030 | 3/28/02 | NITROBENZENE | 0.04 | | 0.08 | UG/L | | * |
| GW-3030-Q101 | 3030 | 2/12/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-3030-032802 | 3030 | 3/28/02 | TETRACHLOROETHENE | 5 | | 10 | UG/L | | * |
| GW-3030-Q101 | 3030 | 2/12/01 | TETRACHLOROETHENE | 1.2 | | 1 | UG/L | | * |
| GW-3030-022801 | 3030 | 2/28/01 | TETRACHLOROETHENE | 1.1 | | 1 | UG/L | | * |
| GW-3030-Q102 | 3030 | 1/9/02 | TETRACHLOROETHENE | 5 | | 10 | UG/L | | * |
| GW-3030-022801 | 3030 | 2/28/01 | TRICHLOROETHENE (TCE) | 220 | | 25 | UG/L | | * |
| GW-3030-Q101 | 3030 | 2/12/01 | TRICHLOROETHENE (TCE) | 200 | | 10 | UG/L | | * |
| GW-3030-Q102 | 3030 | 1/9/02 | TRICHLOROETHENE (TCE) | 300 | | 10 | UG/L | | * |
| GW-3030-032802 | 3030 | 3/28/02 | TRICHLOROETHENE (TCE) | 230 | | 10 | UG/L | | * |
| GW-3030-Q101 | 3030 | 2/12/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | | * |
| GW-3030-032802 | 3030 | 3/28/02 | VINYL CHLORIDE (VC) | 5 | | 10 | UG/L | | * |
| GW-3031-Q102 | 3031 | 1/9/02 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-3031-030101 | 3031 | 3/1/01 | 1,2-DICHLOROETHENE (DCE) | 0.5 | | 1 | UG/L | | * |
| GW-3031-Q101 | 3031 | 2/12/01 | 1,2-DICHLOROETHENE (DCE) | 0.5 | | 1 | UG/L | | * |
| GW-3031-Q102 | 3031 | 1/9/02 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-3031-030101 | 3031 | 3/1/01 | NITROBENZENE | 0.1 | | 0.2 | UG/L | | * |
| GW-3031-Q101 | 3031 | 2/12/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-3031-Q102 | 3031 | 1/9/02 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-3031-Q101 | 3031 | 2/12/01 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-3031-030101 | 3031 | 3/1/01 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-3031-Q101 | 3031 | 2/12/01 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-3031-Q102 | 3031 | 1/9/02 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-3031-030101 | 3031 | 3/1/01 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-3031-Q101 | 3031 | 2/12/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | H0/4 | * |
| GW-3032-Q102 | 3032 | 1/9/02 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-3032-022601 | 3032 | 2/26/01 | 1,2-DICHLOROETHENE (DCE) | 0.5 | | 1 | UG/L | | * |

| WSSRAP_ID | LOCATION | DATE_SAM | PARAMETER | CONC | ERR | DL | UNITS | VER_QUAL | VAL_QUAL |
|---|---|---|---|---|---|---|---|---|---|
| GW-3032-Q101 | 3032 | 2/12/01 | 1,2-DICHLOROETHENE (DCE) | 0.5 | | 1 | UG/L | | * |
| GW-3032-032602 | 3032 | 3/26/02 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-3032-022601 | 3032 | 2/26/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-3032-Q101 | 3032 | 2/12/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-3032-Q102 | 3032 | 1/9/02 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-3032-032602 | 3032 | 3/26/02 | NITROBENZENE | 0.04 | | 0.08 | UG/L | | * |
| GW-3032-Q102 | 3032 | 1/9/02 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-3032-032602 | 3032 | 3/26/02 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-3032-022601 | 3032 | 2/26/01 | TETRACHLOROETHENE | 1.2 | | 1 | UG/L | | * |
| GW-3032-Q101 | 3032 | 2/12/01 | TETRACHLOROETHENE | 1.6 | | 1 | UG/L | | * |
| GW-3032-032602 | 3032 | 3/26/02 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-3032-022601 | 3032 | 2/26/01 | TRICHLOROETHENE (TCE) | 1.6 | | 1 | UG/L | | * |
| GW-3032-Q102 | 3032 | 1/9/02 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-3032-Q101 | 3032 | 2/12/01 | TRICHLOROETHENE (TCE) | 1.9 | | 1 | UG/L | | * |
| GW-3032-Q101 | 3032 | 2/12/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | | * |
| GW-3032-032602 | 3032 | 3/26/02 | VINYL CHLORIDE (VC) | 0.5 | | 1 | UG/L | | * |
| GW-3034-030601 | 3034 | 3/6/01 | 1,2-DICHLOROETHENE (DCE) | 17 | | 1 | UG/L | | * |
| GW-3034-Q102 | 3034 | 1/9/02 | 1,2-DICHLOROETHENE (DCE) | 14 | | 40 | UG/L | | * |
| GW-3034-032602 | 3034 | 3/26/02 | 1,2-DICHLOROETHENE (DCE) | 15 | | 50 | UG/L | | * |
| GW-3034-030601 | 3034 | 3/6/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-3034-Q102 | 3034 | 1/9/02 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-3034-032602 | 3034 | 3/26/02 | NITROBENZENE | 0.04 | | 0.08 | UG/L | | * |
| GW-3034-030601 | 3034 | 3/6/01 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-3034-Q102 | 3034 | 1/9/02 | TETRACHLOROETHENE | 10 | | 20 | UG/L | | * |
| GW-3034-032602 | 3034 | 3/26/02 | TETRACHLOROETHENE | 12.5 | | 25 | UG/L | | * |
| GW-3034-030601 | 3034 | 3/6/01 | TRICHLOROETHENE (TCE) | 780 | | 100 | UG/L | | * |
| GW-3034-032602 | 3034 | 3/26/02 | TRICHLOROETHENE (TCE) | 580 | | 25 | UG/L | | * |
| GW-3034-Q102 | 3034 | 1/9/02 | TRICHLOROETHENE (TCE) | 490 | | 20 | UG/L | | * |
| GW-3034-030601 | 3034 | 3/6/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | | * |
| GW-3034-032602 | 3034 | 3/26/02 | VINYL CHLORIDE (VC) | 12.5 | | 25 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | 1,1,1-TRICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | 1,1,1-TRICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | 1,1,2,2- | 5 | | 10 | UG/L | | * |

| WSSRAP_ID | LOCATION | DATE_SAM | PARAMETER | CONC | ERR | DL | UNITS | VER_QUAL | VAL_QUAL |
|---|---|---|---|---|---|---|---|---|---|
| GW-3035-030501 | 3035 | 3/5/01 | 1,1,2,2- | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | 1,1,2-TRICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | 1,1,2-TRICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | 1,1-DICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | 1,1-DICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | 1,1-DICHLOROETHENE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | 1,1-DICHLOROETHENE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | 1,2-DICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | 1,2-DICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | 1,2-DICHLOROETHENE (DCE) | 1.2 | | 1 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | 1,2-DICHLOROETHENE (DCE) | 1.2 | | 1 | UG/L | | * |
| GW-3035-W101 | 3035 | 3/19/01 | 1,2-DICHLOROETHENE (DCE) | 5.5 | | 10 | UG/L | | * |
| GW-3035-032702 | 3035 | 3/27/02 | 1,2-DICHLOROETHENE (DCE) | 1.1 | | 4 | UG/L | | * |
| GW-3035-032702 | 3035 | 3/27/02 | 1,2-DICHLOROETHENE (DCE) | 1.1 | | 4 | UG/L | | * |
| GW-3035-W101 | 3035 | 3/19/01 | 1,2-DICHLOROETHENE (DCE) | 5.5 | | 10 | UG/L | | * |
| GW-3035-Q102 | 3035 | 1/7/02 | 1,2-DICHLOROETHENE (DCE) | 0.67 | | 2 | UG/L | | * |
| GW-3035-Q102 | 3035 | 1/7/02 | 1,2-DICHLOROETHENE (DCE) | 0.67 | | 2 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | 1,2-DICHLOROPROPANE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | 1,2-DICHLOROPROPANE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | 2-BUTANONE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | 2-BUTANONE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | 2-HEXANONE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | 2-HEXANONE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | 4-METHYL-2-PENTANONE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | 4-METHYL-2-PENTANONE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | ACETONE | 4.9 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | ACETONE | 4.9 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | BENZENE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | BENZENE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | BROMODICHLOROMETHANE | 1.1 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | BROMODICHLOROMETHANE | 1.1 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | BROMOFORM | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | BROMOFORM | 5 | | 10 | UG/L | | * |

| WSSRAP_ID | LOCATION | DATE_SAM | PARAMETER | CONC | ERR | DL | UNITS | VER_QUAL | VAL_QUAL |
|---|---|---|---|---|---|---|---|---|---|
| GW-3035-030501 | 3035 | 3/5/01 | BROMOMETHANE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | BROMOMETHANE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | CARBON DISULFIDE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | CARBON DISULFIDE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | CARBON TETRACHLORIDE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | CARBON TETRACHLORIDE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | CHLOROBENZENE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | CHLOROBENZENE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | CHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | CHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | CHLOROFORM | 5.7 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | CHLOROFORM | 5.7 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | CHLOROMETHANE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | CHLOROMETHANE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | CIS-1,3-DICHLOROPROPENE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | CIS-1,3-DICHLOROPROPENE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | DIBROMOCHLOROMETHANE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | DIBROMOCHLOROMETHANE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | ETHYL BENZENE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | ETHYL BENZENE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | METHYLENE CHLORIDE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | METHYLENE CHLORIDE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | NITROBENZENE | 0.18 | | 0.03 | UG/L | | * |
| GW-3035-Q102 | 3035 | 1/7/02 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-3035-W101 | 3035 | 3/19/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-3035-W101 | 3035 | 3/19/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-3035-Q102 | 3035 | 1/7/02 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | NITROBENZENE | 0.18 | | 0.03 | UG/L | | * |
| GW-3035-032702 | 3035 | 3/27/02 | NITROBENZENE | 0.04 | | 0.08 | UG/L | | * |
| GW-3035-032702 | 3035 | 3/27/02 | NITROBENZENE | 0.04 | | 0.08 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | TETRACHLOROETHENE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | TETRACHLOROETHENE | 5 | | 10 | UG/L | | * |
| GW-3035-Q102 | 3035 | 1/7/02 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |

| WSSRAP_ID | LOCATION | DATE_SAM | PARAMETER | CONC | ERR | DL | UNITS | VER_QUAL | VAL_QUAL |
|---|---|---|---|---|---|---|---|---|---|
| GW-3035-032702 | 3035 | 3/27/02 | TETRACHLOROETHENE | 1 | | 2 | UG/L | | * |
| GW-3035-032702 | 3035 | 3/27/02 | TETRACHLOROETHENE | 1 | | 2 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-3035-W101 | 3035 | 3/19/01 | TETRACHLOROETHENE | 5 | | 10 | UG/L | | * |
| GW-3035-W101 | 3035 | 3/19/01 | TETRACHLOROETHENE | 5 | | 10 | UG/L | | * |
| GW-3035-Q102 | 3035 | 1/7/02 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | TOLUENE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | TOLUENE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | TRANS-1,3- | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | TRANS-1,3- | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | TRICHLOROETHENE | 65 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | TRICHLOROETHENE | 65 | | 10 | UG/L | | * |
| GW-3035-Q102 | 3035 | 1/7/02 | TRICHLOROETHENE (TCE) | 44 | | 2 | UG/L | | * |
| GW-3035-Q102 | 3035 | 1/7/02 | TRICHLOROETHENE (TCE) | 44 | | 2 | UG/L | | * |
| GW-3035-032702 | 3035 | 3/27/02 | TRICHLOROETHENE (TCE) | 63 | | 2 | UG/L | | * |
| GW-3035-W101 | 3035 | 3/19/01 | TRICHLOROETHENE (TCE) | 370 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | TRICHLOROETHENE (TCE) | 83 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | TRICHLOROETHENE (TCE) | 83 | | 10 | UG/L | | * |
| GW-3035-032702 | 3035 | 3/27/02 | TRICHLOROETHENE (TCE) | 63 | | 2 | UG/L | | * |
| GW-3035-W101 | 3035 | 3/19/01 | TRICHLOROETHENE (TCE) | 370 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | | * |
| GW-3035-032702 | 3035 | 3/27/02 | VINYL CHLORIDE (VC) | 1 | | 2 | UG/L | | * |
| GW-3035-032702 | 3035 | 3/27/02 | VINYL CHLORIDE (VC) | 1 | | 2 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | XYLENES, TOTAL | 5 | | 10 | UG/L | | * |
| GW-3035-030501 | 3035 | 3/5/01 | XYLENES, TOTAL | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | 1,1,1-TRICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | 1,1,1-TRICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | 1,1,2,2- | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | 1,1,2,2- | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | 1,1,2-TRICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | 1,1,2-TRICHLOROETHANE | 5 | | 10 | UG/L | | * |

| WSSRAP_ID | LOCATION | DATE_SAM | PARAMETER | CONC | ERR | DL | UNITS | VER_QUAL | VAL_QUAL |
|---|---|---|---|---|---|---|---|---|---|
| GW-3036-030501 | 3036 | 3/5/01 | 1,1-DICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | 1,1-DICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | 1,1-DICHLOROETHENE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | 1,1-DICHLOROETHENE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | 1,2-DICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | 1,2-DICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | 1,2-DICHLOROETHENE (DCE) | 0.5 | | 1 | UG/L | | * |
| GW-3036-W101 | 3036 | 3/19/01 | 1,2-DICHLOROETHENE (DCE) | 0.5 | | 1 | UG/L | | * |
| GW-3036-Q102 | 3036 | 1/8/02 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-3036-032702 | 3036 | 3/27/02 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-3036-W101 | 3036 | 3/19/01 | 1,2-DICHLOROETHENE (DCE) | 0.5 | | 1 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | 1,2-DICHLOROETHENE (DCE) | 0.5 | | 1 | UG/L | | * |
| GW-3036-032702 | 3036 | 3/27/02 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-3036-Q102 | 3036 | 1/8/02 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | 1,2-DICHLOROPROPANE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | 1,2-DICHLOROPROPANE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | 2-BUTANONE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | 2-BUTANONE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | 2-HEXANONE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | 2-HEXANONE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | 4-METHYL-2-PENTANONE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | 4-METHYL-2-PENTANONE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | ACETONE | 4.4 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | ACETONE | 4.4 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | BENZENE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | BENZENE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | BROMODICHLOROMETHANE | 1.4 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | BROMODICHLOROMETHANE | 1.4 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | BROMOFORM | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | BROMOFORM | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | BROMOMETHANE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | BROMOMETHANE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | CARBON DISULFIDE | 5 | | 10 | UG/L | | * |

| WSSRAP_ID | LOCATION | DATE_SAM | PARAMETER | CONC | ERR | DL | UNITS | VER_QUAL | VAL_QUAL |
|---|---|---|---|---|---|---|---|---|---|
| GW-3036-030501 | 3036 | 3/5/01 | CARBON DISULFIDE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | CARBON TETRACHLORIDE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | CARBON TETRACHLORIDE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | CHLOROBENZENE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | CHLOROBENZENE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | CHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | CHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | CHLOROFORM | 3.1 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | CHLOROFORM | 3.1 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | CHLOROMETHANE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | CHLOROMETHANE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | CIS-1,3-DICHLOROPROPENE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | CIS-1,3-DICHLOROPROPENE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | DIBROMOCHLOROMETHANE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | DIBROMOCHLOROMETHANE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | ETHYL BENZENE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | ETHYL BENZENE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | METHYLENE CHLORIDE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | METHYLENE CHLORIDE | 5 | | 10 | UG/L | | * |
| GW-3036-032702 | 3036 | 3/27/02 | NITROBENZENE | 0.04 | | 0.08 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-3036-W101 | 3036 | 3/19/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-3036-Q102 | 3036 | 1/8/02 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-3036-Q102 | 3036 | 1/8/02 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-3036-W101 | 3036 | 3/19/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-3036-032702 | 3036 | 3/27/02 | NITROBENZENE | 0.04 | | 0.08 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | TETRACHLOROETHENE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | TETRACHLOROETHENE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-3036-W101 | 3036 | 3/19/01 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-3036-032702 | 3036 | 3/27/02 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-3036-Q102 | 3036 | 1/8/02 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |

| WSSRAP_ID | LOCATION | DATE_SAM | PARAMETER | CONC | ERR | DL | UNITS | VER_QUAL | VAL_QUAL |
|---|---|---|---|---|---|---|---|---|---|
| GW-3036-Q102 | 3036 | 1/8/02 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-3036-032702 | 3036 | 3/27/02 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-3036-W101 | 3036 | 3/19/01 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | TOLUENE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | TOLUENE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | TRANS-1,3- | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | TRANS-1,3- | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | TRICHLOROETHENE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | TRICHLOROETHENE | 5 | | 10 | UG/L | | * |
| GW-3036-Q102 | 3036 | 1/8/02 | TRICHLOROETHENE (TCE) | 8.1 | | 1 | UG/L | | * |
| GW-3036-032702 | 3036 | 3/27/02 | TRICHLOROETHENE (TCE) | 8.3 | | 1 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | TRICHLOROETHENE (TCE) | 0.71 | | 1 | UG/L | | * |
| GW-3036-032702 | 3036 | 3/27/02 | TRICHLOROETHENE (TCE) | 8.3 | | 1 | UG/L | | * |
| GW-3036-W101 | 3036 | 3/19/01 | TRICHLOROETHENE (TCE) | 2.9 | | 1 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | TRICHLOROETHENE (TCE) | 0.71 | | 1 | UG/L | | * |
| GW-3036-Q102 | 3036 | 1/8/02 | TRICHLOROETHENE (TCE) | 8.1 | | 1 | UG/L | | * |
| GW-3036-W101 | 3036 | 3/19/01 | TRICHLOROETHENE (TCE) | 2.9 | | 1 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | | * |
| GW-3036-032702 | 3036 | 3/27/02 | VINYL CHLORIDE (VC) | 0.5 | | 1 | UG/L | | * |
| GW-3036-032702 | 3036 | 3/27/02 | VINYL CHLORIDE (VC) | 0.5 | | 1 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | XYLENES, TOTAL | 5 | | 10 | UG/L | | * |
| GW-3036-030501 | 3036 | 3/5/01 | XYLENES, TOTAL | 5 | | 10 | UG/L | | * |
| GW-3037-022102 | 3037 | 2/21/02 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-3037-011602 | 3037 | 1/16/02 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-3037-120501 | 3037 | 12/5/01 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-3037-120501 | 3037 | 12/5/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | U |
| GW-3037-022102 | 3037 | 2/21/02 | TETRACHLOROETHENE | 1.2 | | 1 | UG/L | | * |
| GW-3037-011602 | 3037 | 1/16/02 | TETRACHLOROETHENE | 1.2 | | 1 | UG/L | | * |
| GW-3037-120501 | 3037 | 12/5/01 | TETRACHLOROETHENE | 1.6 | | 1 | UG/L | | * |
| GW-3037-120501 | 3037 | 12/5/01 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-3037-011602 | 3037 | 1/16/02 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |

| WSSRAP_ID | LOCATION | DATE_SAM | PARAMETER | CONC | ERR | DL | UNITS | VER_QUAL | VAL_QUAL |
|---|---|---|---|---|---|---|---|---|---|
| GW-3037-022102 | 3037 | 2/21/02 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-3037-120501 | 3037 | 12/5/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | | U |
| GW-3038-032802 | 3038 | 3/28/02 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-3038-022002 | 3038 | 2/20/02 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-3038-120501 | 3038 | 12/5/01 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-3038-011602 | 3038 | 1/16/02 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-3038-032802 | 3038 | 3/28/02 | NITROBENZENE | 0.04 | | 0.08 | UG/L | | * |
| GW-3038-120501 | 3038 | 12/5/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | U |
| GW-3038-120501 | 3038 | 12/5/01 | TETRACHLOROETHENE | 2.4 | | 1 | UG/L | | * |
| GW-3038-011602 | 3038 | 1/16/02 | TETRACHLOROETHENE | 1.5 | | 1 | UG/L | | * |
| GW-3038-022002 | 3038 | 2/20/02 | TETRACHLOROETHENE | 1.4 | | 1 | UG/L | | * |
| GW-3038-032802 | 3038 | 3/28/02 | TETRACHLOROETHENE | 1.1 | | 1 | UG/L | | * |
| GW-3038-032802 | 3038 | 3/28/02 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-3038-022002 | 3038 | 2/20/02 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-3038-120501 | 3038 | 12/5/01 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-3038-011602 | 3038 | 1/16/02 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-3038-120501 | 3038 | 12/5/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | | U |
| GW-3038-032802 | 3038 | 3/28/02 | VINYL CHLORIDE (VC) | 0.5 | | 1 | UG/L | | * |
| GW-3039-032802 | 3039 | 3/28/02 | 1,2-DICHLOROETHENE (DCE) | 5.4 | | 10 | UG/L | | * |
| GW-3039-022002 | 3039 | 2/20/02 | 1,2-DICHLOROETHENE (DCE) | 5.2 | | 10 | UG/L | | * |
| GW-3039-011602 | 3039 | 1/16/02 | 1,2-DICHLOROETHENE (DCE) | 6.4 | | 10 | UG/L | | * |
| GW-3039-120501 | 3039 | 12/5/01 | 1,2-DICHLOROETHENE (DCE) | 3.8 | | 10 | UG/L | | * |
| GW-3039-120501 | 3039 | 12/5/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | U |
| GW-3039-032802 | 3039 | 3/28/02 | NITROBENZENE | 0.04 | | 0.08 | UG/L | | * |
| GW-3039-011602 | 3039 | 1/16/02 | TETRACHLOROETHENE | 2.5 | | 5 | UG/L | | * |
| GW-3039-022002 | 3039 | 2/20/02 | TETRACHLOROETHENE | 2.5 | | 5 | UG/L | | * |
| GW-3039-120501 | 3039 | 12/5/01 | TETRACHLOROETHENE | 2.5 | | 5 | UG/L | | * |
| GW-3039-032802 | 3039 | 3/28/02 | TETRACHLOROETHENE | 2.5 | | 5 | UG/L | | * |
| GW-3039-022002 | 3039 | 2/20/02 | TRICHLOROETHENE (TCE) | 81 | | 5 | UG/L | | * |
| GW-3039-011602 | 3039 | 1/16/02 | TRICHLOROETHENE (TCE) | 110 | | 5 | UG/L | | * |
| GW-3039-120501 | 3039 | 12/5/01 | TRICHLOROETHENE (TCE) | 80 | | 5 | UG/L | | * |
| GW-3039-032802 | 3039 | 3/28/02 | TRICHLOROETHENE (TCE) | 97 | | 5 | UG/L | | * |
| GW-3039-022002 | 3039 | 2/20/02 | VINYL CHLORIDE | 5 | | 10 | UG/L | | * |

| WSSRAP_ID | LOCATION | DATE_SAM | PARAMETER | CONC | ERR | DL | UNITS | VER_QUAL | VAL_QUAL |
|---|---|---|---|---|---|---|---|---|---|
| GW-3039-120501 | 3039 | 12/5/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | | U |
| GW-3039-032802 | 3039 | 3/28/02 | VINYL CHLORIDE (VC) | 2.5 | | 5 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | 1,1,1-TRICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | 1,1,1-TRICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | 1,1,2,2- | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | 1,1,2,2- | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | 1,1,2-TRICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | 1,1,2-TRICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | 1,1-DICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | 1,1-DICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-4031-Q102 | 4031 | 1/8/02 | 1,1-DICHLOROETHENE | 2.5 | | 5 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | 1,1-DICHLOROETHENE | 5 | | 10 | UG/L | | * |
| GW-4031-Q102 | 4031 | 1/8/02 | 1,1-DICHLOROETHENE | 2.5 | | 5 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | 1,1-DICHLOROETHENE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | 1,2-DICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | 1,2-DICHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-4031-Q102 | 4031 | 1/8/02 | 1,2-DICHLOROETHENE (DCE) | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | 1,2-DICHLOROETHENE (DCE) | 5 | | 10 | UG/L | | * |
| GW-4031-030101 | 4031 | 3/1/01 | 1,2-DICHLOROETHENE (DCE) | 2 | | 1 | UG/L | | * |
| GW-4031-Q102 | 4031 | 1/8/02 | 1,2-DICHLOROETHENE (DCE) | 5 | | 10 | UG/L | | * |
| GW-4031-030101 | 4031 | 3/1/01 | 1,2-DICHLOROETHENE (DCE) | 2 | | 1 | UG/L | | * |
| GW-4031-W101 | 4031 | 3/21/01 | 1,2-DICHLOROETHENE (DCE) | 5 | | 10 | UG/L | | * |
| GW-4031-032702 | 4031 | 3/27/02 | 1,2-DICHLOROETHENE (DCE) | 5 | | 10 | UG/L | | * |
| GW-4031-032702 | 4031 | 3/27/02 | 1,2-DICHLOROETHENE (DCE) | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | 1,2-DICHLOROETHENE (DCE) | 5 | | 10 | UG/L | | * |
| GW-4031-032702 | 4031 | 3/27/02 | 1,2-DICHLOROETHENE (DCE) | 5 | | 10 | UG/L | | * |
| GW-4031-W101 | 4031 | 3/21/01 | 1,2-DICHLOROETHENE (DCE) | 5 | | 10 | UG/L | | * |
| GW-4031-030101 | 4031 | 3/1/01 | 1,2-DICHLOROETHENE (DCE) | 2 | | 1 | UG/L | | * |
| GW-4031-Q102 | 4031 | 1/8/02 | 1,2-DICHLOROETHENE (DCE) | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | 1,2-DICHLOROPROPANE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | 1,2-DICHLOROPROPANE | 5 | | 10 | UG/L | | * |
| GW-4031-Q102 | 4031 | 1/8/02 | 1,4-DICHLOROBENZENE | 2.5 | | 5 | UG/L | | * |
| GW-4031-Q102 | 4031 | 1/8/02 | 1,4-DICHLOROBENZENE | 2.5 | | 5 | UG/L | | * |

| WSSRAP_ID | LOCATION | DATE_SAM | PARAMETER | CONC | ERR | DL | UNITS | VER_QUAL | VAL_QUAL |
|---|---|---|---|---|---|---|---|---|---|
| GW-4031-Q101 | 4031 | 2/12/01 | 2-BUTANONE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | 2-BUTANONE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | 2-HEXANONE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | 2-HEXANONE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | 4-METHYL-2-PENTANONE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | 4-METHYL-2-PENTANONE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | ACETONE | 2.4 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | ACETONE | 2.4 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | BENZENE | 5 | | 10 | UG/L | | * |
| GW-4031-Q102 | 4031 | 1/8/02 | BENZENE | 2.5 | | 5 | UG/L | | * |
| GW-4031-Q102 | 4031 | 1/8/02 | BENZENE | 2.5 | | 5 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | BENZENE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | BROMODICHLOROMETHANE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | BROMODICHLOROMETHANE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | BROMOFORM | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | BROMOFORM | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | BROMOMETHANE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | BROMOMETHANE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | CARBON DISULFIDE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | CARBON DISULFIDE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | CARBON TETRACHLORIDE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | CARBON TETRACHLORIDE | 5 | | 10 | UG/L | | * |
| GW-4031-Q102 | 4031 | 1/8/02 | CHLOROBENZENE | 2.5 | | 5 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | CHLOROBENZENE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | CHLOROBENZENE | 5 | | 10 | UG/L | | * |
| GW-4031-Q102 | 4031 | 1/8/02 | CHLOROBENZENE | 2.5 | | 5 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | CHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | CHLOROETHANE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | CHLOROFORM | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | CHLOROFORM | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | CHLOROMETHANE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | CHLOROMETHANE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | CIS-1,3-DICHLOROPROPENE | 5 | | 10 | UG/L | | * |

| WSSRAP_ID | LOCATION | DATE_SAM | PARAMETER | CONC | ERR | DL | UNITS | VER_QUAL | VAL_QUAL |
|---|---|---|---|---|---|---|---|---|---|
| GW-4031-Q101 | 4031 | 2/12/01 | CIS-1,3-DICHLOROPROPENE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | DIBROMOCHLOROMETHANE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | DIBROMOCHLOROMETHANE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | ETHYL BENZENE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | ETHYL BENZENE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | METHYLENE CHLORIDE | 1.2 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | METHYLENE CHLORIDE | 1.2 | | 10 | UG/L | | * |
| GW-4031-032702 | 4031 | 3/27/02 | NITROBENZENE | 0.04 | | 0.08 | UG/L | | * |
| GW-4031-032702 | 4031 | 3/27/02 | NITROBENZENE | 0.04 | | 0.08 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-4031-Q102 | 4031 | 1/8/02 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-4031-030101 | 4031 | 3/1/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-4031-Q102 | 4031 | 1/8/02 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-4031-030101 | 4031 | 3/1/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-4031-030101 | 4031 | 3/1/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-4031-W101 | 4031 | 3/21/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-4031-W101 | 4031 | 3/21/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-4031-Q102 | 4031 | 1/8/02 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-4031-032702 | 4031 | 3/27/02 | NITROBENZENE | 0.04 | | 0.08 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | TETRACHLOROETHENE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | TETRACHLOROETHENE | 5 | | 10 | UG/L | | * |
| GW-4031-032702 | 4031 | 3/27/02 | TETRACHLOROETHENE | 2.5 | | 5 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | TETRACHLOROETHENE | 5 | | 10 | UG/L | | * |
| GW-4031-030101 | 4031 | 3/1/01 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-4031-Q102 | 4031 | 1/8/02 | TETRACHLOROETHENE | 2.5 | | 5 | UG/L | | * |
| GW-4031-Q102 | 4031 | 1/8/02 | TETRACHLOROETHENE | 2.5 | | 5 | UG/L | | * |
| GW-4031-032702 | 4031 | 3/27/02 | TETRACHLOROETHENE | 2.5 | | 5 | UG/L | | * |
| GW-4031-W101 | 4031 | 3/21/01 | TETRACHLOROETHENE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | TETRACHLOROETHENE | 5 | | 10 | UG/L | | * |
| GW-4031-030101 | 4031 | 3/1/01 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | TETRACHLOROETHENE | 5 | | 10 | UG/L | | * |

| WSSRAP_ID | LOCATION | DATE_SAM | PARAMETER | CONC | ERR | DL | UNITS | VER_QUAL | VAL_QUAL |
|---|---|---|---|---|---|---|---|---|---|
| GW-4031-032702 | 4031 | 3/27/02 | TETRACHLOROETHENE | 2.5 | | 5 | UG/L | | * |
| GW-4031-Q102 | 4031 | 1/8/02 | TETRACHLOROETHENE | 2.5 | | 5 | UG/L | | * |
| GW-4031-W101 | 4031 | 3/21/01 | TETRACHLOROETHENE | 5 | | 10 | UG/L | | * |
| GW-4031-030101 | 4031 | 3/1/01 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | TOLUENE | 5 | | 10 | UG/L | | * |
| GW-4031-Q102 | 4031 | 1/8/02 | TOLUENE | 2.5 | | 5 | UG/L | | * |
| GW-4031-Q102 | 4031 | 1/8/02 | TOLUENE | 2.5 | | 5 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | TOLUENE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | TRANS-1,3- | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | TRANS-1,3- | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | TRICHLOROETHENE | 130 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | TRICHLOROETHENE | 130 | | 10 | UG/L | | * |
| GW-4031-W101 | 4031 | 3/21/01 | TRICHLOROETHENE (TCE) | 220 | | 10 | UG/L | | * |
| GW-4031-032702 | 4031 | 3/27/02 | TRICHLOROETHENE (TCE) | 150 | | 5 | UG/L | | * |
| GW-4031-030101 | 4031 | 3/1/01 | TRICHLOROETHENE (TCE) | 170 | | 25 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | TRICHLOROETHENE (TCE) | 160 | | 10 | UG/L | | * |
| GW-4031-032702 | 4031 | 3/27/02 | TRICHLOROETHENE (TCE) | 150 | | 5 | UG/L | | * |
| GW-4031-Q102 | 4031 | 1/8/02 | TRICHLOROETHENE (TCE) | 170 | | 5 | UG/L | | * |
| GW-4031-Q102 | 4031 | 1/8/02 | TRICHLOROETHENE (TCE) | 170 | | 5 | UG/L | | * |
| GW-4031-Q102 | 4031 | 1/8/02 | TRICHLOROETHENE (TCE) | 170 | | 5 | UG/L | | * |
| GW-4031-W101 | 4031 | 3/21/01 | TRICHLOROETHENE (TCE) | 220 | | 10 | UG/L | | * |
| GW-4031-030101 | 4031 | 3/1/01 | TRICHLOROETHENE (TCE) | 170 | | 25 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | TRICHLOROETHENE (TCE) | 160 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | TRICHLOROETHENE (TCE) | 160 | | 10 | UG/L | | * |
| GW-4031-032702 | 4031 | 3/27/02 | TRICHLOROETHENE (TCE) | 150 | | 5 | UG/L | | * |
| GW-4031-030101 | 4031 | 3/1/01 | TRICHLOROETHENE (TCE) | 170 | | 25 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | | * |
| GW-4031-032702 | 4031 | 3/27/02 | VINYL CHLORIDE (VC) | 2.5 | | 5 | UG/L | | * |
| GW-4031-032702 | 4031 | 3/27/02 | VINYL CHLORIDE (VC) | 2.5 | | 5 | UG/L | | * |
| GW-4031-032702 | 4031 | 3/27/02 | VINYL CHLORIDE (VC) | 2.5 | | 5 | UG/L | | * |
| GW-4031-Q101 | 4031 | 2/12/01 | XYLENES, TOTAL | 5 | | 10 | UG/L | | * |

| WSSRAP_ID | LOCATION | DATE_SAM | PARAMETER | CONC | ERR | DL | UNITS | VER_QUAL | VAL_QUAL |
|---|---|---|---|---|---|---|---|---|---|
| GW-4031-Q101 | 4031 | 2/12/01 | XYLENES, TOTAL | 5 | | 10 | UG/L | | * |
| GW-4033-080301 | 4033 | 8/3/01 | 1,2-DICHLOROETHENE (DCE) | 0.5 | | 1 | UG/L | | * |
| GW-4033-071101 | 4033 | 7/11/01 | 1,2-DICHLOROETHENE (DCE) | 0.5 | | 1 | UG/L | | * |
| GW-4033-060601 | 4033 | 6/6/01 | 1,2-DICHLOROETHENE (DCE) | 0.5 | | 1 | UG/L | | * |
| GW-4033-Q102 | 4033 | 2/26/02 | NITROBENZENE | 0.04 | | 0.08 | UG/L | | * |
| GW-4033-060601 | 4033 | 6/6/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-4033-080301 | 4033 | 8/3/01 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-4033-060601 | 4033 | 6/6/01 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-4033-071101 | 4033 | 7/11/01 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-4033-071101 | 4033 | 7/11/01 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-4033-080301 | 4033 | 8/3/01 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-4033-060601 | 4033 | 6/6/01 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-4033-071101 | 4033 | 7/11/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | | * |
| GW-4033-080301 | 4033 | 8/3/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | | * |
| GW-4033-060601 | 4033 | 6/6/01 | VINYL CHLORIDE | 1 | | 2 | UG/L | | * |
| GW-4034-071101 | 4034 | 7/11/01 | 1,2-DICHLOROETHENE (DCE) | 0.5 | | 1 | UG/L | | * |
| GW-4034-060601 | 4034 | 6/6/01 | 1,2-DICHLOROETHENE (DCE) | 0.5 | | 1 | UG/L | | * |
| GW-4034-080301 | 4034 | 8/3/01 | 1,2-DICHLOROETHENE (DCE) | 0.5 | | 1 | UG/L | | * |
| GW-4034-060601 | 4034 | 6/6/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-4034-071101 | 4034 | 7/11/01 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-4034-060601 | 4034 | 6/6/01 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-4034-080301 | 4034 | 8/3/01 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-4034-071101 | 4034 | 7/11/01 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-4034-080301 | 4034 | 8/3/01 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-4034-060601 | 4034 | 6/6/01 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-4034-080301 | 4034 | 8/3/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | | * |
| GW-4034-060601 | 4034 | 6/6/01 | VINYL CHLORIDE | 1 | | 2 | UG/L | | * |
| GW-4034-071101 | 4034 | 7/11/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | | * |
| GW-4035-080301 | 4035 | 8/3/01 | 1,2-DICHLOROETHENE (DCE) | 0.5 | | 1 | UG/L | | * |
| GW-4035-060601 | 4035 | 6/6/01 | 1,2-DICHLOROETHENE (DCE) | 0.5 | | 1 | UG/L | | * |
| GW-4035-071101 | 4035 | 7/11/01 | 1,2-DICHLOROETHENE (DCE) | 0.5 | | 1 | UG/L | | * |
| GW-4035-060601 | 4035 | 6/6/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | * |
| GW-4035-071101 | 4035 | 7/11/01 | TETRACHLOROETHENE | 0.58 | | 1 | UG/L | | * |

| WSSRAP_ID | LOCATION | DATE_SAM | PARAMETER | CONC | ERR | DL | UNITS | VER_QUAL | VAL_QUAL |
|---|---|---|---|---|---|---|---|---|---|
| GW-4035-060601 | 4035 | 6/6/01 | TETRACHLOROETHENE | 1.8 | | 1 | UG/L | | * |
| GW-4035-080301 | 4035 | 8/3/01 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-4035-080301 | 4035 | 8/3/01 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-4035-071101 | 4035 | 7/11/01 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-4035-060601 | 4035 | 6/6/01 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-4035-080301 | 4035 | 8/3/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | | * |
| GW-4035-071101 | 4035 | 7/11/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | | * |
| GW-4035-060601 | 4035 | 6/6/01 | VINYL CHLORIDE | 1 | | 2 | UG/L | | * |
| GW-4036-011602 | 4036 | 1/16/02 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-4036-022102 | 4036 | 2/21/02 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-4036-120401 | 4036 | 12/4/01 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-4036-120401 | 4036 | 12/4/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | U |
| GW-4036-011602 | 4036 | 1/16/02 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-4036-120401 | 4036 | 12/4/01 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-4036-022102 | 4036 | 2/21/02 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-4036-011602 | 4036 | 1/16/02 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-4036-022102 | 4036 | 2/21/02 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-4036-120401 | 4036 | 12/4/01 | TRICHLOROETHENE (TCE) | 0.5 | | 1 | UG/L | | * |
| GW-4036-120401 | 4036 | 12/4/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | | U |
| GW-4037-022102 | 4037 | 2/21/02 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-4037-011602 | 4037 | 1/16/02 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-4037-120401 | 4037 | 12/4/01 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-4037-032802 | 4037 | 3/28/02 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-4037-032802 | 4037 | 3/28/02 | NITROBENZENE | 0.04 | | 0.08 | UG/L | | * |
| GW-4037-120401 | 4037 | 12/4/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | U |
| GW-4037-011602 | 4037 | 1/16/02 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-4037-022102 | 4037 | 2/21/02 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-4037-120401 | 4037 | 12/4/01 | TETRACHLOROETHENE | 0.62 | | 1 | UG/L | | * |
| GW-4037-032802 | 4037 | 3/28/02 | TETRACHLOROETHENE | 0.5 | | 1 | UG/L | | * |
| GW-4037-120401 | 4037 | 12/4/01 | TRICHLOROETHENE (TCE) | 27 | | 1 | UG/L | | * |
| GW-4037-032802 | 4037 | 3/28/02 | TRICHLOROETHENE (TCE) | 5.3 | | 1 | UG/L | | * |
| GW-4037-022102 | 4037 | 2/21/02 | TRICHLOROETHENE (TCE) | 1.6 | | 1 | UG/L | | * |
| GW-4037-011602 | 4037 | 1/16/02 | TRICHLOROETHENE (TCE) | 11 | | 1 | UG/L | | * |

| WSSRAP_ID | LOCATION | DATE_SAM | PARAMETER | CONC | ERR | DL | UNITS | VER_QUAL | VAL_QUAL |
|---|---|---|---|---|---|---|---|---|---|
| GW-4037-120401 | 4037 | 12/4/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | | U |
| GW-4037-032802 | 4037 | 3/28/02 | VINYL CHLORIDE (VC) | 0.5 | | 1 | UG/L | | * |
| GW-4038-011602 | 4038 | 1/16/02 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-4038-022202 | 4038 | 2/20/02 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-4038-120401 | 4038 | 12/4/01 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-4038-032802 | 4038 | 3/28/02 | 1,2-DICHLOROETHENE (DCE) | 1 | | 2 | UG/L | | * |
| GW-4038-032802 | 4038 | 3/28/02 | NITROBENZENE | 0.04 | | 0.08 | UG/L | | * |
| GW-4038-120401 | 4038 | 12/4/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | U |
| GW-4038-032802 | 4038 | 3/28/02 | TETRACHLOROETHENE | 0.44 | | 1 | UG/L | | * |
| GW-4038-022202 | 4038 | 2/20/02 | TETRACHLOROETHENE | 0.41 | | 1 | UG/L | | * |
| GW-4038-011602 | 4038 | 1/16/02 | TETRACHLOROETHENE | 0.44 | | 1 | UG/L | | * |
| GW-4038-120401 | 4038 | 12/4/01 | TETRACHLOROETHENE | 0.51 | | 1 | UG/L | | * |
| GW-4038-120401 | 4038 | 12/4/01 | TRICHLOROETHENE (TCE) | 27 | | 1 | UG/L | | * |
| GW-4038-011602 | 4038 | 1/16/02 | TRICHLOROETHENE (TCE) | 23 | | 1 | UG/L | | * |
| GW-4038-022202 | 4038 | 2/20/02 | TRICHLOROETHENE (TCE) | 27 | | 1 | UG/L | | * |
| GW-4038-032802 | 4038 | 3/28/02 | TRICHLOROETHENE (TCE) | 26 | | 1 | UG/L | | * |
| GW-4038-120401 | 4038 | 12/4/01 | VINYL CHLORIDE | 5 | | 10 | UG/L | | UJ |
| GW-4038-032802 | 4038 | 3/28/02 | VINYL CHLORIDE (VC) | 0.5 | | 1 | UG/L | | * |

# APPENDIX D

Quality Control Data

## MW-4035 SOIL SAMPLING QC DATA

| WSSRAP_ID | LOCATION | DATE_SAM | PARAMETER | CONC | ERR | DL | UNITS | VER_QUAL | VAL_QUAL | REV_QUAL | QCD_QUAL | COMMENTS | CATEGORY | QC_ID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SO-401001-03-MD | 401001 | 5/10/2001 | 1,1-DICHLOROETHENE | 56.1 | | | 6 UG/KG | | * | | 100 | %REC=93 RPD=1 | VOLATILES | MD |
| SO-401001-03-MD | 401001 | 5/10/2001 | BENZENE | 61.1 | | | 6 UG/KG | | * | | 100 | %REC=101 RPD=2 | VOLATILES | MD |
| SO-401001-03-MD | 401001 | 5/10/2001 | CHLOROBENZENE | 61.1 | | | 6 UG/KG | | * | | 100 | %REC=101 RPD=0 | VOLATILES | MD |
| SO-401001-03-MD | 401001 | 5/10/2001 | TOLUENE | 66.8 | | | 6 UG/KG | | * | | 100 | %REC=110 RPD=0 | VOLATILES | MD |
| SO-401001-03-MD | 401001 | 5/10/2001 | TRICHLOROETHENE | 52.3 | | | 6 UG/KG | | * | | 100 | %REC=86 RPD=0 | VOLATILES | MD |
| SO-401001-03-MS | 401001 | 5/10/2001 | 1,1-DICHLOROETHENE | 59.2 | | | 6.5 UG/KG | | * | | 100 | %REC=92 | VOLATILES | MS |
| SO-401001-03-MS | 401001 | 5/10/2001 | BENZENE | 63.5 | | | 6.5 UG/KG | | * | | 100 | %REC=99 | VOLATILES | MS |
| SO-401001-03-MS | 401001 | 5/10/2001 | CHLOROBENZENE | 65.4 | | | 6.5 UG/KG | | * | | 100 | %REC=102 | VOLATILES | MS |
| SO-401001-03-MS | 401001 | 5/10/2001 | TOLUENE | 71.3 | | | 6.5 UG/KG | | * | | 100 | %REC=111 | VOLATILES | MS |
| SO-401001-03-MS | 401001 | 5/10/2001 | TRICHLOROETHENE | 55.1 | | | 6.5 UG/KG | | * | | 100 | %REC=86 | VOLATILES | MS |
| SO-401001-04-FR | 401001 | 5/10/2001 | 1,1,1-TRICHLOROETHANE | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | 1,1,2,2-TETRACHLOROETHANE | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | 1,1,2-TRICHLOROETHANE | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | 1,1-DICHLOROETHANE | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | 1,1-DICHLOROETHENE | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | 1,2-DICHLOROETHANE | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | 1,2-DICHLOROETHENE (TOTAL) | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | 1,2-DICHLOROPROPANE | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | 2-BUTANONE | 0 | | | 13 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | 2-HEXANONE | 0 | | | 13 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | 4-METHYL-2-PENTANONE | 0 | | | 13 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | ACETONE | 11 | | | 13 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | BENZENE | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | BROMODICHLOROMETHANE | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | BROMOFORM | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | BROMOMETHANE | 0 | | | 13 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | CARBON DISULFIDE | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | CARBON TETRACHLORIDE | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | CHLOROBENZENE | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | CHLOROETHANE | 0 | | | 13 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | CHLOROFORM | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | CHLOROMETHANE | 0 | | | 13 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | CIS-1,3-DICHLOROPROPENE | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | DIBROMOCHLOROMETHANE | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | ETHYL BENZENE | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | METHYLENE CHLORIDE | 6 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | PERCENT SOLID | 80.5 | | | 0.01 PRCNT | | * | | 10 | | MISC. | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | STYRENE | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | TETRACHLOROETHENE | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | TOLUENE | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | TRANS-1,3-DICHLOROPROPENE | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | TRICHLOROETHENE | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | VINYL CHLORIDE | 0 | | | 13 UG/KG | | * | | 10 | | VOLATILES | FR |
| SO-401001-04-FR | 401001 | 5/10/2001 | XYLENES, TOTAL | 0 | | | 6 UG/KG | | * | | 10 | | VOLATILES | FR |

| WSSRAP_ID | LOCATION | DATE_SAM | PARAMETER | CONC | ERR | DL | UNITS | COMMENTS | QC_ID |
|---|---|---|---|---|---|---|---|---|---|
| GW-3030-022801-MS | 3030 | 2/28/01 | 1,1-DICHLOROETHENE | 9.42 | | 1 | UG/L | %REC = 92 | MS |
| GW-3030-W2701-MD | 3030 | 9/19/01 | 1,1-DICHLOROETHENE | 121 | | 10 | UG/L | %REC = 121; RPD = 12 | MD |
| GW-3030-W2701-MS | 3030 | 9/19/01 | 1,1-DICHLOROETHENE | 108 | | 10 | UG/L | %REC = 108 | MS |
| GW-3030-W201-MD | 3030 | 3/26/01 | 1,1-DICHLOROETHENE | 87.5 | | 10 | UG/L | %REC = 88; RPD = 7.1 | MD |
| GW-3030-W201-MS | 3030 | 3/26/01 | 1,1-DICHLOROETHENE | 93.9 | | 10 | UG/L | %REC = 94 | MS |
| GW-3030-022801- | 3030 | 2/28/01 | 1,1-DICHLOROETHENE | 8.51 | | 1 | UG/L | %REC = 83; RPD = 10 | MD |
| GW-3030-W2701-FR | 3030 | 9/19/01 | 1,2-DICHLOROETHENE (DCE) | 14 | | 20 | UG/L | | FR |
| GW-3030-W201-FR | 3030 | 3/26/01 | 1,2-DICHLOROETHENE (DCE) | 8.4 | | 10 | UG/L | | FR |
| GW-3030-W201-MD | 3030 | 3/26/01 | 1,4-DICHLOROBENZENE | 106 | | 10 | UG/L | %REC = 106; RPD = 1.4 | MD |
| GW-3030-022801-MS | 3030 | 2/28/01 | 1,4-DICHLOROBENZENE | 10.5 | | 1 | UG/L | %REC = 105 | MS |
| GW-3030-W201-MS | 3030 | 3/26/01 | 1,4-DICHLOROBENZENE | 107 | | 10 | UG/L | %REC = 107 | MS |
| GW-3030-W2701-MD | 3030 | 9/19/01 | 1,4-DICHLOROBENZENE | 105 | | 10 | UG/L | %REC = 105; RPD = 4.4 | MD |
| GW-3030-W2701-MS | 3030 | 9/19/01 | 1,4-DICHLOROBENZENE | 100 | | 10 | UG/L | %REC = 100 | MS |
| GW-3030-022801- | 3030 | 2/28/01 | 1,4-DICHLOROBENZENE | 9.95 | | 1 | UG/L | %REC = 100; RPD = 5.6 | MD |
| GW-3030-022801- | 3030 | 2/28/01 | BENZENE | 10 | | 1 | UG/L | %REC = 100; RPD = 1.1 | MD |
| GW-3030-022801-MS | 3030 | 2/28/01 | BENZENE | 10.1 | | 1 | UG/L | %REC = 101 | MS |
| GW-3030-W201-MS | 3030 | 3/26/01 | BENZENE | 99.2 | | 10 | UG/L | %REC = 99 | MS |
| GW-3030-W2701-MD | 3030 | 9/19/01 | BENZENE | 117 | | 10 | UG/L | %REC = 117; RPD = 6.5 | MD |
| GW-3030-W2701-MS | 3030 | 9/19/01 | BENZENE | 110 | | 10 | UG/L | %REC = 110 | MS |
| GW-3030-W201-MD | 3030 | 3/26/01 | BENZENE | 95.8 | | 10 | UG/L | %REC = 96; RPD = 3.4 | MD |
| GW-3030-W201-MS | 3030 | 3/26/01 | CHLOROBENZENE | 118 | | 10 | UG/L | %REC = 118 | MS |
| GW-3030-W2701-MS | 3030 | 9/19/01 | CHLOROBENZENE | 102 | | 10 | UG/L | %REC = 102 | MS |
| GW-3030-W201-MD | 3030 | 3/26/01 | CHLOROBENZENE | 115 | | 10 | UG/L | %REC = 115; RPD = 2.5 | MD |
| GW-3030-022801- | 3030 | 2/28/01 | CHLOROBENZENE | 9.58 | | 1 | UG/L | %REC = 96; RPD = 2.1 | MD |
| GW-3030-022801-MS | 3030 | 2/28/01 | CHLOROBENZENE | 9.78 | | 1 | UG/L | %REC = 98 | MS |
| GW-3030-W2701-MD | 3030 | 9/19/01 | CHLOROBENZENE | 99.9 | | 10 | UG/L | %REC = 100; RPD = 2.3 | MD |
| GW-3030-W201-MD | 3030 | 3/26/01 | NITROBENZENE | 1.18 | | 0.03 | UG/L | %REC = 59; RPD = 6.3 | MD |
| GW-3030-022801- | 3030 | 2/28/01 | NITROBENZENE | 1.16 | | 0.03 | UG/L | %REC = 58; RPD = 6.8 | MD |
| GW-3030-022801-MS | 3030 | 2/28/01 | NITROBENZENE | 1.08 | | 0.2 | UG/L | %REC = 54 | MS |
| GW-3030-W201-MS | 3030 | 3/26/01 | NITROBENZENE | 1.11 | | 0.03 | UG/L | %REC = 56 | MS |
| GW-3030-W2701-MD | 3030 | 9/19/01 | NITROBENZENE | 0.734 | | 0.03 | UG/L | %REC = 37; RPD = 28 | MD |
| GW-3030-W2701-MS | 3030 | 9/19/01 | NITROBENZENE | 0.978 | | 0.03 | UG/L | %REC = 49 | MS |

| WSSRAP_ID | LOCATION | DATE_SAM | PARAMETER | CONC | ERR | DL | UNITS | COMMENTS | QC_ID |
|---|---|---|---|---|---|---|---|---|---|
| GW-3030-W2701-FR | 3030 | 9/19/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | FR |
| GW-3030-W201-FR | 3030 | 3/26/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | FR |
| GW-3030-W201-FR | 3030 | 3/26/01 | TETRACHLOROETHENE | 5 | | 10 | UG/L | | FR |
| GW-3030-W2701-FR | 3030 | 9/19/01 | TETRACHLOROETHENE | 5 | | 10 | UG/L | | FR |
| GW-3030-022801- | 3030 | 2/28/01 | TOLUENE | 9.61 | | 1 | UG/L | %REC = 96; RPD = 2.0 | MD |
| GW-3030-W201-MS | 3030 | 3/26/01 | TOLUENE | 109 | | 10 | UG/L | %REC = 109 | MS |
| GW-3030-W201-MD | 3030 | 3/26/01 | TOLUENE | 105 | | 10 | UG/L | %REC = 105; RPD = 3.2 | MD |
| GW-3030-W2701-MS | 3030 | 9/19/01 | TOLUENE | 105 | | 10 | UG/L | %REC = 105 | MS |
| GW-3030-W2701-MD | 3030 | 9/19/01 | TOLUENE | 103 | | 10 | UG/L | %REC = 103; RPD = 2.5 | MD |
| GW-3030-022801-MS | 3030 | 2/28/01 | TOLUENE | 9.81 | | 1 | UG/L | %REC = 98 | MS |
| GW-3030-W201-FR | 3030 | 3/26/01 | TRICHLOROETHENE (TCE) | 200 | | 10 | UG/L | | FR |
| GW-3030-W2701-MD | 3030 | 9/19/01 | TRICHLOROETHENE (TCE) | 357 | | 10 | UG/L | %REC = 94; RPD = 3.4 | MD |
| GW-3030-W2701-MS | 3030 | 9/19/01 | TRICHLOROETHENE (TCE) | 345 | | 10 | UG/L | %REC = 82 | MS |
| GW-3030-W2701-FR | 3030 | 9/19/01 | TRICHLOROETHENE (TCE) | 260 | | 10 | UG/L | | FR |
| GW-3030-W201-MD | 3030 | 3/26/01 | TRICHLOROETHENE (TCE) | 297 | | 10 | UG/L | %REC = 85; RPD = 6.9 | MD |
| GW-3030-022801- | 3030 | 2/28/01 | TRICHLOROETHENE (TCE) | 176 | | 1 | UG/L | %REC = 30; RPD = 0.84 | MD |
| GW-3030-022801-MS | 3030 | 2/28/01 | TRICHLOROETHENE (TCE) | 178 | | 1 | UG/L | %REC = 45 | MS |
| GW-3030-W201-MS | 3030 | 3/26/01 | TRICHLOROETHENE (TCE) | 318 | | 10 | UG/L | %REC = 106 | MS |
| GW-3032-022601- | 3032 | 2/26/01 | 1,1-DICHLOROETHENE | 9.5 | | 1 | UG/L | %REC = 95; RPD = 2.4 | MD |
| GW-3032-W501-MS | 3032 | 4/18/01 | 1,1-DICHLOROETHENE | 11.9 | | 1 | UG/L | %REC = 119 | MS |
| GW-3032-W501-MD | 3032 | 4/18/01 | 1,1-DICHLOROETHENE | 12.2 | | 1 | UG/L | %REC = 122; RPD = 2.6 | MD |
| GW-3032-022601-MS | 3032 | 2/26/01 | 1,1-DICHLOROETHENE | 9.7 | | 1 | UG/L | %REC = 97 | MS |
| GW-3032-W501-FR | 3032 | 4/18/01 | 1,2-DICHLOROETHENE (DCE) | 0.5 | | 1 | UG/L | | FR |
| GW-3032-W501-MD | 3032 | 4/18/01 | 1,4-DICHLOROBENZENE | 9.24 | | 1 | UG/L | %REC = 92; RPD = 2.9 | MD |
| GW-3032-W501-MS | 3032 | 4/18/01 | 1,4-DICHLOROBENZENE | 8.98 | | 1 | UG/L | %REC = 90 | MS |
| GW-3032-022601- | 3032 | 2/26/01 | 1,4-DICHLOROBENZENE | 9.98 | | 1 | UG/L | %REC = 100; RPD = 1.6 | MD |
| GW-3032-022601-MS | 3032 | 2/26/01 | 1,4-DICHLOROBENZENE | 9.82 | | 1 | UG/L | %REC = 98 | MS |
| GW-3032-022601-MS | 3032 | 2/26/01 | BENZENE | 9.74 | | 1 | UG/L | %REC = 98 | MS |
| GW-3032-W501-MS | 3032 | 4/18/01 | BENZENE | 9.17 | | 1 | UG/L | %REC = 92 | MS |
| GW-3032-W501-MD | 3032 | 4/18/01 | BENZENE | 9.53 | | 1 | UG/L | %REC = 95; RPD = 3.8 | MD |
| GW-3032-022601- | 3032 | 2/26/01 | BENZENE | 9.9 | | 1 | UG/L | %REC = 99; RPD = 1.6 | MD |
| GW-3032-022601-MS | 3032 | 2/26/01 | CHLOROBENZENE | 9.97 | | 1 | UG/L | %REC = 100 | MS |

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|---|---|---|---|---|---|---|---|---|---|
| GW-3032-W501-MD | 3032 | 4/18/01 | CHLOROBENZENE | 10.1 | | 1 | UG/L | %REC = 101; RPD = 4.5 | MD |
| GW-3032-W501-MS | 3032 | 4/18/01 | CHLOROBENZENE | 9.63 | | 1 | UG/L | %REC = 96 | MS |
| GW-3032-022601- | 3032 | 2/26/01 | CHLOROBENZENE | 9.43 | | 1 | UG/L | %REC = 94; RPD = 5.6 | MD |
| GW-3032-W501-MD | 3032 | 4/18/01 | NITROBENZENE | 1.19 | | 0.03 | UG/L | %REC = 60; RPD = 12 | MD |
| GW-3032-W501-FR | 3032 | 4/18/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | FR |
| GW-3032-022601-MS | 3032 | 2/26/01 | NITROBENZENE | 1.06 | | 0.03 | UG/L | %REC = 53 | MS |
| GW-3032-022601- | 3032 | 2/26/01 | NITROBENZENE | 1.07 | | 0.03 | UG/L | %REC = 54; RPD = 1.4 | MD |
| GW-3032-W501-MS | 3032 | 4/18/01 | NITROBENZENE | 1.05 | | 0.03 | UG/L | %REC = 53 | MS |
| GW-3032-W501-FR | 3032 | 4/18/01 | TETRACHLOROETHENE | 2 | | 1 | UG/L | | FR |
| GW-3032-022601-MS | 3032 | 2/26/01 | TOLUENE | 9.51 | | 1 | UG/L | %REC = 95 | MS |
| GW-3032-022601- | 3032 | 2/26/01 | TOLUENE | 9.44 | | 1 | UG/L | %REC = 95; RPD = 0.59 | MD |
| GW-3032-W501-MS | 3032 | 4/18/01 | TOLUENE | 9.18 | | 1 | UG/L | %REC = 92 | MS |
| GW-3032-W501-MD | 3032 | 4/18/01 | TOLUENE | 9.48 | | 1 | UG/L | %REC = 95; RPD = 3.3 | MD |
| GW-3032-022601-MS | 3032 | 2/26/01 | TRICHLOROETHENE (TCE) | 10.6 | | 1 | UG/L | %REC = 90 | MS |
| GW-3032-W501-MS | 3032 | 4/18/01 | TRICHLOROETHENE (TCE) | 10.8 | | 1 | UG/L | %REC = 92 | MS |
| GW-3032-W501-MD | 3032 | 4/18/01 | TRICHLOROETHENE (TCE) | 11 | | 1 | UG/L | %REC = 94; RPD = 1.6 | MD |
| GW-3032-022601- | 3032 | 2/26/01 | TRICHLOROETHENE (TCE) | 11.1 | | 1 | UG/L | %REC = 95; RPD = 4.4 | MD |
| GW-3032-W501-FR | 3032 | 4/18/01 | TRICHLOROETHENE (TCE) | 1.6 | | 1 | UG/L | | FR |
| GW-4032-W3001-MS | 4032 | 10/10/01 | 1,1-DICHLOROETHENE | 52.1 | | 5 | UG/L | %REC = 104 | MS |
| GW-4032-W3001-MD | 4032 | 10/10/01 | 1,1-DICHLOROETHENE | 52.1 | | 5 | UG/L | %REC = 104; RPD = | MD |
| GW-4032-W3001-FR | 4032 | 10/10/01 | 1,2-DICHLOROETHENE (DCE) | 5 | | 10 | UG/L | | FR |
| GW-4032-W3001-MD | 4032 | 10/10/01 | 1,4-DICHLOROBENZENE | 51.9 | | 5 | UG/L | %REC = 104; RPD = | MD |
| GW-4032-W3001-MS | 4032 | 10/10/01 | 1,4-DICHLOROBENZENE | 51.8 | | 5 | UG/L | %REC = 104 | MS |
| GW-4032-W3001-MS | 4032 | 10/10/01 | BENZENE | 54.8 | | 5 | UG/L | %REC = 110 | MS |
| GW-4032-W3001-MD | 4032 | 10/10/01 | BENZENE | 54.8 | | 5 | UG/L | %REC = 110; RPD = | MD |
| GW-4032-W3001-MD | 4032 | 10/10/01 | CHLOROBENZENE | 52 | | 5 | UG/L | %REC = 104; RPD = | MD |
| GW-4032-W3001-MS | 4032 | 10/10/01 | CHLOROBENZENE | 51.9 | | 5 | UG/L | %REC = 104 | MS |
| GW-4032-W3001-MS | 4032 | 10/10/01 | NITROBENZENE | 0.844 | | 0.03 | UG/L | %REC = 42 | MS |
| GW-4032-W3001-MD | 4032 | 10/10/01 | NITROBENZENE | 0.834 | | 0.03 | UG/L | %REC = 42; RPD = 1.2 | MD |
| GW-4032-W3001-FR | 4032 | 10/10/01 | NITROBENZENE | 0.015 | | 0.03 | UG/L | | FR |
| GW-4032-W3001-FR | 4032 | 10/10/01 | TETRACHLOROETHENE | 2.5 | | 5 | UG/L | | FR |
| GW-4032-W3001-MS | 4032 | 10/10/01 | TOLUENE | 51 | | 5 | UG/L | %REC = 102 | MS |

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| GW-4032-W3001-MD | 4032 | 10/10/01 | TOLUENE | 50.6 | | 5 | UG/L | %REC = 101; RPD = | MD |
| GW-4032-W3001-FR | 4032 | 10/10/01 | TRICHLOROETHENE (TCE) | 140 | | 5 | UG/L | | FR |
| GW-4032-W3001-MD | 4032 | 10/10/01 | TRICHLOROETHENE (TCE) | 170 | | 5 | UG/L | %REC = 79; RPD = 0.64 | MD |
| GW-4032-W3001-MS | 4032 | 10/10/01 | TRICHLOROETHENE (TCE) | 171 | | 5 | UG/L | %REC = 81 | MS |
| GW-4035-060601-MS | 4035 | 6/6/01 | 1,1-DICHLOROETHENE | 11.6 | | 1 | UG/L | %REC = 116 | MS |
| GW-4035-060601- | 4035 | 6/6/01 | 1,1-DICHLOROETHENE | 12.3 | | 1 | UG/L | %REC = 123; RPD = 6.1 | MD |
| GW-4035-060601-MS | 4035 | 6/6/01 | 1,4-DICHLOROBENZENE | 8.64 | | 1 | UG/L | %REC = 86 | MS |
| GW-4035-060601- | 4035 | 6/6/01 | 1,4-DICHLOROBENZENE | 9.9 | | 1 | UG/L | %REC = 99; RPD = 14 | MD |
| GW-4035-060601- | 4035 | 6/6/01 | BENZENE | 10.4 | | 1 | UG/L | %REC = 104; RPD = 8.5 | MD |
| GW-4035-060601-MS | 4035 | 6/6/01 | BENZENE | 9.55 | | 1 | UG/L | %REC = 96 | MS |
| GW-4035-060601-MS | 4035 | 6/6/01 | CHLOROBENZENE | 9.18 | | 1 | UG/L | %REC = 92 | MS |
| GW-4035-060601- | 4035 | 6/6/01 | CHLOROBENZENE | 10.4 | | 1 | UG/L | %REC = 104; RPD = 12 | MD |
| GW-4035-060601- | 4035 | 6/6/01 | NITROBENZENE | 0.614 | | 0.03 | UG/L | %REC = 31; RPD = 1.2 | MD |
| GW-4035-060601-MS | 4035 | 6/6/01 | NITROBENZENE | 0.606 | | 0.03 | UG/L | %REC = 30 | MS |
| GW-4035-060601- | 4035 | 6/6/01 | TOLUENE | 11 | | 1 | UG/L | %REC = 110; RPD = 8.9 | MD |
| GW-4035-060601-MS | 4035 | 6/6/01 | TOLUENE | 10.1 | | 1 | UG/L | %REC = 101 | MS |
| GW-4035-060601- | 4035 | 6/6/01 | TRICHLOROETHENE (TCE) | 9.77 | | 1 | UG/L | %REC = 98; RPD = 7.6 | MD |
| GW-4035-060601-MS | 4035 | 6/6/01 | TRICHLOROETHENE (TCE) | 9.06 | | 1 | UG/L | %REC = 91 | MS |
| GW-4037-032802-MS | 4037 | 3/28/02 | 1,1,1-TRICHLOROETHANE | 11.5 | | 1 | UG/L | %REC = 115 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | 1,1,1-TRICHLOROETHANE | 10.5 | | 1 | UG/L | %REC = 105; RPD = 9.1 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | 1,1,2,2- | 7.39 | | 1 | UG/L | %REC = 74 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | 1,1,2,2- | 7.22 | | 1 | UG/L | %REC = 72; RPD = 2.4 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | 1,1,2-TRICHLOROETHANE | 8.05 | | 1 | UG/L | %REC = 81 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | 1,1,2-TRICHLOROETHANE | 8.08 | | 1 | UG/L | %REC = 81; RPD = 0.31 | MD |
| GW-4037-032802- | 4037 | 3/28/02 | 1,1-DICHLOROETHANE | 9.03 | | 1 | UG/L | %REC = 90; RPD = 6.3 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | 1,1-DICHLOROETHANE | 9.62 | | 1 | UG/L | %REC = 96 | MS |
| GW-4037-032802-MS | 4037 | 3/28/02 | 1,1-DICHLOROETHENE | 11.9 | | 1 | UG/L | %REC = 119 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | 1,1-DICHLOROETHENE | 11.2 | | 1 | UG/L | %REC = 112; RPD = 5.8 | MD |
| GW-4037-032802- | 4037 | 3/28/02 | 1,2-DICHLOROBENZENE | 9.56 | | 1 | UG/L | %REC = 96; RPD = 2.1 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | 1,2-DICHLOROBENZENE | 9.77 | | 1 | UG/L | %REC = 98 | MS |
| GW-4037-032802-MS | 4037 | 3/28/02 | 1,2-DICHLOROETHANE | 8.71 | | 1 | UG/L | %REC = 87 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | 1,2-DICHLOROETHANE | 8 | | 1 | UG/L | %REC = 80; RPD = 8.5 | MD |

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| GW-4037-032802- | 4037 | 3/28/02 | 1,2-DICHLOROETHENE (DCE) | 19 | | 2 | UG/L | %REC = 95; RPD = 2.8 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | 1,2-DICHLOROETHENE (DCE) | 19.5 | | 2 | UG/L | %REC = 98 | MS |
| GW-4037-032802-MS | 4037 | 3/28/02 | 1,2-DICHLOROPROPANE | 8.76 | | 1 | UG/L | %REC = 88 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | 1,2-DICHLOROPROPANE | 7.9 | | 1 | UG/L | %REC = 79; RPD = 10 | MD |
| GW-4037-032802- | 4037 | 3/28/02 | 1,3-DICHLOROBENZENE | 9.8 | | 1 | UG/L | %REC = 98; RPD = 3.7 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | 1,3-DICHLOROBENZENE | 10.2 | | 1 | UG/L | %REC = 102 | MS |
| GW-4037-032802-MS | 4037 | 3/28/02 | 1,4-DICHLOROBENZENE | 9.92 | | 1 | UG/L | %REC = 99 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | 1,4-DICHLOROBENZENE | 9.6 | | 1 | UG/L | %REC = 96; RPD = 3.3 | MD |
| GW-4037-032802- | 4037 | 3/28/02 | 2-BUTANONE | 6.55 | | 5 | UG/L | %REC = 65; RPD = 20 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | 2-BUTANONE | 8 | | 5 | UG/L | %REC = 80 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | 2-HEXANONE | 6.5 | | 5 | UG/L | %REC = 65; RPD = 8.2 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | 2-HEXANONE | 7.05 | | 5 | UG/L | %REC = 71 | MS |
| GW-4037-032802-MS | 4037 | 3/28/02 | 4-METHYL-2-PENTANONE | 7.48 | | 5 | UG/L | %REC = 75 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | 4-METHYL-2-PENTANONE | 7.06 | | 5 | UG/L | %REC = 71; RPD = 5.8 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | ACETONE | 8.41 | | 2 | UG/L | %REC = 84 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | ACETONE | 7.4 | | 2 | UG/L | %REC = 74; RPD = 13 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | BENZENE | 9.66 | | 1 | UG/L | %REC = 97 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | BENZENE | 9.22 | | 1 | UG/L | %REC = 92; RPD = 4.7 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | BROMODICHLOROMETHANE | 9.52 | | 1 | UG/L | %REC = 95 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | BROMODICHLOROMETHANE | 8.73 | | 1 | UG/L | %REC = 87; RPD = 8.6 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | BROMOFORM | 8.82 | | 1 | UG/L | %REC = 88 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | BROMOFORM | 8.96 | | 1 | UG/L | %REC = 90; RPD = 1.5 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | BROMOMETHANE | 15.8 | | 2 | UG/L | %REC = 158 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | BROMOMETHANE | 14.3 | | 2 | UG/L | %REC = 143; RPD = 9.8 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | CARBON DISULFIDE | 12.9 | | 1 | UG/L | %REC = 129 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | CARBON DISULFIDE | 11.9 | | 1 | UG/L | %REC = 119; RPD = 8.1 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | CARBON TETRACHLORIDE | 11.8 | | 1 | UG/L | %REC = 118 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | CARBON TETRACHLORIDE | 10.6 | | 1 | UG/L | %REC = 106; RPD = 10 | MD |
| GW-4037-032802- | 4037 | 3/28/02 | CHLOROBENZENE | 9.17 | | 1 | UG/L | %REC = 92; RPD = 2.9 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | CHLOROBENZENE | 9.44 | | 1 | UG/L | %REC = 94 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | CHLOROETHANE | 11.7 | | 2 | UG/L | %REC = 117; RPD = 4.0 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | CHLOROETHANE | 12.2 | | 2 | UG/L | %REC = 122 | MS |

| WSSRAP_ID | LOCATION | DATE_SAM | PARAMETER | CONC | ERR | DL | UNITS | COMMENTS | QC_ID |
|---|---|---|---|---|---|---|---|---|---|
| GW-4037-032802-MS | 4037 | 3/28/02 | CHLOROFORM | 10.4 | | 1 | UG/L | %REC = 104 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | CHLOROFORM | 9.79 | | 1 | UG/L | %REC = 98; RPD = 5.8 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | CHLOROMETHANE | 11.2 | | 2 | UG/L | %REC = 112 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | CHLOROMETHANE | 11.6 | | 2 | UG/L | %REC = 116; RPD = 3.2 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | CIS-1,3-DICHLOROPROPENE | 8.5 | | 1 | UG/L | %REC = 85 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | CIS-1,3-DICHLOROPROPENE | 8.02 | | 1 | UG/L | %REC = 80; RPD = 5.8 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | DIBROMOCHLOROMETHANE | 9.42 | | 1 | UG/L | %REC = 94 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | DIBROMOCHLOROMETHANE | 8.95 | | 1 | UG/L | %REC = 89; RPD = 5.1 | MD |
| GW-4037-032802- | 4037 | 3/28/02 | ETHYL BENZENE | 9.81 | | 1 | UG/L | %REC = 98; RPD = 2.8 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | ETHYL BENZENE | 10.1 | | 1 | UG/L | %REC = 101 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | METHYLENE CHLORIDE | 7.4 | | 1 | UG/L | %REC = 74; RPD = 0.22 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | METHYLENE CHLORIDE | 7.42 | | 1 | UG/L | %REC = 74 | MS |
| GW-4037-032802-MS | 4037 | 3/28/02 | NITROBENZENE | 1.72 | | 0.2 | UG/L | %REC = 86 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | NITROBENZENE | 1.41 | | 0.2 | UG/L | %REC = 71; RPD = 20 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | TETRACHLOROETHENE | 10.2 | | 1 | UG/L | %REC = 102 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | TETRACHLOROETHENE | 9.85 | | 1 | UG/L | %REC = 98; RPD = 3.5 | MD |
| GW-4037-032802- | 4037 | 3/28/02 | TOLUENE | 9.81 | | 1 | UG/L | %REC = 98; RPD = 3.0 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | TOLUENE | 10.1 | | 1 | UG/L | %REC = 101 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | TRANS-1,3- | 8.66 | | 1 | UG/L | %REC = 87; RPD = 4.9 | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | TRANS-1,3- | 9.1 | | 1 | UG/L | %REC = 91 | MS |
| GW-4037-032802-MS | 4037 | 3/28/02 | TRICHLOROETHENE (TCE) | 14.2 | | 1 | UG/L | %REC = 89 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | TRICHLOROETHENE (TCE) | 13.2 | | 1 | UG/L | %REC = 79; RPD = 7.1 | MD |
| GW-4037-032802- | 4037 | 3/28/02 | VINYL CHLORIDE (VC) | 12.8 | | 2 | UG/L | %REC = 128; RPD = | MD |
| GW-4037-032802-MS | 4037 | 3/28/02 | VINYL CHLORIDE (VC) | 12.9 | | 2 | UG/L | %REC = 129 | MS |
| GW-4037-032802-MS | 4037 | 3/28/02 | XYLENES, TOTAL | 9.68 | | 1 | UG/L | %REC = 97 | MS |
| GW-4037-032802- | 4037 | 3/28/02 | XYLENES, TOTAL | 9.89 | | 1 | UG/L | %REC = 99; RPD = 2.1 | MD |