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PROPOSED GROUND WATER MANAGEMENT ZONE

FOR

KEYSTONE STEEL & WIRE COMPANY
BARTONVILLE, ILLINOIS

JULY 16, 1993

PREPARED BY:

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July 16, 1993

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1430050001 – Peoria Co.
Keystone Steel & Wire
ILD000714881
Subpart F

Gentlemen:

RE: People of the State of Illinois vs
Keystone Consolidated Industries, Inc.
Case No. 93 CH 000103

In accordance with Section XIX Notices of the Consent Order, enclosed is the Proposed Ground Water Management Zone document pursuant to Section VI, 28.A. of the Consent Order. Three copies of the document are being submitted to Mr. Lawrence Eastep and one copy each is being submitted to the remaining addressees. We are also sending one copy to Mr. Ken Lovett of the Illinois Environmental Protection Agency, Permit Section. Please contact me if additional copies are required.

Sincerely,

Robert E. Aten

Robert E. Aten
Vice President

cc: K. Lovett
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1.0 INTRODUCTION

This document is being submitted by Keystone Steel & Wire Company (Keystone) pursuant to Section VI, 28.A. of the Consent Order (Case No. 93 CH 000103) entered on July 2, 1993. This section of the Consent Order specified that within 15 days of the entry of the Consent Order, Keystone would submit to the Illinois Environmental Protection Agency (IEPA) a proposal pursuant to 35 Ill. Adm. Code 620.250 to establish a Ground Water Management Zone (GMZ). The Consent Order specifies that the proposal will, at a minimum:

i. Demonstrate that adequate corrective action measures are being undertaken in a timely and appropriate manner to mitigate groundwater contamination caused by the release of contaminants from the Keystone Property to the groundwater. The corrective action measures should be designed to achieve and maintain groundwater quality that will meet appropriate aquifer standards as defined in 35 Ill. Adm. Code Part 620.410 for a "Class I Aquifer" as defined in 35 Ill. Adm. Code 620.210 (hereinafter "Class I Standards");

ii. Use groundwater monitoring wells and other acceptable field sampling methods to delineate a physically defined three dimensional GMZ containing groundwater contaminants originating from the Keystone Property;

iii. Demonstrate that an adequate groundwater monitoring program has been developed to detect groundwater contamination originating from the Keystone Property above Class I standards beyond the GMZ, and meeting applicable ground water standards

within the GMZ pursuant to 35 Ill. Adm. Code 620.450(a), during corrective action;

iv. Contain appropriate criteria for terminating the groundwater remediation system;

v. Include adequate post-corrective action groundwater monitoring to verify that Class I standards are being met; and

vi. Require that groundwater quality be monitored quarterly and static water level measurements be collected monthly in accordance with an Agency approved sampling and analysis plan. The results shall be submitted to the Agency quarterly on Agency prescribed forms or electronic format. If, upon Agency concurrence that sufficient data has been collected, the sampling and reporting requirements may be reduced provided that an adequate data base is maintained to evaluate the effectiveness of the corrective measure.

1.1 BACKGROUND

On July 1, 1991, Keystone submitted to the Illinois Environmental Protection Agency (IEPA), as part of the Phase 2 Closure Plan, a proposal for remediation of on-site ground water impacted by volatile organic compounds (VOCs). The Phase 2 Closure Plan was resubmitted on February 1, 1992 in response to comments made by IEPA. Upon IEPA's request, the VOC remediation proposal was removed from the Phase 2 Closure Plan and the proposed Ground Water Remediation Program, including the sampling and analysis plan, was submitted to IEPA on June 15, 1992 as a separate document (Appendix A).

The proposed ground water remedial action plan included ground water capture and recovery using a network of purge wells, treatment of recovered ground water via air stripping,

and discharge of the treated ground water to surface water via the process cooling water system and existing wastewater treatment plant.

The preliminary design phase of the remedial action plan included an aquifer test and air stripping pilot study. This work confirmed the feasibility of the proposed treatment and provided a basis for design and implementation of the proposed air stripping system. A report summarizing the results of the aquifer test and air stripping pilot study was submitted to IEPA on November 6, 1992 (Appendix B). This report also contained the work plan, conceptual designs and expected performance capability for the air stripping remediation system. The air and water discharge permit applications were also submitted in the aquifer test and air stripping pilot study report.

The detailed designs for the air stripping system were submitted to IEPA on February 22, 1993, prior to receipt of the air and water permits. Record Drawings will be submitted to IEPA upon completion of construction activities and air stripper start-up.

The air, water and construction permits have been received (Appendix C). They include:

- Joint Construction and Operating Permit issued by IEPA Division of Air Pollution Control, January 11, 1993
- Construction Permit issued by IEPA Division of Water Pollution Control, April 16, 1993
- Modified (NPDES) Permit issued by IEPA Division of Water Pollution Control, June 29, 1993

The construction of the air stripper remediation system is scheduled to start on July 12, 1993 and will be completed and in operation by February 28, 1994 (eight months after receipt of the Modified NPDES Permit) as specified in Section XII 46.A.ii. of the Consent Order.

2.0 PROPOSED GROUND WATER MANAGEMENT ZONE

The purpose of establishing the ground water management zone (GMZ) is to provide for alternative ground water standards during corrective action. The pump and treat (air stripping) remedial alternative has been field tested and proven to be effective for removing the VOC contaminants in the ground water (Appendix B). The air stripper pilot study demonstrated that the VOC contaminants can be removed to below Class I aquifer standards.

Volatile organic compounds were first detected in the ground water in the February 1988 samples. A ground water assessment plan was submitted in September 1988 and the approved plan was implemented in August 1989. The results of this field study were presented in the 1990 Ground Water Assessment Report submitted to IEPA in February 1991. This report is included in Appendix F of the Revised Phase 2 Closure Plan, which is also a part of the Consent Order.

Additional monitoring wells were installed in 1991 and 1992 to better define the plume of VOC contamination. Plate 2-1 in Appendix A shows the location of the wells that have been used to physically define the three dimensional GMZ that contains the VOC contaminant plume. The boring logs and well completion records for wells T-22 through T-25 are presented in Appendix D, as they were installed subsequent to completion of the Phase 2 Closure Plan and were not presented in that document.

2.1 DEFINITION OF GROUND WATER MANAGEMENT ZONE

The ground water flow direction and rate, and the migration of the contaminant plume were defined in the ground water assessment report (Appendix F of the Revised Phase 2 Closure Plan). A representative piezometric surface map showing the direction of ground water flow is presented on Figure 1. The ground water gradient and flow direction has remained relatively stable with only minor fluctuations in water levels from quarter to quarter.

The dominant VOC contaminants are trichloroethylene and 1,1,1-trichloroethane. Representative plume maps for these compounds and total VOCs are presented on Figures 2, 3, and 4. The extent of contamination and the concentrations of contaminants have been relatively stable throughout the ongoing field investigations.

The horizontal extent of the proposed GMZ is shown as the zero isopach line on Figure 5, which portrays the thickness of the VOC contaminant plume. The vertical extent of the GMZ is defined as the unconsolidated sediments from ground surface to the bedrock surface. Geologic cross sections through the GMZ are presented on Plates 1 and 2, which show the depth to bedrock varying from 16 to 104 feet.

The thickness of the plume of VOC contamination is also shown on Plates 1 and 2. The contaminants are predominantly contained in the sand and gravel aquifer located between the underlying bedrock and overlying Cahokia Alluvium (10 to 30 feet of fine grained silt, silty clay and clayey silt). The sand and gravel aquifer ranges from zero to over 75 feet in thickness. At the northern end of the GMZ, the sand and gravel is very coarse (boring logs T-19, T-23, and T-25 on Plate 1). In the southern two-thirds of the GMZ, the aquifer is finer grained, predominantly fine to medium sand with occasional gravel layers (boring logs T-10, T-3, T-7 and T-14 on Plate 2).

2.2 CORRECTIVE MEASURE MONITORING

The ground water monitoring plan for the air stripper corrective action plan was submitted to IEPA on June 15, 1992 in the Ground Water Remediation Program (Appendix A). However, subsequent to that submittal, additional monitoring wells have been installed and the lists of investigative wells and base wells have been revised. The current investigative wells, base wells, and upgradient well are:

- **Investigative Wells:** W-1D, W-2, W-3D, W-4D, T-1, T-2A, T-3, T-4A, T-4B, T-6A, T-6B, T-7B, T-9, T-10, T-11B, T-11C, T-13B, T-16, T-17, T-19C, T-20, and T-23

- **Base Wells:** T-2B, T-5A, T-5B, T-5C, T-6C, T-7A, T-8, T-11A, T-14, T-18, T-19A, T-19B, T-21, T-22A, T-22B, T-24, T-25A, and T-25B

- **Upgradient Well:** T-15

The purpose of the base wells is to monitor the spatial extent of the contaminant plume. These wells are located around the perimeter of the GMZ or above the contaminant plume within the GMZ.

The purpose of the investigative wells is to monitor the changes in VOC contamination during corrective action. It is expected that as the ground water withdrawal and cleanup activities progress, investigative wells will start to show that contaminant concentrations are below the cleanup objectives (Class I standards). Investigative wells will be reclassified as base wells when they have documented that contaminant levels are below Class I standards for four consecutive quarters.

2.2.1 Data Reduction, Analysis, and Evaluation

Investigative wells will be sampled quarterly and base wells will be sampled semiannually for VOCs, pH, specified conductivity, and temperature as discussed in Appendix A. Water level measurements will be obtained for all investigative and base wells on a monthly basis during the first year of remediation and quarterly during subsequent years (with IEPA concurrence).

A potentiometric surface map will be generated each month from water level measurements of all investigative and base wells to monitor the effect of the remediation

program on the ground water flow system through the first year of remediation, and quarterly during subsequent years.

Laboratory results and potentiometric surface maps will be sent, along with a discussion of the extent of contamination and rate of migration, to the IEPA on a quarterly basis. At the end of the first year of the remediation program, a summary report will be provided that will present an evaluation of the efficacy of the program. This report will include a statistical test of the annual mean concentration for trichloroethylene (TCE) and 1,1,1-trichloroethane (TCA) for each investigative well against the Class I ground water standard for the particular parameter at the 95 percent confidence limit and trend analyses utilizing least-squares regression, Mann-Kendall test, or a more appropriate technique. A significant difference will be declared between the annual mean concentration for a given parameter from an investigative well and the Class I ground water standard if the upper 95 percent confidence limit (UCL 95) for the annual mean exceeds the standard for that parameter. If a significant difference is declared for a given investigative well, subsequent quarterly data will be statistically evaluated on an annual basis until no significant difference is determined. If there is no statistically significant difference between the UCL 95 and the cleanup objective, the investigative well will be reclassified as a base well and will be considered, by definition, outside the plume of contamination.

A trend will be declared significant when the slope of the regression line is determined to be statistically significant. Slope analysis will be used only in a qualitative way, because during the course of the remediation both increasing and decreasing trends will likely occur in the data for any given well in response to external stress imposed on the aquifer during remediation.

If contaminants are detected in any of the base well samples, and the detection is confirmed by resampling, the well will be reclassified as an investigative well.

If data from all investigative and extraction wells are determined to be not significantly different from the Class I standards, remediation will be suspended. Quarterly sampling of the

investigative wells will be continued during the suspension period for one year. For the first quarter of the suspension period, the ground water samples will be analyzed for the parameters listed in 35 IAC 620.410. If data from these wells are not significantly different from the cleanup objectives, post-corrective action monitoring will be performed annually for a period of five years. If there have been no statistically significant exceedances of the Class I standards during post-corrective monitoring, the ground water remediation system will be terminated.

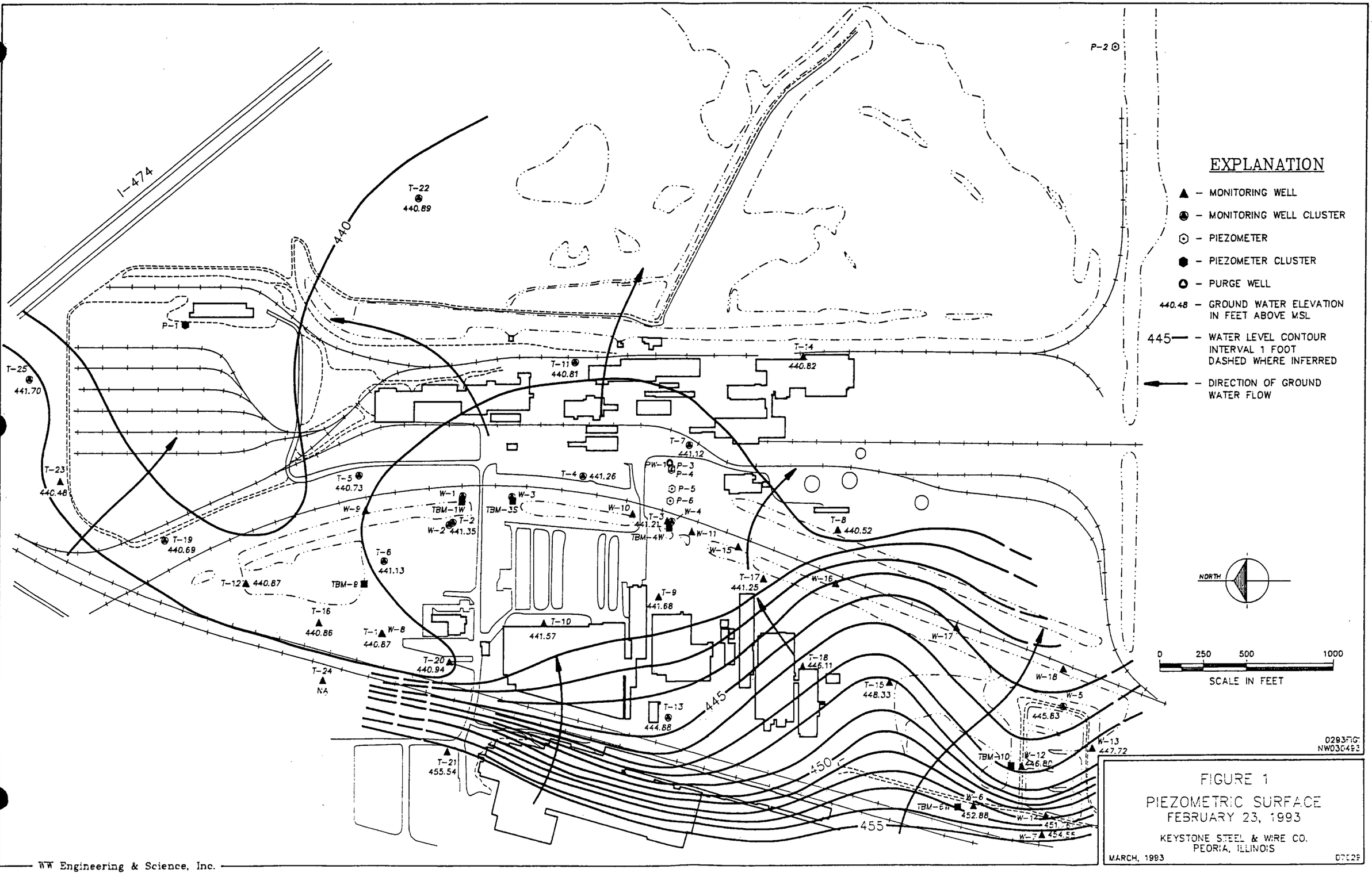
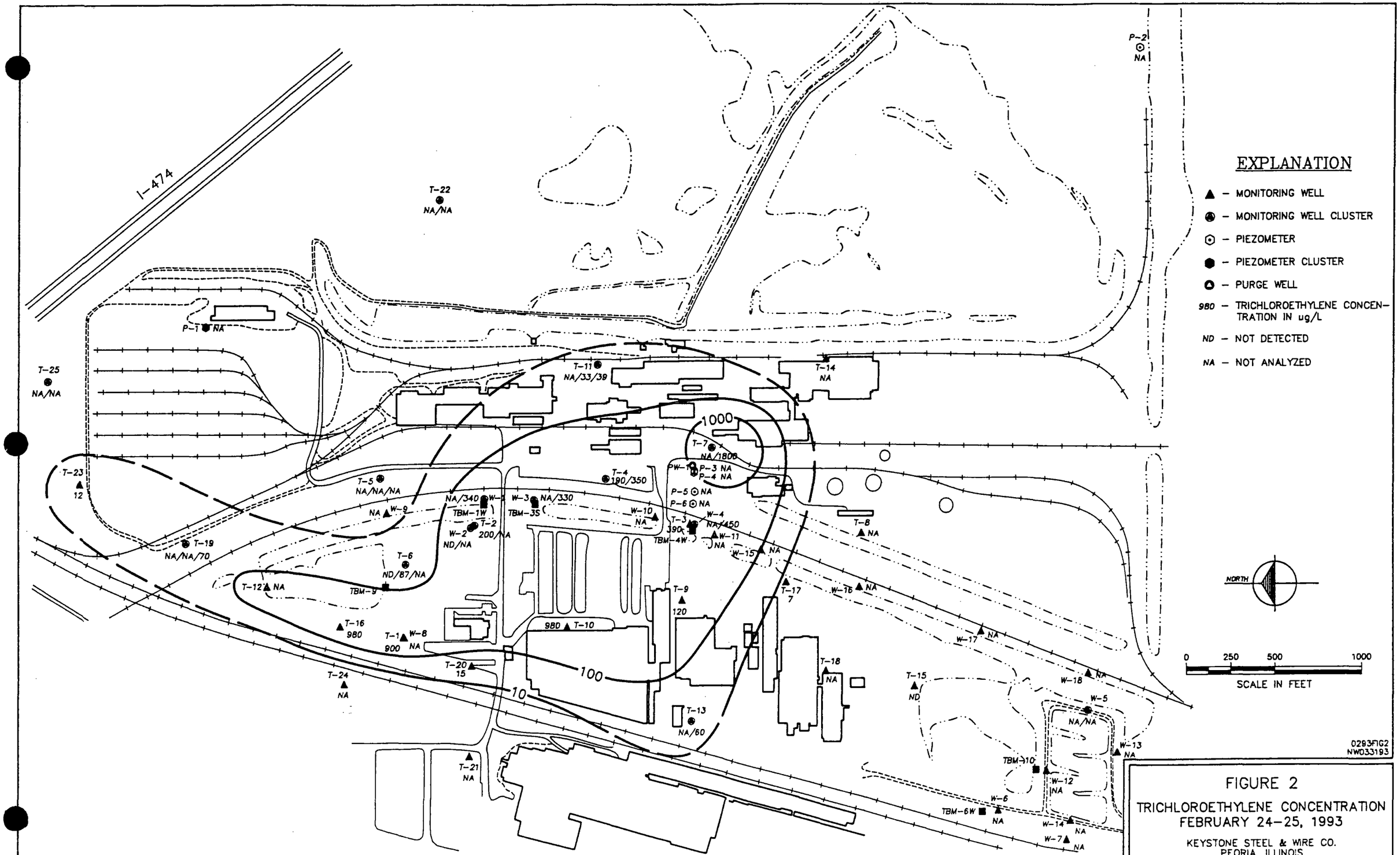


FIGURE 1

PIEZOMETRIC SURFACE
FEBRUARY 23, 1993

KEYSTONE STEEL & WIRE CO.
PEORIA, ILLINOIS

MARCH, 1993 07628



0293FIG2
NW033193

FIGURE 2

TRICHLOROETHYLENE CONCENTRATION
FEBRUARY 24–25, 1993

KEYSTONE STEEL & WIRE CO.
PEORIA, ILLINOIS

MARCH, 1993 07029

WW Engineering & Science, Inc.

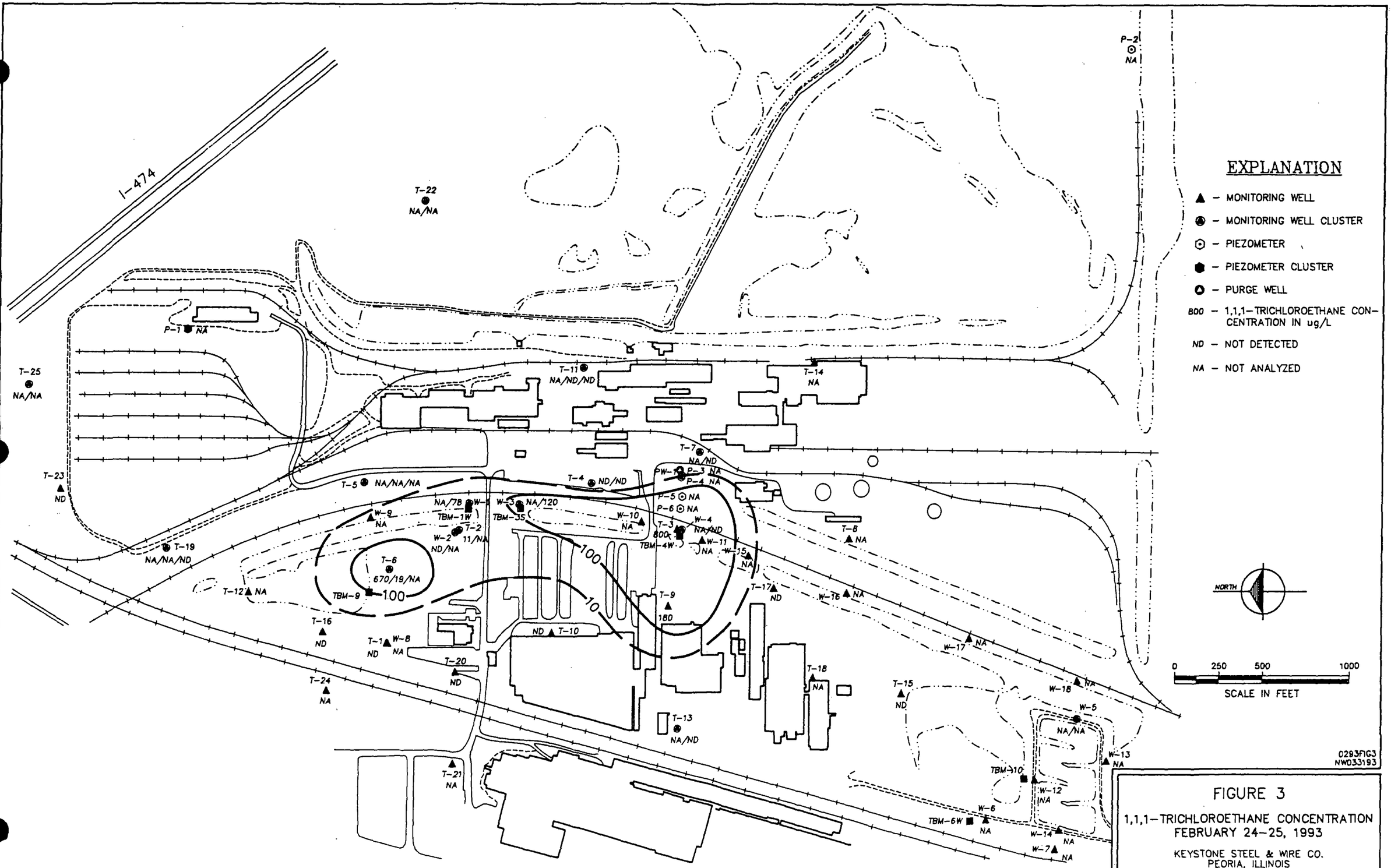
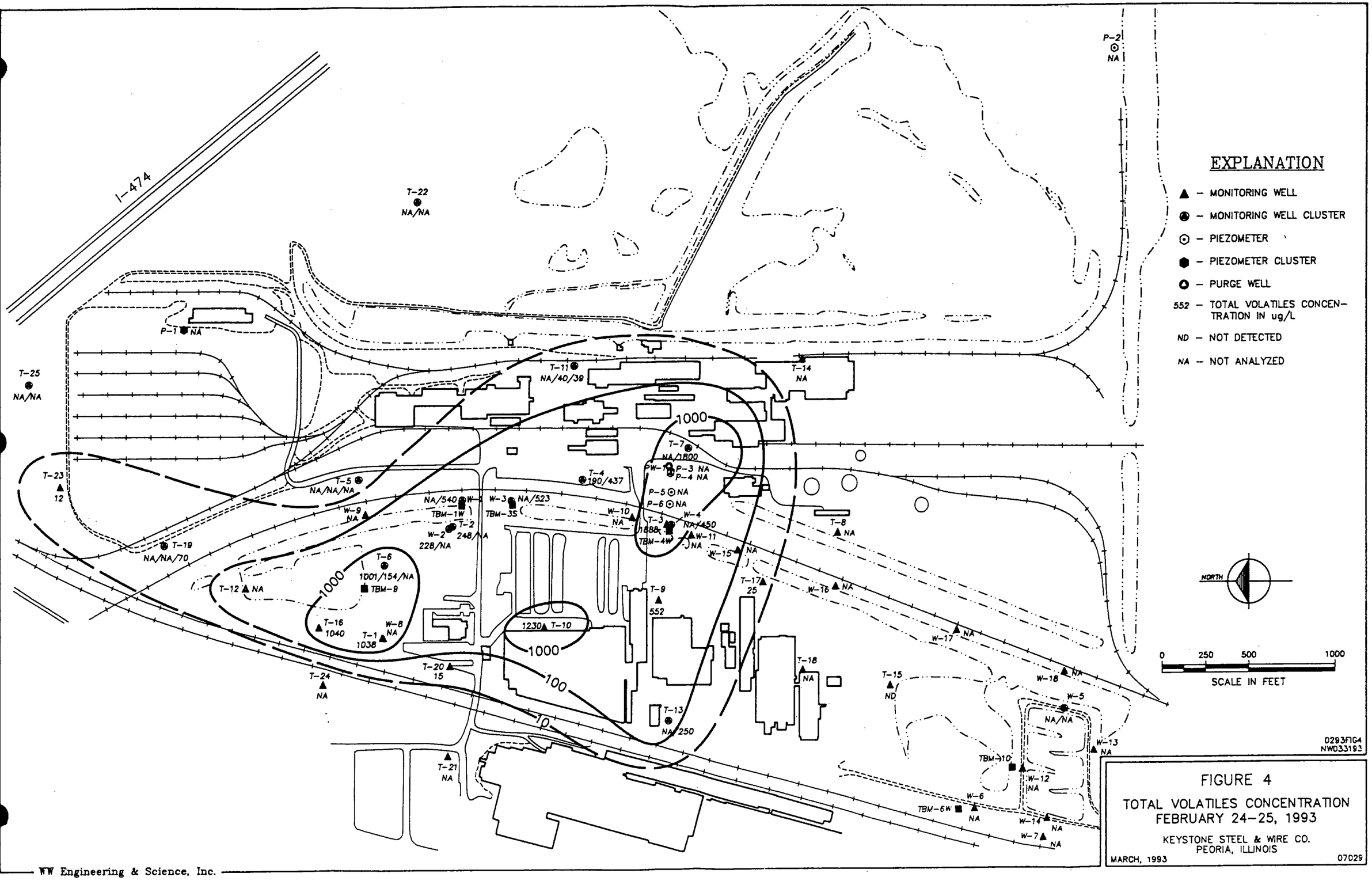


FIGURE 3

1,1,1–TRICHLOROETHANE CONCENTRATION
FEBRUARY 24–25, 1993

KEYSTONE STEEL & WIRE CO.
PEORIA, ILLINOIS

MARCH, 1993 07029



EXPLANATION

- ▲ – MONITORING WELL
- ◉ – MONITORING WELL CLUSTER
- ⊙ – PIEZOMETER
- ⬢ – PIEZOMETER CLUSTER
- ◘ – PURGE WELL
- 552 – TOTAL VOLATILES CONCENTRATION IN ug/L
- ND – NOT DETECTED
- NA – NOT ANALYZED

0293FIG4
NW033193

FIGURE 4

TOTAL VOLATILES CONCENTRATION
FEBRUARY 24–25, 1993

KEYSTONE STEEL & WIRE CO.
PEORIA, ILLINOIS

MARCH, 1993 07029

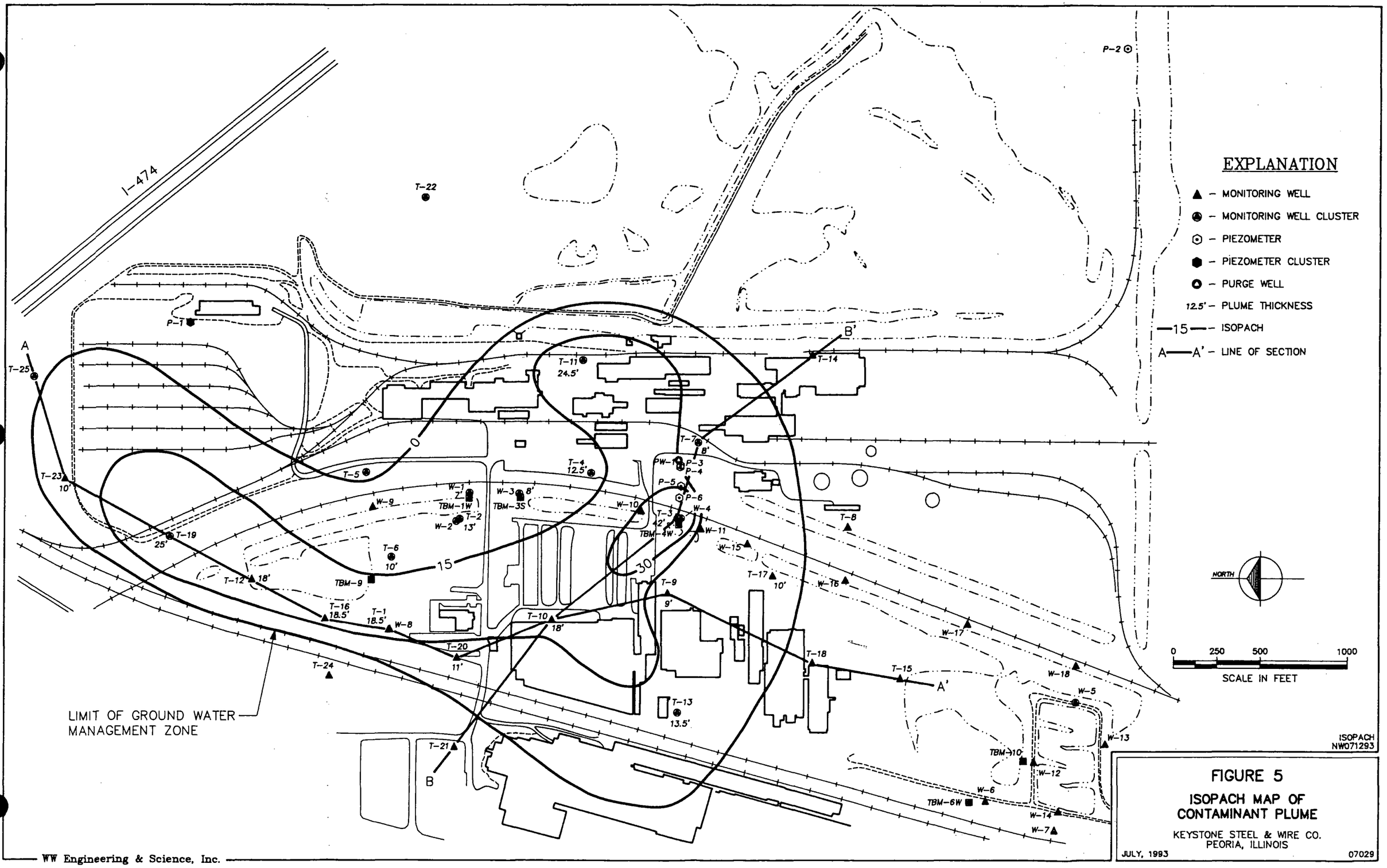


FIGURE 5

ISOPACH MAP OF CONTAMINANT PLUME

KEYSTONE STEEL & WIRE CO.
PEORIA, ILLINOIS

JULY, 1993 07029

A

A'

Elevation (ft msl)

480
470
460
450
440
430
420
410
400
390
380
370
360
350

T-25
SILT LOAM
SAND, M-C
MUDDY SANDY GRAVEL
PEAT
MUDDY SANDY GRAVEL
SILT LOAM
SILTY CLAY LOAM
SAND, F-M
MUDDY SANDY GRAVEL
PEBBLE GRAVEL
SILTY CLAY LOAM
PEBBLE GRAVEL
SAND, F-M
SHALE
TD 95.5'

T-25A

T-25B

T-23
SILTY CLAY LOAM
LOAM
MUDDY SANDY GRAVEL
SAND, F-M, PEBBLY
MUDDY SANDY GRAVEL
SANDY GRAVEL
SAND, C, PEBBLY
SAND, C, PEBBLY, TO SANDY GRAVEL
SHALE
TD 87.5'

T-19
FILL
SILT LOAM
SAND & GRAVEL
LOAM
GRAVEL
SILT LOAM
SILTY CLAY LOAM
SILT LOAM
LOAM
SILT LOAM
SAND & GRAVEL
SAND, F-C, PEBBLY
SAND, M
SAND & GRAVEL
SAND, C, PEBBLY
SAND & GRAVEL
SILTY CLAY LOAM
LOAM
SAND & GRAVEL
SAND, M-C, PEBBLY
SAND & GRAVEL
SHALE
TD 71.2'

T-19A

T-19B

T-19C

T-12
SANDY SILT
SILTY CLAY LOAM
SANDY LOAM
SAND, M
SANDY GRAVEL
SHALE
TD 38.0'

T-16
TOPSOIL
SILTY CLAY
SANDY LOAM
SILTY CLAY
CLAY
SAND, M-C
SAND & GRAVEL
GRAVEL
SHALE
TD 42.5'

T-1
FILL
CLAY LOAM
SILT LOAM
SILTY CLAY LOAM
SILT LOAM
SAND, F-C
SAND & GRAVEL
SHALE
TD 50.0'

T-20
FILL
LOAM
SILTY CLAY LOAM
LOAM
SILTY CLAY LOAM
CLAY
SILT LOAM
CLAY
SILTY CLAY LOAM
SILT LOAM
SILTY CLAY LOAM
SAND, M-C
SAND & GRAVEL
SHALE
TD 48.6'

T-10
FILL
SILT LOAM
SILTY CLAY LOAM
CLAYEY SILT
SAND, F-M
CLAYEY SILT
SAND, F-M
SAND, M
CLAYEY SILT
SAND, F-M
CLAYEY SILT
SILTY CLAY
SAND, F-M
SHALE
TD 42.0'

T-9
FILL
CLAYEY SILT
CINDERS
SLUDGE
SILTY CLAY
CLAYEY SILT
SAND, F
SILT
SAND, M
SILT
SAND, M-C
CLAYEY SILT
SAND & GRAVEL
SHALE
TD 36.5'

T-18
LOAM
CINDERS
LOAM, PEBBLY
SAND, M-C
LOAM
SILT LOAM
LOAM
SILTY CLAY LOAM
SILT LOAM
SHALE
TD 32.1'

T-15
SILTY CLAY
SAND, M-C
SILTY CLAY
SILTY CLAY LOAM, PEBBLY
SHALE
TD 21.5'

0 200 400 Feet
Horizontal Scale

EXPLANATION

Sand and Gravel Aquifer Contaminated with Volatile Organic Compounds

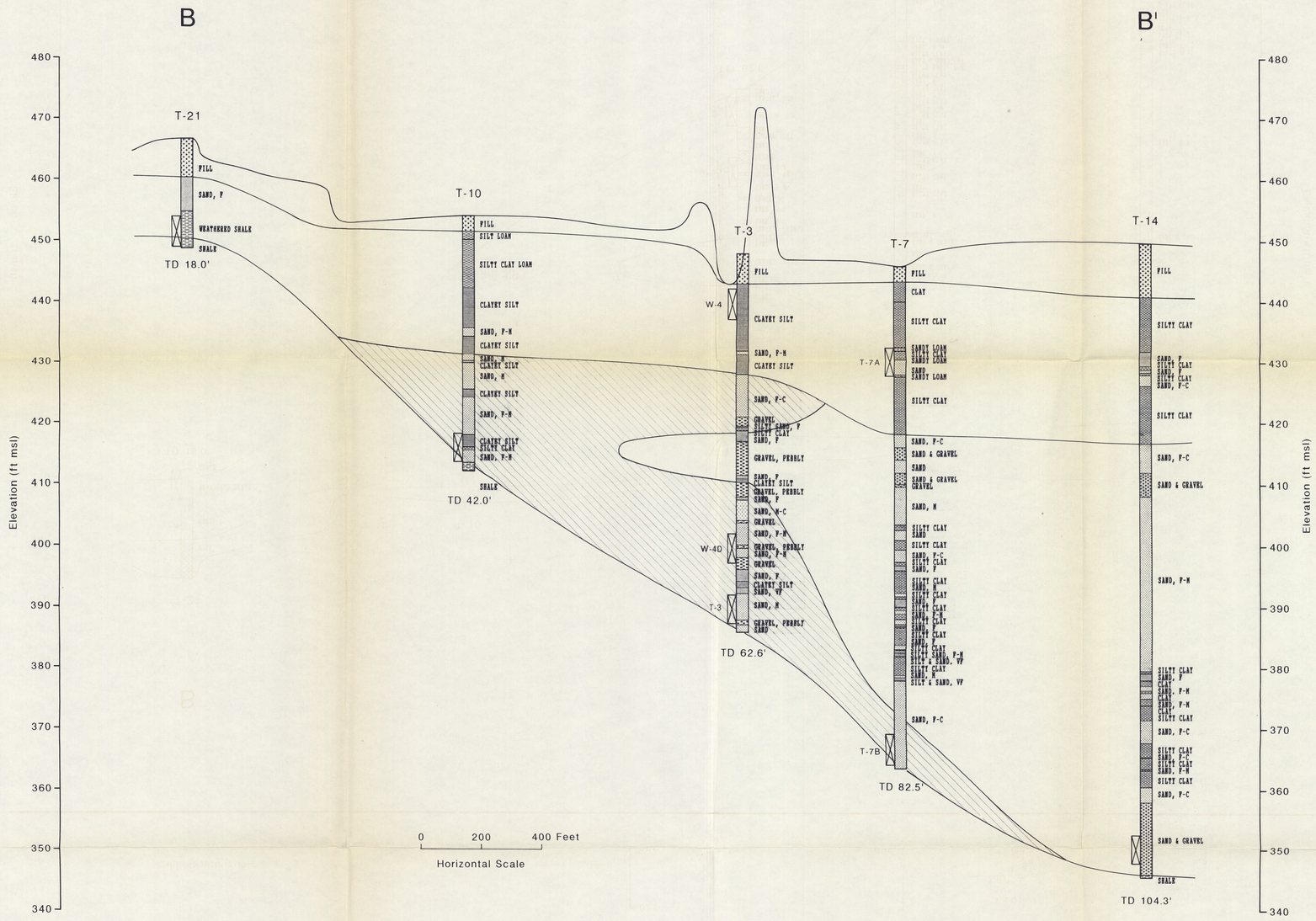
NOTE: Refer to Figure 5 for cross section location.

KEYSTONE STEEL & WIRE COMPANY

PLATE 1 - GEOLOGIC CROSS SECTION A-A'

Drawn By	Date
NW	07/12/93
Checked By	Date

WW Engineering & Science
A Summit Company



EXPLANATION

Sand and Gravel Aquifer Contaminated with Volatile Organic Compounds

NOTE: Refer to Figure 5 for cross section location.

KEYSTONE STEEL & WIRE COMPANY

PLATE 2 - GEOLOGIC CROSS SECTION B-B'

Drawn By	Date
NW	07/12/93
Checked By	Date

WW Engineering & Science
A Summit Company

APPENDIX A

GROUND WATER REMEDIATION PROGRAM

FOR

KEYSTONE STEEL & WIRE COMPANY
BARTONVILLE, ILLINOIS

JUNE 15, 1992

PREPARED BY:

WW ENGINEERING & SCIENCE, INC.
5010 STONE MILL ROAD
BLOOMINGTON, INDIANA 47408

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B	Air Permit Application for the Mobile Pilot air Stripping System
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SECTION 1

1.0 PURPOSE

The Ground Water Remediation Program was originally submitted on July 1, 1991 as a part of the Phase 2 Closure Plan in accordance with the direction received during a meeting with the Illinois Environmental Protection Agency (IEPA) and Keystone Steel & Wire Company (Keystone) on March 30, 1990, and with the conditions and modifications specified by the IEPA in letters dated August 10 and October 31, 1990. The IEPA disapproved Keystone's July 1, 1991 submittal in a letter dated September 24, 1991, and this Remediation Program is being submitted in response to that denial letter.

The results of a ground water sampling event conducted February 17 and 18, 1988 indicated that the ground water under the Keystone property was contaminated with volatile organic compounds (VOCs), particularly trichloroethylene (TCE), as well as other chlorinated organic compounds such as 1,1,1-trichloroethane (TCA).

The objectives of the ground water monitoring and remediation program are to: (1) summarize existing analytical results that define the types and levels of contaminants present in ground water; (2) describe the ongoing ground water assessment program and evaluation procedures used to determine the rate, extent, and concentrations of VOCs in the ground water and to document the effectiveness of the remedial action alternative selected; and (3) present the most cost-effective, environmentally sound, and technically feasible ground water remedial action alternative for the volatile organic contamination.

SECTION 2

2.0 DESCRIPTION OF FACILITY

2.1 Location of Facility

Keystone operates a manufacturing complex in the small community of Bartonville, which is situated just south of Peoria, Illinois, approximately one-half mile west of the Illinois River. The site is located within Sections 25 and 36 of Township 8 North, Range 7 East, and Sections 30 and 31 of Township 8 North, Range 8 East. The regional location map for Bartonville is shown as Figure 2-1, and the location of Keystone's property is shown on Figure 2-2. The approximate area of the complex where ground water contamination has been documented is shown on Figure 2-3.

2.2 Facility Site Plan

The Facility Site Plan Map (Plate 2-1) provides the following details: unit boundaries; establishment of a site bench mark (BM) coordinate system; temporary bench marks (TBMs) for surface water level measurements; identification and location of all monitoring wells, piezometers, production wells, and boring locations; and local ground water flow direction as requested in the IEPA approval letter of August 10, 1990. A description of site BMs and their surveyed locations are presented in Table 2-1.

KEYSTONE STEEL & WIRE COMPANY

WW Engineering & Science
GEOSCIENCES
427 North Morton Street
Bloomington, Indiana 47404 • (812) 336-0072

Drawn By: MW	Date: 6-6-91
Checked By	Date

PLATE 2-1
FACILITY SITE PLAN MAP

EXPLANATION

- T-9 — Monitoring Well - AD-Series Wells Installed 1990; CL-Series Wells Installed 1991; T-Series Wells Installed 1989-1992; W-Series Wells Installed 1986-1988
- P-2 — Piezometer - Installed 1990
- TBM-4 — Temporary Bench Mark for Surface Water Level Measurements
- 8 — Sludge Sampling Site - KS Series Samples
- Soil Sampling Site
- RR-5 — Soil Sampling Site from Bottom of Retention Reservoir
- BG-5 — Background Soil Sampling Site
- B-3 — Soil Boring
- K-14 — Production Well
- BM-3 — Bench Mark
- Local Ground Water Flow Direction
- Hazardous and Solid Waste Management Closure Unit

0 100 200 400 Feet

PHOTOGRAMMETRIC COMPILATION BY ACCLAIM SURVEYS, INC., STROUD, INDIANA (1990-1991)

TABLES

TABLE 2-1

LOCATION OF SITE BENCH MARKS AND TEMPORARY BENCH MARKS

ESTABLISHED SITE BENCH MARKS				
BM NUMBER	NORTHING (FEET)	EASTING (FEET)	ELEVATION (FEET)	DESCRIPTION
BM-3	16486.23	7824.45	461.85	Pump House #3 Floor
BM-8	20024.19	9804.04	448.15	RR Spike Power Pole
BM-10	18236.47	9799.48	451.37	SW Bolt Power Pole
BM-12	18523.71	8274.61	462.66	RR Spike Power Pole
BM-15	16228.36	7729.54	460.13	RR Spike Power Pole
BM-101	16341.97	10830.55	458.58	RR Spike Power Pole
BM-103	21019.03	10483.31	448.53	RR Spike Power Pole

TEMPORARY SURFACE WATER BENCH MARKS			
TBM NUMBER	NORTHING (FEET)	EASTING (FEET)	ELEVATION (FEET)
TBM-1E	20118.46	9586.06	449.27
TBM-1W	20120.36	9582.43	447.89
TBM-3S	19821.01	9581.40	449.02
TBM-4E	18912.78	9444.44	452.28
TBM-4W	18918.57	9440.30	449.19
TBM-6W	17219.31	7834.25	459.60
TBM-9	20686.86	9100.99	446.88
TBM-10	16909.05	8071.59	449.98
TBM-11	18024.73	12333.30	447.22

FIGURES

SCALE: 1" = 12 MILES

0 12 24 36 48 60 72 MILES

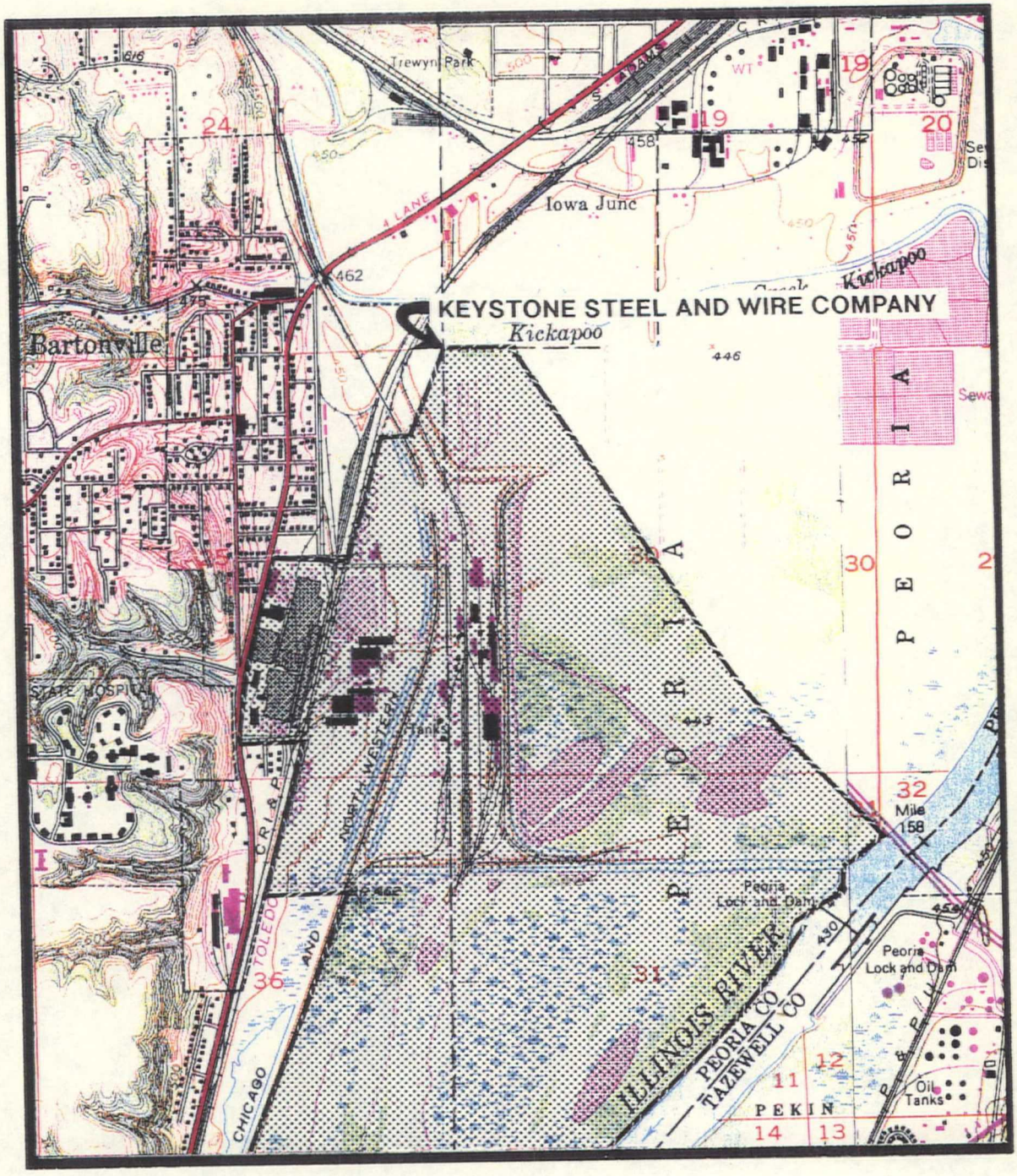
FIGURE 2-1

LOCATION MAP FOR BARTONVILLE ILLINOIS
KEYSTONE STEEL AND WIRE COMPANY

ERM

PROJECT: 0178 | REPORT: PH2CL | DRAWN: BLAS | CHECKED: | DATE: 6/7/91 | APPROVED: | CLIENT NAME: KEYSTONE STEEL AND WIRE

PEORIA WEST QUADRANGLE
ILLINOIS
7.5 MINUTE SERIES (TOPOGRAPHIC)
1949
PHOTOREVISED 1967



SCALE 1:24000

1 .5 0 1 MILE

CONTOUR INTERVAL 10 FEET

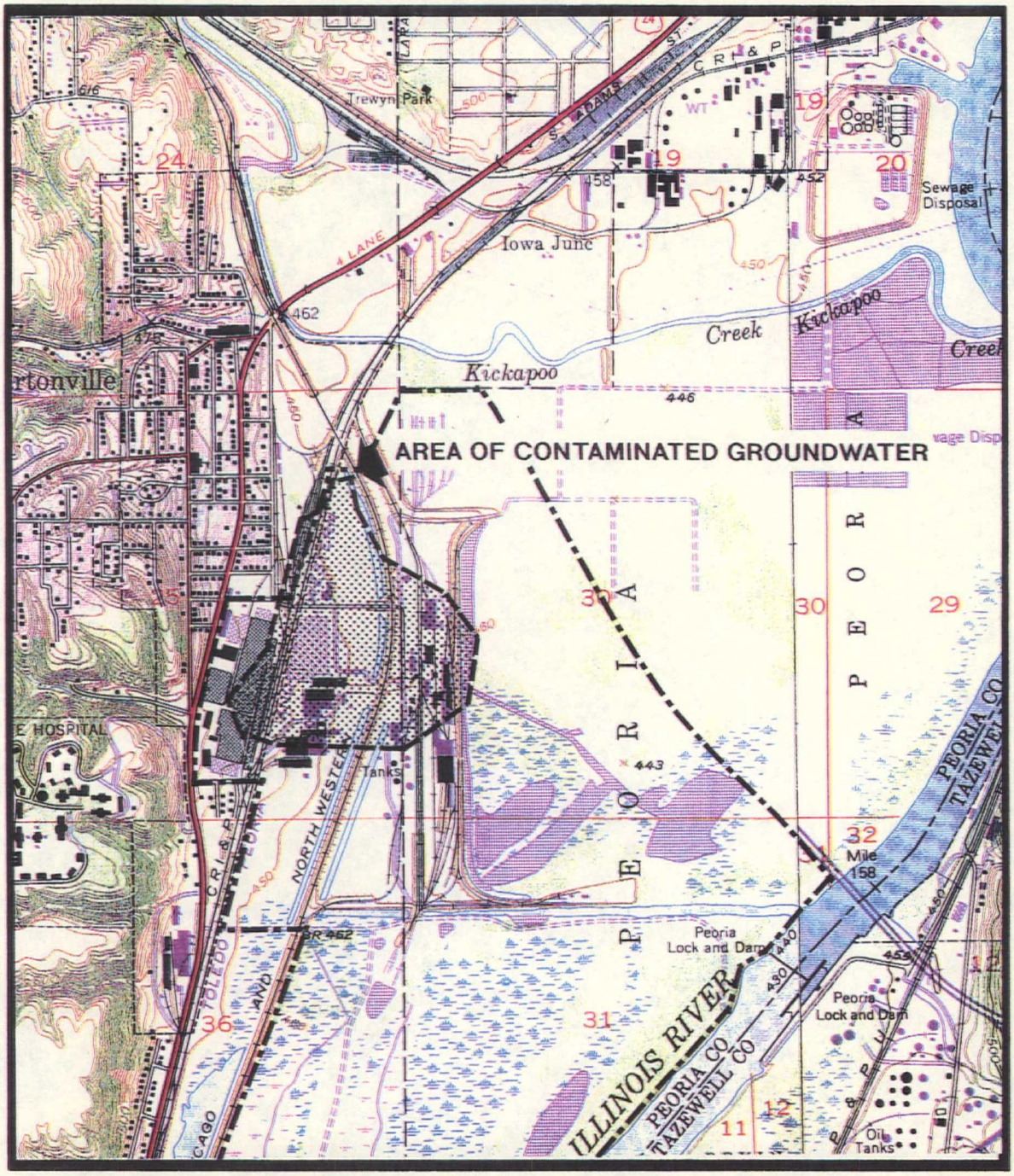
FIGURE 2-2

SITE LOCATION MAP
KEYSTONE STEEL AND WIRE COMPANY
BARTONVILLE, ILLINOIS

ERM

PROJECT: 0176 | REPORT: PH2CL | DRAWN: BLAS | CHECKED | DATED: 6/18/91 | APPROVED | CLIENT NAME: KEYSTONE STEEL AND WIRE COMPANY

PEORIA WEST QUADRANGLE
ILLINOIS
7.5 MINUTE SERIES (TOPOGRAPHIC)
1949
PHOTOREVISED 1967



SCALE 1:24000

1 .5 0 1 MILE

CONTOUR INTERVAL 10 FEET

QUADRANGLE LOCATION

FIGURE 2-3

AREA OF CONTAMINATED GROUND WATER
KEYSTONE STEEL AND WIRE COMPANY
BARTONSVILLE, ILLINOIS

ERM

PROJECT: 0178-3
REPORT: GW
DRAWN: CNM
CHECKED:
DATE: 6/2/92
APPROVED:
CLIENT NAME: KEYSTONE STEEL & WIRE COMPANY

SECTION 3

3.0 SUMMARY OF GROUND WATER ASSESSMENT

3.1 Summary of Data

The following ground water monitoring programs are currently being conducted at Keystone:

- Ground water monitoring at HMWUs ("W" series wells - for lead, cadmium, and chromium);
- Ground water assessment for organic contaminants ("T" series wells and "W" series wells in the Mid-Mill area - for inorganic and VOCs);
- Ground water monitoring at the K061 Closure Area ("AD" series wells - for metals, cyanide, and phenol); and
- Ground water monitoring at the Closed Loop Cooling System ("CL" series wells - for metals and total dissolved solids).

A summary of pertinent information concerning each well and piezometer, as well as the reason for the installation, is included on Table 3-1. The locations of all monitoring wells are shown on Plate 2-1, a summary of well construction information is included on Table 3-2, and boring logs and well completion diagrams are included in Appendix D of the Revised Phase 2 Closure Plan.

Ground water samples have been analyzed for various parameter lists since January 1986. Summaries of all analytical data are included in Tables 3-3 through 3-7. Field parameters are

presented on Table 3-3, which include pH, specific conductance, and temperature. Table 3-4 contains the ground water analytical results for inorganics, except for those parameters that have never been detected or have been detected sporadically at very low levels (i.e., antimony, beryllium, silver, thallium, and vanadium).

The VOCs that have been detected in ground water are presented on Table 3-5. Although 34 VOCs were included on the volatile scan, only the compounds that have been detected are shown on the table.

The semivolatile compounds that have been detected in the ground water samples are presented on Table 3-6. Although the samples were analyzed for 65 semivolatile compounds, including polychlorinated biphenyls (PCBs), only those compounds that were detected are included on the table.

Table 3-7 summarizes miscellaneous parameters that have been analyzed in the past (i.e., hardness, alkalinity, bicarbonate, chloride, sulfate, Total Organic Carbon (TOC), Chemical Oxygen Demand (COD), and Total Organic Halogen (TOX)).

In addition, ground water levels (Table 3-8) have been monitored since January 1986, and surface water elevations (Table 3-9) have been measured since May 1986.

Based on a review of all of the foregoing analytical data, no ground water contamination problems have been identified except for the VOCs first detected in the February 1988 samples (Table 3-5).

3.2 Ground Water Assessment

Keystone initiated a ground water assessment program in 1989 as a result of the VOCs detected in ground water at the site. Keystone submitted a ground water assessment report to the IEPA in February 1991, which summarized the ongoing investigations at the site (Appendix F of the Revised Phase 2 Closure Plan). That report presented geologic cross sections, potentiometric maps, and contaminant maps and described the rate and extent of contaminant migration and concentration.

The VOCs detected at the site with the highest concentrations are TCE and TCA. Maps showing the extent of contamination for these two compounds are presented on Figures 3-1 and 3-2, and a map indicating the extent of VOC contamination is shown on Figure 3-3. The vertical extent of contaminants is shown on the geologic cross sections in Appendix F of the Revised Phase 2 Closure Plan.

Water level measurements indicate that ground water flow is toward the northeast (Figure 3-4) and that a downward hydraulic gradient exists between the upper and lower portions of the alluvial aquifer. The rate of ground water flow in the area of the contaminants is 0.01 to 0.21 feet/day.

A full report of the ground water assessment, including a discussion of possible sources, is included as Appendix F of the Revised Phase 2 Closure Plan.

TABLES

TABLE 3-1

SUMMARY OF WELLS AND PIEZOMETERS

Wells	Installed	Purpose
W-1 through W-6	January 1986	Closure Unit Monitoring
W-1D through W-5D	August 1986	Closure Unit Monitoring
W-7 through W-14	Dec. 1987 - Jan. 1988	Closure Unit Monitoring
T-1 through T-16	Oct. 1989 - Feb. 1990	Ground Water Assessment
P-1 and P-2	Jan. 1990 - Feb. 1990	Ground Water Assessment
AD-1 through AD-5	May 1990	K061 Waste Monitoring
CL-1 through CL-5	Feb. 1991 - April 1991	Closed Loop Monitoring
T-17 through T-21	April 1991	Ground Water Assessment

TABLE 3-2

SUMMARY OF WELL CONSTRUCTION

Well Number	Date Installed	Northing (feet)	Easting (feet)	T.O.C. Elevation (feet)	Ground Elevation (feet)	Screen Length (feet)	Top Screen Depth (feet)	Bottom Screen Depth (feet)	T.O.S. Elevation (feet)	B.O.S. Elevation (feet)	Up or Down Gradient Location
T-1	10/25/89	20583.07	8821.85	453.57	451.10	4.73	44.97	49.70	406.13	401.40	D
T-2A	10/26/89	20183.82	9447.69	450.11	447.80	4.72	39.54	44.26	408.26	403.54	D
T-2B	12/12/89	20193.54	9445.90	450.25	447.60	5.00	61.90	66.90	385.70	380.70	D
T-3	11/01/89	18898.42	9445.91	450.57	448.10	4.72	55.98	60.70	392.12	387.40	D
T-4A	12/05/89	19410.94	9712.40	449.42	446.90	4.72	22.52	27.24	424.38	419.66	D
T-4B	12/18/89	19413.39	9712.70	449.44	446.90	9.45	69.85	79.30	377.05	367.60	D
T-5A	11/07/89	20725.95	9713.91	448.04	445.90	5.00	28.16	33.16	417.74	412.74	D
T-5B	11/17/89	20720.99	9714.52	448.27	445.90	5.00	61.25	66.25	384.65	379.65	D
T-5C	12/08/89	20715.58	9715.50	448.21	446.00	4.71	78.13	82.84	367.87	363.16	D
T-6A	11/08/89	20569.15	9223.84	451.67	449.10	4.94	14.69	19.63	434.41	429.47	D
T-6B	11/14/89	20569.46	9228.68	451.72	449.20	5.00	29.94	34.94	419.26	414.26	D
T-6C	12/20/89	20571.46	9235.72	452.00	449.70	4.74	50.42	55.16	399.28	394.54	D
T-7A	01/12/90	18789.51	9885.09	448.55	446.10	4.73	13.45	18.18	432.65	427.92	D
T-7B	01/18/90	18785.30	9885.16	448.56	446.00	5.00	76.75	81.75	369.25	364.25	D
T-8	01/08/90	17922.68	9407.17	451.00	448.70	4.72	26.89	31.61	421.81	417.09	D
T-9	01/03/90	18964.09	9029.35	459.85	456.80	4.72	30.75	35.47	426.05	421.33	D
T-10	12/04/89	19631.60	8877.87	456.60	454.20	4.73	35.89	40.62	418.31	413.58	D
T-11A	02/09/90	19463.73	10357.50	451.12	448.30	4.72	36.26	40.98	412.04	407.32	D
T-11B	02/19/90	19453.39	10354.33	451.39	448.70	4.74	77.92	82.66	370.78	366.04	D
T-11C	02/15/90	19462.03	10353.17	451.23	448.40	4.72	94.49	99.21	353.91	349.19	D
T-12	11/03/89	21374.43	9101.50	444.93	442.50	9.45	28.19	37.64	414.31	404.86	D
T-13A	12/27/89	18906.66	8347.08	464.25	462.10	4.72	22.92	27.64	439.18	434.46	D
T-13B	01/03/90	18906.29	8350.50	464.44	462.10	4.72	27.31	32.03	434.79	430.07	D
T-14	02/07/90	18131.75	10389.16	452.47	449.90	4.78	97.27	102.05	352.63	347.85	D
T-15	01/04/90	17618.23	8543.52	454.70	452.70	5.00	15.25	20.25	437.45	432.45	U
T-16	11/09/89	20951.93	8883.13	450.51	448.00	5.06	36.90	41.96	411.10	406.04	D
T-17	04/16/91	18357.82	9129.81	461.62	459.65	4.67	37.23	41.90	422.42	417.75	D
T-18	04/18/91	18126.24	8631.01	462.92	461.02	4.66	27.36	32.02	433.66	429.00	D
T-19A	04/17/91	21846.34	9341.84	448.74	446.82	4.68	7.16	11.84	439.66	434.98	D
T-19B	04/23/91	21851.22	9344.32	449.45	447.02	4.67	35.16	39.83	411.86	407.19	D
T-19C	04/26/91	21838.18	9344.45	448.46	446.70	4.99	65.44	70.42	381.26	376.28	D
T-20	04/22/91	20187.91	8659.76	455.97	454.08	4.67	42.77	47.44	411.31	406.64	D
T-21	04/24/91	20199.74	8150.07	468.82	466.68	5.00	12.70	17.70	448.98	448.98	D
P-1A	01/11/90	21731.42	10566.60	450.86	448.20	4.49	30.31	34.80	417.89	413.40	D
P-1B	01/11/90	21734.37	10566.52	450.75	448.20	4.48	66.78	71.26	381.42	376.94	D
P-2	02/23/90	16325.31	12130.72	459.71	457.20	4.50	97.97	102.47	359.23	354.73	D
W-1	01/16/86	20122.55	9592.51	449.85	446.50	5.00	3.96	8.96	442.54	437.54	D
W-1D	08/19/86	20114.57	9590.46	448.82	446.10	4.78	45.50	50.28	400.60	395.82	D
W-2	01/15/86	20180.69	9438.46	451.79	448.60	5.00	7.24	12.24	441.36	436.36	D
W-2D	08/15/86	20187.96	9437.29	451.33	448.40	4.75	45.29	50.04	403.11	398.36	D
W-3*	01/16/86	19818.84	9588.54	447.14	446.80	5.00	4.17	9.17	442.63	437.63	D
W-3D*	08/15/86	19824.99	9590.19	446.94	446.90	4.78	45.56	50.34	401.34	396.56	D

TABLE 3-2

SUMMARY OF WELL CONSTRUCTION

Well Number	Date Installed	Northing (feet)	Easting (feet)	T.O.C. Elevation (feet)	Ground Elevation (feet)	Screen Length (feet)	Top Screen Depth (feet)	Bottom Screen Depth (feet)	T.O.S. Elevation (feet)	B.O.S. Elevation (feet)	Up or Down Gradient Location
W-4	01/17/86	18886.38	9438.15	450.67	447.30	5.00	4.97	9.97	442.33	437.33	D
W-4D*	08/20/86	18892.18	9443.40	449.44	447.60	4.78	45.51	50.29	402.09	397.31	D
W-5	01/14/86	16615.83	8406.25	464.02	461.00	5.00	17.26	22.26	443.74	438.74	D
W-5D	08/07/86	16605.01	8403.98	463.76	461.00	4.78	31.44	36.22	429.56	424.78	D
W-6	01/15/86	17126.21	7842.67	461.38	458.10	5.00	5.06	10.06	453.04	448.04	U
W-7	12/17/87	16731.49	7674.46	459.21	456.20	10.28	4.23	14.51	451.97	441.69	U
W-8	12/16/87	20576.82	8820.28	455.01	451.20	10.24	6.42	16.66	444.78	434.54	U
W-9	12/18/87	20681.11	9519.43	449.78	447.10	10.30	4.55	14.85	442.55	432.25	D
W-10	12/15/87	19122.13	9497.99	451.33	448.50	10.32	4.42	14.74	444.08	433.76	D
W-11	12/14/87	18770.15	9395.01	450.15	447.50	10.28	4.59	14.87	442.91	432.63	D
W-12	01/24/88	16849.76	8068.14	460.38	461.10	9.99	11.05	21.04	450.05	440.06	D
W-13	12/17/87	16435.65	8169.21	459.62	457.70	10.30	14.32	24.62	443.38	433.08	D
W-14	01/24/88	16708.98	7783.31	460.75	461.40	9.81	10.96	20.77	450.44	440.63	D
AD-1	05/29/90	16664.83	12459.38	449.02	446.45	4.99	11.07	16.06	435.38	430.39	D
AD-2	05/17/90	16586.45	12599.76	447.90	445.82	5.00	8.16	13.16	437.66	432.66	D
AD-3	05/29/90	16743.41	12650.09	447.60	445.73	4.99	10.91	15.90	434.82	429.83	D
AD-4	05/22/90	16766.07	12514.72	447.93	445.91	4.99	8.24	13.23	437.67	432.68	D
AD-5	05/29/90	16782.77	12251.71	447.57	445.37	4.99	10.88	15.87	434.49	429.50	U
CL-1	02/26/91	19212.97	10879.09	450.13	447.80	3.98	15.22	19.20	432.58	428.60	D
CL-2	02/26/91	20463.29	10731.31	450.10	447.30	3.98	16.13	20.11	431.17	427.19	D
CL-3	02/26/91	18741.81	11408.04	450.27	447.80	3.98	19.65	23.63	428.15	424.17	D
CL-4	02/27/91	18010.53	12316.96	450.56	448.00	3.98	19.31	23.29	428.69	424.71	D
CL-5	04/09/91	17280.18	12090.12	453.74	450.90	9.44	17.60	27.04	433.30	423.86	D

Note: * Well was repaired in April 1991.

TABLE 3-3

SUMMARY OF GROUND WATER QUALITY
(Field Parameters)

Well Number	Date Sampled	Temperature (degrees C)	pH	Specific Conductance (at 25tC)	Comments:
T-1	11/28/89	11.0	6.5	3100	
T-1	02/27/90	12.5	6.2	3100	
T-1	05/22/90	13.0	6.1	3700	
T-1	08/29/90	19.0	6.6	3700	
T-1	11/28/90	13.0	6.4	4100	
T-1	02/27/91	12.0	6.6	4200	
T-1	02/27/91	12.0	6.7	4200	Replicate
T-1	02/27/91	12.7	6.6	4100	Lab duplicate
T-1	05/29/91	17.0	6.7	3900	
T-1	08/28/91	15.4	6.6	4500	
T-2A	11/27/89	16.2	6.4	1800	
T-2A	02/26/90	13.0	5.9	1600	
T-2A	02/26/90	13.0	5.9	1600	Replicate
T-2A	05/22/90	13.9	6.2	2000	
T-2A	08/29/90	18.8	6.9	1800	
T-2A	11/27/90	14.0	6.8	1900	
T-2A	02/26/91	10.8	6.9	1900	
T-2A	02/26/91	11.0	7.0	1800	Lab duplicate
T-2A	05/29/91	17.5	7.0	1700	
T-2A	08/27/91	16.2	6.9	2000	
T-2B	02/26/90	9.0	6.2	4100	
T-2B	05/22/90	16.0	6.1	4800	
T-2B	08/29/90	18.8	6.6	4300	
T-2B	11/27/90	16.0	6.5	4400	
T-2B	02/26/91	11.0	6.7	4000	
T-2B	05/29/91	15.7	6.6	4000	
T-2B	08/27/91	17.5	6.7	4400	
T-3	11/28/89	13.8	6.6	1300	
T-3	02/27/90	10.5	6.6	990	
T-3	02/27/90	10.5	6.8	1000	Replicate
T-3	05/23/90	13.0	6.0	1200	
T-3	08/29/90	18.0	6.9	1100	
T-3	12/06/90	14.2	7.1	1100	
T-3	02/26/91	10.5	7.1	1100	
T-3	05/31/91	15.0	7.2	1200	
T-3	05/31/91	15.0	NA	NA	Replicate
T-3	08/27/91	16.0	7.1	1100	
T-4A	02/27/90	13.5	6.0	2200	
T-4A	05/22/90	15.5	6.5	2400	
T-4A	08/28/90	19.8	7.0	2200	

TABLE 3-3

SUMMARY OF GROUND WATER QUALITY
(Field Parameters)

Well Number	Date Sampled	Temperature (degrees C)	pH	Specific Conductance (at 25tC)	Comments:
T-4A	11/28/90	13.5	6.6	2300	
T-4A	02/26/91	12.5	6.7	2300	
T-4A	05/29/91	17.8	6.9	2300	
T-4A	08/28/91	18.7	6.8	2000	
T-4B	02/27/90	13.5	6.5	1400	
T-4B	02/27/90	13.5	6.5	1400	Replicate
T-4B	05/22/90	14.9	6.6	1600	
T-4B	08/28/90	23.0	7.1	1300	
T-4B	08/28/90	23.0	7.0	1300	Replicate
T-4B	11/28/90	12.5	6.8	1200	
T-4B	02/26/91	10.3	6.8	1500	
T-4B	05/29/91	16.5	7.0	2500	
T-4B	08/28/91	16.8	6.8	1500	
T-4B	08/28/91	16.5	6.9	1500	Replicate
T-5A	11/28/89	12.8	6.3	1300	
T-5A	02/27/90	9.0	6.2	1200	
T-5A	05/22/90	14.2	6.1	1300	
T-5A	08/28/90	21.8	7.1	1200	
T-5A	11/27/90	17.0	7.0	1200	
T-5A	02/25/91	11.5	7.1	1100	
T-5A	05/29/91	16.5	7.2	1300	
T-5A	08/27/91	19.8	7.1	1300	
T-5B	02/27/90	12.7	6.4	2000	
T-5B	05/22/90	16.0	6.6	2400	
T-5B	08/28/90	20.2	7.1	2200	
T-5B	11/27/90	17.2	6.8	2300	
T-5B	02/25/91	9.6	7.3	1200	
T-5B	05/29/91	17.0	7.1	2300	
T-5B	08/27/91	19.0	7.1	2300	
T-5C	02/27/90	13.0	6.4	3100	
T-5C	05/22/90	15.0	6.3	3500	
T-5C	08/28/90	19.6	6.9	3100	
T-5C	11/27/90	17.0	6.6	3200	
T-5C	02/25/91	11.7	7.0	2900	
T-5C	05/29/91	17.0	6.9	3200	
T-5C	05/29/91	17.0	6.8	3200	Replicate
T-5C	08/27/91	17.5	6.8	3700	
T-5C	08/27/91	17.0	6.8	3700	Replicate

TABLE 3-3

SUMMARY OF GROUND WATER QUALITY
(Field Parameters)

Well Number	Date Sampled	Temperature (degrees C)	pH	Specific Conductance (at 25ºC)	Comments:
T-6A	11/27/89	17.5	6.6	1300	
T-6A	02/26/90	9.0	6.4	1000	
T-6A	05/22/90	14.5	6.6	1400	
T-6A	08/29/90	20.0	6.4	1400	
T-6A	08/29/90	20.0	6.4	1400	Replicate
T-6A	11/27/90	15.5	6.3	1500	
T-6A	11/27/90	15.4	6.4	1500	Replicate
T-6A	02/26/91	10.0	6.4	1600	
T-6A	02/26/91	10.6	6.4	1600	Replicate
T-6A	05/29/91	14.0	6.3	1500	
T-6A	05/29/91	14.0	6.3	1400	Replicate
T-6A	08/28/91	18.0	6.4	1600	
T-6B	11/28/89	11.0	6.7	1700	
T-6B	02/26/90	9.0	6.4	1500	
T-6B	05/22/90	16.0	6.6	1800	
T-6B	08/29/90	19.8	7.0	1600	
T-6B	11/27/90	15.0	6.7	1600	
T-6B	02/26/91	10.0	7.0	1600	
T-6B	05/29/91	15.0	6.9	1400	
T-6B	08/28/91	16.0	7.1	1700	
T-6C	02/26/90	9.0	6.3	3500	
T-6C	05/22/90	15.2	6.5	3800	
T-6C	08/29/90	20.0	6.9	3400	
T-6C	11/27/90	14.2	6.7	3600	
T-6C	02/26/91	10.6	7.0	3400	
T-6C	05/29/91	11.0	6.9	3300	
T-6C	08/28/91	16.5	7.1	3600	
T-7A	02/28/90	9.5	6.5	4100	
T-7A	05/23/90	14.7	6.4	3900	
T-7A	08/30/90	24.5	6.7	2100	
T-7A	11/28/90	14.5	6.8	2100	
T-7A	11/28/90	14.4	6.8	2200	Replicate
T-7A	02/27/91	12.2	6.6	3100	
T-7A	02/27/91	14.5	6.7	3000	Lab duplicate
T-7A	05/29/91	17.7	6.7	2600	
T-7A	08/28/91	19.5	6.7	2500	
T-7B	02/28/90	12.0	6.9	1300	
T-7B	02/28/90	12.0	6.8	1400	Replicate
T-7B	05/23/90	16.8	6.7	1600	

TABLE 3-3

SUMMARY OF GROUND WATER QUALITY
(Field Parameters)

Well Number	Date Sampled	Temperature (degrees C)	pH	Specific Conductance (at 25°C)	Comments:
T-7B	08/30/90	21.0	7.0	2800	
T-7B	08/30/90	21.2	7.0	1500	Replicate
T-7B	11/28/90	12.8	6.8	1500	
T-7B	02/27/91	14.6	7.1	1700	
T-7B	02/27/91	13.4	7.2	1700	Replicate
T-7B	05/29/91	20.5	7.0	1700	
T-7B	05/29/91	20.5	6.9	1700	Replicate
T-7B	08/28/91	20.0	7.2	1800	
T-8	02/28/90	11.2	6.5	2300	
T-8	05/23/90	11.5	6.7	2800	
T-8	08/29/90	19.0	6.8	2200	
T-8	11/28/90	14.7	6.9	2500	
T-8	02/27/91	14.7	7.1	1700	
T-8	05/28/91	16.8	7.1	2300	
T-8	08/28/91	NA	6.9	2200	
T-9	02/28/90	12.0	6.2	850	
T-9	05/24/90	18.2	6.7	1200	
T-9	08/29/90	21.8	6.9	1500	
T-9	11/28/90	15.0	6.7	1600	
T-9	11/28/90	15.0	6.6	1600	Replicate
T-9	02/27/91	11.5	7.1	2000	
T-9	05/29/91	20.5	7.3	1700	
T-9	08/28/91	18.9	7.1	2400	
T-10	02/28/90	12.0	5.6	12000	
T-10	05/23/90	14.8	6.1	8700	
T-10	08/29/90	22.0	6.2	8200	
T-10	11/28/90	15.5	6.1	8800	
T-10	02/27/91	15.4	6.3	8300	
T-10	05/29/91	20.0	6.3	8700	
T-10	08/27/91	19.0	6.3	9200	
T-11A	02/26/90	12.5	6.8	1100	
T-11A	05/22/90	17.5	6.8	1200	
T-11A	08/30/90	19.8	7.0	1100	
T-11A	11/27/90	17.2	7.0	1200	
T-11A	02/26/91	11.0	7.0	1400	
T-11A	02/26/91	11.6	7.0	1400	Lab duplicate
T-11A	05/30/91	17.0	6.8	1300	
T-11A	08/28/91	17.5	7.0	1200	
T-11B	02/26/90	11.0	6.9	1100	

TABLE 3-3

SUMMARY OF GROUND WATER QUALITY
(Field Parameters)

Well Number	Date Sampled	Temperature (degrees C)	pH	Specific Conductance (at 25tC)	Comments:
T-11B	05/22/90	16.5	6.6	1600	
T-11B	08/30/90	19.4	7.1	1500	
T-11B	11/27/90	18.0	6.9	1500	
T-11B	02/26/91	9.5	7.1	1600	
T-11B	05/30/91	16.0	6.8	1500	
T-11B	08/28/91	18.0	7.0	2000	
T-11C	02/26/90	12.5	6.8	1100	
T-11C	05/22/90	17.8	6.5	2000	
T-11C	08/30/90	20.5	6.8	1900	
T-11C	11/27/90	18.0	6.8	1900	
T-11C	02/26/91	12.4	7.0	2000	
T-11C	05/30/91	17.0	6.8	2000	
T-11C	08/28/91	19.5	7.2	2000	
T-12	11/28/90	11.0	6.9	2300	
T-12	02/27/90	10.1	6.4	2200	
T-12	05/24/90	14.7	6.4	2400	
T-12	11/28/90	13.0	6.7	2500	
T-12	02/28/91	10.0	6.9	2400	
T-12	08/28/91	21.5	7.1	2300	
T-13A	02/28/90	11.0	6.1	5500	
T-13A	05/23/90	13.0	6.0	6900	
T-13A	08/28/90	21.5	5.9	5200	
T-13A	11/28/90	13.2	5.9	5200	
T-13A	02/27/91	11.2	6.1	3600	
T-13A	05/29/91	16.5	5.8	5400	
T-13A	08/28/91	20.5	6.1	4400	
T-13B	02/28/90	10.0	5.9	8000	
T-13B	05/23/90	13.0	6.0	12000	
T-13B	08/28/90	22.6	6.1	12000	
T-13B	11/28/90	13.8	6.1	12000	
T-13B	02/27/91	12.7	6.3	11000	
T-13B	05/29/91	18.2	6.1	10000	
T-13B	08/28/91	20.0	6.2	12000	
T-14	02/28/90	12.0	6.7	2500	
T-14	05/23/90	13.0	6.5	2800	
T-14	08/30/90	18.0	6.8	2600	
T-14	11/27/90	18.2	6.7	2600	
T-14	02/27/91	10.0	6.8	2700	

TABLE 3-3

SUMMARY OF GROUND WATER QUALITY
(Field Parameters)

Well Number	Date Sampled	Temperature (degrees C)	pH	Specific Conductance (at 25fC)	Comments:
T-14	05/28/91	21.9	6.7	2600	
T-14	08/28/91	16.0	7.2	2000	
T-15	02/28/90	10.0	6.7	1000	
T-15	05/23/90	8.0	6.8	1500	
T-15	08/29/90	11.0	7.2	1300	
T-15	11/28/90	12.7	6.8	1200	
T-15	02/27/91	9.7	7.5	1300	
T-15	05/28/91	14.2	7.3	1200	
T-15	08/28/91	17.5	7.2	1200	
T-15	08/28/91	16.5	7.2	1200	Replicate
T-16	11/28/90	11.0	6.7	3400	
T-16	02/27/90	12.0	6.3	3400	
T-16	05/24/90	15.0	6.2	3500	
T-16	08/29/90	21.0	6.6	3400	
T-16	11/28/90	12.0	6.4	3700	
T-16	02/28/91	10.2	6.7	3600	
T-16	02/28/91	11.0	6.8	3700	Replicate
T-16	05/29/91	16.0	6.6	3500	
T-16	08/28/91	17.1	6.9	3500	
T-16	08/28/91	16.7	6.9	3700	Replicate
T-17	05/30/91	17.5	7.2	1100	
T-17	05/30/91	NA	7.2	1000	Replicate
T-17	08/28/91	18.5	7.3	2200	
T-18	05/28/91	16.5	7.1	930	
T-18	08/28/91	18.8	7.2	1000	
T-19A	05/29/91	NA	8.4	1300	
T-19A	08/28/91	NA	NA	NA	
T-19B	05/29/91	15.8	6.8	1500	
T-19B	08/27/91	16.0	7.2	1600	
T-19C	05/29/91	15.8	6.7	2600	
T-19C	08/27/91	15.0	6.9	3300	
T-20	05/29/91	17.2	6.7	2500	
T-20	08/28/91	16.4	6.7	3700	
T-21	05/29/91	17.0	6.6	3700	
T-21	08/28/91	18.0	6.7	3100	

TABLE 3-3

SUMMARY OF GROUND WATER QUALITY
(Field Parameters)

Well Number	Date Sampled	Temperature (degrees C)	pH	Specific Conductance (at 25fC)	Comments:
P-1A	02/28/90	9.5	6.4	2800	
P-1A	11/28/90	12.0	6.8	3200	
P-1A	08/28/91	17.0	7.0	6200	
P-1B	02/28/90	12.0	7.2	360	
P-1B	11/28/90	11.5	7.5	550	
P-1B	08/28/91	16.0	7.8	600	
P-2	02/28/90	12.0	6.8	1100	
P-2	11/28/90	12.5	7.0	1400	
P-2	08/28/91	15.0	7.1	1300	
W-1	09/05/86	21.2	5.9	1000	
W-1	11/21/86	11.7	6.0	1400	
W-1	11/21/86		6.0	1500	Duplicate
W-1	11/21/86		6.0	1400	Triplicate
W-1	11/21/86		6.0	1400	Quadruplicate
W-1	02/18/87	6.6	6.1	1900	
W-1	02/18/87		6.1	1900	Duplicate
W-1	02/18/87		6.2	1900	Triplicate
W-1	02/18/87		6.2	1900	Quadruplicate
W-1	05/27/87	18.6	6.3	1500	
W-1	05/27/87		6.3	1600	Duplicate
W-1	05/27/87		6.3	1500	Triplicate
W-1	05/27/87		6.3	1500	Quadruplicate
W-1	09/14/87	21.3	5.9	1100	
W-1	09/14/87		5.9	1100	Duplicate
W-1	09/14/87		5.9	1100	Triplicate
W-1	09/14/87		5.9	1100	Quadruplicate
W-1	02/17/88	7.0	6.3	2500	
W-1	05/25/88	13.5	6.1	1600	
W-1	08/24/88	21.0	5.8	1200	
W-1	11/22/88	15.0	5.8	1100	
W-1	03/02/89	9.5	5.3	1100	
W-1	05/23/89	14.0	5.8	2000	
W-1	08/17/89				Dry
W-1	11/28/89				Dry
W-1	02/27/90	12.0	5.4	1800	
W-1	05/23/90	13.0	6.4	2900	
W-1	08/28/90	23.0	6.8	1400	
W-1	11/28/90	11.0	6.3	1600	

TABLE 3-3

SUMMARY OF GROUND WATER QUALITY
(Field Parameters)

Well Number	Date Sampled	Temperature (degrees C)	pH	Specific Conductance (at 25fC)	Comments:
W-1	02/27/91	4.9	6.7	1200	
W-1	02/27/91	9.0	6.8	1800	Lab duplicate
W-1	05/29/91	17.5	6.6	1200	
W-1	08/26/91	21.0	6.1	1200	
W-1	08/26/91	20.5	6.2	1200	Replicate
W-1D	09/05/86	19.0	6.5	1700	
W-1D	11/21/86	12.9	6.6	1700	
W-1D	11/21/86		6.7	1700	Duplicate
W-1D	11/21/86		6.7	1700	Triplicate
W-1D	11/21/86		6.7	1700	Quadruplicate
W-1D	02/18/87	9.1	6.8	1700	
W-1D	02/18/87		6.8	1800	Duplicate
W-1D	02/18/87		6.8	1800	Triplicate
W-1D	02/18/87		6.8	1800	Quadruplicate
W-1D	05/27/87	15.8	6.9	1700	
W-1D	05/27/87		6.9	1700	Duplicate
W-1D	05/27/87		6.9	1700	Triplicate
W-1D	05/27/87		6.9	1700	Quadruplicate
W-1D	09/14/87	15.4	6.9	1800	
W-1D	09/14/87		7.0	1800	Duplicate
W-1D	09/14/87		7.0	1800	Triplicate
W-1D	09/14/87		7.0	1800	Quadruplicate
W-1D	02/17/88	11.2	6.9	1200	
W-1D	05/25/88	15.8	6.7	1800	
W-1D	08/24/88	16.5	6.7	1900	
W-1D	11/22/88	13.5	5.6	2100	
W-1D	03/01/89	8.0	6.8	1800	
W-1D	05/23/89	16.0	6.6	2100	
W-1D	08/17/89	15.0	6.5	2200	
W-1D	11/28/89	12.6	6.5	2300	
W-1D	11/28/89	12.6	6.5	2300	Replicate
W-1D	02/27/90	14.0	6.2	2200	
W-1D	05/23/90	13.5	6.4	2500	
W-1D	08/28/90	20.0	6.8	2000	
W-1D	11/28/90	12.2	6.6	2100	
W-1D	02/27/91	10.1	7.0	2600	
W-1D	05/29/91	18.0	6.8	2100	
W-1D	08/27/91	17.9	7.0	1800	
W-2	09/05/86	27.9	6.2	1900	
W-2	09/05/86	26.8	6.2	2000	Replicate
W-2	11/21/86	13.6	5.9	2000	
W-2	11/21/86		6.0	2000	Duplicate

TABLE 3-3

SUMMARY OF GROUND WATER QUALITY
(Field Parameters)

Well Number	Date Sampled	Temperature (degrees C)	pH	Specific Conductance (at 25tC)	Comments:
W-2	11/21/86		6.0	2000	Triplicate
W-2	11/21/86		6.0	2000	Quadruplicate
W-2	02/18/87	9.5	6.0	1900	
W-2	02/18/87		6.1	2000	Duplicate
W-2	02/18/87		6.1	2000	Triplicate
W-2	02/18/87		6.1	2000	Quadruplicate
W-2	05/27/87	18.4	6.2	1900	
W-2	05/27/87		6.2	1900	Duplicate
W-2	05/27/87		6.2	1900	Triplicate
W-2	05/27/87		6.2	1900	Quadruplicate
W-2	09/14/87	20.3	6.5	2000	
W-2	09/14/87		6.5	2000	Duplicate
W-2	09/14/87		6.5	2100	Triplicate
W-2	09/14/87		6.5	2000	Quadruplicate
W-2	02/17/88	9.0	6.2	2100	
W-2	05/26/88	13.9	6.2	1900	
W-2	08/24/88	20.0	6.4	2100	
W-2	11/22/88	15.0	5.3	2300	
W-2	03/01/89	7.0	6.6	1800	
W-2	05/23/89	14.2	6.4	2200	
W-2	08/17/89	19.0	6.3	2200	
W-2	11/27/89	17.2	6.3	2000	
W-2	02/26/90	10.0	6.5	1700	
W-2	05/22/90	14.2	6.3	2000	
W-2	08/29/90	21.5	6.2	1700	
W-2	11/27/90	15.0	6.3	1900	
W-2	02/26/91	7.6	6.5	1900	
W-2	05/29/91	14.0	6.5	1900	
W-2	08/27/91	19.5	6.4	1900	
W-2D	09/05/86	22.0	6.4	2300	
W-2D	11/21/86	13.2	6.4	2200	
W-2D	11/21/86		6.4	2300	Duplicate
W-2D	11/21/86		6.5	2300	Triplicate
W-2D	11/21/86		6.4	2300	Quadruplicate
W-2D	02/18/87	12.0	6.6	2100	
W-2D	02/18/87		6.6	2200	Duplicate
W-2D	02/18/87		6.6	2200	Triplicate
W-2D	02/18/87		6.6	2200	Quadruplicate
W-2D	05/27/87	18.0	6.6	2100	
W-2D	05/27/87		6.6	2100	Duplicate
W-2D	05/27/87		6.6	2100	Triplicate
W-2D	05/27/87		6.6	2100	Quadruplicate

TABLE 3-3

SUMMARY OF GROUND WATER QUALITY
(Field Parameters)

Well Number	Date Sampled	Temperature (degrees C)	pH	Specific Conductance (at 25ºC)	Comments:
W-2D	09/14/87	15.7	7.1	2300	
W-2D	09/14/87		7.1	2200	Duplicate
W-2D	09/14/87		7.2	2200	Triplicate
W-2D	09/14/87		7.2	2200	Quadruplicate
W-2D	02/17/88	12.5	6.6	2300	
W-2D	05/26/88	14.5	6.7	2300	
W-2D	08/24/88	16.5	6.6	2700	
W-2D	08/24/88	16.5	6.7	2700	Replicate
W-2D	11/22/88	12.5	5.6	2800	
W-2D	03/01/89	9.0	6.5	2100	
W-2D	05/23/89	15.5	6.7	3100	
W-2D	05/23/89	15.5	6.7	3100	Replicate
W-2D	08/17/89	16.2	6.5	2800	
W-2D	11/27/89	16.8	6.0	2800	
W-2D	02/26/90	12.0	6.5	2300	
W-2D	05/22/90	11.0	6.5	2300	
W-2D	08/29/90	19.6	6.7	2100	
W-2D	11/27/90	14.5	6.6	2300	
W-2D	02/26/91	11.6	6.8	2200	
W-2D	05/29/91	15.2	6.7	2300	
W-2D	08/27/91	16.4	6.7	2400	
W-3	09/05/86	17.5	6.1	1500	
W-3	11/21/86	11.5	6.3	1400	
W-3	11/21/86		6.3	1500	Duplicate
W-3	11/21/86		6.3	1400	Triplicate
W-3	11/21/86		6.3	1400	Quadruplicate
W-3	02/18/87	7.0	6.3	1400	
W-3	02/18/87		6.3	1400	Duplicate
W-3	02/18/87		6.4	1400	Triplicate
W-3	02/18/87		6.4	1400	Quadruplicate
W-3	05/28/87	17.0	6.6	1200	
W-3	05/28/87		6.6	1200	Duplicate
W-3	05/28/87		6.6	1200	Triplicate
W-3	05/28/87		6.6	1200	Quadruplicate
W-3	09/14/87	18.8	6.4	1400	
W-3	09/14/87		6.4	1400	Duplicate
W-3	09/14/87		6.4	1400	Triplicate
W-3	09/14/87		6.4	1400	Quadruplicate
W-3	02/17/88	8.2	6.5	1600	
W-3	05/25/88	13.2	6.7	1300	
W-3	08/24/88	21.0	6.6	1500	
W-3	11/22/88	14.2	5.6	1400	
W-3	03/02/89	7.0	6.9	900	

TABLE 3-3

SUMMARY OF GROUND WATER QUALITY
(Field Parameters)

Well Number	Date Sampled	Temperature (degrees C)	pH	Specific Conductance (at 25ºC)	Comments:
W-3	05/23/89	14.8	6.8	1400	
W-3	08/17/89	19.5	6.4	1500	
W-3	11/28/89	11.0	6.4	1500	
W-3	02/27/90	9.0	6.8	1100	
W-3	05/23/90	14.0	6.6	1300	
W-3	08/29/90	20.0	6.9	1100	
W-3	12/06/90	13.4	7.0	1100	
W-3	02/26/91		7.0	1100	
W-3	05/30/91	15.0	6.8	1200	
W-3	08/26/91	20.2	6.9	1300	
W-3D	09/05/86	16.9	6.3	2600	
W-3D	11/21/86	12.3	6.4	2700	
W-3D	11/21/86		6.4	2700	Duplicate
W-3D	11/21/86		6.4	2700	Triplicate
W-3D	11/21/86		6.4	2700	Quadruplicate
W-3D	02/18/87	11.5	6.4	2400	
W-3D	02/18/87		6.4	2500	Duplicate
W-3D	02/18/87		6.4	2500	Triplicate
W-3D	02/18/87		6.4	2500	Quadruplicate
W-3D	05/28/87	18.6	6.6	2600	
W-3D	05/28/87		6.6	2700	Duplicate
W-3D	05/28/87		6.6	2700	Triplicate
W-3D	05/28/87		6.6	2700	Quadruplicate
W-3D	05/28/87	18.2	6.6	2700	Replicate
W-3D	05/28/87		6.6	2700	Replicate duplicate
W-3D	05/28/87		6.6	2700	Replicate triplicate
W-3D	05/28/87		6.6	2700	Replicate quadruplicat
W-3D	09/14/87	16.8	6.8	3000	
W-3D	09/14/87		6.8	3000	Duplicate
W-3D	09/14/87		6.8	3000	Triplicate
W-3D	09/14/87		6.8	3000	Quadruplicate
W-3D	02/17/88	13.0	6.5	2900	
W-3D	05/25/88	15.1	6.5	3000	
W-3D	05/25/88	15.2	6.5	3000	Replicate
W-3D	08/24/88	17.0	6.6	2800	
W-3D	11/22/88	14.2	5.5	2600	
W-3D	11/22/88	14.2	5.4	2600	Replicate
W-3D	03/01/89	12.5	6.7	2000	
W-3D	05/23/89	16.2	6.7	2800	
W-3D	08/17/89	16.5	6.8	2700	
W-3D	11/28/89	11.2	6.2	2600	
W-3D	02/27/90	13.1	6.5	2600	
W-3D	05/23/90	13.5	6.3	2800	

TABLE 3-3

SUMMARY OF GROUND WATER QUALITY
(Field Parameters)

Well Number	Date Sampled	Temperature (degrees C)	pH	Specific Conductance (at 25ºC)	Comments:
W-3D	08/29/90	19.2	6.7	2600	
W-3D	12/06/90	14.0	6.7	2800	
W-3D	02/27/91	10.5	6.8	2900	
W-3D	05/30/91	15.5	6.7	3100	
W-3D	08/27/91	NA	6.8	3400	
W-4	09/05/86	15.9	5.8	2400	
W-4	11/21/86	12.8	6.4	2400	
W-4	11/21/86		6.4	2500	Duplicate
W-4	11/21/86		6.4	2400	Triplicate
W-4	11/21/86		6.4	2400	Quadruplicate
W-4	11/21/86	13.1	7.0	1400	Replicate
W-4	11/21/86		7.0	1400	Replicate duplicate
W-4	11/21/86		7.0	1400	Replicate triplicate
W-4	11/21/86		7.0	1400	Replicate quadruplicat
W-4	02/18/87	9.0	5.8	2400	
W-4	02/18/87		5.8	2400	Duplicate
W-4	02/18/87		5.8	2300	Triplicate
W-4	02/18/87		5.8	2400	Quadruplicate
W-4	05/28/87	17.8	5.9	2100	
W-4	05/28/87		5.9	2100	Duplicate
W-4	05/28/87		5.9	2100	Triplicate
W-4	05/28/87		5.9	2100	Quadruplicate
W-4	09/15/87	18.1	5.9	2100	
W-4	09/15/87		5.9	2100	Duplicate
W-4	09/15/87		5.9	2100	Triplicate
W-4	09/15/87		5.9	2100	Quadruplicate
W-4	02/17/88	8.0	5.7	2100	
W-4	05/25/88	11.5	5.7	2500	
W-4	08/25/88	18.0	6.1	2300	
W-4	11/22/88	13.2	6.2	1800	
W-4	03/02/89	10.0	6.6	1400	
W-4	05/23/89	14.5	6.3	2100	
W-4	08/17/89	17.2	6.1	1600	
W-4	11/28/89	12.0	5.7	1600	
W-4	02/27/90	8.0	6.2	1400	
W-4	05/23/90	10.0	5.9	1900	
W-4	08/29/90	19.0	6.4	1800	
W-4	12/06/90	13.1	6.4	1700	
W-4	02/26/91	7.9	6.5	2000	
W-4	05/31/91	9.0	6.5	1900	
W-4	08/26/91	19.1	6.4	2100	

TABLE 3-3

SUMMARY OF GROUND WATER QUALITY
(Field Parameters)

Well Number	Date Sampled	Temperature (degrees C)	pH	Specific Conductance (at 25fC)	Comments:
W-4D	09/05/86	15.1	6.9	1500	
W-4D	11/21/86	10.9	6.2	2400	
W-4D	11/21/86		6.2	2400	Duplicate
W-4D	11/21/86		6.2	2400	Triplicate
W-4D	11/21/86		6.2	2400	Quadruplicate
W-4D	02/18/87	13.0	6.8	1400	
W-4D	02/18/87		6.8	1400	Duplicate
W-4D	02/18/87		6.8	1400	Triplicate
W-4D	02/18/87		6.8	1500	Quadruplicate
W-4D	02/18/87	12.5	6.8	1400	Replicate
W-4D	02/18/87		6.8	1500	Replicate duplicate
W-4D	02/18/87		6.8	1500	Replicate triplicate
W-4D	02/18/87		6.8	1500	Replicate quadruplicat
W-4D	05/28/87	18.5	6.7	1400	
W-4D	05/28/87		6.7	1400	Duplicate
W-4D	05/28/87		6.7	1400	Triplicate
W-4D	05/28/87		6.7	1400	Quadruplicate
W-4D	09/15/87	15.5	6.9	2000	
W-4D	09/15/87		6.9	1900	Duplicate
W-4D	09/15/87		6.9	2000	Triplicate
W-4D	09/15/87		6.9	1900	Quadruplicate
W-4D	09/15/87	16.0	6.8	1900	Replicate
W-4D	09/15/87		6.8	1900	Replicate duplicate
W-4D	09/15/87		6.8	1900	Replicate triplicate
W-4D	09/15/87		6.8	1900	Replicate quadruplicat
W-4D	02/17/88	10.0	6.8	2000	
W-4D	05/25/88	12.2	6.8	2500	
W-4D	08/25/88	16.0	6.2	2000	
W-4D	11/22/88	13.0	6.8	2000	
W-4D	03/02/89	8.5	6.9	1300	
W-4D	05/23/89	16.8	7.0	2000	
W-4D	08/17/89	18.0	6.4	1900	
W-4D	11/28/89	12.0	6.3	1700	
W-4D	11/28/89	11.8	6.4	1800	Replicate
W-4D	02/27/90	10.1	6.8	1600	
W-4D	05/23/90	11.5	6.3	1900	
W-4D	08/29/90	18.0	7.0	1700	
W-4D	08/29/90	18.2	7.0	1700	Replicate
W-4D	12/06/90	13.0	7.0	1800	
W-4D	02/26/91	13.5	7.2	1700	
W-4D	05/31/91	15.0	7.3	1100	
W-4D	08/27/91	16.5	7.2	1500	

TABLE 3-3

SUMMARY OF GROUND WATER QUALITY
(Field Parameters)

Well Number	Date Sampled	Temperature (degrees C)	pH	Specific Conductance (at 25tC)	Comments:
W-5	09/05/86	19.5	6.8	2100	
W-5	11/21/86	17.6	6.4	2300	
W-5	11/21/86		6.5	2300	Duplicate
W-5	11/21/86		6.5	2300	Triplicate
W-5	11/21/86		6.5	2300	Quadruplicate
W-5	02/18/87	13.0	6.5	2100	
W-5	02/18/87		6.5	2100	Duplicate
W-5	02/18/87		6.5	2100	Triplicate
W-5	02/18/87		6.5	2100	Quadruplicate
W-5	05/27/87	18.6	6.8	2100	
W-5	05/27/87		6.8	2100	Duplicate
W-5	05/27/87		6.8	2100	Triplicate
W-5	05/27/87		6.8	2100	Quadruplicate
W-5	09/15/87	15.5	6.8	2300	
W-5	09/15/87		6.9	2200	Duplicate
W-5	09/15/87		6.9	2200	Triplicate
W-5	09/15/87		6.9	2200	Quadruplicate
W-5	02/18/88	10.0	6.8	2200	
W-5	05/25/88	11.5	6.8	2700	
W-5	08/24/88	15.5	6.6	2600	
W-5	11/23/88	15.0	6.5	2300	
W-5	11/23/88	15.0	6.5	2300	Replicate
W-5	03/02/89	11.0	6.8	1500	
W-5	05/24/89	14.0	6.8	2200	
W-5	08/18/89	16.2	7.0	2100	
W-5	11/27/89	17.2	6.3	2000	
W-5	02/28/90	13.0	6.4	2000	
W-5	05/23/90	12.0	6.7	2300	
W-5	08/28/90	19.5	6.8	2200	
W-5	11/26/90	12.5	6.8	2500	
W-5	02/25/91	11.6	7.0	2100	
W-5	05/28/91	14.1	6.9	2200	
W-5	08/26/91	15.8	7.0	2300	
W-5D	09/05/86	18.1	6.9	1800	
W-5D	11/21/86	13.4	6.6	1700	
W-5D	11/21/86		6.6	1700	Duplicate
W-5D	11/21/86		6.6	1700	Triplicate
W-5D	11/21/86		6.6	1700	Quadruplicate
W-5D	02/18/87	13.0	6.6	1700	
W-5D	02/18/87		6.6	1700	Duplicate
W-5D	02/18/87		6.6	1800	Triplicate
W-5D	02/18/87		6.6	1700	Quadruplicate
W-5D	05/27/87	20.1	6.9	1700	

TABLE 3-3

SUMMARY OF GROUND WATER QUALITY
(Field Parameters)

Well Number	Date Sampled	Temperature (degrees C)	pH	Specific Conductance (at 25tC)	Comments:
W-5D	05/27/87		6.9	1600	Duplicate
W-5D	05/27/87		6.9	1700	Triplicate
W-5D	05/27/87		6.9	1700	Quadruplicate
W-5D	09/15/87	14.0	7.0	1800	
W-5D	09/15/87		7.0	1800	Duplicate
W-5D	09/15/87		7.0	1800	Triplicate
W-5D	09/15/87		7.0	1800	Quadruplicate
W-5D	02/18/88	10.0	7.0	1800	
W-5D	05/25/88	19.5	7.5	1700	
W-5D	08/24/88	16.2	7.2	1800	
W-5D	11/23/88	14.0	6.6	1800	
W-5D	03/02/89	8.5	7.1	900	
W-5D	05/24/89	15.2	7.2	1700	
W-5D	08/18/89	16.0	7.1	1700	
W-5D	11/27/89	16.0	6.6	1700	
W-5D	02/28/90	14.0	6.7	1500	
W-5D	05/23/90	10.5	6.9	1800	
W-5D	08/28/90	18.0	7.1	1700	
W-5D	11/26/90	12.0	6.9	1900	
W-5D	02/25/91	11.7	7.4	1700	
W-5D	05/28/91	16.0	7.4	1700	
W-5D	08/26/91	16.3	7.4	1800	
W-6	09/05/86	21.5	6.6	1300	
W-6	11/21/86	13.7	6.8	1200	
W-6	11/21/86		6.8	1300	Duplicate
W-6	11/21/86		6.8	1200	Triplicate
W-6	11/21/86		6.8	1200	Quadruplicate
W-6	02/18/87	5.8	6.8	1500	
W-6	02/18/87		6.8	1500	Duplicate
W-6	02/18/87		6.8	1500	Triplicate
W-6	02/18/87		6.8	1500	Quadruplicate
W-6	05/28/87	17.8	6.9	1200	
W-6	05/28/87		6.9	1200	Duplicate
W-6	05/28/87		6.9	1200	Triplicate
W-6	05/28/87		6.9	1200	Quadruplicate
W-6	09/15/87	20.0	6.9	1100	
W-6	09/15/87		6.9	1100	Duplicate
W-6	09/15/87		6.9	1100	Triplicate
W-6	09/15/87		6.9	1100	Quadruplicate
W-6	02/18/88	6.0	7.1	1600	
W-6	05/25/88	12.0	7.2	1700	
W-6	08/24/88	21.5	7.3	1300	
W-6	11/23/88	13.5	6.8	1300	

TABLE 3-3

SUMMARY OF GROUND WATER QUALITY
(Field Parameters)

Well Number	Date Sampled	Temperature (degrees C)	pH	Specific Conductance (at 25IC)	Comments:
W-6	03/02/89	9.5	7.2	1200	
W-6	05/24/89	11.5	7.0	1900	
W-6	08/17/89	17.8	6.9	1300	
W-6	11/27/89	18.0	6.0	1300	
W-6	02/28/90	5.0	6.8	1800	
W-6	05/23/90	10.9	6.6	1700	
W-6	08/28/90	18.8	7.1	1400	
W-6	11/26/90	15.0	7.0	1200	
W-6	02/25/91	11.5	7.5	1400	
W-6	05/28/91	13.5	7.1	2400	
W-6	08/26/91	20.0	7.2	1500	
W-7	02/18/88	8.0	6.7	1200	
W-7	02/18/88	8.0	6.7	1200	Replicate
W-7	05/25/88	15.0	6.7	1400	
W-7	08/24/88	19.0	6.7	1200	
W-7	11/23/88	14.0	6.6	1500	
W-7	03/02/89	9.0	6.8	1000	
W-7	05/24/89	12.0	6.6	1900	
W-7	08/18/89	19.5	6.6	1600	
W-7	11/27/89	16.5	6.2	1600	
W-7	02/28/90	9.0	6.8	1300	
W-7	05/23/90	11.0	6.6	1500	
W-7	08/28/90	19.0	6.8	1400	
W-7	11/26/90	16.0	6.6	1500	
W-7	02/25/91	8.5	6.9	1300	
W-7	05/28/91	13.8	6.6	1300	
W-7	08/26/91	18.7	6.9	1300	
W-7	08/26/91	18.5	6.9	1300	Replicate
W-8	02/17/88	8.0	6.7	1300	
W-8	05/26/88	12.5	6.6	1600	
W-8	05/26/88	12.5	6.6	1600	Replicate
W-8	08/25/88	15.0	6.4	1500	
W-8	11/22/88	14.0	6.4	1500	
W-8	03/01/89	12.5	6.6	1300	
W-8	05/23/89	14.0	6.4	1600	
W-8	08/18/89	15.8	6.5	1600	
W-8	08/18/89	15.6	6.5	1600	Replicate
W-8	11/28/89	11.0	6.3	1700	
W-8	02/27/90	9.2	6.6	1500	
W-8	05/22/90	11.5	6.5	1700	
W-8	08/29/90	19.0	6.6	1500	
W-8	11/28/90	12.3	6.3	1700	

TABLE 3-3

SUMMARY OF GROUND WATER QUALITY
(Field Parameters)

Well Number	Date Sampled	Temperature (degrees C)	pH	Specific Conductance (at 25C)	Comments:
W-8	02/27/91	8.5	6.8	1800	
W-8	05/29/91	18.0	6.7	1500	
W-9	02/17/88	6.8	6.8	2200	
W-9	05/26/88	13.2	6.7	2100	
W-9	08/24/88	19.5	6.8	2000	
W-9	11/22/88	14.0	6.6	1300	
W-9	03/01/89	11.0	6.8	1700	
W-9	03/01/89	11.0	6.8	1700	Replicate
W-9	05/23/89	14.5	6.5	2000	
W-9	08/17/89	15.2	6.5	2200	
W-9	11/28/89	11.2	6.4	2100	
W-9	02/27/90	10.0	5.8	1900	
W-9	05/23/90	11.8	6.5	2800	
W-9	08/28/90	21.5	6.7	3100	
W-9	11/27/90	16.2	6.7	3000	
W-9	02/25/91	4.5	7.9	2600	
W-9	05/29/91	16.8	6.8	2900	
W-9	08/26/91	20.2	6.9	2500	
W-10	02/17/88	8.0	6.3	1800	
W-10	05/25/88	15.5	6.3	2400	
W-10	08/25/88	17.0	6.3	1500	
W-10	08/25/88	17.0	6.3	1500	Replicate
W-10	11/22/88	15.0	6.7	1300	
W-10	03/02/89	7.0	6.7	1300	
W-10	05/23/89	13.5	6.6	2100	
W-10	08/17/89	19.0	6.3	1600	
W-10	11/28/89	13.8	6.4	1400	
W-10	02/27/90	10.0	6.7	1500	
W-10	05/23/90	9.0	6.4	2700	
W-10	08/29/90	22.0	6.5	1900	
W-10	12/06/90	14.5	6.5	1100	
W-10	02/26/91	8.2	6.6	2700	
W-10	05/30/91	13.5	6.8	2500	
W-10	08/26/91	17.8	6.8	2100	
W-11	02/18/88	8.0	4.5	2500	
W-11	05/25/88	16.3	4.4	1900	
W-11	08/24/88	17.0	4.2	2400	
W-11	11/22/88	14.0	4.0	1800	
W-11	03/02/89	10.0	4.0	1300	
W-11	05/23/89	14.5	4.1	2000	

TABLE 3-3

SUMMARY OF GROUND WATER QUALITY
(Field Parameters)

Well Number	Date Sampled	Temperature (degrees C)	pH	Specific Conductance (at 25tC)	Comments:
W-11	05/23/89	14.0	4.1	2000	Replicate
W-11	08/18/89	17.9	4.2	1500	
W-11	11/28/89	12.3	3.7	1800	
W-11	02/27/90	11.0	3.9	2100	
W-11	05/24/90	14.5	4.4	1900	
W-11	08/29/90	21.5	4.5	1900	
W-11	12/06/90	14.3	3.9	1400	
W-11	02/27/91	7.8	4.3	1600	
W-11	05/30/91	14.7	4.7	2000	
W-11	08/26/91	17.7	4.6	2100	
W-12	02/18/88	13.0	6.3	1400	
W-12	02/18/88	13.0	6.2	1400	Replicate
W-12	05/25/88	11.5	6.2	1600	
W-12	08/24/88	17.8	6.4	1400	
W-12	11/23/88	15.5	6.2	1400	
W-12	03/02/89	8.0	6.5	1200	
W-12	05/24/89	12.5	6.2	1500	
W-12	08/17/89	17.2	6.2	1500	
W-12	11/27/89	18.0	5.6	1700	
W-12	02/28/90	11.5	6.6	1800	
W-12	05/23/90	10.2	6.5	2300	
W-12	08/28/90	19.0	6.3	2300	
W-12	11/26/90	18.0	6.1	2800	
W-12	02/25/91	11.0	6.4	2800	
W-12	05/28/91	16.5	6.2	2700	
W-12	08/26/91	19.5	6.3	3000	
W-13	02/18/88	12.0	6.7	2500	
W-13	05/25/88	13.5	6.6	2600	
W-13	08/24/88	15.5	6.7	2500	
W-13	11/23/88	13.0	6.5	2600	
W-13	03/02/89	12.0	6.8	1700	
W-13	03/02/89	12.0	6.9	1700	Replicate
W-13	05/24/89	15.0	6.7	2600	
W-13	08/18/89	17.0	7.2	2400	
W-13	11/27/89	16.2	6.4	2400	
W-13	02/28/90	13.0	6.7	2200	
W-13	05/23/90	12.9	6.8	2500	
W-13	05/23/90	11.0	6.7	2800	Replicate
W-13	08/28/90	19.0	6.8	2300	
W-13	08/28/90	19.0	6.8	2300	Replicate
W-13	11/26/90	17.0	6.7	2400	
W-13	11/26/90	17.0	6.7	2500	Replicate

TABLE 3-3

SUMMARY OF GROUND WATER QUALITY
(Field Parameters)

Well Number	Date Sampled	Temperature (degrees C)	pH	Specific Conductance (at 25ºC)		Comments:
W-13	02/25/91	12.9	7.0	2200		
W-13	02/25/91	8.0	6.9	2100		Replicate
W-13	02/25/91	14.5	7.0	2000		Lab duplicate
W-13	05/28/91	15.0	7.0	2500		
W-13	05/28/91	15.0	6.9	2500		Replicate
W-13	08/26/91	15.2	6.9	2600		
W-14	02/18/88	10.0	6.6	1400		
W-14	05/25/88	15.7	6.9	1300		
W-14	08/24/88	17.2	6.7	1200		
W-14	11/23/88	15.0	6.6	1200		
W-14	03/02/89	11.0	7.0	1100		
W-14	05/24/89	13.0	6.5	2100		
W-14	08/17/89	17.0	6.5	1800		
W-14	08/17/89	15.5	6.7	1800		Replicate
W-14	11/27/89	18.0	6.5	1400		
W-14	02/28/90	9.8	6.9	1200		
W-14	02/28/90	9.8	6.9	1200		Replicate
W-14	05/23/90	13.0	6.6	2600		
W-14	08/28/90	19.2	6.6	3900		
W-14	11/26/90	17.2	6.5	4700		
W-14	02/25/91	11.5	6.6	4100		
W-14	05/28/91	13.8	6.7	2800		
W-14	08/26/91	15.4	6.8	2900		
K-14 (west)	09/05/86	16.0	7.2	1000		
K-14 (west)	11/21/86	11.3	7.0	10000	(1)	
K-14 (west)	11/21/86		7.0	10000	(1)	Duplicate
K-14 (west)	11/21/86		7.0	10000	(1)	Triplicate
K-14 (west)	11/21/86		7.0	10000	(1)	Quadruplicate
K-14 (west)	02/18/87	10.8	6.8	1000		
K-14 (west)	02/18/87		6.8	1000		Duplicate
K-14 (west)	02/18/87		6.9	1000		Triplicate
K-14 (west)	02/18/87		6.9	1000		Quadruplicate
K-14 (west)	05/27/87	18.3	7.3	1000		
K-14 (west)	05/27/87		7.2	1000		Duplicate
K-14 (west)	05/27/87		7.2	1000		Triplicate
K-14 (west)	05/27/87		7.2	1000		Quadruplicate
K-14 (west)	08/24/88	17.7	6.6	910		
K-15 (east)	09/05/86	15.5	7.2	1100		
K-15 (east)	11/21/86	10.4	6.9	11000	(1)	
K-15 (east)	11/21/86		6.9	11000	(1)	Duplicate
K-15 (east)	11/21/86		6.9	11000	(1)	Triplicate

TABLE 3-3

SUMMARY OF GROUND WATER QUALITY
(Field Parameters)

Well Number	Date Sampled	Temperature (degrees C)	pH	Specific Conductance (at 25tC)		Comments:
K-15 (east)	11/21/86		7.0	11000	(1)	Quadruplicate
K-15 (east)	02/18/87	11.5	6.8	1100		
K-15 (east)	02/18/87		6.9	1100		Duplicate
K-15 (east)	02/18/87		6.9	1100		Triplicate
K-15 (east)	02/18/87		6.9	1100		Quadruplicate
K-15 (east)	05/27/87	14.8	7.0	1100		
K-15 (east)	05/27/87		7.0	1100		Duplicate
K-15 (east)	05/27/87		7.0	1100		Triplicate
K-15 (east)	05/27/87		7.0	1100		Quadruplicate
K-61 (north)	08/24/88	24.0	6.3	1000		
AD-1	06/04/90	15.0	7.2	1100		
AD-1	08/28/90	23.0	11.8	3200	(2)	
AD-1	11/26/90	12.0	6.5	1900		
AD-1	02/25/91	10.5	7.0	1600		
AD-1	02/25/91	10.2	7.1	1600		Lab duplicate
AD-1	05/28/91	18.0	6.8	1600		
AD-1	08/29/91	19.2	6.7	1700		
AD-2	06/04/90	13.5	8.0	690		
AD-2	08/28/90	23.0	7.1	940		
AD-2	08/28/90	23.0	7.1	990		Replicate
AD-2	11/26/90	11.5	6.8	960		
AD-2	02/25/91	9.0	7.2	900		
AD-2	05/28/91	16.9	7.2	870		
AD-2	08/29/91	20.0	7.1	900		
AD-3	06/04/90	15.2	8.9	590		
AD-3	08/28/90	23.5	9.1	770		
AD-3	11/26/90	11.5	9.3	670		
AD-3	02/25/91	10.0	10.4	800		
AD-3	05/28/91	17.7	10.8	500		
AD-3	08/29/91	19.0	10.9	690		
AD-4	06/04/90	15.5	11.6	1500		
AD-4	08/28/90	23.2	7.1	1500	(2)	
AD-4	11/26/90	11.5	11.7	3500		
AD-4	11/26/90	11.5	11.6	3500		Replicate
AD-4	02/25/91	8.5	12.3	3400		
AD-4	02/25/91	8.5	12.4	3300		Replicate
AD-4	05/28/91	17.0	12.6	3700		
AD-4	05/28/91	17.0	12.6	4100		Replicate
AD-4	08/29/91	22.0	12.1	4600		

TABLE 3-3

SUMMARY OF GROUND WATER QUALITY
(Field Parameters)

Well Number	Date Sampled	Temperature (degrees C)	pH	Specific Conductance (at 25fC)	Comments:
AD-4	08/29/91	22.2	12.2	4700	Replicate
AD-5	06/04/90	14.5	7.8	580	
AD-5	08/28/90	23.2	8.3	730	
AD-5	11/26/90	11.2	7.6	830	
AD-5	02/25/91	10.9	8.3	730	
AD-5	05/28/91	15.5	7.8	770	
AD-5	08/29/91	18.5	7.6	790	

(1) Probable error in recording field specific conductance values for wells K-14 and K-15 on 11/21/56.
(2) Probable error in recording pH for AD-1 and AD-4 on 08/28/90(values probably reversed).

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
T-1	02/27/90	WWES	<250	<2.0	50	<10	360000	<50	<10	<10	<10	<50	130000	1300	<0.2	10	5600*	<2.0	150000	<20	<50	
T-1	05/22/90	WWES	<200	<2.0	50	<2.0	430000	<10*	<10	<10	60	<5.0	150000	1600	<0.2	<10	4300	<2.0	73000	<20	<10	
T-1	08/29/90	WWES	<200	<2.0	40	<2.0	492000	<10	<10	<10	10	<2.0	163000	1700	<0.2	20	4600	<2.0	73000	<20	<10	
T-1	11/28/90	WWES				<2.0	478000	<10			20	<2.0	161000	1700		20		<2.0	70000	<20		
T-1	02/27/91	WWES				<2.0	530000	<10			10	<1.0	176000	1900		10		<2.0	74000	<20		
T-1	02/27/91	WWES				2.0	535000	<10			<10	<1.0	179000	1800		10		<2.0	75000	<20		Replicate Sample
T-1	05/29/91	WWES				2.1	566000	<2.0			<10	<1.0	177000	2000		<10		<2.0	76000	30		
T-2A	11/27/89	WWES				0.96		<10				<5.0										
T-2A	02/26/90	WWES	<250	<2.0	40	<10	230000	<50	<10	<10	<10	<50	79000	200	<0.2	<10	<5000*	<2.0	85000	<20	<50	
T-2A	02/26/90	WWES	<250	<2.0	40	<10	230000	<50	<10	<10	<10	<50	78000	200	<0.2	<10	<5000*	<2.0	54000	<20	<50	Replicate Sample
T-2A	05/22/90	WWES	<200	<2.0	50	3.0	200000	<10*	<10	<10	40	<5.0	74000	210	<0.2	<10	4200	<2.0	42000	<20	<10	
T-2A	08/29/90	WWES	<200	<2.0	60	<2.0	222000	<10	<10	<10	150	<2.0	76000	150	<0.2	20	4600	<2.0	45000	<20	<10	
T-2A	11/27/90	WWES				<2	200000	<10			160	<2.0	72000	210		<10		<2.0	44000	<20		
T-2A	02/26/91	WWES				<2.0	222000	<10			40	<1.0	72000	150		<10		<2.0	53000	<20		
T-2A	05/29/91	WWES				<2.0	229000	<2.0			100	<1.0	71000	160		<10		<2.0	61000	<20		
T-2B	02/26/90	WWES	<250	<2.0	40	<10	680000	<50	<10	<10	13000	<50	160000	1600	<0.2	<10	7600*	<2.0	90000	<20	<50	
T-2B	05/22/90	WWES	340	<2.0	90	2.0	680000	<10*	<10	<10	15000	<5.0	160000	1700	<0.2	<10	5600	<2.0	41000	<20	<10	
T-2B	08/29/90	WWES	<200	<2.0	30	<2.0	699000	<10	<10	<10	15000	<2.0	154000	1800	<0.2	20	5600	<2.0	44000	<20	<10	
T-2B	11/27/90	WWES				<2	595000	<10			16000	<2.0	135000	1700		<10		<2.0	38000	<20		
T-2B	02/26/91	WWES				<2.0	683000	<10			16000	<1.0	155000	1800		<10		<2.0	39000	<20		
T-2B	05/29/91	WWES				<2.0	667000	<2.0			17000	<1.0	159000	1800		<10		<2.0	43000	<20		
T-3	02/27/90	WWES	<250	<2.0	<200	<10	120000	<50	<10	<10	<10	<50	47000	520	<0.2	<10	<5000	<2.0	66000	<20	<50	
T-3	02/27/90	WWES	<250	<2.0	<200	<10	110000	<50	<10	<10	20	<50	45000	520	<0.2	<10	<5000	<2.0	66000	<20	<50	Replicate Sample
T-3	05/22/90	WWES	340	<2.0	70	<2.0	110000	<10*	<10	<10	<10	<5.0	44000	460	<0.2	<10	2200	<2.0	64000	<20	<10	
T-3	05/22/90	WWES	<200	<2.0	60	<2.0	110000	<10*	<10	<10	10	<5.0	45000	440	<0.2	<10	2200	<2.0	69000	<20	<10	Replicate Sample
T-3	08/29/90	WWES	<200	<2.0	60	<2.0	117000	<10	<10	<10	<10	<2.0	48000	410	<0.2	10	2500	<2.0	55000	<20	<10	
T-3	12/06/90	WWES				<2.0	123000	<10			10	7.0	42000	580		<10		<2.0	53000	420		
T-3	12/06/90	WWES				<2.0	123000	<10			10	7.0	42000	580		<10		<2.0	52000	420		Replicate Sample
T-3	02/26/91	WWES				<2.0	112000	<10			<10	3.2	47000	490		<10		<2.0	54000	200		
T-3	05/31/91	WWES				<2.0	106000	<2.0			<10	3.1	45000	430		<10		<2.0	52000	200		
T-3	05/31/91	WWES				<2.0	110000	<2.0			<10	2.5	43000	440		<10		<2.0	52000	150		Replicate Sample
T-4A	02/27/90	WWES	<250	<2.0	30	<10	320000	<50	<10	<10	<10	<50	94000	510	<0.2	20	<5000*	<2.0	80000	<20	<50	
T-4A	05/22/90	WWES	<200	<2.0	30	<2.0	300000	<10*	<10	<10	<10	<5.0	97000	420	<0.2	<10	2100	<2.0	63000	<20	<10	
T-4A	08/28/90	WWES	<200	<2.0	20	<2.0	315000	<10	<10	<10	20	<2.0	97000	450	<0.2	20	2200	<2.0	64000	<20	<10	
T-4A	11/28/90	WWES				<2	290000	<10			20	<2.0	91000	440		<10		<2.0	61000	<20		
T-4A	02/26/91	WWES				<2.0	240000	<10			<10	<1.0	93000	440		<10		<2.0	65000	<20		
T-4A	05/29/91	WWES				<2.0	311000	<2.0			60	<1.0	94000	420		<10		<2.0	67000	<20		
T-4B	02/27/90	WWES	<250	<2.0	<200	<10	180000	<50	<10	<10	100	<50	57000	1600	<0.2	<10	7100	<2.0	42000	<20	<50	
T-4B	02/27/90	WWES	<250	<2.0	<200	<10	190000	<50	<10	<10	100	<50	61000	1600	<0.2	<10	6700	<2.0	42000	<20	<50	Replicate Sample
T-4B	05/22/90	WWES	220	<2.0	90	<2.0	190000	<10*	<10	<10	120	<5.0	58000	1700	<0.2	<10	6500	<2.0	37000	<20	<10	
T-4B	05/22/90	WWES	480	<2.0	90	<2.0	190000	<10*	<10	<10	140	<5.0	55000	1700	<0.2	<10	6400	<2.0	36000	<20	<10	Replicate Sample
T-4B	08/28/90	WWES	<200	<2.0	70	<2.0	171000	<10	<10	<10	160	<2.0	51000	1500	<0.2	20	6400	<2.0	31000	<20	<10	
T-4B	08/28/90	WWES	<200	<2.0	70	<2.0	171000	<10	<10	<10	130	<2.0	52000	1500	<0.2	20*	6500	<2.0	31000	<20	<10	Replicate Sample

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
T-4B	11/28/90	WWES				<2	141000	<10			640	<2.0	48000	700		<10		<2.0	33000	<20		
T-4B	02/26/91	WWES				<2.0	181000	<10			160	<1.0	54000	1600		<10		<2.0	<28000	<20		
T-4B	05/29/91	WWES				<2.0	174000	<2.0			160	<1.0	49000	1500		<10		<2.0	29000	<20		
T-5A	02/27/90	WWES	<250	<2.0	<200	<10	130000	<50	<10	<10	<10	<50	58000	380	<0.2	<10	<5000	<2.0	36000	<20	<50	
T-5A	05/22/90	WWES	<200	<2.0	30	<2.0	130000	<10*	<10	<10	30	<5.0	55000	290	<0.2	<10	2500	<2.0	35000	<20	<10	
T-5A	08/28/90	WWES	<200	<2.0	30	<2.0	134000	<10	<10	<10	<10	<2.0	58000	320	<0.2	20	2900	<2.0	40000	<20	<10	
T-5A	11/27/90	WWES				<2	119000	<10			20	<2.0	47000	320		<10		<2.0	39000	<20		
T-5A	02/25/91	WWES				<2.0	135000	<10			<10	<1.0	55000	330		<10		<2.0	41000	<20		
T-5A	05/29/91	WWES				<2.0	141000	<2.0			50	<1.0	54000	290		<10		<2.0	45000	<20		
T-5B	02/27/90	WWES	<250	<2.0	<200	<10	280000	<50	<10	<10	1400	<50	110000	140	0.3*	<10	<5000	<2.0	39000	<20	<50	
T-5B	05/22/90	WWES	<200	<2.0	30	<2.0	300000	<10*	<10	<10	600	<5.0	120000	160	<0.2	<10	2900	<2.0	35000	<20	<10	
T-5B	05/22/90	WWES	<200	<2.0	30	<2.0	310000	<10*	<10	<10	550	<5.0	120000	150	<0.2	<10	3000	<2.0	25000	<20	<10	Replicate Sample
T-5B	08/28/90	WWES	<200	<2.0	30	<2.0	321000	<10	<10	<10	490	<2.0	121000	160	0.2	<10	3100	<2.0	36000	<20	<10	
T-5B	11/27/90	WWES				<2.0	327000	<10			6500	<2.0	122000	170		<10		<2.0	31000	<20		
T-5B	02/25/91	WWES				<2.0	292000	<10			5200	<1.0	103000	160		<10		<2.0	34000	60		
T-5B	05/29/91	WWES				<2.0	325000	<2.0			5900	<1.0	112000	160		<10		<2.0	35000	<20		
T-5C	02/27/90	WWES	<250	<2.0	<200	<10	400000	<50	<10	<10	1700	<50	130000	510	<0.2	<10	<5000	<2.0	65000	<20	<50	
T-5C	05/22/90	WWES	<200	<2.0	40	<2.0	430000	<10*	<10	<10	4200	<5.0	140000	470	<0.2	<10	4100	<2.0	56000	<20	<10	
T-5C	08/28/90	WWES	<200	<2.0	30	<2.0	439000	<10	<10	<10	5000	<2.0	146000	630	0.3	<10	4200	<2.0	56000	<20	<10	
T-5C	11/27/90	WWES				<2	376000	<10			5100	<2.0	116000	530		<10		<2.0	52000	<20		
T-5C	02/25/91	WWES				<2.0	439000	<10			4300	<1.0	148000	640		<10		<2.0	55000	<20		
T-5C	05/29/91	WWES				<2.0	437000	<2.0			6000	<1.0	138000	580		<10		<2.0	59000	<20		
T-5C	05/29/91	WWES				<2.0	456000	<2.0			6000	<1.0	141000	640		<10		<2.0	60000	<20		Replicate Sample
T-6A	11/27/89	WWES				1.1		<10				<5.0										
T-6A	02/26/90	WWES	<250	<2.0	30	<10	96000	<50	<10	<10	<10	<50	54000	2300	<0.2	<10	<5000*	<2.0	78000	20	<50	
T-6A	05/22/90	WWES	270	<2.0	30	<2.0	120000	<10*	<10	<10	40	<5.0	62000	2500	<0.2	<10	<500	<2.0	74000	20	<10	
T-6A	08/29/90	WWES	<200	<2.0	30	<2.0	133000	<10	<10	<10	80	<2.0	72000	2400	<0.2	<10	<500	<2.0	78000	<20	<10	
T-6A	08/29/90	WWES	<200	<2.0	30	<2.0	127000	<10	<10	<10	20	<2.0	69000	2400	<0.2	<10	<500	<2.0	74000	<20	<10	Replicate Sample
T-6A	11/27/90	WWES				<2	119000	<10			90	2.1	62000	2700		10		<2.0	75000	<20		
T-6A	11/27/90	WWES				<2	120000	<10			100	<2.0	63000	2700		10		<2.0	75000	<20		Replicate Sample
T-6A	02/26/91	WWES				<2.0	144000	<10			<10	<1.0	75000	2500		<10		<2.0	73000	<20		
T-6A	02/26/91	WWES				<2.0	147000	<10			10	<1.0	72000	2500		<10		<2.0	75000	<20		Replicate Sample
T-6A	05/29/91	WWES				<2.0	153000	<2.0			30	<1.0	76000	2900		<10		<2.0	74000	<20		
T-6A	05/29/91	WWES				<2.0	156000	<2.0			30	<1.0	77000	2900		<10		<2.0	76000	<20		Replicate Sample
T-6B	02/26/90	WWES	<250	<2.0	40	<10	180000	<50	<10	<10	<10	<50	62000	240	<0.2	<10	<5000*	<2.0	59000	<20	<50	
T-6B	05/22/90	WWES	340	<2.0	30	<2.0	190000	<10	<10	<10	<10	<5.0	63000	230	<0.2	<10	2400	<2.0	57000	<20	<10	
T-6B	08/29/90	WWES	<200	<2.0	30	<2.0	189000	<10	<10	<10	<10	<2.0	70000	190	<0.2	<100	2800	<2.0	59000	<20	<10	
T-6B	11/27/90	WWES				<2.0	156000	<10			20	<2.0	54000	220		<10		<2.0	64000	<20		
T-6B	02/26/91	WWES				<2.0	174000	<10			<10	<1.0	60000	170		<10		<2.0	62000	<20		
T-6B	05/29/91	WWES				<2.0	175000	<2.0			<10	<1.0	55000	170		<10		<2.0	63000	<20		
T-6C	02/26/90	WWES	<250	<2.0	70	<10	460000	<50	<10	<10	3900	<50	170000	280	<0.2	<10	<5000*	<2.0	39000	<20	<50	
T-6C	05/22/90	WWES	340	<2.0	70	<2.0	450000	<10	<10	<10	9400	<5.0	170000	290	<0.2	<10	2800	<2.0	37000	<20	<10	
T-6C	08/29/90	WWES	<200	<2.0	80	<2.0	462000	<10	<10	<10	9000	<2.0	172000	270	<0.2	10	3400	<2.0	38000	<20	<10	
T-6C	11/27/90	WWES				<2	440000	<10			9900	<2.0	168000	260		<10		<2.0	39000	<20		
T-6C	02/26/91	WWES				<2.0	477000	<10			8000	<1.0	181000	270		<10		<2.0	37000	<20		

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
T-6C	05/29/91	WWES				<2.0	490000	<2.0			9600	<1.0	170000	240		<10		<2.0	38000	<20		
T-7A	02/28/90	WWES	<150	<2.0	<200	<10	200000	<50	<10	<10	10	<50	66000	300	<0.2	60	<5000	<2.0	580000	<20	<50	
T-7A	05/23/90	WWES	340	<2.0	50	<2.0	160000	<10	<10	<10	50	<5.0	56000	340	<0.2	30	<500	<2.0	530000	<20	<10	
T-7A	08/30/90	WWES	<200	<2.0	40	<2.0	83000	<10	<10	<10	<10	<2.0	28000	160	<0.2	40	<500	<2.0	334000	<20	<10	
T-7A	11/28/90	WWES				<2	79000	<10			40	<2.0	26000	220		60		<2.0	297000	<20		
T-7A	11/28/90	WWES				<2	77000	<10			20	<2.0	26000	230		60		<2.0	307000	<20		Replicate Sample
T-7A	02/27/91	WWES				<2.0	121000	<10			40	<1.0	42000	330		210		<2.0	454000	<20		
T-7A	05/29/91	WWES				<2.0	101000	7.1			170	<1.0	32000	230		120		<2.0	395000	<20		
T-7B	02/28/90	WWES	<150	<2.0	<200	<10	140000	<50	<10	<10	390	<50	59000	240	<0.2	<10	<5000	<2.0	82000	<20	<50	
T-7B	02/28/90	WWES	<150	<2.0	<200	<10	140000	<50	<10	<10	320	<50	59000	240	<0.2	<10	<5000	<2.0	83000	<20	<50	Replicate Sample
T-7B	05/23/90	WWES	<200	<2.0	110	<2.0	140000	<10	<10	<10	270	<5.0	58000	230	<0.2	<10	3000	<2.0	87000	<20	<10	
T-7B	05/23/90	WWES	<200	<2.0	120	<2.0	130000	<10	<10	<10	160	<5.0	54000	230	<0.2	<10	3200	<2.0	88000	<20	<10	Replicate Sample
T-7B	08/30/90	WWES	<200	<2.0	90	<2.0	153000	<10	<10	<10	390	<2.0	66000	220	<0.2	<10	3700	<2.0	84000	<20	<10	
T-7B	08/30/90	WWES	<200	<2.0	100	<2.0	149000	<10	<10	<10	270	<2.0	65000	220	<0.2	<10	3700	<2.0	84000	<20	<10	Replicate Sample
T-7B	11/28/90	WWES				<2	129000	<10			1500	<2.0	56000	350		<10		<2.0	75000	<20		
T-7B	02/27/91	WWES				<2.0	149000	<10			220	<1.0	67000	250		<10		<2.0	85000	<20		
T-7B	02/27/91	WWES				<2.0	148000	<10			260	<1.0	65000	260		<10		<2.0	85000	<20		Replicate Sample
T-7B	05/29/91	WWES				<2.0	182000	<2.0			440	1.0	72000	210		<10		<2.0	80000	40		
T-7B	05/29/91	WWES				<2.0	179000	<2.0			280	<1.0	71000	200		<10		<2.0	79000	<20		Replicate Sample
T-8	02/28/90	WWES	<150	<2.0	<200	<10	370000	<50	<10	<10	6500	<50	150000	870	<0.2	<10	<5000	<2.0	43000	<20	<50	
T-8	05/23/90	WWES	<200	<2.0	80	<2.0	340000	<10	<10	<10	5500	<5.0	150000	930	<0.2	<10	600	<2.0	50000	<20	<10	
T-8	08/29/90	WWES	<200	<2.0	60	<2.0	337000	<10	<10	<10	7200	<2.0	153000	940	<0.2	<10	950	<2.0	44000	<20	<10	
T-8	11/28/90	WWES				<2	311000	<10			7200	<2.0	143000	880		<10		<2.0	43000	<20		
T-8	02/27/91	WWES				<2.0	297000	<10			6000	<1.0	142000	870		<10		<2.0	41000	<20		
T-8	05/28/91	WWES				<2.0	316000	<2.0			5600	<1.0	129000	820		<10		<2.0	41000	<20		
T-9	02/28/90	WWES	<150	<2.0	<200	<10	130000	<50	<10	<10	250	<50	50000	840	<0.2	<10	<5000	<2.0	30000	<20	<50	
T-9	05/23/90	WWES	220	<2.0	80	<2.0	120000	<10	<10	<10	30	<5.0	51000	880	<0.2	<10	1200	<2.0	47000	<20	<10	
T-9	05/23/90	WWES	340	<2.0	60	<2.0	120000	<10	<10	<10	20	<5.0	51000	890	<0.2	<10	1100	<2.0	43000	<20	<10	Replicate Sample
T-9	08/29/90	WWES	<200	<2.0	70	<2.0	128000	<10	<10	<10	220	<2.0	56000	830	<0.2	<10	1600	<2.0	113000	<20	<10	
T-9	11/28/90	WWES				<2	115000	<10			200	<2.0	48000	800		10		<2.0	138000	<20		
T-9	11/28/90	WWES				<2	110000	<10			<10	<2.0	48000	720		10		<2.0	139000	<20		Replicate Sample
T-9	02/27/91	WWES				<2.0	128000	<10			10	<1.0	55000	760		<10		<2.0	208000	<20		
T-9	05/29/91	WWES				<2.0	130000	<2.0			<10	<1.0	49000	550		<10		<2.0	165000	<20		
T-10	02/28/90	WWES	<150	<2.0	<200	<10	1100000	<50	30	<10	29000	<50	270000	2900	<0.2	90	21000	<2.0	51000	<20	<50	
T-10	05/23/90	WWES	<200	<2.0	50	<2.0	1200000	<10	30	<10	31000	<5.0	260000	3200	<0.2	90	17000	<2.0	57000	<20	<10	
T-10	08/29/90	WWES	350	<2.0	40	<2.0	1280000	<10	40	<10	32000	<2.0	275000	3900	<0.2	110	21000	<2.0	59000	<20	<10	
T-10	11/28/90	WWES				<2	1270000	<10			35000	<2.0	248000	5200		110		<2.0*	62000	<20		
T-10	02/27/91	WWES				<2.0	1260000	<10			36000	<1.0	257000	5600		120		<2.0*	57000	<20		
T-10	05/29/91	WWES				31	1450000	<2.0			42000	<1.0	262000	6100		110		<2.0	65000	20		
T-11A	02/26/90	WWES	<150	<2.0	90	<10	83000	<50	<10	<10	<10	<50	34000	530	<0.2	<10	7400*	<2.0	180000	<20	<50	
T-11A	05/22/90	WWES	<200	<2.0	130	<2.0	120000	<10	<10	<10	100	<5.0	49000	850	<0.2	<10	3800	<2.0	52000	<20	<10	
T-11A	08/30/90	WWES	<200	<2.0	110	<2.0	113000	<10	<10	<10	640	<2.0	46000	850	<0.2	10	3300	<2.0	42000	<20	<10	
T-11A	11/27/90	WWES				<2	129000	<10			1900	<2.0	58000	970		<10		<2.0	49000	<20		
T-11A	02/26/91	WWES				<2.0	143000	<10			2600	<1.0	57000	1000		<10		<2.0	56000	<20		
T-11A	05/30/91	WWES				<2.0	132000	<2.0			2900	<1.0	52000	920		<10		<2.0	56000	<20		
T-11B	02/26/90	WWES	<150	<2.0	100	<10	150000	<50	<10	<10	<10	<50	57000	460	<0.2	20	5200*	<2.0	58000	30	<50	

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
T-11B	05/22/90	WWES	<200	<1.0	80	<2.0	160000	<10	<10	<10	70	<5.0	64000	670	<0.2	<10	3400	<1.0	53000	<20	<10	
T-11B	08/30/90	WWES	<200	<1.0	90	<2.0	159000	<10	<10	<10	40	<2.0	64000	630	<0.2	10	3600	<2.0	54000	<20	<10	
T-11B	11/27/90	WWES				<2	147000	<10			<10	<2.0	64000	640		10		<2.0	56000	<20		
T-11B	02/26/91	WWES				<2.0	175000	<10			<10	<1.0	69000	660		10		<2.0	58000	<20		
T-11B	05/30/91	WWES				<2.0	172000	<2.0			40	2.6	66000	620		<10		<2.0	51000	90		
T-11C	02/26/90	WWES	<250	2.6	110	<10	91000	<50	<10	<10	<10	<50	92000	1500	<0.2	30	<5000*	<2.0	50000	20	<50	
T-11C	05/22/90	WWES	<200	<1.0	40	<2.0	240000	<10	<10	<10	10	<5.0	97000	1800	<0.2	<10	3700	<2.0	47000	<20	<10	
T-11C	08/30/90	WWES	<200	<1.0	50	<2.0	256000	<10	<10	<10	150	<2.0	102000	1700	<0.2	10	5900	<2.0	46000	<20	<10	
T-11C	11/27/90	WWES				<2	234000	<10			<10	<2.0	102000	1800		10		<2.0	42000	<20		
T-11C	02/26/91	WWES				<2.0	276000	<10			20	<1.0	109000	1800		<10		<2.0	43000	<20		
T-11C	05/30/91	WWES				<2.0	288000	<2.0			40	<1.0	110000	1900		<10		<2.0	39000	<20		
T-12	02/27/90	WWES	<250	<1.0	30	<10	270000	<50	<10	<10	<10	<50	88000	680	<0.2	<10	<5000*	<2.0	62000	<20	<50	
T-12	05/24/90	WWES	340	<1.0	30	<2.0	280000	<10	<10	<10	930	<5.0	88000	1100	<0.2	<10	4000	<2.0	59000	<20	<10	
T-12	08/29/90	WWES																				N/A
T-12	11/28/90	WWES				<2	257000	<10			10	<2.0	93000	700		<10		<2.0	54000	<20		
T-12	02/28/91	WWES				<2.0	297000	<10			<10	<1.0	91000	790		<10		<2.0	64000	20		
T-13A	02/28/90	WWES	<250	<1.0	<200	40	530000	<50	140	<10	280000	<50	180000	16000	<0.2	560	17000	<2.0	62000	28000	<50	
T-13A	05/23/90	WWES	290	<1.0	50	41	610000	<10	110	<10	180000	35	240000	9700	<0.2	580	19000	<2.0	54000	37000	<10	
T-13A	08/28/90	WWES	<200	<1.0	110	26	532000	<10	60	<10	65000	7.3	227000	6500	<0.2	360	16000	<2.0	41000	25000	<10	
T-13A	11/28/90	WWES				19	489000	<10			73000	4.4	194000	6700		340		<2.0	36000	21000		
T-13A	02/28/91	WWES				21	505000	<10			73000	6.0	202000	6500		360		<2.0	43000	29000		
T-13A	05/29/91	WWES				<2.0	53200	<2.0			105000	3.8	209000	9300		590		<2.0	40000	89000		
T-13B	02/28/90	WWES	<250	<1.0	<200	<10	1500000	<50	50	<10	19000	<50	250000	17000	<0.2	30	13000	<2.0	130000	50	<50	
T-13B	05/23/90	WWES	<200	<1.0	120	<2.0	1600000	<10	60	<10	18000	<5.0	280000	18000	<0.2	30	10000	<2.0	150000	40	<10	
T-13B	08/28/90	WWES	<200	<1.0	110	<2.0	1750000	<10	60	<10	22000	<2.0	321000	18000	<0.2	50	11000	<2.0	139000	150	<10	
T-13B	11/28/90	WWES				<2	1640000	<10			32000	<2.0	291000	18000		30		<2.0	123000	<20		
T-13B	02/28/91	WWES				<2.0	1640000	<10			34000	<1.0	296000	18000		20		<2.0*	145000	120		
T-13B	05/29/91	WWES				<2.0	1830000	4.3			3300	<1.0	303000	19000		30		<2.0	147000	130		
T-14	02/28/90	WWES	<250	<1.0	<200	<10	340000	<50	<10	<10	4400	<50	130000	610	<0.2	<10	<5000	<2.0	80000	30	<50	
T-14	05/23/90	WWES	270	<1.0	40	<2.0	380000	<10	<10	<10	6200	<5.0	120000	610	<0.2	<10	3200	<2.0*	55000	<20	<10	
T-14	08/30/90	WWES	<200	<1.0	20	<2.0	394000	<10	<10	<10	12000	<2.0	148000	570	<0.2	<10	3100	<2.0	47000	60	<10	
T-14	11/27/90	WWES				<2	364000	<10			12000	<2.0	148000	580		<10		<2.0	44000	<20		
T-14	02/27/91	WWES				<2.0	407000	<10			97000	<1.0	150000	520		<10		<2.0	44000	<20		
T-14	05/28/91	WWES				<2.0	420000	<2.0			13000	<1.0	149000	590		<10		<2.0	43000	<20		
T-15	02/28/90	WWES	<250	<1.0	<200	<10	140000	60	10	<10	220	<50	60000	670	<0.2	20	<5000	<2.0	32000	<20	<50	
T-15	05/23/90	WWES	<200	<1.0	170	<2.0	130000	<10	<10	<10	1700	<5.0	56000	710	<0.2	<10	1800	<2.0	35000	380	<10	
T-15	08/29/90	WWES	<200	<1.0	1600	<2.0	140000	<10	<10	<10	1200	<2.0	57000	530	<0.2	<10	1800	<2.0	32000	<20	<10	
T-15	11/28/90	WWES				<2	145000	<10			590	<2.0	57000	690		10		<2.0	30000	<20		
T-15	02/27/91	WWES				<2.0	144000	<10			170	<1.0	55000	550		<10		<2.0	32000	<20		
T-15	05/28/91	WWES				<2.0	135000	<2.0			410	<1.0	54000	540		<10		<2.0	28000	<20		
T-16	02/27/90	WWES	<250	<1.0	<200	<10	420000	<50	<10	<10	<10	<50	130000	1300	<0.2	<10	6600	<2.0	61000	<20	<50	
T-16	05/24/90	WWES	<200	<1.0	40	<2.0	460000	<10	<10	<10	20	<5.0	120000	1400	<0.2	<10	5400	<2.0	62000	<20	<10	
T-16	08/29/90	WWES	<200	<1.0	40	<2.0	459000	<10	<10	<10	30	<2.0	150000	1300	<0.2	70	5500	<2.0	60000	<20	<10	
T-16	11/28/90	WWES				<2.0	446000	<10			360	<2.0	142000	1300		50		<2.0	55000	160		
T-16	02/28/91	WWES				<2.0	456000	<10			<10	<1.0	139000	1300		60		<2.0	59000	<20		

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
T-16	02/28/91	WWES				2.0	452000	<10			<10	<1.0	137000	1300		60		<2.0	60000	<20		Replicate Sample
T-16	05/29/91	WWES				<2.0	461000	<2.0			230	<1.0	165000	1400		20		<2.0	62000	30		
T-17	05/30/91	WWES				<2.0	104000	<2.0			520	<1.0	43000	1700		<10		<2.0	34000	20		
T-17	05/30/91	WWES				<2.0	104000	<2.0			10	<1.0	45000	1300		<10		<2.0	35000	<20		Replicate Sample
T-18	05/28/91	WWES				<2.0	104000	<2.0			60	<1.0	45000	1000		<10		<2.0	27000	<20		
T-19A	05/29/91	WWES				<2.0	157000	<2.0			240	6.1	70000	1400		30		<2.0	33000	70		
T-19B	05/29/91	WWES				<2.0	171000	<2.0			160	<1.0	66000	660		10		<2.0	65000	20		
T-19C	05/29/91	WWES				<2.0	295000	<2.0			60	1.2	97000	1300		20		3.7	210000	20		
T-20	05/29/91	WWES				<2.0	502000	<2.0			4000*	<1.0	146000	3600		<10		<2.0	94000	30		
T-21	05/29/91	WWES				<2.0	432000	<2.0			31000	<1.0	107000	4500		10		<2.0	361000	20		
W-1	01/23/86	DAL						<5				40										Filtered
W-1	01/23/86	DAL						<5				40										Unfiltered
W-1	09/04/86	DAL		20*	40	<10		20			4200	20		2900	0.2			<1*	70000	70		
W-1	11/21/86	DAL		<5	60	8		<10			5200	70		8800	<0.2			<5	100000	60		
W-1	02/18/87	DAL		<5	10	6		<10			620	<20		3700	<0.2			<5	110000	350		
W-1	03/24/87	ECI										2						1				
W-1	03/24/87	DAL										<20						10				
W-1	04/23/87	ECI										<1						<1				
W-1	04/23/87	RASS										<1						<1				
W-1	05/27/87	RASS		<5	35	<10		<10			8190	<10		4130	<0.2			<5	94600	362		
W-1	09/14/87	RASS						<10				<10										Filtered
W-1	09/14/87	RASS						<10				<10										Unfiltered
W-1	02/17/88	RASS		<10	17	12.9		<10			117	<5		1560	0.25			<5	107000	3220		
W-1	05/25/88	RASS				<5		<10														
W-1	08/24/88	RASS				<5		<10				<5										
W-1	11/22/88	RASS				<5		<10				<5										
W-1	03/02/89	RASS				<5.0		<10				<5.0										
W-1	05/23/89	RASS				9.3		<10				<5.0										
W-1	08/17/89	WWES																				Dry
W-1	11/22/89	WWES																				Dry
W-1	02/27/90	WWES	<250	<5.0	<200	<10	200000	<50	50	<10	<10	<50	77000	9300	<0.2	200	<5000	<5.0	120000	430	<50	
W-1	05/23/90	WWES	<200	<5.0	20	9.0	280000	<10	30	<10	70	<5.0	100000	3400	<0.2	140	2900	<5.0	190000	1500	<10	
W-1	08/28/90	WWES	220	2.7	80	<5.0	173000	<10	<10	<10	15000	<5.0	59000	6800	<0.2	20	2600	<5.0	66000	<20	<10	
W-1	11/28/90	WWES				<5	174000	<10			4200	<5.0	57000	3300		60		<5.0	72000	300		
W-1	02/27/91	WWES				<5.0	110000	<10			480	<1.0	39000	2100		30		<5.0	48000	110		
W-1	05/29/91	WWES				<5.0	152000	<5.0			1000	7.0	47000	4100	40	<5.0			65000	120		
W-1	08/26/91	WWES				<5.0		<10				<5.0										
W-1	08/26/91	WWES				<5.0		<10				<5.0										Replicate
W-1D	09/04/86	DAL		6*	80	<10		<10			<20	50		380	<0.2			2*	55000	20		
W-1D	11/21/86	DAL		<5	70	8		<10			<10	70		320	<0.2			6	49000	20		
W-1D	02/18/87	DAL		<5	30	<5		<10			20	<20		150	<0.2			<5	52000	10		
W-1D	03/24/87	ECI										1						5				
W-1D	03/24/87	DAL										<20						7				
W-1D	04/23/87	ECI										<1						<1				

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
W-1D	04/23/87	RASS										1						<1				
W-1D	05/27/87	RASS		<4	27	<10		<10			37	<10		100	<0.2			<4	40000	78		
W-1D	09/14/87	RASS						<10				<10										Filtered
W-1D	09/14/87	RASS						<10				<10										Unfiltered
W-1D	02/17/88	RASS		<10	36	<5		10.8			55	<5		71	<0.2			<5	42200	16		
W-1D	05/25/88	RASS				<5		<10				<5										
W-1D	08/24/88	RASS				<5		<10				<5										
W-1D	11/22/88	RASS				<5		<10				<5										
W-1D	03/01/89	RASS				<5.0		<10				<5.0										
W-1D	05/23/89	RASS				<5.0		<10				<5.0										
W-1D	08/17/89	RASS				<5.0*		<10				<5.0										
W-1D	11/28/89	WWES				1.7		<10				<5.0										
W-1D	11/28/89	WWES				1.1		<10				<5.0										Replicate Sample
W-1D	02/27/90	WWES	<250	<5.0	<200	<10	270000	<50	<10	<10	430	<50	100000	240	<0.2	50	<5000	<5.0	63000	<20	<50	
W-1D	05/23/90	WWES	<200	<5.0	60	<5.0	290000	<10	<10	<10	20	<5.0	98000	100	<0.2	10	4200	<5.0	78000	<20	<10	
W-1D	08/28/90	WWES	<200	<5.0	40	<5.0	246000	<10	<10	<10	<10	<5.0	89000	100	<0.2	20	4300	<5.0	76000	<20	<10	
W-1D	11/28/90	WWES				<5	254000	<10			<10	<5.0	89000	90		10		<5.0	84000	<20		
W-1D	02/27/91	WWES				<5.0	257000	<10			<10	<1.0	89000	90		10		<5.0	97000	<20		
W-1D	05/29/91	WWES				<5.0	245000	<5.0			60	<1.0	87000	100		20		<5.0	97000	<20		
W-1D	08/27/91	WWES				<5.0		<10				<5.0										
W-2	01/23/86	DAL						<5				40										Filtered
W-2	01/23/86	DAL						5				60										Unfiltered
W-2	09/04/86	DAL		5*	120	<10		<10			130	70		4300	<0.2			4*	56000	70		
W-2	09/04/86	DAL		4*	100	<10		<10			180	60		4100	<0.2			2*	56000	50		Replicate Sample
W-2	11/21/86	DAL		<5	80	8		<10			630	60		4500	<0.2			9	51000	40		
W-2	02/18/87	DAL		<5	50	<5		<10			110	<20		4900	0.4			<5	50000	30		
W-2	03/24/87	BCI										2						4				
W-2	03/24/87	DAL										<20						9				
W-2	04/23/87	BCI										<1						<1				
W-2	04/23/87	RASS										1						<1				
W-2	05/27/87	RASS		<4	31	<10		<10			451	<10		3530	<0.2			<4	40400	63		
W-2	09/14/87	RASS						<10				27										Filtered
W-2	09/14/87	RASS						13				60										Unfiltered
W-2	02/17/88	RASS		<10	33	<5		<10			771	7.2		4910	<0.2			<5	45600	3220		
W-2	05/25/88	RASS				<5		<10				<5										
W-2	08/24/88	RASS				<5		<10				<5										
W-2	11/22/88	RASS				<5		<10				<5										
W-2	03/01/89	RASS				<5.0		<10				<5.0										
W-2	05/23/89	RASS				<5.0		<10				<5.0										
W-2	08/17/89	RASS				<5.0*		<10				<5.0										
W-2	11/27/89	WWES				0.70		<10				<5.0										
W-2	02/26/90	WWES	<250	<5.0	40	<10	250000	<50	<10	<10	60	<50	82000	3000	<0.2	20	<5000*	<5.0	51000	<20	<50	
W-2	05/22/90	WWES	<200	<5.0	40	<5.0	210000	<10*	<10	<10	410	<5.0	72000	3100	<0.2	10	<500	<5.0	49000	<20	<10	
W-2	08/29/90	WWES	220	<5.0	40	<5.0	220000	<10	<10	<10	450	<5.0	80000	3700	<0.2	30	<500	<5.0	53000	<20	<10	
W-2	11/27/90	WWES				<5	191000	<10			520	<5.0	81000	4500		30		<5.0	48000	<20		
W-2	02/26/91	WWES				2.0	240000	<10			370	<1.0	87000	5300		10		<5.0	53000	<20		
W-2	05/29/91	WWES				<5.0	225000	<5.0			550	1.8	83000	4600		20		<5.0	57000	80		
W-2	08/27/91	WWES				<5.0	<10					<5.0										
W-2D	09/04/86	DAL		8*	240	<10		<10			<20	80		620	<0.2			6*	75000	50		
W-2D	11/21/86	DAL		5	50	7		<10			60	70		580	<0.2			9	49000	30		
W-2D	02/18/87	DAL		<5	30	<5		<10			20	<20		560	<0.2			<5	47000	10		

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
W-2D	03/24/87	BCI										1						<1				
W-2D	03/24/87	DAL										<20						7				
W-2D	04/23/87	BCI										<1						<1				
W-2D	04/23/87	RASS										<1						<1				
W-2D	05/27/87	RASS		<3	23	<10		<10			114	<10		451	<0.2			<3	41000	56		
W-2D	09/14/87	RASS						<10				<10										Filtered
W-2D	09/14/87	RASS						<10				<10										Unfiltered
W-2D	02/17/88	RASS		<10	29	<3		13.9			114	<3		482	<0.2			<3	48400	<10		
W-2D	05/25/88	RASS				<3		<10				<3										
W-2D	08/24/88	RASS				<3		<10				5.1										
W-2D	08/24/88	RASS				<3		<10				<3										Replicate Sample
W-2D	11/22/88	RASS				<3		<10				<3										
W-2D	05/23/89	RASS				<3.0		<10				<3.0										
W-2D	05/23/89	RASS				<3.0		<10				<3.0										Replicate Sample
W-2D	08/17/89	RASS				<3.0*		<10				<3.0										
W-2D	11/27/89	WWES				1.8		<10				<3.0										
W-2D	02/26/90	WWES	<250	<3.0	30	<10	320000	<50	<10	<10	<10	<50	93000	710	<0.2	20	8700*	<3.0	46000	<20	<50	
W-2D	05/22/90	WWES	<200	<3.0	30	<3.0	310000	<10	<10	<10	90	<3.0	89000	600	<0.2	<10	6300	<3.0	44000	<20	<10	
W-2D	08/29/90	WWES	<200	<3.0	30	<3.0	301000	<10	<10	<10	<10	<3.0	85000	620	<0.2	10	7000	<3.0	40000	<20	<10	
W-2D	11/27/90	WWES				<3	286000	<10			100	<3.0	88000	670		10		<3.0	37000	<20		
W-2D	02/26/91	WWES				<3.0	340000	<10			90	<1.0	96000	720		<10		<3.0	41000	<20		
W-2D	05/29/91	WWES				<3.0	229000	<3.0			90	<1.0	72000	600		<10		<3.0	44000	<20		
W-2D	08/27/91	WWES				<3.0		<10				<3.0										
W-3	01/23/86	DAL						5				50										Filtered
W-3	01/23/86	DAL						10				70										Unfiltered
W-3	09/05/86	DAL		7*	80	<10		<10			50	50		4100	<0.2			9*	73000	50		
W-3	11/21/86	DAL		<3	40	8		10			50	50		2400	<0.2			6	70000	30		
W-3	02/18/87	DAL		<3	20	<3		<10			90	<20		1700	<0.2			<3	50000	10		
W-3	03/25/87	BCI										<1						<1				
W-3	03/25/87	DAL										<20						7				
W-3	04/23/87	BCI										<1						1				
W-3	04/23/87	RASS										<1						<1				
W-3	05/28/87	RASS		<3	14	<10		<10			51	<10		1900	<0.2			<3	40100	67		
W-3	09/14/87	RASS						<10				<10										Filtered
W-3	09/14/87	RASS						20				19										Unfiltered
W-3	02/17/88	RASS		<10	31	<3		<10			216	<3		2910	<0.2			<3	70700	33		
W-3	05/25/88	RASS				<3		<10				<3										
W-3	08/24/88	RASS				<3		<10				<3										
W-3	11/22/88	RASS				<3		<10				<3										
W-3	03/02/89	RASS				<3.0		<10				<3.0										
W-3	05/23/89	RASS				<3.0		<10				<3.0										
W-3	08/17/89	RASS				<3.0*		<10				<3.0										
W-3	11/28/89	WWES				0.35		<10				<3.0										
W-3	02/27/90	WWES	<250	<3.0	<200	<10	120000	<50	<10	<10	<10	<50	43000	<10	<0.2	<10	<5000	<3.0	77000	<20	<50	
W-3	05/23/90	WWES	<200	<3.0	20	<3.0	120000	<10	<10	<10	40	<3.0	41000	1100	<0.2	40	<500	<3.0	77000	<20	<10	
W-3	08/29/90	WWES	<200	<3.0	30	<3.0	112000	<10	<10	<10	<10	<3.0	36000	1700	<0.2	40	680	<3.0	62000	<20	<10	
W-3	12/06/90	WWES				<3.0	118000	<10			50	<3.0	38000	800		10		<3.0	59000	<20		
W-3	02/27/91	WWES				<3.0	131000	<10			<10	<1.0	41000	340		<10		<3.0	52000	<20		
W-3	05/30/91	WWES				<3.0	136000	<3.0			50	<1.0	46000	1600		20		<3.0	53000	<3.0		
W-3	08/26/91	WWES				<3.0		<10				<3.0										

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
W-3D	09/05/86	DAL		13*	190	<10		<10			80	100		1500	<0.2			10*	97000	50		
W-3D	11/21/86	DAL		<5	70	8		<10			50	70		1900	<0.2			14	86000	20		
W-3D	02/18/87	DAL		<5	40	<5		<10			40	<20		1500	<0.2			<5	69000	20		
W-3D	03/25/87	BCI										1						<1				
W-3D	03/25/87	DAL										<20						15				
W-3D	04/23/87	BCI										2						<1				
W-3D	04/23/87	RASS										<1						<1				
W-3D	05/28/87	RASS		<5	25	<10		<10			59	<10		1100	<0.2			<5	65900	48		
W-3D	05/28/87	RASS		<5	26	<10		<10			32	<10		1060	<0.2			<5	61300	32		Replicate Sample
W-3D	09/14/87	RASS						<10				<10										Filtered
W-3D	09/14/87	RASS						21				29										Unfiltered
W-3D	02/17/88	RASS		<10	24	<5.0		<10			39	<5.0	1260		0.2			<5.0	63000	<10		
W-3D	05/25/88	RASS				<5.0		<10				<5.0										Replicate Sample
W-3D	05/25/88	RASS				<5.0		<10				<5.0										
W-3D	08/24/88	RASS				<5.0		<10				<5.0										Replicate Sample
W-3D	11/22/88	RASS				<5		<10				<5										
W-3D	11/22/88	RASS				<5		<10				<5										Replicate Sample
W-3D	03/01/89	RASS				<5.0		<10				<5.0										
W-3D	05/23/89	RASS				<5.0		<10				<5.0										
W-3D	08/17/89	RASS				<5.0*		<10				<5.0										
W-3D	11/28/89	WWES				0.34		<10				<5.0										
W-3D	02/27/90	WWES	<250	<2.0	<200	<10	350000	<50	<10	<10	<10	<50	110000	1500	<0.2	20	<5000	<2.0	45000	<20	<50	
W-3D	05/23/90	WWES	<200	<2.0	30	<2.0	370000	<10	<10	<10	70	<5.0	120000	1600	<0.2	20	2900	<2.0	58000	<20	<10	
W-3D	08/29/90	WWES	200	<2.0	30	<2.0	365000	<10	<10	<10	10	<2.0	115000	1500	<0.2	20	2400	<2.0	88000	<20	<10	
W-3D	12/06/90	WWES				<2.0	386000	<10			40	<2.0	123000	1500		<10		<2.0	112000	20		
W-3D	02/27/91	WWES				<2.0	407000	<10			10	<1.0	137000	1700		<10		<2.0	107000	<20		
W-3D	05/30/91	WWES				<2.0	<500	<2.0			20	<1.0	<500	2100		10		<2.0	105,000*	20		
W-3D	08/27/91	WWES				<2.0		<10				<5.0										
W-4	01/23/86	DAL						<5				60										Filtered
W-4	01/23/86	DAL						<5				70										Unfiltered
W-4	09/05/86	DAL		13*	80	<10		<10			110000	50		13000	1.9			10*	32000	610		
W-4	11/21/86	DAL		<5	50	28		<10			95000	90		13000	0.5			8	35000	570		
W-4	11/21/86	DAL		<5	40	33		<10			130000	90		14000	0.2			9	32000	570		Replicate Sample
W-4	02/18/87	DAL		<5	20	16		<10			160000	30		16000	1.0			<5	28000	1000		
W-4	03/25/87	BCI										<1						<1				
W-4	03/25/87	DAL										<20						<5				
W-4	04/24/87	BCI										<1						<1				
W-4	04/24/87	RASS										<1						<1				
W-4	05/28/87	RASS		<5	52	<10		<10			205000	53		12400	0.3			<5	27900	860		
W-4	09/15/87	RASS						<10				<10										Filtered
W-4	09/15/87	RASS						31				35										Unfiltered
W-4	02/17/88	RASS		<10	18	24.5		<10			122000	6.4		12200	0.9			<5.0	34900	660		
W-4	05/25/88	RASS				<5		<10				<5.0										
W-4	08/25/88	RASS				7		10				10.7										
W-4	11/22/88	RASS				<5		<10				<5.0										
W-4	03/02/89	RASS				<5.0		<10				<5.0										
W-4	05/23/89	RASS				8.2		<10				<5.0										
W-4	08/17/89	RASS				<5.0*		<10				<5.0										
W-4	11/28/89	WWES				4.8		<10				<5.0										
W-4	02/27/90	WWES	<250	<2.0	<200	<10	200000	<50	70	<10	25000	<50	32000	10000	<0.2	110	<5000	<2.0	33000	360	<50	
W-4	05/23/90	WWES	<200	<2.0	<20	4.0	250000	<10	80	<10	55000	<5.0	35000	11000	<0.2	120	1800	<2.0	39000	430	<10	
W-4	08/29/90	WWES	360*	<2.0	<20	5.0	278000	<10	80	<10	48000	<2.0	35000	10000	<0.2	120	2400	<2.0	36000	350	<10	

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
W-4	12/06/90	WWES				9.0	284000	<10			29000	<2.0	35000	12000		120		<2.0	33000	320		
W-4	02/28/91	WWES				7.1	317000	<10			50000	<1.0	38000	14000		160		<2.0	32000	400		
W-4	05/31/91	WWES				5.6	260000	4.2			53000	<1.0	34000	13000		250		<2.0	33000	370		
W-4	08/26/91	WWES				2.0		<10				<5.0										
W-4D	09/05/86	DAL		7*	40	<10		<10			120	50		1100	<0.2			6*	47000	40		
W-4D	11/21/86	DAL		<5	60	<5		<10			150	50		1000	<0.2			9	42000	20		
W-4D	02/18/87	DAL		<5	50	<5		<10			220	<20		890	<0.2			<5	45000	20		
W-4D	03/18/87	DAL		<5	50	<5		<10			<10	<20		930	<0.2			<5	48000	<10		Replicate Sample
W-4D	03/25/87	BCI										<1						4				
W-4D	03/25/87	DAL										<20						5				
W-4D	04/24/87	BCI										1						<1				Replicate Sample
W-4D	04/24/87	BCI										<1						<1				
W-4D	04/24/87	RASS										<1						<1				Replicate Sample
W-4D	04/24/87	RASS										<1						<1				
W-4D	05/28/87	RASS		<5	41	<10		<10			144	<10		728	0.9			<5	32900	54		
W-4D	09/15/87	RASS						<10				<10										Filtered
W-4D	09/15/87	RASS						<10				<10										Replicate Sample
W-4D	09/15/87	RASS						<10				10										Unfiltered
W-4D	09/15/87	RASS						<10				10										Replicate Sample
W-4D	02/17/88	RASS		<10	77	<5.0		<10			281	<5.0		1050	0.3			<5.0	44600	<10		
W-4D	05/25/88	RASS				<5.0		<10				<5.0										
W-4D	08/25/88	RASS				<5.0		<10				<5.0										
W-4D	11/22/88	RASS				<5.0		<10				<5.0										
W-4D	03/02/89	RASS				<5.0		<10				<5.0										
W-4D	05/23/89	RASS				<5.0		<10				<5.0										
W-4D	08/17/89	RASS				<5.0*		<10				5.7										
W-4D	11/28/89	WWES				0.53		<10				<5.0										
W-4D	11/28/89	WWES				0.28		<10				<5.0										Replicate Sample
W-4D	02/27/90	WWES	<50	<2.0	<200	<10	190000	<50	<10	<10	10	<50	80000	490	0.4*	<10	<5000	<2.0	47000	<20	<50	
W-4D	05/23/90	WWES	<200	<2.0	<50	<2.0	200000	<10	<10	<10	600	<5.0	80000	650	<0.2	<10	2900	<2.0	48000	<20	<10	
W-4D	08/29/90	WWES	<200	<2.0	50	<2.0	198000	<10	<10	<10	250	<2.0	82000	570	<0.2	10	3100	<2.0	49000	<20	<10	
W-4D	08/29/90	WWES	<200	<2.0	60	<2.0	200000	<10	<10	<10	230	<2.0	83000	570	<0.2	10	3200	<2.0	49000	<20	<10	Replicate Sample
W-4D	12/06/90	WWES				<2.0	198000	<10			250	<2.0	810000	540		<10		<2.0	47000	50		
W-4D	02/28/91	WWES				<2.0	171000	<10			70	<1.0	66000	490		<10		<2.0	56000	20		
W-4D	05/31/91	WWES				<2.0	128000	<2.0			440	<1.0	28000	730		<10		<2.0	12000	40		
W-4D	08/27/91	WWES				<2.0		<10				<5.0										
W-5	01/23/86	DAL						<5				40										Filtered
W-5	01/23/86	DAL						<5				50										Unfiltered
W-5	09/04/86	DAL		7*	180	<10		<10			110	50		1800	<0.2			5*	110000	40		
W-5	11/21/86	DAL		<5	230	6		<10			580	70		2200	<0.2			10	110000	30		
W-5	02/18/87	DAL		<5	110	<5		<10			220	<20		3400	<0.2			<5	100000	10		
W-5	03/25/87	BCI										1						6				
W-5	03/25/87	DAL										<20						13				
W-5	04/24/87	BCI										2						<1				
W-5	04/24/87	RASS										<1						<1				
W-5	05/27/87	RASS		<5	112	<10		<10			1500	<10		2810	0.3			<5	115000	107		
W-5	09/15/87	RASS						<10				<10										Filtered
W-5	09/15/87	RASS						<10				<10										Unfiltered
W-5	02/17/88	RASS		<10	114	<5.0		<10			8320	25.8		3740	<2			<5	115000	44		
W-5	05/25/88	RASS				<5.0		<10				<5.0										
W-5	08/25/88	RASS				<5.0		<10				<5.0										

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
W-5	11/22/88	RASS				<5.0		<10				<5.0										
W-5	11/22/88	RASS				<5.0		<10				<5.0										Replicate Sample
W-5	03/02/89	RASS				<5.0		<10				<5.0										
W-5	05/24/89	RASS				<5.0		<10				<5.0										
W-5	08/18/89	RASS				<5.0*		<10				<5.0										
W-5	11/27/89	WWES				<0.20		<10				<5.0										
W-5	02/28/90	WWES				<0.20		<1.0				<5.0										
W-5	05/23/90	WWES				<5.0		<10*				<5.0										
W-5	08/28/90	WWES				<5.0		<10				<5.0										
W-5	11/26/90	WWES				<2.0		<10				<2.0										
W-5	02/25/91	WWES				8.7		<10				<1.0										
W-5	05/28/91	WWES				<2.0		<2.0				<1.0										
W-5	08/26/91	WWES				<2.0		<10				<5.0										
W-5D	09/04/86	DAL		9*	60	<10		<10			110	60		2200	<0.2			1*	58000	30		
W-5D	11/21/86	DAL		<5	120	<5		<10			220	70		1600	<0.2			6	60000	30		
W-5D	02/18/87	DAL		<5	30	<5		<10			<10	<20		140	<0.2			<5	58000	<10		
W-5D	03/25/87	ECI										5						4				
W-5D	03/25/87	ECI										4						4				Replicate Sample
W-5D	03/25/87	DAL										<20						8				
W-5D	03/25/87	DAL										<20						6				Replicate Sample
W-5D	04/24/87	ECI										2						<5				
W-5D	04/24/87	RASS										<1						<5				
W-5D	05/27/87	RASS		<5	74	<10		<10			62	<10		692	<0.2			<5	99200	18		
W-5D	09/15/87	RASS						<10				<10										Filtered
W-5D	09/15/87	RASS						<10				<10										Unfiltered
W-5D	02/17/88	RASS		<10	70	<5.0		14.5			600	<5.0		910	<0.2			<5.0	62700	27		
W-5D	05/25/88	RASS				<5.0		<10				<5.0										
W-5D	08/25/88	RASS				<5.0		<10				<5.0										
W-5D	11/22/88	RASS				<5.0		<10				<5.0										
W-5D	03/02/89	RASS				<5.0		<10				<5.0										
W-5D	05/24/89	RASS				<5.0		<10				<5.0										
W-5D	08/18/89	RASS				<5.0*		<10				<5.0										
W-5D	11/27/89	WWES				<0.20		<10				<5.0										
W-5D	02/28/90	WWES				0.52		<1.0				<5.0										
W-5D	05/23/90	WWES				<5.0		<10*				<5.0										
W-5D	08/28/90	WWES				<5.0		<10				<2.0										
W-5D	11/26/90	WWES				<2.0		<10				3.0										
W-5D	02/25/91	WWES				2.6		<10				<1.0										
W-5D	05/28/91	WWES				<2.0		<2.0				<1.0										
W-5D	08/26/91	WWES				<2.0		<10				<5.0										
W-6	01/23/86	DAL						<5				20										Filtered
W-6	01/23/86	DAL						20				50										Unfiltered
W-6	09/04/86	DAL		6*	80	<10		<10			40	40		1800	<0.2			3*	50000	<10		
W-6	11/21/86	DAL		<5	70	6		<10			180	50		2800	<0.2			8	35000	40		
W-6	02/18/87	DAL		<5	40	<5		<10			40	<20		3700	<0.2			<5	41000	20		
W-6	03/25/87	ECI										5						<5				
W-6	03/25/87	DAL										<20						<5				
W-6	04/24/87	ECI										2						<5				
W-6	04/24/87	RASS										<1						<5				
W-6	05/25/87	RASS		<5	44	<10		<10			321	<10		2650	0.3			<5	30400	52		

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
W-6	09/15/87	RASS						<10				<10										Filtered
W-6	09/15/87	RASS						<10				10										Unfiltered
W-6	02/17/88	RASS		<10	38	<5.0		<10			248	<5.0		2880	0.2			<5.0	40200	<10		
W-6	05/25/88	RASS				<5.0		<10				<5.0										
W-6	08/25/88	RASS				<5.0		<10				<5.0										
W-6	11/22/88	RASS				<5.0		<10				<5.0										
W-6	03/02/89	RASS				<5.0		<10				<5.0										
W-6	05/24/89	RASS				<5.0		<10				<5.0										
W-6	08/17/89	RASS				<5.0*		<10				<5.0										
W-6	11/27/89	WWES				<0.20		<10				<5.0										
W-6	02/28/90	WWES				0.4		<1.0				<5.0										
W-6	05/23/90	WWES				<5.0		<10*				<5.0										
W-6	08/28/90	WWES				<5.0		<10				<2.0										
W-6	11/26/90	WWES				<2.0		<10				3.1										
W-6	02/25/91	WWES				6.0		<10				1.2										
W-6	05/28/91	WWES				<2.0		<2.0				<1.0										
W-6	08/26/91	WWES				<2.0		<10				<5.0										
W-7	02/17/88	RASS		<10	52	<5.0		<10			459	<5.0		1400	0.3			<5	36800	<10		
W-7	02/17/88	RASS		<10	56	<5.0		<10			190	6.4		1420	<0.2			<5	38500	384		Replicate Sample
W-7	05/25/88	RASS				<5.0		<10				<5.0										
W-7	08/24/88	RASS				<5.0		<10				<5.0										
W-7	11/22/88	RASS				<5.0		<10				<5.0										
W-7	03/02/89	RASS				<5.0		<10				<5.0										
W-7	05/24/89	RASS				<5.0		<10				<5.0										
W-7	08/18/89	RASS				<5.0*		14.7				<5.0										
W-7	11/27/89	WWES				0.45		<10				<5.0										
W-7	02/28/90	WWES				0.74		<1.0				<5.0										
W-7	05/23/90	WWES				<5.0		<10*				<5.0										
W-7	08/28/90	WWES				<5.0		<10				<2.0										
W-7	11/26/90	WWES				<2.0		<10				<2.0										
W-7	02/25/91	WWES				7.9		<10				1.2										
W-7	05/28/91	WWES				<2.0		<2.0				<1.0										
W-7	08/26/91	WWES				<2.0		<10				<5.0										
W-7	08/26/91	WWES				<2.0		<10				<5.0										Replicate Sample
W-8	02/17/88	RASS		<10	58	5.8		<10			3200	<5.0		5760	0.3			<5.0	31500	13		
W-8	05/25/88	RASS				7.6		<10				<5.0										
W-8	05/24/88	RASS				<5.0		<10				<5.0										Replicate Sample
W-8	08/24/88	RASS				<5.0		<10				<5.0										
W-8	11/22/88	RASS				<5.0		<10				<5.0										
W-8	03/01/89	RASS				<5.0		<10				<5.0										
W-8	05/23/89	RASS				<5.0		<10				<5.0										
W-8	08/18/89	RASS				<5.0*		<10				<5.0										
W-8	08/18/89	RASS				<5.0		10.4				<5.0										Replicate Sample
W-8	11/28/89	WWES				0.81		<10				<5.0										
W-8	02/27/90	WWES	<250	<2.0	30	<10	230000	<50	<10	<10	<10	<50	74000	4700	<0.2	20	<5000*	7.7	34000	<20	<50	
W-8	05/22/90	WWES	<200	<2.0	30	<2.0	210000	<10*	<10	<10	<10	<50	71000	4900	<0.2	10	1400	4.3	32000	<20	<10	
W-8	08/29/90	WWES	200	<2.0	30	<2.0	213000	<10	<10	<10	<10	<2.0	67000	3300	<0.2	20	1600	<2.0	33000	<20	<10	
W-8	11/28/90	WWES				<2	223000	<10			20	<2.0	71000	2700		20		<2.0	30000	20		
W-8	02/27/91	WWES				<2.0	229000	<10			40	<1.0	70000	3800		10		<2.0	33000	<20		
W-8	05/29/91	WWES				<2.0	213000	<2.0			320	1.4	71000	3800		10		<2.0	32000	330		

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
W-9	02/17/88	RASS		<10	22	6.5		<10			771	<5.0		833	0.4			<5.0	94500	44		
W-9	05/25/88	RASS				6.6		<10				<5.0										
W-9	08/24/88	RASS				<5.0		<10				9.5										
W-9	11/22/88	RASS				<5.0		<10				<5.0										
W-9	03/01/89	RASS				<5.0		<10				<5.0										
W-9	03/01/89	RASS				<5.0		<10				<5.0										Replicate Sample
W-9	05/23/89	RASS				<5.0		<10				<5.0										
W-9	08/17/89	RASS				<5.0		16.3				<5.0										
W-9	11/28/89	WWES				0.45		<10				<5.0										
W-9	02/27/90	WWES	<250	<2.0	<200	<10	200000	<50	<10	<10	210	<50	100000	780	<0.2	190	<5000	<2.0	79000	<20	<50	
W-9	05/23/90	WWES	<200	<2.0	30	<2.0	270000	<10	<10	<10	<10	<5.0	130000	680	<0.2	80	<500	<2.0	120000	<20	<10	
W-9	08/28/90	WWES	<200	<2.0	30	<2.0	388000	<10	<10	<10	40	<2.0	175000	1900	<0.2	50	<500	<2.0	200000	<20	<10	
W-9	11/27/90	WWES				<2	310000	<10			60	<2.0	152000	2300		40		<2.0	146000	<20		
W-9	02/25/91	WWES				<2.0	313000	<10			10	<1.0	138000	3000		30		<2.0	153000	<20		
W-9	05/29/91	WWES				<2.0	320000	<2.0			80	<1.0	155000	2500		20		<2.0	139000	<20		
W-9	08/26/91	WWES				<2.0		<10				<5.0										
W-10	02/17/88	RASS		<10	16	6.1		<10			386	<5.0		1000	<0.2			<5.0	132000	<10		
W-10	05/25/88	RASS				<5.0		<10				<5.0										
W-10	08/24/88	RASS				<5.0		<10				<5.0										Replicate Sample
W-10	08/24/88	RASS				<5.0		<10				<5.0										
W-10	11/22/88	RASS				<5.0		<10				<5.0										
W-10	03/02/89	RASS				<5.0		<10				<5.0										
W-10	05/23/89	RASS				<5.0		<10				<5.0										
W-10	08/17/89	RASS				<5.0		<10				<5.0										
W-10	11/28/89	WWES				0.73		<10				<5.0										
W-10	02/27/90	WWES	<250	<2.0	<200	<10	140000	<50	<10	<10	<10	<50	44000	230	<0.2	20	<5000	<2.0	130000	<20	<50	
W-10	05/23/90	WWES	<200	<2.0	40	<2.0	200000	<10	<10	<10	40	<5.0	64000	300	<0.2	60	<500	<2.0	200000	<20	<10	
W-10	08/29/90	WWES	<200	<2.0	20	<2.0	186000	<10	<10	<10	130	<2.0	61000	380	<0.2	30	<500	<2.0	170000	<20	<10	
W-10	12/06/90	WWES				<2.0	196000	<10			260	<2.0	63000	300		30		<2.0	160000	50		
W-10	02/25/91	WWES				2.6	261000	<10			120	<1.0	84000	480		40		<2.0	210000	<20		
W-10	05/30/91	WWES				<2.0	236000	<2.0			10	<1.0	67000	420		10		<2.0	232000	<20		
W-10	08/26/91	WWES				<2.0		<10				<5.0										
W-11	02/18/88	RASS		<10	14	36.1		39.8			173000	7.6		150000	<0.2			<5.0	39200	2750		
W-11	05/25/88	RASS				<5.0		<10				16.3										
W-11	08/24/88	RASS				<5.0		<10				8.6										
W-11	11/22/88	RASS				<5.0		<10				20.4										
W-11	03/02/89	RASS				<5.0		<10				19.8										
W-11	05/23/89	RASS				28.8		42.5				16.2*										
W-11	05/23/89	RASS				29.0		48.9				20.3*										Replicate Sample
W-11	08/18/89	RASS				15.6		<10				12										
W-11	11/28/89	WWES				12		54*				29										
W-11	02/27/90	WWES	5800	<2.0	<200	<10	220000	50	600	30	110000	<50.	63000	49000	<0.2	840	<5000	<2.0	45000	2400	<50.	
W-11	05/24/90	WWES	2700	<2.0	<20	240	160000	<10	430	20	120	10	48000	37000	<0.2	610	1800	<2.0	37000	1800	<10.	
W-11	08/28/90	WWES	2000	<2.0	<20	<2.0	208000	<10	570	<10.	129000	4.8	56000	43000	<0.2	710	2000	<2.0	29000	2000	<10.	
W-11	12/06/90	WWES				6.0	139000	<10			99000	5.5	37000	24000		360		<2.0	24000	1400		
W-11	02/27/91	WWES				6.0	132000	<10			101000	2.7	36000	23000		370		<2.0*	22000	1400		
W-11	05/30/91	WWES				10	205000	18			61000	3.4	57000	56000		670		<2.0	28000	1700		
W-11	08/26/91	WWES				9.0		30				<5.0										

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
W-12	02/18/88	RASS		<10	35	<5.0		<10			16600	<5.0		7500	<0.2			<5.0	43300	142		
W-12	02/18/88	RASS		<10	36	<5.0		12			16900	<5.0		7530	0.2			<5.0	43300	24		Replicate Sample
W-12	05/25/88	RASS				<5.0		<10				<5.0										
W-12	08/24/88	RASS				<5.0		<10				<5.0										
W-12	11/22/88	RASS				<5.0		<10				<5.0										
W-12	03/02/89	RASS				<5.0		<10				<5.0										
W-12	05/24/89	RASS				<5.0		10.5				9.5*										
W-12	08/17/89	RASS				<5.0		<10				<5.0										
W-12	11/27/89	WWES				0.26		<10				<5.0										
W-12	02/28/90	WWES				0.66		<1.0				<5.0										
W-12	05/23/90	WWES				<5.0		<10*				<5.0										
W-12	08/28/90	WWES				<5.0		<10				<5.0										
W-12	11/26/90	WWES				<2.0		<10				<2.0										
W-12	02/25/91	WWES				2.0		<10				<1.0										
W-12	05/28/91	WWES				<2.0		2.9				<1.0										
W-12	08/26/91	WWES				<2.0		<10				<5.0										
W-13	02/18/88	RASS		<10	96	<5.0		<10			3490	<5.0		13000	<0.2			<5.0	153000	26		
W-13	05/25/88	RASS				<5.0		<10				17.3										
W-13	08/24/88	RASS				<5.0		<10				<5.0										
W-13	11/22/88	RASS				<5.0		<10				<5.0										
W-13	03/02/89	RASS				<5.0		<10				<5.0										
W-13	03/02/89	RASS				<5.0		<10				<5.0										Replicate Sample
W-13	05/24/89	RASS				<5.0		14				9.7*										
W-13	08/18/89	RASS				<5.0		<10				<5.0										
W-13	11/27/89	WWES				<0.20		<10				<5.0										
W-13	02/28/90	WWES				<0.20		<1.0				<5.0										
W-13	05/23/90	WWES				<5.0		<10				<5.0										
W-13	05/23/90	WWES				<5.0		<10*				<5.0										Replicate Sample
W-13	08/28/90	WWES				<5.0		<10*				<5.0										
W-13	08/28/90	WWES				<5.0		<10				<5.0										Replicate Sample
W-13	11/26/90	WWES				<2.0		<10				<2.0										
W-13	11/26/90	WWES				<2.0		<10				<2.0										Replicate Sample
W-13	02/25/91	WWES				<2.0		<10				<1.0										
W-13	02/25/91	WWES				<2.0		<10				<1.0										Replicate Sample
W-13	05/28/91	WWES				<2.0		2.3				<1.0										
W-13	05/28/91	WWES				<2.0		2.6				<1.0										Replicate Sample
W-13	08/26/91	WWES				<2.0		<10				<5.0										
W-14	02/18/88	RASS		<10	57	<5.0		<10			112	<5.0		1650	<0.2			<5.0	36800	35		
W-14	05/25/88	RASS				<5.0		<10				<5.0										
W-14	08/24/88	RASS				<5.0		<10				<5.0										
W-14	11/22/88	RASS				<5.0		<10				<5.0										
W-14	03/02/89	RASS				<5.0		<10				<5.0										
W-14	05/24/89	RASS				<5.0		10.3				<5.0										
W-14	08/17/89	RASS				<5.0		<10				<5.0										
W-14	08/17/89	RASS				<5.0		<10				<5.0										Replicate Sample
W-14	11/27/89	WWES				0.57		<10				<5.0										
W-14	02/28/90	WWES				0.55		<1.0				<5.0										
W-14	02/28/90	WWES				0.55		<1.0				<5.0										Replicate Sample
W-14	05/23/90	WWES				<5.0		<10*				<5.0										
W-14	08/28/90	WWES				<5.0		<10				<5.0										
W-14	11/26/90	WWES				<2.0		<10				<2.0										

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
W-14	02/25/91	WWES				2.3		<10				<1.0										
W-14	05/28/91	WWES				<2.0		<5.0				<1.0										
W-14	08/26/91	WWES				<2.0		<10				<5.0										
K-14	01/16/73			72	100	4				57	2730	64		140				6		35	<4	
K-14	02/01/73			20	80	<4	112200			18	2470	19	42100	190			2130	2	27000	50	<4	
K-14	05/02/73			5	100	<4				17	1510	28		190				1		30	1	
K-14	08/20/73			8	110	3				43	2880	23		160				<4		60		
K-14	10/05/73			8	100	<1				31	1160	10		160				<4		50		
K-14	11/21/73			8	100	<5				17	2500	15		190				<4		50		
K-14	03/28/78						125000			50	217	<50	40000	180	24700		2860		27000	156		
K-14	12/04/78						124000	0.0			2240	0.0	52000	240	3000		2200		29000	10		
K-14	06/03/81				200	0.0	110000	0.0		20	2400	0.0	48300	170	3000	200	2100		28000	0.0		
K-14	03/26/85			<100	40	<10	120000			50	2400	<10	45000	130			1800	<1	34000	50		
K-14	01/23/86	DAL						<5				50										Filtered
K-14	01/23/86	DAL						<5				20										Unfiltered
K-14	09/04/86	DAL		8*	140	<10		<10			2900	30		150	<0.2			2*	29000	<10		
K-14	11/21/86	DAL		<5	180	6		<10			2400	20		340	<0.2			5	27000	20		
K-14	02/18/87	DAL		<5	140	<5		<10			2000	<20		140	<0.2			<5	26000	<10		
K-14	05/27/87	RASS		3	121	<10		<10			1910	<10		134	<0.2			<5	23100	133		
K-14	08/24/88					<5		<10				<5										
K-15	01/16/73			1	100	4				20	2620	11		210				4		40	<4	
K-15	02/01/73			1	80	<4	122400			36	2390	29	44100	270			2660	3	31000	50	<4	
K-15	05/02/73			1	90	<4				17	2380	20		270				1		30	1	
K-15	08/20/73			1	220	<1				36	2880	34		240				<4		50		
K-15	10/05/73			1	100	<1				25	1050	12		230				<4		60		
K-15	11/21/73			1	100	<5				20	2220	12		240				<4		60		
K-15	03/28/78									61	2050	<50	34000	270	18500					266		
K-15	01/23/86	DAL						<5				10										Filtered
K-15	01/23/86	DAL						<5				10										Unfiltered
K-15	09/05/86	DAL		5*	80	<10		<10			2200	40		170	<0.2			2*	36000	<10		
K-15	11/21/86	DAL		<5	150	<5		<10			2200	20		230	<0.2			5	40000	40		
K-15	02/18/87	DAL		<5	120	<5		<10			1700	<20		180	<0.2			<5	40000	10		
K-15	05/27/87	RASS		2	101	<10		<10			1810	<10		173	<0.2			<5	29100	255		
AD-1	06/04/90	WWES	<200	4.3	120	<2.0	140000	<10*	<10	<10	10	<5.0	86000	3000	<0.2	<10	3100	<2.0	48000*	<20	<10	
AD-1	08/29/90	WWES	<200	2.5	170	<2.0	131000	<10	<10	<10	40	<2.0	115000	3800	<0.2	20	1600	<2.0	46000	<20	<10	
AD-1	11/26/90	WWES				<2.0		<10				<2.0				10					<10	
AD-1	02/25/91	WWES				<2.0		<10				<1.0				10					<10	
AD-1	05/28/91	WWES				<2.0		<2.0				3.2				<10						
AD-1	08/29/91	WWES	<200				175000				460		108000	7500			<500		52000			
AD-2	06/04/90	WWES	<200	<2.0	40	<2.0	79000	<10*	<10	<10	60	<5.0	36000	1200	<0.2	10	500	<2.0	49000*	<20	<10	
AD-2	08/28/90	WWES	<200	<2.0	50	<2.0	86000	<10	<10	<10	90	<2.0	39000	1700	<0.2	20	<500	<2.0	46000	<20	<10	
AD-2	08/28/90	WWES	<200	<2.0	50	<2.0	88000	<10	<10	<10	20	<2.0	42000	1600	<0.2	20	<500	<2.0	47000	<20	<10	Replicate Sample
AD-2	11/26/90	WWES				<2.0		<10				<2.0				10					<10	
AD-2	02/25/91	WWES				<2.0		<10				<1.0				<10					<10	
AD-2	05/28/91	WWES				<2.0		<2.0				6.6				<10						
AD-2	08/29/91	WWES	<200				84000				70		40000	1600			<500		46000			
AD-3	06/04/90	WWES	410	8.4	<20	<2.0	28000	<10*	<10	<10	10	<5.0	11000	40	<0.2	<10	15000	<2.0	78000*	<20	<10	
AD-3	06/04/90	WWES	410	9.3	20	<2.0	36000	<10*	<10	<10	<10	<5.0	13000	70	<0.2	<10	14000	<2.0	76000*	<20	<10	Replicate Sample

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
AD-3	08/28/90	WWES	530	11	20	<2.0	18000	<10	<10	<10	<10	<2.0	5300	<10	<0.2	10	22000	<2.0	76000	<20	<10	
AD-3	11/26/90	WWES				<2.0		<10				<2.0				<10					<10	
AD-3	02/25/91	WWES				<2.0		<10				<1.0				<10					<10	
AD-3	05/28/91	WWES				<2.0		<2.0				<1.0				<10						
AD-3	08/29/91	WWES	430				30000				20		2300	<10			21000		67000			
AD-4	06/04/90	WWES	580	6.6	60	<2.0	87000	69*	<10	30	<10	<5.0	<500	<10	<0.2	10	42000	5.4	150000*	<20	<10	
AD-4	08/28/90	WWES	1700	3.3	340	2	238000	<10	<10	<10	<10	<2.0	<500	<10	0.2	20	68000	2.1	101000	<20	20	
AD-4	11/26/90	WWES				<2.0		<10				<2.0				<10					<10	
AD-4	11/26/90	WWES				<2.0		<10				<2.0				<10					<10	Replicate Sample
AD-4	02/25/91	WWES				<2.0		<10				<1.0				<10					<10	
AD-4	02/25/91	WWES				<2.0		<10				<1.0				<10					<10	Replicate Sample
AD-4	05/28/91	WWES				<2.0		<2.0				<1.0				<10						
AD-4	05/28/91	WWES				<2.0		<2.0				<1.0				<10						Replicate Sample
AD-4	08/29/91	WWES	710				301000				<10		<500	<10			61000		62000			
AD-4	08/29/91	WWES	740				332000				<10		<500	<10			66000		66000			Replicate Sample
AD-5	06/04/90	WWES	<200	5.8	40	<2.0	55000	<10*	<10	<10	50	<5.0	23000	140	<0.2	<10	1900	<2.0	65000*	<20	<10	
AD-5	08/28/90	WWES	<200	3.3	40	<2.0	37000	<10	<10	<10	<10	<2.0	26000	120	<2.0	<10	1600	<2.0	74000	<20	<10	
AD-5	11/26/90	WWES				<2.0		<10				<2.0				<10					<10	
AD-5	02/25/91	WWES				<2.0		<10				<1.0				<10					<10	
AD-5	05/28/91	WWES				<2.0		<2.0				<1.0				<10						
AD-5	08/29/91	WWES	<200				49000				40		31000	610			1300		74000			

Key: Less than indicates that metal was not found or was below the reported detection limit.
DAL = Daily Analytical Laboratories, Peoria, Illinois.
ECI = Environmental Consultants, Inc., Clarksville, Indiana.
RASS = Randolph & Associates, Inc., Peoria, Illinois.
WWES = WW Engineering & Science, Grand Rapids, Michigan.

Note: * Estimated value as a result of data not meeting QA/QC validation criteria.

COMMENTS:

1. K-14 = Keystone Production Well (West Well).
2. K-15 = Keystone Production Well (East Well).

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
T-1	11/28/89	WWE	<10	<5.0	<5.0	29	<5.0	<5.0	<5.0	<5.0	440	<10	
T-1	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	400	<10	
T-1	05/22/90	WWE	<50	<25	<25	45	<25	<25	<25	<25	630	<50	
T-1	08/29/90	WWE	<50	<25	<25	46	<25	<25	<25	<25	590	<50	
T-1	11/28/90	WWE	<50	<25	<25	61	<25	<25	<25	<25	710	<50	
T-1	02/27/91	WWE	<50	<25	<25	92*	<25	<25	<25	<25	810	<50	
T-1	02/27/91	WWE	<50	<25	<25	98*	<25	<25	<25	<25	870	<50	Replicate
T-1	05/29/91	WWE	<50	<25	<25	<25	<25	<25	<25	<25	800	<50	(1)
T-1	08/28/91	WWE	<50	<25	<25	50	<25	<25	<25	<25	630	<50	
T-2A	10/31/89	WWE	<10	8	6	14	<5.0	<2.0	19	15	180	<10	
T-2A	11/27/89	WWE	<10	7	8	14	<5.0	<5.0	<5.0	13	230	<10	
T-2A	02/26/90	WWE	<10	<5.0	<5.0	9	<5.0	<5.0	<5.0	10	220	<10	
T-2A	02/26/90	WWE	<10	<5.0	<5.0	11	<50	<5.0	<5.0	13	240	<10	Replicate
T-2A	05/22/90	WWE	<10	<5.0	<5.0	13	<5.0	<5.0	<5.0	15	210	<10	
T-2A	08/29/90	WWE	<20	<10	<10	13	<10	<10	<10	<10	180	<20	
T-2A	11/27/90	WWE	<10	<5.0	<5.0	14	<5.0	<5.0	<5.0	6.6	210*	<10	
T-2A	02/26/91	WWE	<10	<5.0	<5.0	16	<5.0	<5.0	<5.0	5.0	230	<10	
T-2A	05/29/91	WWE	<20	<10	<10	<10	<10	<10	<10	16	220	<20	
T-2A	08/27/91	WWE	<20	<10	<10	<10	<10	<10	<10	<10	260	<20	
T-2B	02/26/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-2B	05/22/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-2B	08/29/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-2B	11/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-2B	02/26/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-2B	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-2B	08/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-3	11/28/89	WWE	<10	<5.0	480	130	<5.0	6	<5.0	3200	1200	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
T-3	02/27/90	WWE	<10	<5.0	210	98	<5.0	12	<5.0	1600	1400	<10	
T-3	02/27/90	WWE	<100	<50	200	64	<50	<50	<50	1800	1100	<100	Replicate
T-3	05/23/90	WWE	<20	<10	180	130	<10	20	<10	2800	1400	<20	
T-3	05/23/90	WWE	<50	<25	170	120	<25	<25	<25	2600	1100	<50	Replicate
T-3	08/29/90	WWE	<100	<50	120	77	<50	<50	<50	1800	990	<100	
T-3	12/06/90	WWE	<200	<100	<100	<100	<100	<100	<100	1300	830	<200	
T-3	12/06/90	WWE	<200	<100	<100	<100	<100	<100	<100	1300	830	<200	Replicate
T-3	02/26/91	WWE	<200	<100	<100	<100	<100	<100	<100	1600	1000	<200	
T-3	05/31/91	WWE	<100	<50	160	74	<50	<50	<50	1600	1000	<100	
T-3	05/31/91	WWE	<100	<50	150	73	<50	<50	<50	1600	990	<100	Replicate
T-3	08/27/91	WWE	<100	<50	<50	<50	120	<50	<50	790	730	<100	
T-4A	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	340	<10	
T-4A	05/22/90	WWE	<20	<10	<10	<10	<10	<10	<10	<10	440	<20	
T-4A	08/28/90	WWE	<20	<10	<10	<10	<10	<10	<10	<10	290	<20	
T-4A	11/28/90	WWE	<50	<25	<25	<25	<25	<25	<25	<25	440	<50	
T-4A	02/26/91	WWE	<10	<5.0	<5.0	5.8	<5.0	<5.0	<5.0	<5.0	280	<10	
T-4A	05/29/91	WWE	<20	<10	<10	<10	<10	<10	<10	<10	270	<20	
T-4A	08/28/91	WWE	<20	<10	<10	<10	<10	<10	<10	<10	210	<20	
T-4B	02/27/90	WWE	<10	<5.0	<5.0	12	<5.0	<5.0	<5.0	<5.0	150	<10	
T-4B	02/27/90	WWE	<10	<5.0	<5.0	12	<5.0	<5.0	<5.0	<5.0	190	<10	Replicate
T-4B	05/22/90	WWE	<10	6.1	<5.0	14	<5.0	<5.0	<5.0	<5.0	170	<10	
T-4B	05/22/90	WWE	<10	6.2	<5.0	12	<5.0	<5.0	<5.0	<5.0	170	<10	Replicate
T-4B	08/28/90	WWE	<10	<5.0	<5.0	9	<5.0	<5.0	<5.0	<5.0	140	<10	
T-4B	08/28/90	WWE	<10	5.0	<5.0	10	<5.0	<5.0	<5.0	<5.0	150	<10	Replicate
T-4B	11/28/90	WWE	<20	<10	<10	<10	<10	<10	<10	<10	66	<20	
T-4B	02/26/91	WWE	<10	<5.0	<5.0	8.4	<5.0	<5.0	<5.0	<5.0	160	<10	
T-4B	05/29/91	WWE	<10	<5.0	<5.0	6.2	<5.0	<5.0	<5.0	<5.0	130	<10	
T-4B	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	130	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
T-4B	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	110	<10	Replicate
T-5A	11/08/89	WWE	<10	<2.0	<2.0	<2.0	<5.0	<2.0	<1.0	<2.0	<2.0	<10	
T-5A	11/28/89	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5A	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5A	05/22/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5A	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5A	11/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5A	02/25/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5A	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5A	08/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5B	11/28/89	WWE	<10	<2.0	<2.0	<2.0	<5.0	<2.0	<1.0	<2.0	<2.0	<10	
T-5B	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5B	05/22/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5B	05/22/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	Replicate
T-5B	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5B	11/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5B	02/25/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5B	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5B	08/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5C	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5C	05/22/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5C	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5C	11/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5C	02/25/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5C	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5C	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	Replicate
T-5C	08/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
T-5C	08/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	Replicate
T-6A	11/08/89	WWE	<10	120	220	<2.0	<5.0	<2.0	<1.0	1300	<2.0	<10	
T-6A	11/27/89	WWE	<10	110	250	<5.0	<5.0	<5.0	<5.0	1400	<5.0	<10	
T-6A	02/26/90	WWE	<10	100	210	<5.0	<5.0	<5.0	<5.0	1400	<5.0	<10	
T-6A	05/22/90	WWE	<100	92	160	<50	<5.0	<50	<50	920	<50	<100	
T-6A	08/29/90	WWE	<100	73	140	<50	<50	<50	<50	720	<50	<10	
T-6A	08/29/90	WWE	<100	78	150	<50	<50	<50	<50	800	<50	<10	Replicate
T-6A	11/27/90	WWE	<100	89	140	<50	<50	<50	<50	850	<50	<100	
T-6A	11/27/90	WWE	<200	100	150	<100	<100	<100	<100	1000	<100	<200	Replicate
T-6A	02/26/91	WWE	<100	80	160	<50	<50	<50	<50	830	<50	<100	
T-6A	02/26/91	WWE	<100	87	180	<50	<50	<50	<50	870	<50	<100	Replicate
T-6A	05/29/91	WWE	<100	86	170	<50	<50	<50	<50	790	<50	<100	
T-6A	05/29/91	WWE	<100	83	170	<50	<50	<50	<50	730	<50	<100	Replicate
T-6A	08/28/91	WWE	<20	94	240	330	22	17	<10	780	440	<20	
T-6B	11/14/89	WWE	<10	4	<2.0	13	<5.0	<2.0	<1.0	<2.0	82	<10	
T-6B	11/28/89	WWE	<10	<5.0	<5.0	15	<5.0	<5.0	<5.0	<5.0	110	<10	
T-6B	02/26/90	WWE	<10	<5.0	<5.0	14	<5.0	<5.0	<5.0	<5.0	120	<10	
T-6B	05/22/90	WWE	<10	<5.0	<5.0	17	<5.0	<5.0	<5.0	<5.0	110	<10	
T-6B	08/29/90	WWE	<10	<5.0	<5.0	13	<5.0	<5.0	<5.0	<5.0	100	<10	
T-6B	11/27/90	WWE	<10	<5.0	<5.0	10	<5.0	<5.0	<5.0	<5.0	74	<10	
T-6B	02/26/91	WWE	<10	6.5	<5.0	11	<5.0	<5.0	<5.0	5.6	110	<10	
T-6B	05/29/91	WWE	<10	<5.0	<5.0	33	<5.0	<5.0	5.4	5.8	78	<10	(2)
T-6B	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	78	<10	
T-6C	02/26/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-6C	05/22/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-6C	08/29/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-6C	11/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
T-6C	02/26/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-6C	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-6C	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	10	<10	
T-7A	02/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-7A	05/23/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-7A	08/30/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-7A	11/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-7A	11/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	Replicate
T-7A	02/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-7A	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-7A	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-7B	02/28/90	WWE	<100	<50	<50	76	<50	<50	<50	<50	2500	<100	
T-7B	02/28/90	WWE	<100	<50	<50	83	<50	<50	<50	<50	2500	<100	Replicate
T-7B	05/23/90	WWE	<200	<100	<100	<100	<100	<100	<100	<100	2200	<200	
T-7B	05/23/90	WWE	<200	<100	<100	<100	<100	<100	<100	<100	2600	<200	Replicate
T-7B	08/30/90	WWE	<200	<100	<100	<100	<100	<100	<100	<100	2200	<200	
T-7B	08/30/90	WWE	<200	<100	<100	<100	<100	<100	<100	<100	2200	<200	Replicate
T-7B	11/28/90	WWE	<200	<100	<100	<100	<100	<100	<100	<100	1900	<200	
T-7B	02/27/91	WWE	<200	<100	<100	<100	<100	<100	<100	<100	2200	<200	
T-7B	02/27/91	WWE	<200	<100	<100	<100	<100	<100	<100	<100	2200	<200	Replicate
T-7B	05/29/91	WWE	<200	<100	<100	<100	<100	<100	<100	<100	2200	<200	(2)
T-7B	05/29/91	WWE	<200	<100	<100	<100	<100	<100	<100	<100	2200	<200	Replicate
T-7B	08/28/91	WWE	<200	<100	<100	<100	<100	<100	<100	<100	2100	<200	
T-8	02/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-8	05/23/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-8	08/29/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-8	11/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
T-8	02/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-8	05/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-8	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-9	02/28/90	WWE	<100	<50	460	60	<50	230	<50	2700	470	<100	
T-9	05/24/90	WWE	<50	<25	83	<25	<25	170	<25	730	240	<50	
T-9	05/24/90	WWE	<50	<25	86	<25	<25	190	<25	740	250	<50	Replicate
T-9	08/29/90	WWE	<200	<100	280	160	<100	<100	<100	1400	170	<200	
T-9	11/28/90	WWE	<50	<25	46	<25	<25	210	<25	630	210	<50	
T-9	11/28/90	WWE	<50	<25	45	<25	<25	200	<25	640	220	<50	Replicate
T-9	02/27/91	WWE	<50	25	370	34*	<25	170	<25	620	170	<50	
T-9	05/29/91	WWE	<200	<100	340	<100	<100	120	<100*	1200	160	<200	(2)
T-9	08/28/91	WWE	<50	<25	160	<25	<25	210	<25	790	170	<50	
T-10	02/28/90	WWE	<10	<5.0	<5.0	150	<5.0	14	<5.0	<5.0	220	25	
T-10	05/23/90	WWE	26	85	<10	390	<10	17	<10	<10	250	59	
T-10	08/29/90	WWE	<20	<10	<10	310	<10	<10	<10	<10	200	24	
T-10	11/28/90	WWE	<50	<25	<25	520	<25	<25	<25	<25	340	<50	
T-10	02/27/91	WWE	<200	<100	<100	770*	<100	<100	<100	<100	680	<200	
T-10	05/29/91	WWE	<50	<25	<25	320	<25	<25	<25	<25	380	<50	
T-10	08/27/91	WWE	<25	<13	<13	330	<13	17	<13	<13	440	<25	
T-11A	02/26/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-11A	05/22/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-11A	08/30/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-11A	11/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-11A	02/26/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-11A	05/30/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-11A	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments
T-11B	02/26/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-11B	05/22/90	WWE	<10	<5.0	<5.0	17	<5.0	<5.0	<5.0	<5.0	86	<10	
T-11B	08/30/90	WWE	<10	<5.0	<5.0	19	<5.0	<5.0	<5.0	<5.0	140	<10	
T-11B	11/27/90	WWE	<50	<25	<25	30	<25	<25	<25	<25	240	<50	
T-11B	02/26/91	WWE	<10	<5.0	<5.0	44	<5.0	<5.0	<5.0	<5.0	200	<10	
T-11B	05/30/91	WWE	<50	<25	25	<25	<25	<25	<25	<25	260	<50	
T-11B	08/28/91	WWE	<10	<5.0	<5.0	27	<5.0	<5.0	<5.0	<5.0	260	<10	
T-11C	02/26/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-11C	05/22/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	18	<10	
T-11C	08/30/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	21	<10	
T-11C	11/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	55	<10	
T-11C	02/26/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	31	<10	
T-11C	05/30/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	40	<10	
T-11C	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	29	<10	
T-12	11/28/89	WWE	<10	<5.0	<5.0	17	<5.0	<5.0	<5.0	<5.0	390	<10	
T-12	02/27/90	WWE	<10	<5.0	<5.0	14	<5.0	<5.0	<5.0	<5.0	490	<10	
T-12	05/24/90	WWE	<50	<25	<25	<25	<25	<25	<25	<25	340	<50	
T-12	11/28/90	WWE	<50	<25	<25	<25	<25	<25	<25	<25	420	<50	
T-12	02/28/91	WWE	<50	<25	<25	<25	<25	<25	<25	<25	450	<50	
T-12	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	70	<10	
T-13A	02/28/90	WWE	<10	<5.0	5.7	11	<5.0	7.0	<5.0	<5.0	170	<10	
T-13A	05/23/90	WWE	<10	4.4	<5.0	4.4	<5.0	<5.0	<5.0	<5.0	54	<10	
T-13A	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	14	<10	
T-13A	11/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	20	<10	
T-13A	02/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	19	27	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
T-13A	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	8.6	<10	
T-13A	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	30	<10	
T-13B	02/28/90	WWE	<10	<5.0	<5.0	280	<5.0	<5.0	<5.0	<5.0	46	<10	
T-13B	05/23/90	WWE	<20	<10	<10	240	<10	<10	<10	<10	37	<20	
T-13B	08/28/90	WWE	<10	<5.0	<5.0	260	<5.0	<5.0	<5.0	<5.0	36	<10	
T-13B	11/28/90	WWE	<20	<10	<10	290	<10	<10	<10	<10	54	<20	
T-13B	02/27/91	WWE	<20	<10	<10	260*	<10	<10	<10	36	52	<20	
T-13B	05/29/91	WWE	<100	310	<50	1300	<50	<50	<50	<50	310	<100	
T-13B	08/28/91	WWE	<20	<10	<10	200	<10	<10	<10	<10	64	<20	
T-14	02/28/90	WWE	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-14	05/23/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-14	08/30/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-14	11/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-14	02/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-14	05/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-14	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-15	02/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-15	05/23/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-15	08/29/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-15	11/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-15	02/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-15	05/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-15	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-15	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	Replicate
T-16	11/28/89	WWE	<10	11	<5.0	50	<5.0	<5.0	<5.0	16	1200	<10	
T-16	02/28/90	WWE	<100	<50	<50	<50	<50	<50	<50	<50	880	<100	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
T-16	05/24/90	WWE	<100	<50	<50	<50	<50	<50	<50	<50	880	<100	
T-16	08/29/90	WWE	<100	<50	<50	100	<50	<50	<50	<50	1200	<100	
T-16	11/28/90	WWE	<100	<50	<50	52	<50	<50	<50	<50	1100	<100	
T-16	02/28/91	WWE	<100	<50	<50	<50	<50	<50	<50	<50	1000	<100	
T-16	02/28/91	WWE	<100	<50	<50	120*	<50	<50	<50	<50	1900	<100	Replicate
T-16	05/29/91	WWE	<100	<50	<50	84	<50	<50	<50	<50	1400	<100	
T-16	08/28/91	WWE	<100	<50	92	<50	<50	<50	<50	300	490	<100	
T-16	08/28/91	WWE	<100	<50	<50	<50	<50	<50	<50	<50	610	<100	Replicate
T-17	05/30/91	WWE	<10	12	21	66	<5.0	20	<5.0	150	34	<10	
T-17	05/30/91	WWE	<10	12	25	69	<5.0	23	<5.0	120	33	<10	Replicate
T-17	08/28/91	WWE	<10	5.0	15	37	<5.0	40	<5.0	75	43	<10	
T-18	05/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-18	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-19A	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-19A	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-19B	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-19B	08/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-19C	05/29/91	WWE	<50	<25	<25	<25	<25	<25	<25	<25	150	<50	
T-19C	08/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	95	<10	
T-20	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-20	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-21	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-21	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments
P-1A	02/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
P-1A	11/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
P-1A	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
P-1B	02/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
P-1B	11/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
P-1B	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
P-2	02/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
P-2	11/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
P-2	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-1	02/17/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-1	05/25/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-1	11/28/89						-						Dry
W-1	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-1	05/23/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-1	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-1	11/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-1	02/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-1	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-1D	02/17/88	RASS	<10	<5.0	<5.0	10	49	<5.0	<5.0	<5.0	210	<10	
W-1D	05/25/88	RASS	<10	6	<5.0	10	<5.0	<5.0	<5.0	<5.0	210	<10	
W-1D	11/28/89	WWE	<10	<5.0	<5.0	12	<5.0	<5.0	<5.0	<5.0	360	<10	
W-1D	11/28/89	WWE	<10	<5.0	<5.0	9	<5.0	<5.0	<5.0	<5.0	270	<10	Replicate
W-1D	02/27/90	WWE	<10	<5.0	<5.0	8.4	<5.0	<5.0	<5.0	<5.0	370	<10	
W-1D	05/23/90	WWE	<20	<10	<10	11	<10	<10	<10	<10	480	<20	
W-1D	08/28/90	WWE	<20	<10	<10	<10	<10	<10	<10	<10	280	<20	
W-1D	11/28/90	WWE	<50	<25	<25	<25	<25	<25	<25	<25	370	<50	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
W-1D	02/27/91	WWE	<50	<25	<25	<25	<25	<25	<25	<25	390	<50	
W-1D	05/29/91	WWE	<20	<10	<10	12	<10	<10	<10	<10	400	<20	
W-1D	08/27/91	WWE	<50	<25	<25	<25	<25	<25	<25	<25	380	<50	
W-2	02/17/88	RASS	410	1600	510	<5.0	<5.0	<5.0	<5.0	690	7	8*	
W-2	05/26/88	RASS	150	2100	830	<5.0	41*	<5.0	<5.0	700	6	13	
W-2	11/27/89	WWE	82	1300	370	<5.0	<5.0	<5.0	<5.0	150	<5.0	11	
W-2	02/26/90	WWE	49	1100	290	<5.0	<5.0	<5.0	<5.0	84	<5.0	<10	
W-2	05/22/90	WWE	<100	1000	280	<50	<50	<50	<50	89	<50	<100	
W-2	08/29/90	WWE	<100	1000	420	<50	<50	<50	<50	<50	<50	<100	
W-2	11/27/90	WWE	<100	1000	<50	<50	<50	<50	<50	74	<50	<100	
W-2	02/26/91	WWE	<100	750	230	<50	<50	<50	<50	<50	<50	<100	
W-2	05/29/91	WWE	<100	680	210	<50	<50	<50	<50	<50	<50	<100	
W-2	08/27/91	WWE	<100	440	140	<50	<50	<50	<50	<50	<50	<100	
W-2D	02/17/88	RASS	<10	7	<5.0	9	<5.0	<5.0	<5.0	<5.0	260	<10	
W-2D	05/26/88	RASS	<10	<5.0	<5.0	8	46*	<5.0	<5.0	<5.0	280	<10	
W-2D	11/27/89	WWE	<10	<5.0	<5.0	12	<5.0	<5.0	<5.0	<5.0	300	<10	
W-2D	02/26/90	WWE	<10	<5.0	<5.0	10	<5.0	<5.0	<5.0	<5.0	370	<10	
W-2D	05/22/90	WWE	<20	<10	<10	21	<10	<10	<10	<10	420	<20	
W-2D	08/29/90	WWE	<20	<10	<10	15	<10	<10	<10	<10	180	<20	
W-2D	11/27/90	WWE	<20	<10	<10	16	<10	<10	<10	<10	320	<20	
W-2D	02/26/91	WWE	<20	<10	<10	23	<10	<10	<10	<10	370	<20	
W-2D	05/29/91	WWE	<20	<10	<10	21	<10	<10	<10	<10	290	<20	
W-3	02/17/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-3	05/25/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-3	11/28/89	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-3	02/26/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-3	05/23/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
W-3	08/29/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-3	12/06/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-3	02/26/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-3	05/30/91	WWE	<10	<5.0	<5.0	<5.0	5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-3D	02/17/88	RASS	<10	<5.0	<5.0	19	<5.0	<5.0	<5.0	8	720	<10	
W-3D	05/25/88	RASS	<10	6	7	20	7*	<5.0	<5.0	12	780	<10	
W-3D	05/25/88	RASS	<10	5	6	20	6*	<5.0	<5.0	12	790	<10	Replicate
W-3D	11/28/89	WWE	<10	6.0	<5.0	15	<5.0	<5.0	<5.0	<5.0	570	<10	
W-3D	02/27/90	WWE	<10	<5.0	<5.0	14	<5.0	<5.0	<5.0	<5.0	500	<10	
W-3D	05/23/90	WWE	<50	<25	<25	<25	<25	<25	<25	<25	540	<50	
W-3D	08/29/90	WWE	<50	<25	<25	<25	<25	<25	<25	<25	440	<50	
W-3D	12/06/90	WWE	<50	<25	<25	<25	<25	<25	<25	<25	490	<50	
W-3D	02/27/91	WWE	<50	<25	36	<25	<25	<25	<25	<25	590	<50	
W-3D	05/30/91	WWE	<50	<25	<25	<25	<25	<25	<25	<25	390	<50	
W-3D	08/27/91	WWE	<50	<25	<25	<25	<25	<25	<25	<25	450	<50	
W-4	02/17/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-4	05/25/88	RASS	<10	<5.0	<5.0	<5.0	73	<5.0	<5.0	<5.0	<5.0	<10	
W-4	11/28/89	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	19	<5.0	<10	
W-4	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-4	05/23/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	8.9	<5.0	<10	
W-4	08/29/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	13	<5.0	<10	
W-4	12/06/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	7.3	<5.0	<10	
W-4	02/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	5.8	<5.0	<10	
W-4	05/31/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-4D	02/17/88	RASS	<10	<5.0	<5.0	6	<5.0	<5.0	<5.0	<5.0	320	9*	
W-4D	05/25/88	RASS	<10	<5.0	<5.0	6	<5.0	<5.0	<5.0	<5.0	230	<10	
W-4D	11/28/89	WWE	<10	<5.0	<5.0	7.0	<5.0	<5.0	<5.0	5.0	470	12	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
W-4D	11/28/89	WWE	<10	<5.0	<5.0	7.0	<5.0	<5.0	<5.0	5.0	470	11	Replicate
W-4D	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	5.4	480	<10	
W-4D	05/23/90	WWE	<50	<25	<25	<25	<25	<25	<25	<25	370	<50	
W-4D	08/29/90	WWE	<50	<25	<25	<25	<25	<25	<25	<25	380	<50	
W-4D	08/29/90	WWE	<50	<25	<25	<25	<25	<25	<25	<25	390	<50	Replicate
W-4D	12/06/90	WWE	<50	<25	<25	<25	<25	<25	<25	<25	410	<50	
W-4D	02/28/91	WWE	<50	<25	<25	<25	<25	<25	<25	<25	500	<50	
W-4D	05/31/91	WWE	<50	<25	<25	<25	<25	<25	<25	<25	120	<50	
W-4D	08/27/91	WWE	<50	<25	<25	<25	<25	<25	<25	<25	250	<50	
W-5	02/18/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-5	05/25/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-5D	02/18/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-5D	05/25/88	RASS	<10	<5.0	<5.0	<5.0	35*	<5.0	<5.0	<5.0	<5.0	<10	
W-6	02/18/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-6	05/25/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-7	02/18/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-7	02/18/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	Replicate
W-7	05/25/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-8	02/17/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	9	<10	
W-8	05/26/88	RASS	<10	<5.0	<5.0	<5.0	320	<5.0	<5.0	<5.0	<5.0	<10	
W-8	05/26/88	RASS	<10	<5.0	<5.0	<5.0	350	<5.0	<5.0	<5.0	<5.0	<10	Replicate
W-8	11/28/89	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-8	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-8	05/22/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-8	08/29/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
W-8	11/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-8	02/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-8	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-9	02/17/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-9	05/26/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-9	11/28/89	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-9	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-9	05/23/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-9	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-9	11/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-9	02/25/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-9	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-10	02/17/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-10	05/25/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-10	11/28/89	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-10	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-10	05/23/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-10	08/29/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-10	12/06/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0*	<10	
W-10	02/26/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-10	05/30/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-11	02/18/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-11	05/25/88	RASS	<10	<5.0	<5.0	<5.0	29	<5.0	<5.0	<5.0	<5.0	<10	
W-11	11/28/89	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-11	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-11	05/24/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-11	08/29/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments
W-11	12/06/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-11	02/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-11	05/30/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-12	02/18/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-12	02/18/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	Replicate
W-12	05/25/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-13	02/18/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-13	05/25/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-14	02/18/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-14	05/25/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
AD-1	06/04/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
AD-1	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
AD-2	06/04/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
AD-2	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
AD-2	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	Replicate
AD-3	06/04/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
AD-3	06/04/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	Replicate
AD-3	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
AD-4	06/04/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
AD-4	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
AD-5	06/04/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
AD-5	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	

Key: Less than indicates that the compound was not found or was below the reported detection limit. Thirty-four volatile compounds were included in the analytical scan. Compounds not detected are not shown on the table.
DAL = Daily Analytical Laboratories, Peoria, Illinois.
ECI = Environmental Consultants, Inc., Clarksville, Indiana.
RASS = Randolph & Associates, Inc., Peoria, Illinois.
WWES = WW Engineering & Science, Grand Rapids, Michigan.

Note: (1) Chloroform = 54 ug/l
(2) Xylene detected in T-6B (21 ug/l), T-7B (240 ug/l), T-7B Rep.(230 ug/l), and T-9 (270 ug/l)
* Estimated value as a result of data not meeting QA/QC validation criteria.

TABLE 3-6

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR SEMIVOLATILE ORGANICS
(all results in ug/l)

Well Number	Date Sampled	Lab	Bis-(2-Ethyl Hexyl) Phthalate	Butyl Benzyl Phthalate	Diethyl-phthalate	Di-n-butyl Phthalate	Di-n-octyl phthalate	4-Methyl-phenol	Phenol	Pyrene	Comments
T-1	02/27/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-1	05/22/90	WWES	<2.0	<3.0		<1.0	<2.0			2	
T-1	08/29/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
T-2A	02/26/90	WWES	<2.0	<3.0		5.0	<2.0			<1.0	
T-2A	02/26/90	WWES	<2.0	<3.0		8.0	<2.0			<1.0	Replicate
T-2A	05/22/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-2A	08/29/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
T-2B	02/26/90	WWES	3.0	<3.0		18	<2.0			<1.0	
T-2B	05/22/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-2B	08/29/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
T-3	02/27/90	WWES	3.0	<3.0		<1.0	<2.0			<1.0	
T-3	02/27/90	WWES	10	<3.0		<1.0	<2.0			<1.0	Replicate
T-3	05/23/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-3	05/23/90	WWES	<2.0	<3.0		<1.0	<2.0			2	Replicate
T-3	08/29/90	WWES	4.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
T-4A	02/27/90	WWES	3.0	3.0		<1.0	<2.0	<5.0		<1.0	
T-4A	05/22/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0		<1.0	
T-4A	08/28/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
T-4B	02/27/90	WWES	7.0	<3.0		2.0	<2.0			<1.0	
T-4B	02/27/90	WWES	9.0	<3.0		<1.0	<2.0			<1.0	Replicate
T-4B	05/22/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-4B	05/22/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	Replicate
T-4B	08/28/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	

TABLE 3-6

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR SEMIVOLATILE ORGANICS
(all results in ug/l)

Well Number	Date Sampled	Lab	Bis-(2-Ethyl Hexyl) Phthalate	Butyl Benzyl Phthalate	Diethyl-phthalate	Di-n-butyl Phthalate	Di-n-octyl phthalate	4-Methyl-phenol	Phenol	Pyrene	Comments
T-4B	08/28/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	Replicate
T-5A	02/27/90	WWES	6.0	<3.0		<1.0	<2.0			<1.0	
T-5A	05/22/90	WWES	<2.0	<3.0		<1.0	9			<1.0	
T-5A	08/28/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
T-5B	02/27/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-5B	05/22/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-5B	05/22/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	Replicate
T-5B	08/28/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
T-5C	02/27/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-5C	05/22/90	WWES	<1000	<3.0		<1.0	3			<1.0	
T-5C	08/28/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
T-6A	02/26/90	WWES	<2.0	3.0		24	<2.0			<1.0	
T-6A	05/22/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-6A	08/29/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
T-6A	08/29/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	Replicate
T-6B	02/26/90	WWES	5.0	<3.0		4.0	<2.0			<1.0	
T-6B	05/22/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-6B	08/29/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
T-6C	02/26/90	WWES	<2.0	<3.0		6.0	<2.0			<1.0	
T-6C	05/22/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-6C	08/29/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	

TABLE 3-6

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR SEMIVOLATILE ORGANICS
(all results in ug/l)

Well Number	Date Sampled	Lab	Bis-(2-Ethyl Hexyl) Phthalate	Butyl Benzyl Phthalate	Diethyl-phthalate	Di-n-butyl Phthalate	Di-n-octyl phthalate	4-Methyl-phenol	Phenol	Pyrene	Comments
T-7A	02/28/90	WWES	<2.0*	<3.0*		<1.0*	<2.0			<1.0	
T-7A	05/23/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-7A	08/30/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
T-7B	02/28/90	WWES	8.0*	<3.0*		<1.0*	<2.0			<1.0	
T-7B	02/28/90	WWES	5.0	<3.0		<1.0	<2.0			<1.0	Replicate
T-7B	05/23/90	WWES	<3.0	<3.0		<1.0	<2.0			<1.0	
T-7B	05/23/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	Replicate
T-7B	08/30/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
T-7B	08/30/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	Replicate
T-8	02/28/90	WWES	3.0*	<3.0*		<1.0*	<2.0			<1.0	
T-8	05/23/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-8	08/29/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
T-9	02/28/90	WWES	4.0*	<3.0*		<1.0*	<2.0			<1.0	
T-9	05/24/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-9	05/24/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	Replicate
T-9	08/29/90	WWES	28	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
T-10	02/28/90	WWES	11	<3.0		<1.0	<2.0			<1.0	
T-10	05/23/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-10	08/29/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
T-11A	02/26/90	WWES	3.0	<3.0		13.0	<2.0			<1.0	
T-11A	05/22/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-11A	08/30/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	

TABLE 3-6

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR SEMIVOLATILE ORGANICS
(all results in ug/l)

Well Number	Date Sampled	Lab	Bis-(2-Ethyl Hexyl) Phthalate	Butyl Benzyl Phthalate	Diethyl-phthalate	Di-n-butyl Phthalate	Di-n-octyl phthalate	4-Methyl-phenol	Phenol	Pyrene	Comments
T-11B	02/26/90	WWES	<2.0	<3.0		2.0	<2.0			<1.0	
T-11B	05/22/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-11B	08/30/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
T-11C	02/26/90	WWES	3.0	<3.0		<1.0	<2.0			<1.0	
T-11C	05/22/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-11C	08/30/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
T-12	02/27/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-12	05/24/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-12	08/29/90	WWES									N/A
T-13A	02/28/90	WWES	5.0*	<3.0*		<1.0*	<2.0			<1.0	
T-13A	05/23/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-13A	08/28/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
T-13B	02/28/90	WWES	11	<3.0		3.0	<2.0			<1.0	
T-13B	05/23/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-13B	08/28/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
T-14	02/28/90	WWES	20	<3.0		<1.0	<2.0			<1.0	
T-14	05/23/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-14	08/30/90	WWES	37	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
T-15	02/28/90	WWES	9.0	<3.0		<1.0	<2.0			<1.0	
T-15	05/23/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
T-15	08/29/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	

TABLE 3-6

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR SEMIVOLATILE ORGANICS
(all results in ug/l)

Well Number	Date Sampled	Lab	Bis-(2-Ethyl Hexyl) Phthalate	Butyl Benzyl Phthalate	Diethyl-phthalate	Di-n-butyl Phthalate	Di-n-octyl phthalate	4-Methyl-phenol	Phenol	Pyrene	Comments
T-16	02/28/90	WWES	17	<3.0		<1.0	<2.0			<1.0	
T-16	05/24/90	WWES	<3.0	<3.0		<1.0	<2.0			<1.0	
T-16	08/29/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
W-1	02/17/88	RASS	<10		<10	<10	91				
W-1	02/27/90	WWES	<2.0	<3.0		4.0	<2.0			<1.0	
W-1	05/23/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
W-1	08/28/90	WWES	<3.0	<3.0		<1.0	<2.0	7.0	<2.0	3	
W-1D	02/17/88	RASS	<10		<10	<10	<10				
W-1D	02/27/90	WWES	<2.0	<3.0		5.0	<2.0			<1.0	
W-1D	05/23/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
W-1D	08/28/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
W-2	02/17/88	RASS	<10		<10	<10	<10				
W-2	02/26/90	WWES	<2.0	<3.0		35	<2.0			<1.0	
W-2	05/22/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
W-2	08/29/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
W-2D	02/17/88	RASS	<10		<10	<10	12				
W-2D	02/26/90	WWES	<2.0	<3.0		22	<2.0			<1.0	
W-2D	05/22/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
W-2D	08/29/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
W-3	02/17/88	RASS	<10		<10	<10	42				
W-3	02/27/90	WWES	<2.0	<3.0		5.0	<2.0			<1.0	
W-3	05/23/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
W-3	08/29/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	

TABLE 3-6

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR SEMIVOLATILE ORGANICS
(all results in ug/l)

Well Number	Date Sampled	Lab	Bis-(2-Ethyl Hexyl) Phthalate	Butyl Benzyl Phthalate	Diethyl-phthalate	Di-n-butyl Phthalate	Di-n-octyl phthalate	4-Methyl-phenol	Phenol	Pyrene	Comments
W-3D	02/17/88	RASS	<10		<10	<10	<10				
W-3D	02/27/90	WWES	<2.0	<3.0		2.0	<2.0			<1.0	
W-3D	05/23/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
W-3D	08/29/90	WWES	9.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
W-4	02/17/88	RASS	<10		64	<10	<10*				
W-4	02/27/90	WWES	<2.0	<3.0		14	<2.0			<1.0	
W-4	05/23/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
W-4	08/29/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
W-4D	02/17/88	RASS	<10		<10	<10	71				
W-4D	02/27/90	WWES	3.0	<3.0		3.0	<2.0			<1.0	
W-4D	05/23/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
W-4D	08/29/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
W-4D	08/29/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	Replicate
W-5	02/18/88	WWES	<10		<10	<10	<10*				
W-5D	02/18/88	WWES	<10		<10	<10	45*				
W-6	02/18/88	WWES	<10		<10	<10	421*				
W-7	02/18/88	WWES	<10		<10	<10	22*				
W-7	02/18/88	WWES	<10*		<10	<10	<10				Replicate
W-8	02/17/88	WWES	<10		<10	<10	20*				
W-8	02/27/90	WWES	<2.0	<3.0		25	<2.0			<1.0	
W-8	05/22/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
W-8	08/29/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	

TABLE 3-6

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR SEMIVOLATILE ORGANICS
(all results in ug/l)

Well Number	Date Sampled	Lab	Bis-(2-Ethyl Hexyl) Phthalate	Butyl Benzyl Phthalate	Diethyl-phthalate	Di-n-butyl Phthalate	Di-n-octyl phthalate	4-Methyl-phenol	Phenol	Pyrene	Comments
W-9	02/17/88	WWES	<10		<10	<10	<10*				
W-9	02/27/90	WWES	3.0	<3.0		3.0	<2.0			<1.0	
W-9	05/23/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
W-9	08/28/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
W-10	02/17/88	WWES	13		<10	<10	61				
W-10	02/27/90	WWES	3.0	<3.0		<1.0	<2.0			<1.0	
W-10	05/23/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
W-10	08/29/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
W-11	02/18/88	WWES	<10		<10	<10	<10				
W-11	02/27/90	WWES	<2.0*	<3.0*		12*	<2.0			<1.0	
W-11	05/24/90	WWES	17	<3.0		<1.0	<2.0			<1.0	
W-11	08/29/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
W-12	02/18/88	WWES	<10		<10	<10	<10				
W-12	02/18/88	WWES	<10		<10	<10	<10				Replicate
W-13	02/18/88	WWES	<10*		<10	<10	<10				
W-14	02/18/88	WWES	<10*		<10	<10	<10				
K-14	01/16/73								<1		
K-14	02/01/73								2		
K-14	05/02/73								1		
K-14	08/20/73								8		
K-14	10/05/73								1		
K-14	11/21/73								<1		
K-14	03/28/78										

TABLE 3-6

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR SEMIVOLATILE ORGANICS
(all results in ug/l)

Well Number	Date Sampled	Lab	Bis-(2-Ethyl Hexyl) Phthalate	Butyl Benzyl Phthalate	Diethyl-phthalate	Di-n-butyl Phthalate	Di-n-octyl phthalate	4-Methyl-phenol	Phenol	Pyrene	Comments
K-14	12/04/78										
K-14	06/03/81										
K-14	03/26/85								<100		
K-15	01/16/73								<1		
K-15	02/01/73								<1		
K-15	05/02/73								2		
K-15	08/20/73								7		
K-15	10/05/73								3		
K-15	11/21/73								<1		
AD-1	06/04/90	WWES	18	<3.0		<1.0	<2.0			<1.0	
AD-1	08/28/90	WWES	<3.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
AD-1	11/26/90	WWES							<20		
AD-1	02/25/91	WWES							<10		
AD-1	05/28/91	WWES							<20		
AD-2	06/04/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
AD-2	08/28/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
AD-2	08/28/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
AD-2	11/26/90	WWES							<20		
AD-2	02/25/91	WWES							<10		
AD-2	05/28/91	WWES							<20		
AD-3	06/04/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
AD-3	06/04/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
AD-3	08/28/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	40	<1.0	
AD-3	11/26/90	WWES							<20		
AD-3	02/25/91	WWES							40		

TABLE 3-6

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR SEMIVOLATILE ORGANICS
(all results in ug/l)

Well Number	Date Sampled	Lab	Bis-(2-Ethyl Hexyl) Phthalate	Butyl Benzyl Phthalate	Diethyl-phthalate	Di-n-butyl Phthalate	Di-n-octyl phthalate	4-Methyl-phenol	Phenol	Pyrene	Comments
AD-3	05/28/91	WWES							60		
AD-4	06/04/90	WWES	<2.0	<3.0		<1.0	<2.0			<1.0	
AD-4	08/28/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	31	<1.0	
AD-4	11/26/90	WWES							<20		
AD-4	11/26/90	WWES							<20		Replicate
AD-4	02/25/91	WWES							30		
AD-4	02/25/91	WWES							40		Replicate
AD-4	05/28/91	WWES							60		
AD-4	05/28/91	WWES							60		Replicate
AD-5	06/04/90	WWES	28	<3.0		<1.0	<2.0			<1.0	
AD-5	08/28/90	WWES	<2.0	<3.0		<1.0	<2.0	<5.0	<2.0	<1.0	
AD-5	11/26/90	WWES							<20		
AD-5	02/25/91	WWES							<10		
AD-5	05/28/91	WWES							<20		

Note: Less than indicates that the compound was not found or was below the reported detection limit. Sixty-five semivolatile compounds were included in the analytical scan. Compounds not detected are not shown on the table.
* Estimated value as a result of data not meeting QA/QC validation criteria.

Key: DAL = Daily Analytical Laboratories, Peoria, Illinois.
ECI = Environmental Consultants, Inc., Clarksville, Indiana.
RASS = Randolph & Associates, Inc., Peoria, Illinois.
WWES = WW Engineering & Science, Grand Rapids, Michigan.

COMMENTS:
1. K-14 = Keystone Production Well (West Well).
2. K-15 = Keystone Production Well (East Well).

TABLE 3-7

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR MISCELLANEOUS PARAMETERS

Well #	Date Sampled	Lab	Hardness as mg/l CaCO3	Total Alkalinity (mg/l)	Bicarbonate (mg/l)	Chloride (mg/l)	Sulfate (mg/l)	TOC (mg/l)	COD (mg/l)	TOX (ug/L)	Comments:
T-1	11/28/90	WWES	2200	381	465	942	394	<1.0	16		
T-1	02/27/91	WWES	2110	377	460	1040	351	<1.0	<5.0		
T-1	02/27/91	WWES	2130	377	459	1020	387	<1.0	85		Replicate
T-1	05/29/91	WWES	2250	383	383	1010	375	1.1	6.4		
T-2A	11/27/90	WWES	824	411	501	267	130	1.0	<5.0		
T-2A	02/26/91	WWES	900	402	491	255	150	1.2	9.2		
T-2A	05/29/91	WWES	940	407	407	203	200	1.1	<5.0		
T-2B	11/27/90	WWES	1648	420	512	937	550	1.2	20		
T-2B	02/26/91	WWES	2400	399	487	978	583	1.0	19		
T-2B	05/29/91	WWES	2660	403	403	961	525	<1.0	<5.0		
T-3	12/06/90	WWES	522	397	485	52	80	<1.0	<5.0		
T-3	12/06/90	WWES	478	403	491	53	76	<1.0	<5.0		Replicate
T-3	02/26/91	WWES	560	410	500	50	106	1.1	<5.0		
T-3	05/31/91	WWES	580	409	409	56	113	1.2	<5.0		
T-3	05/31/91	WWES	520	402	402	58	114	<1.0	<5.0		Replicate
T-4A	11/28/90	WWES	1220	381	466	199	574	<1.0	13		
T-4A	02/26/91	WWES	1280	387	472	202	600	1.6	<5.0		
T-4A	05/29/91	WWES	1370	391	391	187	450	<1.0	14		
T-4B	11/28/90	WWES	660	284	347	150	135	<1.0	17		
T-4B	02/26/91	WWES	680	336	409	151	161	<1.0	<5.0		
T-4B	05/29/91	WWES	710	336	336	145	110	<1.0	<5.0		
T-5A	11/27/90	WWES	491	370	451	69	110	1.7	5.6		
T-5A	02/25/91	WWES	680	382	466	71	163	1.9	<5.0		
T-5A	05/29/91	WWES	650	392	392	73	110	1.5	<5.0		
T-5B	11/27/90	WWES	1153	386	471	146	600	<1.0	<5.0		
T-5B	02/25/91	WWES	1240	332	405	133	450	1.8	<5.0		
T-5B	05/29/91	WWES	1310	376	376	14	650	<1.0	<5.0		
T-5C	11/27/90	WWES	1089	393	479	549	475	<1.0	24		
T-5C	02/25/91	WWES	1760	383	468	571	373	<1.0	6.9		
T-5C	05/29/91	WWES	1890	395	395	575	450	<1.0	19		
T-5C	05/29/91	WWES	1830	398	398	582	450	1.2	7.5		Replicate
T-6A	11/27/90	WWES	505	190	232	77	300	3.2*	15		
T-6A	11/27/90	WWES	541	191	233	80	350	3.1	8.4		Replicate
T-6A	02/26/91	WWES	760	188	229	80	322	3.2	10		
T-6A	02/26/91	WWES	740	187	228	80	503	3.2	11		Replicate
T-6A	05/29/91	WWES	710	188	188	83	450	3.7	<5.0		
T-6A	05/29/91	WWES	710	190	190	83	450	3.8	<5.0		Replicate

TABLE 3-7

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR MISCELLANEOUS PARAMETERS

Well #	Date Sampled	Lab	Hardness as mg/l CaCO3	Total Alkalinity (mg/l)	Bicarbonate (mg/l)	Chloride (mg/l)	Sulfate (mg/l)	TOC (mg/l)	COD (mg/l)	TOX (ug/L)	Comments:
T-6B	11/27/90	WWES	461	369	450	180	120	1.5	<5.0		
T-6B	02/26/91	WWES	700	367	448	149	210	2.0	6.0		
T-6B	05/29/91	WWES	680	359	359	138	180	2.3	<5.0		
T-6C	11/27/90	WWES	1392	374	457	690	450	<1.0	<5.0		
T-6C	02/26/91	WWES	1940	369	450	694	385	<1.0	12		
T-6C	05/29/91	WWES	1020	374	374	710	599	1.0	8.0		
T-7A	11/28/90	WWES	340	273	333	388	106	2.5	14		
T-7A	11/28/90	WWES	328	282	345	408	127	2.5	11		Replicate
T-7A	02/27/91	WWES	560	279	341	752	102	2.4	13		
T-7A	05/29/91	WWES	410	284	284	585	131	2.5	<5.0		
T-7B	11/28/90	WWES	650	351	429	150	154	<1.0	<5.0		
T-7B	02/27/91	WWES	710	374	457	190	161	<1.0	<5.0		
T-7B	02/27/91	WWES	680	368	450	192	168	<1.0	<5.0		Replicate
T-7B	05/29/91	WWES	880	371	371	209	194	1.1	6.8		
T-7B	05/29/91	WWES	930	370	370	218	192	<1.0	<5.0		Replicate
T-8	11/28/90	WWES	1188	454	533	78	843	2.5	6.6		
T-8	02/27/91	WWES	1520	446	544	75	727	2.4	<5.0		
T-8	05/28/91	WWES	1380	439	439	69	805	3.1	<5.0		
T-9	11/28/90	WWES	460	371	453	233	111	<1.0	<5.0		
T-9	11/28/90	WWES	424	373	455	238	91	<1.0	<5.0		Replicate
T-9	02/27/91	WWES	610	373	455	362	87	<1.0	<5.0		
T-9	05/29/91	WWES	590	385	385	249	110	<1.0	<5.0		
T-10	11/28/90	WWES	3560	320	391	2200	1520	1.2	35		
T-10	02/27/91	WWES	4460	299	365	2250	1170	1.3	60		
T-10	05/29/91	WWES	2970	302	302	2090	1340	1.5	34		
T-11A	11/27/90	WWES	450	421	513	77	65	2.3	<5.0		
T-11A	02/26/91	WWES	660	379	462	93	187	2.9	<5.0		
T-11A	05/30/91	WWES	550	383	383	93	176	3.6	8.8		
T-11B	11/27/90	WWES	634	366	447	165	160	<1.0	21		
T-11B	02/26/91	WWES	800	359	437	182	202	<1.0	<5.0		
T-11B	05/30/91	WWES	710	356	356	147	193	1.1	<5.0		
T-11C	11/27/90	WWES	824	389	475	92	475	1.5	24		
T-11C	02/26/91	WWES	1220	383	219	92	674	1.5	9.2		
T-11C	05/30/91	WWES	1460	382	382	94	188	1.8	17		

TABLE 3-7

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR MISCELLANEOUS PARAMETERS

Well #	Date Sampled	Lab	Hardness as mg/l CaCO3	Total Alkalinity (mg/l)	Bicarbonate (mg/l)	Chloride (mg/l)	Sulfate (mg/l)	TOC (mg/l)	COD (mg/l)	TOX (ug/L)	Comments:
T-12	11/28/90	WWES	730	372	453	476	317	1.1	24		
T-12	02/28/91	WWES	1170	376	459	343	317	<1.0	6.6		
T-13A	11/28/90	WWES	1735	260	318	1340	198	1.0	34		
T-13A	02/28/91	WWES	2480	170	207	1520	239	1.1	14		
T-13A	05/29/91	WWES	2430	180	180	1480	136	1.6	35		
T-13B	11/28/90	WWES	6600	302	373	3780	250	1.6	61		
T-13B	02/28/91	WWES	6600	291	355	3540	511	1.7	87		
T-13B	05/29/91	WWES	3770	300	300	3630	629	1.9	53		
T-14	11/27/90	WWES	1499	436	533	102	900	2.6	<5.0		
T-14	02/27/91	WWES	1580	431	526	102	968	2.9	<5.0		
T-14	05/28/91	WWES	1660	426	426	100	1120	3.5	<5.0		
T-15	11/28/90	WWES	640	305	376	51	115	<1.0	36		
T-15	02/27/91	WWES	630	309	377	54	195	<1.0	<5.0		
T-15	05/28/91	WWES	840	309	309	47	255	1.3	<5.0		
T-16	11/28/90	WWES	1860	383	467	876	374	<1.0	11		
T-16	02/28/91	WWES	1780	388	473	821	381	<1.0	25		
T-16	02/28/91	WWES	1940	391	477	822	304	<1.0	12		Replicate
T-16	05/29/91	WWES	1940	383	383	845	403	1.0	<5.0		
T-17	05/30/91	WWES	2720	412	412	32	134	1.1	576		
T-17	05/30/91	WWES	2980	414	414	31	125	1.5	676		Replicate
T-18	05/28/91	WWES	2760	383	383	18	156	3.6	5800		
T-19A	05/29/91	WWES	740	307	307	20	231	33	184		
T-19B	05/29/91	WWES	1080	405	405	71	301	5.1	24		
T-19C	05/29/91	WWES	1460	417	417	144	945	1.6	<5.0		
T-20	05/29/91	WWES	5640	372	372	653	704	1.9	1920		
T-21	05/29/91	WWES	1740	449	449	116	1610	2.5	940		
W-1	09/04/86	DAL				83	220	8.4		6.4	
W-1	09/04/86	DAL								17.6	Duplicate
W-1	11/21/86	DAL				130	370	6.61		10.6	
W-1	11/21/86	DAL						6.45		10.4	Duplicate
W-1	11/21/86	DAL						6.14		10.8	Triplicate
W-1	11/21/86	DAL						6.50		9.3	Quadruplicate
W-1	02/18/87	DAL				160	610	4.40		12.9	

TABLE 3-7

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR MISCELLANEOUS PARAMETERS

Well #	Date Sampled	Lab	Hardness as mg/l CaCO3	Total Alkalinity (mg/l)	Bicarbonate (mg/l)	Chloride (mg/l)	Sulfate (mg/l)	TOC (mg/l)	COD (mg/l)	TOX (ug/L)	Comments:
W-1	02/18/87	DAL						4.33		18.9	Duplicate
W-1	02/18/87	DAL						4.63		13.8	Triplicate
W-1	02/18/87	DAL						4.49		13.3	Quadruplicate
W-1	05/27/87	RASS				76.3	489	9.06		18	
W-1	05/27/87	RASS						8.26		17	Duplicate
W-1	05/27/87	RASS						9.08		15	Triplicate
W-1	05/27/87	RASS						8.06		17	Quadruplicate
W-1	02/17/88	RASS				207	831				
W-1	11/28/89										Dry
W-1	11/28/90	WWES	696	180	219	86	396	1.1	56		
W-1	02/27/91	WWES	480	269	328	40	162	7.4	20		
W-1	05/29/91	WWES	590	336	336	53	97	16	56		
W-1D	09/04/86	DAL				220	250	2.5		216	
W-1D	09/04/86	DAL								200	Duplicate
W-1D	11/21/86	DAL				230	240	2.82		182	
W-1D	11/21/86	DAL						2.75		184	Duplicate
W-1D	11/21/86	DAL						2.48		189	Triplicate
W-1D	11/21/86	DAL						2.16		157	Quadruplicate
W-1D	02/18/87	DAL				230	230	1.80		122	
W-1D	02/18/87	DAL						2.45		132	Duplicate
W-1D	02/18/87	DAL						2.20		148	Triplicate
W-1D	02/18/87	DAL						1.85		140	Quadruplicate
W-1D	05/27/87	RASS				232	215	7.17		280	
W-1D	05/27/87	RASS						6.80		260	Duplicate
W-1D	05/27/87	RASS						5.68		220	Triplicate
W-1D	05/27/87	RASS						5.49		180	Quadruplicate
W-1D	02/17/88	RASS				246	303				
W-1D	11/28/90	WWES	1056	423	516	235	421	<1.0	<5.0		
W-1D	02/27/91	WWES	1012	420	513	240	383	1.2	<5.0		
W-1D	05/29/91	WWES	990	418	418	196	336	1.7	<5.0		
W-2	09/04/86	DAL				250	250	9.8		1530	
W-2	09/04/86	DAL								1840	Duplicate
W-2	09/04/86	DAL				250	240	9.6		1690	Replicate
W-2	09/04/86	DAL								2180	Replicate,
W-2	11/21/86	DAL				270	230	8.87		1660	
W-2	11/21/86	DAL						8.83		2360	Duplicate
W-2	11/21/86	DAL						10.3		1310	Triplicate
W-2	11/21/86	DAL						9.65		1830	Quadruplicate
W-2	02/18/87	DAL				290	230	7.01		1139	
W-2	02/18/87	DAL						7.22		1157	Duplicate
W-2	02/18/87	DAL						7.95		1131	Triplicate
W-2	02/18/87	DAL						7.31		1231	Quadruplicate
W-2	05/27/87	RASS				308	189	8.55		2200	
W-2	05/27/87	RASS						8.29		2400	Duplicate

TABLE 3-7

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR MISCELLANEOUS PARAMETERS

Well #	Date Sampled	Lab	Hardness as mg/l CaCO3	Total Alkalinity (mg/l)	Bicarbonate (mg/l)	Chloride (mg/l)	Sulfate (mg/l)	TOC (mg/l)	COD (mg/l)	TOX (ug/L)	Comments:
W-2	05/27/87	RASS						7.44		2400	Triplicate
W-2	05/27/87	RASS						7.13		2800	Quadruplicate
W-2	02/17/88	RASS				309	250				
W-2	11/27/90	WWES	764	387	473	204	320	4.9	15		
W-2	02/26/91	WWES	980	336	410	178	308	5.1	20		
W-2	05/29/91	WWES	950	357	357	171	393	6.1	25		
W-2D	09/04/86	DAL				370	380	3.1		2500	
W-2D	09/04/86	DAL								2480	Duplicate
W-2D	11/21/86	DAL				370	330	1.86		194	
W-2D	11/21/86	DAL						1.61		192	Duplicate
W-2D	11/21/86	DAL						2.17		190	Triplicate
W-2D	11/21/86	DAL						1.79		189	Quadruplicate
W-2D	02/18/87	DAL				360	330	1.48		187	
W-2D	02/18/87	DAL						1.99		212	Duplicate
W-2D	02/18/87	DAL						1.72		190	Triplicate
W-2D	02/18/87	DAL						1.53		194	Quadruplicate
W-2D	05/27/87	RASS				362	297	3.51		90	
W-2D	05/27/87	RASS						3.27		110	Duplicate
W-2D	05/27/87	RASS						3.49		100	Triplicate
W-2D	05/27/87	RASS						3.45		90	Quadruplicate
W-2D	02/17/88	RASS				371	305				
W-2D	11/27/90	WWES	618	420	513	350	250	<1.0	5.0		
W-2D	02/26/91	WWES	1210	419	511	358	328	<1.0	<5.0		
W-2D	05/29/91	WWES	1260	416	416	339	341	1.0	6.1		
W-3	09/05/86	DAL				94	630	5.6		22.1	
W-3	09/05/86	DAL								29.0	Duplicate
W-3	11/21/86	DAL				71	370	6.04		34.2	
W-3	11/21/86	DAL						5.56		21.8	Duplicate
W-3	11/21/86	DAL						5.54		14.4	Triplicate
W-3	11/21/86	DAL						5.62		32.4	Quadruplicate
W-3	02/18/87	DAL				59	350	4.23		16.8	
W-3	02/18/87	DAL						4.96		17.8	Duplicate
W-3	02/18/87	DAL						4.42		19.8	Triplicate
W-3	02/18/87	DAL						4.37		20.0	Quadruplicate
W-3	05/28/87	RASS				78.3	243	34.5		30	
W-3	05/28/87	RASS						35.9		34	Duplicate
W-3	05/28/87	RASS						35.5		18	Triplicate
W-3	05/28/87	RASS						35.4		22	Quadruplicate
W-3	02/17/88	RASS				140	360				
W-3	12/06/90	WWES	500	297	362	63	193	3.1	8.4		
W-3	02/27/91	WWES	500	299	364	37	202	2.4	<5.0		
W-3	05/30/91	WWES	890	344	344	51	720	3.5	55		

TABLE 3-7

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR MISCELLANEOUS PARAMETERS

Well #	Date Sampled	Lab	Hardness as mg/l CaCO3	Total Alkalinity (mg/l)	Bicarbonate (mg/l)	Chloride (mg/l)	Sulfate (mg/l)	TOC (mg/l)	COD (mg/l)	TOX (ug/L)	Comments:
W-3D	09/05/86	DAL				320	660	2.6		535	
W-3D	09/05/86	DAL								532	Duplicate
W-3D	11/21/86	DAL				310	720	2.44		944	
W-3D	11/21/86	DAL						2.18		1440	Duplicate
W-3D	11/21/86	DAL						2.62		1040	Triplicate
W-3D	11/21/86	DAL						2.32		733	Quadruplicate
W-3D	02/18/87	DAL				320	730	3.33		483	
W-3D	02/18/87	DAL						3.46		517	Duplicate
W-3D	02/18/87	DAL						4.16		643	Triplicate
W-3D	02/18/87	DAL						2.99		646	Quadruplicate
W-3D	05/28/87	RASS				324	669	19.5		270	
W-3D	05/28/87	RASS						18.4		275	Duplicate
W-3D	05/28/87	RASS						17.7		240	Triplicate
W-3D	05/28/87	RASS						18.2		240	Quadruplicate
W-3D	05/28/87	RASS				328	628	15.2		4100	Replicate
W-3D	05/28/87	RASS						13.8		3500	Replicate, Quadruplicate
W-3D	05/28/87	RASS						14.7		2900	Replicate, triplicate
W-3D	05/28/87	RASS						13.6		2700	Replicate, Quadruplicate
W-3D	02/17/88	RASS				405	809				
W-3D	12/06/90	WWES	1660	407	496	203	885	1.7	<5.0		
W-3D	02/27/91	WWES	1700	414	505	195	786	1.9	<5.0		
W-3D	05/30/91	WWES	1740	407	407	194	105	2.2	<5.0		
W-4	09/05/86	DAL				75	1300	7.0		11.2	
W-4	09/05/86	DAL								5.6	Duplicate
W-4	11/21/86	DAL				72	1200	6.54		15.3	
W-4	11/21/86	DAL						6.14		13.7	Duplicate
W-4	11/21/86	DAL						6.03		19.3	Triplicate
W-4	11/21/86	DAL						6.95		17.1	Quadruplicate
W-4	11/21/86	DAL				70	1200	6.84		14.3	Replicate
W-4	11/21/86	DAL						6.48		17.8	Replicate,
W-4	11/21/86	DAL						6.94		30.6	Replicate,
W-4	11/21/86	DAL						6.26		49.5	Replicate,
W-4	02/18/87	DAL				67	1200	5.79		7.8	
W-4	02/18/87	DAL						5.91		5.0	Duplicate
W-4	02/18/87	DAL						6.27		12.5	Triplicate
W-4	02/18/87	DAL						6.75		8.2	Quadruplicate
W-4	05/28/87	RASS				<5.00	902	10.3		15	
W-4	05/28/87	RASS						11.1		16	Duplicate
W-4	05/28/87	RASS						9.84		22	Triplicate
W-4	05/28/87	RASS						9.74		19	Quadruplicate
W-4	02/17/88	RASS				72	783				
W-4	12/06/90	WWES	935	177	216	65	777	3.6	8.6		

TABLE 3-7

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR MISCELLANEOUS PARAMETERS

Well #	Date Sampled	Lab	Hardness as mg/l CaCO3	Total Alkalinity (mg/l)	Bicarbonate (mg/l)	Chloride (mg/l)	Sulfate (mg/l)	TOC (mg/l)	COD (mg/l)	TOX (ug/L)	Comments:
W-4	02/28/91	WWES	1060	120	146	57	938	3.8	12		
W-4	05/31/91	WWES	1260	153	153	54	463	4.3	24*		
W-4D	09/05/86	DAL				130	230	1.6		14.7	
W-4D	09/05/86	DAL								17.5	Duplicate
W-4D	11/21/86	DAL				140	190	1.97		6.4	
W-4D	11/21/86	DAL						2.18		8.1	Duplicate
W-4D	11/21/86	DAL						1.71		22.9	Triplicate
W-4D	11/21/86	DAL						1.61		9.7	Quadruplicate
W-4D	02/18/87	DAL				150	210	1.57		15.3	
W-4D	02/18/87	DAL						2.54		12.6	Duplicate
W-4D	02/18/87	DAL						1.58		16.9	Triplicate
W-4D	02/18/87	DAL						2.01		12.4	Quadruplicate
W-4D	02/18/87	DAL				150	210	2.12		23.8	Replicate
W-4D	02/18/87	DAL						1.60		18.3	Replicate Duplicate
W-4D	02/18/87	DAL						1.50		13.0	Replicate Triplicate
W-4D	02/18/87	DAL						1.69		15.1	Replicate Quadruplicate
W-4D	05/28/87	RASS				164	162	7.85		19	
W-4D	05/28/87	RASS						8.27		11	Duplicate
W-4D	05/28/87	RASS						8.57		16	Triplicate
W-4D	05/28/87	RASS						8.83		17	Quadruplicate
W-4D	02/17/88	RASS				318	265				
W-4D	12/06/90	WWES	820	370	451	215	187	<1.0	<5.0		
W-4D	02/28/91	WWES	762	365	445	208	137	<1.0	<5.0		
W-4D	05/31/91	WWES	600	246	246	14	249	12	52		
W-5	09/05/86	DAL				120	200	9.4		25.1	
W-5	09/05/86	DAL								38.5	Duplicate
W-5	11/21/86	DAL				170	210	8.53		57.9	
W-5	11/21/86	DAL						8.34		62.1	Duplicate
W-5	11/21/86	DAL						7.82		97.7	Triplicate
W-5	11/21/86	DAL						8.51		159	Quadruplicate
W-5	02/18/87	DAL				130	180	11.9		37.7	
W-5	02/18/87	DAL						9.33		26.8	Duplicate
W-5	02/18/87	DAL						8.99		27.5	Triplicate
W-5	02/18/87	DAL						9.32		43.8	Quadruplicate
W-5	05/27/87	RASS				136	188	14.3		30	
W-5	05/27/87	RASS						14.5		30	Duplicate
W-5	05/27/87	RASS						14.8		29	Triplicate
W-5	05/27/87	RASS						14.4		32	Quadruplicate
W-5	02/18/88	RASS				135	145				
W-5D	09/05/86	DAL				130	480	4.4		16.3	
W-5D	09/05/86	DAL								11.5	Duplicate
W-5D	11/21/86	DAL				130	450	2.76		75.9	
W-5D	11/21/86	DAL						2.63		95.9	Duplicate

TABLE 3-7

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR MISCELLANEOUS PARAMETERS

Well #	Date Sampled	Lab	Hardness as mg/l CaCO3	Total Alkalinity (mg/l)	Bicarbonate (mg/l)	Chloride (mg/l)	Sulfate (mg/l)	TOC (mg/l)	COD (mg/l)	TOX (ug/L)	Comments:
W-5D	11/21/86	DAL						2.56		98.4	Triplicate
W-5D	11/21/86	DAL						2.81		49.7	Quadruplicate
W-5D	02/18/87	DAL				130	420	2.89		11.0	
W-5D	02/18/87	DAL						2.95		15.3	Duplicate
W-5D	02/18/87	DAL						2.77		11.0	Triplicate
W-5D	02/18/87	DAL						2.68		7.3	Quadruplicate
W-5D	05/27/87	RASS				134	368	7.13		22	
W-5D	05/27/87	RASS						5.97		19	Duplicate
W-5D	05/27/87	RASS						5.58		17	Triplicate
W-5D	05/27/87	RASS						5.76		19	Quadruplicate
W-5D	02/18/88	RASS				140	430				
W-6	09/05/86	DAL				79	210	5.9		27.4	
W-6	09/05/86	DAL								22.6	Duplicate
W-6	11/21/86	DAL				110	220	3.30		12.6	
W-6	11/21/86	DAL						3.25		6.7	Duplicate
W-6	11/21/86	DAL						3.45		6.5	Triplicate
W-6	11/21/86	DAL						3.29		9.2	Quadruplicate
W-6	02/18/87	DAL				110	210	7.50		8.6	
W-6	02/18/87	DAL						8.00		8.9	Duplicate
W-6	02/18/87	DAL						6.89		<5.0	Triplicate
W-6	02/18/87	DAL						6.52		8.9	Quadruplicate
W-6	05/28/87	RASS				117	181	20.8		4	
W-6	05/28/87	RASS						19.3		9	Duplicate
W-6	05/28/87	RASS						21.1		14	Triplicate
W-6	05/28/87	RASS						18.0		16	Quadruplicate
W-6	02/18/88	RASS				188	251				
W-7	02/18/88	RASS				87	133				
W-7	02/18/88	RASS				87	145				Replicate
W-8	02/17/88	RASS				82	275				
W-8	11/28/90	WWES	920	389	475	70	443	3.0	12		
W-8	02/27/91	WWES	950	422	515	70	312	2.8	6.6		
W-8	05/29/91	WWES	890	440	440	58	351	3.8	6.2		
W-9	02/17/88	RASS				159	533				
W-9	11/27/90	WWES	1153	464	567	209	1000	4.0	9.5		
W-9	02/25/91	WWES	1440	493	602	160	871	3.6	10		
W-9	05/29/91	WWES	1520	539	539	166	919	4.5	19		
W-10	02/17/88	RASS				227	303				
W-10	12/06/90	WWES	808	118	230	260	553	4.1	21		
W-10	02/25/91	WWES	1140	208	253	356	528	4.2	14		
W-10	05/30/91	WWES	910	231	231	209	789	4.1	9.2*		

TABLE 3-7

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR MISCELLANEOUS PARAMETERS

Well #	Date Sampled	Lab	Hardness as mg/l CaCO3	Total Alkalinity (mg/l)	Bicarbonate (mg/l)	Chloride (mg/l)	Sulfate (mg/l)	TOC (mg/l)	COD (mg/l)	TOX (ug/L)	Comments:
W-11	02/18/88	RASS				68	2140				
W-11	12/06/90	WWES	576	<2.0	<2.0	70	647	2.1	12		
W-11	02/27/91	WWES	740	<2.0	<2.0	63	634	2.4	14		
W-11	05/30/91	WWES	710	<2.0	<2.0	58	740	2.7	11*		
W-12	02/18/88	RASS				125	392				
W-12	02/18/88	RASS				121	404				Replicate
W-13	02/18/88	RASS				154	99				
W-14	02/18/88	RASS				149	177				
K-14	01/16/73					29.5	61				
K-14	02/01/73		476	328		33.3	128				
K-14	05/02/73					37.1	150				
K-14	08/20/73					44.4	97.5				
K-14	10/05/73					43.4	105				
K-14	11/21/73					45.3	94.5				
K-14	03/28/78		486	328		43.6	138		24.7		
K-14	12/04/78		498	334		47	146		3		
K-14	06/03/81		485	342		50	146		3		
K-14	03/26/85		490	340		41	130				
K-14	09/04/86	DAL				47	140	2.1		25.1	
K-14	09/04/86	DAL						19.1			Duplicate
K-14	11/21/86	DAL				44	140	2.16		12.3	
K-14	11/21/86	DAL						2.18		42.7	Duplicate
K-14	11/21/86	DAL						1.64		22.0	Triplicate
K-14	11/21/86	DAL						2.18		9.5	Quadruplicate
K-14	02/18/87	DAL				45	140	4.45		<5.0	
K-14	02/18/87	DAL						5.38		5.4	Duplicate
K-14	02/18/87	DAL						4.16		5.5	Triplicate
K-14	02/18/87	DAL						4.64		<5.0	Quadruplicate
K-14	05/27/87	RASS				50.9	112	5.01		<3	
K-14	05/27/87	RASS						4.36		4	Duplicate
K-14	05/27/87	RASS						4.66		<3	Triplicate
K-14	05/27/87	RASS						3.91		4	Quadruplicate
K-15	01/16/73					45.2	54				
K-15	02/01/73		508	356		50.9	159				
K-15	05/02/73					65.9	165				
K-15	08/20/73					54.9	105				
K-15	10/05/73					52.1	111				
K-15	11/21/73					53.5	85				
K-15	03/28/78		421	282		59.6	122		18.5		

TABLE 3-7

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR MISCELLANEOUS PARAMETERS

Well #	Date Sampled	Lab	Hardness as mg/l CaCO3	Total Alkalinity (mg/l)	Bicarbonate (mg/l)	Chloride (mg/l)	Sulfate (mg/l)	TOC (mg/l)	COD (mg/l)	TOX (ug/L)	Comments:
K-15	09/04/86	DAL				65	130	1.3		<5	
K-15	09/04/86	DAL								<5	Duplicate
K-15	11/21/86	DAL				72	130	2.23		<5	
K-15	11/21/86	DAL						2.11		<5	Duplicate
K-15	11/21/86	DAL						2.00		22.3	Triplicate
K-15	11/21/86	DAL						1.58		7.6	Quadruplicate
K-15	02/18/87	DAL				68	140	2.17		12.5	
K-15	02/18/87	DAL						3.50		10.2	Duplicate
K-15	02/18/87	DAL						1.55		<5.0	Triplicate
K-15	02/18/87	DAL						1.55		10.5	Quadruplicate
K-15	05/27/87	RASS				67.5	98.7	14.40		4	
K-15	05/27/87	RASS						17.50		4	Duplicate
K-15	05/27/87	RASS						9.77		<3	Triplicate
K-15	05/27/87	RASS						9.55		<3	Quadruplicate
AD-1	08/29/91	WWES		1040		29000	51000				
AD-2	08/29/91	WWES		483		31000	8400				
AD-3	08/29/91	WWES		89		88000	12000				
AD-4	08/29/91	WWES		80		26000	35000				
AD-4	08/29/91	WWES		81		25000	31000				Replicate
AD-5	08/29/91	WWES		442		17000	9700				

Key: DAL = Daily Analytical Laboratories, Peoria, Illinois.
ECI = Environmental Consultants, Inc., Clarksville, Indiana.
RASS = Randolph & Associates, Inc., Peoria, Illinois.
WWES = WW Engineering & Science, Grand Rapids, Michigan.

Note: * Estimated Value as a result of data not meeting QA/QC validation criteria.

COMMENTS:

1. K-14 = Keystone Production Well (West Well).
2. K-15 = Keystone Production Well (East Well).

TABLE 3-8

SUMMARY OF GROUND WATER ELEVATION

Date	W-1	W-1D	W-2	W-2D	W-3	W-3D	W-4	W-4D	W-5	W-5D	W-6	W-7	W-8	W-9	W-10
01/22/86	443.64		443.79		444.12		444.16								
01/23/86	-		-		-		-		444.87		453.09				
04/22/86	443.80		443.88		443.63		444.42		445.70		454.64				
05/28/86	443.81		443.93		443.46		445.22		445.38		453.10				
06/23/86	444.26		444.25		443.59		446.18		445.52		454.31				
07/31/86	444.17		444.26		443.97		445.65		445.69		454.01				
08/19/86	443.43	440.29	443.64	439.95	442.92	440.19	444.72	-	445.96	445.34	453.59				
08/20/86	-	-	-	-	-	-	-	439.99	-	-	-				
09/03/86	443.30	439.86	443.62	439.59	442.75	439.73	444.04	439.64	446.04	445.37	453.57				
09/29/86	443.60	440.93	444.17	440.54	443.48	440.80	445.97	440.55	446.18	445.73	453.93				
10/30/86	444.67	442.52	444.38	442.25	443.85	442.36	445.57	441.87	447.09	446.57	453.70				
11/20/86	440.80	-	-	-	443.85	-	444.79	-	447.25	446.72	-				
11/21/86	-	441.43	441.94	441.30	-	441.41	-	441.12	-	-	453.54				
12/16/86	442.35	442.26	443.09	441.89	444.17	443.22	445.54	441.68	447.02	446.46	453.65				
02/17/87	442.60	441.12	443.04	440.88	443.87	441.03	445.00	440.87	446.91	446.39	453.59				
03/24/87	442.70	440.94	443.19	440.68	443.68	440.85	444.65	440.72	446.90	446.38	453.60				
04/23/87	443.13	440.87	443.61	440.60	443.77	440.85	445.39	440.69	446.76	446.26	453.75				
05/27/87	442.61	440.37	443.04	440.12	443.23	440.29	444.17	440.25	447.09	446.38	453.48				
07/01/87	442.23	439.37	442.74	439.12	442.87	439.33	443.94	439.30	447.27	446.68	453.55				
07/28/87	441.55	439.06	441.94	438.67	443.05	438.93	443.77	438.98	446.38	445.71	453.19				
08/31/87	441.25	438.33	442.16	437.88	442.31	438.24	443.12	438.48	446.74	446.23	453.24				
09/14/87	440.84	438.00	441.61	437.54	442.19	437.97	-	-	-	-	-				
09/15/87	-	-	-	-	-	-	442.79	438.16	446.77	445.93	453.17				
10/28/87	440.35	437.33	440.91	436.93	441.82	437.24	442.82	437.24	445.79	445.88	453.24				
11/24/87	440.26	437.57	441.06	437.04	441.77	437.49	443.04	437.93	446.11	445.59	453.13				
12/15/87	441.07	438.11	442.26	437.55	442.25	438.08	443.81	438.42	446.33	445.61	453.36				
02/02/88	442.44	439.17	442.99	438.58	442.82	439.14	445.34	439.42	445.72	445.38	453.63	455.08	444.30	442.88	444.05
02/17/88	442.36	438.63	442.88	438.05	442.00	438.80	444.53	438.91	446.34	-	-	-	444.12	442.90	443.28
02/18/88	-	-	-	-	-	-	-	-	-	444.91	453.41	454.52	-	-	-

TABLE 3-8

SUMMARY OF GROUND WATER ELEVATION

Date	W-1	W-1D	W-2	W-2D	W-3	W-3D	W-4	W-4D	W-5	W-5D	W-6	W-7	W-8	W-9	W-10
03/02/88	442.51	438.76	442.79	438.28	442.53	438.67	444.31	439.08	446.82	445.26	453.47	454.49	444.36	442.74	443.46
04/15/88	443.26	439.87	443.40	439.07	442.66	439.58	445.13	439.94	445.52	445.16	453.47	454.71	444.31	443.57	443.07
05/25/88	442.88	438.16	-	-	442.14	438.19	444.09	438.35	445.74	445.36	453.51	454.19	-	-	444.11
05/26/88	-	-	444.09	437.59	-	-	-	-	-	-	-	-	444.23	443.31	-
06/29/88	440.85	436.51	441.79	436.20	441.92	437.78	442.67	441.91	446.48	445.96	453.28	453.70	442.74	441.11	442.83
07/27/88	440.23	435.88	441.19	435.61	443.16	439.15	441.87	435.81	446.19	446.51	453.13	452.18	442.11	440.46	443.51
08/24/88	439.41	433.84	440.36	433.05	440.99	433.60	-	-	445.75	445.17	452.72	452.07	-	440.68	-
08/25/88	-	-	-	-	-	-	442.02	434.61	-	-	-	-	440.05	-	442.33
09/22/88	438.33	433.56	440.22	432.73	440.73	433.65	442.12	434.39	446.35	445.66	452.61	452.26	441.14	440.43	442.49
10/19/88	437.70	432.62	439.67	431.70	439.97	432.53	441.57	433.46	445.87	445.51	452.58	452.16	441.14	440.28	442.05
11/22/88	438.55	432.92	441.49	432.03	439.85	433.00	442.64	433.99	-				442.31	440.63	442.66
11/23/88	-	-	-	-	-	-	-	-	444.32	443.96	452.94	453.94	-	-	-
12/21/88	438.20	432.37	440.09	431.63	439.37	429.74	442.64	433.31	445.47	445.11	453.45	453.71	443.16	440.30	442.23
01/19/89	439.12	433.10	441.29	432.23	439.22	433.14	443.35	434.22	445.42	445.16	453.08	454.01	443.79	441.06	442.48
03/01/89	439.06	432.29	441.33	431.43	439.05	432.36	-	-	-	-	-	-	443.74	440.99	442.76
03/02/89	-	-	-	-	-	-	442.93	433.43	445.44	445.11	453.07	453.58	-	-	-
03/28/89	439.54	432.16	440.66	431.21	439.54	432.20	443.70	433.11	445.39	444.94	453.23	454.31	443.84	441.05	441.81
04/25/89	440.65	432.82	441.89	431.78	440.60	433.31	445.67	433.76	445.67	445.16	452.67	453.74	444.63	439.96	443.13
05/23/89	440.58	431.95	441.54	431.06	439.68	432.03	443.93	433.11	-	-	-	-	444.06	441.21	441.96
05/24/89	-	-	-	-	-	-	-	-	445.67	445.15	453.15	453.86	-	-	-
06/20/89	439.27	431.56	440.69	430.63	444.82	431.67	445.47	432.76	445.57	445.01	452.74	452.80	443.11	440.73	443.16
07/17/89	Dry	427.02	439.52	429.91	444.53	430.92	443.30	432.01	445.70	445.11	452.10	452.11	441.72	436.06	442.58
08/17/89	Dry	430.37	439.39	429.40	439.64	430.37	442.91	431.54	445.65	445.12	452.08	452.25	441.20	439.71	441.58
09/28/89	Dry	432.30	440.58	431.30	439.32	432.38	442.12	433.55	445.82	445.21	452.93	453.44	443.46	440.57	442.03
10/19/89	Dry	431.80	440.58	430.88	439.86	431.87	442.99	432.96	445.68	445.16	452.92	453.15	443.24	440.43	442.66
11/27/89	Dry	432.22	439.99	431.35	439.70	432.35	442.88	433.37	445.86	445.14	453.02	453.32	443.13	439.88	442.98
12/29/89	Dry	432.14	438.90	431.37	438.99	432.18	442.56	433.14	445.53	445.05	453.23	452.90	442.69	439.86	442.57
01/25/90	Dry	432.47	440.92	431.66	440.00	432.55	443.93	433.51	445.61	445.14	453.91	454.41	443.33	443.29	443.21

TABLE 3-8

SUMMARY OF GROUND WATER ELEVATION

Date	W-1	W-1D	W-2	W-2D	W-3	W-3D	W-4	W-4D	W-5	W-5D	W-6	W-7	W-8	W-9	W-10
02/26/90	440.00	434.66	442.27	433.71	440.75	434.65	445.37	435.46	445.82	445.61	453.93	455.26	444.72	441.41	443.44
03/27/90	442.07	438.91	442.40	438.15	442.37	438.92	445.17	439.47	446.17	445.52	453.90	455.03	444.31	442.04	443.08
04/23/90	442.00	437.22	442.29	437.92	442.35	438.96	444.77	438.31	445.74	445.41	453.70	454.60	443.26	441.86	442.98
05/21/90	442.80	439.32	443.01	438.58	442.57	439.32	445.61	439.91	445.88	445.42	454.07	455.32	444.66	442.90	443.28
06/04/90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
06/27/90	443.35	439.61	443.79	438.84	442.56	439.58	444.14	439.96	446.24	445.58	453.87	455.21	444.39	443.66	443.03
07/25/90	444.76	439.98	444.70	439.03	443.33	439.61	444.72	440.31	446.07	445.59	454.40	455.56	445.15	444.80	443.23
08/27/90	445.10	439.02	444.99	438.08	443.82	439.02	445.89	439.36	446.35	445.75	454.47	455.43	445.31	445.13	443.36
09/27/90	441.68	437.59	442.21	436.76	442.20	437.57	444.04	438.20	446.57	445.96	454.24	454.38	443.91	441.95	442.78
10/25/90	442.28	437.53	442.47	436.69	442.20	437.51	445.41	438.21	446.15	445.45	454.33	455.34	444.53	442.48	442.85
11/26/90	442.87	437.90	442.89	437.19	442.29	437.85	444.77	438.42	445.52	445.30	454.28	456.12	444.53	442.95	442.97
12/19/90	444.62	440.64	444.44	440.08	444.07	440.63	445.27	440.73	446.05	445.44	454.85	454.64	445.14	444.12	444.82
01/25/91	444.60	440.82	444.36	440.35	443.84	440.70	444.80	440.86	446.00	445.62		454.97	445.08	444.64	443.63
02/25/91	444.63	441.13	444.38	440.76	440.38	441.02	445.02	441.25	445.72	445.29	454.71	454.96	445.23	444.62	443.74
03/25/91	444.52	443.08	444.52	443.00	444.77	441.87	445.17	442.81	446.87	446.61	453.03	454.86	445.46	444.56	444.28
04/25/91	444.38	443.05	444.46	442.83	444.64	443.03	445.32	442.71	445.92	445.32	445.94	454.60	445.20	444.16	444.01
05/28/91	444.10	443.05	444.49	442.66	444.69	442.99	446.03	442.76	446.50	445.94	453.16	455.16	445.53	444.10	444.12
06/17/91	443.30	441.29	443.73	440.89	442.74	441.29	444.03	441.20	445.77	445.12	452.88	453.75	444.34	443.45	442.81
07/23/91	443.11	438.64	443.28	438.15	440.78	438.69	442.82	438.82	445.65	444.95	452.75	452.82	443.38	443.36	442.24
08/26/91	443.69	436.90	443.66	436.18	441.08	436.86	441.59	437.39	445.71	445.28	452.68	452.61	443.44	443.96	442.70
09/24/91	444.07	435.88	444.02	435.18	442.29	435.96	441.83	436.48	446.54	445.96	452.71	452.92	444.05	444.22	442.89
10/29/91	446.19	436.74	445.71	453.94	-	-	443.42	436.99	446.02	445.46	452.93	454.97	446.24	446.16	445.11
11/18/91	443.85	437.15	443.98	436.32	443.14	437.20	446.15	441.05	446.61	446.46	453.29	455.20	445.88	444.39	443.43

TABLE 3-8

SUMMARY OF GROUND WATER ELEVATION

Date	W-11	W-12	W-13	W-14	T-1	T-2A	T-2B	T-3	T-4A	T-4B	T-5A	T-5B	T-5C	T-6A	T-6B	T-6C
02/02/88	444.89	447.30	448.07	452.10												
02/17/88	-	-	-	-												
02/18/88	444.30	447.08	447.80	451.90												
03/02/88	444.08	447.21	448.01	453.25												
04/15/88	444.73	447.26	447.80	451.82												
05/25/88	443.98	446.61	447.47	452.73												
05/26/88	-	-	-	-												
06/29/88	442.54	445.66	451.42	450.90												
07/27/88	443.00	446.48	447.32	450.75												
08/24/88	443.21	446.08	447.08	450.59												
08/25/88	-	-	-	-												
09/22/88	443.18	446.49	447.38	450.68												
10/19/88	442.94	446.32	447.49	450.68												
11/22/88	443.30	445.48	-	-												
11/23/88	-	-	447.37	451.60												
12/21/88	443.35	446.35	447.15	451.10												
01/19/89	444.18	446.46	447.23	451.62												
03/01/89	-	-	-	-												
03/02/89	-	446.46	447.25	451.48												
03/28/89	444.34	446.53	447.41	451.78												
04/25/89	446.31	446.78	447.40	452.30												
05/23/89	444.23	-	-	-												
05/24/89	-	446.69	447.62	450.90												
06/20/89	445.85	446.28	447.24	450.96												
07/17/89	444.27	445.53	446.77	450.43												
08/17/89	443.37	445.69	446.67	450.53												
09/28/89	443.10	446.43	447.67	451.35												
10/19/89	443.45	446.49	447.64	451.33												

TABLE 3-8

SUMMARY OF GROUND WATER ELEVATION

Date	W-11	W-12	W-13	W-14	T-1	T-2A	T-2B	T-3	T-4A	T-4B	T-5A	T-5B	T-5C	T-6A	T-6B	T-6C
11/27/89	443.65	446.58	447.87	451.41	429.17	431.47		432.48			430.24			440.25	429.96	
12/29/89	442.96	446.48	447.50	451.20	429.57	431.48	431.77	432.37	432.84	432.23	430.57	430.87	429.31	439.19	430.22	
01/25/90	443.94	446.70	447.71	452.19	430.13	431.83	432.15	432.68	433.13	432.59	430.96	431.33	429.72	440.33	430.59	431.31
02/26/90	443.37	446.78	447.76	452.37	431.75	433.84	433.86	434.52	435.41	434.25	432.78	432.92	430.94	443.34	432.37	432.45
03/27/90	445.02	446.73	447.97	452.27	436.43	438.26	438.31	439.04	439.36	438.82	437.54	437.77	435.94	442.98	437.05	437.16
04/23/90	444.64	446.78	447.67	452.20	435.65	437.98	438.04	437.72	438.17	437.44	436.44	436.69	435.21	442.16	437.11	437.08
05/21/90	445.39	446.84	447.96	452.49	436.88	438.68	438.69	439.52	439.74	439.31	437.97	438.07	436.37	443.42	437.48	437.54
06/04/90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
06/27/90	444.75	446.76	448.04	452.38	437.14	438.96	438.96	439.50	439.98	439.29	438.15	438.32	436.54	443.84	437.73	437.81
07/25/90	444.31	446.90	448.20	452.69	436.96	439.19	439.15	439.74	440.42	439.54	438.15	438.38	436.16	444.97	437.46	437.71
08/27/90	445.39	447.07	448.27	452.74	436.14	438.20	438.20	438.91	439.48	438.71	437.29	437.46	435.43	445.29	436.76	436.86
09/27/90	444.08	447.33	447.86	452.35	434.90	436.87	436.85	437.55	438.12	437.34	436.11	436.25	434.26	442.54	435.57	435.64
10/25/90	445.11	447.37	448.49	452.89	434.77	436.82	436.83	437.59	438.01	437.32	435.94	436.25	434.16	443.05	435.45	435.55
11/26/90	444.55	447.24	448.34	452.77	435.66	437.31	437.34	437.94	438.39	437.75	436.56	436.72	435.20	443.15	436.18	436.25
12/19/90	444.94	446.17	448.31	452.90	438.61	440.18	440.18	440.62	440.82	440.64	439.54	439.80	438.23	440.90	438.85	438.89
01/25/91	444.59	447.14	448.31	Frozen	439.32	440.46	440.43	440.82	441.01	440.77	440.02	440.17	439.03	444.75	439.75	439.78
02/25/91	444.87	447.15	448.24	452.82	439.99	440.86	440.83	441.07	441.20	441.04	440.59	439.75	439.73	444.80	440.32	440.34
03/25/91	444.44	447.98	448.67	452.40	442.12	442.86	441.80	443.12	443.02	443.14	442.71	442.59	441.94	444.98	442.42	442.35
04/25/91	445.65	451.47	448.16	452.17	442.52	442.91	442.85	441.97	442.92	442.99	442.79	442.80	442.21	444.54	442.62	442.38
05/28/91	445.51	447.46	448.63	452.75	441.92	442.76	442.73	442.72	443.01	442.75	442.45	442.44	441.57	444.51	442.25	442.20
06/17/91	443.72	447.02	447.84	451.88	440.10	440.98	440.94	441.04	441.36	441.04	440.62	440.73	439.69	443.59	440.42	440.43
07/23/91	442.61	446.34	447.44	451.28	437.19	438.24	438.26	438.34	438.94	438.27	437.70	437.92	437.76	443.42	437.52	437.59
08/26/91	442.72	446.19	447.47	451.10	435.31	436.30	436.35	436.67	437.26	436.39	435.58	435.84	434.49	443.92	435.38	435.48
09/24/91	443.21	446.75	448.03	451.25	433.80	435.29	435.35	435.68	436.46	435.46	434.45	434.65	433.25	444.17	434.24	434.35
10/29/91	446.07	447.88	448.05	451.94	434.32	436.07	436.08	436.22	437.27	436.05	435.04	435.27	433.56	446.37	434.77	434.90
11/18/91	445.60	447.64	448.40	452.75	434.67	436.44	436.46	436.68	437.72	436.49	435.48	435.62	433.97	444.82	435.18	435.25

TABLE 3-8

SUMMARY OF GROUND WATER ELEVATION

Date	T-7A	T-7B	T-8	T-9	T-10	T-11A	T-11B	T-11C	T-12	T-13A	T-13B	T-14	T-15	T-16	T-17	T-18	T-19A
11/27/89									428.46					428.83			
12/29/89					432.76				429.35					429.33			
01/25/90	440.71	432.56	435.25	434.23	433.11				429.63	439.43	439.71		447.05	429.89			
02/26/90	442.66	434.16	437.00	436.15	435.26	435.77	433.63	433.12	430.97	441.58	441.75	434.40	447.13	431.43			
03/27/90	441.59	438.91	440.34	439.98	439.24	440.47	438.44	439.13	435.73	444.36	444.48	438.82	447.20	436.14			
04/23/90	440.85	437.39	439.10	438.85	439.02	439.42	437.44	438.03		443.85	443.94	437.17	446.89	435.41			
05/21/90	442.23	439.37	440.80	440.37	439.62	440.84	438.95	438.54	436.18	445.02	445.13	439.37	447.37	436.67			
06/04/90	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
06/27/90	442.31	439.29	440.51	440.58	439.91	440.67	438.85	438.59		445.20	445.39	439.17	447.09	436.88			
07/25/90	443.19	439.46	440.79	441.01	440.30	441.25	439.01	438.65		446.27	446.36	439.34	447.37	436.63			
08/27/90	442.05	438.70	439.95	439.99	439.36	440.44	438.22	437.93		445.10	445.21	438.52	447.25	435.78			
09/27/90	440.44	437.31	439.14	438.77	438.02	439.65	436.83	436.53	434.20	443.94	444.01	437.17	446.90	434.59			
10/25/90	440.94	437.36	439.20	438.80	437.95	439.36	436.86	436.59	434.08	444.80	444.40	437.29	447.10	434.49			
11/26/90	440.25	437.76	439.22	448.09*	438.30	438.98	437.35	437.13	435.18	444.58	444.66	437.67	446.97	435.41			
12/19/90	441.20	440.62	440.80	442.05	441.50	441.57	440.31	440.18	-	445.05	445.19	440.50	446.88	438.43			
01/25/91	440.82	440.81	440.82	441.32	440.88	441.51	440.85	440.52	439.03	449.77	444.89	440.67	446.92	439.20			
02/25/91	440.64	442.08	440.50	441.35	441.16	441.55	440.91	440.83	-	444.49	444.60	440.92	446.99	439.89			
03/25/91	441.55	443.14	444.25	442.85	443.05	443.28	443.09	443.12	-	445.75	445.84	442.80	447.95	441.08			
04/25/91	440.95	443.01	441.95	442.95	442.95	443.02	441.94	441.88	-	444.33	445.44	442.82	447.10	442.36	442.37	446.52	442.69
05/28/91	442.94	442.74	442.22	443.14	443.01	443.21	442.49	442.33	-	446.68	446.76	442.51	447.55	441.88	442.83	448.19	442.97
06/17/91	440.71	440.98	440.70	441.49	441.32	441.79	440.75	440.60	439.79	444.77	444.86	440.75	446.60	440.01	441.05	445.71	441.22
07/23/91	439.71	438.12	438.90	439.48	438.92	438.97	437.81	437.54	436.97	444.25	444.34	437.81	445.63	437.11	440.05	444.95	437.60
08/26/91	439.64	436.25	437.76	437.98	437.23	437.36	435.83	435.50	434.56	443.43	443.53	435.97	445.12	434.84	438.82	444.33	435.38
09/24/91	439.71	435.33	437.10	437.25	436.40	436.43	434.83	434.46	433.35	443.17	443.25	435.04	446.42	433.62	438.22	444.36	Dry
10/29/91	442.35	435.81	437.81	437.97	437.15	437.37	435.26	434.81	-	444.05	444.20	435.39	437.44*	434.05	438.92	445.76	Dry
11/18/91	442.82	436.25	438.27	438.50	437.63	437.89	435.74	435.27	432.08	444.87	444.98	435.86	448.27	434.43	439.48	446.59	435.48

TABLE 3-8

SUMMARY OF GROUND WATER ELEVATION

Date	T-19B	T-19C	T-20	T-21	P-1A	P-1B	P-2	AD-1	AD-2	AD-3	AD-4	AD-5	CL-1	CL-2	CL-3	CL-4	CL-5
01/25/90					429.85	431.26											
02/26/90					431.41	431.65	436.31										
03/27/90					436.61	437.05	440.79										
04/23/90					435.41	435.84	440.50										
05/21/90					437.01	437.18	441.46		442.90								
06/04/90					-	-	-	443.89	443.87	444.00	444.09	443.97					
06/27/90					437.34	437.52	440.62	443.97	443.85	444.07	444.11	444.09					
07/25/90					437.10	437.17	440.84	444.27	444.12	444.40	444.46	444.44					
08/27/90					436.12	436.37	439.93	444.12	443.90	444.30	444.37	444.34					
09/27/90					434.83	435.24	438.33	444.05	443.63	444.38	444.53	444.44					
10/25/90					434.61	435.04	438.84	443.76	443.42	444.09	444.23	444.10					
11/26/90					435.50	435.81	438.78	443.60	443.25	443.93	444.09	443.96					
12/19/90					438.70	439.16	441.72	444.36	444.23	444.55	444.64	444.59					
01/25/91					439.43	439.68	441.68	443.98	444.16	444.66	444.75	444.70					
02/25/91					440.15	440.31	441.73	444.35	444.06	444.60	444.70	444.14					
03/25/91					442.46	442.45	444.31	444.04	444.95	445.50*	444.75	444.77					
04/25/91	442.30		442.52	454.37	442.56	442.70	443.71	444.67	444.75	444.73	444.73	444.77	444.86	444.75	444.77	444.86	445.09
05/28/91	441.50	441.42	442.04	455.60	442.26	442.08	443.46	445.05	444.91	445.13	445.17	445.19	445.24	445.21	445.26	445.31	445.41
06/17/91	439.69	439.60	440.22	455.39	440.13	440.35	441.41	444.38	443.94	444.60	444.73	444.68	444.84	444.68	444.85	444.86	444.92
07/23/91	436.75	436.66	437.29	455.37	437.14	437.33	438.32	443.52	443.02	443.78	444.00	443.94	443.38	441.05	444.07	444.04	444.29
08/26/91	434.45	434.43	435.07	455.42	434.84	435.05	436.73	443.22	442.70	443.42	443.69	443.59	-	-	-	-	-
09/24/91	433.17	433.09	433.89	455.50	433.55	433.78	435.97	442.82	442.37	443.00	443.24	443.13	427.89	426.42	423.47	423.89	423.37
10/29/91	433.47	433.41	434.36	456.02	434.14	434.20	436.64	443.20	442.77	443.54	443.76	443.60	442.67	438.90	443.49	443.42	443.74
11/18/91	433.83	433.76	434.73	456.20	434.53	434.57	437.17	443.63	443.07	443.82	444.02	443.90	443.18	439.78	443.69	443.90	444.07

Note: * Probable error in field measurement.

TABLE 3-9

SURFACE WATER ELEVATIONS

DATE	TBM-1W	TBM-3S	TBM-4W	TBM-5W	TBM-5E	TBM-6W	TBM-8	TBM-9	TBM-10	TBM-11	Illinois River Peoria Lock & Dam (1) Upper Pool	Illinois River Peoria Lock & Dam (1) Lower Pool
05/28/86	446.44	447.82	447.97	457.37	448.37 •	457.38						
06/23/86	446.75	448.02 •	448.23	458.02	449.43	457.66 •						
07/31/86	447.04	448.16	448.31	457.17	448.74	457.38						
08/19/86	-	447.52 •	447.89	457.88	449.16	destroyed						
09/29/86	443.83	444.17	442.69	456.40	447.37	455.57						
10/30/86	444.29	443.64	444.04	Dry	448.37	455.41						
11/21/86	442.89	444.07	443.94	456.90	448.37	455.56						
12/16/86	440.59	444.12	443.87	Dry	448.37	455.52						
02/17/87	443.39	444.32	444.35	457.18	448.37 •	455.51						
03/24/87	443.49	444.12	444.09	Dry	448.37 •	-						
04/23/87	443.69	444.10	444.04	Dry	449.27	455.49						
05/27/87	443.39	444.20	444.07	Dry	448.37 •	455.43						
07/01/87	443.04	443.62	443.74	457.25	448.57 •	455.56						
07/28/87	442.79	444.32	444.24	Dry	447.87 •	455.39						
08/31/87	442.29	443.57	443.74	Dry	448.12 •	455.42						
09/14/87	442.04	-	-	-	-	-						
09/15/87	-	443.62	443.59	Dry	447.87	455.44						
10/28/87	441.19	443.87	443.44	Dry	447.57 •	455.58						
11/24/87	441.09	443.82	443.59	Dry	447.67 •	455.49						
12/15/87	442.29	443.62	443.89	Dry	447.37 •	455.49						
02/02/88	443.04	443.49	443.84	Dry	447.87 •	455.31						
03/02/88	443.29	444.07	443.94	Dry	448.07 •	455.33	444.16	443.06	445.88			
04/15/88	443.67	443.57	443.74	Dry	447.57 •	455.43	444.39	443.73	446.34			
05/25/88	443.52	443.86	444.05	-	-	-	-	-	-			
05/26/88	-	-	-	-	-	455.26	444.15	442.88	446.38			
06/29/88	Dry	Dry	444.38	-	-	455.21	Dry	Dry	445.67			
07/27/88	Dry	445.02	444.59	-	-	455.11	Dry	Dry	446.27			
08/25/88	441.39	444.10	443.99	-	-	-	Dry	Dry	Dry			
09/22/88	Dry	443.82	443.79	-	-	455.44	Dry	Dry	445.98			
10/19/88	440.89	443.52	443.19	-	-	455.26	Dry	Dry	446.00			
11/22/88	Dry	Dry	444.09	-	-	-	Dry	Dry	-			
11/23/88	-	-	-	-	-	455.42	-	-	Dry			
12/21/88	Dry	Dry	Dry	-	-	454.95	Dry	Dry	Dry			
01/19/89	440.89	Dry	443.69	-	-	455.38	Dry	Dry	Dry			
03/01/89	440.89	Dry	-	-	-	-	Dry	Dry	Dry			
03/02/89	-	-	443.49	-	-	455.51	Dry	Dry	Dry			
03/28/89	442.19	445.82	444.39			455.61	Dry	Dry	446.18			
04/25/89	DRY	446.81	445.19			455.18	444.35	442.97	Dry			
05/23/89	441.69	444.12	443.69			-	Dry	441.38	446.03			
05/24/89	-	-	-			455.41	-	-	-			
06/20/89	441.29	445.82	445.99			455.41	Dry	440.38	446.23			
07/17/89	440.69	445.62	444.99			455.38	Dry	Dry	Dry			
08/17/89	440.89	445.62	443.79			455.26	Dry	Dry	Dry			
09/28/89	440.69	445.52	444.49			455.38	Dry	Dry	449.98			
10/19/89	440.47	444.42	444.04			455.47	Dry	Dry	445.18			
11/29/89	441.39 •	443.27 •	443.94			455.26	Dry	Dry	445.83		440.5	433.8
12/29/89	441.79 •	443.22 •	443.79 •			455.06 •	Dry	Dry	445.68 •		440.2	434.4
01/25/90	441.89 •	443.52 •	443.89 •			455.16 •	Dry	Dry	445.78 •		441.0	435.7
02/26/90	441.79	443.54	443.69			455.26	Dry	Dry	445.98		442.8	442.8

TABLE 3-9

SURFACE WATER ELEVATIONS

DATE	TBM-1W	TBM-3S	TBM-4W	TBM-5W	TBM-5E	TBM-6W	TBM-8	TBM-9	TBM-10	TBM-11	Illinois River Peoria Lock & Dam (1) Upper Pool	Illinois River Peoria Lock & Dam (1) Lower Pool
03/27/90	442.19 *	443.02 *	443.19 *			455.36 *	Dry	Dry	446.18 *		445.4	445.4
04/23/90	441.89 *	443.31 *	443.19 *			455.24 *	443.75	Dry	446.08 *		440.7	436.5
05/21/90	441.34	444.18	444.72			454.55	444.35	442.94	445.93		446.5	446.5
06/27/90	442.39 *	443.52 *	444.19			453.86 *	Destroyed	443.88	445.18 *		443.6	443.6
07/25/90	444.89 *	443.72 *				453.96 *	-	443.88	445.28 *		443.4	443.4
08/27/90			443.19			453.66 *	-				442.3	442.3
09/27/90											440.2	433.7
10/01/90	442.04	444.72	443.19				-		446.33		440.2	431.6
10/25/90	442.69	Dry	443.79			455.76	-	Dry	446.28		440.3	440.3
11/26/90											440.5	435.8
12/19/90	446.07	444.30	443.69			456.36		442.93	445.61		443.3	443.2
01/25/91	445.19	444.42	444.79			445.18		445.18	446.08		442.8	442.7
02/25/91	444.59	444.32	443.99			456.16		444.68	446.08	444.82	442.5	442.4
03/25/91	444.74	Dry	443.19			453.41		444.88	446.48	444.72	448.0	447.9
04/25/91	444.09	445.02	444.44			454.80			446.28	445.32	455.9	445.8
05/28/91	443.99	444.62	443.94			454.70			446.08	445.32	445.6	445.5
06/17/91	443.39	Dry	Dry			454.70			445.48	444.92		
07/23/91	443.39	Dry	Dry			454.80			Dry	444.12	440.4	431.5
08/26/91											440.2	431.2
09/24/91	444.29	444.82	444.29			454.70		444.28	Dry	443.32	440.1	430.7
10/29/91	446.39		447.49			454.50		446.08			440.6	436.0
11/18/91	443.79	444.22	444.19			454.80		443.78	446.78	443.82	440.1	436.7

Note: * Approximated value.
1. Water level data for the Illinois River obtained from the U.S. Army Corps of Engineers Rock Island District.
2. All elevations refer to Mean Sea Level.

FIGURES

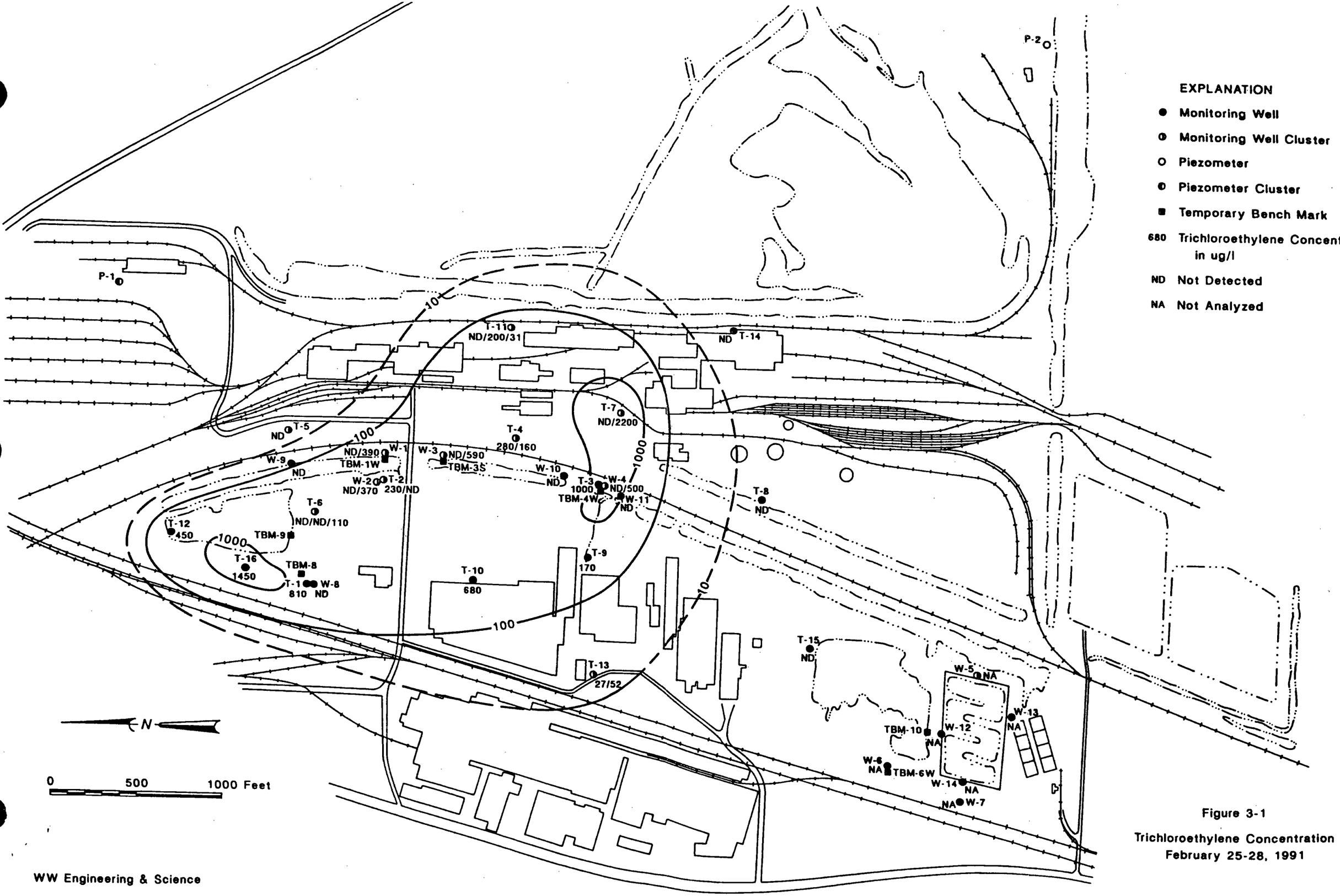


Figure 3-1

Trichloroethylene Concentration
February 25-28, 1991

WW Engineering & Science

EXPLANATION

- ● Monitoring Well
- ◐ Monitoring Well Cluster
- O Piezometer
- ◐ Piezometer Cluster
- ■ Temporary Bench Mark
- 1600 1,1,1-Trichloroethane Concentration in ug/l
- ND Not Detected
- NA Not Analyzed

P-1 ◐

P-2 O

T-11 ◐ ND

ND T-14

T-7 ◐ ND

T-4 ◐ ND

T-5 ◐ ND

W-1 ND

W-3 ND TBM-3S

W-10 ND

T-3 1600

W-4 5.8/ND

TBM-4W

W-11 ND

T-8 ND

W-9 ND

TBM-1W

W-2 ND

T-2 ND

100

T-6 830/5.6/ND

T-12 ND

TBM-9

T-16 ND

TBM-8

T-1 ND W-8 ND

1000

10

100

T-9 620

T-10 ND

T-13 9/36

T-15 ND

W-5 NA

W-13 NA

W-12 NA

TBM-10 NA

W-6 NA

TBM-6W

W-14 NA

NA W-7

N

0 500 1000 Feet

Figure 3-2

1,1,1-Trichloroethane Concentration
February 25-28, 1991

WW Engineering & Science

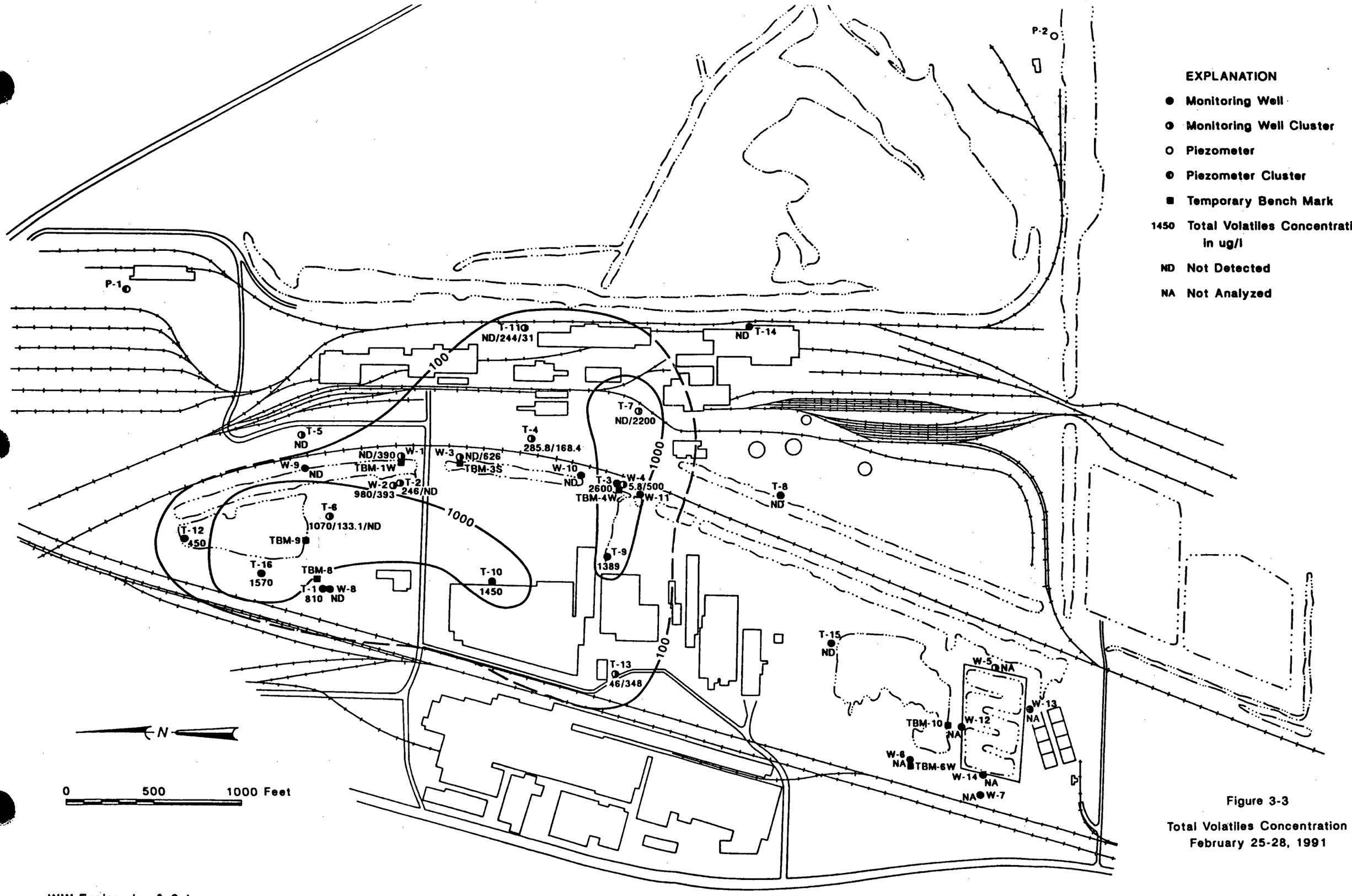


Figure 3-3

Total Volatiles Concentration
February 25-28, 1991

EXPLANATION

- Monitoring Well
- Monitoring Well Cluster
- Piezometer
- Piezometer Cluster
- Temporary Bench Mark
- 441.16 Ground Water Elevation in Feet msl
- —440— Water Level Contour Interval 1 Foot Dashed Where Inferred
- → Direction of Ground Water Flow

P-1
P-2
T-1 439.99
T-2 440.83
T-3 441.07
T-4 441.04
T-5 439.73
T-6 440.34
T-7 442.08
T-8 440.50
T-9 441.35
T-10 441.16
T-11 440.83
T-12
T-13 444.60
T-14 440.92
T-15 446.99
T-16 439.89
W-1
W-2
W-3
W-4
W-5 445.21
W-6 454.71
W-7 454.96
W-8
W-9
W-10
W-11
W-12 447.15
W-13 448.24
W-14 452.82
TBM-1W
TBM-3S
TBM-4W
TBM-6W
TBM-8
TBM-9
TBM-10
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455

N

0 500 1000 Feet

Figure 3-4

Potentiometric Surface
February 25, 1991

WW Engineering & Science

SECTION 4

4.0 GROUND WATER CLEANUP LEVELS

The State of Illinois, under the Ground Water Protection Act (35 IAC 620), has established guidelines for the classification, nondegradation, and remediation of ground water, based on the potential impacts resulting from the intended future uses of the ground water resources. Under these rules, ground water resources have been classified as Class I, II, III, or IV. General water quality standards have been established for each classification. Class I ground water is water that is, or potentially could be, used in the future as a drinking water source. Class II ground water is water that is not used as a source for drinking water and presents a relatively low risk of harmful impacts on the environment and human health in the future.

The upper 15 to 20 feet of unconsolidated materials at the Keystone facility consist of very fine grained alluvial deposits with occasional thin sand units (see cross sections in Appendix F of the Revised Phase 2 Closure Plan). The deposits are predominantly silt loam and silty clay loam in texture, as shown by grain size analyses (see results for samples between 0 and 20 feet on Table 4-1). These materials contain from 26 to over 90 percent fines that pass the No. 200 sieve and therefore, would not meet the requirements of 35 IAC 620.210(a)(2) for a Class I aquifer.

Laboratory hydraulic conductivity tests for samples collected from the upper 20 feet at the Keystone facility (Table 4-2) reveals an average vertical hydraulic conductivity of 2.37×10^{-7} cm/sec with a range of 2.8×10^{-6} cm/sec to 4.2×10^{-9} cm/sec. Field slug tests (Table 4-3) reveal an average hydraulic conductivity of 4.22×10^{-4} cm/sec for those wells completed in the upper 20 feet, with a range of 1.45×10^{-3} cm/sec to 2.36×10^{-5} cm/sec. In summary, the upper 20 feet of very fine grained alluvium at the Keystone facility has very low hydraulic conductivities and would not be considered a useable aquifer and would be classified as a Class II General Resource Groundwater.

The unconsolidated materials between about 20 feet and the underlying bedrock consists predominantly of sandy materials with occasional sand and gravel units (see cross sections in Appendix F of the Revised Phase 2 Closure Plan). It is in these materials that the organic contaminants have been detected in the ground water at the Keystone facility. The materials and ground water in this depth interval (20 feet to bedrock) meet the requirements of 35 IAC 620.210 for a Class I Potable Resource Groundwater. The IEPA has therefore established Class I ground water standards (35 IAC 620.410) as the cleanup objectives for the ground water remediation program.

Keystone is requesting that a Groundwater Management Zone (GMZ) be established in accordance with 35 IAC 620.250 for the duration of the ground water remediation program, and the application of "Alternative Groundwater Quality Standards" as provided for in 35 IAC 620.450. Three new monitoring well clusters have recently been installed at Keystone to complete the horizontal and vertical definition of the contaminant plume to the north and northeast. Analyses are currently being performed on samples from these new wells and as soon as the results are received from the laboratory, a new plume map will be prepared to determine the GMZ boundary. This map will be submitted to IEPA by July 15, 1992.

TABLES

TABLE 4–1

SUMMARY OF SOIL TEXTURE, ATTERBERG LIMITS, AND CLASSIFICATION

		TEXTURE (PERCENT FINER)													
		SIEVE						HYDROMETER			ATTERBERG LIMITS			CLASSIFICATION	
SAMPLE NUMBER	DEPTH (ft)	#4 4.75 mm	#10 2.00 mm	#35 0.500 mm	#60 0.250 mm	#120 0.125 mm	#200 0.075 mm	0.050 mm	0.005 mm	0.002 mm	LL	PL	PI	USDA	UNIFIED
T–1	48.0–50.0	70.1	62.3	33.6	16.5	11.0	8.6	6.2	1.8	1.2	nonplastic			very gravelly sand	SW–SM
T–2	40.0–42.0	100.0	100.0	94.7	25.9	11.0	9.1	7.0	2.2	2.2	nonplastic			sand	SP–SM
T–2B	52.0–54.0	100.0	100.0	99.7	98.9	95.9	94.2	91.5	41.5	28.2	26.8	15.7	11.0	silty clay loam	CL
T–3	58.0–60.0	100.0	97.0	80.7	21.3	13.1	10.8	8.8	1.8	1.5	nonplastic			sand	SP–SM
T–4A	24.0–26.0	95.2	92.6	85.8	71.5	41.9	34.4	28.5	6.5	6.2	nonplastic			sandy loam	SM
T–4B	28.0–30.0	100.0	100.0	99.8	99.7	98.7	92.9	80.5	16.5	12.2	nonplastic			silt loam	ML
T–4B	74.0–76.0	99.6	99.5	86.0	21.9	12.1	10.4	7.2	2.5	2.5	nonplastic			sand	SP–SM
T–5A	30.0–32.0	69.3	55.1	25.9	10.9	5.3	3.9	2.8	1.5	1.5	nonplastic			very gravelly sand	SP
T–5B	52.0–54.0	99.9	99.9	98.7	93.9	89.8	86.6	81.0	18.8	13.5	nonplastic			silt loam	ML
T–5B	62.0–64.0	100.0	100.0	97.8	52.4	19.1	14.0	10.2	2.2	2.0	nonplastic			sand	SM
T–5C	80.0–82.0	54.9	32.1	19.2	11.3	8.6	7.6	6.5	2.0	2.0	nonplastic			e gravelly loamy sand	SW–SM
T–6A	16.0–18.0	100.0	100.0	99.7	99.3	95.5	90.9	84.8	35.8	26.5	35.3	17.3	18.0	silt loam	CL
T–6B	24.0–26.0	100.0	99.9	98.8	97.8	96.7	94.6	89.0	35.2	28.2	35.7	19.0	16.7	silt loam	CL
T–6B	32.0–34.0	82.9	71.3	44.8	23.0	15.7	14.3	10.5	3.0	2.0	nonplastic			gravelly loamy sand	SM
T–6C	52.0–54.0	99.9	99.9	93.7	64.4	37.9	31.8	24.0	4.5	3.5	nonplastic			loamy sand	SM
T–7A	16.0–18.0	100.0	100.0	99.8	79.0	45.8	29.5	23.0	8.8	7.0	nonplastic			loamy sand–sandy loam	SM
T–7B	20.0–22.0	100.0	100.0	99.9	99.7	86.2	71.1	59.5	14.0	12.0	24.4	19.4	5.0	loam	CL
T–7B	78.0–80.0	98.3	90.8	45.7	19.4	14.9	13.1	10.0	3.5	2.2	nonplastic			sand	SM
T–8	28.0–30.0	70.6	51.1	31.5	22.8	19.9	18.1	15.0	5.0	3.5	nonplastic			v gravelly sandy loam	SM
T–9	32.0–34.0	97.5	87.6	48.6	20.1	9.8	7.7	6.0	1.8	1.8	nonplastic			sand	SP–SM
T–10	36.0–38.0	99.9	99.9	94.9	88.0	79.9	72.8	62.5	23.5	18.5	nonplastic			loam	ML
T–11A	38.0–40.0	85.4	85.2	54.1	27.6	22.1	20.1	13.2	3.0	2.0	nonplastic			loamy sand	SM
T–11B	46.0–48.0	100.0	100.0	99.9	99.8	98.9	89.5	76.5	11.5	6.5	nonplastic			silt loam	ML
T–11B	81.0–83.0	98.6	95.6	44.7	10.4	7.2	6.4	4.5	1.5	1.5	nonplastic			sand	SP–SM
T–11C	58.0–60.0	100.0	100.0	99.7	98.0	86.7	79.0	70.0	22.5	15.0	nonplastic			silt loam	ML
T–11C	78.0–80.0	99.2	97.6	53.9	18.3	13.4	11.7	7.5	2.8	2.0	nonplastic			sand	SP–SM
T–11C	96.0–98.0	100.0	99.9	78.0	66.8	59.5	54.7	45.0	13.0	9.8	nonplastic			sandy loam	ML
T–12	34.0–36.0	38.1	21.7	14.9	7.0	5.3	4.4	4.0	1.5	1.2	nonplastic			e gravelly loamy sand	GP
T–13A	24.0–26.0	76.0	55.7	26.2	14.4	10.3	8.4	7.0	2.0	1.5	nonplastic			very gravelly sand	SW–SM
T–13B	32.0–34.0	90.1	89.5	88.0	55.5	21.1	14.1	11.0	4.2	3.2	nonplastic			sand	SM
T–14	52.0–54.0	99.8	99.8	99.1	48.2	13.9	7.6	5.0	2.2	2.0	nonplastic			sand	SP–SM
T–15	18.0–20.0	91.7	89.6	84.8	75.9	68.7	66.2	60.8	17.0	12.2	26.3	17.5	8.8	silt loam	CL
W–7	8.0–10.0		97.3				82.0			29.2	41.1	18.8	22.3	silty clay loam	CL
W–8	12.0–14.0		100.0				93.0			43.0	52.7	22.8	29.9	silty clay	CH
W–12	4.0–6.0		100.0				89.1			33.4	45.4	21.0	24.4	silty clay loam	CL
W–12	20.0–22.0		71.8				7.2			2.9	nonplastic			very gravelly sand	SM–SW
W–12	22.0–23.0		100.0				88.9			33.2	42.4	19.1	23.3	silty clay loam	CL
W–13	4.0–6.0		99.2				85.5			33.0	45.3	22.5	22.8	silty clay loam	CL
W–13	20.0–22.0		100.0				99.0			47.5	64.7	25.6	39.1	silty clay	CH
W–14	4.0–6.0		100.0				91.3			34.5	42.7	21.8	20.9	silty clay loam	CL
W–14	18.6–20.0		95.1				28.4			11.2	21.0	15.0	6.0	sandy loam	SM–SC
W–14	20.5–21.0		81.3				4.9			2.4	nonplastic			sand	SW
W–14	21.4–21.8		56.5				7.8			1.9	nonplastic			e gravelly loamy sand	GM
RR–2	0.0–1.0		100.0				91.5			28.0	42.4	21.4	21.0	silty clay loam	CL
RR–5	0.0–1.6		87.0				38.5			16.5	30.0	19.0	11.0	sandy loam	SC
RR–10	0.0–0.5		100.0				68.0			15.5	24.2	20.3	3.9	silt loam	ML
RR–13	0.0–1.4		98.0				67.0			16.0	36.0	28.0	8.0	silt loam	ML
RR–15	0.0–2.0		100.0				92.0			19.0	33.6	23.8	9.8	silt loam	ML

Note: e = extremely
v = very

TABLE 4-2

SUMMARY OF SOIL PERMEABILITY RESULTS(1)

Boring	Depth (feet)	Natural Moisture (%)	Dry Density (lb/ft3)	Permeability (cm/sec)
T-2B	52.0-54.0	26.6	93.4	1.0E-07
T-4B	28.0-30.0	22.5	102.6	1.0E-07
T-5B	52.0-54.0	33.0	91.9	3.0E-07
T-6B	24.0-26.0	26.9	98.0	4.0E-08
T-7B	20.0-22.0	24.0	101.0	9.0E-07
T-11B	46.0-48.0	20.5	101.8	2.0E-05
W-2	10.0-12.0	--	84.5	3.6E-07
W-5	28.0-30.0	--	86.4	3.5E-07
W-7	8.0-10.0	28.1	94.3	3.3E-07
W-8	12.0-14.0	25.7	101.1	8.6E-09
W-12	4.0-6.0	22.5	108.2	4.2E-09
W-12	22.0-23.0	26.5	102.1	4.5E-08
W-13	4.0-6.0	25.3	98.4	1.5E-08
W-13	20.0-22.0	37.3	87.9	7.5E-09
W-14	4.0-6.0	22.0	107.1	4.7E-09
B-1	8.5-10.5	31.9	95.3	4.3E-08
B-1	30.0-32.0	28.6	85.2	4.2E-07
B-2	14.0-16.0	29.2	97.0	1.8E-07
B-2	35.0-40.0	29.1	86.7	8.4E-08
B-3	8.0-10.0	31.7	89.9	5.0E-08
B-3	25.0-27.0	27.6	96.2	1.6E-07
B-4	20.0-22.0	29.4	98.2	1.4E-08
B-4	40.0-42.0	31.3	92.3	5.3E-07
B-5	11.5-13.5	37.0	91.4	5.3E-08
B-5	30.0-32.0	32.5	89.8	1.2E-07
B-6	40.0-42.0	30.0	92.8	2.0E-06
B-7	35.0-37.0	32.9	97.5	8.1E-08
B-8	8.0-10.0	41.8	78.8	4.9E-08
B-8	25.0-27.0	33.7	95.0	1.1E-08
B-8	25.0-27.0	22.8	98.5	4.2E-04

TABLE 4-2

SUMMARY OF SOIL PERMEABILITY RESULTS(1)

Boring	Depth (feet)	Natural Moisture (%)	Dry Density (lb/ft3)	Permeability (cm/sec)
CL-1	9.0-11.0	44.3	77.4	2.4E-08
CL-1	18.0-20.0	21.3	108.2	2.8E-06
CL-2	10.0-12.0	25.1	100.8	1.0E-08
CL-3	15.0-17.0	27.0	100.3	2.7E-07
CL-4	9.0-11.0	42.3	77.7	2.1E-07
RETENTION RESERVOIR (Shelby tube samples obtained from top 2 feet of reservoir bottom)				
RR 2		25.6	105.0	4.0E-08
RR 5		16.6	114.7	1.5E-08
RR 10		23.3	105.3	2.0E-07
RR13		28.1	93.0	5.0E-08
RR15		28.9	103.1	2.0E-07

Key: -- Not Analyzed

Note: (1) Refer to Appendix C for Test Boring Logs.

TABLE 4-3

SUMMARY OF IN-SITU HYDRAULIC CONDUCTIVITY RESULTS

Well Number	Screen Depth Interval (feet)	Dominant Lithology	Hydraulic Conductivity (ft/day)	Hydraulic Conductivity (cm/sec)
T-1	44.97-49.70	Sandy pebbly gravel and fine to coarse sand	2.01E+02	7.09E-02
T-2A	39.54-44.26	Fine to medium sand	4.09E+01	1.44E-02
T-2B	61.90-66.90	Silt loam and fine to medium sand	1.58E+01	5.57E-03
T-3	55.98-60.70	Silty medium sand	1.44E+01	5.08E-03
T-4A	22.52-27.24	Fine to medium sand with silty clay laminations	9.53E+00	3.36E-03
T-4B	69.85-79.30	Medium sand	7.22E+00	2.55E-03
T-5A	28.16-33.16	Medium to coarse sand	6.44E+01	2.27E-02
T-5B	61.08-66.08	Dirty fine to medium sand	2.45E+00	8.64E-04
T-5C	78.13-82.84	Pebbly medium sand and medium to coarse gravel	5.30E+01	1.87E-02
T-6A	14.69-19.63	Silty clay loam	1.69E+00	5.96E-04
T-6B	29.94-34.94	Dirty medium to coarse pebbly sand	2.42E+02	8.54E-02
T-6C	50.70-55.16	Dirty fine to medium sand	8.59E-01	3.03E-04
T-7A	13.45-18.18	Sandy loam	1.10E+00	3.88E-04
T-7B	76.75-81.75	Fine to coarse pebbly sand	2.77E+01	9.77E-03
T-8	26.89-31.61	Silty clay, sandy gravel and fine pebbly sand	4.11E+00	1.45E-03
T-9	30.75-35.47	Medium to coarse sand	8.96E+01	3.16E-02
T-10	35.89-40.62	Medium to fine sand and silt loam	1.04E+01	3.67E-02
T-11A	36.26-40.98	Pebbly gravel and medium to coarse sand	5.81E+01	2.05E-02
T-11B	77.92-82.66	Medium to coarse sand and silty clay	4.25E+01	1.50E-02
T-11C	94.49-99.21	Silty clay and fine to coarse sand	2.14E+00	7.55E-04
T-13B	27.31-32.03	Clay and fine to medium sand	3.29E+01	1.16E-02
T-14	97.27-102.05	Pebbly sandy gravel	5.18E+02	1.83E-01
T-15	15.25-20.25	Silty clay	6.34E-01	2.24E-04
T-16	36.90-41.98	Sandy gravel	1.04E+02	3.67E-02
W-1	3.96-8.96	Silt loam to silty clay loam	4.11E+00	1.45E-03
W-1D	45.50-50.28	Fine to medium sand	2.24E+02	7.89E-02
W-2	7.24-12.24	Silt loam to silty clay loam	3.72E-01	1.31E-04
W-2D	45.29-50.04	Silty clay loam and med-coarse sand	3.72E+00	1.31E-03
W-3	4.17-9.17	Silt loam to silty clay loam	4.14E-01	1.46E-04
W-3D	45.56-50.34	Fine to medium sand, some gravel	8.42E+01	2.97E-02
W-4	4.97-9.97	Silt loam to silty clay loam	7.55E-02	2.67E-05
W-4D	45.51-50.29	Fine to medium sand	8.47E+00	2.99E-03
W-5	17.26-22.26	Silt loam to silty clay loam	6.70E-02	2.36E-05
W-5D	31.44-36.22	Silty clay loam and very fine sand	7.48E-03	2.64E-06
W-6	5.06-10.06	Silty sand and fine gravel	2.30E+00	8.09E-04

SECTION 5

5.0 GROUND WATER REMEDIATION PROGRAM

5.1 Ground Water Remediation

5.1.1 Introduction

The most cost-effective, environmentally sound, and technically feasible ground water remedial action alternative for the VOC contamination is air stripping using four extraction wells for ground water withdrawal. Treated ground water will be used in Keystone's cooling water system, which ultimately discharges to the on-site WWTP. The use of treated ground water in the cooling water system will be confirmed during a pilot study when data regarding the hardness of the treated water will be obtained.

5.1.2 Evaluation of Ground Water Remedial Action Alternatives

Based on previous assessments of the hydrogeological system and the conditions of the potential source areas (fill areas west of the Mid-Mill Ditch, wastewater collection pond, fill area on the northwest side of the South Ditch-North Half, and several fill areas west of the South Ditch-South Half), VOC control in the ground water under the Keystone site will include ground water removal, treatment, and discharge of the treated ground water to Keystone's cooling water system. Since no distinct source areas have been identified, no soil remediation is included.

The most cost-effective and environmentally acceptable approach to capturing and treating the VOC plume is evaluated in this section. Based on the depth of the VOC contamination (approximately 20 to 80 feet below ground level) and past experience, remediation will involve pumping ground water from a series of strategically placed purge wells.

Purge wells are wells screened in the saturated soils and located to intercept or reverse the flow of contaminated ground water. Typically, drilling equipment is used to install the wells, and submersible pumps are placed in the wells to recover ground water. Migration of contamination is prevented by pumping ground water from the wells. Pumping lowers the ground water levels around the wells, creating a zone of influence or capture. The ground water pumped to the surface is then treated and discharged.

Other ground water recovery/control alternatives, such as interceptor trenches and slurry walls, were not evaluated because they are not necessary, cost-effective or feasible due to the depth of the ground water contamination, the extent of the contaminant plume, and geologic conditions under the Keystone property.

Ground water flow modeling has been used to predict the most efficient purge well locations and the optimum pumping rates. The effectiveness and feasibility of the remediation alternatives and regulatory requirements for implementation of the alternatives have also been evaluated. In addition, cost estimates have been developed to provide a basis for an economic comparison. The evaluation of ground water remedial action alternatives presented in the following sections provides the basis for the program described herein.

5.1.3 Ground Water Modeling

A ground water flow model was applied to the Keystone site to provide a basis for determining the effectiveness of ground water recovery alternatives. The model used was developed by M.G. McDonald and A.W. Harbaugh of the U.S. Geological Survey and is entitled "A Modular Three-Dimensional Finite Difference Ground-Water Flow Model" (MODFLOW). The modular design of MODFLOW allows the assignment of modules of computer code call packages to simulate the

different aspects of the hydrogeologic system. The Basic, Block Centered Flow, Strongly Implicit Procedure, River, and Well packages of the MODFLOW program were used to evaluate the existing ground water flow patterns and to estimate the effectiveness of the proposed remedial system.

A conceptual model of the hydrogeologic system was constructed prior to initiating the ground water flow modeling. The area to be modeled can be viewed conceptually as a two-layer system in which a silty, sandy clay in the upper portion of the surficial sediments forms the upper layer of the model. The second layer consists of the remaining unconsolidated soils comprised of silty to sandy clays mixed with discontinuous thin to thick lenses of sand and gravel. This second layer is located directly below the upper layer and rests on a bedrock that forms a bottom confining layer.

The upper layer has a relatively uniform thickness of approximately 15 feet. The second layer decreases from approximately 80 feet in the northeast and eastern portions of the property to 0 feet in the southwestern portion of the property. Ground water in the upper layer occurs under water table conditions. Because the upper layer acts as a leaky confining layer, ground water in the lower layer occurs under semi-confined aquifer conditions. Ground water flow between the two layers is from the upper to the lower layer.

A 6,300 by 3,200 foot grid, consisting of the two layers, was constructed by using a 100 by 100 foot cell size to provide a base for data input into the MODFLOW model (Figure 5-1). The grid boundaries were set a sufficient distance away from the area of investigation to eliminate model boundary effects and to coincide with the hydrogeologic boundaries of the property. The outer nodes for each layer were simulated as constant head nodes with the head elevation set to the ground water elevation at each constant head node location.

The upper layer was simulated as a water table aquifer. The model nodes in the upper layer of the model were assigned hydraulic conductivities between 4×10^{-6} and 5×10^{-5} feet per second (ft/s) based on the results of the *in situ* hydraulic conductivity analyses in the 1990 Ground Water Assessment Report (Appendix F of the Revised Phase 2 Closure Plan). The bottom elevation for each node location of the upper layer of the model was set to the observed or interpreted bottom elevation of the upper layer of the unconsolidated soils. The lower layer was simulated as a semi-confined aquifer and assigned hydraulic conductivities between 9×10^{-6} and 7×10^{-3} ft/s by using the results of the *in situ* tests. The bottom elevation for each node location in the lower layer of the model was assigned the observed or interpreted bedrock elevation. A vertical conductivity between 1×10^{-9} and 9×10^{-9} ft/s was used to simulate vertical ground water flow based on previous laboratory permeability analyses.

The River package of MODFLOW was used to simulate the three surface water collection Ditches located within the model area (i.e., North Ditch, Mid-Mill Ditch, and South Ditch-North Half and South Ditch-South Half). Each collection Ditch was divided into reaches equal to the length of the Ditch within each corresponding cell. A conductance value for the sediments in each collection Ditch was calculated and assigned to each reach based on a three foot thick silty sand Ditch bed and the cross-sectional area of the bed. A constant head elevation or stage was used in each collection Ditch to simulate the presence of standing water.

The Strongly Implicit Procedure package of MODFLOW was used to solve the ground water flow equations resulting from the model input. All ground water flow simulations were conducted using the steady-state flow option.

After the model was set up, the ground water flow model was calibrated to the December 20, 1990 water table elevations by using the steady-state flow option. The results of the model calibration are shown in Figures 5-2 and 5-3. A calibration of approximately two feet was obtained over most of the model area for both layers.

5.1.4 Ground Water Recovery

The information obtained from slug tests (Appendix F of the Revised Phase 2 Closure Plan) and the conceptual ground water flow model were used to determine pumping rates for containing and capturing contaminated ground water from beneath the Keystone property. The targeted zone of capture includes all of the ground water in the shallow and deep layers of the upper aquifer that extend from the Toledo, Peoria and Western Railroad on the west, the Keystone property line to the north, the eastern edge of the Steel Works, and the Barge Canal to the south.

Numerous purge well locations and pumping rates were simulated with the ground water flow model to evaluate the most efficient design and performance for the ground water recovery system. Based on the results of the modeling runs, capture of the VOC constituents beneath the property will include pumping ground water from four purge wells (designated as Purge Wells A, B, C, and D). The recommended purge well locations are shown in Figure 5-4. These locations will optimize ground water capture because of the relative positioning with respect to natural ground water flow paths and localized geological conditions.

The initial conditions (model inputs) for selected purge-and-treat options were based on the hydraulic conductivities obtained from the model calibration (slug test data). For modeling, the hydraulic conductivity values from the model calibration were increased by one order of

magnitude to allow for variations in the hydrogeologic system and to provide for a margin of safety in the design capacity of the treatment system.

During the modeling, the pumping rates for each well were increased until the desired zone of capture was obtained. The results of the model (Figures 5-4 and 5-5) provided the basis of the design. Figures 5-4 and 5-5 show the ground water capture predicted for the upper layer (layer 1) and second layer (layer 2), respectively. In addition, the purge rates predicted for each well are presented in Table 5-1. The results of the modeling indicate that a total ground water purge rate of 615 gallons per minute (gpm) is necessary to capture the plume of contaminated ground water beneath the Keystone property. A relatively large ground water recovery rate was modeled for Purge Well D (400 gpm), whereas a relatively low purge rate was predicted for Purge Well C (15 gpm) because of different soil permeabilities. The pumping zone for Purge Well D is within a large gravel area while the zone for Purge Well C is located primarily in silty soils.

Based on past experience with the remediation of similar sites, the total ground water purge rates required for complete capture may be underestimated by preliminary modeling and may need to be increased in the future to achieve the final cleanup objectives. In general, ground water flow modeling does not account for *all* variations in subsurface soils because the model inputs are derived from localized, equilibrium data for monitoring wells. As a result, the flow rates predicted by ground water flow modeling are subject to further calibration and refinements based on actual pumping conditions and may need to be increased after a pump test has been performed and start-up of a full scale treatment system is complete. In addition, it is possible that additional purge wells may be required to achieve the final cleanup objectives. Therefore, based on the result of the modeling, a flow rate of 1,000 gpm will be used as a conservative design basis for ground water remediation.

5.1.5 Basis of Design

The design criteria used for the evaluation of the ground water remediation alternatives are based on aquifer characteristics, ground water modeling, and the VOC and inorganic concentrations detected during the ground water monitoring program conducted from February 25 through 28, 1991. Table 5-2 shows the design basis used for this evaluation.

The expected quality of ground water to be recovered from Purge Wells A, B, C, and D is based on the VOC concentrations detected in ground water samples from nearby monitoring wells. Under pumping conditions, the VOC concentrations in ground water purged from the recovery wells are expected to be diluted by uncontaminated or less contaminated ground water from areas surrounding each purge well. To account for the dilution of contaminants, the VOC concentrations in ground water pumped from each purge well are projected to be approximately half of the maximum VOC concentrations detected in monitoring wells immediately adjacent to each recovery well. The predicted concentrations of contaminants in the combined ground water flow from the four purge wells were determined by calculating the flow-weighted average for each constituent.

Table 5-2 also includes expected VOC concentrations for discharges of ground water to the Illinois River, which are based on USEPA surface water quality criteria and past experience with NPDES permit requirements. While a determination of actual effluent standards for discharge to the Illinois River would require a detailed evaluation of outfall characteristics, the receiving water, the relative toxicity of each parameter, and possible synergistic effects of the constituents on effluent stream toxicity, the standards shown in Table 5-2 should provide a conservative design basis.

5.1.6 Air Stripping

Several remedial action alternatives that include ground water recovery, on-site treatment, and disposal to the Illinois River were evaluated to determine the most environmentally sound, technically feasible, and cost-effective method of ground water remediation. All of the ground water remediation alternatives evaluated are capable of removing the dissolved contaminants from the on-site ground water to levels necessary for surface water discharge. In addition, since these ground water remedial actions involve ground water recovery from a series of purge wells and aboveground treatment and disposal, the rate at which the ground water can be remediated is independent of the ground water treatment alternative used.

Air stripping was identified as the most technically feasible and cost-effective ground water remediation technology. Other treatment technologies, such as steam stripping, chemical oxidation, and aqueous carbon adsorption, were evaluated; however, these technologies were eliminated because they may not provide for reliable treatment and/or would be cost prohibitive. In addition, based on the contaminant concentrations, flow rates, and past experience, it has been concluded that biological treatment would not be feasible or provide cost-effective ground water treatment and control. For example, *in situ* biological treatment of chlorinated organics detected at the site has not been proven or demonstrated, but may be possible.

Air stripping is a common technology used to treat ground water contaminated with VOCs. Figure 5-6 illustrates a general process flow schematic for this technology. In the air stripping process, ground water is pumped to the top of a packed tower where it is evenly distributed over a bed of plastic media. Air, introduced at the base of the column, passes countercurrent to the falling water and strips the VOCs from the water. The air exiting the top of the tower is discharged to the atmosphere or treated by an air emission control device, if required.

Scaling and bacteria growth, if not controlled, can accumulate during the operation over time and drastically reduce the treatment efficiency of an air stripping tower. Depending on naturally occurring concentrations of inorganic parameters (hardness, alkalinity, iron, etc.) in the ground water, acid and/or an oxidizing chemical may be necessary to control scaling and biological growth in the column.

Carbon dioxide is removed from the water during treatment in an air stripper. This can affect the carbonate equilibrium and result in precipitation of carbonates on surfaces in the column or the presence of suspended solids in the effluent. In addition, since the treated ground water is to be used in Keystone's cooling water system, the presence of suspended solids or a high potential for scaling in the treated ground water may be undesirable.

The presence of a significant amount of iron in the ground water can lead to proliferation of iron bacteria. In most subsurface environments, iron bacteria are naturally occurring and would multiply in the aerobic conditions of an air stripping tower. The levels of iron (1 mg/l) and hardness (1,100 mg/l) expected in the purged ground water indicate that carbonate scaling and iron bacteria growth may require control by the addition of acid and an oxidizing agent. The presence of iron bacteria may also necessitate the periodic cleaning of the purge wells and air stripping tower with a bactericide and the replacement of packing in the tower. These potential problems will be evaluated during the air stripping pilot study.

Because air stripping can achieve the removal of VOC contaminants to levels below detection limits, water treated via air stripping can be discharged directly to surface water (e.g., the Illinois River). However, an NPDES permit would have to be obtained from the IEPA. This would involve adding a new discharge point and revising Keystone's existing NPDES permit. Existing

Keystone personnel, which includes a licensed treatment plant operator, can be used for system operation, maintenance, and effluent discharge monitoring.

Under 35 IAC 215.301, the installation of an air stripping system may also require Keystone to obtain an Air Permit to Install from the Air Quality Division of IEPA. In general, air emission controls may be required depending on the impacts predicted by modeling. Therefore, dispersion modeling of the ground level impact of air emissions from the stripping tower may be necessary prior to obtaining the permit. If air emission controls are necessary, emissions from the air stripping system could be treated by carbon vapor adsorption (CVA). A CVA treatment system allows the airborne VOCs discharged from the system to be adsorbed by activated carbon, and the treated air is then discharged to the atmosphere. During operation, the carbon becomes saturated with VOCs and periodically requires regeneration. When the carbon becomes saturated, it could be regenerated with steam on site, and the contaminants adsorbed onto the carbon would be volatilized, condensed, and recovered for off-site disposal. Typically, a CVA system consists of two carbon beds in parallel so one carbon bed can adsorb while the other regenerates. Although CVA systems are relatively simple to operate and require a low level of maintenance, the addition of air controls to an air stripping system increases the capital and operating costs significantly.

Past experience has shown that the ground water chemistry of a site can affect air stripping design parameters, operating procedures, and treatment efficiencies. To confirm treatability, provide full scale design parameters, and refine the design basis for air and surface water discharge permit applications, an air stripping pilot study and an aquifer pump test will be conducted. The work plan for this study is presented in Appendix A and the air permit application for the pilot study is presented in Appendix B.

5.1.7 Treated Ground Water Discharge

Keystone intends to direct the treated water discharge from the air stripping tower to the make-up cooling water line at the Steel Mill. Keystone believes this approach is cost-effective and provides a functional use for the pumped ground water. Process cooling water is currently discharged to the WWTP via the Ditches. Discussions have already been initiated with the IEPA relative to a modification to this NPDES permit.

If, for some unknown reason, use of the treated ground water in the Steel Mill process cooling water system is not feasible, several other alternatives for the discharge of treated ground water to the Illinois River were investigated. The only practical options are:

- Direct discharge to the Keystone WWTP, or
- Direct discharge to the Illinois River via another discharge point as of yet not identified.

Discharge of the treated ground water directly to the Kickapoo Creek north of the site was also investigated, but this alternative was determined to be too costly because of the length of effluent piping required.

Keystone discharges an average of approximately 4.4 MGD of process cooling water and wastewater to the on-site WWTP which has an existing outfall to the Illinois River. The majority of this water is supplied to manufacturing operations by an on-site pumping station that draws water from the Illinois River and on-site ground water supply wells.

Treated ground water is a logical source for process cooling water because of the relatively low water temperature (55°F) and high flow rate (615 gpm). Treated ground water can be substituted for a portion of the River water flow currently used for cooling water supply. Since the process cooling water is discharged to the on-site WWTP, the treated ground water would also be discharged to the Illinois River via the existing WWTP outfall. Figure 5-7 illustrates the proposed process flow schematic for discharge of the treated ground water into the existing cooling water system. The process cooling water flow rates shown in this diagram were obtained from a water balance performed for Keystone's 1988 NPDES permit application. Treated ground water would be discharged into the cooling water supply line directly downstream of the river water supply pump. Since the treated ground water would replace an equivalent volume of river water, the total cooling water discharge flow rate to the WWTP would not change significantly from current conditions. Finally, discharge of the treated ground water to the existing on-site WWTP would enhance the feasibility of this approach by: (1) avoiding additional NPDES permitting/reporting requirements; (2) eliminating unnecessary discharge piping because of the use of existing discharge piping from process cooling areas to the WWTP; (3) eliminating the need for an additional outfall; and (4) reducing energy requirements for the water flow drawn from the Illinois River.

The feasibility of substituting treated ground water for process cooling water will be evaluated during the pilot study and aquifer test because of the expected hardness of the ground water recovered. It is likely that the river water currently used in process areas has a lower hardness level than the ground water beneath the site. Therefore, substitution of river water with ground water could result in increased scaling in process piping and process areas. If scaling of the treated ground water is evidenced during the pilot/cooling water study, substitution of the existing cooling water flow from on-site wells with treated ground water may be explored.

5.1.8 Regulatory Requirements for Construction and Operation

The regulatory requirements for the construction and operation of the ground water remedial program are presented in this section. Air stripping would require an air permit for construction and operation and the use of the treated ground water in Keystone's cooling water system would require a new or revised NPDES permit. Construction of pipelines through the on-site railroad right-of-ways will require easements from the railroad. However, these are common construction requirements and therefore are not discussed further.

Under 35 IAC 215.301, a permit is required for air discharges from ground water air stripping systems. In addition, air emission controls would be required if total VOC emissions of photochemically reactive compounds are more than eight pounds per hour and the impacts resulting from the emissions are above acceptable levels. Acceptable levels for TCE, PCE, and vinyl chloride are concentrations yielding an increased cancer risk of 1×10^{-6}, while acceptable levels for noncarcinogenic compounds such as 1,1-DCA, 1,1-DCE, trans-1,2-DCE, and 1,1,1-TCA are 0.33 percent of the threshold limit value-time weighted average (TLV-TWA). In most cases, the 1×10^{-6} risk levels for carcinogenic compounds are the more stringent limits.

The need for air emission controls on air discharged from an air stripping system was preliminarily assessed by evaluating the effects on potential receptors by using the USEPA SCREEN model, version 1.1 and a dilution matrix model. Both of these models are based on "worst case" assumptions regarding air flow patterns, meteorological conditions, and other attributes of the site. The SCREEN model was used to predict the effects of noncarcinogenic compounds while the dilution matrix was utilized to estimate those for carcinogenic compounds.

A discharge elevation of 60 feet and a distance to the nearest property line of 700 feet were assumed during the modeling of the site. Building downwash effects were ignored because of the relatively large distance between the proposed air stripping tower and nearby buildings.

The results of the preliminary assessment using the SCREEN and matrix models indicate that the emissions of photochemically reactive VOCs are below one pound per hour and therefore meet the State of Illinois allowable limits. Based on these results, air emission controls for an air stripping system would not be necessary. However, before an air permit for the proposed air stripping system is submitted, the IEPA will be contacted to determine applicable permit conditions.

State of Illinois NPDES permits are required for point-source discharges to surface waters, and USEPA water quality standards for receiving streams are based on their classification or uses and potential exposure pathways. Discharge standards for a specific outfall are determined through a detailed assessment of the potential exposure pathways, effluent stream characteristics, receiving stream characteristics, and the implemented treatment technology for human health (drinking water and fish consumption) and aquatic life (acute and chronic). As the treated ground water will be discharged via the existing WWTP, the NPDES permit for the existing WWTP will be amended.

5.1.9 Summary of Evaluations

The following summarizes the foregoing evaluations:

- Remediation of on-site ground water contaminated with VOCs is necessary to prevent further migration of the contamination. The most cost-effective and technically feasible method of ground water capture and recovery is pumping and treating ground water from a series of purge wells.

- A total flow rate of approximately 615 gallons per minute is estimated to be sufficient to capture and confine the on-site ground water contamination. The ground water recovery system would consist of four purge wells strategically located on the north and east sides of the Wire Mill. The purged water would be treated by air stripping, and the water discharge from the air stripper will be used as make-up water in Keystone's cooling water system.

5.1.10 Remedial Action Program

Figure 5-8 illustrates a general plan view for the air stripping ground water treatment system. Ground water from Purge Wells A, B, C, and D is pumped through metering pits where the purge rates and pressure readings are measured, and from the metering pits through transmission piping to the air stripping treatment system.

The air stripping of the combined purge well streams would consist of: (1) adding acid and oxidant chemical, if necessary; (2) pumping the ground water to the top of the air stripping tower and allowing the water to be evenly distributed and to trickle down through a bed of packing material; and (3) injecting air up into the tower with water flowing downward and air being injected upward, causing the air to come into continuous and thorough contact with the liquid.

The packing material provides a large surface area for the mixing of air and water, contact time for the VOC molecules to transfer from water to air, and a large void volume to reduce the air system's energy loss. The treated water that collects at the bottom of the tower would be pumped at a controlled rate into the discharge line of the existing river water supply pump that provides process cooling water.

The supply of process cooling water will be controlled by a pressure transmitter and control valve. If the flow from the ground water treatment system were interrupted or the system were shut down, the pressure transmitter would sense a decrease in supply pressure and open the control valve, effectively increasing the pressure and maintaining cooling water flow to process areas.

Depending on the requirements of the modified NPDES permit for the existing WWTP, the system may require weekly monitoring and monthly reporting. Keystone personnel will check the operation of the system and record system operating parameters on a daily basis, collect influent and effluent samples on a weekly basis, and at a minimum, perform equipment maintenance on a monthly basis.

In addition, periodic monitoring of the ground water recovery system will be necessary to document the capture of contaminated ground water beneath the site and to evaluate the effectiveness of the pumping rates. This monitoring will entail measuring water levels in the purge wells and monitoring wells and tracking the water table elevations under pumping conditions on a contour map.

If the results of a pilot study on the cooling water system show that the treated ground water cannot be used as make-up cooling water, the discharge from the air stripping tower will either be directed to the existing WWTP, or another discharge point to the Illinois River will be identified.

The schedule for implementation of the ground water remediation program is shown on Figure 5-10.

5.1.11 Remedial Action Program Implementation

After IEPA's approval of the ground water remedial action program presented herein, the following will be implemented:

- Refine the hydraulic conductivity parameters under the dynamic pumping conditions by performing a pump test. The results of the pump test will provide a more accurate basis of design for the ground water recovery and air stripping treatment systems. The work plan for the pump test is presented in Appendix A.

- Confirm design parameters for a full-scale air stripping treatment system by performing an air stripping and cooling water system pilot study to determine: (1) the potential effect of the on-site ground water chemistry on typical design criteria; (2) if excessive scaling and/or biological growth may occur during full-scale treatment; and (3) the potential impacts of treated ground water reuse on the cooling water system. The work plan for the pilot study is included in Appendix A.

- Based on the results of the pump test and air stripping pilot study, refine the design basis for the full-scale air stripping treatment system and for the preparation of air and water discharge permits.

- Perform detailed "site-specific" air dispersion modeling, determine the impacts of the emissions, and prepare and submit an air permit application for the proposed air stripping system to the IEPA Air Quality Division.

- Apply for a modification to the NPDES permit for the WWTP to include the discharge of VOCs.

- Design and construct the four purge wells, transmission piping, air stripping system, and discharge piping and controls.

- Start up the treatment system and pump the four purge wells at a rate of 615 gpm, or the rate required to capture the impacted ground water on site.

- Monitor the effectiveness of the ground water purge wells by measuring ground water levels in the adjacent monitoring wells on a monthly basis after startup of the treatment system.

5.2 Ground Water Monitoring

The analytical results from the ground water monitoring conducted at the site show that only VOCs are above the Class I cleanup objectives. Metals, semivolatile compounds and other inorganic compounds have historically been below Class I cleanup objectives. Although lead, cadmium and nickel have occasionally been above Class I limits at various well locations, they are

not consistently above the 35 IAC 620.410 standards at any well completed within the Class I aquifer. Therefore, only VOCs will be analyzed during the cleanup of the ground water.

5.2.1 Surface Water and Ground Water Elevation Survey

Static water levels will be recorded for existing surface water TBMs, all monitoring wells, and piezometers within a 12-hour period. Initially, water levels will be measured monthly through the first year of ground water remediation and quarterly thereafter until cleanup objectives are achieved. The ground water levels will be measured with an electronic tape from the top of individual well casings (surveyed reference points), and the surface water levels will be measured with a steel tape (or equivalent) from the top of individual TBMs. All water level data will be recorded in a bound field notebook. These data will be used to evaluate changing ground water flow conditions during the ground water remediation program. Potentiometric surface maps will be prepared and submitted with quarterly progress reports.

5.2.2 Sampling Locations and Analysis

Ground water samples will be collected from 39 monitoring wells for laboratory analysis of VOCs, pH, specific conductivity, and temperature in the locations shown on Figure 5-9. Samples will be obtained from 25 investigative wells on a quarterly basis for the first year of ground water remediation and from 14 base wells semiannually. After the first year of monitoring, the analytical results will be used to evaluate the frequency of monitoring and the parameters being analyzed.

The investigative wells will provide data for quarterly reports on the extent of contamination, the rate of migration, and concentrations of volatiles in the ground water. If four consecutive quarters of analytical results for an investigative well are below cleanup objectives, it will be reassigned as a base well. Conversely, if a base well shows contamination, it will be reassigned as an investigative well. If a base well becomes unnecessary, it will be eliminated from the monitoring program (i.e., another base well is located between the contaminant plume and the base well to be dropped). The proposed investigative and base wells include (see Figure 5-9):

- Investigative Wells: designated as W-1D, W-2, W-3D, W-4D, T-1, T-2A, T-3, T-4A, T-4B, T-6A, T-6B, T-7B, T-9, T-10, T-11B, T-11C, T-13B, T-16, T-17, T-18, T-19B, T-19C, T-20, T-21, and
- Upgradient Well: designated as T-15
- Base Wells: designated as T-2B, T-5A, T-5B, T-5C, T-6C, T-7A, T-8, T-11A, T14, T-19A, T-22A, T-22B, T-23, and T-24.

In addition to the 25 investigative and 14 base samples, replicate and field blank samples will be collected and analyzed for VOCs during each ground water sampling event. One field blank and one replicate sample will be prepared for every 10 samples collected, and one trip blank will be sent with each shipment of samples to the laboratory. The blank and replicate samples will be prepared as follows.

- Field blank samples will be prepared to assess the adequacy of laboratory decontamination procedures. Prior to sampling, organic-free deionized water will be poured into a bailer and then transferred into the appropriate sample container.

- Trip blanks will be prepared upon receipt of the sample bottles and will be kept with the investigative samples through the sampling event. The trip blanks will be analyzed to check for procedural contamination of samples that occurred during shipping.

- Replicate samples will be prepared by filling two sample containers with water from the same bailer. The samples will be labeled the same except an "R" or "Rep" will follow the sample location designation.

5.2.3 Sampling Equipment and Procedures

A laboratory cleaned bailer will be used to collect the ground water sample from each well. Prior to sampling, standing water in the wells will be removed by purging each well of three well volumes or until stabilization of temperature, pH, and specific conductance is achieved. If the well goes dry before three well volumes have been removed, samples will be collected as soon as the well recovers.

Teflon or stainless steel bailers will be used for purging the wells, and purged water from the wells will be placed in a 55 gallon drum and discharged through the ground water treatment system. Bailers, ropes, pumps, and all equipment will be decontaminated prior to insertion into the well.

Ground water samples will be collected directly after purging with the same bailer used to purge the well. The bailer will be gently lowered into the water, and samples collected for volatiles will be carefully poured into 40 ml glass vials preserved with HCl, just to overflowing, ensuring that no air bubbles are present in the sample. Each vial will be sealed with a clean Teflon-lined septa and cap so that no headspace entrapped air bubbles are present in the sample. Each sample will then be placed in an insulated cooler with blue ice and shipped to the laboratory for analysis in accordance with proper chain-of-custody procedures. All samples will be clearly labeled with the site name, well identification, date, name of sampler, and time of collection. Chain-of-custody forms that indicate the parameters for analysis will accompany all samples shipped to the laboratory. Field measurements of pH, specific conductivity, and temperature will be obtained from a separate sample aliquot using an Orion pH meter (Model 210) with an Orion gel filled pH probe, an American Scientific Products thermometer, and a YSI 5-C-T conductivity meter (Model 33) with a YSI probe (Model 3310) or equivalent instruments. All field probes and thermometers will be cleaned in the laboratory prior to field use and rinsed with organic-free deionized water between use. For each 20 samples collected, one duplicate analyses and one USEPA QA/QC check sample with a known value will be analyzed for pH and specific conductivity.

The sample collection activities, including pH, specific conductivity, temperature, color, and noticeable odor, will be documented in a bound field notebook.

5.2.4 Decontamination Procedures

The following procedures will be used for the decontamination of Teflon and stainless steel bailers:

- Wash with hot water and nonfoaming detergent;
- Rinse with hot water;
- Rinse with deionized water; and
- Air dry.

Stainless steel bailer cables, Teflon bailer balls, and tops will be decontaminated in the same manner, except that they will be baked dry. All decontamination procedures will be performed in the laboratory, and the bailers and cables will be wrapped in clear plastic for transport to the site. Since a different bailer will be used for each well, field decontamination will not be necessary. The results of field bailer blanks will be reviewed to ensure the adequacy of decontamination procedures.

5.2.5 Analytical Methods

All VOC analyses will be performed according to current SW 846 methods. The quality assurance/quality control procedures manual for the laboratory currently being used is included in Appendix C. If another laboratory is selected in the future, their QA/QC manual will be submitted as an addendum.

5.3 Evaluation Procedures

5.3.1 Historical Data

From five to nine sets of VOC historical data have been collected and will be used to establish a baseline case against which the overall performance of the remediation program will be evaluated. The baseline case will include the mean, sample standard deviation, sample variance, and trend line plots for each parameter that exceeds cleanup objectives on a well-by-well basis.

5.3.2 Data Reduction, Analysis, and Evaluation

Investigative wells will be sampled quarterly, and base wells will be sampled semiannually for VOCs, pH, specific conductivity, and temperature as previously discussed. Water level measurements will be obtained for all investigative and base wells on a monthly basis during the first year of the remediation and quarterly during subsequent years.

A potentiometric surface map will be generated each month from water level measurements of all investigative and base wells through the first year of remediation to monitor the effect of the remediation program on the ground water flow system.

Laboratory results and potentiometric surface maps along with a discussion of the extent of contamination and rate of migration will be sent to the IEPA on a quarterly basis. At the end of the first year of the remediation program, a summary report will be provided that will present an evaluation of the efficacy of the program. This report will include a statistical trend-analysis utilizing least-squares regression or the Mann-Kendall technique, and a test of the annual mean concentration per parameter for each well against the cleanup objective at the 80 percent

confidence level as specified in SW 846 (Third Edition, V.II, p. 1-26). A significant difference will be declared if the upper 80 percent confidence limit of the true mean exceeds the cleanup objective. If a significant difference is declared for a given investigative well, subsequent quarterly data will be statistically evaluated on an annual basis until no significant difference is determined. If there is no statistically significant difference between the upper 80 percent confidence limit and the cleanup objective, the investigative well will be reclassified as a base well.

If data from all investigative and extraction wells are determined to be not significantly different from the cleanup objectives, remediation will be suspended. Quarterly sampling of the investigative wells will be continued during the suspension period for one year. For the first quarter of the suspension period, the ground water samples will be analyzed for the parameters listed in 35 IAC 620.410. If data from these wells are not significantly different from the cleanup objectives, then the subsequent sampling of the investigative wells will be performed annually for a period of five years.

TABLES

TABLE 5-1

PREDICTED GROUND WATER PUMPING RATES

Proposed Purge Well	Predicted Pumping Rate (gpm)(1)
A	100
B	100
C	15
D	400
Total Projected Purge Rate	615

Note: (1) Purge rates predicted by preliminary ground water modeling performed in May 1991.

TABLE 5-2

DESIGN BASIS

General Design Parameters:

Hydraulic Capacity = 1,000 gpm
Influent Purge Water Temperature = 55° F

Concentration Design Parameters		
Parameter	Influent Purge Water[1]	Effluent Water to Illinois River[2]
Volatile Organics (ug/l)		
1,1-Dichloroethane	55	<2
1,1-Dichloroethylene	60	<2
trans 1,2-Dichloroethylene	60	<5
Tetrachloroethylene	55	<2
1,1,1-Trichloroethane	200	<100
Trichloroethylene	1,000	<5
Vinyl Chloride	10	<1
Inorganics (mg/l)		
Cadmium	<0.002	---
Calcium	320	---
Chromium	<0.01	---
Iron	1	---
Lead	<0.001	---
Magnesium	110	---
Nickel	0.04	---
Selenium	<0.002	---
Zinc	0.1	---

TABLE 5-2

DESIGN BASIS

Concentration Design Parameters		
Parameter	Influent Purge Water[1]	Effluent Water to Illinois River[2]
Miscellaneous Parameters (mg/l)		
Sodium	44	---
Hardness (as $CaCO_3$)	1,100	---
Alkalinity (as $CaCO_3$)	350	---
Bicarbonate Alkalinity (as $CaCO_3$)	350	---
Chloride	590	---
Sulfate	290	---

Note: 1. Projected ground water influent concentrations based on flow-weighted averages from proposed purge wells A, B, C, and D.

2. Assumed effluent water quality if ground water is discharged to Illinois River, which would require a new or modified NPDES.

Key: --- Parameter either is nondetectable in the recovered ground water or is not regulated.

FIGURES

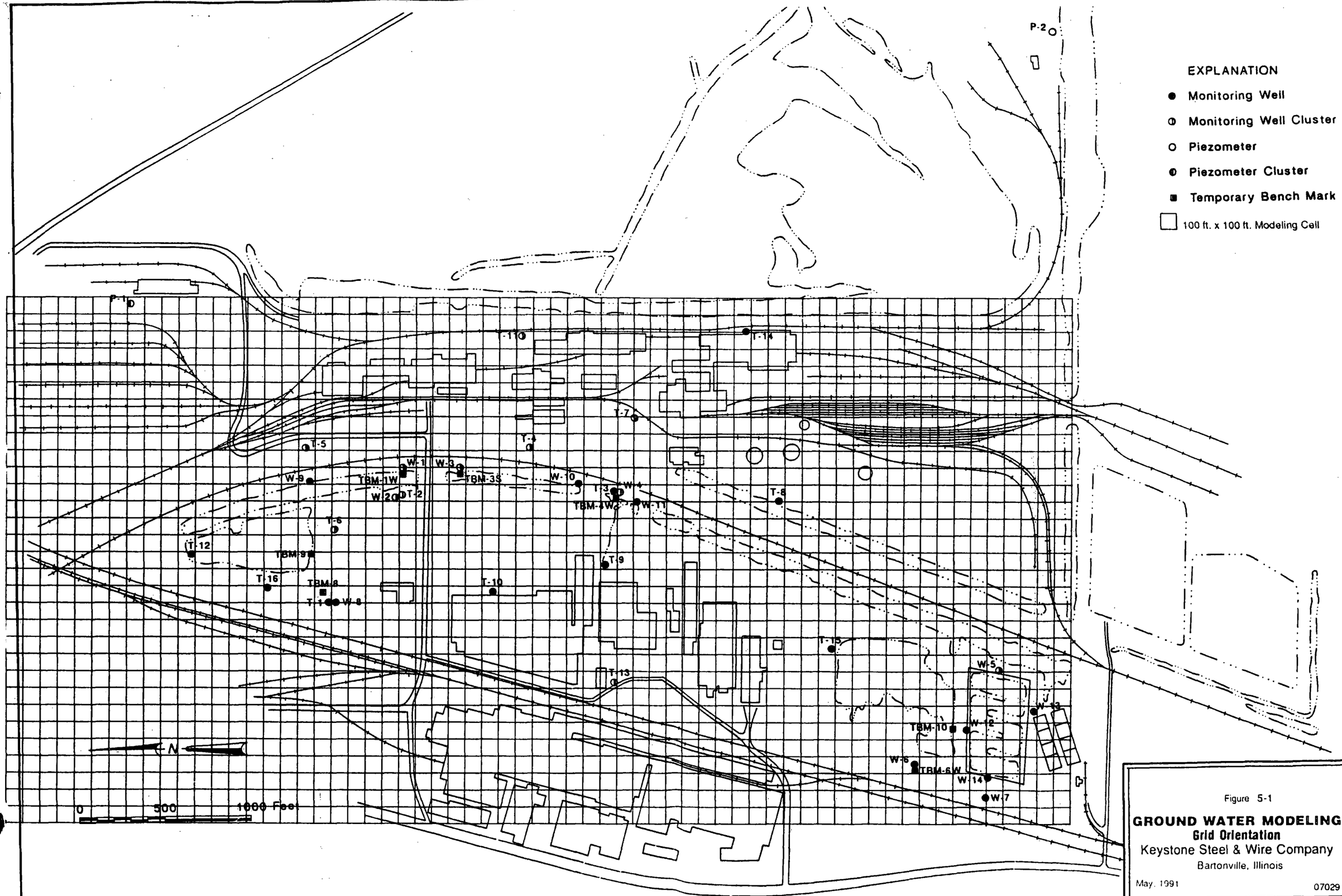


Figure 5-1

GROUND WATER MODELING

Grid Orientation

Keystone Steel & Wire Company

Bartonville, Illinois

May, 1991

07029

EXPLANATION

- Monitoring Well
- Monitoring Well Cluster
- Piezometer
- Piezometer Cluster
- Temporary Bench Mark

442 Ground Water Elevation (Contour Interval = 1 Ft.)

P-1 P-2 T-1 T-2 T-3 T-4 T-5 T-6 T-7 T-8 T-10 T-11 T-12 T-13 T-14 T-15 T-16 W-1 W-2 W-3 W-4 W-5 W-7 W-8 W-9 W-10 W-11 W-12 W-13 W-14 TBM-1W TBM-3S TBM-4W TBM-8 TBM-9 TBM-10 TBM-11W

439 440 441 442 443 444 445 446 447 448 449 450

N

0 500 1000 Feet

Figure 5-2

GROUND WATER MODELING
Calibration Results for Layer 1
Keystone Steel & Wire Company
Bartonville, Illinois

May, 1991 07029

WW Engineering & Science

EXPLANATION

- Monitoring Well
- Monitoring Well Cluster
- Piezometer
- Piezometer Cluster
- Temporary Bench Mark

432 Ground Water Elevation (Contour Interval = 1 Ft.)

P-1 P-2 T-1 T-2 T-3 T-4 T-5 T-6 T-7 T-8 T-9 T-10 T-11 T-12 T-13 T-14 T-15 T-16
W-1 W-2 W-3 W-4 W-5 W-6 W-7 W-8 W-9 W-10 W-11 W-12 W-13 W-14
TBM-1W TBM-3S TBM-4W TBM-6W TBM-8 TBM-9 TBM-10
430 431 432 433

N

0 500 1000 Feet

Figure 5-3

GROUND WATER MODELING
Calibration Results for Layer 2
Keystone Steel & Wire Company
Bartonville, Illinois

May, 1991 07029

WW Engineering & Science

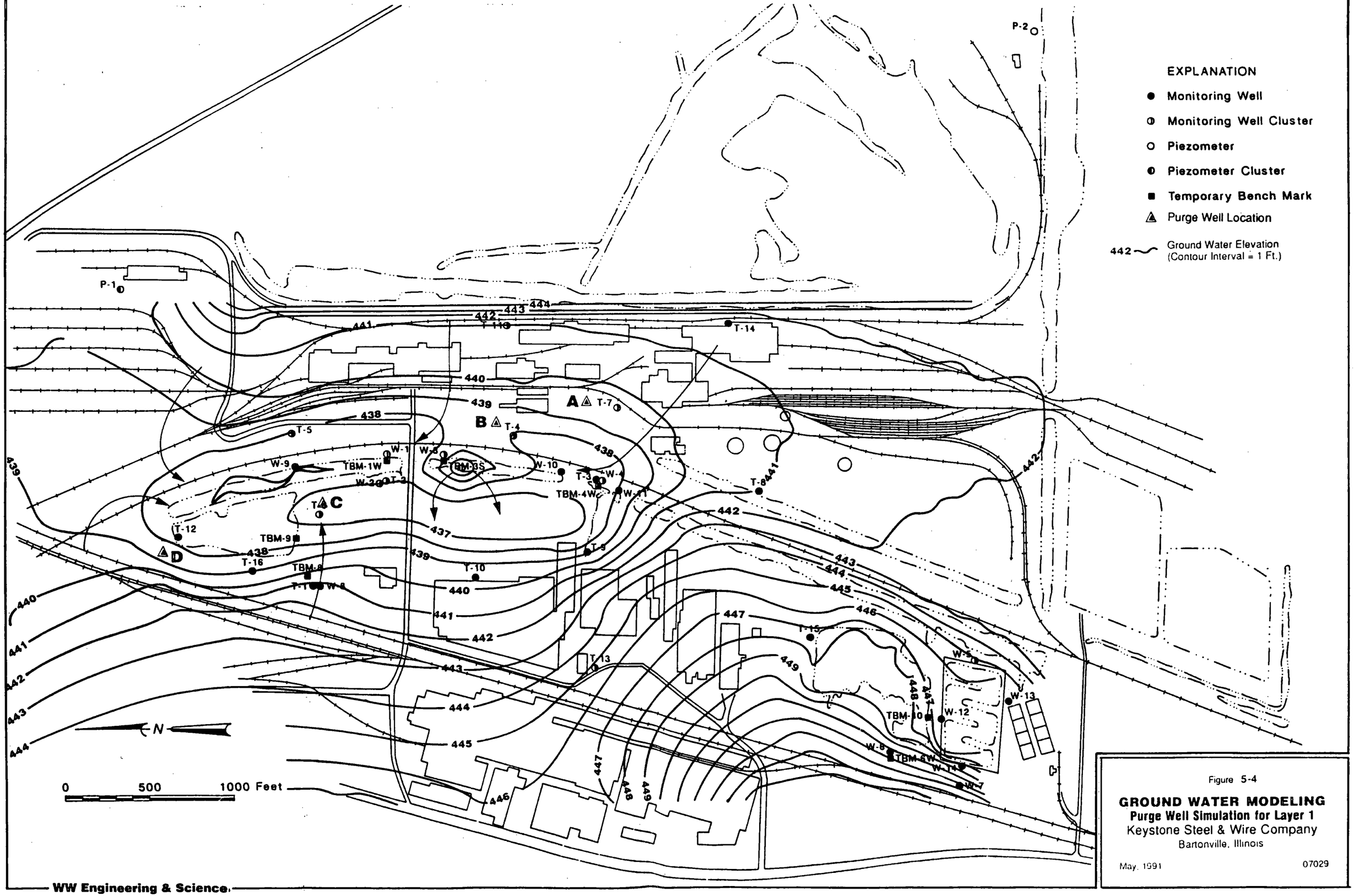


Figure 5-4

GROUND WATER MODELING
Purge Well Simulation for Layer 1
Keystone Steel & Wire Company
Bartonville, Illinois

May, 1991 07029

WW Engineering & Science

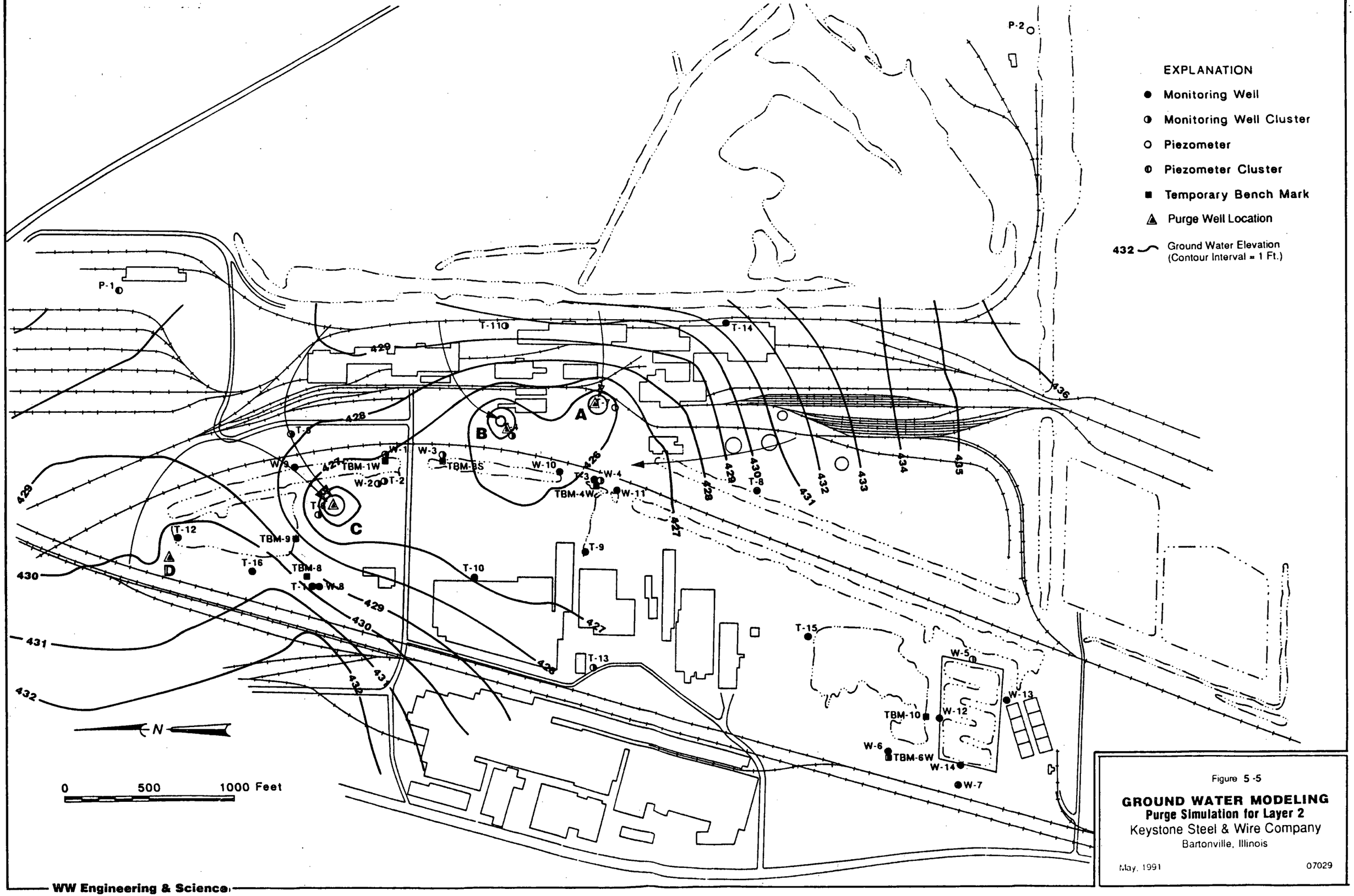


Figure 5-5

GROUND WATER MODELING

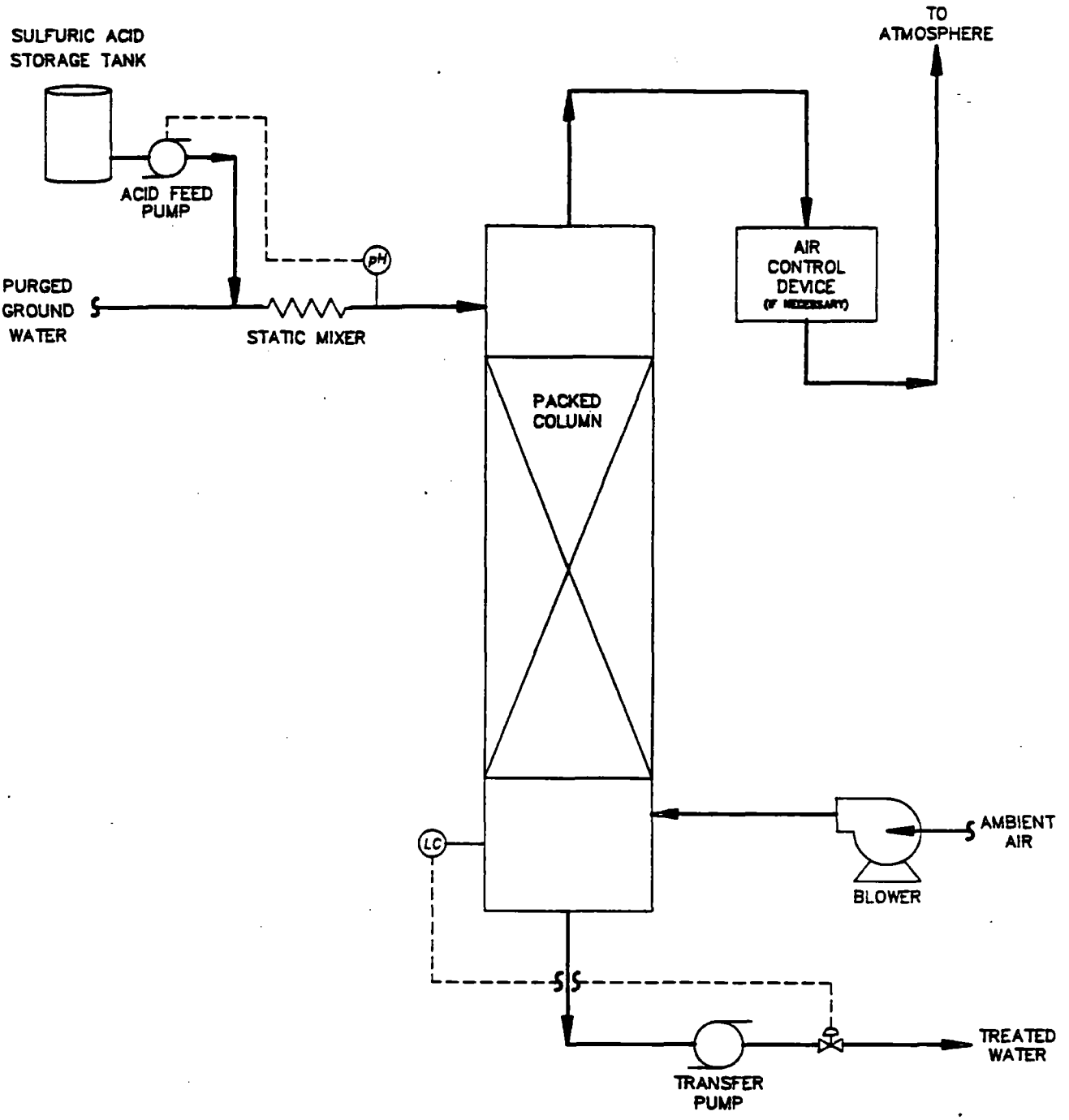
Purge Simulation for Layer 2

Keystone Steel & Wire Company

Bartonville, Illinois

May, 1991

07029



LEGEND

- (pH) – pH CONTROL
- (LC) – LEVEL CONTROL
- ⋈ – CONTROL VALVE

LVP053091

FIGURE 5-6

AIR STRIPPING PROCESS SCHEMATIC

KEYSTONE STEEL AND WIRE CO.
BARTONVILLE, ILLINOIS

MAY, 1991 07029

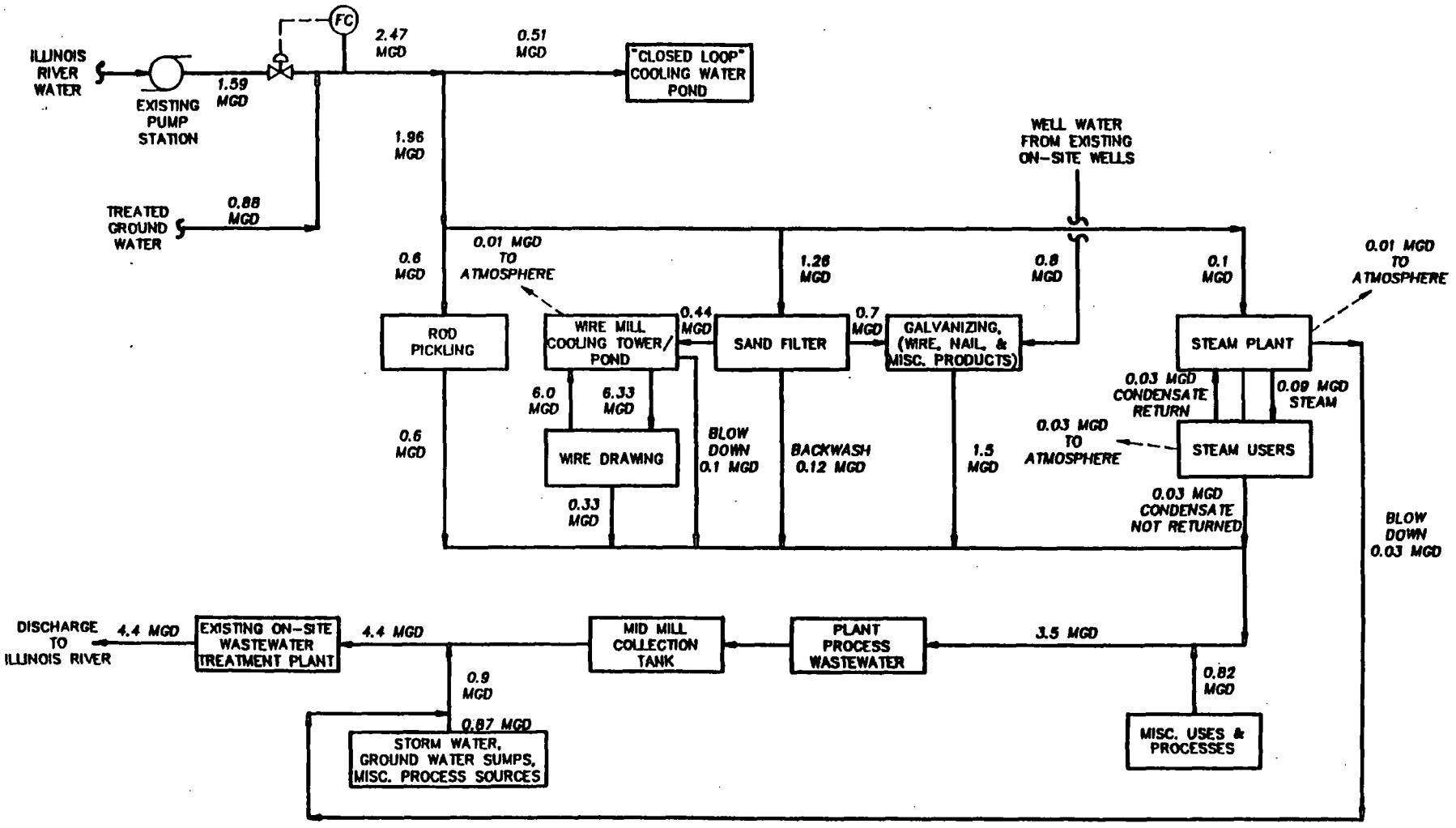


FIGURE 5 -7

FLOW SCHEMATIC FOR DISCHARGE OF TREATED GROUND WATER TO PROCESS COOLING WATER SYSTEM

KEYSTONE STEEL AND WIRE CO.
BARTONVILLE, ILLINOIS

MAY, 1991 07029

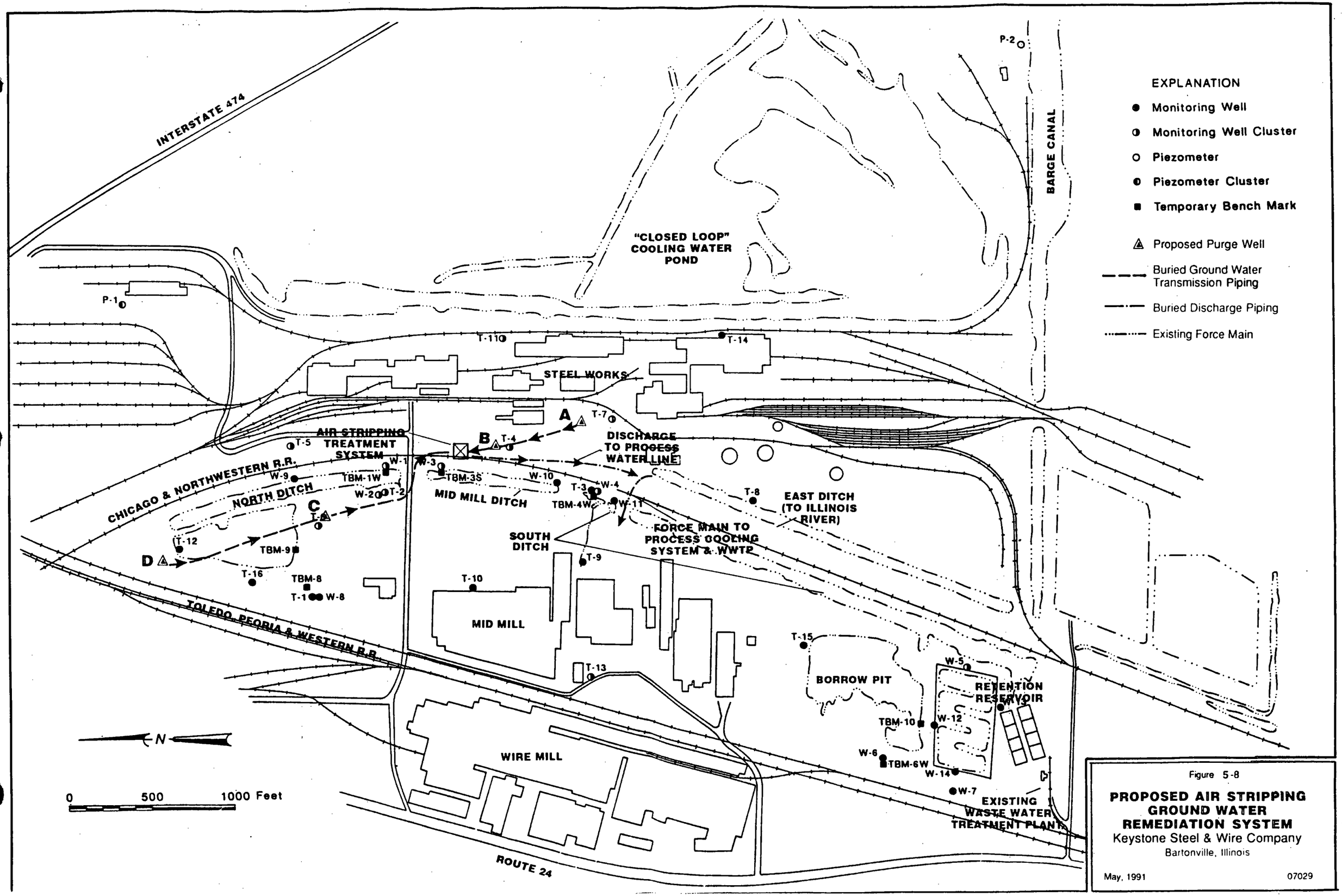


Figure 5-8

PROPOSED AIR STRIPPING GROUND WATER REMEDIATION SYSTEM

Keystone Steel & Wire Company

Bartonville, Illinois

May, 1991

07029

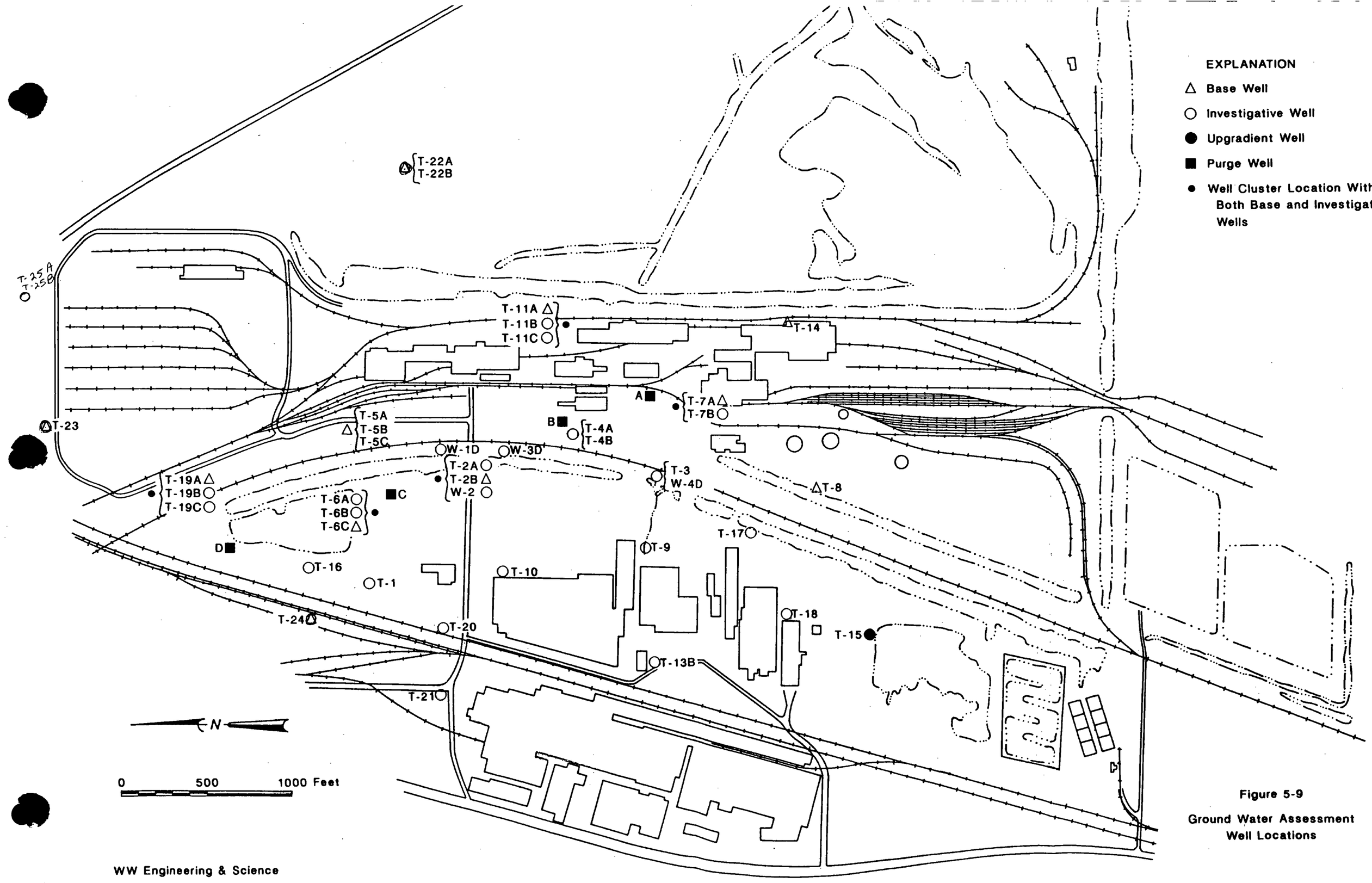
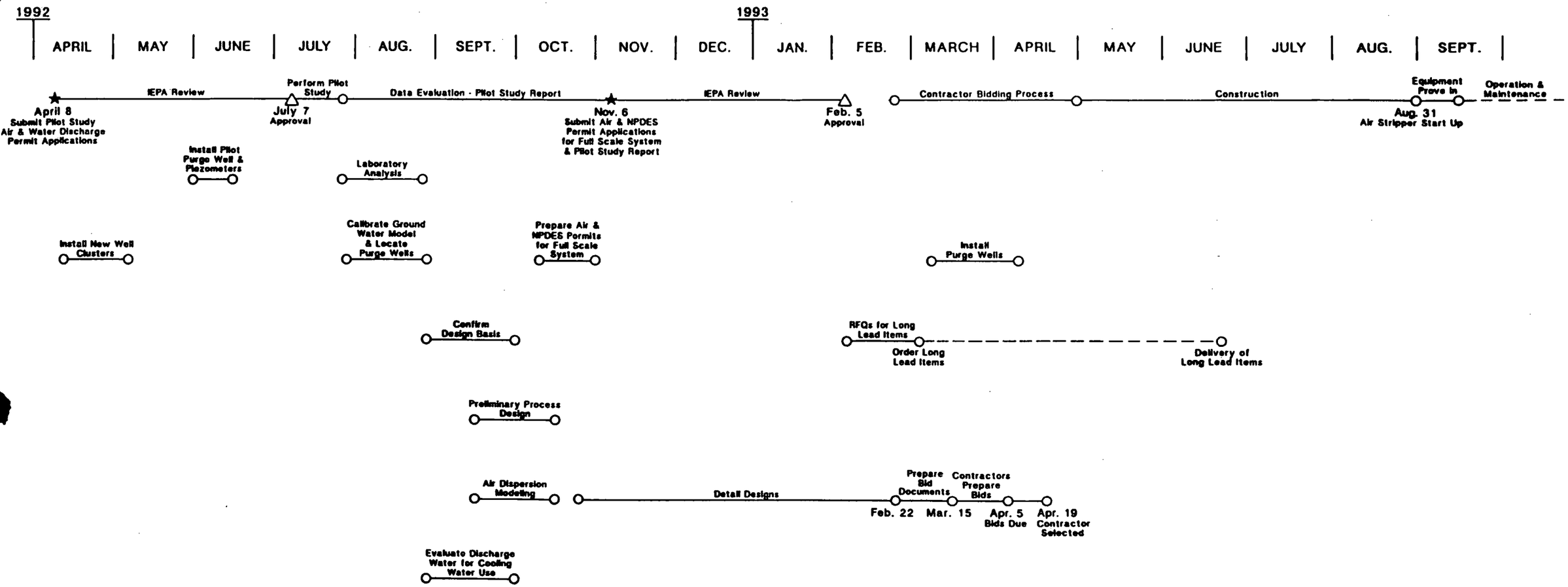


Figure 5-9

Ground Water Assessment
Well Locations

WW Engineering & Science



★ Submittal of Permit Applications to IEPA

△ IEPA Approval of Permit Applications

Figure 5-10

Keystone Steel & Wire Company

Schedule for Ground Water Remediation

SECTION 6

6.0 GROUND WATER REMEDIATION COST ESTIMATE

Cost estimates for the ground water remediation program include costs for the installation and operation of the purge wells and air stripping tower, and the cost for annual ground water monitoring for VOCs.

The estimate for the air stripping tower is based on the following: (1) air emission controls will not be necessary; (2) discharge water from the air stripper will be used as cooling water make-up and will be discharged to the WWTP; and (3) high-density polyethylene (HDPE) pipe will be used. The capital cost was calculated based on a hydraulic design capacity of 1,000 gpm and the use of HDPE pipe, and the operating cost was estimated based on a ground water flow rate of 615 gpm. Detailed engineering cost estimates for the air stripping tower are presented in Table 6-1, and a summary of the cost estimates is provided in Table 6-2. Annual operating cost estimates are included in Table 6-3.

		Capital Cost	Annual Operating Cost	Estimated Cost for 10 Year Program
o	Air Stripping	$1,360,000	$212,000	$3,480,000
o	Ground Water Monitoring (annual)		64,000	640,000
		Total 10 Year Estimated Cost		**$4,120,000**

TABLES

TABLE 6-1

ENGINEERING COST ESTIMATES-GROUND WATER TREATMENT
(Page 1 of 7)

Item Description	Unit	Estimated Quantity	Materials Unit Cost	Materials Total Cost	Installation Unit Cost	Installation Total Cost	Total Cost
1. GROUND WATER RECOVERY AND TRANSMISSION PIPING SYSTEM							
Mobilization/demobilization	LS	1			$1,000	$1,000	$1,000
10" dia. purge well w/15' ss screen, high flow	EA	1	$7,000	$7,000	$4,500	$4,500	$11,500
6" dia. purge well w/15' ss screen, med. flow	EA	2	$4,000	$8,000	$3,500	$7,000	$15,000
6" dia. purge well w/15' ss screen, low flow	EA	1	$4,000	$4,000	$3,500	$3,500	$7,500
Well pump & level control electrodes, high flow	EA	1	$8,000	$8,000	$1,500	$1,500	$9,500
Well pump & level control electrodes, med. flow	EA	2	$3,500	$7,000	$1,500	$3,000	$10,000
Well pump & level control electrodes, low flow	EA	1	$2,300	$2,300	$1,500	$1,500	$3,800
6' dia. manhole w/mechanical components	EA	4	$3,000	$12,000	$2,500	$10,000	$22,000
Electrical equipment at purge well	EA	4	$1,500	$6,000	$1,000	$4,000	$10,000
3" SDR 11 HDPE piping flgd., buried	LF	150	$2.26	$339	$2.44	$366	$705
4" SDR 11 HDPE piping flgd., buried	LF	50	$3.85	$193	$3.80	$190	$383
6" SDR 11 HDPE piping flgd., buried	LF	2900	$6.66	$19,328	$4.11	$11,919	$31,247
Trenching: excavation/backfill/compaction (5' deep; 1:1 slope)	LF	3100	$6.10	$18,910	$8.30	$25,730	$44,640
Fees: construction permits/contract bonds	LS	1			$3,000	$3,000	$3,000
3" propeller water flow meter	LS	4	$1,100	$4,400	$500	$2,000	$6,400
Power/control conduit to wells: 1-1/4" PVC Schedule 40	LF	3100	$1.28	$3,976	$1.65	$5,106	$9,081
Power/control conduit to wells: 1" PVC Schedule 40	LF	3100	$1.04	$3,209	$1.51	$4,673	$7,882
Conductors: #8 wire	LF	6200	$0.25	$1,556	$0.31	$1,922	$3,478

TABLE 6-1

ENGINEERING COST ESTIMATES-GROUND WATER TREATMENT
(Page 2 of 7)

Item Description	Unit	Estimated Quantity	Materials Unit Cost	Materials Total Cost	Installation Unit Cost	Installation Total Cost	Total Cost
Conductors: #6 wire	LF	9300	$0.40	$3,692	$0.38	$3,534	$7,226
Flow/pressure switch	EA	4	$500	$2,000	$500	$2,000	$4,000
3" Schedule 40 galvanized piping w/supports	LF	45	$9.46	$426	$11.45	$515	$941
4" Schedule 40 galvanized piping w/supports	LF	15	$15.08	$226	$14.10	$212	$438
Air/vacuum relief valve, 1/2"	EA	5	$250	$1,250	$300	$1,500	$2,750
Pressure gauges, 1/2"	EA	8	$100	$800	$200	$1,600	$2,400
Ball valves, 1/2"	EA	22	$80	$1,760	$150	$3,300	$5,060
Ball valves, 3"	EA	12	$600	$7,200	$250	$3,000	$10,200
Butterfly valves, 3"	EA	4	$150	$600	$200	$800	$1,400
Ball valves, 8"	EA	2	$1,000	$2,000	$300	$600	$2,600
Butterfly valves, 8"	EA	2	$800	$1,600	$250	$500	$2,100
Boring & jack 12" casing under railroad	LF	100	$40	$4,000	$260	$26,000	$30,000
Tie-in transmission piping into treatment building	LS	1	$500	$500	$500	$500	$1,000
10" Schedule 40 galvanized piping flgd, w/ supports	LF	50	$49.94	$2,497	$38.44	$1,922	$4,419
8" propeller water flow meter	EA	1	$2,200	$2,200	$800	$800	$3,000
Prefilter/strainer	EA	1	$4,000	$4,000	$800	$800	$4,800
Heat tracing for "exposed" 6" piping	LF	120	$4.17	$500	$0.76	$91	$592
Insulation for "exposed" 6" piping, 2" thick	LF	120	$6.16	$739	$3.56	$427	$1,166
Thermostat controls for heat tracing	LS	1	$500	$500	$200	$200	$700
Misc. electrical & wiring	LS	1	$5,000	$5,000	$5,000	$5,000	$10,000

TABLE 6-1

ENGINEERING COST ESTIMATES-GROUND WATER TREATMENT
(Page 3 of 7)

Item Description	Unit	Estimated Quantity	Materials Unit Cost	Materials Total Cost	Installation Unit Cost	Installation Total Cost	Total Cost
Misc. mechanical & site restoration	LS	1	$2,000	$2,000	$2,000	$2,000	$4,000
Misc. fittings & valves	LS	1	$5,000	$5,000	$5,000	$5,000	$10,000
MATERIAL SUBTOTALS				$154,700		$151,200	$305,900
SHIPPING[1]							$4,641
CONTRACTOR: LABOR, TAXES, & INSURANCE[2]							$22,700
EQUIPMENT PASS THROUGH[3]							$15,500
ENGINEERING[4]							$35,700
CONSTRUCTION MANAGEMENT[4]							$35,700
CONTINGENCIES[5]							$85,600
TOTAL							**$506,000**
2. TREATED WATER DISCHARGE TO WIRE MILL COOLING WATER SYSTEM							
Mobilization/demobilization	LS	1			$1,000	$1,000	$1,000
10" SDR 11 HDPE piping, buried	LF	1500	$15.27	$22,906	$5.86	$8,790	$31,696
Trenching: excavation/backfill/compaction (5' deep; 1:1 slope)	LF	1500	$6.10	$9,150	$8.30	$12,450	$21,600
Effluent pumps	EA	2	$6,000	$12,000	$1,200	$2,400	$14,400
Treated water filter/strainer	EA	1	$10,000	$10,000	$1,000	$1,000	$11,000
10" galvanized. Schedule 40 piping, w/supports	LF	100	$49.94	$4,994	$38.44	$3,844	$8,838

TABLE 6-1

ENGINEERING COST ESTIMATES-GROUND WATER TREATMENT

Item Description	Unit	Estimated Quantity	Materials Unit Cost	Materials Total Cost	Installation Unit Cost	Installation Total Cost	Total Cost
Tie-in to existing cooling water piping	LS	1	$1,000	$1,000	$1,000	$1,000	$2,000
Heat tracing for "exposed" 10" piping	LF	100	$4.42	$442	$1.01	$101	$543
Insulation for "exposed" 10" piping, 2" thick	LF	100	$9.09	$909	$5.10	$510	$1,419
Thermostat controls for heat tracing	LS	1	$500	$500	$200	$200	$700
Air/vacuum relief valve, 1/2"	EA	1	$250	$250	$300	$300	$550
Pressure gauges, 1/2"	EA	4	$100	$400	$200	$800	$1,200
Pneumatic actuated valve, 8" w/solen.	EA	2	$4,500	$9,000	$1,200	$2,400	$11,400
Air compressor	EA	1	$3,500	$3,500	$1,000	$1,000	$4,500
Flow meter, 8" propeller	EA	1	$2,200	$2,200	$800	$800	$3,000
Pressure transmitter/controller	EA	1	$2,500	$2,500	$1,000	$1,000	$3,500
Remote electrical control panel	LS	2	$3,000	$6,000	$1,500	$3,000	$9,000
Control conduit to river water pump station, 1-1/4"	LF	1500	$1.28	$1,920	$1.65	$2,475	$4,395
Control wire to river pump station, #8 wire	LF	3000	$0.25	$750	$0.31	$930	$1,680
6" galvanized Schedule 40 piping, w/supports	LF	100	$26.75	$2,675	$23.00	$2,300	$4,975
Motor control center/starters	LS	1	$1,500	$1,500	$1,000	$1,000	$2,500
Main disconnect/circuit breakers	LS	1	$600	$600	$600	$600	$1,200
Misc. electrical & wiring	LS	1	$10,000	$10,000	$10,000	$10,000	$20,000
Misc. mechanical, fittings, & valves	LS	1	$10,000	$10,000	$10,000	$10,000	$20,000

TABLE 6-1

ENGINEERING COST ESTIMATES-GROUND WATER TREATMENT

Item Description	Unit	Estimated Quantity	Materials Unit Cost	Materials Total Cost	Installation Unit Cost	Installation Total Cost	Total Cost
MATERIAL SUBTOTALS				$113,200		$67,900	$181,100
SHIPPING[1]							$3,400
CONTRACTOR: LABOR, TAXES, & INSURANCE[2]							$10,200
EQUIPMENT PASS THROUGH[3]							$11,300
ENGINEERING[4]							$21,200
CONSTRUCTION MANAGEMENT[4]							$21,200
CONTINGENCIES[5]							$50,800
TOTAL							**$300,000**
3. AIR STRIPPING TREATMENT SYSTEM (without air emission controls)							
Mobilization/demobilization	LS	1			$1,000	$1,000	$1,000
Air strip. tower: 8' diam. 60'H, FRP w/platform	EA	1	$60,000	$60,000	$5,000	$5,000	$65,000
Internals: distributor, support plate, demister, 304 ss	LS	1	$16,000	$16,000	$2,000	$2,000	$18,000
Packing media	CF	1508	$9.00	$13,572	$3.00	$4,524	$18,096
Blower (including equip. pad), 10,000 cfm	EA	1	$3,600	$3,600	$1,500	$1,500	$5,100
Foundations and structural supports, includes building	LS	2	$3,500	$7,000	$3,000	$6,000	$13,000
Acid/oxidant storage tank, 3,000 gal PE	EA	2	$3,200	$6,400	$1,000	$2,000	$8,400
Acid/oxidant metering pump	EA	2	$1,200	$2,400	$500	$1,000	$3,400
In-line pH probe, analyzer, & controller	EA	1	$4,000	$4,000	$1,000	$1,000	$5,000
In-line mixer, 8" FRP w/150 lb. pressure rated flanges	EA	1	$3,000	$3,000	$500	$500	$3,500

TABLE 6-1

ENGINEERING COST ESTIMATES-GROUND WATER TREATMENT
(Page 6 of 7)

Item Description	Unit	Estimated Quantity	Materials Unit Cost	Materials Total Cost	Installation Unit Cost	Installation Total Cost	Total Cost
Level controls	EA	2	$800	$1,600	$300	$600	$2,200
Control panel/motor control center	EA	1	$25,000	$25,000	$2,000	$2,000	$27,000
Main disconnect/circuit breaker	EA	1	$500	$500	$250	$250	$750
New electrical service connection	IS	1	$5,000	$5,000	$10,000	$10,000	$15,000
Treatment building (20' x 25'): pre-engineered	LS	500	$30	$15,000	$30	$15,000	$30,000
Heating and ventilation for treatment building	LS	1	$2,000	$2,000	$1,500	$1,500	$3,500
Containment dike/building sump	LS	1	$2,500	$2,500	$1,500	$1,500	$4,000
Sump pump	EA	1	$600	$600	$1,200	$1,200	$1,800
Pressure switch	EA	1	$500	$500	$500	$500	$1,000
Pressure gauges	EA	4	$100	$400	$200	$800	$1,200
1/2" FRP piping, 150 lb. pressure rated flgd.	LF	20	$5.83	$117	$4.20	$84	$201
1" FRP piping, 150 lb. pressure rated flgd.	LF	40	$8.75	$350	$6.30	$252	$602
3" FRP piping, 150 lb. pressure rated flgd.	LF	30	$13.20	$396	$9.10	$273	$669
6" FRP piping, 150 lb. pressure rated flgd.	LF	30	$22.80	$684	$14.00	$420	$1,104
8" FRP piping, 150 lb. pressure rated flgd.	LF	30	$29.85	$896	$17.85	$536	$1,431
10" FRP piping, 150 lb. pressure rated flgd.	LF	120	$40.45	$4,854	$23.45	$2,814	$7,668
Heat tracing for "exposed" 10" piping	LF	90	$4.42	$398	$1.01	$91	$489
Insulation for "exposed" 10" piping, 2" thick	LF	90	$9.09	$818	$5.10	$459	$1,277
Thermostat control for heat tracing	LS	1	$500	$500	$200	$200	$700
Pilot study and pump test	LS	1			$50,000	$50,000	$50,000

TABLE 6-1

ENGINEERING COST ESTIMATES-GROUND WATER TREATMENT
(Page 7 of 7)

Item Description	Unit	Estimated Quantity	Materials Unit Cost	Materials Total Cost	Installation Unit Cost	Installation Total Cost	Total Cost
Misc. electrical/wiring/controls	LS	1	$5,000	$5,000	$5,000	$5,000	$10,000
Misc. site improvements/restoration	LS	1	$2,000	$2,000	$2,000	$2,000	$4,000
Misc. equipment rental	LS	1			$1,500	$1,500	$1,500
Misc. mechanical, fittings, valves, & piping	LS	1	$15,000	$15,000	$15,000	$15,000	$30,000
MATERIAL SUBTOTALS				$200,100		$136,500	$336,600
SHIPPING[1]							$6,000
CONTRACTOR: LABOR, TAXES, & INSURANCE[2]							$20,500
EQUIPMENT PASS THROUGH[3]							$20,000
ENGINEERING[4]							$39,300
CONSTRUCTION MANAGEMENT[4]							$39,300
CONTINGENCIES[5]							$94,300
TOTAL							**$556,000**

Notes:

[1]Shipping is calculated at 3% of the total material cost.
[2]Contractor LT&I is calculated at 15% of total installation cost.
[3]Equipment Pass Through is calculated at 10% of total materials cost.
[4]Engineering & Construction Management is calculated at 10% of the construction subtotal.
[5]Contingencies is calculated at 20% of the total costs, which includes construction subtotal, engineering, and construction management.

TABLE 6-2

ENGINEERING COST ESTIMATE SUMMARY - GROUND WATER TREATMENT

Air Stripping Remedial Alternative	Equipment	Engineering	Management	Contingencies	Total Cost
1. Ground Water Recovery System (HDPE buried pipe)	$348,700	$35,700	$35,700	$85,600	$506,000
2. Treated Water Discharge to Waste Water Treatment Plant (via Wire Mill Process Cooling System)	$206,000	$21,200	$21,200	$50,800	$300,000
3. Air Stripping System (without air emission controls)	$383,100	$39,300	$39,300	$94,300	$556,000
TOTAL COST	**$939,000**	**$96,000**	**$96,000**	**$231,000**	**$1,362,000**

TABLE 6-3

OPERATING COST ESTIMATES GROUND WATER TREATMENT AIR STRIPPING SYSTEM (without air emissions controls)

Item	Description	Unit[1]	Estimated Quantity	Unit Price	Total Cost
1.	Power requirements:				
	purge well pumps (65 hp)	KWHR	413,135	$0.035	$14,460
	transfer and metering pumps (50 hp)	KWHR	317,796	$0.035	$11,123
	blower (25 hp)	KWHR	156,898	$0.035	$5,561
	misc. requirements: compressor, etc.	KWHR	31,780	$0.035	$1,112
2.	Oxidant:				
	10 ppm of H_2O_2 from 50% solution	LB	52,421	$0.52	$27,259
3.	Acid:				
	98% H_2SO_4 (0.38 gal/1,000 gal)	GAL	119,467	$0.70	$83,627
4.	Labor:				
	checking operations	HR	355	$25	$8,875
	equipment maintenance/repair	HR	400	$25	$10,000
	administration	HR	208	$25	$5,200
	misc. labor	HR	104	$25	$2,600
5.	Equipment maintenance/repair	LS	1	$10,000	$10,000
6.	Packing replace/dispose/install[2]	CF	503	$35	$17,592
7.	Monitoring (analytical):				
	Weekly testing of influent/effluent	EVENT	52	$250	$13,000
	SUBTOTAL				$210,000
	Misc. Professional Services				$10,000
	Net savings from reduced river water pumping[3]				- $8,000
	ANNUAL OPERATING COST				$212,000

NOTES:

(1) KWHR - Kilowatt hour, LB-pound, GAL-gallon, HR-hour, LS-lump sum, CF-cubic feet.

(2) Assume replaced every 3 years.

(3) Power savings for decreased load on Illinois River water pump.
Cost estimated based on estimated power required to pump 615 gpm at 50 psig & 50% efficiency.

APPENDIX A

WORK PLAN TO PERFORM AQUIFER TEST AND AIR STRIPPER PILOT STUDY

WORK PLAN TO PERFORM AQUIFER TEST AND AIR STRIPPING PILOT STUDY

KEYSTONE STEEL & WIRE COMPANY
BARTONVILLE, ILLINOIS

Prepared by

WW ENGINEERING & SCIENCE
5010 STONE MILL ROAD
BLOOMINGTON, INDIANA 47408

MARCH 1992

PROJECT 07029

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FIGURE

1 Well and Equipment Locations for Aquifer Testing

TABLES

1 Summary of Experimental Procedure for Air Stripping Pilot Study
2 Summary of Inorganic Analytical Methods for Ground Water

APPENDICES

A Standard Operating Procedures
- A-3 Elevation Survey for Monitoring Wells
- A-7 Installation of Permanent Monitoring wells with Hollow-Stem Augers
- A-24 Water Level Measurements
- A-29 Decontamination, Downhole Sampling Equipment
- A-35 Soil Boring Drilling Using Hollow-Stem Augers

B Chain-of-Custody Form

1.0 INTRODUCTION

1.1 BACKGROUND

On July 1, 1991 Keystone Steel & Wire Company (Keystone) submitted to the Illinois Environmental Protection Agency (IEPA), as part of the Phase 2 Closure Plan, a proposal for remediation of on-site ground water impacted by volatile organic compounds (VOC's). The proposed ground water remedial action plan included ground water capture and recovery using a network of purge wells, treatment of recovered ground water via air stripping, and discharge of treated ground water to surface water via the process cooling water system and existing waste water treatment plant. The preliminary design phase of the remedial action plan included an aquifer test and air stripping pilot study to confirm the feasibility of the proposed treatment and to provide a basis for design and implementation of the proposed air stripping system. This Work Plan fulfills the preliminary design requirements and schedules proposed in the Phase 2 Closure Plan.

1.2 PURPOSE

The purpose of this Work Plan is to describe the methods, analyses, and evaluation procedures which will be used to confirm the feasibility of using air stripping for treatment of the ground water and to develop the basis of design for the proposed ground water remediation system (e.g. number and locations of purge wells, recovery rates for purge wells, contaminant-specific mass transfer parameters, scaling potential of treated and untreated ground water, other operation parameters, etc.). An aquifer test and air stripping pilot study will be performed to provide the site-specific data necessary for completion of these tasks.

1.3 BASIS FOR AQUIFER TEST AND PILOT STUDY

The aquifer test will be performed to determine, under dynamic pumping conditions, the site-specific parameters which control the flow of ground water beneath the site. The results of the aquifer test will be used to accurately determine the aquifer characteristics in the test area and calibrate the ground water flow model previously developed for the site. Aquifer characteristics (e.g. hydraulic conductivity) determined during the pumping test will be compared to slug test data obtained during previous investigations. In addition, the pumping test will allow for determination of parameters (e.g., storativity and leakage) which could not be measured under the static conditions of previous testing.

The aquifer characteristics determined during the pumping test will be applied across the site, using the ground water flow model. The slug test data obtained previously will be scaled to estimate hydraulic conductivities which are indicative of actual pumping conditions and to allow for evaluation of variability in hydrogeologic conditions across the site. These values will be used to calibrate the ground water flow model. The calibrated ground water flow model will be used to determine the optimum site-wide ground water capture and recovery system.

The test area will consist of the localized zone near a test purge well which will be installed for the aquifer test and air stripping pilot study. This test purge well will also be designed to be used as a recovery well in the full-scale treatment system. The test purge well will be located east of the Chicago and Northwestern Railroad tracks as shown on Figure 1. This area is suitable for the aquifer and pilot tests because the aquifer contains elevated concentrations of the two primary VOC's, trichloroethylene (TCE) and 1,1,1-trichloroethane (TCA), and the proximity of an existing sanitary sewer reduces the equipment requirements for discharge of treated water during the test.

The data generated during the air stripping pilot study will be considered representative of the site-specific ground water treatability and will be evaluated to develop full-scale design parameters and to identify the need for additional treatment/conditioning of the ground water. This basis is consistent with the variability in water quality and contaminant concentrations observed during previous investigations.

The ground water recovered during the aquifer test will be treated by a pilot air stripping system and discharged to the sanitary sewer. Discharging the treated ground water will minimize the requirements for test permits and effluent water quality. Discharge of the treated ground water to surface water would require a National Pollutant Discharge Elimination System (NPDES) permit and more stringent effluent standards to be met during the test. Therefore, it has been concluded that for the aquifer and pilot testing, discharge of treated ground water to the sanitary sewer would be the most expeditious and cost-effective alternative.

2.0 TEST PERMITS

Prior to performing the aquifer test and air stripping pilot study, the appropriate air and water discharge permits will be obtained. To expedite the approval of the permit applications, the permits will be for the test period only and will not include full-scale

treatment. In addition, the results of the aquifer test and air stripping pilot study will be used to develop the basis for preparation of full-scale permit applications.

A permit application will be prepared and submitted to the Greater Peoria Sanitary and Sewer Disposal District (local publicly owned treatment works) for discharge of the treated ground water from the aquifer test and pilot study. Also, in accordance with IEPA policy, a permit application for the proposed discharge of ground water will be prepared and submitted to the IEPA Division of Water Pollution Control. These permits will describe the treatment process to be used and the conditions of the proposed discharge to the sanitary sewer, including but not limited to, the maximum allowable discharge flow rates and contaminant concentrations, discharge location, duration of the test period, etc.

In addition, applications for air permits to construct and operate will be prepared and submitted to the IEPA Division of Air Pollution Control for approval. The permit applications will include estimated influent and effluent ground water concentrations, maximum air contaminant concentrations and flow rates to be discharged, stack height and diameter, distance from stack to nearest plant boundary, etc.

3.0 AQUIFER TEST

An aquifer test will be performed to determine under dynamic pumping conditions the site-specific aquifer characteristics that control ground water flow beneath the Keystone site. The results of this testing will be used to calibrate the preliminary ground water modeling presented in the Phase 2 Closure Plan and to develop a basis for full-scale design of the site wide ground water capture system.

The ground water recovered during the aquifer test will be treated with a pilot air stripping system and will meet the applicable pretreatment standards prior to being discharged into the Peoria sanitary sewer.

3.1 TEST PURGE WELL DESIGN AND INSTALLATION

A test purge well will be designed and installed to provide the ground water recovery rates necessary for the aquifer test.

3.1.1 PILOT BORING

Proper design of a purge well requires an accurate determination of the grain size and sorting of the sediments at the exact well location. To determine these factors, a pilot boring will be drilled and sampled using the standard operating procedures for hollow-stem auger drilling and sampling (Appendix A). Samples from the pilot boring will be collected using split spoon samplers at continuous 2-foot intervals throughout the expected screened interval of the purge well. All drilling and sampling equipment used during this investigation will be properly decontaminated following the standard operating procedure for decontamination of downhole sampling equipment (Appendix A).

3.1.2 TEST PURGE WELL DESIGN

Sediment samples from the pilot boring will be analyzed to determine the grain size and sorting of the sediments at the proposed purge well location. These data will be used to design a purge well which will have the hydraulic capacity anticipated to be necessary at this location for operation of the site wide ground water capture system. Based on the results of preliminary ground water modeling, it has been estimated that a maximum ground water recovery rate of approximately 100 gallons per minute (gpm) may be required in this area.

The purge well design will include determination of the appropriate drilling method for purge well installation, proper screen type and size, grain size and thickness of the sand pack, well diameter, specifications of all materials including a pitless adapter, and grouting requirements. Based on the hydrogeologic conditions determined during previous investigations, it is expected that the test purge well will be approximately 95 feet deep and consist of a 6-inch diameter, 20-foot-long stainless steel well screen with 6-inch diameter schedule 80 polyvinylchloride (PVC) riser pipe. Sediments from the drilling of the purge well will be screened with a photoionization detector (PID), and impacted soils will be placed in drums pending proper characterization for disposal.

3.1.3 TEST PURGE WELL INSTALLATION

Following design of the test purge well, a qualified drilling subcontractor will be selected for installation of the purge well. Drilling field work will be conducted under the supervision of a field geologist to certify well installation details and quality.

Following the installation of the test purge well, the well will be developed until the purge water is free of suspended sediment. Development water, which is expected to be of limited volume, will be discharged to the local publicly owned treatment works (POTW). A temporary submersible pump will be installed in the well to provide the necessary ground water recovery for conducting the aquifer test, since the operating conditions for the full-scale system will be determined later during full-scale system design.

3.2 Piezometer Installation and Elevation Survey

Accurate evaluation of an aquifer test requires water level drawdown measurements at several distances away from the purge well. Prior to conducting the aquifer test, additional piezometers will be installed for the collection of water level drawdown measurements. Based on the proposed location of the test purge well, three piezometers may be required for the aquifer test. Approximate locations of these piezometers are shown in Figure 1. These piezometers will also be used for future evaluation of the performance of the site wide ground water capture system.

Piezometers that are required for evaluation of the aquifer test will be installed using standard operating procedure for installation of permanent monitoring wells with hollow-stem augers (Appendix A). The piezometers will be constructed with 5-foot long, 2-inch diameter, stainless steel well screens and 2-inch diameter PVC casings. The screened interval of piezometers will be installed at the elevation of the top 5 feet of the screen for the test purge well. The boring for each piezometer will be continuously sampled to total depth. Each piezometer will be grouted in place for permanent use as a monitoring well and completed at the ground surface with either a locking pro-casing or a flush mount manhole assembly and locking well cap.

Following the installation of the piezometers and test purge well, all new wells will be surveyed using standard operating procedure for elevation surveys (Appendix A).

3.3 METHODS

3.3.1 Antecedent Data

Prior to beginning the pumping phase of the aquifer test, water level data will be collected for seven days to determine any aquifer fluctuations which may affect the interpretation of the test results. Additionally, barometric pressure will be measured for

seven days prior to beginning the aquifer test to determine if fluctuations in atmospheric conditions affect the measurement of water levels in the wells due to a confined aquifer response.

Water levels and barometric pressures will be measured using a Hermit Datalogger and pressure transducers. The Hermit system is a computerized water level recording system which makes rapid and precise measurements of water levels. The water levels will be recorded from three wells (the test purge well, T-7, and T-10) at thirty-minute intervals for seven days prior to the start of the pumping phase of the test. The combination of water level data and barometric pressure data will allow the determination of the barometric efficiency and data correction if a confined aquifer response is observed.

3.3.2 Drawdown Phase

The drawdown phase of the aquifer test will be conducted in stages or steps over a period of approximately five days. First, a step test will be performed during which the ground water recovery rate is varied from 20 gallons per minute (gpm) to 30 gpm to 40 gpm. During each step, the ground water recovery rate will be held constant for a minimum period of approximately 2 hours before being increased. Forty gallons per minute is approximately the hydraulic capacity of the air stripping system to be used for treatment of the ground water recovered during the test. The step test will provide data on the aquifer characteristics while allowing for evaluation of air stripping technology at different operating conditions. After the step test is completed, a constant rate test will be performed at 40 gpm for the remainder of the test period, or approximately four days. The ground water recovered during the test will be treated by the pilot air stripping system and discharged to the sanitary sewer.

As with the antecedent data, water level and barometric pressure measurements will be collected during the drawdown phase using Hermit Dataloggers and pressure transducers. Water level readings will be taken in the three piezometers and the test purge well. Water levels in adjacent monitoring wells (T-3, W-4, T-7 and T-10) will be measured periodically using an electric water level tape following standard operating procedure for water level measurement (Appendix A). The collection of data in the wells included in the test will be synchronized with the start of pumping in the test purge well.

The discharge rate of the purge well will be measured using an in-line water flow meter and adjustments to the flow rate will be made manually with valves, as required, to

maintain a constant pumping rate during each step of the test. The pumping rate will be monitored continually at the start of each step of the test and periodically throughout the test to maintain the accuracy of the test.

Water levels will also be periodically measured in the wells using an electrical water level tape to check the operation and accuracy of the Hermit system.

3.3.3 Recovery Phase

Following the completion of the stepped and constant rate drawdown phases of the test, the purge well will be shut off to allow the water level to return to static conditions. During the recovery phase, water levels will be collected at logarithmic time intervals using the Hermit Dataloggers and pressure transducers and the same procedures employed in the drawdown phase. Recovery phase water levels will be taken for approximately three days or until the water levels have recovered 95 percent. The pump in the test purge well will be equipped with a check valve to prevent the downward flow of water into the well after the pump has been turned off to allow for measurement of ground water recovery in the test purge well.

3.4 RESULTS

3.4.1 Data Evaluation

Results of the aquifer test will be evaluated to determine the aquifer characteristics at the site. Each phase of the aquifer test will be evaluated using appropriate analytical methods. The analytical methods to be used will depend on the type of aquifer response observed during the test. If the aquifer exhibits a water table response to pumping, the results of the test will be evaluated using the Neuman-Delayed-Yield method. If the aquifer exhibits a confined aquifer response to pumping, the test data will be evaluated using the Theis-Curve-Matching method. If the aquifer demonstrates a leaky confined response to pumping, the test will be evaluated using the Hantush-Jacob-Leaky-Confined method. In addition, to these analytical methods, the Jacob-Semilog-Straight-Line method may be used for interpretation of the test data. Using these methods, values for the site-specific hydrogeologic parameters: transmissivity, storativity, leakage, etc. will be determined. The data evaluation will involve a variety of analytical, graphical, and computer-aided techniques.

3.4.2 GROUND WATER MODELING

The results of the aquifer test will be used to support a computer model evaluation and design of the full-scale ground water capture system. The computer model previously designed for preliminary evaluation of remedial alternatives will be recalibrated using the aquifer test results. The refined model will be used along with the most recent ground water monitoring data and IEPA ground water cleanup standards to develop a conceptual design for the ground water capture system. The conceptual design will include the number, location, and pumping rates for the purge wells necessary for capture of the dissolved contaminant plume.

3.4.2.1 Existing Model

For evaluation of the ground water remediation alternatives and preparation of the Phase 2 Closure Plan, a preliminary computer model was prepared that simulated the ground water flow conditions at the site and estimated the ground water recovery requirements for capture of the dissolved contaminant plume. The results of this preliminary modeling are shown in the Phase 2 Closure Plan. The preliminary ground water flow model used the MODFLOW-386 computer software developed by M.G. McDonald & A.W. Harbaugh of the United States Geological Survey (U.S.G.S.) and is entitled "A Modular Three-Dimensional Finite Difference Ground-Water Flow Model." The model was established to simulate the site conditions and was run as a two layer system consisting of a lower aquifer unit overlain by a leaky confining layer. In the model, both of these layers are bordered by constant head boundaries and simulate the effects of precipitation, horizontal ground water flow, vertical ground water flow, and surface water flow across the site.

The preliminary ground water flow model was initially calibrated to December 20, 1990 water table elevations using the steady-state flow option. A calibration accuracy of approximately two feet was obtained for both layers over most of the model area. The results of this calibration will be used as a starting point for recalibration of the existing model. The transient flow option of the software will be used to recalibrate the model using the water table measurements obtained under the dynamic pumping conditions of the aquifer test. Upon completion of the transient flow calibration, the model will be run without the pumping stress (under static conditions), and the output will be compared to the results of the December 20, 1990 calibration. If necessary, additional modifications

may be made to calibrate the model to this previous set of water table measurements and the aquifer test results.

3.4.2.2 Proposed Model Simulations

After the model has been recalibrated under active pumping conditions, a series of purge well configurations and pumping scenarios will be evaluated using the ground water flow model to determine the optimum configuration of purge wells and extraction rates which results in the capture of the dissolved VOC plume. To determine the most effective capture system, purge well locations and pumping rates for each proposed purge well configuration will be evaluated for a series of model runs. During the evaluation of each proposed purge well array, the resulting zone of ground water capture will be investigated using particle tracking software, MODPATH-386.

4.0 AIR STRIPPING PILOT STUDY

An air stripping pilot test will be performed to confirm the effectiveness of air stripping technology for removal of dissolved VOC's, provide full-scale design parameters, and refine the basis of design for full-scale air and surface water discharge permit applications. Air stripping technology will be evaluated by treating the ground water recovered during the aquifer test with a Mobile Pilot Stripper (MPS). The MPS is trailer-mounted and is capable of treating up to 40 gpm in an air stripping mode. The MPS operates using an eighteen inch diameter (nominal) packed column, with a packing height which can be varied between ten and twenty feet. The column is randomly packed with 1.5-inch long-term heat aged (LTHA) polypropylene Pall rings. This results in a ratio of column diameter to nominal packing size of approximately twelve. This ratio is expected to be sufficient to minimize any potential wall effects during operation. The MPS will generate treatability data which will be used to determine design parameters for the full-scale ground water treatment system.

4.1 METHODS

4.1.1 PROCESS VARIABLES

Process variables which include ground water flow rate, air flow rate, and packing height will be controlled during the pilot study. The pilot system will be operated during the five days of the aquifer test, and these process variables will be changed according to the schedule shown in Table 1. The resulting response in treatment efficiency will be

monitored by sampling and analysis of influent and effluent from the MPS after steady-state have been achieved. Steady-state conditions are conservatively estimated to be reached after two hours of continuous operation at the specified conditions.

The air flow velocity will be measured with a Pitot tube installed in the ambient air inlet line to the air stripping column, and the air flow rate will be calculated using the cross-sectional area of the inlet line and air velocity measurements. The water flow rate will be monitored in the same manner as that used for the aquifer test.

Packing height of the MPS will also be changed manually during the study. To allow for the packing height change, the MPS and ground water pump test will be shut down temporarily. The packing height change will consist of installation of an additional 10 feet of packed column and will be coordinated with scheduled shut down between the step and continuous-rate phases of the aquifer test.

The MPS will be operated by an engineer and field technician for the duration of the study. Records of operating conditions and sample collection will be maintained in a bound notebook. The MPS will be operated at ground water flow rates of 20, 30, or 40 gpm.

Depending on the discharge standards imposed by the GPSSD, effluent from the air stripper may need to be further treated by a bed of activated carbon to meet effluent standards during all phases of the study. The pilot study has been designed to provide for fluctuations in the removal efficiency achieved by the MPS when changes in the process conditions are made. These changes in removal efficiency (effluent concentrations) are necessary because they allow the optimum operating conditions and design basis for the full-scale air stripping system to be determined. The effluent concentrations resulting from the proposed changes in operating conditions will be estimated using a computer program which simulates the performance of a conventional air stripping system. If the effluent concentrations resulting from the proposed changes in operating conditions are expected to exceed the discharge standards, activated carbon polishing may be required prior to discharge into the sanitary sewer. The need for activated carbon polishing of the effluent will be determined during the permitting phase of the pilot study.

Based on the results of preliminary discussions with representatives of IEPA Air Quality Division, it has been estimated that the anticipated maximum air emissions from the MPS will comply with the applicable requirements regarding discharges of air contaminants.

Therefore, it has been assumed that air emission controls will not be required for the pilot study.

4.1.2 Sampling and Analysis of Ground Water

Samples of the influent and effluent ground water will be collected from the sample taps located on the influent and effluent lines of the MPS. The proposed schedule for sampling and analysis of ground water influent and effluent samples is shown in Table 1. The sampling procedure will consist of opening the sample valve, flushing the line to ensure that all stagnant water is removed, and filling of three 40 milliliter glass vials, taking care not to agitate the samples or introduce air bubbles. The sample vials will be sealed with caps containing Teflon-lined septa. The samples will be inverted after collection to check for the presence of air bubbles. Sample tags will be attached immediately to the samples indicating sample location, date and time of sample collection, and the initials of the individual who collected the sample. The samples will also be logged on a chain-of-custody form, as shown in Appendix B.

Influent and effluent samples will be stored on ice in separate coolers and transported to the laboratory after two days of operation and at the conclusion of the air stripping pilot study. The samples will be logged in and the chain-of-custody form will be signed over to the Analytical Laboratory. The samples will be analyzed for the full scan of VOC's currently analyzed in quarterly monitoring of the on-site ground water using U.S. EPA method 8240, from SW-846, 3rd edition. Of those VOC constituents, TCA and TCE are considered the primary contaminants. These data will be used to determine the removal efficiency achieved by the MPS for each set of operating conditions.

Influent and effluent ground water samples will also be collected and analyzed for parameters which describe the scaling or fouling potential of the ground water. Four sets of influent and effluent samples will be collected and analyzed for calcium, iron, magnesium, manganese, total alkalinity, bicarbonate alkalinity, total hardness, total dissolved solids, total organic carbon, total suspended solids, and pH. U.S. EPA methods listed in Table 2 will be used for these sample analyses. These data will be used to evaluate the scaling or fouling potential of the ground water before and after treatment and to determine the need for a chemical feed system for control of scale deposits or biological growth in the full-scale treatment system.

The laboratory follows U.S. EPA SW-846, (3rd edition) guidelines for quality assurance/quality control (QA/QC) procedures. These procedures are acceptable for routine monitoring included as a requirement of NPDES permits, and therefore, should be adequate for monitoring the discharge to the sanitary sewer. For every batch of 20 samples, one matrix spike (in the ground water matrix), one method spike (in deionized water), and one duplicate sample are analyzed. Trip blanks containing laboratory grade deionized water will accompany the sample bottles throughout the pilot study. One trip blank will be provided for each cooler which contains samples for analysis of VOC's. An equipment blank is provided in the experimental design summarized in Table 1. Test No. 1 will be the equipment blank since it will be collected from the MPS effluent port during operation without the addition of air.

4.1.3 Relative Volatility Analyses

The relative volatility is a compound-specific design parameter that affects the removal of individual VOC's in an air stripping system. For design of an air stripping system, the relative volatility of a VOC is defined as the VOC air concentration that is in equilibrium with a particular VOC water concentration at a certain temperature and pressure. Previous experience indicates that the relative volatilities presented in the literature may not be accurate, particularly for extremely dilute solutions (low ug/l).

Air and water analyses will be performed by the laboratory to determine the relatively volatility of TCA in dilute water solutions. The relative volatility of TCE previously determined will be used for evaluation of design parameters and development of the full-scale basis of design. Standard dilute solutions of TCA in water will be prepared by spiking deionized water samples with known amounts of TCA. Standard gas mixtures of TCA in air will also be prepared by spiking "zero gas" air samples with known amounts of liquid TCA. These standard gas mixtures will be used for calibration of the solvent vapor analyses. Four dilute solutions of TCA in water (10,000 ug/l, 1,000 ug/l, 100 ug/l, and 10 ug/l) will be prepared in 40 milliliter glass vials with Telfon-lined septa. The vials containing these dilute standard solutions will be half-filled so the volume of water in the vials will be approximately equal to volume of air or head space in the vials. The standard solutions will be allowed to equilibrate for approximately one hour at a temperature of about 10 degrees Celsius (^{o}C), which is the approximate temperature of the ground water. The head space concentration of TCA will then be analyzed in the vials using gas chromatography.

The TCA vapor head space and water concentrations for the solutions will be converted into equivalent molar weight fractions for calculation of the relative volatility. Literature values of vapor and liquid equilibrium constants for dilute solutions (Henry's Law constants) that are based on mass concentrations should not be used as mass transfer design criteria. The mass transfer equations used to determine removal efficiencies for air stripping are based on mole fractions.[1] Therefore, the relative volatility will be calculated using mole fractions rather than mass concentrations.

The relative volatility for each concentration will be determined by dividing the mole fraction of TCA analyzed in the vapor head space by the mole fraction of TCA in the water solution.

4.1.4 Acid Titrations

One influent and effluent ground water sample will be collected during the test for titration with sulfuric acid to determine the dosage requirements for acid treatment of the water. Acid treatment of the ground water may be necessary to control calcium carbonate scaling or fouling in the air stripping tower and/or discharge to the process cooling water system. One liter samples of ground water will be titrated with sulfuric acid and titration curves will be developed. The titration will be continued until the end point is defined. The results of the titrations will also be used to evaluate the need for chemical treatment.

4.2 RESULTS

The analytical data obtained from the study will be summarized in tables along with air and water flow rates and other operating conditions. The removal efficiencies for each constituent will be determined from the analytical results and will also be included in these tables.

4.2.1 Mass Transfer Design Criteria

The equilibrium concentrations of TCA in air and water analyzed will be used to calculate the relative volatility of TCA in dilute solutions. Using the values of relative volatility determined for TCA and previously developed for TCE and literature values for other minor constituents, stripping factors will be calculated for each constituent at each

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1 Hines, A.L. and R. N. Maddox, Mass Transfer Fundamentals and Applications, Prentice-Hall, Inc. 1985. p. 152.

air to water ratio in the pilot study. These stripping factors, along with influent and effluent concentrations, will be used to establish the number of transfer units (N_{OL}) achieved by the MPS. Calculation procedures for determining N_{OL} for stripping from dilute solutions have been outlined by Treybal[2] and by Hines and Maddox.[3]

Based on the respective N_{OL} values and overall packed height, values for the height of transfer unit (H_{OL}) will also be determined. The H_{OL} is a parameter which describes the mass transfer criteria that control the removals achieved in an air stripping tower under certain operating conditions (degree of air to water contact). H_{OL} values are expected to be relatively constant regardless of the packed height used and the compound used for calculation.

Treatment efficiency in packed towers is known to vary with liquid and vapor loading. In the case of packed air stripping columns, this variation is primarily dependent upon liquid loading and is typically observed as an increase in H_{OL} with increased liquid flow rate. This relationship will be evaluated by plotting values of H_{OL} versus liquid loading (mass flow rate of water divided by column cross-sectional area) for the various operating conditions. From this plot, values of H_{OL} for use in full-scale tower design will be estimated based on liquid loading. Since it is anticipated that 1.5-inch LTHA polypropylene Pall rings will also be used in the full-scale air stripping system, the estimated H_{OL} values will be used in the preliminary design of the full-scale tower, with the addition of a small contingency to account for any potential maldistribution in a larger diameter tower.

4.2.2 Chemical Treatment Requirements

Calcium carbonate ($CaCO_3$) scaling or fouling can occur due to a shift in the carbonate balance which can result when carbon dioxide is stripped from the ground water during the air stripping process. The calcium carbonate scaling tendency of the ground water before and after air stripping treatment will be evaluated using the Langlier Index.[4] The Langlier Index is defined as the difference between the actual (measured) pH of a water sample and the hypothetical pH the water would have if it were in equilibrium with calcium carbonate (i.e., pH at which no calcium carbonate precipitates). The scale

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2 Treybal, R.E., Mass-Transfer Operations, 3rd Ed. McGraw-Hill Inc. 1980. p. 309.

3 Hines, A.L. and R. N. Maddox, Mass Transfer Fundamentals and Applications, Prentice-Hall, Inc. 1985. p. 152.

4 Snoeyink, V.L. and D. Jenkins, Water Chemistry, John Wiley & Sons. 1980. p.289.

forming tendency of the ground water samples may also be evaluated using the Ryznar or stability index.[5]

Relatively high concentrations of other inorganic constituents can also cause fouling of the air stripping tower packing and downstream equipment due to precipitation of inorganic scale or biological growth (caused by iron, manganese, and other bacteria). Iron bacteria derive energy from oxidation of ferrous ions in solution to ferric ions and may result in the formation of an insoluble precipitate which can add to tower/equipment fouling. Similar effects may also be observed from oxidation of iron by exposure to air in the air stripping tower. Manganese may also be oxidized by bacteria or air contact in the stripping tower to an insoluble precipitate and contribute to tower fouling.

The inorganic analytical results obtained during the pilot study will be used to calculate Langlier indices and establish chemical treatment requirements for the full-scale stripping system. The scaling potential of both the influent and effluent from the air stripping system will be evaluated to determine if chemical treatment (acid addition) is necessary for control of scaling deposits in the full-scale air stripping system. The results of the iron and total organic carbon analyses will also be evaluated to establish the need for chemical treatment (oxidant addition) to control bacteria growth in the full-scale tower.

Based on the results of previous inorganic analyses of ground water samples from the site, it is likely that chemical treatment may be required to control scale deposits in the full-scale air stripping tower and/or discharge to the process cooling water system. Past experience has shown that iron concentrations exceeding 5 mg/l and hardness concentrations exceeding 300 mg/l as $CaCO_3$ may signal the need for some chemical treatment.

The results of the acid titrations on the influent and effluent ground water samples will be used to determine dosage requirements for chemical treatment. Evaluation of the need for chemical treatment will also be based on these dosage requirements.

4.2.3 Preliminary Design Parameters

Using the results of the pilot testing and literature values, preliminary, technology-based NPDES effluent standards will be proposed. Based on review and interpretation of the data obtained from the pilot study and the proposed NPDES effluent standards, the

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5 Kemmer, F.N., The Nalco Water Handbook, 2nd ed. Mc-Graw Hill. 1988. p. 417.

following preliminary design parameters will be developed for full-scale treatment of the ground water recovered by the proposed capture system:

- Cross-sectional area of the stripping column,
- Height and characteristics of packing material,
- Air-to-water flow ratio,
- VOC removal efficiencies, and
- Chemical treatment requirements.

The full-scale capital and operating cost estimates prepared for the air stripping remediation proposal in the Phase 2 Closure Plan may be refined based on the results of the aquifer test and pilot study.

5.0 REPORT

After the preliminary design parameters for the ground water capture and air stripping systems have been developed, a report of our findings and recommendations will be prepared. The report will summarize the data collected during the aquifer test and pilot study along with conclusions regarding the technical feasibility of using air stripping and the basis for full-scale design derived from the test. A preliminary process and instrumentation diagram (P&ID) of the proposed ground water air stripping system will be prepared, and the preliminary cost estimates for treatment of the ground water via air stripping will be revised.

FIGURE

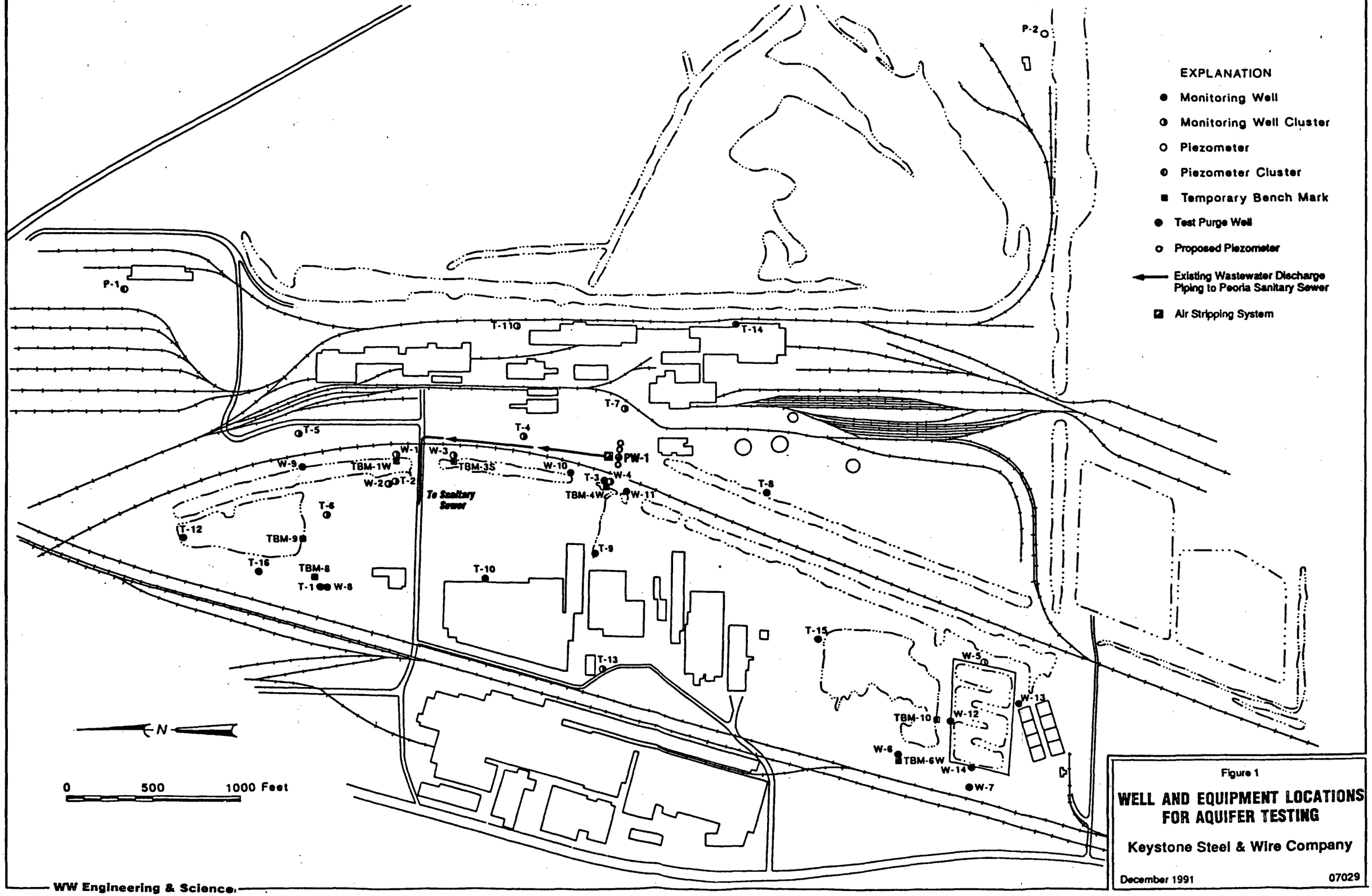

Figure 1

WELL AND EQUIPMENT LOCATIONS FOR AQUIFER TESTING

Keystone Steel & Wire Company

December 1991 07029

WW Engineering & Science

TABLES

TABLE 1

SUMMARY OF EXPERIMENTAL PROCEDURE FOR AIR STRIPPING PILOT STUDY

Test No.	Ground Water Flow Rate (gpm)	Air Flow Rate (cfm)	Packing Height (feet)	SAMPLE COLLECTION AND ANALYSIS VOC's Influent	VOC's Effluent	Inorganic Parameters Influent	Inorganic Parameters Effluent
1	20	0	10	x	x	x	x
2	20	200	10	x	x*	x	x
3	20	300	10	x	x*		
4	20	400	10	x	x*		
5	30	300	10	x	x*		
6	40	400	10	x	x*		
7	40	400	20	x	x*		
8	40	500	20	x	x*	x	x

* Duplicate samples will be collected and analyzed for QA/QC purposes during the pilot study. Duplicate samples are recommended to minimize potential for data scatter which may result due to sampling and analysis of VOC concentrations near detection limits.

TABLE 2

SUMMARY OF INORGANIC ANALYTICAL METHODS

FOR GROUND WATER

Parameter	U.S. EPA Test Method*
Calcium	200.7
Iron	236.1
Magnesium	200.7
Manganese	243.1
Total hardness	130.2
Total alkalinity	310.1
Bicarbonate alkalinity	310.1
Total dissolved solids	160.1
Total organic carbon	415.1
Total suspended solids	160.2
pH	150.1

* "Methods for Chemical Analysis of Water and Wastes," 3rd Ed., U.S. EPA. March 1983.

Appendix A

Standard Operating Procedures

ELEVATION SURVEYS FOR MONITOR WELLS

MINIMUM EQUIPMENT AND INFORMATION NEEDED

- standard surveyors level
- two persons
- well lock keys
- tools to open well caps
- survey forms
- tri-pod
- calculator
- stadia rod
- hand-held tape in 0.01-foot increments
- detailed well location map
- well numbers to be surveyed
- a point of known or relative elevation from which to begin survey

JOB DESCRIPTION

Obtain survey elevations for wells.

EXPECTATIONS

- Shoot and record well elevations at the ***top of casing***.
- Shoot and record ground elevation at each well location.
- Tie all loops together and to reference datum.

The data generated from the survey is used to obtain accurate elevations which are necessary to gain a common reference point from which groundwater elevations, well screen elevations, cross-section maps, elevation contour maps, and more can be generated and compared to each other.

Before going into the field, decide with the person who has requested the work what the reference point should be. If the reference point is to be taken from a U.S.G.S. datum, it is necessary to know exactly where that benchmark is before beginning the survey. If a relative datum (e.g., 100.00 feet) is used, choose a benchmark that is a part of a permanent structure. Accurately detail the location chosen so that results may be duplicated in the future if necessary. An example of a good permanent benchmark may be a specific corner of a concrete foundation of a specific building, or a specific point on a fire hydrant.

The basic procedure is (refer to Example 1):

A. Begin the survey by recording the elevation and location of the reference point.

B. Set up the tri-pod and surveyor's level at the first station and level the instrument. Check instrument level by rotating 180°; relevel if necessary.

C. Have one party hold the stadia rod on the reference point after the level and tri-pod have been set up.

D. Record the elevation shot in the +S column. By adding the +S to the known elevation, the height of the instrument (HI) will be determined:

Elevation + S = HI

E. The rod man moves in the general direction of the well location and chooses a good turning point. The turning point must be well defined and solid, such as a rock, tree, root, or the top of a screw driver driven solidly into the ground.

F. Record the reading at the turning point as a -S on the form. The -S reading is subtracted from the HI to give the elevation of the turning point:

HI - S = Elevation at Turning Point (TP - 1)

G. The instrument man now moves the tri-pod and level in the general direction of the well.

H. The new reading is recorded as a +S.

Elevation at TP - 1 + S = New HI

I. The procedure is repeated until a -S reading can be taken at each well top-of-casing and at each ground level at the well.

J. It may be necessary to use several turning points and loops to obtain all the data required. Be sure they are all tied together.

K. Once all the elevations have been recorded, close the loop. The rod man and instrument man proceed as before back to the original reference point. The loop is closed when the rod man returns to the original point of reference and that elevation is again recorded.

L. Clean the well cap threads with a wire brush and lubricate with teflon paste or beeswax before replacing.

M. Refer to the elevation survey illustration for a simple example.

ACCURACY

Each elevation measurement must be recorded to the nearest 0.01 foot. An elevation survey is of acceptable accuracy if the beginning and final elevation are within $\pm$0.03 feet.

Check the work when the survey is complete. Make sure the locations of the benchmarks are described in detail. Describe any difficulties which may have had an effect on the data. Turn in the paperwork when it is completed and legible to the person who requested it. Keep records for personal files.

HINTS

- If the rod cannot be positioned at the TOC, measure and record the elevation difference from TOC to the point where the rod was positioned.

- Rock the stadia rod toward and away from the instrument man at each location. The instrument man should record the lowest elevation reading as the rod is rocking. The lowest reading indicates when the rod is straight up and down.

- Use the top of casings (TOC's) as turning points. If this can be done, it will be possible to mathematically verify the results from the office.

IMPORTANT TERMS

BENCHMARK (BM):

A definite point of known or assumed elevation not subject to change. Permanent benchmarks have been established throughout the United States by the U.S. Coast and Geodetic Survey and the U.S. Geologic Survey (U.S.G.S.). Benchmarks are used as starting points for surveys requiring a common reference point.

SURVEY FIELD NOTES:

The record of the work performed. Typical entries should be:

- date
- description of weather
- names of individuals in the party and their responsibilities
- the instrument and methods being used

LEVEL NOTES:

The standard form for recording stations and elevations taken (see example).

PLUS SIGHT (+S):

A rod reading taken on a point of known or assumed elevation. The plus sight added to the elevation at the point gives the height of the instrument.

MINUS SIGHT (-S):

A rod reading taken on a point where elevation is to be determined. HI - S = the elevation of the point.

HEIGHT OF INSTRUMENT (HI):

The elevation of the line of sight when the instrument is level.

TURNING POINT (TP):

A solid, well-defined point on which the rod is set while the instrument is being moved from one location to another. A minus sight is taken on a TP from the first level set-up to determine its elevation. A plus sight (+S) is taken on a TP from the second set-up to determine the new height of the instrument.

TOP OF CASING (TOC):

The top of casing or top of threads is the uppermost point of the well casing.

INSTALLATION OF PERMANENT MONITOR WELLS WITH HOLLOW STEM AUGERS

The objective of any monitor well installation is to obtain a representative ground water sample from a desired depth interval. That sample should be obtained with a minimum of disturbance to the soil, ground water flow, and ground water chemistry in the aquifer. To meet this objective can be challenging but well worth the effort.

Using hollow stem augers (HSA) to install a monitor well does have advantages:

- The use of drilling fluids above the water table is not required.
- Accurate, undisturbed soil samples are obtainable.
- The water table is easily detected.
- The augers create a temporary casing within which the well can be constructed.

There are also disadvantages:

- The augers are useful only in relatively soft drilling conditions.
- Augers are limited to relatively shallow depths.
- It is usually necessary to introduce water or mud to advance a boring once a significant aquifer has been encountered.

PROCEDURE:

In ideal conditions, the construction of a monitor well inside the augers is straight-forward:

1. Advance the HSA to the desired depth.

2. Remove the center plug.

3. Install the steam-cleaned well.

4. Seal all the well joints with Teflon tape.

5. Set the well screen on the bottom of the hole. Pour the coarse grade sand inside the HSA to fill the annulus between the well screen and the borehole as the augers are pulled back. The sand pack should extend at least 1 to 2 feet above the top of the screen.

6. Pull the bottom of the auger string back to a depth just above the sand pack.

7. Seal the sand pack from the upper portion of the remaining borehole annulus with 1 foot of pelletized or coarse grade bentonite placed above the sand pack.

8. Pull the bottom of the auger string back to a depth just above the bentonite seal.

9. Tremie grout the remaining annular space. (The inside diameter of the augers has been carefully selected to allow enough room for a tremie rod to be lowered along the well casing inside the augers.) A cement/bentonite grout is mixed at the surface and pressure pumped down through the tremie rod to fill the annular space from the bentonite seal up to a depth of 2 feet below the land surface.

10. Finish the well construction at the ground surface with either a locking flush-mount cap or a locking protective casing set in concrete which slopes away from the well diverting any surface water from the well casing.

11. Develop the well until sediment-free water is produced. The well should be developed by a method which surges water into and out of the screen until relatively particle-free water is produced. It is best to perform the development after the grout has set.

Since ideal conditions are rarely encountered in the field, there are several factors which may cause a deviation from the ideal well configuration. These factors may necessitate the elimination of the sand pack or the bentonite seal, or both. In some cases, allowing the natural collapse of the saturated soil around the well screen provides sufficient sand pack for the well screen.

Proper placement of a bentonite seal for well screens placed far below the top of the water table can also prove impractical. In these cases, the bentonite seal may be forfeited to assure that the cement/bentonite grout will be properly placed with a tremie rod.

If the hollow stem I.D. will not allow a tremie rod, a clean flexible hose may be lightly taped to the length of the well casing prior to insertion to provide a conduit for delivering grout at depth.

All well construction data will be recorded on the standard well/boring log forms.

WATER LEVEL MEASUREMENT

There are two devices that are acceptable for measuring water levels. These are a steel tape and water-soluble carpenter's chalk, and an electric tape. While the electric tape reports measurements to 0.01 foot, it is less accurate than the steel tape method; therefore, the steel tape method should be preferred over the electric tape.

For some applications, the electric tape is preferred. An electric tape gives an accurate measurement to the water without actually going into the water. The electric tape is less likely to cross contaminate between wells that are to be sampled. Since the electric tape only touches the water, it is easier to decontaminate after a water level measurement is taken. Water levels are obtained more quickly than with a steel tape.

The steel tape and chalk method is very accurate. This method, however, is a little less desirable for measuring water levels on wells that are to be sampled. The steel tape method introduces chalk to the water, the tape becomes rusted, and it is necessary to submerge a small portion of the tape to obtain a correct measurement.

The standard procedure for taking a water level measurement, whether using an electric tape or steel tape and chalk, is basically the same.

JOB DESCRIPTION:

Obtain a round of water levels.

TASK-SPECIFIC EQUIPMENT AND MINIMUM INFORMATION NEEDED:

- steel water level tape or electric water level indicator
- water-soluble carpenter's chalk
- paper towels
- hand-held engineer's measuring tape
- well location map
- well keys
- previous water level or water elevation data

EXPECTATIONS:

Water levels will be taken at all the indicated wells and recorded to the nearest 0.01 foot.

Document the time, date, and the method of the measurement.

PROCEDURES FOR A STEEL TAPE AND CHALK:

1. Uncap all the wells of a cluster to be measured to allow the water levels to stabilize. Be sure to place the well caps on a clean area (use visqueen if necessary). Vented well caps should provide for minimum (essentially zero) time for water level stabilization.

2. Smear the graduated portion at the end of the tape with chalk.

3. Carefully lower the tape into the well until the chalked portion of the tape intersects the water in the well.

4. Advance the tape until the nearest one-foot increment of the tape is exactly even with the top-of-casing; record.

5. Recoil the tape from the well and read the water level measurement directly from the wetted portion of the tape; record.

6. Dry the tape with a paper towel and resmear it with chalk, and take a second, confirmation measurement; record.

7. Clean the tape before proceeding to the next well.

8. Replace the well cap.

PROCEDURES FOR AN ELECTRIC WATER LEVEL INDICATOR:

1. Uncap the wells.

2. Carefully lower the tape into the well.

3. The buzzer will sound as the probe hits the water. Once the buzzer has sounded, slowly pull the tape up until the buzzer turns off.

4. Read the measurement from the top-of-casing and record it.

5. Take a second measurement to confirm; record it.

6. Clean the tape before proceeding to the next well.

7. Replace the well cap.

Each time a water level measurement is taken, a second confirmation reading is necessary to ensure that the water level is stable. If the second measurement is within ±0.01 feet of the first, the measurement is good and can be recorded as a stable water level. If the second measurement does not confirm the first, then wait for the well to stabilize and try again.

Indicate in your field notes if the measurements were taken after or during a period of rainfall. Be alert to any irregularities observed which may have an affect on the water levels (such as a nearby pumping well).

Always record the date, time and method of each measurement.

If the measurement references a "holding point" other than the top of the casing, or you are unsure of which point is the top of casing, indicate the reference point used, measure the difference between the top-of-casing and the reference point, and provide a diagram.

DECONTAMINATION, DOWNHOLE SAMPLING EQUIPMENT

This guideline consists of minimum requirements for the decontamination of split-spoon sampling devices, temporary well materials, augers, and water sampling bailers used at hazardous waste sites for obtaining samples to be analyzed in the laboratory.

The requirements apply foremost to equipment being used to obtain samples for the laboratory and, therefore, are intended to minimize incidents of cross-contamination of samples. The requirements also apply to the auger where contaminated soils are sampled only for on-site identification purposes. This is to avoid cross-contamination of locations. The requirements apply to the auger, particularly when moving from a "dirty" to a "clean" location.

ANALYTE TYPES

Different decontamination steps are recommended for different kinds and physical states of analytes. The analyte types for this purpose are:

- **inorganics**--major dissolved ions, along with heavy metals.
- **dissolved organics**--organics as aqueous species, no "free" organic phase present.
  (1) *soluble organics*--ketones, alcohols, ethers, and others that are fairly to infinitely soluble in water
  (2) *VOC's*--sparingly soluble
  (3) *semi-volatiles*--sparingly soluble
  (4) *PCB's and pesticides*--nearly insoluble in water, but very soluble in oil
- **free organics**--a visible or suspected organic liquid phase. This is usually not an analyte, but when present interferes with analysis of the aqueous phase compounds and presents a strong potential for cross-contamination.
- **combination**

The decontamination procedures apply to equipment in contact with analytes whether present within a soil matrix or as a "free" liquid.

DECONTAMINATION FREQUENCY

The lead auger (and any flites affected by formation heave) should be decontaminated between each location. The split-spoon sampler, temporary well materials, and bailers should be decontaminated between each use. Well evacuation followed immediately by sampling would be considered a single use of a bailer. If two or more wells are consecutively evacuated prior to any sampling, or if there is a delay between evacuation and sampling the well, the bailer should be decontaminated after each evacuation. With a

few exceptions to be mentioned, all named equipment should receive the same kind of decontamination.

DECONTAMINATION PROCEDURES

The recommended decontamination steps are given in the accompanying table.

Where soluble organics, VOC's or semi-volatiles are present, the least time consuming decontamination method is steam cleaning. Although tap water is typically used for steam cleaning, no final DI rinse should be required because the steam should be at an elevated temperature which enhances the removal of volatiles. Steam cleaning should be always conducted at "live steam" temperatures, which exceed 212°F. Be sure the steamer water is taken from a public water supply or a source of known and approved quality. If you know or suspect that unvaporized water is carrying over, use a final DI rinse or halt work until the steamer is performing as it should. Also, be sure the steam delivery wand is of sufficient length to deliver live steam to remote points (e.g., center of 20-foot pipe section).

The inorganics and heavy metals call for an initial soapy wash, tap water rinse, dilute acid rinse, and a final DI rinse. The "soap" for the soapy wash can be a TSP (trisodium phosphate) product. If phosphate or phosphorus is an analyte, or otherwise disadvantageous, a low-phosphate detergent, such as Alconox, may be used, followed by a dilute acid rinse and a DI rinse. The dilute acid for the inorganic rinse, and to remove any traces of phosphate detergent where necessary, can be reagent grade nitric or hydrochloric acid of 0.01 normal strength.

The PCB's, pesticides, and free organic phase contaminants call for solvent rinses following a soapy wash, and immediately preceding the final DI rinse. An alternative to performing the final DI rinse following a methanol or acetone rinse is to apply live steam to the equipment to volatilize these compounds.

DISPOSAL OF DECONTAMINATION WATERS

In general, all spent wash and rinse waters including organic rinse liquids should be contained to prevent them from being returned to the ground. All decontamination liquids, along with other incidental waters such as well-development or well evacuation water, should be appropriately disposal. Disposal arrangements or plans should be developed prior to the work, where feasible, and with the client's input and concurrence. Appropriate disposal for liquids, **except for hexane**, may involve disposal to a sanitary sewer or disposal to an industrial wastewater treatment system.

RECOMMENDED FREQUENCY OF CHANGING SOAPY WASH WATER AND TAP WATER

The cleanest way to perform soap and tap water decon is to have a squirt bottle, sprayer or other applicator for the soapy water, and a flowing stream of tap water. In this manner, the soapy water and tap water "reservoirs" are always clean, and equipment comes in contact with clean solutions only.

If you have to use a tub or dip tank for immersion of equipment in soapy water, the following is offered. Related to the frequency of change is the order in which equipment should be decontaminated. Some general guidelines to minimizing the needed changes:

- Wash cleaner (less soiled or "oily") equipment first.

- Have several split-spoon samplers on hand where practical, to save decontamination time and to allow washing these in a batch before the auger needs to be washed.

- Wash bailers in a dedicated soapy solution. This should not often be inconvenient since drilling/soil sampling is usually done separately from well sampling. Having several bailers on hand can allow batch washing of them before a dirtier piece of equipment needs to be washed.

- Wash temporary well casing and screens in a soapy solution dedicated to these materials only.

If a tap water stream is impractical, change the tap water when it first shows discoloration, floating debris, or foaming tendencies due to soap carryover. Two tap water baths in series, changing out both when the second bath reaches the above condition, will minimize changes.

Change soapy water when you change the rinse bath, sooner if the soapy water shows a slick that is other than detergent film. Change soapy water when the solution is too "spent" to generate soap/detergent foam with moderate agitation. If, before any of the above indications occurs, the soap solution becomes discolored with suspended clay or silt, it becomes a matter of personal judgment. It is a good idea to have sufficient drum capacity on hand to be able to change the soapy water "more" frequently rather than "less". Be sensitive to aesthetics and impression as well, when the client's representatives or regulatory personnel are on site, and be prepared for more frequent changes than your experience might otherwise dictate.

SOIL BORING DRILLING USING HOLLOW-STEM AUGERS

Introduction:

When the primary objective of the drilling is to obtain soil samples from discreet depths, the hollow stem augering (HSA) technique of drilling is one of the most effective. The soil is penetrated with five-foot-long, continuous helical flight augers which are driven by a rotary drive head mounted on a hydraulic feed system which pushes the drill stem down or pulls it up. Cuttings are mechanically removed from the borehole by the flights on the HSA's.

Goal:

To drill a soil boring from which the depths and descriptions of the soils encountered can be accurately logged and to obtain samples of the soils from accurate soil depth intervals.

Task-Specific Equipment Needed:

1. All drilling equipment and labor are supplied by the subcontracted drilling company.

Procedure:

1. Access the drill rig and all necessary equipment to the proposed borehole location.
2. Advance the HSA's to the top of the proposed soil sampling depth.
3. With the augers in place and at rest, remove the center plug from the inside of the augers.
4. Attach a decontaminated split-spoon sampling or other device to the drilling rods.
5. Lower the device inside the HSA to the bottom of the borehole.
6. Drive the device into the soil as described, for example, in the WWES' Standard Operating Procedure (SOP) for "Split-spoon Sampling".
7. Recover the device.
8. Replace the plug inside the HSA and continue drilling to the next sampling depth.
9. When the desired completion depth has been attained, properly backfill the borehole from the bottom up as described in WWES's SOP for "Soil Boring Grouting" and decontaminate the drilling and sampling tools according to the SOP "Decontamination, Downhole Sampling Equipment".

   Unless there is a specific need for another size auger, WWES's standard is to drill soil borings with 4.25 - inch inside diameter HSA's. The outside diameter of these augers is 8.25 inches.

Appendix B

Chain-of-Custody Form

WW Engineering & Science, Inc.
Environmental Laboratory Division

Chain of Custody Record

No 26041

Project No.	Project Name					No. of Containers	Container Type & Volume	Preservation Method	Analysis Required/Comments
Samplers (signature)									
Date	Time	Matrix*	Comp	GRAB	Sample I.D.				

Relinquished by: (signature)	Date / Time	Received by:	Relinquished by:	Date / Time	Received by: (signature)	
Dispatched by: (signature)	Date / Time	Carrier:	Received to lab by:	Date / Time	Logged in by:	Date/Time

* MATRIX: WATER (WTR), WASTEWATER (WW), SOIL (SOL), SLUDGE (SLU), AIR, OIL, HAZARDOUS WASTE (HW)

03 EDI/Chain of Cust-Dist. Files

APPENDIX B

AIR PERMIT APPLICATION FOR THE MOBILE PILOT AIR STRIPPING SYSTEM

AIR PERMIT APPLICATION FOR THE MOBILE AIR STRIPPING SYSTEM

Prepared for

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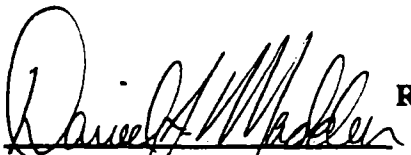

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2 Summary of Ground Water Quality for Wells T-3 and T-7B

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1 Site Map

2 Facility Map

3 Process Flow Diagram

APPENDICES

A Air Permit Applications

APC-200 Application for Permit to Construct & Operate

APC-220 Data and Information - Process Emission Source

B Mobile Pilot Air Stripping System Literature

1.0 INTRODUCTION

Keystone Steel & Wire Company (Keystone) is applying for a permit to install and operate the mobile pilot air stripping (MPS) system designed and constructed by WW Engineering & Science (WWES) for a one week pilot test at its facility in Peoria, Illinois. Figure 1 illustrates the location of the site. In accordance with the "Work Plan to Perform an Aquifer Test and Air Stripping Pilot Study" submitted by Keystone to the Illinois Environmental Protection Agency (IEPA) on March 24, 1992, an aquifer test and air stripping pilot test will be performed to confirm the effectiveness of air stripping technology for removal of dissolved volatile organic compounds (VOC's) from impacted ground water on the site. The results of the test will also provide full-scale design parameters and refine the basis for preparation of a final air use permit application for the full-scale ground water pump and treat remediation system. The MPS system will operate during the pilot and aquifer tests for no longer than seven days at this location with an estimated time of total operation of approximately 110 hours.

2.0 DESCRIPTION

Figure 2 shows the proposed locations of the aquifer test purge well, MPS system, and the discharge of air and treated water. For the aquifer and pilot tests, ground water will be recovered from a test purge well located on the eastern portion of the property and pumped through the MPS system under various test conditions.

Air stripping is a common technology used to treat ground water contaminated with VOC's. Figure 3 illustrates a general process flow schematic for this technology. In the air stripping process, ground water is pumped to the top of a packed tower where it is evenly distributed over a bed of plastic media. Air introduced at the base of the column is passed countercurrent to the falling water, stripping the VOC's from the water. The air exiting the top of the tower is discharged to the atmosphere or, if required, treated by an air emission control device. For the one week pilot test, no air emission controls will be used. Literature describing the MPS System utilized by WWES is included in Appendix B.

3.0 METHODOLOGY

As was described in the pilot test work plan, approximately eight different tests or sets of operating conditions will be evaluated with the pilot air stripper during its operation. Process variables which include ground water flow rate, air flow rate, and packing height will be varied during these tests. Operating parameters for each of the tests, including stack height,

stack diameter, and temperature, are presented in Table 1. Of those eight test conditions, the worst case situation which would result in VOC maximum emissions (Test No. 8) was selected for estimation of maximum emissions for this permit application. This was done to simplify the permit application while still providing for predictions of maximum VOC emissions for the entire test.

The contaminants of concern when operating the pilot stripper are: 1) trichloroethylene (TCE); 2) 1,1,1-trichloroethane (TCA); and 3) a combination of other VOC's that are expected to be present in relatively low concentrations (1,1-dichloroethylene, 1,2 dichloroethylene, perchloroethylene, and 1,2-dichloroethane). Concentrations of these compounds in the inlet and outlet ground water and air from the MPS system are also summarized in Table 1.

4.0 AIR EMISSION CALCULATIONS

The amount of material discharged from the pilot stripper to the ambient air was determined by performing a mass balance on the MPS for the worst case scenario (Test No. 8). The difference between the estimated untreated influent and treated effluent ground water VOC concentrations was used to determine the ground water VOC concentration ~~which~~ that would be stripped in the MPS and transferred into the air discharge. The VOC mass loading discharged to the atmosphere was then determined by multiplying the ground water VOC concentration transferred to the air, by the ground water flow rate for the test. The estimated influent ground water VOC concentrations were obtained from recent ground water data for monitoring wells near the proposed pilot test purge well. The maximum analytical results for ground water samples collected from monitoring well T-3 were used for estimation of maximum untreated VOC concentrations in the ground water. Table 2 summarizes the ground water VOC monitoring data for the two wells which surround the proposed test purge well (T-3 and T-7B).

Although it is possible that small pockets of ground water VOC concentrations which are above those analyzed in T-3 or T-7B may exist, the concentrations detected in monitoring well T-3 are expected to be conservative estimates of concentrations recovered under pumping conditions. It is expected that under pumping conditions, ground water from impacted areas would be diluted with ground water from areas of lower concentration. The concentration difference for Test No. 8 was estimated to be:

	Estimated Ground Water Influent Concentration (mg/L)	Estimated Ground Water Effluent Concentration (mg/L)	Estimated Total Concentration Transferred to Air (mg/L)
TCE	1.0	0.004	0.996
TCA	1.6	0.003	1.597
Other VOC's	0.4	0.001	0.399

The rate of VOC's discharged to the atmosphere for Test No. 8 was calculated as follows:

TCE:

(0.996 mg/L) x (40 gal/min) x (3.785 L/gal) x (1 g/1000 mg) x (1 lb/453.592 g) x (60 min/hr)

= 0.0199 lbs/hr

TCA:

(1.597 mg/L) x (40 gal/min) x (3.785 L/gal) x (1 g/1000 mg) x (1 lb/453.592 g) x (60 min/hr)

= 0.0320 lbs/hr

Other VOC's:

(0.399 mg/L) x (40 gal/min) x (3.785 L/gal) x (1 g/1000 mg) x (1 lb/453.592 g) x (60 min/hr)

= 0.008 lbs/hr

5.0 CONCLUSION

The total pounds per hour of VOC's expected to be emitted to the atmosphere is 0.0599 lbs/hr. This is well below the limit of 8.0 lbs/hr as stated in 35 Illinois Administrative Code 215.301, therefore, the proposed MPS system does not require air pollution control equipment according to Illinois regulations. All appropriate State of Illinois application forms can be found in Appendix A.

TABLES

Table 1

Scheduled Operating Parameters

Table 1
Scheduled Operating Parameters
Air Stripping Pilot Study
Keystone Steel & Wire Company
Bartonville, Illinois

Test No.	Ground Water Flow/ Discharge Rate (gpm)	Air Flow Rate (cfm)	Packing Height (feet)	Stack Height (feet)	Stack Diameter (inches)	Air Discharge Temperature (F)	Projected Duration of Test (hours)	Amount of Water Treated (lb/hr)	Anticipated Maximum Ground Water Discharge Concentration(a) TCE(c) (mg/l)	TCA(d) (mg/l)	VOC's(b) (mg/l)	Anticipated Air Discharge Rate TCE (lb/hr)	TCA (lb/hr)	VOC's (lb/hr)
1	20	0	10	25	4	60	0.1	10004	1	1.6	0.4	0	0	0
2	20	200	10	25	4	60	2	10004	0.062	0.064	0.017	0.0187	0.0307	0.0004
3	20	300	10	25	4	60	2	10004	0.052	0.061	0.016	0.0189	0.0308	0.0005
4	20	400	10	25	4	60	2	10004	0.047	0.06	0.016	0.019	0.0308	0.0005
5	30	300	10	25	4	60	2	15007	0.062	0.064	0.017	0.0187	0.0307	0.0004
6	40	400	10	25	4	60	2	20009	0.062	0.064	0.017	0.0187	0.0307	0.0004
7	40	400	20	35	4	60	2	20009	0.005	0.003	0.001	0.0199	0.032	0.008
8(e)	**40**	**500**	**20**	**35**	**4**	**60**	**96**	**20009**	**0.004**	**0.003**	**<.001**	**0.0199**	**0.032**	**0.008**

(a) The anticipated maximum effluent VOC concentrations to be discharged to the sanitary sewer are based on the projected maximum ground water VOC concentrations which are recovered from the new purge well during the pump/pilot test. These concentrations are based on analytical data for ground water samples collected near the proposed purge well location. Note that these concentrations are projected and the actual concentrations cannot be determined without pumping the well and performing the test. The maximum VOC concentrations expected in the untreated water are: 1.0 mg/l TCE, 1.6 mg/l TCA, 0.1 mg/l 1,1-DCE, 0.1 mg/l 1,2-DCE, 0.1mg/l PCE, and 0.1 mg/l 1,2-DCA.

(b) Total concentration of other VOC's detected in the untreated ground water, namely 1,1-Dichloroethylene, 1,2-Dichloroethylene, 1,2-Dichloroethane, and Tetrachloroethylene.

(c) Trichloroethylene.

(d) 1,1,1-Trichloroethane

(e) This test run is considered to be the worst case scenario or indicative of maximum VOC emissions, and therefore, is used for emission calculations for the Air Use Permit Application.

Table 2

Summary of Ground Water Quality for Wells T-3 and T-7B

TABLE 2

SUMMARY OF GROUND WATER QUALITY FOR WELLS T-3 AND T-7B
Volatiles (ug/l)

Well Number	Date Sampled	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments
T-3	11/28/89	<10	<5.0	480	130	<5.0	6	<5.0	3200	1200	<10	
T-3	02/27/90	<10	<5.0	210	98	<5.0	12	<5.0	1600	1400	<10	
T-3	02/27/90	<100	<50	200	64	<50	<50	<50	1800	1100	<100	Replicate
T-3	05/23/90	<20	<10	180	130	<10	20	<10	2800	1400	<20	
T-3	05/23/90	<50	<25	170	120	<25	<25	<25	2600	1100	<50	Replicate
T-3	08/29/90	<100	<50	120	77	<50	<50	<50	1800	990	<100	
T-3	12/06/90	<200	<100	<100	<100	<100	<100	<100	1300	830	<200	
T-3	12/06/90	<200	<100	<100	<100	<100	<100	<100	1300	830	<200	Replicate
T-3	02/26/91	<200	<100	<100	<100	<100	<100	<100	1600	1000	<200	
T-3	05/31/91	<100	<50	160	74	<50	<50	<50	1600	1000	<100	
T-3	05/31/91	<100	<50	150	73	<50	<50	<50	1600	990	<100	Replicate
T-3	08/27/91	<100	<50	<50	<50	120	<50	<50	790	730	<100	
T-3	11/20/91	<100	<50	<50	<50	70*	<50	<50	640	460	<100	
T-7B	02/28/90	<100	<50	<50	76	<50	<50	<50	<50	2500	<100	
T-7B	02/28/90	<100	<50	<50	83	<50	<50	<50	<50	2500	<100	Replicate
T-7B	05/23/90	<200	<100	<100	<100	<100	<100	<100	<100	2200	<200	
T-7B	05/23/90	<200	<100	<100	<100	<100	<100	<100	<100	2600	<200	Replicate
T-7B	08/30/90	<200	<100	<100	<100	<100	<100	<100	<100	2200	<200	
T-7B	08/30/90	<200	<100	<100	<100	<100	<100	<100	<100	2200	<200	Replicate
T-7B	11/28/90	<200	<100	<100	<100	<100	<100	<100	<100	1900	<200	
T-7B	02/27/91	<200	<100	<100	<100	<100	<100	<100	<100	2200	<200	
T-7B	02/27/91	<200	<100	<100	<100	<100	<100	<100	<100	2200	<200	Replicate
T-7B	05/29/91	<200	<100	<100	<100	<100	<100	<100	<100	2200	<200	(1)
T-7B	05/29/91	<200	<100	<100	<100	<100	<100	<100	<100	2200	<200	Replicate
T-7B	08/28/91	<200	<100	<100	<100	<100	<100	<100	<100	2100	<200	
T-7B	11/20/91	<200	<100	<100	<100	<100	<100	<100	<100	2200	<200	
T-7B	11/20/91	<200	<100	<100	<100	<100	<100	<100	<100	1500	<200	Replicate

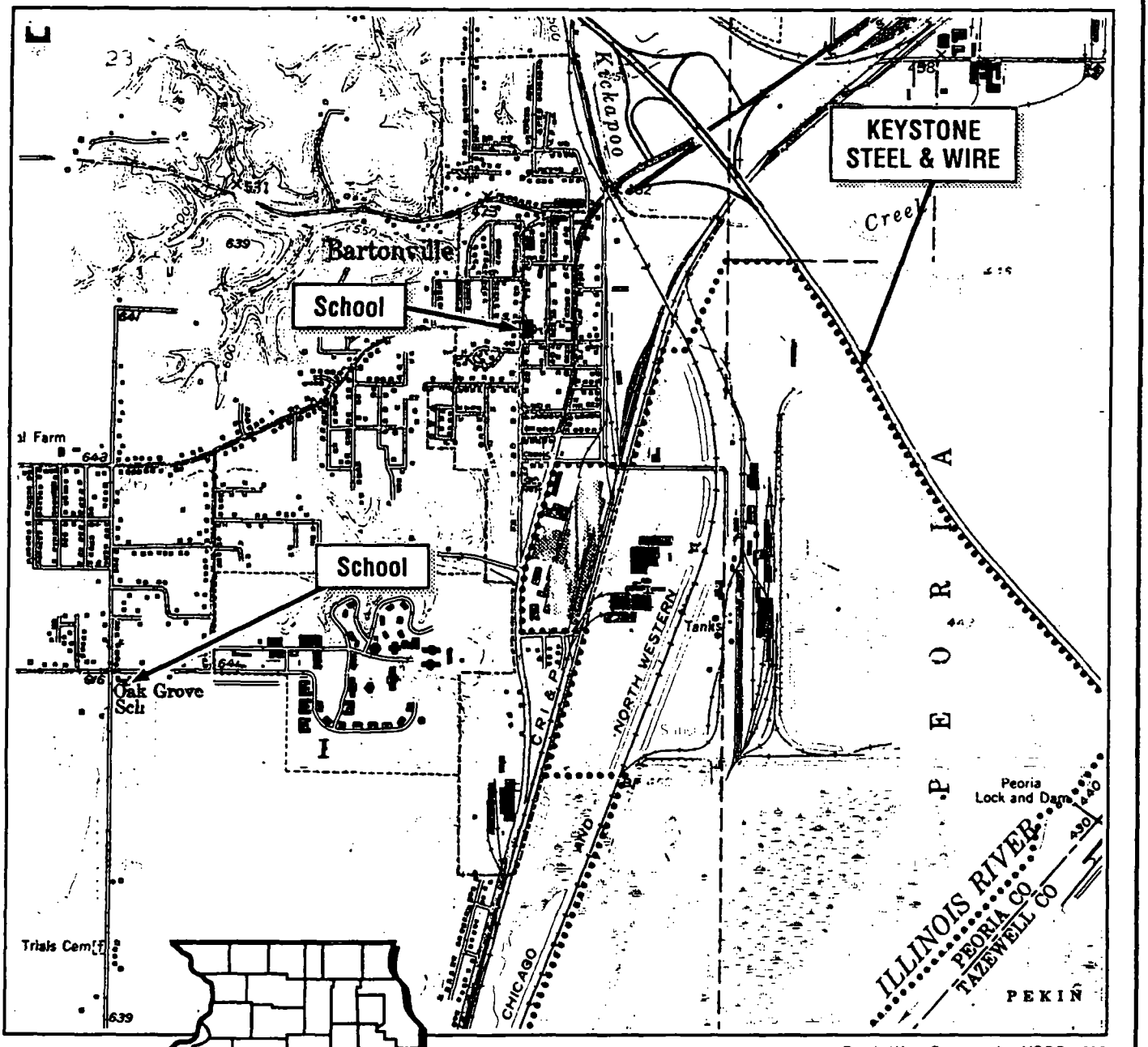
* Estimated value as a result of data not meeting QA/QC validation criteria.

(1) Xylene was also detected in T-7B (240 ug/l) and T-7B Rep. (230 ug/l).

FIGURES

Figure 1

Site Map



Peoria West Quadrangle - USGS, 1979

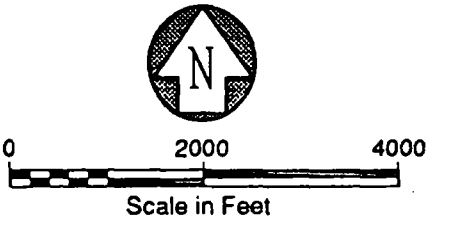


Figure 1

SITE MAP

Keystone Steel & Wire Company

Peoria, Illinois

April 1992 07029

WW Engineering & Science

Figure 2

Facility Map

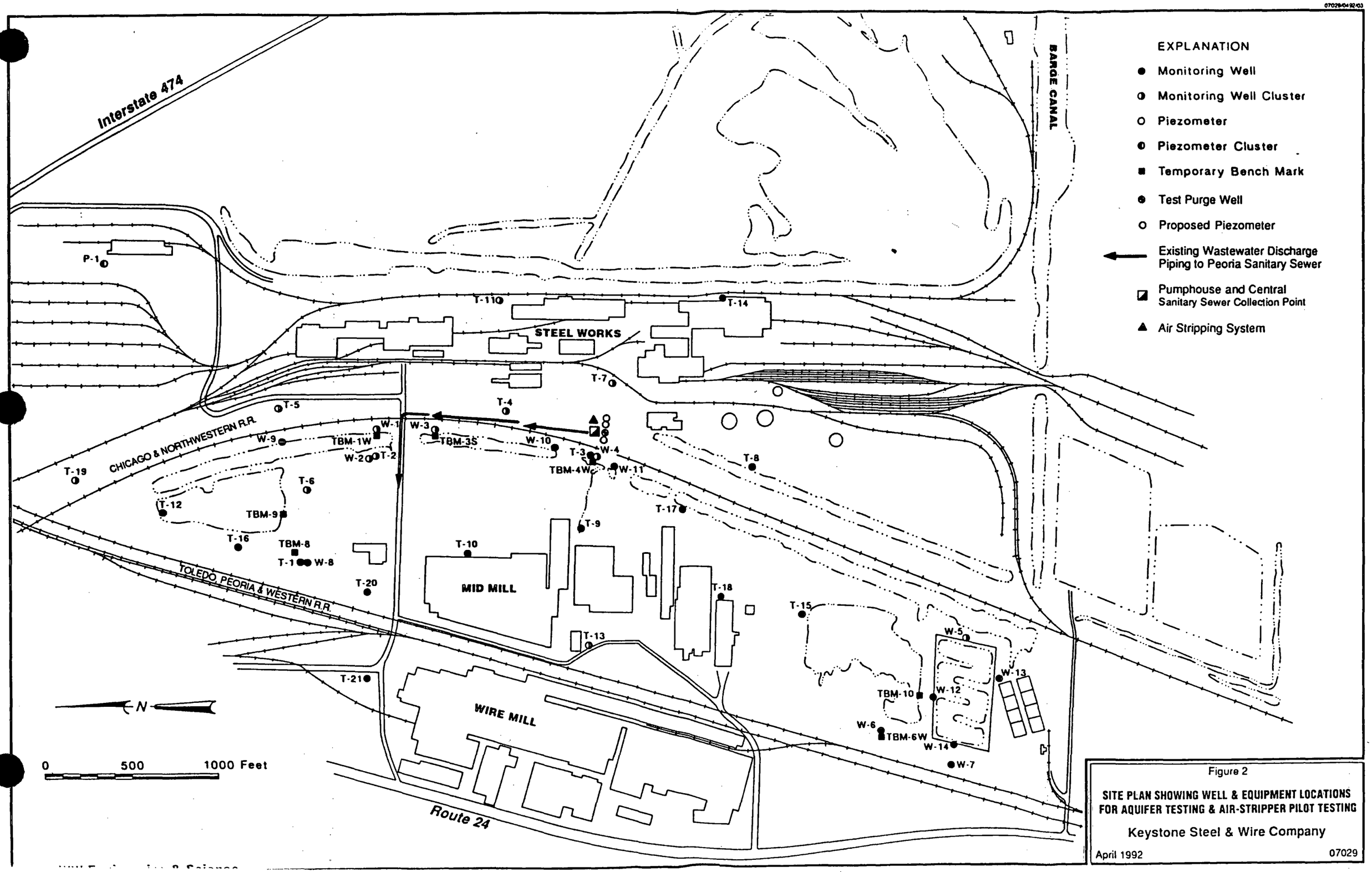


Figure 2

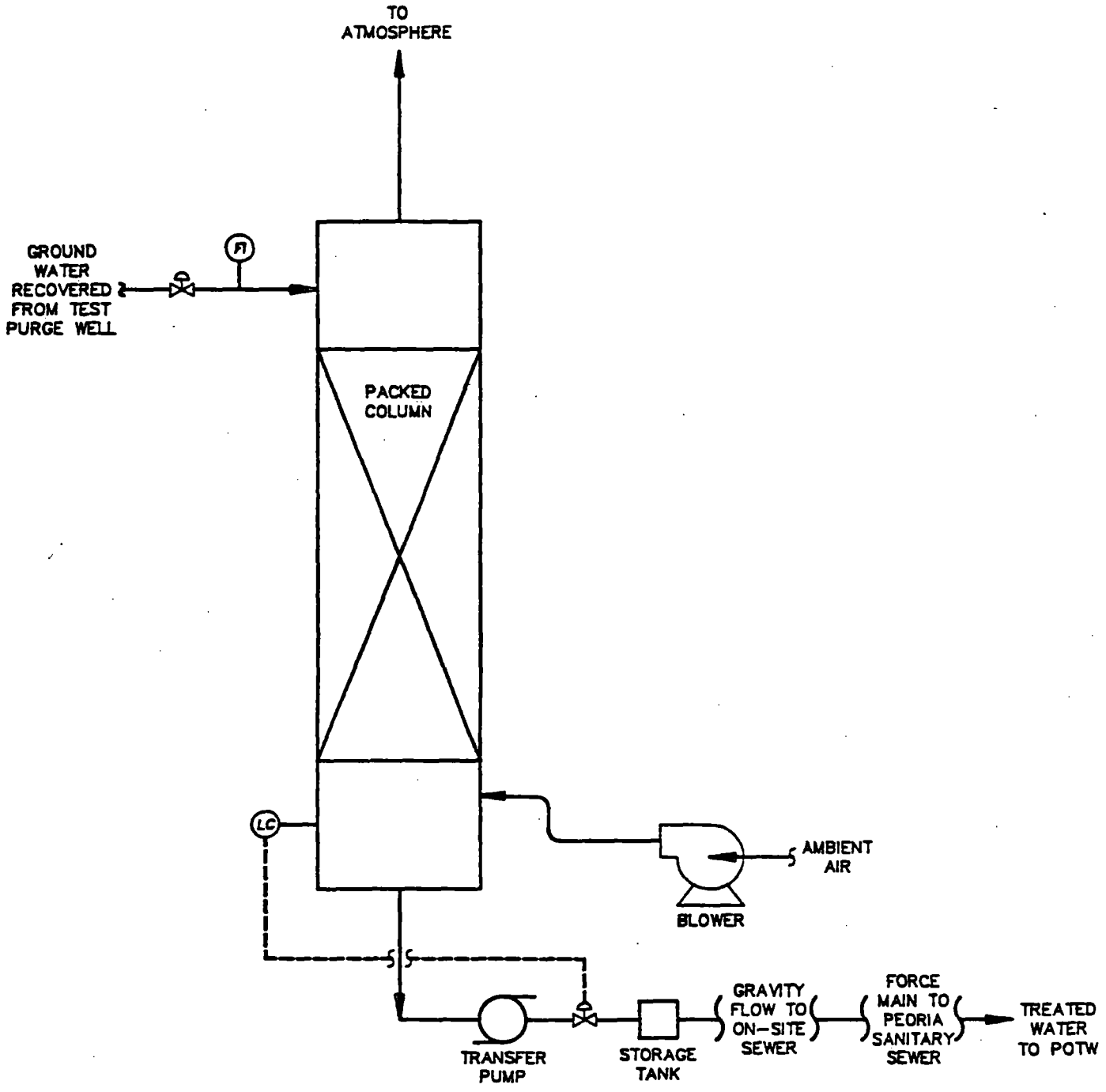
SITE PLAN SHOWING WELL & EQUIPMENT LOCATIONS FOR AQUIFER TESTING & AIR-STRIPPER PILOT TESTING

Keystone Steel & Wire Company

April 1992 07029

Figure 3

Process Flow Diagram



LEGEND

(LC) – LEVEL CONTROL

(FI) – FLOW INDICATOR

– THROTTLING VALVE

07029ASP
VR040192

FIGURE 3

AIR STRIPPING PROCESS SCHEMATIC

KEYSTONE STEEL AND WIRE CO.
PEORIA, ILLINOIS

MARCH, 1992 07029

APPENDICES

Appendix A

Air Permit Applications

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF AIR POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62794-9276

APPLICATION FOR PERMIT(A)	FOR AGENCY USE ONLY
[x] CONSTRUCT [x] OPERATE	I.D. NO.
NAME OF EQUIPMENT TO BE CONSTRUCTED OR OPERATED: Air Stripping Pilot System(B)	PERMIT NO.
	DATE

1a. NAME OF OWNER: Keystone Steel & Wire Company		2a. NAME OF OPERATOR: Keystone Steel & Wire Company	
1b. STREET ADDRESS OF OWNER: 7000 S.W. Adams Street		2b. STREET ADDRESS OF OPERATOR: 7000 S.W. Adams Street	
1c. CITY OF OWNER: Peoria		2c. CITY OF OPERATOR: Peoria	
1d. STATE OF OWNER: Illinois	1e. ZIP CODE: 61641	2d. STATE OF OPERATOR: Illinois	2e. ZIP CODE: 61641

3a. NAME OF CORPORATE DIVISION OR PLANT: Same as above		3b. STREET ADDRESS OF EMISSION SOURCE: 7000 S.W. Adams Street		
3c. CTIY OF EMISSION SOURCE: PEORIA	3d. LOCATED WITHIN CITY LIMITS: [ ] YES [X] NO	3e. TOWNSHIP: LIMESTONE	3f. COUNTY: PEORIA	3g. ZIP CODE: 61641

4. ALL CORRESPONDENCE TO: (TITLE AND/OR NAME OF INDIVIDUAL) Mr. Dale L. Bennington / Mngr. Energy & Env.	5. TELEPHONE NUMBER FOR AGENCY TO CALL: (309) 697-7552
6. ADDRESS FOR CORRESPONDENCE: (CHECK ONLY ONE) [X] OWNER [ ] OPERATOR [ ] EMISSION SOURCE	7. YOUR DESIGNATION FOR THIS APPLICATION:(C) K E Y P I L O T

8. THE UNDERSIGNED HEREBY MAKES APPLICATION FOR A PERMIT AND CERTIFIES THAT THE STATEMENTS CONTAINED HEREIN ARE TRUE AND CORRECT, AND FURTHER CERTIFIES THAT ALL PREVIOUSLY SUBMITTED INFORMATION REFERENCED IN THIS APPLICATION REMAINS TRUE, CORRECT AND CURRENT. BY AFFIXING HIS SIGNATURE HERETO HE FURTHER CERTIFIES THAT HE IS AUTHORIZED TO EXECUTE THIS APPLICATION.

AUTHORIZED SIGNATURE(S):(D)

BY _____ SIGNATURE	_____ DATE
Dale L. Bennington, P.E. TYPED OR PRINTED NAME OF SIGNER	
Manager Energy & Environmental Engineering TITLE OF SIGNER	

BY _____ SIGNATURE	_____ DATE
_____ TYPED OR PRINTED NAME OF SIGNER	
_____ TITLE OF SIGNER	

(A) THIS FORM IS TO PROVIDE THE AGENCY WITH GENERAL INFORMATION ABOUT THE EQUIPMENT TO BE CONSTRUCTED OR OPERATED. THIS FORM MAY BE USED TO REQUEST A CONSTRUCTION PERMIT, AN OPERATING PERMIT, A CONSTRUCTION OR OPERATING PERMIT.

(B) ENTER THE GENERIC NAME OF THE EQUIPMENT TO BE CONSTRUCTED OR OPERATED. THIS NAME WILL APPEAR ON THE PERMIT WHICH MAY BE ISSUED PURSUANT TO THIS APPLICATION. THIS FORM MUST BE ACCOMPANIED BY OTHER APPLICABLE FORMS AND INFORMATION.

C) PROVIDE A DESIGNATION IN ITEM 7 ABOVE WHICH YOU WOULD LIKE THE AGENCY TO USE FOR IDENTIFICATION OF YOUR EQUIPMENT. YOUR DESIGNATION WILL BE REFERENCED IN CORRESPONDENCE FROM THIS AGENCY RELATIVE TO THIS APPLICATION. YOUR DESIGNATION MUST NOT EXCEED TEN (10) CHARACTERS.

(D) THIS APPLICATION MUST BE SIGNED IN ACCORDANCE WITH 35 ILL. ADM. CODE 201.154 OR 201.159 WHICH STATES: "ALL APPLICATIONS AND SUPPLEMENTS THERETO SHALL BE SIGNED BY THE OWNER AND OPERATOR OF THE EMISSION SOURCE OR AIR POLLUTION CONTROL EQUIPMENT, OR THEIR AUTHORIZED AGENT, AND SHALL BE ACCOMPANIED BY EVIDENCE OF AUTHORITY TO SIGN THE APPLICATION."

IF THE OWNER OR OPERATOR IS A CORPORATION, SUCH CORPORATION MUST HAVE ON FILE WITH THE AGENCY A CERTIFIED COPY OF A RESOLUTION OF THE CORPORATION'S BOARD OF DIRECTORS AUTHORIZING THE PERSONS SIGNING THIS APPLICATION TO CAUSE OR ALLOW THE CONSTRUCTION OR OPERATION OF THE EQUIPMENT TO BE COVERED BY THE PERMIT.

9. DOES THIS APPLICATION CONTAIN A PLOT PLAN/MAP:

[X] YES [ ] NO

IF A PLOT PLAN/MAP HAS PREVIOUSLY BEEN SUBMITTED, SPECIFY:

AGENCY I.D. NUMBER _____ APPLICATION NUMBER _____

IS THE APPROXIMATE SIZE OF APPLICANT'S PREMISES LESS THAN 1 ACRE?

[ ] YES [X] NO: SPECIFY 500 ACRES

10. DOES THIS APPLICATION CONTAIN A PROCESS FLOW DIAGRAM(S) THAT ACCURATELY AND CLEARLY REPRESENTS CURRENT PRACTICE.

[X] YES [ ] NO

11a. WAS ANY EQUIPMENT, COVERED THIS APPLICATION, OWNED OR CONTRACTED FOR, BY THE APPLICANT PRIOR TO APRIL 14, 1972:

[ ] YES [X] NO

IF "YES" ATTACH AN ADDITIONAL SHEET, EXHIBIT A, THAT:
(a) LISTS OR DESCRIBES THE EQUIPMENT
(b) STATES WHETHER THE EQUIPMENT WAS IN COMPLIANCE WITH THE RULES AND REGULATIONS GOVERNING THE CONTROL OF AIR POLLUTION PRIOR TO APRIL 4, 1972

11b. HAS ANY EQUIPMENT, COVERED BY THIS APPLICATION, NOTPREVIOUSLY RECEIVED AN OPERATING PERMIT:

[ ] YES [X] NO

IF "YES", ATTACH AN ADDITIONAL SHEET, EXHIBIT B, THAT:
(a) LISTS OR DESCRIBES THE EQUIPMENT
(b) STATES WHETHER THE EQUIPMENT
(i) IS ORIGINAL OR ADDITIONAL EQUIPMENT
(ii) REPLACES EXISTING EQUIPMENT, OR
(iii) MODIFIES EXISTING EQUIPMENT
(c) PROVIDES THE ANTICIPATED OR ACTUAL DATES OF THE COMMENCEMENT OF CONSTRUCTION AND THE START-UP OF THE EQUIPMENT

12. IF THIS APPLICATION INCORPORATES BY REFERENCE A PREVIOUSLY GRANTED PERMIT(S), HAS FORM APC-210, "DATA AND INFORMATION—INCORPORATION BY REFERENCE" BEEN COMPLETED.

APPLICATION FOR OPERATING PERMIT ONLY

13. DOES THE STARTUP OF AN EMISSION SOURCE COVERED BY THIS APPLICATION PRODUCE AIR CONTAMINANT EMISSION IN EXCESS OF APPLICABLE STANDARDS:

[ ] YES [X] NO

IF "YES," HAS FORM APC-203, "OPERATION DURING STARTUP" BEEN COMPLETED FOR THIS SOURCE.

[ ] YES [ ] NO

14. DOES THIS APPLICATION REQUEST PERMISSION TO OPREATE AN EMISSION SOURCE DURING MALFUNCTIONS OR BREAKDOWNS:

[ ] YES [X] NO

IF "YES," HAS FORM APC-204, "OPERATION DURING MALFUNCTION AND BREAKDOWN" BEEN COMPLETED FOR THIS SOURCE

[ ] YES [ ] NO

15. IS AN EMISSION SOURCE COVERED BY THIS APPLICATION SUBJECT TO A FUTURE COMPLIANCE DATE:

[ ] YES [X] NO

IF "YES," HAS FORM APC-202, "COMPLIANCE PROGRAM & PROJECT COMPLETION SCHEDULE," BEEN COMPLETED FOR THIS SOURCE:

[ ] YES [X] NO

16. DOES THE FACILITY COVERED BY THIS APPLICATION REQUIRE AN EPISODE ACTION PLAN (REFER TO GUIDELINES FOR EPISODE ACTION PLANS):

[ ] YES [X] NO

17. LIST AND IDENTIFY ALL FORMS, EXHIBITS, AND OTHER INFORMATION SUBMITTED AS PART OF THIS APPLICATION. INCLUDE THE PAGE NUMBERS OF EACH ITEM (ATTACH ADDITIONAL SHEETS IF NECESSARY):

Figure 1	Site Map	Appendix B	Marketing Brochure for MPS System
Figure 2	Facility Map		
Figure 3	Process Flow Diagram		
Table 1	Operating Parameters		
Table 2	Summary of Ground Water Quality for Wells T-3 and T-7B		

TOTAL NUMBER OF PAGES _____

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF AIR POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62706

This Agency is authorized to require this information under Illinois Revised Statutes, 1979, Chapter 111 1/2, Section 1039. Disclosure of this information is required under that Section. Failure to do so may prevent this form from being processed and could result in your application being denied. This form has been approved by the Forms Management Center.

*DATA AND INFORMATION PROCESS EMISSION SOURCE	

*THIS INFORMATION FORM IS TO BE COMPLETED FOR AN EMISSION SOURCE OTHER THAN A FUEL COMBUSTION EMISSION SOURCE OR AN INCINERATOR. A FUEL COMBUSTION EMISSION SOURCE IS A FURNACE, BOILER, OR SIMILAR EQUIPMENT USED PRIMARILY FOR PRODUCING HEAT OR POWER BY INDIRECT HEAT TRANSFER. AN INCINERATOR IS AN APPARATUS IN WHICH REFUSE IS BURNED.

1. NAME OF PLANT OWNER: Keystone Consolidated Industries	2. NAME OF CORPORATE DIVISION OR PLANT (IF DIFFERENT FROM OWNER): Keystone Steel & Wire Company
3. STREET ADDRESS OF EMISSION SOURCE: 7000 S.W. Adams Street	4. CITY OF EMISSION SOURCE: Peoria

GENERAL INFORMATION		
5. NAME OF PROCESS: Air Stripping	6. NAME OF EMISSION SOURCE EQUIPMENT: Air Stripping Tower	
7. EMISSION SOURCE EQUIPMENT MANUFACTURER: NA	8. MODEL NUMBER: NA	9. SERIAL NUMBER: NA
10. FLOW DIAGRAM DESIGNATION(S) OF EMISSION SOURCE: (see attached diagrams)		
11. IDENTITY(S) OF ANY SIMILAR SOURCE(S) AT THE PLANT OR PREMISES NOT COVERED BY THE FORM (IF THE SOURCE IS COVERED BY ANOTHER APPLICATION, IDENTIFY THE APPLICATION):		
12. AVERAGE OPERATING TIME OF EMISSION SOURCE: 24 HRS/DAY 7 DAYS/WK 1 WKS/YR	13. MAXIMUM OPERATING TIME OF EMISSION SOURCE: 24 HRS/DAY 7 DAYS/WK 1 WKS/YR	
14. PERCENT OF ANNUAL THROUGHPUT: DEC-FEB ____ % MAR-MAY NA % JUN-AUG ____ % SEPT-NOV ____ %		

INSTRUCTIONS

1. COMPLETE THE ABOVE IDENTIFICATION AND GENERAL INFORMATION SECTION.
2. COMPLETE THE RAW MATERIAL, PRODUCT, WASTE MATERIAL, AND FUEL USAGE SECTIONS FOR THE PARTICULAR SOURCE EQUIPMENT. COMPOSITIONS OF MATERIALS MUST BE SUFFICIENTLY DETAILED TO ALLOW DETERMINATION OF THE NATURE AND QUANTITY OF POTENTIAL EMISSIONS. IN PARTICULAR, THE COMPOSITION OF PAINTS, INKS, ETC., AND ANY SOLVENTS MUST BE FULLY DETAILED.
3. EMISSION AND EXHAUST POINT INFORMATION MUST BE COMPLETED, UNLESS EMISSIONS ARE EXHAUSTED THROUGH AIR POLLUTION CONTROL EQUIPMENT.
4. OPERATING TIME AND CERTAIN OTHER ITEMS REQUIRE BOTH AVERAGE AND MAXIMUM VALUES.
5. FOR GENERAL INFORMATION REFER TO "GENERAL INSTRUCTIONS FOR PERMIT APPLICATIONS," APC-201.

DEFINITIONS

AVERAGE - THE VALUE THAT SUMMARIZES OR REPRESENTS THE GENERAL CONDITION OF THE EMISSION SOURCE, OR THE GENERAL STATE OF PRODUCTION OF THE EMISSION SOURCE. SPECIFICALLY:
AVERAGE OPERATING TIME - ACTUAL TOTAL HOURS OF OPERATION FOR THE PRECEDING TWELVE MONTH PERIOD.
AVERAGE RATE - ACTUAL TOTAL QUANTITY OF "MATERIAL" FOR THE PRECEDING TWELVE MONTH PERIOD, DIVIDED BY THE AVERAGE OPERATING TIME.
AVERAGE OPERATION - OPERATION TYPICAL OF THE PRECEDING TWELVE MONTH PERIOD, AS REPRESENTED BY AVERAGE OPERATING TIME AND AVERAGE RATES.

MAXIMUM - THE GREATEST VALUE ATTAINABLE OR ATTAINED FROM THE EMISSION SOURCE, OR THE PERIOD OF GREATEST OR UTMOST PRODUCTION OF THE EMISSION SOURCE. SPECIFICALLY:
MAXIMUM OPERATING TIME - GREATEST EXPECTED TOTAL HOURS OF OPERATIONS FOR ANY TWELVE MONTH PERIOD.
MAXIMUM RATE - GREATEST QUANTITY OF "MATERIAL" EXPECTED PER ANY ONE HOUR OF OPERATION.
MAXIMUM OPERATION - GREATEST EXPECTED OPERATION, AS REPRESENTED BY MAXIMUM OPERATING TIME AND MAXIMUM RATES.

RAW MATERIAL INFORMATION		
NAME OF RAW MATERIAL	AVERAGE RATE PER IDENTICAL SOURCE	MAXIMUM RATE PER IDENTICAL SOU
20a.	b. LB/HR	c. LB/HR
21a.	b. LB/HR	c. LB/HR
22a.	b. LB/HR	c. LB/HR
23a.	b. LB/HR	c. LB/HR
24a.	b. LB/HR	c. LB/HR

PRODUCT INFORMATION		
NAME OF PRODUCT	AVERAGE RATE PER IDENTICAL SOURCE	MAXIMUM RATE PER IDENTICAL SOURCE
30a. Trichloroethylene	b. NA LB/HR	c. 0.0199 LB/HR
31a. 1,1,1-Trichloroethane	b. NA LB/HR	c. 0.032 LB/HR
32a. Other VOC's (1,1-DCE, 1,2-DCE, PCE,	b. NA LB/HR	c. 0.008 LB/HR
33a. 1,2-DCA)	b. LB/HR	c. LB/HR
34a. *SEE ATTACHED REPORT	b. LB/HR	c.

WASTE MATERIAL INFORMATION		
NAME OF WASTE MATERIAL	AVERAGE RATE PER IDENTICAL SOURCE	MAXIMUM RATE PER IDENTICAL SOURCE
40a.	b. LB/HR	c. LB/HR
41a.	b. LB/HR	c. LB/HR
42a.	b. LB/HR	c. LB/HR
43a.	b. LB/HR	c. LB/HR
44a.	b. LB/HR	c. LB/HR

*FUEL USAGE INFORMATION		
FUEL USED	TYPE	HEAT CONTENT
50a. NATURAL GAS ☐	b.	c. 1000 BTU/SCF
OTHER GAS ☐		BTU/SCF
OIL ☐		BTU/GAL
COAL ☐		BTU/LB
OTHER ☐		BTU/
d. AVERAGE FIRING RATE PER IDENTICAL SOURCE: BTU/HR	e. MAXIMUM FIRING RATE PER IDENTICAL SOURCE:	BTU/HR

*THIS SECTION IS TO BE COMPLETED FOR ANY FUEL USED DIRECTLY IN THE PROCESS EMISSION SOURCE, E.G. GAS IN A DRYER, OR COAL IN A MELT FURNACE.

*EMISSION INFORMATION

51. NUMBER OF IDENTICAL SOURCES (DESCRIBE AS REQUIRED): None

AVERAGE OPERATION

CONTAMINANT	CONCENTRATION OR EMISSION RATE PER IDENTICAL SOURCE		METHOD USED TO DETERMINE CONCENTRATION OR EMISSION RATE
PARTICULATE MATTER	52a. GR/SCF	b. LB/HR	c.
CARBON MONOXIDE	53a. PPM (VOL)	b. LB/HR	c.
NITROGEN OXIDES	54a. PPM (VOL)	b. LB/HR	c.
ORGANIC MATERIAL	55a. PPM (VOL)	b. LB/HR	c.
SULFUR DIOXIDE	56a. PPM (VOL)	b. LB/HR	c.
**OTHER (SPECIFY)	57a. PPM (VOL)	b. LB/HR	c.

MAXIMUM OPERATION

CONTAMINANT	CONCENTRATION OR EMISSION RATE PER IDENTICAL SOURCE		METHOD USED TO DETERMINE CONCENTRATION OR EMISSION RATE
PARTICULATE MATTER	58a. GR/SCF	b. LB/HR	c.
CARBON MONOXIDE	59a. PPM (VOL)	b. LB/HR	c.
NITROGEN OXIDES	60a. PPM (VOL)	b. LB/HR	c.
ORGANIC MATERIAL	61a. PPM (VOL)	b. 0.0599 LB/HR	c. *SEE ATTACHED REPORT
SULFUR DIOXIDE	62a. PPM (VOL)	b. LB/HR	c.
**OTHER (SPECIFY)	63a. PPM (VOL)	b. LB/HR	c.

*ITEMS 52 THROUGH 63 NEED NOT BE COMPLETED IF EMISSIONS ARE EXHAUSTED THROUGH AIR POLLUTION CONTROL EQUIPMENT.
**"OTHER" CONTAMINANT SHOULD BE USED FOR AN AIR CONTAMINANT NOT SPECIFICALLY NAMED ABOVE. POSSIBLE OTHER CONTAMINANTS ARE ASBESTOS, BERYLLIUM, MERCURY, VINYL CHLORIDE, LEAD, ETC.

***EXHAUST POINT INFORMATION

64. FLOW DIAGRAM DESIGNATION(S) OF EXHAUST POINT: Air Stripping Tower Exhaust

65. DESCRIPTION OF EXHAUST POINT (LOCATION IN RELATION TO BUILDINGS, DIRECTION, HOODING, ETC.): See Figure 2

66. EXIT HEIGHT ABOVE GRADE: 25 or 35 feet	67. EXIT DIAMETER: 4 inches
68. GREATEST HEIGHT OF NEARBY BUILDINGS: 50 FT	69. EXIT DISTANCE FROM NEAREST PLANT BOUNDARY: 1600 FT
AVERAGE OPERATION	MAXIMUM OPERATION
70. EXIT GAS TEMPERATURE: 60 °F	72. EXIT GAS TEMPERATURE: 70 °F
71. GAS FLOW RATE THROUGH EACH EXIT: ACFM	73. GAS FLOW RATE THROUGH EACH EACH EXIT: 500 ACFM

***THIS SECTION SHOULD NOT BE COMPLETED IF EMISSIONS ARE EXHAUSTED THROUGH AIR POLLUTION CONTROL EQUIPMENT.

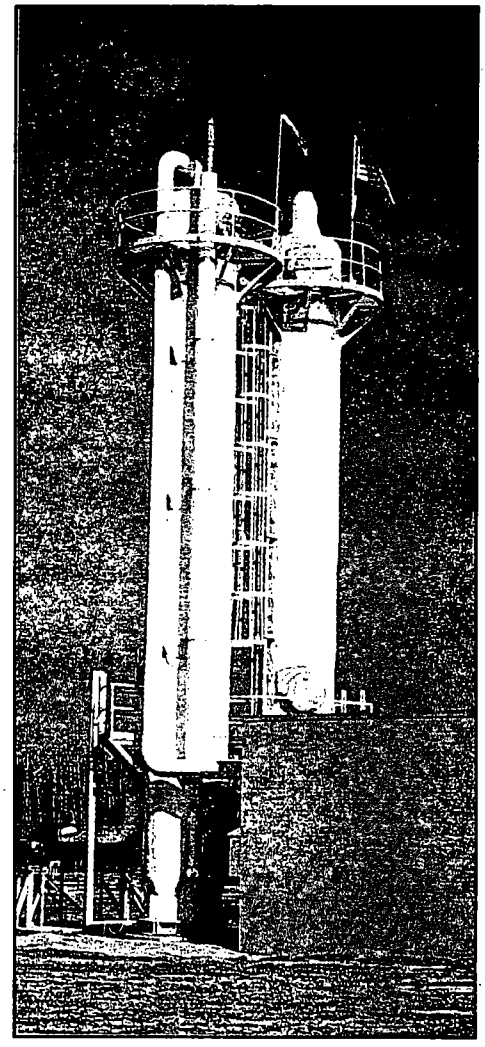
Appendix B

Mobile Pilot Air Stripping System Literature

Service Profile

Remediation and Ground Water Treatment

With the increase in environmental regulatory activity during the 1970's and 1980's came the growth and maturation of WW Engineering & Science's Environmental Services Division. At a time before others had entered the field, we were involved in investigating contaminated sites and in developing and managing remedial action programs ranging from emergency spill response to the implementation of long-term site cleanups and closures. Our long-standing experience with environmental regulations and regulatory agencies enables us to develop sensible remedial action programs designed to meet comprehensive cleanup objectives.



WW Engineering & Science has been honored with several awards from the American Consulting Engineer's Council for its role in certain remedial action or reclamation projects. We have been a leader in the use of air and steam stripping technology for the treatment of contaminated ground water and other waste streams. We have designed and constructed a mobile air/steam stripping system which is used onsite both to develop full-scale design parameters and to perform small-scale cleanups.

WW Engineering & Science has also designed site-specific remedial action or closure programs for ground water and contaminated soils using a variety of traditional and innovative technologies. We have managed the installation or construction of these remediation systems and, in many cases, undertaken long-term system operation.

Utilizing the Most Feasible Remediation Technology

Remediation is a field marked by rapid technological development. WW Engineering & Science stays abreast of these various changes so that it can utilize both traditional and innovative technologies in a manner most appropriate and most efficient for a particular contamination problem. Given our experience, our technical knowledge of the different options available, and our ability to perform bench or pilot testing when appropriate, we are able to assemble the most feasible and reliable program possible for the remediation of ground water, soils, surface water, and wastes.

Feasibility Studies

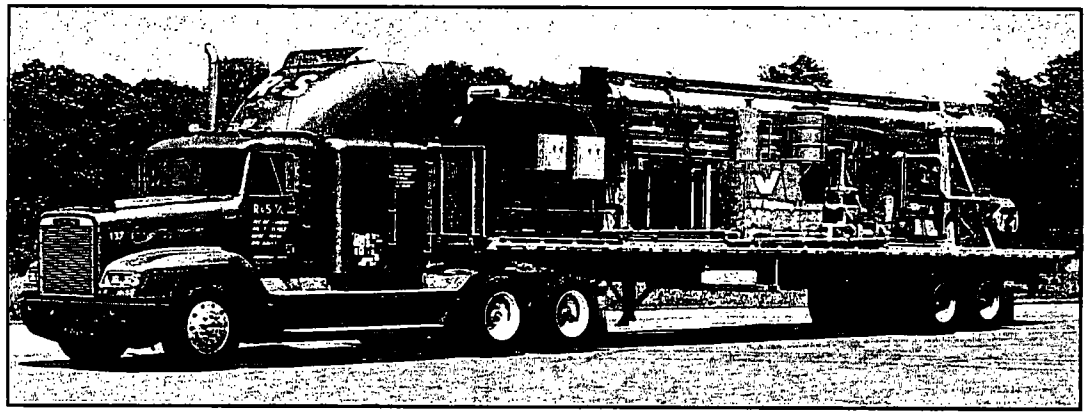
Mobile Pilot System Capabilities

- Air or Steam Stripping
- Soil Vapor Extraction

Laboratory or Bench Scale Treatability Evaluations

- Advanced Oxidation
- Biological (Including In-Situ Bioremediation)
- Activated Carbon Adsorption
- Solidification/Stabilization
- Membrane Filtration
- Other Physical/Chemical Treatment

Process Design (All Disciplines)



WW Engineering & Science, Inc.

3555 Greenwood Hills Parkway, SE • P.O. Box 874 • Grand Rapids, MI 49588-0874 • (616) 942-9600, Fax 942-6499

Atlanta	Detroit, MI	Bloomington, IN	Columbus, OH	Chattanooga, TN	Minneapolis, MN	Milwaukee, WI
[illegible]	[illegible]	[illegible]	[illegible]	(615) 870-7766	(612) 781-1647	(414) 241-4560

A Summit Environmental Group Company

Engineering Bulletin

WW Engineering & Science Unveils a New Mobile Organics Separations Unit, which is used for either pilot or full-scale evaluations of air or steam stripping processes. Mounted on a flatbed trailer, the mobile system is almost completely self-contained. With its own integral boiler, instrumentation, and controls, the 5- to 30-gpm unit requires only 480 volt temporary plug-in power, plus temporary influent and discharge piping.

WW Engineering & Science's engineers have designed and constructed the unit to demonstrate air stripping, thermally enhanced air stripping, atmospheric steam stripping, and vacuum steam stripping (to 150 mm Hg) on any aqueous stream carrying organic compounds, including many considered non-strippable. The unit is especially useful for developing full-scale design parameters for unusual aqueous streams carrying troublesome inorganic constituents such as chlorides, high calcium, brines, and high iron concentrations.

The system allows real-time evaluations of stripping processes for:

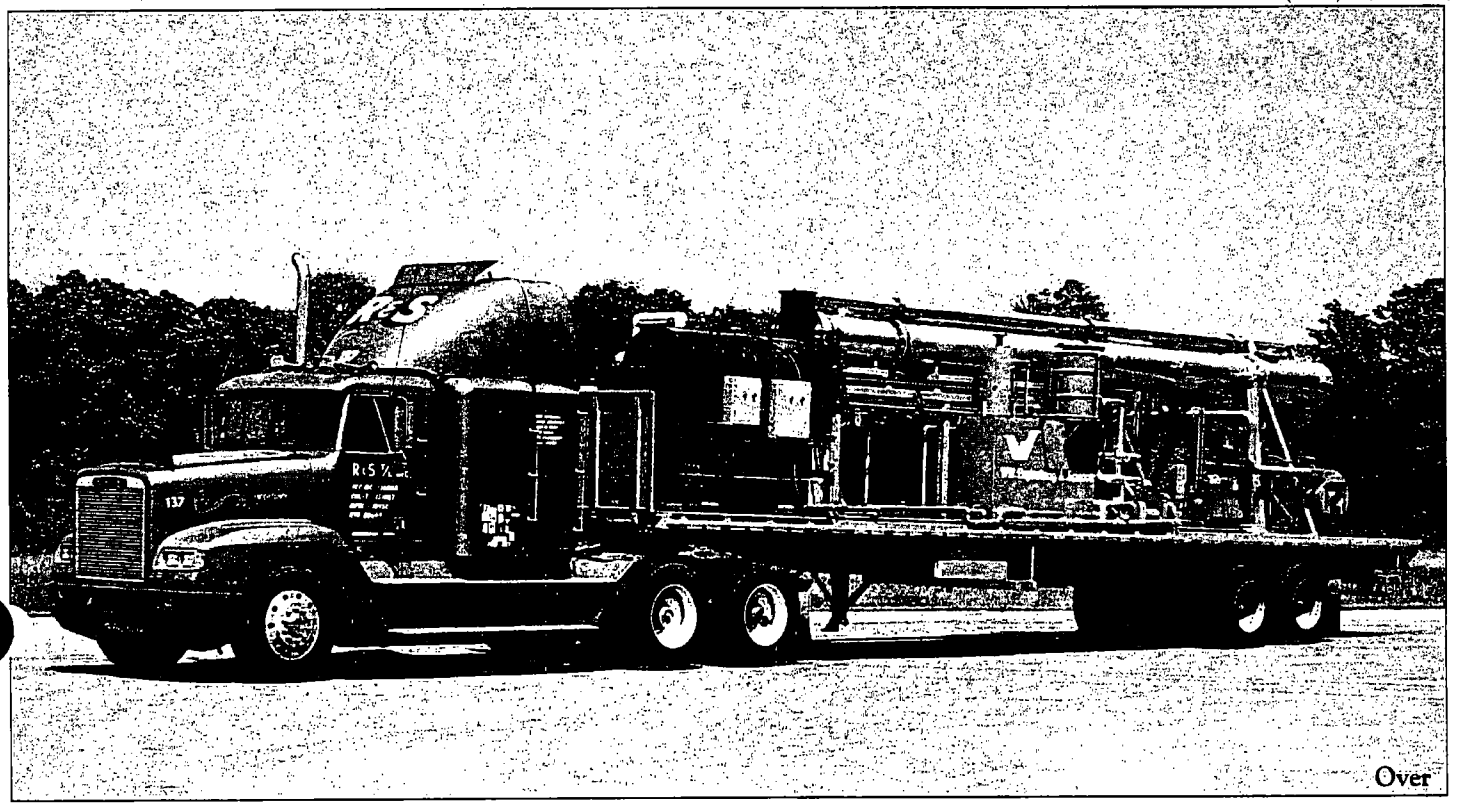
- groundwater treatment
- process wastewater treatment
- OCPSF compliance
- on-site treatment of aqueous wastes to comply with Land Disposal Restrictions
- water treatment from well development and dewatering operations
- treatment of aqueous streams from phase separators
- upgrading existing stripping processes.

Engineers at WWES use actual on-site performance data to custom design full scale stripping systems, taking into account:

- desired removals (up to 99.999% in a single stage)
- optimum hydraulic flux(es)
- minimum vapor flows
- packing requirements
- water conditioning requirements
- materials of construction
- heat exchange requirements

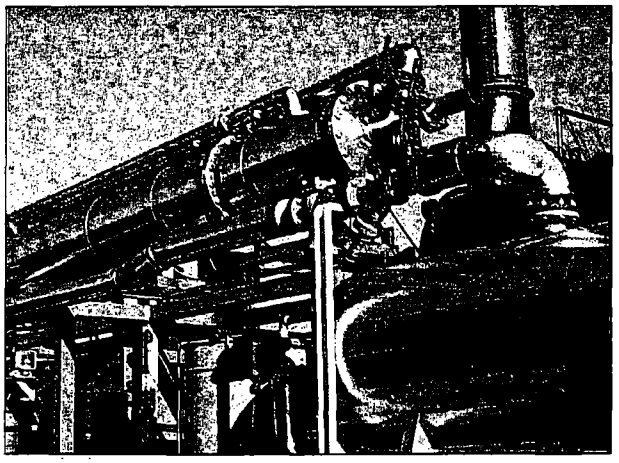
The unit usually demonstrates that overhead vapor flow rates can be dramatically reduced from existing flow rates or commonly held rules-of-thumb. With the mobile system, brine solutions can be shown to be stripped in lower temperature environments under moderate vacuums, thereby eliminating some costly materials of construction to resist high-temperature attack. The unit can also be used for short-term cleanups of discrete volumes of organically contaminated water.

Contact
Sam Tawney,
Eric Strang, or
Ralph Berner
(800) 678-1394



Over

WW Engineering & Science's mobile pilot organic separations unit recently proved its worth at a contaminated groundwater site in Kentucky. Using this system, engineers from WW Engineering & Science were able to demonstrate an actual organic removal efficiency of 99.999 percent, from levels approaching 1,000,000 ug/l to less than 10 ug/l. The full-scale steam stripping process — now in design — will replace an older stripping system and will be about 60 percent more efficient in terms of steam throughput. The new system will yield an annual savings of over $1.3 million annually in steam costs at $8 per million BTU.



The project team originally wanted to demonstrate the viability of vacuum steam stripping (at 150 mm Hg vacuum), but the surprise appearance of free distillate oils in the feedstock eliminated this possibility. The appearance of free oils of varying specific gravities in the purge wells proved the need for serious pilot testing prior to building an expensive, full-scale process. If the project team had not had the mobile pilot system to help define the necessary process changes, a full-scale 1,000 gpm stationary steam stripping system would have been rendered useless, initially. The mobile system was also used to evaluate methods to control severe inorganic water chemistries plaguing the existing system.

For more information about this and other pilot systems, contact:

Sam Tawney, Eric Strang, or Ralph Berner at (800) 678-1394

WW Engineering & Science, Inc.

5555 Glenwood Hills Parkway SE • P.O. Box 874 • Grand Rapids, Michigan 49588-0874 • PH(616)942-9600 FX(616)942-6499

Branch Offices:	Livonia, MI (313)591-0522	Bloomington, IN (812)336-0972	Columbus, OH (614)847-6008	Omaha, NE (402)330-0870	Allen Park, MI (313)386-0401	Monroe, MI (313)241-0130	Lapeer, MI (313)664-9922

a member of Summit Environmental Group, Inc.

APPENDIX C

LABORATORY QA/QC PROCEDURE MANUAL

Analytical Services Division

Quality Assurance / Quality Control

Procedures Manual

WW Engineering & Science

EDI ANALYTICAL SERVICES DIVISION
QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES MANUAL

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1.0 PURPOSE OF THE MANUAL

1.0 PURPOSE OF THE MANUAL

The purpose of this manual is to specify procedures and technical requirements to be used by the EDI Engineering & Science chemistry laboratories to assure that the data generated by the laboratory is accurate, reproducible and timely. This manual provides the chemistry laboratory a quality control plan which is to be used by every individual involved in the analytical efforts at EDI. This manual conforms to and is an extension of the EDI Quality Control Manual. If a conflict should arise, the EDI Quality Control Manual shall take precedence.

1.1 THE NEED FOR ANALYTICAL QUALITY CONTROL

There is a growing importance attached to the measurement of the concentration of any contaminant in water, effluents, and solid samples. As with any type of measurement the results of the methods utilized to measure the concentrations of these contaminants generally differ from the true concentration, i.e. all results are subject to error. Many experimental studies have shown that errors can arise which are as large as a 50 percent variation from the true value, and in fact, may vary between laboratories. Inaccurate analytical results restrict the ability of the analyst and the recipient of the data to draw valid conclusions and usually lead to false or misleading conclusions. Examples of common problems which arise during an analytical effort are as follow:

A. Results, which are compared between two or more laboratories, are in error relative to each other.

B. Results are to be used to decide if a water quality standard has been observed especially as the level of the analysis approaches the detection level.

C. The analytical method, such as GCMS analysis, is only semi-quantitive in nature and, therefore, relative errors are anticipated between equivalent laboratories and even equivalent instruments.

D. An inappropriate test procedure has been used to determine the analyte, resulting in values that do not represent the true sample concentration, i.e. direct aspiration of a turbid sample.

There is also increasing concern about the control of these errors being expressed at the local, the national and the international levels. The concern centers around the need to have a maximum amount of valid information obtained in a cost effective manner. In order to control errors, it is necessary to be able to measure the magnitude of these errors. This manual identifies the activities that are involved in the measurement and control of error. EDI considers analytical quality control of great importance, and requires that it be a primary feature in any analytical effort. The EDI requirements for analytical quality control are in concert with the quality control needs and demands of other organizations, such as the Environmental Protection Agency, the Michigan Department of Natural

Resources, various state regulatory agencies, and such organizations as may need to insure their product quality.

Approximately twenty to thirty percent of all the available effort for routine analysis is absorbed in the execution of quality control requirements. It is often argued that the extent of this effort is too great with respect to routine laboratories and their need to be profitable in their operation. The argument therefore claims that extensive quality control is an impractical expectation for a routine laboratory. However, the corporate policy at EDI demands that the appropriate level of quality control be applied to all analytical effort at EDI, regardless of the sample lot.

In the total effort, it is preferable to obtain twenty to thirty percent fewer results of known accuracy for each analytical batch than it is to obtain larger numbers of results of undefined accuracy. Due to the fact that all analytical procedures are subject to errors derived from many sources, it is not reasonable to assume that quality control is unnecessary with a "good" analyst. Even a "good" analyst may not have an adequate idea of his (her) accuracy. Multiple studies by the EPA, both within laboratories and between laboratories, has shown such reasoning to be generally unsound.

2.0 QUALITY ASSURANCE ORGANIZATION AND RESPONSIBILITIES

2.0 QUALITY ASSURANCE ORGANIZATION AND RESPONSIBILITIES

2.1 OBJECTIVE OF THE QA PROGRAM AT EDI

The purpose of the quality control program is to continuously monitor error, both random and systematic, which inhibits the production of reliable and defensible analytical data. Error is inherent in any analytical routine, even with the most rigorous controls, and thus, a good QC program addresses not only the basic control techniques but also statistical means of measuring precision and accuracy and the confidence limits on these measurements.

The purpose of this manual is to specify the procedures, records, chain of command, and technical requirements which will be adhered to by the laboratories of EDI. This manual conforms to and is an extension of the EDI Quality Assurance Manual and as such, gives final authority to the Corporate QA Manager.

2.2 ORGANIZATION

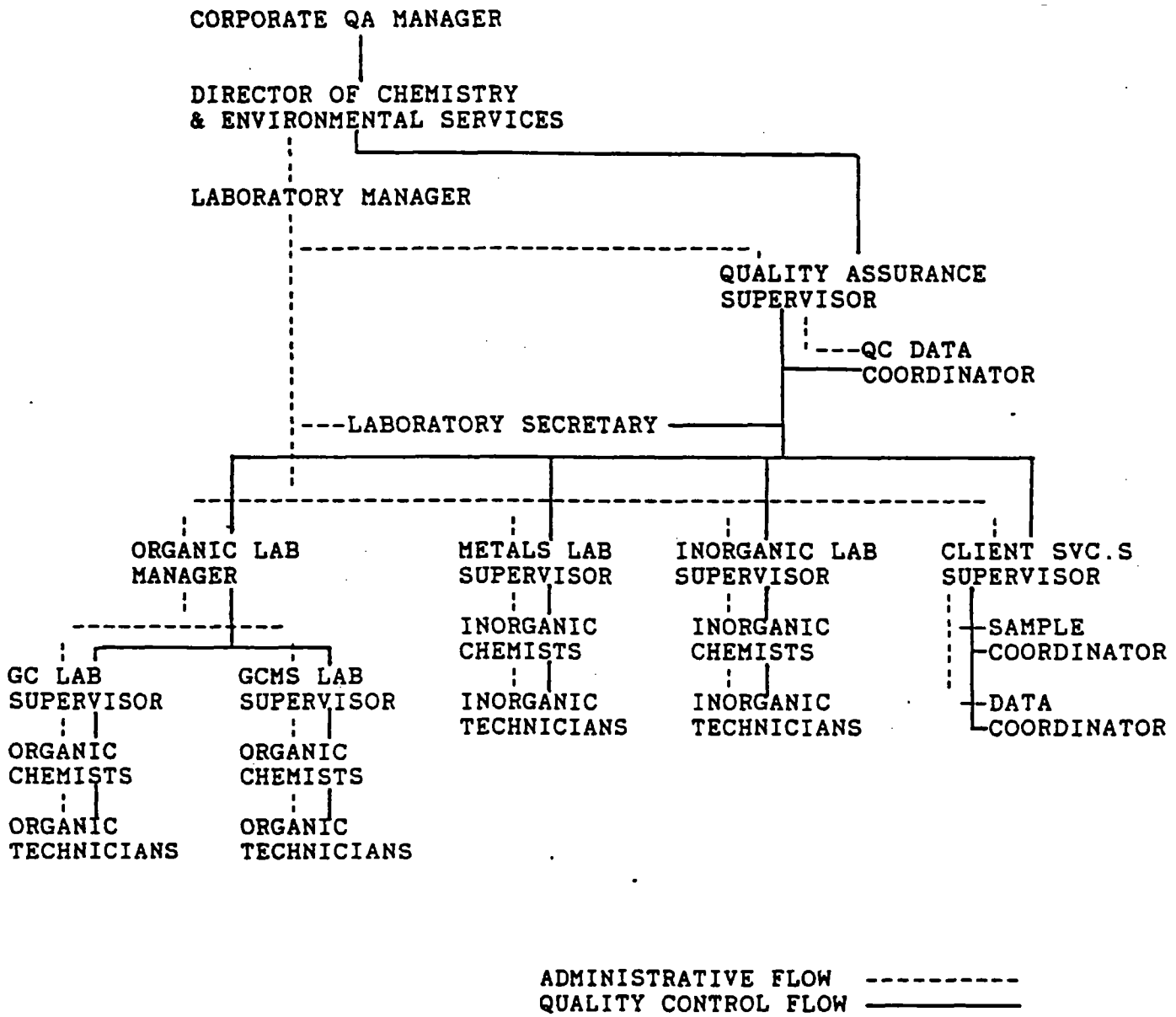
Responsibility for quality control at EDI begins with the bench analyst and moves up through the chain of command ultimately residing at the level of the President. A QC program which is administered only at the upper levels of management is doomed to failure and is unfair to the bench level analyst who needs a means by which he can observe the quality of his work. Quality Control is a two way program at EDI where directives from management are equally important to suggestions and assistance from the bench analyst.

2.2.1 QC Chain of Command Flow Chart

The following flow chart represents both the QA chain of command (solid line) and the administrative chain of command (dotted). The flow chart represents the philosophy of EDI relative to the interaction of QC and production. Although the QA Supervisor reports to the Laboratory Manager in the supervisory chain of command, his responsibilities for quality control require that he answer to the Director of Analytical Services. The QA Supervisor acts as an immediate record keeper and QA Administrator.

However, when a question relative to the quality of analytical data arises, the QA Supervisor, in conjunction with the Director of Analytical Services, has the right to prevent data dissemination. In cases of conflict, the Director of Analytical Services has final authority except when a compromise or directive is issued by the Chief Operating Officer or the President.

QUALITY CONTROL
CHAIN OF COMMAND
FLOW CHART



2.2.2 Responsibilities and Objectives of the Corporate QA Manager

2.2.2.1 Objectives

- To develop and implement a Company wide quality assurance program
- To assist management with the integration of individual quality assurance programs into all operations
- To establish an attitude that focuses on defining causes of nonconformance and eliminating them
- To assist managers in defining performance requirements

2.2.2.2 Responsibilities

The EDI Quality Assurance Manager (QAM) is responsible for developing and administering the EDI QA program. The QAM will review laboratory program audits and take appropriate action as necessary. In addition, the QAM may serve as an arbitrator in any QA/QC disputes which might arise in the laboratory.

2.2.3 Responsibilities of the Laboratory QA Supervisor

2.2.3.1 To monitor the Quality Assurance activities in the laboratory insuring adherence to all policies and procedures.

2.2.3.2 To identify problem areas and help in recommending improvement and changes.

2.2.3.3 To keep abreast of changing development in analytical QC particularly requirements set by regulatory agencies.

2.2.3.4 To arrange or produce performance evaluation samples.

2.2.3.5 To maintain QC records on all analytical activities and update control limits in a timely manner.

2.2.3.6 To assure maintenance records are maintained on every piece of equipment.

2.2.3.7 To assure that bottle preparation and storage practices are routinely followed.

2.2.4 Responsibilities of the Sample Coordinator

- To insure that all samples received at EDI are properly preserved, logged-in, and stored in agreement with the log-in manual.
- To insure that all COC shipments are handled according to established procedures including storage, sample tracking and completion of files.
- To insure that all project records and subsequent paperwork are completed and filed.
- To insure that labile samples are distributed in a timely manner.
- To cooperate with the QA Supervisor in introducing performance evaluation samples.

2.2.5 Responsibilities of the Analytical Staff

- To insure that all QC records are generated and recorded on a daily basis.
- To insure that the following bench level QC requirements are met: to fill out lab notebooks daily is required; to provide for QC on every batch of samples at a minimum of:

  10% duplicate
  1 blank per run
  10% matrix spike
  1 method blank per run
  1 Downfield standard(s) per run

  (Frequency for GCMS analyses is 1 in 15 for duplicates and matrix spikes.)
- To insure that instruments are calibrated prior to initiating any analysis and that no analyses are started unless calibration has been satisfactorily completed and documented.
- To insure that every batch of analyses meets established QC guidelines or is reanalyzed automatically.
- To inform the lab Supervisor of any reoccurring problems or systematic trends which may effect quality.

2.2.6 Responsibilities of the Laboratory Supervisor

- To insure that sufficient staff is available to administer QC.
- To insure that all participating analysts are fully trained in the test they are performing.
- To insure that effective training and orientation takes place for every new analyst.
- To insure that all QC procedures, directives or project oriented requirements are met.
- To review all benchsheet data and approve prior to computer entry.
- To interface with the QA Supervisor and Laboratory Manager on a routine and consistent basis.
- To take responsibility for immediate solutions to QC problems which may slow or stop production.

2.2.7 Responsibilities of the QC Data Coordinator

The QC Data Coordinator's responsibilities are:

- To enter all QC data generated into the appropriate records.
- To maintain the laboratory QC database.
- To produce client quality control reports on request.
- To generate and distribute laboratory QC performance monitoring and database reports on a regular basis.

3.0 FACILITIES AND EQUIPMENT

3.0 FACILITIES AND EQUIPMENT

3.1 The physical plant layout diagram is enclosed. The approximate square footage allocated to each analysis area is presented as well as the number of personnel normally working in each area. A listing of equipment presently utilized by EDI is also enclosed.

3.2 The quality of the analytical instrumentation utilized by EDI is of great importance considering its ultimate effect on data quality. The following guidelines exist for the procurement of analytical instrumentation:

3.2.1 Equipment Need

An equipment need is identified by the Lab Manager or the Director of Environmental Services as a result of:

- o New Contractural Effort
- o Regulatory Changes
- o Normal Upgrade/Replacement
- o Capacity Improvements

3.2.2 Procurement Procedure

The performance specifications defined by the need are used to identify prospective equipment suppliers. The Lab Manager mails the performance specifications to the prospective equipment suppliers. Those suppliers able to meet the performance specifications are asked to provide a quotation for the purchase or lease of the equipment. An evaluation of the quotations is made by the Lab Manager with consideration given to such items as: equipment ease of use, degree of automation, specification compliance, potential for computerization, price and space requirements.

A written recommendation by the Lab Manager is presented to the Director of Environmental Services for their review and comment.

A final recommendation by the Director of Environmental Services is made to the President of EDI. The final approval is granted based on the assurance of complying with all regulatory and corporate guidelines for the generation of the highest quality data.

3.3 CHEMICAL PROCUREMENT AND INVENTORY PROCEDURE

All reagent specifications are dictated by EPA/APHA or NIOSH approved analytical methods. These reagents specifications are identified and our ordering of these materials complies with the national quality specifications.

The ordering of all materials, standards, reagents, plastic ware etc. is done by one of two designated lab area supervisors. This activity provides consistency and allows the orderly purchasing of materials from a vendor that has been identified as being able to provide the specified material.

Problems with reagents or stock chemicals are detected by the routine analysis of method or reagent blanks and/or method spikes for organics as specified in section 9.0, the general quality control practices.

A detectable concentration of an analyte from a method or reagent blank requires the notification of such to the QA supervisor and the lab area supervisor. Corrective actions will be taken resulting in a non-detectable reagent or method blank.

3.4 PREVENTATIVE MAINTENANCE

Every analytical instrument has a separate maintenance log book as identified in the Document Control Section No. 6.3.7. The required maintenance activities have been developed by the Lab Manager and each Group Leader/Area Supervisor. The maintenance activities comply with manufacturer specifications and working experience requirements.

Each maintenance log book contains a table indicating the frequency and type of maintenance required. The maintenance activity is documented as the frequency requirements dictate.

Analysts are assigned the responsibility of maintaining various instruments or equipment in their respective laboratory areas. The Group Leader or Area Supervisor is responsible for checking the maintenance log books. The Quality Assurance Supervisor is notified of any deviations or lack of maintenance activity performance, and corrective actions are taken.

EQUIPMENT

Analytical Area	Equipment/ Instrument Name	Manufacturer	Model No.
Inorganic Chemistry	Analytical Balance(2)	Mettler	AE163
	Analytical Balance	Mettler	PC4400
	Auto Analyzer	Bran & Luebe	TRAACS 800
	Auto Analyzer	Technicon	AA II
	Conductivity Meter	YSI	32
	IR Spectrophotometer	Perkin Elmer	567
	pH/mv Meter	Beckman-Altex	o 70
	pH/mv/ISE/Do Meter	Orion	EA920
	Spectrophotometer	Hitachi	100-40
	TOC Analyzer	Beckman	915-B
	TOX Analyzer	Xertex/Dohrmann	MC-1
	Turbidimeter	Hach	2100A
Atomic Absorption	AA Spectrophotometer	Perkin Elmer	5000
	AA Spectrophotometer	Perkin Elmer	5100PC
	Zeeman Furnace	Perkin Elmer	
	Plasma Emission Spectrometer	Perkin Elmer	Plasma 40
	Microwave Digestion System	CEM	MDS 81D
	pH Controller(3)	Cole Parmer	5652-10
Gas Chromatography	Gas Chromatograph	Varian	3700
	Gas Chromatograph (2)	Varian	3760
	Gas Chromatograph	Varian	3400
	Gas Chromatograph	Tracor	540
	Gas Chromatograph	Tracor	585
	Gas Chromatograph	Hewlett Packard	5840A
	Gas Chromatograph	HNU	301
	Integrator (7)	Varian	4270
	HPLC	ISCO	2300
Mass Spectroscopy	Mass Spectrometer(2)	Finnigan MAT	OWA 1000
	Mass Spectrometer	Extrel	ELQ-400
	Sample Concentrator(2)	Tekmar	LSC-2
	Gas Chromatograph(2)	Perkin Elmer	Sigma 3B
	Gas Chromatograph	Varian	3400

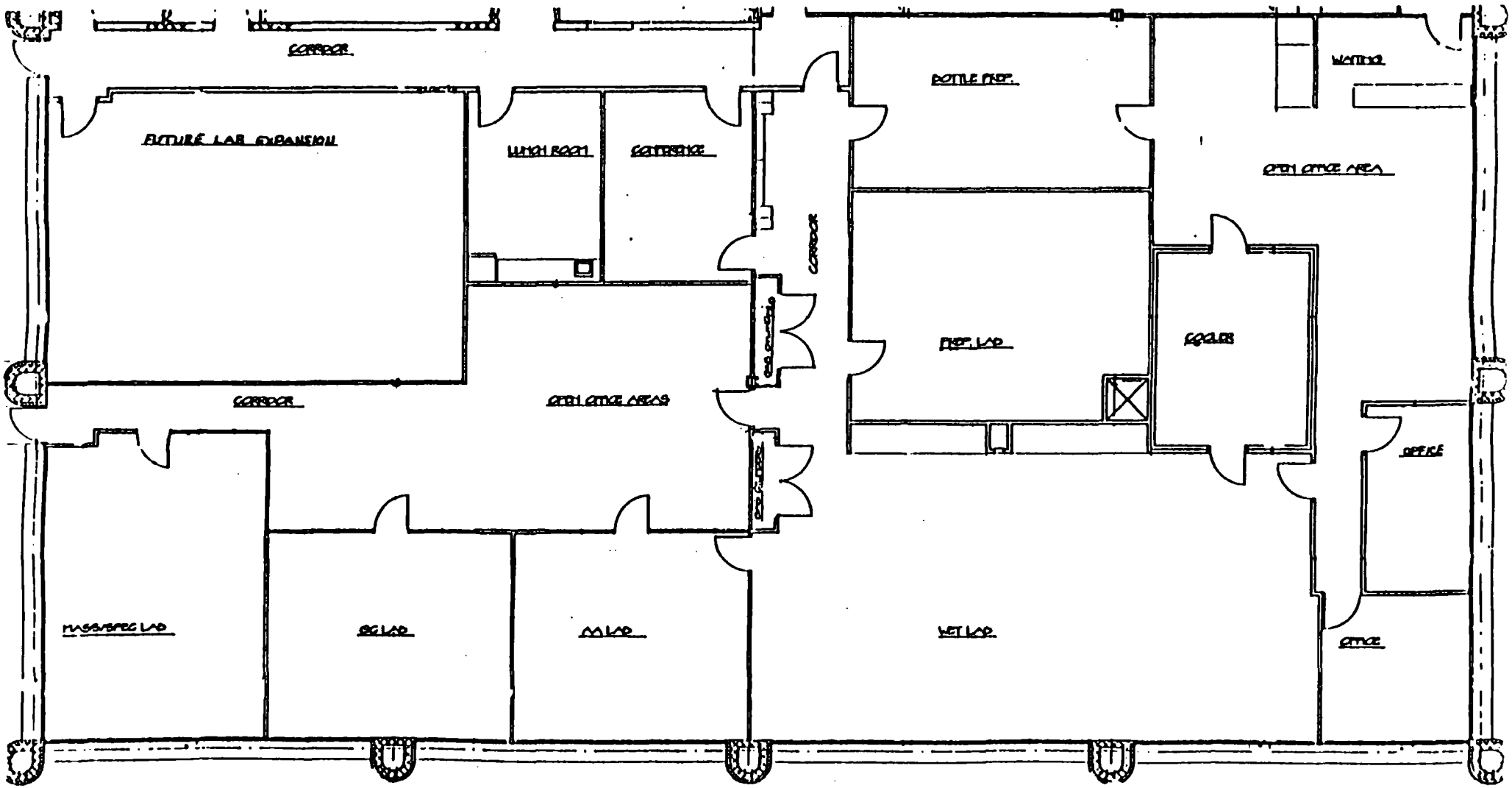
PHYSICAL PLANT

Laboratory Name and Address: EDI ENGINEERING & SCIENCE
5555 Glenwood Hills Parkway S.E.
Grand Rapids, MI 49508

Name of Laboratory Manager: John P. Dullaghan

Describe or attach a drawing of the laboratory layout, indicating the general areas of analysis, the space allotted to each and the number of personnel generally assigned to each area.

ANALYSIS	SPACE ALLOTTED, FT^2	NO. OF PERSONNEL
Wet Chemistry/Microbiology	Approx. 1350	8
Atomic Absorption/Emission	Approx. 400	4
Gas Chromatography (GC)	Approx. 400	5
GC/Mass Spectrometry	Approx. 500	4
Sample Processing & Storage	Approx. 600	4
Administrative Offices	Approx. 1350	10
Organic Pretreatment	Approx. 525	1
Laboratory Offices	Approx. 750	--


CORRIDOR
FUTURE LAB EXPANSION
LUNCH ROOM
CONFERENCE
CORRIDOR
OPEN OFFICE AREAS
CORRIDOR
BOTTLE PREP.
WAITING
OPEN OFFICE AREA
PREP LAB
EQUIP.
OFFICE
OFFICE
VET LAB

4.0 ANALYTICAL METHODOLOGIES

4.1 METHODS UTILIZED

The EDI Laboratory maintains and updated reference volumes of approved analytical methodologies for environmental and non-environmental analysis. A responsibility of the Lab Manager and the Director of Environmental Services is to continually seek and review regulatory method changes and their impact on current laboratory practices. The most commonly referenced materials include:

- "Methods for Chemical Analysis of Water and Wastes" EPA-600/4-79-020 revised March 1972.
- "Manual of Analytical Procedures" NIOSH, Volumes 1 & 2, Third Edition, Feb., 1984.
- Standard Methods for the Evaluation of Water and Wastewater, APHA, AWWA, WPCF 1980.
- "Handbook for Analytical Quality Control in Water and Wastewater Laboraories", EPA 600/4-79-019, March 1979.
- "Physical and Chemical Methods for the Evaluation of Solid Waste" EPA-SW846 Third Edition, 1982.
- "Guidelines Establishing Text Procedures for the Analysis of Pollutants" Proposed Regulations. CFR December 3, 1979; updated Oct. 26, 1984.

4.2 METHOD CALIBRATION AND OPERATING PROCEDURES

A standard operating procedure manual exists for all analytical procedures. The S.O.P's include specific calibration procedures that must be followed by an analyst prior to conducting sample analysis. The analyst is required to perform and document the calibration procedure. The calibration activity is identified by each analyst in their lab notebooks. The actual standards utilized are found in each instrument log book. It is the responsibility of each analyst to document all calibration and operating procedures utilized in the instrument log books. It is the responsibility of the group leaders and/or supervisors to notify the Quality Assurance Officer when deviations occur so that corrective actions can be taken. The corrective action will be to identify whether the information is simply missing (not entered) and to have it recorded or if the calibration has not been performed, to not release data generated that day and require those samples to be rerun.

5.0 ANALYST TRAINING

5.0 ANALYST TRAINING

5.1 RATIONAL

Consistent with requirements by the EPA and other regulatory agencies for analyst training programs, EDI has a new policy relative to the training of analysts prior to their involvement in the analysis of client samples. The program is necessary in order to maintain continuity in all analytical programs and to insure the integrity of all data.

5.2 TRAINING

The Laboratory Supervisor is responsible for training all new personnel. Training will include, but not be limited to, EDI QC requirements, paperwork flow, lab safety and organizational structure. In addition, the new analyst will be given copies of the QC manual and methodologies which the analyst will be required to read. Training in the methods to be used will be completed and verified by the Laboratory Supervisor prior to analysis of client samples.

5.3 PERFORMANCE VERIFICATION

Each new EDI analyst will be required to receive thorough training for all methods which he is to perform. Such training insures that the analyst can meet EDI detection limits and quality control limits as established for the method. The following methods represent appropriate means of verifying analyst performance.

5.3.1 Method Spikes

Analysis of spiked lab pure water at the levels of 2.0x and 5.0x where x is the established detection limit. This should include 2 blanks and a duplicated spike at 2.0x or 5.0x and should occur on 2 separate days. These results must match current EDI Schwart control chart limits. Additional parameters such as consistent instrument calibration curves should be evaluated.

5.3.2 Check Sample Analysis

The analyst should test a known blind check sample in duplicate including a blank. All the data must fall within established control limits for the parameters.

5.3.3 Current Analysts Training

The EDI analyst, who is assigned a new method, should complete training and performance verification for the method as outlined above prior to performing analyses on client samples.

5.4 PERFORMANCE AUDITS

The Laboratory Manager, in cooperation with the Laboratory area Supervisors and QA Supervisor, will perform individual audits on all aspects of the operation biannually. These audits will include performance data, control limits, all levels of records and laboratory performance on all check samples and instituted blind QC samples. A report of the audit results including recommendations will be forwarded to the Director of Analytical Services.

6.0 DOCUMENT CONTROL, FLOW AND STORAGE

6.0 DOCUMENT CONTROL, FLOW AND STORAGE

6.1 PURPOSE

The paperwork trail must be designed to insure that after the issuance of a report, anyone - a client, a lawyer or the President of EDI - can track a single sample result back through EDI records to the origin of the standards used in calibration and the identity of the person who prepared the sample bottles.

6.2 PAPERWORK FLOW

As shown in Figure 1, "Flow Diagram" the paperwork trail is eventually the same for routine work as it is for samples under Chain-of-Custody. The general axiom is that a COC procedure is doomed to failure without a pre-existing scheme of tight sample and analytical control available as a routine measure. This contention, however, is only of minimal consequence with respect to the need for detailed records. The records trail can provide the following:

- Answers to questions of analytical integrity for results which are 2 months or two years old.
- Assistance in finding and solving random and systematic problems.
- Assistance in insuring continuity of analytical effort despite personnel and mechanical changes.

6.3 DOCUMENT REQUIREMENTS

The following subsection identifies all documents which are generated during the course of any project:

6.3.1 Project Sheets

Every sample or group of samples which enter the EDI facility must be accompanied by the appropriate project sheet which has been properly filled out and provided to the Sample Coordinator (SC). The SC may not log-in samples for which there are no project sheets or for which the project sheet is incomplete. An example project sheet is attached as Figures 2 and 3.

6.3.2 Problem Project Sheets

When the Sample Coordinator (SC) identifies a problem with a sample shipment or project sheet, a Problem Project Sheet may be initialed and sent to the project chemist for resolution when direct communication attempts have failed. See Figure 4.

Figure 2

Analytical Services Project Sheet

A To be completed prior to submittal Pg. of

Client Name: Date of Request:

Project No Samples will arrive on/about:

Project Manager Number of Samples Turnaround

Job Description

Quality Control RAS ☐ SAS ☐ CLP ☐ COC: Field ☐ Lab ☐ None ☐

B To be completed at sample log-in

Sampled By:

Sample Locations:

Date Sampled: Time: am pm

Date Received: Time: am pm

Received By:

Date Logged In: By

Worksheet: Shelf Letter:

C Laboratory processing record

Client No.: Job No.:

Lab Project Manager:

Invoice Amt: Factor:

Analyst:

Date Analysis Completed am ☐ pm ☐

Quality Control Review By:

Date Reported to Office:

Date of Final Report:

D Data: List parameters requested prior to submittal.

Cpd. No.	Sample ID: Matrix:					O.D.L	Units
—	Parameter(s)	#	#	#	#	—	—

Comments:

Schduled Laboratory Completion Date:

Figure 3

Route To:

From:

Date:

EDI Laboratory
New Project Approval Form

Request for Budget: _____

Request for Work: _____

Client Information

Name: _____

Address: _____

_____

Billing Address: _____

_____

Client Contact: _____

Phone Number: _____

LCS or CCS

Quotation No: _____

P.O. Number: _____

Contract No.: _____

Lab Project No.: _____

CCS Project No.: _____

Project Information

Project Description: _____

_____

Site/Sample Hazards: _____

_____

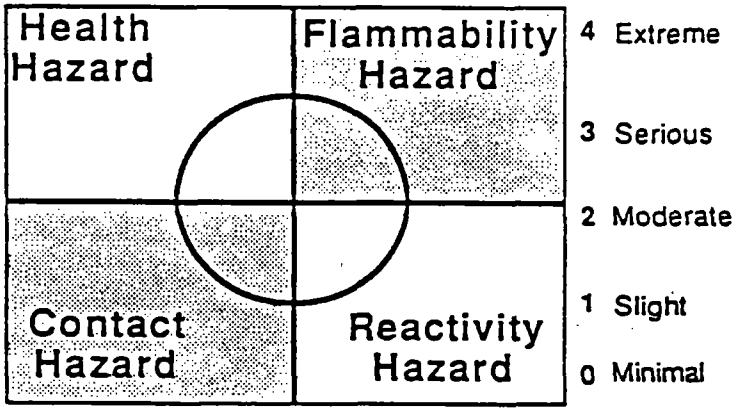
_____

_____

Sample Disposal Instructions: _____

_____

_____



SampleStorage: Short Term (30 Days) _____, Long Term (90 Days) _____, Other _____

Sample Containers: please ship ☐ will pick up ☐ not required ☐

when: _____ carrier: _____

Turnaround: (3weeks) _____ (2 weeks) _____ (1 week) _____ (48-72 hrs) _____ (< 24 hrs) _____

Frequency of sample reciept: weekly _____ monthly _____ quarterly _____ one time _____ other _____

Samples Scheduled to Arrive: _____ am ☐ pm ☐

Contract Dates: beginning _____ ending _____

Project Analytical Cost

Cost/Sample: _____ X Number of Samples _____ X Turnaround Factor _____ = _____

Other Costs (sampling) _____

Project Cost: _____

Project Acceptance *(project manager & area supervisors must sign and return to the laboratory manager)*

Name:	Date:	Name:	Date:
1. _____	_____	3. _____	_____
2. _____	_____	4. _____	_____

Internal Use Only:

	$ Amount	O	$ Amount	M	$ Amount	S	$ Amount

Discount % _____

FIGURE 4

ROUTE TO: _____ DATE: _____
TIME: _____

EDI LABORATORY
PROBLEM PROJECT REPORT

SAMPLES RECEIVED ON _____ AT _____AM/PM FROM: _____
AND DESCRIBED AS _____ WERE RECEIVED HAVING THE FOLLOWING DEFICIENCIES.

REQUEST FORM - ABSCENT/INCOMPLETE	[_]
CHAIN-OF-CUSTODY - ABSCENT/INCOMPLETE	[_]
CHAIN-OF-CUSTODY - DOES NOT MATCH SAMPLE TAGS	[_]
SAMPLE BOTTLES - BROKEN	[_]
SAMPLES ABSCENT - QUAN. DOES NOT MATCH REQUEST FORM	[_]
SAMPLE BOTTLES - INCORRECT FOR ANALYSIS	[_]
SAMPLE PRESERVATIVES - INCORRECT FOR ANALYSIS	[_]
SAMPLE VOLUMES - INCORRECT FOR ANALYSIS	[_]
SAMPLE TAGS - WRONG I.D./ABSCENT	[_]
FIELD FORMS - ABSCENT/INCOMPLETE	[_]
CUSTODY SEALS - ABSCENT/NOT INTACTED	[_]
SMO FORMS - ABSCENT	[_]
NON-ROUTINE PROJECT - NO PRIOR APPROVAL	[_]

THE SAMPLES IN QUESTION WILL BE PROCESSED AS IS_ PLACED ON HOLD _

UNTIL THE CORRECTIVE ACTIONS OR DIRECTIVES ARE ISSUED.

THANK YOU
EDI LABORATORY
SAMPLE COORDINATOR

6.3.3 Chain-of-Custody Forms

There are three forms for Chain-of-Custody samples. All three forms must be properly completed and included in the project file for each and every COC project.

6.3.3.1 COC Shipping Record

The shipping record must be received in the shipping container with every COC shipment. The form attached as Figure 5 is similar to the form used by the EPA. This form will be used by EDI field samplers and returned with the samples. Other forms of a similar nature may be used by other clients. However, the information required on the EDI form must be present on any other client form or they run the risk of their COC being rejected as a continuous trackable COC event.

6.3.3.2 COC Project Log-in Form

This form, attached as Figure 6, is to be used for the receipt of any COC shipment regardless of the origin of the shipping record. COC projects which have poor or nonexistent shipping records will be logged-in (with notification of the deficiency to the Project Chemist) and this form will be completed. The form is completed by the Sample Coordinator and placed immediately in the COC Project File.

6.3.3.3 COC Sample Control Record

This form is used as a record of the movement of COC samples in and out of the COC locked storage. The analyst signs samples in and out each time a sample(s) is removed for any analysis. A copy of the form is attached as Figure 7. After all analyses are complete, the Sample Coordinator files the form in the COC project file.

EDI Engineering & Science

Chain of Custody Record

0001468

Project No.	Project Name									
Samplers (signature)										
Date	Time	Matrix*	Comp	GRAB	Sample I.D.	No. of Containers	Container Type & Volume	Preservation Method	Analysis Required/Comments	

Relinquished by: (signature)	Date / Time	Received by:	Relinquished by:	Date / Time	Received by: (signature)	
Relinquished by: (signature)	Date / Time	Received by:	Relinquished by:	Date / Time	Received by: (signature)	
Dispatched by: (signature)	Date / Time	Carrier:	Received to lab by:	Date / Time	Logged in by:	Date/Time

* MATRIX: WATER (WTR), WASTEWATER (WW), SOIL (SOL), SLUDGE (SLU), AIR, OIL, HAZARDOUS WASTE (HW)

03 EDI/Chain of Cust Rec

Figure 5

FIGURE 6

EDI LABORATORY CHAIN-OF-CUSTODY LOG-IN FORM

DOCUMENT CONTROL #_____

sample custodian (signature):_____ date:_____

circle the apropriate response

1. custody seals — present/absent; intact/not intact — case number_____ airbill # _____
2. chain-of-custody COC — present/absent
3. sample tags — present/absent
   sample tag #'s — listed/not listed on-COC
4. SMO forms — present/absent

date received	time received	COC record number	SMO sample numbers	corresponding		information OK
				tag #	lab #	

remarks: (condition of shipment) _____

6.3.4 Work Sheets/Bench Sheets

Work sheets and bench sheets are the analytical assignment forms generated by the computer or the Lab Supervisor for each group of projects or tests. The work sheets are divided into work stations, i.e. the analytes for which one or more analysts have sole responsibility. Bench sheets will have an entry position for the results of each analyses for each sample. In either case, the results, upon completion of all analyses, will be turned into the appropriate supervisor for review and approval. Examples of bench sheets can be found in figures 8, 9 and 10.

6.3.5 Lab Notebooks

The lab notebooks are the daily records of all activities of analysts working in the lab. The notebooks will be bound and paginated. The notebook will be cleanly labeled on the inside cover with the date issued, the analyst's name, and the date completed. There are several specific rules which will be as follows:

- All entries are in ink
- There are no erasures, obliterations, or white outs allowed
- Corrections are single lined and initialed
- A new page is started each day and/or with every batch of samples
- Empty space is covered with a Z and signed and dated across the obtuse line
- Any and all work, observations and errors are noted
- Problem areas are identified

6.3.6 Instrument Run Log Books

Each analytical instrument will have a bound notebook identified as the Instrument Run Log Book. This logbook will contain entries identifying the date of instrument use, the analyte(s) being tested for, the standard concentrations of the analytes used to establish a calibration curve, whether the system met calibration and what samples (EDI lab sample numbers) were analyzed that day in a given batch or run.

These logbooks are to be maintained by all laboratory analysts and they are routinely reviewed by the lab area supervisor for completeness and accuracy.

FIGURE 8

EDI SPECTROPHOTOMETRIC WORKSHEET

PARAMETER: MBAS-SURFACTANTS
METHOD:
DATE:
ANALYST:

PROJECT	CLIENT	WRK#	SAMPLE #	MACHINE READING	DILUTION FACTOR	REPORTED CONC	STANDARD 1 ABS	STANDARD 1 CONC	STANDARD 2 ABS	STANDARD 2 CONC	STANDARD 3 ABS	STANDARD 3 CONC	DOWNFIELD VERIFICAT.	DUPL. CONC
25229	BOC GROUP - LANSING	4	65699											
25229	''	8	65702											
25229	''	12	65706											
25229	''	12	65707											
25229	''	12	65708											
25229	''	16	65709											
25229	''	16	65710											
25229	''	16	65711											
25229	''	16	65712											
25229	''	24	65717											

QUALITY CONTROL DATA SUMMARY

PROJECT	QCSAMPLE / CLIENT	SAMPLE#	INSTRUMENT READING	DILUTION FACTOR	TEST RESULT	DUPLICATE RESULT	SPIKE RESULT	SPIKE QUANTITY	% RECOVERY / DIFFERENCE
99991	METHOD SPIKE | EPA ERA					- - - -			
99991	METHOD BLANK					- - - -	- - -	- - - -	
	MATRIX SPIKE/					- - - -			
	DUPLICATE/						- - -	- - - -	

FIGURE 9

EDI GRAVIMETRIC BENCH SHEET

Mg/L TS=(A-B)X1000

MLS OF SAMPLE

A=WT. OF DISH+DRY RESIDUE
B=WT. OF DISH

PARAMETER: RESIDUE,NONFILTERABL
METHOD:
DATE:
ANALYST:

PROJECT	CLIENT	WRK#	SAMPLE #	I.D.	DISH + RESIDUE	DISH WEIGHT	MLS OF SAMPLE	REPORTED CONC.
25229	BOC GROUP - LANSING	3	65699					
25229	''	7	65702					
25229	''	11	65706					
25229	''	11	65707					
25229	''	11	65708					
25229	''	15	65709					
25229	''	15	65710					
25229	''	15	65711					
25229	''	15	65712					
25229	''	19	65713					

QUALITY CONTROL DATA SUMMARY

PROJECT	QCSAMPLE / CLIENT	SAMPLE#	DISH + RESIDUE	DISH WEIGHT	MLS OF SAMPLE	TEST RESULT	DUPLICATE RESULT	SPIKE RESULT	SPIKE QUANTITY	% RECOVERY / DIFFERENCE
99991	METHOD SPIKE | EPA ERA						- - - - -			
99991	METHOD BLANK						- - - - -	- - -	- - - -	
	MATRIX SPIKE/						- - - - -			
	DUPLICATE							- - -	- - - -	

FIGURE 10

EDI TITRIMETRIC BENCH SHEET

PARAMETER: CHLORIDE
METHOD:
ANALYST:

PROJECT	CLIENT	WRK#	SAMPLE #	DATE OF ANALYSIS	ml SAMPLE	ml TITRANT	NORMALITY TITRANT	CONC. Mg/l
25229	BOC GROUP - LANSING	12	65706					
25229	''	12	65707					
25229	''	12	65708					
25229	''	16	65709					
25229	''	16	65710					
25229	''	16	65711					
25229	''	16	65712					
25229	''	24	65717					
25229	''	24	65718					
25229	''	24	65719					

QUALITY CONTROL DATA SUMMARY

PROJECT	QCSAMPLE / CLIENT	SAMPLE#	ML SAMPLE	ML TITRANT	TEST RESULT	DUPLICATE RESULT	SPIKE RESULT	SPIKE QUANTITY	% RECOVERY / DIFFERENCE
99991	METHOD SPIKE | EPA ERA					- - - - -			
99991	METHOD BLANK					- - - - -	- - -	- - - -	
	MATRIX SPIKE/					- - - - -			
	DUPLICATE/						- - -	- - - -	

6.3.7 Instrument Maintenance Log

The instrument maintenance log is used to record routine maintenance and identify corrective actions for any maintenance problem. Anytime the instrument is repaired or modified in any way, the event must be noted with all specifics, including what was done, by whom, and why. A two detector GC has one log tracking two detectors.

6.3.8 Oven, Refrigerator and Freezer Temperature Logs

Each oven, furnace, plus all cold storage devices, will have their temperatures checked and recorded daily, or at a minimum, 5 days a week. Each device will have a thermometer in place or a temperature recorder in-place which will be checked by an assigned lab analyst. A log book with sections for each device will be used to record all entries of date and temperature and will be initialed. The lab will have an NBS thermometer which will move between devices to act as a QC check for the primary temperature device. All devices which have a removable thermometer will be checked by removing the thermometer and placing them in a beaker of water which has the NBS thermometer in it. After a suitable stabilization time, each device thermometer will be read and the reading compared to the reading from the NBS thermometer. Unacceptable temperature reading will result in the recalibration of a thermometer or its replacement.

6.3.9 Balance Logs

An area analyst will check all balances in the laboratory at least once a week using NBS class S weights. The analyst will record each weekly reading in a log developed for each balance. A balance which fails to meet criteria will be removed from service until repaired. The Lab Supervisor will insure that every balance is serviced and calibrated annually recording such service in the log.

6.3.10 Standard Record Books

Every standard used in the laboratory must be labeled and the label will possess the following information:

- Analyst initials
- A standard mix no. (referenced in standard log book identifying mix contents
- The analyte or analytes contained in the standard (for inorganics)
- The concentration
- The preservative, i.e. nitric acid
- The date made
- The Standard Reference Number

The last item, Standard Reference Number, is the identified standard and dilution sequence no. taken from the Standard Record Book in which the standard solution data is recorded.

All standards (including dilutions) will be recorded in a Standard Record Book assigned to the work station. Two record books are used where applicable, each of which has a different purpose. The record books are subtitled as follows:

6.3.10.1 Stock Standards Log

This book contains standards starting with the identification of the starting material. One standard and/or standard mix with it's corresponding dilutions are identified.

6.3.10.2 Working Standards Log

A working standard reference number is assigned and the corresponding dilutions are identified.

6.3.11 Control Charts

Each analytical method will require at least one control chart. Some tests may involve several control charts, i.e. duplicate, matrix spikes and method spikes. The QA Supervisor will supply the limits to be used to the work station involved. Every data point generated with every analytical batch will be entered into the computer. Every out-of-control data point will be noted on the corrective actions form and sent to the QA Supervisor and the lab area supervisor. Completed control charts will be computer generated on a regular basis.

6.3.12 Preliminary Reports

After all data has been entered for a project, the computer will flag the project ready for a preliminary report. The report will be identical to the final report in content except for the following:

- Preliminary Report will be reviewed and corrected if necessary on each page in large type.
- Comments necessary to the project will be printed under each sample or at the end of the report.

The DC will print the preliminary report review it against bench sheets or an ASPS and correct if necessary. If no corrections are required, the DC will then print a Final Report. A final report is then sent to the Project Chemist for final review, then signed by the Lab Manager for mailing.

6.3.13 Final Report

After the preliminary report has been corrected and cleared all reviews, the DC will manually alter the computer flag and print a Final Report which will be forwarded to the Project Chemist for approval. The DC will then arrange for delivery of the final report.

6.3.14 Project Files

The Project File is the comprehensive record of every project completed at EDI. A project file initially consists of a file folder set up by the Lab Secretary (LS) at the time of log-in. Chain-of-Custody projects will be stored in a locked COC file with strict limited access while routine project files are stored in a separate nominally limited access file. The LS will be responsible for including the following in the project file: .

- Project Sheets
- Problem Project Sheets
- Chain-of-Custody Forms (3 each)
- All correspondence or documents received with the samples
- Separate Report Papers, i.e. Field Reports (if applicable) - Final Report
- Any additional paperwork which may follow the report

All project files are stored for a period of 3 years and then transferred to microfilm.

7.0 SAMPLE CONTROL, FLOW, AND STORAGE

7.0 SAMPLE CONTROL, FLOW, AND STORAGE

All samples received at the EDI Engineering and Sciences must be logged in before any work is performed on the samples. This procedural requirement is specific not only to the chemistry lab, but the microbiological laboratory. The purpose of the log-in procedure, including sequential numbers assigned to all samples received in the facility, is to insure that EDI has a means by which samples can be tracked, data can be stored, and quality control can be tracked for any sequence of events during a particular analytical period. In handling projects in this manner, EDI, or the client, can insure a consistent and documented sequence of events under any analytical situation.

Management acknowledges that there are situations in which log-in of samples will be difficult due to rapid turn around requirements for particular compounds that may decompose or volatilize. An example of this kind of analysis is the total coliform samples which can be anticipated and for which holding times are short. Should a secondary mode of operation be necessary for the receipt of such samples, a mechanism will be developed between the sample coordinator and the Quality Assurance Supervisor. Any deviation from the standard log-in procedures detailed herein will be at the discretion of the laboratory supervisor or the laboratory manager. The execution of the log-in procedures for Chain-of-custody samples (see Section 7.8) is extremely crucial. Samples, that have been designated for Chain-of-Custody by a client, possess the potential of involvement in litigation or other legal situations., i.e. standards development or patents. By breaking Chain-of-Custody requirements, all results are invalid for such purposes.

7.1 PROJECT INFORMATION

All information relative to a specific project must be recorded on a project sheet by the chemist responsible for that project prior to the receipt and log-in of samples. Projects, and therefore samples which are not routine to the EDI laboratory, must have project sheets prepared and submitted to the Sample Coordinator before samples may be received.

The project sheet includes the following information:

- Client name, address, and client contact personnel
- Anticipated due date of the report (i.e. report in client hands by _____)
- Compound names or computer test codes or group computer test code
- Project and sample comments
- Contract number or purchase order for project
- Instructions relative to the proper completion of the project
- Pricing information relative to the proper completion of the project
- Chain-of-custody requirements
- Specific report requirements
- Additional requirements such as rush, hazardous, labile

If a new project will require special support from the analytical facilities, that project must be approved by the laboratory supervisors and the laboratory manager prior to project pricing and sample receipt. Routine samples are those samples and analyses which are continuously processed by EDI, such as priority pollutant samples, microbiological samples, and drinking water samples.

Projects which are non-routine are those that may require special testing, or which request parameters not routinely run within the laboratory, special holding times, or rush turn around. Projects and/or samples arriving at EDI which are nonroutine in nature, and for which there has been no prior approval, will not be processed. In this case, the manager responsible for the non-routine project will be advised of the problem and will then explain to the client why the delay is necessary for the execution of testing before proceeding to obtain the necessary approvals.

7.2 SAMPLE RECEIPT

7.2.1 Introduction

All samples will be received at the EDI facilities by the Sample Coordinator (SC). It will be the responsibility of the SC to determine: a) whether or not the proper project sheet is available for the arriving samples; b) whether or not the samples require chain of custody; c) whether or not the samples are labile in nature and require immediate attention; d) the manner in which those samples will be split, preserved and stored or routed. It is the objective of the SC to insure that the receipt of all samples is consistent with the requirements of this manual and that all pertinent information relative to those samples is recorded. This information may be used in client reports, communicated to the laboratory or to the client and, in some cases, reported to a legal authority relative to Chain-of-Custody samples.

7.2.2 Examination of Shipping Container

Immediately upon receipt of a sample shipment at EDI, the SC will examine the shipping container (the container may be a box, a cooler, a styrofoam container, etc.) to ascertain and document the condition of the samples and to process Chain-of-Custody papers, where appropriate. The SC will record the condition of the shipping container, the identification of the shipper, the presence or absence of any seals on the container (if it is Chain-of-Custody), and the labeling which may include special instructions prior to opening the container. If the shipping container is damaged, a report will be sent immediately to the shipper and the project chemist (see Section 7.13.2, Problem Project Sheet).

7.3 EXAMINATION OF CONTAINER CONTENTS

Unless the shipping container contents are marked "hazardous" the SC will proceed to open the sample container. If the SC had not previously identified the project sheet appropriate for these samples, the SC will attempt to ascertain immediately the origin of the samples found in this container and obtain the appropriate project sheet. If a project sheet is not found, the SC will store the samples and notify the Project Chemist. The SC will identify whether or not all the samples have arrived intact, whether or not the labels are intact and attached properly, and whether or not the samples have leaked in any fashion. The SC will also identify any shipping instructions, field instructions, or any other materials that may be present in the shipping container.

7.3.1 Chain-of-Custody Shipments

Should the SC identify the shipping container as a Chain-of-Custody project, the SC will immediately follow the procedure outlined in Section 7.6, "Chain-of-Custody Samples".

7.4 PROJECT VERIFICATION

The sample coordinator, having opened the shipping container and examined all the samples, will verify that the project sheet matches the samples, the number of samples received is consistent with the project sheet, and that the requirements identified on the project sheet are consistent with any paperwork obtained which will include the project sheet and any other documents in the sample container. The project files will be maintained by the lab secretary. If all required project information is not complete, the SC will fill out a Problem Project Sheet (see Section 6.3.2) and turn it over to the Project Chemist.

7.5 LABILE SAMPLE DISTRIBUTION

Should the SC identify labile samples within the shipping container, (i.e. coliforms or nitrites) for which there is a very short holding time and a need to rapidly move the samples into the laboratory, the SC will make every effort to immediately log-in those samples. Should log-in be delayed, the SC will coordinate with the responsible analytical group in order to move the samples into analysis. The coordinated effort will included means by which the SC can label the samples after log-in and insure that the results correlate with the proper samples. It will be the responsibility of the SC, once labile samples have been distributed to the laboratory to insure that those samples are properly logged in and that they are labeled with properly sequenced numbers. The agreement that is made between the SC and the appropriate laboratory manager or laboratory supervisor will be based on the premise that the SC understands that he/she is ultimately responsible and will be held accountable for any samples that are lost in such a

movement. Consequently, the SC will find the samples that are labile and apply the necessary labels.

If a shipping container is labeled "Hazardous", the SC will immediately notify the laboratory supervisor who will determine the extent of hazard and/or the manner in which the samples will be handled. The supervisor will involve the laboratory manager as needed in resolving questions of hazardous samples.

7.6 CHAIN-OF-CUSTODY SAMPLES

7.6.1 Continuance of Log-In Procedures for Chain-of-Custody Samples

All samples in the possession of EDI under Chain-of-Custody (COC) procedures must be traceable from the time the samples are received at the EDI door (or collected by EDI staff) until results are reported and sample disposition has been determined from the client. For any samples that may be collected during enforcement investigations, under litigatory requirements, or evidentiary in nature, Chain-of-Custody procedures are required.

7.6.2 Examination of Container Contents

Although Section 7.3 under Sample Receipt discusses the thorough examination of container contents, the proper examination of a container which is involved in a Chain-of-Custody procedure is even more important. For example, should the sample labels be mismarked or a particular sample appear somewhat strange in nature, it is necessary to note all observations and deviations from the project sheet. It is the SC's responsibility to examine whether or not each of the sample containers are individually sealed, whether those seals are intact, whether a sampler's initials are on the seals, and whether or not the paperwork matches the contents of the package. In addition, the SC must note whether or not all the dates and times are consistent, and whether or not the sample description on the paper work matches the description on the sample container.

7.7 PROJECT VERIFICATION

In the same manner in which the examination of the container contents is critical to a COC project, the verification of the project is equally important. These project verification steps include not only the need to follow the requirements identified in Section 7.4, but also thorough examination of all aspects of the project and the consistency of all the paper work involved with those particular samples in that shipping container. It is also important that the SC place in the COC project file: the shipping document; a signed Chain-of-Custody document; a copy of the project sheet; a copy of the filed sampling report if appropriate; and originals of all paperwork received for the project. The COC project file is kept in locked storage in the possession of the SC.

7.8 CHAIN-OF-CUSTODY LOG-IN

The log-in procedure identified in section 7.13 titled "Log-in", is followed in the same manner for Chain-of-Custody samples with a few modifications. Those areas which are changed are addressed in the following sections:

- Sample Storage
- Project Files
- Laboratory Access
- Data Storage

7.9 CHAIN-OF-CUSTODY SAMPLE STORAGE

All samples received under Chain-of-Custody procedures will be kept under locked storage and will be distributed for analysis to the laboratory only when the analyst has signed for the samples on the form shown in Figure 7. The SC or a designated representative will provide access to COC storage. Records of movement of all COC samples within the lab facility must be recorded.

7.10 CHAIN-OF-CUSTODY PROJECT FILES

All Chain-of-Custody project files will be kept in a project folder in a locked cabinet with all related documents and paperwork relative to those files.

7.11 MAINTENANCE OF LAB CUSTODY

Laboratory custody must be consistent with all the Chain-of-Custody requirements from the beginning of sampling to the final report. To this end, every analyst requiring access to the Chain-of-Custody samples will go to the SC for access to the COC locked sample storage. The SC will insure that the analyst signs for the receipt of all COC samples on the form shown in Figure 7 and that the analyst returns and signs in those same samples on the same day for which they were signed out. This documentation, after the completion of all analyses, will be placed in the locked Chain-of-Custody project file by the SC.

7.11.1 Sample Custodian

The COC sample custodian at EDI will be designated as the Sample Coordinator (SC). The SC is responsible for following the COC requirements outlined in these procedures for all samples received at EDI.

7.11.2 Lab Custodial Responsibilities

It will be the responsibility of every analyst signing for a Chain-of-Custody sample or samples to insure that; a) these samples are kept in a minimum access facility; b) they are within their possession during the particular period during which they are being analyzed; and c) the analyst returns those samples to the Chain-of-Custody lockup in the manner prescribed. The analyst will sign out and return the samples to COC lock-up on the same day. The analyst will be using the SC as the sample custodian for all COC samples. Due to the legal implications for the client of breaking the COC procedures and possibility of legal action that could be taken against EDI, errors in the execution of Chain-of-Custody procedures will not be tolerated.

7.12 CHAIN-OF-CUSTODY SAMPLE DISPOSAL

All samples received for COC procedures will be stored in the EDI COC lock-up facilities until a final report is issued. It will be the responsibility of the Project Chemist, in cooperation with the SC, to obtain information from the client relative to the length of time the COC samples will be stored. It is anticipated that for long term storage, i.e. more than 30 days, the client will reimburse EDI an appropriate rate for keeping completed samples under Chain-of-Custody procedures. No Chain-of-Custody samples may be discarded until written permission is received from the client relative to disposal of those samples.

7.13 LOG-IN

7.13.1 Introduction

After the SC has inspected the shipping containers, the project sheets, the samples and any documentation required in Sections 7.2 and 7.6, the SC will insure that all pertinent information is entered on the project sheet. There are specific areas of the project sheet that are to be completed by the SC, i.e., date and time received. The EDI project sheet is included as Figures 2 and 3.

Minimum information required for log-in include:

- Client's name and Client contact, as well as client #, is assigned.
- The due date
- The analytical test or test codes or group tests
- Specific project comments
- Contract requirements
- Contract number
- Pricing if necessary
- Chain-of-Custody, if required
- Specific report requirements

7.13.2 Project Problems

If any of the information identified in sub-section 7.13.1 is missing, the SC will immediately notify the Project Chemist, via a Problem Project Sheet, (Figure 4) of the discrepancy. The Project Chemist will make all reasonable efforts to insure that the answers are provided to the SC immediately.

Simple Project Sheet deficiencies such as client number, extra comments, or the contract number, should not prevent log-in. The SC will proceed with log-in addressing the unknowns as subjects that must be changed or modified once the information is received. It is the responsibility of the SC to see that all samples are logged in as soon as received at EDI whenever possible.

7.13.3 Samples on Hold

When there is a considerable amount of inadequate information on a project sheet, i.e. a missing test, or broken samples, the entire project will be placed on hold until the information is available or the corrective actions have been taken to insure that EDI is not held responsible for a poorly handled project. The SC will notify the Project Chemist via a Problem Project Sheet as to the hold status of the project and the reasons for the hold. The Project Chemist will make every attempt to quickly identify the necessary actions that will be taken for those samples or the remaining samples for that project. The Project Chemist may approve log-in of the remaining samples for a portion of the project in order to insure that the project progresses. Projects that are on hold will be placed in storage. The SC will insure that those samples are retrieved and logged in as soon as the appropriate changes have been made and the samples are freed for log-in.

7.13.4 Handling Labile Samples

All samples received by the SC that are labile in nature, i.e. coliforms, need to be logged into the facility in a very rapid fashion in order that they may be attended to within the analytical holding time. The most labile of all samples are the microbiological samples, which must be forwarded to the micro lab as soon as possible. The SC and the Project Chemists responsible for micro work will attempt to insure that appropriate information is available to the SC in order that the SC can assign numbers for all labile samples. Samples such as nitrites, which are labile but have a somewhat longer holding time, will usually be logged into the system like normal samples. However, slow shipment or other problems may require the lab to initiate the analyses immediately. In such a case, assuming a project sheet was initiated in advance of sample receipt, the SC can quickly assign sample numbers and ask the laboratory to act in an expedious fashion. The SC will make all efforts to insure that samples move through the laboratory in a

timely fashion when holding times are of utmost importance to the proper completion of the analytical requirements.

7.14 SAMPLE LABELING

All samples received at the EDI facility will be labeled at the time of log-in. These labels will include information such as the requested sample number, the EDI project number, and/or the client.

7.15 DISTRIBUTION AND STORAGE

Logged samples will be taken by the SC to the appropriate walk-in cooler for cold storage or to the room temperature storage area indicated for metals.

COC samples are stored as set forth in Section 7.9.

7.16 SAMPLE STORAGE

7.16.1 Non Chain-of-Custody Storage

The SC, after completing all the log-in processes of various samples connected with a particular project, will store the samples in the designated areas in the EDI laboratory.

- Routine Water and Solid Samples: Samples which need to be refrigerated will be stored in the walk in facility designated for all routine water and soil samples.
- Routine Water and Solid Samples for Metal Parameters: The preserved water samples and solid samples, which are not preserved, may be stored on shelves designated for the metals analysis.
- Odoriforous and Hazardous Samples: These samples will be stored in a hooded facility within the laboratory which is designated for odoriforous and hazardous samples. These samples will be identified to the lab personnel and noted on the log-in procedures in order to insure that the lab personnel are aware of the problems with these samples.

7.17 CHAIN-OF-CUSTODY SAMPLE STORAGE

All samples that are involved as physical evidence in a legal procedure or simply identified as Chain-of-Custody will be handled under certain procedural safeguards. These safeguards have been tentatively identified in section 7.9 but for purposes or reiteration are again addressed below:

NOTE: For any legal proceedings, the court must be shown that the laboratory is a secured area, that all samples have been stored in a secured fashion, and samples can be accounted for at all times.

7.17.1 Chain-of-Custody Water and Solid Samples

All samples of this nature will be stored within the locked cages in the designated walk-in cooler for routine samples. Keyed access is available only through the SC.

7.17.2 Water and Soil Samples for Metals

All samples received for metals analysis under Chain-of-Custody procedures, whether they be liquid or solids(s), will be stored in a locked cabinet which does not need to be in the walk-in facility. Such a cabinet will be designated and placed by the SC.

8.0 DATA HANDLING, REPORTING, RECORDKEEPING AND VALIDATION

8.0 DATA HANDLING, REPORTING, RECORDKEEPING AND VALIDATION

There are two significant aspects of any analytical procedure:

- The selection and use of a method appropriate for the analyte and matrix
- The collection, control and interpretation of the data generated.

Encompassing these two components is the Quality Assurance program. The QA program provides means by which method selection can be validated, the method can be controlled and the appropriate data generated, displayed and reduced.

The following sections deal with error, data handling, data validation, data reporting and data recordkeeping.

8.1 ERROR: IT'S NATURE AND SIMPLE STATISTICAL CONCEPTS

8.1.1 Random Errors

Repeated analysis of identical aliquots of a homogeneous sample does not give a series of equivalent results. The results will differ among themselves and they will be more or less scattered about some value. The scatter can be attributed to random error, so named because the prediction of the sign or magnitude of the error of any particular result is not possible at the time of analysis.

One therefore, says that each result must have an uncertainty attached to it, and can be regarded only as an estimate of the true value. Generally that estimate will differ from the true value. Random errors are caused by uncontrolled and/or uncontrollable random variations in factors which affect analytical results, i.e. variations in the volumes of the reagents added, variations in the concentrations of reagents, variations in the time allotted for the chemical analysis, contaminated glassware, poor quality reagents, instrumental fluctuations. Among the various texts that are available discussing errors, the terms repeatability, reproducibility and precision have been used to denote the scatter of results. The term "precision" will be used throughout this manual and is the most common term used for random error in this country and especially by the EPA.

Precision does improve as the scatter among results becomes smaller. All analytical results have random error present which necessitates statistical techniques to evaluate the results and to provide correct inferences of the true value of the result.

8.2 SYSTEMATIC ERRORS

Systematic errors are indicated by the tendency of results to be greater or smaller than, the true value. It is necessary to take care in exactly defining systematic error because the analysis is also subject to random error. The mean of n analytical results on the same sample approaches a definite value u as the number of results increases indefinitely. When u differs from the true value Tau results are said to be subject to systematic error of the magnitude B, wherein B is equal u minus Tau. Bias is the term used synonymously with systematic error and will be used in that fashion throughout this manual. Analytical methods, which are subject to interferences from substances present in the sample, or methods that only recover a fraction of the material present are an example of systematic error.

It is impractical to make an indefinitely large number of analysis on a single sample in order to determine the true value of u is known. At the same time a practically obtained value for a sample that is based on minimal analysis is subject to random error, so that the experimental estimates of bias will also be subject to random error. Therefore, statistical techniques are also required when bias is to be estimated.

The basic difference between random and systematic error is that, in principal, the latter may be predicted so that a correction can be made to eliminate its effect. An example of this allowance can be accounted for in the effect of fluoride in the determination of aluminum by absorbance measurements. This effect is overcome by adding to the calibration standards an amount of fluoride equal to the fluoride content of the sample. The added fluoride in the calibration standards then eliminates the systematic error of fluoride interference. However, it must be recognized that the complete elimination of systematic error may require such detailed knowledge of the properties of the sample that the correction of the analytical system is impractical and would in fact increase the amount of random error. Thus, in all applications where unbiased results are necessary, the approach to be used is to devise and use analytical systems capable of giving results which have negligible systematic error.

8.3 TOTAL ERROR

Some analysts use the term accuracy to denote only systematic error. The term accuracy as applied in this manual will denote total error of the results. In other words, accuracy represents the combined systematic and random error of the results and, therefore, the accuracy of an analysis improves as the total error becomes smaller.

8.4 STATISTICAL TECHNIQUES

Statistical techniques are essential to the measurement of analytical error. This manual and this section recognize that many analysts have had little experience with statistical technique. This section is, therefore, written in such a way as to explain simple but basic concepts of the statistical approach and to describe the particular techniques most commonly required in dealing with analytical errors. There are a large number of text books dealing with statistics and this particular section does not attempt to replace these books. The intention is merely to present the essential aspects in the simplest manner possible. Certain approximations have been used when considered appropriate and no previous knowledge of statistics has been assumed.

The fundamental statistical concepts are essentially simple and equivalent to the intuitive common sense, or perhaps scientific approach, adopted by any good analyst.

8.4.1 Random Error Distribution

If the results from the analysis of numerous aliquots of a homogeneous sample are plotted on a histogram, it is generally found that the proportion of the results deviating from the mean increased, i.e., as the deviation of the results from the mean grows broader. In other words, the probability of obtaining a random error of a given size decreases as the size of the error increases. The basis of statistical techniques is to quantitatively estimate the probabilities of errors of different sizes so that one can deduce the probable random error of a particular analytical result. If the analyst were to increase the number of analysis of a single sample indefinitely, and the size of the intervals used for plotting the histogram were decreased, the latter would tend to smooth the curve. This limiting curve is the frequency distribution of results and defines a relationship between the magnitude of the result and the probability of obtaining such a value. Throughout this manual, it will be assumed that the analytical results follow the normal distribution which is defined by the following equation:

$$p(x) = u + o$$

Where: $u =$ the mean of all the conceptionally infinite number of results.

$o =$ the standard deviation of results

$p(x) =$ the probability density which is interpreted by noting that the probability of obtaining a result between the values a & b is the area of the curve between those values.

and this interval can be evaluated given the equation for P(X).

The peak of this distribution curve occurs at x=u, the theoretically perfect mean established by an infinite number of results. The width (which is indicated by the scatter results) is determined solely by the standard deviation of the test. For example, 95% of the area under the curve, i.e. 95% of all results, is enclosed within the limits plus or minus 1.96. Such properties allow limits for the uncertainty of an individual analytical result to be calculated. Taking the current discussion, for example, on no more than 5 occasions in one hundred will the result differ from the mean u be more than 1.96. Thus, an analyst may attach to a result limits that define the range in which the true mean is expected to lie. The statement, R-1.96 is less than u which is less the R+1.96, is an accurate statement on 95% of all occasions. "R" in this particular case would stand for the result. By referring to texts on statistics, there are statistical tables which included a tabulation of areas enclosed between specific limits as an analyst might want to define them. It should be noted that the distribution is always symmetrical about the mean. In other words, if one is using the 1.96 levels 5% of the results will be outside of the range of u +/- 1.96, but only 2.5% of all results will exceed u + 1.96 and 2.5% of the results will be less than u - 1.96.

Focusing this into a discussion more pertinent to the laboratory and, perhaps more viable with respect to occurrences within the laboratory, let us discuss the rare exception in which an analyst is taking 20 tests on a particular sample using the 1.96 level. Considering that 5% of the results will lie outside that level, the analyst has 1 chance in 20 of missing the true value outside the stated confidence range. At the same time one can decrease this chance by increasing the allowable range. For instance, if the range is R =/- 2.58 the results will be included on 99% of the occasions or 99% of the tests. However, by increasing the confidence limit, one is also increasing the uncertainty in the true value. In this case, uncertainty can be decreased by taking the mean of several analytical results or by decreasing the value.

These statistical concepts allow valuable quantification of the random error of an analytical result and emphasize that decisions, based on the significance of the result, have some risk of being wrong. Knowledge of the standard deviation, of the results is, therefore, vital in reaching objective decisions. Use of the standard deviation will be explained in the following sections dealing with data handling and validation.

8.4.2 Data Handling, Reporting, Recordkeeping

A flow diagram, Figure 1, delineates the original and procedural steps in data generation.

The initiation of an analysis starts with the completion of a project sheet. The information is computer entered. The computer entry internally creates a report form and inventories the analysis by parameter or compound. The computer entry function of all analytical work requests is a shared responsibility of the sample coordinator and data coordinator. A copy of the project sheet is manually inserted into a three ring binder notebook for laboratory reference use. The maintenance of the laboratory job reference notebook is a responsibility of the sample coordinator. The group leader/supervisor generates analytical bench sheets for a given parameter each morning or the prior day. The samples and parameters testing sequence is dictated by a weekly work schedule. The weekly work schedule is developed manually each week by the group leaders/area supervisors and approved each week by the laboratory manager. The schedule is developed from a computer printout that inventories and ages by project job or parameter. Contractual due dates and sample holding times are the compliance criteria by which all schedules are judged.

The bench sheets examples are shown in Figure 8, 9, 10,. The bench sheets identify to an analyst the proper samples to analyze that day. The analyst lab notebook and the bench sheets constitute the two raw data reporting locations. The content of the laboratory notebook is defined in an earlier section, 6.3.5. The analyst completes the benchsheet information, attaches a calibration curve if appropriate, and follows the analytical sample sequence identified in section 9.0. The analyst identifies which sample(s) were utilized for precision and accuracy determinations. The analyst will assess the data set as being in control or not. The assessment will be described in the data validation section to follow. An approved data set is transfered to all appropriate project sheets in the laboratory job reference notebook. The bench sheets and calibration curves are forwarded to the lab supervisor for further review. The last entry into the worksheet constitutes a completed project subject to computer generation of a preliminary report. The group leader/supervisors provide the DC with the approved project sheets for computer entry and preliminary report generation. The remaining activities related to preliminary report, final report generation and review and project filing are identified in this manual under sections 6.3.12, 6.3.13 and 6.3.14 respectively.

8.5 DATA VALIDATION

The data validation process includes a set of computerized and manual checks at various appropriate levels of the measurement process.

The data validation process starts with the laboratory analyst. The analyst verify in their lab notebook that all method specific operational parameters are utilized or met. This information is specifically documented in all instrument logbooks. The analyst then verifies that the calibration of the equipment is linear and documents this in the instrument logbooks. If the operating parameters of a particular method are modified, it should be written in the analyst lab notebook. A noncalibrated system must be identified by the analyst and corrections made to achieve calibration prior to sample analysis.

The generation of sample data by an analyst will include the generation of quality control data for each sample set. The monitoring of method blanks, sample spikes, method spikes and sample duplicate analysis is accomplished by the utilization of Schwart Quality Control Charts and the lab QC management software. The analyst computes the data precision and accuracy and compares the computed value to the acceptance intervals identified for that parameter, method, and matrix. The computed value will be determined in control if it lies within the acceptance interval. If the computed value is deemed out-of-control the data set is not submitted for supervisor approval but it is brought immediately to the attention of the supervisor and quality assurance supervisor via the corrective actions form (Figure 11) that an out-of-control condition exists. Jointly, a review is conducted to determine the cause(s) and conduct corrective action. The data set is rerun once the corrective actions have taken place and the new data reviewed as stated above.

The QC Data Coordinator receives all the completed precision and accuracy data summary forms and enters the data into the laboratory quality control computer system. The system produces summary reports of all quality control data generated for review by the Quality Assurance Supervisor. The computer system also generates all Schwart Control Charts for method blanks, method spikes, sample duplicates and sample spikes. The charts are permanently maintained and reviewed by the group leader/supervisor and the Quality Assurance Supervisor. The generated charts provide an accurate review of all recently (last 30) QC data points and allows the monitoring of data trends or other anomalies to the system.

Figure 11

Analytical Quality Control Occurrance Report

Parameter: _____

Method: _____

Date: _____

Analyst: _____

Description of Occurrance:

_____

_____

_____

Analysis of Occurrance:

_____

_____

_____

_____

_____

_____

_____

_____

Disposition of Data:

_____

_____

_____

_____

_____

_____

_____

9.0 GENERAL QUALITY CONTROL PRACTICES

Sample #9
Sample Spiked #9
Sample #10

Downfield Calibration

Any high level concentrations of analyte will be followed by a method blank. The exact analytical sequence is left to the discretion of the analyst.

9.2 ACCURACY, PRECISION AND SENSITIVITY OF ANALYSES

The fundamental QA objective with impacting accuracy, precision and sensitivity of laboratory analytical data is to achieve the QC acceptance criteria of the analytical protocols. The accuracy and precision requirements for routine analytical services (RAS) for organics are shown in Table 1. These QC control limits should be completely met without any outliers.

These limits are three (3) standard deviations from the mean and reflect control limit criteria established and utilized on Schwart Control Charts for precision and accuracy.

The standard operating procedures that would lead to an outlier being identified and the resulting corrective actions is described in section 9.0, Data Reporting, Validation and Handling. In general, if an out-of-control result occurs the analyst will identify it as such and report the occurrence to the Group Leader and/or Area Supervisor via the corrective actions form. The Group Leader and/or Area Supervisor will review the corrective actions form with the analyst to identify the problem and discuss the corrective action(s) taken. The corrective action(s) will be identified in the analyst notebook and in writing to the QA Supervisor. The QA Supervisor will review the Schwart Chart later that day or the next day to identify a successful corrective action via a new in-control data point for the same data set. The sensitivities required for RAS analyses are the operating detection limits shown in Tables 2 and 3.

The accuracy and precision requirements for Chain-of-Custody (C.O.C.) samples from the CLP-HSL are specified in the protocols. The sensitivities required for Hazardous Substance List (HSL) analysis of organic and inorganic compounds will be the EDI operational detection limits, shown in Tables 2 and 3.

TABLE 1

ACCURACY AND PRECISION CRITERIA FOR ORGANICS FROM RAS

PARAMETER	AUDIT	COMPOUNDS	CONTROL LIMITS
Volatiles	Method Blank	---	d.l.
	Matrix Spike Duplicate Precision	---	<20% RPD (95% CI)
	Surrogate Spike Recovery	D4-1,2-dichloroethane	70-130%
		2-bromo-1-chloropropane	70-130%
		Dioethylbenzene	70-130%
	Method Spike Recovery	benzene	37-151%
		1,2-dichloroethane	49-155%
		1,1,1,-trichloroethane	52-162%
		trans-1,2-dichloroethane	49-155%
		trans-1,2-dichloropropene	17-183%
		cis-1,2-dichloropropoene	0-227%
		ethyl benzene	37-162%
		toluene	47-162%
		1,1,2,2-tetrachloroethane	46-157%
		bromoform	45-170%
Pesticides & PCBs	Method Blank	---	d.l.
	Sample Duplicate	---	25 RPD (95% CI at level >1 ppb)
	Method Spike Recovery (normal pesticide analysis is run)	endrin	69-119%
		lindane	62-118%
		dieldrin	20-136%
		aldrin	50-166%
		4,4,-DDD	10-145%
		4,4,-DDT	10-203%
		endosulfan II	---
		endosulfan sulfate	10-100%
		4,4,-DDE	10-136%
		heptachlor	10-192%
		chlordane	65-129%

9.0 GENERAL QUALITY CONTROL PRACTICES

The Quality Assurance/Quality Control practices at EDI are based on several of the following government guidelines:

- "Handbook for Analytical Quality Control in Water and Wastewater Laboratories"EPA 600/4-79-019, March 3, 1979
- The Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act (Federal Register, Dec. 3, 1979, updated on October 26, 1984.)
- Manual of Analytical Methods for the Analysis of Pesticides in Humans and Environmental Samples" EPA 600/8-80-038 June 1980.
- ASTM

The quality control procedures used during analysis are described below and do conform with sample control and document control requirements described for the EPA Contract Lab Program (CLP). The specific sample and document control practices employed at EDI may be found in the appropriate sections of this manual identified as Sample Control (section 7.0) and Document Control (section 6.0).

The procedures described here will deal with the analytical quality control techniques. The quality control checks routinely performed during sample analysis include method blank analysis to identify potential method interferences, reagent blank analysis to establish analyte levels, duplicate analysis to establish analytical precision, method and matrix spike analysis to determine analytical accuracy. The frequency of these quality assurance checks are defined in the EPA CLP and result in the following suggested analytical run sequence:

Reagent Blank
Standard(s)
Method Blank
Sample #1
#2
#3
#4
#5

Method Spike
Sample #6
#7
#8

Sample Duplicate #8

TABLE 1 (cont.)

Base-Neutral/Acid Compounds	Method Blank	---	d.l.
	Sample Duplicate	---	<25 RPD (95% CI)
	Surrogate Spike Recovery	Pentafluorophenol	30-110%
		2-fluorophenol	21-110%
		2,4,6-tribromophenol	50-150%
		D5-nitrobenzene	35-120%
		2-fluorobiphenyl	43-120%
		decafluorobiphenyl	40-120%
	Method Spike Recovery	phenol	10-121%
		2-chlorophenol	23-134%
		1,4-dichlorobenzene	20-124%
		benzyl alcohol	10-124%
		n-nitrosodipropylamine	10-127%
		1,2,4-trichlorobenzene	44-142%
		4-chloraniline	10-120%
		p-chloro-a-cresol	22-147%
		acenaphthene	47-145%
		2,4-dinitrotoluene	39-139%
		4-nitrophenol	D-132
		pentachlorophenol	14-176%
		Di-n-butyl phthalate	1-118%
		pyrene	52-115%
		1,3,-dichlorobenzene	10-172%
		2,6-dinitrotoluene	50-158%

TABLE 2

OPERATING DETECTION LIMITS FOR ORGANICS FROM RAS

Pesticides and PCBs

Cas No.	Compound	Operating Detection Limit (ug/l)
319-85-7	B-BHC	1.0
319-84-6	BHC	1.0
319-86-8	d-BHC	1.0
76-44-8	heptachlor	1.0
58-89-9	g-BHC (Lindane)	1.0
309-00-2	aldrin	1.0
1024-57-3	heptachlor epoxide	1.0
959-98-8	ensosulfan I	1.0
72-55-9	4,4,-DDE	1.0
60-57-1	dieldrin	1.0
72-20-8	endrin	1.0
72-54-8	4,4,-DDD	1.0
33212-65-9	endosulfan II	1.0
50-29-3	4,4,-DDT	1.0
57-74-9	chlordane	1.0
8001-35-2	toxaphene	1.0
72-43-5	methoxylchlor	1.0
8001-35-2	aroclor 1016	1.0
11097-69-1	aroclor 1242	1.0
11096-82-5	aroclor 1248	1.0
11104-28-2	aroclor 1254	1.0
12674-11-2	aroclor 1260	1.0

TABLE 2 (cont.)

Base/Neutral and Acid Extractable Compounds

Cas No.	Compound	Operating Detection Limit (ug/l)
62-53-3	aniline	5
111-44-4	bis (2-chloroethyl) ether	4
108-95-2	phenol	2
95-57-8	2-chlorophenol	2
541-73-1	1,3-dichlorobenzene	3
106-46-7	1,4-dichlorobenzene	3
95-50-1	1,2-dichlorobenzene	3
100-51-6	benzyl alcohol	10
118-60-1	bis (2-chloroisopropyl) ether	1
95-48-7	2-methylphenol	5
67-72-1	hexachloroethane	7
621-64-7	N-nitrosodipropylamine	4
98-95-3	nitrobenzene	4
108-39-4	4-methylphenol	5
78-59-1	isophorone	2
88-75-5	2-nitrophenol	5
105-67-9	2,4-dimethylphenol	3
11-91-1	bis (2-chlorethoxy) methane	4
120-83-2	2,4-dichlorophenol	3
120-82-1	1,2,4-trichlorobenzene	3
91-20-3	naphthalene	1
106-47-8	4-chloroaniline	5
87-68-3	hexachlorobutadiene	5
65-85-0	benzoic acid	50
91-57-6	2-methylnaphthalene	1
59-50-7	p-chloro-m-cresol	4
77-47-4	hexachlorocyclopentadiene	10
95-95-4	2,4,5-trichlorophenol	50
88-06-2	2,4,6-trichlorophenol	5
91-58-7	2-chloronaphthalene	2
208-96-8	acenaphthylene	1
131-11-3	dimethyl phthalate	2
606-20-2	2,6-dinitrotoluene	9
83-32-9	acenaphthene	2
99-09-2	3-nitroaniline	50
132-64-9	dibenzofuran	10
51-28-5	2,4-dinitrophenol	50
121-14-2	2,4-dinitrotoluene	10
86-73-7	fluorene	1
100-02-7	4-nitrophenol	15
7005-72-3	4-chlorophenyl phenyl ether	3
84-66-2	diethyl phthalate	2
534-52-1	4,6-dinitro-2-methylphenol	50
122-66-7	1,2-diphenylhydrazine (azobenzene)	1

TABLE 2 (cont.)

86-30-6	N-nitrosodiphenylamine (diphenylamine)	2
100-01-6	4-nitroaniline	50
101-55-3	4-bromophenyl phenyl ether	7
118-74-1	hexachlorobenzene	5
87-86-5	pentachlorophenol	20
85-01-8	phenanthrene	1
120-12-7	anthracene	1
84-72-2	di-n-butyl phthalate	1
206-44-0	fluoranthene	1
129-00-0	pyrene	1
85-68-7	butyl benzene phthalate	3
218-01-9	chrysene	5
56-55-3	benzo(a)anthracene	5
117-81-7	bis(2-ethylehexyl)phthalate	2
117-84-0	di-n-octyl-phthalate	2
205-99-2	benzo(b)fluoranthene	5
207-08-9	benzo(k)fluoranthene	5
50-32-8	benzo(a)pyrene	5
193-39-5	ideno(1,2,3-cd)pyrene	10
53-70-3	dibenzo(a,h)anthracene	10
191-24-3	benzo(ghi)perylene	10
92-87-5	benzidine	50
91-94-1	3,3-dichlorobenzidine	20

TABLE 2 (cont.)

Volatile Compounds

Cas No.	Compound	Operating Detection Limit (ug/l)
74-87-3	chloromethane	10
74-83-9	bromomethane	10
75-01-4	vinyl chloride	10
75-00-3	chloroethane	10
75-09-2	methylene chloride	2
107-02-8	acrolein	15
67-64-1	acetone	50
107-13-1	acrylonitrile	15
75-15-0	carbondisulfide	5
75-35-4	1,1-dichloroethene	2
75-34-3	1,1,-dichloroethane	2
156-60-5	trans-1,2-dichloroethane	2
67-66-3	chloroform	1
78-93-3	2-butanone	50
107-06-2	1,2-dichloroethane	2
71-55-6	1,1,1-trichloroethane	2
56-23-5	carbon tetrachloride	4
108-05-4	vinyl acetate	10
75-27-4	bromodichloromethane	2
78-87-5	1,2-dichloropropane	3
10061-02-6	trans-1,3-dichloropropane	4
79-01-6	trichloroethene	2
71-43-2	benzene	1
124-48-1	chlorodibromomethane	3
79-00-5	1,1,2-trichloroethane	3
10061-01-05	cis-1,3-dichloropropene	4
110-75-8	2-chloroethylvinyl ether	10
75-25-2	bromoform	15
108-10-1	4-methyl-2-pentanone	50
519-78-6	2-Hexanone	50
127-18-4	tetrachloroethene	2
79-34-5	1,1,2,2-tetrachloroethane	2
108-88-3	toluene	1
108-90-7	chlorobenzene	1
100-41-4	ethylbenzene	1
100-42-5	styrene	10
	m-xylene	10
95-47-6	o-xylene, p-xylene	10

TABLE 3

OPERATING DETECTION LIMITS FOR INORGANICS FROM RAS

Parameter	Detection Limit (ug/l)
Aluminum	250
Chromium	50
Barium	100
Beryllium	10
Cobalt	10
Copper	10
Iron	10
Nickel	10
Manganese	10
Zinc	20
Boron	100
Vanadium	250
Silver	10
Arsenic	2
Antimony	2
Selenium	2
Thallium	100
Mercury	0.5
Tin	1000
Cadmium	10
Lead	50
Cyanide	50
Alkalinity ($CaCO_3$)	2000
Chloride	1000
Fluoride	10
Sulfate	5000
Ammonia Nitrogen	50
TKN	60
Nitrate and Nitrite	50
TOC	5000
Total Phosphorus	10

Other organic detection limits can be provided when requested.

APPENDIX B

AQUIFER TEST AND
AIR STRIPPING PILOT STUDY

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PLATE

1 Geologic Cross Section of Aquifer Test Area

develop the basis of design for the proposed ground water remediation system (e.g. number and locations of purge wells, recovery rates for purge wells, contaminant-specific mass transfer parameters, scaling potential of treated and untreated ground water, etc.). The basis used for preparation of the air and water discharge permit applications for the proposed ground water remediation system are also contained in this report.

1.3 BASIS FOR AQUIFER TEST AND PILOT STUDY

The basis for the aquifer test and pilot study was outlined in the work plan for the aquifer test and pilot study submitted to IEPA in March 1992. The objective of the aquifer test was to determine, under dynamic pumping conditions, the site specific parameters that control the flow of ground water beneath the site. The results of the aquifer test have been used to determine aquifer characteristics in the test area and to calibrate the ground water flow model previously developed for the site. Aquifer characteristics (e.g. hydraulic conductivity) determined from the aquifer test results have been compared to slug test data obtained during previous investigations. In addition, the aquifer test allowed for determination of parameters (e.g., storativity and leakage) that could not be measured under the static conditions of previous testing.

The aquifer characteristics determined during the pumping test were applied across the site using the ground water flow model. The slug test data obtained previously were scaled to estimate hydraulic conductivities which are indicative of actual pumping conditions and to allow for evaluation of variability in hydrogeologic conditions across the site. These values were used to calibrate the ground water flow model. The calibrated ground water flow model was then used to determine the optimum ground water capture and recovery system.

The selected test area consisted of the localized zone near a test purge well that was installed for the aquifer test and air stripping pilot study. This test purge well was also designed to be used as a recovery well in the full scale treatment system. The test purge well is located east of the Chicago and Northwestern Railroad tracks as shown on Figure 1. This area is suitable for the aquifer and pilot tests because the aquifer contains elevated concentrations of the two primary VOCs, trichloroethylene (TCE) and 1,1,1-trichloroethane (TCA). The proximity of an existing sanitary sewer also reduced the equipment requirements for the discharge of treated water during the test. The ground water recovered during the aquifer test was treated by the pilot air stripping system and discharged to the sanitary sewer.

The data generated during the air stripping pilot study are considered representative of the site-specific ground water treatability and were evaluated to develop full-scale design

The purge well and piezometers were sampled immediately after purging at least three casing volumes from each well with a Teflon bailer. Two 40 milliliter (ml) glass vials with Teflon septa preserved with hydrochloric acid (HCl) were filled directly from the bailer for each sample. The sample containers were filled so that no air space was present in the sample. All samples were immediately placed in a chest with ice under chain-of-custody and custody seal until they were received by the analytical laboratory.

In addition, ground water samples were collected from monitoring wells T-5B and T-5C for acid titration analysis. The wells were sampled immediately after purging at least three casing volumes from each well with a Teflon bailer. Four 1,000 ml plastic bottles (no preservative) and two 250 ml plastic bottles with nitric acid preservative were filled directly from the bailer for each sample set. The samples were placed in a chest with ice and shipped overnight to the analytical laboratory using proper chain-of-custody procedures.

2.7 GEOTECHNICAL AND CHEMICAL METHODS

2.7.1 GEOTECHNICAL METHODS

In order to determine well screen and sand pack design criteria for the purge well, particle size analysis was run on 14 soil samples from Pilot Boring 1 and 13 soil samples from Pilot Boring 2. Soils were analyzed according to ASTM D422 and D2487. All analyses were performed by the WW Engineering & Science (WWES) soil laboratory in Bloomington, Indiana. Laboratory data sheets are presented in Appendix D.

2.7.2 CHEMICAL METHODS

2.7.2.1 Ground Water

Ground water samples were analyzed for volatile organic compounds according to U.S. EPA SW846 Methods 5030 and 8240. Inorganic analyses were performed according to the U.S. EPA methods listed on Table 4.

2.8 AQUIFER TEST

2.8.1 ANTECEDENT DATA

Prior to beginning the pumping phase of the aquifer test, water level data were collected for five days to determine any aquifer fluctuations that may affect the interpretation of the test results. Additionally, barometric pressure was measured five days prior to the beginning the aquifer test to determine atmosphere effects on water level fluctuations.

Water levels and barometric pressure were measured using a Hermit 2000 data logger and pressure transducers. Pressure transducers were positioned in piezometers P-3, P-4, P-5, and P-6 and the purge well PW-1. A single pressure transducer was placed inside the pump house to record barometric pressure. The data logger was programmed to record water level and barometric pressure at thirty-minute intervals through the antecedent data collection phase. The combination of water level data and barometric pressure data were useful in determining barometric efficiency and regional ground water trend corrections.

The pressure transducer in P-3 failed during this collection phase of water level data resulting in no data for P-3. However, the transducer was replaced prior to conducting the actual aquifer test. In addition, a data logger monitoring water level fluctuations in well T-7B failed, requiring manual collection of water level data during the drawdown phases of the aquifer test.

2.8.2 Drawdown Phase

The drawdown phase of the aquifer test was conducted in two stages over a period from July 14 to July 19, 1992. The first stage consisted of a series of three variable water recovery rate tests which varied from 20 gallons per minute (gpm), to 30 gpm to 40 gpm. During each test, the ground water withdrawal rate was held constant for approximately two hours before being increased. After the variable rate test, a constant rate test was performed at 40 gpm for four days.

As with the antecedent data, water level and barometric pressure measurements were collected from the same wells using a Hermit 2000 data logger and pressure transducers. In addition to automated measurements, water levels were measured manually in adjacent monitoring wells W-4, W-4D, T-3, T-4A, T-4B, T-7A, T-7B, and T-9 using an electric water level tape (Well Wizard water level meter, model 6000).

The discharge rate of the purge well was measured using an in-line water flow meter and adjustments to the flow rate were made manually with throttling valves, as required, to maintain a constant pumping rate during each test. The pumping rate was monitored continually at the start of each test and periodically throughout the remainder of the test.

2.8.3 Recovery Phase

Following the completion of the variable rate and constant drawdown phases of the test, the purge well was shut off to allow the water level to return to static conditions. During the recovery phase, water levels were collected using the data logger and pressure transducers as employed in the drawdown phase. Recovery phase water levels were collected until the water levels recovered at least 85 percent. Since the pump was equipped with a check value to prevent the downward flow of water after the pump had been turned off, ground water recovery in the test purge well was also measured.

2.8.4 MISCELLANEOUS DATA

In addition to water level and barometric pressure data, monthly climatological and river stage data were obtained for the month of July. The local climatological data were obtained from the National Weather Service, Peoria, Illinois and Illinois River stage data were obtain from the Army Corps of Engineers, Rock Island District.

2.9 AIR STRIPPING PILOT STUDY

The air stripping pilot test was performed to confirm the effectiveness of air stripping technology for removal of dissolved VOCs, provide full-scale design parameters for the full-scale ground water treatment system, and refine the basis of design for full-scale air and surface water discharge permit applications. Air stripping technology was evaluated by treating the ground water recovered during the aquifer test with a Mobile Pilot Stripper (MPS). The MPS is trailer-mounted and is capable of treating up to 40 gpm in an air stripping mode. The MPS operates using an eighteen inch diameter (nominal) packed column, with a packing height of ten or twenty feet. The column is randomly packed with 1.5-inch long-term heat aged (LTHA) polypropylene Pall rings, which results in a ratio of column diameter to nominal packing size of approximately twelve. This ratio is sufficient to minimize any potential wall effects during operation.

2.9.1 PROCESS VARIABLES

Ground water withdrawal (influent) rate, air flow rate, and packing height were the process variables controlled during the pilot study. The pilot system was operated during the five days of the aquifer test, and the process variables were changed as shown in Table 5. The resulting response in treatment efficiency was monitored by sampling and analysis of influent and effluent water from the MPS after steady-state conditions had been achieved. Steady-state conditions are conservatively assumed after approximately two hours of continuous operation at the specified conditions.

The air flow velocity was measured with a Pitot tube installed in the ambient air inlet line to the air stripping column. The air flow rate was calculated using the cross-sectional area of the inlet line and air velocity measurements. The influent water flow rate was monitored in the same manner as that used for the aquifer test.

Packing height of the MPS was changed once during the study. The packing height was changed from ten to twenty feet by installation of an additional section of packed column.

The MPS was operated at ground water pumping rates of 20, 30, and 40 gpm. Records of operating conditions and sample collection were maintained in a bound notebook.

ground water were titrated with 36 Normal sulfuric acid and titration curves were developed. The titration was continued until the end point was identified (Figure 2). The titration end point is defined as the point at which further acid addition has limited effect on the solution pH.

3.0 RESULTS

3.1 AQUIFER TEST RESULTS

A variable rate test and a 96 hour continuous rate test were initiated by WW Engineering & Science on July 14, 1992. A group of newly installed piezometers located north of the steel mill steam plant in conjunction with adjacent existing monitoring wells were used. A generalized geologic cross section through the aquifer test site is presented on Plate 1. The effects of pumping purge well PW-1 were measured in P-3, P-4, P-5, P-6, W-4, W-4D, T-3, T-4A, T-4B, T-7A, T-7B and T-9. Pumping was started at 3:15pm on July 14 at a rate of 20 gpm for approximately 2.5 hours. Pumping was restarted at 7:50am on July 15 at a rate of 30 gpm. The pumping rate was increased two hours later to 40 gpm which continued to the end of the variable rate test. The 96 hour continuous rate test (40 gpm) was started at 2:50pm on July 15.

The unconsolidated deposits in the study area consist of interbedded glaciofluvial materials overlain by recent alluvial and colluvial materials (Plate 1). The deposits are contained in a buried valley cut into underlying bedrock shale of Pennsylvanian Age. Although ground water is present within the overlying alluvial and colluvial deposits, the primary aquifer is associated with the glaciofluvial deposits. Due to the lithological variations within the aquifer, downward vertical gradients exist between the upper and lower parts of the aquifer. The thickness of the aquifer decreases toward the valley wall to the west and increases toward the Illinois River to the east.

Drawdowns in the observation wells were corrected for residual water level decline and for atmospheric pressure changes and were plotted against time on logarithmic paper (Appendix C). The average barometric efficiency of the wells was determined to be 15 percent from water level and atmospheric pressure data collected July 9 to 14, 1992 (Table 6). These data also indicate that the water level was steadily dropping at an average rate of 0.069 ft/day during July 12 to 14 as shown in Figures 2, 3, 4, and 5. Drawdowns in wells at the end of each step during the variable rate test and at the conclusion of the 96 hour continuous rate test are given in Table 7.

The time-drawdown graphs for the observation wells were superposed on, and the early time-drawdown data were matched to the appropriate Hantush & Jacob Leaky Artesian Aquifer type curve[2]. Match-point coordinates W(u, r/B), 1/u, s and t were substituted to determine the transmissivity (T) and storativity (S) of the aquifer in the following equations:

$$T = \frac{114.6\,Q\,W(u, r/B)}{S}$$

$$S = \frac{Ttu}{2693r^2}$$

where Q is pumping rate in gallons per minute and r is the distance, in feet, from the purge well to the observation well where drawdown measurements were made.

During the variable rate test, leakage through the aquiclude overlying the aquifer was negligible. The drawdown observed in the shallow wells could be related to normal ground water fluctuations and not directly influenced by short periods of ground water withdrawal. However, drawdown observed in the shallow wells during the continuous rate test suggest that a longer period of ground water withdrawal from the aquifer may influence ground water flow through discrete flow paths attributed to the variability of lithology within the aquifer. In contrast, this same lithology creates situations were ground water at the location of P-3 is unaffected by water withdrawal .

The cone of depression, as shown in Figure 6, was distorted not only by the presence of the barrier boundary but also because the thickness of the aquifer decreases with distance from the purge well toward observation well T-3. The evaluation of distance-drawdown data yielded T and S values approximately three times the average of time-drawdown values (Table 8).

The results of the aquifer test indicate that the average coefficients of transmissivity, hydraulic conductivity, and storage of the aquifer are 1.1×10^{1} cm²/sec, 3.1×10^{-2} cm/sec, and 4.5×10^{-4}, respectively (Table 8). The range of values for hydraulic conductivity are comparable to those values associated with clean sand.

Analytical data collected during the variable and continuous rate tests show the effect ground water withdrawal had on TCE and TCA concentrations at the purge well and

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2 Cooper, H.H., Jr., 1963, Type Curves for Nonsteady Radial Flow in an Infinite Leaky Artesian Aquifer, in Bentall Ray, Compiler, Shortcuts and Special Problems in Aquifer Tests: US Geological Survey Water-Supply Paper 1545-C p. C48-C55.

piezometers (Figure 7). Concentrations of TCE and TCA steadily increased during periods of ground water withdrawal at the purge well location. Maximum TCE and TCA concentrations were recorded at the time pumping was terminated. Analytical data collected at the end of the continuous rate test indicate that the concentration of TCE and TCA were reduced at the piezometer locations. However, it is expected that the concentrations will return to near start-up conditions as indicated by the results from the August 27 sampling event (Figure 7).

3.2 AIR STRIPPING PILOT STUDY

The results of the air stripping pilot study and several laboratory investigations were evaluated to determine the proper sizing and design parameters for the Keystone air stripping system. The thermodynamic characteristics were determined for the chemical species identified as key components in the Keystone ground water and those characteristics were used to perform sizing calculations for the full-scale stripping tower. This section describes the development of the design criteria from the pilot study and lab data.

3.2.1 MASS TRANSFER DESIGN CRITERIA

The determination of accurate thermodynamic data is the critical first step to determining the mass transfer criteria for the air stripper and developing the full-scale design. Laboratory evaluations were performed to determine the Henry's Law constant of one of the key components 1,1,1-trichloroethane (TCA) as described above. Previous work by WWES developed the Henry's Law constant of the other major constituent in the Keystone ground water, trichloroethlyene (TCE).

The relative volatility of TCA (Table 9) was then calculated from the ratio of the Henry's Law constant to the partial pressure of water at the test conditions. The relative volatility of TCA was determined to be constant at the two temperatures evaluated. The relative volatility of TCE was calculated in the same manner using existing WWES data. The relative volatilities of the several minor constituents in the ground water were determined from the literature.

WWES has developed a computer simulation model of the air stripping system that utilizes overall mass transfer coefficients and relative volatility. The simulation model is based on detailed calculation procedures for determining stripping characteristics in dilute solutions as described by Treybal[3] and by Hines and Maddox[4]. The influent and effluent data from the nine different conditions examined in the pilot test are shown in Table 10. Influent and effluent data were gathered for each operating condition along

3 Treybal, R.E., Mass-Transfer Operations, 3rd Ed. McGraw-Hill Inc. p. 309

4 Hines, A.L. and R.N. Maddox, Mass Transfer Fundamentals and Applications, Prentice-Hall, Inc.

with all pertinent operating data (air and water flow rate, temperature, height of the packed section of the air stripping tower and the relative volatilities of the components found in the ground water). The data were input into the model for each set of operating conditions. The computer model was then calibrated to match the actual pilot data by adjusting the height of a transfer unit (H_{OL}), until the predicted effluent quality matched the observed effluent quality for the conditions being examined. The H_{OL} of the system is the key mass transfer parameter used to develop the full-scale design.

Treatment efficiency in packed towers varies with liquid and vapor loading. In the case of packed air stripping columns, the variation is primarily dependent upon liquid loading and is typically observed as an increase in H_{OL} with increased liquid loading. This relationship was evaluated by plotting values of H_{OL} verses liquid loading rate (mass flow rate of water divided by column cross-sectional area) for the various operating conditions. The plot showed that when other parameters were held constant, H_{OL} is linearly dependent on liquid loading for a given air to water ratio.

The pilot data (Figure 8) show that as the air to water rate is reduced from 10:1 (cfm:gpm) as in tests 2,5,6 and 7 to 7.5:1 (test 10), to 5:1 (test 8), and finally to 3:1 (test 9), the H_{OL} increases. As the air: water ratio is reduced, the amount of air passing through the column is reduced. The gas phase is becoming more important, relative to the liquid phase, in controlling overall mass transfer. Increasing H_{OL} values require increased height in the design of the tower. An air to water ratio of 10:1 has been selected for this design to optimize tower height and blower requirements.

The H_{OL} for the pilot tests ranged from 25 inches at a liquid loading rate of 12,750 pounds per hour per square foot ($lb/hr \cdot ft^2$) to 31 inches at a liquid loading rate of 25,500 $lb/hr \cdot ft^2$ (at a constant air to water ratio of 10 cfm:1 gpm) (Figure 8). Values of H_{OL} for use in full-scale tower design have been estimated using this data. Since it is anticipated that 1.5-inch LTHA polypropylene Pall rings will be used in the full-scale air stripping system (as was used in the pilot test), the estimated H_{OL} values can be used in the design of the full-scale tower. A contingency (20%), will be added to the H_{OL} determined in the pilot work to account for any potential maldistribution in a larger diameter tower.

This model, which has been calibrated to match the pilot test data, was used to develop the full-scale design criteria for the air stripper. Appendix E contains sample output from the computer simulation model.

3.2.2 Chemical Treatment Requirements

Calcium carbonate ($CaCO_3$) scaling or fouling can occur due to a shift in the carbonate equilibrium, which can result when carbon dioxide is stripped from the ground water during the air stripping treatment process. The calcium carbonate scaling tendency of the

ground water before and after air stripping was evaluated using the Langelier Index[5]. The Langelier Index provides an approximation of the calcium carbonate scaling potential for any given sample.

The Langelier Index is defined as the difference between the actual (measured) pH of a water sample and the hypothetical pH the water would have if it were in equilibrium with calcium carbonate (i.e., pH at which no calcium carbonate precipitates).

Langelier Index	=	pH (actual water)	-	pH (water if it were in equilibrium with $CaCO_3$ at existing concentrations of calcium and bicarbonate ions)

A Langelier Index which is negative is indicative of a corrosive system. A Langelier Index which is positive is indicative of a system that may have scaling. Ideally, a system would operate with a Langelier Index just slightly above zero.

The scale forming tendency of the ground water samples was also evaluated using the Ryznar or stability index. The Langelier index is considered a good indicator of scaling potential in a bulk system, i.e., an area of low flow velocity such as in the stripping tower. The Ryznar Index is considered to be an indicator of scaling tendency in flowing systems, such as the system piping. The Ryznar Index is calculated as follows:

Ryznar Index	=	2x (pH of water if it were in equilibrium with $CaCO_3$ at existing concentrations of calcium and bicarbonate ions)	-	pH (actual water)

The Langelier Index calculated from the inorganic analytical data for several untreated ground water samples from the site ranged from 0.49 to 0.51 (Table 11). This indicates the influent to the stripper has a scaling tendency. The Langelier Index of the treated water (after stripping) was calculated to be approximately 1.2, indicating a higher tendency to form scale deposits. The increase in scaling tendency across the tower is due to the stripping of carbon dioxide (CO_2) from the ground water, which increases the pH of the water and reduces the solubility of calcium carbonate. The reduced $CaCO_3$ solubility could result in precipitation of calcium carbonate on the tower packing. The Ryznar Index is 6.24 for the influent to the stripper. A Ryznar Index of less than 6.0 indicates a scaling potential; therefore, no scaling of the piping system would be expected.

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5 Kemmer, F. N., The Nalco Water Handbook, 2nd ed. McGraw-Hill, 1988. p. 417.

WELL PACKAGE

The well package was used to simulate the proposed purge wells. All purge wells were simulated in the lower aquifer unit.

RECHARGE PACKAGE

The recharge package was used to simulate the infiltration of precipitation. A recharge rate of 10 inches per year (2.64×10^{-8} ft/s) was assigned to the upper-most layer.

STRONGLY IMPLICIT PROCEDURE PACKAGE

The strongly implicit package was used to solve the ground water flow equations resulting from the model input. All ground water flow simulations were conducted using the steady-state flow option.

4.1.3 CALIBRATION

After the model was set up, the ground water flow model was calibrated to the July 21, 1992 water table elevations using the steady-state flow option (Figures 11 and 12). The model was also calibrated to the aquifer test conditions (Figure 13). A calibration of approximately two feet was obtained over most of the model area for the upper layer and approximately 1 foot or better for the lower layer. Because the upper layer is less significant in its contribution to the purge wells than the lower layer, the calibration is less important in the upper layer.

4.2 GROUND WATER RECOVERY OPTIONS

The ground water flow model was used to determine pumping rates for containing and capturing contaminated ground water from the proposed ground water management zone. The targeted zone of capture includes all of the ground water in the upper and lower layers of the aquifer beneath the site within the ground water management zone (Figure 10).

The initial conditions (model inputs) for the purge well simulations were based on the hydraulic conductivities obtained from the model calibration. For modeling, the hydraulic conductivity values from the model calibration were increased by one-tenth of the calibrated hydraulic conductivity to allow for variations in the hydrogeologic system and provide for a margin of safety in the design capacity of the treatment system. During the modeling, the pumping rates for each scenario were increased until the desired zone of capture was obtained.

are required because the total VOCs emitted are less than eight pounds per hour. The Keystone stripper is not expected to emit more than a maximum of 2.5 pounds per hour total VOCs.

4.3.1 VOC Removal

The main organic components in the ground water at the Keystone site are TCA and TCE. There are other contaminants present, but at significantly lower concentrations. TCE and TCA are the two constituents that set the design conditions for the stripping tower. The pilot test data and computer simulations were used to establish design criteria for the full-scale air stripper. The relative volatility of both TCE and TCA were used to determine the stripping factors for TCE and TCA, and the stripping factors were input into the computer simulation model. The calibrated computer model was used to determine the H_{OL} for the stripping system.

The design of the tower is based on the influent flow rate, which varies based on assumptions of well production and recovery requirements. As indicated, the minimum anticipated ground water flow rate produced from the four wells is expected to be approximately 450 gpm. The average ground water recovery rate is anticipated to be about 550 gpm, and the maximum recovery from the four wells is expected to be 650 gpm. The air stripper is sized to treat up to 800 gpm to allow for the addition of more purge wells in the future, if needed.

The anticipated average and maximum concentrations of organic contaminants in the feed were developed from the May 1992 quarterly monitoring well sampling results. The monitoring data from several wells located near the future recovery wells were blended on a flow-weighted basis proportional to their anticipated contribution to the full-scale stripper feed. The resulting feed concentration (Table 12) was multiplied by a safety factor of three and was used to size the stripper. This safety factor was applied to account for possible variations in ground water contaminant concentrations. This assumption is conservative based on past experience and the variability seen in the wells over time. The TCE and TCA inlet concentrations are expected to be 720 ug/l and 440 ug/l, respectively.

The size of the tower was developed using the computer simulation model described earlier in this report. The ground water-specific mass transfer data were input into the program along with the projected influent flow rate and concentration data. The temperature of the ground water feed to the stripper was conservatively assumed to be 10°C (50°F). The stripper will be packed with 1.5 inch LTHA polypropylene Pall rings. This packing type is relatively inexpensive and lightweight, provides a large surface area for mass transfer, and has been proven in field studies to provide excellent stripping results.

The packed bed height of the stripper has been limited to thirty feet, resulting in an overall tower height of approximately fifty feet. The additional height of the tower is required to provide a liquid wet well at the base of the tower and a vapor disengagement space at the top of the tower. Holding the overall tower height to fifty feet allows the use of a stainless steel or a fiberglass reinforced plastic (FRP) tower without requiring extensive external support of the tower.

The packing material is supported on a stainless steel gas injection plate. A stainless steel distributor installed above the packed section of the tower assures proper distribution of the liquid feed and adequate wetting of the packed surfaces. A demister pad will be installed above the distributor to reduce liquid carryover from the tower. The tower itself may be constructed of stainless steel or FRP. Piping from the wells will be buried high density polyethylene (HDPE), except for exposed piping. The above ground piping in the tower area will be steel or FRP.

The diameter of the tower was selected to provide sufficient removal of VOCs during stripping, to maintain liquid loading within recommended guidelines, and to limit pressure drop through the tower. The tower pressure drop determines the size of the air blower, and thus blower capital and operating costs. Liquid loading is defined as the throughput of the tower, expressed as pounds per hour of liquid, divided by the cross-sectional flow area of the tower, measured in square feet. The liquid loading will be held between 4000 $lb/hr \cdot ft^2$ and 15,000 $lb/hr \cdot ft^2$.

An eight foot diameter tower has been selected for the air stripper. The liquid loading values for the eight foot tower are within the acceptable range. The loading is 5,478 $lb/hr \cdot ft^2$ at the expected average flow rate of 550 gpm, 4,482 $lb/hr \cdot ft^2$ at the design minimum flow rate of 450 gpm, and 7,968 $lb/hr \cdot ft^2$ at the design maximum flow rate of 800 gpm. The turndown ratio of the tower is the minimum flow rate divided by the maximum flow rate, or approximately 0.56.

The air blower has been sized to provide the amount of air flow which results in the desired effluent quality. The design flow for the blower is 8,000 cubic feet per minute. This provides a ratio of air flow (cfm) to liquid flow (gpm) of 10:1. This ratio matches the basic criteria for blower sizing which has been proven in previous installations. This air flow rate produces a pressure drop through the tower of about 6 inches of water column at the design flow rate of 800 gpm. Assuming 25 percent additional pressure drop for the system piping and a 60 percent blower efficiency, the horsepower requirement is estimated to be about 15.

The effluent from the tower will be pumped to an existing process cooling water supply line which currently feeds river water from the canal by the steam plant to the wire mill pond. The required discharge pressure to enter this line varies between 40 and 60 pounds per square inch (psi). The tower effluent pumps have been preliminarily sized for 70 psi discharge pressure at the design flow rate of 800 gpm. A flow control valve on the pump

discharge will be interlocked with the level controls to maintain the liquid level in the base of the tower and the required cooling water supply.

4.3.2 Ground Water Conditioning

The ground water at the site has sufficient hardness and mineral content to have a scaling tendency in the air stripping system. Anticipated inorganic water quality data are presented in Table 11. The water will be treated by the addition of sulfuric acid to prevent scale build-up in the tower and piping system. Sulfuric acid (98 weight percent) will be continuously metered into the tower feed by a metering pump. The acid will be stored in a 6,000 gallon epoxy/fiberglass tank located near the air stripper. Acid consumption at 800 gpm has been calculated to be 7.75 gallons per hour, or approximately 5,580 gallons per month.

The acid will be fed into the tower influent line prior to a static mixer. The mixer will provide adequate distribution of the acid in the tower feed and allow the acid to react to completion prior to being monitored by the influent pH controller. The acid feed pump will be sized to provide the required flow rate to lower the maximum influent flow of 800 gpm to a pH of approximately 5.5. The actual operating pH will be determined during start-up. A spare acid feed pump will be provided.

The pH of the tower feed will be measured by a pH controller located on the feed line downstream of the acid injection point and static mixer. A second pH sensor located on the tower effluent will provide a feedback signal to the main pH controller. Redundant pH alarms will be provided on the system to prevent discharge of water at an undesirable pH level.

4.4 GROUND WATER REUSE/DISCHARGE

Treated effluent from the air stripping system will be pumped into the river water supply line running from the steam plant to the wire mill pond. The stripper effluent is expected to be below a maximum of 5 ug/l or detection limits for all the organic contaminants identified in the ground water. The other characteristics of the water, such as hardness and mineral content, are not expected to affect the process cooling or mill processes because the scaling potential of the water will be neutralized. After passing through the mill water system, the stripped ground water will be sent through the existing waste water treatment system and discharged through an existing NPDES permitted outfall. The monitoring point for organic contaminants in the treated ground water will be at the stripper discharge, prior to mixing with the river water in the wire mill cooling water supply line.

The best tie-in point is at the steam plant, where the supply header exits the building. The effluent will be pumped by the tower effluent pump through a buried eight inch carbon steel line (or equivalent) to an underground tie-in with the existing supply header. The header is fed currently from two pumps in the steam plant basement. The discharge pressure of those pumps is approximately 60 psi. The air stripping tower effluent pumps will be sized to provide enough pressure to enter the header. A pressure controller will be installed in the header downstream of the tie-in point. This controller will position the existing valve on the header (located in the steam plant basement at the discharge of the existing pumps) to maintain the desired flow rate to the wire mill pond. The stripper effluent will have priority in the line and the steam plant pump flow will vary on demand to maintain header pressure.

5.0 AIR AND WATER DISCHARGE PERMIT REQUIREMENTS

State of Illinois and U.S. EPA regulations require permits for both the air and water discharges from the ground water recovery and treatment system. The following compounds are included in the air and water permit applications attached as Appendix G and Appendix H, respectively:

- Carbon tetrachloride
- Chloroethane
- Chloroform
- 1,1-Dichloroethane
- 1,2-Dichloroethane
- 1,1-Dichloroethylene
- Methylene chloride
- Tetrachloroethylene
- Toluene
- Trans-1,2-dichloroethylene
- 1,1,1-Trichloroethane
- Trichloroethylene
- Vinyl chloride

5.2 AIR DISCHARGE PERMIT

The quantities of VOCs expected to be discharged from the air stripper to the ambient air were determined by performing a mass balance on the stripper for the average and maximum scenarios. The difference between the expected ground water influent VOC concentration and treated effluent VOC concentration was used to determine the quantity of VOCs which would be transferred into the air discharge. The VOC mass loadings in both the stripper influent and effluent were then determined by multiplying the ground water VOC concentrations by the design ground water flow rates for the system. The estimated influent ground water VOC concentrations were obtained from May 1992 ground water data for monitoring wells near the proposed recovery wells. The maximum expected concentrations were obtained by multiplying the May 1992 sampling results by three. This assumption is conservative based on past experience and the variability seen in the wells over time. Table 12 summarizes the anticipated ground water VOC concentration data for the full-scale system. The air stripper effluent VOC concentrations were conservatively assumed to be zero for this calculation; therefore, all of the VOCs would be discharged to the atmosphere.

The quantity of VOCs discharged to the atmosphere from the air stripper was calculated as follows:

Average:

(1.6 mg/l - 0 mg/l) x (550 gal/min) x (3.785 L/gal) x (1g/1000 mg) x (1 lb/454 g) x (60 min/hr)

= 0.45 lb/hr

Maximum:

(4.9 mg/l - 0 mg/l) x (800 gal/min) x (3.785 L/gal) x (1 g/1000 mg) x (1 lb/454 g) x (60 min/hr)

= 1.96 lb/hr

The maximum total pounds per hour of VOCs expected to be emitted to the atmosphere is 1.96 lb/hr. This is well below the limit of 8.0 lbs/hr as stated in 35 Illinois Administrative Code 215.301. Therefore, the proposed air stripping system does not require air pollution control equipment according to Illinois regulations. All appropriate State of Illinois application forms are included in Appendix G.

6.0 COST ESTIMATE

6.1 EVALUATION OF PROJECT COSTS

A cost estimate for this project has been prepared by adjusting and updating the previous estimate, (June 15, 1992), to reflect changes in the design basis. The capital cost for the project is estimated to be approximately $1,360,000 including a 20 percent contingency. Changes in ground water recovery and treatment flow rates and in well locations account for the majority of the changes in the cost estimates. A detailed breakdown of the capital and operating costs are included in Appendix F.

Below is a summary of the estimated costs for a 10 year ground water remediation program. These estimates include the annual costs for operation and ground water monitoring for VOCs.

	Capital Cost	Annual Operating Cost	Estimated Cost for 10 Year Program
o Air Stripping	$1,360,000	$180,000	$3,160,000
o Ground Water Monitoring		65,000	650,000
Total 10 Year Estimated Cost			**$3,810,000**

Several outstanding issues must be settled prior to development of a definitive cost estimate. The items include; exact recovery well locations, routing of the stripper effluent line and tie-in point, determination of underground interferences, and possible coordination with the mill for acid storage or delivery. These issues will be addressed in the detailed design documents which will be used for contractor bidding and construction.

- tower will be constructed of stainless steel or FRP with stainless steel internals and supports;
- a demister pad will be installed at the top of the tower;
- the tower will have a 30-foot section of packing material;
- overall tower height will be approximately 50 feet total, including packed bed, liquid wet well and vapor disengagement space
- packing will be 1.5-inch LTHA polypropylene Pall rings;
- tower diameter will be eight feet;
- tower and above ground feed lines will be heat traced and insulated;
- tower feed will have a flow recorder/totalizer installed;
- the tower will be located north of the steam plant;
- power for the stripping system is available locally;
- the air blower for the tower will be rated for 10 inches water column at 8,000 CFM, and require approximately 15 horsepower;
- automatic shutdowns will be supplied for;
    - low water level in purge well(s),
    - loss of feed,
    - low flow from purge wells,
    - loss of blower discharge pressure,
    - pH out of range (influent or effluent),
    - low flow from effluent pump,
    - high liquid level in tower bottom
- a common trouble alarm will be directed to a central control location;
- instrumentation, recorder(s), and some of the equipment will be housed in a new, local building, (approximately 20' by 20').

7.3 GROUND WATER CONDITIONING AND REUSE

The design basis assumed for the ground water conditioning and reuse system is:

- tower influent will be decreased to a pH of approximately 5.5 prior to entering the tower;
- acid used will be 98 weight percent sulfuric acid;
- acid consumption at maximum ground water flow rate is 7.8 gallons per hour or 5,600 gallons per month;
- acidification will be continuous, based on pH measurement of the feed stream;
- acid will be stored near the tower in a new 6,000 acid resistant epoxy/fiberglass storage tank;
- the storage tank will have secondary containment;
- the acid will be fed to the stripper feed by a positive displacement pump;
- the pump is preliminarily sized for 10 gallons per hour at 50 psig discharge pressure;
- the acid pump will be fully spared;
- flow control of the acid feed pump will be accomplished by a pH controller on the tower inlet line sending a signal to adjust the speed of the acid feed pump;
- treated effluent will be pumped by one of two new centrifugal pumps located at the tower base;
- effluent pumps are preliminarily sized for 800 gpm at 70 psi discharge (50 horsepower);
- effluent will be pumped to the river water process cooling supply line running from the steam plant to the wire mill pond
- a pressure control loop will be installed on the water header to insure adequate pressure is maintained in the header;
- the pressure controller will modulate an existing valve on the steam plant pump discharge.

7.4 PROCESS FLOW SCHEMATIC

A preliminary Process Flow Schematic is included as Figure 15 and a preliminary plot plan of the air stripping unit is included as Figure 16.

8.0 REMEDIATION PROGRAM

Based on the results of the aquifer test and pilot study and preliminary engineering design work, the following statements summarize the status of the ground water remediation program at the Keystone Steel & Wire Company facility:

- The aquifer test and air stripping pilot study have demonstrated that ground water recovery based on pumping and treating via air stripping are feasible technologies for remediation of the VOC contaminated ground water.

- This report provides the preliminary design criteria for both the ground water recovery well/transmission piping system and the air stripping/chemical conditioning system.

- The preliminary design criteria will be used to prepare detailed designs of both the ground water recovery and treatment systems. The project schedule requires detailed designs to be complete by February 22, 1993. Work will begin immediately to meet this schedule.

- Following preparation of detailed designs, the project schedule calls for contractor bids to be prepared and contracts to be awarded by April 19, 1993. Assuming that no delays are incurred during approval of the remediation plan or permits, construction is expected to be complete by August 31, 1993, and the stripper will start up at that time.

TABLES

TABLE 1

Summary of Drilling Methods
Aquifer Test and Pilot Study
Keystone Steel & Wire Company

Boring Number	HSA[1]	Mud Rotary[1]
Pilot Boring 1	0 - 40'	40 - 70.8'
Pilot Boring 2	0 - 81'	81 - 81.7'
PW - 1	0 - 81'	-
P - 3	0 - 40'	-
P - 4	0 - 39'	39 - 68.5'
P - 5	0 - 70.0'	-
P - 6	0 - 68.0'	-

[1] Depth below grade that drilling technique was used.

TABLE 2

Summary of Soil Sampling Methods
Aquifer Test and Pilot Study
Keystone Steel & Wire Company

Boring Number*	Continuous 5' Sampler	Split Spoon 24" Sampler
Pilot Boring 1	5 - 40'	40 - 70.8'
Pilot Boring 2	4 - 39' 49 - 69' 71 - 74'	39 - 49' 69 - 71' 74 - 81.8'
P - 4	4 - 39'	39 - 68'
P - 6	5 - 62'	62 - 67.5'

* Soil samples were not collected from borings PW-1, P-3, and P-5.

TABLE 3

Summary of Survey Data*
Aquifer Test and Pilot Study
Keystone Steel & Wire Company

Boring Location	Northing (feet)	Easting (feet)	Ground Elevation (feet)	Top of Casing Elevation (feet)
Pilot Boring 1 (P-5)	18,888.19	9,636.99	447.33	447.11
Pilot Boring 2 (PW-1)	18,901.76	9,785.06	447.40	448.62
P-3	18,891.03	9,754.87	447.61	447.27
P-4	18,892.20	9,745.69	447.55	447.23
P-6	18,897.67	9,569.23	447.25	446.90

* All survey data were collected by Clark Engineers NW, Inc., Peoria, Illinois.

TABLE 4
SUMMARY OF INORGANIC ANALYTICAL METHODS FOR GROUND WATER

Parameter	U.S. EPA Test Method*
Calcium	200.7
Iron	236.1
Magnesium	200.7
Manganese	243.1
Total hardness	130.2
Total alkalinity	310.1
Bicarbonate alkalinity	310.1
Total dissolved solids	160.1
Total organic carbon	415.1
Total suspended solids	160.2
pH	150.1

*"Methods for Chemical Analysis of Water and Wastes," 3rd Ed., U.S. EPA. March 1983.

TABLE 5

SUMMARY OF EXPERIMENTAL PROCEDURE
FOR AIR STRIPPING PILOT STUDY
Keystone Steel & Wire Company

TEST NO	INFLUENT FLOW RATE (GPM)	AIR FLOW RATE (CFM)	PACKING HEIGHT (FT)	AIR: WATER RATIO (CFM: GPM)	SAMPLE COLLECTION AND ANALYSIS: VOCs INFLUENT	VOCs EFFLUENT	Inorganic Parameters INFLUENT	Inorganic Parameters EFFLUENT	DURATION OF TEST (HOURS)
1	20	---	---	Equipment Blank	---	X			0.1
2	20	200	10	10:1	X	X*	X	X	1.5
3	20	300	10	15:1	X	X*			1.5
4	20	400	10	20:1	X	X*			1.5
5	30	300	10	10:1	X	X*	X	X	2.0
6	40	400	10	10:1	X	X*			1.8
7	40	400	20	10:1	X	X*			2.0
8	40	200	20	5:1	X	X*	X	X	21.5
9	40	120	20	3:1	X	X*			21.5
10	40	300	20	7.5:1	X	X*			48.0

* Duplicate samples were collected and analyzed for QA/QC purposes during the pilot study. Duplicate samples are recommended to minimize potential for data scatter which may result due to sampling and analysis of VOC concentrations near detection limits.

TABLE 6

Data Correction Factors
Aquifer Test and Pilot Study
Keystone Steel & Wire Company

Well Number	Residual Trend (ft./day)	Barometric Efficiency (percent)
PW-1	0.084	7
P-4	0.065	10
P-5	0.065	14
P-6	0.060	27
Average	0.069	15

TABLE 7

Drawdown in Observation Wells Used
During Aquifer Test
Keystone Steel & Wire Company

Location	DRAWDOWN (Feet)			
	Variable Rate Test			Constant Rate Test
	20 gpm	30 gpm	40 gpm	40 gpm
Shallow Wells				
W-4	0.030	0.010	0.010	0.190
P-3	-0.018	0.014	0.042	0.004
T-4A	1.000	0.030	0.070	0.240
T-7A	0.010	0.000	0.020	0.250
T-9	------	0.050	0.090	0.220
Deep Wells				
PW-1	22.055	29.375	39.812	41.296
P-4	0.832	1.248	1.749	1.660
P-5	0.741	1.124	1.534	1.474
P-6	0.621	0.960	1.322	1.291
T-3	0.440	0.790	1.100	1.300
W-4D	0.090	0.110	0.220	0.470
T-4B	0.250	0.500	0.700	0.860
T-7B	------	1.000	1.36	1.600

TABLE 8

Summary of Aquifer Characteristics

Aquifer Test & Pilot Study
Keystone Steel & Wire Company

	Transmissivity			Hydraulic Conductivity	
Well	gpd/ft	cm^2/sec	Storativity	gpd/ft^2	cm/sec
P-4*	2,547	3.7E0	1.5E-3	150	7.1E-3
P-5*	4,584	6.6E0	8.4E-4	437	2.1E-2
P-6*	7,052	1.0E1	7.4E-5	403	1.9E-2
T-3*	10,786	1.5E1	7.8E-5	1,438	6.8E-2
T-4B*	7,769	1.1E1	7.6E-5	622	2.9E-2
T-7B*	12,698	1.8E1	1.4E-4	847	4.0E-2
Average	7,573	1.1E1	4.5E-4	650	3.1E-2
Distance Drawdown Method	24,361	3.5E1	1.0E-4	1,949	9.2E-2

* Drawdown data evaluated using Hantush & Jacob Leaky Artesian Aquifer Model.

TABLE 9

Henry's Law and Relative Volatility Data for 1,1,1-TCA

Liquid Phase		Vapor Phase		Henry's Law Constant	Relative Volatility
TCA Concentration ug/l[1]	TCA Mole Fraction Xi	TCA Concentration ppm (volume)[1]	TCA Mole Fraction Yi	KTCA[2]	a[3]
100	1.803×10^{-8}	6.59	6.59×10^{-6}	365	30,400
200	2.704×10^{-8}	13.18	1.32×10^{-5}	487	40,600
300	6.762×10^{-8}	32.96	3.30×10^{-5}	487	40,600

(1) Measured in laboratory test

(2) $K_{TCA} = \frac{Yi}{Xi}$

(3) $a = \frac{K_{TCA}}{K_{water}}$

TABLE 10

AIR STRIPPING PILOT TEST
ANALYTICAL RESULTS

Keystone Steel & Wire Company

	Chloroform	1,1-Dichloroethane	1,1-Dichloroethylene	1,2-Dichloroethylene	Methylene Chloride	Tetrachloroethylene	1,1,1-TCA	TCE	Toluene	1,2-Dichloroethane	Carbon Tetrachloride
TEST 1											
Influent											
Effluent								1			
% Removal											
TEST 2											
Influent	12	9	200	81	120	33	9	770	8		
Effluent	ND	ND	1/1	1/1	ND	ND	ND	9/8	ND		
% Removal			99.5	98.8				98.9			
TEST 3											
Influent		16	380	130			49	1400			
Effluent		ND	ND/1	ND	3/ND		ND	7/6			
% Removal			99.9					99.5			
TEST 4											
Influent			130	50	23		29	700		6	
Effluent			1/1	ND	ND/4		ND	7/6	ND/1	ND	
% Removal			99.2		91.3			99.1			
TEST 5											
Influent			150	68			53	840			
Effluent			2/2	2/1			ND	13/13		ND/4	
% Removal			98.7	97.8				98.5			
TEST 6											
Influent		7	170	63	7		67	860			10
Effluent		ND	2/2	2/2	7/6		ND	17/17			ND
% Removal			98.9	96.8	21.4			98.0			
TEST 7											
Influent		9	220	79	7		86	890			11
Effluent		ND	ND	ND	ND		ND	ND/1		3/ND	ND
% Removal								99.9			
TEST 8											
Influent		7	200	58	5		140	990			
Effluent		ND	ND	ND	ND		ND	2/2			
% Removal								99.8			
TEST 9											
Influent		6	150	45			170	980			
Effluent		ND	ND	1/1	ND/1		ND	5/5			
% Removal				97.8				99.5			
TEST 10											
Influent		11	300	89			490	1500			
Effluent		ND	ND	ND			ND	2/2		2/ND	
% Removal								99.9			

All concentrations are listed as ug/l (ppb).
ND = Nondetect for all analyses is less than 1 ug/l.
Only influent concentrations which are detectable are shown.
Percent removals are only calculated for detectable influent and effluent samples.
Values shown with a dash indicate results of sample and duplicate sample.

TABLE 11

PROJECTED INORGANIC WATER QUALITY
Proposed Ground Water Recovery System
Keystone Steel & Wire Company

Parameter[1]	Tower Influent
Calcium, (mg/l)	316
Magnesium, (mg/l)	98
Hardness (as $CaCO_3$, mg/l)	1,222
Bicarbonate Alkalinity (as $CaCO_3$, mg/l)	385
Total Alkalinity (as $CaCO_3$, mg/l)	385
Iron, (mg/l)	2.1
pH	7.26
Langelier Index	0.51
Ryznar Index	6.24

(1) Based on a ground water pumping rate of 550 gpm from four wells located as shown on Figure 14, flow-weighted in proportion to anticipated well pumping rates.

TABLE 12

PROJECTED VOLATILE ORGANIC COMPOUND WATER QUALITY

Proposed Ground Water Recovery System

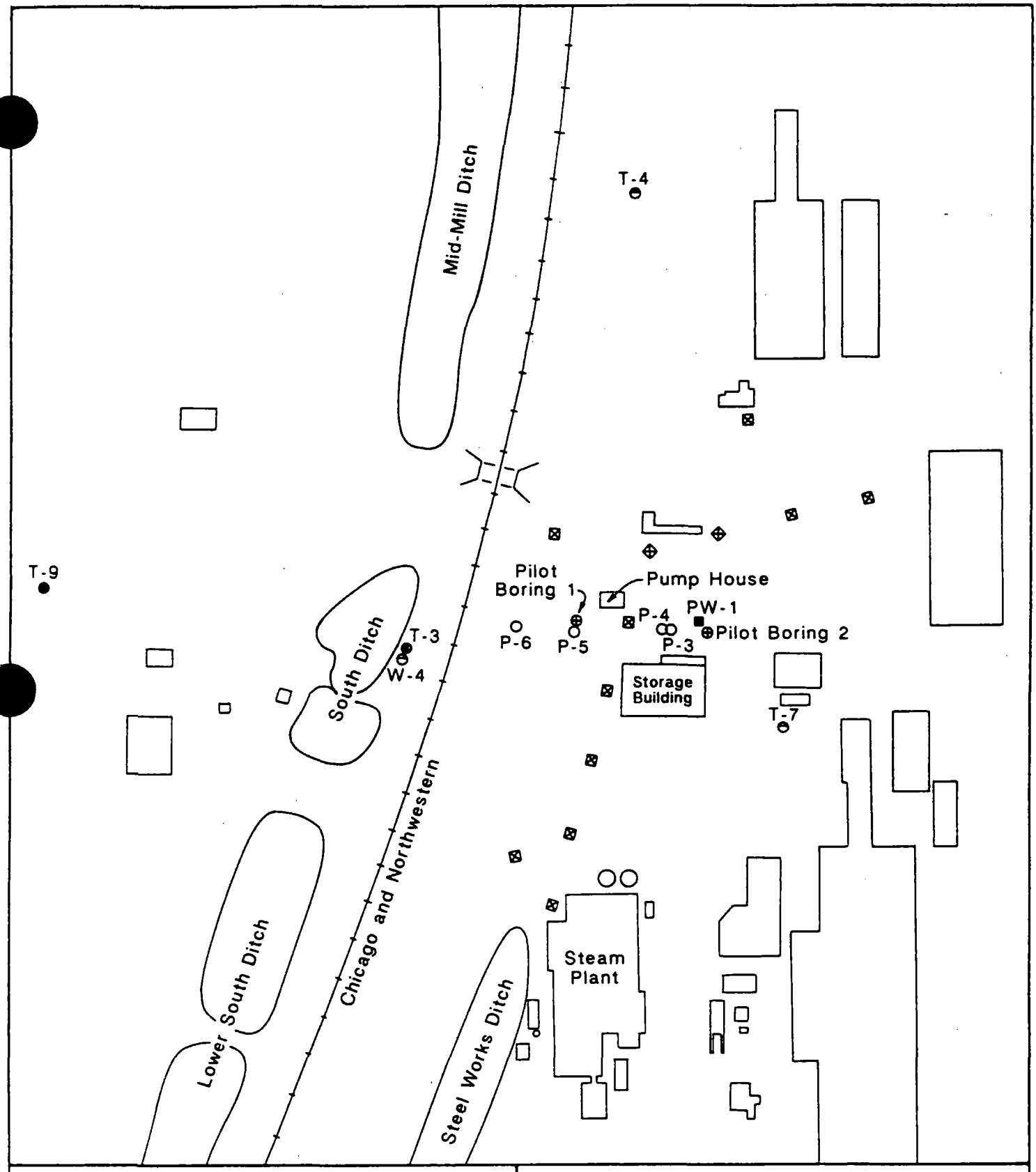
Keystone Steel & Wire Company

VOC	Projected VOC Water Quality (mg/l) Average (1)	Maximum (2)
1,1-Dichloroethane	0.17	0.51
1,1-Dichloroethylene	0.13	0.39
1,2-Dichloroethylene	0.06	0.18
Tetrachloroethylene	0.06	0.18
1,1,1-Trichloroethane	0.44	1.32
Trichloroethylene	0.72	2.16
Chloroform	0.012	0.036
Methylene Chloride	0.03	0.09
Toluene	0.008	0.024
1,2-Dichloroethane	0.002	0.005
Carbon Tetrachloride	0.01	0.03
Total VOCs	1.6	4.9

(1) Based on VOC concentration reported in the May 1992 quarterly monitoring report for monitoring wells located near proposed recovery wells. The individual well data were combined on a flow-weighted basis according to individual well pumping rates shown in Figure 14.

(2) Anticipated maximum equals three times the average value.

FIGURES



EXPLANATION

- ⊕ Soil Boring
- ● Monitoring Well
- ⊖ Monitoring Well Cluster
- ○ Piezometer
- ■ Purge Well

Figure 1

Soil Boring and Observation Well Locations

WW ENGINEERING & SCIENCE

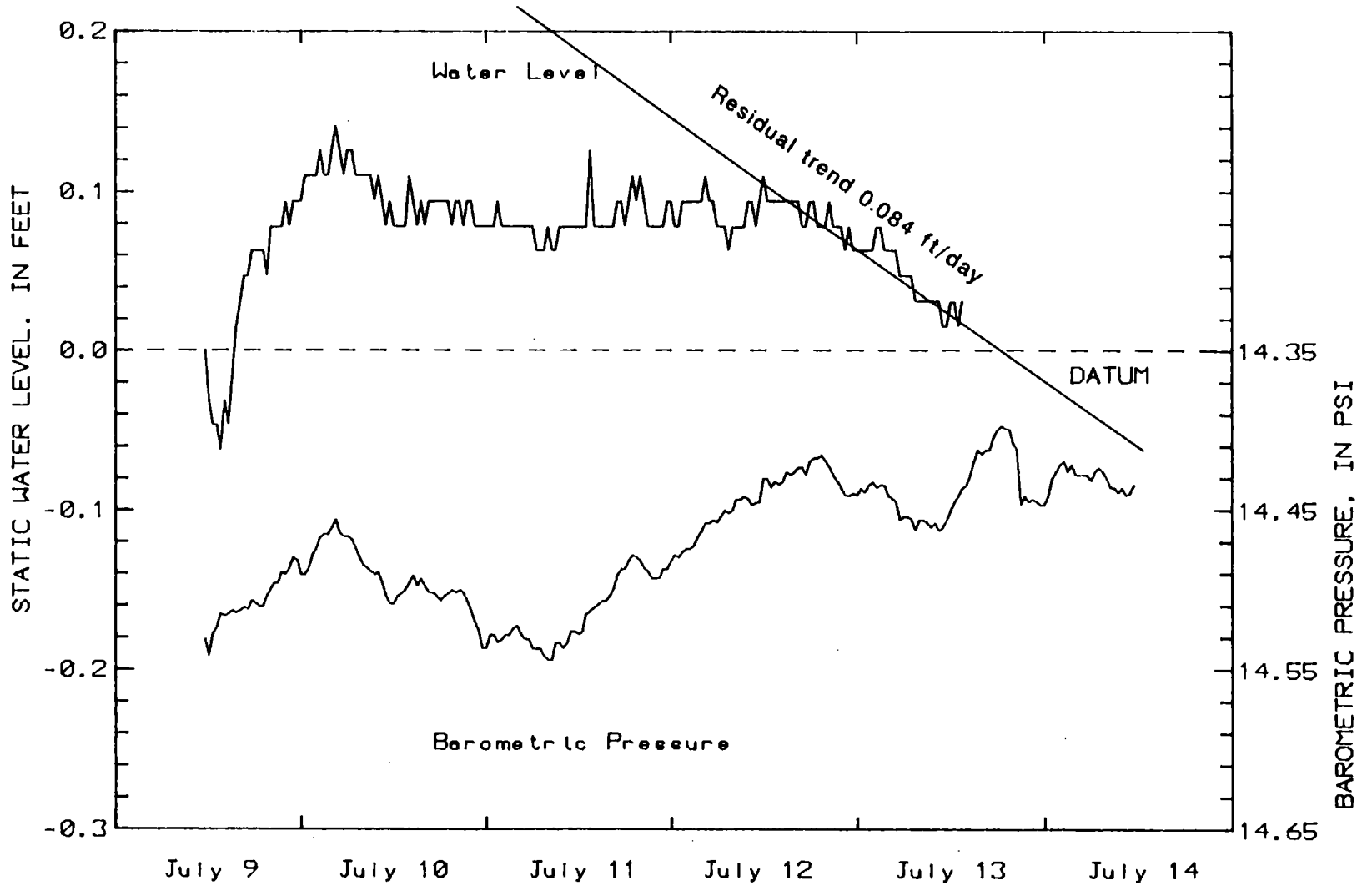


Figure 2. Response of water level in purge well PW-1 to barometric pressure change from July 9 through 14, 1992.

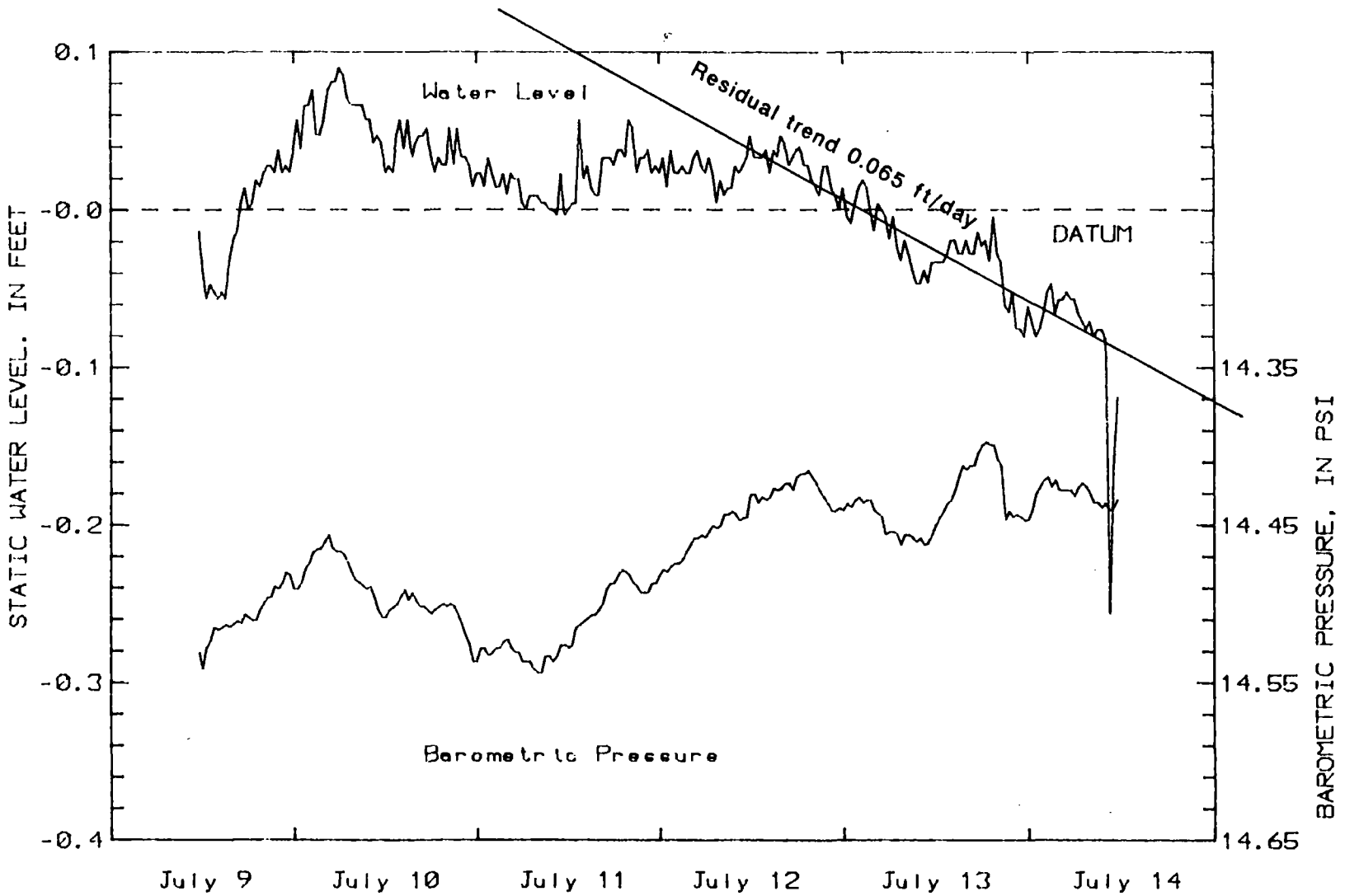


Figure 3. Response of water level in piezometer P-4 to barometric pressure change from July 9 through 14, 1992.

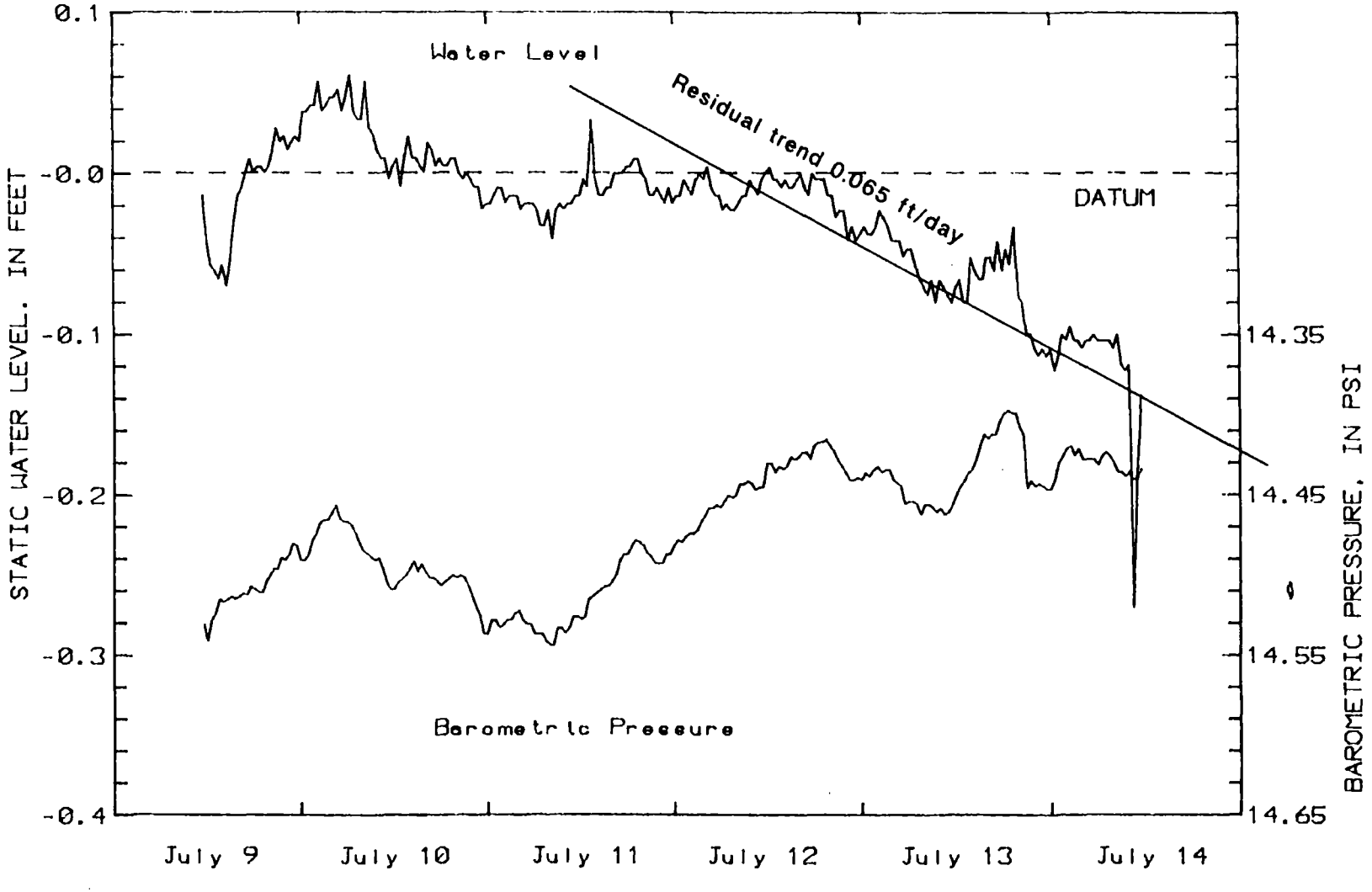


Figure 4. Response of water level in piezometer P-5 to barometric pressure change from July 9 through 14, 1992.

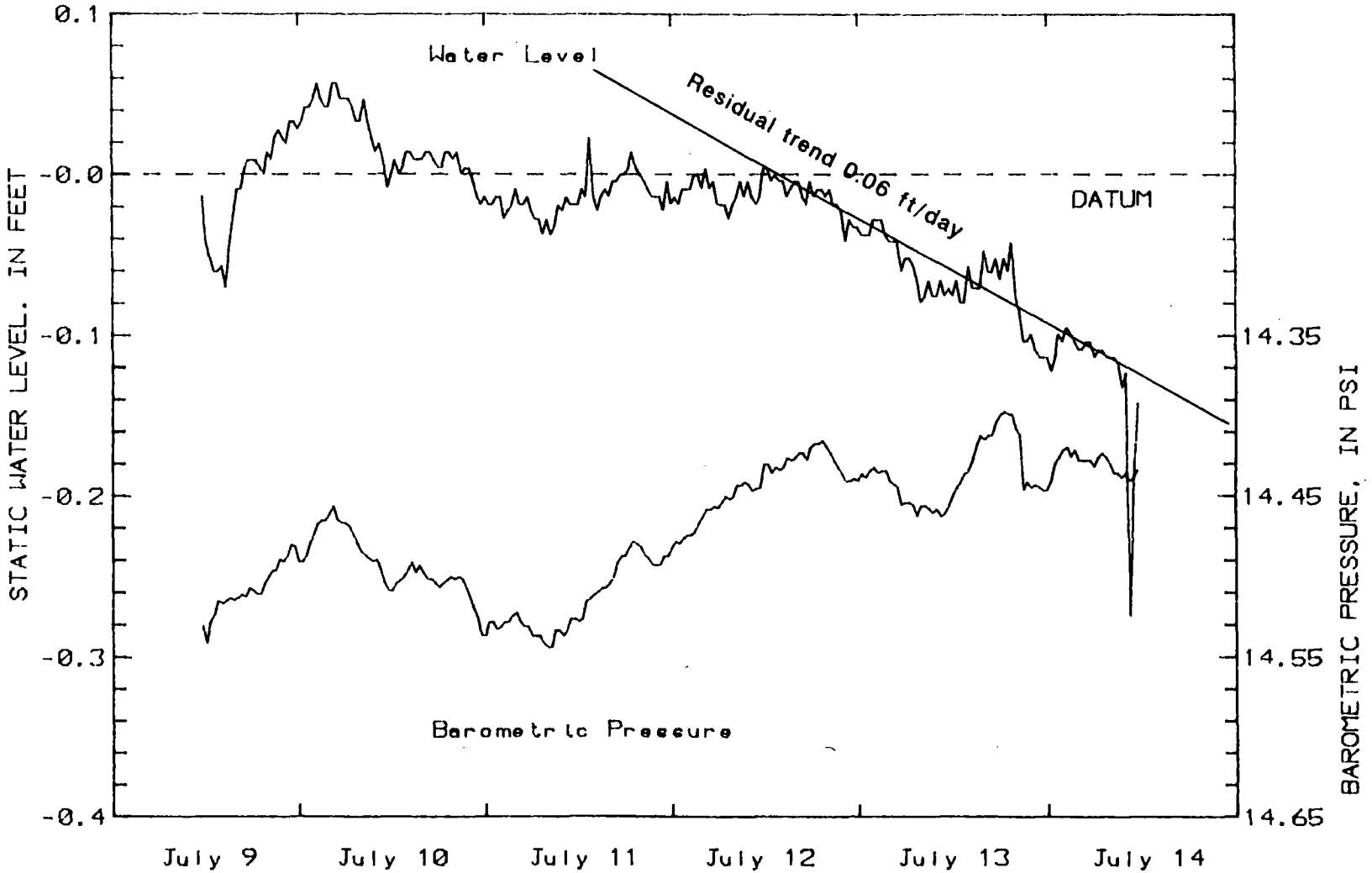


Figure 5. Response of water level in piezometer P-6 to barometric pressure change from July 9 through 14, 1992.

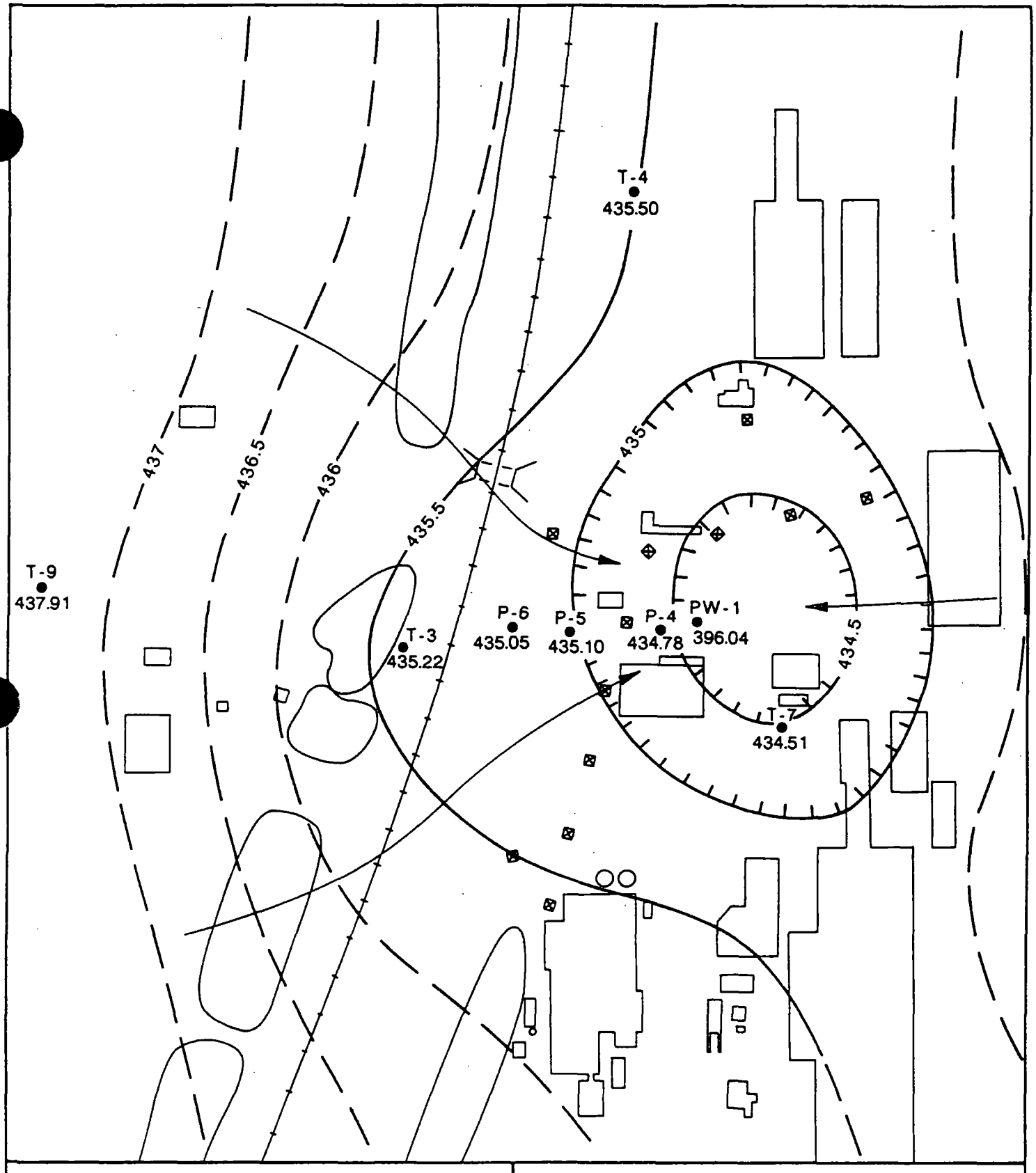


Figure 6

Water Table Contours

July 19, 1992

WW ENGINEERING & SCIENCE

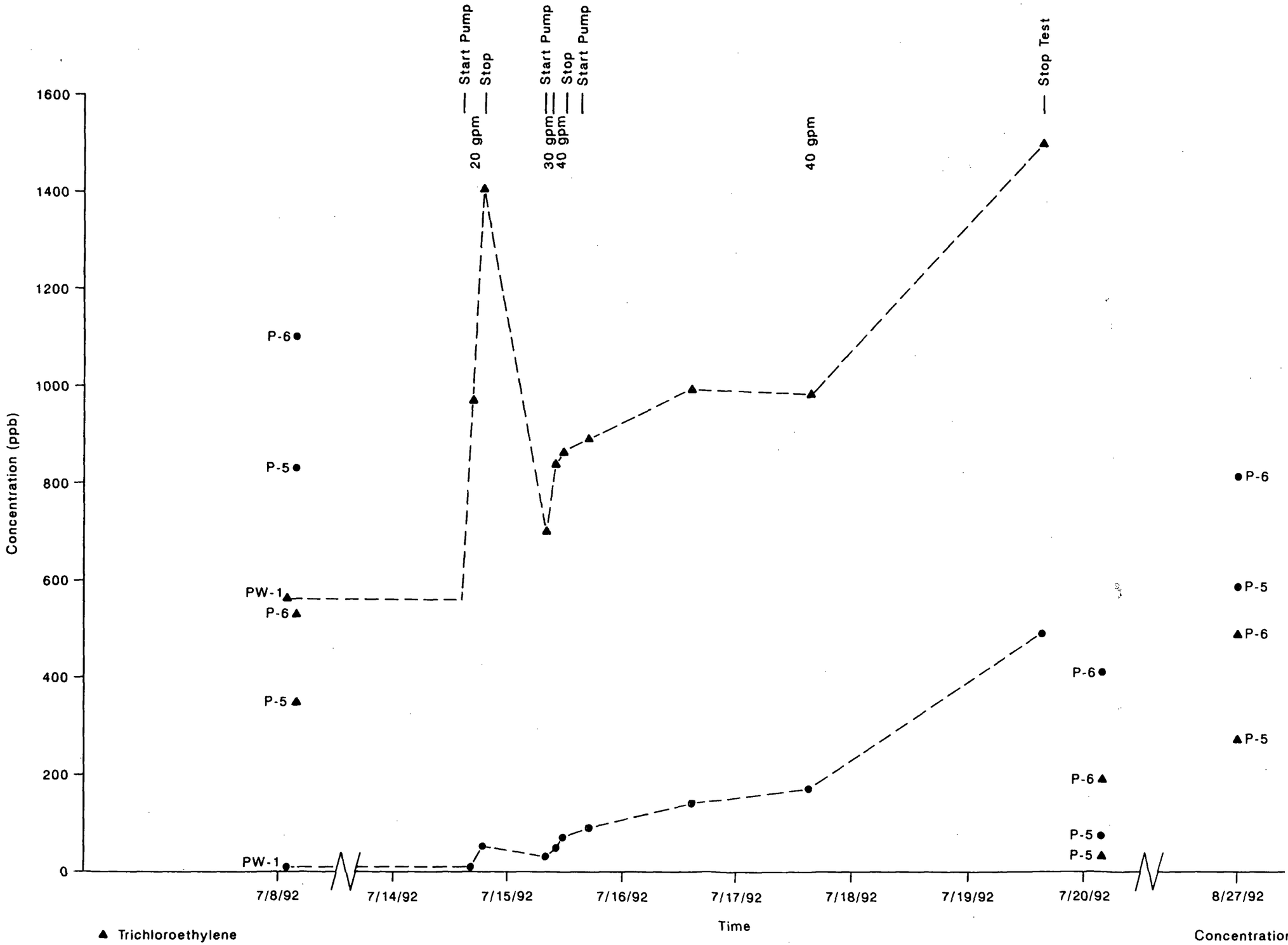


Figure 7

Concentration of Trichloroethylene and 1,1,1-Trichloroethane During Variable Rate and Continuous Rate Aquifer Tests

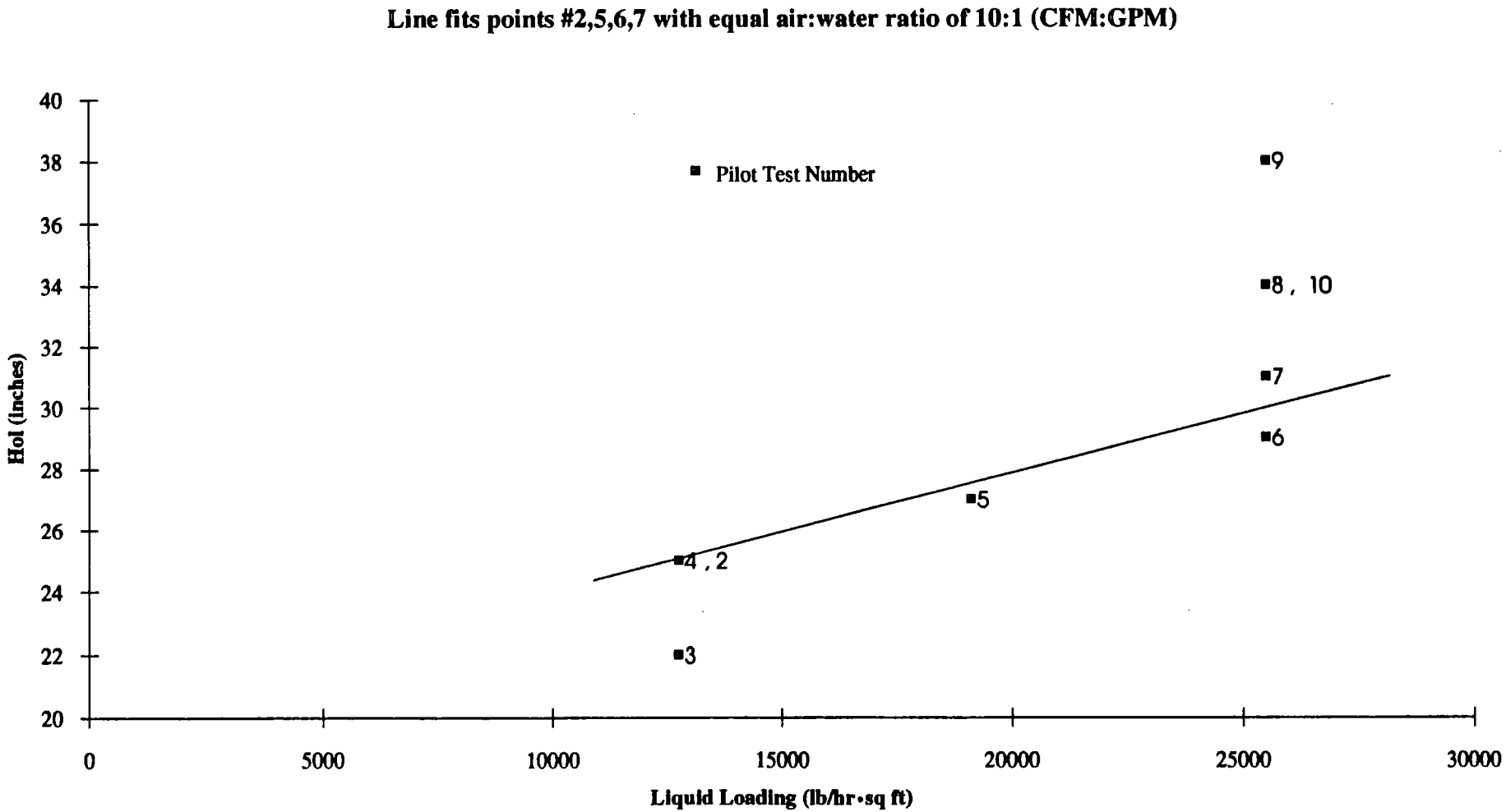


Figure 8 Height of a Transfer Unit vs. Liquid Loading

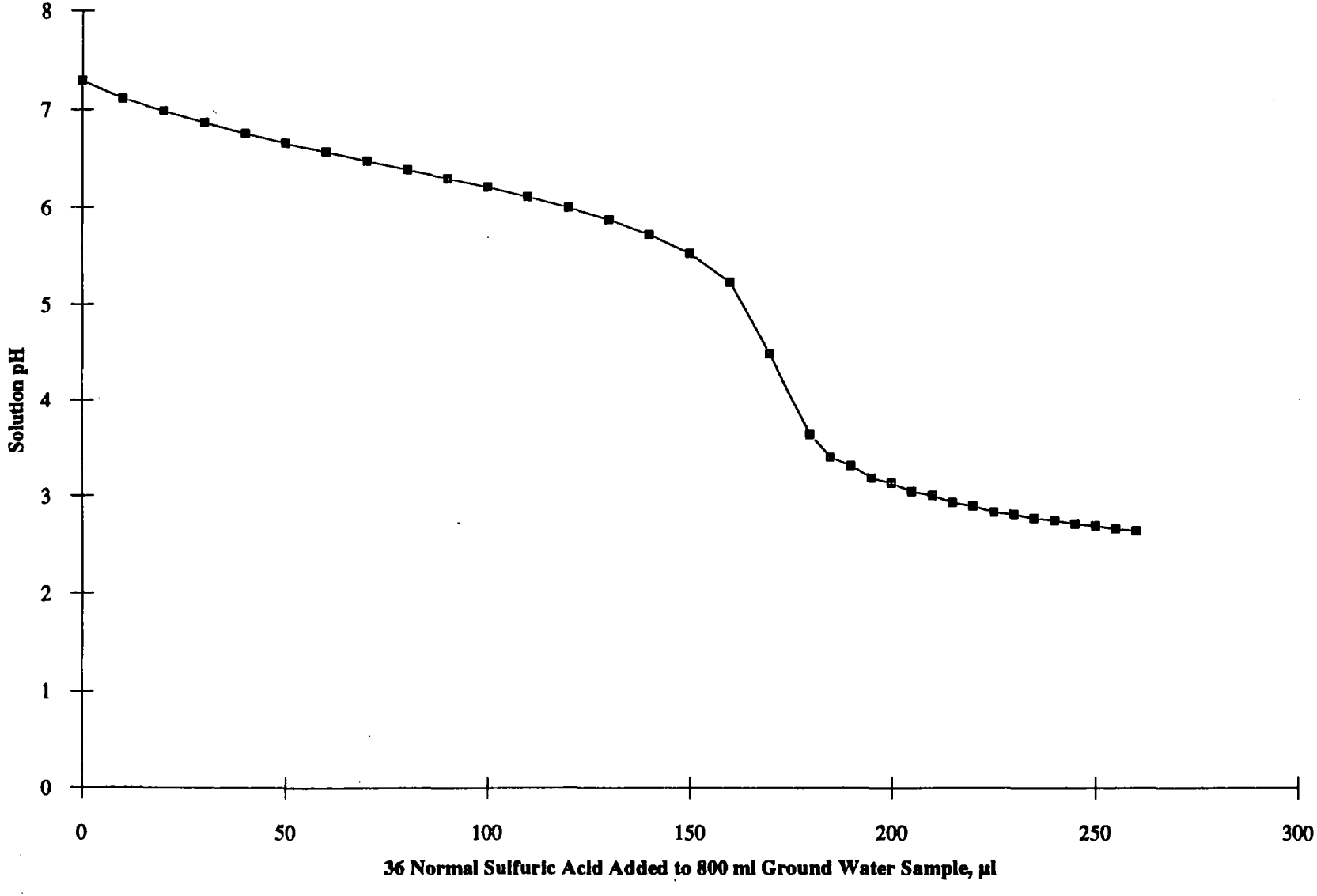


Figure 9 pH Titration Curve for Ground Water

NOTE: MODEL GRID EXTENDS OUT TO KICKAPOO CREEK

I-474

EXPLANATION

- ▲ – MONITORING WELL LOCATION
- ◉ – MONITORING WELL CLUSTER
- ■ – TEMPORARY BENCH MARK LOCATION
- ⊙ – PIEZOMETER
- ⬢ – PIEZOMETER CLUSTER
- ◎ – PURGE WELL LOCATION
- – – – PROPOSED AREA OF GROUND WATER MANAGEMENT ZONE

NORTH

0 250 500 1000

SCALE IN FEET

KEY-GRID
LVP110292

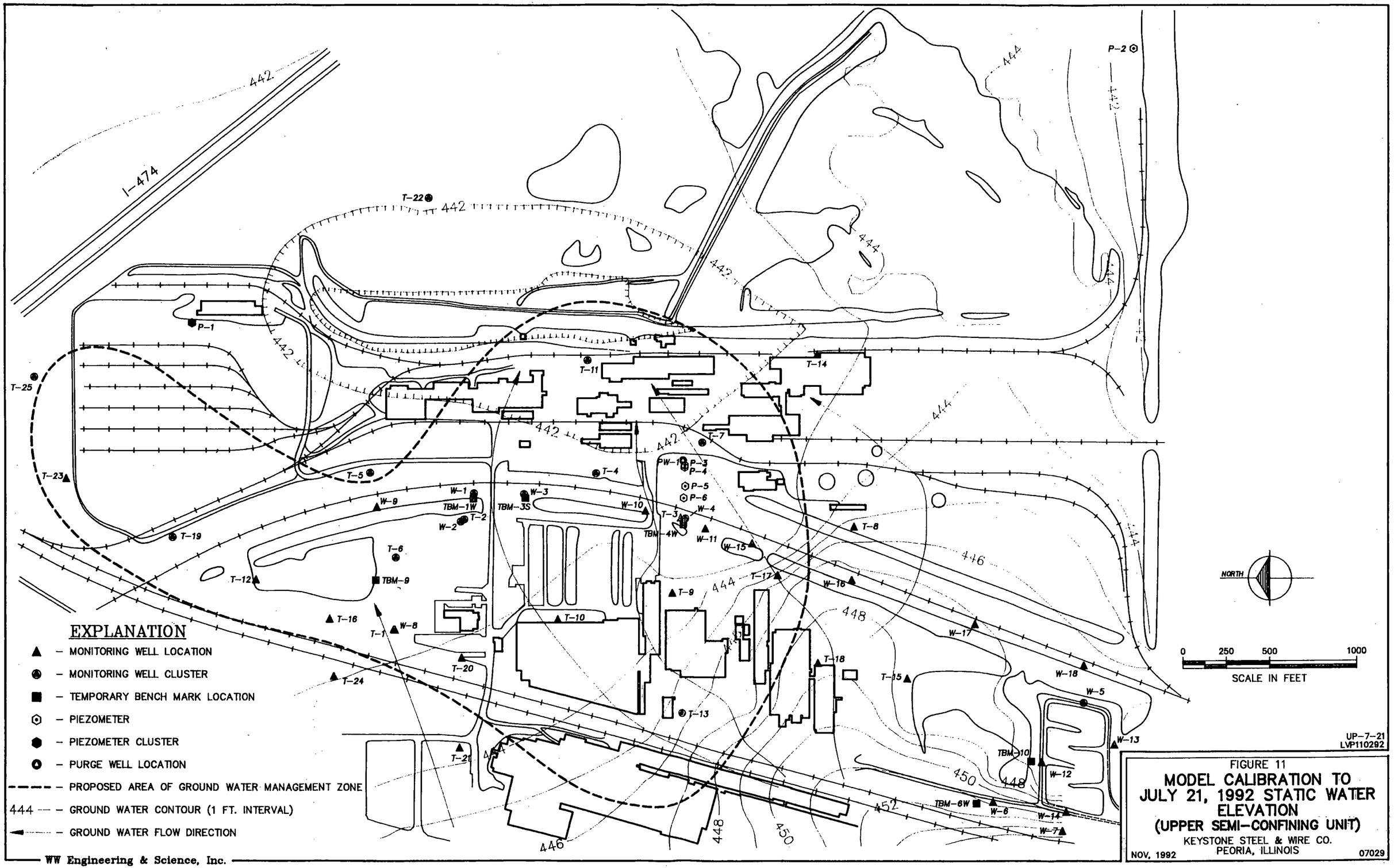
FIGURE 10

FINITE DIFFERENCE MODEL GRID AND GROUND WATER MANAGEMENT ZONE (LOWER AQUIFER)

KEYSTONE STEEL & WIRE CO.
PEORIA, ILLINOIS

NOV. 1992 07029

WW Engineering & Science, Inc.



UP-7-21
LVP110292

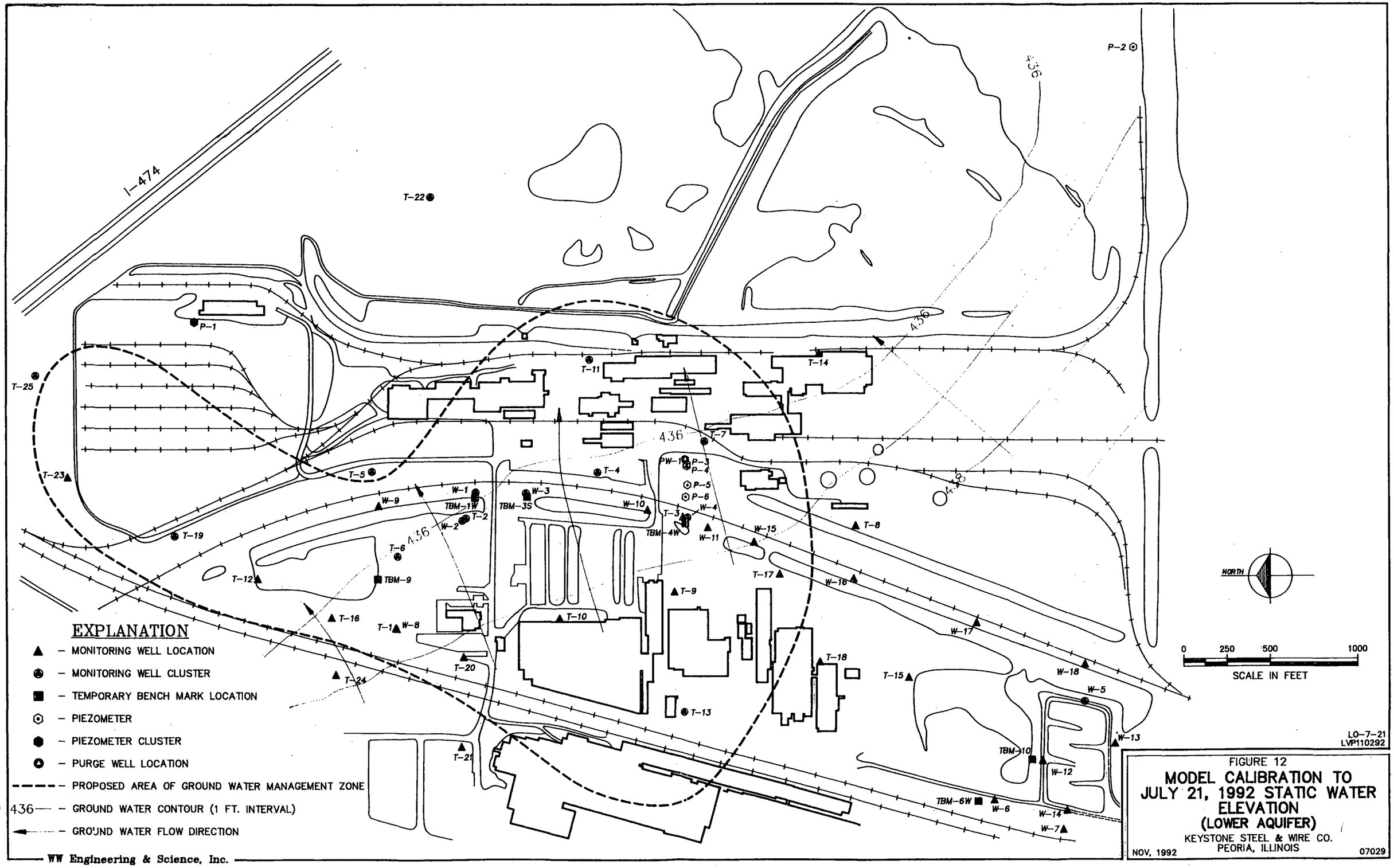
FIGURE 11

MODEL CALIBRATION TO JULY 21, 1992 STATIC WATER ELEVATION (UPPER SEMI-CONFINING UNIT)

KEYSTONE STEEL & WIRE CO.
PEORIA, ILLINOIS

NOV, 1992 07029

WW Engineering & Science, Inc.



LO-7-21
LVP110292

FIGURE 12

MODEL CALIBRATION TO JULY 21, 1992 STATIC WATER ELEVATION (LOWER AQUIFER)

KEYSTONE STEEL & WIRE CO.
PEORIA, ILLINOIS

NOV, 1992 07029

WW Engineering & Science, Inc.

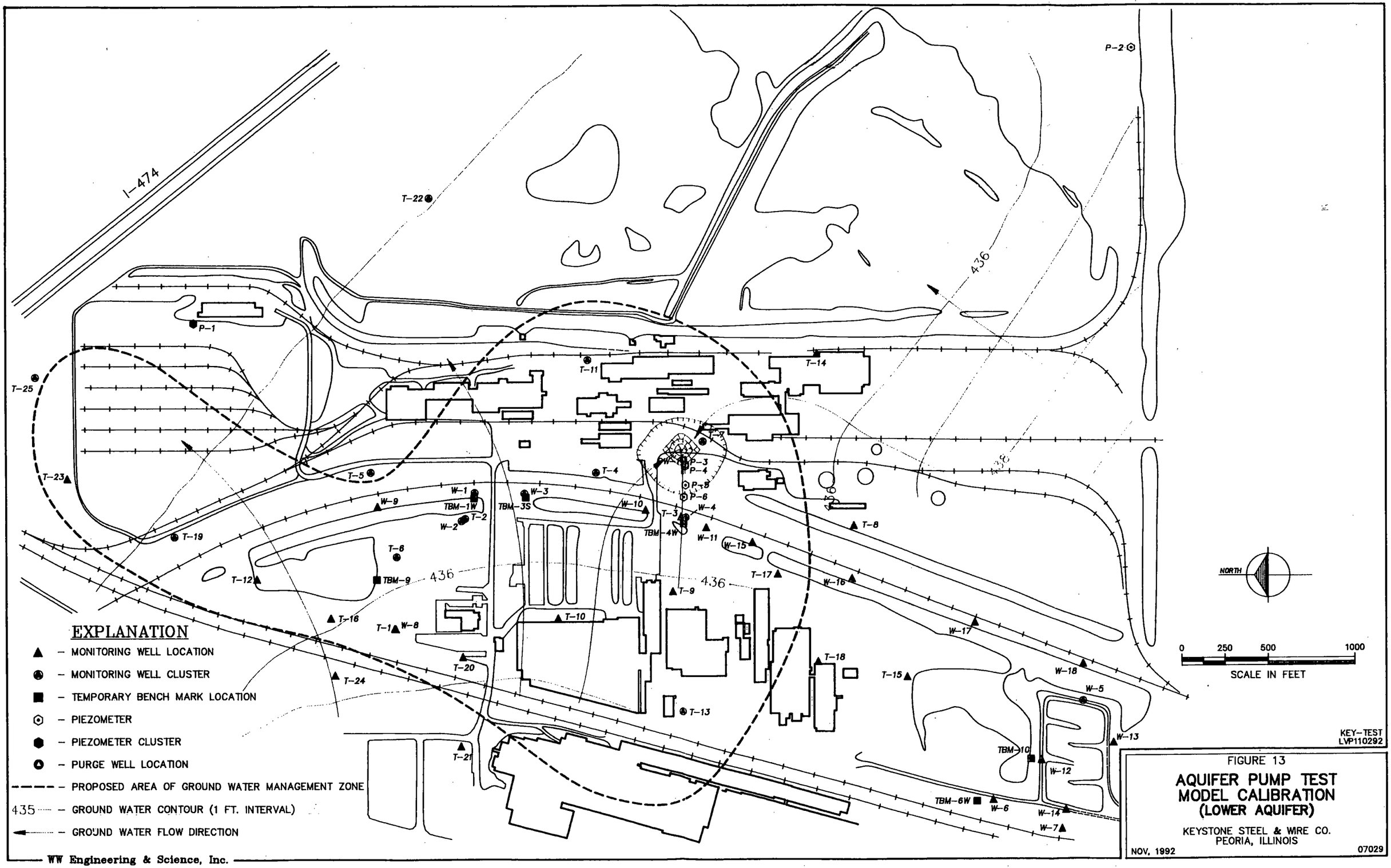


FIGURE 13

AQUIFER PUMP TEST MODEL CALIBRATION (LOWER AQUIFER)

KEYSTONE STEEL & WIRE CO.
PEORIA, ILLINOIS

NOV, 1992 07029

WW Engineering & Science, Inc.

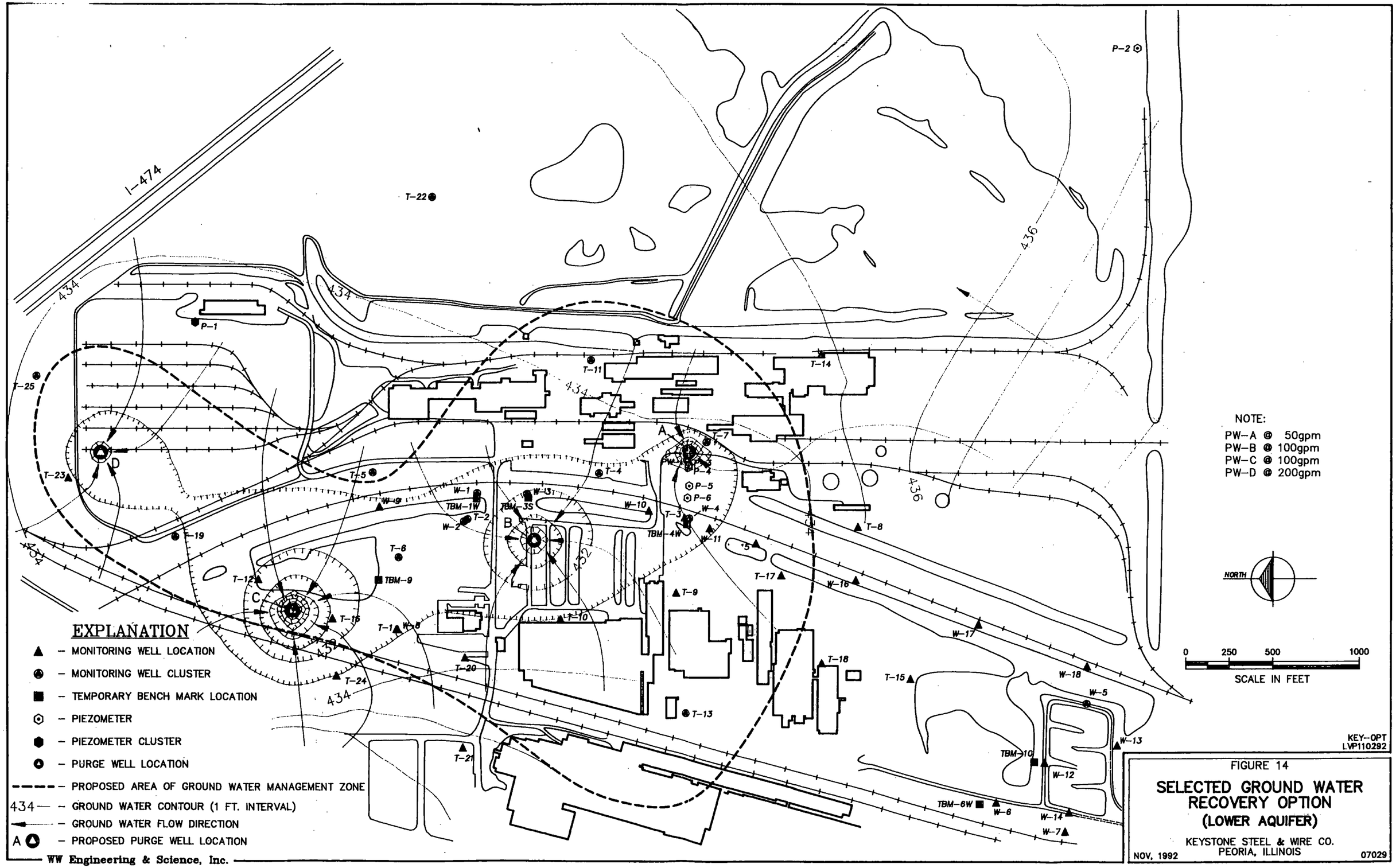


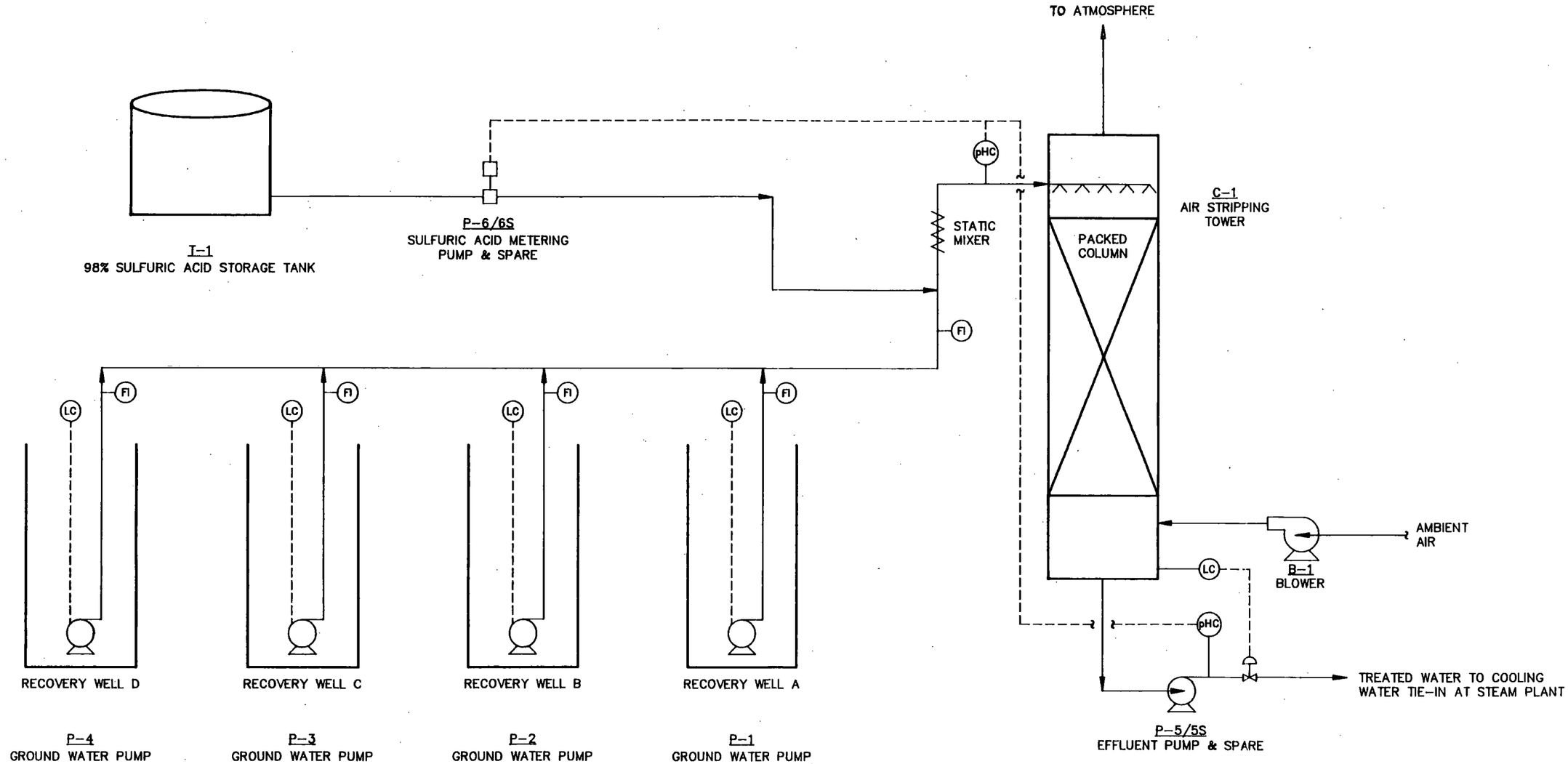
FIGURE 14

SELECTED GROUND WATER RECOVERY OPTION (LOWER AQUIFER)

KEYSTONE STEEL & WIRE CO.
PEORIA, ILLINOIS

NOV, 1992

07029



EXPLANATION

- (FI) FLOW INDICATOR
- (LC) LEVEL CONTROLLER
- (pHC) pH CONTROLLER

07029PIS
VR110292

FIGURE 15

PROCESS FLOW SCHEMATIC

GROUND WATER RECOVERY & TREATMENT

KEYSTONE STEEL & WIRE CO.
PEORIA, ILLINOIS

NOVEMBER, 1992 07029

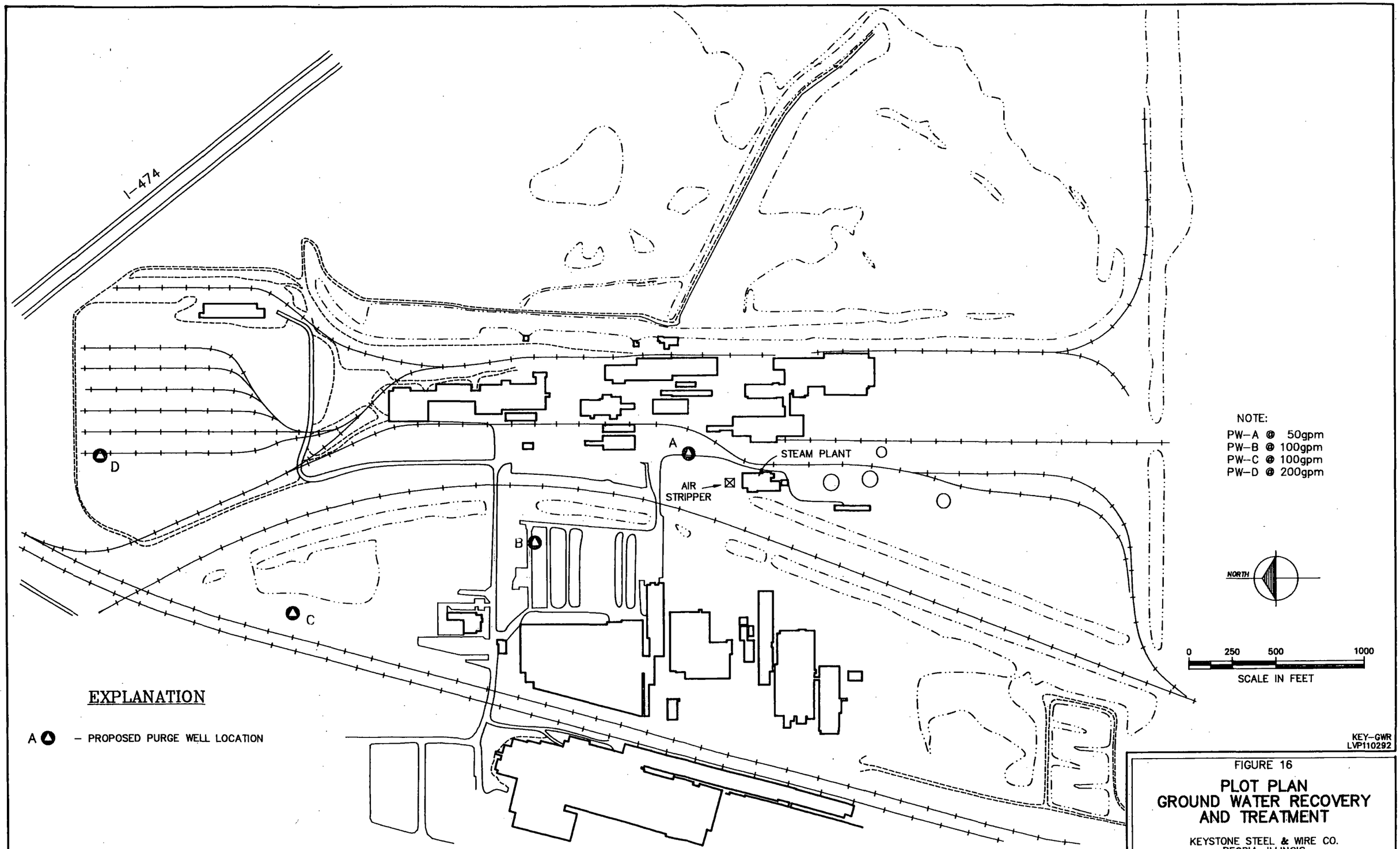


FIGURE 16

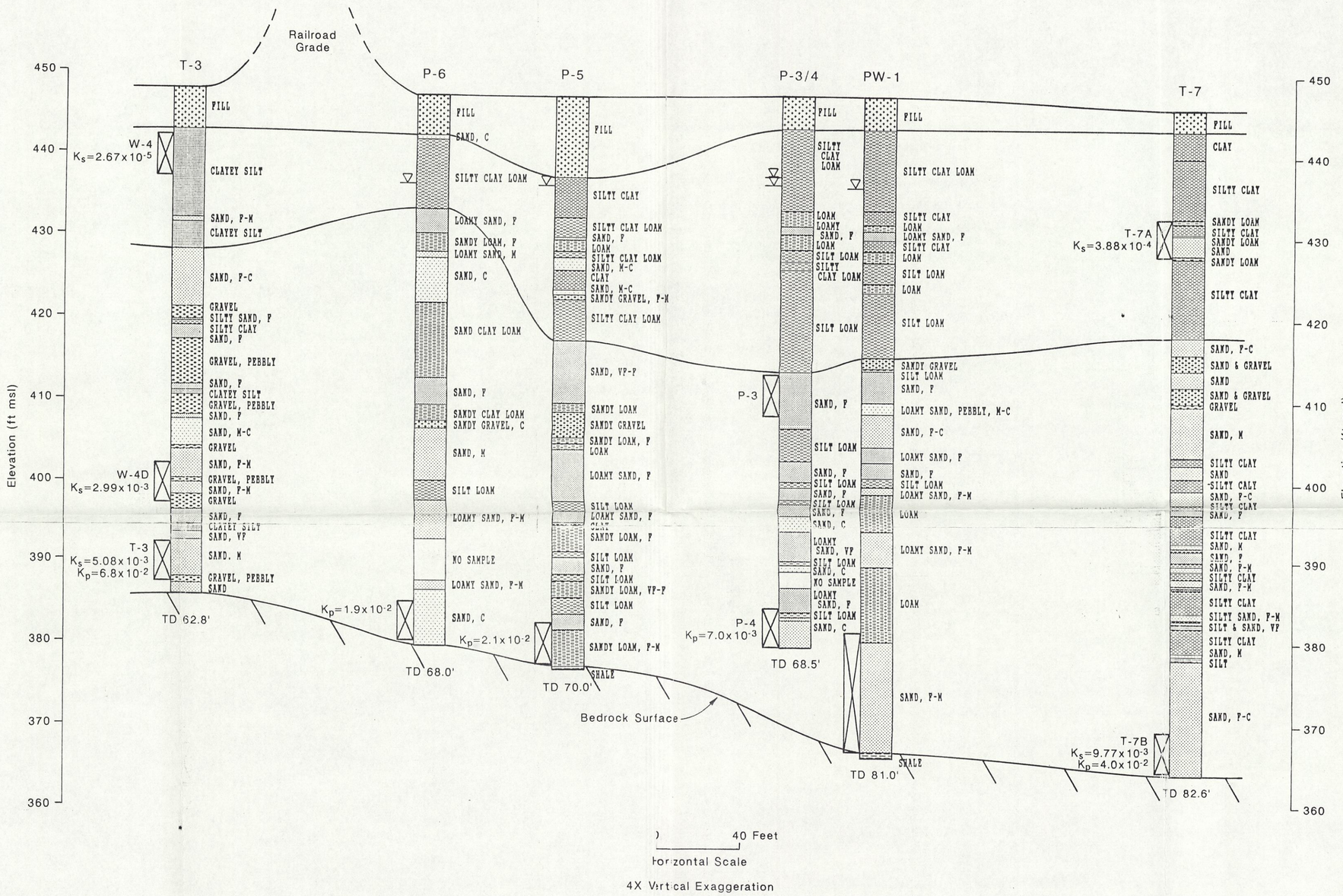
PLOT PLAN GROUND WATER RECOVERY AND TREATMENT

KEYSTONE STEEL & WIRE CO.
PEORIA, ILLINOIS

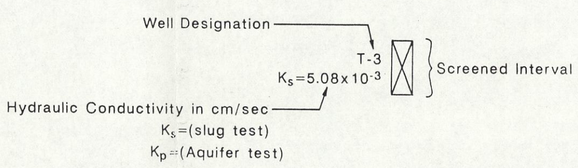
NOV, 1992 07029

WW Engineering & Science, Inc.

PLATE



EXPLANATION



KEYSTONE STEEL & WIRE COMPANY

PLATE 1
GEOLOGIC CROSS SECTION
OF AQUIFER TEST AREA

Drawn By	Date
NW	10-23-92
Checked By	Date

WW Engineering & Science
A Summit Company

APPENDIX A

WELL COMPLETION DIAGRAMS AND BORING LOGS

WW ENGINEERING & SCIENCE
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Site	Keystone Steel & Wire Company	**Boring No.**	P-3
Date	June 19, 1992	**Driller**	B. Crachy/Fox Drilling
Logged by	M. Lytle	**Elevation**	447.61
Location	N 18,891.03 ft.; E 9,754.87 ft.	**Page**	1 of 1

Water Level					Start		Finish	
Time					Time	9:40AM	Time	11:20AM
Date					Date	6-19-92	Date	6-19-92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				0		0 - 40.0' See log for boring P-4
				1		
				2		Bottom of Boring 40.0'
				3		
				4		
				5		
				6		
				7		
				8		
				9		
				10		
				1		
				2		
				3		
				4		
				5		
				6		
				7		
				8		
				9		
				20		

Remarks

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Site	Keystone Steel & Wire Company	**No.**	P-4
Date	June 18, 1992	**Driller**	B. Crachy/Fox Drilling
Logged by	J.A. Duwelius	**Elevation**	447.55 ft.
Location	N 18,892.20 ft.; E 9,745.69 ft.	**Page**	1 of 4

Water Level					Start		Finish	
Time					Time	7:30AM	Time	3:30PM
Date					Date	6/18/92	Date	6/18/92

SAMPLE TYPE	DRIVE	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				0		Fill, containing coal and slag, loam
				1		
				2		
				3		
				4		
CS	5.0	5.0		5		Silty clay loam, very dark gray (10 YR 3/1), color change at 6.6' to brown (10 YR 5/3), mottled, few, common, distinct, medium to coarse, yellowish brown (10 YR 5/6), slightly moist, slightly plastic, noncalcareous, color change contains coal fragments throughout
				6		
				7		
				8		
				9		
CS	5.0	5.0		10		Silty clay loam, mixed brown (10 YR 5/3) and gray (10 YR 5/1), mottled, common, distinct, coarse to very coarse, yellowish brown (10 YR 5/6), moist, plastic, noncalcareous, contains coal fragments throughout
				1		
				2		
				3		
				4		
CS	5.0	4.5		5		Loam, gray (10 YR 5/1), mottled, few, distinct, coarse, yellowish brown (10 YR 5/6), moist, friable, noncalcareous, abrupt contact at 16', loamy sand, yellowish brown (10 YR 5/4), wet, loose, nonplastic, noncalcareous, abrupt contact at 17' to loam as 15' above, trace coal fragments
				6		
				7		
				8		
				9		
CS	5.0	5.0		20		Silt loam, mixed gray (10 YR 5/1) and brown (10 YR 5/3), mottled, common, distinct, very coarse, yellowish brown (10 YR 5/6), moist, slightly plastic, friable, noncalcareous, abrupt contact

Remarks Diedrich D-50 equipped with 3 3/4" ID / & 7 1/4 OD HSA.

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Site	Keystone Steel & Wire Company	**No.**	P-4
Date	June 18, 1992	**Driller**	B. Crachy/Fox Drilling
Logged by	J.A. Duwelius/M. Lytle	**Elevation**	447.55 ft.
Location	N 18,892.20 ft.; E 9,745.69 ft.	**Page**	2 **of** 4

Water Level					Start		Finish	
Time					Time	7:30AM	Time	3:30PM
Date					Date	6/18/92	Date	6/18/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				20		At 20.5' to silty clay loam, gray (10 YR 5/1), moist to plastic, noncalcareous, abrupt contact at 21.5' to silt loam, as 19' above
				1		
				2		
				3		
				4		
CS	5.0	5.0		5		Silt loam, gray (10 YR 5/1), moist, friable, sticky, calcareous, contains gravel and fine sand laminations, wet, pale red (2.5 YR 6/2) banding
				6		
				7		
				8		
				9		
CS	5.0	3.3		30		Silt loam as 24' above, contains fine sand and clay laminations, wet, (combined call loam)
				1		
				2		
				3		
				4		
CS	5.0	5.0		5		Sand, fine, gray (10 YR 5/1), wet, loose, nonplastic, calcareous, well sorted and moderately washed, contains moist silt loam laminations
				6		
				7		
				8		
				9		
SS	2.0	1.1	2			Sand, as 34' above with silt loam laminations
			3	40		

Remarks Switched to mud rotary at 39' with 3 1/2" tricone

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Site	Keystone Steel & Wire Company	**No.**	P-4
Date	June 18, 1992	**Driller**	B. Crachy/Fox Drilling
Logged by	M. Lytle	**Elevation**	447.55 ft.
Location	N 18,892.20 ft.; E 9,745.69 ft.	**Page**	3 of 4

Water Level					Start		Finish	
Time					Time	7:30AM	Time	3:30PM
Date					Date	6/18/92	Date	6/18/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				40		
SS	2.0	1.1	8			Sand, as 39' above, with silt laminations
			12	1		
SS	2.0	1.5	5			Silt loam, gray (10 YR 5/1), wet, moist, friable, sticky, calcareous, laminated, contact at 42.3' with sand, as 39' above
			5	2		
			5			
			8	3		
SS	2.0	1.7	4			Silt loam, gray, as 41.0' above
			7	4		
			6			
			6	5		
SS	2.0	1.5	6			Sand, as 39.0' above
			7	6		
			9			
			10	7		
SS	2.0	1.6	3			Sand, as 39.0' above, contact at 47.4' with silt loam, as 41.0' above, contact 48.2' with sand, as 39.0' above
			5	8		
			10			
			13	9		
SS	2.0	1.6	5			Sand, as 39.0' above, contact at 49.8' with silt loam, as 41.0' above, contact at 50.4' with sand, as 39.0' above
			5	50		
			5			
			9	1		
SS	2.0	1.3	WOH			Sand, as 39.0' above, grades to coarse at 52.0'
			8	2		
			12			
			16	3		
SS	2.0	1.7	9			Sand, coarse, gray (10 YR 5/1), wet, washed and sorted, calcareous, contact at 54.0' with loamy sand, very fine, gray (10 YR 5/1), wet, friable, nonplastic, slightly laminated, calcareous
			12	4		
			10			
			9	5		
SS	2.0	1.4	3			Loamy sand, as 54.0' above, contains few stringers of silt loam
			5	6		
			8			
			18	7		
SS	2.0	1.6	5			Loamy sand, as 54.0' above, contact at 57.7' with silt loam, as 41.0' above, contact at 58.2' with sand, as 53.0' above
			5	8		
			5			
			9	9		
	2.0	0.0				No sample
				60		

Remarks

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Site	Keystone Steel & Wire Company	No.	P-4
Date	June 18, 1992	Driller	B. Crachy/Fox Drilling
Logged by	M. Lytle	Elevation	447.55 ft.
Location	N 18,892.20 ft.; E 9,745.69 ft.	Page 4	of 4

Water Level					Start		Finish	
Time					Time	7:30AM	Time	3:30PM
Date					Date	6/18/92	Date	6/18/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
	2.0	0.0		60		No sample
SS	2.0	2.0	8	1		Loamy sand, fine, as 54.0' above
			7			
			9	2		
			9			
SS	2.0	2.0	5	3		Loamy sand, as 54.0' above, contact at 64.0' with silt loam, as 41.0' above, contact at 64.6' with loamy sand, as 54.0' above
			5			
			7	4		
			11			
SS	2.0	1.6	18	5		Sand, coarse, brown (10 YR 5/3), wet, washed and sorted, calcareous
			32			
			41	6		
			45			
SS	1.0	1.0	38	7		Sand, as 65.0' above
			38			
				8		
						Bottom of Boring 68.50'
				9		
				70		
				1		
				2		
				3		
				4		
				5		
				6		
				7		
				8		
				9		
				80		

Remarks

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Site	Keystone Steel & Wire Company	**Boring No.**	P-5 (Pilot Boring 1)
Date	May 5, 1992	**Driller**	Gary Yocky/ Fox Drilling
Logged by	J.A. Duwelius	**Elevation**	447.33 ft.
Location	N 18,888.19 ft.; E 9,636.99 ft.	**Page**	1 of 4

Water Level					Start		Finish	
Time					Time	2:00PM	Time	11:30AM
Date					Date	5/5/92	Date	5/7/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				0		Fill, hand dug to 4.5' (4-29-92)
				1		
				2		
				3		
				4		
				5		
CS	5.0	0.4		6		Fill mixed with silty clay loam, gray and very dark gray (10 YR 5/1) and (10 YR 3/1), dry, soft, calcareous
				7		
				8		
				9		
				10		
CS	5.0	3.8		1		Silty clay, dark greenish gray (5 GY 5/1), mottled, common, distinct, coarse, dark yellowish brown (10 YR 4/6), moist, friable, plastic, noncalcareous, contains trace coal fragments, silty clay loam lamination and organic material
				2		
				3		
				4		
				5		
CS	5.0	3.5		6		Silty clay loam, dark greenish gray (5 GY 5/1), mottled, common, distinct, coarse, dark yellowish brown (10 YR 4/6), moist, plastic, abrupt contact at 17.5' to sand, fine, brown, (10 YR 5/3), wet, sticky, noncalcareous, well sorted and poorly washed, abrupt contact at 17.8' to loam, gray and brown (10 YR 5/1) and (10 YR 5/3), wet, slightly plastic, noncalcareous, abrupt contact at 19.2' to silty clay loam, as 15.0' above
				7		
				8		
				9		
				20		

Remarks ATV Diedrich D-50 equipped with 3 3/4" ID / 7 1/4" OD HSA

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Site	Keystone Steel & Wire Company	**Boring No.**	P-5 (Pilot Boring 1)
Date	May 5, 1992	**Driller**	Gary Yocky/ Fox Drilling
Logged by	J.A. Duwelius	**Elevation**	447.33 ft.
Location	N 18,888.19 ft.; E 9,636.99 ft.	**Page**	2 **of** 4

Water Level					Start		Finish	
Time					Time	2:00PM	Time	11:30AM
Date					Date	5/5/92	Date	5/7/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
CS	5.0	3.8		20		Sand, medium to coarse, brown (10 YR 5/3), wet, loose, noncalcareous, moderately sorted and washed, abrupt contact at 21.5' to clay, trace pebbles, gray (10 YR 5/1), moist, plastic, noncalcareous, abrupt contact at 23.8' to sand, medium to coarse, as 20.0' above, abrupt contact at 24.4' to sandy gravel, fine to medium, brown (10 YR 5/3), wet, loose, noncalcareous
				1		
				2		
				3		
				4		
				5		
CS	5.0	4.0		6		Silty clay loam, gray (10 YR 5/1), moist to wet, plastic to loose, slightly calcareous, contains fine sand laminations throughout
				7		
				8		
				9		
				30		
CS	5.0	2.0		1		Sand, very fine to fine, gray (10 YR 5/1), wet, loose, calcareous, well sorted and washed, trace of silt in spoon tip
				2		
				3		
				4		
				5		
CS	5.0	4.7		6		Loamy sand, fine, gray (10 YR 5/1), wet, loose, calcareous, well sorted and washed, abrupt contact at 37.8' to sandy loam, gray (10 YR 5/1), wet, slightly sticky, calcareous, contains fine sand laminations, abrupt contact at 38.9' to sandy gravel, medium, gray (10 YR 5/1), wet, loose, calcareous
				7		
				8		
				9		
				40		

Remarks Switched to mud rotary at 40.0 feet (3 1/2" tricone bit)

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Date	May 5, 1992	**Driller**	Gary Yocky/ Fox Drilling
Logged by	J.A. Duwelius	**Elevation**	447.33 ft.
Location	N 18,888.19 ft.; E 9,636.99 ft.	**Page**	3 of 4

Water Level					Start		Finish	
Time					Time	2:00PM	Time	11:30AM
Date					Date	5/5/92	Date	5/7/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				40		
SS	2.0	0	14			
			10	1		
			8			
			8	2		
SS	2.0	1.5	13			Sandy loam, fine, as 37.8' above, abrupt contact at 42.7' to loam, gray (10 YR 5/1), moist, plastic, calcareous, contains fine sand laminations, abrupt contact at 43.4' to loamy sand, fine, as 35.0'
			6	3		
			6			
			11	4		
SS	2.0	1.7	9			Loamy sand, fine, as 35.0' above
			9	5		
			6			
			11	6		
SS	2.0	1.5	6			Loamy sand, fine, as 35.0' above, with silty clay loam laminations
			3	7		
			5			
			7	8		
SS	2.0	1.1	3			Sand, fine, gray (10 YR 5/1), wet, loose, calcareous, well sorted and washed
			4	9		
			5			
			12	50		
SS	2.0	1.5	6			Silt loam, gray (10 YR 5/1), wet to moist, plastic, calcareous, abrupt contact at 51.3' to sand, fine, as 48.0' above
			2	1		
			9			
			15	2		
SS	2.0	1.5	6			Sand, fine, as 48.0' above, with clay lamination, abrupt contact at 52.8' to clay, gray (10 YR 5/1), moist, plastic, calcareous, abrupt contact at 53.1' to sandy loam, fine, gray (10 YR 5/1), wet, loose, calcareous
			13	3		
			22			
			17	4		
SS	2.0	1.9	6			Sand, fine, and clay, gray (10 YR 5/1), wet to moist, loose to plastic, calcareous, interbedded (loam)
			7	5		
			9			
			12	6		
SS	2.0	1.8	3			Sand, fine, as 48.0' above, abrupt contact at 56.5' to silt loam, as 50.0' above, abrupt contact at 57.2' to sand, fine, as 48.0' above
			6	7		
			10			
			17	8		
SS	2.0	1.7	6			Sand, fine, as 48.0' above, abrupt contact at 59.2' to silt loam, as 50.0' above
			4	9		
			4			
			7	60		

Remarks Three feet of heave at 40'

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Site	Keystone Steel & Wire Company	**Boring No.**	P-5 (Pilot Boring 1)
Date	May 5, 1992	**Driller**	Gary Yocky/ Fox Drilling
Logged by	J.A. Duwelius	**Elevation**	447.33 ft.
Location	N 18,888.19 ft.; 9,636.99 ft.	**Page**	4 **of** 4

Water Level					Start		Finish	
Time					Time	2:00PM	Time	11:30AM
Date					Date	5/5/92	Date	5/7/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
SS	2.0	1.6	3 3 4 7	60 1 2		Sandy loam, fine to very fine, gray (10 YR 5/1), wet, loose, calcareous, well sorted and washed
SS	2.0	2.0	4 5 6 5	3 4		Silt loam, gray (10 YR 5/1), moist, plastic, calcareous, contains very fine sand laminations
SS	2.0	1.7	3 7 10 23	5 6		Sand, fine, gray (10 YR 5/1), wet, loose, calcareous, well sorted and washed, contains silty clay laminations, abrupt color change at 65.6' to strong brown (7.5 YR 5/8)
SS	2.0	1.4	5 23 48 69	7 8		Sandy loam, fine to medium, brown (10 YR 5/3), wet, loose, slightly calcareous, well sorted and washed
SS	2.0	1.3	22 31 69 76	9 70		Sandy loam, fine to medium, as 66.0' above
SS	0.8	0.8	22 100/3	1 2		Sandy loam, fine to medium, as 66.0' above, abrupt contact at 70.5' to shale, gray (10 YR 5/1), dry, hard, noncalcareous
				3 4 5 6 7 8 9 0		Bottom of Boring 70.8 feet

Remarks Boring was backfilled with cement-bentonite grout on completion.

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Site	Keystone Steel & Wire Company	**Boring No.**	P-6
Date	June 22, 1992	**Driller**	B. Crachy/Fox Drilling
Logged by	M. Lytle	**Elevation**	447.25 ft.
Location	N 18,897.67 ft., E 9,569.23 ft.	**Page**	1 of 4

Water Level					Start		Finish	
Time					Time	10:30AM	Time	11:00AM
Date					Date	6-22-92	Date	6-23-92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				0		Auger drill through cinder fill
				1		
				2		
				3		
				4		
				5		
CS	5.0	2.5		6		Sand, coarse, very dark gray (10 YR 3/1), moist, loose, washed and sorted, calcareous, abrupt contact at 5.5' with silty clay loam, dark gray (5 YR 4/1), moist, friable, plastic, nonsticky, massive, iron stains, noncalcareous, plant fragments throughout
				7		
				8		
				9		
				10		
CS	5.0	5.0		1		Silty clay loam, as 5.5' above, color change at 12.5' to gray (5 YR 5/1), gradual contact at 14.0' to loamy sand, fine, gray (5 YR 5/1), moist to wet, friable, calcareous
				2		
				3		
				4		
				5		
CS	5.0	4.9		6		Loamy sand, as 14.0' above with layers of silty clay loam, contact at 17.0' with sandy loam, fine, brown (10 YR 5/3), moist, very friable, plastic, mottled, very dark grayish brown (10 YR 3/2), calcareous, iron stains from 18.1' - 19.3', contact at 19.3' with loamy sand, medium, brown (10 YR 5/3), wet, nonplastic, calcareous
				7		
				8		
				9		
				20		

Remarks

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Site	Keystone Steel & Wire Company	**Boring No.**	P-6
Date	June 22, 1992	**Driller**	B. Crachy/Fox Drilling
Logged by	M. Lytle	**Elevation**	447.25 ft.
Location	N 18,897.67 ft., E 9,569.23 ft.	**Page**	2 of 4

Water Level					Start		Finish	
Time					Time	10:30AM	Time	11:00AM
Date					Date	6-22-92	Date	6-23-92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
CS	5.0	3.9		20		Sand, coarse, dark yellowish brown (10 YR 3/6), wet, poorly washed and sorted
				1		
				2		
				3		
				4		
				5		
CS	5.0	4.7		6		Sand, as 20' above, abrupt contact at 25.4' with sandy clay loam, fine, dark gray (7.5 YR 4/), wet, friable, plastic, nonsticky, massive, laminated, calcareous
				7		
				8		
				9		
				30		
CS	5.0	5.0		1		Sandy clay loam, as 25.4' above, abrupt contact at 34.7' with sand, fine, dark gray (7.5 YR 4/), wet, washed and sorted, calcareous
				2		
				3		
				4		
				5		
CS	5.0	2.0		6		Sand, fine, as 34.7' above, most not recovered by sampler, contact at 38.0' with sandy clay loam, as 25.4' above, with layers of sand
				7		
				8		
				9		
				40		

Remarks

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Site	Keystone Steel & Wire Company	**Boring No.**	P-6
Date	June 22 - 23, 1992	**Driller**	B. Crachy/Fox Drilling
Logged by	M. Lytle	**Elevation**	447.25 ft.
Location	N 18,897.67 ft., E 9,569.23 ft.	**Page**	3 of 4

Water Level					Start		Finish	
Time					Time	10:30AM	Time	11:00AM
Date					Date	6-22-92	Date	6-23-92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
CS	5.0	1.8		40		Sandy gravel, coarse, gray (10 YR 5/1), wet, well washed, calcareous, contact at 40.9' with sand, medium, yellowish brown (10 YR 5/4), wet, poorly washed and sorted, calcareous
				1		
				2		
				3		
				4		
CS	5.0	2.6		5		Sand, medium, gray (10 YR 5/1), wet, washed and sorted, contact at 47.4' with silt loam, fine, sand, gray (10 YR 5/1), wet, plastic, nonsticky, massive, slightly laminated, calcareous
				6		
				7		
				8		
				9		
				50		
CS	5.0	3.0		1		Loamy sand, fine to medium, dark grayish brown (10 YR 4/2), wet, poorly washed and sorted, laminated with silt stringers, calcareous
				2		
				3		
				4		
				5		
CS	5.0	0.0		6		No recovery
				7		
				8		
				9		
				60		

Remarks

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Site	Keystone Steel & Wire Company	**Boring No.**	P-6
Date	June 23, 1992	**Driller**	B. Crachy/Fox Drilling
Logged by	M. Lytle	**Elevation**	447.25 ft.
Location	N 18,897.67 ft., E 9,569.23 ft.	**Page**	4 of 4

Water Level					Start		Finish	
Time					Time	10:30AM	Time	11:00AM
Date					Date	6-22-92	Date	6-23-92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
CS	3.0	1.7		60		Loamy sand, as 50.0' above, abrupt contact at 61.2' with sand, coarse, yellowish brown (10 YR 5/4), wet, washed and sorted, calcareous
				1		
				2		
SS	2.5	0		3		
				4		
				5		
SS	2.0	1.5	16	6		Sand, as 61.2' above
			24			
			68	7		
			75			
				8		Bottom of Boring 68.0', auger refusal, Bedrock
				9		
				70		
				1		
				2		
				3		
				4		
				5		
				6		
				7		
				8		
				9		
				80		

Remarks Auger refusal at 62.5', go to 2" hammered SS 63.0' - 65.5', augers sank approximately 0.5' under own weight as sample tool was pulled out of hole.
No sample retained by spoon.

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Site	Keystone Steel & Wire Company	**Boring No.**	PW-1 (Pilot Boring 2)
Date	June 15, 1992	**Driller**	B. Crachy/Fox Drilling
Logged by	J.A. Duwelius	**Elevation**	447.40 ft.
Location	N 18,901.76 ft.; E 9,785.06 ft.	**Page**	1 of 5

Water Level					Start		Finish	
Time					Time	3:45PM	Time	1:26PM
Date					Date	6/15/92	Date	6/17/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				0		Fill, slag and coal, hand dug 0 to 4.0'
CS	5.0	5.0		4		Silty clay loam, very dark gray (10 YR 3/1), mottled, common, distinct, medium, yellowish brown (10 YR 5/8), gradual color change at 6.8' to mixed yellowish brown and gray (10 YR 5/8) and (10 YR 5/1), slightly moist, plastic, noncalcareous, contains fine sand clasts
CS	5.0	4.6		9		Silty clay loam, mixed gray and yellowish brown (10 YR 5/1) and (10 YR 5/6), mottled, common, distinct, medium, brownish yellow (10 YR 6/8), moist, slightly plastic, noncalcareous, contains coal fragments throughout
CS	5.0	5.0		4		Silty clay, light gray (5 Y 7/1), dry, soft, noncalcareous, mottled, common, distinct, coarse, brownish yellow (10 YR 6/8), abrupt contact at 15.8' to loam, light gray (5 Y 7/1), moist, friable, noncalcareous, abrupt contact at 16.6' to loamy sand, brown (10 YR 5/3), wet, loose, nonplastic, noncalcareous, abrupt contact at 17.7' to silty clay, gray (10 YR 5/1), mottled, common, distinct, very coarse, dry, soft, noncalcareous
CS	5.0	5.0		9		Loam, light gray (10 YR 7/1), moist, firm, noncalcareous, abrupt contact at 20.4' to silt loam, gray (10 YR 5/1), moist, firm, noncalcareous, abrupt contact at 22.9' to loam, gray (10 YR 5/1), mottled, common, distinct, very coarse, yellowish brown (10 YR 5/6), moist, very friable, noncalcareous

Remarks Diedrich D-50 equipped with 3 3/4" ID/7 1/4" OD HSA

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Site	Keystone Steel & Wire Company	**Boring No.**	PW-1 (Pilot Boring 2)
Date	June 15, 1992	**Driller**	B. Crachy/Fox Drilling
Logged by	J.A. Duwelius	**Elevation**	447.40 ft.
Location	N 18,901.76 ft.; E 9,785.06 ft.	**Page**	2 **of** 5

Water Level					Start		Finish	
Time					Time	3:45PM	Time	1:26PM
Date					Date	6/15/92	Date	6/17/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
CS	5.0	5.0		20 1 2 3 4 5 6 7 8 9		Silt loam, gray (10 YR 5/1), with pale red and black varves (2.5 YR 6/2) and (10 YR 2/1), moist, friable, slightly calcareous
CS	5.0	4.0		30 1 2 3 4 5 6 7 8 9		Silt loam, as 24.0' above, abrupt contact at 32.0' to sandy gravel, gray (10 YR 5/1), wet, loose, nonplastic, calcareous, abrupt contact at 33.4' to silt loam, as 24.0' above, but contains wood fragments, abrupt contact at 33.7' to sand, fine, black and gray (10 YR 2/1) and (10 YR 5/1), wet, loose, nonplastic, calcareous
CS	5.0	5.0		40		Sand, fine to medium, slightly granular, brown (10 YR 5/3), wet, loose, nonplastic, calcareous, abrupt contact at 37.6' to loamy sand, medium to coarse, slightly pebbly, brown (10 YR 5/3) wet, loose, nonplastic, calcareous
SS	2.0	2.0	17 20			Sand, fine to coarse, pebbly, graded bedding, brown (10 YR 5/3), wet, loose, nonplastic, calcareous, contains coal fragments, moderately sorted and washed, trace of silt loam in tip of spoon

Remarks

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Site	Keystone Steel & Wire Company	**Boring No.**	PW-1 (Pilot Boring 2)
Date	June 15, 1992	**Driller**	B. Crachy/Fox Drilling
Logged by	J.A. Duwelius	**Elevation**	447.40 ft.
Location	N 18,901.76 ft.; E 9,785.06 ft.	**Page**	3 of 5

Water Level					Start		Finish	
Time					Time	3:45PM	Time	1:26PM
Date					Date	6/15/92	Date	6/17/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				40		
			23			
			26	1		
SS	2.0	1.8	16			Sand, fine, trace granules, gray (10 YR 5/1), wet, loose, nonplastic, calcareous, well sorted and moderately washed
			18	2		
			21			
			22	3		
SS	2.0	1.5	1			Loamy sand, fine, gray (10 YR 5/1), wet, loose, nonplastic, calcareous, moderately sorted and poorly washed
			5	4		
			9			
			11	5		
SS	1.0	1.0	10			Sand, fine, gray (10 YR 5/1), wet, loose, nonplastic, calcareous, well sorted and moderately washed
			100	6		
				7		
SS	2.0	2.0	6			Silt loam, gray (10 YR 5/1), wet, nonplastic, calcareous, contains fine sand laminations, abrupt contact at 48.1' to loamy sand, fine to medium, gray (10 YR 5/1), wet, loose, nonplastic, calcareous
			9	8		
			15			
			20	9		
CS	5.0	4.0				Loam, gray (10 YR 5/1), wet, nonplastic, calcareous, (present as laminated fine sand and silt loam)
				50		
				1		
				2		
				3		
				4		
CS	5.0	2.0				Loamy sand, fine to medium, gray (10 YR 5/1), wet, loose, nonplastic, calcareous, moderately sorted and washed, abrupt contact at 58.3' to loam, as 49.0' above
				5		
				6		
				7		
				8		
				9		
CS	5.0	4.0				Loam, gray (10 YR 5/1), wet, nonplastic, calcareous
				60		

Remarks

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Site	Keystone Steel & Wire Company	**Boring No.**	PW-1 (Pilot Boring 2)
Date	June 15, 1992	**Driller**	B. Crachy/Fox Drilling
Logged by	J.A. Duwelius	**Elevation**	447.40 ft.
Location	N 18,901.76 ft.; E 9,785.06 ft.	**Page**	4 of 5

Water Level					Start		Finish	
Time					Time	3:45PM	Time	1:26PM
Date					Date	6/15/92	Date	6/17/92

SAMPLE TYPE	DRIVE	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				60		
				1		
				2		
				3		
				4		
CS	5.0	4.0		5		Loam, as 59.0' above, abrupt contact at 67.5' to sand, fine to medium, gray (10 YR 5/1), abrupt color change at 68.3' to strong brown (7.5 YR 5/8), wet, loose, nonplastic, calcareous, well sorted and washed
				6		
				7		
				8		
				9		
SS	2.0	1.7	10			Sand, fine, brown (10 YR 5/3), wet, loose, calcareous, well sorted and moderately washed
			9	70		
			13			
			19	1		
CS	3.0	3.0				Sand, fine to medium, as 69.0' above
				2		
				3		
				4		
SS	2.0	2.0	17			Sand, fine to medium, brown (10 YR 5/3) wet, loose, nonplastic, calcareous, moderately sorted and washed
			23	5		
			26			
			30	6		
SS	1.65	1.65	21			Sand, fine to medium, as 74.0' above
			35	7		
			96			
			100 2"	8		
				9		
SS	1.65	1.65	62			Sand, fine to medium, as 74.0' above
			100 2"	80		

Remarks

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Site	Keystone Steel & Wire Company	**Boring No.**	PW-1 (Pilot Boring 2)
Date	June 15, 1992	**Driller**	B. Crachy/Fox Drilling
Logged by	J.A. Duwelius	**Elevation**	447.40 ft.
Location	N 18,901.76 ft.; E 9,785.06 ft.	**Page**	5 of 5

Water Level					Start		Finish	
Time					Time	3:45PM	Time	1:26PM
Date					Date	6/15/92	Date	6/17/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				80		
SS	1.25	1.25	28			Sand, fine to medium, as 74.0' above
			95	1		
			100 3"			Shale at 81.0', gray (10 YR 5/1), dry, very hard, slightly calcareous
SS	0.45	0.45	100 5"	2		
				3		
				4		
				5		
				6		
				7		
				8		
				9		
				0		
				1		
				2		
				3		
				4		
				5		
				6		
				7		
				8		
				9		
				0		

Remarks Switched to mud rotary at 81.0' with 3 1/2" tricone bit

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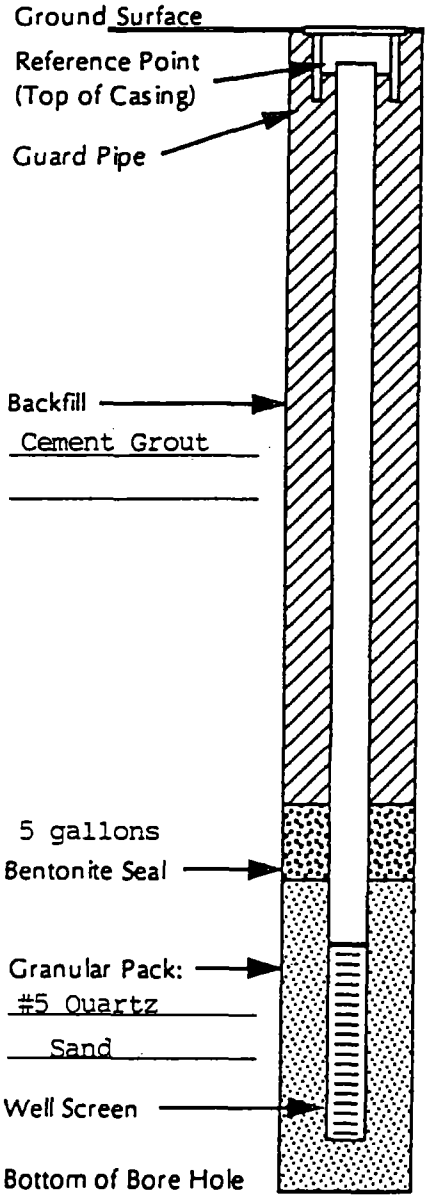
Well Completion Diagram

Well No. P-3

Project: Keystone Steel & Wire Company
Time & Date: Started 6-19-92 9:40Am
Completed 6-19-92 11:20AM
Location: N 18,891.03 ft.; E 9,754.87 ft.

Installed By: B. Crachy/Fox Drilling
Inspected By: M. Lytle



447.61 FT. (MSL)
447.27 FT. (MSL)

30.38 FT.
32.05 FT.
34.38 FT. 413.23 FT. (MSL)
39.37 FT. = 45.73 (Tot. Pipe) - 6.34 (Cut Off) - 0.36 (Bot. Blk.) - (-.34) (Stick)
40.00 FT.

Drilling Method: Diedrich D-50
3 3/4" ID / 7 1/4" OD HSA

Screen:
Type 2" 304 Stainless Steel
Slot Size 0.010
Top Blank 0.26'
Bottom Blank 0.36'
Total Screen 4.99'
Total Length 5.61'

Stand Pipe:
Type 2" Schedule 40 PVC
Total Length 40.12'

Not to Scale

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Well Completion Diagram

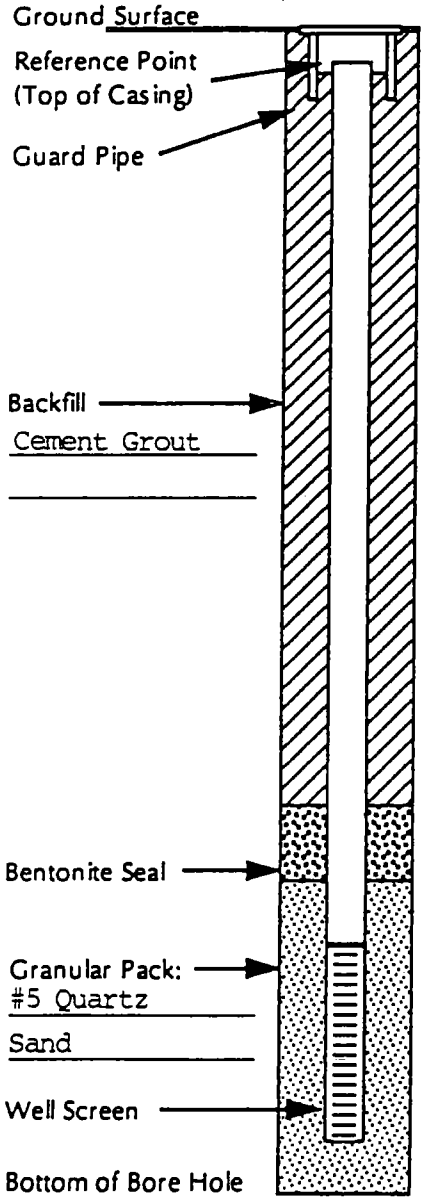
Well No. P-4

Project: Keystone Steel & Wire Company

Time & Date: Started 3:50PM 6-18-92
Completed 5:00PM 6-18-92

Location: N 18,892.20'; E 9,745.69'

Installed By: B. Crachy/Fox Drilling
Inspected By: M. Lytle



Ground Surface 447.55 FT. (MSL)
Reference Point (Top of Casing) 447.23 FT. (MSL)

Bentonite Seal 58.88 FT.
61.00 FT.
Granular Pack: #5 Quartz Sand 63.40 FT. 384.15 FT. (MSL)
Well Screen 68.41 FT. = 75.96' (Tot. Pipe) - 7.50' (Cut Off) - 0.37' (Bot. Blk.) - (-0.32') (Stick)
Bottom of Bore Hole 68.50 FT.

Not to Scale

Drilling Method: Diedrich D-50
3 3/4" ID / 7 1/4" OD HSA & 3 1/2" Tri-cone

Screen:
Type 2" 304 Stainless Steel
Slot Size 10 slot
Top Blank 0.25'
Bottom Blank 0.37'
Total Screen 5.01'
Total Length 5.63'

Stand Pipe:
Type 2" Schedule 40 PVC
Total Length 70.33'

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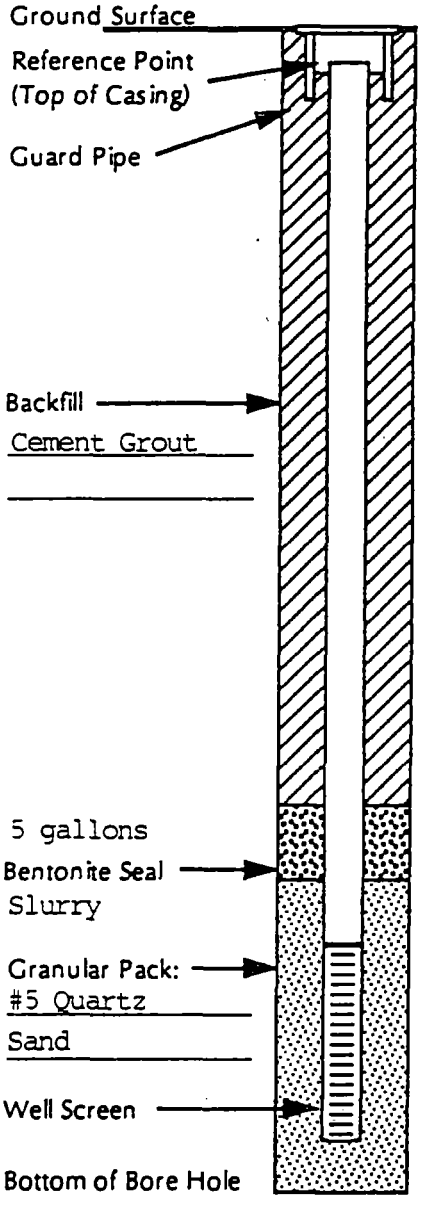
Well Completion Diagram

Well No. P-5

Project: Keystone Steel & Wire Company
Time & Date: Started 9:50AM 6-24-92
Completed 11:15AM 6-24-92
Location: N 18,888.19'; E 9,636.99'

Installed By: B. Crachy/Fox Drilling
Inspected By: M. Lytle



447.33 FT. (MSL)
447.11 FT. (MSL)
59.88 FT.
62.00 FT.
64.93 FT. 382.40 FT. (MSL)
69.97 FT. = 75.63' (Tot. Pipe) - 5.57' (Cut Off) - 0.31' (Bot. Blk.) - (-0.22') (Stick)
70.00 FT.

Drilling Method: Diedrich D-50
3 3/4" ID / 7 1/4" OD HSA

Screen:
Type 2" 304 Stainless Steel
Slot Size 10 slot
Top Blank 0.13'
Bottom Blank 0.31'
Total Screen 5.04'
Total Length 5.48'

Stand Pipe:
Type 2" Schedule 80 PVC
Total Length 70.15'

Not to Scale

002.1

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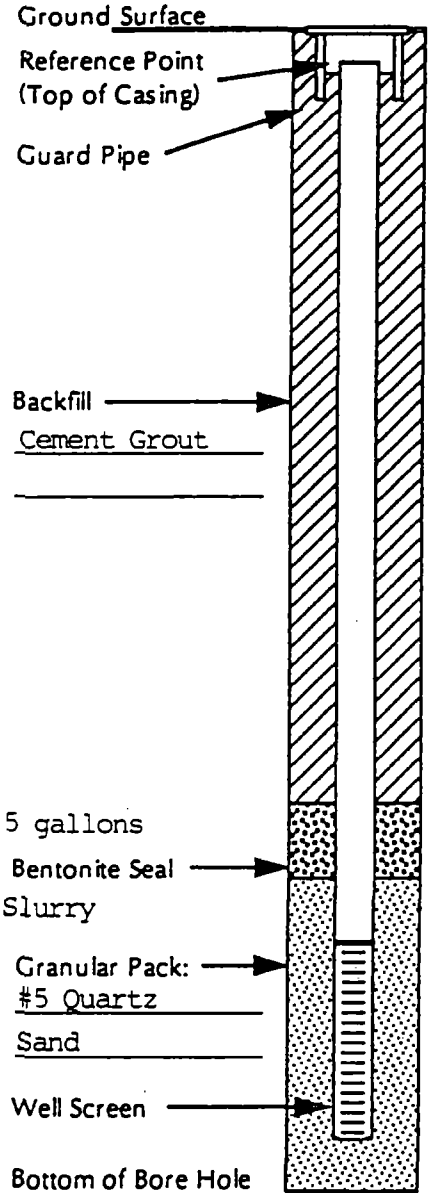
Well Completion Diagram

Well No. P-6

Project: Keystone Steel & Wire Company
Time & Date: Started 11:00AM 6-23-92
Completed 4:20PM 6-23-92
Location: N 18,897.67'; E 9,569.23'

Installed By: B. Crachy/Fox Drilling
Inspected By: M. Lytle



447.25 FT. (MSL)
446.90 FT. (MSL)

57.88 FT.
60.00 FT.
62.16 FT. 385.09 FT. (MSL)

67.14 FT. = 70.72' - 3.55' - 0.38' - (-0.35')
(Tot. Pipe - Cut Off - Bot. Blk. - Stick)
68.00 FT.

Drilling Method: Diedrich D-50
3 3/4" ID / 7 1/4" OD HSA

Screen:
Type 2" 304 Stainless Steel
Slot Size 10 slot
Top Blank 0.13'
Bottom Blank 0.38'
Total Screen 4.98'
Total Length 5.49'

Stand Pipe:
Type 2" Schedule 40 PVC
Total Length 65.23'

Not to Scale

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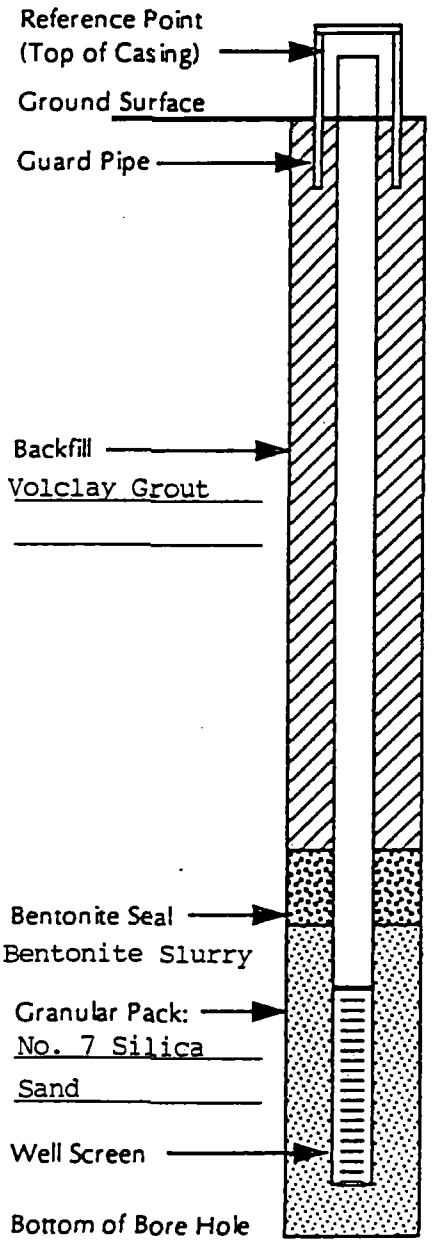
Well Completion Diagram

Well No. PW-1 (Purge Well #1)

Project: Keystone Steel & Wire Company
Time & Date: Started 7-1-92 1:30PM
Completed 7-8-92 12:00PM

Installed By: R. Edger/Fox Drilling
Inspected By: J.A. Duwelius

Location: N 18,901.76 ft.; E 9,785.06 ft.



448.62 FT. (MSL)

447.40 FT. (MSL)

62.00 FT.

64.00 FT.

66.22 FT. 381.18 FT. (MSL)

80.99 FT. = 83.61 (Tot. Pipe) - 1.27 (Cut Off) - 0.13 (Bot. Blk.) - 1.22 (Stick)

81.00 FT.

Drilling Method: Mobile B-61
8 1/4" ID / 12" OD HSA

Screen:
Type 6" 304 Stainless Steel
Slot Size 10 slot
Top Blank 0.32' (Mid Blank 0.41')
Bottom Blank 0.13'
Total Screen 9.75' + 4.61' = 14.36'
Total Length 15.22'

Stand Pipe:
Type 6" Schedule 80 PVC
Total Length 68.39

Not to Scale

APPENDIX B

AQUIFER TEST DRAWDOWN DATA

B.1 BACKGROUND DATA

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 9, 1992

Project No.: 07029.00

Well Locaton: PW-1

Personnel: J.A. Duwelius

Pumping Rate: 0 gpm

Date	Clock Time	Time (minutes)	Water Level In Feet					Barometric Pressure (psi)
			PW-1	P-3	P-4	P-5	P-6	
09-Jul	11:30	0	0.000	1.481	0.014	0.014	0.014	14.531
	12:00	30	0.031	1.476	0.038	0.042	0.042	14.542
		60	0.047	1.471	0.057	0.057	0.052	14.528
		90	0.047	1.476	0.047	0.061	0.061	14.524
		120	0.063	1.476	0.052	0.066	0.061	14.515
		150	0.031	1.467	0.057	0.057	0.057	14.517
		180	0.047	1.471	0.052	0.071	0.071	14.515
		210	0.015	1.467	0.057	0.057	0.047	14.513
		240	-0.015	1.467	0.033	0.033	0.028	14.515
	16:00	270	-0.031	1.462	0.019	0.014	0.009	14.513
		300	-0.047	1.462	0.014	0.009	0.009	14.511
		330	-0.047	1.457	-0.004	0.000	-0.004	14.513
		360	-0.063	1.452	-0.014	-0.009	-0.009	14.507
		390	-0.063	1.462	0.000	0.000	-0.009	14.509
		420	-0.063	1.462	-0.004	-0.004	-0.009	14.511
		450	-0.063	1.452	-0.019	-0.004	-0.004	14.511
		480	-0.047	1.471	-0.014	0.000	0.000	14.504
	20:00	510	-0.078	1.457	-0.023	-0.004	-0.014	14.500
		540	-0.078	1.443	-0.028	-0.014	-0.009	14.496
		570	-0.078	1.443	-0.028	-0.028	-0.023	14.496
		600	-0.078	1.443	-0.023	-0.019	-0.028	14.489
		630	-0.094	1.448	-0.038	-0.023	-0.023	14.491
		660	-0.078	1.452	-0.023	-0.014	-0.019	14.487
		690	-0.094	1.443	-0.028	-0.019	-0.033	14.480
		720	-0.094	1.429	-0.023	-0.023	-0.033	14.482
10-Jul	00:00	750	-0.094	1.448	-0.038	-0.019	-0.028	14.491
		780	-0.110	1.419	-0.057	-0.038	-0.033	14.491
		810	-0.110	1.405	-0.038	-0.038	-0.042	14.487
		840	-0.110	1.405	-0.066	-0.042	-0.042	14.478
		870	-0.110	1.410	-0.066	-0.042	-0.047	14.474
		900	-0.126	1.391	-0.076	-0.057	-0.057	14.467

			930	-0.110	1.424	-0.047	-0.038	-0.047	14.465
			960	-0.110	1.414	-0.047	-0.042	-0.042	14.465
		04:00	990	-0.126	1.410	-0.057	-0.047	-0.042	14.461
			1020	-0.141	26.135	-0.076	-0.047	-0.057	14.456
			1050	-0.126	26.135	-0.081	-0.052	-0.057	14.465
			1080	-0.110	26.135	-0.081	-0.038	-0.047	14.467
			1110	-0.126	26.135	-0.090	-0.047	-0.047	14.467
			1140	-0.126	26.135	-0.085	-0.061	-0.047	14.469
			1170	-0.110	26.135	-0.071	-0.038	-0.042	14.474
			1200	-0.110	26.135	-0.066	-0.033	-0.033	14.480
		08:00	1230	-0.110	26.135	-0.066	-0.033	-0.033	14.485
			1260	-0.110	26.135	-0.066	-0.057	-0.047	14.487
			1290	-0.110	26.135	-0.066	-0.028	-0.033	14.489
			1320	-0.094	26.135	-0.057	-0.023	-0.023	14.491
			1350	-0.110	26.135	-0.057	-0.014	-0.014	14.489
			1380	-0.094	26.135	-0.042	-0.009	-0.019	14.496
			1410	-0.078	26.135	-0.047	-0.009	-0.009	14.504
			1440	-0.094	26.135	-0.042	0.004	0.009	14.509
		12:00	1470	-0.078	26.135	-0.023	-0.004	0.000	14.509
			1500	-0.078	26.135	-0.028	-0.009	-0.009	14.504
			1530	-0.078	26.135	-0.023	0.009	0.000	14.502
			1560	-0.078	26.135	-0.047	-0.009	-0.004	14.500
			1590	-0.110	26.135	-0.057	-0.023	-0.014	14.496
			1620	-0.094	26.135	-0.038	-0.009	-0.014	14.491
			1650	-0.078	26.135	-0.057	-0.009	-0.009	14.498
			1680	-0.094	26.135	-0.033	-0.004	-0.009	14.493
		16:00	1710	-0.078	26.135	-0.042	0.000	-0.009	14.498
			1740	-0.094	26.135	-0.047	-0.019	-0.014	14.502
			1770	-0.094	26.135	-0.047	-0.014	-0.014	14.502
			1800	-0.094	26.135	-0.052	-0.004	-0.009	14.504
			1830	-0.094	26.135	-0.033	-0.009	-0.004	14.507
			1860	-0.094	26.135	-0.023	-0.004	-0.004	14.504
			1890	-0.094	26.135	-0.033	-0.004	-0.014	14.502
			1920	-0.078	26.135	-0.028	-0.009	-0.014	14.500
		20:00	1950	-0.094	26.135	-0.028	-0.009	-0.009	14.502
			1980	-0.094	26.135	-0.052	0.000	-0.014	14.500
			2010	-0.078	26.135	-0.028	0.004	0.000	14.502
			2040	-0.094	26.135	-0.052	0.000	-0.004	14.507
			2070	-0.094	26.135	-0.033	0.004	-0.004	14.513
			2100	-0.078	26.135	-0.033	0.009	0.004	14.520
			2130	-0.078	26.135	-0.028	0.009	0.014	14.526
			2160	-0.078	26.135	-0.014	0.023	0.019	14.537
	11-Jul	00:00	2190	-0.078	26.135	-0.023	0.019	0.014	14.537
			2220	-0.078	26.135	-0.023	0.019	0.019	14.528
			2250	-0.078	26.135	-0.014	0.014	0.019	14.528
			2280	-0.094	26.135	-0.033	0.009	0.014	14.533

			2310	-0.078	26.135	-0.023	0.009	0.014	14.531
			2340	-0.078	26.135	-0.014	0.019	0.028	14.528
			2370	-0.078	26.135	-0.014	0.014	0.023	14.528
			2400	-0.078	26.135	-0.023	0.014	0.019	14.524
		04:00	2430	-0.078	26.135	-0.009	0.014	0.009	14.522
			2460	-0.078	26.135	-0.023	0.023	0.019	14.528
			2490	-0.078	26.135	-0.019	0.019	0.019	14.531
			2520	-0.078	26.135	-0.019	0.019	0.014	14.531
			2550	-0.078	26.135	-0.004	0.019	0.023	14.537
			2580	-0.063	26.135	0.000	0.023	0.028	14.537
			2610	-0.063	26.135	-0.009	0.033	0.028	14.537
			2640	-0.063	26.135	-0.009	0.033	0.038	14.542
		08:00	2670	-0.078	26.135	-0.009	0.023	0.028	14.544
			2700	-0.063	26.135	-0.004	0.042	0.038	14.544
			2730	-0.063	26.135	-0.004	0.023	0.033	14.533
			2760	-0.078	26.135	0.000	0.019	0.019	14.533
			2790	-0.078	26.135	0.000	0.023	0.023	14.537
			2820	-0.078	26.135	0.004	0.019	0.014	14.533
			2850	-0.078	26.135	-0.023	0.019	0.019	14.526
			2880	-0.078	26.135	0.004	0.014	0.019	14.526
		12:00	2910	-0.078	26.135	0.000	0.014	0.019	14.528
			2940	-0.078	26.135	-0.004	0.004	0.009	14.526
			2970	-0.078	26.135	-0.004	0.009	0.014	14.515
			3000	-0.126	26.135	-0.057	-0.033	-0.023	14.513
			3030	-0.078	26.135	-0.019	0.004	0.014	14.511
			3060	-0.078	26.135	-0.028	0.014	0.023	14.509
			3090	-0.078	26.135	-0.014	0.014	0.014	14.507
			3120	-0.078	26.135	-0.009	0.009	0.009	14.507
		16:00	3150	-0.078	26.135	-0.009	0.009	0.014	14.504
			3180	-0.078	26.135	-0.033	0.000	0.004	14.500
			3210	-0.094	26.135	-0.033	0.000	0.004	14.491
			3240	-0.094	26.135	-0.033	0.000	0.000	14.487
			3270	-0.078	26.135	-0.028	-0.004	0.000	14.487
			3300	-0.094	26.135	-0.038	-0.004	-0.004	14.482
			3330	-0.110	26.135	-0.038	-0.009	-0.014	14.478
			3360	-0.094	26.135	-0.033	-0.009	-0.004	14.480
		20:00	3390	-0.110	26.135	-0.057	0.000	0.000	14.482
			3420	-0.094	26.135	-0.052	0.004	0.004	14.487
			3450	-0.078	26.135	-0.023	0.014	0.009	14.489
			3480	-0.078	26.135	-0.033	0.014	0.014	14.493
			3510	-0.078	26.135	-0.033	0.009	0.014	14.493
			3540	-0.078	26.135	-0.038	0.014	0.014	14.493
			3570	-0.078	26.135	-0.023	0.019	0.023	14.487
			3600	-0.094	26.135	-0.028	0.009	0.004	14.487
	12-Jul	00:00	3630	-0.094	26.135	-0.023	0.019	0.019	14.482
			3660	-0.078	26.135	-0.033	0.014	0.014	14.478

		3690	-0.078	26.135	-0.014	0.014	0.019	14.480
		3720	-0.094	26.135	-0.038	0.004	0.009	14.476
		3750	-0.094	26.135	-0.023	0.009	0.009	14.474
		3780	-0.094	26.135	-0.023	0.014	0.009	14.474
		3810	-0.094	26.135	-0.028	0.004	0.000	14.472
		3840	-0.094	26.135	-0.023	0.000	0.000	14.467
	04:00	3870	-0.094	26.135	-0.023	0.004	0.009	14.463
		3900	-0.110	26.135	-0.033	-0.004	-0.004	14.458
		3930	-0.094	26.135	-0.038	0.009	0.009	14.458
		3960	-0.094	26.135	-0.028	0.014	0.004	14.456
		3990	-0.078	26.135	-0.023	0.014	0.019	14.458
		4020	-0.078	26.135	-0.033	0.023	0.019	14.454
		4050	-0.078	26.135	-0.023	0.019	0.019	14.450
		4080	-0.063	26.135	-0.004	0.023	0.028	14.452
	08:00	4110	-0.078	26.135	-0.019	0.023	0.019	14.450
		4140	-0.078	26.135	-0.009	0.019	0.014	14.443
		4170	-0.078	26.135	-0.014	0.014	0.004	14.443
		4200	-0.078	26.135	-0.014	0.014	0.014	14.441
		4230	-0.094	26.135	-0.028	0.004	0.004	14.443
		4260	-0.094	26.135	-0.023	0.009	0.014	14.447
		4290	-0.078	26.135	-0.028	0.014	0.019	14.445
		4320	-0.094	26.135	-0.033	0.004	0.014	14.445
	12:00	4350	-0.110	26.135	-0.047	0.000	-0.004	14.430
		4380	-0.094	26.135	-0.033	-0.004	-0.004	14.430
		4410	-0.094	26.135	-0.033	0.004	0.004	14.436
		4440	-0.094	26.135	-0.033	0.004	0.000	14.432
		4470	-0.094	26.135	-0.038	0.009	0.004	14.434
		4500	-0.094	26.135	-0.023	0.004	0.004	14.432
		4530	-0.094	26.135	-0.038	0.009	0.014	14.426
		4560	-0.094	26.135	-0.033	0.009	0.009	14.428
	16:00	4590	-0.094	26.135	-0.047	0.004	0.004	14.426
		4620	-0.094	26.135	-0.042	0.000	0.004	14.423
		4650	-0.078	26.135	-0.028	0.009	0.014	14.423
		4680	-0.078	26.135	-0.033	0.014	0.019	14.428
		4710	-0.094	26.135	-0.038	0.000	0.004	14.419
		4740	-0.094	26.135	-0.040	0.004	0.014	14.417
		4770	-0.078	26.135	-0.028	0.004	0.009	14.417
		4800	-0.078	26.135	-0.028	0.004	0.009	14.415
	20:00	4830	-0.078	26.135	-0.019	0.014	0.014	14.419
		4860	-0.094	26.135	-0.014	0.014	0.009	14.423
		4890	-0.078	26.135	-0.009	0.028	0.019	14.428
		4920	-0.078	26.135	-0.028	0.023	0.019	14.432
		4950	-0.078	26.135	-0.028	0.023	0.023	14.436
		4980	-0.063	26.135	-0.014	0.042	0.042	14.441
		5010	-0.078	26.135	-0.009	0.033	0.028	14.441
		5040	-0.063	26.135	0.000	0.042	0.033	14.439

13-Jul	00:00	5070	-0.063	26.135	-0.014	0.038	0.033	14.441
		5100	-0.063	26.135	0.004	0.033	0.038	14.436
		5130	-0.063	26.135	0.009	0.038	0.038	14.439
		5160	-0.063	26.135	-0.004	0.038	0.038	14.434
		5190	-0.063	26.135	-0.014	0.033	0.028	14.432
		5220	-0.078	26.135	-0.019	0.023	0.028	14.436
		5250	-0.078	26.135	-0.014	0.028	0.028	14.434
		5280	-0.063	26.135	0.000	0.033	0.038	14.434
	04:00	5310	-0.063	26.135	0.014	0.042	0.042	14.441
		5340	-0.063	26.135	-0.004	0.042	0.042	14.443
		5370	-0.063	26.135	0.000	0.042	0.042	14.445
		5400	-0.047	26.135	0.004	0.052	0.061	14.456
		5430	-0.047	26.135	0.019	0.047	0.052	14.454
		5460	-0.047	26.135	0.004	0.047	0.052	14.454
		5490	-0.047	26.135	0.023	0.057	0.057	14.456
		5520	-0.031	26.135	0.033	0.066	0.066	14.463
	08:00	5550	-0.031	26.135	0.019	0.071	0.080	14.456
		5580	-0.031	26.135	0.028	0.076	0.076	14.456
		5610	-0.031	26.135	0.038	0.066	0.066	14.458
		5640	-0.031	26.135	0.047	0.081	0.076	14.461
		5670	-0.031	26.135	0.047	0.066	0.076	14.458
		5700	-0.031	26.135	0.038	0.071	0.066	14.463
		5730	-0.015	26.135	0.047	0.076	0.076	14.461
		5760	-0.015	26.135	0.033	0.081	0.071	14.456
	12:00	5790	-0.031	26.135	0.033	0.071	0.076	14.450
		5820	-0.031	26.135	0.033	0.066	0.066	14.445
		5850	-0.015	26.135	0.033	0.081	0.080	14.441
		5880	-0.031	26.135	0.028	0.081	0.080	14.436
		5910	57.241	26.135	0.019	0.052	0.057	14.434
		5940	57.257	26.135	0.019	0.061	0.071	14.428
		5970	57.272	26.135	0.028	0.066	0.071	14.419
		6000	57.272	26.135	0.028	0.066	0.071	14.412
	16:00	6030	0.788	26.135	0.019	0.052	0.047	14.415
		6060	0.741	26.135	0.028	0.052	0.061	14.412
		6090	0.741	26.135	0.028	0.061	0.061	14.412
		6120	0.725	26.135	0.014	0.042	0.052	14.404
		6150	0.741	26.135	0.023	0.061	0.066	14.399
		6180	0.725	26.135	0.019	0.047	0.052	14.397
		6210	0.725	26.135	0.033	0.057	0.061	14.399
		6240	0.709	26.135	0.004	0.033	0.042	14.399
	20:00	6270	0.741	26.135	0.028	0.076	0.076	14.408
		6300	0.741	26.135	0.033	0.081	0.085	14.412
		6330	0.772	26.135	0.061	0.100	0.104	14.447
		6360	0.757	26.135	0.066	0.100	0.104	14.441
		6390	0.757	26.135	0.052	0.109	0.099	14.445
		6420	0.757	26.135	0.076	0.114	0.109	14.443

		6450	0.772	26.135	0.076	0.109	0.114	14.445
		6480	0.772	26.135	0.081	0.114	0.114	14.447
14-Jul	00:00	6510	0.757	26.135	0.061	0.109	0.114	14.447
		6540	0.772	26.135	0.071	0.123	0.123	14.441
		6570	0.757	26.135	0.081	0.114	0.114	14.430
		6600	0.757	26.135	0.076	0.100	0.099	14.426
		6630	0.757	26.135	0.066	0.104	0.104	14.421
		6660	0.741	26.135	0.052	0.095	0.095	14.419
		6690	0.757	26.135	0.047	0.104	0.099	14.426
		6720	0.757	26.135	0.066	0.104	0.104	14.421
	04:00	6750	0.757	26.135	0.057	0.109	0.109	14.428
		6780	0.757	26.135	0.057	0.104	0.109	14.428
		6810	0.757	26.135	0.052	0.104	0.104	14.428
		6840	0.757	26.135	0.057	0.100	0.104	14.428
		6870	0.757	26.135	0.057	0.104	0.114	14.432
		6900	0.757	26.135	0.066	0.104	0.109	14.426
		6930	0.757	26.135	0.071	0.104	0.109	14.423
		6960	0.757	26.135	0.076	0.104	0.114	14.426
	08:00	6990	0.757	26.135	0.071	0.109	0.114	14.430
		7020	0.772	26.135	0.081	0.100	0.114	14.436
		7050	0.741	26.135	0.076	0.119	0.118	14.436
		7080	0.741	26.135	0.076	0.123	0.133	14.439
		7110	0.725	26.135	0.081	0.119	0.123	14.436
		7140	1.198	26.135	0.257	0.271	0.275	14.441
		7170	0.772	26.135	0.162	0.185	0.195	14.439
	11:30	7200	0.725	26.135	0.119	0.138	0.142	14.434

B.2 VARIABLE RATE TEST DATA

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 14, 1992

Project No.: 07029.00

Well Locaton: PW-1

Personnel: J.A. Duwelius

Pumping Rate: 20 gpm

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
14-Jul	15:15	0.0	0.110	0.110	0.110
		0.1000	1.608	1.608	1.608
		0.1166	1.009	1.009	1.009
		0.1333	1.277	1.277	1.277
		0.1500	1.608	1.608	1.608
		0.1666	1.813	1.813	1.813
		0.1833	2.097	2.097	2.097
		0.2000	2.334	2.334	2.334
		0.2166	2.570	2.570	2.570
		0.2333	2.791	2.791	2.791
		0.2500	3.059	3.059	3.059
		0.2666	3.280	3.280	3.280
		0.2833	3.517	3.517	3.517
		0.3000	3.738	3.738	3.738
		0.3166	3.943	3.943	3.943
		0.3333	4.148	4.148	4.148
		0.4166	5.220	5.220	5.220
		0.5000	6.182	6.182	6.182
		0.5833	7.066	7.066	7.066
		0.6666	7.902	7.902	7.902
		0.7500	8.674	8.674	8.674
		0.8333	9.400	9.400	9.400
		0.9166	10.094	10.094	10.094
	15:16	1.0000	10.709	10.709	10.709
		1.0833	11.387	11.387	11.387
		1.1666	11.908	11.908	11.908
		1.2500	12.460	12.460	12.460
		1.3333	12.948	12.948	12.948
		1.4166	13.437	13.437	13.437
		1.5000	13.847	13.847	13.847
		1.5833	14.273	14.273	14.273

	1.6666	14.683	14.683	14.683
	1.7500	15.062	15.062	15.062
	1.8333	15.440	15.440	15.440
	1.9166	15.740	15.740	15.740
15:17	2	16.024	16.024	16.024
	2.5	17.680	17.680	17.680
	3	18.768	18.768	18.768
	3.5	19.556	19.556	19.556
	4	20.077	20.077	20.077
	4.5	20.471	20.471	20.471
15:20	5	20.739	20.739	20.739
	5.5	20.913	20.913	20.913
	6	21.070	21.070	21.070
	6.5	21.118	21.118	21.118
	7	21.196	21.196	21.196
	7.5	21.259	21.259	21.259
	8	21.275	21.275	21.275
	8.5	21.291	21.291	21.291
	9	21.354	21.353	21.353
	9.5	21.370	21.369	21.369
15:25	10	21.338	21.337	21.337
	12	21.433	21.432	21.432
	14	21.433	21.432	21.432
	16	21.496	21.495	21.495
	18	21.559	21.558	21.558
15:30	20	21.543	21.542	21.542
	22	21.575	21.574	21.574
	24	21.622	21.621	21.621
	26	21.575	21.573	21.573
	28	21.559	21.557	21.557
15:45	30	21.622	21.620	21.620
	32	21.670	21.668	21.668
	34	21.701	21.699	21.699
	36	21.685	21.683	21.683
	38	21.701	21.699	21.699
15:55	40	21.685	21.683	21.683
	42	21.748	21.746	21.746
	44	21.701	21.698	21.698
	46	21.827	21.824	21.824
	48	21.764	21.761	21.761
16:05	50	21.764	21.761	21.761
	52	21.780	21.777	21.777
	54	21.811	21.808	21.808
	56	21.764	21.761	21.761
	58	21.764	21.761	21.761
16:15	60	21.764	21.761	21.761

		62	21.827	21.823	21.823
		64	21.843	21.839	21.839
		66	21.780	21.776	21.776
		68	21.859	21.855	21.855
	16:25	70	22.016	22.012	22.012
		72	21.938	21.934	21.934
		74	21.953	21.949	21.949
		76	21.922	21.918	21.918
		78	21.953	21.948	21.948
	16:35	80	21.922	21.917	21.917
		82	21.906	21.901	21.901
		84	21.922	21.917	21.917
		86	21.906	21.901	21.901
		88	21.906	21.901	21.901
	16:45	90	21.890	21.885	21.885
		92	21.906	21.901	21.901
		94	21.875	21.870	21.870
		96	21.890	21.884	21.884
		98	21.843	21.837	21.837
	16:55	100	21.938	21.932	21.932
	17:05	110	21.922	21.916	21.916
	17:15	120	21.969	21.962	21.962
		130	21.969	21.961	21.961
	17:35	140	22.032	22.024	22.024
		150	22.048	22.039	22.039
	17:55	160	22.064	22.055	22.055

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: PW-1

Personnel: J.A. Duwelius

Pumping Rate: 30 gpm

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
15-Jul	07:50	0.0	10.693	10.693	10.693
		0.0083	10.709	10.709	10.709
		0.0166	10.709	10.709	10.709
		0.0250	10.772	10.772	10.772
		0.0333	10.740	10.740	10.740
		0.0416	10.819	10.819	10.819
		0.0500	10.772	10.772	10.772
		0.0583	10.835	10.835	10.835
		0.0666	10.835	10.835	10.835
		0.0750	10.898	10.898	10.898
		0.0833	10.914	10.914	10.914
		0.1000	10.977	10.977	10.977
		0.1166	11.024	11.024	11.024
		0.1333	11.056	11.056	11.056
		0.1500	11.056	11.056	11.056
		0.1666	11.087	11.087	11.087
		0.1833	11.166	11.166	11.166
		0.2000	11.198	11.198	11.198
		0.2166	11.292	11.292	11.292
		0.2333	11.340	11.340	11.340
		0.2500	11.387	11.387	11.387
		0.2666	11.403	11.403	11.403
		0.2833	11.434	11.434	11.434
		0.3000	11.450	11.450	11.450
		0.3166	11.497	11.497	11.497
		0.3333	11.545	11.545	11.545
		0.4166	11.718	11.718	11.718
		0.5000	11.955	11.955	11.955
		0.5833	12.097	12.097	12.097
		0.6666	12.286	12.286	12.286
		0.7500	12.412	12.412	12.412

			0.8333	12.538	12.538	12.538
			0.9166	12.728	12.728	12.728
		7:51	1.0000	12.822	12.822	12.822
			1.0833	12.917	12.917	12.917
			1.1666	13.075	13.075	13.075
			1.2500	13.248	13.248	13.248
			1.3333	13.280	13.280	13.280
			1.4166	13.358	13.358	13.358
			1.5000	13.485	13.485	13.485
			1.5833	13.611	13.611	13.611
			1.6666	13.674	13.674	13.674
			1.7500	13.690	13.690	13.690
			1.8333	13.784	13.784	13.784
			1.9166	13.926	13.926	13.926
		7:52	2	14.005	14.005	14.005
			2.5	14.368	14.368	14.368
			3	14.557	14.557	14.557
			3.5	14.573	14.573	14.573
			4	14.794	14.794	14.794
			4.5	14.904	14.904	14.904
		7:55	5	13.516	13.516	13.516
			5.5	8.296	8.296	8.296
			6	4.921	4.921	4.921
			6.5	16.702	16.702	16.702
			7	31.021	31.021	31.021
			7.5	36.003	36.003	36.003
			8	35.436	35.436	35.436
			8.5	36.114	36.114	36.114
			9	36.240	36.239	36.239
			9.5	36.634	36.633	36.633
		8:00	10	34.963	34.962	34.962
			12	32.566	32.565	32.565
			14	29.097	29.096	29.096
			16	26.716	26.715	26.715
			18	27.157	27.156	27.156
		8:10	20	27.536	27.535	27.535
			22	27.678	27.677	27.677
			24	27.725	27.724	27.724
			26	27.820	27.818	27.818
			28	27.883	27.881	27.881
		8:20	30	27.930	27.928	27.928
			32	27.961	27.959	27.959
			34	28.009	28.007	28.007
			36	28.103	28.101	28.101
			38	28.103	28.101	28.101
		8:30	40	28.135	28.133	28.133

		42	28.166	28.164	28.164
		44	28.198	28.195	28.195
		46	28.261	28.258	28.258
		48	28.277	28.274	28.274
	8:40	50	28.340	28.337	28.337
		52	28.356	28.353	28.353
		54	28.371	28.368	28.368
		56	28.450	28.447	28.447
		58	28.435	28.432	28.432
	8:50	60	28.450	28.447	28.447
		62	28.482	28.478	28.478
		64	28.482	28.478	28.478
		66	28.529	28.525	28.525
		68	28.529	28.525	28.525
	9:00	70	28.561	28.557	28.557
		72	28.545	28.541	28.541
		74	28.576	28.572	28.572
		76	28.624	28.620	28.620
		78	28.655	28.650	28.650
	9:10	80	28.655	28.650	28.650
		82	28.655	28.650	28.650
		84	28.655	28.650	28.650
		86	28.687	28.682	28.682
		88	28.655	28.650	28.650
	9:20	90	28.687	28.682	28.682
		92	28.718	28.713	28.713
		94	28.766	28.761	28.761
		96	28.750	28.744	28.744
		98	28.766	28.760	28.760
	9:30	100	28.813	28.807	28.807
	9:40	110	29.381	29.375	29.375

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: PW-1

Personnel: J.A. Duwelius

Pumping Rate: 40 gpm

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
15-Jul	09:50	0.0000	28.923	28.923	28.923
		0.0083	28.908	28.908	28.908
		0.0166	28.939	28.939	28.939
		0.0250	28.908	28.908	28.908
		0.0333	28.923	28.923	28.923
		0.0416	28.955	28.955	28.955
		0.0500	28.892	28.892	28.892
		0.0583	28.939	28.939	28.939
		0.0666	28.971	28.971	28.971
		0.0750	28.939	28.939	28.939
		0.0833	28.939	28.939	28.939
		0.1000	28.908	28.908	28.908
		0.1166	28.923	28.923	28.923
		0.1333	28.923	28.923	28.923
		0.1500	28.939	28.939	28.939
		0.1666	28.955	28.955	28.955
		0.1833	28.908	28.908	28.908
		0.2000	28.955	28.955	28.955
		0.2166	28.908	28.908	28.908
		0.2333	28.923	28.923	28.923
		0.2500	28.908	28.908	28.908
		0.2666	28.923	28.923	28.923
		0.2833	28.908	28.908	28.908
		0.3000	28.908	28.908	28.908
		0.3166	28.923	28.923	28.923
		0.3333	28.923	28.923	28.923
		0.4166	28.923	28.923	28.923
		0.5000	28.892	28.892	28.892
		0.5833	29.113	29.113	29.113
		0.6666	29.728	29.728	29.728
		0.7500	30.863	30.863	30.863

	0.8333	31.951	31.951	31.951
	0.9166	32.897	32.897	32.897
9:51	1.0000	33.890	33.890	33.890
	1.0833	34.758	34.758	34.758
	1.1666	35.546	35.546	35.546
	1.2500	35.925	35.925	35.925
	1.3333	36.319	36.319	36.319
	1.4166	36.587	36.587	36.587
	1.5000	36.949	36.949	36.949
	1.5833	37.233	37.233	37.233
	1.6666	37.438	37.438	37.438
	1.7500	37.706	37.706	37.706
	1.8333	37.943	37.943	37.943
	1.9166	38.164	38.164	38.164
9:52	2	38.337	38.337	38.337
	2.5	39.141	39.141	39.141
	3	37.943	37.943	37.943
	3.5	37.012	37.012	37.012
	4	36.555	36.555	36.555
	4.5	36.681	36.681	36.681
9:55	5	37.028	37.028	37.028
	5.5	37.612	37.612	37.612
	6	38.022	38.022	38.022
	6.5	38.242	38.242	38.242
	7	38.384	38.384	38.384
	7.5	38.447	38.447	38.447
	8	38.463	38.463	38.463
	8.5	38.495	38.495	38.495
	9	38.495	38.494	38.494
	9.5	38.495	38.494	38.494
10:00	10	38.731	38.730	38.730
	12	39.630	39.629	39.629
	14	39.614	39.613	39.613
	16	39.520	39.519	39.519
	18	39.520	39.519	39.519
10:10	20	39.567	39.566	39.566
	22	39.598	39.597	39.597
	24	39.614	39.613	39.613
	26	39.646	39.644	39.644
	28	39.614	39.612	39.612
10:20	30	39.646	39.644	39.644
	32	39.646	39.644	39.644
	34	39.630	39.628	39.628
	36	39.724	39.722	39.722
	38	39.677	39.675	39.675
10:30	40	39.709	39.707	39.707

		42	39.709	39.707	39.707
		44	39.646	39.643	39.643
		46	39.693	39.690	39.690
		48	39.724	39.721	39.721
	10:40	50	39.740	39.737	39.737
		52	39.709	39.706	39.706
		54	39.740	39.737	39.737
		56	39.677	39.674	39.674
		58	39.724	39.721	39.721
	10:50	60	39.709	39.706	39.706
		62	39.709	39.705	39.705
		64	39.693	39.689	39.689
		66	39.709	39.705	39.705
		68	39.646	39.642	39.642
	11:00	70	39.677	39.673	39.673
		72	39.709	39.705	39.705
		74	39.740	39.736	39.736
		76	39.693	39.689	39.689
		78	39.693	39.688	39.688
	11:10	80	39.756	39.751	39.751
		82	39.709	39.704	39.704
		84	39.724	39.719	39.719
		86	39.756	39.751	39.751
		88	39.677	39.672	39.672
	11:20	90	39.756	39.751	39.751
		92	39.772	39.767	39.767
		94	39.740	39.735	39.735
		96	39.709	39.703	39.703
		98	39.709	39.703	39.703
	11:30	100	39.709	39.703	39.703
	11:40	110	39.835	39.829	39.829
	11:50	120	39.819	39.812	39.812

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: PW-1

Personnel: J.A. Duwelius

Pumping Rate: Recovery

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
15-Jul	11:52	0.0000	39.772	39.772	39.772
		0.0083	39.756	39.756	39.756
		0.0166	39.756	39.756	39.756
		0.0250	39.740	39.740	39.740
		0.0333	39.740	39.740	39.740
		0.0416	39.803	39.803	39.803
		0.0500	39.772	39.772	39.772
		0.0583	40.197	40.197	40.197
		0.0666	39.330	39.330	39.330
		0.0750	39.078	39.078	39.078
		0.0833	38.794	38.794	38.794
		0.1000	38.242	38.242	38.242
		0.1166	37.690	37.690	37.690
		0.1333	37.139	37.139	37.139
		0.1500	36.603	36.603	36.603
		0.1666	36.066	36.066	36.066
		0.1833	35.546	35.546	35.546
		0.2000	35.026	35.026	35.026
		0.2166	34.505	34.505	34.505
		0.2333	33.985	33.985	33.985
		0.2500	33.480	33.480	33.480
		0.2666	32.960	32.960	32.960
		0.2833	32.471	32.471	32.471
		0.3000	31.967	31.967	31.967
		0.3166	31.478	31.478	31.478
		0.3333	31.005	31.005	31.005
		0.4166	28.671	28.671	28.671
		0.5000	26.495	26.495	26.495
		0.5833	24.445	24.445	24.445
		0.6666	22.537	22.537	22.537
		0.7500	20.755	20.755	20.755

			0.8333	19.083	19.083	19.083
			0.9166	17.538	17.538	17.538
		11:53	1.0000	16.103	16.103	16.103
			1.0833	14.778	14.778	14.778
			1.1666	13.563	13.563	13.563
			1.2500	12.444	12.444	12.444
			1.3333	11.419	11.419	11.419
			1.4166	10.457	10.457	10.457
			1.5000	9.573	9.573	9.573
			1.5833	8.769	8.769	8.769
			1.6666	8.028	8.028	8.028
			1.7500	7.349	7.349	7.349
			1.8333	6.734	6.734	6.734
			1.9166	6.182	6.182	6.182
		11:54	2	5.678	5.678	5.678
			2.5	3.454	3.454	3.454
		11:55	3	2.287	2.287	2.287
			3.5	1.656	1.656	1.656
			4	1.340	1.340	1.340
			4.5	1.167	1.167	1.167
			5	1.072	1.072	1.072
			5.5	0.993	0.993	0.993
			6	0.946	0.946	0.946
			6.5	0.914	0.914	0.914
			7	0.883	0.883	0.883
			7.5	0.851	0.851	0.851
		12:00	8	0.835	0.835	0.835
			8.5	0.804	0.804	0.804
			9	0.788	0.787	0.787
			9.5	0.772	0.771	0.771
		12:02	10	0.741	0.740	0.740
			12	0.678	0.677	0.677
			14	0.630	0.629	0.629
			16	0.567	0.566	0.566
			18	0.536	0.535	0.535
		12:12	20	0.488	0.487	0.487
			22	0.457	0.456	0.456
			24	0.425	0.424	0.424
			26	0.394	0.392	0.392
			28	0.378	0.376	0.376
		12:22	30	0.347	0.345	0.345
			32	0.331	0.329	0.329
			34	0.315	0.313	0.313
			36	0.299	0.297	0.297
			38	0.283	0.281	0.281
		12:32	40	0.268	0.266	0.266

		42	0.252	0.250	0.250
		44	0.236	0.233	0.233
		46	0.236	0.233	0.233
		48	0.220	0.217	0.217
	12:42	50	0.220	0.217	0.217
		52	0.205	0.202	0.202
		54	0.189	0.186	0.186
		56	0.189	0.186	0.186
		58	0.189	0.186	0.186
	12:52	60	0.173	0.170	0.170
	12:54	62	0.173	0.169	0.169
	12:56	64	0.173	0.169	0.169

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 14, 1992

Project No.: 07029.00

Well Locaton: P-3

Personnel: J.A. Duwelius

Pumping Rate: 20 gpm

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
14-Jul	15:15	0.0	-0.004		
		0.0083	-0.009		
		0.0166	-0.004		
		0.0250	-0.004		
		0.0333	-0.009		
		0.0416	-0.004		
		0.0500	-0.004		
		0.0583	-0.004		
		0.0666	-0.004		
		0.0750	-0.009		
		0.0833	0.000		
		0.1000	-0.009		
		0.1166	-0.004		
		0.1333	-0.004		
		0.1500	-0.004		
		0.1666	0.000		
		0.1833	-0.009		
		0.2000	-0.004		
		0.2166	-0.004		
		0.2333	-0.004		
		0.2500	-0.009		
		0.2666	0.000		
		0.2833	-0.004		
		0.3000	-0.004		
		0.3166	0.000		
		0.3333	-0.004		
		0.4166	0.000		
		0.5000	-0.004		
		0.5833	-0.004		
		0.6666	-0.004		
		0.7500	-0.004		

			0.8333	-0.004			
			0.9166	-0.004			
		15:16	1.0000	-0.004			
			1.0833	-0.004			
			1.1666	0.000			
			1.2500	-0.009			
			1.3333	-0.009			
			1.4166	-0.004			
			1.5000	-0.009			
			1.5833	-0.009			
			1.6666	-0.004			
			1.7500	-0.009			
			1.8333	-0.009			
			1.9166	-0.014			
		15:17	2	-0.004			
			2.5	-0.004			
			3	-0.018			
			3.5	-0.018			
			4	-0.023			
			4.5	-0.014			
		15:20	5	-0.018			
			5.5	-0.014			
			6	-0.018			
			6.5	-0.009			
			7	-0.014			
			7.5	-0.014			
			8	-0.014			
			8.5	-0.009			
			9	-0.009			
			9.5	-0.014			
		15:25	10	-0.009			
			12	-0.009			
			14	-0.009			
			16	-0.009			
			18	-0.009			
		15:35	20	-0.009			
			22	-0.004			
			24	-0.009			
			26	-0.014			
			28	-0.018			
		15:45	30	-0.023			
			32	-0.018			
			34	-0.018			
			36	-0.004			
			38	-0.095			
		15:55	40	-0.023			

		42	-0.009		
		44	0.000		
		46	-0.004		
		48	-0.009		
	16:05	50	-0.028		
		52	-0.014		
		54	-0.014		
		56	-0.018		
		58	-0.018		
	16:15	60	-0.014		
		62	-0.018		
		64	-0.018		
		66	-0.028		
		68	-0.023		
	16:25	70	-0.004		
		72	0.000		
		74	-0.009		
		76	-0.028		
		78	-0.028		
	16:35	80	-0.038		
		82	-0.018		
		84	-0.004		
		86	-0.009		
		88	-0.018		
	16:45	90	-0.023		
		92	-0.018		
		94	-0.028		
		96	-0.018		
		98	-0.018		
	16:55	100	-0.018		
	17:05	110	-0.014		
	17:15	120	-0.014		
		130	-0.014		
	17:35	140	-0.023		
		150	-0.023		
	17:55	160	-0.018		

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: P-3

Personnel: J.A. Duwelius

Pumping Rate: 30 gpm

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
15-Jul	07:50	0.0	0.004		
		0.0083	0.000		
		0.0166	0.004		
		0.0250	0.004		
		0.0333	0.004		
		0.0416	0.009		
		0.0500	0.004		
		0.0583	0.004		
		0.0666	0.004		
		0.0750	0.000		
		0.0833	0.009		
		0.1000	0.004		
		0.1166	0.009		
		0.1333	0.004		
		0.1500	0.009		
		0.1666	0.009		
		0.1833	0.009		
		0.2000	0.004		
		0.2166	0.014		
		0.2333	0.004		
		0.2500	0.004		
		0.2666	0.004		
		0.2833	0.004		
		0.3000	0.004		
		0.3166	0.009		
		0.3333	0.009		
		0.4166	0.009		
		0.5000	0.004		
		0.5833	0.009		
		0.6666	0.004		
		0.7500	0.009		

			0.8333	0.009		
			0.9166	0.009		
		7:51	1.0000	0.004		
			1.0833	0.004		
			1.1666	0.009		
			1.2500	0.004		
			1.3333	0.009		
			1.4166	0.004		
			1.5000	0.004		
			1.5833	0.009		
			1.6666	0.009		
			1.7500	0.004		
			1.8333	0.004		
			1.9166	0.014		
		7:52	2	0.000		
			2.5	0.000		
			3	0.000		
			3.5	-0.004		
			4	-0.004		
			4.5	-0.004		
		7:55	5	0.004		
			5.5	0.009		
			6	0.004		
			6.5	0.004		
			7	0.009		
			7.5	0.004		
			8	0.009		
			8.5	0.000		
			9	0.000		
			9.5	0.000		
		8:00	10	0.000		
			12	0.004		
			14	0.009		
			16	0.009		
			18	0.000		
		8:10	20	0.004		
			22	0.004		
			24	0.000		
			26	-0.004		
			28	0.009		
		8:20	30	0.004		
			32	0.004		
			34	0.004		
			36	0.009		
			38	-0.004		
		8:30	40	-0.004		

		42	-0.009		
		44	0.000		
		46	0.000		
		48	0.000		
	8:40	50	0.000		
		52	0.014		
		54	0.014		
		56	0.009		
		58	0.004		
	8:50	60	0.004		
		62	-0.004		
		64	-0.004		
		66	-0.009		
		68	-0.004		
	9:00	70	0.000		
		72	0.000		
		74	0.000		
		76	0.009		
		78	0.019		
	9:10	80	0.014		
		82	0.014		
		84	0.009		
		86	0.014		
		88	0.000		
	9:20	90	0.004		
		92	0.000		
		94	0.014		
		96	0.014		
		98	0.014		
	9:30	100	0.014		
	9:40	110	0.014		

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: P-3

Personnel: J.A. Duwelius

Pumping Rate: 40 gpm

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
15-Jul	09:50	0.0	0.019		
		0.0083	0.019		
		0.0166	0.014		
		0.0250	0.019		
		0.0333	0.014		
		0.0416	0.019		
		0.0500	0.019		
		0.0583	0.019		
		0.0666	0.019		
		0.0750	0.023		
		0.0833	0.019		
		0.1000	0.023		
		0.1166	0.014		
		0.1333	0.023		
		0.1500	0.019		
		0.1666	0.028		
		0.1833	0.019		
		0.2000	0.019		
		0.2166	0.023		
		0.2333	0.019		
		0.2500	0.023		
		0.2666	0.023		
		0.2833	0.019		
		0.3000	0.023		
		0.3166	0.019		
		0.3333	0.023		
		0.4166	0.019		
		0.5000	0.019		
		0.5833	0.019		
		0.6666	0.019		
		0.7500	0.019		

			0.8333	0.019		
			0.9166	0.019		
		9:51	1.0000	0.019		
			1.0833	0.019		
			1.1666	0.023		
			1.2500	0.014		
			1.3333	0.019		
			1.4166	0.019		
			1.5000	0.019		
			1.5833	0.019		
			1.6666	0.023		
			1.7500	0.014		
			1.8333	0.019		
			1.9166	0.014		
		9:52	2	0.019		
			2.5	0.019		
			3	0.019		
			3.5	0.014		
			4	0.019		
			4.5	0.014		
		9:55	5	0.019		
			5.5	0.019		
			6	0.023		
			6.5	0.023		
			7	0.019		
			7.5	0.023		
			8	0.023		
			8.5	0.019		
			9	0.023		
			9.5	0.019		
		10:00	10	0.028		
			12	0.023		
			14	0.000		
			16	0.028		
			18	0.019		
		10:10	20	0.019		
			22	0.023		
			24	0.023		
			26	0.028		
			28	0.019		
		10:20	30	0.023		
			32	0.019		
			34	0.004		
			36	0.019		
			38	0.028		
		10:30	40	0.028		

		42	0.023		
		44	0.028		
		46	0.028		
		48	0.028		
	10:40	50	0.023		
		52	0.023		
		54	0.023		
		56	0.028		
		58	0.023		
	10:50	60	0.023		
		62	0.019		
		64	0.023		
		66	0.023		
		68	0.019		
	11:00	70	0.019		
		72	0.028		
		74	0.028		
		76	-0.038		
		78	0.019		
	11:10	80	0.038		
		82	0.033		
		84	0.033		
		86	0.028		
		88	0.028		
	11:20	90	0.038		
		92	0.038		
		94	0.038		
		96	0.033		
		98	0.038		
	11:30	100	0.042		
	11:40	110	0.042		
	11:50	120	0.042		

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: P-3

Personnel: J.A. Duwelius

Pumping Rate: Recovery

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
15-Jul	11:52	0.0	0.042		
		0.0083	0.033		
		0.0166	0.042		
		0.0250	0.038		
		0.0333	0.042		
		0.0416	0.038		
		0.0500	0.038		
		0.0583	0.038		
		0.0666	0.042		
		0.0750	0.042		
		0.0833	0.038		
		0.1000	0.038		
		0.1166	0.038		
		0.1333	0.038		
		0.1500	0.038		
		0.1666	0.038		
		0.1833	0.038		
		0.2000	0.038		
		0.2166	0.042		
		0.2333	0.038		
		0.2500	0.042		
		0.2666	0.042		
		0.2833	0.038		
		0.3000	0.033		
		0.3166	0.042		
		0.3333	0.038		
		0.4166	0.038		
		0.5000	0.038		
		0.5833	0.042		
		0.6666	0.042		
		0.7500	0.038		

			0.8333	0.038		
			0.9166	0.042		
		11:53	1.0000	0.042		
			1.0833	0.042		
			1.1666	0.042		
			1.2500	0.042		
			1.3333	0.038		
			1.4166	0.042		
			1.5000	0.038		
			1.5833	0.042		
			1.6666	0.038		
			1.7500	0.038		
			1.8333	0.042		
			1.9166	0.047		
		11:54	2	0.042		
			2.5	0.033		
		11:55	3	0.042		
			3.5	0.038		
			4	0.042		
			4.5	0.042		
			5	0.042		
			5.5	0.042		
			6	0.052		
			6.5	0.047		
			7	0.042		
			7.5	0.047		
		12:00	8	0.042		
			8.5	0.042		
			9	0.042		
			9.5	0.042		
		12:02	10	0.038		
			12	0.038		
			14	0.038		
			16	0.033		
			18	0.038		
		12:12	20	0.038		
			22	0.033		
			24	0.033		
			26	0.033		
			28	0.028		
		12:22	30	0.028		
			32	0.033		
			34	0.033		
			36	0.033		
			38	0.042		
		12:32	40	0.038		

		42	0.038		
		44	0.038		
		46	0.033		
		48	0.033		
	12:42	50	0.038		
		52	0.038		
		54	0.038		
		56	0.042		
		58	0.038		
	12:52	60	0.038		
	12:54	62	0.047		
	12:56	64	0.047		

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 14, 1992

Project No.: 07029.00

Well Locaton: P-4

Personnel: J.A. Duwelius

Pumping Rate: 20 gpm

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
14-Jul	15:15	0.0	0.104	0.104	0.104
		0.0166	0.119	0.119	0.119
		0.0250	0.109	0.109	0.109
		0.0333	0.123	0.123	0.123
		0.0416	0.119	0.119	0.119
		0.0500	0.109	0.109	0.109
		0.0583	0.123	0.123	0.123
		0.0666	0.119	0.119	0.119
		0.0750	0.109	0.109	0.109
		0.0833	0.128	0.128	0.128
		0.1000	0.114	0.114	0.114
		0.1166	0.114	0.114	0.114
		0.1333	0.128	0.128	0.128
		0.1500	0.109	0.109	0.109
		0.1666	0.119	0.119	0.119
		0.1833	0.123	0.123	0.123
		0.2000	0.119	0.119	0.119
		0.2166	0.114	0.114	0.114
		0.2333	0.128	0.128	0.128
		0.2500	0.123	0.123	0.123
		0.2666	0.114	0.114	0.114
		0.2833	0.128	0.128	0.128
		0.3000	0.119	0.119	0.119
		0.3166	0.109	0.109	0.109
		0.3333	0.128	0.128	0.128
		0.4166	0.109	0.109	0.109
		0.5000	0.123	0.123	0.123
		0.5833	0.128	0.128	0.128
		0.6666	0.133	0.133	0.133
		0.7500	0.123	0.123	0.123
		0.8333	0.133	0.133	0.133

			0.9166	0.133	0.133	0.133
		15:16	1.0000	0.147	0.147	0.147
			1.0833	0.152	0.152	0.152
			1.1666	0.147	0.147	0.147
			1.2500	0.166	0.166	0.166
			1.3333	0.176	0.176	0.176
			1.4166	0.166	0.166	0.166
			1.5000	0.171	0.171	0.171
			1.5833	0.190	0.190	0.190
			1.6666	0.195	0.195	0.195
			1.7500	0.190	0.190	0.190
			1.8333	0.200	0.200	0.200
			1.9166	0.214	0.214	0.214
		15:17	2	0.200	0.200	0.200
			2.5	0.247	0.247	0.247
			3	0.276	0.276	0.276
			3.5	0.324	0.324	0.324
			4	0.367	0.367	0.367
			4.5	0.376	0.376	0.376
		15:20	5	0.424	0.424	0.424
			5.5	0.429	0.429	0.429
			6	0.457	0.457	0.457
			6.5	0.471	0.471	0.471
			7	0.491	0.491	0.491
			7.5	0.495	0.495	0.495
			8	0.519	0.519	0.519
			8.5	0.524	0.524	0.524
			9	0.548	0.548	0.548
			9.5	0.557	0.557	0.557
		15:25	10	0.567	0.567	0.567
			12	0.595	0.594	0.594
			14	0.610	0.609	0.609
			16	0.648	0.647	0.647
			18	0.672	0.671	0.671
		15:35	20	0.672	0.671	0.671
			22	0.691	0.690	0.690
			24	0.705	0.704	0.704
			26	0.705	0.704	0.704
			28	0.715	0.714	0.714
		15:45	30	0.719	0.718	0.718
			32	0.719	0.718	0.718
			34	0.734	0.732	0.732
			36	0.743	0.741	0.741
			38	0.719	0.717	0.717
		15:55	40	0.748	0.746	0.746
			42	0.753	0.751	0.751

		44	0.767	0.765	0.765
		46	0.772	0.770	0.770
		48	0.767	0.765	0.765
	16:05	50	0.781	0.779	0.779
		52	0.777	0.775	0.775
		54	0.791	0.789	0.789
		56	0.786	0.783	0.783
		58	0.791	0.788	0.788
	16:15	60	0.781	0.778	0.778
		62	0.796	0.793	0.793
		64	0.767	0.764	0.764
		66	0.762	0.759	0.759
		68	0.757	0.754	0.754
	16:25	70	0.772	0.769	0.769
		72	0.772	0.769	0.769
		74	0.796	0.793	0.793
		76	0.791	0.788	0.788
		78	0.786	0.782	0.782
	16:35	80	0.796	0.792	0.792
		82	0.777	0.773	0.773
		84	0.796	0.792	0.792
		86	0.796	0.792	0.792
		88	0.796	0.792	0.792
	16:45	90	0.781	0.777	0.777
		92	0.805	0.801	0.801
		94	0.786	0.782	0.782
		96	0.796	0.792	0.792
		98	0.796	0.792	0.792
	16:55	100	0.800	0.795	0.795
	17:05	110	0.805	0.800	0.800
	17:15	120	0.824	0.819	0.819
		130	0.815	0.809	0.809
	17:35	140	0.819	0.813	0.813
		150	0.839	0.832	0.832
	17:55	160	0.839	0.832	0.832

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: P-4

Personnel: J.A. Duwelius

Pumping Rate: 30 gpm

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
15-Jul	07:50	0.0	0.085	0.085	0.085
		0.0333	0.085	0.085	0.085
		0.0416	0.090	0.090	0.090
		0.0500	0.090	0.090	0.090
		0.0583	0.090	0.090	0.090
		0.0666	0.095	0.095	0.095
		0.0750	0.090	0.090	0.090
		0.0833	0.090	0.090	0.090
		0.1000	0.090	0.090	0.090
		0.1166	0.095	0.095	0.095
		0.1333	0.095	0.095	0.095
		0.1500	0.095	0.095	0.095
		0.1666	0.090	0.090	0.090
		0.1833	0.100	0.100	0.100
		0.2000	0.100	0.100	0.100
		0.2166	0.100	0.100	0.100
		0.2333	0.104	0.104	0.104
		0.2500	0.104	0.104	0.104
		0.2666	0.100	0.100	0.100
		0.2833	0.104	0.104	0.104
		0.3000	0.104	0.104	0.104
		0.3166	0.109	0.109	0.109
		0.3333	0.109	0.109	0.109
		0.4166	0.119	0.119	0.119
		0.5000	0.119	0.119	0.119
		0.5833	0.123	0.123	0.123
		0.6666	0.128	0.128	0.128
		0.7500	0.138	0.138	0.138
		0.8333	0.133	0.133	0.133
		0.9166	0.152	0.152	0.152
	7:51	1.0000	0.157	0.157	0.157

			1.0833	0.157	0.157	0.157
			1.1666	0.166	0.166	0.166
			1.2500	0.171	0.171	0.171
			1.3333	0.176	0.176	0.176
			1.4166	0.181	0.181	0.181
			1.5000	0.185	0.185	0.185
			1.5833	0.185	0.185	0.185
			1.6666	0.185	0.185	0.185
			1.7500	0.204	0.204	0.204
			1.8333	0.200	0.200	0.200
			1.9166	0.204	0.204	0.204
		7:52	2	0.214	0.214	0.214
			2.5	0.243	0.243	0.243
			3	0.262	0.262	0.262
			3.5	0.286	0.286	0.286
			4	0.300	0.300	0.300
			4.5	0.319	0.319	0.319
		7:55	5	0.343	0.343	0.343
			5.5	0.343	0.343	0.343
			6	0.338	0.338	0.338
			6.5	0.324	0.324	0.324
			7	0.352	0.352	0.352
			7.5	0.414	0.414	0.414
			8	0.491	0.491	0.491
			8.5	0.562	0.562	0.562
			9	0.624	0.624	0.624
			9.5	0.686	0.686	0.686
		8:00	10	0.729	0.729	0.729
			12	0.862	0.861	0.861
			14	0.910	0.909	0.909
			16	0.920	0.919	0.919
			18	0.929	0.928	0.928
		8:10	20	0.953	0.952	0.952
			22	0.967	0.966	0.966
			24	1.001	1.000	1.000
			26	1.015	1.014	1.014
			28	1.029	1.028	1.028
		8:20	30	1.043	1.042	1.042
			32	1.058	1.057	1.057
			34	1.072	1.070	1.070
			36	1.086	1.084	1.084
			38	1.096	1.094	1.094
		8:30	40	1.101	1.099	1.099
			42	1.105	1.103	1.103
			44	1.125	1.123	1.123
			46	1.129	1.127	1.127

		48	1.129	1.127	1.127
	8:40	50	1.144	1.142	1.142
		52	1.153	1.151	1.151
		54	1.158	1.156	1.156
		56	1.167	1.164	1.164
		58	1.177	1.174	1.174
	8:50	60	1.167	1.164	1.164
		62	1.167	1.164	1.164
		64	1.172	1.169	1.169
		66	1.182	1.179	1.179
		68	1.191	1.188	1.188
	9:00	70	1.186	1.183	1.183
		72	1.191	1.188	1.188
		74	1.201	1.198	1.198
		76	1.210	1.207	1.207
		78	1.220	1.216	1.216
	9:10	80	1.215	1.211	1.211
		82	1.220	1.216	1.216
		84	1.225	1.221	1.221
		86	1.229	1.225	1.225
		88	1.225	1.221	1.221
	9:20	90	1.225	1.221	1.221
		92	1.225	1.221	1.221
		94	1.234	1.230	1.230
		96	1.239	1.235	1.235
		98	1.244	1.240	1.240
	9:30	100	1.244	1.239	1.239
	9:40	110	1.253	1.248	1.248

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: P-4

Personnel: J.A. Duwelius

Pumping Rate: 40 gpm

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
15-Jul	09:50	0.0	1.267	1.267	1.267
		0.0083	1.267	1.267	1.267
		0.0166	1.272	1.272	1.272
		0.0250	1.267	1.267	1.267
		0.0333	1.263	1.263	1.263
		0.0416	1.267	1.267	1.267
		0.0500	1.277	1.277	1.277
		0.0583	1.267	1.267	1.267
		0.0666	1.267	1.267	1.267
		0.0750	1.272	1.272	1.272
		0.0833	1.272	1.272	1.272
		0.1000	1.272	1.272	1.272
		0.1166	1.277	1.277	1.277
		0.1333	1.272	1.272	1.272
		0.1500	1.272	1.272	1.272
		0.1666	1.272	1.272	1.272
		0.1833	1.267	1.267	1.267
		0.2000	1.272	1.272	1.272
		0.2166	1.267	1.267	1.267
		0.2333	1.267	1.267	1.267
		0.2500	1.272	1.272	1.272
		0.2666	1.272	1.272	1.272
		0.2833	1.272	1.272	1.272
		0.3000	1.277	1.277	1.277
		0.3166	1.272	1.272	1.272
		0.3333	1.272	1.272	1.272
		0.4166	1.272	1.272	1.272
		0.5000	1.267	1.267	1.267
		0.5833	1.272	1.272	1.272
		0.6666	1.267	1.267	1.267
		0.7500	1.272	1.272	1.272

			0.8333	1.272	1.272	1.272
			0.9166	1.272	1.272	1.272
		9:51	1.0000	1.282	1.282	1.282
			1.0833	1.277	1.277	1.277
			1.1666	1.277	1.277	1.277
			1.2500	1.282	1.282	1.282
			1.3333	1.287	1.287	1.287
			1.4166	1.277	1.277	1.277
			1.5000	1.291	1.291	1.291
			1.5833	1.291	1.291	1.291
			1.6666	1.296	1.296	1.296
			1.7500	1.296	1.296	1.296
			1.8333	1.301	1.301	1.301
			1.9166	1.310	1.310	1.310
		9:52	2	1.306	1.306	1.306
			2.5	1.329	1.329	1.329
			3	1.358	1.358	1.358
			3.5	1.377	1.377	1.377
			4	1.391	1.391	1.391
			4.5	1.401	1.401	1.401
		9:55	5	1.410	1.410	1.410
			5.5	1.425	1.425	1.425
			6	1.430	1.430	1.430
			6.5	1.444	1.444	1.444
			7	1.453	1.453	1.453
			7.5	1.463	1.463	1.463
			8	1.477	1.477	1.477
			8.5	1.482	1.482	1.482
			9	1.482	1.482	1.482
			9.5	1.492	1.492	1.492
		10:00	10	1.492	1.492	1.492
			12	1.530	1.529	1.529
			14	1.544	1.543	1.543
			16	1.568	1.567	1.567
			18	1.587	1.586	1.586
		10:10	20	1.596	1.595	1.595
			22	1.601	1.600	1.600
			24	1.620	1.619	1.619
			26	1.625	1.624	1.624
			28	1.625	1.624	1.624
		10:20	30	1.634	1.633	1.633
			32	1.639	1.638	1.638
			34	1.644	1.642	1.642
			36	1.649	1.647	1.647
			38	1.654	1.652	1.652
		10:30	40	1.663	1.661	1.661

		42	1.668	1.666	1.666
		44	1.668	1.666	1.666
		46	1.673	1.671	1.671
		48	1.673	1.671	1.671
	10:40	50	1.677	1.675	1.675
		52	1.687	1.685	1.685
		54	1.687	1.685	1.685
		56	1.687	1.684	1.684
		58	1.687	1.684	1.684
	10:50	60	1.696	1.693	1.693
		62	1.696	1.693	1.693
		64	1.696	1.693	1.693
		66	1.701	1.698	1.698
		68	1.706	1.703	1.703
	11:00	70	1.701	1.698	1.698
		72	1.706	1.703	1.703
		74	1.711	1.708	1.708
		76	1.696	1.693	1.693
		78	1.706	1.702	1.702
	11:10	80	1.711	1.707	1.707
		82	1.720	1.716	1.716
		84	1.720	1.716	1.716
		86	1.716	1.712	1.712
		88	1.720	1.716	1.716
	11:20	90	1.730	1.726	1.726
		92	1.725	1.721	1.721
		94	1.735	1.731	1.731
		96	1.730	1.726	1.726
		98	1.739	1.735	1.735
	11:30	100	1.735	1.730	1.730
	11:40	110	1.749	1.744	1.744
	11:50	120	1.754	1.749	1.749

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: P-4

Personnel: J.A. Duwelius

Pumping Rate: Recovery

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
15-Jul	11:52	0.0	1.754	1.754	1.754
		0.0083	1.749	1.749	1.749
		0.0166	1.754	1.754	1.754
		0.0250	1.758	1.758	1.758
		0.0333	1.754	1.754	1.754
		0.0416	1.758	1.758	1.758
		0.0500	1.754	1.754	1.754
		0.0583	1.754	1.754	1.754
		0.0666	1.754	1.754	1.754
		0.0750	1.754	1.754	1.754
		0.0833	1.754	1.754	1.754
		0.1000	1.754	1.754	1.754
		0.1166	1.754	1.754	1.754
		0.1333	1.754	1.754	1.754
		0.1500	1.758	1.758	1.758
		0.1666	1.758	1.758	1.758
		0.1833	1.749	1.749	1.749
		0.2000	1.749	1.749	1.749
		0.2166	1.758	1.758	1.758
		0.2333	1.758	1.758	1.758
		0.2500	1.749	1.749	1.749
		0.2666	1.744	1.744	1.744
		0.2833	1.754	1.754	1.754
		0.3000	1.744	1.744	1.744
		0.3166	1.749	1.749	1.749
		0.3333	1.754	1.754	1.754
		0.4166	1.749	1.749	1.749
		0.5000	1.739	1.739	1.739
		0.5833	1.739	1.739	1.739
		0.6666	1.739	1.739	1.739
		0.7500	1.730	1.730	1.730

		0.8333	1.725	1.725	1.725
		0.9166	1.716	1.716	1.716
	11:53	1.0000	1.701	1.701	1.701
		1.0833	1.701	1.701	1.701
		1.1666	1.687	1.687	1.687
		1.2500	1.673	1.673	1.673
		1.3333	1.663	1.663	1.663
		1.4166	1.654	1.654	1.654
		1.5000	1.634	1.634	1.634
		1.5833	1.625	1.625	1.625
		1.6666	1.615	1.615	1.615
		1.7500	1.596	1.596	1.596
		1.8333	1.587	1.587	1.587
		1.9166	1.568	1.568	1.568
	11:54	2	1.553	1.553	1.553
		2.5	1.468	1.468	1.468
	11:55	3	1.372	1.372	1.372
		3.5	1.282	1.282	1.282
		4	1.210	1.210	1.210
		4.5	1.144	1.144	1.144
		5	1.077	1.077	1.077
		5.5	1.034	1.034	1.034
		6	0.996	0.996	0.996
		6.5	0.953	0.953	0.953
		7	0.924	0.924	0.924
		7.5	0.891	0.891	0.891
	12:00	8	0.862	0.862	0.862
		8.5	0.843	0.843	0.843
		9	0.819	0.819	0.819
		9.5	0.796	0.796	0.796
	12:02	10	0.772	0.772	0.772
		12	0.715	0.714	0.714
		14	0.662	0.661	0.661
		16	0.619	0.618	0.618
		18	0.581	0.580	0.580
	12:12	20	0.548	0.547	0.547
		22	0.519	0.518	0.518
		24	0.486	0.485	0.485
		26	0.462	0.461	0.461
		28	0.438	0.437	0.437
	12:22	30	0.419	0.418	0.418
		32	0.400	0.399	0.399
		34	0.381	0.379	0.379
		36	0.362	0.360	0.360
		38	0.352	0.350	0.350
	12:32	40	0.333	0.331	0.331

		42	0.328	0.326	0.326
		44	0.319	0.317	0.317
		46	0.300	0.298	0.298
		48	0.300	0.298	0.298
	12:42	50	0.286	0.284	0.284
		52	0.281	0.279	0.279
		54	0.266	0.264	0.264
		56	0.262	0.259	0.259
		58	0.252	0.249	0.249
	12:52	60	0.247	0.244	0.244
	12:54	62	0.243	0.240	0.240
	12:56	64	0.233	0.230	0.230

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 14, 1992

Project No.: 07029.00

Well Locaton: P-5

Personnel: J.A. Duwelius

Pumping Rate: 20 gpm

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
14-Jul	15:15	0.0	0.104	0.104	0.104
		0.3333	0.109	0.109	0.109
		0.4166	0.114	0.114	0.114
		0.5000	0.128	0.128	0.128
		0.5833	0.119	0.119	0.119
		0.6666	0.128	0.128	0.128
		0.7500	0.133	0.133	0.133
		0.8333	0.142	0.142	0.142
		0.9166	0.142	0.142	0.142
	15:16	1.0000	0.147	0.147	0.147
		1.0833	0.152	0.152	0.152
		1.1666	0.162	0.162	0.162
		1.2500	0.171	0.171	0.171
		1.3333	0.176	0.176	0.176
		1.4166	0.181	0.181	0.181
		1.5000	0.185	0.185	0.185
		1.5833	0.190	0.190	0.190
		1.6666	0.204	0.204	0.204
		1.7500	0.200	0.200	0.200
		1.8333	0.209	0.209	0.209
		1.9166	0.214	0.214	0.214
	15:17	2	0.219	0.219	0.219
		2.5	0.247	0.247	0.247
		3	0.271	0.271	0.271
		3.5	0.300	0.300	0.300
		4	0.324	0.324	0.324
		4.5	0.343	0.343	0.343
	15:20	5	0.362	0.362	0.362
		5.5	0.371	0.371	0.371
		6	0.395	0.395	0.395
		6.5	0.405	0.405	0.405

		7	0.414	0.414	0.414
		7.5	0.419	0.419	0.419
		8	0.438	0.438	0.438
		8.5	0.452	0.452	0.452
		9	0.457	0.457	0.457
		9.5	0.467	0.467	0.467
	15:25	10	0.476	0.476	0.476
		12	0.509	0.508	0.508
		14	0.528	0.527	0.527
		16	0.552	0.551	0.551
		18	0.567	0.566	0.566
	15:35	20	0.586	0.585	0.585
		22	0.605	0.604	0.604
		24	0.614	0.613	0.613
		26	0.624	0.623	0.623
		28	0.629	0.628	0.628
	15:45	30	0.633	0.632	0.632
		32	0.643	0.642	0.642
		34	0.652	0.650	0.650
		36	0.662	0.660	0.660
		38	0.629	0.627	0.627
	15:55	40	0.662	0.660	0.660
		42	0.671	0.669	0.669
		44	0.681	0.679	0.679
		46	0.690	0.688	0.688
		48	0.695	0.693	0.693
	16:05	50	0.690	0.688	0.688
		52	0.695	0.693	0.693
		54	0.695	0.693	0.693
		56	0.700	0.697	0.697
		58	0.705	0.702	0.702
	16:15	60	0.700	0.697	0.697
		62	0.710	0.707	0.707
		64	0.710	0.707	0.707
		66	0.705	0.702	0.702
		68	0.719	0.716	0.716
	16:25	70	0.719	0.716	0.716
		72	0.729	0.726	0.726
		74	0.724	0.721	0.721
		76	0.714	0.711	0.711
		78	0.719	0.715	0.715
	16:35	80	0.710	0.706	0.706
		82	0.719	0.715	0.715
		84	0.733	0.729	0.729
		86	0.738	0.734	0.734
		88	0.729	0.725	0.725

	16:45	90	0.729	0.725	0.725
		92	0.738	0.734	0.734
		94	0.729	0.725	0.725
		96	0.733	0.729	0.729
		98	0.729	0.725	0.725
	16:55	100	0.733	0.728	0.728
	17:05	110	0.738	0.733	0.733
	17:15	120	0.748	0.743	0.743
		130	0.743	0.737	0.737
	17:35	140	0.729	0.723	0.723
		150	0.743	0.736	0.736
	17:55	160	0.748	0.741	0.741

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: P-5

Personnel: J.A. Duwelius

Pumping Rate: 30 gpm

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
15-Jul	07:50	0.0	0.100	0.100	0.100
		0.2333	0.109	0.109	0.109
		0.2500	0.114	0.114	0.114
		0.2666	0.119	0.119	0.119
		0.2833	0.119	0.119	0.119
		0.3000	0.114	0.114	0.114
		0.3166	0.119	0.119	0.119
		0.3333	0.119	0.119	0.119
		0.4166	0.123	0.123	0.123
		0.5000	0.128	0.128	0.128
		0.5833	0.133	0.133	0.133
		0.6666	0.138	0.138	0.138
		0.7500	0.142	0.142	0.142
		0.8333	0.147	0.147	0.147
		0.9166	0.152	0.152	0.152
	7:51	1.0000	0.157	0.157	0.157
		1.0833	0.157	0.157	0.157
		1.1666	0.162	0.162	0.162
		1.2500	0.171	0.171	0.171
		1.3333	0.176	0.176	0.176
		1.4166	0.181	0.181	0.181
		1.5000	0.181	0.181	0.181
		1.5833	0.185	0.185	0.185
		1.6666	0.190	0.190	0.190
		1.7500	0.195	0.195	0.195
		1.8333	0.190	0.190	0.190
		1.9166	0.200	0.200	0.200
	7:52	2	0.209	0.209	0.209
		2.5	0.214	0.214	0.214
		3	0.233	0.233	0.233
		3.5	0.247	0.247	0.247

			4	0.262	0.262	0.262
			4.5	0.281	0.281	0.281
		7:55	5	0.285	0.285	0.285
			5.5	0.290	0.290	0.290
			6	0.266	0.266	0.266
			6.5	0.257	0.257	0.257
			7	0.309	0.309	0.309
			7.5	0.400	0.400	0.400
			8	0.481	0.481	0.481
			8.5	0.538	0.538	0.538
			9	0.581	0.581	0.581
			9.5	0.619	0.619	0.619
		8:00	10	0.648	0.648	0.648
			12	0.690	0.689	0.689
			14	0.795	0.794	0.794
			16	0.791	0.790	0.790
			18	0.810	0.809	0.809
		8:10	20	0.838	0.837	0.837
			22	0.867	0.866	0.866
			24	0.891	0.890	0.890
			26	0.910	0.909	0.909
			28	0.919	0.918	0.918
		8:20	30	0.938	0.937	0.937
			32	0.948	0.947	0.947
			34	0.967	0.965	0.965
			36	0.976	0.974	0.974
			38	0.981	0.979	0.979
		8:30	40	0.995	0.993	0.993
			42	1.005	1.003	1.003
			44	1.014	1.012	1.012
			46	1.014	1.012	1.012
			48	1.024	1.022	1.022
		8:40	50	1.029	1.027	1.027
			52	1.043	1.041	1.041
			54	1.053	1.051	1.051
			56	1.048	1.045	1.045
			58	1.057	1.054	1.054
		8:50	60	1.029	1.026	1.026
			62	1.067	1.064	1.064
			64	1.062	1.059	1.059
			66	1.067	1.064	1.064
			68	1.076	1.073	1.073
		9:00	70	1.076	1.073	1.073
			72	1.081	1.078	1.078
			74	1.081	1.078	1.078
			76	1.062	1.059	1.059

		78	1.105	1.101	1.101
	9:10	80	1.105	1.101	1.101
		82	1.100	1.096	1.096
		84	1.100	1.096	1.096
		86	1.100	1.096	1.096
		88	1.100	1.096	1.096
	9:20	90	1.105	1.101	1.101
		92	1.110	1.106	1.106
		94	1.115	1.111	1.111
		96	1.115	1.111	1.111
		98	1.115	1.111	1.111
	9:30	100	1.124	1.119	1.119
	9:40	110	1.129	1.124	1.124

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: P-5

Personnel: J.A. Duwelius

Pumping Rate: 40 gpm

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
15-Jul	09:50	0.0	1.134	1.134	1.134
		0.0083	1.134	1.134	1.134
		0.0166	1.138	1.138	1.138
		0.0250	1.134	1.134	1.134
		0.0333	1.134	1.134	1.134
		0.0416	1.138	1.138	1.138
		0.0500	1.134	1.134	1.134
		0.0583	1.138	1.138	1.138
		0.0666	1.134	1.134	1.134
		0.0750	1.134	1.134	1.134
		0.0833	1.138	1.138	1.138
		0.1000	1.134	1.134	1.134
		0.1166	1.138	1.138	1.138
		0.1333	1.138	1.138	1.138
		0.1500	1.138	1.138	1.138
		0.1666	1.134	1.134	1.134
		0.1833	1.134	1.134	1.134
		0.2000	1.138	1.138	1.138
		0.2166	1.138	1.138	1.138
		0.2333	1.134	1.134	1.134
		0.2500	1.134	1.134	1.134
		0.2666	1.134	1.134	1.134
		0.2833	1.138	1.138	1.138
		0.3000	1.134	1.134	1.134
		0.3166	1.138	1.138	1.138
		0.3333	1.138	1.138	1.138
		0.4166	1.134	1.134	1.134
		0.5000	1.134	1.134	1.134
		0.5833	1.134	1.134	1.134
		0.6666	1.134	1.134	1.134
		0.7500	1.138	1.138	1.138

		0.8333	1.138	1.138	1.138
		0.9166	1.138	1.138	1.138
	9:51	1.0000	1.138	1.138	1.138
		1.0833	1.138	1.138	1.138
		1.1666	1.148	1.148	1.148
		1.2500	1.148	1.148	1.148
		1.3333	1.148	1.148	1.148
		1.4166	1.153	1.153	1.153
		1.5000	1.162	1.162	1.162
		1.5833	1.167	1.167	1.167
		1.6666	1.167	1.167	1.167
		1.7500	1.172	1.172	1.172
		1.8333	1.176	1.176	1.176
		1.9166	1.181	1.181	1.181
	9:52	2	1.186	1.186	1.186
		2.5	1.205	1.205	1.205
		3	1.219	1.219	1.219
		3.5	1.238	1.238	1.238
		4	1.243	1.243	1.243
		4.5	1.248	1.248	1.248
	9:55	5	1.253	1.253	1.253
		5.5	1.262	1.262	1.262
		6	1.272	1.272	1.272
		6.5	1.281	1.281	1.281
		7	1.291	1.291	1.291
		7.5	1.296	1.296	1.296
		8	1.300	1.300	1.300
		8.5	1.305	1.305	1.305
		9	1.315	1.315	1.315
		9.5	1.319	1.319	1.319
	10:00	10	1.315	1.315	1.315
		12	1.348	1.347	1.347
		14	1.367	1.366	1.366
		16	1.391	1.390	1.390
		18	1.400	1.399	1.399
	10:10	20	1.410	1.409	1.409
		22	1.415	1.414	1.414
		24	1.434	1.433	1.433
		26	1.434	1.433	1.433
		28	1.439	1.438	1.438
	10:20	30	1.443	1.442	1.442
		32	1.458	1.457	1.457
		34	1.443	1.441	1.441
		36	1.462	1.460	1.460
		38	1.472	1.470	1.470
	10:30	40	1.472	1.470	1.470

		42	1.481	1.479	1.479
		44	1.481	1.479	1.479
		46	1.481	1.479	1.479
		48	1.477	1.475	1.475
	10:40	50	1.486	1.484	1.484
		52	1.496	1.494	1.494
		54	1.491	1.489	1.489
		56	1.491	1.488	1.488
		58	1.496	1.493	1.493
	10:50	60	1.491	1.488	1.488
		62	1.505	1.502	1.502
		64	1.500	1.497	1.497
		66	1.500	1.497	1.497
		68	1.500	1.497	1.497
	11:00	70	1.505	1.502	1.502
		72	1.510	1.507	1.507
		74	1.510	1.507	1.507
		76	1.486	1.483	1.483
		78	1.505	1.501	1.501
	11:10	80	1.510	1.506	1.506
		82	1.520	1.516	1.516
		84	1.515	1.511	1.511
		86	1.524	1.520	1.520
		88	1.520	1.516	1.516
	11:20	90	1.524	1.520	1.520
		92	1.524	1.520	1.520
		94	1.529	1.525	1.525
		96	1.524	1.520	1.520
		98	1.524	1.520	1.520
	11:30	100	1.529	1.524	1.525
	11:40	110	1.539	1.534	1.534
	11:50	120	1.539	1.534	1.534

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: P-5

Personnel: J.A. Duwelius

Pumping Rate: Recovery

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
15-Jul	11:52	0.0	1.539	1.539	1.539
		0.0083	1.529	1.529	1.529
		0.0166	1.534	1.534	1.534
		0.0250	1.539	1.539	1.539
		0.0333	1.534	1.534	1.534
		0.0416	1.539	1.539	1.539
		0.0500	1.539	1.539	1.539
		0.0583	1.534	1.534	1.534
		0.0666	1.534	1.534	1.534
		0.0750	1.543	1.543	1.543
		0.0833	1.543	1.543	1.543
		0.1000	1.539	1.539	1.539
		0.1166	1.539	1.539	1.539
		0.1333	1.539	1.539	1.539
		0.1500	1.539	1.539	1.539
		0.1666	1.539	1.539	1.539
		0.1833	1.539	1.539	1.539
		0.2000	1.539	1.539	1.539
		0.2166	1.534	1.534	1.534
		0.2333	1.539	1.539	1.539
		0.2500	1.543	1.543	1.543
		0.2666	1.539	1.539	1.539
		0.2833	1.539	1.539	1.539
		0.3000	1.539	1.539	1.539
		0.3166	1.539	1.539	1.539
		0.3333	1.539	1.539	1.539
		0.4166	1.529	1.529	1.529
		0.5000	1.529	1.529	1.529
		0.5833	1.515	1.515	1.515
		0.6666	1.505	1.505	1.505
		0.7500	1.496	1.496	1.496

			0.8333	1.491	1.491	1.491
			0.9166	1.477	1.477	1.477
		11:53	1.0000	1.467	1.467	1.467
			1.0833	1.453	1.453	1.453
			1.1666	1.443	1.443	1.443
			1.2500	1.429	1.429	1.429
			1.3333	1.415	1.415	1.415
			1.4166	1.400	1.400	1.400
			1.5000	1.386	1.386	1.386
			1.5833	1.372	1.372	1.372
			1.6666	1.353	1.353	1.353
			1.7500	1.343	1.343	1.343
			1.8333	1.334	1.334	1.334
			1.9166	1.315	1.315	1.315
		11:54	2	1.300	1.300	1.300
			2.5	1.215	1.215	1.215
		11:55	3	1.148	1.148	1.148
			3.5	1.095	1.095	1.095
			4	1.043	1.043	1.043
			4.5	0.995	0.995	0.995
			5	0.957	0.957	0.957
			5.5	0.929	0.929	0.929
			6	0.891	0.891	0.891
			6.5	0.867	0.867	0.867
			7	0.843	0.843	0.843
			7.5	0.824	0.824	0.824
		12:00	8	0.795	0.795	0.795
			8.5	0.776	0.776	0.776
			9	0.757	0.757	0.757
			9.5	0.738	0.738	0.738
		12:02	10	0.714	0.714	0.714
			12	0.657	0.656	0.656
			14	0.605	0.604	0.604
			16	0.557	0.556	0.556
			18	0.514	0.513	0.513
		12:12	20	0.481	0.480	0.480
			22	0.443	0.442	0.442
			24	0.419	0.418	0.418
			26	0.386	0.385	0.385
			28	0.366	0.365	0.365
		12:22	30	0.352	0.351	0.351
			32	0.314	0.313	0.313
			34	0.309	0.307	0.307
			36	0.290	0.288	0.288
			38	0.281	0.279	0.279
		12:32	40	0.266	0.264	0.264

		42	0.252	0.250	0.250
		44	0.238	0.236	0.236
		46	0.223	0.221	0.221
		48	0.219	0.217	0.217
	12:42	50	0.209	0.207	0.207
		52	0.200	0.198	0.198
		54	0.195	0.193	0.193
		56	0.195	0.192	0.192
		58	0.181	0.178	0.178
	12:52	60	0.176	0.173	0.173
	12:54	62	0.176	0.173	0.173
	12:56	64	0.162	0.159	0.159

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 14, 1992

Project No.: 07029.00

Well Locaton: P-6

Personnel: J.A. Duwelius

Pumping Rate: 20 gpm

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
14-Jul	15:15	0.0	0.090	0.090	0.090
		0.6666	0.085	0.085	0.085
		0.7500	0.090	0.090	0.090
		0.8333	0.095	0.095	0.095
		0.9166	0.099	0.099	0.099
	15:16	1.0000	0.104	0.104	0.104
		1.0833	0.104	0.104	0.104
		1.1666	0.109	0.109	0.109
		1.2500	0.114	0.114	0.114
		1.3333	0.114	0.114	0.114
		1.4166	0.109	0.109	0.109
		1.5000	0.118	0.118	0.118
		1.5833	0.133	0.133	0.133
		1.6666	0.137	0.137	0.137
		1.7500	0.133	0.133	0.133
		1.8333	0.142	0.142	0.142
		1.9166	0.133	0.133	0.133
	15:17	2	0.137	0.137	0.137
		2.5	0.157	0.157	0.157
		3	0.180	0.180	0.180
		3.5	0.199	0.199	0.199
		4	0.223	0.223	0.223
		4.5	0.237	0.237	0.237
	15:20	5	0.252	0.252	0.252
		5.5	0.271	0.271	0.271
		6	0.280	0.280	0.280
		6.5	0.290	0.290	0.290
		7	0.309	0.309	0.309
		7.5	0.314	0.314	0.314
		8	0.333	0.333	0.333
		8.5	0.337	0.337	0.337

		9	0.347	0.347	0.347
		9.5	0.356	0.356	0.356
	15:25	10	0.366	0.366	0.366
		12	0.394	0.393	0.393
		14	0.418	0.417	0.417
		16	0.433	0.432	0.432
		18	0.452	0.451	0.451
	15:35	20	0.466	0.465	0.465
		22	0.480	0.479	0.479
		24	0.499	0.498	0.498
		26	0.504	0.503	0.503
		28	0.504	0.503	0.503
	15:45	30	0.518	0.517	0.517
		32	0.528	0.527	0.527
		34	0.528	0.526	0.526
		36	0.547	0.545	0.545
		38	0.528	0.526	0.526
	15:55	40	0.537	0.535	0.535
		42	0.551	0.549	0.549
		44	0.556	0.554	0.554
		46	0.575	0.573	0.573
		48	0.580	0.578	0.578
	16:05	50	0.566	0.564	0.564
		52	0.575	0.573	0.573
		54	0.571	0.569	0.569
		56	0.580	0.577	0.577
		58	0.580	0.577	0.577
	16:15	60	0.590	0.587	0.587
		62	0.585	0.582	0.582
		64	0.599	0.596	0.596
		66	0.590	0.587	0.587
		68	0.590	0.587	0.587
	16:25	70	0.594	0.591	0.591
		72	0.604	0.601	0.601
		74	0.604	0.601	0.601
		76	0.604	0.601	0.601
		78	0.590	0.586	0.586
	16:35	80	0.594	0.590	0.590
		82	0.594	0.590	0.590
		84	0.609	0.605	0.605
		86	0.609	0.605	0.605
		88	0.604	0.600	0.600
	16:45	90	0.599	0.595	0.595
		92	0.604	0.600	0.600
		94	0.613	0.609	0.609
		96	0.609	0.605	0.605

		98	0.609	0.605	0.605
	16:55	100	0.604	0.599	0.599
	17:05	110	0.613	0.608	0.608
	17:15	120	0.628	0.623	0.623
		130	0.632	0.626	0.626
	17:35	140	0.623	0.617	0.617
		150	0.623	0.616	0.616
	17:55	160	0.628	0.621	0.621

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: P-6

Personnel: J.A. Duwelius

Pumping Rate: 30 gpm

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
15-Jul	07:50	0.0	0.047	0.047	0.047
		0.1166	0.047	0.047	0.047
		0.1333	0.057	0.057	0.057
		0.1500	0.052	0.052	0.052
		0.1666	0.057	0.057	0.057
		0.1833	0.057	0.057	0.057
		0.2000	0.057	0.057	0.057
		0.2166	0.052	0.052	0.052
		0.2333	0.052	0.052	0.052
		0.2500	0.057	0.057	0.057
		0.2666	0.057	0.057	0.057
		0.2833	0.061	0.061	0.061
		0.3000	0.057	0.057	0.057
		0.3166	0.061	0.061	0.061
		0.3333	0.061	0.061	0.061
		0.4166	0.066	0.066	0.066
		0.5000	0.061	0.061	0.061
		0.5833	0.076	0.076	0.076
		0.6666	0.076	0.076	0.076
		0.7500	0.071	0.071	0.071
		0.8333	0.076	0.076	0.076
		0.9166	0.080	0.080	0.080
	7:51	1.0000	0.090	0.090	0.090
		1.0833	0.085	0.085	0.085
		1.1666	0.090	0.090	0.090
		1.2500	0.095	0.095	0.095
		1.3333	0.095	0.095	0.095
		1.4166	0.104	0.104	0.104
		1.5000	0.104	0.104	0.104
		1.5833	0.104	0.104	0.104
		1.6666	0.114	0.114	0.114

			1.7500	0.114	0.114	0.114
			1.8333	0.123	0.123	0.123
			1.9166	0.118	0.118	0.118
		7:52	2	0.123	0.123	0.123
			2.5	0.137	0.137	0.137
			3	0.157	0.157	0.157
			3.5	0.166	0.166	0.166
			4	0.176	0.176	0.176
			4.5	0.190	0.190	0.190
		7:55	5	0.204	0.204	0.204
			5.5	0.209	0.209	0.209
			6	0.209	0.209	0.209
			6.5	0.199	0.199	0.199
			7	0.218	0.218	0.218
			7.5	0.261	0.261	0.261
			8	0.309	0.309	0.309
			8.5	0.356	0.356	0.356
			9	0.399	0.399	0.399
			9.5	0.428	0.428	0.428
		8:00	10	0.466	0.466	0.466
			12	0.490	0.489	0.489
			14	0.651	0.650	0.650
			16	0.647	0.646	0.646
			18	0.656	0.655	0.655
		8:10	20	0.685	0.684	0.684
			22	0.708	0.707	0.707
			24	0.728	0.727	0.727
			26	0.751	0.750	0.750
			28	0.766	0.765	0.765
		8:20	30	0.785	0.784	0.784
			32	0.794	0.793	0.793
			34	0.808	0.806	0.806
			36	0.818	0.816	0.816
			38	0.827	0.825	0.825
		8:30	40	0.837	0.835	0.835
			42	0.842	0.840	0.840
			44	0.856	0.854	0.854
			46	0.861	0.859	0.859
			48	0.870	0.868	0.868
		8:40	50	0.870	0.868	0.868
			52	0.880	0.878	0.878
			54	0.889	0.887	0.887
			56	0.889	0.886	0.886
			58	0.899	0.896	0.896
		8:50	60	0.894	0.891	0.891
			62	0.908	0.905	0.905

		64	0.908	0.905	0.905
		66	0.913	0.910	0.910
		68	0.918	0.915	0.915
	9:00	70	0.918	0.915	0.915
		72	0.923	0.920	0.920
		74	0.923	0.920	0.920
		76	0.899	0.896	0.896
		78	0.942	0.938	0.938
	9:10	80	0.937	0.933	0.933
		82	0.937	0.933	0.933
		84	0.946	0.942	0.942
		86	0.946	0.942	0.942
		88	0.946	0.942	0.942
	9:20	90	0.937	0.933	0.933
		92	0.946	0.942	0.942
		94	0.951	0.947	0.947
		96	0.956	0.952	0.952
		98	0.961	0.957	0.957
	9:30	100	0.956	0.951	0.951
	9:40	110	0.965	0.960	0.960

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: P-6

Personnel: J.A. Duwelius

Pumping Rate: 40 gpm

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
15-Jul	09:50	0.0	0.970	0.970	0.970
		0.0083	0.965	0.965	0.965
		0.0166	0.975	0.975	0.975
		0.0250	0.970	0.970	0.970
		0.0333	0.970	0.970	0.970
		0.0416	0.975	0.975	0.975
		0.0500	0.975	0.975	0.975
		0.0583	0.980	0.980	0.980
		0.0666	0.975	0.975	0.975
		0.0750	0.970	0.970	0.970
		0.0833	0.975	0.975	0.975
		0.1000	0.975	0.975	0.975
		0.1166	0.980	0.980	0.980
		0.1333	0.975	0.975	0.975
		0.1500	0.975	0.975	0.975
		0.1666	0.970	0.970	0.970
		0.1833	0.975	0.975	0.975
		0.2000	0.975	0.975	0.975
		0.2166	0.975	0.975	0.975
		0.2333	0.975	0.975	0.975
		0.2500	0.975	0.975	0.975
		0.2666	0.970	0.970	0.970
		0.2833	0.975	0.975	0.975
		0.3000	0.970	0.970	0.970
		0.3166	0.975	0.975	0.975
		0.3333	0.975	0.975	0.975
		0.4166	0.970	0.970	0.970
		0.5000	0.970	0.970	0.970
		0.5833	0.975	0.975	0.975
		0.6666	0.980	0.980	0.980
		0.7500	0.965	0.965	0.965

		0.8333	0.975	0.975	0.975
		0.9166	0.980	0.980	0.980
	9:51	1.0000	0.975	0.975	0.975
		1.0833	0.975	0.975	0.975
		1.1666	0.980	0.980	0.980
		1.2500	0.980	0.980	0.980
		1.3333	0.980	0.980	0.980
		1.4166	0.984	0.984	0.984
		1.5000	0.984	0.984	0.984
		1.5833	0.984	0.984	0.984
		1.6666	0.984	0.984	0.984
		1.7500	0.984	0.984	0.984
		1.8333	0.994	0.994	0.994
		1.9166	0.999	0.999	0.999
	9:52	2	0.999	0.999	0.999
		2.5	1.008	1.008	1.008
		3	1.027	1.027	1.027
		3.5	1.037	1.037	1.037
		4	1.046	1.046	1.046
		4.5	1.051	1.051	1.051
	9:55	5	1.056	1.056	1.056
		5.5	1.061	1.061	1.061
		6	1.065	1.065	1.065
		6.5	1.075	1.075	1.075
		7	1.084	1.084	1.084
		7.5	1.089	1.089	1.089
		8	1.094	1.094	1.094
		8.5	1.103	1.103	1.103
		9	1.108	1.108	1.108
		9.5	1.113	1.113	1.113
	10:00	10	1.118	1.118	1.118
		12	1.137	1.136	1.136
		14	1.146	1.145	1.145
		16	1.175	1.174	1.174
		18	1.189	1.188	1.188
	10:10	20	1.194	1.193	1.193
		22	1.208	1.207	1.207
		24	1.218	1.217	1.217
		26	1.222	1.221	1.221
		28	1.227	1.226	1.226
	10:20	30	1.237	1.236	1.236
		32	1.241	1.240	1.240
		34	1.232	1.230	1.230
		36	1.241	1.239	1.239
		38	1.251	1.249	1.249
	10:30	40	1.251	1.249	1.249

		42	1.265	1.263	1.263
		44	1.270	1.268	1.268
		46	1.275	1.273	1.273
		48	1.275	1.273	1.273
	10:40	50	1.270	1.268	1.268
		52	1.279	1.277	1.277
		54	1.279	1.277	1.277
		56	1.284	1.281	1.281
		58	1.279	1.276	1.276
	10:50	60	1.284	1.281	1.281
		62	1.284	1.281	1.281
		64	1.289	1.286	1.286
		66	1.289	1.286	1.286
		68	1.289	1.286	1.286
	11:00	70	1.289	1.286	1.286
		72	1.294	1.291	1.291
		74	1.298	1.295	1.295
		76	1.289	1.286	1.286
		78	1.294	1.290	1.290
	11:10	80	1.298	1.294	1.294
		82	1.308	1.304	1.304
		84	1.308	1.304	1.304
		86	1.308	1.304	1.304
		88	1.303	1.299	1.299
	11:20	90	1.313	1.309	1.309
		92	1.313	1.309	1.309
		94	1.313	1.309	1.309
		96	1.317	1.313	1.313
		98	1.317	1.313	1.313
	11:30	100	1.317	1.312	1.312
	11:40	110	1.327	1.322	1.322
	11:50	120	1.327	1.322	1.322

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: P-6

Personnel: J.A. Duwelius

Pumping Rate: Recovery

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
15-Jul	11:52	0.0	1.322	1.322	1.322
		0.0083	1.317	1.317	1.317
		0.0166	1.322	1.322	1.322
		0.0250	1.327	1.327	1.327
		0.0333	1.322	1.322	1.322
		0.0416	1.327	1.327	1.327
		0.0500	1.327	1.327	1.327
		0.0583	1.322	1.322	1.322
		0.0666	1.322	1.322	1.322
		0.0750	1.327	1.327	1.327
		0.0833	1.327	1.327	1.327
		0.1000	1.322	1.322	1.322
		0.1166	1.317	1.317	1.317
		0.1333	1.327	1.327	1.327
		0.1500	1.327	1.327	1.327
		0.1666	1.332	1.332	1.332
		0.1833	1.322	1.322	1.322
		0.2000	1.327	1.327	1.327
		0.2166	1.322	1.322	1.322
		0.2333	1.327	1.327	1.327
		0.2500	1.327	1.327	1.327
		0.2666	1.322	1.322	1.322
		0.2833	1.327	1.327	1.327
		0.3000	1.332	1.332	1.332
		0.3166	1.327	1.327	1.327
		0.3333	1.327	1.327	1.327
		0.4166	1.317	1.317	1.317
		0.5000	1.327	1.327	1.327
		0.5833	1.317	1.317	1.317
		0.6666	1.313	1.313	1.313
		0.7500	1.317	1.317	1.317

			0.8333	1.313	1.313	1.313
			0.9166	1.303	1.303	1.303
		11:53	1.0000	1.298	1.298	1.298
			1.0833	1.294	1.294	1.294
			1.1666	1.289	1.289	1.289
			1.2500	1.284	1.284	1.284
			1.3333	1.275	1.275	1.275
			1.4166	1.270	1.270	1.270
			1.5000	1.265	1.265	1.265
			1.5833	1.256	1.256	1.256
			1.6666	1.246	1.246	1.246
			1.7500	1.237	1.237	1.237
			1.8333	1.227	1.227	1.227
			1.9166	1.218	1.218	1.218
		11:54	2	1.208	1.208	1.208
			2.5	1.146	1.146	1.146
		11:55	3	1.099	1.099	1.099
			3.5	1.046	1.046	1.046
			4	1.003	1.003	1.003
			4.5	0.961	0.961	0.961
			5	0.927	0.927	0.927
			5.5	0.899	0.899	0.899
			6	0.870	0.870	0.870
			6.5	0.846	0.846	0.846
			7	0.818	0.818	0.818
			7.5	0.799	0.799	0.799
		12:00	8	0.770	0.770	0.770
			8.5	0.756	0.756	0.756
			9	0.737	0.737	0.737
			9.5	0.708	0.708	0.708
		12:02	10	0.694	0.694	0.694
			12	0.637	0.636	0.636
			14	0.590	0.589	0.589
			16	0.537	0.536	0.536
			18	0.499	0.498	0.498
		12:12	20	0.461	0.460	0.460
			22	0.428	0.427	0.427
			24	0.404	0.403	0.403
			26	0.375	0.374	0.374
			28	0.352	0.351	0.351
		12:22	30	0.328	0.327	0.327
			32	0.309	0.308	0.308
			34	0.295	0.293	0.293
			36	0.285	0.283	0.283
			38	0.266	0.264	0.264
		12:32	40	0.256	0.254	0.254

		42	0.242	0.240	0.240
		44	0.233	0.231	0.231
		46	0.223	0.221	0.221
		48	0.209	0.207	0.207
	12:42	50	0.195	0.193	0.193
		52	0.190	0.188	0.188
		54	0.190	0.188	0.188
		56	0.180	0.177	0.177
		58	0.176	0.173	0.173
	12:52	60	0.171	0.168	0.168
	12:54	62	0.166	0.163	0.163
	12:56	64	0.166	0.163	0.163

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Co.

Date: July 14, 1992

Project No.: 07029.00

Well Locaton: T-3

Personnel: R.J. Flores

Meter No.: 4

Date	Clock Time	Time (minutes)	Tapedown (feet)	Drawdown (feet)	Pump Rate (gpm)
14-Jul	15:15	0.0	14.07	0.00	20
		0.5	14.07	0.00	20
	15:16	1.0	14.10	0.03	20
		1.5	14.12	0.05	20
	15:17	2.0	14.14	0.07	20
		2.5	14.15	0.08	20
	15:18	3.0	14.15	0.08	20
		3.5	14.17	0.10	20
	15:19	4.0	14.19	0.12	20
		4.5	14.20	0.13	20
	15:20	5.0	14.20	0.13	20
		6.0	14.21	0.14	20
		7.0	14.25	0.18	20
		8.0	14.26	0.19	20
		9.0	14.28	0.21	20
	15:25	10.0	14.30	0.23	20
		15.0	14.34	0.27	20
	15:45	30.0	14.40	0.33	20
	16:00	45.0	14.45	0.38	20
	16:30	75.0	14.47	0.40	20
	17:00	105.0	14.49	0.42	20
	17:30	135.0	14.50	0.43	20
	18:00	165.0	14.51	0.44	20

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Co.

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: T-3

Personnel: R.J. Flores

Meter No.: 4

Date	Clock Time	Time (minutes)	Tapedown (feet)	Drawdown (feet)	Pump Rate (gpm)
15-Jul	07:50	0.0	14.01	0.00	18/19
		0.5	14.01	0.00	18/19
		1.0	14.04	0.03	18/19
		1.5	14.06	0.05	18/19
		2.0	14.06	0.05	18/19
		2.5	14.09	0.08	18/19
		3.0	14.10	0.09	18/19
		3.5	14.10	0.09	18/19
		4.0	14.12	0.11	18/19
		4.5	14.15	0.14	18/19
	07:55	5.0	14.20	0.19	18/19
		6.0	14.25	0.24	18/19
		7.0	14.31	0.30	18/19
		8.0	14.35	0.34	18/19
		9.0	14.50	0.49	18/19
	08:00	10.0	14.63	0.62	18/19
	08:05	15.0	14.35	0.34	30
	08:20	30.0	14.50	0.49	30
	08:35	45.0	14.63	0.62	30
	08:50	60.0	14.70	0.69	30
	09:05	75.0	14.80	0.79	30
	09:35	105.0	14.80	0.79	30
	09:50	120.0	14.80	0.79	40
		120.5	14.80	0.79	40
		121.0	14.82	0.81	40
		121.1	14.83	0.82	40
		122.0	14.83	0.82	40
		122.5	14.83	0.82	40
		123.0	14.83	0.82	40
		123.5	14.83	0.82	40
		124.0	14.85	0.84	40

		124.5	14.85	0.84	40
	09:55	125.0	14.87	0.86	40
		126.0	14.87	0.86	40
		127.0	14.89	0.88	40
		128.0	14.90	0.89	40
		129.0	14.91	0.90	40
	10:00	130.0	14.91	0.90	40
	10:05	135.0	14.96	0.95	40
	10:15	145.0	14.99	0.98	40
	10:25	155.0	15.03	1.02	40
	10:35	165.0	15.05	1.04	40
	10:45	175.0	15.06	1.05	40
	10:55	185.0	15.08	1.06	40
	11:05	195.0	15.10	1.09	40
	11:15	205.0	15.10	1.09	40
	11:25	215.0	15.11	1.10	40
	11:35	225.0	15.11	1.10	40
	11:45	235.0	15.11	1.10	40
	11:50	240.0	15.11	1.10	40
15-Jul	12:51	241.0	15.11	1.10	0
	12:52	242.0	15.11	1.10	0
	12:53	243.0	15.11	1.10	0
	12:54	244.0	14.96	0.95	0
	12:55	245.0	14.95	0.94	0
		246.0	14.90	0.89	0
		247.0	14.87	0.86	0
		248.0	14.81	0.80	0
		249.0	14.76	0.75	0
	13:00	250.0	14.73	0.71	0
		251.0	14.70	0.69	0
		252.0	14.68	0.67	0
		253.0	14.63	0.62	0
		254.0	14.60	0.59	0
	13:05	255.0	14.59	0.58	0

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Co.

Date: July 14, 1992

Project No.: 07029.00

Well Locaton: T-4A

Personnel: R. Aten

Meter No.: 6

Date	Clock Time	Time (minutes)	Tapedown (feet)	Drawdown (feet)	Pump Rate (gpm)
14-Jul	15:15	0.0	11.73	0.00	20
	15:33	18.0	11.73	0.00	20
	16:00	45.0	11.73	0.00	20
	16:30	75.0	11.73	0.00	20
	18:00	165.0	11.74	0.01	20

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Co.

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: T-4A

Personnel: R. Aten

Meter No.: 6

Date	Clock Time	Time (minutes)	Tapedown (feet)	Drawdown (feet)	Pump Rate (gpm)
15-Jul	07:50	0.0	11.85	0.00	18/19
	08:05	15.0	11.85	0.00	30
	08:35	45.0	11.85	0.00	30
	09:35	95.0	11.88	0.03	30
	09:50	110.0	11.88	0.03	40
	10:07	127.0	11.88	0.03	40
	11:06	186.0	11.90	0.05	40
	11:49	229.0	11.90	0.05	40
	12:12	252.0	11.91	0.06	40
	12:18	258.0	11.92	0.07	40
	12:27	267.0	11.92	0.07	40

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Co.

Date: July 14, 1992

Project No.: 07029.00

Well Locaton: T-4B

Personnel: R. Aten

Meter No.: 6

Date	Clock Time	Time (minutes)	Tapedown (feet)	Drawdown (feet)	Pump Rate (gpm)
14-Jul	15:15	0.0	13.06	0.00	20
		0.5	13.06	0.00	20
		1.0	13.06	0.00	20
		1.5	13.06	0.00	20
		2.0	13.06	0.00	20
		2.5	13.06	0.00	20
		3.0	13.06	0.00	20
		3.5	13.06	0.00	20
		4.0	13.06	0.00	20
		4.5	13.06	0.00	20
	15:20	5.0	13.08	0.01	20
		6.0	13.08	0.01	20
		7.0	13.09	0.03	20
		8.0	13.10	0.04	20
		9.0	13.11	0.05	20
	15:25	10.0	13.14	0.08	20
	15:30	15.0	13.18	0.12	20
	15:45	30.0	13.23	0.16	20
	16:00	45.0	13.26	0.20	20
	16:30	75.0	13.28	0.22	20
	17:00	105.0	13.30	0.24	20
	17:30	135.0	13.30	0.24	20
	18:00	165.0	13.31	0.25	20

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Co.

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: T-4B

Personnel: R. Aten

Meter No.: 6

Date	Clock Time	Time (minutes)	Tapedown (feet)	Drawdown (feet)	Pump Rate (gpm)
15-Jul	07:50	0.0	13.03	0.00	18/19
		0.5	13.03	0.00	18/19
		1.0	13.04	0.01	18/19
		1.5	13.05	0.03	18/19
		2.0	13.05	0.03	18/19
		2.5	13.06	0.04	18/19
		3.0	13.06	0.04	18/19
		3.5	13.07	0.04	18/19
		4.0	13.08	0.05	18/19
		4.5	13.08	0.05	18/19
	07:55	5.0	13.08	0.05	18/19
		6.0	13.09	0.06	18/19
		7.0	13.10	0.07	18/19
		8.0	13.12	0.09	18/19
		9.0	13.13	0.10	18/19
	08:00	10.0	13.14	0.12	18/19
	08:05	15.0	13.28	0.25	30
	08:20	30.0	13.38	0.36	30
	08:35	45.0	13.45	0.42	30
	08:50	60.0	13.50	0.47	30
	09:05	75.0	13.53	0.50	30
	09:35	105.0	13.53	0.50	30
	09:50	120.0	13.54	0.51	40
		120.5	13.54	0.51	40
		121.0	13.54	0.51	40
		121.1	13.54	0.51	40
		122.0	13.54	0.51	40
		122.5	13.54	0.51	40
		123.0	13.54	0.51	40
		123.5	13.54	0.51	40
		124.0	13.54	0.51	40

		124.5	13.54	0.51	40
	09:55	125.0	13.54	0.51	40
		126.0	13.54	0.51	40
		127.0	13.55	0.53	40
		128.0	13.56	0.54	40
		129.0	13.58	0.55	40
	10:00	130.0	13.58	0.55	40
	10:05	135.0	13.60	0.57	40
	10:20	150.0	13.65	0.63	40
	10:35	165.0	13.68	0.65	40
	11:05	195.0	13.70	0.67	40
	11:35	225.0	13.72	0.70	40
	11:50	240.0	13.72	0.70	40
15-Jul	11:51	241.0	13.72	0.70	0
	11:52	242.0	13.72	0.70	0
	11:53	243.0	13.72	0.70	0
	11:54	244.0	13.72	0.70	0
	11:55	245.0	13.72	0.70	0
		246.0	13.70	0.67	0
		247.0	13.68	0.65	0
		248.0	13.65	0.63	0
		249.0	13.62	0.59	0
	12:00	250.0	13.60	0.57	0
		251.0	13.57	0.55	0
		252.0	13.55	0.53	0
		253.0	13.52	0.49	0
		254.0	13.50	0.47	0
	12:05	255.0	13.48	0.46	0
	12:10	260.0	13.39	0.37	0
	12:15	265.0	13.35	0.32	0
	12:20	270.0	13.30	0.28	0
	12:25	275.0	13.26	0.23	0
	12:30	280.0	13.23	0.21	0
	12:45	295.0	13.18	0.15	0
	13:00	305.0	13.14	0.12	0

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Co.

Date: July 14, 1992

Project No.: 07029.00

Well Locaton: T-7A

Personnel: J.A. Duwelius

Meter No.: 5

Date	Clock Time	Time (minutes)	Tapedown (feet)	Drawdown (feet)	Pump Rate (gpm)
14-Jul	15:15	0.0	6.64	0.00	20
	15:45	30.0	6.63	-0.01	20
	16:15	60.0	6.64	0.00	20
	16:45	90.0	6.64	0.00	20
	17:15	120.0	6.64	0.00	20
	17:45	180.0	6.65	0.01	20

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Co.

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: T-7A

Personnel: J.A. Duwelius

Meter No.: 5

Date	Clock Time	Time (minutes)	Tapedown (feet)	Drawdown (feet)	Pump Rate (gpm)
15-Jul	07:50	0.0	6.71	0.00	30
	08:10	15.0	6.70	-0.01	30
	09:10	75.0	6.71	0.00	30
	10:01	126.0	6.72	0.01	40
	11:10	195.0	6.72	0.01	40
	11:45	230.0	6.73	0.02	40

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Co.

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: T-7B

Personnel: J.A. Duwelius

Meter No.: 5

Date	Clock Time	Time (minutes)	Tapedown (feet)	Drawdown (feet)	Pump Rate (gpm)
15-Jul	07:50	0.0	12.45	0.00	18/19
		0.5	12.55	0.10	18/19
		1.0	12.58	0.13	18/19
		1.5	12.60	0.15	18/19
		2.0	12.61	0.16	18/19
		2.5	12.61	0.16	18/19
		3.0	12.63	0.18	18/19
		3.5	12.65	0.20	18/19
		4.0	12.68	0.23	18/19
		4.5	12.69	0.24	18/19
	07:55	5.0	12.69	0.24	18/19
		6.0	12.67	0.22	18/19
		7.0	12.75	0.30	18/19
		8.0	12.87	0.42	18/19
		9.0	12.94	0.49	18/19
	08:00	10.0	12.99	0.54	18/19
	08:05	15.0	13.12	0.67	30
	08:20	30.0	13.28	0.83	30
	08:35	45.0	13.34	0.89	30
	08:50	60.0	13.36	0.91	30
	09:05	75.0	13.43	0.98	30
	09:20	90.0	13.43	0.98	30
	09:35	105.0	13.45	1.00	30
	09:50	120.0	13.46	1.01	40
		120.5	13.46	1.01	40
		121.0	13.47	1.02	40

		121.1	13.49	1.04	40
		122.0	13.50	1.05	40
		122.5	13.53	1.08	40
		123.0	13.54	1.09	40
		123.5	13.54	1.09	40
		124.0	13.55	1.10	40
		124.5	13.55	1.10	40
	09:55	125.0	13.56	1.11	40
		126.0	13.57	1.12	40
		127.0	13.58	1.13	40
		128.0	13.59	1.14	40
		129.0	13.60	1.15	40
	10:00	130.0	13.61	1.16	40
	10:05	135.0	13.66	1.21	40
	10:20	150.0	13.72	1.27	40
	10:35	165.0	13.75	1.30	40
	10:50	180.0	13.77	1.32	40
	11:05	195.0	13.67	1.22	40
	11:20	210.0	13.80	1.35	40
	11:35	225.0	13.81	1.36	40
	11:50	240.0	13.81	1.36	40

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Co.

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: T-9

Personnel: R. Aten

Meter No.: 6

Date	Clock Time	Time (minutes)	Tapedown (feet)	Drawdown (feet)	Pump Rate (gpm)
15-Jul	07:35	0.0	21.63	0.00	0
	08:11	36.0	21.64	0.02	30
	08:25	50.0	21.64	0.02	30
	08:55	80.0	21.65	0.02	30
	09:40	125.0	21.67	0.05	30
	10:25	170.0	21.68	0.05	40
	11:12	217.0	21.68	0.05	40
	12:36	301.0	21.71	0.09	40

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Co.

Date: July 14, 1992

Project No.: 07029.00

Well Locaton: W-4

Personnel: R.J. Flores

Meter No.: 4

Date	Clock Time	Time (minutes)	Tapedown (feet)	Drawdown (feet)	Pump Rate (gpm)
14-Jul	15:16	0.0	8.30	0.00	20
	15:46	30.0	8.33	0.03	20
	16:16	60.0	8.33	0.03	20
	16:46	90.0	8.33	0.03	20
	17:16	120.0	8.33	0.03	20
	18:01	165.0	8.33	0.03	20

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Co.

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: W-4

Personnel: R.J. Flores

Meter No.: 4

Date	Clock Time	Time (minutes)	Tapedown (feet)	Drawdown (feet)	Pump Rate (gpm)
15-Jul	07:50	0.0	8.33	0.00	30
	08:20	30.0	8.34	0.01	30
	08:50	60.0	8.34	0.01	30
	09:20	90.0	8.34	0.01	30
	09:50	120.0	8.34	0.01	30
	10:20	150.0	8.34	0.01	40
	10:50	180.0	8.34	0.01	40
	11:20	210.0	8.34	0.01	40
	11:50	240.0	8.34	0.01	40

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Co.

Date: July 14, 1992

Project No.: 07029.00

Well Locaton: W-4D

Personnel: R.J. Flores

Meter No.: 4

Date	Clock Time	Time (minutes)	Tapedown (feet)	Drawdown (feet)	Pump Rate (gpm)
14-Jul	15:16	0.0	11.96	0.00	20
	15:46	30.0	11.99	0.03	20
	16:16	60.0	12.00	0.04	20
	16:46	90.0	12.02	0.06	20
	17:16	120.0	12.05	0.09	20
	17:46	165.0	12.05	0.09	20

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Co.

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: W-4D

Personnel: R.J. Flores

Meter No.: 4

Date	Clock Time	Time (minutes)	Tapedown (feet)	Drawdown (feet)	Pump Rate (gpm)
15-Jul	07:50	0.0	11.97	0.00	30
	08:20	30.0	12.05	0.08	30
	08:50	60.0	12.10	0.07	30
	09:20	90.0	12.14	0.11	30
	09:50	120.0			40
	10:20	150.0	12.21	0.18	40
	10:50	180.0	12.23	0.20	40
	11:20	210.0	12.25	0.22	40
	11:50	240.0	12.25	0.22	40

B.3 CONSTANT RATE TEST

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: PW-1

Personnel: J.A. Duwelius

Pumping Rate: 40 gpm

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
15-Jul	14:50	0.0	0.015	0.015	0.015
		0.6666	2.744	2.744	2.744
		0.7500	5.283	5.283	5.283
		0.8333	8.264	8.264	8.264
		0.9166	11.419	11.419	11.419
		1.0000	14.084	14.084	14.084
		1.0833	16.796	16.796	16.796
		1.1666	19.272	19.272	19.272
		1.2500	21.559	21.559	21.559
		1.3333	23.641	23.641	23.641
		1.4166	25.502	25.502	25.502
		1.5000	26.984	26.984	26.984
		1.5833	28.403	28.403	28.403
		1.6666	29.680	29.680	29.680
		1.7500	30.942	30.942	30.942
		1.8333	32.046	32.046	32.046
		1.9166	33.039	33.039	33.039
		2	34.032	34.032	34.032
		2.5	37.123	37.123	37.123
		3	38.747	38.747	38.747
		3.5	39.598	39.598	39.598
		4	40.071	40.071	40.071
		4.5	39.677	39.677	39.677
		5	39.125	39.125	39.125
		5.5	38.810	38.810	38.810
		6	38.621	38.621	38.621
		6.5	38.495	38.495	38.495
		7	38.353	38.353	38.353
		7.5	37.817	37.817	37.817
		8	37.454	37.454	37.454
		8.5	37.281	37.281	37.281

			9	37.139	37.138	37.138
			9.5	37.139	37.138	37.138
		15:00	10	37.139	37.138	37.138
			12	37.139	37.138	37.138
			14	37.265	37.264	37.264
			16	37.391	37.390	37.390
			18	37.549	37.548	37.548
			20	37.501	37.500	37.500
			22	37.517	37.516	37.516
			24	37.517	37.516	37.516
			26	37.517	37.515	37.515
			28	37.627	37.625	37.625
			30	37.612	37.610	37.610
			32	37.706	37.704	37.704
			34	37.659	37.657	37.657
			36	37.643	37.641	37.641
			38	37.769	37.767	37.767
			40	37.706	37.704	37.704
			42	37.722	37.720	37.720
			44	37.722	37.719	37.719
			46	37.769	37.766	37.766
			48	37.801	37.798	37.798
			50	37.832	37.829	37.829
			52	37.801	37.798	37.798
			54	37.801	37.798	37.798
			56	37.801	37.798	37.798
			58	37.832	37.829	37.829
			60	37.864	37.861	37.861
			62	37.959	37.955	37.955
			64	37.848	37.844	37.844
			66	37.880	37.876	37.876
			68	37.880	37.876	37.876
			70	37.911	37.907	37.907
			72	37.895	37.891	37.891
			74	37.943	37.939	37.939
			76	37.959	37.955	37.955
			78	37.990	37.985	37.985
			80	37.911	37.906	37.906
			82	37.895	37.890	37.890
			84	37.943	37.938	37.938
			86	37.974	37.969	37.969
			88	37.943	37.938	37.938
			90	37.974	37.969	37.969
			92	37.927	37.922	37.922
			94	37.959	37.954	37.954
			96	37.959	37.953	37.953

			98	38.006	38.000	38.000
			100	38.006	38.000	38.000
			110	37.990	37.984	37.984
			120	38.022	38.015	38.015
			130	38.116	38.108	38.108
			140	38.132	38.124	38.124
			150	38.164	38.155	38.155
			160	38.148	38.139	38.139
			170	38.227	38.217	38.217
			180	38.085	38.075	38.075
			190	38.179	38.168	38.168
			200	38.242	38.230	38.230
			210	38.179	38.167	38.167
			220	38.211	38.198	38.198
			230	38.242	38.229	38.229
			240	38.211	38.197	38.197
			250	38.274	38.259	38.259
			260	38.258	38.243	38.243
			270	38.274	38.258	38.258
			280	38.305	38.289	38.289
			290	38.242	38.225	38.225
			300	38.290	38.273	38.273
			310	38.274	38.256	38.256
			320	38.164	38.145	38.145
			330	38.211	38.192	38.192
			340	38.242	38.222	38.222
			350	38.258	38.238	38.238
			360	38.290	38.269	38.269
			370	38.321	38.299	38.299
			380	38.337	38.315	38.315
			390	38.368	38.345	38.345
			400	38.384	38.361	38.361
			410	38.432	38.408	38.408
			420	38.416	38.392	38.392
			430	38.447	38.422	38.422
			440	38.432	38.406	38.406
			450	38.463	38.437	38.437
			460	38.432	38.405	38.405
			470	38.447	38.420	38.420
			480	38.463	38.435	38.435
			490	38.495	38.466	38.466
			500	38.510	38.481	38.481
			510	38.510	38.480	38.480
			520	38.558	38.528	38.528
			530	38.573	38.542	38.542
			540	38.589	38.558	38.558

16-Jul	00:00	550	38.495	38.463	38.463
		560	38.573	38.540	38.540
		570	38.605	38.572	38.572
		580	38.542	38.508	38.508
		590	38.479	38.445	38.445
		600	38.542	38.507	38.507
		610	38.526	38.490	38.490
		620	38.510	38.474	38.474
		630	38.573	38.536	38.536
		640	38.573	38.536	38.536
		650	38.605	38.567	38.567
		660	38.558	38.520	38.519
		670	38.589	38.550	38.550
		680	38.605	38.565	38.565
		690	38.605	38.565	38.565
		700	38.621	38.580	38.580
		710	38.542	38.501	38.501
		720	38.621	38.579	38.579
		730	38.637	38.594	38.594
		740	38.621	38.578	38.578
		750	38.605	38.561	38.561
		760	38.542	38.498	38.498
		770	38.573	38.528	38.528
		780	38.621	38.576	38.576
		790	38.542	38.496	38.496
		800	38.605	38.558	38.558
		810	38.668	38.621	38.621
		820	38.637	38.589	38.589
		830	38.652	38.604	38.604
		840	38.652	38.603	38.603
		850	38.715	38.665	38.665
		860	38.715	38.665	38.665
		870	38.700	38.649	38.649
		880	38.731	38.680	38.680
		890	38.794	38.742	38.742
		900	38.731	38.679	38.679
	06:00	910	38.700	38.647	38.647
		920	38.684	38.630	38.630
		930	38.637	38.583	38.583
		940	38.668	38.613	38.613
		950	38.700	38.645	38.645
		960	38.684	38.628	38.628
		970	38.652	38.595	38.595
		980	38.715	38.658	38.658
		990	38.700	38.642	38.642
		1000	38.700	38.642	38.642

			1030	38.700	38.640	38.640
			1060	38.763	38.701	38.701
			1090	38.715	38.651	38.651
			1120	38.700	38.635	38.635
			1150	38.826	38.759	38.759
			1180	38.826	38.757	38.757
			1210	38.889	38.818	38.818
			1240	38.889	38.817	38.817
		12:00	1270	38.905	38.831	38.831
			1300	38.889	38.813	38.813
			1330	38.905	38.827	38.827
			1360	38.968	38.889	38.889
			1390	39.046	38.965	38.965
			1420	38.983	38.900	38.900
			1450	39.078	38.993	38.993
			1480	39.062	38.976	38.976
			1510	39.094	39.006	39.006
			1540	39.046	38.956	38.956
			1570	39.110	39.018	39.018
			1600	39.094	39.001	39.001
		18:00	1630	39.078	38.983	38.983
			1660	39.125	39.028	39.028
			1690	39.078	38.979	38.979
			1720	39.141	39.041	39.041
			1750	39.141	39.039	39.039
			1780	39.157	39.053	39.053
			1810	39.173	39.067	39.067
			1840	39.283	39.176	39.176
			1870	39.346	39.237	39.237
			1900	39.236	39.125	39.125
			1930	39.251	39.138	39.138
			1960	39.393	39.279	39.279
	17-Jul	00:00	1990	39.362	39.246	39.246
			2020	39.409	39.291	39.291
			2050	39.425	39.305	39.305
			2080	39.393	39.272	39.272
			2110	39.425	39.302	39.302
			2140	39.393	39.268	39.268
			2170	39.425	39.298	39.298
			2200	39.346	39.218	39.218
			2230	39.362	39.232	39.232
			2260	39.330	39.198	39.198
			2290	39.456	39.322	39.322
			2320	39.409	39.274	39.274
		06:00	2350	39.441	39.304	39.304
			2380	41.885	41.746	41.746

		2410	41.727	41.586	41.587
		2440	41.553	41.411	41.411
		2470	41.427	41.283	41.283
		2500	41.380	41.234	41.234
		2530	41.396	41.249	41.249
		2560	41.333	41.184	41.184
		2590	41.285	41.134	41.134
		2620	41.222	41.069	41.069
		2650	41.207	41.053	41.053
		2680	41.144	40.988	40.988
	12:00	2710	41.144	40.986	40.986
		2740	41.128	40.968	40.968
		2770	41.112	40.951	40.951
		2800	41.191	41.028	41.028
		2830	41.144	40.979	40.979
		2860	41.159	40.992	40.992
		2890	41.128	40.960	40.960
		2920	41.002	40.832	40.832
		2950	41.017	40.845	40.845
		2980	40.875	40.701	40.701
		3010	40.907	40.732	40.732
		3040	40.891	40.714	40.714
	18:00	3070	40.860	40.681	40.681
		3100	40.891	40.710	40.710
		3130	40.875	40.693	40.693
		3160	40.844	40.660	40.660
		3190	40.907	40.721	40.721
		3220	40.860	40.672	40.672
		3250	40.986	40.797	40.797
		3280	40.954	40.763	40.763
		3310	41.033	40.840	40.840
		3340	40.954	40.759	40.759
		3370	40.986	40.790	40.790
		3400	41.112	40.914	40.914
18-Jul	00:00	3430	40.954	40.754	40.754
		3460	40.954	40.752	40.752
		3490	41.049	40.846	40.846
		3520	41.033	40.828	40.828
		3550	41.080	40.873	40.873
		3580	41.065	40.856	40.856
		3610	41.033	40.823	40.823
		3640	41.033	40.821	40.821
		3670	41.049	40.835	40.835
		3700	41.096	40.880	40.880
		3730	41.112	40.895	40.895
		3760	41.175	40.956	40.956

		5170	41.427	41.126	41.126
		5200	41.569	41.266	41.266
	0.25	5230	41.490	41.185	41.185
		5260	41.459	41.152	41.152
		5290	41.475	41.167	41.167
		5320	41.443	41.133	41.133
		5350	41.443	41.131	41.131
		5380	41.664	41.350	41.350
		5410	41.601	41.286	41.286
		5440	41.601	41.284	41.284
		5470	41.648	41.329	41.329
		5500	41.490	41.169	41.169
		5530	41.585	41.263	41.263
		5560	41.538	41.214	41.214
	0.5	5590	41.538	41.212	41.212
		5620	41.585	41.257	41.257
		5650	41.585	41.256	41.256
		5680	41.585	41.254	41.254
		5710	41.585	41.252	41.252
		5740	41.585	41.250	41.250
	0.625	5770	41.632	41.296	41.296

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 19, 1992

Project No.: 07029.00

Well Locaton: PW-1

Personnel: J.A. Duwelius

Pumping Rate: Recovery

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
19-Jul	15:02	0.0000	41.601	41.601	41.601
		0.0083	41.632	41.632	41.632
		0.0166	41.617	41.617	41.617
		0.0250	41.648	41.648	41.648
		0.0333	41.601	41.601	41.601
		0.0416	41.617	41.617	41.617
		0.0500	41.506	41.506	41.506
		0.0583	41.096	41.096	41.096
		0.0666	40.781	40.781	40.781
		0.0750	40.513	40.513	40.513
		0.0833	40.213	40.213	40.213
		0.1000	39.646	39.646	39.646
		0.1166	39.078	39.078	39.078
		0.1333	38.526	38.526	38.526
		0.1500	37.974	37.974	37.974
		0.1666	37.422	37.422	37.422
		0.1833	36.871	36.871	36.871
		0.2000	36.350	36.350	36.350
		0.2166	35.798	35.798	35.798
		0.2333	35.278	35.278	35.278
		0.2500	34.773	34.773	34.773
		0.2666	34.253	34.253	34.253
		0.2833	33.733	33.733	33.733
		0.3000	33.228	33.228	33.228
		0.3166	32.724	32.724	32.724
		0.3333	32.235	32.235	32.235
		0.4166	29.838	29.838	29.838
		0.5000	27.583	27.583	27.583
		0.5833	25.486	25.486	25.486
		0.6666	23.515	23.515	23.515
		0.7500	21.669	21.669	21.669

			0.8333	19.951	19.951	19.951
			0.9166	18.342	18.342	18.342
		15:03	1.0000	16.860	16.860	16.860
			1.0833	15.488	15.488	15.488
			1.1666	14.242	14.242	14.242
			1.2500	13.075	13.075	13.075
			1.3333	12.002	12.002	12.002
			1.4166	11.024	11.024	11.024
			1.5000	10.110	10.110	10.110
			1.5833	9.289	9.289	9.289
			1.6666	8.517	8.517	8.517
			1.7500	7.807	7.807	7.807
			1.8333	7.176	7.176	7.176
			1.9166	6.608	6.608	6.608
		15:04	2	6.072	6.072	6.072
			2.5	3.753	3.753	3.753
		15:05	3	2.555	2.555	2.555
			3.5	1.924	1.924	1.924
			4	1.593	1.593	1.593
			4.5	1.403	1.403	1.403
			5	1.309	1.309	1.309
			5.5	1.230	1.230	1.230
			6	1.182	1.182	1.182
			6.5	1.135	1.135	1.135
			7	1.104	1.104	1.104
			7.5	1.072	1.072	1.072
		15:10	8	1.056	1.056	1.056
			8.5	1.041	1.041	1.041
			9	1.009	1.008	1.008
			9.5	0.993	0.992	0.992
			10	0.977	0.976	0.976
			12	0.899	0.898	0.898
			14	0.820	0.819	0.819
			16	0.772	0.771	0.771
		15:20	18	0.725	0.724	0.724
			20	0.694	0.693	0.693
			22	0.678	0.677	0.677
			24	0.630	0.629	0.629
			26	0.599	0.597	0.597
		15:30	28	0.567	0.565	0.565
			30	0.552	0.550	0.550
			32	0.536	0.534	0.534
			34	0.520	0.518	0.518
			36	0.504	0.502	0.502
		15:40	38	0.488	0.486	0.486
			40	0.457	0.455	0.455

		42	0.457	0.455	0.455
		44	0.457	0.454	0.454
		46	0.425	0.422	0.422
	15:50	48	0.410	0.407	0.407
		50	0.410	0.407	0.407
		52	0.394	0.391	0.391
		54	0.378	0.375	0.375
		56	0.378	0.375	0.375
	16:00	58	0.362	0.359	0.359
		60	0.362	0.359	0.359
		62	0.347	0.343	0.343
		64	0.347	0.343	0.343
		66	0.347	0.343	0.343
	16:10	68	0.331	0.327	0.327
		70	0.315	0.311	0.311
		72	0.315	0.311	0.311
		74	0.315	0.311	0.311
		76	0.299	0.295	0.295
	16:20	78	0.299	0.294	0.294
		80	0.299	0.294	0.294
		82	0.283	0.278	0.278
		84	0.283	0.278	0.278
		86	0.283	0.278	0.278
	16:30	88	0.299	0.294	0.294
		90	0.268	0.263	0.263
		92	0.268	0.263	0.263
		94	0.268	0.263	0.263
		96	0.268	0.262	0.262
	16:40	98	0.268	0.262	0.262
		100	0.252	0.246	0.246
		110	0.252	0.246	0.246
	17:02	120	0.22	0.213	0.213
		130	0.22	0.212	0.212
		140	0.22	0.212	0.212
		150	0.22	0.211	0.211
		160	0.205	0.196	0.196
		170	0.205	0.195	0.195
	18:02	180	0.189	0.179	0.179
		190	0.189	0.178	0.178
		200	0.189	0.177	0.177
		210	0.173	0.161	0.161
		220	0.189	0.176	0.176
		230	0.189	0.176	0.176
	19:02	240	0.189	0.175	0.175
		250	0.173	0.158	0.158
		260	0.189	0.174	0.174

		270	0.157	0.141	0.141
		280	0.173	0.157	0.157
		290	0.173	0.156	0.156
	20:02	300	0.173	0.156	0.156
		310	0.189	0.171	0.171
		320	0.157	0.138	0.138
		330	0.173	0.154	0.154
		340	0.173	0.153	0.153
		350	0.157	0.137	0.137
	21:02	360	0.173	0.152	0.152
		370	0.157	0.135	0.135
		380	0.157	0.135	0.135
		390	0.157	0.134	0.134
		400	0.173	0.150	0.150
		410	0.173	0.149	0.149
	22:02	420	0.173	0.149	0.149
		430	0.157	0.132	0.132
		440	0.173	0.147	0.147
		450	0.157	0.131	0.131
		460	0.157	0.130	0.130
		470	0.141	0.114	0.114
	23:02	480	0.173	0.145	0.145
		490	0.173	0.144	0.144
		500	0.157	0.128	0.128
		510	0.173	0.143	0.143
		520	0.157	0.127	0.127
		530	0.157	0.126	0.126
20-Jul	00:02	540	0.157	0.126	0.126
		550	0.173	0.141	0.141
		560	0.157	0.124	0.124
		570	0.157	0.124	0.124
		580	0.157	0.123	0.123
		590	0.157	0.123	0.123
	01:02	600	0.173	0.138	0.138
		610	0.173	0.137	0.137
		620	0.141	0.105	0.105
		630	0.157	0.120	0.120
		640	0.157	0.120	0.120
		650	0.157	0.119	0.119
	02:02	660	0.141	0.103	0.103
		670	0.157	0.118	0.118
		680	0.141	0.101	0.101
		690	0.141	0.101	0.101
		700	0.141	0.100	0.100
		710	0.141	0.100	0.100
	03:02	720	0.141	0.099	0.099

		730	0.141	0.098	0.098
		740	0.141	0.098	0.098
		750	0.141	0.097	0.097
		760	0.141	0.097	0.097
		770	0.126	0.081	0.081
	04:02	780	0.141	0.096	0.096
		790	0.126	0.080	0.080
		800	0.141	0.094	0.094
		810	0.126	0.079	0.079
		820	0.141	0.093	0.093
		830	0.157	0.109	0.109
	05:02	840	0.141	0.092	0.092
		850	0.141	0.091	0.091
		860	0.141	0.091	0.091
		870	0.141	0.090	0.090
		880	0.141	0.090	0.090
		890	0.141	0.089	0.089
	06:02	900	0.141	0.089	0.089
		910	0.141	0.088	0.088
		920	0.141	0.087	0.087
		930	0.141	0.087	0.087
		940	0.157	0.102	0.102
		950	0.141	0.086	0.086
	07:02	960	0.141	0.085	0.085
		970	0.157	0.100	0.100
		980	0.157	0.100	0.100
		990	0.141	0.083	0.083
		1000	0.141	0.083	0.083
	08:12	1030	0.141	0.081	0.081
		1060	0.141	0.079	0.079
	09:12	1090	56.689	56.625	56.625
		1120	-0.977	-1.042	-1.042
	10:12	1150	-0.993	-1.060	-1.060

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: P-3

Personnel: J.A. Duwelius

Pumping Rate: 40 gpm

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
15-Jul	14:50	0.0	0.000		
		0.0083	0.004		
		0.0166	0.004		
		0.0250	0.004		
		0.0333	0.004		
		0.0416	0.004		
		0.0500	0.004		
		0.0583	0.009		
		0.0666	0.004		
		0.0750	0.009		
		0.0833	0.009		
		0.1000	0.004		
		0.1166	0.009		
		0.1333	0.009		
		0.1500	0.014		
		0.1666	0.009		
		0.1833	0.009		
		0.2000	0.004		
		0.2166	0.009		
		0.2333	0.000		
		0.2500	0.004		
		0.2666	0.009		
		0.2833	0.009		
		0.3000	0.009		
		0.3166	0.004		
		0.3333	0.004		
		0.4166	0.004		
		0.5000	0.004		
		0.5833	-0.004		
		0.6666	0.000		
		0.7500	0.000		

			0.8333	-0.004			
			0.9166	-0.009			
			1.0000	0.000			
			1.0833	-0.004			
			1.1666	-0.004			
			1.2500	-0.009			
			1.3333	-0.009			
			1.4166	-0.014			
			1.5000	-0.014			
			1.5833	-0.014			
			1.6666	-0.009			
			1.7500	-0.009			
			1.8333	-0.014			
			1.9166	-0.009			
			2.0	-0.009			
			2.5	-0.004			
			3.0	-0.009			
			3.5	-0.009			
			4.0	-0.009			
			4.5	-0.014			
			5.0	-0.023			
			5.5	-0.028			
			6.0	-0.019			
			6.5	-0.009			
			7.0	-0.014			
			7.5	-0.009			
			8.0	-0.004			
			8.5	-0.009			
			9.0	-0.009			
			9.5	-0.004			
		15:00	10.0	-0.014			
			12.0	-0.004			
			14.0	-0.004			
			16.0	0.000			
			18.0	-0.009			
			20.0	-0.014			
			22.0	0.000			
			24.0	-0.009			
			26.0	-0.004			
			28.0	0.014			
			30.0	-0.019			
			32.0	-0.004			
			34.0	-0.004			
			36.0	-0.009			
			38.0	0.009			
			40.0	0.000			

		270.0	0.000
		280.0	0.009
		290.0	0.000
		300.0	0.019
		310.0	0.009
		320.0	0.000
		330.0	0.009
		340.0	0.004
		350.0	0.009
		360.0	0.019
		370.0	0.014
		380.0	0.000
		390.0	0.019
		400.0	0.009
		410.0	0.019
		420.0	0.019
		430.0	0.033
		440.0	0.019
		450.0	0.023
		460.0	0.023
		470.0	0.042
		480.0	0.033
		490.0	0.033
		500.0	0.038
		510.0	0.047
		520.0	0.033
		530.0	0.057
		540.0	0.038
16-Jul	00:00	550.0	0.038
		560.0	0.047
		570.0	0.061
		580.0	0.052
		590.0	0.028
		600.0	0.038
		610.0	0.047
		620.0	0.042
		630.0	0.038
		640.0	0.019
		650.0	0.038
		660.0	0.028
		670.0	0.009
		680.0	0.019
		690.0	0.023
		700.0	0.028
		710.0	0.023
		720.0	0.033

		1570.0	-0.028
	18:00	1600.0	-0.028
		1630.0	-0.028
		1660.0	-0.023
		1690.0	-0.066
		1720.0	-0.033
		1750.0	-0.042
		1780.0	-0.023
		1810.0	-0.033
		1840.0	-0.047
		1870.0	-0.037
		1900.0	-0.047
		1930.0	-0.071
17-Jul	00:00	1960.0	-0.071
		1990.0	-0.028
		2020.0	-0.047
		2050.0	-0.037
		2080.0	-0.033
		2110.0	-0.042
		2140.0	-0.037
		2170.0	-0.047
		2200.0	-0.047
		2230.0	-0.061
		2260.0	-0.076
		2290.0	-0.085
	06:00	2320.0	-0.052
		2350.0	-0.052
		2380.0	-0.066
		2410.0	-0.052
		2440.0	-0.047
		2470.0	-0.052
		2500.0	-0.042
		2530.0	-0.052
		2560.0	-0.042
		2590.0	-0.037
		2620.0	-0.057
		2650.0	-0.042
	12:00	2680.0	-0.042
		2710.0	-0.037
		2740.0	-0.042
		2770.0	-0.028
		2800.0	-0.033
		2830.0	-0.028
		2860.0	-0.033
		2890.0	-0.033
		2920.0	-0.023

			2950.0	-0.033		
			2980.0	-0.023		
			3010.0	-0.047		
		18:00	3040.0	-0.052		
			3070.0	-0.037		
			3100.0	-0.037		
			3130.0	-0.052		
			3160.0	-0.033		
			3190.0	-0.037		
			3220.0	-0.023		
			3250.0	-0.028		
			3280.0	-0.042		
			3310.0	-0.037		
			3340.0	-0.037		
			3370.0	-0.037		
	18-Jul	00:00	3400.0	-0.014		
			3430.0	-0.042		
			3460.0	-0.047		
			3490.0	-0.033		
			3520.0	-0.061		
			3550.0	-0.042		
			3580.0	-0.047		
			3610.0	-0.019		
			3640.0	-0.019		
			3670.0	-0.042		
			3700.0	-0.033		
			3730.0	-0.042		
		06:00	3760.0	-0.047		
			3790.0	-0.042		
			3820.0	-0.037		
			3850.0	-0.037		
			3880.0	-0.028		
			3910.0	-0.037		
			3940.0	-0.033		
			3970.0	-0.033		
			4000.0	-0.037		
			4030.0	-0.047		
			4060.0	-0.037		
			4090.0	-0.028		
		12:00	4120.0	-0.033		
			4150.0	-0.033		
			4180.0	-0.014		
			4210.0	-0.047		
			4240.0	-0.023		
			4270.0	-0.028		
			4300.0	-0.028		

		4330.0	-0.028
		4360.0	-0.019
		4390.0	-0.019
		4420.0	-0.028
		4450.0	-0.014
	18:00	4480.0	-0.009
		4510.0	-0.019
		4540.0	-0.019
		4570.0	-0.023
		4600.0	-0.014
		4630.0	-0.014
		4660.0	-0.009
		4690.0	-0.014
		4720.0	-0.009
		4750.0	-0.014
		4780.0	-0.004
		4810.0	0.009
19-Jul	00:00	4840.0	0.000
		4870.0	0.009
		4900.0	0.019
		4930.0	0.019
		4960.0	0.028
		4990.0	0.033
		5020.0	0.057
		5050.0	0.076
		5080.0	0.076
		5110.0	0.071
		5140.0	0.080
		5170.0	0.071
	06:00	5200.0	0.076
		5230.0	0.052
		5260.0	0.047
		5290.0	0.047
		5320.0	0.023
		5350.0	0.023
		5380.0	0.028
		5410.0	0.019
		5440.0	0.023
		5470.0	0.023
		5500.0	0.019
		5530.0	0.023
	12:00	5560.0	0.014
		5590.0	0.004
		5620.0	0.014
		5650.0	0.009
		5680.0	0.009

	15:00	5710.0 5740.0 5770.0 5740.0	0.014 0.019 0.004 0.019		

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 19, 1992

Project No.: 07029.00

Well Locaton: P-3

Personnel: J.A. Duwelius

Pumping Rate: Recovery

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
19-Jul	15:02	0.0	0.028		
		0.0083	0.033		
		0.0166	0.028		
		0.0250	0.028		
		0.0333	0.023		
		0.0416	0.028		
		0.0500	0.028		
		0.0583	0.033		
		0.0666	0.028		
		0.0750	0.023		
		0.0833	0.023		
		0.1000	0.023		
		0.1166	0.028		
		0.1333	0.028		
		0.1500	0.028		
		0.1666	0.033		
		0.1833	0.028		
		0.2000	0.028		
		0.2166	0.028		
		0.2333	0.028		
		0.2500	0.023		
		0.2666	0.028		
		0.2833	0.028		
		0.3000	0.028		
		0.3166	0.028		
		0.3333	0.028		
		0.4166	0.028		
		0.5000	0.023		
		0.5833	0.033		
		0.6666	0.028		
		0.7500	0.028		

			0.8333	0.028			
			0.9166	0.028			
		15:03	1.0000	0.028			
			1.0833	0.028			
			1.1666	0.028			
			1.2500	0.023			
			1.3333	0.028			
			1.4166	0.028			
			1.5000	0.033			
			1.5833	0.028			
			1.6666	0.023			
			1.7500	0.023			
			1.8333	0.023			
			1.9166	0.023			
		15:04	2	0.014			
			2.5	0.014			
		15:05	3	0.004			
			3.5	0.009			
			4	0.009			
			4.5	0.028			
			5	0.019			
			5.5	0.028			
			6	0.014			
			6.5	0.009			
			7	0.004			
			7.5	0.004			
		15:10	8	0.009			
			8.5	0.019			
			9	0.014			
			9.5	0.014			
			10	0.014			
			12	0.000			
			14	-0.004			
			16	-0.009			
		15:20	18	0.000			
			20	0.004			
			22	0.004			
			24	0.004			
			26	0.004			
		15:30	28	-0.004			
			30	0.014			
			32	0.000			
			34	0.004			
			36	0.019			
		15:40	38	0.023			
			40	0.019			

			42	0.023		
			44	0.009		
			46	0.014		
		15:50	48	0.000		
			50	0.014		
			52	0.000		
			54	0.000		
			56	0.000		
		16:00	58	0.004		
			60	0.000		
			62	-0.009		
			64	-0.014		
			66	0.004		
		16:10	68	-0.009		
			70	-0.014		
			72	-0.009		
			74	-0.004		
			76	-0.019		
		16:20	78	-0.009		
			80	-0.028		
			82	-0.023		
			84	-0.023		
			86	-0.014		
		16:30	88	-0.004		
			90	-0.023		
			92	-0.009		
			94	-0.019		
			96	-0.014		
		16:40	98	-0.009		
			100	-0.023		
			110	-0.019		
		17:02	120	-0.037		
			130	-0.028		
			140	-0.033		
			150	-0.033		
			160	-0.037		
			170	-0.033		
		18:02	180	-0.042		
			190	-0.033		
			200	-0.028		
			210	-0.057		
			220	-0.047		
			230	-0.042		
		19:02	240	-0.047		
			250	-0.047		
			260	-0.042		

			270	-0.071		
			280	-0.052		
			290	-0.061		
		20:02	300	-0.052		
			310	-0.047		
			320	-0.066		
			330	-0.057		
			340	-0.052		
			350	-0.057		
		21:02	360	-0.061		
			370	-0.076		
			380	-0.066		
			390	-0.066		
			400	-0.061		
			410	-0.057		
		22:02	420	-0.061		
			430	-0.066		
			440	-0.057		
			450	-0.076		
			460	-0.080		
			470	-0.104		
		23:02	480	-0.061		
			490	-0.071		
			500	-0.080		
			510	-0.057		
			520	-0.080		
			530	-0.080		
	20-Jul	00:02	540	-0.066		
			550	-0.066		
			560	-0.071		
			570	-0.071		
			580	-0.080		
			590	-0.071		
		01:02	600	-0.061		
			610	-0.066		
			620	-0.080		
			630	-0.071		
			640	-0.071		
			650	-0.071		
		02:02	660	-0.085		
			670	-0.080		
			680	-0.090		
			690	-0.085		
			700	-0.080		
			710	-0.076		
		03:02	720	-0.076		

		730	-0.080		
		740	-0.080		
		750	-0.085		
		760	-0.080		
		770	-0.095		
	04:02	780	-0.090		
		790	-0.099		
		800	-0.099		
		810	-0.104		
		820	-0.090		
		830	-0.085		
	05:02	840	-0.090		
		850	-0.090		
		860	-0.099		
		870	-0.104		
		880	-0.090		
		890	-0.109		
	06:02	900	-0.104		
		910	-0.099		
		920	-0.085		
		930	-0.095		
		940	-0.090		
		950	-0.104		
	07:02	960	-0.090		
		970	-0.090		
		980	-0.095		
		990	-0.104		
		1000	-0.109		
	08:12	1030	-0.147		
		1060	-0.147		
	09:12	1090	-0.137		
		1120	-0.232		
	10:12	1150	-0.228		

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: P-4

Personnel: J.A. Duwelius

Pumping Rate: 40 gpm

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
15-Jul	14:50	0.0	0.000	0.000	0.000
		0.9166	0.019	0.019	0.019
		1.0000	0.019	0.019	0.019
		1.0833	0.028	0.028	0.028
		1.1666	0.033	0.033	0.033
		1.2500	0.047	0.047	0.047
		1.3333	0.057	0.057	0.057
		1.4166	0.071	0.071	0.071
		1.5000	0.076	0.076	0.076
		1.5833	0.095	0.095	0.095
		1.6666	0.114	0.114	0.114
		1.7500	0.119	0.119	0.119
		1.8333	0.147	0.147	0.147
		1.9166	0.147	0.147	0.147
		2.0	0.176	0.176	0.176
		2.5	0.281	0.281	0.281
		3.0	0.386	0.386	0.386
		3.5	0.476	0.476	0.475
		4.0	0.562	0.562	0.562
		4.5	0.643	0.643	0.643
		5.0	0.700	0.700	0.699
		5.5	0.748	0.748	0.748
		6.0	0.810	0.810	0.810
		6.5	0.848	0.848	0.848
		7.0	0.886	0.886	0.886
		7.5	0.915	0.915	0.915
		8.0	0.948	0.948	0.948
		8.5	0.977	0.977	0.977
		9.0	1.001	1.001	1.001
		9.5	1.005	1.005	1.005
	15:00	10.0	1.043	1.043	1.043

			12.0	1.091	1.090	1.091
			14.0	1.144	1.143	1.144
			16.0	1.196	1.195	1.195
			18.0	1.225	1.224	1.224
			20.0	1.258	1.257	1.257
			22.0	1.277	1.276	1.276
			24.0	1.301	1.300	1.300
			26.0	1.325	1.324	1.324
			28.0	1.344	1.343	1.343
			30.0	1.358	1.357	1.357
			32.0	1.382	1.381	1.381
			34.0	1.382	1.380	1.380
			36.0	1.410	1.408	1.409
			38.0	1.415	1.413	1.413
			40.0	1.425	1.423	1.423
			42.0	1.444	1.442	1.442
			50.0	1.463	1.461	1.461
			52.0	1.487	1.485	1.485
			54.0	1.491	1.489	1.489
			56.0	1.506	1.503	1.503
			58.0	1.506	1.503	1.504
			60.0	1.515	1.512	1.512
			62.0	1.515	1.512	1.512
			64.0	1.520	1.517	1.517
			66.0	1.530	1.527	1.527
			68.0	1.549	1.546	1.546
			70.0	1.549	1.546	1.546
			72.0	1.549	1.546	1.546
			74.0	1.539	1.536	1.535
			76.0	1.563	1.560	1.560
			78.0	1.553	1.549	1.550
			80.0	1.553	1.549	1.549
			82.0	1.563	1.559	1.559
			84.0	1.577	1.573	1.573
			86.0	1.577	1.573	1.573
			88.0	1.577	1.573	1.573
			90.0	1.582	1.578	1.578
			92.0	1.577	1.573	1.573
			94.0	1.577	1.573	1.573
			96.0	1.592	1.588	1.588
			98.0	1.587	1.583	1.583
			100.0	1.587	1.582	1.582
			110.0	1.592	1.587	1.587
			120.0	1.596	1.591	1.591
			130.0	1.630	1.624	1.625
			140.0	1.620	1.614	1.614

		150.0	1.625	1.618	1.618
		160.0	1.634	1.627	1.626
		170.0	1.644	1.636	1.637
		180.0	1.649	1.641	1.641
		190.0	1.658	1.649	1.649
		200.0	1.658	1.649	1.649
		210.0	1.663	1.654	1.654
		220.0	1.658	1.648	1.648
		230.0	1.668	1.658	1.658
		240.0	1.663	1.652	1.652
		250.0	1.668	1.657	1.657
		260.0	1.668	1.656	1.656
		270.0	1.673	1.661	1.661
		280.0	1.682	1.669	1.670
		290.0	1.677	1.664	1.665
		300.0	1.673	1.659	1.660
		310.0	1.677	1.663	1.663
		320.0	1.668	1.654	1.654
		330.0	1.677	1.662	1.662
		340.0	1.668	1.653	1.653
		350.0	1.673	1.657	1.657
		360.0	1.687	1.671	1.671
		370.0	1.687	1.670	1.670
		380.0	1.682	1.665	1.665
		390.0	1.687	1.669	1.669
		400.0	1.682	1.664	1.663
		410.0	1.687	1.669	1.668
		420.0	1.692	1.673	1.672
		430.0	1.696	1.677	1.676
		440.0	1.696	1.676	1.676
		450.0	1.692	1.672	1.671
		460.0	1.701	1.680	1.680
		470.0	1.711	1.690	1.690
		480.0	1.715	1.693	1.693
		490.0	1.706	1.684	1.684
		500.0	1.711	1.688	1.689
		510.0	1.715	1.692	1.692
		520.0	1.715	1.692	1.692
		530.0	1.715	1.691	1.691
		540.0	1.706	1.682	1.681
16-Jul	00:00	550.0	1.715	1.690	1.690
		560.0	1.720	1.695	1.695
		570.0	1.715	1.689	1.689
		580.0	1.715	1.689	1.689
		590.0	1.701	1.674	1.675
		600.0	1.711	1.684	1.685

		610.0	1.706	1.678	1.680
		620.0	1.711	1.683	1.684
		630.0	1.696	1.668	1.667
		640.0	1.677	1.648	1.648
		650.0	1.711	1.682	1.682
		660.0	1.649	1.619	1.616
		680.0	1.663	1.632	1.629
		690.0	1.706	1.675	1.677
		700.0	1.701	1.669	1.671
		710.0	1.706	1.674	1.674
		720.0	1.715	1.683	1.683
		730.0	1.720	1.687	1.687
		740.0	1.725	1.692	1.691
		750.0	1.725	1.691	1.691
		760.0	1.711	1.677	1.677
		770.0	1.715	1.680	1.680
		780.0	1.711	1.676	1.676
		790.0	1.711	1.675	1.676
		800.0	1.730	1.694	1.696
		810.0	1.720	1.683	1.685
		820.0	1.715	1.678	1.678
		830.0	1.715	1.678	1.676
		840.0	1.711	1.673	1.672
		850.0	1.720	1.682	1.681
		860.0	1.725	1.686	1.685
		870.0	1.730	1.691	1.689
		880.0	1.730	1.690	1.689
		890.0	1.739	1.699	1.699
		900.0	1.735	1.694	1.695
	06:00	910.0	1.725	1.684	1.685
		920.0	1.720	1.679	1.679
		930.0	1.715	1.673	1.673
		940.0	1.715	1.673	1.674
		950.0	1.715	1.672	1.673
		960.0	1.720	1.677	1.677
		970.0	1.715	1.671	1.671
		980.0	1.706	1.662	1.662
		990.0	1.715	1.670	1.670
		1000.0	1.715	1.670	1.670
		1030.0	1.715	1.669	1.669
		1060.0	1.711	1.663	1.663
		1090.0	1.711	1.662	1.662
		1120.0	1.715	1.664	1.664
		1150.0	1.730	1.678	1.677
		1180.0	1.730	1.677	1.676
		1210.0	1.725	1.670	1.670

			1240.0	1.735	1.679	1.679
		12:00	1270.0	1.739	1.682	1.681
			1300.0	1.725	1.666	1.666
			1330.0	1.749	1.689	1.689
			1360.0	1.744	1.683	1.682
			1390.0	1.744	1.681	1.681
			1420.0	1.744	1.680	1.680
			1450.0	1.735	1.670	1.670
			1480.0	1.754	1.687	1.687
			1510.0	1.725	1.657	1.656
			1540.0	1.739	1.670	1.669
			1570.0	1.735	1.664	1.664
			1600.0	1.730	1.658	1.658
		18:00	1630.0	1.725	1.651	1.651
			1660.0	1.735	1.660	1.660
			1690.0	1.725	1.649	1.649
			1720.0	1.725	1.647	1.647
			1750.0	1.730	1.651	1.651
			1780.0	1.739	1.659	1.658
			1810.0	1.720	1.638	1.639
			1840.0	1.735	1.652	1.653
			1870.0	1.725	1.641	1.641
			1900.0	1.735	1.649	1.649
			1930.0	1.735	1.648	1.647
			1960.0	1.735	1.647	1.646
	17-Jul	00:00	1990.0	1.735	1.645	1.645
			2020.0	1.749	1.658	1.658
			2050.0	1.739	1.647	1.646
			2080.0	1.735	1.641	1.641
			2110.0	1.730	1.635	1.635
			2140.0	1.735	1.638	1.638
			2170.0	1.730	1.632	1.632
			2200.0	1.725	1.626	1.627
			2230.0	1.725	1.624	1.625
			2260.0	1.715	1.613	1.613
			2290.0	1.720	1.617	1.617
			2320.0	1.730	1.625	1.625
		06:00	2350.0	1.730	1.624	1.624
			2380.0	1.754	1.647	1.646
			2410.0	1.787	1.678	1.678
			2440.0	1.801	1.691	1.690
			2470.0	1.811	1.700	1.699
			2500.0	1.820	1.707	1.706
			2530.0	1.825	1.711	1.710
			2560.0	1.830	1.715	1.715
			2590.0	1.825	1.708	1.708

		2620.0	1.811	1.693	1.692
		2650.0	1.835	1.715	1.715
		2680.0	1.825	1.704	1.704
	12:00	2710.0	1.830	1.708	1.708
		2740.0	1.825	1.701	1.701
		2770.0	1.844	1.719	1.718
		2800.0	1.839	1.713	1.712
		2830.0	1.839	1.711	1.712
		2860.0	1.825	1.696	1.696
		2890.0	1.839	1.709	1.708
		2920.0	1.844	1.712	1.712
		2950.0	1.839	1.706	1.706
		2980.0	1.830	1.696	1.696
		3010.0	1.825	1.689	1.689
		3040.0	1.825	1.688	1.688
	18:00	3070.0	1.830	1.692	1.692
		3100.0	1.816	1.676	1.676
		3130.0	1.820	1.679	1.679
		3160.0	1.825	1.682	1.682
		3190.0	1.830	1.686	1.685
		3220.0	1.835	1.690	1.690
		3250.0	1.820	1.673	1.673
		3280.0	1.830	1.682	1.681
		3310.0	1.830	1.681	1.680
		3340.0	1.835	1.684	1.683
		3370.0	1.835	1.683	1.682
		3400.0	1.839	1.686	1.685
18-Jul	00:00	3430.0	1.839	1.684	1.684
		3460.0	1.825	1.669	1.669
		3490.0	1.854	1.697	1.696
		3520.0	1.835	1.676	1.676
		3550.0	1.830	1.670	1.669
		3580.0	1.830	1.669	1.669
		3610.0	1.839	1.676	1.677
		3640.0	1.844	1.680	1.680
		3670.0	1.835	1.669	1.669
		3700.0	1.839	1.672	1.672
		3730.0	1.839	1.671	1.670
		3760.0	1.839	1.669	1.669
	06:00	3790.0	1.849	1.678	1.678
		3820.0	1.839	1.667	1.666
		3850.0	1.844	1.670	1.670
		3880.0	1.854	1.679	1.679
		3910.0	1.849	1.673	1.672
		3940.0	1.839	1.661	1.660
		3970.0	1.858	1.679	1.678

		4000.0	1.844	1.664	1.663
		4030.0	1.854	1.672	1.672
		4060.0	1.849	1.666	1.665
		4090.0	1.849	1.665	1.665
		4120.0	1.868	1.682	1.682
	12:00	4150.0	1.858	1.671	1.670
		4180.0	1.858	1.669	1.669
		4210.0	1.863	1.673	1.673
		4240.0	1.854	1.663	1.663
		4270.0	1.849	1.656	1.656
		4300.0	1.854	1.660	1.661
		4330.0	1.849	1.654	1.654
		4360.0	1.858	1.661	1.661
		4390.0	1.844	1.646	1.647
		4420.0	1.849	1.650	1.650
		4450.0	1.839	1.638	1.639
		4480.0	1.835	1.633	1.633
	18:00	4510.0	1.844	1.641	1.641
		4540.0	1.830	1.625	1.626
		4570.0	1.830	1.624	1.624
		4600.0	1.830	1.623	1.623
		4630.0	1.820	1.611	1.612
		4660.0	1.825	1.615	1.615
		4690.0	1.830	1.618	1.618
		4720.0	1.825	1.612	1.612
		4750.0	1.825	1.611	1.611
		4780.0	1.839	1.623	1.623
		4810.0	1.839	1.622	1.622
		4840.0	1.854	1.636	1.635
19-Jul	00:00	4870.0	1.849	1.629	1.628
		4900.0	1.844	1.623	1.622
		4930.0	1.839	1.617	1.617
		4960.0	1.844	1.620	1.621
		4990.0	1.844	1.619	1.619
		5020.0	1.839	1.613	1.612
		5050.0	1.844	1.616	1.616
		5080.0	1.835	1.606	1.607
		5110.0	1.849	1.619	1.619
		5140.0	1.849	1.617	1.618
		5170.0	1.844	1.611	1.611
		5200.0	1.863	1.628	1.628
	06:00	5230.0	1.839	1.603	1.603
		5260.0	1.849	1.612	1.612
		5290.0	1.849	1.610	1.610
		5320.0	1.854	1.614	1.613
		5350.0	1.868	1.627	1.627

		5380.0	1.878	1.635	1.635
		5410.0	1.887	1.643	1.643
		5440.0	1.882	1.637	1.637
		5470.0	1.882	1.635	1.635
		5500.0	1.887	1.639	1.639
		5530.0	1.887	1.638	1.638
		5560.0	1.897	1.646	1.647
	12:00	5590.0	1.901	1.649	1.650
		5620.0	1.911	1.658	1.658
		5650.0	1.920	1.665	1.665
		5680.0	1.911	1.655	1.655
		5710.0	1.906	1.648	1.648
		5740.0	1.925	1.666	1.666
	15:00	5770.0	1.920	1.660	1.660

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 19, 1992

Project No.: 07029.00

Well Locaton: P-4

Personnel: J.A. Duwelius

Pumping Rate: Recovery

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
19-Jul	15:02	0.0	1.925	1.925	1.925
		0.0083	1.925	1.925	1.925
		0.0166	1.916	1.916	1.916
		0.0250	1.920	1.920	1.920
		0.0333	1.925	1.925	1.925
		0.0416	1.920	1.920	1.920
		0.0500	1.920	1.920	1.920
		0.0583	1.930	1.930	1.930
		0.0666	1.916	1.916	1.916
		0.0750	1.920	1.920	1.920
		0.0833	1.930	1.930	1.930
		0.1000	1.930	1.930	1.930
		0.1166	1.920	1.920	1.920
		0.1333	1.930	1.930	1.930
		0.1500	1.925	1.925	1.925
		0.1666	1.920	1.920	1.920
		0.1833	1.925	1.925	1.925
		0.2000	1.916	1.916	1.916
		0.2166	1.911	1.911	1.911
		0.2333	1.925	1.925	1.925
		0.2500	1.916	1.916	1.916
		0.2666	1.920	1.920	1.920
		0.2833	1.930	1.930	1.930
		0.3000	1.925	1.925	1.925
		0.3166	1.920	1.920	1.920
		0.3333	1.930	1.930	1.930
		0.4166	1.916	1.916	1.916
		0.5000	1.916	1.916	1.916
		0.5833	1.911	1.911	1.911
		0.6666	1.901	1.901	1.901
		0.7500	1.901	1.901	1.901

			0.8333	1.897	1.897	1.897
			0.9166	1.878	1.878	1.878
		15:03	1.0000	1.873	1.873	1.873
			1.0833	1.868	1.868	1.868
			1.1666	1.858	1.858	1.858
			1.2500	1.854	1.854	1.854
			1.3333	1.839	1.839	1.839
			1.4166	1.820	1.820	1.820
			1.5000	1.806	1.806	1.806
			1.5833	1.796	1.796	1.796
			1.6666	1.777	1.777	1.777
			1.7500	1.773	1.773	1.773
			1.8333	1.773	1.773	1.773
			1.9166	1.744	1.744	1.744
		15:04	2	1.720	1.720	1.720
			2.5	1.639	1.639	1.639
		15:05	3	1.549	1.549	1.549
			3.5	1.463	1.463	1.463
			4	1.391	1.391	1.391
			4.5	1.320	1.320	1.320
			5	1.272	1.272	1.272
			5.5	1.210	1.210	1.210
			6	1.158	1.158	1.158
			6.5	1.124	1.124	1.124
			7	1.086	1.086	1.086
			7.5	1.058	1.058	1.058
		15:10	8	1.034	1.034	1.034
			8.5	0.996	0.996	0.996
			9	0.986	0.986	0.986
			9.5	0.962	0.962	0.962
			10	0.939	0.939	0.939
			12	0.872	0.871	0.871
			14	0.805	0.804	0.804
			16	0.753	0.752	0.752
		15:20	18	0.729	0.728	0.728
			20	0.686	0.685	0.685
			22	0.662	0.661	0.661
			24	0.638	0.637	0.637
			26	0.595	0.594	0.594
		15:30	28	0.581	0.580	0.580
			30	0.567	0.566	0.566
			32	0.538	0.537	0.537
			34	0.519	0.517	0.517
			36	0.514	0.512	0.512
		15:40	38	0.500	0.498	0.498
			40	0.481	0.479	0.479

			42	0.457	0.455	0.455
			44	0.462	0.460	0.460
			46	0.452	0.450	0.450
		15:50	48	0.438	0.436	0.436
			50	0.414	0.412	0.412
			52	0.409	0.407	0.407
			54	0.400	0.398	0.398
			56	0.390	0.387	0.387
		16:00	58	0.376	0.373	0.373
			60	0.357	0.354	0.354
			62	0.371	0.368	0.368
			64	0.348	0.345	0.345
			66	0.338	0.335	0.335
		16:10	68	0.357	0.354	0.354
			70	0.314	0.311	0.311
			72	0.314	0.311	0.311
			74	0.314	0.311	0.311
			76	0.309	0.306	0.306
		16:20	78	0.300	0.296	0.296
			80	0.286	0.282	0.282
			82	0.290	0.286	0.286
			84	0.276	0.272	0.272
			86	0.276	0.272	0.272
		16:30	88	0.276	0.272	0.272
			90	0.257	0.253	0.253
			92	0.257	0.253	0.253
			94	0.266	0.262	0.262
			96	0.257	0.253	0.253
		16:40	98	0.243	0.239	0.239
			100	0.247	0.242	0.242
			110	0.219	0.214	0.214
		17:02	120	0.200	0.195	0.195
			130	0.195	0.189	0.189
			140	0.181	0.175	0.175
			150	0.176	0.169	0.169
			160	0.162	0.155	0.155
			170	0.166	0.158	0.158
		18:02	180	0.128	0.120	0.120
			190	0.143	0.134	0.134
			200	0.143	0.134	0.134
			210	0.128	0.119	0.119
			220	0.138	0.128	0.128
			230	0.133	0.123	0.123
		19:02	240	0.119	0.108	0.108
			250	0.119	0.108	0.108
			260	0.123	0.111	0.111

			270	0.123	0.111	0.111
			280	0.109	0.096	0.096
			290	0.119	0.106	0.106
		20:02	300	0.114	0.100	0.100
			310	0.119	0.105	0.105
			320	0.100	0.086	0.086
			330	0.100	0.085	0.085
			340	0.109	0.094	0.094
			350	0.104	0.088	0.088
		21:02	360	0.104	0.088	0.088
			370	0.090	0.073	0.073
			380	0.100	0.083	0.083
			390	0.104	0.086	0.086
			400	0.095	0.077	0.077
			410	0.100	0.082	0.082
		22:02	420	0.085	0.066	0.066
			430	0.085	0.066	0.066
			440	0.100	0.080	0.080
			450	0.081	0.061	0.061
			460	0.095	0.074	0.074
			470	0.081	0.060	0.060
		23:02	480	0.090	0.068	0.068
			490	0.085	0.063	0.063
			500	0.095	0.072	0.072
			510	0.085	0.062	0.062
			520	0.090	0.067	0.067
			530	0.085	0.061	0.061
	20-Jul	00:02	540	0.090	0.066	0.066
			550	0.076	0.051	0.051
			560	0.081	0.056	0.056
			570	0.085	0.059	0.059
			580	0.081	0.055	0.055
			590	0.085	0.058	0.058
		01:02	600	0.081	0.054	0.054
			610	0.090	0.062	0.062
			620	0.085	0.057	0.057
			630	0.085	0.057	0.057
			640	0.085	0.056	0.056
			650	0.081	0.052	0.052
		02:02	660	0.081	0.051	0.051
			670	0.085	0.055	0.055
			680	0.076	0.045	0.045
			690	0.071	0.040	0.040
			700	0.066	0.034	0.034
			710	0.085	0.053	0.053
		03:02	720	0.061	0.029	0.029

		730	0.066	0.033	0.033
		740	0.066	0.033	0.033
		750	0.061	0.027	0.027
		760	0.071	0.037	0.037
		770	0.066	0.031	0.031
	04:02	780	0.061	0.026	0.026
		790	0.052	0.016	0.016
		800	0.052	0.016	0.016
		810	0.057	0.020	0.020
		820	0.066	0.029	0.029
		830	0.061	0.024	0.024
	05:02	840	0.066	0.028	0.028
		850	0.066	0.028	0.028
		860	0.071	0.032	0.032
		870	0.066	0.027	0.027
		880	0.071	0.031	0.031
		890	0.076	0.036	0.036
	06:02	900	0.076	0.035	0.035
		910	0.071	0.030	0.030
		920	0.076	0.035	0.035
		930	0.071	0.029	0.029
		940	0.076	0.034	0.034
		950	0.071	0.028	0.028
	07:02	960	0.071	0.028	0.028
		970	0.076	0.032	0.032
		980	0.076	0.032	0.032
		990	-0.157	-0.202	-0.202
		1000	-0.033	-0.078	-0.078
	08:12	1030	0.052	0.006	0.006
		1060	0.066	0.018	0.018
	09:12	1090	0.090	0.041	0.041
		1120	0.081	0.030	0.030
	10:12	1150	0.071	0.019	0.019

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: P-5

Personnel: J.A. Duwelius

Pumping Rate: 40 gpm

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
15-Jul	14:50	0.0	0.004	0.004	0.004
		1.0000	0.019	0.019	0.019
		1.0833	0.023	0.023	0.023
		1.1666	0.038	0.038	0.038
		1.2500	0.052	0.052	0.052
		1.3333	0.071	0.071	0.071
		1.4166	0.090	0.090	0.090
		1.5000	0.109	0.109	0.109
		1.5833	0.123	0.123	0.123
		1.6666	0.138	0.138	0.138
		1.7500	0.157	0.157	0.157
		1.8333	0.176	0.176	0.176
		1.9166	0.190	0.190	0.190
		2.0	0.204	0.204	0.204
		2.5	0.319	0.319	0.319
		3.0	0.400	0.400	0.400
		3.5	0.462	0.462	0.462
		4.0	0.514	0.514	0.514
		4.5	0.562	0.562	0.562
		5.0	0.595	0.595	0.595
		5.5	0.633	0.633	0.633
		6.0	0.671	0.671	0.671
		6.5	0.705	0.705	0.705
		7.0	0.729	0.729	0.729
		7.5	0.762	0.762	0.762
		8.0	0.791	0.791	0.791
		8.5	0.805	0.805	0.805
		9.0	0.824	0.824	0.824
		9.5	0.848	0.848	0.848
	15:00	10.0	0.867	0.867	0.867
		12.0	0.924	0.923	0.923

		14.0	0.981	0.980	0.980
		16.0	1.029	1.028	1.028
		18.0	1.062	1.061	1.061
		20.0	1.091	1.090	1.090
		22.0	1.129	1.128	1.128
		24.0	1.143	1.142	1.142
		26.0	1.172	1.171	1.171
		28.0	1.210	1.209	1.209
		30.0	1.200	1.199	1.199
		32.0	1.224	1.223	1.223
		34.0	1.234	1.232	1.232
		36.0	1.262	1.260	1.260
		38.0	1.277	1.275	1.275
		40.0	1.277	1.275	1.275
		42.0	1.296	1.294	1.294
		44.0	1.291	1.289	1.289
		46.0	1.305	1.303	1.303
		48.0	1.315	1.313	1.313
		50.0	1.324	1.322	1.322
		52.0	1.324	1.322	1.322
		54.0	1.329	1.327	1.327
		56.0	1.343	1.340	1.340
		58.0	1.348	1.345	1.345
		60.0	1.343	1.340	1.340
		62.0	1.358	1.355	1.355
		64.0	1.358	1.355	1.355
		66.0	1.372	1.369	1.369
		68.0	1.372	1.369	1.369
		70.0	1.377	1.374	1.374
		72.0	1.381	1.378	1.378
		74.0	1.381	1.378	1.378
		76.0	1.377	1.374	1.374
		78.0	1.386	1.382	1.382
		80.0	1.391	1.387	1.387
		82.0	1.400	1.396	1.396
		84.0	1.400	1.396	1.396
		86.0	1.405	1.401	1.401
		88.0	1.391	1.387	1.387
		90.0	1.396	1.392	1.392
		92.0	1.400	1.396	1.396
		94.0	1.415	1.411	1.411
		96.0	1.405	1.401	1.401
		98.0	1.410	1.406	1.406
		100.0	1.410	1.405	1.405
		110.0	1.410	1.405	1.405
		120.0	1.419	1.414	1.414

		130.0	1.434	1.428	1.428
		140.0	1.434	1.428	1.428
		150.0	1.439	1.432	1.432
		160.0	1.448	1.441	1.441
		170.0	1.462	1.454	1.454
		180.0	1.443	1.435	1.435
		190.0	1.458	1.449	1.449
		200.0	1.453	1.444	1.444
		210.0	1.467	1.458	1.458
		220.0	1.467	1.457	1.457
		230.0	1.467	1.457	1.457
		240.0	1.458	1.447	1.447
		250.0	1.472	1.461	1.461
		260.0	1.467	1.455	1.455
		270.0	1.477	1.465	1.465
		280.0	1.486	1.473	1.473
		290.0	1.462	1.449	1.449
		300.0	1.486	1.472	1.472
		310.0	1.477	1.463	1.463
		320.0	1.472	1.458	1.458
		330.0	1.481	1.466	1.466
		340.0	1.477	1.462	1.462
		350.0	1.477	1.461	1.461
		360.0	1.472	1.456	1.456
		370.0	1.486	1.469	1.469
		380.0	1.477	1.460	1.460
		390.0	1.491	1.473	1.473
		400.0	1.486	1.468	1.468
		410.0	1.491	1.473	1.473
		420.0	1.500	1.481	1.481
		430.0	1.510	1.491	1.491
		440.0	1.496	1.476	1.476
		450.0	1.500	1.480	1.480
		460.0	1.496	1.475	1.475
		470.0	1.510	1.489	1.489
		480.0	1.505	1.483	1.483
		490.0	1.505	1.483	1.483
		500.0	1.510	1.487	1.487
		510.0	1.515	1.492	1.492
		520.0	1.510	1.487	1.487
		530.0	1.510	1.486	1.486
		540.0	1.510	1.486	1.486
16-Jul	00:00	550.0	1.515	1.490	1.490
		560.0	1.520	1.495	1.495
		570.0	1.515	1.489	1.489
		580.0	1.515	1.489	1.489

		590.0	1.496	1.469	1.469
		600.0	1.496	1.469	1.469
		610.0	1.510	1.482	1.482
		620.0	1.500	1.472	1.472
		630.0	1.496	1.468	1.468
		640.0	1.481	1.452	1.452
		650.0	1.510	1.481	1.481
		660.0	1.496	1.466	1.466
		670.0	1.472	1.442	1.442
		680.0	1.472	1.441	1.441
		690.0	1.481	1.450	1.450
		700.0	1.486	1.454	1.454
		710.0	1.486	1.454	1.454
		720.0	1.481	1.449	1.449
		730.0	1.496	1.463	1.463
		740.0	1.496	1.463	1.463
		750.0	1.491	1.457	1.457
		760.0	1.486	1.452	1.452
		770.0	1.491	1.456	1.456
		780.0	1.496	1.461	1.461
		790.0	1.486	1.450	1.450
		800.0	1.486	1.450	1.450
		810.0	1.491	1.454	1.454
		820.0	1.486	1.449	1.449
		830.0	1.491	1.454	1.454
		840.0	1.496	1.458	1.458
		850.0	1.505	1.467	1.467
		860.0	1.510	1.471	1.471
		870.0	1.505	1.466	1.466
		880.0	1.510	1.470	1.470
		890.0	1.505	1.465	1.465
		900.0	1.510	1.469	1.469
	06:00	910.0	1.505	1.464	1.464
		920.0	1.505	1.464	1.464
		930.0	1.510	1.468	1.468
		940.0	1.500	1.458	1.458
		950.0	1.510	1.467	1.467
		960.0	1.505	1.462	1.462
		970.0	1.496	1.452	1.452
		980.0	1.496	1.452	1.452
		990.0	1.505	1.460	1.460
		1000.0	1.505	1.460	1.460
		1030.0	1.500	1.454	1.454
		1060.0	1.510	1.462	1.462
		1090.0	1.510	1.461	1.461
		1120.0	1.515	1.464	1.464

		1150.0	1.500	1.448	1.448
		1180.0	1.505	1.452	1.452
		1210.0	1.515	1.460	1.460
		1240.0	1.520	1.464	1.464
	12:00	1270.0	1.529	1.472	1.472
		1300.0	1.524	1.465	1.465
		1330.0	1.534	1.474	1.474
		1360.0	1.529	1.468	1.468
		1390.0	1.524	1.461	1.461
		1420.0	1.548	1.484	1.484
		1450.0	1.534	1.469	1.469
		1480.0	1.543	1.476	1.476
		1510.0	1.520	1.452	1.452
		1540.0	1.534	1.465	1.465
		1570.0	1.529	1.458	1.458
		1600.0	1.529	1.457	1.457
	18:00	1630.0	1.529	1.455	1.455
		1660.0	1.539	1.464	1.464
		1690.0	1.520	1.444	1.444
		1720.0	1.529	1.451	1.451
		1750.0	1.534	1.455	1.455
		1780.0	1.539	1.459	1.459
		1810.0	1.529	1.447	1.447
		1840.0	1.529	1.446	1.446
		1870.0	1.539	1.455	1.455
		1900.0	1.529	1.443	1.443
		1930.0	1.529	1.442	1.442
		1960.0	1.534	1.446	1.446
17-Jul	00:00	1990.0	1.543	1.453	1.453
		2020.0	1.543	1.452	1.452
		2050.0	1.558	1.466	1.466
		2080.0	1.553	1.459	1.459
		2110.0	1.548	1.453	1.453
		2140.0	1.548	1.451	1.451
		2170.0	1.529	1.431	1.431
		2200.0	1.539	1.440	1.440
		2230.0	1.534	1.433	1.433
		2260.0	1.524	1.422	1.422
		2290.0	1.524	1.421	1.421
		2320.0	1.539	1.434	1.434
	06:00	2350.0	1.539	1.433	1.433
		2380.0	1.567	1.460	1.460
		2410.0	1.600	1.491	1.491
		2440.0	1.610	1.500	1.500
		2470.0	1.610	1.499	1.499
		2500.0	1.620	1.507	1.507

		2530.0	1.620	1.506	1.506
		2560.0	1.624	1.509	1.509
		2590.0	1.629	1.512	1.512
		2620.0	1.605	1.487	1.487
		2650.0	1.629	1.509	1.509
		2680.0	1.629	1.508	1.508
	12:00	2710.0	1.629	1.507	1.507
		2740.0	1.624	1.500	1.500
		2770.0	1.639	1.514	1.514
		2800.0	1.629	1.503	1.503
		2830.0	1.639	1.511	1.511
		2860.0	1.639	1.510	1.510
		2890.0	1.639	1.509	1.509
		2920.0	1.643	1.511	1.511
		2950.0	1.624	1.491	1.491
		2980.0	1.620	1.486	1.486
		3010.0	1.615	1.479	1.479
		3040.0	1.620	1.483	1.483
		3070.0	1.620	1.482	1.482
		3100.0	1.624	1.484	1.484
		3130.0	1.624	1.483	1.483
		3160.0	1.629	1.486	1.486
		3190.0	1.629	1.485	1.485
		3220.0	1.639	1.494	1.494
		3250.0	1.648	1.501	1.501
		3280.0	1.639	1.491	1.491
		3310.0	1.643	1.494	1.494
		3340.0	1.648	1.497	1.497
		3370.0	1.653	1.501	1.501
		3400.0	1.658	1.505	1.505
18-Jul	00:00	3430.0	1.643	1.488	1.488
		3460.0	1.639	1.483	1.483
		3490.0	1.653	1.496	1.496
		3520.0	1.648	1.489	1.489
		3550.0	1.639	1.479	1.479
		3580.0	1.643	1.482	1.482
		3610.0	1.648	1.485	1.485
		3640.0	1.648	1.484	1.484
		3670.0	1.643	1.477	1.477
		3700.0	1.648	1.481	1.481
		3730.0	1.643	1.475	1.475
	06:00	3760.0	1.639	1.469	1.469
		3790.0	1.648	1.477	1.477
		3820.0	1.648	1.476	1.476
		3850.0	1.653	1.479	1.479
		3880.0	1.653	1.478	1.478

		3910.0	1.658	1.482	1.482
		3940.0	1.672	1.494	1.494
		3970.0	1.667	1.488	1.488
		4000.0	1.653	1.473	1.473
		4030.0	1.653	1.471	1.471
		4060.0	1.648	1.465	1.465
		4090.0	1.662	1.478	1.478
		4120.0	1.653	1.467	1.467
	12:00	4150.0	1.653	1.466	1.466
		4180.0	1.667	1.478	1.478
		4210.0	1.639	1.449	1.449
		4240.0	1.653	1.462	1.462
		4270.0	1.653	1.460	1.460
		4300.0	1.643	1.449	1.449
		4330.0	1.648	1.453	1.453
		4360.0	1.658	1.461	1.461
		4390.0	1.653	1.455	1.455
		4420.0	1.643	1.444	1.444
		4450.0	1.658	1.457	1.457
		4480.0	1.639	1.437	1.437
	18:00	4510.0	1.643	1.440	1.440
		4540.0	1.629	1.424	1.424
		4570.0	1.629	1.423	1.423
		4600.0	1.639	1.432	1.432
		4630.0	1.629	1.420	1.420
		4660.0	1.643	1.433	1.433
		4690.0	1.634	1.422	1.422
		4720.0	1.639	1.426	1.426
		4750.0	1.634	1.420	1.420
		4780.0	1.648	1.432	1.432
		4810.0	1.662	1.445	1.445
		4840.0	1.653	1.435	1.435
19-Jul	00:00	4870.0	1.658	1.438	1.438
		4900.0	1.653	1.432	1.432
		4930.0	1.653	1.431	1.431
		4960.0	1.648	1.424	1.424
		4990.0	1.653	1.428	1.428
		5020.0	1.653	1.427	1.427
		5050.0	1.658	1.430	1.430
		5080.0	1.648	1.419	1.419
		5110.0	1.653	1.423	1.423
		5140.0	1.653	1.421	1.421
		5170.0	1.643	1.410	1.410
		5200.0	1.653	1.418	1.418
	06:00	5230.0	1.648	1.412	1.412
		5260.0	1.653	1.416	1.416

		5290.0	1.653	1.414	1.414
		5320.0	1.653	1.413	1.413
		5350.0	1.672	1.431	1.431
		5380.0	1.681	1.438	1.438
		5410.0	1.686	1.442	1.442
		5440.0	1.691	1.446	1.446
		5470.0	1.691	1.444	1.444
		5500.0	1.691	1.443	1.443
		5530.0	1.696	1.447	1.447
		5560.0	1.681	1.430	1.430
	12:00	5590.0	1.696	1.444	1.444
		5620.0	1.715	1.462	1.462
		5650.0	1.720	1.465	1.465
		5680.0	1.715	1.459	1.459
		5710.0	1.734	1.476	1.476
		5740.0	1.729	1.470	1.470
	15:00	5770.0	1.734	1.474	1.474

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 19, 1992

Project No.: 07029.00

Well Locaton: P-5

Personnel: J.A. Duwelius

Pumping Rate: Recovery

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
19-Jul	15:02	0.0	1.739	1.739	1.739
		0.0083	1.739	1.739	1.739
		0.0166	1.739	1.739	1.739
		0.0250	1.739	1.739	1.739
		0.0333	1.734	1.734	1.734
		0.0416	1.739	1.739	1.739
		0.0500	1.739	1.739	1.739
		0.0583	1.739	1.739	1.739
		0.0666	1.748	1.748	1.748
		0.0750	1.743	1.743	1.743
		0.0833	1.739	1.739	1.739
		0.1000	1.743	1.743	1.743
		0.1166	1.739	1.739	1.739
		0.1333	1.739	1.739	1.739
		0.1500	1.743	1.743	1.743
		0.1666	1.743	1.743	1.743
		0.1833	1.739	1.739	1.739
		0.2000	1.739	1.739	1.739
		0.2166	1.734	1.734	1.734
		0.2333	1.743	1.743	1.743
		0.2500	1.739	1.739	1.739
		0.2666	1.739	1.739	1.739
		0.2833	1.739	1.739	1.739
		0.3000	1.739	1.739	1.739
		0.3166	1.743	1.743	1.743
		0.3333	1.743	1.743	1.743
		0.4166	1.729	1.729	1.729
		0.5000	1.729	1.729	1.729
		0.5833	1.720	1.720	1.720
		0.6666	1.710	1.710	1.710
		0.7500	1.696	1.696	1.696

			0.8333	1.691	1.691	1.691
			0.9166	1.677	1.677	1.677
		15:03	1.0000	1.662	1.662	1.662
			1.0833	1.653	1.653	1.653
			1.1666	1.634	1.634	1.634
			1.2500	1.620	1.620	1.620
			1.3333	1.610	1.610	1.610
			1.4166	1.591	1.591	1.591
			1.5000	1.567	1.567	1.567
			1.5833	1.558	1.558	1.558
			1.6666	1.534	1.534	1.534
			1.7500	1.520	1.520	1.520
			1.8333	1.505	1.505	1.505
			1.9166	1.486	1.486	1.486
		15:04	2	1.477	1.477	1.477
			2.5	1.396	1.396	1.396
		15:05	3	1.319	1.319	1.319
			3.5	1.262	1.262	1.262
			4	1.215	1.215	1.215
			4.5	1.176	1.176	1.176
			5	1.134	1.134	1.134
			5.5	1.105	1.105	1.105
			6	1.067	1.067	1.067
			6.5	1.029	1.029	1.029
			7	1.005	1.005	1.005
			7.5	0.991	0.991	0.991
		15:10	8	0.967	0.967	0.967
			8.5	0.953	0.953	0.953
			9	0.929	0.929	0.929
			9.5	0.905	0.905	0.905
			10	0.886	0.886	0.886
			12	0.814	0.813	0.813
			14	0.757	0.756	0.756
			16	0.705	0.704	0.704
		15:20	18	0.662	0.661	0.661
			20	0.633	0.632	0.632
			22	0.595	0.594	0.594
			24	0.571	0.570	0.570
			26	0.543	0.542	0.542
		15:30	28	0.519	0.518	0.518
			30	0.500	0.499	0.499
			32	0.467	0.466	0.466
			34	0.457	0.455	0.455
			36	0.447	0.445	0.445
		15:40	38	0.433	0.431	0.431
			40	0.409	0.407	0.407

			42	0.409	0.407	0.407
			44	0.390	0.388	0.388
			46	0.381	0.379	0.379
		15:50	48	0.362	0.360	0.360
			50	0.347	0.345	0.345
			52	0.338	0.336	0.336
			54	0.328	0.326	0.326
			56	0.319	0.316	0.316
		16:00	58	0.309	0.306	0.306
			60	0.300	0.297	0.297
			62	0.295	0.292	0.292
			64	0.281	0.278	0.278
			66	0.281	0.278	0.278
		16:10	68	0.281	0.278	0.278
			70	0.262	0.259	0.259
			72	0.262	0.259	0.259
			74	0.262	0.259	0.259
			76	0.252	0.249	0.249
		16:20	78	0.252	0.248	0.248
			80	0.243	0.239	0.239
			82	0.238	0.234	0.234
			84	0.233	0.229	0.229
			86	0.233	0.229	0.229
		16:30	88	0.238	0.234	0.234
			90	0.219	0.215	0.215
			92	0.223	0.219	0.219
			94	0.219	0.215	0.215
			96	0.219	0.215	0.215
		16:40	98	0.214	0.210	0.210
			100	0.209	0.204	0.204
			110	0.204	0.199	0.199
		17:02	120	0.185	0.180	0.180
			130	0.181	0.175	0.175
			140	0.171	0.165	0.165
			150	0.171	0.164	0.164
			160	0.157	0.150	0.150
			170	0.157	0.149	0.149
		18:02	180	0.147	0.139	0.139
			190	0.152	0.143	0.143
			200	0.157	0.148	0.148
			210	0.138	0.129	0.129
			220	0.152	0.142	0.142
			230	0.147	0.137	0.137
		19:02	240	0.138	0.127	0.127
			250	0.128	0.117	0.117
			260	0.142	0.130	0.130

			270	0.123	0.111	0.111
			280	0.133	0.120	0.120
			290	0.133	0.120	0.120
		20:02	300	0.128	0.114	0.114
			310	0.142	0.128	0.128
			320	0.128	0.114	0.114
			330	0.128	0.113	0.113
			340	0.133	0.118	0.118
			350	0.128	0.112	0.112
		21:02	360	0.128	0.112	0.112
			370	0.119	0.102	0.102
			380	0.123	0.106	0.106
			390	0.119	0.101	0.101
			400	0.123	0.105	0.105
			410	0.123	0.105	0.105
		22:02	420	0.128	0.109	0.109
			430	0.119	0.100	0.100
			440	0.128	0.108	0.108
			450	0.123	0.103	0.103
			460	0.119	0.098	0.098
			470	0.109	0.088	0.088
		23:02	480	0.123	0.101	0.101
			490	0.123	0.101	0.101
			500	0.109	0.086	0.086
			510	0.123	0.100	0.100
			520	0.119	0.096	0.096
			530	0.114	0.090	0.090
	20-Jul	00:02	540	0.123	0.099	0.099
			550	0.114	0.089	0.089
			560	0.119	0.094	0.094
			570	0.119	0.093	0.093
			580	0.119	0.093	0.093
			590	0.119	0.092	0.092
		01:02	600	0.123	0.096	0.096
			610	0.123	0.095	0.095
			620	0.100	0.072	0.072
			630	0.109	0.081	0.081
			640	0.114	0.085	0.085
			650	0.114	0.085	0.085
		02:02	660	0.109	0.079	0.079
			670	0.104	0.074	0.074
			680	0.100	0.069	0.069
			690	0.104	0.073	0.073
			700	0.104	0.072	0.072
			710	0.114	0.082	0.082
		03:02	720	0.095	0.063	0.063

		730	0.100	0.067	0.067
		740	0.100	0.067	0.067
		750	0.095	0.061	0.061
		760	0.109	0.075	0.075
		770	0.085	0.050	0.050
	04:02	780	0.090	0.055	0.055
		790	0.090	0.054	0.054
		800	0.095	0.059	0.059
		810	0.090	0.053	0.053
		820	0.100	0.063	0.063
		830	0.100	0.063	0.063
	05:02	840	0.095	0.057	0.057
		850	0.100	0.062	0.062
		860	0.100	0.061	0.061
		870	0.095	0.056	0.056
		880	0.104	0.064	0.064
		890	0.090	0.050	0.050
	06:02	900	0.095	0.054	0.054
		910	0.090	0.049	0.049
		920	0.104	0.063	0.063
		930	0.100	0.058	0.058
		940	0.109	0.067	0.067
		950	0.100	0.057	0.057
	07:02	960	0.104	0.061	0.061
		970	0.114	0.070	0.070
		980	0.114	0.070	0.070
		990	0.109	0.064	0.064
		1000	0.100	0.055	0.055
	08:12	1030	0.100	0.054	0.054
		1060	0.100	0.052	0.052
	09:12	1090	0.119	0.070	0.070
		1120	0.095	0.044	0.044
	10:12	1150	0.090	0.038	0.038

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 15, 1992

Project No.: 07029.00

Well Locaton: P-6

Personnel: J.A. Duwelius

Pumping Rate: 40 gpm

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
15-Jul	14:50	0.0	0.004	0.004	0.004
		1.2500	0.014	0.014	0.014
		1.3333	0.014	0.014	0.014
		1.4166	0.028	0.028	0.028
		1.5000	0.033	0.033	0.033
		1.5833	0.042	0.042	0.042
		1.6666	0.047	0.047	0.047
		1.7500	0.061	0.061	0.061
		1.8333	0.071	0.071	0.071
		1.9166	0.080	0.080	0.080
		2.0	0.090	0.090	0.090
		2.5	0.161	0.161	0.161
		3.0	0.223	0.223	0.223
		3.5	0.271	0.271	0.271
		4.0	0.323	0.323	0.323
		4.5	0.371	0.371	0.371
		5.0	0.399	0.399	0.399
		5.5	0.437	0.437	0.437
		6.0	0.475	0.475	0.475
		6.5	0.504	0.504	0.504
		7.0	0.532	0.532	0.532
		7.5	0.556	0.556	0.556
		8.0	0.580	0.580	0.580
		8.5	0.609	0.609	0.609
		9.0	0.628	0.628	0.628
		9.5	0.642	0.642	0.642
	15:00	10.0	0.666	0.666	0.666
		12.0	0.728	0.728	0.728
		14.0	0.785	0.784	0.784
		16.0	0.827	0.826	0.826
		18.0	0.865	0.864	0.864

			620.0	1.298	1.273	1.273
			630.0	1.294	1.269	1.269
			640.0	1.275	1.249	1.249
			650.0	1.298	1.272	1.272
			660.0	1.289	1.263	1.263
			670.0	1.270	1.243	1.243
			680.0	1.275	1.248	1.248
			690.0	1.270	1.242	1.242
			700.0	1.284	1.256	1.256
			710.0	1.294	1.266	1.266
			720.0	1.289	1.260	1.260
			730.0	1.289	1.260	1.260
			740.0	1.289	1.259	1.259
			750.0	1.284	1.254	1.254
			760.0	1.284	1.254	1.254
			770.0	1.279	1.248	1.248
			780.0	1.303	1.272	1.272
			790.0	1.284	1.252	1.252
			800.0	1.284	1.252	1.252
			810.0	1.284	1.252	1.252
			820.0	1.289	1.256	1.256
			830.0	1.289	1.256	1.256
			840.0	1.303	1.269	1.269
			850.0	1.298	1.264	1.264
			860.0	1.308	1.274	1.274
			870.0	1.303	1.268	1.268
			880.0	1.308	1.273	1.273
			890.0	1.303	1.267	1.267
			900.0	1.313	1.277	1.277
		06:00	910.0	1.303	1.267	1.267
			920.0	1.298	1.261	1.261
			930.0	1.298	1.261	1.261
			940.0	1.298	1.260	1.260
			950.0	1.308	1.270	1.270
			960.0	1.298	1.260	1.260
			970.0	1.294	1.255	1.255
			980.0	1.298	1.259	1.259
			990.0	1.303	1.263	1.263
			1000.0	1.298	1.258	1.258
			1030.0	1.294	1.253	1.253
			1060.0	1.303	1.261	1.261
			1090.0	1.317	1.273	1.273
			1120.0	1.313	1.268	1.268
			1150.0	1.308	1.262	1.262
			1180.0	1.308	1.261	1.261
			1210.0	1.322	1.274	1.274

			1240.0	1.322	1.272	1.272
		12:00	1270.0	1.322	1.271	1.271
			1300.0	1.332	1.280	1.280
			1330.0	1.327	1.274	1.274
			1360.0	1.337	1.283	1.283
			1390.0	1.337	1.281	1.281
			1420.0	1.337	1.280	1.280
			1450.0	1.337	1.279	1.279
			1480.0	1.337	1.278	1.278
			1510.0	1.327	1.267	1.267
			1540.0	1.337	1.275	1.275
			1570.0	1.337	1.274	1.274
			1600.0	1.332	1.268	1.268
		18:00	1630.0	1.337	1.272	1.272
			1660.0	1.332	1.266	1.266
			1690.0	1.327	1.259	1.259
			1720.0	1.332	1.263	1.263
			1750.0	1.332	1.262	1.262
			1780.0	1.337	1.266	1.266
			1810.0	1.337	1.265	1.265
			1840.0	1.327	1.253	1.253
			1870.0	1.337	1.262	1.262
			1900.0	1.337	1.261	1.261
			1930.0	1.341	1.264	1.264
			1960.0	1.337	1.259	1.259
	17-Jul	00:00	1990.0	1.346	1.266	1.266
			2020.0	1.337	1.256	1.256
			2050.0	1.346	1.264	1.264
			2080.0	1.346	1.263	1.263
			2110.0	1.337	1.253	1.253
			2140.0	1.341	1.255	1.255
			2170.0	1.337	1.250	1.250
			2200.0	1.337	1.249	1.249
			2230.0	1.327	1.238	1.238
			2260.0	1.322	1.232	1.232
			2290.0	1.317	1.225	1.225
			2320.0	1.346	1.253	1.253
		06:00	2350.0	1.337	1.243	1.243
			2380.0	1.360	1.265	1.265
			2410.0	1.398	1.302	1.302
			2440.0	1.413	1.315	1.315
			2470.0	1.408	1.309	1.309
			2500.0	1.408	1.308	1.308
			2530.0	1.408	1.307	1.307
			2560.0	1.413	1.311	1.311
			2590.0	1.422	1.318	1.318

			2620.0	1.408	1.303	1.303
			2650.0	1.417	1.311	1.311
			2680.0	1.422	1.315	1.315
		12:00	2710.0	1.417	1.309	1.309
			2740.0	1.417	1.307	1.307
			2770.0	1.427	1.316	1.316
			2800.0	1.422	1.310	1.310
			2830.0	1.417	1.304	1.304
			2860.0	1.427	1.313	1.313
			2890.0	1.427	1.311	1.311
			2920.0	1.432	1.315	1.315
			2950.0	1.408	1.290	1.290
			2980.0	1.422	1.303	1.303
			3010.0	1.413	1.293	1.293
			3040.0	1.413	1.291	1.291
		18:00	3070.0	1.403	1.280	1.280
			3100.0	1.413	1.289	1.289
			3130.0	1.413	1.288	1.288
			3160.0	1.427	1.301	1.301
			3190.0	1.413	1.285	1.285
			3220.0	1.432	1.303	1.303
			3250.0	1.432	1.302	1.302
			3280.0	1.427	1.296	1.296
			3310.0	1.441	1.309	1.309
			3340.0	1.436	1.302	1.302
			3370.0	1.436	1.301	1.301
			3400.0	1.451	1.315	1.315
	18-Jul	00:00	3430.0	1.436	1.299	1.299
			3460.0	1.394	1.256	1.256
			3490.0	1.451	1.311	1.311
			3520.0	1.432	1.291	1.291
			3550.0	1.436	1.294	1.294
			3580.0	1.436	1.293	1.293
			3610.0	1.441	1.297	1.297
			3640.0	1.441	1.295	1.295
			3670.0	1.441	1.294	1.294
			3700.0	1.441	1.293	1.293
			3730.0	1.436	1.287	1.287
			3760.0	1.427	1.277	1.277
		06:00	3790.0	1.441	1.289	1.289
			3820.0	1.446	1.293	1.293
			3850.0	1.446	1.292	1.292
			3880.0	1.451	1.296	1.296
			3910.0	1.451	1.295	1.295
			3940.0	1.484	1.326	1.326
			3970.0	1.465	1.306	1.306

		4000.0	1.441	1.281	1.281
		4030.0	1.441	1.280	1.280
		4060.0	1.441	1.279	1.279
		4090.0	1.460	1.296	1.296
		4120.0	1.446	1.281	1.281
	12:00	4150.0	1.441	1.275	1.275
		4180.0	1.451	1.284	1.284
		4210.0	1.436	1.268	1.268
		4240.0	1.451	1.281	1.281
		4270.0	1.455	1.284	1.284
		4300.0	1.441	1.269	1.269
		4330.0	1.441	1.268	1.268
		4360.0	1.446	1.272	1.272
		4390.0	1.446	1.270	1.270
		4420.0	1.436	1.259	1.259
		4450.0	1.436	1.258	1.258
		4480.0	1.441	1.262	1.262
	18:00	4510.0	1.436	1.256	1.256
		4540.0	1.417	1.235	1.235
		4570.0	1.413	1.230	1.230
		4600.0	1.427	1.243	1.243
		4630.0	1.427	1.242	1.242
		4660.0	1.432	1.246	1.246
		4690.0	1.422	1.234	1.234
		4720.0	1.436	1.247	1.247
		4750.0	1.427	1.237	1.237
		4780.0	1.436	1.245	1.245
		4810.0	1.451	1.259	1.259
		4840.0	1.446	1.252	1.252
19-Jul	00:00	4870.0	1.446	1.251	1.251
		4900.0	1.436	1.240	1.240
		4930.0	1.441	1.244	1.244
		4960.0	1.436	1.238	1.238
		4990.0	1.436	1.236	1.236
		5020.0	1.446	1.245	1.245
		5050.0	1.451	1.249	1.249
		5080.0	1.446	1.243	1.243
		5110.0	1.441	1.237	1.237
		5140.0	1.446	1.240	1.240
		5170.0	1.432	1.225	1.225
		5200.0	1.446	1.238	1.238
	06:00	5230.0	1.446	1.237	1.237
		5260.0	1.451	1.241	1.241
		5290.0	1.451	1.239	1.239
		5320.0	1.446	1.233	1.233
		5350.0	1.465	1.251	1.251

		5380.0	1.479	1.264	1.264
		5410.0	1.479	1.263	1.263
		5440.0	1.489	1.271	1.271
		5470.0	1.484	1.265	1.265
		5500.0	1.474	1.254	1.254
		5530.0	1.484	1.263	1.263
		5560.0	1.489	1.267	1.267
	12:00	5590.0	1.489	1.265	1.265
		5620.0	1.498	1.273	1.273
		5650.0	1.503	1.277	1.277
		5680.0	1.517	1.290	1.290
		5710.0	1.522	1.294	1.294
		5740.0	1.513	1.283	1.283
	15:00	5770.0	1.522	1.291	1.291

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Company

Date: July 19, 1992

Project No.: 07029.00

Well Locaton: P-6

Personnel: J.A. Duwelius

Pumping Rate: Recovery

Date	Clock Time	Time (minutes)	Drawdown (feet)		
			Uncorrected	Corrected for Residual Trend	Corrected for Atmospheric Pressure
19-Jul	15:02	0.0	1.522	1.522	1.522
		0.0083	1.527	1.527	1.527
		0.0166	1.527	1.527	1.527
		0.0250	1.522	1.522	1.522
		0.0333	1.527	1.527	1.527
		0.0416	1.527	1.527	1.527
		0.0500	1.527	1.527	1.527
		0.0583	1.522	1.522	1.522
		0.0666	1.522	1.522	1.522
		0.0750	1.522	1.522	1.522
		0.0833	1.517	1.517	1.517
		0.1000	1.527	1.527	1.527
		0.1166	1.522	1.522	1.522
		0.1333	1.532	1.532	1.532
		0.1500	1.527	1.527	1.527
		0.1666	1.522	1.522	1.522
		0.1833	1.527	1.527	1.527
		0.2000	1.522	1.522	1.522
		0.2166	1.527	1.527	1.527
		0.2333	1.522	1.522	1.522
		0.2500	1.527	1.527	1.527
		0.2666	1.527	1.527	1.527
		0.2833	1.522	1.522	1.522
		0.3000	1.522	1.522	1.522
		0.3166	1.527	1.527	1.527
		0.3333	1.527	1.527	1.527
		0.4166	1.536	1.536	1.536
		0.5000	1.527	1.527	1.527
		0.5833	1.522	1.522	1.522
		0.6666	1.527	1.527	1.527
		0.7500	1.517	1.517	1.517

			0.8333	1.513	1.513	1.513
			0.9166	1.498	1.498	1.498
		15:03	1.0000	1.508	1.508	1.508
			1.0833	1.494	1.494	1.494
			1.1666	1.489	1.489	1.489
			1.2500	1.484	1.484	1.484
			1.3333	1.470	1.470	1.470
			1.4166	1.460	1.460	1.460
			1.5000	1.451	1.451	1.451
			1.5833	1.446	1.446	1.446
			1.6666	1.436	1.436	1.436
			1.7500	1.422	1.422	1.422
			1.8333	1.408	1.408	1.408
			1.9166	1.403	1.403	1.403
		15:04	2	1.389	1.389	1.389
			2.5	1.332	1.332	1.332
		15:05	3	1.279	1.279	1.279
			3.5	1.227	1.227	1.227
			4	1.189	1.189	1.189
			4.5	1.151	1.151	1.151
			5	1.113	1.113	1.113
			5.5	1.084	1.084	1.084
			6	1.046	1.046	1.046
			6.5	1.013	1.013	1.013
			7	0.989	0.989	0.989
			7.5	0.975	0.975	0.975
		15:10	8	0.946	0.946	0.946
			8.5	0.927	0.927	0.927
			9	0.904	0.904	0.904
			9.5	0.889	0.889	0.889
			10	0.875	0.875	0.875
			12	0.794	0.793	0.793
			14	0.742	0.741	0.741
			16	0.694	0.693	0.693
		15:20	18	0.647	0.646	0.646
			20	0.618	0.617	0.617
			22	0.594	0.593	0.593
			24	0.561	0.560	0.560
			26	0.537	0.536	0.536
		15:30	28	0.504	0.503	0.503
			30	0.490	0.489	0.489
			32	0.471	0.470	0.470
			34	0.452	0.450	0.450
			36	0.442	0.440	0.440
		15:40	38	0.423	0.421	0.421
			40	0.413	0.411	0.411

			42	0.404	0.402	0.402
			44	0.390	0.388	0.388
			46	0.380	0.378	0.378
		15:50	48	0.361	0.359	0.359
			50	0.347	0.345	0.345
			52	0.333	0.331	0.331
			54	0.318	0.316	0.316
			56	0.314	0.311	0.311
		16:00	58	0.309	0.306	0.306
			60	0.304	0.301	0.301
			62	0.295	0.292	0.292
			64	0.280	0.277	0.277
			66	0.285	0.282	0.282
		16:10	68	0.275	0.272	0.272
			70	0.261	0.258	0.258
			72	0.256	0.253	0.253
			74	0.256	0.253	0.253
			76	0.252	0.249	0.249
		16:20	78	0.252	0.248	0.248
			80	0.242	0.238	0.238
			82	0.237	0.233	0.233
			84	0.242	0.238	0.238
			86	0.233	0.229	0.229
		16:30	88	0.237	0.233	0.233
			90	0.223	0.219	0.219
			92	0.223	0.219	0.219
			94	0.228	0.224	0.224
			96	0.218	0.214	0.214
		16:40	98	0.214	0.210	0.210
			100	0.204	0.199	0.200
			110	0.199	0.194	0.194
		17:02	120	0.190	0.185	0.185
			130	0.180	0.174	0.174
			140	0.171	0.165	0.165
			150	0.171	0.164	0.164
			160	0.157	0.150	0.150
			170	0.157	0.149	0.149
		18:02	180	0.157	0.149	0.149
			190	0.152	0.143	0.143
			200	0.152	0.143	0.143
			210	0.142	0.133	0.133
			220	0.147	0.137	0.137
			230	0.142	0.132	0.132
		19:02	240	0.147	0.136	0.136
			250	0.133	0.122	0.122
			260	0.142	0.130	0.130

			270	0.123	0.111	0.111
			280	0.137	0.124	0.124
			290	0.128	0.115	0.115
		20:02	300	0.128	0.114	0.114
			310	0.137	0.123	0.123
			320	0.128	0.114	0.114
			330	0.133	0.118	0.118
			340	0.123	0.108	0.108
			350	0.118	0.102	0.102
		21:02	360	0.118	0.102	0.102
			370	0.123	0.106	0.106
			380	0.118	0.101	0.101
			390	0.118	0.100	0.100
			400	0.128	0.110	0.110
			410	0.123	0.105	0.104
		22:02	420	0.128	0.109	0.109
			430	0.118	0.099	0.099
			440	0.133	0.113	0.113
			450	0.118	0.098	0.098
			460	0.118	0.097	0.097
			470	0.114	0.093	0.093
		23:02	480	0.123	0.101	0.101
			490	0.123	0.101	0.101
			500	0.114	0.091	0.091
			510	0.133	0.110	0.110
			520	0.109	0.086	0.086
			530	0.114	0.090	0.090
	20-Jul	00:02	540	0.114	0.090	0.090
			550	0.118	0.093	0.093
			560	0.123	0.098	0.098
			570	0.104	0.078	0.078
			580	0.104	0.078	0.078
			590	0.114	0.087	0.087
		01:02	600	0.114	0.087	0.087
			610	0.118	0.090	0.090
			620	0.099	0.071	0.071
			630	0.104	0.076	0.076
			640	0.114	0.085	0.085
			650	0.114	0.085	0.085
		02:02	660	0.104	0.074	0.074
			670	0.099	0.069	0.069
			680	0.099	0.068	0.068
			690	0.095	0.064	0.064
			700	0.099	0.067	0.067
			710	0.109	0.077	0.077
		03:02	720	0.099	0.067	0.067

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Co.
Project No.: 07029.00
Personnel: R.J. Flores

Date: July 15, 1992
Well Locaton: W-4
Meter No.: 4

Date	Clock Time	Time (minutes)	Tapedown (feet)	Drawdown (feet)	Pump Rate (gpm)
15-Jul	14:50	0.0	8.34	0.00	40
	15:20	30.0	8.34	0.00	40
	15:50	60.0	8.34	0.00	40
	16:20	90.0	8.34	0.00	40
	16:50	120.0	8.34	0.00	40
	17:42	172.0	8.34	0.00	40
	18:11	201.0	8.34	0.00	40
	18:41	231.0	8.34	0.00	40
	19:12	262.0	8.34	0.00	40
	19:42	292.0	8.34	0.00	40
	21:43	413.0	8.39	0.05	40
	23:41	531.0	8.39	0.05	40
16-Jul	01:41	631.0	8.39	0.05	40
	03:45	775.0	8.39	0.05	40
	07:57	1027.0	8.36	0.02	40
	11:35	1245.0	8.35	0.01	40
	15:43	1493.0	8.34	0.00	40
	19:43	1733.0	8.35	0.01	40
	23:42	1972.0	8.35	0.01	40
17-Jul	03:43	2213.0	8.34	0.00	40
	09:42	2572.0	8.33	-0.01	40
	15:42	2932.0	8.34	0.00	40
	21:42	3292.0	8.39	0.05	40
18-Jul	03:42	3652.0	8.44	0.10	40
	09:38	4008.0	8.45	0.11	40
	15:37	4366.0	8.47	0.13	40
	21:42	4731.0	8.50	0.16	40
19-Jul	03:42	5092.0	8.53	0.19	40
	09:41	5451.0	8.53	0.19	40
	14:41	5751.0	8.53	0.19	40
20-Jul	10:02	6912.0	8.55	0.21	0

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Co.
Project No.: 07029.00
Personnel: R.J. Flores

Date: July 15, 1992
Well Locaton: W-4D
Meter No.: 4

Date	Clock Time	Time (minutes)	Tapedown (feet)	Drawdown (feet)	Pump Rate (gpm)
15-Jul	14:50	0.0	12.03	0.00	40
	15:20	30.0	12.12	0.09	40
	15:50	60.0	12.19	0.16	40
	16:20	90.0	12.20	0.17	40
	16:50	120.0	12.23	0.20	40
	17:41	171.0	12.25	0.22	40
	18:10	200.0	12.25	0.22	40
	18:40	230.0	12.25	0.22	40
	19:11	261.0	12.25	0.22	40
	19:41	291.0	12.28	0.25	40
	21:42	412.0	12.31	0.28	40
	23:40	530.0	12.34	0.31	40
16-Jul	01:40	650.0	12.35	0.32	40
	03:42	772.0	12.34	0.31	40
	07:56	1026.0	12.37	0.34	40
	11:34	1244.0	12.39	0.36	40
	15:42	1492.0	12.41	0.38	40
	19:42	1732.0	12.40	0.37	40
	23:41	1971.0	12.41	0.38	40
17-Jul	03:42	2212.0	12.39	0.36	40
	09:41	2571.0	12.44	0.41	40
	15:41	2931.0	12.43	0.40	40
	21:41	3291.0	12.46	0.43	40
18-Jul	03:41	3651.0	12.47	0.44	40
	09:37	4007.0	12.48	0.45	40
	15:36	4366.0	12.49	0.46	40
	21:41	4731.0	12.47	0.44	40
19-Jul	03:41	5091.0	12.50	0.47	40
	09:40	5450.0	12.50	0.47	40
	14:40	5750.0	12.50	0.47	40
20-Jul	10:01	6911.0	12.13	0.10	0

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Co.
Project No.: 07029.00
Personnel: R.J. Flores

Date: July 15, 1992
Well Locaton: T-3
Meter No.: 4

Date	Clock Time	Time (minutes)	Tapedown (feet)	Drawdown (feet)	Pump Rate (gpm)
15-Jul	14:50	0.0	14.05	0.00	40
		0.5	14.07	0.02	40
		1.0	14.09	0.04	40
		1.5	14.10	0.05	40
		2.0	14.15	0.10	40
		2.5	14.20	0.15	40
		3.0	14.22	0.17	40
		3.5	14.28	0.22	40
		4.0	14.30	0.25	40
		4.5	14.32	0.27	40
	14:55	5.0	14.35	0.30	40
		5.5	14.38	0.33	40
		6.0	14.41	0.36	40
		6.5	14.44	0.39	40
		7.0	14.45	0.40	40
		7.5	14.48	0.42	40
		8.0	14.50	0.45	40
		8.5	14.51	0.46	40
		9.0	14.53	0.47	40
		9.5	14.55	0.50	40
	15:00	10.0	14.56	0.51	40
		11.0	14.59	0.54	40
		12.0	14.61	0.56	40
		13.0	14.65	0.60	40
		14.0	14.66	0.61	40
	15:05	15.0	14.68	0.63	40
		16.0	14.71	0.66	40
		17.0	14.73	0.67	40
		18.0	14.73	0.67	40
		19.0	14.74	0.69	40
	15:10	20.0	14.76	0.71	40
	15:15	25.0	14.84	0.79	40
	15:20	30.0	14.87	0.82	40
	15:25	35.0	14.90	0.85	40

	15:30	40.0	14.93	0.88	40
	15:35	45.0	14.95	0.90	40
	15:45	55.0	14.98	0.93	40
	15:55	65.0	15.00	0.95	40
	16:10	80.0	15.03	0.97	40
	16:15	85.0	15.04	0.99	40
	16:25	95.0	15.04	0.99	40
	16:35	105.0	15.05	1.00	40
	16:50	120.0	15.05	1.00	40
	17:05	135.0	15.07	1.02	40
	17:40	170.0	15.06	1.01	40
	18:09	199.0	15.09	1.04	40
	18:39	229.0	15.10	1.05	40
	19:10	260.0	15.11	1.06	40
	19:40	290.0	15.11	1.06	40
	21:40	410.0	15.15	1.10	40
	23:39	529.0	15.16	1.11	40
16-Jul	01:39	649.0	15.17	1.12	40
	03:41	771.0	15.12	1.07	40
	07:55	1025.0	15.16	1.11	40
	11:33	1243.0	15.18	1.13	40
	15:40	1490.0	15.19	1.14	40
	19:40	1730.0	15.18	1.13	40
	23:40	1970.0	15.20	1.15	40
17-Jul	03:40	2210.0	15.19	1.14	40
	09:40	2570.0	15.27	1.22	40
	15:40	2930.0	15.40	1.35	40
	21:40	3290.0	15.28	1.23	40
18-Jul	03:40	3650.0	15.29	1.24	40
	09:36	4006.0	15.29	1.24	40
	15:35	4365.0	15.29	1.24	40
	21:40	4730.0	15.28	1.23	40
19-Jul	03:40	5090.0	15.29	1.24	40
	09:39	5449.0	15.32	1.27	40
	14:39	5749.0	15.35	1.30	40
20-Jul	10:00	6910.0	14.16	1.71	0

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Co.
Project No.: 07029.00
Personnel: R. Aten

Date: July 15, 1992
Well Locaton: T-4A
Meter No.: 6

Date	Clock Time	Time (minutes)	Tapedown (feet)	Drawdown (feet)	Pump Rate (gpm)
15-Jul	14:47	0.0	11.89	0.00	40
	15:25	38.0	11.88	-0.02	40
	15:56	69.0	11.88	-0.02	40
	17:10	143.0	11.86	-0.03	40
	17:45	178.0	11.85	-0.04	40
	18:16	209.0	11.87	-0.02	40
	18:45	238.0	11.89	0.00	40
	19:16	269.0	11.89	0.00	40
	19:44	297.0	11.89	0.00	40
	21:47	420.0	11.95	0.06	40
	23:45	538.0	11.95	0.06	40
16-Jul	03:50	783.0	11.92	0.03	40
	07:44	1017.0	11.98	0.09	40
	11:42	1255.0	12.02	0.13	40
	15:48	1501.0	12.03	0.14	40
	19:46	1739.0	12.04	0.15	40
	23:48	1981.0	12.05	0.16	40
17-Jul	03:48	2221.0	12.04	0.15	40
	09:48	2581.0	12.07	0.18	40
	15:51	2944.0	12.08	0.19	40
	21:47	3300.0	12.13	0.24	40
18-Jul	03:47	3660.0	12.14	0.25	40
	09:47	4020.0	12.14	0.25	40
	15:42	4375.0	12.13	0.24	40
	21:46	4739.0	12.14	0.25	40
19-Jul	03:36	5089.0	12.15	0.26	40
	09:46	5459.0	12.13	0.24	40
	14:44	5757.0	12.13	0.24	40
20-Jul	10:07	6926.0	12.03	0.14	0

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Co.
Project No.: 07029.00
Personnel: R. Aten

Date: July 15, 1992
Well Locaton: T-4B
Meter No.: 6

Date	Clock Time	Time (minutes)	Tapedown (feet)	Drawdown (feet)	Pump Rate (gpm)
15-Jul	14:50	0.0	13.08	0.00	40
		0.5	13.08	0.00	40
		1.0	13.08	0.00	40
		1.5	13.08	0.00	40
		2.0	13.08	0.00	40
		2.5	13.08	0.00	40
		3.0	13.08	0.00	40
		3.5	13.10	0.02	40
		4.0	13.11	0.03	40
		4.5	13.13	0.04	40
	14:55	5.0	13.14	0.06	40
		5.5	13.15	0.07	40
		6.0	13.17	0.09	40
		6.5	13.19	0.11	40
		7.0	13.20	0.12	40
		7.5	13.22	0.14	40
		8.0	13.23	0.15	40
		8.5	13.25	0.17	40
		9.0	13.26	0.18	40
		9.5	13.28	0.20	40
	15:00	10.0	13.29	0.21	40
		11.0	13.31	0.23	40
		12.0	13.33	0.25	40
		13.0	13.36	0.28	40
		14.0	13.38	0.30	40
	15:05	15.0	13.39	0.31	40
		16.0	13.41	0.33	40
		17.0	13.42	0.34	40
		18.0	13.43	0.35	40
		19.0	13.45	0.37	40
	15:10	20.0	13.46	0.38	40
	15:15	25.0	13.50	0.42	40
		30.0	13.53	0.45	40
		35.0	13.55	0.47	40

	15:30	40.0	13.58	0.49	40
		45.0	13.60	0.52	40
		55.0	13.63	0.55	40
		65.0	13.63	0.55	40
		75.0	13.64	0.56	40
	16:15	85.0	13.65	0.57	40
		95.0	13.66	0.58	40
	16:35	105.0	13.67	0.59	40
	17:08	138.0	13.68	0.60	40
	17:44	174.0	13.68	0.60	40
	18:15	205.0	13.68	0.60	40
	18:46	236.0	13.70	0.62	40
	19:17	267.0	13.70	0.62	40
	19:45	295.0	13.70	0.62	40
	21:48	418.0	13.75	0.67	40
	23:46	536.0	13.74	0.66	40
16-Jul	03:52	782.0	13.73	0.65	40
	07:45	1015.0	13.75	0.67	40
	11:40	1250.0	13.78	0.70	40
	15:47	1497.0	13.79	0.71	40
	19:47	1737.0	13.78	0.70	40
	23:47	1977.0	13.80	0.72	40
17-Jul	03:46	2216.0	13.81	0.73	40
	09:47	2577.0	13.84	0.76	40
	15:50	2940.0	13.84	0.76	40
	21:46	3296.0	13.87	0.79	40
18-Jul	03:46	3656.0	13.88	0.80	40
	09:45	4015.0	13.88	0.80	40
	15:41	4371.0	13.88	0.80	40
	21:45	4735.0	13.87	0.79	40
19-Jul	03:45	5095.0	13.88	0.80	40
	09:45	5455.0	13.91	0.83	40
	14:43	5753.0	13.94	0.86	40
20-Jul	10:06	6926.0	13.19	0.11	0

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Co.
Project No.: 07029.00
Personnel: J.A. Duwelius

Date: July 15, 1992
Well Locaton: T-7A
Meter No.: 5

Date	Clock Time	Time (minutes)	Tapedown (feet)	Drawdown (feet)	Pump Rate (gpm)
15-Jul	14:50	0.0	6.75	0.00	40
	15:11	21.0	6.75	0.00	40
	16:11	81.0	6.75	0.00	40
	17:37	167.0	6.76	0.01	40
	18:06	196.0	6.76	0.01	40
	18:35	225.0	6.76	0.01	40
	19:06	256.0	6.76	0.01	40
	19:35	285.0	6.76	0.01	40
	21:35	405.0	6.81	0.06	40
	23:35	525.0	6.82	0.07	40
16-Jul	01:35	625.0	6.86	0.11	40
	03:35	765.0	6.56	-0.19	40
	07:35	1005.0	6.34	-0.41	40
	11:28	1238.0	6.27	-0.48	40
	15:33	1483.0	6.27	-0.48	40
	19:35	1725.0	6.31	-0.44	40
	23:35	1965.0	6.32	-0.43	40
17-Jul	03:35	2205.0	6.35	-0.40	40
	09:35	2565.0	6.40	-0.35	40
	15:35	2925.0	6.45	-0.30	40
	21:35	3285.0	6.53	-0.22	40
18-Jul	03:35	3645.0	6.60	-0.15	40
	09:30	4000.0	6.67	-0.08	40
	15:30	4360.0	6.73	-0.02	40
	21:35	4725.0	6.81	0.06	40
19-Jul	03:35	5085.0	6.89	0.14	40
	09:35	5445.0	6.95	0.20	40
	14:35	5745.0	7.00	0.25	40
20-Jul	09:54	6904.0	7.02	0.27	0

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Co.
Project No.: 07029.00
Personnel: J.A. Duwelius

Date: July 15, 1992
Well Locaton: T-7B
Meter No.: 5

Date	Clock Time	Time (minutes)	Tapedown (feet)	Drawdown (feet)	Pump Rate (gpm)
15-Jul	14:50	0.0	12.45	0.00	40
		0.5	12.57	0.12	40
		1.0	12.60	0.15	40
		1.5	12.67	0.22	40
		2.0	12.74	0.29	40
		2.5	12.80	0.35	40
		3.0	12.85	0.40	40
		3.5	12.90	0.45	40
		4.0	12.94	0.49	40
		4.5	12.97	0.52	40
	14:55	5.0	13.02	0.57	40
		5.5	13.04	0.59	40
		6.0	13.06	0.61	40
		6.5	13.08	0.63	40
		7.0	13.12	0.67	40
		7.5	13.15	0.70	40
		8.0	13.17	0.72	40
		8.5	13.18	0.73	40
		9.0	13.20	0.75	40
		9.5	13.21	0.76	40
	15:00	10.0	13.23	0.78	40
		11.0	13.27	0.82	40
		12.0	13.29	0.84	40
		13.0	13.30	0.85	40
		14.0	13.34	0.89	40
	15:05	15.0	13.36	0.91	40
		16.0	13.37	0.92	40
		17.0	13.39	0.94	40
		18.0	13.41	0.96	40
		19.0	13.43	0.98	40
	15:10	20.0	13.44	0.99	40
	15:15	25.0	13.52	1.07	40
	15:20	30.0	13.56	1.11	40
	15:25	35.0	13.59	1.14	40

	15:30	40.0	13.67	1.22	40
	15:35	45.0	13.67	1.22	40
	15:45	55.0	13.67	1.22	40
	15:55	65.0	13.72	1.27	40
	16:10	80.0	13.73	1.28	40
	16:15	85.0	13.73	1.28	40
	16:25	95.0	13.74	1.29	40
	16:35	105.0	13.75	1.30	40
	16:50	120.0	13.77	1.32	40
	17:05	135.0	13.78	1.33	40
	17:35	165.0	13.78	1.33	40
	18:05	195.0	13.78	1.33	40
	18:36	226.0	13.78	1.33	40
	19:05	255.0	13.78	1.33	40
	19:36	286.0	13.79	1.34	40
	21:36	406.0	13.83	1.38	40
	23:36	526.0	13.85	1.40	40
16-Jul	01:36	626.0	13.85	1.40	40
	03:36	766.0	13.79	1.34	40
	07:38	1008.0	13.83	1.38	40
	11:28	1238.0	13.85	1.40	40
	15:35	1485.0	13.88	1.43	40
	19:37	1727.0	13.86	1.41	40
	23:36	1966.0	13.88	1.43	40
17-Jul	03:36	2206.0	13.86	1.41	40
	09:36	2566.0	13.94	1.49	40
	15:36	2926.0	13.95	1.50	40
	21:36	3286.0	13.96	1.51	40
18-Jul	03:36	3646.0	13.95	1.50	40
	09:31	4001.0	13.96	1.51	40
	15:31	4360.0	13.95	1.50	40
	21:36	4725.0	13.93	1.48	40
19-Jul	03:36	5086.0	13.91	1.46	40
	09:36	5445.0	13.98	1.53	40
	14:36	5746.0	14.05	1.60	40
20-Jul	09:55	6905.0	12.60	0.15	0

PUMP TEST DATA SHEET

Client: Keystone Steel & Wire Co.
Project No.: 07029.00
Personnel: R. Aten

Date: July 15, 1992
Well Locaton: T-9
Meter No.: 6

Date	Clock Time	Time (minutes)	Tapedown (feet)	Drawdown (feet)	Pump Rate (gpm)
15-Jul	14:37	0.0	21.67	0.00	0
	15:38	61.0	21.65	-0.02	40
	16:30	113.0	21.65	-0.02	40
	17:51	194.0	21.65	-0.02	40
	18:22	225.0	21.65	-0.02	40
	18:52	255.0	21.65	-0.02	40
	19:23	286.0	21.65	-0.02	40
	19:52	315.0	21.65	-0.02	40
	21:55	438.0	21.74	0.07	40
	23:52	555.0	21.74	0.07	40
16-Jul	03:58	801.0	21.71	0.04	40
	07:50	1033.0	21.77	0.10	40
	11:46	1269.0	21.80	0.13	40
	15:50	1513.0	21.82	0.15	40
	19:52	1755.0	21.82	0.15	40
	23:54	1997.0	21.83	0.16	40
17-Jul	03:54	2237.0	21.81	0.14	40
	09:52	2595.0	21.82	0.15	40
	15:55	2958.0	21.84	0.17	40
	21:52	3315.0	21.90	0.23	40
18-Jul	03:52	3675.0	21.91	0.24	40
	09:52	4035.0	21.92	0.25	40
	15:47	4390.0	21.89	0.22	40
	21:51	4754.0	21.90	0.23	40
19-Jul	03:51	5114.0	21.91	0.24	40
	09:50	5473.0	21.89	0.22	40
	14:49	5772.0	21.89	0.22	40
20-Jul	10:14	6937	21.78	0.11	0

APPENDIX C

SAMPLE AQUIFER TEST CALCULATIONS

Calculation Sheet

Computed by JAD
Checked by _____
Subject AQUIFER TEST CALCULATIONS
Sheet 1 of _____
Job No. 07029
Client KEYSTONE
Date 8/5/92

P-4

$Q = 40$ gpm
$r = 41$ ft
$S = 1.80$ ft
$t = 2.65$ min
$1/u = 1$
$W(u, r/B) = 1$
$r/B = 0.7$

TRANSMISSIVITY

$$T_{P-4} = \frac{114.6\,Q}{S}\,W(u, r/B)$$

$$T_{P-4} = \frac{(114.6)(40)(1)}{1.80}$$

$T_{P-4} = 2547$ gal/day/ft $\sim 3.7 \times 10^{0}$ cm^2/sec

STORATIVITY:

$$S_{P-4} = \frac{T_{P-4}\,t\,u}{2693\,r^2}$$

$$S_{P-4} = \frac{(2547)(2.65)(1)}{(2693)(41)^2}$$

$S_{P-4} = 1.5 \times 10^{-3}$

HYDRAULIC CONDUCTIVITY:

$T = 2547$ gal/day/ft

$b = 17$ ft

$$K_{P-4} = T_{P-4}/b$$

$K_{P-4} = 2547/17$

$K_{P-4} = 150$ gal/day/ft^2 $\sim 7.1 \times 10^{-3}$ cm/sec

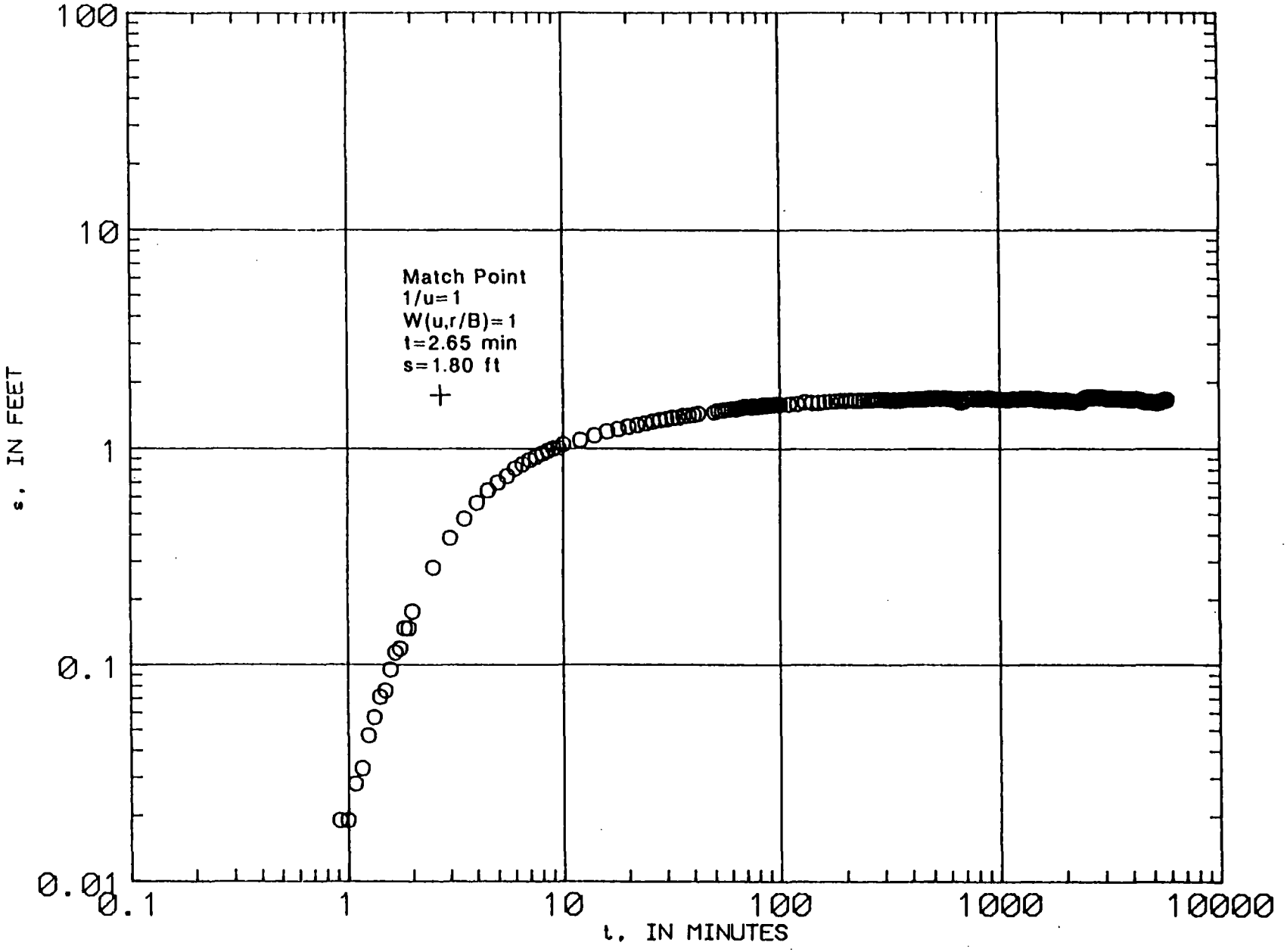


Figure C-1. Time-drawdown graph for observation well P-4. Pumping rate 40 gpm.

Calculation Sheet

Computed by JAD
Checked by _____
Subject AQUIFER TEST CALCULATIONS
Sheet 2 of _____
Job No. 07029
Client KEYSTONE
Date 8/5/92

P-5

TRANSMISSIVITY:

$Q = 40 gpm$

$r = 149 ft$

$S = 1.0 ft$

$t = 11.0 min$

$1/u = 1$

$W(u, r/B) = 1$

$r/B = 0.7$

$$T_{P-S} = \frac{114.6\,Q}{S} W(u, r/B)$$

$$T_{P-S} = \frac{(114.6)(40)}{(1.0)} (1)$$

$$T_{P-S} = 4584 \text{ gal/day/ft} \sim 6.6 \times 10^{0} \text{ cm}^2\text{/sec}$$

STORATIVITY:

$$S_{P-S} = \frac{T_{P-S}\, t\, u}{2693 (r^2)}$$

$$S_{P-S} = \frac{(4584)(11)(1)}{(2693)(149)^2}$$

$$S_{P-S} = 8.4 \times 10^{-4}$$

HYDRAULIC CONDUCTIVITY:

$T = 4584 \text{ gal/day/ft}$

$b = 10.5 ft$

$$K_{P-S} = T_{P-S}/b$$

$$K_{P-S} = 4584/10.5$$

$$K_{P-S} = 437 \text{ gal/day/ft}^2 \sim 2.1 \times 10^{-2} \text{ cm/sec}$$

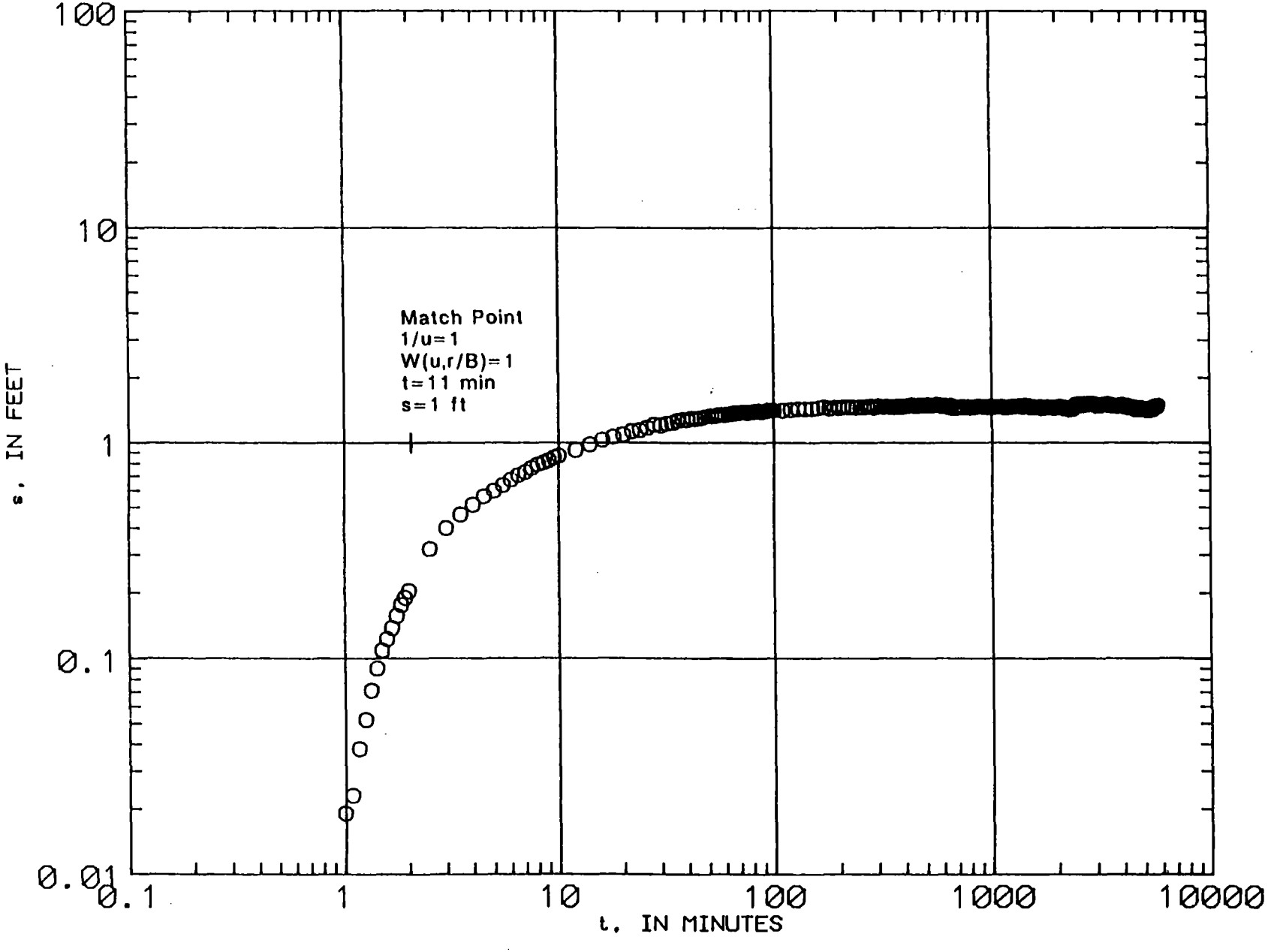


Figure C-2. Time-drawdown graph for observation well P-5. Pumping rate 40 gpm.

Calculation Sheet

Computed by JAD
Checked by _____
Subject Aquifer Test Calculation
Client Keystone
Sheet 3 of _____
Job No. 07029
Date 8/5/92

P-6

TRANSMISSIVITY:

$Q = 40$ gpm
$r = 216$ ft
$S = 0.65$ ft
$t = 1.31$ min
$1/u = 1$
$W(u, r/B) = 1$
$r/B = 0.5$

$$T_{P-6} = \frac{114.6\,Q}{S}\,W(u, r/B)$$

$$T_{P-6} = \frac{(114.6)(40)}{0.65\text{ ft}}\,(1)$$

$$T_{P-6} = 7052 \text{ gal/day/ft} \sim 1.0\times10^{1} \text{ cm}^2/\text{sec}$$

STORATIVITY:

$$S_{P-6} = \frac{T_{P-6}\,t\,u}{2693(r^2)}$$

$$S_{P-6} = \frac{(7052)(1)(1.31)}{(2693)(216)^2}$$

$$S_{P-6} = 7.4\times10^{-5}$$

HYDRAULIC CONDUCTIVITY:

$T_{P-6} = 7052$ gal/day/ft

$b = 17.5$ ft

$$K_{P-6} = T/b$$

$$K_{P-6} = 7052/17.5$$

$$K_{P-6} = 403 \text{ gal/day/ft}^2 \sim 1.9\times10^{-2} \text{ cm/sec}$$

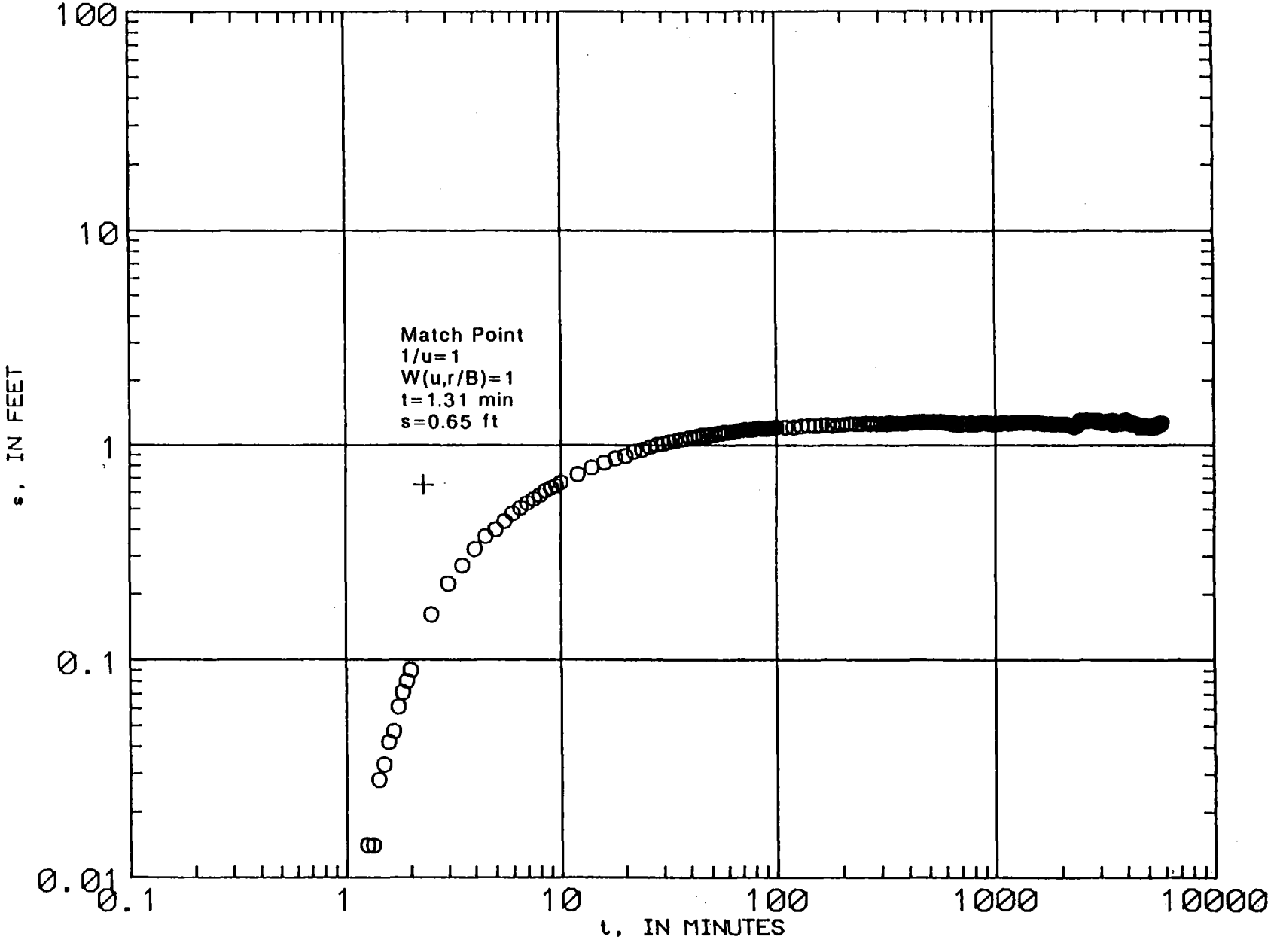


Figure C-3. Time-drawdown graph for observation well P-6. Pumping rate 40 gpm.

Calculation Sheet

Computed by JAD
Checked by _____
Subject Aquifer Test Calculations
Client KEYSTONE
Sheet 4 of _____
Job No. 07029
Date 8/5/92

TRANSMISSIVITY:

T-3

$Q = 40$ gpm
$r = 339$ ft
$S = 0.425$ ft
$t = 2.24$ min
$1/u = 1$
$W(u, r/B) = 1$
$r/B = 0.5$

$$T_{T-3} = \frac{114.6\,Q}{S}\,W(u, r/B)$$

$$T_{T-3} = \frac{(114.6)(40)}{0.425}(1)$$

$$T_{T-3} = 10{,}786 \text{ gal/day/ft} \sim 1.5\times10^{1} \text{ cm}^2/\text{sec}$$

STORATIVITY:

$$S_{T-3} = \frac{T\,t\,u}{2693\,r^2}$$

$$S_{T-3} = \frac{(10786)(2.24)(1)}{(2693)(339)^2}$$

$$S_{T-3} = 7.8\times10^{-5}$$

HYDRAULIC CONDUCTIVITY:

$T_{T-3} = 10786$ gal/day/ft

$b = 7.5$ ft

$$K_{T-3} = T_{T-3}/b$$

$$K_{T-3} = 10786/7.5$$

$$K_{T-3} = 1438 \text{ gal/day/ft}^2 \sim 6.8\times10^{-2} \text{ cm/sec}$$

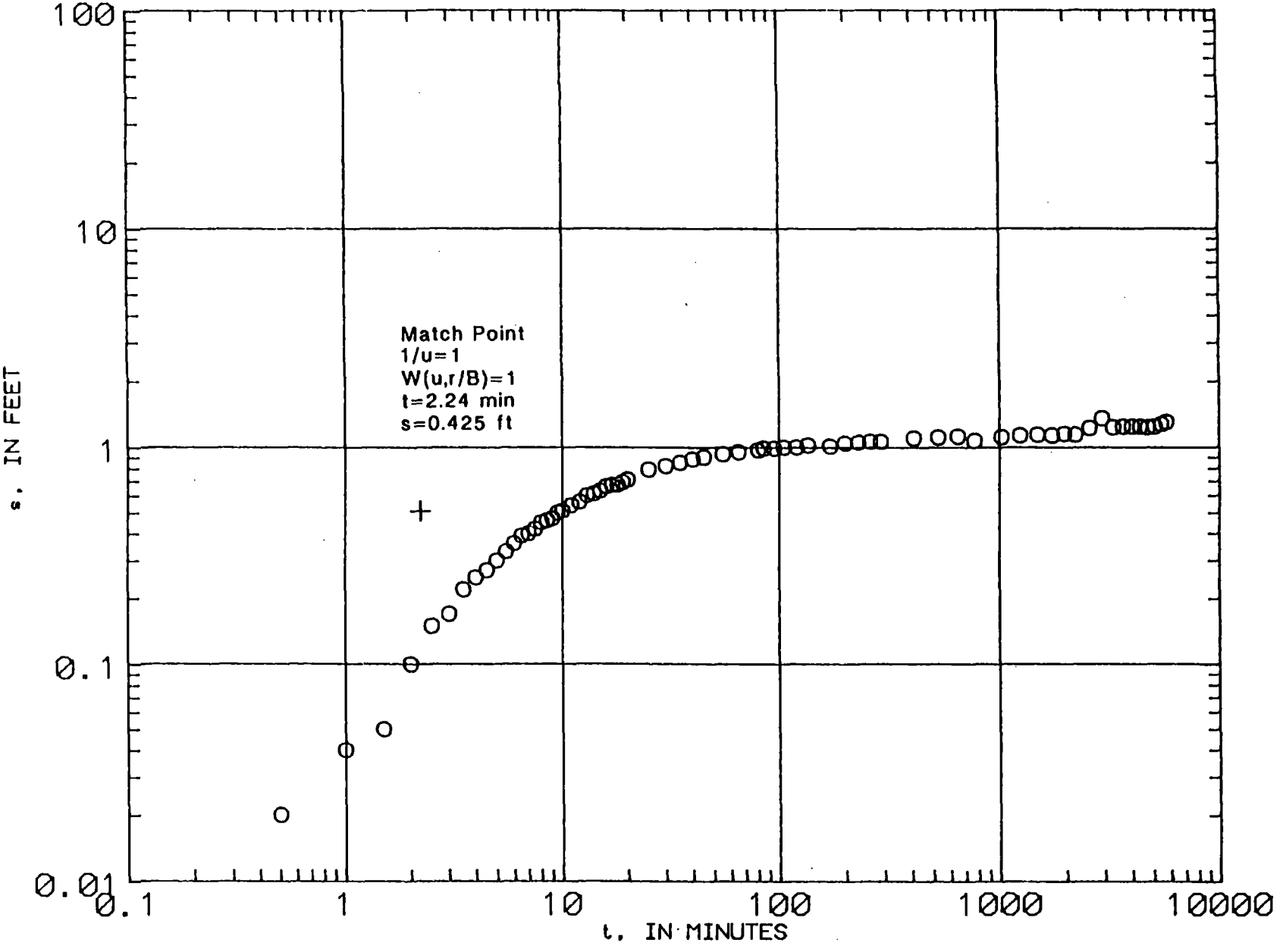


Figure C-4. Time-drawdown graph for observation well T-3. Pumping rate 40 gpm.

Calculation Sheet

Computed by JAD
Checked by _____
Subject Aquifer Test Calculations
Client KEYSTONE
Sheet 5 of _____
Job No. 07029
Date 8/5/92

T-4B

TRANSMISSIVITY:

$Q = 40$ gpm
$r = 517$ ft
$S = 0.59$ ft
$t = 7$ min
$1/u = 1$
$W(u, r/B) = 1$
$r/B = 0.85$

$$T_{T\text{-}4B} = \frac{114.6\,Q}{S} W(u, r/B)$$

$$T_{T\text{-}4B} = \frac{(114.6)(40)}{0.59}(1)$$

$T_{T\text{-}4B} = 7769$ gal/day/ft $\sim 1.1 \times 10^{1}$ cm²/sec

STORATIVITY:

$$S_{T\text{-}4B} = \frac{T\,t\,u}{2693 \cdot r^2}$$

$$S_{T\text{-}4B} = \frac{(7769)(7)(1)}{(2693)(517)^2}$$

$S_{T\text{-}4B} = 7.6 \times 10^{-5}$

HYDRAULIC CONDUCTIVITY:

$T = 7769$ gal/day/ft
$b = 12.5$ ft

$$K_{T\text{-}4B} = T_{T\text{-}4B} / b$$

$$K_{T\text{-}4B} = 7769/12.5$$

$K_{T\text{-}4B} = 622$ gal/day/ft² $\sim 2.9 \times 10^{-2}$ cm/sec

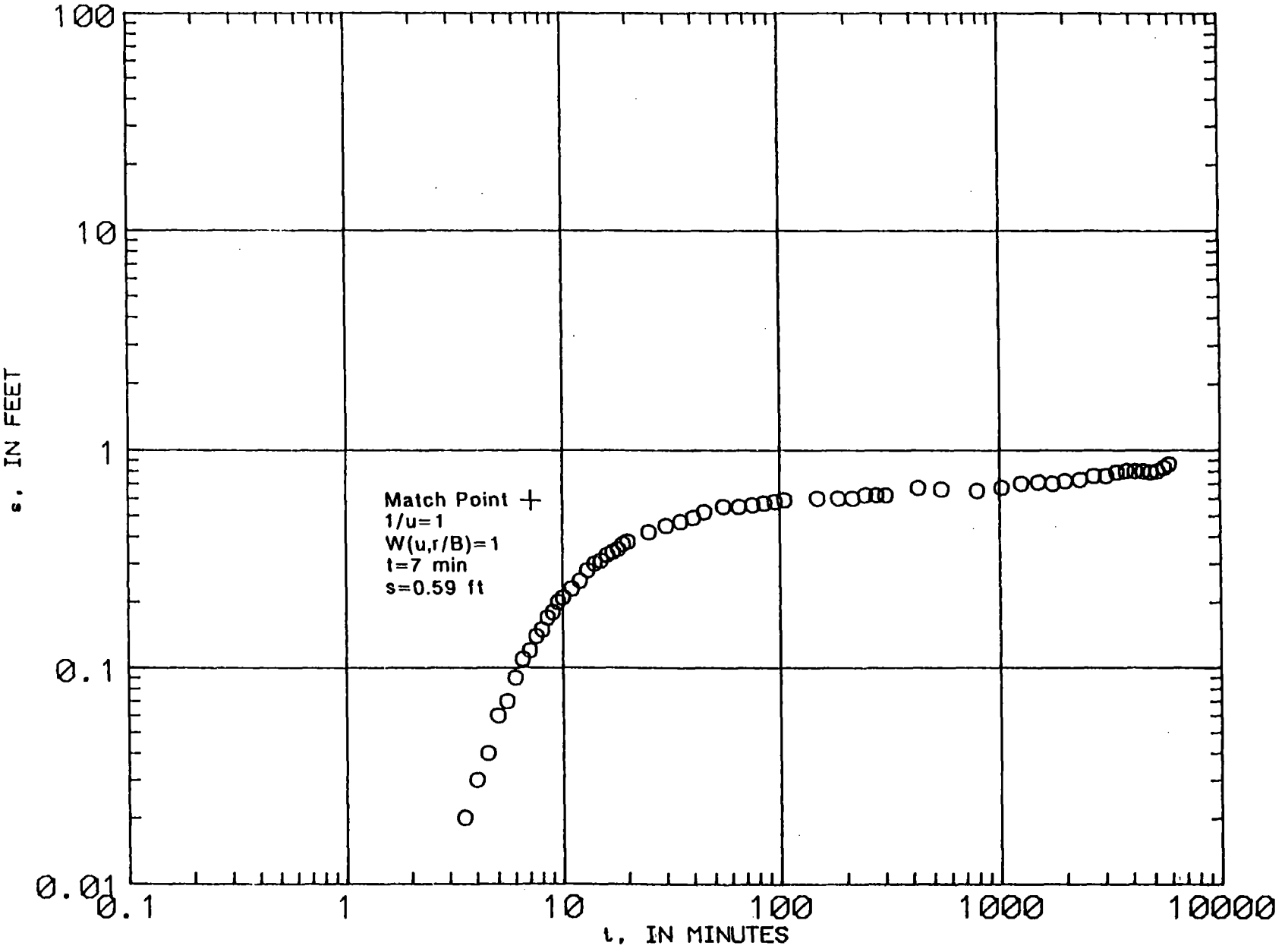


Figure C-5. Time-drawdown graph for observation well T-4B. Pumping rate 40 gpm.

Calculation Sheet

Computed by JAD
Checked by _____
Subject Aquifer Test Calculations
Client KEYSTONE
Sheet 6 of _____
Job No. 07029
Date 8/5/92

T-7B

TRANSMISSIVITY:

Q = 40 gpm
r = 154 ft
S = 0.361 ft
t = 0.69 min
1/μ = 1
W(μ, r/B) = 1
r/B = 0.15

$$T_{T\text{-}7B} = \frac{114.6\,Q}{S}\,W(\mu, r/B)$$

$$T_{T\text{-}7B} = \frac{(114.6)(40)}{0.361}\,(1)$$

$$T_{T\text{-}7B} = 12{,}698\ \text{gal/day/ft} \sim 1.8\times10^{1}\ \text{cm}^2/\text{sec}$$

STORATIVITY:

$$S_{T\text{-}7B} = \frac{T t \mu}{2693 \cdot r^2}$$

$$S_{T\text{-}7B} = \frac{(12{,}698)(0.69)(1)}{(2693)(154)^2}$$

$$S_{T\text{-}7B} = 1.4\times10^{-4}$$

HYDRAULIC CONDUCTIVITY

T = 12,698 gal/day/ft

b = 15 ft

$$K_{T\text{-}7B} = T/b$$

$$K_{T\text{-}7B} = 12{,}698/15$$

$$K_{T\text{-}7B} = 847\ \text{gal/day/ft}^2 \sim 4.0\times10^{-2}\ \text{cm/sec}$$

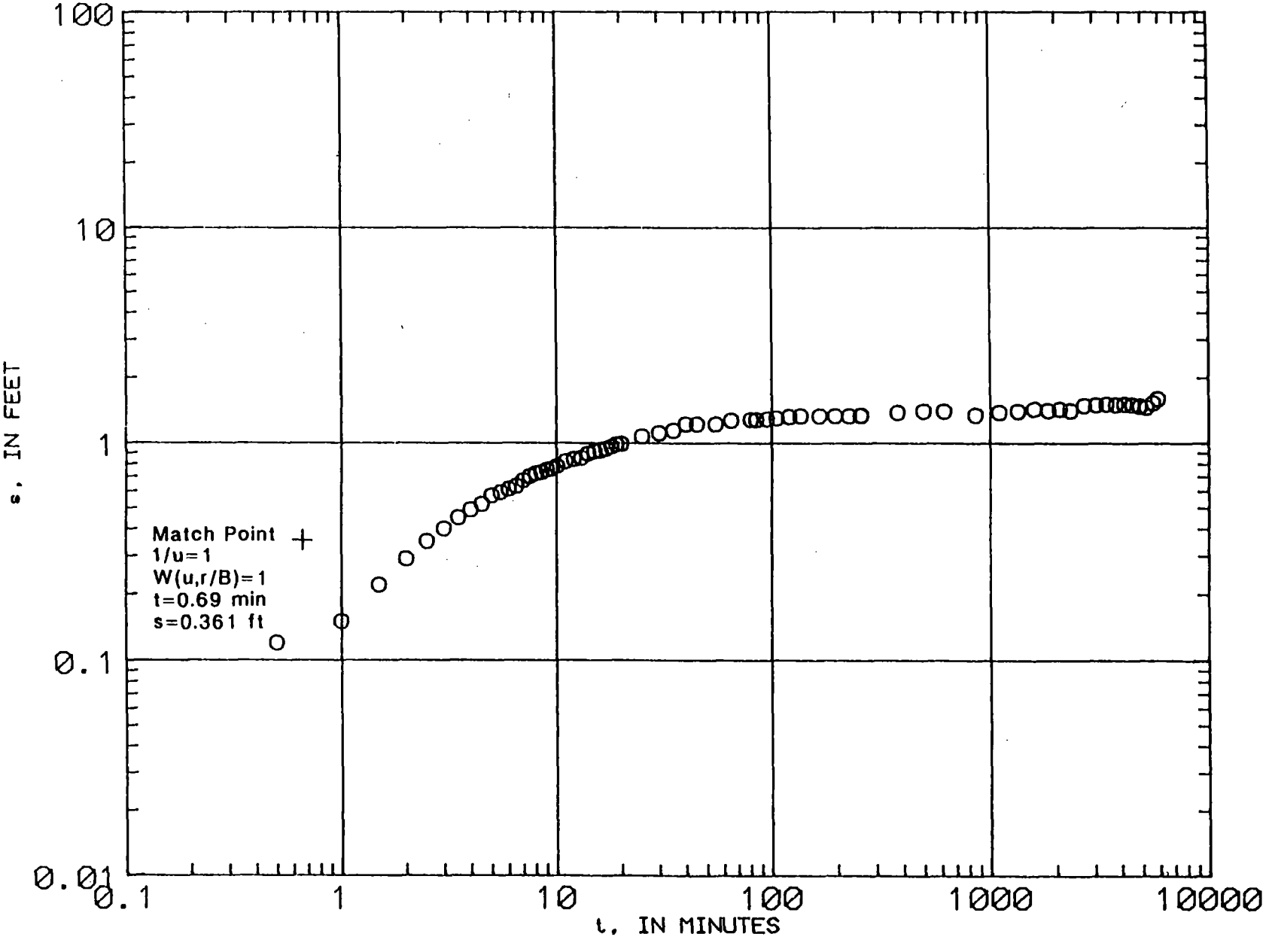
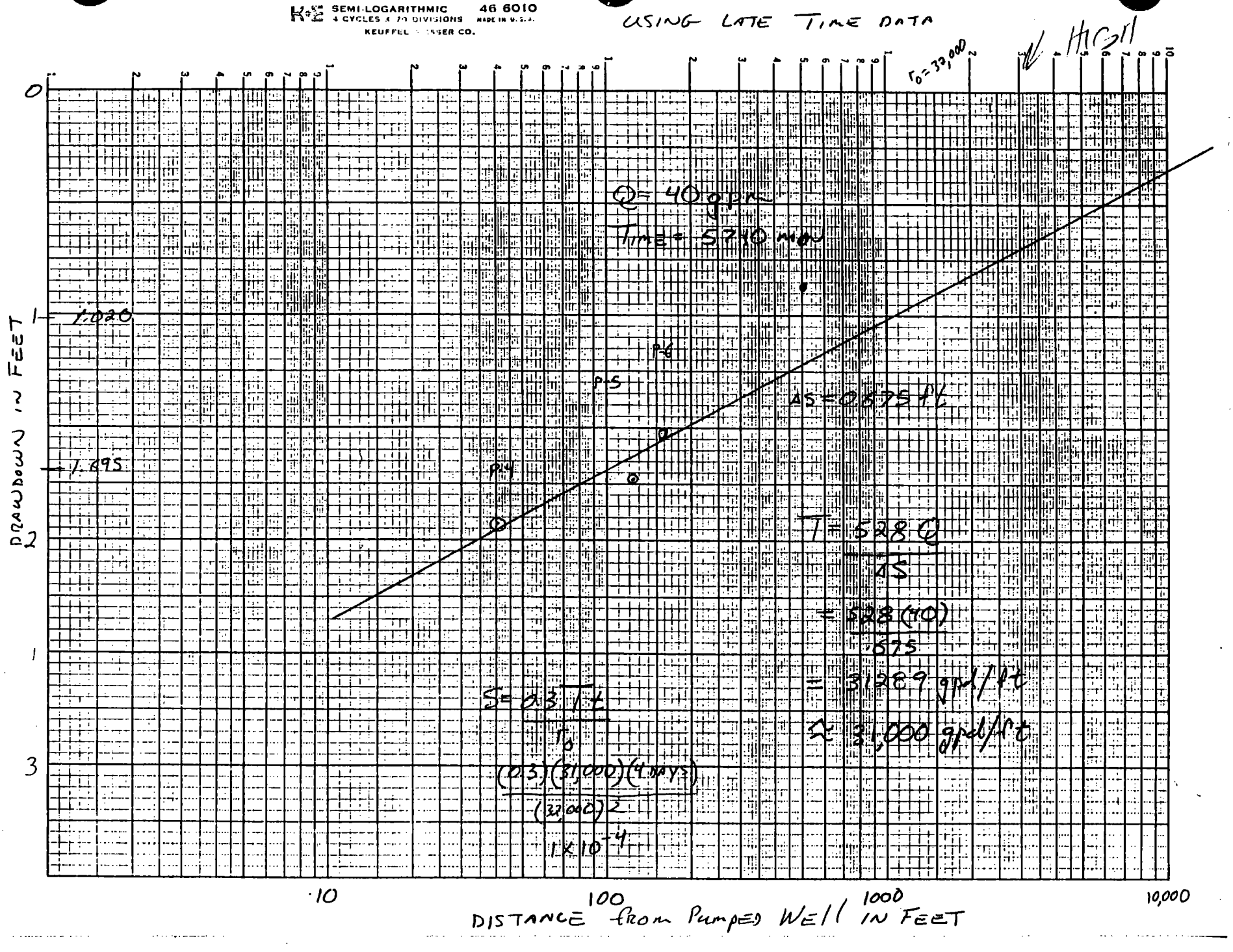


Figure C-6. Time-drawdown graph for observation well T-7B. Pumping rate 40 gpm.


K&E SEMI-LOGARITHMIC 46 6010
4 CYCLES X 70 DIVISIONS MADE IN U.S.A.
KEUFFEL & ESSER CO.
USING LATE TIME DATA
Hill
r_o = 33,000
Q = 40 gpm
Time = 5240 min
1.020
1.895
P-6
P-5
P-4
Δs = 0.875 ft
$T = \frac{528\,Q}{\Delta s}$
$= \frac{528(40)}{.675}$
= 31289 gpd/ft
≈ 31,000 gpd/ft
$S = 2.3\frac{Tt}{r_o^2}$
$\frac{(0.3)(31{,}000)(4\ \text{days})}{(33{,}000)^2}$
1×10^{-4}
DRAWDOWN IN FEET
0
1
2
3
10
100
1000
10,000
DISTANCE from Pumped Well IN FEET

APPENDIX D

LABORATORY DATA SHEETS

SUMMARY OF SOIL ANALYSIS

JOB: KEYSTONE STEEL & WIRE **Project No: 07029**
METHODS: ASTM D422, and D2487

SAMPLE NUMBER	DEPTH (ft)	LAB NUMBER	TEXTURE (PERCENT FINER) SIEVE #4 4.75 mm	#10 2.00 mm	#35 0.500 mm	#60 0.250 mm	#120 0.125 mm	#200 0.075 mm	HYDROMETER 0.050 mm	0.005 mm	0.002 mm	CLASSIFICATION USDA
PB	30.0-35.0	9205021	100.0	100.0	99.6	92.3	18.7	9.2	6.0	3.3	3.0	SAND
PB	37.8-38.9	9205022	98.9	98.5	96.4	78.5	55.1	50.6	45.5	15.2	12.5	SANDY LOAM
PB	38.9-40.0	9205023	70.9	62.3	49.4	25.6	10.1	6.5	5.4	3.5	2.6	VERY GRAVELLY SAND
PB	42.0-42.7	9205024	100.0	99.9	99.2	95.2	67.4	39.0	25.2	9.2	7.5	SANDY LOAM
PB	42.7-43.4	9205025	100.0	100.0	99.5	97.9	93.6	82.8	73.5	31.8	23.1	LOAM
PB	43.4-44.0	9205026	90.8	89.4	87.0	74.4	45.3	25.6	17.3	6.0	5.8	LOAMY SAND
PB	48.0-50.0	9205027	100.0	100.0	94.1	58.3	19.7	9.8	7.0	4.7	4.5	SAND
PB	50.0-51.3	9205028	100.0	100.0	99.5	98.0	94.7	91.4	86.8	37.2	26.5	SILT LOAM
PB	53.1-54.0	9205029	100.0	99.9	98.5	73.0	41.3	32.1	28.2	10.2	8.1	SANDY LOAM
PB	54.0-56.0	9205030	100.0	100.0	99.8	96.4	84.6	77.5	72.2	26.4	20.0	LOAM
PB	60.0-62.0	9205031	100.0	100.0	99.8	97.3	85.7	61.7	40.5	11.5	9.2	SANDY LOAM
PB	62.0-64.0	9205032	100.0	99.9	99.7	98.9	97.5	92.5	81.5	28.5	21.0	SILT LOAM
PB	64.0-65.6	9205033	100.0	99.6	78.3	18.2	10.6	8.6	7.2	4.5	4.3	SAND
PB	68.0-70.0	9205034	100.0	100.0	95.3	62.5	50.6	44.6	37.0	9.1	8.2	SANDY LOAM

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SUMMARY OF SOIL ANALYSIS

JOB: KEYSTONE STEEL & WIRE
METHODS: ASTM D422 and D2487

Project No: 07029

SAMPLE NUMBER	DEPTH (ft)	LAB NUMBER	TEXTURE (PERCENT FINER) SIEVE #4 4.75 mm	#10 2.00 mm	#35 0.500 mm	#60 0.250 mm	#120 0.125 mm	#200 0.075 mm	HYDROMETER 0.050 mm	0.005 mm	0.002 mm	CLASSIFICATION USDA
PB-2	47.0-48.1	9206074	100.0	100.0	99.7	98.9	97.4	93.0	85.5	28.2	19.8	SILT LOAM
PB-2	49.0-54.0	9206075	100.0	100.0	99.5	96.8	77.5	63.7	55.7	20.2	13.8	LOAM
PB-2	54.0-58.3	9206076	100.0	100.0	92.5	57.6	32.1	24.7	22.2	6.4	5.6	LOAMY SAND
PB-2	58.3-59.0	9206077	99.9	99.9	99.0	92.5	69.9	52.2	44.5	12.5	10.0	SANDY LOAM
PB-2	59.0-64.0	9206078	100.0	100.0	99.6	93.8	75.0	58.8	45.6	13.5	10.0	SANDY LOAM
PB-2	64.0-67.5	9206079	100.0	100.0	99.3	94.3	89.4	81.8	70.0	16.0	12.2	SILT LOAM
PB-2	67.5-69.0	9206080	100.0	100.0	88.6	34.1	20.0	16.0	12.7	3.9	3.0	SAND
PB-2	69.0-71.0	9206081	99.9	99.8	85.8	18.4	8.9	7.2	5.8	2.8	2.2	SAND
PB-2	71.0-74.0	9206082	100.0	99.8	81.3	17.5	8.9	7.0	5.7	1.7	1.5	SAND
PB-2	74.0-76.0	9206083	99.8	98.7	64.9	11.6	6.8	5.7	4.7	2.8	2.2	SAND
PB-2	76.0-78.0	9206084	99.1	98.0	68.3	16.1	9.6	7.6	6.0	3.0	3.0	SAND
PB-2	78.0-80.0	9206085	98.6	97.6	72.4	16.7	9.8	7.7	5.7	3.4	3.0	SAND
PB-2	80.0-81.0	9206086	99.9	98.9	69.6	11.4	6.5	5.6	4.8	2.9	2.2	SAND

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VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 1992 Rush Samples
Sample: Equipment Blank (TEST 1 EFFLUENT)

Submittal Number 29276- 21
Date Sampled: 07/10/92 Time: 00:00
Date Received: 07/10/92 Time: 00:00
Analysis Date: 07/08/92
Sample No: 25993

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<50	1,2-Dichloropropane	<1.0
Benzene	<1.0	cis-1,3-Dichloropropene	<1.0
Bromodichloromethane	<1.0	trans-1,3-Dichloropropene	<1.0
Bromoform	<1.0	Ethylbenzene	<1.0
Bromomethane	<1.0	2-Hexanone	<50
Methyl Ethyl Ketone	<50	4-Methyl-2-Pentanone	<50
Carbon Disulfide	<1.0	Methylene Chloride	<1.0
Carbon Tetrachloride	<1.0	Styrene	<1.0
Chlorobenzene	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Chloroethane	<1.0	Tetrachloroethene	<1.0
2-Chloroethyl Vinyl Ether	<1.0	1,1,1-Trichloroethane	<1.0
Chloroform	<1.0	1,1,2-Trichloroethane	<1.0
Chloromethane	<1.0	Trichloroethene	1.0
Dibromochloromethane	<1.0	Toluene	<1.0
1,1-Dichloroethane	<1.0	Vinyl Acetate	<1.0
1,2-Dichloroethane	<1.0	Vinyl Chloride	<1.0
1,1-Dichloroethylene	<1.0	Xylene, Total	<3.0
1,2-Dichloroethene(total)	<1.0		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 13-17 Samples
Sample: Influent Test 2

Submittal Number 29276- 22
Date Sampled: 07/14/92 Time: 17:15
Date Received: 07/16/92 Time: 09:00
Analysis Date: 07/21/92
Sample No: 26456

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<250	1,2-Dichloropropane	<5.0
Benzene	<5.0	cis-1,3-Dichloropropene	<5.0
Bromodichloromethane	<5.0	trans-1,3-Dichloropropene	<5.0
Bromoform	<5.0	Ethylbenzene	<5.0
Bromomethane	<5.0	2-Hexanone	<250
Methyl Ethyl Ketone	<250	4-Methyl-2-Pentanone	<250
Carbon Disulfide	<5.0	Methylene Chloride	120
Carbon Tetrachloride	<5.0	Styrene	<5.0
Chlorobenzene	<5.0	1,1,2,2-Tetrachloroethane	<5.0
Chloroethane	<5.0	Tetrachloroethene	33
2-Chloroethyl Vinyl Ether	<5.0	1,1,1-Trichloroethane	9.0
Chloroform	12	1,1,2-Trichloroethane	<5.0
Chloromethane	<5.0	Trichloroethene	770
Dibromochloromethane	<5.0	Toluene	8.0
1,1-Dichloroethane	9.0	Vinyl Acetate	<5.0
1,2-Dichloroethane	<5.0	Vinyl Chloride	<5.0
1,1-Dichloroethylene	200	Xylene, Total	<15
1,2-Dichloroethene(total)	81		

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VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 13-17 Samples
Sample: Effluent Test 2

Submittal Number 29276- 22
Date Sampled: 07/14/92 Time: 17:15
Date Received: 07/16/92 Time: 09:00
Analysis Date: 07/21/92
Sample No: 26458

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<50	1,2-Dichloropropane	<1.0
Benzene	<1.0	cis-1,3-Dichloropropene	<1.0
Bromodichloromethane	<1.0	trans-1,3-Dichloropropene	<1.0
Bromoform	<1.0	Ethylbenzene	<1.0
Bromomethane	<1.0	2-Hexanone	<50
Methyl Ethyl Ketone	<50	4-Methyl-2-Pentanone	<50
Carbon Disulfide	<1.0	Methylene Chloride	<1.0
Carbon Tetrachloride	<1.0	Styrene	<1.0
Chlorobenzene	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Chloroethane	<1.0	Tetrachloroethene	<1.0
2-Chloroethyl Vinyl Ether	<1.0	1,1,1-Trichloroethane	<1.0
Chloroform	<1.0	1,1,2-Trichloroethane	<1.0
Chloromethane	<1.0	Trichloroethene	9.0
Dibromochloromethane	<1.0	Toluene	<1.0
1,1-Dichloroethane	<1.0	Vinyl Acetate	<1.0
1,2-Dichloroethane	<1.0	Vinyl Chloride	<1.0
1,1-Dichloroethylene	1.0	Xylene, Total	<3.0
1,2-Dichloroethene(total)	1.0		

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VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 13-17 Samples
Sample: Effluent
Test 2
Duplicate

Submittal Number 29276- 22
Date Sampled: 07/14/92 Time: 17:15
Date Received: 07/16/92 Time: 09:00
Analysis Date: 07/22/92
Sample No: 26459

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<50	1,2-Dichloropropane	<1.0
Benzene	<1.0	cis-1,3-Dichloropropene	<1.0
Bromodichloromethane	<1.0	trans-1,3-Dichloropropene	<1.0
Bromoform	<1.0	Ethylbenzene	<1.0
Bromomethane	<1.0	2-Hexanone	<50
Methyl Ethyl Ketone	<50	4-Methyl-2-Pentanone	<50
Carbon Disulfide	<1.0	Methylene Chloride	<1.0
Carbon Tetrachloride	<1.0	Styrene	<1.0
Chlorobenzene	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Chloroethane	<1.0	Tetrachloroethene	<1.0
2-Chloroethyl Vinyl Ether	<1.0	1,1,1-Trichloroethane	<1.0
Chloroform	<1.0	1,1,2-Trichloroethane	<1.0
Chloromethane	<1.0	Trichloroethene	8.0
Dibromochloromethane	<1.0	Toluene	<1.0
1,1-Dichloroethane	<1.0	Vinyl Acetate	<1.0
1,2-Dichloroethane	<1.0	Vinyl Chloride	<1.0
1,1-Dichloroethylene	1.0	Xylene, Total	<3.0
1,2-Dichloroethene(total)	1.0		

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VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 13-17 Samples
Sample: Influent
Test 3

Submittal Number 29276- 22
Date Sampled: 07/14/92 Time: 18:30
Date Received: 07/16/92 Time: 00:00
Analysis Date: 07/27/92
Sample No: 26487

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<500	1,2-Dichloropropane	<10
Benzene	<10	cis-1,3-Dichloropropene	<10
Bromodichloromethane	<10	trans-1,3-Dichloropropene	<10
Bromoform	<10	Ethylbenzene	<10
Bromomethane	<10	2-Hexanone	<500
Methyl Ethyl Ketone	<500	4-Methyl-2-Pentanone	<500
Carbon Disulfide	<10	Methylene Chloride	<10
Carbon Tetrachloride	<10	Styrene	<10
Chlorobenzene	<10	1,1,2,2-Tetrachloroethane	<10
Chloroethane	<10	Tetrachloroethene	<10
2-Chloroethyl Vinyl Ether	<10	1,1,1-Trichloroethane	49
Chloroform	<10	1,1,2-Trichloroethane	<10
Chloromethane	<10	Trichloroethene	1400
Dibromochloromethane	<10	Toluene	<10
1,1-Dichloroethane	16	Vinyl Acetate	<10
1,2-Dichloroethane	<10	Vinyl Chloride	<10
1,1-Dichloroethylene	380	Xylene, Total	<30
1,2-Dichloroethene(total)	130		

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Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 13-17 Samples
Sample: Effluent Test 3

Submittal Number 29276- 22
Date Sampled: 07/14/92 Time: 18:30
Date Received: 07/16/92 Time: 09:00
Analysis Date: 07/24/92
Sample No: 26460

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<50	1,2-Dichloropropane	<1.0
Benzene	<1.0	cis-1,3-Dichloropropene	<1.0
Bromodichloromethane	<1.0	trans-1,3-Dichloropropene	<1.0
Bromoform	<1.0	Ethylbenzene	<1.0
Bromomethane	<1.0	2-Hexanone	<50
Methyl Ethyl Ketone	<50	4-Methyl-2-Pentanone	<50
Carbon Disulfide	<1.0	Methylene Chloride	3.0
Carbon Tetrachloride	<1.0	Styrene	<1.0
Chlorobenzene	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Chloroethane	<1.0	Tetrachloroethene	<1.0
2-Chloroethyl Vinyl Ether	<1.0	1,1,1-Trichloroethane	<1.0
Chloroform	<1.0	1,1,2-Trichloroethane	<1.0
Chloromethane	<1.0	Trichloroethene	7.0
Dibromochloromethane	<1.0	Toluene	<1.0
1,1-Dichloroethane	<1.0	Vinyl Acetate	<1.0
1,2-Dichloroethane	<1.0	Vinyl Chloride	<1.0
1,1-Dichloroethylene	<1.0	Xylene, Total	<3.0
1,2-Dichloroethene(total)	<1.0		

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Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 13-17 Samples
Sample: Effluent
Test 3
Duplicate

Submittal Number 29276- 22
Date Sampled: 07/14/92 Time: 18:30
Date Received: 07/16/92 Time: 09:00
Analysis Date: 07/23/92
Sample No: 26461

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<50	1,2-Dichloropropane	<1.0
Benzene	<1.0	cis-1,3-Dichloropropene	<1.0
Bromodichloromethane	<1.0	trans-1,3-Dichloropropene	<1.0
Bromoform	<1.0	Ethylbenzene	<1.0
Bromomethane	<1.0	2-Hexanone	<50
Methyl Ethyl Ketone	<50	4-Methyl-2-Pentanone	<50
Carbon Disulfide	<1.0	Methylene Chloride	<1.0
Carbon Tetrachloride	<1.0	Styrene	<1.0
Chlorobenzene	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Chloroethane	<1.0	Tetrachloroethene	<1.0
2-Chloroethyl Vinyl Ether	<1.0	1,1,1-Trichloroethane	<1.0
Chloroform	<1.0	1,1,2-Trichloroethane	<1.0
Chloromethane	<1.0	Trichloroethene	6.0
Dibromochloromethane	<1.0	Toluene	<1.0
1,1-Dichloroethane	<1.0	Vinyl Acetate	<1.0
1,2-Dichloroethane	<1.0	Vinyl Chloride	<1.0
1,1-Dichloroethylene	1.0	Xylene, Total	<3.0
1,2-Dichloroethene(total)	<1.0		

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Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 13-17 Samples
Sample: Influent Test 4

Submittal Number 29276- 22
Date Sampled: 07/14/92 Time: 08:00
Date Received: 07/16/92 Time: 09:00
Analysis Date: 07/24/92
Sample No: 26467

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<250	1,2-Dichloropropane	<5.0
Benzene	<5.0	cis-1,3-Dichloropropene	<5.0
Bromodichloromethane	<5.0	trans-1,3-Dichloropropene	<5.0
Bromoform	<5.0	Ethylbenzene	<5.0
Bromomethane	<5.0	2-Hexanone	<250
Methyl Ethyl Ketone	<250	4-Methyl-2-Pentanone	<250
Carbon Disulfide	<5.0	Methylene Chloride	23
Carbon Tetrachloride	<5.0	Styrene	<5.0
Chlorobenzene	<5.0	1,1,2,2-Tetrachloroethane	<5.0
Chloroethane	<5.0	Tetrachloroethene	<5.0
2-Chloroethyl Vinyl Ether	<5.0	1,1,1-Trichloroethane	29
Chloroform	<5.0	1,1,2-Trichloroethane	<5.0
Chloromethane	<5.0	Trichloroethene	700
Dibromochloromethane	<5.0	Toluene	<5.0
1,1-Dichloroethane	<5.0	Vinyl Acetate	<5.0
1,2-Dichloroethane	6.0	Vinyl Chloride	<5.0
1,1-Dichloroethylene	130	Xylene, Total	<15
1,2-Dichloroethene(total)	50		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 13-17 Samples
Sample: Effluent
Test 4

Submittal Number 29276- 22
Date Sampled: 07/14/92 Time: 08:00
Date Received: 07/16/92 Time: 09:00
Analysis Date: 07/23/92
Sample No: 26468

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<50	1,2-Dichloropropane	<1.0
Benzene	<1.0	cis-1,3-Dichloropropene	<1.0
Bromodichloromethane	<1.0	trans-1,3-Dichloropropene	<1.0
Bromoform	<1.0	Ethylbenzene	<1.0
Bromomethane	<1.0	2-Hexanone	<50
Methyl Ethyl Ketone	<50	4-Methyl-2-Pentanone	<50
Carbon Disulfide	<1.0	Methylene Chloride	<1.0
Carbon Tetrachloride	<1.0	Styrene	<1.0
Chlorobenzene	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Chloroethane	<1.0	Tetrachloroethene	<1.0
2-Chloroethyl Vinyl Ether	<1.0	1,1,1-Trichloroethane	<1.0
Chloroform	<1.0	1,1,2-Trichloroethane	<1.0
Chloromethane	<1.0	Trichloroethene	7.0
Dibromochloromethane	<1.0	Toluene	<1.0
1,1-Dichloroethane	<1.0	Vinyl Acetate	<1.0
1,2-Dichloroethane	<1.0	Vinyl Chloride	<1.0
1,1-Dichloroethylene	1.0	Xylene, Total	<3.0
1,2-Dichloroethene(total)	<1.0		

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Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 13-17 Samples
Sample: Effluent
Test 4
Duplicate

Submittal Number 29276- 22
Date Sampled: 07/14/92 Time: 08:00
Date Received: 07/16/92 Time: 09:00
Analysis Date: 07/23/92
Sample No: 26469

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<50	1,2-Dichloropropane	<1.0
Benzene	<1.0	cis-1,3-Dichloropropene	<1.0
Bromodichloromethane	<1.0	trans-1,3-Dichloropropene	<1.0
Bromoform	<1.0	Ethylbenzene	<1.0
Bromomethane	<1.0	2-Hexanone	<50
Methyl Ethyl Ketone	<50	4-Methyl-2-Pentanone	<50
Carbon Disulfide	<1.0	Methylene Chloride	4.0
Carbon Tetrachloride	<1.0	Styrene	<1.0
Chlorobenzene	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Chloroethane	<1.0	Tetrachloroethene	<1.0
2-Chloroethyl Vinyl Ether	<1.0	1,1,1-Trichloroethane	<1.0
Chloroform	<1.0	1,1,2-Trichloroethane	<1.0
Chloromethane	<1.0	Trichloroethene	6.0
Dibromochloromethane	<1.0	Toluene	1.0
1,1-Dichloroethane	<1.0	Vinyl Acetate	<1.0
1,2-Dichloroethane	<1.0	Vinyl Chloride	<1.0
1,1-Dichloroethylene	1.0	Xylene, Total	<3.0
1,2-Dichloroethene(total)	<1.0		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 13-17 Samples
Sample: Influent
Test 5

Submittal Number 29276- 22
Date Sampled: 07/15/92 Time: 10:00
Date Received: 07/16/92 Time: 09:00
Analysis Date: 07/24/92
Sample No: 26463

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<500	1,2-Dichloropropane	<10
Benzene	<10	cis-1,3-Dichloropropene	<10
Bromodichloromethane	<10	trans-1,3-Dichloropropene	<10
Bromoform	<10	Ethylbenzene	<10
Bromomethane	<10	2-Hexanone	<500
Methyl Ethyl Ketone	<500	4-Methyl-2-Pentanone	<500
Carbon Disulfide	<10	Methylene Chloride	<10
Carbon Tetrachloride	<10	Styrene	<10
Chlorobenzene	<10	1,1,2,2-Tetrachloroethane	<10
Chloroethane	<10	Tetrachloroethene	<10
2-Chloroethyl Vinyl Ether	<10	1,1,1-Trichloroethane	53
Chloroform	<10	1,1,2-Trichloroethane	<10
Chloromethane	<10	Trichloroethene	840
Dibromochloromethane	<10	Toluene	<10
1,1-Dichloroethane	<10	Vinyl Acetate	<10
1,2-Dichloroethane	<10	Vinyl Chloride	<10
1,1-Dichloroethylene	150	Xylene, Total	<30
1,2-Dichloroethene(total)	68		

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VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 13-17 Samples
Sample: Effluent
Test 5

Submittal Number 29276- 22
Date Sampled: 07/15/92 Time: 10:00
Date Received: 07/16/92 Time: 09:00
Analysis Date: 07/22/92
Sample No: 26465

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<50	1,2-Dichloropropane	<1.0
Benzene	<1.0	cis-1,3-Dichloropropene	<1.0
Bromodichloromethane	<1.0	trans-1,3-Dichloropropene	<1.0
Bromoform	<1.0	Ethylbenzene	<1.0
Bromomethane	<1.0	2-Hexanone	<50
Methyl Ethyl Ketone	<50	4-Methyl-2-Pentanone	<50
Carbon Disulfide	<1.0	Methylene Chloride	<1.0
Carbon Tetrachloride	<1.0	Styrene	<1.0
Chlorobenzene	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Chloroethane	<1.0	Tetrachloroethene	<1.0
2-Chloroethyl Vinyl Ether	<1.0	1,1,1-Trichloroethane	<1.0
Chloroform	<1.0	1,1,2-Trichloroethane	<1.0
Chloromethane	<1.0	Trichloroethene	13
Dibromochloromethane	<1.0	Toluene	<1.0
1,1-Dichloroethane	<1.0	Vinyl Acetate	<1.0
1,2-Dichloroethane	<1.0	Vinyl Chloride	<1.0
1,1-Dichloroethylene	2.0	Xylene, Total	<3.0
1,2-Dichloroethene(total)	2.0		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 13-17 Samples
Sample: Effluent Test 5 Duplicate

Submittal Number 29276- 22
Date Sampled: 07/15/92 Time: 10:00
Date Received: 07/16/92 Time: 09:00
Analysis Date: 07/23/92
Sample No: 26466

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<50	1,2-Dichloropropane	<1.0
Benzene	<1.0	cis-1,3-Dichloropropene	<1.0
Bromodichloromethane	<1.0	trans-1,3-Dichloropropene	<1.0
Bromoform	<1.0	Ethylbenzene	<1.0
Bromomethane	<1.0	2-Hexanone	<50
Methyl Ethyl Ketone	<50	4-Methyl-2-Pentanone	<50
Carbon Disulfide	<1.0	Methylene Chloride	<1.0
Carbon Tetrachloride	<1.0	Styrene	<1.0
Chlorobenzene	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Chloroethane	<1.0	Tetrachloroethene	<1.0
2-Chloroethyl Vinyl Ether	<1.0	1,1,1-Trichloroethane	<1.0
Chloroform	<1.0	1,1,2-Trichloroethane	<1.0
Chloromethane	<1.0	Trichloroethene	13
Dibromochloromethane	<1.0	Toluene	<1.0
1,1-Dichloroethane	<1.0	Vinyl Acetate	<1.0
1,2-Dichloroethane	4.0	Vinyl Chloride	<1.0
1,1-Dichloroethylene	2.0	Xylene, Total	<3.0
1,2-Dichloroethene(total)	1.0		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 13-17 Samples
Sample: Influent
Matrix Sp.
Test 5

Submittal Number 29276- 22
Date Sampled: 07/15/92 Time: 10:00
Date Received: 07/16/92 Time: 00:00
Analysis Date: 07/27/92
Sample No: 26488

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<500	1,2-Dichloropropane	<10
Benzene	<10	cis-1,3-Dichloropropene	<10
Bromodichloromethane	<10	trans-1,3-Dichloropropene	<10
Bromoform	<10	Ethylbenzene	<10
Bromomethane	<10	2-Hexanone	<500
Methyl Ethyl Ketone	<500	4-Methyl-2-Pentanone	<500
Carbon Disulfide	<10	Methylene Chloride	<10
Carbon Tetrachloride	<10	Styrene	<10
Chlorobenzene	<10	1,1,2,2-Tetrachloroethane	<10
Chloroethane	<10	Tetrachloroethene	<10
2-Chloroethyl Vinyl Ether	<10	1,1,1-Trichloroethane	46
Chloroform	<10	1,1,2-Trichloroethane	<10
Chloromethane	<10	Trichloroethene	760
Dibromochloromethane	<10	Toluene	<10
1,1-Dichloroethane	<10	Vinyl Acetate	<10
1,2-Dichloroethane	<10	Vinyl Chloride	<10
1,1-Dichloroethylene	170	Xylene, Total	<30
1,2-Dichloroethene(total)	60		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 13-17 Samples
Sample: Influent
Method Sp.
Test 5

Submittal Number 29276- 22
Date Sampled: 07/15/92 Time: 10:00
Date Received: 07/16/92 Time: 00:00
Analysis Date: 07/27/92
Sample No: 26489

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<500	1,2-Dichloropropane	<10
Benzene	<10	cis-1,3-Dichloropropene	<10
Bromodichloromethane	<10	trans-1,3-Dichloropropene	<10
Bromoform	<10	Ethylbenzene	<10
Bromomethane	<10	2-Hexanone	<500
Methyl Ethyl Ketone	<500	4-Methyl-2-Pentanone	<500
Carbon Disulfide	<10	Methylene Chloride	<10
Carbon Tetrachloride	<10	Styrene	<10
Chlorobenzene	<10	1,1,2,2-Tetrachloroethane	<10
Chloroethane	<10	Tetrachloroethene	<10
2-Chloroethyl Vinyl Ether	<10	1,1,1-Trichloroethane	46
Chloroform	<10	1,1,2-Trichloroethane	<10
Chloromethane	<10	Trichloroethene	720
Dibromochloromethane	<10	Toluene	<10
1,1-Dichloroethane	<10	Vinyl Acetate	<10
1,2-Dichloroethane	<10	Vinyl Chloride	<10
1,1-Dichloroethylene	170	Xylene, Total	<30
1,2-Dichloroethene(total)	59		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 13-17 Samples
Sample: Influent
Test 6

Submittal Number 29276- 22
Date Sampled: 07/15/92 Time: 11:45
Date Received: 07/16/92 Time: 09:00
Analysis Date: 07/24/92
Sample No: 26470

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<250	1,2-Dichloropropane	<5.0
Benzene	<5.0	cis-1,3-Dichloropropene	<5.0
Bromodichloromethane	<5.0	trans-1,3-Dichloropropene	<5.0
Bromoform	<5.0	Ethylbenzene	<5.0
Bromomethane	<5.0	2-Hexanone	<250
Methyl Ethyl Ketone	<250	4-Methyl-2-Pentanone	<250
Carbon Disulfide	<5.0	Methylene Chloride	7.0
Carbon Tetrachloride	10	Styrene	<5.0
Chlorobenzene	<5.0	1,1,2,2-Tetrachloroethane	<5.0
Chloroethane	<5.0	Tetrachloroethene	<5.0
2-Chloroethyl Vinyl Ether	<5.0	1,1,1-Trichloroethane	67
Chloroform	<5.0	1,1,2-Trichloroethane	<5.0
Chloromethane	<5.0	Trichloroethene	860
Dibromochloromethane	<5.0	Toluene	<5.0
1,1-Dichloroethane	7.0	Vinyl Acetate	<5.0
1,2-Dichloroethane	<5.0	Vinyl Chloride	<5.0
1,1-Dichloroethylene	170	Xylene, Total	<15
1,2-Dichloroethene(total)	63		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 13-17 Samples
Sample: Effluent Test 6

Submittal Number 29276- 22
Date Sampled: 07/15/92 Time: 11:45
Date Received: 07/16/92 Time: 09:00
Analysis Date: 07/23/92
Sample No: 26471

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<50	1,2-Dichloropropane	<1.0
Benzene	<1.0	cis-1,3-Dichloropropene	<1.0
Bromodichloromethane	<1.0	trans-1,3-Dichloropropene	<1.0
Bromoform	<1.0	Ethylbenzene	<1.0
Bromomethane	<1.0	2-Hexanone	<50
Methyl Ethyl Ketone	<50	4-Methyl-2-Pentanone	<50
Carbon Disulfide	<1.0	Methylene Chloride	7.0
Carbon Tetrachloride	<1.0	Styrene	<1.0
Chlorobenzene	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Chloroethane	<1.0	Tetrachloroethene	<1.0
2-Chloroethyl Vinyl Ether	<1.0	1,1,1-Trichloroethane	<1.0
Chloroform	<1.0	1,1,2-Trichloroethane	<1.0
Chloromethane	<1.0	Trichloroethene	17
Dibromochloromethane	<1.0	Toluene	<1.0
1,1-Dichloroethane	<1.0	Vinyl Acetate	<1.0
1,2-Dichloroethane	<1.0	Vinyl Chloride	<1.0
1,1-Dichloroethylene	2.0	Xylene, Total	<3.0
1,2-Dichloroethene(total)	2.0		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 13-17 Samples
Sample: Effluent Test 6 Duplicate

Submittal Number 29276- 22
Date Sampled: 07/15/92 Time: 11:45
Date Received: 07/16/92 Time: 09:00
Analysis Date: 07/23/92
Sample No: 26472

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<50	1,2-Dichloropropane	<1.0
Benzene	<1.0	cis-1,3-Dichloropropene	<1.0
Bromodichloromethane	<1.0	trans-1,3-Dichloropropene	<1.0
Bromoform	<1.0	Ethylbenzene	<1.0
Bromomethane	<1.0	2-Hexanone	<50
Methyl Ethyl Ketone	<50	4-Methyl-2-Pentanone	<50
Carbon Disulfide	<1.0	Methylene Chloride	6.0
Carbon Tetrachloride	<1.0	Styrene	<1.0
Chlorobenzene	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Chloroethane	<1.0	Tetrachloroethene	<1.0
2-Chloroethyl Vinyl Ether	<1.0	1,1,1-Trichloroethane	<1.0
Chloroform	<1.0	1,1,2-Trichloroethane	<1.0
Chloromethane	<1.0	Trichloroethene	17
Dibromochloromethane	<1.0	Toluene	<1.0
1,1-Dichloroethane	<1.0	Vinyl Acetate	<1.0
1,2-Dichloroethane	<1.0	Vinyl Chloride	<1.0
1,1-Dichloroethylene	2.0	Xylene, Total	<3.0
1,2-Dichloroethene(total)	2.0		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 13-17 Samples
Sample: Influent Test 7

Submittal Number 29276- 22
Date Sampled: 07/15/92 Time: 16:50
Date Received: 07/16/92 Time: 09:00
Analysis Date: 07/24/92
Sample No: 26473

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<250	1,2-Dichloropropane	<5.0
Benzene	<5.0	cis-1,3-Dichloropropene	<5.0
Bromodichloromethane	<5.0	trans-1,3-Dichloropropene	<5.0
Bromoform	<5.0	Ethylbenzene	<5.0
Bromomethane	<5.0	2-Hexanone	<250
Methyl Ethyl Ketone	<250	4-Methyl-2-Pentanone	<250
Carbon Disulfide	<5.0	Methylene Chloride	7.0
Carbon Tetrachloride	11	Styrene	<5.0
Chlorobenzene	<5.0	1,1,2,2-Tetrachloroethane	<5.0
Chloroethane	<5.0	Tetrachloroethene	<5.0
2-Chloroethyl Vinyl Ether	<5.0	1,1,1-Trichloroethane	86
Chloroform	<5.0	1,1,2-Trichloroethane	<5.0
Chloromethane	<5.0	Trichloroethene	890
Dibromochloromethane	<5.0	Toluene	<5.0
1,1-Dichloroethane	9.0	Vinyl Acetate	<5.0
1,2-Dichloroethane	<5.0	Vinyl Chloride	<5.0
1,1-Dichloroethylene	220	Xylene, Total	<15
1,2-Dichloroethene(total)	79		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 13-17 Samples
Sample: Effluent
Test 7

Submittal Number 29276- 22
Date Sampled: 07/15/92 Time: 16:50
Date Received: 07/16/92 Time: 09:00
Analysis Date: 07/27/92
Sample No: 26474

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<50	1,2-Dichloropropane	<1.0
Benzene	<1.0	cis-1,3-Dichloropropene	<1.0
Bromodichloromethane	<1.0	trans-1,3-Dichloropropene	<1.0
Bromoform	<1.0	Ethylbenzene	<1.0
Bromomethane	<1.0	2-Hexanone	<50
Methyl Ethyl Ketone	<50	4-Methyl-2-Pentanone	<50
Carbon Disulfide	<1.0	Methylene Chloride	<1.0
Carbon Tetrachloride	<1.0	Styrene	<1.0
Chlorobenzene	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Chloroethane	<1.0	Tetrachloroethene	<1.0
2-Chloroethyl Vinyl Ether	<1.0	1,1,1-Trichloroethane	<1.0
Chloroform	<1.0	1,1,2-Trichloroethane	<1.0
Chloromethane	<1.0	Trichloroethene	<1.0
Dibromochloromethane	<1.0	Toluene	<1.0
1,1-Dichloroethane	<1.0	Vinyl Acetate	<1.0
1,2-Dichloroethane	3.0	Vinyl Chloride	<1.0
1,1-Dichloroethylene	<1.0	Xylene, Total	<3.0
1,2-Dichloroethene(total)	<1.0		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 13-17 Samples
Sample: Effluent Test 7 Duplicate

Submittal Number 29276- 22
Date Sampled: 07/15/92 Time: 16:50
Date Received: 07/16/92 Time: 09:00
Analysis Date: 07/27/92
Sample No: 26475

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<50	1,2-Dichloropropane	<1.0
Benzene	<1.0	cis-1,3-Dichloropropene	<1.0
Bromodichloromethane	<1.0	trans-1,3-Dichloropropene	<1.0
Bromoform	<1.0	Ethylbenzene	<1.0
Bromomethane	<1.0	2-Hexanone	<50
Methyl Ethyl Ketone	<50	4-Methyl-2-Pentanone	<50
Carbon Disulfide	<1.0	Methylene Chloride	<1.0
Carbon Tetrachloride	<1.0	Styrene	<1.0
Chlorobenzene	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Chloroethane	<1.0	Tetrachloroethene	<1.0
2-Chloroethyl Vinyl Ether	<1.0	1,1,1-Trichloroethane	<1.0
Chloroform	<1.0	1,1,2-Trichloroethane	<1.0
Chloromethane	<1.0	Trichloroethene	1.0
Dibromochloromethane	<1.0	Toluene	<1.0
1,1-Dichloroethane	<1.0	Vinyl Acetate	<1.0
1,2-Dichloroethane	<1.0	Vinyl Chloride	<1.0
1,1-Dichloroethylene	<1.0	Xylene, Total	<3.0
1,2-Dichloroethene(total)	<1.0		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 16,17 & 19 Samples
Sample: Influent
Test 8

Submittal Number 29276- 23
Date Sampled: 07/16/92 Time: 14:30
Date Received: 07/21/92 Time: 08:00
Analysis Date: 07/28/92
Sample No: 26815

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<250	1,2-Dichloropropane	<5.0
Benzene	<5.0	cis-1,3-Dichloropropene	<5.0
Bromodichloromethane	<5.0	trans-1,3-Dichloropropene	<5.0
Bromoform	<5.0	Ethylbenzene	<5.0
Bromomethane	<5.0	2-Hexanone	<250
Methyl Ethyl Ketone	<250	4-Methyl-2-Pentanone	<250
Carbon Disulfide	<25	Methylene Chloride	5.0
Carbon Tetrachloride	<5.0	Styrene	<5.0
Chlorobenzene	<5.0	1,1,2,2-Tetrachloroethane	<5.0
Chloroethane	<5.0	Tetrachloroethene	<5.0
2-Chloroethyl Vinyl Ether	<50	1,1,1-Trichloroethane	140
Chloroform	<5.0	1,1,2-Trichloroethane	<5.0
Chloromethane	<5.0	Trichloroethene	990
Dibromochloromethane	<5.0	Toluene	<5.0
1,1-Dichloroethane	7.0	Vinyl Acetate	<25
1,2-Dichloroethane	<5.0	Vinyl Chloride	<5.0
1,1-Dichloroethylene	200	Xylene, Total	<15
1,2-Dichloroethene(total)	58		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 16,17 & 19 Samples
Sample: Influent
Test 8
Matrix Sp.

Submittal Number 29276- 23
Date Sampled: 07/16/92 Time: 14:30
Date Received: 07/21/92 Time: 08:00
Analysis Date: 07/28/92
Sample No: 26816

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<250	1,2-Dichloropropane	<5.0
Benzene	<5.0	cis-1,3-Dichloropropene	<5.0
Bromodichloromethane	<5.0	trans-1,3-Dichloropropene	<5.0
Bromoform	<5.0	Ethylbenzene	<5.0
Bromomethane	<5.0	2-Hexanone	<250
ethyl Ethyl Ketone	<250	4-Methyl-2-Pentanone	<250
rbon Disulfide	33	Methylene Chloride	<5.0
Carbon Tetrachloride	<5.0	Styrene	<5.0
Chlorobenzene	<5.0	1,1,2,2-Tetrachloroethane	<5.0
Chloroethane	<5.0	Tetrachloroethene	<5.0
2-Chloroethyl Vinyl Ether	<50	1,1,1-Trichloroethane	120
Chloroform	<5.0	1,1,2-Trichloroethane	<5.0
Chloromethane	<5.0	Trichloroethene	930
Dibromochloromethane	<5.0	Toluene	<5.0
1,1-Dichloroethane	6.0	Vinyl Acetate	<25
1,2-Dichloroethane	<5.0	Vinyl Chloride	<5.0
1,1-Dichloroethylene	170	Xylene, Total	<15
1,2-Dichloroethene(total)	50		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 16,17 & 19 Samples
Sample: Effluent
Test 8

Submittal Number 29276- 23
Date Sampled: 07/16/92 Time: 14:30
Date Received: 07/21/92 Time: 08:00
Analysis Date: 07/28/92
Sample No: 26817

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<50	1,2-Dichloropropane	<1.0
Benzene	<1.0	cis-1,3-Dichloropropene	<1.0
Bromodichloromethane	<1.0	trans-1,3-Dichloropropene	<1.0
Bromoform	<1.0	Ethylbenzene	<1.0
Bromomethane	<1.0	2-Hexanone	<50
ethyl Ethyl Ketone	<50	4-Methyl-2-Pentanone	<50
rbon Disulfide	<5.0	Methylene Chloride	<1.0
Carbon Tetrachloride	<1.0	Styrene	<1.0
Chlorobenzene	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Chloroethane	<1.0	Tetrachloroethene	<1.0
2-Chloroethyl Vinyl Ether	<10	1,1,1-Trichloroethane	<1.0
Chloroform	<1.0	1,1,2-Trichloroethane	<1.0
Chloromethane	<1.0	Trichloroethene	2.0
Dibromochloromethane	<1.0	Toluene	<1.0
1,1-Dichloroethane	<1.0	Vinyl Acetate	<5.0
1,2-Dichloroethane	<1.0	Vinyl Chloride	<1.0
1,1-Dichloroethylene	<1.0	Xylene, Total	<3.0
1,2-Dichloroethene(total)	<1.0		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 16,17 & 19 Samples
Sample: Effluent
Test 8
Duplicate

Submittal Number 29276- 23
Date Sampled: 07/16/92 Time: 14:30
Date Received: 07/21/92 Time: 08:00
Analysis Date: 07/28/92
Sample No: 26818

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<50	1,2-Dichloropropane	<1.0
Benzene	<1.0	cis-1,3-Dichloropropene	<1.0
Bromodichloromethane	<1.0	trans-1,3-Dichloropropene	<1.0
Bromoform	<1.0	Ethylbenzene	<1.0
Bromomethane	<1.0	2-Hexanone	<50
ethyl Ethyl Ketone	<50	4-Methyl-2-Pentanone	<50
rbon Disulfide	<5.0	Methylene Chloride	<1.0
Carbon Tetrachloride	<1.0	Styrene	<1.0
Chlorobenzene	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Chloroethane	<1.0	Tetrachloroethene	<1.0
2-Chloroethyl Vinyl Ether	<10	1,1,1-Trichloroethane	<1.0
Chloroform	<1.0	1,1,2-Trichloroethane	<1.0
Chloromethane	<1.0	Trichloroethene	2.0
Dibromochloromethane	<1.0	Toluene	<1.0
1,1-Dichloroethane	<1.0	Vinyl Acetate	<5.0
1,2-Dichloroethane	<1.0	Vinyl Chloride	<1.0
1,1-Dichloroethylene	<1.0	Xylene, Total	<3.0
1,2-Dichloroethene(total)	<1.0		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 16,17 & 19 Samples
Sample: Influent
Test 9

Submittal Number 29276- 23
Date Sampled: 07/17/92 Time: 15:00
Date Received: 07/21/92 Time: 08:00
Analysis Date: 07/28/92
Sample No: 26819

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<250	1,2-Dichloropropane	<5.0
Benzene	<5.0	cis-1,3-Dichloropropene	<5.0
Bromodichloromethane	<5.0	trans-1,3-Dichloropropene	<5.0
Bromoform	<5.0	Ethylbenzene	<5.0
Bromomethane	<5.0	2-Hexanone	<250
Methyl Ethyl Ketone	<250	4-Methyl-2-Pentanone	<250
Carbon Disulfide	<25	Methylene Chloride	<5.0
Carbon Tetrachloride	<5.0	Styrene	<5.0
Chlorobenzene	<5.0	1,1,2,2-Tetrachloroethane	<5.0
Chloroethane	<5.0	Tetrachloroethene	<5.0
2-Chloroethyl Vinyl Ether	<50	1,1,1-Trichloroethane	170
Chloroform	<5.0	1,1,2-Trichloroethane	<5.0
Chloromethane	<5.0	Trichloroethene	980
Dibromochloromethane	<5.0	Toluene	<5.0
1,1-Dichloroethane	6.0	Vinyl Acetate	<25
1,2-Dichloroethane	<5.0	Vinyl Chloride	<5.0
1,1-Dichloroethylene	150	Xylene, Total	<15
1,2-Dichloroethene(total)	45		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 16,17 & 19 Samples
Sample: Effluent
Test 9

Submittal Number 29276- 23
Date Sampled: 07/17/92 Time: 15:00
Date Received: 07/21/92 Time: 08:00
Analysis Date: 07/28/92
Sample No: 26820

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<50	1,2-Dichloropropane	<1.0
Benzene	<1.0	cis-1,3-Dichloropropene	<1.0
Bromodichloromethane	<1.0	trans-1,3-Dichloropropene	<1.0
Bromoform	<1.0	Ethylbenzene	<1.0
Bromomethane	<1.0	2-Hexanone	<50
ethyl Ethyl Ketone	<50	4-Methyl-2-Pentanone	<50
rbon Disulfide	<5.0	Methylene Chloride	<1.0
Carbon Tetrachloride	<1.0	Styrene	<1.0
Chlorobenzene	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Chloroethane	<1.0	Tetrachloroethene	<1.0
2-Chloroethyl Vinyl Ether	<10	1,1,1-Trichloroethane	<1.0
Chloroform	<1.0	1,1,2-Trichloroethane	<1.0
Chloromethane	<1.0	Trichloroethene	5.0
Dibromochloromethane	<1.0	Toluene	<1.0
1,1-Dichloroethane	<1.0	Vinyl Acetate	<5.0
1,2-Dichloroethane	<1.0	Vinyl Chloride	<1.0
1,1-Dichloroethylene	<1.0	Xylene, Total	<3.0
1,2-Dichloroethene(total)	1.0		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 16,17 & 19 Samples
Sample: Effluent
Test 9
Duplicate

Submittal Number 29276- 23
Date Sampled: 07/17/92 Time: 15:00
Date Received: 07/21/92 Time: 08:00
Analysis Date: 07/28/92
Sample No: 26821

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<50	1,2-Dichloropropane	<1.0
Benzene	<1.0	cis-1,3-Dichloropropene	<1.0
Bromodichloromethane	<1.0	trans-1,3-Dichloropropene	<1.0
Bromoform	<1.0	Ethylbenzene	<1.0
Bromomethane	<1.0	2-Hexanone	<50
Methyl Ethyl Ketone	<50	4-Methyl-2-Pentanone	<50
Carbon Disulfide	<5.0	Methylene Chloride	1.0
Carbon Tetrachloride	<1.0	Styrene	<1.0
Chlorobenzene	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Chloroethane	<1.0	Tetrachloroethene	<1.0
2-Chloroethyl Vinyl Ether	<10	1,1,1-Trichloroethane	<1.0
Chloroform	<1.0	1,1,2-Trichloroethane	<1.0
Chloromethane	<1.0	Trichloroethene	5.0
Dibromochloromethane	<1.0	Toluene	<1.0
1,1-Dichloroethane	<1.0	Vinyl Acetate	<5.0
1,2-Dichloroethane	<1.0	Vinyl Chloride	<1.0
1,1-Dichloroethylene	<1.0	Xylene, Total	<3.0
1,2-Dichloroethene(total)	1.0		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 16,17 & 19 Samples
Sample: Influent
Test 10

Submittal Number 29276- 23
Date Sampled: 07/19/92 Time: 15:00
Date Received: 07/21/92 Time: 08:00
Analysis Date: 07/28/92
Sample No: 26822

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<500	1,2-Dichloropropane	<10
Benzene	<10	cis-1,3-Dichloropropene	<10
Bromodichloromethane	<10	trans-1,3-Dichloropropene	<10
Bromoform	<10	Ethylbenzene	<10
Bromomethane	<10	2-Hexanone	<500
Methyl Ethyl Ketone	<500	4-Methyl-2-Pentanone	<500
Carbon Disulfide	<50	Methylene Chloride	<10
Carbon Tetrachloride	<10	Styrene	<10
Chlorobenzene	<10	1,1,2,2-Tetrachloroethane	<10
Chloroethane	<10	Tetrachloroethene	<10
2-Chloroethyl Vinyl Ether	<100	1,1,1-Trichloroethane	490
Chloroform	<10	1,1,2-Trichloroethane	<10
Chloromethane	<10	Trichloroethene	1500
Dibromochloromethane	<10	Toluene	<10
1,1-Dichloroethane	11	Vinyl Acetate	<50
1,2-Dichloroethane	<10	Vinyl Chloride	<10
1,1-Dichloroethylene	300	Xylene, Total	<30
1,2-Dichloroethene(total)	89		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 16,17 & 19 Samples
Sample: Effluent
Test 10

Submittal Number 29276- 23
Date Sampled: 07/19/92 Time: 15:00
Date Received: 07/21/92 Time: 08:00
Analysis Date: 07/28/92
Sample No: 26823

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<50	1,2-Dichloropropane	<1.0
Benzene	<1.0	cis-1,3-Dichloropropene	<1.0
Bromodichloromethane	<1.0	trans-1,3-Dichloropropene	<1.0
Bromoform	<1.0	Ethylbenzene	<1.0
Bromomethane	<1.0	2-Hexanone	<50
Methyl Ethyl Ketone	<50	4-Methyl-2-Pentanone	<50
Carbon Disulfide	37	Methylene Chloride	<1.0
Carbon Tetrachloride	<1.0	Styrene	<1.0
Chlorobenzene	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Chloroethane	<1.0	Tetrachloroethene	<1.0
2-Chloroethyl Vinyl Ether	<10	1,1,1-Trichloroethane	<1.0
Chloroform	<1.0	1,1,2-Trichloroethane	<1.0
Chloromethane	<1.0	Trichloroethene	2.0
Dibromochloromethane	<1.0	Toluene	<1.0
1,1-Dichloroethane	<1.0	Vinyl Acetate	<5.0
1,2-Dichloroethane	2.0	Vinyl Chloride	<1.0
1,1-Dichloroethylene	<1.0	Xylene, Total	<3.0
1,2-Dichloroethene(total)	<1.0		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 16,17 & 19 Samples
Sample: Effluent
Test 10
Duplicate

Submittal Number 29276- 23
Date Sampled: 07/19/92 Time: 15:00
Date Received: 07/21/92 Time: 08:00
Analysis Date: 07/29/92
Sample No: 26824

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<50	1,2-Dichloropropane	<1.0
Benzene	<1.0	cis-1,3-Dichloropropene	<1.0
Bromodichloromethane	<1.0	trans-1,3-Dichloropropene	<1.0
Bromoform	<1.0	Ethylbenzene	<1.0
Bromomethane	<1.0	2-Hexanone	<50
Methyl Ethyl Ketone	<50	4-Methyl-2-Pentanone	<50
Carbon Disulfide	<5.0	Methylene Chloride	<1.0
Carbon Tetrachloride	<1.0	Styrene	<1.0
Chlorobenzene	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Chloroethane	<1.0	Tetrachloroethene	<1.0
2-Chloroethyl Vinyl Ether	<10	1,1,1-Trichloroethane	<1.0
Chloroform	<1.0	1,1,2-Trichloroethane	<1.0
Chloromethane	<1.0	Trichloroethene	2.0
Dibromochloromethane	<1.0	Toluene	<1.0
1,1-Dichloroethane	<1.0	Vinyl Acetate	<5.0
1,2-Dichloroethane	<1.0	Vinyl Chloride	<1.0
1,1-Dichloroethylene	<1.0	Xylene, Total	<3.0
1,2-Dichloroethene(total)	<1.0		

WW Engineering & Science, Inc.
Environmental Laboratory Division

ANALYTICAL REPORT

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 13-17 Samples

Submittal Number: 29276- 22
Location:
CCS Number 7029.00
CCS Manager: Robert Aten

	Influent Test 2	Effluent Test 2	Influent Test 5	Detection Limit	Units
WWES Sample No:	26455	26457	26462		
Calcium, Dissolved	115	116	118	0.50	mg/l
Calcium, Total	117	122	122	0.50	mg/l
Iron, Dissolved	0.35	0.01	0.08	0.01	mg/l
Iron, Total	0.24	0.24	0.21	0.01	mg/l
Magnesium, Dissolved	40	39	40	0.50	mg/l
Magnesium, Total	42	41	41	0.50	mg/l
[illegible]qanese, Dissolved	0.52	0.36	0.44	0.01	mg/l
[illegible]anese, Total	0.54	0.51	0.45	0.01	mg/l
Hardness, Total	475	438	469	2.0	mg/l
Alkalinity, Total	431	386	373	2.0	mg/l
Alkalinity, Bicarbonate	431	386	373	2.0	mg/l
Carbon, Total Organic	1.1	1.0	1.0	1.0	mg/l
Residue, Dissolved	712	677	638	1	mg/l
Residue, Suspended	25	26	6	1	mg/l
pH	7.11	8.07	7.17	1.00	pH Units
Sampled by:	B.Pushaw	B.Pushaw	B.Pushaw		
Date Sampled:	07/14/92	07/14/92	07/15/92		
Time Sampled:	17:15	17:15	10:00		
Date Received:	07/16/92	07/16/92	07/16/92		
Time Received:	09:00	09:00	09:00		

WW Engineering & Science, Inc.
Environmental Laboratory Division

ANALYTICAL REPORT

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 13-17 Samples

Submittal Number: 29276- 22
Location:
CCS Number 7029.00
CCS Manager: Robert Aten

	Effluent Test 5	Detection Limit	Units
WWES Sample No:	26464		
Calcium, Dissolved	118	0.50	mg/l
Calcium, Total	121	0.50	mg/l
Iron, Dissolved	<0.01	0.01	mg/l
Iron, Total	0.14	0.01	mg/l
Magnesium, Dissolved	41	0.50	mg/l
Magnesium, Total	41	0.50	mg/l
[illegible]ganese, Dissolved	0.44	0.01	mg/l
[illegible]ganese, Total	0.45	0.01	mg/l
Hardness, Total	434	2.0	mg/l
Alkalinity, Total	411	2.0	mg/l
Alkalinity, Bicarbonate	411	2.0	mg/l
Carbon, Total Organic	1.0	1.0	mg/l
Residue, Dissolved	632	1	mg/l
Residue, Suspended	19	1	mg/l
pH	7.75	1.00	pH Units

Sampled by: B.Pushaw
Date Sampled: 07/15/92
Time Sampled: 10:00
Date Received: 07/16/92
Time Received: 09:00

WW Engineering & Science, Inc.
Environmental Laboratory Division

ANALYTICAL REPORT

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 16,17 & 19 Samples

Submittal Number: 29276- 23
Location:
CCS Number 7029.00
CCS Manager: Robert Aten

	Influent Test 8	Effluent Test 8	Detection Limit	Units
WWES Sample No:	26813	26814		
Calcium, Dissolved	102	104	0.50	mg/l
Calcium, Total	104	107	0.50	mg/l
Iron, Dissolved	0.08	0.01	0.01	mg/l
Iron, Total	0.14	0.04	0.01	mg/l
Magnesium, Dissolved	40	39	0.50	mg/l
Magnesium, Total	40	40	0.50	mg/l
[illegible]ganese, Dissolved	0.32	0.30	0.01	mg/l
[illegible]anese, Total	0.32	0.31	0.01	mg/l
Hardness, Total	462	414	2.0	mg/l
Alkalinity, Total	410	353	2.0	mg/l
Alkalinity, Bicarbonate	410	353	2.0	mg/l
Carbon, Total Organic	<1.0	<1.0	1.0	mg/l
Residue, Dissolved	653	611	1	mg/l
Residue, Suspended	2	6	1	mg/l
pH	7.49	7.93	1.00	pH Units
Sampled by:	B.Pushaw	B.Pushaw		
Date Sampled:	07/16/92	07/16/92		
Time Sampled:	14:30	14:30		
Date Received:	07/21/92	07/21/92		
Time Received:	08:00	08:00		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 1992 Rush Samples
Sample: P-5

Submittal Number 29276- 21
Date Sampled: 07/08/92 Time: 09:00
Date Received: 07/10/92 Time: 10:00
Analysis Date: 07/09/92
Sample No: 25942

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<50	1,2-Dichloropropane	<1.0
Benzene	<1.0	cis-1,3-Dichloropropene	<1.0
Bromodichloromethane	<1.0	trans-1,3-Dichloropropene	<1.0
Bromoform	<1.0	Ethylbenzene	<1.0
Bromomethane	<1.0	2-Hexanone	<50
Methyl Ethyl Ketone	<50	4-Methyl-2-Pentanone	<50
Carbon Disulfide	<1.0	Methylene Chloride	<1.0
Carbon Tetrachloride	<1.0	Styrene	<1.0
Chlorobenzene	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Chloroethane	<1.0	Tetrachloroethene	<1.0
2-Chloroethyl Vinyl Ether	<1.0	1,1,1-Trichloroethane	830
Chloroform	<1.0	1,1,2-Trichloroethane	<1.0
Chloromethane	<1.0	Trichloroethene	350
Dibromochloromethane	<1.0	Toluene	<1.0
1,1-Dichloroethane	3.0	Vinyl Acetate	<1.0
1,2-Dichloroethane	<1.0	Vinyl Chloride	<1.0
1,1-Dichloroethylene	82	Xylene, Total	<3.0
1,2-Dichloroethene(total)	44		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 1992 Rush Samples
Sample: P-6

Submittal Number 29276- 21
Date Sampled: 07/08/92 Time: 08:20
Date Received: 07/10/92 Time: 10:00
Analysis Date: 07/09/92
Sample No: 25943

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<50	1,2-Dichloropropane	<1.0
Benzene	<1.0	cis-1,3-Dichloropropene	<1.0
Bromodichloromethane	<1.0	trans-1,3-Dichloropropene	<1.0
Bromoform	<1.0	Ethylbenzene	<1.0
Bromomethane	<1.0	2-Hexanone	<50
thyl Ethyl Ketone	<50	4-Methyl-2-Pentanone	<50
arbon Disulfide	<1.0	Methylene Chloride	<1.0
Carbon Tetrachloride	<1.0	Styrene	<1.0
Chlorobenzene	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Chloroethane	<1.0	Tetrachloroethene	<1.0
2-Chloroethyl Vinyl Ether	<1.0	1,1,1-Trichloroethane	1100
Chloroform	<1.0	1,1,2-Trichloroethane	<1.0
Chloromethane	<1.0	Trichloroethene	530
Dibromochloromethane	<1.0	Toluene	<1.0
1,1-Dichloroethane	12	Vinyl Acetate	<1.0
1,2-Dichloroethane	<1.0	Vinyl Chloride	<1.0
1,1-Dichloroethylene	59	Xylene, Total	<3.0
1,2-Dichloroethene(total)	62		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 1992 Rush Samples
Sample: PW-1

Submittal Number 29276- 21
Date Sampled: 07/09/92 Time: 09:00
Date Received: 07/10/92 Time: 10:00
Analysis Date: 07/09/92
Sample No: 25944

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<50	1,2-Dichloropropane	<1.0
Benzene	<1.0	cis-1,3-Dichloropropene	<1.0
Bromodichloromethane	<1.0	trans-1,3-Dichloropropene	<1.0
Bromoform	<1.0	Ethylbenzene	<1.0
Bromomethane	<1.0	2-Hexanone	<50
2-Butanone (Methyl Ethyl Ketone)	<50	4-Methyl-2-Pentanone	<50
Carbon Disulfide	<1.0	Methylene Chloride	<1.0
Carbon Tetrachloride	<1.0	Styrene	<1.0
Chlorobenzene	<1.0	1,1,2,2-Tetrachloroethane	<1.0
Chloroethane	<1.0	Tetrachloroethene	<1.0
2-Chloroethyl Vinyl Ether	<1.0	1,1,1-Trichloroethane	3.0
Chloroform	<1.0	1,1,2-Trichloroethane	<1.0
Chloromethane	<1.0	Trichloroethene	560
Dibromochloromethane	<1.0	Toluene	<1.0
1,1-Dichloroethane	5.0	Vinyl Acetate	<1.0
1,2-Dichloroethane	<1.0	Vinyl Chloride	1.0
1,1-Dichloroethylene	130	Xylene, Total	<3.0
1,2-Dichloroethene(total)	51		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 20, 1992 Sampling
Sample: P-5

Submittal Number 29276- 24
Date Sampled: 07/20/92 Time: 15:10
Date Received: 07/21/92 Time: 10:30
Analysis Date: 07/30/92
Sample No: 26829

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<100	1,2-Dichloropropane	<5.0
Benzene	<5.0	cis-1,3-Dichloropropene	<5.0
Bromodichloromethane	<5.0	trans-1,3-Dichloropropene	<5.0
Bromoform	<5.0	Ethylbenzene	<5.0
Bromomethane	<10	2-Hexanone	<50
Methyl Ethyl Ketone	<100	4-Methyl-2-Pentanone	<50
Carbon Disulfide	<5.0	Methylene Chloride	<5.0
Carbon Tetrachloride	<5.0	Styrene	<5.0
Chlorobenzene	<5.0	1,1,2,2-Tetrachloroethane	<5.0
Chloroethane	<10	Tetrachloroethene	<5.0
2-Chloroethyl Vinyl Ether	<10	1,1,1-Trichloroethane	60
Chloroform	<5.0	1,1,2-Trichloroethane	<5.0
Chloromethane	<10	Trichloroethene	33
Dibromochloromethane	<5.0	Toluene	<5.0
1,1-Dichloroethane	<5.0	Vinyl Acetate	<10
1,2-Dichloroethane	<5.0	Vinyl Chloride	<10
1,1-Dichloroethylene	5.0	Xylene, Total	<5.0
1,2-Dichloroethene(total)	<5.0		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: July 20, 1992 Sampling
Sample: P-6

Submittal Number 29276- 24
Date Sampled: 07/20/92 Time: 12:25
Date Received: 07/21/92 Time: 10:30
Analysis Date: 07/30/92
Sample No: 26830

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<250	1,2-Dichloropropane	<13
Benzene	<13	cis-1,3-Dichloropropene	<13
Bromodichloromethane	<13	trans-1,3-Dichloropropene	<13
Bromoform	<13	Ethylbenzene	<13
Bromomethane	<25	2-Hexanone	<130
2-Butanone (Methyl Ethyl Ketone)	<250	4-Methyl-2-Pentanone	<130
Carbon Disulfide	<13	Methylene Chloride	<13
Carbon Tetrachloride	<13	Styrene	<13
Chlorobenzene	<13	1,1,2,2-Tetrachloroethane	<13
Chloroethane	<25	Tetrachloroethene	<13
2-Chloroethyl Vinyl Ether	<25	1,1,1-Trichloroethane	410
Chloroform	<13	1,1,2-Trichloroethane	<13
Chloromethane	<25	Trichloroethene	190
Dibromochloromethane	<13	Toluene	<13
1,1-Dichloroethane	<13	Vinyl Acetate	<25
1,2-Dichloroethane	<13	Vinyl Chloride	<25
1,1-Dichloroethylene	24	Xylene, Total	<13
1,2-Dichloroethene(total)	27		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: August 28, 1992 Submittal
Sample: P-5

Submittal Number 29276- 28
Date Sampled: 08/27/92 Time: 09:25
Date Received: 08/28/92 Time: 09:00
Analysis Date: 08/31/92
Sample No: 30584

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<100	1,2-Dichloropropane	<5.0
Benzene	<5.0	cis-1,3-Dichloropropene	<5.0
Bromodichloromethane	<5.0	trans-1,3-Dichloropropene	<5.0
Bromoform	<5.0	Ethylbenzene	<5.0
Bromomethane	<10	2-Hexanone	<50
[illegible]thyl Ethyl Ketone	<100	4-Methyl-2-Pentanone	<50
[illegible]arbon Disulfide	<5.0	Methylene Chloride	<5.0
Carbon Tetrachloride	<5.0	Styrene	<5.0
Chlorobenzene	<5.0	1,1,2,2-Tetrachloroethane	<5.0
Chloroethane	<10	Tetrachloroethene	<5.0
2-Chloroethyl Vinyl Ether	<10	1,1,1-Trichloroethane	590
Chloroform	<5.0	1,1,2-Trichloroethane	<5.0
Chloromethane	<10	Trichloroethene	270
Dibromochloromethane	<5.0	Toluene	<5.0
1,1-Dichloroethane	<5.0	Vinyl Acetate	<10.0
1,2-Dichloroethane	<5.0	Vinyl Chloride	<10
1,1-Dichloroethylene	48	Xylene, Total	<5.0
1,2-Dichloroethene(total)	38		

WW Engineering & Science, Inc.
Environmental Laboratory Division

VOLATILE ORGANICS
USEPA-8240 SCAN

Keystone Steel & Wire
Proj: Quarterly Groundwater Monitoring
Subm: August 28, 1992 Submittal
Sample: P-6

Submittal Number 29276- 28
Date Sampled: 08/27/92 Time: 09:55
Date Received: 08/28/92 Time: 09:00
Analysis Date: 08/31/92
Sample No: 30583

Parameter	Result ug/l	Parameter	Result ug/l
Acetone	<1000	1,2-Dichloropropane	<50
Benzene	<50	cis-1,3-Dichloropropene	<50
Bromodichloromethane	<50	trans-1,3-Dichloropropene	<50
Bromoform	<50	Ethylbenzene	<50
Bromomethane	<100	2-Hexanone	<500
[illegible]thyl Ethyl Ketone	<1000	4-Methyl-2-Pentanone	<500
[illegible]rbon Disulfide	<50	Methylene Chloride	<50
Carbon Tetrachloride	<50	Styrene	<50
Chlorobenzene	<50	1,1,2,2-Tetrachloroethane	<50
Chloroethane	<100	Tetrachloroethene	<50
2-Chloroethyl Vinyl Ether	<100	1,1,1-Trichloroethane	820
Chloroform	<50	1,1,2-Trichloroethane	<50
Chloromethane	<100	Trichloroethene	490
Dibromochloromethane	<50	Toluene	<50
1,1-Dichloroethane	<50	Vinyl Acetate	<100
1,2-Dichloroethane	<50	Vinyl Chloride	<100
1,1-Dichloroethylene	57	Xylene, Total	<50
1,2-Dichloroethene(total)	82		

APPENDIX E

AIR STRIPPING PILOT TEST SAMPLE CALCULATIONS

Conventional stripping calculations for: Keystone
Job Number: 07029
Sample Description: Keystone Pilot Study Run#2

INPUT DATA	
AIR Flow (CFM).....	200
WATER Flow (GPM).....	20
Diameter (ft).....	1
Packing Ht. (ft).....	10
Packing Factor.....	32
Temperature (C).....	10
Pounds steam per pound VOA (regeneration).....	0.00
Removal in VCA (%).....	95

CALCULATED DATA	
Vapor Pressure of water at Temp (mmHg).....	9.12
HOL (Height of a Transfer Unit (in)).....	25.0
NOL.....	4.8
LLF.....	16126.4
For Pressure Drop Through Tower	
Liq Load (lb/hr sqft)....	12749.0
Gas Load (lb/hr sqft).....	1189.3
X axis value..... (Treybal	0.379
Y axis value.....(Treybal)	0.034

COMPONENT	FEED CONC.(ppm)	SOLUBILITY LIMIT(ppm)	RELATIVE VOLATILITY	STRIPPING FACTOR	% REMOVAL in STRIPPER	Theroretical Rel. Volatility
MeCl2	0.1	20000	4248	3.0	0.9719	
CHCl3	0.0	8000	6875	4.8	0.9821	
CCl4	0.0	800	51377	35.7	0.9908	
CHL ETHANE	0.0	5740	31650	22.0	0.9902	
1,1 DCA	0.0	5370	7245	5.0	0.9828	
1,2 DCA	0.0	8690	574	0.4	0.3988	2,571
1,1,1 TCA	0.0	1300	40600	28.2	0.9906	
1,1,2 TCA	0.0	4500	1127	0.8	0.7265	
1,1,2,2 TetCA	0.0	2900	919	0.6	0.6228	
1,1 DCE	0.2	2500	53492	37.2	0.9909	
tr-1,2 DCE	0.1	600	75427	52.4	0.9912	
TCE	0.8	2000	25513	17.7	0.9898	
PCE	0.0	375	21029	14.6	0.9893	
VINYL CHL	0.0	6800	57063	39.7	0.9909	
BENZENE	0.0	1760	9860	6.9	0.9858	
TOLUENE	0.0	566	5153	3.6	0.9771	
XYLENE	0.0	180	9424	6.6	0.9855	
ETHYL BENZ.	0.0	180	13194	9.2	0.9876	
CHLOR BENZ.	0.0	490	6699	4.7	0.9818	
DEE	0.0	75000	1015	0.7	0.6745	
triClF-METH	0.0	1100	235444	163.6	0.9916	
diClF-METH	0.0	0	8000	5.6	0.9839	
1,2 DCP	0.0	1000	5335	3.7	0.9779	
2-CLvinylether	0.0	15000	289	0.2	0.8965	
Styrene	0.0	450	3210	2.2	0.9956	
cis-1,3DCPE	0.0	2800	2313	1.6	0.9946	
PCB-1248	0.0	0	6657	4.6	0.9966	
PCB-1254	0.0	0	5842	4.1	0.9961	
	1.2	PPM				

Conventional stripping calculations for: Keystone
Job Number: 07029

Air Flow Rate(CFM)..... 200
Water Flow Rate(GPM)..... 20

*MASS BALANCE STREAM IDENTIFICATION:ALL STREAMS ARE IN LB/HR. Streams are as follow:

STREAM 1: Groundwater Feed into System
STREAM 2: Recycle from VCA Decanter
STREAM 3: Combined Feed into Tower
STREAM 4: Effluent from Tower
STREAM 5: Contaminated Air from Tower
STREAM 6: Steam into VCA units (regeneration)
STREAM 7: Clean Air Exit from VCA
STREAM 8: Condensate Flow from VCA Regeneration
STREAM 9: Recovered Solvents from Decanter
Clean Air Intake is not identified as a STREAM

COMPONENT	STREAM 1	STREAM 2	STREAM 3	STREAM 4	(ppb)	STREAM 5
MeCl2	0.0012	0.0000	0.0012	0.0000	3.4	0.0012
CHCl3	0.0001	0.0000	0.0001	0.0000	0.2	0.0001
CCl4	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
CHL ETHANE	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
1,1 DCA	0.0001	0.0000	0.0001	0.0000	0.2	0.0001
1,2 DCA	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
1,1,1 TCA	0.0001	0.0000	0.0001	0.0000	0.1	0.0001
1,1,2 TCA	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
1,1,2,2 TetCA	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
1,1 DCE	0.0020	0.0000	0.0020	0.0000	1.8	0.0020
tr-1,2 DCE	0.0008	0.0000	0.0008	0.0000	0.7	0.0008
TCE	0.0077	0.0000	0.0077	0.0001	7.8	0.0076
PCE	0.0003	0.0000	0.0003	0.0000	0.4	0.0003
VINYL CHL	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
BENZENE	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
TOLUENE	0.0001	0.0000	0.0001	0.0000	0.2	0.0001
XYLENE	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
ETHYL BENZ.	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
CHLOR BENZ.	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
DEE	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
triClF-METH	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
diClF-METH	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
1,2 DCP	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
PCB-1221	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
PCB-1232	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
PCB-1242	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
PCB-1248	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
PCB-1254	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
	0.0124	0.0000	0.0124	0.0001	14.7	0.0123

Conventional stripping calculations for: Keystone
Job Number: 07029
Sample Description: Keystone Pilot Study Test #3

INPUT DATA

AIR Flow (CFM).....	300
WATER Flow (GPM).....	20
Diameter (ft).....	1
Packing Ht. (ft).....	10
Packing Factor.....	32
Temperature (C).....	10
Pounds steam per pound VOA (regeneration).....	0.00
Removal in VCA (%).....	95

CALCULATED DATA

Vapor Pressure of water at Temp (mmHg).....	9.12
HOL (Height of a Transfer Unit (in)).....	22.0
NOL.....	5.5
LLF.....	16126.4
For Pressure Drop Through Tower	
Liq Load (lb/hr sqft)....	12749.0
Gas Load (lb/hr sqft).....	1783.9
X axis value..... (Treybal	0.252
Y axis value.....(Treybal)	0.077

COMPONENT	FEED CONC.(ppm)	SOLUBILITY LIMIT(ppm)	RELATIVE VOLATILITY	STRIPPING FACTOR	% REMOVAL in STRIPPER	Theroretical Rel. Volatility
MeCl2	0.0	20000	4248	4.4	0.9886	
CHCl3	0.0	8000	6875	7.2	0.9921	
CCl4	0.0	800	51377	53.6	0.9954	
CHL ETHANE	0.0	5740	31650	33.0	0.9951	
1,1 DCA	0.0	5370	7245	7.6	0.9924	
1,2 DCA	0.0	8690	574	0.6	0.5922	2,571
1,1,1 TCA	0.0	1300	40600	42.3	0.9952	
1,1,2 TCA	0.0	4500	1127	1.2	0.8938	
1,1,2,2 TetCA	0.0	2900	919	1.0	0.8291	
1,1 DCE	0.4	2500	53492	55.8	0.9954	
tr-1,2 DCE	0.1	600	75427	78.6	0.9955	
TCE	1.4	2000	25513	26.6	0.9949	
PCE	0.1	375	21029	21.9	0.9948	
VINYL CHL	0.0	6800	57063	59.5	0.9954	
BENZENE	0.0	1760	9860	10.3	0.9934	
TOLUENE	0.0	566	5153	5.4	0.9904	
XYLENE	0.0	180	9424	9.8	0.9933	
ETHYL BENZ.	0.0	180	13194	13.8	0.9941	
CHLOR BENZ.	0.0	490	6699	7.0	0.9920	
DEE	0.0	75000	1015	1.1	0.8642	
triClF-METH	0.0	1100	235444	245.5	0.9956	
diClF-METH	0.0	0	8000	8.3	0.9928	
1,2 DCP	0.0	1000	5335	5.6	0.9906	
2-CLvinylether	0.0	15000	289	0.3	0.8965	
Styrene	0.0	450	3210	3.3	0.9956	
cis-1,3DCPE	0.0	2800	2313	2.4	0.9946	
PCB-1248	0.0	0	6657	6.9	0.9966	
PCB-1254	0.0	0	5842	6.1	0.9961	
	2.1	PPM				

Conventional stripping calculations for: Keystone
Job Number: 07029

Air Flow Rate(CFM)..... 300
Water Flow Rate(GPM)..... 20

*MASS BALANCE STREAM IDENTIFICATION:ALL STREAMS ARE IN LB/HR. Streams are as follow:

STREAM 1: Groundwater Feed into System
STREAM 2: Recycle from VCA Decanter
STREAM 3: Combined Feed into Tower
STREAM 4: Effluent from Tower
STREAM 5: Contaminated Air from Tower
STREAM 6: Steam into VCA units (regeneration)
STREAM 7: Clean Air Exit from VCA
STREAM 8: Condensate Flow from VCA Regeneration
STREAM 9: Recovered Solvents from Decanter
Clean Air Intake is not identified as a STREAM

COMPONENT	STREAM 1	STREAM 2	STREAM 3	STREAM 4	(ppb)	STREAM 5
MeCl2	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
CHCl3	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
CCl4	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
CHL ETHANE	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
1,1 DCA	0.0002	0.0000	0.0002	0.0000	0.1	0.0002
1,2 DCA	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
1,1,1 TCA	0.0005	0.0000	0.0005	0.0000	0.2	0.0005
1,1,2 TCA	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
1,1,2,2 TetCA	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
1,1 DCE	0.0038	0.0000	0.0038	0.0000	1.8	0.0038
tr-1,2 DCE	0.0013	0.0000	0.0013	0.0000	0.6	0.0013
TCE	0.0140	0.0000	0.0140	0.0001	7.1	0.0139
PCE	0.0010	0.0000	0.0010	0.0000	0.5	0.0010
VINYL CHL	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
BENZENE	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
TOLUENE	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
XYLENE	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
ETHYL BENZ.	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
CHLOR BENZ.	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
DEE	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
triClF-METH	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
diClF-METH	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
1,2 DCP	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
PCB-1221	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
PCB-1232	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
PCB-1242	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
PCB-1248	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
PCB-1254	0.0000	0.0000	0.0000	0.0000	0.0	0.0000
	0.0207	0.0000	0.0207	0.0001	10.3	0.0206

APPENDIX F

COST ESTIMATES

ENGINEERING COST ESTIMATES:

KEYSTONE STEEL & WIRE COMPANY
Bartonville, Illinois

PROJECT NUMBER: 07029

DATE: 3-Nov-92

BASIS:

The cost estimates presented are for an 800 gpm ground water recovery system, on-site treatment, secondary use as process cooling water, and discharge of treated ground water to the Illinois River via the existing wastewaster treatment plant.
Costs for obtaining an air discharge permit and modifying Keystone's NPDES surface water discharge permit are not included in these estimates.
The estimates assume that plant compressed air (90-100 psig) is available for use in controls associated with steam plant tie-in.
No costs for sales tax are included.

GENERAL ASSUMPTIONS:

SHIPPING (%):	
(cost of shipping equipment to site as a percentage of total materials cost)	3
CONTRACTOR L.T. & I (%):	
(cost of contractors labor, taxes, and insurance for employees: based on a percentage of installation cost)	15
EQUIPMENT PASS-THROUGH (%):	
(pass through cost for a contractor: based on a percentage of total materials cost)	10
ENGINEERING:	
(based on project budget)	*
CONSTRUCTION MANAGMENT:	
(based on project budget)	*
CONTINGENCY (%):	
(based on percentage of total installed equipment cost)	20

*Costs shown as line item entries on last page of estimate.
Unit costs for certain items presented in this estimate taken from 1992 Means Catalogs.
Other costs presented in this estimate based on vendor quotes or past experience.

ITEM #	ITEM DESCRIPTION	UNIT	Estimated Quantity	Materials Unit Cost	Materials Total Cost	Installation Unit Cost	Installation Total Cost	Total Cost
GROUND WATER RECOVERY AND TRANSMISSION PIPING SYSTEM								
	mobilization/demobilization	LS	1			$1,000	1,000	$1,000
	10" dia. purge well w/15' ss screen, wells B&D	EA	2	$7,000	$14,000	$6,000	$12,000	$26,000
	6" dia. purge well w/15' ss screen, wells A&C	EA	1	$4,000	$4,000	$3,500	$3,500	$7,500
	well pump & level control electrodes, P-1 & P-3	EA	2	$3,500	$7,000	$1,500	$3,000	$10,000
	well pump & level control electrodes, P-2	EA	1	$4,000	$4,000	$1,500	$1,500	$5,500
	well pump & level control electrodes, P-4	EA	1	$5,000	$5,000	$1,500	$1,500	$6,500
	8' dia. manhole w/mechanical components	EA	4	$3,000	$12,000	$2,500	$10,000	$22,000
	electrical equipment at purge well:	EA	4	$2,000	$8,000	$1,000	$4,000	$12,000
	disconnect, l.c. relays, light. arrest., etc.							
	3" SDR 11 HDPE piping, buried	LF	1,500	$2.58	$3,870	$2.95	$4,425	$8,295
	4" SDR 11 HDPE piping, buried	LF	3,500	$3.85	$13,475	$3.80	$13,300	$26,775
	6" SDR 11 HDPE piping, buried	LF	1,100	$6.06	$6,666	$3.28	$3,608	$10,274
	8" SDR 11 HDPE piping, buried	LF	500	$9.96	$4,980	$5.23	$2,615	$7,595
	trenching: excavation/backfill/compaction	LF	6,600	$2.10	$13,860	$5.90	$38,940	$52,800
	pavmt. replacmt.:bit. asphalt;1.5" binder/1"wear	SY	1,400	$3.79	$5,306	$0.77	$1,078	$6,384
	fees re: construction permits/contract bonds	LS	1			$3,000	$3,000	$3,000
	3" propeller water flow meter	EA	2	$1,100	$2,200	$500	$1,000	$3,200
	4" propeller water flow meter	EA	2	$1,300	$2,600	$600	$1,200	$3,800
	power/control conduit to wells:							
	2" PVC in existing trench for transmission lines	LF	3,200	$1.07	$3,424	$1.74	$5,568	$8,992
	1" PVC in existing trench for transmission lines	LF	10,000	$0.49	$4,900	$1.04	$10,400	$15,300
	conductors; #6 wire	LF	13,200	$0.25	$3,300	$0.31	$4,092	$7,392
	#4 wire	LF	19,800	$0.38	$7,524	$0.39	$7,722	$15,246
	flow/pressure switch	EA	4	$500	$2,000	$500	$2,000	$4,000
	3" sch 40 galv., piping w/supports	LF	60	$9.46	$568	$11.45	$687	$1,255
	4" sch 40 galv., piping w/supports	LF	30	$15.08	$452	$14.10	$423	$875
	air/vacuum relief valve, 1/2"	EA	5	$250	$1,250	$300	$1,500	$2,750
	pressure gauges, 1/2"	EA	8	$100	$800	$200	$1,600	$2,400
	ball valves, 1/2"	EA	22	$80	$1,760	$150	$3,300	$5,060
	ball valves, 3"	EA	12	$600	$7,200	$250	$3,000	$10,200
	butterfly valves, 3"	EA	4	$150	$600	$200	$800	$1,400
	ball valves, 8"	EA	2	$1,000	$2,000	$300	$600	$2,600

ITEM #	ITEM DESCRIPTION	UNIT	Estimated Quantity	Materials Unit Cost	Materials Total Cost	Installation Unit Cost	Installation Total Cost	Total Cost
	butterfly valves, 8"	EA	2	$800	$1,600	$250	$500	$2,100
	boring & jacking 12" casing under railroad	LF	50	$40	$2,000	$260	$13,000	$15,000
	tie-in transmission piping into treatment bldg.	LS	1	$500	$500	$500	$500	$1,000
	8" sch 40 galv. piping flgd. w/supports	LF	50	$49.94	$2,497	$38.44	$1,922	$4,419
	8" propeller water flow meter	EA	1	$2,200	$2,200	$800	$800	$3,000
	prefilter/strainer	EA	1	$4,000	$4,000	$800	$800	$4,800
	heat tracing for "exposed" 6" piping	LF	100	$4.17	$417	$0.76	$76	$493
	insulation for "exposed" 6" piping, 2" thick	LF	100	$6.16	$616	$3.56	$356	$972
	thermostat controls for heat tracing	LS	1	$500	$500	$200	$200	$700
	misc. electrical & wiring	LS	1	$5,000	$5,000	$5,000	$5,000	$10,000
	misc. mechanical & site restoration	LS	1	$2,000	$2,000	$2,000	$2,000	$4,000
	misc. fittings & valves	LS	1	$5,000	$5,000	$5,000	$5,000	$10,000
		SUBTOTALS			$169,100		$177,500	$346,600

SHIPPING:	$5,100
CONTRACTOR LT&I:	$26,600
EQUIPMENT PASS THROUGH:	$16,900
SUBTOTAL: GROUND WATER RECOVERY AND TRANSMISSION PIPING SYSTEM:	$395,200

ITEM #	ITEM DESCRIPTION	UNIT	Estimated Quantity	Materials Unit Cost	Materials Total Cost	Installation Unit Cost	Installation Total Cost	Total Cost
TREATED WATER DISCHARGE TO WIRE MILL/MID MILL COOLING WATER SYSTEM								
(to NPDES outfall via existing wastewater discharge piping to on-site WWTP)								
	mobilization/demobilization	LS	1			$1,000	1,000	$1,000
	8" Carbon Steel, buried, coated & wrapped	LF	150	$14.51	$2,177	$6.47	$971	$3,147
	trenching: excavation/backfill/compaction	LF	150	$2.10	$315	$5.90	$885	$1,200
	effluent pumps (800 gpm, 70 psi, 50 HP)	EA	2	$9,000	$18,000	$3,250	$6,500	$24,500
	treated water filter/strainer	EA	2	$5,000	$10,000	$500	$1,000	$11,000
	tie-in to existing cooling water piping	LS	1	$1,000	$1,000	$2,000	2,000	$3,000
	air/vacuum relief valve, 1/2"	EA	1	$250	$250	$300	$300	$550
	pressure gauges, 1/2"	EA	4	$100	$400	$200	$800	$1,200
	pneu. actuated valve, 8" w/solen.	EA	2	$4,500	$9,000	$1,200	$2,400	$11,400
	flow meter, 8" propeller	EA	1	$2,200	$2,200	$800	$800	$3,000
	pressure transmitter/controller	EA	1	$2,500	$2,500	$1,000	$1,000	$3,500
	remote electrical control panel	LS	2	$3,000	$6,000	$1,500	$3,000	$9,000
	power/control conduit to river water pump station, 2"	LF	300	$1.07	$321	$1.74	$522	$843
	power/control wire to river pump station, #4 wire	LF	300	$0.38	$114	$0.39	$117	$231
	8" galv. sch 40 piping, w/supports	LF	30	$49.94	$1,498	$38.44	$1,153	$2,651
	motor control center/starters	LS	1	$3,000	$3,000	$2,000	$2,000	$5,000
	main disconnect/circuit breakers	LS	1	$1,200	$1,200	$1,200	$1,200	$2,400
	misc. electrical & wiring	LS	1	$10,000	$10,000	$10,000	$10,000	$20,000
	misc. mechanical, fittings, & valves	LS	1	$10,000	$10,000	$10,000	$10,000	$20,000
		SUBTOTALS			$78,000		$45,600	$123,600
							SHIPPING:	$2,300
							CONTRACTOR LT&I:	$6,800
							EQUIPMENT PASS THROUGH:	$7,800
							SUBTOTAL: TREATED WATER DISCHARGE TO WIRE/MID MILL COOLING WATER SYSTEM:	$140,500

ITEM #	ITEM DESCRIPTION	UNIT	Estimated Quantity	Materials Unit Cost	Materials Total Cost	Installation Unit Cost	Installation Total Cost	Total Cost
AIR STRIPPING TREATMENT SYSTEM								
	mobilization/demobilization	LS	1			$1,000	$1,000	$1,000
	air strip. tower: 8' dia., 50'H, 304 ss w/platform	EA	1	$75,000	$75,000	$5,000	$5,000	$80,000
	internals: distributor, support plate, demister, 304 ss	LS	1	$16,000	$16,000	$2,000	$2,000	$18,000
	packing media	CF	1,508	$9.00	$13,572	$3.00	$4,524	$18,096
	blower (including equip. pad), 8,000 cfm	EA	1	$3,400	$3,400	$1,500	$1,500	$4,900
	foundations and structural supports	LS	1	$9,000	$9,000	$6,000	$6,000	$15,000
	acid storage tank, 6,000 gal FRP	EA	1	$7,500	$7,500	$1,500	$1,500	$9,000
	acid metering pumps	EA	2	$1,200	$2,400	$500	$1,000	$3,400
	in-line pH probe, analyzer, & controller	EA	2	$4,000	$8,000	$1,000	$2,000	$10,000
	in-line mixer, 8" FRP w/150 lb. flgs.	EA	1	$3,000	$3,000	$500	$500	$3,500
	level controls	EA	2	$800	$1,600	$300	$600	$2,200
	control panel/motor control center	EA	1	$25,000	$25,000	$2,500	$2,500	$27,500
	main disconnect/circuit breaker	EA	1	$500	$500	$250	$250	$750
	new electrical service connection	LS	1	$5,000	$5,000	$5,000	$5,000	$10,000
	treatment building (20'x20'): pre-engineered w/HVAC	SF	400	$37.50	$15,000	$37.50	$15,000	$30,000
	containment dike/bldg. sump/tanker containment/found	LS	1	$5,000	$5,000	$2,500	$2,500	$7,500
	air compressor	EA	1	$3,500	$3,500	$1,000	$1,000	$4,500
	sump pump	EA	1	$600	$600	$1,200	$1,200	$1,800
	pressure switch	EA	1	$500	$500	$500	$500	$1,000
	pressure gauges	EA	4	$100	$400	$200	$800	$1,200
	1/2" 304 SS Sch 10 piping	LF	40	$3.33	$133	$4.26	$170	$304
	1" 304 SS Sch 10 piping	LF	75	$5.26	$394	$5.18	$389	$783
	3" FRP piping, 150 lb. flgd.	LF	30	$13.20	$396	$9.10	$273	$669
	6" FRP piping, 150 lb. flgd.	LF	30	$22.80	$684	$14.00	$420	$1,104
	8" FRP piping, 150 lb. flgd.	LF	150	$29.85	$4,478	$17.85	$2,678	$7,155
	heat tracing for "exposed" 8" piping	LF	90	$4.42	$398	$1.01	$91	$489
	insulation for "exposed" 8" piping, 2" thick	LF	90	$9.09	$818	$5.10	$459	$1,277
	thermostat control for heat tracing	LS	1	$500	$500	$200	$200	$700

ITEM #	ITEM DESCRIPTION	UNIT	Estimated Quantity	Materials Unit Cost	Materials Total Cost	Installation Unit Cost	Installation Total Cost	Total Cost
	misc. electrical/wiring/controls	LS	1	$5,000	$5,000	$5,000	$5,000	$10,000
	misc. site improvements/restoration	LS	1	$2,000	$2,000	$2,000	$2,000	$4,000
	misc. equipment rental	LS	1			$1,500	$1,500	$1,500
	misc. mechanical, fittings, valves, & piping	LS	1	$15,000	$15,000	$30,000	$30,000	$45,000
		SUBTOTALS			$224,800		$97,600	$322,400

SHIPPING:	$6,700
CONTRACTOR LT&I:	$14,600
EQUIPMENT PASS THROUGH:	$22,500
SUBTOTAL: AIR STRIPPING TREATMENT SYSTEM	$366,200

ITEM #	ITEM DESCRIPTION	UNIT	Estimated Quantity	Materials Unit Price	Materials Total Price	Installation Unit Price	Installation Total Price	Total Price
PROJECT TOTALS								
	Ground Water Recovery & Transmission Piping				$169,100		$177,500	$346,600
	Treated Water Discharge				$78,000		$45,600	$123,600
	Air Stripping Treatment System				$224,800		$97,600	$322,400
		SUBTOTALS			$471,900		$320,700	$792,600

SHIPPING	$14,100
CONTRACTOR LT&I	$48,000
EQUIPMENT PASS-THROUGH	$47,200
INSTALLED EQUIPMENT SUBTOTAL	$901,900
CONTINGENCY (20%)	$180,400
ENGINEERING	$131,700
CONSTRUCTION MANAGEMENT	$128,200
STARTUP/O&M MANUALS	$20,000
TOTAL	$1,362,200
TOTAL CAPITAL COST (rounded)	**$1,362,000**

OPERATING COST ESTIMATES: *Keystone Steel & Wire Company*

PROJECT NUMBER: 07029

DATE: 23-Oct-92

GENERAL ASSUMPTIONS:

1. Operating cost estimates assume that the total ground water purge rate is 550 gallons per minute, based on results of ground water modeling.
2. On-site electricity cost is approximately $0.035 per kilowatt-hour.
3. The operations and maintenance labor, equipment repair, and monitoring costs presented here are based on past experience.
4. The operating cost estimates are based on operation 355 days per year, which allows for approximately ten days of equipment failures/scheduled shutdowns for maintenance per year.
5. Plant compressed air is currently available for pneumatic controls at no additional charge.
6. The existing river water pumping station supplies plant cooling water system at a pressure of 60 psig.

ITEM #	ITEM DESCRIPTION	UNIT	Estimated Quantity	Unit Price	Total Cost
1.	AIR STRIPPING TREATMENT SYSTEM				
	power requirements:				
	purge well pumps (60 hp)	KWHR	381,355	$0.035	$13,347
	transfer and metering pumps (50 hp)	KWHR	317,796	$0.035	$11,123
	blower (15 hp)	KWHR	95,339	$0.035	$3,337
	misc. power, compressor, etc.	KWHR	31,780	$0.035	$1,112
	acid:				
	98% H2SO4 (.24 gal/1,000 gal)	GAL	67,478	$0.70	$47,235
	labor:				
	checking operations	HR	355	$50	$17,750
	equipment maintenance/repair	HR	400	$50	$20,000
	administration	HR	208	$50	$10,400
	misc. labor	HR	104	$50	$5,200
	equipment maintenance/repair	LS	1	$10,000	$10,000
	pack. replace/disp./instal. (1 per 3 yrs.)	CF	503	$35	$17,592
	monitoring (analytical):				
	air stripper influent/effluent (weekly)	EVENT	52	$250	$13,000
	SUBTOTAL				$170,000
	MISC. PROFESSIONAL SERVICES				$10,000
	ANNUAL OPERATING COST - AIR STRIPPING TREATMENT SYSTEM				$180,000

APPENDIX G

AIR DISCHARGE PERMIT APPLICATION FOR FULL-SCALE TREATMENT

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF AIR POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62794-9276

APPLICATION FOR PERMIT(A)

[X] CONSTRUCT [X] OPERATE

NAME OF EQUIPMENT TO BE CONSTRUCTED OR OPERATED: FULL SCALE AIR STRIPPING SYSTEM (B)

FOR AGENCY USE ONLY

I.D. NO. _____

PERMIT NO. _____

DATE _____

1a. NAME OF OWNER: KEYSTONE CONSOLIDATED INDUSTRIES, INC.		2a. NAME OF OPERATOR: KETSTONE STEEL AND WIRE CO	
1b. STREET ADDRESS OF OWNER: 5430 LBJ FREEWAY		2b. STREET ADDRESS OF OPERATOR: 7000 SW ADAMS STREET	
1c. CITY OF OWNER: DALLAS		2c. CITY OF OPERATOR: PEORIA	
1d. STATE OF OWNER: TX	1e. ZIP CODE: 75250	2d. STATE OF OPERATOR: IL	2e. ZIP CODE: 61641

3a. NAME OF CORPORATE DIVISION OR PLANT: SAME AS ABOVE		3b. STREET ADDRESS OF EMISSION SOURCE: 7000 SW ADAMS STREET		
3c. CTIY OF EMISSION SOURCE: PEORIA	3d. LOCATED WITHIN CITY LIMITS: [ ] YES [X] NO	3e. TOWNSHIP: LIMESTONE	3f. COUNTY: PEORIA	3g. ZIP CODE: 61641

4. ALL CORRESPONDENCE TO: (TITLE AND/OR NAME OF INDIVIDUAL) MR DALE L. BENNINGTON, MGR. ENERGY & ENVIR.	5. TELEPHONE NUMBER FOR AGENCY TO CALL: (307) 697-7552
6. ADDRESS FOR CORRESPONDENCE: (CHECK ONLY ONE) [X] OWNER [ ] OPERATOR [ ] EMISSION SOURCE	7. YOUR DESIGNATION FOR THIS APPLICATION:(C) K E Y S T R I P

8. THE UNDERSIGNED HEREBY MAKES APPLICATION FOR A PERMIT AND CERTIFIES THAT THE STATEMENTS CONTAINED HEREIN ARE TRUE AND CORRECT, AND FURTHER CERTIFIES THAT ALL PREVIOUSLY SUBMITTED INFORMATION REFERENCED IN THIS APPLICATION REMAINS TRUE, CORRECT AND CURRENT. BY AFFIXING HIS SIGNATURE HERETO HE FURTHER CERTIFIES THAT HE IS AUTHORIZED TO EXECUTE THIS APPLICATION.

AUTHORIZED SIGNATURE(S):(D)

BY _____ SIGNATURE _____ DATE	BY _____ SIGNATURE _____ DATE
DALE L. BENNINGTON, P.E. TYPED OR PRINTED NAME OF SIGNER	TYPED OR PRINTED NAME OF SIGNER
MANAGER ENERGY & ENVIRONMENTAL ENGINEERING TITLE OF SIGNER	TITLE OF SIGNER

(A) THIS FORM IS TO PROVIDE THE AGENCY WITH GENERAL INFORMATION ABOUT THE EQUIPMENT TO BE CONSTRUCTED OR OPERATED. THIS FORM MAY BE USED TO REQUEST A CONSTRUCTION PERMIT, AN OPERATING PERMIT, A CONSTRUCTION OR OPERATING PERMIT.

(B) ENTER THE GENERIC NAME OF THE EQUIPMENT TO BE CONSTRUCTED OR OPERATED. THIS NAME WILL APPEAR ON THE PERMIT WHICH MAY BE ISSUED PURSUANT TO THIS APPLICATION. THIS FORM MUST BE ACCOMPANIED BY OTHER APPLICABLE FORMS AND INFORMATION.

C) PROVIDE A DESIGNATION IN ITEM 7 ABOVE WHICH YOU WOULD LIKE THE AGENCY TO USE FOR IDENTIFICATION OF YOUR EQUIPMENT. YOUR DESIGNATION WILL BE REFERENCED IN CORRESPONDENCE FROM THIS AGENCY RELATIVE TO THIS APPLICATION. YOUR DESIGNATION MUST NOT EXCEED TEN (10) CHARACTERS.

(D) THIS APPLICATION MUST BE SIGNED IN ACCORDANCE WITH 35 ILL. ADM. CODE 201.154 OR 201.159 WHICH STATES: "ALL APPLICATIONS AND SUPPLEMENTS THERETO SHALL BE SIGNED BY THE OWNER AND OPERATOR OF THE EMISSION SOURCE OR AIR POLLUTION CONTROL EQUIPMENT, OR THEIR AUTHORIZED AGENT, AND SHALL BE ACCOMPANIED BY EVIDENCE OF AUTHORITY TO SIGN THE APPLICATION."

IF THE ONWER OR OPERATOR IS A CORPORATION, SUCH CORPORATION MUST HAVE ON FILE WITH THE AGENCY A CERTIFIED COPY OF A RESOLUTION OF THE CORPORATION'S BOARD OF DIRECTORS AUTHORIZING THE PERSONS SIGNING THIS APPLICATION TO CAUSE OR ALLOW THE CONSTRUCTION OR OPERATION OF THE EQUIPMENT TO BE COVERED BY THE PERMIT.

9. DOES THIS APPLICATION CONTAIN A PLOT PLAN/MAP:

[X] YES [ ] NO

IF A PLOT PLAN/MAP HAS PREVIOUSLY BEEN SUBMITTED, SPECIFY:

AGENCY I.D. NUMBER _____ APPLICATION NUMBER _____

IS THE APPROXIMATE SIZE OF APPLICANT'S PREMISES LESS THAN 1 ACRE?

[ ] YES [X] NO: SPECIFY 500 ACRES

10. DOES THIS APPLICATION CONTAIN A PROCESS FLOW DIAGRAM(S) THAT ACCURATELY AND CLEARLY REPRESENTS CURRENT PRACTICE.

[X] YES [ ] NO

11a. WAS ANY EQUIPMENT, COVERED THIS APPLICATION, OWNED OR CONTRACTED FOR, BY THE APPLICANT PRIOR TO APRIL 14, 1972:

[ ] YES [X] NO

IF "YES" ATTACH AN ADDITIONAL SHEET, EXHIBIT A, THAT:
(a) LISTS OR DESCRIBES THE EQUIPMENT
(b) STATES WHETHER THE EQUIPMENT WAS IN COMPLIANCE WITH THE RULES AND REGULATIONS GOVERNING THE CONTROL OF AIR POLLUTION PRIOR TO APRIL 4, 1972

11b. HAS ANY EQUIPMENT, COVERED BY THIS APPLICATION, NOTPREVIOUSLY RECEIVED AN OPERATING PERMIT:

[ ] YES [X] NO

IF "YES", ATTACH AN ADDITIONAL SHEET, EXHIBIT B, THAT:
(a) LISTS OR DESCRIBES THE EQUIPMENT
(b) STATES WHETHER THE EQUIPMENT
(i) IS ORIGINAL OR ADDITIONAL EQUIPMENT
(ii) REPLACES EXISTING EQUIPMENT, OR
(iii) MODIFIES EXISTING EQUIPMENT
(c) PROVIDES THE ANTICIPATED OR ACTUAL DATES OF THE COMMENCEMENT OF CONSTRUCTION AND THE START-UP OF THE EQUIPMENT

12. IF THIS APPLICATION INCORPORATES BY REFERENCE A PREVIOUSLY GRANTED PERMIT(S), HAS FORM APC-210, "DATA AND INFORMATION—INCORPORATION BY REFERENCE" BEEN COMPLETED.

APPLICATION FOR OPERATING PERMIT ONLY

13. DOES THE STARTUP OF AN EMISSION SOURCE COVERED BY THIS APPLICATION PRODUCE AIR CONTAMINANT EMISSION IN EXCESS OF APPLICABLE STANDARDS:

[ ] YES [X] NO

IF "YES," HAS FORM APC-203, "OPERATION DURING STARTUP" BEEN COMPLETED FOR THIS SOURCE.

[ ] YES [ ] NO

14. DOES THIS APPLICATION REQUEST PERMISSION TO OPREATE AN EMISSION SOURCE DURING MALFUNCTIONS OR BREAKDOWNS:

[ ] YES [X] NO

IF "YES," HAS FORM APC-204, "OPERATION DURING MALFUNCTION AND BREAKDOWN" BEEN COMPLETED FOR THIS SOURCE

[ ] YES [ ] NO

15. IS AN EMISSION SOURCE COVERED BY THIS APPLICATION SUBJECT TO A FUTURE COMPLIANCE DATE:

[ ] YES [X] NO

IF "YES," HAS FORM APC-202, "COMPLIANCE PROGRAM & PROJECT COMPLETION SCHEDULE," BEEN COMPLETED FOR THIS SOURCE:

[ ] YES [ ] NO

16. DOES THE FACILITY COVERED BY THIS APPLICATION REQUIRE AN EPISODE ACTION PLAN (REFER TO GUIDELINES FOR EPISODE ACTION PLANS):

[ ] YES [X] NO

17. LIST AND IDENTIFY ALL FORMS, EXHIBITS, AND OTHER INFORMATION SUBMITTED AS PART OF THIS APPLICATION. INCLUDE THE PAGE NUMBERS OF EACH ITEM (ATTACH ADDITIONAL SHEETS IF NECESSARY):

TOTAL NUMBER OF PAGES _____

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF AIR POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62706

This Agency is authorized to require this information under Illinois Revised Statutes, 1979, Chapter 111 1/2, Section 1039. Disclosure of this information is required under that Section. Failure to do so may prevent this form from being processed and could result in your application being denied. This form has been approved by the Forms Management Center.

*DATA AND INFORMATION PROCESS EMISSION SOURCE	

*THIS INFORMATION FORM IS TO BE COMPLETED FOR AN EMISSION SOURCE OTHER THAN A FUEL COMBUSTION EMISSION SOURCE OR AN INCINERATOR. A FUEL COMBUSTION EMISSION SOURCE IS A FURNACE, BOILER, OR SIMILAR EQUIPMENT USED PRIMARILY FOR PRODUCING HEAT OR POWER BY INDIRECT HEAT TRANSFER. AN INCINERATOR IS AN APPARATUS IN WHICH REFUSE IS BURNED.

1. NAME OF PLANT OWNER:	2. NAME OF CORPORATE DIVISION OR PLANT (IF DIFFERENT FROM OWNER):
KEYSTONE CONSOLIDATED INDUSTRIES	KEYSTONE STEEL AND WIRE CO.
3. STREET ADDRESS OF EMISSION SOURCE:	4. CITY OF EMISSION SOURCE:
7000 SW ADAMS	PEORIA

GENERAL INFORMATION

5. NAME OF PROCESS:	6. NAME OF EMISSION SOURCE EQUIPMENT:	
AIR STRIPPING	AIR STRIPPING TOWER	
7. EMISSION SOURCE EQUIPMENT MANUFACTURER	8. MODEL NUMBER:	9. SERIAL NUMBER:
NA	NA	NA

10. FLOW DIAGRAM DESIGNATION(S) OF EMISSION SOURCE:
(SEE ATTACHED DIAGRAMS)

11. IDENTITY(S) OF ANY SIMILAR SOURCE(S) AT THE PLANT OR PREMISES NOT COVERED BY THE FORM (IF THE SOURCE IS COVERED BY ANOTHER APPLICATION, IDENTIFY THE APPLICATION):

12. AVERAGE OPERATING TIME OF EMISSION SOURCE:	13. MAXIMUM OPERATING TIME OF EMISSION SOURCE:
24 HRS/DAY 7 DAYS/WK 52 WKS/YR	24 HRS/DAY 7 DAYS/WK 52 WKS/YR

14. PERCENT OF ANNUAL THROUGHPUT:
DEC-FEB 25 % MAR-MAY 25 % JUN-AUG 25 % SEPT-NOV 25 %

INSTRUCTIONS

1. COMPLETE THE ABOVE IDENTIFICATION AND GENERAL INFORMATION SECTION.
2. COMPLETE THE RAW MATERIAL, PRODUCT, WASTE MATERIAL, AND FUEL USAGE SECTIONS FOR THE PARTICULAR SOURCE EQUIPMENT. COMPOSITIONS OF MATERIALS MUST BE SUFFICIENTLY DETAILED TO ALLOW DETERMINATION OF THE NATURE AND QUANTITY OF POTENTIAL EMISSIONS. IN PARTICULAR, THE COMPOSITION OF PAINTS, INKS, ETC., AND ANY SOLVENTS MUST BE FULLY DETAILED.
3. EMISSION AND EXHAUST POINT INFORMATION MUST BE COMPLETED, UNLESS EMISSIONS ARE EXHAUSTED THROUGH AIR POLLUTION CONTROL EQUIPMENT.
4. OPERATING TIME AND CERTAIN OTHER ITEMS REQUIRE BOTH AVERAGE AND MAXIMUM VALUES.
5. FOR GENERAL INFORMATION REFER TO "GENERAL INSTRUCTIONS FOR PERMIT APPLICATIONS," APC-201.

DEFINITIONS

AVERAGE - THE VALUE THAT SUMMARIZES OR REPRESENTS THE GENERAL CONDITION OF THE EMISSION SOURCE, OR THE GENERAL STATE OF PRODUCTION OF THE EMISSION SOURCE. SPECIFICALLY:
AVERAGE OPERATING TIME - ACTUAL TOTAL HOURS OF OPERATION FOR THE PRECEDING TWELVE MONTH PERIOD.
AVERAGE RATE - ACTUAL TOTAL QUANTITY OF "MATERIAL" FOR THE PRECEDING TWELVE MONTH PERIOD, DIVIDED BY THE AVERAGE OPERATING TIME.
AVERAGE OPERATION - OPERATION TYPICAL OF THE PRECEDING TWELVE MONTH PERIOD, AS REPRESENTED BY AVERAGE OPERATING TIME AND AVERAGE RATES.

MAXIMUM - THE GREATEST VALUE ATTAINABLE OR ATTAINED FROM THE EMISSION SOURCE, OR THE PERIOD OF GREATEST OR UTMOST PRODUCTION OF THE EMISSION SOURCE. SPECIFICALLY:
MAXIMUM OPERATING TIME - GREATEST EXPECTED TOTAL HOURS OF OPERATIONS FOR ANY TWELVE MONTH PERIOD.
MAXIMUM RATE - GREATEST QUANTITY OF "MATERIAL" EXPECTED PER ANY ONE HOUR OF OPERATION.
MAXIMUM OPERATION - GREATEST EXPECTED OPERATION, AS REPRESENTED BY MAXIMUM OPERATING TIME AND MAXIMUM RATES.

RAW MATERIAL INFORMATION		
NAME OF RAW MATERIAL	AVERAGE RATE PER IDENTICAL SOURCE	MAXIMUM RATE PER IDENTICAL SOURCE
20a.	b. LB/HR	c. LB/HR
21a.	b. LB/HR	c. LB/HR
22a.	b. LB/HR	c. LB/HR
23a.	b. LB/HR	c. LB/HR
24a.	b. LB/HR	c. LB/HR

PRODUCT INFORMATION		
NAME OF PRODUCT	AVERAGE RATE PER IDENTICAL SOURCE	MAXIMUM RATE PER IDENTICAL SOURCE
30a. TRICHLOROETHYLENE	b. 0.20 LB/HR	c. 0.86 LB/HR
31a. 1,1,1-TRICHLOROETHANE	b. 0.12 LB/HR	c. 0.53 LB/HR
32a. OTHER VOCs (1,1-DCE, 1,2-DCE, PCE,	b. LB/HR	c. LB/HR
33a. 1,2-DCA, 1,1-DCA, VINYL CHLORIDE,	b. 0.12 LB/HR	c. 0.58 LB/HR
34a. TOLUENE, CHLOROFORM, CHLOROETHANE,	b. LB/HR	c. LB/HR

CARBON TETRACHLORIDE, METHYLENE CHLORIDE)

WASTE MATERIAL INFORMATION		
NAME OF WASTE MATERIAL	AVERAGE RATE PER IDENTICAL SOURCE	MAXIMUM RATE PER IDENTICAL SOURCE
40a.	b. LB/HR	c. LB/HR
41a.	b. LB/HR	c. LB/HR
42a.	b. LB/HR	c. LB/HR
43a.	b. LB/HR	c. LB/HR
44a.	b. LB/HR	c. LB/HR

*FUEL USAGE INFORMATION		
FUEL USED	TYPE	HEAT CONTENT
50a. NATURAL GAS ☐	b. ———	c. 1000 BTU/SCF
OTHER GAS ☐		BTU/SCF
OIL ☐		BTU/GAL
COAL ☐		BTU/LB
OTHER ☐		BTU/LB
d. AVERAGE FIRING RATE PER IDENTICAL SOURCE: BTU/HR	e. MAXIMUM FIRING RATE PER IDENTICAL SOURCE: BTU/HR	

*THIS SECTION IS TO BE COMPLETED FOR ANY FUEL USED DIRECTLY IN THE PROCESS EMISSION SOURCE, E.G. GAS IN A DRYER, OR COAL IN A MELT FURNACE.

*EMISSION INFORMATION

51. NUMBER OF IDENTICAL SOURCES (DESCRIBE AS REQUIRED):

AVERAGE OPERATION

CONTAMINANT	CONCENTRATION OR EMISSION RATE PER IDENTICAL SOURCE		METHOD USED TO DETERMINE CONCENTRATION OR EMISSION RATE
PARTICULATE MATTER	52a. GR/SCF	b. LB/HR	c.
CARBON MONOXIDE	53a. PPM (VOL)	b. LB/HR	c.
NITROGEN OXIDES	54a. PPM (VOL)	b. LB/HR	c.
ORGANIC MATERIAL	55a. PPM (VOL)	b. 0.45 LB/HR	c. SEE ATTACHED REPORT
SULFUR DIOXIDE	56a. PPM (VOL)	b. LB/HR	c.
**OTHER (SPECIFY)	57a. PPM (VOL)	b. LB/HR	c.

MAXIMUM OPERATION

CONTAMINANT	CONCENTRATION OR EMISSION RATE PER IDENTICAL SOURCE		METHOD USED TO DETERMINE CONCENTRATION OR EMISSION RATE
PARTICULATE MATTER	58a. GR/SCF	b. LB/HR	c.
CARBON MONOXIDE	59a. PPM (VOL)	b. LB/HR	c.
NITROGEN OXIDES	60a. PPM (VOL)	b. LB/HR	c.
ORGANIC MATERIAL	61a. PPM (VOL)	b. 1.96 LB/HR	c. SEE ATTACHED REPORT
SULFUR DIOXIDE	62a. PPM (VOL)	b. LB/HR	c.
** OTHER (SPECIFY)	63a. PPM (VOL)	b. LB/HR	c.

* ITEMS 52 THROUGH 63 NEED NOT BE COMPLETED IF EMISSIONS ARE EXHAUSTED THROUGH AIR POLLUTION CONTROL EQUIPMENT.
**"OTHER" CONTAMINANT SHOULD BE USED FOR AN AIR CONTAMINANT NOT SPECIFICALLY NAMED ABOVE. POSSIBLE OTHER CONTAMINANTS ARE ASBESTOS, BERYLLIUM, MERCURY, VINYL CHLORIDE, LEAD, ETC.

***EXHAUST POINT INFORMATION

64. FLOW DIAGRAM DESIGNATION(S) OF EXHAUST POINT: AIR STRIPPING TOWER EXHAUST

65. DESCRIPTION OF EXHAUST POINT (LOCATION IN RELATION TO BUILDINGS, DIRECTION, HOODING, ETC.): SEE FIGURE #15 & #16

66. EXIT HEIGHT ABOVE GRADE: 50'	67. EXIT DIAMETER: 24"
68. GREATEST HEIGHT OF NEARBY BUILDINGS: 80' FT	69. EXIT DISTANCE FROM NEAREST PLANT BOUNDARY: 3000' FT
AVERAGE OPERATION	MAXIMUM OPERATION
70. EXIT GAS TEMPERATURE: 50 °F	72. EXIT GAS TEMPERATURE: 55 °F
71. GAS FLOW RATE THROUGH EACH EXIT: 8000 SCFM	73. GAS FLOW RATE THROUGH EACH EACH EXIT: 8000 SCFM

***THIS SECTION SHOULD NOT BE COMPLETED IF EMISSIONS ARE EXHAUSTED THROUGH AIR POLLUTION CONTROL EQUIPMENT.

APPENDIX H

WATER DISCHARGE PERMIT APPLICATION FOR FULL-SCALE TREATMENT

The NPDES #IL0002526
Permit Modification Package for the
Keystone Steel and Wire Company,
Peoria, Illinois facility includes the following:

- Application Form 1
- Application Form 2D
- Topography Map
- Line Drawing
- Attachment I: Effluent Characteristics

Keystone Steel and Wire Company
Peoria, Illinois
IDL000714881

Keystone Steel and Wire Company
Peoria, Illinois
IDL000714881

Please print or type in the unshaded areas only
(fill—in areas are spaced for elite type, i.e., 12 characters/inch).

Form Approved. OMB No. 2040-0086. Approval expires 5-31-92

FORM 1 GENERAL

U.S. ENVIRONMENTAL PROTECTION AGENCY

GENERAL INFORMATION

Consolidated Permits Program

(Read the "General Instructions" before starting.)

I. EPA I.D. NUMBER

F I L D 0 0 0 7 1 4 8 8 1 D

LABEL ITEMS

II. EPA I.D. NUMBER

III. FACILITY NAME

V. FACILITY MAILING ADDRESS

VI. FACILITY LOCATION

PLEASE PLACE LABEL IN THIS SPACE

GENERAL INSTRUCTIONS

If a preprinted label has been provided, affix it in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill—in area below. Also, if any of the preprinted data is absent *(the area to the left of the label space lists the information that should appear)*, please provide it in the proper fill—in area*(s)* below. If the label is complete and correct, you need not complete Items I, III, V, and VI *(except VI-B which must be completed regardless)*. Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.

II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold—faced terms.

SPECIFIC QUESTIONS	MARK 'X' YES	NO	FORM ATTACHED	SPECIFIC QUESTIONS	MARK 'X' YES	NO	FORM ATTACHED
A. Is this facility a **publicly owned treatment works** which results in a **discharge** to **waters of the U.S.**? (FORM 2A)		X		B. Does or will this facility *(either existing or proposed)* include a **concentrated animal feeding operation** or **aquatic animal production facility** which results in a **discharge** to **waters of the U.S.**? (FORM 2B)		X	
C. Is this a facility which currently results in **discharges** to **waters of the U.S.** other than those described in A or B above? (~~X SKIP X~~) (see Form 2D)	X		NA	D. Is this a proposed facility *(other than those described in A or B above)* which will result in a **discharge** to **waters of the U.S.**? (FORM 2D)	X		2D
E. Does or will this facility treat, store, or dispose of **hazardous wastes**? (FORM 3) (Form updated in 1991)	X		NA	F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)		X	
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)		X		H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4)		X	
I. Is this facility a proposed **stationary source** which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)		X		J. Is this facility a proposed **stationary source** which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)		X	

III. NAME OF FACILITY

1 SKIP KEYSTONE STEEL AND WIRE COMPANY

IV. FACILITY CONTACT

A. NAME & TITLE *(last, first, & title)*	B. PHONE *(area code & no.)*
2 PHILLIPS, LESLIE W VP OF MFG	309 697 7020

V. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX

3 7000 S.W. ADAMS STREET

B. CITY OR TOWN	C. STATE	D. ZIP CODE
4 PEORIA	IL	61641

VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER

7000 SW ADAMS STREET

B. COUNTY NAME

PEORIA

C. CITY OR TOWN	D. STATE	E. ZIP CODE	F. COUNTY CODE *(if known)*
6 PEORIA	IL	61641	143

CONTINUED FROM THE FRONT

VII. SIC CODES (4-digit, in order of priority)

A. FIRST	B. SECOND
3312 (specify) HOT ROLLED IRON AND STEEL PRODUCTS	3315 (specify) COLD DRAWN CARBON STEEL WIRE
C. THIRD	**D. FOURTH**
9511 (specify) WATER MANAGEMENT (TREATMENT)	(specify)

VIII. OPERATOR INFORMATION

A. NAME

KETSTONE STEEL AND WIRE COMPANY

B. Is the name listed in Item VIII-A also the owner? ☐ YES ☒ NO

C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other", specify.)

F = FEDERAL; S = STATE; P = PRIVATE; M = PUBLIC (other than federal or state); O = OTHER (specify)

P (specify)

D. PHONE (area code & no.)

A 309 697 7020

E. STREET OR P.O. BOX

7000 S.W. ADAMS STREET

F. CITY OR TOWN

PEORIA

G. STATE IL

H. ZIP CODE 61641

IX. INDIAN LAND

Is the facility located on Indian lands? ☐ YES ☒ NO

X. EXISTING ENVIRONMENTAL PERMITS

A. NPDES (Discharges to Surface Water)	D. PSD (Air Emissions from Proposed Sources)
9 N IL0002526	9 P
B. UIC (Underground Injection of Fluids)	**E. OTHER (specify)**
9 U NONE	9 (specify)
C. RCRA (Hazardous Wastes)	**E. OTHER (specify)**
9 R	9 (specify)

XI. MAP

Attach to this application a topographic map of the area extending to at least one mile beyond property bounderies. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in the map area. See instructions for precise requirements.

XII. NATURE OF BUSINESS (provide a brief description)

MANUFACTURING OF IRON AND STEEL INCLUDING SEMI-FINISHING AND FINISHED WIRE PRODUCTS AND THE REMEDIATION OF IMPACTED GROUND WATER VIA A TREATMENT SYSTEM (AIR STRIPPER).

XIII. CERTIFICATION (see instructions)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME & OFFICIAL TITLE (type or print)	B. SIGNATURE	C. DATE SIGNED
LESLIE W. PHILLIPS VICE-PRESIDENT OF MANUFACTURING		

COMMENTS FOR OFFICIAL USE ONLY

C

Keystone Steel and Wire Company
Peoria, Illinois
IDL000714881

Please type or print in the unshaded areas only

EPA ID Number (copy from item 1 of Form 1): ILD000714881

Form Approved OMB No. 2040-0086 Approval expires 7-31-88

Form 2D NPDES

EPA New Sources and New Dischargers Application for Permit to Discharge Process Wastewater

I. Outfall Location

For each outfall, list the latitude and longitude, and the name of the receiving water

Outfall Number (list)	Latitude Deg	Min	Sec	Longitude Deg	Min	Sec	Receiving Water (name)
001	40	38	10	89	38	50	UNNAMED STREAM TRIBUTARY TO ILLINOIS RIVER

II. Discharge Date (When do you expect to begin discharging?) GROUND WATER REMEDIATION WILL TENTATIVELY BEGIN OPERATION & DISCHARGE ON 8/31/93, THUS JOINING THE EXISTING LINE WHICH FLOWS TO OUTFALL 001.

III. Flows, Sources of Pollution, and Treatment Technologies

A. For each outfall, provide a description of (1) All operations contributing wastewater to the effluent, including process wastewater, sanitary wastewater, cooling water, and stormwater runoff; (2) The average flow contributed by each operation; and (3) The treatment received by the wastewater. Continue on additional sheets if necessary.

Outfall Number	1. Operations Contributing Flow	2. Average Flow (include units)	3. Treatment (Description or List Codes from Table 2D-1)
001	EXISTING DISCHARGE		
	ROD PICKLING	0.60 MGD	MID MILL COLLECTION TANK:
	WIRE DRAWING	0.33 MGD	500,000 GAL TANK, 3.5
	GALVANIZING WIRE, NAILS		MGD, 3.0 HR. RETENTION
	AND MISC. PRODUCTS	1.50 MGD	TIME.
	MISC. USES AND PROCESSES	0.82 MGD	NEUTRALIZATION TANK:
	COOLING TOWER BLOWDOWN	0.10 MGD	70,000 GAL TANK WITH LIME
	FILTER BACKWASH	0.12 MGD	ADDITION, 4.4 MGD FLOW,
	STEAM CONDENSATE	0.03 MGD	20 MIN. RETENTION TIME
	STEAM PLANT BLOWDOWN	0.03 MGD	
	GROUND WATER	0.20 MGD	
	STORM WATER (ESTIMATE	0.53 MGD	CLARIFICATION/SEDIMENTATION
	FROM PUMP OPERATION)		BASINS:
	MISC. COOLING WATER	0.14 MGD	2-25,000 FT^2 SURFACE AREA
			BASINS, 88 GAL./DAY/FT^2
			OVERFLOW RATE
NEW DISCHARGE:	GROUND WATER REMEDIATION	1.15 MGD	REMEDIATION VIA AN AIR STRIPPING SYSTEM

B. Attach a line drawing showing the water flow through the facility. Indicate sources of intake water, operations contributing wastewater to the effluent, and treatment units labeled to correspond to the more detailed descriptions in Item III-A. Construct a water balance on the line drawing by showing average flows between intakes, operations, treatment units, and outfalls. If a water balance cannot be determined (e.g., for certain mining activities), provide a pictorial description of the nature and amount of any sources of water and any collection or treatment measures.

C. Except for storm runoff, leaks, or spills, will any of the discharges described in Item III-A be intermittent or seasonal?

☐ Yes (complete the following table) ☒ No (go to Item IV)

Outfall Number	1 Frequency		2 Flow		
	a Days Per Week (specify average)	b Months Per Year (specify average)	a Maximum Daily Flow Rate (in mgd)	b Maximum Total Volume (specify with units)	c Duration (in days)

IV Production

If there is an applicable production-based effluent guideline or NSPS, for each outfall list the estimated level of production (projection of actual production level, not design), expressed in the terms and units used in the applicable effluent guideline or NSPS, for each of the first 3 years of operation. If production is likely to vary, you may also submit alternative estimates (attach a separate sheet).

Year	a Quantity Per Day	b Units of Measure	40CFR420 c Operation, Product, Material, etc (specify)
	1780	TONS/DAY	(D) 420.43-ELECTRIC FURNACE STEEL PRODUCTION
	1675	"	(F) 420.62,63-CONTINOUS CASTING OF BILLETS
	1609	"	(G) 420.77(b)(1)-SECTION MILL, HOT FORMING OF BILLETS INTO RODS.
	683	"	(I)420.92(a)(1)-SULFURIC ACID PICKLING OF HOT ROLLED RODS
	528	"	(L)420.122(b)(1)-GALVANIZING OF WIRE & WIRE PRODUCTS.

CONTINUED FROM THE FRONT	EPA ID Number *(copy from Item 1 of Form 1)*	Outfall Number
	ILD000714881	001

V. Effluent Characteristics

A, and B: These items require you to report estimated amounts *(both concentration and mass)* of the pollutants to be discharged from each of your outfalls. Each part of this item addresses a different set of pollutants and should be completed in accordance with the specific instructions for that part. Data for each outfall should be on a separate page. Attach additional sheets of paper if necessary.

General Instructions *(See table 2D-2 for Pollutants)*

Each part of this item requests you to provide an estimated daily maximum and average for certain pollutants and the source of information. Data for all pollutants in Group A, for all outfalls, must be submitted unless waived by the permitting authority. For all outfalls, data for pollutants in Group B should be reported only for pollutants which you believe will be present or are limited directly by an effluent limitations guideline or NSPS or indirectly through limitations on an indicator pollutant.

1. Pollutant	2. Maximum Daily Value *(include units)*	3. Average Daily Value *(include units)*	4. Source *(see instructions)*
SEE ATTACHMENT 1: EFFLUENT CHARACTERISTICS			

CONTINUED FROM THE FRONT	EPA ID Number (copy from item 1 of Form 1)	
	ILD000714881	

C. Use the space below to list any of the pollutants listed in Table 2D-3 of the instructions which you know or have reason to believe will be discharged from any outfall. For every pollutant you list, briefly describe the reasons you believe it will be present.

1 Pollutant	2 Reason for Discharge
NONE ARE KNOWN OR BELIEVED PRESENT	

VI Engineering Report on Wastewater Treatment

A If there is any technical evaluation concerning your wastewater treatment, including engineering reports or pilot plant studies, check the appropriate box below

☒ Report Available ☐ No Report

B Provide the name and location of any existing plant(s) which, to the best of your knowledge, resembles this production facility with respect to production processes, wastewater constituents, or wastewater treatments.

Name	Location

EPA ID Number *(copy from item one of Form 1)*
ILD000714881

VII. Other Information *(Optional)*

Use the space below to expand upon any of the above questions or to bring to the attention of the reviewer any other information you feel should be considered in establishing permit limitations for the proposed facility. Attach additional sheets if necessary.

This NPDES permit application is a modification of the Keystone facility's existing NPDES permit #Il10002526. The existing permit covers surface water discharges from outfalls 001, 002, 003. This modification involves the addition of a proposed NPDES point source, a ground water remediation system, which is to discharge treated ground water to the existing outfall 001. According to the Illinois Environmental Protection Agency, since the change in discharge only involves outfall 001, this application need not provide information on outfalls 002 and 003.

The ground water remediation system will purge impacted ground water and pump it to an air stripping tower. Impacted ground water will be contacted with fresh air where organic constituents will be transferred to the vapor phase and discharged to the atmosphere. Treated water from the air stripping tower will be discharged to the wire mill water supply system. After being used in the wire mill as process and cooling water, it will be discharged to the existing waste water treatment system. The compliance monitoring point for the discharge from the air stripper will be at the discharge of the air stripper effluent pumps, prior to mixing with the river water in the supply header.

The maximum flow (continuous) anticipated is 800 gpm, the design capacity of the stripping system. Permit calculations are based on this flow rate. Additional wells would have to be installed in order to produce a flow greater than 650 gpm, but the stripper has been designed to treat up to 800 gpm to accommodate possible future wells.

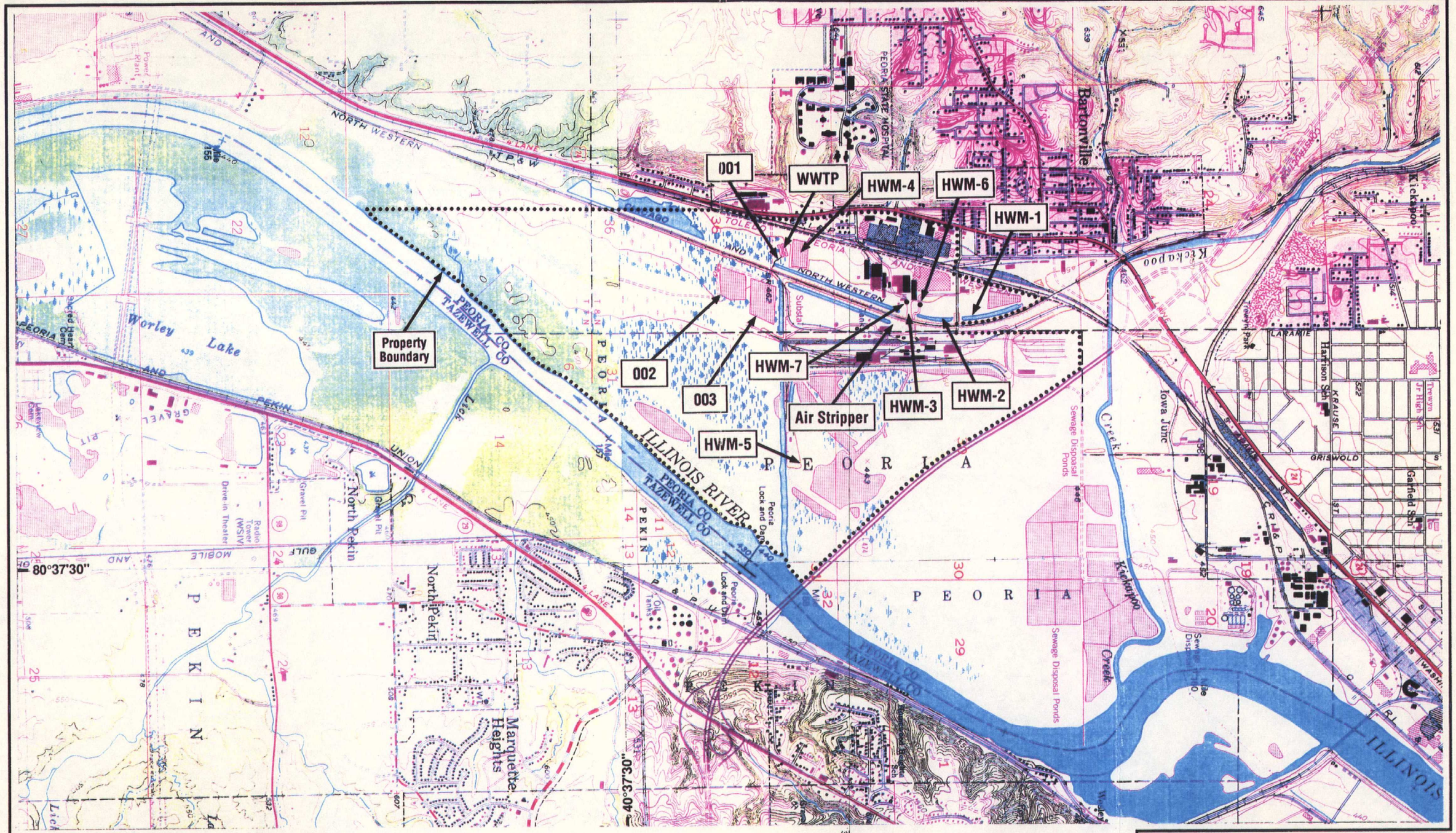
The effluent characteristics (Attachment I) show the existing characteristics and those of the proposed remediation system (expected characteristics at air stripping effluent). Calculations for the proposed system are based on a maximum flow rate of 800 gpm. It is expected that the proposed system will not affect the existing outfall's discharge of BOD, COD, TOC, TSS, ammonia, flow, temperature, and pH.

VIII. Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A. Name and Official Title *(type or print)*	B. Phone No
LESLIE W. PHILLIPS, VICE-PRESIDENT OF MANUFACTURING	(309) 697-7020
C. Signature	D. Date Signed

Keystone Steel and Wire Company
Peoria, Illinois
IDL000714881



Hazardous Waste Management Units

1. North Ditch
2. Mid Mill Ditch
3. South Ditch (North and South Halves)
4. 24-Hour Retention Reservoir
5. KO61 Waste Pile
6. Dredge Pile
7. Dredge Pile

Peoria West Quadrangle - U.S.G.S. 1949, photorevised 1967 and 1979
Peoria East Quadrangle - U.S.G.S. 1949, photorevised 1967 and 1979
Pekin Quadrangle - U.S.G.S. 1960, photorevised 1967 and 1979
Marquette Heights Quadrangle - U.S.G.S. 1960, photorevised 1967 and 1979

UTM Grid and 1979 Magnetic North Declination at Center of Sheet

0 1000 2000 4000
Scale in feet

Figure 1

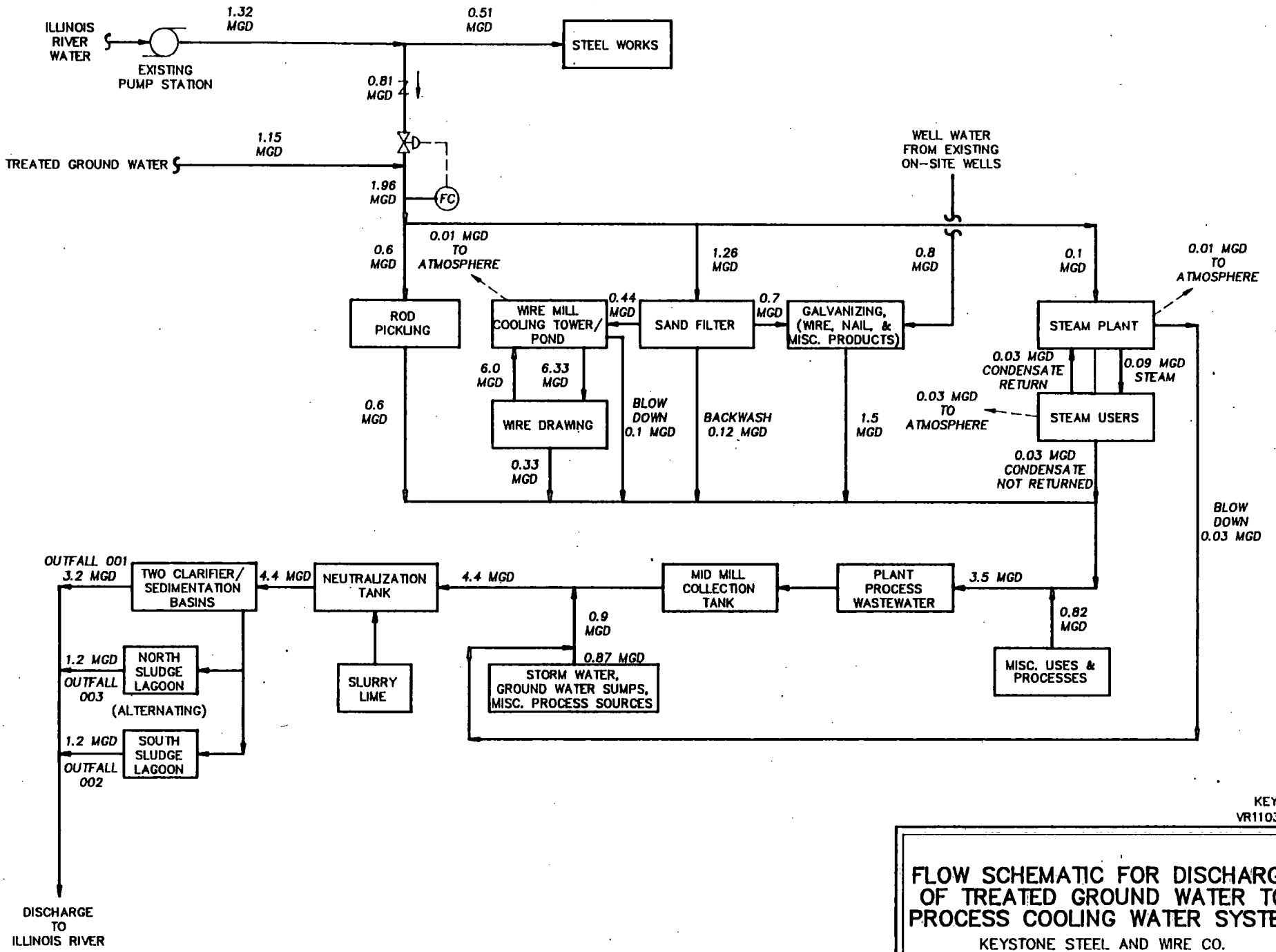
SITE LOCATION MAP
Keystone Steel & Wire Company
Peoria, Illinois

October 1992 07029

WW Engineering & Science

LINE DRAWING

Keystone Steel and Wire Company
Peoria, Illinois
IDL000714881



KEY-5
VR110392

FLOW SCHEMATIC FOR DISCHARGE OF TREATED GROUND WATER TO PROCESS COOLING WATER SYSTEM

KEYSTONE STEEL AND WIRE CO.
BARTENVILLE, ILLINOIS

NOVEMBER, 1992 07029

ATTACHMENT I

EFFLUENT CHARACTERISTICS

Keystone Steel and Wire Company
Peoria, Illinois
IDL000714881

THE FOLLOWING PAGES DESCRIBE
THE CONCENTRATION AND MASS LIMITS IN EFFECT ON EXISTING
OUTFALL 001

PLEASE PRINT OR TYPE IN THE UNSHADED AREAS ONLY. You may report some or all of this information on separate sheets *(use the same format)* instead of completing these pages. SEE INSTRUCTIONS.

EPA I.D. NUMBER *(copy from Item 1 of Form 1)*: ILD000714881

Form Approved. OMB No. 2040-0086 Approval expires 7-31-88

V. INTAKE AND EFFLUENT CHARACTERISTICS *(continued from page 3 of Form 2-C)*

OUTFALL NO: 001

PART A - You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

1. POLLUTANT	2. EFFLUENT a. MAXIMUM DAILY VALUE (1) CONCENTRATION	2. EFFLUENT a. MAXIMUM DAILY VALUE (2) MASS	2. EFFLUENT b. MAXIMUM 30 DAY VALUE (if available) (1) CONCENTRATION	2. EFFLUENT b. MAXIMUM 30 DAY VALUE (if available) (2) MASS	2. EFFLUENT c. LONG TERM AVRG. VALUE (if available) (1) CONCENTRATION	2. EFFLUENT c. LONG TERM AVRG. VALUE (if available) (2) MASS	2. EFFLUENT d. NO. OF ANALYSES	3. UNITS (specify if blank) a. CONCENTRATION	3. UNITS b. MASS	4. INTAKE (optional) a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	4. INTAKE (optional) a. LONG TERM AVERAGE VALUE (2) MASS	4. INTAKE (optional) b. NO. OF ANALYSES
a. Biochemical Oxygen Demand (BOD)	4.0	124					1	mg/l	lbs			
b. Chemical Oxygen Demand (COD)	10.0	310					1	mg/l	lbs			
c. Total Organic Carbon (TOC)	3.7	115					1	mg/l	lbs			
d. Total Suspended Solids (TSS)	8.0	231.8	3.57	92.6	2.24	59.2	104	mg/l	lbs			
e. Ammonia (as N)	4.3	133					1	mg/l	lbs			
f. Flow	VALUE 4.586		VALUE 3.597		VALUE 3.193		365	MGD		VALUE		
g. Temperature (winter)	VALUE		VALUE		VALUE			°C		VALUE		
h. Temperature (summer)	VALUE		VALUE		VALUE			°C		VALUE		
i. pH	MINIMUM 7.85	MAXIMUM 9.35	MINIMUM	MAXIMUM				STANDARD UNITS				

PART B - Mark "X" in column 2-a for each pollutant you know or have reason to believe is present. Mark "X" in column 2-b for each pollutant you believe to be absent. If you mark column 2a for any pollutant which is limited either directly, or indirectly but expressly, in an effluent limitations guideline, you must provide the results of at least one analysis for that pollutant. For other pollutants for which you mark column 2a, you must provide quantitative data or an explanation of their presence in your discharge. Complete one table for each outfall. See the instructions for additional details and requirements.

1. POLLUTANT AND CAS NO. (if available)	2. MARK 'X' a. BELIEVED PRESENT	2. MARK 'X' b. BELIEVED ABSENT	3. EFFLUENT a. MAXIMUM DAILY VALUE (1) CONCENTRATION	3. EFFLUENT a. MAXIMUM DAILY VALUE (2) MASS	3. EFFLUENT b. MAXIMUM 30 DAY VALUE (if available) (1) CONCENTRATION	3. EFFLUENT b. MAXIMUM 30 DAY VALUE (if available) (2) MASS	3. EFFLUENT c. LONG TERM AVRG. VALUE (if available) (1) CONCENTRATION	3. EFFLUENT c. LONG TERM AVRG. VALUE (if available) (2) MASS	3. EFFLUENT d. NO. OF ANALYSES	4. UNITS a. CONCENTRATION	4. UNITS b. MASS	5. INTAKE (optional) a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	5. INTAKE (optional) a. LONG TERM AVERAGE VALUE (2) MASS	5. INTAKE (optional) b. NO. OF ANALYSES
a. Bromide (24959-67-9)		X	< 0.3	< 9.3					1	mg/l	lbs			
b. Chlorine, Total Residual		X	< 0.1	< 3.1					1	mg/l	lbs			
c. Color		X	< 5.0	---					1	units	---			
d. Fecal Coliform		X	0	---					1	#/100ml	---			
e. Fluoride (16984-48-8)		X	0.3	9.3					1	mg/l	lbs			
f. Nitrate-Nitrite (as N)	X		2.05	63.6					1	mg/l	lbs			

ITEM V-B CONTINUED FROM FRONT

1. POLLUTANT AND CAS NO. (if available)	2. MARK 'X' a. BELIEVED PRESENT	2. MARK 'X' b. BELIEVED ABSENT	3. EFFLUENT a. MAXIMUM DAILY VALUE (1) CONCENTRATION	a. MAXIMUM DAILY VALUE (2) MASS	b. MAXIMUM 30 DAY VALUE (if available) (1) CONCENTRATION	b. MAXIMUM 30 DAY VALUE (if available) (2) MASS	c. LONG TERM AVRG. VALUE (if available) (1) CONCENTRATION	c. LONG TERM AVRG. VALUE (if available) (2) MASS	d. NO. OF ANALYSES	4. UNITS a. CONCENTRATION	4. UNITS b. MASS	5. INTAKE (optional) a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	5. INTAKE (optional) a. LONG TERM AVERAGE VALUE (2) MASS	5. INTAKE (optional) b. NO. OF ANALYSES
g. Nitrogen, Total Organic (as N)	X		206	6390					1	mg/l	lbs			
h. Oil and Grease	X		6.0	156.82	2.37	67.82	1.82	48.92	104	mg/l	lbs			
i. Phosphorus (as P), Total (7723-14-0)		X	< 0.02	< 0.62					1	mg/l	lbs			
j. Radioactivity														
(1) Alpha, Total		X												
(2) Beta, Total		X												
(3) Radium, Total		X												
(4) Radium 226, Total		X												
k. Sulfate (as SO_4) (14808-79-8)	X		290	8990					1	mg/l	lbs			
l. Sulfide (as S)		X	< 0.04	< 1.24					1	mg/l	lbs			
m. Sulfite (as SO_3) (14265-45-3)		X	< 2.0	< 62.0					1	mg/l	lbs			
n. Surfactants		X	< 0.1	< 3.1					1	mg/l	lbs			
o. Aluminum, Total (7429-90-5)		X	0.05	1.55					1	mg/l	lbs			
p. Barium, Total (7440-39-3)		X	0.05	1.55					1	mg/l	lbs			
q. Boron, Total (7440 42-8)		X	0.18	5.58					1	mg/l	lbs			
r. Cobalt, Total (7440-48-4)		X	< 0.01	< 0.31					1	mg/l	lbs			
s. Iron, Total (7439-89-6)	X		2.40	69.55	0.46	11.93	0.21	5.67	104	mg/l	lbs			
t. Magnesium, Total (7439-95-4)	X		20.0	620.0					1	mg/l	lbs			
u. Molybdenum, Total (7439-98-7)		X	< 0. 02	< 0.62					1	mg/l	lbs			
v. Manganese, Total (7439-96-5)		X	0.50	1.55					1	mg/l	lbs			
w. Tin, Total (7440-31-5)		X	< 0.02	< 0.62					1	mg/l	lbs			
x. Titanium, Total (7440-32-6)		X	< 0.005	< 0.155					1	mg/l	lbs			

EPA I.D. NUMBER (copy from Item 1 of Form 1): ILD000714881

OUTFALL NUMBER: 001

Form Approved
OMB No. 2040-0
Approval expires 7-31-88

CONTINUED FROM PAGE 3 OF FORM 2-C

PART C - If you are a primary industry and this outfall contains process wastewater, refer to Table 2c-2 in the instructions to determine which of the GC/MS fractions you must test for. Mark "X" in column 2-a for all such GC/MS fractions that apply to your industry and for ALL toxic metals, cyanides, and total phenols. If you are not required to mark column 2-a *(secondary industries, nonprocess wastewater outfalls, and nonrequired GC/MS fractions)*, mark "X" in column 2-b for each pollutant you know or have reason to believe is present. Mark "X" in column 2-c for each pollutant you believe is absent. If you mark column 2a for any pollutant, you must provide the results of at least one analysis for that pollutant. If you mark column 2b for any pollutant, you must provide the results of at least one analysis for that pollutant if you know or have reason to believe it will be discharged in concentrations of 10 ppb or greater. If you mark column 2b for acrolein, acrylonitrile, 2,4 dinitrophenol, or 2-methyl-4, 6 dinitrophenol, you must provide the results of at least one analysis for each of these pollutants which you know or have reason to believe that you discharge in concentrations of 100 ppb or greater. Otherwise, for pollutants for which you mark column 2b, you must either submit at least one analysis or briefly describe the reasons the pollutant is expected to be discharged. Note that there are 7 pages to this part; please review each carefully. Complete one table *(all 7 pages)* for each outfall. See instructions for additional details and requirements.

1. POLLUTANT AND CAS NUMBER (if available)	2. MARK "X"			3. EFFLUENT							4. UNITS		5. INTAKE (optional)		
	a. TEST-ING REQUIRED BY PERMIT	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE (if available)		c. LONG TERM AVRG. VALUE (if available)		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
METALS, CYANIDE, AND TOTAL PHENOLS															
1M. Antimony, Total (7440-36-0)	X			<0.02	<0.62					1	mg/l	lbs			
2M. Arsenic, Total (7440-38-2)	X			<0.005	<0.155					1	mg/l	lbs			
3M. Beryllium, Total, 7440-41-7)	X			<0.005	<0.155					1	mg/l	lbs			
4M. Cadmium, Total (7440-43-9)	X			<0.005	<0.155					1	mg/l	lbs			
5M. Chromium, Total (7440-47-3)	X			<0.01	<0.31					1	mg/l	lbs			
6M. Copper, Total (7440-50-8)	X			<0.05	<1.55					1	mg/l	lbs			
7M. Lead, Total (7439-92-1)	X			0.07	1.93	0.05	1.28	0.013	0.35	104	mg/l	lbs			
8M. Mercury, Total (7439-97-6)	X			0.0005	0.015					1	mg/l	lbs			
9M. Nickel, Total (7440-02-0)	X			<0.01	<0.31					1	mg/l	lbs			
10M. Selenium, Total (7782-49-2)	X			0.01	0.31					1	mg/l	lbs			
11M. Silver, Total (7440-22-4)	X			<0.01	<0.31					1	mg/l	lbs			
12M. Thallium, Total (7440-28-0)	X			<0.005	<0.155					1	mg/l	lbs			
13M. Zinc, Total (7440-66-6)	X			0.33	9.15	0.09	2.64	0.068	1.83	104	mg/l	lbs			
14M. Cyanide, Total (57-12-5)	X			0.01	0.31					1	mg/l	lbs			
15M. Phenols, Total	X			<0.1	<3.1					1	mg/l	lbs			
DIOXIN															
2,3,7,8-Tetrachlorodibenzo-P-Dioxin (1764-01-6)			X	DESCRIBE RESULTS											

CONTINUE [redacted] THE FRONT

1. POLLUTANT AND CAS NUMBER (if available)	2. MARK 'X' a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	3. EFFLUENT a. MAXIMUM DAILY VALUE (1) CONCENTRATION	(2) MASS	b. MAXIMUM 30 DAY VALUE (if available) (1) CONCENTRATION	(2) MASS	c. LONG TERM AVG. VALUE (if available) (1) CONCENTRATION	(2) MASS	d. NO. OF ANALYSES	4. UNITS a. CONCENTRATION	b. MASS	5. INTAKE (optional) a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	(2) MASS	b. NO. OF ANALYSES
GC/MS FRACTION – VOLATILE COMPOUNDS															
1V. Acrolein (107-02-8)	X			<50	<1.55					1	ug/l	lbs			
2V. Acrylonitrile (107-13-1)	X			<50	<1.55					1	ug/l	lbs			
3V. Benzene (71-43-2)	X			< 5	<0.155					1	ug/l	lbs			
4V. Bis (Chloromethyl) Ether (542-88-1)	X			< 5	<0.155					1	ug/l	lbs			
5V. Bromoform (75-25-2)	X			< 5	<0.155					1	ug/l	lbs			
6V. Carbon Tetrachloride (56-23-5)	X			< 5	<0.155					1	ug/l	lbs			
7V. Chlorobenzene (108-90-7)	X			< 5	<0.155					1	ug/l	lbs			
8V. Chlorodibromomethane (124-48-1)	X			< 5	<0.155					1	ug/l	lbs			
9V. Chloroethane (75-00-3)	X			<10	<0.31					1	ug/l	lbs			
10V. 2-Chloroethylvinyl Ether (110-75-8)	X			< 5	<0.155					1	ug/l	lbs			
11V. Chloroform (67-66-3)	X			< 5	<0.155					1	ug/l	lbs			
12V. Dichlorobromomethane (75-27-4)	X			< 5	<0.155					1	ug/l	lbs			
13V. Dichlorodifluoromethane (75-71-8)	X			< 10	<0.31					1	ug/l	lbs			
14V. 1,1-Dichloroethane (75-34-3)	X			< 5	<0.155					1	ug/l	lbs			
15V. 1,2-Dichloroethane (107-06-2)	X			< 5	<0.155					1	ug/l	lbs			
16V. 1,1-Dichloroethylene (75-35-4)	X			< 5	<0.155					1	ug/l	lbs			
17V. 1,2-Dichloropropane (78 87-5)	X			< 5	<0.155					1	ug/l	lbs			
18V. 1,3-Dichloropropylene (542-75-6)	X			< 5	<0.155					1	ug/l	lbs			
19V. Ethylbenzene (100-41-4)	X			< 5	<0.155					1	ug/l	lbs			
20V. Methyl Bromide (74-83-9)	X			<10	<0.31					1	ug/l	lbs			
21V. Methyl Chloride (74-87-3)	X			<10	<0.31					1	ug/l	lbs			

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EPA I.D. NUMBER (copy from Item 1) ILD000714881 | OUTFALL NUMBER 001

Form Approved
OMB No 2040-0086
Approval expires 7-31-88

1. POLLUTANT AND CAS NUMBER (if available)	2. MARK 'X' a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	3. EFFLUENT a. MAXIMUM DAILY VALUE (1) CONCENTRATION	(2) MASS	b. MAXIMUM 30 DAY VALUE (if available) (1) CONCENTRATION	(2) MASS	c. LONG TERM AVRG. VALUE (if available) (1) CONCENTRATION	(2) MASS	d. NO. OF ANALYSES	4. UNITS a. CONCENTRATION	b. MASS	5. INTAKE (optional) a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	(2) MASS	b. NO. OF ANALYSES
GC/MS FRACTION – VOLATILE COMPOUNDS (continued)															
22V. Methylene Chloride (75-09-2)	X			6	0.186					1	ug/l	lbs			
23V. 1,1,2,2-Tetrachloroethane (79-34-5)	X			< 5	< 0.155					1	ug/l	lbs			
24V. Tetrachloroethylene (127-18-4)	X			< 5	< 0.155					1	ug/l	lbs			
25V. Toluene (108-88-3)	X			< 5	< 0.155					1	ug/l	lbs			
26V. 1,2-Trans-Dichloroethylene (156-60-5)	X			< 5	< 0.155					1	ug/l	lbs			
27V. 1,1,1-Trichloroethane (71-55-6)	X			< 5	< 0.155					1	ug/l	lbs			
28V. 1,1,2-Trichloroethane (79-00-5)	X			< 5	< 0.155					1	ug/l	lbs			
29V. Trichloroethylene (79-01-6)	X			< 5	< 0.155					1	ug/l	lbs			
30V. Trichlorofluoromethane (75-69-4)	X			< 5	< 0.155					1	ug/l	lbs			
31V. Vinyl Chloride (75-01-4)	X			< 10	< 0.31					1	ug/l	lbs			
GC/MS FRACTION – ACID COMPOUNDS															
1A. 2-Chlorophenol (95-57-8)	X			< 10	< 0.31					1	ug/l	lbs			
2A. 2,4-Dichlorophenol (120-83-2)	X			< 10	< 0.31					1	ug/l	lbs			
3A. 2,4-Dimethylphenol (105-67-9)	X			< 10	< 0.31					1	ug/l	lbs			
4A. 4,6-Dinitro-O-Cresol (534-52-1)	X			< 50	< 1.55					1	ug/l	lbs			
5A. 2,4-Dinitrophenol (51-28-5)	X			< 50	< 1.55					1	ug/l	lbs			
6A. 2-Nitrophenol (88-75-5)	X			< 50	< 1.55					1	ug/l	lbs			
7A. 4-Nitrophenol (100-02-7)	X			< 50	< 1.55					1	ug/l	lbs			
8A. P-Chloro-M-Cresol (59-50-7)	X			< 10	< 0.31					1	ug/l	lbs			
9A. Pentachlorophenol (87-86-5)	X			< 50	< 1.55					1	ug/l	lbs			
10A. Phenol (108-95-2)	X			< 10	< 0.31					1	ug/l	lbs			
11A. 2,4,6-Trichlorophenol (88-06-2)	X			< 10	< 0.31					1	ug/l	lbs			

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1. POLL[redacted] AND [redacted] NUMBER (if available)	2. MARK "X" a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	3. EFFLU[redacted] a. MAXIMUM DAILY VALUE (1) CONCENTRATION	a. MAXIMUM DAILY VALUE (2) MASS	b. MAXIMUM 30 DAY V[redacted]UE (if available) (1) CONCENTRATION	b. MAXIMUM 30 DAY V[redacted]UE (if available) (2) MASS	c. LONG TERM AVRG. VALUE (if available) (1) CONCENTRATION	c. LONG TERM AVRG. VALUE (if available) (2) MASS	d. NO. OF ANALYSES	4. UNITS a. CONCENTRATION	4. UNITS b. MASS	5. [redacted]AKE (optional) a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	5. [redacted]AKE (optional) a. LONG TERM AVERAGE VALUE (2) MASS	5. [redacted]AKE (optional) b. NO. OF ANALYSES
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS															
1B. Acenaphthene (83-32-9)	X			< 10	< 0.31					1	ug/l	lbs			
2B. Acenaphtylene (208-96-8)	X			< 10	< 0.31					1	ug/l	lbs			
3B. Anthracene (120-12-7)	X			< 10	< 0.31					1	ug/l	lbs			
4B. Benzidine (92-87-5)	X			< 80	< 2.48					1	ug/l	lbs			
5B. Benzo (a) Anthracene (56-55-3)	X			< 10	< 0.31					1	ug/l	lbs			
6B. Benzo (a) Pyrene (50-32-8)	X			< 10	< 0.31					1	ug/l	lbs			
7B. 3,4-Benzo-fluoranthene (205-99-2)	X			< 10	< 0.31					1	ug/l	lbs			
8B. Benzo (ghi) Perylene (191-24-2)	X			< 10	< 0.31					1	ug/l	lbs			
9B. Benzo (k) Fluoranthene (207-08-9)	X			< 10	< 0.31					1	ug/l	lbs			
10B. Bis (2-Chloro-ethoxy) Methane (111-91-1)	X			< 10	< 0.31					1	ug/l	lbs			
11B. Bis (2-Chloro-ethyl) Ether (111-44-4)	X			< 10	< 0.31					1	ug/l	lbs			
12B. Bis (2-Chloroiso-propyl) Ether (102-60-1)	X			< 10	< 0.31					1	ug/l	lbs			
13B. Bis (2-Ethyl-hexyl) Phthalate (117-81-7)	X			29	0.899					1	ug/l	lbs			
14B. 4-Bromo-phenyl Phenyl Ether (101-55-3)	X			< 10	< 0.31					1	ug/l	lbs			
15B. Butyl Benzyl Phthalate (85-68-7)	X			< 10	< 0.31					1	ug/l	lbs			
16B. 2-Chloro-naphthalene (91-58-7)	X			< 10	< 0.31					1	ug/l	lbs			
17B. 4 Chloro-phenyl Phenyl Ether (7005-72-3)	X			< 10	< 0.31					1	ug/l	lbs			
18B. Chrysene (218-01-9)	X			< 10	< 0.31					1	ug/l	lbs			
19B. Dibenzo (a,h) Anthracene (53-70-3)	X			< 10	< 0.31					1	ug/l	lbs			
20B. 1,2-Dichloro-benzene (95-50-1)	X			< 10	< 0.31					1	ug/l	lbs			
21B. 1,3-Dichloro-benzene (541-73-1)	X			< 10	< 0.31					1	ug/l	lbs			

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EPA I.D. NUMBER (copy from Item 1 o i) ILD000714881 | OUTFALL NUMBER 001

Form Approved.
OMB No. 2040-0086
Approval expires 7-31-88

1. POLLUTANT AND CAS NUMBER (if available)	2. MARK 'X' a. TEST INCLUDED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	3. EFFLUENT a. MAXIMUM DAILY VALUE (1) CONCENTRATION	a. MAXIMUM DAILY VALUE (2) MASS	b. MAXIMUM 30 DAY VALUE (if available) (1) CONCENTRATION	b. MAXIMUM 30 DAY VALUE (if available) (2) MASS	c. LONG TERM AVRG. VALUE (if available) (1) CONCENTRATION	c. LONG TERM AVRG. VALUE (if available) (2) MASS	d. NO. OF ANALYSES	4. UNITS a. CONCENTRATION	4. UNITS b. MASS	5. INTAKE (optional) a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	5. INTAKE (optional) a. LONG TERM AVERAGE VALUE (2) MASS	5. INTAKE (optional) b. NO. OF ANALYSES
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS (continued)															
22B. 1,4-Dichlorobenzene (106-46-7)	X			< 10	< 0.31					1	ug/l	lbs			
23B. 3,3'-Dichlorobenzidine (91-94-1)	X			< 20	< 0.62					1	ug/l	lbs			
24B. Diethyl Phthalate (84-66-2)	X			< 10	< 0.31					1	ug/l	lbs			
25B. Dimethyl Phthalate (131-11-3)	X			< 10	< 0.31					1	ug/l	lbs			
26B. Di-N-Butyl Phthalate (84-74-2)	X			< 10	< 0.31					1	ug/l	lbs			
27B. 2,4-Dinitrotoluene (121-14-2)	X			< 10	< 0.31					1	ug/l	lbs			
28B. 2,6-Dinitrotoluene (606-20-2)	X			< 10	< 0.31					1	ug/l	lbs			
29B. Di-N-Octyl Phthalate (117-84-0)	X			< 10	< 0.31					1	ug/l	lbs			
30B. 1,2-Diphenylhydrazine (as Azobenzene) (122-66-7)	X			< 10	< 0.31					1	ug/l	lbs			
31B. Fluoranthene (206-44-0)	X			< 10	< 0.31					1	ug/l	lbs			
32B. Fluorene (86-73-7)	X			< 10	< 0.31					1	ug/l	lbs			
33B. Hexachlorobenzene (118-74-1)	X			< 10	< 0.31					1	ug/l	lbs			
34B. Hexachlorobutadiene (87-68-3)	X			< 10	< 0.31					1	ug/l	lbs			
35B. Hexachlorocyclopentadiene (77-47-4)	X			< 10	< 0.31					1	ug/l	lbs			
36B. Hexachloroethane (67-72-1)	X			< 10	< 0.31					1	ug/l	lbs			
37B. Indeno (1,2,3-cd) Pyrene (193-39-5)	X			< 10	< 0.31					1	ug/l	lbs			
38B. Isophorone (78-59-1)	X			< 10	< 0.31					1	ug/l	lbs			
39B. Naphthalene (91-20-3)	X			< 10	< 0.31					1	ug/l	lbs			
40B. Nitrobenzene (98-95-3)	X			< 10	< 0.31					1	ug/l	lbs			
41B. N-Nitrosodimethylamine (62-75-9)	X			< 10	< 0.31					1	ug/l	lbs			
42B. N-Nitrosodi-N-Propylamine (621-64-7)	X			< 10	< 0.31					1	ug/l	lbs			

CONTINUED FROM THE FRONT

1. POLLUTANT AND CAS NUMBER (if available)	2. MARK 'X' a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	3. EFFLUENT a. MAXIMUM DAILY VALUE (1) CONCENTRATION	a. MAXIMUM DAILY VALUE (2) MASS	b. MAXIMUM 30 DAY VALUE (if available) (1) CONCENTRATION	b. MAXIMUM 30 DAY VALUE (if available) (2) MASS	c. LONG TERM AVRG. VALUE (if available) (1) CONCENTRATION	c. LONG TERM AVRG. VALUE (if available) (2) MASS	d. NO. OF ANALYSES	4. UNITS a. CONCENTRATION	4. UNITS b. MASS	5. INTAKE (optional) a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	5. INTAKE (optional) a. LONG TERM AVERAGE VALUE (2) MASS	5. INTAKE (optional) b. NO. OF ANALYSES
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS (continued)															
43B. N-Nitrosodiphenylamine (86-30-6)	X			< 10	< 0.31					1	ug/l	lbs			
44B. Phenanthrene (85-01-8)	X			< 10	< 0.31					1	ug/l	lbs			
45B. Pyrene (129-00-0)	X			< 10	< 0.31					1	ug/l	lbs			
46B. 1,2,4 - Trichlorobenzene (120-82-1)	X			< 10	< 0.31					1	ug/l	lbs			
GC/MS FRACTION – PESTICIDES															
1P. Aldrin (309-00-2)			X							0					
2P. α-BHC (319-84-6)			X							0					
3P. β-BHC (319-85-7)			X							0					
4P. γ-BHC (58-89-9)			X							0					
5P. δ-BHC (319-86-8)			X							0					
6P. Chlordane (57-74-9)			X							0					
7P. 4,4'-DDT (50-29-3)			X							0					
8P. 4,4'-DDE (72-55-9)			X							0					
9P. 4,4'-DDD (72-54-8)			X							0					
10P. Dieldrin (60-57-1)			X							0					
11P. α-Endosulfan (115-29-7)			X							0					
12P. β-Endosulfan (115-29-7)			X							0					
13P. Endosulfan Sulfate (1031-07-8)			X							0					
14P. Endrin (72-20-8)			X							0					
15P. Endrin Aldehyde (7421-93-4)			X							0					
16P. Heptachlor (76-44-8)			X							0					

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EPA I.D. NUMBER (copy from Item 1 of Page 1)	OUTFALL NUMBER
ILD000714881	001

Form Approved
OMB No. 2040-0086
Approval expires 7-31-88

1. POLLUTANT AND CAS NUMBER (if available)	2. MARK 'X'			3. EFFLUENT							4. UNITS		5. INTAKE (optional)		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE (if available)		c. LONG TERM AVRG. VALUE (if available)		d. NO. OF ANALYSES	a. CONCENTRATION	b. MASS	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS				(1) CONCENTRATION	(2) MASS	
GC/MS FRACTION — PESTICIDES (continued)															
17P. Heptachlor Epoxide (1024-57-3)			X							0					
18P. PCB-1242 (53469-21-9)			X							0					
19P. PCB-1254 (11097-69-1)			X							0					
20P. PCB-1221 (11104-28-2)			X							0					
21P. PCB-1232 (11141-16-5)			X							0					
22P. PCB-1248 (12672-29-6)			X							0					
23P. PCB-1260 (11096-82-5)			X							0					
24P. PCB-1016 (12674-11-2)			X							0					
25P. Toxaphene (8001-35-2)			X							0					

THE FOLLOWING TWO PAGES DESCRIBE
THE CONCENTRATION AND MASS LIMITS ANTICIPATED FOR THE
TREATED GROUND WATER AS MEASURED IN THE
AIR STRIPPER EFFLUENT

1. POLLUTANT AND CAS NUMBER (if available)	2. MARK 'X' a. TEST INCLUDED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	3. EFFLUENT (800 GPM) a. MAXIMUM DAILY VALUE (1) CONCENTRATION	(2) MASS	b. MAXIMUM 30 DAY VALUE (if available) (1) CONCENTRATION	(2) MASS	c. LONG TERM AVRG. VALUE (if available) (1) CONCENTRATION	(2) MASS	d. NO. OF ANALYSES	4. UNITS a. CONCENTRATION	b. MASS	5. INTAKE (optional) a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	(2) MASS	b. NO. OF ANALYSES
GC/MS FRACTION – VOLATILE COMPOUNDS															
1V. Acrolein (107-02-8)			X												
2V. Acrylonitrile (107-13-1)			X												
3V. Benzene (71-43-2)			X												
4V. Bis (Chloromethyl) Ether (542-88-1)			X												
5V. Bromoform (75-25-2)			X												
6V. Carbon Tetrachloride (56-23-5)		X		< 5.0	< .048			< 5.0	< .048		ug/1	lbs			
7V. Chlorobenzene (108-90-7)			X												
8V. Chlorodibromomethane (124-48-1)			X												
9V. Chloroethane (75-00-3)		X		< 5.0	< .048			< 5.0	< .048		ug/1	lbs			
10V. 2-Chloroethylvinyl Ether (110-75-8)			X												
11V. Chloroform (67-66-3)		X		< 5.0	< .048			< 5.0	< .048		ug/1	lbs			
12V. Dichlorobromomethane (75-27-4)			X												
13V. Dichlorodifluoromethane (75-71-8)			X												
14V. 1,1-Dichloroethane (75-34-3)		X		< 5.0	< .048			< 5.0	< .048		ug/1	lbs			
15V. 1,2-Dichloroethane (107-06-2)		X		< 5.0	< .048			< 5.0	< .048		ug/1	lbs			
16V. 1,1-Dichloroethylene (75-35-4)		X		< 5.0	< .048			< 5.0	< .048		ug/1	lbs			
17V. 1,2-Dichloropropane (78-87-5)			X												
18V. 1,3-Dichloropropylene (542-75-6)			X												
19V. Ethylbenzene (100-41-4)			X												
20V. Methyl Bromide (74-83-9)			X												
21V. Methyl Chloride (74-87-3)			X												

1. POLLUTANT AND CAS NUMBER (if available)	2. MARK "X" a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	3. EFFLUENT 800 (GPM) a. MAXIMUM DAILY VALUE (1) CONCENTRATION	(2) MASS	b. MAXIMUM 30 DAY VALUE (if available) (1) CONCENTRATION	(2) MASS	c. LONG TERM AVRG. VALUE (if available) (800 GPM) (1) CONCENTRATION	(2) MASS	d. NO. OF ANALYSES	4. UNITS a. CONCENTRATION	b. MASS	5. INTAKE (optional) a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	(2) MASS	b. NO. OF ANALYSES
GC/MS FRACTION – VOLATILE COMPOUNDS (continued)															
22V. Methylene Chloride (75-09-2)		X		< 5.0	< .048			< 5.0	< .048		ug/1	lbs			
23V. 1,1,2,2-Tetrachloroethane (79-34-5)			X												
24V. Tetrachloroethylene (127-18-4)		X		< 5.0	< .048			< 5.0	< .048		ug/1	lbs			
25V. Toluene (108-88-3)		X		< 5.0	< .048			< 5.0	< .048		ug/1	lbs			
26V. 1,2-Trans-Dichloroethylene (156-60-5)		X		< 5.0	< .048			< 5.0	< .048		ug/1	lbs			
27V. 1,1,1-Trichloroethane (71-55-6)		X		< 5.0	< .048			< 5.0	< .048		ug/1	lbs			
28V. 1,1,2-Trichloroethane (79-00-5)			X												
29V. Trichloroethylene (79-01-6)		X		< 5.0	< .048			< 5.0	< .048		ug/1	lbs			
30V. Trichlorofluoromethane (75-69-4)			X												
31V. Vinyl Chloride (75-01-4)		X		< 5.0	< .048			< 5.0	< .048		ug/1	lbs			
GC/MS FRACTION – ACID COMPOUNDS															
1A. 2-Chlorophenol (95-57-8)			X												
2A. 2,4-Dichlorophenol (120-83-2)			X												
3A. 2,4-Dimethylphenol (105-67-9)			X												
4A. 4,6-Dinitro-O-Cresol (534-52-1)			X												
5A. 2,4-Dinitrophenol (51-28-5)			X												
6A. 2-Nitrophenol (88-75-5)			X												
7A. 4-Nitrophenol (100-02-7)			X												
8A. P-Chloro-M-Cresol (59-50-7)			X												
9A. Pentachlorophenol (87-86-5)			X												
10A. Phenol (108-95-2)			X												
11A. 2,4,6-Trichlorophenol (88-06-2)			X												

SUPPLEMENTAL PERMIT APPLICATION INFORMATION

file

WW Engineering & Science
A Summit Company

December 21, 1992

CERTIFIED MAIL: P374 153 611

Mr. Lawrence W. Eastep, P.E.
Manager, Permit Section
Illinois Environmental Protection Agency
Division of Land Pollution Control, #33
2200 Churchill Road
P.O. Box 19276
Springfield, IL 62794-9276

Dear Mr. Eastep:

RE: Keystone Steel & Wire Company, Ground Water Remediation Program, Air Permit Application for Air Stripping System

This letter transmits three copies of a letter response to Mr. Dickson Nwaji (IEPA) from Mr. Tom Heller. The letter clarifies a few points in the Air Permit application as requested by Mr. Nwaji during phone conversations with Mr. Heller and myself. I am also sending one copy of this letter by certified mail directly to Mr. Nwaji to facilitate review of the application. Please contact me if you have any questions or require additional information.

Sincerely,

Robert E. Aten
Vice President

Enclosure

cc: D. Bennington
R. End
A. Running

5010 Stone Mill Road Bloomington IN 47408 812 336-0972 Fax 812 336-0991
Indianapolis IN Milwaukee WI Minneapolis MN

WW Engineering & Science
A Summit Company

December 21, 1992

CERTIFIED MAIL: P374 153 610

Mr. Dickson Nwaji
Illinois EPA
2200 Churchill Road
P.O. Box 19276
Springfield, IL 62794-9276

Dear Mr. Nwaji:

RE: Keystone Steel & Wire Company, Ground Water Remediation Program, Air Permit Application for Air Stripping System

Enclosed is a copy of a letter form Mr. Tom Heller, responding to questions you had on the Air Permit applications for Keystone. Please contact me or Mr. Heller if you need additional information.

Sincerely,

Robert E. Aten
Vice President

Enclosure

cc: D. Bennington
R. End
A. Running

5010 Stone Mill Road Bloomington, IN 47408 812/336-0972 Fax 812/336-3991
Bloomington, IN Chattanooga, TN Columbus, OH Detroit, MI Grand Rapids, MI Indianapolis, IN Milwaukee, WI Minneapolis, MN

WW Engineering & Science
A Summit Company

December 18, 1992

CERTIFED MAIL: P 374 153 611

Mr. Dickson Nwaji
Illinois EPA
2200 Churchill Road
P.O. Box 19276
Springfield, IL 62794-9276

Dear Mr. Nwaji:

RE: AIR PERMIT APPLICATION - KEYSTONE STEEL & WIRE COMPANY - PEORIA, ILLINOIS: FOLLOW-UP TO PHONE CONVERSATION REGARDING VOC LOADINGS

The attached table shows the anticipated concentrations (mg/l) and mass loadings (pounds/hour) for the Keystone Steel & Wire Company project in Peoria, Illinois. This table expands upon the data submitted to your office in the air permit application for the project, and in Table 12 of the design report, which lists each of the volatile organic compounds (VOCs) anticipated to be in the recovered ground water at the site. The thirteen VOCs listed in the permit application are included in the table.

Two of those, vinyl chloride and chloroethane, are expected to have less than detectable concentrations, but are still included in the permit application. Vinyl chloride is included because it is a known degradation byproduct of some of the chlorinated VOCs present in the ground water at the site, and therefore could be detected in the future. Vinyl chloride has been detected in only seven ground water samples at the site, and at very low (less than 60 parts per billion) levels. Chloroethane has been detected in only two wells at the site. The blended average feed stream calculated for the air stripping tower has concentrations of both chloroethane and vinyl chloride less than 0.001 mg/l, so their concentrations are listed as zero mg/l on the attached table.

The average anticipated air stripper feed concentrations were calculated based on the actual VOC data from existing monitoring wells located at or near the future recovery well locations. The VOC concentration data anticipated from each of the four recovery wells were combined on a flow-weighted basis according to the calculated pumping rate from each well to determine the concentration of VOCs expected in the air stripper influent.

5010 Stone Mill Road Bloomington, IN 47408 812/336-0972 Fax 812/336-3991
Bloomington, IN Chattanooga, TN Columbus, OH Detroit, MI Grand Rapids, MI Indianapolis, IN Milwaukee, WI Minneapolis, MN

Analysis of the subsurface geology and hydrogeology at the site indicate the average anticipated ground water recovery rate is 550 gpm (total from four wells).

The anticipated maximum ground water recovery rate from the site, accounting for the potential addition of more recovery wells, is 800 gpm. The anticipated maximum concentration of VOCs in the recovered ground water can not be predicted due to the nature of the hydrogeology and soil conditions at the site, and the number of sampling results available. Therefore, the maximum VOC concentrations are assumed to be three times the average concentrations calculated from the data at the site. This assumption is conservative based on observations from other sites and because the recovery wells may pull in some clean water from around the site, diluting the VOC concentration in the recovered water. The maximum VOC mass loading to the air stripper was calculated by combining the maximum expected recovery rate with the maximum expected VOC concentration. Thus, the maximum anticipated mass loadings listed on the attached table, and used in the design of the air stripper, are very conservative.

If I can be of further assistance, please call me at (616) 942-9600. Thank you.

Sincerely,

WW ENGINEERING & SCIENCE
Environmental Services

Thomas W. Heller

Thomas W. Heller
Project Engineer

KEYSTONE STEEL & WIRE

Air Stripping Project

Project Number 07029.05

Number	*Component*	*Loading*			
		Average		*Maximum*	
		mg/l	*lb/hr*	*mg/l*	*lb/hr*
1	Trichloroethylene	0.720	0.1981	2.160	0.863
2	1,1,1-TCA	0.440	0.1211	1.320	0.528
3	1,1-DCE	0.130	0.0358	0.390	0.156
4	1,2-DCE	0.060	0.0165	0.180	0.072
5	Tetrachloroethylene	0.060	0.0165	0.180	0.072
6	1,2-DCA	0.002	0.0006	0.005	0.002
7	1,1-DCA	0.170	0.0468	0.510	0.204
8	Vinyl Chloride	0.000	0.0000	0.000	0.000
9	Toluene	0.008	0.0022	0.024	0.010
10	Chloroform	0.012	0.0033	0.036	0.014
11	Chloroethane	0.000	0.0000	0.000	0.000
12	Carbon Tetrachloride	0.010	0.0028	0.030	0.012
13	Methylene Chloride	0.030	0.0083	0.090	0.036
Totals		1.642	0.4517	4.925	1.968

Notes:
1. Vinyl Chloride and chloroethane concentrations are less than 0.001 mg/l.
2. Average concentrations were combined with average flow rate (550 gpm) to yield average loadings (lb/day).
3. Maximum concentrations were combined with maximum flow rate (800 gpm) to yield maximum loadings (lb/day).

Illinois Environmental Protection Agency
Permit Section, Division of Water Pollution Control
P. O. Box 19276
Springfield, Illinois 62794-9276

Application For Permit Or Construction Approval

WPC-PS-1

For IEPA Use:

1. **Name and Location:**

Name of project: REMEDIATION OF IMPACTED GROUND WATER USING AN AIR STRIPPING TREATMENT SYSTEM

Municipality or Township: PEORIA County: PEORIA

2. **Brief Description of Project:** IMPACTED GROUND WATER WILL BE RECOVERED AND TREATED BY AN AIR STRIPPING SYSTEM. TREATED WATER WILL BE PUMPED INTO THE WIRE MILL COOLING WATER SYSTEM BEFORE BEING PUMPED TO THE WASTE WATER TREATMENT SYSTEM AND DISCHARGED VIA NPDES OUTFALL 001.

3. **Documents Being Submitted:** If the project involves any of the items listed below, submit the corresponding schedule, and check the appropriate spaces.

Project					
Private Sewer Connection/Extension	A/B		Spray Irrigation	H	
Sewer Extension Construct Only	C		Septic Tanks	I	
Sewage Treatment Works	D		Industrial Treatment or Pretreatment	J	X
Excess Flow Treatment	E		Waste Characteristics	N	X
Lift Station/Force Main	F		Erosion Control	P	
Sludge Disposal	G		Trust Disclosure	T	

Plans:-Title _____ Number of Pages: _____

Specifications: Title _____ Number of Books/Pages: _____

Other Documents (Please Specify) AQUIFER TEST AND AIR STRIPPING PILOT STUDY REPORT, NOV. 6, 1992. PARAMETERS ARE LISTED IN SECTION 7 OF THIS REPORT.

4. **Land Trust:** Is the project identified in item number 1 herein, for which a permit is requested, to be constructed on land which is the subject of a trust? ____ Yes X No
If yes, Schedule T (Trust Disclosure) must be completed and item number 7.1.1 must be signed by a beneficiary, trustee or trust officer.

5. **This is an Application for** *(Check Appropriate Line):*

X A. Joint Construction And Operating Permit
_____ B. Authorization to Construction (See Instructions) NPDES Permit No. IL00 _____ Issue Date _____
_____ C. Construct Only Permit (Does Not Include Operations)
_____ D. Operate Only Permit (Does Not Include Construction)

6. **Certifications and Approval:**

6.1 Certificate by Design Engineer *(When required; refer to instructions)*
I hereby certify that I am familiar with the information contained in this application, including the attached schedules indicate above, and that to the best of my knowledge and belief such information is true, complete and accurate. The plans and specifications (specifications other than Standard Specifications or local specifications on file with this Agency) as described above were prepared by me or under my direction.

Engineer DALE BENNINGTON, P.E. (Name) 062-035579 (Registration Number) _____ (Seal)

Firm: KEYSTONE STEEL & WIRE COMPANY

Address: 7000 S.W. ADAMS STREET

PEORIA, IL 61641 Phone Number: (309)697-7552

Signature X _____

7. **Certifications and Approvals for Permits:**

7.1 Certificate by Applicant(s)
I/We hereby certify that I/we have read and thoroughly understand the conditions and requirements of this Application, and am/are authorized to sign this application in accordance with the Rules and Regulations of the Illinois Pollution Control Board. I/We hereby agree to conform with the Standard Conditions and with any other Special Conditions made part of this Permit.

7.1.1 Name of Applicant For Permit To Construct DALE L. BENNINGTON, P.E.

7000 S.W. ADAMS STREET (Street) PEORIA (City) IL (State) 61641 (Zip Code)

Signature X _____ DALE L. BENNINGTON (Printed Name) (309)697-7552 (Phone Number)

Title MANAGER, ENERGY & ENVIRONMENTAL ENG. Organization KEYSTONE STEEL & WIRE

IL 532-0012
WPC 150 (Rev. 5/92)

7.1.2 Name Of Applicant For Permit To Own and Operate KEYSTONE STEEL & WIRE COMPANY

7000 S.W. ADAMS STREET (Street) | PEORIA (City) | IL (State) | 61641 (Zip Code)

Signature X _____ DALE L. BENNINGTON (Printed Name) (309)697-7552 (Phone Number)

Title MANAGER, ENERGY & ENVIRONMENTAL ENGINEERING

7.2 **Attested (Required When Applicant is a Unit of Government)** NOT APPLICABLE

Signature X _____ Date _____ Title _____
(City Clerk, Village Clerk, Sanitary District Clerk, Etc.)

7.3 Applicants from non-governmental applicants which are not signed by the owner, must be signed by a principal executive officer of at least the level of vice president, or a duly authorized representative.

7.4 **Certificate By Intermediate Sewer Owner** NOT APPLICABLE

I hereby certify that (Please check one):

_____1. The sewers to which this project will be tributary have adequate reserve capacity to transport the wastewater that will be added by this project without causing a violation of the Environmental Protection Act or Subtitle C, Chapter I, or

_____2. The Illinois Pollution Control Board, in PCB _____ dated _____, granted a variance from Subtitle C, Chapter I to allow construction facilities that are the subject of this application.

Name and location of sewer system to which this project will be tributary: _____

Sewer System Owner _____

_____
Street City State Zip Code

Signature X _____ Date _____ Title _____

7.4.1 **Additional Certificate By Intermediate Sewer Owner** NOT APPLICABLE

I hereby certify that (Please check one):

_____1. The sewers to which this project will be tributary have adequate reserve capacity to transport the wastewater that will be added by this project without causing a violation of the Environmental Protection Act or Subtitle C, Chapter I, or

_____2. The Illinois Pollution Control Board, in PCB _____ dated _____, granted a variance from Subtitle C, Chapter I to allow construction and operation of the facilities that are the subject of this application.

Name and location of sewer system to which this project will be tributary: _____

Sewer System Owner _____

_____
Street City State Zip Code

Signature X _____ Date _____ Title _____

7.5 **Certificate By Waste Treatment Works Owner** NOT APPLICABLE

I hereby certify that (Please check one):

_____1. The waste treatment plant to which this project will be tributary has adequate reserve capacity to treat the wastewater that will be added by this project without causing a violation of the Environmental Protection Act or Subtitle C, Chapter I, or

_____2. The Illinois Pollution Control Board, in PCB _____ dated _____, granted a variance from Subtitle C, Chapter I to allow construction and operation of the facilities that are the subject of this application.

I also certify that the industrial waste discharges described in the application is capable of being treated by the treatment works.

Name and location of waste treatment works to which this project will be tributary: _____

Treatment Works Owner _____

_____
Street City State Zip Code

Signature X _____ Date _____ Title _____

The IEPA is authorized to require this information under Illinois Revised Statutes, 1979, Chapter 111 1/2, Section 1039. Disclosure of this information is required under that Section. Failure to do so may prevent this form from being processed and could result in your application being denied. This form has been approved by the Forms Management Center.

Printed on Recycled Paper

FOR IEPA USE:
LOG #
DATE RECEIVED:

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF WATER POLLUTION CONTROL
PERMIT SECTION
Springfield, Illinois 62706

SCHEDULE J INDUSTRIAL TREATMENT WORKS CONSTRUCTION OR PRETREATMENT WORKS

1. NAME AND LOCATION:

1.1 Name of project REMEDIATION OF IMPACTED GROUND WATER USING AN AIR STRIPPING TREATMENT SYSTEM

1.2 Plant Location

1.2.1	NA	30 & 31	8N	8E	
	Quarter Section	Section	Township	Range	P.M.
1.2.2 Latitude		40 °	38 '	45 "	North
Longitude		89 °	38 '	15 "	West

1.2.3 Name of USGS Quadrangle Map (7.5 or 15 Minutes) PEORIA WEST ILLINOIS QUAD (7.5 MINUTE)

2. NARRATIVE DESCRIPTION AND SCHEMATIC WASTE FLOW DIAGRAM: (see instructions)

SEE ATTACHMENTS FOR NARRATIVE DESCRIPTION.
A SCHEMATIC FLOW DIAGRAM IS PROVIDED ON FIGURE 15 OF THE AQUIFER TEST AND AIR STRIPPING PILOT STUDY, SUBMITTED NOV 6, 1992. (FIGURE 15 IS ATTACHED)

2.1 PRINCIPAL PRODUCTS: WIRE AND STEEL PRODUCTS

2.2 PRINCIPAL RAW MATERIALS: SCRAP STEEL

3. DESCRIPTION OF TREATMENT FACILITIES:

3.1 Submit a flow diagram through all treatment units showing size, volumes, detention times, organic loadings, surface settling rate, weir overflow rate, and other pertinent design data. Include hydraulic profiles and description of monitoring systems. SEE ATTACHMENTS

3.2 Waste Treatment Works is: Batch ____, Continuous X ; No. of Batches/day ____, No. of Shifts/day 3

3.3 Submit plans and specifications for proposed construction.

3.4 Discharge is: Existing ____; Will begin on SEPT., 1993 .

4. DIRECT DISCHARGE IS TO: Receiving Stream ____ Municipal Sanitary Sewer ____, Municipal storm or municipal combined sewer ____. If receiving stream or storm sewer indicated complete the following: SEE ATTACHMENTS

Name of receiving stream ____; tributary to ____:

tributary to ____; tributary to ____.

5. Is the treatment works subject to flooding? If so, what is the maximum flood elevation of record (in reference to the treatment works datum) and what provisions have been made to eliminate the flooding hazard? NO , FLOOD PROTECTION LEVIES ARE IN PLACE.

6. APPROXIMATE TIME SCHEDULE: Estimated construction schedule:

Start of Construction APRIL, 1993 ; Date of Completion SEPTEMBER, 1993

Operation Schedule 24 HOURS PER DAY ; Date Operation Begins SEPTEMBER, 1993

100% design load to be reached by year SEPTEMBER, 1993 .

This Agency is authorized to require this information under Illinois Revised Statutes, 1979, Chapter 111 1/2, Section 1039. Disclosure of this information is required under that Section. Failure to do so may prevent this form from being processed and could result in your application being denied. This form has been approved by the Forms Management Center.

IL 532 0018
WPC 158 REV.(4/91

090-001

7. DESIGN LOADINGS

7.1 Design population equivalent (one population equivalent is 100 gallons of wastewater per day, containing 0.17 pounds of BOD_5 and 0.20 pounds of suspended solids;
BOD 2.0 mg/l ; Suspended Solids 8.0 mg/l ; Flow 800 gpm(max).

7.2 Design Average Flow Rate 1.15 MGD.

7.3 Design Maximum Flow Rate 1.15 MGD.

7.4 Design Minimum Flow Rate 0.65 MGD.

7.5 Minimum 7-day, 10-year low flow NA cfs MGD.

Minimum 7-day, 10-year flow obtained from NA.

7.6 Dilution Ratio NA : .

8. FLOW TO TREATMENT WORKS (if existing):

8.1 Flow (last 12 months)

8.1.1 Average Flow NA MGD

8.1.2 Maximum Flow NA MGD

8.2 Equipment used in determing above flows NA.

9. Has a preliminary engineering report for this project been submitted to this Agency for Approval?

YES X NO . If so, when was it submitted and approved. Date Submitted NOV. 6, 1992 AQUIFER TEST & AIR STRIPPING
Certification? NA PILOT STUDY
Dated NOV. 6, 1992

10. List Permits previously issued for the facility: NPDES # ILL0002526

11. Describe provisions for operation during contingencies such as power failures, flooding, peak loads, equipment failure, maintenances shut-downs and other emergencies. THE REMEDIATION OF IMPACTED GROUND WATER USING AN AIR STRIPPING TREATMENT SYSTEM WILL FUNCTION ON A CONTINUOUS BASIS. IF ANY OF THESE PROBLEMS ARISE, THE PURGE WELLS WILL AUTOMATICALLY SHUT DOWN AND THE DISCHARGE FLOW WILL CEASE.

12. Complete and submit Schedule G if sludge disposal will be required by this facility. NOT APPLICABLE

13. WASTE CHARACTERISTICS: Schedule N must be submitted.

14. TREATMENT WORKS OPERATOR CERTIFICATION: List names and certification numbers of certified operators:
SIGFRIED SCHUBERT: SOCIAL SECURITY # 337-26-9959
ALFRED SONDAG: SOCIAL SECURITY # 502-34-6427

This Agency is authorized to require this information under Illinois Revised Statutes, 1979, Chapter 111 1/2, Section 1039. Disclosure of this information is required under that Section. Failure to do so may prevent this form from being processed and could result in your application being denied. This form has been approved by the Forms Management Center.

FOR IEPA USE:
LOG #
DATE RECEIVED:

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF WATER POLLUTION CONTROL
PERMIT SECTION
Springfield, Illinois 62706

SCHEDULE N WASTE CHARACTERISTICS

1. Name of Project REMEDIATION OF IMPACTED GROUND WATER USING AN AIR STRIPPING TREATMENT SYSTEM

2. FLOW DATA

	EXISTING	PROPOSED-DESIGN
2.1 Average Flow (gpd)	0	1,152,000
2.2 Maximum Daily Flow (gpd)	0	1,152,000

2.3 TEMPERATURE

Time of year	Ave. Intake Temp. F	Avg. Effluent Temp. F	Max. Intake Temp. F	Max. Effluent Temp. F	Max. Temp. Outside Mixing Zone F
SUMMER	60	62	70	72	NA
WINTER	60	62	70	72	NA

2.4 Minimum 7-day, 10-year flow: NA cfs _____ MGD.

2.5 Dilution Ratio: NA ; _____

2.6 Stream flow rate at time of sampling NA cfs _____ MGD.

3. CHEMICAL CONSTITUENT Existing Permitted Conditions ___; Existing conditions ___; Proposed Permitted Conditions X .

Type of sample: ___grab (time of collection ___); ___composite (Number of samples per day ___)

(see instructions for analyses required) SEE TABLE I FOR CHEMICAL CONSTITUENTS

NOTE: This new water flow will replace an existing cooling water supply stream, so there will be no net increase in total flow through the existing waste water treatment facility (i.e., outfall 001).

Barium			
Boron			
BOD_5			
Cadmium			
Carbon Chloroform Extract			
Chloride			
Chromium (total hexavalent)			
Chromium (total tribalent)			
Copper			
Cyanide (total)			
Cyanide (readily released @150°F & pH 4.5)			
Dissolved Oxygen			
Fecal Coliform			

SEE TABLE I FOR CHEMICAL CONSTITUENTS

	RAW WASTE (mg/l)	TREATED EFFLUENT Avg. (mg/l) Max.	UPSTREAM (mg/l)	DOWNSTREAM SAMPLES (mg/l)
Fluoride				
Hardness (as $CaCO_3$)				
Iron (total)				
Lead				
Manganese				
MBAS				
Mercury				
Nickel				
Nitrates (asN)				
Oil & Grease (hexane solubles or equivalents)				
Organic Nitrogen (as N)				
pH				
Phenols				
Phosphorous (as P)				
Radioactivity				
Selenium				
Silver				
Sulfate				
Suspended Solids				
Total Dissolved Solids				
Zinc				
Others				

ATTACHMENTS

ATTACHMENTS TO ILLINOIS EPA SCHEDULE J

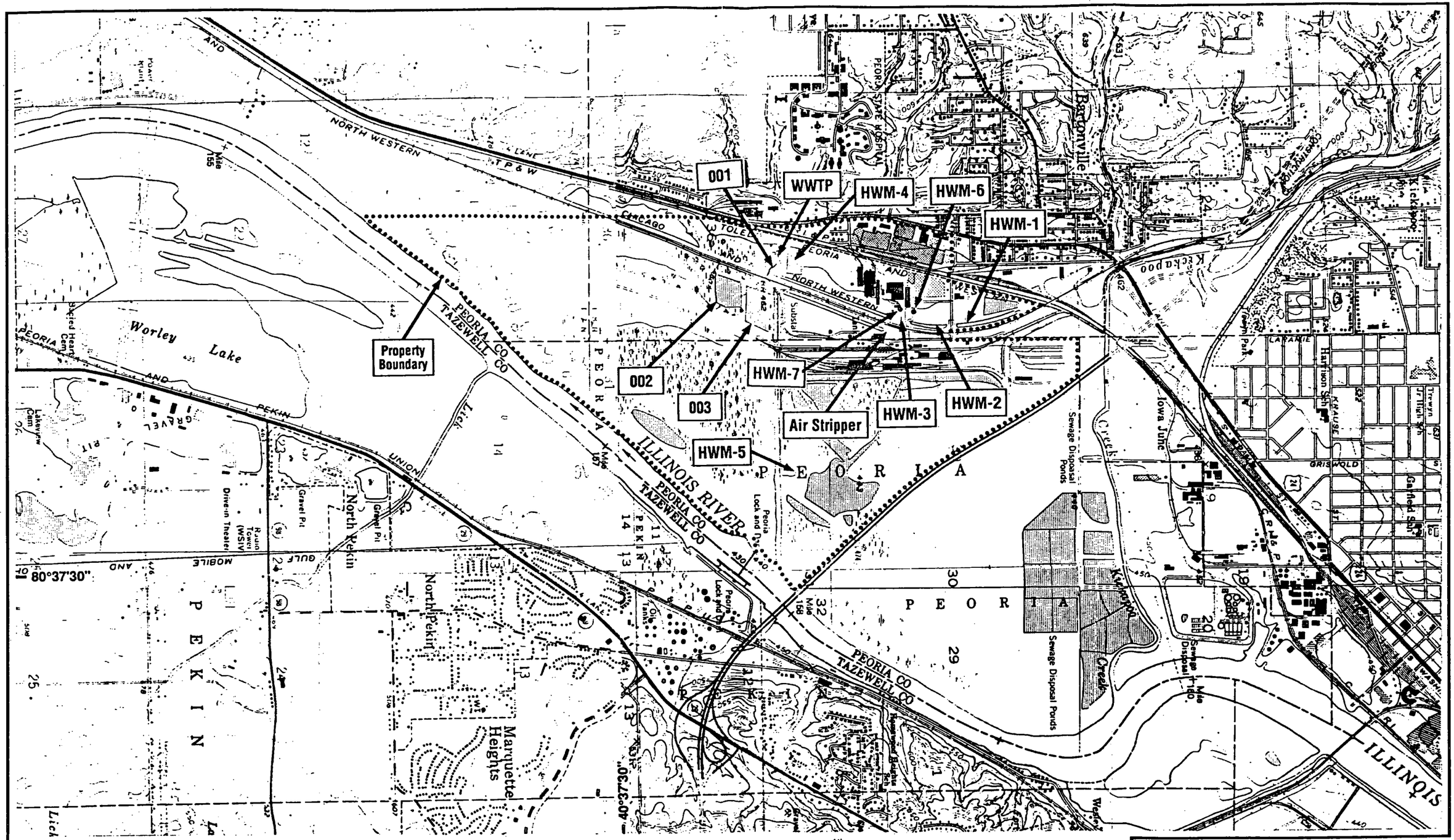
ATTACHMENT FOR ILLINOIS EPA SCHEDULE J, SECTION 2 & SECTION 4

The ground water remediation system will purge impacted ground water and pump it to an air stripping tower. Impacted ground water will be contacted with fresh air where organic constituents will be transferred to the vapor phase and discharged to the atmosphere. Treated water from the air stripping tower will be discharged to the wire mill water supply system. After being used in the wire mill as process and cooling water, it will be discharged to the existing waste water treatment system. The compliance monitoring point for the discharge from the air stripper will be at the discharge of the air stripper effluent pumps, prior to mixing with the river water in the supply header.

The maximum flow (continuous) anticipated is 800 gpm, the design capacity of the stripping system. Permit calculations are based on this flow rate. Additional wells would have to be installed in order to produce a flow greater than 650 gpm, but the stripper has been designed to treat up to 800 gpm to accommodate possible future wells.

ATTACHMENT FOR ILLINOIS EPA SCHEDULE J, SECTION 3.1

Section 7 of the "Aquifer Test and Air Stripping Pilot Study" report, lists the parameters used for design of the air stripping treatment system. The methods used to determine these parameters are discussed in Sections 3 and 4 of this report.



Hazardous Waste Management Units

1. North Ditch
2. Mid Mill Ditch
3. South Ditch (North and South Halves)
4. 24-Hour Retention Reservoir
5. KO61 Waste Pile
6. Dredge Pile
7. Dredge Pile

Peoria West Quadrangle - U.S.G.S. 1949, photorevised 1967 and 1979
Peoria East Quadrangle - U.S.G.S. 1949, photorevised 1967 and 1979
Pekin Quadrangle - U.S.G.S. 1950, photorevised 1967 and 1979
Marquette Heights Quadrangle - U.S.G.S. 1950, photorevised 1967 and 1979

1°45' 31 MILS
GN
MN
20' 44 MILS
UTM Grid and 1979 Magnetic North Declination at Center of Sheet

N

0 1000 2000 4000
Scale in feet

Figure 1

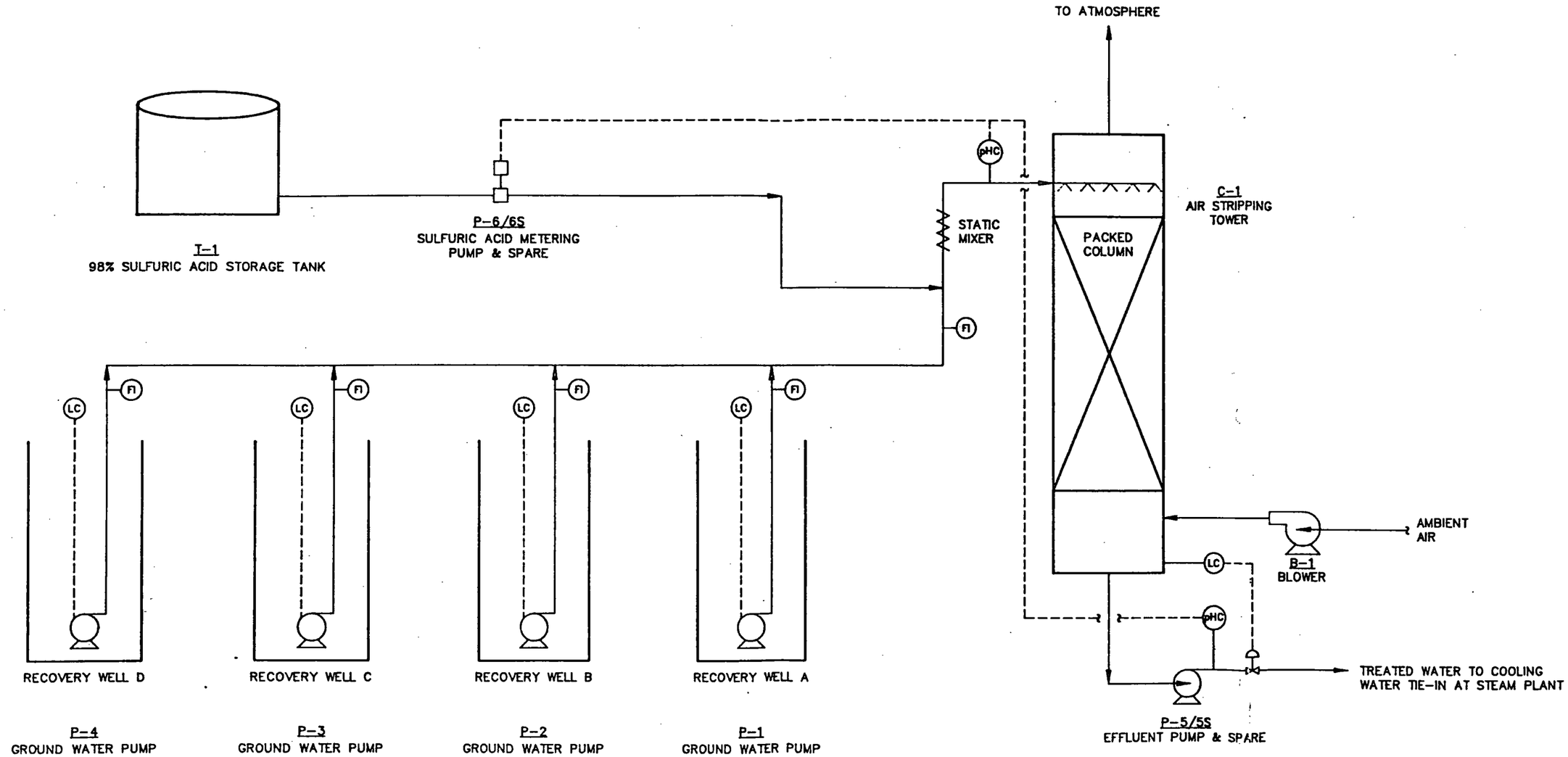
SITE LOCATION MAP

Keystone Steel & Wire Company

Peoria, Illinois

October 1992 07029

WW Engineering & Science



EXPLANATION

- (FI) FLOW INDICATOR
- (LC) LEVEL CONTROLLER
- (pHC) pH CONTROLLER

07029PIS
VR110292

FIGURE 15

PROCESS FLOW SCHEMATIC

GROUND WATER RECOVERY & TREATMENT

KEYSTONE STEEL & WIRE CO.
PEORIA, ILLINOIS

NOVEMBER, 1992

07029

TABLES

ILLINOIS EPA SCHEDULE N, SECTION 3
TABLE 1

	Raw Waste Maximum (mg/l)	Treated Effluent Maximum (mg/l) Max.	Upstream/Downstream Samples (mg/l)
Carbon Tetrachloride	0.00	<0.005	Not Applicable
Chloroethane[a]	0.00	<0.005	Not Applicable
Chloroform	0.036	<0.005	Not Applicable
1,1-Dichloroethane	0.51	<0.005	Not Applicable
1,2-Dichloroethane	0.005	<0.005	Not Applicable
1,1-Dichloroethylene	0.39	<0.005	Not Applicable
Methylene Chloride	0.09	<0.005	Not Applicable
Tetrachloroethylene	0.18	<0.005	Not Applicable
Toluene	0.024	<0.005	Not Applicable
1,2-Dichloroethylene	0.18	<0.005	Not Applicable
1,1,1-Trichloroethane	1.32	<0.005	Not Applicable
Trichloroethylene	2.16	<0.005	Not Applicable
Vinyl Chloride[a]	0.00	<0.005	Not Applicable

Further information on existing ground water quality can be found in the reports submitted to the Illinois EPA, "Aquifer Test and Air Stripping Pilot Study," November 6, 1992, and "Ground Water Remediation Program," June 15, 1992. Tables 3-4 and 3-5 from the latter report are attached.

---

[a] These compounds are expected to have less than detectable concentration in the combined flow-weighted average influent water. These compounds were presented because they have been detected in selected ground water samples at very low levels

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
T-1	02/27/90	WWES	<250	<2.0	50	<10	360000	<50	<10	<10	<10	<50	130000	1300	<0.2	10	5600*	<2.0	150000	<20	<50	
T-1	05/22/90	WWES	<200	<2.0	50	<2.0	430000	<10*	<10	<10	60	<5.0	150000	1600	<0.2	<10	4300	<2.0	73000	<20	<10	
T-1	08/29/90	WWES	<200	<2.0	40	<2.0	492000	<10	<10	<10	10	<2.0	163000	1700	<0.2	20	4600	<2.0	73000	<20	<10	
T-1	11/28/90	WWES				<2.0	478000	<10			20	<3.0	161000	1700		20		<2.0	70000	<20		
T-1	02/27/91	WWES				<2.0	530000	<10			10	<1.0	176000	1900		10		<2.0	74000	<20		
T-1	02/27/91	WWES				2.0	535000	<10			<10	<1.0	179000	1800		10		<2.0	75000	<20		Replicate Sample
T-1	05/29/91	WWES				2.1	566000	<2.0			<10	<1.0	177000	2000		<10		<2.0	76000	30		
T-2A	11/27/89	WWES				0.96		<10				<5.0										
T-2A	02/26/90	WWES	<250	<2.0	40	<10	230000	<50	<10	<10	<10	<50	79000	200	<0.2	<10	<5000*	<2.0	85000	<20	<50	
T-2A	02/26/90	WWES	<250	<2.0	40	<10	230000	<50	<10	<10	<10	<50	78000	200	<0.2	<10	<5000*	<2.0	54000	<20	<50	Replicate Sample
T-2A	05/22/90	WWES	<200	<2.0	50	3.0	200000	<10*	<10	<10	40	<5.0	74000	210	<0.2	<10	4200	<2.0	42000	<20	<10	
T-2A	08/29/90	WWES	<200	<2.0	60	<2.0	222000	<10	<10	<10	150	<2.0	76000	150	<0.2	20	4600	<2.0	45000	<20	<10	
T-2A	11/27/90	WWES				<2	200000	<10			160	<2.0	72000	210		<10		<2.0	44000	<20		
T-2A	02/26/91	WWES				<2.0	222000	<10			40	<1.0	72000	150		<10		<2.0	53000	<20		
T-2A	05/29/91	WWES				<2.0	229000	<2.0			100	<1.0	71000	160		<10		<2.0	61000	<20		
T-2B	02/26/90	WWES	<250	<2.0	40	<10	680000	<50	<10	<10	13000	<50	160000	1600	<0.2	<10	7600*	<2.0	90000	<20	<50	
T-2B	05/22/90	WWES	240	<2.0	30	2.0	680000	<10*	<10	<10	15000	<5.0	160000	1700	<0.2	<10	5600	<2.0	41000	<20	<10	
T-2B	08/29/90	WWES	<200	<2.0	30	<2.0	699000	<10	<10	<10	15000	<2.0	154000	1800	<0.2	20	5600	<2.0	44000	<20	<10	
T-2B	11/27/90	WWES				<2	595000	<10			16000	<2.0	133000	1700		<10		<2.0	38000	<20		
T-2B	02/26/91	WWES				<2.0	683000	<10			16000	<1.0	155000	1800		<10		<2.0	39000	<20		
T-2B	05/29/91	WWES				<2.0	667000	<2.0			17000	<1.0	159000	1800		<10		<2.0	43000	<20		
T-3	02/27/90	WWES	<250	<2.0	<200	<10	120000	<50	<10	<10	<10	<50	47000	520	<0.2	<10	<5000	<2.0	66000	<20	<50	
T-3	02/27/90	WWES	<250	<2.0	<200	<10	110000	<50	<10	<10	20	<50	45000	520	<0.2	<10	<5000	<2.0	66000	<20	<50	Replicate Sample
T-3	05/22/90	WWES	240	<2.0	70	<2.0	110000	<10*	<10	<10	<10	<5.0	44000	460	<0.2	<10	2200	<2.0	64000	<20	<10	
T-3	05/22/90	WWES	<200	<2.0	60	<2.0	110000	<10*	<10	<10	10	<5.0	45000	440	<0.2	<10	2200	<2.0	69000	<20	<10	Replicate Sample
T-3	08/29/90	WWES	<200	<2.0	60	<2.0	117000	<10	<10	<10	<10	<2.0	48000	410	<0.2	10	2500	<2.0	55000	<20	<10	
T-3	12/06/90	WWES				<2.0	123000	<10			10	7.0	42000	580		<10		<2.0	53000	420		
T-3	12/06/90	WWES				<2.0	123000	<10			10	7.0	42000	580		<10		<2.0	52000	420		Replicate Sample
T-3	02/26/91	WWES				<2.0	112000	<10			<10	3.2	47000	490		<10		<2.0	54000	200		
T-3	05/31/91	WWES				<2.0	106000	<2.0			<10	3.1	45000	430		<10		<2.0	52000	200		
T-3	05/31/91	WWES				<2.0	110000	<2.0			<10	2.5	43000	440		<10		<2.0	52000	150		Replicate Sample
T-4A	02/27/90	WWES	<250	<2.0	30	<10	320000	<50	<10	<10	<10	<50	94000	510	<0.2	20	<5000*	<2.0	80000	<20	<50	
T-4A	05/22/90	WWES	<200	<2.0	30	<2.0	300000	<10*	<10	<10	<10	<5.0	97000	420	<0.2	<10	2100	<2.0	63000	<20	<10	
T-4A	08/28/90	WWES	<200	<2.0	20	<2.0	315000	<10	<10	<10	20	<2.0	97000	450	<0.2	20	2200	<2.0	64000	<20	<10	
T-4A	11/28/90	WWES				<2	290000	<10			20	<2.0	91000	440		<10		<2.0	61000	<20		
T-4A	02/26/91	WWES				<2.0	240000	<10			<10	<1.0	93000	440		<10		<2.0	65000	<20		
T-4A	05/29/91	WWES				<2.0	311000	<2.0			60	<1.0	94000	420		<10		<2.0	67000	<20		
T-4B	02/27/90	WWES	<250	<2.0	<200	<10	180000	<50	<10	<10	100	<50	57000	1600	<0.2	<10	7100	<2.0	42000	<20	<50	
T-4B	02/27/90	WWES	<250	<2.0	<200	<10	190000	<50	<10	<10	100	<50	61000	1600	<0.2	<10	6700	<2.0	42000	<20	<50	Replicate Sample
T-4B	05/22/90	WWES	220	<2.0	90	<2.0	190000	<10*	<10	<10	120	<5.0	58000	1700	<0.2	<10	6500	<2.0	37000	<20	<10	
T-4B	05/22/90	WWES	480	<2.0	90	<2.0	190000	<10*	<10	<10	140	<5.0	55000	1700	<0.2	<10	6400	<2.0	36000	<20	<10	Replicate Sample
T-4B	08/28/90	WWES	<200	<2.0	70	<2.0	171000	<10	<10	<10	160	<2.0	51000	1500	<0.2	20	6400	<2.0	31000	<20	<10	
T-4B	08/28/90	WWES	<200	<2.0	70	<2.0	171000	<10	<10	<10	130	<2.0	52000	1500	<0.2	20*	6500	<2.0	31000	<20	<10	Replicate Sample

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
T-4B	11/28/90	WWES				<2	141000	<10			640	<2.0	48000	700		<10		<2.0	33000	<20		
T-4B	02/26/91	WWES				<2.0	181000	<10			160	<1.0	54000	1600		<10		<2.0	<28000	<20		
T-4B	05/29/91	WWES				<2.0	174000	<2.0			160	<1.0	49000	1500		<10		<2.0	29000	<20		
T-5A	02/27/90	WWES	<150	<2.0	<200	<10	130000	<50	<10	<10	<10	<50	58000	380	<0.2	<10	<5000	<2.0	36000	<20	<50	
T-5A	05/22/90	WWES	<200	<2.0	30	<2.0	130000	<10*	<10	<10	30	<5.0	55000	290	<0.2	<10	2500	<2.0	35000	<20	<10	
T-5A	08/28/90	WWES	<200	<2.0	30	<2.0	134000	<10	<10	<10	<10	<2.0	58000	320	<0.2	20	2900	<2.0	40000	<20	<10	
T-5A	11/27/90	WWES				<2	119000	<10			20	<2.0	47000	320		<10		<2.0	39000	<20		
T-5A	02/25/91	WWES				<2.0	135000	<10			<10	<1.0	55000	330		<10		<2.0	41000	<20		
T-5A	05/29/91	WWES				<2.0	141000	<2.0			50	<1.0	54000	290		<10		<2.0	45000	<20		
T-5B	02/27/90	WWES	<150	<2.0	<200	<10	280000	<50	<10	<10	1400	<50	110000	140	0.3*	<10	<5000	<2.0	39000	<20	<50	
T-5B	05/22/90	WWES	<200	<2.0	30	<2.0	300000	<10*	<10	<10	600	<5.0	120000	160	<0.2	<10	2900	<2.0	35000	<20	<10	
T-5B	05/22/90	WWES	<200	<2.0	30	<2.0	310000	<10*	<10	<10	550	<5.0	120000	150	<0.2	<10	3000	<2.0	25000	<20	<10	Replicate Sample
T-5B	08/28/90	WWES	<200	<2.0	30	<2.0	321000	<10	<10	<10	490	<2.0	121000	160	0.2	<10	3100	<2.0	36000	<20	<10	
T-5B	11/27/90	WWES				<2.0	327000	<10			6500	<2.0	122000	170		<10		<2.0	31000	<20		
T-5B	02/25/91	WWES				<2.0	292000	<10			5200	<1.0	103000	160		<10		<2.0	34000	60		
T-5B	05/29/91	WWES				<2.0	325000	<2.0			5900	<1.0	112000	160		<10		<2.0	35000	<20		
T-5C	02/27/90	WWES	<150	<2.0	<200	<10	400000	<50	<10	<10	1700	<50	130000	510	<0.2	<10	<5000	<2.0	65000	<20	<50	
T-5C	05/22/90	WWES	<200	<2.0	40	<2.0	430000	<10*	<10	<10	4200	<5.0	140000	470	<0.2	<10	4100	<2.0	56000	<20	<10	
T-5C	08/28/90	WWES	<200	<2.0	30	<2.0	439000	<10	<10	<10	5000	<2.0	146000	630	0.3	<10	4200	<2.0	56000	<20	<10	
T-5C	11/27/90	WWES				<2	376000	<10			5100	<2.0	116000	530		<10		<2.0	52000	<20		
T-5C	02/25/91	WWES				<2.0	439000	<10			4300	<1.0	148000	640		<10		<2.0	55000	<20		
T-5C	05/29/91	WWES				<2.0	437000	<2.0			6000	<1.0	138000	580		<10		<2.0	59000	<20		
T-5C	05/29/91	WWES				<2.0	456000	<2.0			6000	<1.0	141000	640		<10		<2.0	60000	<20		Replicate Sample
T-6A	11/27/89	WWES				1.1		<10				<5.0										
T-6A	02/26/90	WWES	<150	<2.0	30	<10	96000	<50	<10	<10	<10	<50	54000	2300	<0.2	<10	<5000*	<2.0	78000	20	<50	
T-6A	05/22/90	WWES	270	<2.0	30	<2.0	120000	<10*	<10	<10	40	<5.0	62000	2500	<0.2	<10	<500	<2.0	74000	20	<10	
T-6A	08/29/90	WWES	<200	<2.0	30	<2.0	133000	<10	<10	<10	80	<2.0	72000	2400	<0.2	<10	<500	<2.0	78000	<20	<10	
T-6A	08/29/90	WWES	<200	<2.0	30	<2.0	127000	<10	<10	<10	20	<2.0	69000	2400	<0.2	<10	<500	<2.0	74000	<20	<10	Replicate Sample
T-6A	11/27/90	WWES				<2	119000	<10			90	2.1	62000	2700		10		<2.0	75000	<20		
T-6A	11/27/90	WWES				<2	120000	<10			100	<2.0	63000	2700		10		<2.0	75000	<20		Replicate Sample
T-6A	02/26/91	WWES				<2.0	144000	<10			<10	<1.0	75000	2500		<10		<2.0	73000	<20		
T-6A	02/26/91	WWES				<2.0	147000	<10			10	<1.0	72000	2500		<10		<2.0	75000	<20		Replicate Sample
T-6A	05/29/91	WWES				<2.0	153000	<2.0			30	<1.0	76000	2900		<10		<2.0	74000	<20		
T-6A	05/29/91	WWES				<2.0	156000	<2.0			30	<1.0	77000	2900		<10		<2.0	76000	<20		Replicate Sample
T-6B	02/26/90	WWES	<150	<2.0	40	<10	180000	<50	<10	<10	<10	<50	62000	240	<0.2	<10	<5000*	<2.0	59000	<20	<50	
T-6B	05/22/90	WWES	340	<2.0	30	<2.0	190000	<10	<10	<10	<10	<5.0	63000	230	<0.2	<10	3400	<2.0	57000	<20	<10	
T-6B	08/29/90	WWES	<200	<2.0	30	<2.0	189000	<10	<10	<10	<10	<2.0	70000	190	<0.2	<100	2800	<2.0	59000	<20	<10	
T-6B	11/27/90	WWES				<2.0	156000	<10			20	<2.0	54000	220		<10		<2.0	64000	<20		
T-6B	02/26/91	WWES				<2.0	174000	<10			<10	<1.0	60000	170		<10		<2.0	62000	<20		
T-6B	05/29/91	WWES				<2.0	175000	<2.0			<10	<1.0	55000	170		<10		<2.0	63000	<20		
T-6C	02/26/90	WWES	<150	<2.0	70	<10	460000	<50	<10	<10	3900	<50	170000	280	<0.2	<10	<5000*	<2.0	39000	<20	<50	
T-6C	05/22/90	WWES	340	<2.0	70	<2.0	450000	<10	<10	<10	9400	<5.0	170000	290	<0.2	<10	2800	<2.0	37000	<20	<10	
T-6C	08/29/90	WWES	<200	<2.0	80	<2.0	462000	<10	<10	<10	9000	<2.0	172000	270	<0.2	10	3400	<2.0	38000	<20	<10	
T-6C	11/27/90	WWES				<2	440000	<10			9900	<2.0	168000	260		<10		<2.0	39000	<20		
T-6C	02/26/91	WWES				<2.0	477000	<10			8000	<1.0	181000	270		<10		<2.0	37000	<20		

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
T-6C	05/29/91	WWES				<2.0	490000	<3.0			9600	<1.0	170000	240		<10		<2.0	38000	<20		
T-7A	02/28/90	WWES	<250	<2.0	<200	<10	200000	<50	<10	<10	10	<50	66000	300	<0.2	60	<5000	<2.0	580000	<20	<50	
T-7A	05/23/90	WWES	340	<2.0	50	<2.0	160000	<10	<10	<10	50	<5.0	56000	340	<0.2	30	<500	<2.0	530000	<20	<10	
T-7A	08/30/90	WWES	<200	<2.0	40	<2.0	83000	<10	<10	<10	<10	<2.0	28000	160	<0.2	40	<500	<2.0	334000	<20	<10	
T-7A	11/28/90	WWES				<2	79000	<10			40	<2.0	26000	220		60		<2.0	297000	<20		
T-7A	11/28/90	WWES				<2	77000	<10			20	<2.0	26000	230		60		<2.0	307000	<20		Replicate Sample
T-7A	02/27/91	WWES				<2.0	121000	<10			40	<1.0	42000	330		210		<2.0	454000	<20		
T-7A	05/29/91	WWES				<2.0	101000	7.1			170	<1.0	32000	230		120		<2.0	395000	<20		
T-7B	02/28/90	WWES	<250	<2.0	<200	<10	140000	<50	<10	<10	390	<50	59000	240	<0.2	<10	<5000	<2.0	82000	<20	<50	
T-7B	02/28/90	WWES	<250	<2.0	<200	<10	140000	<50	<10	<10	320	<50	59000	240	<0.2	<10	<5000	<2.0	83000	<20	<50	Replicate Sample
T-7B	05/23/90	WWES	<200	<2.0	110	<2.0	140000	<10	<10	<10	270	<5.0	58000	230	<0.2	<10	3000	<2.0	87000	<20	<10	
T-7B	05/23/90	WWES	<200	<2.0	120	<2.0	130000	<10	<10	<10	160	<5.0	54000	230	<0.2	<10	3200	<2.0	88000	<20	<10	Replicate Sample
T-7B	08/30/90	WWES	<200	<2.0	90	<2.0	153000	<10	<10	<10	390	<2.0	66000	220	<0.2	<10	3700	<2.0	84000	<20	<10	
T-7B	08/30/90	WWES	<200	<2.0	100	<2.0	149000	<10	<10	<10	270	<2.0	65000	220	<0.2	<10	3700	<2.0	84000	<20	<10	Replicate Sample
T-7B	11/28/90	WWES				<2	129000	<10			1500	<2.0	56000	350		<10		<2.0	75000	<20		
T-7B	02/27/91	WWES				<2.0	149000	<10			220	<1.0	67000	250		<10		<2.0	85000	<20		
T-7B	02/27/91	WWES				<2.0	148000	<10			260	<1.0	65000	260		<10		<2.0	85000	<20		Replicate Sample
T-7B	05/29/91	WWES				<2.0	182000	<2.0			440	1.0	72000	210		<10		<2.0	80000	40		
T-7B	05/29/91	WWES				<2.0	179000	<2.0			280	<1.0	71000	200		<10		<2.0	79000	<20		Replicate Sample
T-8	02/28/90	WWES	<250	<2.0	<200	<10	370000	<50	<10	<10	6500	<50	150000	870	<0.2	<10	<5000	<2.0	43000	<20	<50	
T-8	05/23/90	WWES	<200	<2.0	80	<2.0	340000	<10	<10	<10	5500	<5.0	150000	930	<0.2	<10	800	<2.0	50000	<20	<10	
T-8	08/29/90	WWES	<200	<2.0	60	<2.0	337000	<10	<10	<10	7200	<2.0	153000	940	<0.2	<10	950	<2.0	44000	<20	<10	
T-8	11/28/90	WWES				<2	311000	<10			7200	<2.0	143000	880		<10		<2.0	43000	<20		
T-8	02/27/91	WWES				<2.0	297000	<10			6000	<1.0	142000	870		<10		<2.0	41000	<20		
T-8	05/28/91	WWES				<2.0	316000	<2.0			5600	<1.0	129000	820		<10		<2.0	41000	<20		
T-9	02/28/90	WWES	<250	<2.0	<200	<10	130000	<50	<10	<10	250	<50	50000	840	<0.2	<10	<5000	<2.0	30000	<20	<50	
T-9	05/23/90	WWES	220	<2.0	80	<2.0	120000	<10	<10	<10	30	<5.0	51000	880	<0.2	<10	1200	<2.0	47000	<20	<10	
T-9	05/23/90	WWES	340	<2.0	60	<2.0	120000	<10	<10	<10	20	<5.0	51000	890	<0.2	<10	1100	<2.0	43000	<20	<10	Replicate Sample
T-9	08/29/90	WWES	<200	<2.0	70	<2.0	128000	<10	<10	<10	220	<2.0	56000	830	<0.2	<10	1600	<2.0	113000	<20	<10	
T-9	11/28/90	WWES				<2	115000	<10			200	<2.0	48000	800		10		<2.0	138000	<20		
T-9	11/28/90	WWES				<2	110000	<10			<10	<2.0	48000	720		10		<2.0	139000	<20		Replicate Sample
T-9	02/27/91	WWES				<2.0	128000	<10			10	<1.0	55000	760		<10		<2.0	208000	<20		
T-9	05/29/91	WWES				<2.0	130000	<2.0			<10	<1.0	49000	550		<10		<2.0	165000	<20		
T-10	02/28/90	WWES	<250	<2.0	<200	<10	1100000	<50	30	<10	29000	<50	270000	2900	<0.2	90	21000	<2.0	51000	<20	<50	
T-10	05/23/90	WWES	<200	<2.0	50	<2.0	1200000	<10	30	<10	31000	<5.0	260000	3200	<0.2	90	17000	<2.0	57000	<20	<10	
T-10	08/29/90	WWES	350	<2.0	40	<2.0	1280000	<10	40	<10	32000	<2.0	275000	3900	<0.2	110	21000	<2.0	59000	<20	<10	
T-10	11/28/90	WWES				<2	1270000	<10			35000	<2.0	248000	5200		110		<2.0*	62000	<20		
T-10	02/27/91	WWES				<2.0	1260000	<10			36000	<1.0	257000	5600		120		<2.0*	57000	<20		
T-10	05/29/91	WWES				31	1450000	<2.0			42000	<1.0	262000	6100		110		<2.0	65000	20		
T-11A	02/26/90	WWES	<250	<2.0	90	<10	83000	<50	<10	<10	<10	<50	34000	530	<0.2	<10	7400*	<2.0	180000	<20	<50	
T-11A	05/22/90	WWES	<200	<2.0	130	<2.0	120000	<10	<10	<10	100	<5.0	49000	850	<0.2	<10	3800	<2.0	52000	<20	<10	
T-11A	08/30/90	WWES	<200	<2.0	110	<2.0	113000	<10	<10	<10	640	<2.0	46000	850	<0.2	10	3300	<2.0	42000	<20	<10	
T-11A	11/27/90	WWES				<2	129000	<10			1900	<2.0	58000	970		<10		<2.0	49000	<20		
T-11A	02/26/91	WWES				<2.0	143000	<10			2600	<1.0	57000	1000		<10		<2.0	56000	<20		
T-11A	05/30/91	WWES				<2.0	132000	<2.0			2900	<1.0	52000	920		<10		<2.0	56000	<20		
T-11B	02/26/90	WWES	<250	<2.0	100	<10	150000	<50	<10	<10	<10	<50	57000	460	<0.2	20	5200*	<2.0	58000	30	<50	

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
T-11B	05/22/90	WWES	<200	<2.0	80	<2.0	160000	<10	<10	<10	70	<5.0	64000	670	<0.2	<10	3400	<2.0	53000	<20	<10	
T-11B	08/30/90	WWES	<200	<2.0	90	<2.0	159000	<10	<10	<10	40	<2.0	64000	630	<0.2	10	3600	<2.0	54000	<20	<10	
T-11B	11/27/90	WWES				<2	147000	<10			<10	<2.0	64000	640		10		<2.0	56000	<20		
T-11B	02/26/91	WWES				<2.0	175000	<10			<10	<1.0	69000	660		10		<2.0	58000	<20		
T-11B	05/30/91	WWES				<2.0	172000	<2.0			40	2.6	66000	620		<10		<2.0	51000	90		
T-11C	02/26/90	WWES	<250	2.6	110	<10	91000	<50	<10	<10	<10	<50	92000	1500	<0.2	30	<5000*	<2.0	50000	20	<50	
T-11C	05/22/90	WWES	<200	<2.0	40	<2.0	240000	<10	<10	<10	10	<5.0	97000	1800	<0.2	<10	3700	<2.0	47000	<20	<10	
T-11C	08/30/90	WWES	<200	<2.0	50	<2.0	256000	<10	<10	<10	150	<2.0	102000	1700	<0.2	10	5900	<2.0	46000	<20	<10	
T-11C	11/27/90	WWES				<2	234000	<10			<10	<2.0	102000	1800		10		<2.0	42000	<20		
T-11C	02/26/91	WWES				<2.0	276000	<10			20	<1.0	109000	1800		<10		<2.0	43000	<20		
T-11C	05/30/91	WWES				<2.0	288000	<2.0			40	<1.0	110000	1900		<10		<2.0	39000	<20		
T-12	02/27/90	WWES	<250	<2.0	30	<10	270000	<50	<10	<10	<10	<50	88000	680	<0.2	<10	<5000*	<2.0	62000	<20	<50	
T-12	05/24/90	WWES	340	<2.0	30	<2.0	280000	<10	<10	<10	930	<5.0	88000	1100	<0.2	<10	4000	<2.0	59000	<20	<10	
T-12	08/29/90	WWES																				N/A
T-12	11/28/90	WWES				<2	257000	<10			10	<2.0	93000	700		<10		<2.0	54000	<20		
T-12	02/28/91	WWES				<2.0	297000	<10			<10	<1.0	91000	790		<10		<2.0	64000	20		
T-13A	02/28/90	WWES	<250	<2.0	<200	40	530000	<50	140	<10	280000	<50	180000	16000	<0.2	560	17000	<2.0	62000	28000	<50	
T-13A	05/23/90	WWES	290	<2.0	50	41	610000	<10	110	<10	180000	35	240000	9700	<0.2	580	19000	<2.0	54000	37000	<10	
T-13A	08/28/90	WWES	<200	<2.0	110	26	532000	<10	60	<10	65000	7.3	227000	6500	<0.2	360	16000	<2.0	41000	25000	<10	
T-13A	11/28/90	WWES				19	489000	<10			73000	4.4	194000	6700		340		<2.0	36000	21000		
T-13A	02/28/91	WWES				21	505000	<10			73000	6.0	202000	6500		360		<2.0	43000	29000		
T-13A	05/29/91	WWES				<2.0	53200	<2.0			105000	3.8	209000	9300		590		<2.0	40000	89000		
T-13B	02/28/90	WWES	<250	<2.0	<200	<10	1500000	<50	50	<10	19000	<50	250000	17000	<0.2	30	13000	<2.0	130000	50	<50	
T-13B	05/23/90	WWES	<200	<2.0	120	<2.0	1600000	<10	60	<10	18000	<5.0	280000	18000	<0.2	30	10000	<2.0	150000	40	<10	
T-13B	08/28/90	WWES	<200	<2.0	110	<2.0	1750000	<10	60	<10	22000	<2.0	321000	18000	<0.2	50	11000	<2.0	139000	150	<10	
T-13B	11/28/90	WWES				<2	1640000	<10			32000	<2.0	291000	18000		30		<2.0	123000	<20		
T-13B	02/28/91	WWES				<2.0	1640000	<10			34000	<1.0	296000	18000		20		<2.0*	145000	120		
T-13B	05/29/91	WWES				<2.0	1830000	4.3			3300	<1.0	303000	19000		30		<2.0	147000	130		
T-14	02/28/90	WWES	<250	<2.0	<200	<10	340000	<50	<10	<10	4400	<50	130000	610	<0.2	<10	<5000	<2.0	80000	30	<50	
T-14	05/23/90	WWES	270	<2.0	40	<2.0	380000	<10	<10	<10	6200	<5.0	120000	610	<0.2	<10	3200	<2.0*	55000	<20	<10	
T-14	08/30/90	WWES	<200	<2.0	20	<2.0	394000	<10	<10	<10	12000	<2.0	148000	570	<0.2	<10	3100	<2.0	47000	60	<10	
T-14	11/27/90	WWES				<2	364000	<10			12000	<2.0	148000	580		<10		<2.0	44000	<20		
T-14	02/27/91	WWES				<2.0	407000	<10			97000	<1.0	150000	520		<10		<2.0	44000	<20		
T-14	05/28/91	WWES				<2.0	420000	<2.0			13000	<1.0	149000	590		<10		<2.0	43000	<20		
T-15	02/28/90	WWES	<250	<2.0	<200	<10	140000	60	10	<10	220	<50	60000	670	<0.2	20	<5000	<2.0	32000	<20	<50	
T-15	05/23/90	WWES	<200	<2.0	170	<2.0	130000	<10	<10	<10	1700	<2.0	56000	710	<0.2	<10	1800	<2.0	35000	380	<10	
T-15	08/29/90	WWES	<200	<2.0	1600	<2.0	140000	<10	<10	<10	1200	<2.0	57000	530	<0.2	<10	1800	<2.0	32000	<20	<10	
T-15	11/28/90	WWES				<2	145000	<10			590	<2.0	57000	690		10		<2.0	30000	<20		
T-15	02/27/91	WWES				<2.0	144000	<10			170	<1.0	55000	550		<10		<2.0	32000	<20		
T-15	05/28/91	WWES				<2.0	135000	<2.0			410	<1.0	54000	540		<10		<2.0	28000	<20		
T-16	02/27/90	WWES	<250	<2.0	<200	<10	420000	<50	<10	<10	<10	<50	130000	1300	<0.2	<10	6600	<2.0	61000	<20	<50	
T-16	05/24/90	WWES	<200	<2.0	40	<2.0	460000	<10	<10	<10	20	<5.0	120000	1400	<0.2	<10	5400	<2.0	62000	<20	<10	
T-16	08/29/90	WWES	<200	<2.0	40	<2.0	459000	<10	<10	<10	30	<2.0	150000	1300	<0.2	70	5500	<2.0	60000	<20	<10	
T-16	11/28/90	WWES				<2.0	446000	<10			360	<2.0	142000	1300		50		<2.0	55000	160		
T-16	02/28/91	WWES				<2.0	456000	<10			<10	<1.0	139000	1300		60		<2.0	59000	<20		

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
T-16	02/28/91	WWES				2.0	452000	<10			<10	<1.0	137000	1300		60		<2.0	60000	<20		Replicate Sample
T-16	05/29/91	WWES				<2.0	461000	<2.0			230	<1.0	165000	1400		30		<2.0	62000	30		
T-17	05/30/91	WWES				<2.0	104000	<2.0			520	<1.0	43000	1700		<10		<2.0	34000	20		
T-17	05/30/91	WWES				<2.0	104000	<2.0			10	<1.0	45000	1300		<10		<2.0	35000	<20		Replicate Sample
T-18	05/28/91	WWES				<2.0	104000	<2.0			60	<1.0	45000	1000		<10		<2.0	27000	<20		
T-19A	05/29/91	WWES				<2.0	157000	<2.0			240	6.1	70000	1400		30		<2.0	33000	70		
T-19B	05/29/91	WWES				<2.0	171000	<2.0			160	<1.0	66000	660		10		<2.0	65000	20		
T-19C	05/29/91	WWES				<2.0	295000	<2.0			60	1.2	97000	1300		20		3.7	210000	20		
T-20	05/29/91	WWES				<2.0	502000	<2.0			4000*	<1.0	146000	3600		<10		<2.0	94000	30		
T-21	05/29/91	WWES				<2.0	432000	<2.0			31000	<1.0	107000	4500		10		<2.0	361000	20		
W-1	01/23/86	DAL						<5				40										Filtered
W-1	01/23/86	DAL						<5				40										Unfiltered
W-1	09/04/86	DAL		20*	40	<10		20			4200	20		2900	0.2			<1*	70000	70		
W-1	11/21/86	DAL		<5	60	8		<10			5200	70		8800	<0.2			<5	100000	60		
W-1	02/18/87	DAL		<5	10	6		<10			620	<20		3700	<0.2			<5	110000	350		
W-1	03/24/87	ECI										2						1				
W-1	03/24/87	DAL										<20						10				
W-1	04/23/87	ECI										<1						<1				
W-1	04/23/87	RASS										<1						<1				
W-1	05/27/87	RASS		<2	35	<10		<10			8190	<10		4130	<0.2			<2	94600	362		
W-1	09/14/87	RASS						<10				<10										Filtered
W-1	09/14/87	RASS						<10				<10										Unfiltered
W-1	02/17/88	RASS		<10	17	12.9		<10			117	<5		1560	0.25			<5	107000	3220		
W-1	05/25/88	RASS				<5		<10				<5										
W-1	08/24/88	RASS				<5		<10				<5										
W-1	11/22/88	RASS				<5		<10				<5										
W-1	03/02/89	RASS				<5.0		<10				<5.0										
W-1	05/23/89	RASS				9.3		<10				<5.0										
W-1	08/17/89	WWES																				Dry
W-1	11/28/89	WWES																				Dry
W-1	02/27/90	WWES	<50	<2.0	<200	<10	200000	<50	50	<10	<10	<50	77000	9300	<0.2	200	<5000	<2.0	120000	430	<50	
W-1	05/23/90	WWES	<200	<2.0	20	9.0	280000	<10	30	<10	70	<5.0	100000	3400	<0.2	140	2900	<2.0	190000	1500	<10	
W-1	08/28/90	WWES	220	2.7	80	<2.0	173000	<10	<10	<10	15000	<2.0	59000	6800	<0.2	20	2600	<2.0	66000	<20	<10	
W-1	11/28/90	WWES		<2		<2	174000	<10			4200	<2.0	57000	3300		60		<2.0	72000	300		
W-1	02/27/91	WWES				<2.0	110000	<10			480	<1.0	39000	2100		30		<2.0	48000	110		
W-1	05/29/91	WWES				<2.0	132000	<2.0			1000	7.0	47000	4100	40	<2.0			65000	120		
W-1	08/26/91	WWES				<2.0		<10				<5.0										
W-1	08/26/91	WWES				<2.0		<10				<5.0										Replicate
W-1D	09/04/86	DAL		6*	80	<10		<10			<20	50		380	<0.2			2*	55000	20		
W-1D	11/21/86	DAL		<5	70	8		<10			<10	70		320	<0.2			6	49000	20		
W-1D	02/18/87	DAL		<5	30	<5		<10			20	<20		150	<0.2			<5	52000	10		
W-1D	03/24/87	ECI										1						5				
W-1D	03/24/87	DAL										<20						7				
W-1D	04/23/87	ECI										<1						<1				

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
W-1D	04/23/87	RASS										1						<1				
W-1D	05/27/87	RASS		<2	27	<10		<10			37	<10		100	<0.2			<3	40000	78		
W-1D	09/14/87	RASS						<10				<10										Filtered
W-1D	09/14/87	RASS						<10				<10										Unfiltered
W-1D	02/17/88	RASS		<10	36	<5		10.8			55	<5		71	<0.2			<3	42200	16		
W-1D	05/25/88	RASS				<5		<10				<5										
W-1D	08/24/88	RASS				<5		<10				<5										
W-1D	11/22/88	RASS				<5		<10				<5										
W-1D	03/01/89	RASS				<5.0		<10				<5.0										
W-1D	05/23/89	RASS				<5.0		<10				<5.0										
W-1D	08/17/89	RASS				<5.0*		<10				<5.0										
W-1D	11/28/89	WWES				1.7		<10				<5.0										
W-1D	11/28/89	WWES				1.1		<10				<5.0										Replicate Sample
W-1D	02/27/90	WWES	<250	<2.0	<200	<10	270000	<50	<10	<10	430	<50	100000	240	<0.2	30	<5000	<3.0	63000	<20	<50	
W-1D	05/23/90	WWES	<200	<2.0	60	<2.0	290000	<10	<10	<10	20	<5.0	98000	100	<0.2	10	4200	<2.0	78000	<20	<10	
W-1D	08/28/90	WWES	<200	<2.0	40	<2.0	246000	<10	<10	<10	<10	<2.0	89000	100	<0.2	20	4300	<2.0	76000	<20	<10	
W-1D	11/28/90	WWES				<3	254000	<10			<10	<2.0	89000	90		10		<2.0	84000	<20		
W-1D	02/27/91	WWES				<2.0	257000	<10			<10	<1.0	89000	90		10		<2.0	97000	<20		
W-1D	05/29/91	WWES				<2.0	245000	<2.0			60	<1.0	87000	100		20		<2.0	97000	<20		
W-1D	08/27/91	WWES				<2.0		<10				<5.0										
W-2	01/23/86	DAL						<5				40										Filtered
W-2	01/23/86	DAL						5				60										Unfiltered
W-2	09/04/86	DAL		5*	120	<10		<10			130	70		4300	<0.2			4*	56000	70		
W-2	09/04/86	DAL		4*	100	<10		<10			180	60		4100	<0.2			2*	56000	50		Replicate Sample
W-2	11/21/86	DAL		<3	80	8		<10			630	60		4500	<0.2			9	51000	40		
W-2	02/18/87	DAL		<3	50	<5		<10			110	<20		4900	0.4			<3	50000	30		
W-2	03/24/87	BCI										2						4				
W-2	03/24/87	DAL										<20						9				
W-2	04/23/87	BCI										<1						<1				
W-2	04/23/87	RASS										1						<1				
W-2	05/27/87	RASS		<2	31	<10		<10			451	<10		3530	<0.2			<3	40400	63		
W-2	09/14/87	RASS						<10				27										Filtered
W-2	09/14/87	RASS						13				60										Unfiltered
W-2	02/17/88	RASS		<10	33	<5		<10			771	7.2		4910	<0.2			<3	45600	3220		
W-2	05/25/88	RASS				<5		<10				<5										
W-2	08/24/88	RASS				<5		<10				<5										
W-2	11/22/88	RASS				<5		<10				<5										
W-2	03/01/89	RASS				<5.0		<10				<5.0										
W-2	05/23/89	RASS				<5.0		<10				<5.0										
W-2	08/17/89	RASS				<5.0*		<10				<5.0										
W-2	11/27/89	WWES				0.70		<10				<5.0										
W-2	02/26/90	WWES	<250	<2.0	40	<10	250000	<50	<10	<10	60	<50	82000	3000	<0.2	20	<5000*	<2.0	51000	<20	<50	
W-2	05/22/90	WWES	<200	<2.0	40	<2.0	210000	<10*	<10	<10	410	<5.0	72000	3100	<0.2	10	<500	<2.0	49000	<20	<10	
W-2	08/29/90	WWES	220	<2.0	40	<2.0	220000	<10	<10	<10	450	<2.0	80000	3700	<0.2	30	<500	<2.0	53000	<20	<10	
W-2	11/27/90	WWES				<3	191000	<10			520	<2.0	81000	4500		30		<2.0	48000	<20		
W-2	02/26/91	WWES				2.0	240000	<10			370	<1.0	87000	5300		10		<2.0	53000	<20		
W-2	05/29/91	WWES				<2.0	225000	<2.0			550	1.8	83000	4600		20		<2.0	57000	80		
W-2	08/27/91	WWES				<2.0	<10					<5.0										
W-2D	09/04/86	DAL		8*	240	<10		<10			<20	80		620	<0.2			6*	75000	50		
W-2D	11/21/86	DAL		5	50	7		<10			60	70		580	<0.2			9	49000	30		
W-2D	02/18/87	DAL		<3	30	<5		<10			20	<20		560	<0.2			<3	47000	10		

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
W-2D	03/24/87	BCI										1						<1				
W-2D	03/24/87	DAL										<20						7				
W-2D	04/23/87	BCI										<1						<1				
W-2D	04/23/87	RASS										<1						<1				
W-2D	05/27/87	RASS		<3	23	<10		<10			114	<10		451	<0.2			<3	41000	56		
W-2D	09/14/87	RASS						<10				<10										Filtered
W-2D	09/14/87	RASS						<10				<10										Unfiltered
W-2D	02/17/88	RASS		<10	29	<5		13.9			114	<5		482	<0.2			<5	48400	<10		
W-2D	05/25/88	RASS				<5		<10				<5										
W-2D	08/24/88	RASS				<5		<10				5.1										
W-2D	08/24/88	RASS				<5		<10				<5										Replicate Sample
W-2D	11/22/88	RASS				<5		<10				<5										
W-2D	05/23/89	RASS				<5.0		<10				<5.0										
W-2D	05/23/89	RASS				<5.0		<10				<5.0										Replicate Sample
W-2D	08/17/89	RASS				<5.0*		<10				<5.0										
W-2D	11/27/89	WWES				1.8		<10				<5.0										
W-2D	02/26/90	WWES	<250	<2.0	30	<10	320000	<50	<10	<10	<10	<50	93000	710	<0.2	20	8700*	<2.0	46000	<20	<50	
W-2D	05/22/90	WWES	<200	<2.0	30	<2.0	310000	<10	<10	<10	90	<5.0	89000	600	<0.2	<10	6300	<2.0	44000	<20	<10	
W-2D	08/29/90	WWES	<200	<2.0	30	<2.0	301000	<10	<10	<10	<10	<2.0	85000	620	<0.2	10	7000	<2.0	40000	<20	<10	
W-2D	11/27/90	WWES				<2	286000	<10			100	<2.0	88000	670		10		<2.0	37000	<20		
W-2D	02/26/91	WWES				<2.0	340000	<10			90	<1.0	96000	720		<10		<2.0	41000	<20		
W-2D	05/29/91	WWES				<2.0	229000	<2.0			90	<1.0	72000	600		<10		<2.0	44000	<20		
W-2D	08/27/91	WWES				<2.0		<10				<5.0										
W-3	01/23/86	DAL						5				50										Filtered
W-3	01/23/86	DAL						10				70										Unfiltered
W-3	09/05/86	DAL		7*	80	<10		<10			50	50		4100	<0.2			9*	73000	50		
W-3	11/21/86	DAL		<5	40	8		10			50	50		2400	<0.2			6	70000	30		
W-3	02/18/87	DAL		<5	20	<5		<10			90	<20		1700	<0.2			<5	50000	10		
W-3	03/25/87	BCI										<1						<1				
W-3	03/25/87	DAL										<20						7				
W-3	04/23/87	BCI										<1						<1				
W-3	04/23/87	RASS										<1						<1				
W-3	05/28/87	RASS		<3	14	<10		<10			51	<10		1900	<0.2			<3	40100	67		
W-3	09/14/87	RASS						<10				<10										Filtered
W-3	09/14/87	RASS						20				19										Unfiltered
W-3	02/17/88	RASS		<10	31	<5		<10			216	<5		2910	<0.2			<5	70700	33		
W-3	05/25/88	RASS				<5		<10				<5										
W-3	08/24/88	RASS				<5		<10				<5										
W-3	11/22/88	RASS				<5		<10				<5										
W-3	03/02/89	RASS				<5.0		<10				<5.0										
W-3	05/23/89	RASS				<5.0		<10				<5.0										
W-3	08/17/89	RASS				<5.0*		<10				<5.0										
W-3	11/28/89	WWES				0.35		<10				<5.0										
W-3	02/27/90	WWES	<250	<2.0	<200	<10	120000	<50	<10	<10	<10	<50	43000	<10	<0.2	<10	<5000	<2.0	77000	<20	<50	
W-3	05/23/90	WWES	<200	<2.0	20	<2.0	120000	<10	<10	<10	40	<5.0	41000	1100	<0.2	40	<500	<2.0	77000	<20	<10	
W-3	08/29/90	WWES	<200	<2.0	30	<2.0	112000	<10	<10	<10	<10	<2.0	36000	1700	<0.2	40	680	<2.0	62000	<20	<10	
W-3	12/06/90	WWES				<2.0	118000	<10			50	<2.0	38000	800		10		<2.0	59000	<20		
W-3	02/27/91	WWES				<2.0	131000	<10			<10	<1.0	41000	340		<10		<2.0	52000	<20		
W-3	05/30/91	WWES				<2.0	136000	<2.0			50	<1.0	46000	1600		20		<2.0	53000	<2.0		
W-3	08/26/91	WWES				<2.0		<10				<5.0										

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
W-3D	09/05/86	DAL		13*	190	<10		<10			80	100		1500	<0.2			10*	97000	50		
W-3D	11/21/86	DAL		<5	70	8		<10			50	70		1900	<0.2			14	86000	20		
W-3D	02/18/87	DAL		<5	40	<5		<10			40	<20		1500	<0.2			<5	69000	20		
W-3D	03/25/87	ECI										1						<1				
W-3D	03/25/87	DAL										<20						15				
W-3D	04/23/87	ECI										2						<1				
W-3D	04/23/87	RASS										<1						<1				
W-3D	05/28/87	RASS		<2	25	<10		<10			59	<10		1100	<0.2			<2	65900	48		
W-3D	05/28/87	RASS		<2	26	<10		<10			32	<10		1060	<0.2			<2	61300	32		Replicate Sample
W-3D	09/14/87	RASS						<10				<10										Filtered
W-3D	09/14/87	RASS						21				29										Unfiltered
W-3D	02/17/88	RASS		<10	24	<5.0		<10			39	<5.0	1260		0.2			<5.0	63000	<10		
W-3D	05/25/88	RASS				<5.0		<10				<5.0										Replicate Sample
W-3D	05/25/88	RASS				<5.0		<10				<5.0										
W-3D	08/24/88	RASS				<5.0		<10				<5.0										Replicate Sample
W-3D	11/22/88	RASS				<5		<10				<5										
W-3D	11/22/88	RASS				<5		<10				<5										Replicate Sample
W-3D	03/01/89	RASS				<5.0		<10				<5.0										
W-3D	05/23/89	RASS				<5.0		<10				<5.0										
W-3D	08/17/89	RASS				<5.0*		<10				<5.0										
W-3D	11/28/89	WWES				0.34		<10				<5.0										
W-3D	02/27/90	WWES	<250	<2.0	<200	<10	350000	<50	<10	<10	<10	<50	110000	1500	<0.2	20	<5000	<2.0	45000	<20	<50	
W-3D	05/23/90	WWES	<200	<2.0	30	<2.0	370000	<10	<10	<10	70	<5.0	120000	1600	<0.2	20	2900	<2.0	58000	<20	<10	
W-3D	08/29/90	WWES	200	<2.0	30	<2.0	365000	<10	<10	<10	10	<2.0	115000	1500	<0.2	20	2400	<2.0	88000	<20	<10	
W-3D	12/06/90	WWES				<2.0	386000	<10			40	<2.0	123000	1500		<10		<2.0	112000	20		
W-3D	02/27/91	WWES				<2.0	407000	<10			10	<1.0	137000	1700		<10		<2.0	107000	<20		
W-3D	05/30/91	WWES				<2.0	<500	<2.0			20	<1.0	<500	2100		10		<2.0	105,000*	20		
W-3D	08/27/91	WWES				<2.0		<10				<5.0										
W-4	01/23/86	DAL						<5				60										Filtered
W-4	01/23/86	DAL						<5				70										Unfiltered
W-4	09/05/86	DAL		13*	80	<10		<10			110000	50		13000	1.9			10*	32000	610		
W-4	11/21/86	DAL		<5	30	28		<10			95000	90		13000	0.5			8	35000	570		
W-4	11/21/86	DAL		<5	40	33		<10			130000	90		14000	0.2			9	32000	570		Replicate Sample
W-4	02/18/87	DAL		<5	20	16		<10			160000	30		16000	1.0			<5	28000	1000		
W-4	03/25/87	ECI										<1						<1				
W-4	03/25/87	DAL										<20						<5				
W-4	04/24/87	ECI										<1						<1				
W-4	04/24/87	RASS										<1						<1				
W-4	05/28/87	RASS		<2	52	<10		<10			205000	53		12400	0.3			<2	27900	860		
W-4	09/15/87	RASS						<10				<10										Filtered
W-4	09/15/87	RASS						31				35										Unfiltered
W-4	02/17/88	RASS		<10	18	24.5		<10			122000	6.4		12200	0.9			<5.0	34900	660		
W-4	05/25/88	RASS				<5		<10				<5.0										
W-4	08/25/88	RASS				7		10				10.7										
W-4	11/22/88	RASS				<5		<10				<5.0										
W-4	03/02/89	RASS				<5.0		<10				<5.0										
W-4	05/23/89	RASS				8.2		<10				<5.0										
W-4	08/17/89	RASS				<5.0*		<10				<5.0										
W-4	11/28/89	WWES				4.8		<10				<5.0										
W-4	02/27/90	WWES	<250	<2.0	<200	<10	200000	<50	70	<10	25000	<50	32000	10000	<0.2	110	<5000	<2.0	33000	360	<50	
W-4	05/23/90	WWES	<200	<2.0	<20	4.0	250000	<10	80	<10	55000	<5.0	35000	11000	<0.2	120	1800	<2.0	39000	430	<10	
W-4	08/29/90	WWES	340*	<2.0	<20	5.0	278000	<10	80	<10	48000	<2.0	35000	10000	<0.2	120	2400	<2.0	36000	350	<10	

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
W-4	12/06/90	WWES				9.0	284000	<10			29000	<3.0	35000	12000		120		<2.0	33000	320		
W-4	02/28/91	WWES				7.1	317000	<10			50000	<1.0	38000	14000		150		<2.0	32000	400		
W-4	05/31/91	WWES				5.6	260000	4.2			53000	<1.0	34000	13000		250		<2.0	33000	370		
W-4	08/26/91	WWES				2.0		<10				<3.0										
W-4D	09/05/86	DAL		7*	40	<10		<10			120	50		1100	<0.2			6*	47000	40		
W-4D	11/21/86	DAL		<5	60	<5		<10			150	50		1000	<0.2			9	42000	20		
W-4D	02/18/87	DAL		<5	50	<5		<10			220	<20		890	<0.2			<5	45000	20		
W-4D	02/18/87	DAL		<5	50	<5		<10			<10	<20		930	<0.2			<5	48000	<10		Replicate Sample
W-4D	03/25/87	ECI										<1						4				
W-4D	03/25/87	DAL										<20						5				
W-4D	04/24/87	ECI										1						<1				Replicate Sample
W-4D	04/24/87	ECI										<1						<1				
W-4D	04/24/87	RASS										<1						<1				Replicate Sample
W-4D	04/24/87	RASS										<1						<1				
W-4D	05/28/87	RASS		<5	41	<10		<10			144	<10		728	0.9			<5	32900	54		
W-4D	09/15/87	RASS						<10				<10										Filtered
W-4D	09/15/87	RASS						<10				<10										Replicate Sample
W-4D	09/15/87	RASS						<10				10										Unfiltered
W-4D	09/15/87	RASS						<10				10										Replicate Sample
W-4D	02/17/88	RASS		<10	77	<5.0		<10			281	<5.0		1050	0.3			<5.0	44600	<10		
W-4D	05/25/88	RASS				<5.0		<10				<5.0										
W-4D	08/25/88	RASS				<5.0		<10				<5.0										
W-4D	11/22/88	RASS				<5.0		<10				<5.0										
W-4D	03/02/89	RASS				<5.0		<10				<5.0										
W-4D	05/23/89	RASS				<5.0		<10				<5.0										
W-4D	08/17/89	RASS				<5.0*		<10				5.7										
W-4D	11/28/89	WWES				0.53		<10				<3.0										
W-4D	11/28/89	WWES				0.28		<10				<3.0										Replicate Sample
W-4D	02/27/90	WWES	<50	<3.0	<200	<10	190000	<50	<10	<10	10	<50	80000	490	0.4*	<10	<5000	<2.0	47000	<20	<50	
W-4D	05/23/90	WWES	<200	<3.0	<50	<2.0	200000	<10	<10	<10	600	<3.0	80000	650	<0.2	<10	2900	<2.0	48000	<20	<10	
W-4D	08/29/90	WWES	<200	<3.0	50	<2.0	198000	<10	<10	<10	250	<2.0	82000	570	<0.2	10	3100	<2.0	49000	<20	<10	
W-4D	08/29/90	WWES	<200	<3.0	60	<2.0	200000	<10	<10	<10	230	<2.0	83000	570	<0.2	10	3200	<2.0	49000	<20	<10	Replicate Sample
W-4D	12/06/90	WWES				<2.0	198000	<10			250	<2.0	810000	540		<10		<2.0	47000	50		
W-4D	02/28/91	WWES				<2.0	171000	<10			70	<1.0	66000	490		<10		<2.0	56000	20		
W-4D	05/31/91	WWES				<2.0	128000	<2.0			440	<1.0	28000	730		<10		<2.0	12000	40		
W-4D	08/27/91	WWES				<2.0		<10				<3.0										
W-5	01/23/86	DAL						<5				40										Filtered
W-5	01/23/86	DAL						<5				50										Unfiltered
W-5	09/04/86	DAL		7*	180	<10		<10			110	50		1800	<0.2			5*	110000	40		
W-5	11/21/86	DAL		<5	230	6		<10			580	70		2200	<0.2			10	110000	30		
W-5	02/18/87	DAL		<5	110	<5		<10			220	<20		3400	<0.2			<5	100000	10		
W-5	03/25/87	ECI										1						6				
W-5	03/25/87	DAL										<20						13				
W-5	04/24/87	ECI										2						<1				
W-5	04/24/87	RASS										<1						<1				
W-5	05/27/87	RASS		<5	112	<10		<10			1500	<10		2810	0.3			<5	115000	107		
W-5	09/15/87	RASS						<10				<10										Filtered
W-5	09/15/87	RASS						<10				<10										Unfiltered
W-5	02/17/88	RASS		<10	114	<5.0		<10			8320	25.8		3740	<2			<5	115000	44		
W-5	05/25/88	RASS				<5.0		<10				<5.0										
W-5	08/25/88	RASS				<5.0		<10				<5.0										

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
W-5	11/22/88	RASS				<5.0		<10				<5.0										
W-5	11/22/88	RASS				<5.0		<10				<5.0										Replicate Sample
W-5	03/02/89	RASS				<5.0		<10				<5.0										
W-5	05/24/89	RASS				<5.0		<10				<5.0										
W-5	08/18/89	RASS				<5.0*		<10				<5.0										
W-5	11/27/89	WWES				<0.20		<10				<5.0										
W-5	02/28/90	WWES				<0.20		<1.0				<5.0										
W-5	05/23/90	WWES				<5.0		<10*				<5.0										
W-5	08/28/90	WWES				<5.0		<10				<5.0										
W-5	11/26/90	WWES				<5.0		<10				<5.0										
W-5	02/25/91	WWES				8.7		<10				<1.0										
W-5	05/28/91	WWES				<5.0		<5.0				<1.0										
W-5	08/26/91	WWES				<5.0		<10				<5.0										
W-5D	09/04/86	DAL		9*	60	<10		<10			110	60		2200	<0.2			1*	58000	30		
W-5D	11/21/86	DAL		<5	120	<5		<10			220	70		1600	<0.2			6	60000	30		
W-5D	02/18/87	DAL		<5	30	<5		<10			<10	<20		140	<0.2			<5	58000	<10		
W-5D	03/25/87	ECI										5						4				
W-5D	03/25/87	ECI										4						4				Replicate Sample
W-5D	03/25/87	DAL										<20						8				
W-5D	03/25/87	DAL										<20						6				Replicate Sample
W-5D	04/24/87	ECI										2						<1				
W-5D	04/24/87	RASS										<1						<1				
W-5D	05/27/87	RASS		<5	74	<10		<10			62	<10		632	<0.2			<5	99200	18		
W-5D	09/15/87	RASS						<10				<10										Filtered
W-5D	09/15/87	RASS						<10				<10										Unfiltered
W-5D	02/17/88	RASS		<10	70	<5.0		14.5			600	<5.0		910	<0.2			<5.0	62700	27		
W-5D	05/25/88	RASS				<5.0		<10				<5.0										
W-5D	08/25/88	RASS				<5.0		<10				<5.0										
W-5D	11/22/88	RASS				<5.0		<10				<5.0										
W-5D	03/02/89	RASS				<5.0		<10				<5.0										
W-5D	05/24/89	RASS				<5.0		<10				<5.0										
W-5D	08/18/89	RASS				<5.0*		<10				<5.0										
W-5D	11/27/89	WWES				<0.20		<10				<5.0										
W-5D	02/28/90	WWES				0.52		<1.0				<5.0										
W-5D	05/23/90	WWES				<5.0		<10*				<5.0										
W-5D	08/28/90	WWES				<5.0		<10				<5.0										
W-5D	11/26/90	WWES				<5.0		<10				3.0										
W-5D	02/25/91	WWES				2.6		<10				<1.0										
W-5D	05/28/91	WWES				<5.0		<5.0				<1.0										
W-5D	08/26/91	WWES				<5.0		<10				<5.0										
W-6	01/23/86	DAL						<5				20										Filtered
W-6	01/23/86	DAL						20				50										Unfiltered
W-6	09/04/86	DAL		6*	80	<10		<10			40	40		1800	<0.2			3*	50000	<10		
W-6	11/21/86	DAL		<5	70	6		<10			180	50		2800	<0.2			8	35000	40		
W-6	02/18/87	DAL		<5	40	<5		<10			40	<20		3700	<0.2			<5	41000	20		
W-6	03/25/87	ECI										5						<1				
W-6	03/25/87	DAL										<20						<5				
W-6	04/24/87	ECI										2						1				
W-6	04/24/87	RASS										<1						<1				
W-6	05/27/87	RASS		<2	44	<10		<10			321	<10		2660	0.3			<2	30400	52		

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
W-6	09/15/87	RASS						<10				<10										Filtered
W-6	09/15/87	RASS						<10				10										Unfiltered
W-6	02/17/88	RASS		<10	38	<5.0		<10			248	<5.0		2880	0.2			<5.0	40200	<10		
W-6	05/25/88	RASS				<5.0		<10				<5.0										
W-6	08/25/88	RASS				<5.0		<10				<5.0										
W-6	11/22/88	RASS				<5.0		<10				<5.0										
W-6	03/02/89	RASS				<5.0		<10				<5.0										
W-6	05/24/89	RASS				<5.0		<10				<5.0										
W-6	08/17/89	RASS				<5.0*		<10				<5.0										
W-6	11/27/89	WWES				<0.20		<10				<5.0										
W-6	02/28/90	WWES				0.4		<1.0				<5.0										
W-6	05/23/90	WWES				<5.0		<10*				<5.0										
W-6	08/28/90	WWES				<5.0		<10				<2.0										
W-6	11/26/90	WWES				<2.0		<10				3.1										
W-6	02/25/91	WWES				6.0		<10				1.2										
W-6	05/28/91	WWES				<2.0		<2.0				<1.0										
W-6	08/26/91	WWES				<2.0		<10				<5.0										
W-7	02/17/88	RASS		<10	52	<5.0		<10			459	<5.0		1400	0.3			<5	36800	<10		
W-7	02/17/88	RASS		<10	56	<5.0		<10			190	6.4		1420	<0.2			<5	38300	384		Replicate Sample
W-7	05/25/88	RASS				<5.0		<10				<5.0										
W-7	08/24/88	RASS				<5.0		<10				<5.0										
W-7	11/22/88	RASS				<5.0		<10				<5.0										
W-7	03/02/89	RASS				<5.0		<10				<5.0										
W-7	05/24/89	RASS				<5.0		<10				<5.0										
W-7	08/18/89	RASS				<5.0*		14.7				<5.0										
W-7	11/27/89	WWES				0.45		<10				<5.0										
W-7	02/28/90	WWES				0.74		<1.0				<5.0										
W-7	05/23/90	WWES				<5.0		<10*				<5.0										
W-7	08/28/90	WWES				<5.0		<10				<2.0										
W-7	11/26/90	WWES				<2.0		<10				<2.0										
W-7	02/25/91	WWES				7.9		<10				1.2										
W-7	05/28/91	WWES				<2.0		<2.0				<1.0										
W-7	08/26/91	WWES				<2.0		<10				<5.0										
W-7	08/26/91	WWES				<2.0		<10				<5.0										Replicate Sample
W-8	02/17/88	RASS		<10	58	5.8		<10			3200	<5.0		5760	0.3			<5.0	31500	13		
W-8	05/25/88	RASS				7.6		<10				<5.0										
W-8	05/24/88	RASS				<5.0		<10				<5.0										Replicate Sample
W-8	08/24/88	RASS				<5.0		<10				<5.0										
W-8	11/22/88	RASS				<5.0		<10				<5.0										
W-8	03/01/89	RASS				<5.0		<10				<5.0										
W-8	05/23/89	RASS				<5.0		<10				<5.0										
W-8	08/18/89	RASS				<5.0*		<10				<5.0										
W-8	08/18/89	RASS				<5.0		10.4				<5.0										Replicate Sample
W-8	11/28/89	WWES				0.81		<10				<5.0										
W-8	02/27/90	WWES	<250	<2.0	30	<10	230000	<50	<10	<10	<10	<50	74000	4700	<0.2	20	<5000*	7.7	34000	<20	<50	
W-8	05/22/90	WWES	<200	<2.0	30	<2.0	210000	<10*	<10	<10	<10	<50	71000	4900	<0.2	10	1400	4.3	32000	<20	<10	
W-8	08/29/90	WWES	200	<2.0	30	<2.0	213000	<10	<10	<10	<10	<2.0	67000	3300	<0.2	20	1600	<2.0	33000	<20	<10	
W-8	11/28/90	WWES				<2	223000	<10			20	<2.0	71000	2700		20		<2.0	30000	20		
W-8	02/27/91	WWES				<2.0	229000	<10			40	<1.0	70000	3800		10		<2.0	33000	<20		
W-8	05/29/91	WWES				<2.0	213000	<2.0			320	1.4	71000	3800		10		<2.0	32000	330		

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
W-9	02/17/88	RASS		<10	22	6.5		<10			771	<5.0		833	0.4			<5.0	94500	44		
W-9	05/25/88	RASS				6.6		<10				<5.0										
W-9	08/24/88	RASS				<5.0		<10				9.5										
W-9	11/22/88	RASS				<5.0		<10				<5.0										
W-9	03/01/89	RASS				<5.0		<10				<5.0										
W-9	03/01/89	RASS				<5.0		<10				<5.0										Replicate Sample
W-9	05/23/89	RASS				<5.0		<10				<5.0										
W-9	08/17/89	RASS				<5.0		16.3				<5.0										
W-9	11/28/89	WWES				0.45		<10				<5.0										
W-9	02/27/90	WWES	<250	<2.0	<200	<10	200000	<50	<10	<10	210	<50	100000	780	<0.2	190	<5000	<2.0	79000	<20	<50	
W-9	05/23/90	WWES	<200	<2.0	30	<2.0	270000	<10	<10	<10	<10	<5.0	130000	680	<0.2	80	<500	<2.0	120000	<20	<10	
W-9	08/28/90	WWES	<200	<2.0	30	<2.0	388000	<10	<10	<10	40	<5.0	175000	1900	<0.2	50	<500	<2.0	200000	<20	<10	
W-9	11/27/90	WWES				<2	310000	<10			60	<2.0	152000	2300		40		<2.0	146000	<20		
W-9	02/25/91	WWES				<2.0	313000	<10			10	<1.0	138000	3000		30		<2.0	153000	<20		
W-9	05/29/91	WWES				<2.0	320000	<2.0			80	<1.0	155000	2500		20		<2.0	139000	<20		
W-9	08/26/91	WWES				<2.0		<10				<5.0										
W-10	02/17/88	RASS		<10	16	6.1		<10			386	<5.0		1000	<0.2			<5.0	132000	<10		
W-10	05/25/88	RASS				<5.0		<10				<5.0										
W-10	08/24/88	RASS				<5.0		<10				<5.0										Replicate Sample
W-10	08/24/88	RASS				<5.0		<10				<5.0										
W-10	11/22/88	RASS				<5.0		<10				<5.0										
W-10	03/02/89	RASS				<5.0		<10				<5.0										
W-10	05/23/89	RASS				<5.0		<10				<5.0										
W-10	08/17/89	RASS				<5.0		<10				<5.0										
W-10	11/28/89	WWES				0.73		<10				<5.0										
W-10	02/27/90	WWES	<250	<2.0	<200	<10	140000	<50	<10	<10	<10	<50	44000	230	<0.2	20	<5000	<2.0	130000	<20	<50	
W-10	05/23/90	WWES	<200	<2.0	40	<2.0	200000	<10	<10	<10	40	<5.0	64000	300	<0.2	60	<500	<2.0	200000	<20	<10	
W-10	08/29/90	WWES	<200	<2.0	20	<2.0	186000	<10	<10	<10	130	<2.0	61000	380	<0.2	30	<500	<2.0	170000	<20	<10	
W-10	12/06/90	WWES				<2.0	196000	<10			260	<2.0	63000	300		30		<2.0	160000	50		
W-10	02/25/91	WWES				2.6	261000	<10			120	<1.0	84000	480		40		<2.0	210000	<20		
W-10	05/30/91	WWES				<2.0	236000	<2.0			10	<1.0	67000	420		10		<2.0	232000	<20		
W-10	08/26/91	WWES				<2.0		<10				<5.0										
W-11	02/18/88	RASS		<10	14	36.1		39.8			173000	7.6		150000	<0.2			<5.0	39200	2750		
W-11	05/25/88	RASS				<5.0		<10				16.3										
W-11	08/24/88	RASS				<5.0		<10				8.6										
W-11	11/22/88	RASS				<5.0		<10				20.4										
W-11	03/02/89	RASS				<5.0		<10				19.8										
W-11	05/23/89	RASS				28.8		42.5				16.2*										
W-11	05/23/89	RASS				29.0		48.9				20.3*										Replicate Sample
W-11	08/18/89	RASS				15.6		<10				12										
W-11	11/28/89	WWES				12		54*				29										
W-11	02/27/90	WWES	5800	<2.0	<200	<10	220000	50	600	30	110000	<50.	63000	49000	<0.2	840	<5000	<2.0	45000	2400	<50.	
W-11	05/24/90	WWES	2700	<2.0	<20	240	160000	<10	430	20	120	10	48000	37000	<0.2	610	1800	<2.0	37000	1800	<10.	
W-11	08/28/90	WWES	2000	<2.0	<20	<2.0	208000	<10	570	<10.	129000	4.8	56000	43000	<0.2	710	2000	<2.0	29000	2000	<10.	
W-11	12/06/90	WWES				6.0	139000	<10			99000	5.5	37000	24000		360		<2.0	24000	1400		
W-11	02/27/91	WWES				6.0	132000	<10			101000	2.7	36000	23000		370		<2.0*	22000	1400		
W-11	05/30/91	WWES				10	205000	18			61000	3.4	57000	56000		670		<2.0	28000	1700		
W-11	08/26/91	WWES				9.0		30				<5.0										

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
W-12	02/18/88	RASS		<10	35	<5.0		<10			16600	<5.0		7500	<0.2			<5.0	43300	142		
W-12	02/18/88	RASS		<10	36	<5.0		12			16900	<5.0		7530	0.2			<5.0	43300	24		Replicate Sample
W-12	05/25/88	RASS				<5.0		<10				<5.0										
W-12	08/24/88	RASS				<5.0		<10				<5.0										
W-12	11/22/88	RASS				<5.0		<10				<5.0										
W-12	03/02/89	RASS				<5.0		<10				<5.0										
W-12	05/24/89	RASS				<5.0		10.5				9.5*										
W-12	08/17/89	RASS				<5.0		<10				<5.0										
W-12	11/27/89	WWES				0.26		<10				<5.0										
W-12	02/28/90	WWES				0.66		<1.0				<5.0										
W-12	05/23/90	WWES				<5.0		<10*				<5.0										
W-12	08/28/90	WWES				<5.0		<10				<5.0										
W-12	11/26/90	WWES				<5.0		<10				<5.0										
W-12	02/25/91	WWES				2.0		<10				<1.0										
W-12	05/28/91	WWES				<5.0		2.9				<1.0										
W-12	08/26/91	WWES				<5.0		<10				<5.0										
W-13	02/18/88	RASS		<10	96	<5.0		<10			3490	<5.0		13000	<0.2			<5.0	153000	26		
W-13	05/25/88	RASS				<5.0		<10				17.3										
W-13	08/24/88	RASS				<5.0		<10				<5.0										
W-13	11/22/88	RASS				<5.0		<10				<5.0										
W-13	03/02/89	RASS				<5.0		<10				<5.0										
W-13	03/02/89	RASS				<5.0		<10				<5.0										Replicate Sample
W-13	05/24/89	RASS				<5.0		14				9.7*										
W-13	08/18/89	RASS				<5.0		<10				<5.0										
W-13	11/27/89	WWES				<0.20		<10				<5.0										
W-13	02/28/90	WWES				<0.20		<1.0				<5.0										
W-13	05/23/90	WWES				<5.0		<10				<5.0										
W-13	05/23/90	WWES				<5.0		<10*				<5.0										Replicate Sample
W-13	08/28/90	WWES				<5.0		<10*				<5.0										
W-13	08/28/90	WWES				<5.0		<10				<5.0										Replicate Sample
W-13	11/26/90	WWES				<5.0		<10				<5.0										
W-13	11/26/90	WWES				<5.0		<10				<5.0										Replicate Sample
W-13	02/25/91	WWES				<5.0		<10				<1.0										
W-13	02/25/91	WWES				<5.0		<10				<1.0										Replicate Sample
W-13	05/28/91	WWES				<5.0		2.3				<1.0										
W-13	05/28/91	WWES				<5.0		2.6				<1.0										Replicate Sample
W-13	08/26/91	WWES				<5.0		<10				<5.0										
W-14	02/18/88	RASS		<10	57	<5.0		<10			112	<5.0		1650	<0.2			<5.0	36800	35		
W-14	05/25/88	RASS				<5.0		<10				<5.0										
W-14	08/24/88	RASS				<5.0		<10				<5.0										
W-14	11/22/88	RASS				<5.0		<10				<5.0										
W-14	03/02/89	RASS				<5.0		<10				<5.0										
W-14	05/24/89	RASS				<5.0		10.3				<5.0										
W-14	08/17/89	RASS				<5.0		<10				<5.0										
W-14	08/17/89	RASS				<5.0		<10				<5.0										Replicate Sample
W-14	11/27/89	WWES				0.57		<10				<5.0										
W-14	02/28/90	WWES				0.55		<1.0				<5.0										
W-14	02/28/90	WWES				0.55		<1.0				<5.0										Replicate Sample
W-14	05/23/90	WWES				<5.0		<10*				<5.0										
W-14	08/28/90	WWES				<5.0		<10				<5.0										
W-14	11/26/90	WWES				<5.0		<10				<5.0										

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
W-14	02/25/91	WWES				2.3		<10				<1.0										
W-14	05/28/91	WWES				<2.0		<2.0				<1.0										
W-14	08/26/91	WWES				<2.0		<10				<3.0										
K-14	01/16/73			72	100	4				57	2730	64		140				6		35	<1	
K-14	02/01/73			20	80	<2	112200			18	2470	19	42100	190			2130	2	27000	50	<1	
K-14	05/02/73			5	100	<2				17	1510	28		190				1		30	1	
K-14	08/20/73			8	110	3				43	2880	23		160				<1		60		
K-14	10/05/73			8	100	<1				31	1160	10		160				<1		50		
K-14	11/21/73			8	100	<3				17	2500	15		190				<1		50		
K-14	03/28/78						125000			50	217	<50	40000	180	24700		2860		27000	156		
K-14	12/04/78						124000	0.0			2240	0.0	52000	240	3000		2200		29000	10		
K-14	06/03/81				200	0.0	110000	0.0		20	2400	0.0	48300	170	3000	200	2100		28000	0.0		
K-14	03/26/85			<100	40	<10	120000			50	2400	<10	45000	130			1800	<1	34000	50		
K-14	01/23/86	DAL						<3				30										Filtered
K-14	01/23/86	DAL						<3				20										Unfiltered
K-14	09/04/86	DAL		8*	140	<10		<10			2900	30		150	<0.2			2*	29000	<10		
K-14	11/21/86	DAL		<3	180	6		<10			2400	20		340	<0.2			5	27000	20		
K-14	02/18/87	DAL		<3	140	<3		<10			2000	<20		140	<0.2			<3	26000	<10		
K-14	05/27/87	RASS		3	121	<10		<10			1910	<10		134	<0.2			<2	23100	133		
K-14	08/24/88					<3		<10				<3										
K-15	01/16/73			1	100	4				20	2620	11		210				4		40	<1	
K-15	02/01/73			1	80	<2	122400			36	2390	29	44100	270			2660	3	31000	50	<1	
K-15	05/02/73			1	90	<2				17	2380	20		270				1		30	1	
K-15	08/20/73			1	220	<1				36	2880	34		240				<1		50		
K-15	10/05/73			1	100	<1				25	1050	12		230				<1		60		
K-15	11/21/73			1	100	<3				20	2220	12		240				<1		60		
K-15	03/28/78									61	2050	<50	34000	270	18500					266		
K-15	01/23/86	DAL						<3				10										Filtered
K-15	01/23/86	DAL						<3				10										Unfiltered
K-15	09/05/86	DAL		5*	80	<10		<10			2200	40		170	<0.2			2*	36000	<10		
K-15	11/21/86	DAL		<3	150	<3		<10			2200	20		230	<0.2			5	40000	40		
K-15	02/18/87	DAL		<3	120	<3		<10			1700	<20		180	<0.2			<3	40000	10		
K-15	05/27/87	RASS		2	101	<10		<10			1810	<10		173	<0.2			<2	29100	255		
AD-1	06/04/90	WWES	<200	4.3	120	<2.0	140000	<10*	<10	<10	10	<3.0	86000	3000	<0.2	<10	3100	<2.0	48000*	<20	<10	
AD-1	08/29/90	WWES	<200	2.5	170	<2.0	131000	<10	<10	<10	40	<2.0	115000	3800	<0.2	20	1600	<2.0	46000	<20	<10	
AD-1	11/26/90	WWES				<2.0		<10				<2.0				10					<10	
AD-1	02/25/91	WWES				<2.0		<10				<1.0				10					<10	
AD-1	05/28/91	WWES				<2.0		<2.0				3.2				<10						
AD-1	08/29/91	WWES	<200				175000				460		108000	7500			<500		52000			
AD-2	06/04/90	WWES	<200	<2.0	40	<2.0	79000	<10*	<10	<10	60	<3.0	36000	1200	<0.2	10	500	<2.0	49000*	<20	<10	
AD-2	08/28/90	WWES	<200	<2.0	50	<2.0	86000	<10	<10	<10	90	<2.0	39000	1700	<0.2	20	<500	<2.0	46000	<20	<10	
AD-2	08/28/90	WWES	<200	<2.0	50	<2.0	88000	<10	<10	<10	20	<2.0	42000	1600	<0.2	20	<500	<2.0	47000	<20	<10	Replicate Sample
AD-2	11/26/90	WWES				<2.0		<10				<2.0				10					<10	
AD-2	02/25/91	WWES				<2.0		<10				<1.0				<10					<10	
AD-2	05/28/91	WWES				<2.0		<2.0				6.6				<10						
AD-2	08/29/91	WWES	<200				84000				70		40000	1600			<500		46000			
AD-3	06/04/90	WWES	410	8.4	<20	<2.0	28000	<10*	<10	<10	10	<3.0	11000	40	<0.2	<10	15000	<2.0	78000*	<20	<10	
AD-3	06/04/90	WWES	410	9.3	20	<2.0	36000	<10*	<10	<10	<10	<3.0	13000	70	<0.2	<10	14000	<2.0	76000*	<20	<10	Replicate Sample

TABLE 3-4

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR INORGANICS (all results in ug/l)

Well #	Date	Lab	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc	Total Cyanide	Comments
AD-3	08/28/90	WWES	530	11	20	<2.0	18000	<10	<10	<10	<10	<2.0	5300	<10	<0.2	10	22000	<2.0	76000	<20	<10	
AD-3	11/26/90	WWES				<2.0		<10				<2.0				<10					<10	
AD-3	02/25/91	WWES				<2.0		<10				<1.0				<10					<10	
AD-3	05/28/91	WWES				<2.0		<2.0				<1.0				<10						
AD-3	08/29/91	WWES	430				30000				20		2300	<10			21000		67000			
AD-4	06/04/90	WWES	580	6.6	60	<2.0	87000	69*	<10	30	<10	<3.0	<500	<10	<0.2	10	42000	5.4	150000*	<20	<10	
AD-4	08/28/90	WWES	1700	3.3	340	2	238000	<10	<10	<10	<10	<2.0	<500	<10	0.2	20	68000	2.1	101000	<20	20	
AD-4	11/26/90	WWES				<2.0		<10				<2.0				<10					<10	
AD-4	11/26/90	WWES				<2.0		<10				<2.0				<10					<10	Replicate Sample
AD-4	02/25/91	WWES				<2.0		<10				<1.0				<10					<10	
AD-4	02/25/91	WWES				<2.0		<10				<1.0				<10					<10	Replicate Sample
AD-4	05/28/91	WWES				<2.0		<2.0				<1.0				<10						
AD-4	05/28/91	WWES				<2.0		<2.0				<1.0				<10						Replicate Sample
AD-4	08/29/91	WWES	710				301000				<10		<500	<10			61000		62000			
AD-4	08/29/91	WWES	740				332000				<10		<500	<10			66000		66000			Replicate Sample
AD-5	06/04/90	WWES	<200	5.8	40	<2.0	55000	<10*	<10	<10	50	<3.0	23000	140	<0.2	<10	1900	<2.0	65000*	<20	<10	
AD-5	08/28/90	WWES	<200	3.3	40	<2.0	37000	<10	<10	<10	<10	<2.0	26000	120	<2.0	<10	1600	<2.0	74000	<20	<10	
AD-5	11/26/90	WWES				<2.0		<10				<2.0				<10					<10	
AD-5	02/25/91	WWES				<2.0		<10				<1.0				<10					<10	
AD-5	05/28/91	WWES				<2.0		<2.0				<1.0				<10						
AD-5	08/29/91	WWES	<200				49000				40		31000	610			1300		74000			

Key: Less than indicates that metal was not found or was below the reported detection limit.
DAL = Daily Analytical Laboratories, Peoria, Illinois.
ECI = Environmental Consultants, Inc., Clarksville, Indiana.
RASS = Randolph & Associates, Inc., Peoria, Illinois.
WWES = WW Engineering & Science, Grand Rapids, Michigan.

Note: * Estimated value as a result of data not meeting QA/QC validation criteria.

COMMENTS:

1. K-14 = Keystone Production Well (West Well).
2. K-15 = Keystone Production Well (East Well).

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
T-1	11/28/89	WWE	<10	<5.0	<5.0	29	<5.0	<5.0	<5.0	<5.0	440	<10	
T-1	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	400	<10	
T-1	05/22/90	WWE	<50	<25	<25	45	<25	<25	<25	<25	630	<50	
T-1	08/29/90	WWE	<50	<25	<25	46	<25	<25	<25	<25	590	<50	
T-1	11/28/90	WWE	<50	<25	<25	61	<25	<25	<25	<25	710	<50	
T-1	02/27/91	WWE	<50	<25	<25	92*	<25	<25	<25	<25	810	<50	
T-1	02/27/91	WWE	<50	<25	<25	98*	<25	<25	<25	<25	870	<50	Replicate
T-1	05/29/91	WWE	<50	<25	<25	<25	<25	<25	<25	<25	800	<50	(1)
T-1	08/28/91	WWE	<50	<25	<25	50	<25	<25	<25	<25	630	<50	
T-2A	10/31/89	WWE	<10	8	6	14	<5.0	<2.0	19	15	180	<10	
T-2A	11/27/89	WWE	<10	7	8	14	<5.0	<5.0	<5.0	13	230	<10	
T-2A	02/26/90	WWE	<10	<5.0	<5.0	9	<5.0	<5.0	<5.0	10	220	<10	
T-2A	02/26/90	WWE	<10	<5.0	<5.0	11	<50	<5.0	<5.0	13	240	<10	Replicate
T-2A	05/22/90	WWE	<10	<5.0	<5.0	13	<5.0	<5.0	<5.0	15	210	<10	
T-2A	08/29/90	WWE	<20	<10	<10	13	<10	<10	<10	<10	180	<20	
T-2A	11/27/90	WWE	<10	<5.0	<5.0	14	<5.0	<5.0	<5.0	6.6	210*	<10	
T-2A	02/26/91	WWE	<10	<5.0	<5.0	16	<5.0	<5.0	<5.0	5.0	230	<10	
T-2A	05/29/91	WWE	<20	<10	<10	<10	<10	<10	<10	16	220	<20	
T-2A	08/27/91	WWE	<20	<10	<10	<10	<10	<10	<10	<10	260	<20	
T-2B	02/26/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-2B	05/22/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-2B	08/29/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-2B	11/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-2B	02/26/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-2B	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-2B	08/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-3	11/28/89	WWE	<10	<5.0	480	130	<5.0	6	<5.0	3200	1200	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
T-3	02/27/90	WWE	<10	<5.0	210	98	<5.0	12	<5.0	1600	1400	<10	
T-3	02/27/90	WWE	<100	<50	200	64	<50	<50	<50	1800	1100	<100	Replicate
T-3	05/23/90	WWE	<20	<10	180	130	<10	20	<10	2800	1400	<20	
T-3	05/23/90	WWE	<50	<25	170	120	<25	<25	<25	2600	1100	<50	Replicate
T-3	08/29/90	WWE	<100	<50	120	77	<50	<50	<50	1800	990	<100	
T-3	12/06/90	WWE	<200	<100	<100	<100	<100	<100	<100	1300	830	<200	
T-3	12/06/90	WWE	<200	<100	<100	<100	<100	<100	<100	1300	830	<200	Replicate
T-3	02/26/91	WWE	<200	<100	<100	<100	<100	<100	<100	1600	1000	<200	
T-3	05/31/91	WWE	<100	<50	160	74	<50	<50	<50	1600	1000	<100	
T-3	05/31/91	WWE	<100	<50	150	73	<50	<50	<50	1600	990	<100	Replicate
T-3	08/27/91	WWE	<100	<50	<50	<50	120	<50	<50	790	730	<100	
T-4A	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	340	<10	
T-4A	05/22/90	WWE	<20	<10	<10	<10	<10	<10	<10	<10	440	<20	
T-4A	08/28/90	WWE	<20	<10	<10	<10	<10	<10	<10	<10	290	<20	
T-4A	11/28/90	WWE	<50	<25	<25	<25	<25	<25	<25	<25	440	<50	
T-4A	02/26/91	WWE	<10	<5.0	<5.0	5.8	<5.0	<5.0	<5.0	<5.0	280	<10	
T-4A	05/29/91	WWE	<20	<10	<10	<10	<10	<10	<10	<10	270	<20	
T-4A	08/28/91	WWE	<20	<10	<10	<10	<10	<10	<10	<10	210	<20	
T-4B	02/27/90	WWE	<10	<5.0	<5.0	12	<5.0	<5.0	<5.0	<5.0	150	<10	
T-4B	02/27/90	WWE	<10	<5.0	<5.0	12	<5.0	<5.0	<5.0	<5.0	190	<10	Replicate
T-4B	05/22/90	WWE	<10	6.1	<5.0	14	<5.0	<5.0	<5.0	<5.0	170	<10	
T-4B	05/22/90	WWE	<10	6.2	<5.0	12	<5.0	<5.0	<5.0	<5.0	170	<10	Replicate
T-4B	08/28/90	WWE	<10	<5.0	<5.0	9	<5.0	<5.0	<5.0	<5.0	140	<10	
T-4B	08/28/90	WWE	<10	5.0	<5.0	10	<5.0	<5.0	<5.0	<5.0	150	<10	Replicate
T-4B	11/28/90	WWE	<20	<10	<10	<10	<10	<10	<10	<10	66	<20	
T-4B	02/26/91	WWE	<10	<5.0	<5.0	8.4	<5.0	<5.0	<5.0	<5.0	160	<10	
T-4B	05/29/91	WWE	<10	<5.0	<5.0	6.2	<5.0	<5.0	<5.0	<5.0	130	<10	
T-4B	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	130	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
T-4B	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	110	<10	Replicate
T-5A	11/08/89	WWE	<10	<2.0	<2.0	<2.0	<5.0	<2.0	<1.0	<2.0	<2.0	<10	
T-5A	11/28/89	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5A	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5A	05/22/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5A	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5A	11/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5A	02/25/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5A	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5A	08/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5B	11/28/89	WWE	<10	<2.0	<2.0	<2.0	<5.0	<2.0	<1.0	<2.0	<2.0	<10	
T-5B	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5B	05/22/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5B	05/22/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	Replicate
T-5B	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5B	11/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5B	02/25/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5B	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5B	08/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5C	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5C	05/22/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5C	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5C	11/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5C	02/25/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5C	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-5C	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	Replicate
T-5C	08/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
T-5C	08/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	Replicate
T-6A	11/08/89	WWE	<10	120	220	<2.0	<5.0	<2.0	<1.0	1300	<2.0	<10	
T-6A	11/27/89	WWE	<10	110	250	<5.0	<5.0	<5.0	<5.0	1400	<5.0	<10	
T-6A	02/26/90	WWE	<10	100	210	<5.0	<5.0	<5.0	<5.0	1400	<5.0	<10	
T-6A	05/22/90	WWE	<100	92	160	<50	<5.0	<50	<50	920	<50	<100	
T-6A	08/29/90	WWE	<100	73	140	<50	<50	<50	<50	720	<50	<10	
T-6A	08/29/90	WWE	<100	78	150	<50	<50	<50	<50	800	<50	<10	Replicate
T-6A	11/27/90	WWE	<100	89	140	<50	<50	<50	<50	850	<50	<100	
T-6A	11/27/90	WWE	<200	100	150	<100	<100	<100	<100	1000	<100	<200	Replicate
T-6A	02/26/91	WWE	<100	80	160	<50	<50	<50	<50	830	<50	<100	
T-6A	02/26/91	WWE	<100	87	180	<50	<50	<50	<50	870	<50	<100	Replicate
T-6A	05/29/91	WWE	<100	86	170	<50	<50	<50	<50	790	<50	<100	
T-6A	05/29/91	WWE	<100	83	170	<50	<50	<50	<50	730	<50	<100	Replicate
T-6A	08/28/91	WWE	<20	94	240	330	22	17	<10	780	440	<20	
T-6B	11/14/89	WWE	<10	4	<2.0	13	<5.0	<2.0	<1.0	<2.0	82	<10	
T-6B	11/28/89	WWE	<10	<5.0	<5.0	15	<5.0	<5.0	<5.0	<5.0	110	<10	
T-6B	02/26/90	WWE	<10	<5.0	<5.0	14	<5.0	<5.0	<5.0	<5.0	120	<10	
T-6B	05/22/90	WWE	<10	<5.0	<5.0	17	<5.0	<5.0	<5.0	<5.0	110	<10	
T-6B	08/29/90	WWE	<10	<5.0	<5.0	13	<5.0	<5.0	<5.0	<5.0	100	<10	
T-6B	11/27/90	WWE	<10	<5.0	<5.0	10	<5.0	<5.0	<5.0	<5.0	74	<10	
T-6B	02/26/91	WWE	<10	6.5	<5.0	11	<5.0	<5.0	<5.0	5.6	110	<10	
T-6B	05/29/91	WWE	<10	<5.0	<5.0	33	<5.0	<5.0	5.4	5.8	78	<10	(2)
T-6B	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	78	<10	
T-6C	02/26/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-6C	05/22/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-6C	08/29/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-6C	11/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
T-6C	02/26/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-6C	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-6C	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	10	<10	
T-7A	02/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-7A	05/23/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-7A	08/30/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-7A	11/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-7A	11/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	Replicate
T-7A	02/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-7A	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-7A	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-7B	02/28/90	WWE	<100	<50	<50	76	<50	<50	<50	<50	2500	<100	
T-7B	02/28/90	WWE	<100	<50	<50	83	<50	<50	<50	<50	2500	<100	Replicate
T-7B	05/23/90	WWE	<200	<100	<100	<100	<100	<100	<100	<100	2200	<200	
T-7B	05/23/90	WWE	<200	<100	<100	<100	<100	<100	<100	<100	2600	<200	Replicate
T-7B	08/30/90	WWE	<200	<100	<100	<100	<100	<100	<100	<100	2200	<200	
T-7B	08/30/90	WWE	<200	<100	<100	<100	<100	<100	<100	<100	2200	<200	Replicate
T-7B	11/28/90	WWE	<200	<100	<100	<100	<100	<100	<100	<100	1900	<200	
T-7B	02/27/91	WWE	<200	<100	<100	<100	<100	<100	<100	<100	2200	<200	
T-7B	02/27/91	WWE	<200	<100	<100	<100	<100	<100	<100	<100	2200	<200	Replicate
T-7B	05/29/91	WWE	<200	<100	<100	<100	<100	<100	<100	<100	2200	<200	(2)
T-7B	05/29/91	WWE	<200	<100	<100	<100	<100	<100	<100	<100	2200	<200	Replicate
T-7B	08/28/91	WWE	<200	<100	<100	<100	<100	<100	<100	<100	2100	<200	
T-8	02/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-8	05/23/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-8	08/29/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-8	11/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
T-8	02/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-8	05/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-8	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-9	02/28/90	WWE	<100	<50	460	60	<50	230	<50	2700	470	<100	
T-9	05/24/90	WWE	<50	<25	83	<25	<25	170	<25	730	240	<50	
T-9	05/24/90	WWE	<50	<25	86	<25	<25	190	<25	740	250	<50	Replicate
T-9	08/29/90	WWE	<200	<100	280	160	<100	<100	<100	1400	170	<200	
T-9	11/28/90	WWE	<50	<25	46	<25	<25	210	<25	630	210	<50	
T-9	11/28/90	WWE	<50	<25	45	<25	<25	200	<25	640	220	<50	Replicate
T-9	02/27/91	WWE	<50	25	370	34*	<25	170	<25	620	170	<50	
T-9	05/29/91	WWE	<200	<100	340	<100	<100	120	<100*	1200	160	<200	(2)
T-9	08/28/91	WWE	<50	<25	160	<25	<25	210	<25	790	170	<50	
T-10	02/28/90	WWE	<10	<5.0	<5.0	150	<5.0	14	<5.0	<5.0	220	25	
T-10	05/23/90	WWE	26	85	<10	390	<10	17	<10	<10	250	59	
T-10	08/29/90	WWE	<20	<10	<10	310	<10	<10	<10	<10	200	24	
T-10	11/28/90	WWE	<50	<25	<25	520	<25	<25	<25	<25	340	<50	
T-10	02/27/91	WWE	<200	<100	<100	770*	<100	<100	<100	<100	680	<200	
T-10	05/29/91	WWE	<50	<25	<25	320	<25	<25	<25	<25	380	<50	
T-10	08/27/91	WWE	<25	<13	<13	330	<13	17	<13	<13	440	<25	
T-11A	02/26/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-11A	05/22/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-11A	08/30/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-11A	11/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-11A	02/26/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-11A	05/30/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-11A	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
T-11B	02/26/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-11B	05/22/90	WWE	<10	<5.0	<5.0	17	<5.0	<5.0	<5.0	<5.0	86	<10	
T-11B	08/30/90	WWE	<10	<5.0	<5.0	19	<5.0	<5.0	<5.0	<5.0	140	<10	
T-11B	11/27/90	WWE	<50	<25	<25	30	<25	<25	<25	<25	240	<50	
T-11B	02/26/91	WWE	<10	<5.0	<5.0	44	<5.0	<5.0	<5.0	<5.0	200	<10	
T-11B	05/30/91	WWE	<50	<25	25	<25	<25	<25	<25	<25	260	<50	
T-11B	08/28/91	WWE	<10	<5.0	<5.0	27	<5.0	<5.0	<5.0	<5.0	260	<10	
T-11C	02/26/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-11C	05/22/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	18	<10	
T-11C	08/30/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	21	<10	
T-11C	11/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	55	<10	
T-11C	02/26/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	31	<10	
T-11C	05/30/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	40	<10	
T-11C	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	29	<10	
T-12	11/28/89	WWE	<10	<5.0	<5.0	17	<5.0	<5.0	<5.0	<5.0	390	<10	
T-12	02/27/90	WWE	<10	<5.0	<5.0	14	<5.0	<5.0	<5.0	<5.0	490	<10	
T-12	05/24/90	WWE	<50	<25	<25	<25	<25	<25	<25	<25	340	<50	
T-12	11/28/90	WWE	<50	<25	<25	<25	<25	<25	<25	<25	420	<50	
T-12	02/28/91	WWE	<50	<25	<25	<25	<25	<25	<25	<25	450	<50	
T-12	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	70	<10	
T-13A	02/28/90	WWE	<10	<5.0	5.7	11	<5.0	7.0	<5.0	<5.0	170	<10	
T-13A	05/23/90	WWE	<10	4.4	<5.0	4.4	<5.0	<5.0	<5.0	<5.0	54	<10	
T-13A	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	14	<10	
T-13A	11/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	20	<10	
T-13A	02/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	19	27	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments
T-13A	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	8.6	<10	
T-13A	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	30	<10	
T-13B	02/28/90	WWE	<10	<5.0	<5.0	280	<5.0	<5.0	<5.0	<5.0	46	<10	
T-13B	05/23/90	WWE	<20	<10	<10	240	<10	<10	<10	<10	37	<20	
T-13B	08/28/90	WWE	<10	<5.0	<5.0	260	<5.0	<5.0	<5.0	<5.0	36	<10	
T-13B	11/28/90	WWE	<20	<10	<10	290	<10	<10	<10	<10	54	<20	
T-13B	02/27/91	WWE	<20	<10	<10	260*	<10	<10	<10	36	52	<20	
T-13B	05/29/91	WWE	<100	310	<50	1300	<50	<50	<50	<50	310	<100	
T-13B	08/28/91	WWE	<20	<10	<10	200	<10	<10	<10	<10	64	<20	
T-14	02/28/90	WWE	<10	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-14	05/23/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-14	08/30/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-14	11/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-14	02/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-14	05/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-14	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-15	02/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-15	05/23/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-15	08/29/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-15	11/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-15	02/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-15	05/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-15	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-15	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	Replicate
T-16	11/28/89	WWE	<10	11	<5.0	50	<5.0	<5.0	<5.0	16	1200	<10	
T-16	02/28/90	WWE	<100	<50	<50	<50	<50	<50	<50	<50	880	<100	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
T-16	05/24/90	WWE	<100	<50	<50	<50	<50	<50	<50	<50	880	<100	
T-16	08/29/90	WWE	<100	<50	<50	100	<50	<50	<50	<50	1200	<100	
T-16	11/28/90	WWE	<100	<50	<50	52	<50	<50	<50	<50	1100	<100	
T-16	02/28/91	WWE	<100	<50	<50	<50	<50	<50	<50	<50	1000	<100	
T-16	02/28/91	WWE	<100	<50	<50	120*	<50	<50	<50	<50	1900	<100	Replicate
T-16	05/29/91	WWE	<100	<50	<50	84	<50	<50	<50	<50	1400	<100	
T-16	08/28/91	WWE	<100	<50	92	<50	<50	<50	<50	300	490	<100	
T-16	08/28/91	WWE	<100	<50	<50	<50	<50	<50	<50	<50	610	<100	Replicate
T-17	05/30/91	WWE	<10	12	21	66	<5.0	20	<5.0	150	34	<10	
T-17	05/30/91	WWE	<10	12	25	69	<5.0	23	<5.0	120	33	<10	Replicate
T-17	08/28/91	WWE	<10	5.0	15	37	<5.0	40	<5.0	75	43	<10	
T-18	05/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-18	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-19A	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-19A	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-19B	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-19B	08/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-19C	05/29/91	WWE	<50	<25	<25	<25	<25	<25	<25	<25	150	<50	
T-19C	08/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	95	<10	
T-20	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-20	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-21	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
T-21	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
P-1A	02/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
P-1A	11/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
P-1A	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
P-1B	02/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
P-1B	11/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
P-1B	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
P-2	02/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
P-2	11/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
P-2	08/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-1	02/17/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-1	05/25/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-1	11/28/89												Dry
W-1	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-1	05/23/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-1	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-1	11/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-1	02/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-1	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-1D	02/17/88	RASS	<10	<5.0	<5.0	10	49	<5.0	<5.0	<5.0	210	<10	
W-1D	05/25/88	RASS	<10	6	<5.0	10	<5.0	<5.0	<5.0	<5.0	210	<10	
W-1D	11/28/89	WWE	<10	<5.0	<5.0	12	<5.0	<5.0	<5.0	<5.0	360	<10	
W-1D	11/28/89	WWE	<10	<5.0	<5.0	9	<5.0	<5.0	<5.0	<5.0	270	<10	Replicate
W-1D	02/27/90	WWE	<10	<5.0	<5.0	8.4	<5.0	<5.0	<5.0	<5.0	370	<10	
W-1D	05/23/90	WWE	<20	<10	<10	11	<10	<10	<10	<10	480	<20	
W-1D	08/28/90	WWE	<20	<10	<10	<10	<10	<10	<10	<10	280	<20	
W-1D	11/28/90	WWE	<50	<25	<25	<25	<25	<25	<25	<25	370	<50	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
W-1D	02/27/91	WWE	<50	<25	<25	<25	<25	<25	<25	<25	390	<50	
W-1D	05/29/91	WWE	<20	<10	<10	12	<10	<10	<10	<10	400	<20	
W-1D	08/27/91	WWE	<50	<25	<25	<25	<25	<25	<25	<25	380	<50	
W-2	02/17/88	RASS	410	1600	510	<5.0	<5.0	<5.0	<5.0	690	7	8*	
W-2	05/26/88	RASS	150	2100	830	<5.0	41*	<5.0	<5.0	700	6	13	
W-2	11/27/89	WWE	82	1300	370	<5.0	<5.0	<5.0	<5.0	150	<5.0	11	
W-2	02/26/90	WWE	49	1100	290	<5.0	<5.0	<5.0	<5.0	84	<5.0	<10	
W-2	05/22/90	WWE	<100	1000	280	<50	<50	<50	<50	89	<50	<100	
W-2	08/29/90	WWE	<100	1000	420	<50	<50	<50	<50	<50	<50	<100	
W-2	11/27/90	WWE	<100	1000	<50	<50	<50	<50	<50	74	<50	<100	
W-2	02/26/91	WWE	<100	750	230	<50	<50	<50	<50	<50	<50	<100	
W-2	05/29/91	WWE	<100	680	210	<50	<50	<50	<50	<50	<50	<100	
W-2	08/27/91	WWE	<100	440	140	<50	<50	<50	<50	<50	<50	<100	
W-2D	02/17/88	RASS	<10	7	<5.0	9	<5.0	<5.0	<5.0	<5.0	260	<10	
W-2D	05/26/88	RASS	<10	<5.0	<5.0	8	46*	<5.0	<5.0	<5.0	280	<10	
W-2D	11/27/89	WWE	<10	<5.0	<5.0	12	<5.0	<5.0	<5.0	<5.0	300	<10	
W-2D	02/26/90	WWE	<10	<5.0	<5.0	10	<5.0	<5.0	<5.0	<5.0	370	<10	
W-2D	05/22/90	WWE	<20	<10	<10	21	<10	<10	<10	<10	420	<20	
W-2D	08/29/90	WWE	<20	<10	<10	15	<10	<10	<10	<10	180	<20	
W-2D	11/27/90	WWE	<20	<10	<10	16	<10	<10	<10	<10	320	<20	
W-2D	02/26/91	WWE	<20	<10	<10	23	<10	<10	<10	<10	370	<20	
W-2D	05/29/91	WWE	<20	<10	<10	21	<10	<10	<10	<10	290	<20	
W-3	02/17/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-3	05/25/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-3	11/28/89	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-3	02/26/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-3	05/23/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
W-3	08/29/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-3	12/06/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-3	02/26/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-3	05/30/91	WWE	<10	<5.0	<5.0	<5.0	5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-3D	02/17/88	RASS	<10	<5.0	<5.0	19	<5.0	<5.0	<5.0	8	720	<10	
W-3D	05/25/88	RASS	<10	6	7	20	7*	<5.0	<5.0	12	780	<10	
W-3D	05/25/88	RASS	<10	5	6	20	6*	<5.0	<5.0	12	790	<10	Replicate
W-3D	11/28/89	WWE	<10	6.0	<5.0	15	<5.0	<5.0	<5.0	<5.0	570	<10	
W-3D	02/27/90	WWE	<10	<5.0	<5.0	14	<5.0	<5.0	<5.0	<5.0	500	<10	
W-3D	05/23/90	WWE	<50	<25	<25	<25	<25	<25	<25	<25	540	<50	
W-3D	08/29/90	WWE	<50	<25	<25	<25	<25	<25	<25	<25	440	<50	
W-3D	12/06/90	WWE	<50	<25	<25	<25	<25	<25	<25	<25	490	<50	
W-3D	02/27/91	WWE	<50	<25	36	<25	<25	<25	<25	<25	590	<50	
W-3D	05/30/91	WWE	<50	<25	<25	<25	<25	<25	<25	<25	390	<50	
W-3D	08/27/91	WWE	<50	<25	<25	<25	<25	<25	<25	<25	450	<50	
W-4	02/17/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-4	05/25/88	RASS	<10	<5.0	<5.0	<5.0	73	<5.0	<5.0	<5.0	<5.0	<10	
W-4	11/28/89	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	19	<5.0	<10	
W-4	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-4	05/23/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	8.9	<5.0	<10	
W-4	08/29/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	13	<5.0	<10	
W-4	12/06/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	7.3	<5.0	<10	
W-4	02/28/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	5.8	<5.0	<10	
W-4	05/31/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-4D	02/17/88	RASS	<10	<5.0	<5.0	6	<5.0	<5.0	<5.0	<5.0	320	9*	
W-4D	05/25/88	RASS	<10	<5.0	<5.0	6	<5.0	<5.0	<5.0	<5.0	230	<10	
W-4D	11/28/89	WWE	<10	<5.0	<5.0	7.0	<5.0	<5.0	<5.0	5.0	470	12	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
W-4D	11/28/89	WWE	<10	<5.0	<5.0	7.0	<5.0	<5.0	<5.0	5.0	470	11	Replicate
W-4D	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	5.4	480	<10	
W-4D	05/23/90	WWE	<50	<25	<25	<25	<25	<25	<25	<25	370	<50	
W-4D	08/29/90	WWE	<50	<25	<25	<25	<25	<25	<25	<25	380	<50	
W-4D	08/29/90	WWE	<50	<25	<25	<25	<25	<25	<25	<25	390	<50	Replicate
W-4D	12/06/90	WWE	<50	<25	<25	<25	<25	<25	<25	<25	410	<50	
W-4D	02/28/91	WWE	<50	<25	<25	<25	<25	<25	<25	<25	500	<50	
W-4D	05/31/91	WWE	<50	<25	<25	<25	<25	<25	<25	<25	120	<50	
W-4D	08/27/91	WWE	<50	<25	<25	<25	<25	<25	<25	<25	250	<50	
W-5	02/18/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-5	05/25/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-5D	02/18/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-5D	05/25/88	RASS	<10	<5.0	<5.0	<5.0	35*	<5.0	<5.0	<5.0	<5.0	<10	
W-6	02/18/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-6	05/25/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-7	02/18/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-7	02/18/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	Replicate
W-7	05/25/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-8	02/17/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	9	<10	
W-8	05/26/88	RASS	<10	<5.0	<5.0	<5.0	320	<5.0	<5.0	<5.0	<5.0	<10	
W-8	05/26/88	RASS	<10	<5.0	<5.0	<5.0	350	<5.0	<5.0	<5.0	<5.0	<10	Replicate
W-8	11/28/89	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-8	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-8	05/22/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-8	08/29/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
W-8	11/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-8	02/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-8	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-9	02/17/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-9	05/26/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-9	11/28/89	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-9	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-9	05/23/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-9	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-9	11/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-9	02/25/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-9	05/29/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-10	02/17/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-10	05/25/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-10	11/28/89	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-10	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-10	05/23/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-10	08/29/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-10	12/06/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0*	<10	
W-10	02/26/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-10	05/30/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-11	02/18/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-11	05/25/88	RASS	<10	<5.0	<5.0	<5.0	29	<5.0	<5.0	<5.0	<5.0	<10	
W-11	11/28/89	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-11	02/27/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-11	05/24/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-11	08/29/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
W-11	12/06/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-11	02/27/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-11	05/30/91	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-12	02/18/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-12	02/18/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	Replicate
W-12	05/25/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-13	02/18/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-13	05/25/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-14	02/18/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
W-14	05/25/88	RASS	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
AD-1	06/04/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
AD-1	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
AD-2	06/04/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
AD-2	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
AD-2	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	Replicate
AD-3	06/04/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
AD-3	06/04/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	Replicate
AD-3	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
AD-4	06/04/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
AD-4	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	

TABLE 3-5

SUMMARY OF GROUND WATER ANALYTICAL RESULTS FOR VOLATILE FRACTION
(all results in ug/l)

Well Number	Date Sampled	Lab	Chloro-ethane	1,1-Dichloro-ethane	1,1-Dichloro-ethylene	trans-1,2-Dichloro-ethylene	Methylene Chloride	Tetra-Chloro-ethylene	Toluene	1,1,1-Trichloro-ethane	Trichloro-ethylene	Vinyl Chloride	Comments:
AD-5	06/04/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	
AD-5	08/28/90	WWE	<10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	

Key: Less than indicates that the compound was not found or was below the reported detection limit. Thirty-four volatile compounds were included in the analytical scan. Compounds not detected are not shown on the table.
DAL = Daily Analytical Laboratories, Peoria, Illinois.
ECI = Environmental Consultants, Inc., Clarksville, Indiana.
RASS = Randolph & Associates, Inc., Peoria, Illinois.
WWES = WW Engineering & Science, Grand Rapids, Michigan.

Note: (1) Chloroform = 54 ug/l
(2) Xylene detected in T-6B (21 ug/l), T-7B (240 ug/l), T-7B Rep.(230 ug/l), and T-9 (270 ug/l)
* Estimated value as a result of data not meeting QA/QC validation criteria.

APPENDIX C

CC: Les Phillips / Bob Miller / Gary Bellinger / Dave Semelroth
Bob Bouwkamp / Bob Aten
THIS GIVES US APPROVAL TO CONSTRUCT & OPERATE. WWES is CHECKING W WATER (IL DWPC) CHECKING ON WATER DISCH. PERMIT

Illinois Environmental Protection Agency P. O. Box 19276, Springfield, IL 62794-9276
217/782-2113

D73
1/4/93

JOINT CONSTRUCTION AND OPERATING PERMIT

RECEIVED
LEGAL DEPARTMENT
JAN 15 1992

PERMITTEE

Keystone Consolidated Industries, Inc.
Attn: Dale L. Bennington
5430 LBJ Freeway
Dallas, TX 75250

GND WTR REMEDIATION
AIR STRIPPER
AIR PERMIT.

Application No.: 92110086
Applicant's Designation: KEYSTRIP
Subject: Air Stripper
Date Issued: January 11, 1993
Location: 7000 Southwest Adams Street, Peoria

I.D. No.: 143808AAA
Date Received: November 30, 1992
Operating Permit Expiration Date: January 6, 1998

Permit is hereby granted to the above-designated Permittee to CONSTRUCT and OPERATE emission source(s) and/or air pollution control equipment consisting of an air stripper as described in the above-referenced application. This Permit is subject to standard conditions attached hereto and the following special condition(s):

1. Operation of the emission source(s) included in this permit shall not begin until all associated air pollution control equipment has been constructed and is operational.

2. Emissions and operation of equipment shall not exceed the following limits:

Item of Equipment	Pumping Rate (Gal/Min)	VOM Emissions (Lb/Hr)	VOM Emissions (Ton/Yr)	NON VOM Emissions (Lb/Hr)	NON VOM Emissions (Ton/Yr)
Air Stripper	800	1.41	6.14	0.56	2.46

These limits are based on the maximum emission rate and hours of operation indicated in the permit application. The annual limit is the product of the hourly limit and the maximum hours of operation. Compliance with annual limits shall be determined from a running total of 12 months of data.

3. Issuance of this permit does not relieve the owner or operator from compliance with the 35 Ill. Adm. Code Title Part 731 Underground Storage Tank regulations or the permit requirements of Section 21 and 39 of the Environmental Protection Act, nor does it constitute a release from further responsibility for preventive or corrective action as defined under Section 4(y) of the Ill. Environmental Protection Act.

If you have any questions on this, please call Bill Marr at 217/782-2113.

Donald E. Sutton, P.E.
Manager, Permit Section
Division of Air Pollution Control

DES:WDM:mab/680N/sp/69-70

cc: Region 2

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF AIR POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62706

STANDARD CONDITIONS FOR OPERATING PERMITS

July 1, 1985

The Illinois Environmental Protection Act (Illinois Revised Statutes, Chapter 111-1/2, Section 1039) grants the Environmental Protection Agency authority to impose conditions on permits which it issues.

The following conditions are applicable unless superseded by special permit condition(s).

1. The issuance of this permit does not release the permittee from compliance with state and federal regulations which are part of the Illinois State Implementation Plan, as well as with other applicable statutes and regulations of the United States or the State of Illinois or with applicable local laws, ordinances and regulations.

2. The Agency has issued this permit based upon the information submitted by the permittee in the permit application. Any misinformation, false statement or mispresentation in the application shall be grounds for revocation under 35 Ill. Adm. Code 201.207.

3. a. The permittee shall not authorize, cause, direct or allow any modification, as defined in 35 Ill. Adm. Code 201.102, of equipment, operations or practices which are reflected in the permit application as submitted unless a new application or request for revision of the existing permit is filed with the Agency and unless a new permit or revision of the existing permit(s) is issued for such modification.

   b. This permit only covers emission sources and control equipment while physically present at the indicated plant location(s). Unless the permit specifically provides for equipment relocation, this permit is void for an item of equipment on the day it is removed from the permitted location(s) or if all equipment is removed, notwithstanding the expiration date specified on the permit.

4. The permittee shall allow any duly authorized agent of the Agency, upon the presentation of credentials, at reasonable times:

   a. to enter the permittee's property where actual or potential effluent, emission or noise sources are located or where any activity is to be conducted pursuant to this permit,

   b. to have access to and to copy any records required to be kept under the terms and conditions of this permit,

   c. to inspect, including during any hours of operation of equipment constructed or operated under this permit, such equipment and any equipment required to be kept, used, operated, calibrated and maintained under this permit,

   d. to obtain and remove samples of any discharge or emission of pollutants, and

   e. to enter and utilize any photographic, recording, testing, monitoring or other equipment for the purpose of preserving, testing, monitoring or recording any activity, discharge or emission authorized by this permit.

5. The issuance of this permit:

   a. shall not be considered as in any manner affecting the title of the premises upon which the permitted facilities are located,

   b. does not release the permittee from any liability for damage to person or property caused by or resulting from the construction, maintenance, or operation of the facilities,

c. does not take into consideration or attest to the structural stability of any unit or part of the project, and

d. in no manner implies or suggests that the Agency (or its officers, agents or employees) assumes any liability, directly or indirectly, for any loss due to damage, installation, maintenance, or operation of the proposed equipment or facility.

6. The facilities covered by this permit shall be operated in such a manner that the disposal of air contaminants collected by the equipment shall not cause a violation of the Environmental Protection Act or regulations promulgated thereunder.

7. The permittee shall maintain all equipment covered under this permit in such a manner that the performance of such equipment shall not cause a violation of the Environmental Protection Act or regulations promulgated thereunder.

8. The permittee shall maintain a maintenance record on the premises for each item of air pollution control equipment. This record shall be made available to any agent of the Environmental Protection Agency at any time during normal working hours and/or operating hours. As a minimum, this record shall show the dates of performance and nature of preventative maintenance activities.

9. No person shall cause or allow continued operation during malfunction, breakdown or startup of any emission source or related air pollution control equipment if such operation would cause a violation of an applicable emission standard or permit limitation. Should a malfunction, breakdown or startup occur which results in emissions in excess of any applicable standard or permit limitation, the permittee shall:

   a. immediately report the incident to the Agency's Regional Field Operations Section Office by telephone, telegraph, or other method as constitutes the fastest available alternative, and shall comply with all reasonable directives of the Agency with respect to the incident;

   maintain the following records for a period of no less than two (2) years:

   i. date and duration of malfunction, breakdown or startup,

   ii. full and detailed explanation of the cause,

   iii. contaminants emitted and an estimate of quantity of emissions,

   iv. measures taken to minimize the amount of emissions during the malfunction, breakdown or startup, and

   v. measures taken to reduce future occurrences and frequency of incidents.

10. If the permit application contains a compliance program and project completion schedule, the permittee shall submit a project completion status report within thirty (30) days of any date specified in the compliance program and project completion schedule or at six month intervals, whichever is more frequent.

11. Beginning one year from the date of this permit the permittee shall submit an "Annual Emission Report," form APC-208, as required by 35 Ill. Adm. Code 201.302. (Note: If the permittee has other operating permits for this facility, the "Annual Emission Report" for all such permits may be included in a single annual submission.)

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF AIR POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62706

STANDARD CONDITIONS FOR CONSTRUCTION/DEVELOPMENT PERMITS ISSUED BY THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

July 1, 1985

The Illinois Environmental Protection Act (Illinois Revised Statutes, Chapter 111-1/2, Section 1039) authorizes the Environmental Protection Agency to impose conditions on permits which it issues.

The following conditions are applicable unless susperseded by special condition(s).

1. Unless this permit has been extended or it has been voided by a newly issued permit, this permit will expire one year from the date of issuance, unless a continuous program of construction or development on this project has started by such time.

2. The construction or development covered by this permit shall be done in compliance with applicable provisions of the Illinois Environmental Protection Act and Regulations adopted by the Illinois Pollution Control Board.

3. There shall be no deviations from the approved plans and specifications unless a written request for modification, along with plans and specifications as required, shall have been submitted to the Agency and a supplemental written permit issued.

4. The permittee shall allow any duly authorized agent of the Agency upon the presentation of credentials, at reasonable times:

   a. to enter the permittee's property where actual or potential effluent, emission or noise sources are located or where any activity is to be conducted pursuant to this permit,

   b. to have access to and to copy any records required to be kept under the terms and conditions of this permit,

   c. to inspect, including during any hours of operation of equipment constructed or operated under this permit, such equipment and any equipment required to be kept, used, operated, calibrated and maintained under this permit,

   d. to obtain and remove samples of any discharge or emissions of pollutants, and

   e. to enter and utilize any photographic, recording, testing, monitoring or other equipment for the purpose of preserving, testing, monitoring, or recording any activity, discharge, or emission authorized by this permit.

5. The issuance of this permit:

   a. shall not be considered as in any manner affecting the title of the premises upon which the permitted facilities are to be located,

   b. does not release the permittee from any liability for damage to person or property caused by or resulting from the construction, maintenance, or operation of the proposed facilities,

   c. does not release the permittee from compliance with other applicable statutes and regulations of the United States, of the State of Illinois, or with applicable local laws, ordinances and regulations,

   d. does not take into consideration or attest to the structural stability of any units or parts of the project, and

c. does not take into consideration or attest to the structural stability of any unit or part of the project, and

d. in no manner implies or suggests that the Agency (or its officers, agents or employees) assumes any liability, directly or indirectly, for any loss due to damage, installation, maintenance, or operation of the proposed equipment or facility.

6. The facilities covered by this permit shall be operated in such a manner that the disposal of air contaminants collected by the equipment shall not cause a violation of the Environmental Protection Act or regulations promulgated thereunder.

7. The permittee shall maintain all equipment covered under this permit in such a manner that the performance of such equipment shall not cause a violation of the Environmental Protection Act or regulations promulgated thereunder.

8. The permittee shall maintain a maintenance record on the premises for each item of air pollution control equipment. This record shall be made available to any agent of the Environmental Protection Agency at any time during normal working hours and/or operating hours. As a minimum, this record shall show the dates of performance and nature of preventative maintenance activities.

9. No person shall cause or allow continued operation during malfunction, breakdown or startup of any emission source or related air pollution control equipment if such operation would cause a violation of an applicable emission standard or permit limitation. Should a malfunction, breakdown or startup occur which results in emissions in excess of any applicable standard or permit limitation, the permittee shall:

   a. immediately report the incident to the Agency's Regional Field Operations Section Office by telephone, telegraph, or other method as constitutes the fastest available alternative, and shall comply with all reasonable directives of the Agency with respect to the incident;

   b. maintain the following records for a period of no less than two (2) years:

      i. date and duration of malfunction, breakdown or startup,

      ii. full and detailed explanation of the cause,

      iii. contaminants emitted and an estimate of quantity of emissions,

      iv. measures taken to minimize the amount of emissions during the malfunction, breakdown or startup, and

      v. measures taken to reduce future occurrences and frequency of incidents.

10. If the permit application contains a compliance program and project completion schedule, the permittee shall submit a project completion status report within thirty (30) days of any date specified in the compliance program and project completion schedule or at six month intervals, whichever is more frequent.

11. Beginning one year from the date of this permit the permittee shall submit an "Annual Emission Report," form APC-208, as required by 35 Ill. Adm. Code 201.302. (Note: If the permittee has other operating permits for this facility, the "Annual Emission Report" for all such permits may be included in a single annual submission.)

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
WATER POLLUTION CONTROL PERMIT

LOG NUMBERS: 2673-93

PERMIT NO.: 1993-EB-2673

DATE ISSUED: April 16, 1993

SUBJECT: KEYSTONE STEEL & WIRE COMPANY -- Groundwater Remediation by Air Stripping -- Treated Water will be utilized as make up with discharge tributary to the Illinois River

PERMITTEE TO CONSTRUCT
Keystone Steel & Wire Company
7000 S.W. Adams Street
Peoria, Illinois 61641

Permit is hereby granted to the above designated permittee to construct water pollution control facilities described as follows:

An air stripper eight feet in diameter with 30 feet of 1.5 inch polypropylene pall rings and an air blower rated at 8,000 CFM to treat an average of 550 gpm and a maximum of 800 gpm of contaminated groundwater water to be utilized as make up water prior to discharge to the Illinois River.

This Permit is issued subject to the following Special Condition(s). If such Special Condition(s) require(s) additional or revised facilities, satisfactory engineering plan documents must be submitted to this Agency for review and approval for issuance of a Supplemental Permit.

SPECIAL CONDITION 1: The operational portion of this permit shall be governed by NPDES Permit No. IL0002526.

THE STANDARD CONDITIONS OF ISSUANCE INDICATED ON THE REVERSE SIDE MUST BE COMPLIED WITH IN FULL. READ ALL CONDITIONS CAREFULLY.

TGM:REP:kc/611v,24

cc: EPA - Peoria Regional Office
W.W. Engineering & Science ✓
Records
Binds

DIVISION OF WATER POLLUTION CONTROL

Thomas G. McSwiggin, P.E.
Manager, Permit Section

READ ALL CONDITIONS CAREFULLY:
STANDARD CONDITIONS

The Illinois Environmental Protection Act (Illinois Revised Statutes, Chapter 111-1/2, Section 1039) grants the Environmental Protection Agency authority to impose conditions on permits which it issues.

Unless the construction for which this permit is issued has been completed, this permit will expire (1) two years after the date of issuance for permits to construct sewers or wastewater sources or (2) three years after the date of issuance for permits to construct treatment works or pretreatment works.

The construction or development of facilities covered by this permit shall be done in compliance with applicable provisions of Federal laws and regulations, the Illinois Environmental Protection Act, and Rules and Regulations adopted by the Illinois Pollution Control Board.

There shall be no deviations from the approved plans and specifications unless a written request for modification of the project, along with plans and specifications as required, shall have been submitted to the Agency and a supplemental written permit issued.

The permittee shall allow any agent duly authorized by the Agency upon the presentation of credentials:

a. To enter at reasonable times the permittee's premises where actual or potential effluent, emission or noise sources are located or where any activity is to be conducted pursuant to this permit.

b. To have access to and copy at reasonable times any records required to be kept under the terms and conditions of this permit.

c. To inspect at reasonable times, including during any hours of operation of equipment constructed or operated under this permit, such equipment or monitoring methodology or equipment required to be kept, used, operated, calibrated and maintained under this permit.

d. To obtain and remove at reasonable times samples of any discharge or emission of pollutants.

e. To enter at reasonable times and utilize any photographic, recording, testing, monitoring or other equipment for the purpose of preserving, testing, monitoring or recording any activity, discharge, or emission authorized by this permit.

5. The issuance of this permit:

a. shall not be considered as in any manner affecting the title of the premises upon which the permitted facilities are to be located;

b. does not release the permittee from any liability for damage to person or property caused by or resulting from the construction, maintenance, or operation of the proposed facilities;

c. does not release the permittee from compliance with other applicable statutes and regulations of the United States, of the State of Illinois, or with applicable local laws, ordinances and regulations;

d. does not take into consideration or attest to the structural stability of any units or parts of the project;

e. in no manner implies or suggests that the Agency (or its officers, agents or employees) assumes any liability, directly or indirectly, for any loss due to damage, installation, maintenance, or operation of the proposed equipment or facility.

6. Unless a joint construction/operation permit has been issued, a permit for operating shall be obtained from the Agency before the facility or equipment covered by this permit is placed into operation.

7. These standard conditions shall prevail unless modified by special conditions.

8. The Agency may file a complaint with the Board for suspension or revocation of a permit:

a. upon discovery that the permit application contained misrepresentations, misinformation or false statements or that all relevant facts were not disclosed;

b. upon finding that any standard or special conditions have been violated; or

c. upon any violation of the Environmental Protection Act or any Rule or Regulation effective thereunder as a result of the construction or development authorized by this permit.

State of Illinois
ENVIRONMENTAL PROTECTION AGENCY

Mary A. Gade, Director

2200 Churchill Road, Springfield, IL 62794-9276

217/782-0610

June 29, 1993

Keystone Steel & Wire Co.
7000 S.W. Adams Street
Peoria, Illinois 61641

Re: Keystone Steel & Wire Co.
Keystone Steel & Wire Co.
NPDES Permit No. IL0002526
Modification of NPDES Permit (After Public Notice)

Gentlemen:

The Illinois Environmental Protection Agency has reviewed the request for modification of the above-referenced NPDES Permit and issued a public notice based on that request. The final decision of the Agency is to modify the Permit as follows:

To allow treated contaminated groundwater to be utilized as facility make up water with subsequent discharge through outfall 001.

Enclosed is a copy of the modified Permit. You have the right to appeal this modification to the Illinois Pollution Control Board within a 30 day period following the modification date shown on the first page of the permit.

Should you have any question or comments regarding the above, please contact Richard E. Pinneo of my staff.

Very truly yours,

Thomas G. McSwiggin, P.E.
Manager, Permit Section
Division of Water Pollution Control

TGM:TRK:REP:0571v,68-76

Attachment: Modified Permit

cc: USEPA 5WQP
Records Unit
Peoria Region
CAS

Printed on Recycled Paper

NPDES Permit No. IL0002526

Illinois Environmental Protection Agency

Division of Water Pollution Control

2200 Churchill Road

P.O. Box 19276

Springfield, Illinois 62794-9276

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

Modified (NPDES) Permit

Expiration Date: December 1, 1995
Modification Issue Date: June 29, 1993
Modification Effective Date: June 29, 1993

Issue Date: March 27, 1991
Effective Date: April 26, 1991

Name and Address of Permittee:

Keystone Steel and Wire Company
7000 South Adams Street
Peoria, Illinois 61641

Facility Name and Address:

Keystone Steel and Wire Company
7000 South Adams Street
Peoria, Illinois 61641
Peoria County

Discharge Number and Name:	Receiving Waters
001 and 001a Sedimentation Basin Effluent	Keystone's Discharge Channel tributary to the Illinois River
002 and 002a South Sludge Lagoon Overflow	Keystone's Discharge Channel tributary to the Illinois River
003 and 003a North Sludge Lagoon Overflow	Keystone's Discharge Channel tributary to the Illinois River
005 Air Stripper Effluent (Plant Makeup Water)	Keystone's Discharge Channel tributary to the Illinois River

In compliance with the provisions of the Illinois Environmental Protection Act, Subtitle C and/or Subtitle D Rules and Regulations of the Illinois Pollution Control Board, and the Clean Water Act, the above named permittee is hereby authorized to discharge at the above location to the above-named receiving stream in accordance with the standard conditions and attachments herein.

Permittee is not authorized to discharge after the above expiration date. In order to receive authorization to discharge beyond the expiration date, the permittee shall submit the proper application as required by the Illinois Environmental Protection Agency (IEPA) not later than 180 days prior to the expiration date.

Thomas G. McSwiggin, P.E.
Manager, Permit Section
Division of Water Pollution Control

TGM:REP:dks/sp/3701n, 3

NPDES Permit No. IL0002526

Effluent Limitations and Monitoring

PARAMETER	LOAD LIMITS lbs/day 30 DAY AVG.	LOAD LIMITS lbs/day DAILY MAX.	CONCENTRATION LIMITS mg/l 30 DAY AVG.	CONCENTRATION LIMITS mg/l DAILY MAX.	SAMPLE FREQUENCY	SAMPLE TYPE

1. From the effective date of this permit until December 1, 1995, the effluent of the following discharge(s) shall be monitored and limited at all times as follows:

Outfall(s): 001***, 002*** and 003***

Flow (MGD)					Weekly Reading	
Total Suspended Solids	973*	2415*	15	30	1/Week	Composite**
Oil and Grease	382*	859*	15	30	1/Week	Grab
Total Lead	3.2*	9.64*	0.2	0.4	1/Week	Composite**
Total Zinc	4.33*	12.97*	1.0	2.0	1/Week	Composite**
Total Iron	336*	672*	2.0	4.0	1/Week	Composite**
Ammonia					1/Month	Composite**
pH	The pH shall be in the ragne of 6.0-10.0				1/Week	Grab

*This load limit represents the total load allowed from the three outfalls combined. See Special Condition 6
**Grab sampling may be conducted on outfalls 002 and 003 in lieu of composite samples.
***These limitations and monitoring requirements apply when flow is not blocked from going to the Illinois River. See Special Condition 4.

Outfalls: 001a***, 002a*** and 003a***

Flow (MGD)					Weekly Reading	
Total Suspended Solids	973*	2415*	15	30	1/Week	Composite**
Oil & Grease	382*	859*	15	30	1/Week	Grab
Total Lead	3.2*	7.04*		0.1	1/Week	Composite**
Total Zinc	4.33*	12.97*		1.0	1/Week	Composite**
Total Iron	336*	672*	2.0	4.0	1/Week	Composite**
Ammonia					1/Month	Composite**
pH	The pH shall be in the range of 6.0 - 10.0				1/Week	Grab
Fluoride		98.6*		1.4	1/Week	Composite**
Boron		70.4*		1.0	1/Week	Composite**
Dissolved Iron		70.4*		1.0	1/Week	Composite**
Copper	1.32*	3.17*	0.027	.045	1/Week	Composite**
Cyanide	.24*	1.07*	.005	.022	1/Week	Composite**
TDS		70398*		1,000	1/Week	Composite**

*This load limit represents the total allowed from the three outfalls combined. See Special Condition 6
**Grab sampling may be conducted on outfalls 002a and 003a in lieu of composite samples.
***These limitations and monitoring requirements apply when flow is blocked from going to the Illinois River. See Special Condition 4.

 Modification Date: June 29, 1993

NPDES Permit No. IL0002526

Effluent Limitations and Monitoring

PARAMETER	LOAD LIMITS lbs/day 30 DAY AVG.	LOAD LIMITS lbs/day DAILY MAX.	CONCENTRATION LIMITS mg/l 30 DAY AVG.	CONCENTRATION LIMITS mg/l DAILY MAX.	SAMPLE FREQUENCY	SAMPLE TYPE
1. *From the modification effective date of this permit until December 1, 1995, the effluent of the following discharge(s) shall be monitored and limited at all times as follows:*						
Outfall(s): 005*						
1,1-Dichlorethane					1/Month	Grab
1,1-Dichloroethylene					1/Month	Grab
1,2-Dichloroethylene					1/Month	Grab
Tetrachloroethylene					1/Month	Grab
1,1,1-Trichloroethane					1/Month	Grab
Trichloroethylene					1/Month	Grab
Chloroform					1/Month	Grab
Methylene Chloride					1/Month	Grab
Toluene					1/Month	Grab
1,2 Dichloroethane					1/Month	Grab
Carbon Tetrachloride					1/Month	Grab
Flow (MGD)					Daily	Calculate Total

*See Special Condition 7

Special Conditions

1. Samples taken in compliance with the effluent monitoring requirements shall be taken at a point representative of the discharge, but prior to entry into the receiving stream.

2. The permittee shall record monitoring results on Discharge Monitoring Report forms using one such form for each discharge each month. The completed Discharge Monitoring Report form shall be submitted monthly to IEPA, no later than the 15th of the following month, unless otherwise specified by the Agency, to the following address:

Illinois Environmental Protection Agency
Division of Water Pollution Control
Compliance Assurance Section
2200 Churchill Road
P.O. Box 19276
Springfield, Illinois 62794-9276

3. The use or operation of this facility shall be by or under the supervision of a Certified Class K operator.

4. The permittee shall submit separate DMR forms for outfalls 001, 002 and 003 and for outfalls 001a, 002a and 003a. On each form, the permittee shall indicate the number of days of the month the outfall was in that particular discharge mode designated for that outfall.

5. If an applicable effluent standard or limitation is promulgated under Sections 301(b)(2)(C) and (D), 304(b)(2), and 307(a)(2) of the Clean Water Act and that effluent standard or limitation is more stringent than any effluent limitation in the permit or controls a pollutant not limited in the NPDES Permit, the Agency shall revise or modify the permit in accordance with the more stringent standard or prohibition and shall so notify the permittee.

6. A separate DMR form shall be submitted reporting total load discharged from outfalls 001, 002 and 003 and/or 001a, 002a and 003a.

7. For the purpose of this permit, the discharge outfall 005, is limited to treated contaminated groundwater, free from process and other wastewater discharges to be utilized as facility makeup water. Should the levels of the monitored pollutants exceed Division of Land Pollution Controls cleanup objective criteria in the effluent of the air stripper, the Permittee shall notify the Division of Land Pollution Control and request that a determination be made regarding the continued use of the treated contaminated groundwater as facility makeup water.

8. The Agency has determined that the effluent limitations in this permit constitute BAT/BCT for storm water which is treated in the existing treatment facilities for purposes of this permit reissuance, and no pollution prevention plan will be required for such storm water. In addition to the chemical specific monitoring required elsewhere in this permit, the permittee shall conduct an annual inspection of the facility site to identify areas contributing to a storm water discharge associated with industrial activity, and determine whether any facility modifications have occurred which result in previously-treated storm water discharges no longer receiving treatment. If any such discharges are identified the permittee shall request a modification of this permit within 30 days after the inspection. Records of the annual inspection shall be retained by the permittee for the term of this permit and be made available to the Agency on request.

APPENDIX D

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Keystone Steel & Wire Company
April 15, 1992
Logged by J.A. Duwelius
Location N 20,375.43 ft.; E 11,281.86 ft.

Boring No. T-22A
Driller G. Yocky/Fox Drilling
Elevation 445.40 ft.
Page 1 **of** 4

Water Level					Start		Finish	
Time					Time	7:45AM	Time	10:30AM
Date					Date	4/15/92	Date	4/17/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
CS	4.0	3.3		0		Silty clay, very dark grayish brown (10 YR 3/2), mottled, common, distinct, medium, yellowish brown (10 YR 5/8), moist, friable, slightly plastic, noncalcareous, contains plant material
				1		
				2		
				3		
CS	5.0	4.0		4		Silty clay loam, mixed gray and brown (10 YR 5/1) and (10 YR 5/8), mottled, common, distinct, medium, yellowish brown (10 YR 5/8), moist to slightly wet, very friable to plastic, noncalcareous, contains coal fragments throughout
				5		
				6		
				7		
				8		
CS	5.0	4.2		9		Silty clay, as 0.0' above, wet, plastic, contains wood and coal fragments, gradual contact at 11.2' to sandy loam, medium, wet, slightly sticky, noncalcareous, abrupt contact at 11.7' to silty clay as 19.0' above
				10		
				1		
				2		
				3		
CS	5.0	4.2		4		Silt loam, trace pebbles, mixed gray and yellowish brown (10 YR 5/1) and (10 YR 5/8), mottled, common, distinct, coarse, brownish yellow (10 YR 6/8), wet, slightly sticky, plastic, noncalcareous, contains wood and coal fragments
				5		
				6		
				7		
				8		
				9		
CS	5.0	4.1				Silt loam, as 14.0' above, but contains medium sand laminations, abrupt contact at 22.1' to
				20		

Remarks: Diedrich D-50 equipped with 3 3/4" ID/ 7 1/4" OD HSA.

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[redacted]	Keystone Steel & Wire Company	**Boring No.**	T-22A
	April 15, 1992	**Driller**	G. Yocky/Fox Drilling
Logged by	J.A. Duwelius	**Elevation**	445.40 ft.
Location	N 20,375.43 ft.; E 11,281.86 ft.	**Page** 2	**of** 4

Water Level					Start		Finish	
Time					Time	7:45AM	Time	10:30AM
Date					Date	4/15/92	Date	4/17/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				20		
				1		
				2		Silty clay, gray (10 YR 5/1), moist to wet, slightly sticky, plastic, abrupt contact at 23.7' to loamy sand, fine, yellowish brown (10 YR 5/8), wet, loose, slightly sticky, noncalcareous
				3		
				4		
CS	5.0	4.2		5		Silty clay, gray (10 YR 5/1), mottled, common, distinct, coarse, yellowish brown (10 YR 5/8), moist to wet, friable, slightly sticky, noncalcareous, abrupt contact at 26.1' to sandy loam, fine, gray (10 YR 5/1), wet, sticky, noncalcareous, abrupt contact at 27.1' to silty clay, gray (10 YR 5/1), mottled, common, distinct, medium, black (10 YR 2/1), moist, slightly sticky, slightly plastic, abrupt contact at 28.8' to sandy loam, fine, gray (10 YR 5/1), wet, slightly sticky, noncalcareous
				6		
				7		
				8		
				9		
CS	5.0	4.5		30		Sand, fine to medium, brown (10 YR 5/3), wet, loose, slightly calcareous, well sorted and washed
				1		
				2		
				3		
				4		
CS	5.0	1.0		5		Sand, fine to medium,, as 29.0' above, with trace granules
				6		
				7		
				8		
				9		
SS	1.0	1.0	27	40		Sand, granular and pebbly, medium to coarse, brown (10 YR 5/3), wet, loose, nonplastic, slightly calcareous, poorly sorted and moderately washed
			55			

Remarks Two feet of sand heave at 39 feet, added water to depress heave.

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[redacted]
Keystone Steel & Wire Company
April 15, 1992
Logged by J.A. Duwelius
Location N 20,375.43 ft.; E 11,281.86 ft.

Boring No. T-22A
Driller G. Yocky/ Fox Drilling
Elevation 445.40 ft.
Page 3 of 4

Water Level					Start		Finish	
Time					Time	7:45AM	Time	10:30AM
Date					Date	4/15/92	Date	4/17/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				40		
SS	2.0	0.5	1			Sandy gravel, fine, brown (10 YR 5/3), wet, loose, nonplastic, calcareous, poorly sorted and washed
			6	1		
			14			
			13	2		
SS	2.0	1.2	10			Sandy gravel, fine, as 40.0' above
			16	3		
			17			
			18	4		
SS	2.0	0.2	12			Sandy gravel, fine to medium, as 40.0' above
			18	5		
			14			
			14	6		
SS	2.0	0.7	4			Sand, fine to medium, brown (10 YR 5/3), wet, loose, slightly sticky, moderately sorted and washed
			12	7		
			16			
			23	8		
SS	2.0	0	2			(Heave)
			3	9		
			6			
			22	50		
SS	2.0	0.3	7			Sand, fine to medium, grayish brown (10 YR 5/2), wet, loose, calcareous, moderately sorted and washed
			6	1		
			13			
			20	2		
SS	2.0	1.0	7			Sand, fine to medium, brown (10 YR 5/3), wet, loose, calcareous, well sorted and moderately washed
			6	3		
			7			
			15	4		
SS	1.5	1.5	5			
			12	5		
			50			
				6		
				7		(Heave)
				8		
				9		
				60		

Remarks: Switched to mud rotary at 40 feet, 3 3/4" tricone bit.

Switched to 5 foot sampling intervals due to heave.

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[redacted]

Keystone Steel & Wire Company
April 15, 1992
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Location N 20,375.43; E 11,281.86 ft.

Boring No. T-22A
Driller G. Yocky/Fox Drilling
Elevation 445.40 ft.
Page 4 of 4

Water Level					Start		Finish	
Time					Time	7:45AM	Time	10:30AM
Date					Date	4/15/92	Date	4/17/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				60		
SS	2.0	0	10			
			15	1		
			35			
			50	2		
				3		(Encountered 15 feet of heave, flushed with water through tremie pipe)
				4		
				5		
SS	2.0	1.0	6			Silt loam, gray (10 YR 5/1), wet, nonplastic, slightly sticky, calcareous
[redacted]			8	6		
			8			
			10	7		
				8		
				9		
				70		Silt loam, as 65.0' above
SS	2.0	1.5	4			
			8	1		
			8			
			8	2		Bottom of Boring 72.0'
				3		
				4		
				5		
				6		
				7		
				8		
				9		
				0		

[redacted]ks Set monitoring well T-22A in boring on completion.

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[redacted]
Keystone Steel & Wire Company
April 28, 1992
Logged by J.A. Duwelius
Location N 20,381.49 ft.; E 11,277.41 ft.

Boring No. T-22B
Driller B. Crachy/Fox Drilling
Elevation 445.37 ft.
Page 1 of 3

Water Level					Start		Finish	
Time					Time	3:00PM	Time	8:55AM
Date					Date	4/28/92	Date	5/1/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				70		0 - 72.0' See log for Boring T-22A
				1		
				2		
				3		
				4		
				5		
				6		
[redacted]	2.0	1.4	10			Silt loam, gray (10 YR 5/1), wet, friable, calcareous
			10	7		
			10			
			8	8		
SS	2.0	2.0	9			Silty clay loam, gray (10 YR 5/1), moist to wet, plastic, calcareous, contains fine sand laminations and trace coal fragments
			8	9		
			8			
			10	80		
SS	2.0	1.5	7			Silty clay loam, as 78.0' above, clear contact at 81.4' sand, medium to coarse, gray (10 YR 5/1), wet, loose, calcareous, poorly sorted and moderately washed
			9	1		
			10			
			16	2		
SS	2.0	1.1	5			Sand, granular to slightly pebbly, medium to coarse, gray (10 YR 5/1), wet, loose, calcareous, poorly sorted and moderately washed
			16	3		
			13			
			16	4		
SS	2.0	0	9			(Stone in spoon)
			12	5		
			7			
			10	6		
SS	2.0	0.8	12			Sand, pebbly, fine to coarse, gray (10 YR 5/1), wet, loose, calcareous, moderately sorted and washed
			12	7		
			12			
			20	8		
SS	2.0	1.0	15			Sand, granular, fine to coarse, gray (10 YR 5/1), wet, loose, calcareous, moderately sorted and washed
			14	9		
			13			
			11	90		

[redacted]rks ATV Diedrich D-50 equipped with 3 3/4" ID/ 7 1/4" OD HSA.

Switched to mud rotary at 74 feet, 3 1/2" tricone bit.

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[redacted]

	Keystone Steel & Wire Company	Boring No.	T-22B
[redacted]	April 28, 1992	Driller	B. Crachy/Fox Drilling
Logged by	J.A. Duwelius	Elevation	445.37 ft.
Location	N 20,381.49 ft.; E 11,277.41 ft.	Page	2 of 3

Water Level					Start		Finish	
Time					Time	3:00PM	Time	8:55AM
Date					Date	4/28/92	Date	5/1/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				90		
SS	2.0	0.9	13			Sand, granular, fine to coarse, gray (10 YR 5/1), wet, loose, calcareous, moderately sorted and washed
			11	1		
			18			
			20	2		
SS	2.0	1.1	21			Sand, pebbly, medium to coarse, gray (10 YR 5/1), wet, loose, calcareous, moderately sorted and washed
			14	3		
			16			
			18	4		
SS	2.0	1.1	14			Sand, granular to slightly pebbly, medium to coarse, gray (10 YR 5/1), wet, loose, calcareous, moderately sorted and washed
			18	5		
			21			
			26	6		
[redacted]	2.0	0.8	17			Sand, granular to slightly pebbly, medium to coarse, as 94.0' above
			18	7		
			18			
			15	8		
SS	2.0	1.0	12			Sand, granular to slightly pebbly, medium to coarse, as 94.0' above
			16	9		
			15			
			11	100		
SS	2.0	0.8	23			Sand, granular to slightly pebbly, medium to coarse, as 94.0' above
			23	1		
			34			
			40	2		
SS	1.5	0.9	18			Sand, granular, medium, pale red (2.5 YR 6/2), wet, loose, noncalcareous, moderately sorted and washed, contains heavy minerals
			43	3		
			51			
				4		
						(Rods slipped 1 foot at 104 ft)
				5		
SS	1.3	1.0	26			Sand, fine, pale red (2.5 YR 6/2), wet, loose, noncalcareous, moderately sorted and washed, contains pebbly sand laminations and heavy minerals
			58	6		
			15			
				7		
SS	2.0	1.0	32			Sand, fine, pale red, (2.5 YR 6/2), wet, loose, noncalcareous, moderately sorted and washed, contains heavy minerals
			33	8		
			37			
			57	9		
				110		

[redacted]rks

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Keystone Steel & Wire Company
April 28, 1992
Logged by J.A. Duwelius
Location N 20,381.49 ft.; E 11,277.41 ft.

Boring No. T-22B
Driller B. Crachy/Fox Drilling
Elevation 445.37 ft.
Page 3 **of** 3

Water Level					Start		Finish	
Time					Time	3:00PM	Time	8:55AM
Date					Date	4/28/92	Date	5/1/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				110		
SS	2.0	1.2	27			Sand, fine to medium, pale red (2.5 YR 6/2), wet, loose, noncalcareous, well sorted and washed, contains heavy minerals
			52	1		
			50			
			69	2		
SS	2.0	1.1	27	3		Sand, fine to medium, pale brown (10 YR 6/3), wet, loose, noncalcareous, well sorted and washed, contains heavy minerals
			46			
			37	4		
			63			
				5		
SS	2.0	1.3	5			Sand, fine to medium, as 110.0' above
			9	6		
			22			
			43	7		
SS	1.8	1.2	24	8		Sand, fine, as 110.0' above, abrupt contact at 119.3' to Shale, gray (10 YR 5/1), dry, very hard, noncalcareous, (sampled cuttings)
			29			
			71	9		
			100			
				120		
						Bottom of Boring 120.0 feet
				1		
				2		
				3		
				4		
				5		
				6		
				7		
				8		
				9		
				0		

Remarks Switched to 2.5 foot sampling intervals at 110 feet.

Set monitoring well T-22B in boring on completion.

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[redacted]	Keystone Steel & Wire Company	**Boring No.**	T-23
Date	April 20, 1992	**Driller**	G. Yocky/Fox Drilling
Logged by	J.A. Duwelius	**Elevation**	449.20 ft
Location	N 22,451.96 ft.; E 9,678.10 ft.	**Page**	1 of 5

Water Level					**Start**		**Finish**	
Time					**Time**	4:00PM	**Time**	3:00PM
Date					**Date**	4/20/92	**Date**	4/27/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
CS	5.0	0.3		0		Silty clay loam, dark grayish brown (10 YR 4/2), moist, friable, noncalcareous, contains slag and wood fragments
				1		
				2		
				3		
				4		
				5		
CS	5.0	0		6		Silty clay loam, as 0.0' above
				7		
				8		
				9		
				10		
CS	5.0	0.1		1		Loam, yellowish brown (10 YR 5/6), moist, friable, noncalcareous, contains coal fragments
				2		
				3		
				4		
				5		
CS	5.0	1.0		6		Muddy sandy gravel, fine to medium, brown (10 YR 5/3), wet, loose, nonplastic, noncalcareous, poorly sorted and washed
				7		
				8		
				9		
				20		

[redacted]arks

Diedrich D-50 equipped with 3 3/4" ID/ 7 1/4" OD HSA.
5 feet of heave in augers at 15.0 ft
10 feet of heave in augers at 20.0 ft

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[redacted] Keystone Steel & Wire Company
[redacted]e April 20, 1992
Logged by J.A. Duwelius
Location N 22,451.96 ft.; E 9,678.10 ft.

Boring No. T-23
Driller G. Yocky/Fox Drilling
Elevation 449.20
Page 2 of 5

Water Level					Start		Finish	
Time					Time	4:00PM	Time	3:00PM
Date					Date	4/20/92	Date	4/27/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
SS	2.0	0.7	4 6 8 9	20 1 2		Sand, pebbly, fine to medium, brown (10 YR 5/3), wet, loose, nonplastic, slightly calcareous, moderately sorted and washed
SS	2.0	1.0	20 25 8 12	3 4 5 6 7		Sandy gravel, fine to medium, brown (10 YR 5/3), wet, loose, nonplastic, slightly calcareous, poorly sorted and washed
SS	2.0	1.2	30 30 15 20	8 9 30 1 2		Sandy, gravel, fine to medium, as 25.0' above
SS	2.0	1.3	7 20 25 30	3 4 5 6 7		Muddy sandy gravel, fine to medium, brown (10 YR 5/3), wet, loose, nonplastic, slightly calcareous, poorly sorted and washed
				8 9 40		

[redacted]arks Switched to 5-foot sampling intervals due to heaving sand at 20 feet.

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[redacted]
Keystone Steel & Wire Company
April 20, 1992
Logged by J.A. Duwelius
Location N 22,451.96 ft.; E 9,678.10 ft.

Boring No. T-23
Driller G. Yocky/Fox Drilling
Elevation 449.20
Page 3 of 5

Water Level					Start		Finish	
Time					Time	4:00PM	Time	3:00PM
Date					Date	4/20/92	Date	4/27/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
SS	2.0	1.0	6 8 8 8	40 1 2		Sand, pebbly, coarse, brown (10 YR 5/3), wet, loose, nonplastic, slightly calcareous, moderately sorted and washed
SS	2.0	1.0	10 20 20 20	3 4 5 6 7		Sandy gravel, fine to medium, brownish yellow (10 YR 6/8), wet, loose, nonplastic, slightly calcareous, poorly sorted and washed
SS	2.0	0.5	7 9 12 12	8 9 50 1 2		Sandy gravel, fine to medium, as 45.0' above
SS	2.0	0	9 9 6 9	3 4 5 6 7		No recovery
				8 9 60		

Remarks
Rods stuck at 45.0 ft due to heave, flushed with water through tremie pipe
Switched to mud rotary at 47 feet
Switched back to HSA at 50 feet
Rods stuck at 55.0 ft due to heave and collapse, flushed with water through tremie pipe

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[redacted]	Keystone steel & Wire Company	**Boring No.**	T-23
	April 20, 1992	**Driller**	G. Yocky/Fox Drilling
Logged by	J.A.Duwelius	**Elevation**	449.20
Location	N 22,451.96 ft.; E 9,678.10 ft.	**Page**	4 of 5

Water Level					Start		Finish	
Time					Time	4:00PM	Time	3:00PM
Date					Date	4/20/92	Date	4/27/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				60		
SS	2.0	1.0	8			Sandy gravel, fine to medium, brownish yellow (10 YR 6/8), wet, loose, nonplastic, slightly calcareous, poorly washed and sorted
			12	1		
			12			
			12	2		
				3		
				4		
				5		
SS	2.0	0.5	10			Sandy gravel, fine to medium, as 60.0' above
			14	6		
			16			
			16	7		
				8		
				9		
				70		
SS	2.0	1.0	10			Sand, pebbly, coarse, to sandy gravel, fine, yellowish brown (10 YR 5/8), wet, loose, nonplastic, slightly calcareous, moderately sorted and washed
			18	1		
			15			
			18	2		
				3		
				4		
				5		
SS	2.0	0	10			No recovery
			14	6		
			18			
			18	7		
				8		
				9		
				80		

Remarks

[redacted]

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[redacted]
Keystone Steel & Wire Company
April 20, 1992
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Location N 22,451.96 ft.; E 9,678.10 ft.

Boring No. T-23
Driller G. Yocky/Fox Drilling
Elevation 449.20
Page 5 of 5

Water Level					Start		Finish	
Time					Time	4:00PM	Time	3:00PM
Date					Date	4/20/92	Date	4/27/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
SS	2.0	1.3	7 11 16 16	80 1 2		Sand, pebbly, coarse, to sandy gravel, fine, yellowish brown (10 YR 5/8), wet, loose, nonplastic, slightly calcareous, moderately sorted and washed
				3		
				4		
SS	2.0	1.0	7 14 20 20	5 6 7		Sand, pebbly, coarse to sandy gravel, as 80.0' above
				8		Shale, black to gray (10 YR 2/1) (10 YR 5/1), dry, hard, (sampled cuttings)
				9		
				90 1		Bottom of Boring 87.5 feet
				2		
				3		
				4		
				5		
				6		
				7		
				8		
				9		
				0		

Remarks
Switched to mud rotary at 87 feet, switched back to HSA due to no bentonite seal
Twisted augers apart at 87 feet, moved boring location and redrilled through 4-inch casing
Set monitoring well T-23 in boring on completion.

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[redacted]	Keystone Steel & Wire Company	**Boring No.**	T-24
[redacted]	June 2, 1992	**Driller**	B. Crachy/Fox Drilling
Logged by	J.A. Duwelius	**Elevation**	455.86 ft.
Location	N 20,928.39 ft.; E 8,553.81 ft.	**Page**	1 **of** 2

Water Level					Start		Finish	
Time					Time	12:00PM	Time	2:45PM
Date					Date	6/2/92	Date	6/2/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
SS	2.0	1.0	2 4 7 11	0 1 2		Loam, pebbly, dark brown (10 YR 3/3), dry, loose, calcareous, contains slag throughout (Fill)
CS	5.0	2.4		3 4 5 6 7		Loam, pebbly, as 0.0' above abrupt contact at 6.0' to loam, dark brown (10 YR 3/3), moist, friable, calcareous (Fill)
	5.0	3.7		8 9 10 1		Loam, as 6.0' above, dark brown (10 YR 3/3), contains brick fragments, abrupt contact at 9.8' to silty clay, dark gray (10 YR 4/1), moist, plastic, noncalcareous, contains coal fragments, abrupt contact at 11.2' to silty clay loam, very dark gray (10 YR 3/1), moist, friable, noncalcareous
CS	5.0	4.2		2 3 4 5 6 7		Loam, gray (10 YR 5/1), mottled, common, coarse, faint, brownish yellow (10 YR 6/6), moist, friable, noncalcareous, contains wood fragments throughout, abrupt contact at 15.8' to silt loam, very dark gray (10 YR 3/1), mottled, common, coarse, faint, brownish yellow (10 YR 6/6), dry, slightly hard, noncalcareous
CS	5.0	5.0		8 9 20		Silt loam, mixed gray and light yellowish brown (10 YR 5/1) and (10 YR 6/4), moist, firm, noncalcareous

Remarks: Diedrich D-50 equipped with 3 3/4" ID/ 7 1/4" OD HSA

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[redacted] Keystone Steel & Wire Company
June 2, 1992
Logged by J.A. Duwelius
Location N 20,928.39 ft.; E 8,553.81 ft.

Boring No. T-24
Driller B. Crachy/Fox Drilling
Elevation 455.86 ft.
Page 2 of 2

Water Level					Start		Finish	
Time					Time	12:00PM	Time	2:45PM
Date					Date	6/2/92	Date	6/2/92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				20		
				1		
				2		
CS	5.0	5.0				Silt loam, as 17.0' above, contains coal fragments throughout
				3		
				4		
				5		
				6		
				7		
	5.0	3.7				Loam, pebbly, brown (10 YR 5/3), wet, sticky, noncalcareous, abrupt contact at 28.4' to muddy sandy gravel, brown (10 YR 5/3), wet, loose, noncalcareous, poorly sorted and washed, abrupt contact at 31.6' sand, fine, brown (10 YR 5/3), wet, loose, noncalcareous, well sorted and washed
				8		
				9		
				30		
				1		
				2		
CS	5.0	4.0				Sand, fine, brown (10 YR 5/3), wet, loose, noncalcareous, well sorted and washed, pebbly zone at 34.5', color change at 36.3' to yellowish brown (10 YR 5/6)
				3		
				4		
				5		
				6		
				7		
CS	3.4	1.6				Sand, very fine, loamy sand, sandy loam, silt loam, and silt, gray (10 YR 5/1), wet, loose, nonplastic, calcareous, abrupt contact at 40' to shale, gray (10 YR 5/1), dry, hard, noncalcareous
				8		
				9		
				40		
						Bottom of Boring 40.4 ft

Remarks Set monitoring well T-24 in boring on completion.

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Site	Keystone Steel & Wire Company	Boring No.	T-25A
Date	July 20, 1992	Driller	R. Edger/Fox Drilling
Logged by	M. Lytle	Elevation	450.10
Location	N 22,635.24 ft.; E 10,257.07 ft.	Page 1	of 1

Water Level	17.48				Start		Finish	
Time	7:45AM				Time	11:30AM	Time	4:30PM
Date	7-21-92				Date	7-20-92	Date	7-20-92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				0		0 - 40 See log for boring T-25B
				1		
				2		
				3		
				4		Bottom of Boring 40.0'
				5		
				6		
				7		
				8		
				9		
				10		
				1		
				2		
				3		
				4		
				5		
				6		
				7		
				8		
				9		
				20		

Remarks

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[redacted]

[redacted]e	Keystone Steel & Wire Company	**Boring No.**	T-25B
	July 14, 1992	**Driller**	R. Edger/Fox Drilling
Logged by	M. Lyle	**Elevation**	450.0 ft.
Location	N 22,634.31 ft.; E 10,265.09 ft.	**Page**	1 of 5

Water Level	17.85					**Start**		**Finish**
Time	7:45AM				**Time**	9:30AM	**Time**	12:15PM
Date	7-20-92				**Date**	7-14-92	**Date**	7-17-92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				0		
SS	2.0	1.0	8			Silt loam, very dark grayish brown (10 YR 3/2), dry, loose silt laminations, noncalcareous
			9	1		
			10			
			14	2		
SS	2.0	1.4	6			Silt loam, very dark grayish brown (10 YR 3/2), dry, loose, noncalcareous, interbedded with sand, medium, dark yellowish brown (10 YR 4/4), dry, loose, slightly calcareous
			6	3		
			7			
			7	4		
SS	2.0	1.0	8			Silt loam, as 2.0' above
			11	5		
			14			
			11	6		
[redacted]	2.0	1.8	5			Silt loam, dark yellowish brown (10 YR 4/4), dry loose, slightly calcareous, interbedded with sand, fine to medium, dark yellowish brown (10 YR 4/4), dry, loose, slightly calcareous
			5	7		
			3			
			5	8		
SS	2.0	1.7	5			Silt loam interbedded with sand, as 6.0' above
			6	9		
			4			
			5	10		
SS	2.0	0.5	3			Sand, medium to coarse, yellowish brown (10 YR 5/6), moist, loose, well washed and sorted, slightly calcareous
			6	1		
			8			
			8	2		
SS	2.0	1.0	6			Sand, as 10.0' above, with abundant coal fragments
			9	3		
			11			
			10	4		
SS	2.0	1.5	4			Sand, as 10.0' above, wet
			6	5		
			8			
			8	6		
SS	2.0	1.3	5			Sand, as 14.0' above
			7	7		
			8			
			9	8		
SS	2.0	1.2	10			Sand, as 14.0' above
			7	9		
			8			
			8	20		

[redacted]arks

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Site	Keystone Steel & Wire Company	**Boring No.**	T-25B
	July 14, 1992	**Driller**	R. Edger/Fox Drilling
Logged by	M. Lytle	**Elevation**	450.0 ft.
Location	N 22,634.31 ft.; E 10,265.09 ft.	**Page** 2	**of** 5

Water Level	17.85				**Start**		**Finish**	
Time	7:45AM				**Time**	9:30AM	**Time**	12:15PM
Date	7-20-92				**Date**	7-14-92	**Date**	7-17-92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				20		
SS	2.0	1.1	7			Muddy sandy gravel, coarse pebbles, dark reddish brown (5 YR 3/4), wet, loose, poorly washed and sorted, slightly calcareous
			8	1		
			11			
			14	2		
SS	2.0	1.4	6			Muddy sandy gravel, coarse pebbles, as 20.0' above
			7	3		
			8			
			12	4		
SS	2.0	0.5	9			Muddy sandy gravel, coarse pebbles, yellowish brown (10 YR 5/6), wet, loose, poorly washed and sorted, slightly calcareous, rock in tip of spoon
			10	5		
			11			
			12	6		
SS	2.0	1.0	8			Muddy sandy gravel, as 24.0' above, abrupt contact at 26.2' with Peat, black (10 YR 2/1), moist, friable, noncalcareous, abrupt contact at 26.5' with muddy sandy gravel, as 24.0' above
			10	7		
			16			
			20	8		
SS	2.0	0.0	17			No recovery, large rock in tip of spoon
			12	9		
			15			
			24	30		
SS	2.0	0.7	13			Muddy sandy gravel, coarse pebbles, brown (10 YR 5/3), wet, loose, poorly washed and sorted, calcareous
			11	1		
			7			
			9	2		
SS	2.0	1.3	28			Muddy sandy gravel, as 30.0' above
			24	3		
			14			
			9	4		
SS	2.0	0.9	32			Muddy sandy gravel, as 30.0' above
			24	5		
			22			
			19	6		
SS	2.0	1.1	28			Muddy sandy gravel, as 30.0' above
			24	7		
			21			
			19	8		
SS	2.0	1.3	34			Muddy sandy gravel, as 30.0' above, abrupt contact at 38.5 with silt loam, gray (10 YR 5/1), wet friable, plastic, nonsticky, massive, laminated, calcareous
			32	9		
			9			
			9	40		

Remarks

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[redacted]	Keystone Steel & Wire Company	**Boring No.**	T-25B
[redacted]	July 14, 1992	**Driller**	R. Edger/Fox Drilling
Logged by	M. Lytle	**Elevation**	450.0 ft.
Location	N 22,634.31 ft.; E 10,265.09 ft.	**Page**	3 **of** 5

Water Level	17.85					**Start**	**Finish**	
Time	7:45AM				**Time**	9:30AM	**Time**	12:15PM
Date	7-20-92				**Date**	7-14-92	**Date**	7-17-92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				40		
SS	2.0	1.7	4			Silt loam, as 38.5' above, contact at 41.5' with silty clay loam, gray (N 5/), moist to wet, friable,
			4	1		plastic, sticky, massive, laminated with silt, calcareous
			4			
			6	2		
SS	2.0	2.0	3			Silty clay loam, as 41.5' above with silt laminations
			2	3		
			3			
			3	4		
SS	2.0	2.0	4			Silty clay loam, as 41.5' above with silt laminations and sand stringers, fine, calcareous
			6	5		
			8			
			7	6		
SS	2.0	2.0	2			Silty clay loam, as 41.5' above
			3	7		
			3			
			5	8		
SS	2.0	1.4	10			Silty clay loam, as 41.5' above, abrupt contact at 48.2' with sand, fine to medium,
			12	9		gray (10 YR 5/1), wet, loose, poorly washed and sorted, calcareous
			12			
			9	50		
SS	2.0	0.9	10			Muddy sandy gravel, coarse pebbles, gray (10 YR 5/1), wet, poorly washed and sorted,
			7	1		calcareous
			8			
			9	2		
				3		
SS	1.5	0.0	27			No recovery, rock in tip of spoon
			18	4		
			18			
				5		
SS	1.5	0.5	23	6		Muddy sandy gravel, coarse pebbles, as 50.0' above
			10			
			9	7		
				8		
SS	1.5	0.8	10			Muddy sandy gravel, as 50.0' above
			9	9		
			9			
				60		

Remarks Lost circulation at 52.0', also getting hole collapse.
Went to 2.5' sample intervals hoping hole will stay open.

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[redacted]
Keystone Steel & Wire Company
July 14, 1992
Logged by M. Lyde
Location N 22,634.31 ft.; E 10,265.09 ft.

Boring No. T-25B
Driller R. Edger/Fox Drilling
Elevation 450.0 ft.
Page 4 of 5

Water Level	17.85				Start		Finish	
Time	7:45AM				Time	9:30AM	Time	12:15PM
Date	7-20-92				Date	7-14-92	Date	7-17-92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				60		
SS	1.5	1.0	13, 12, 7	1		Muddy sandy gravel, as 50.0' above
				2		
				3		
SS	1.5	0.0	10, 7, 8	4		No recovery
				5		
SS	1.5	0.5	9, 8, 6	6		Pebbly gravel, wet, washed, poorly sorted, calcareous
				7		
				8		
SS	1.5	0.8	8, 8, 7	9		Pebbly gravel, as 65.5' above
				70		
SS	1.5	0.9	9, 10, 11	1		Pebbly gravel, as 65.5' above
				2		
				3		
SS	1.5	1.1	11, 10, 8	4		Pebbly gravel, as 65.5' above
				5		
SS	1.5	1.1	8, 10, 11	6		Pebbly gravel, as 65.5' above
				7		
				8		
SS	1.5	1.3	9, 8, 20	9		Pebbly gravel, as 65.5' above
				80		

[redacted]arks

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[redacted]

Keystone Steel & Wire Company
July 14, 1992
Logged by M. Lytle
Location N 22,634.31 ft.; E 10,265.09 ft.

Boring No. T-25B
Driller R. Edger/Fox Drilling
Elevation 450.0 ft.
Page 5 **of** 5

Water Level	17.85				Start		Finish	
Time	7:45AM				Time	9:30AM	Time	12:15PM
Date	7-20-92				Date	7-14-92	Date	7-17-92

SAMPLE TYPE	DRIVEN	RECOVERED	BLOWS (6")	DEPTH (ft.)	GRAPHIC	DESCRIPTION
				80		
SS	1.5	0.3	40	1		Silty clay loam, gray (10 YR 5/1), dry, hard, nonplastic, nonsticky, laminated, calcareous, contact at 80.7' with pebbly gravel, as 65.5' above
			33			
			35	2		
				3		
SS	1.5	1.2	34			Pebbly gravel, as 65.5' above
			24	4		
			13			
				5		
SS	1.5	0.8	14	6		Pebbly gravel, as 65.5' above
			17			
			20	7		
				8		
SS	1.5	1.2	13			Sand, fine to medium, trace pebbly, reddish brown (5 YR 5/3), wet, loose, poorly washed and sorted, calcareous
			37	9		
			50			
				90		
SS	1.0	1.0	37	1		Sand, as 88.0' above
			50/5			
				2		
				3		
SS	1.5	1.5	12			Sand, as 88.0' above
			12	4		
			39			
				5		Shale, black, fissile
				6		Bottom of Boring 95.5'
				7		
				8		
				9		
				100		

[redacted]marks

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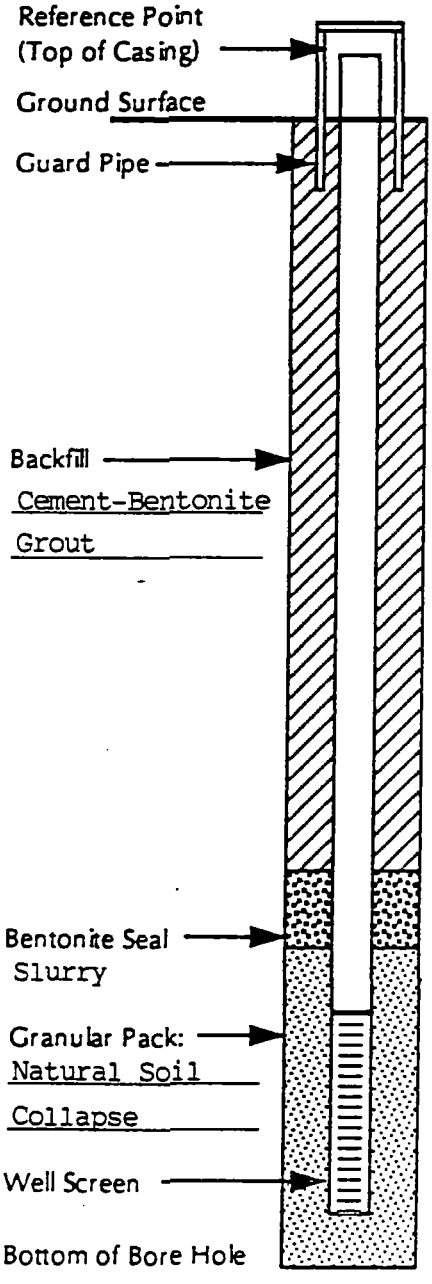
Well Completion Diagram

Well No. T-22A

Project: Keystone Steel & Wire Company
Time & Date: Started 11:00AM 4-17-92
Completed 1:00PM 4-17-92
Location: N 20,375.43'; E 11,281.86'

Installed By: Fox Drilling/G. Yocky
Inspected By: J. A. Duwelius



447.97 FT. (MSL)

445.40 FT. (MSL)

25.30 FT.

27.30 FT.

58.16 FT. 387.24 FT. (MSL)

68.56 FT. = 76.57 (Tot. Pipe) - 5.05' (Cut Off) - 0.39' (Bot. Blk.) - 2.57' (Stick)

72.00 FT.

Not to Scale

Drilling Method: Diedrich D-50
HSA 3 3/4" ID/ 7 1/4" OD and mud rotary

Screen:
Type 2" 304 Stainless Steel
Slot Size 10 slot
Top Blank 0.25' (Mid Blank 0.40')
Bottom Blank 0.39'
Total Screen 10.00'
Total Length 11.04'

Stand Pipe:
Type 2" 304 SS + Sch. 40 PVC
Total Length 5.02' + 60.51' = 65.53'

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Well Completion Diagram

Well No. T-22B

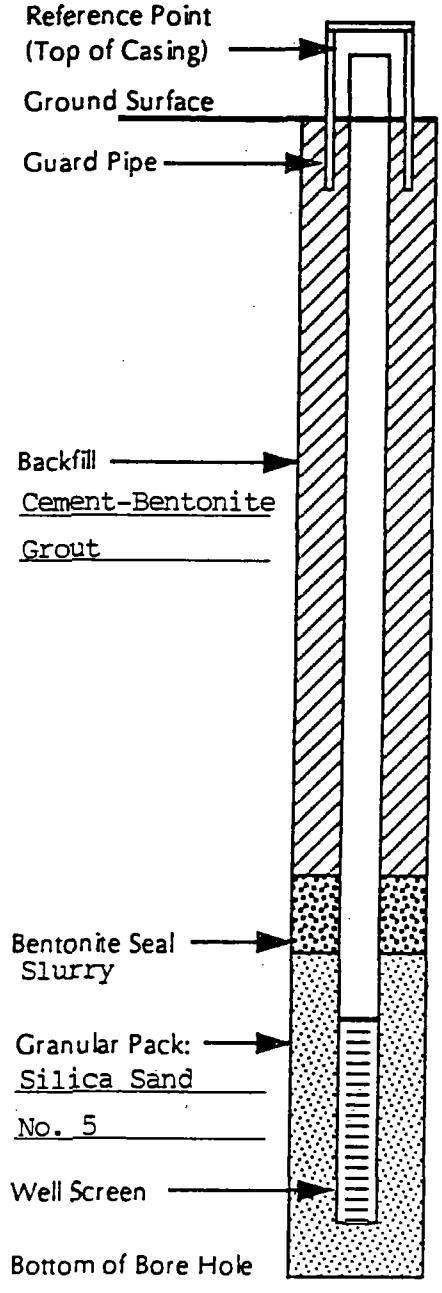
Project: Keystone Steel & Wire Company

Time & Date: Started 10:15AM 5-1-92
Completed 1:00PM 5-1-92

Location: N 20,381.49'; E 11,277.41'

Installed By: Fox Drilling/B. Crachy

Inspected By: J.A. Duwelius



447.37 FT. (MSL)

445.37 FT. (MSL)

104.00 FT.

106.00 FT.

108.93 FT. 336.44 FT. (MSL)

119.29 FT. = 126.13' - 4.49' - 0.35' - 2.00'
(Tot. Pipe - Cut Off - Bot. Blk. - Stick)

120.00 FT.

Drilling Method: ATV Diedrich D-50
HSA 3 3/4" ID/ 7 1/4" OD and mud rotary, 3 1/4" Tricone

Screen:
Type 2" 304 Stainless Steel
Slot Size 10 slot
Top Blank 0.13' (Mid Blank 0.38')
Bottom Blank 0.35'
Total Screen 9.98'
Total Length 10.84'

Stand Pipe:
Type 2" 304 SS + Sch. 40 PVC
Total Length 5.01' + 110.28' = 115.29'

Not to Scale

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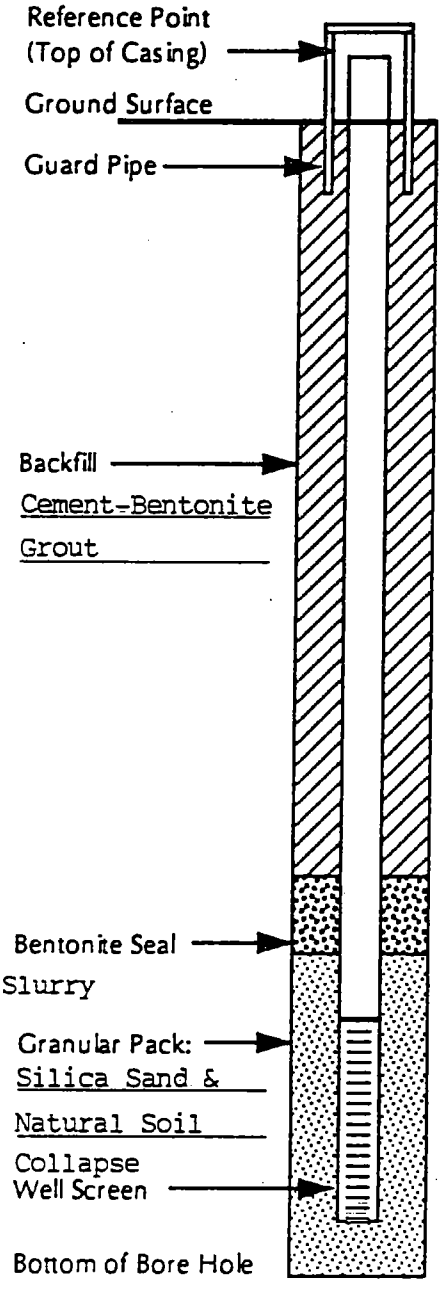
Well Completion Diagram

Well No. T-23

Project: Keystone Steel & Wire Company
Time & Date: Started 3:30PM 4-27-92
Completed 9:00AM 4-28-92
Location: N 22,451.96'; E 9,678.10'

Installed By: Fox Drilling/ G. Yocky
Inspected By: J.A. Duwelius



451.70 FT. (MSL)

449.20 FT. (MSL)

63.00 FT.

65.00 FT.

77.58 FT. 371.62 FT. (MSL)

87.59 FT. = 96.32' - 5.85' - 0.38' - 2.50'
(Tot. Pipe - Cut Off - Bot. Blk. - Stick)

87.60 FT.

Drilling Method: Diedrich D-50
HSA 3 3/4" ID/ 7 1/4" OD and mud rotary through 4" steel casing

Screen:
Type 2" 304 Stainless Steel
Slot Size 10 slot
Top Blank 0.25'
Bottom Blank 0.38'
Total Screen 10.01'
Total Length 10.64'

Stand Pipe:
Type 2" 304 SS + Sch. 40 PVC
Total Length 5.02' + 80.66' = 85.68'

Not to Scale

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Well Completion Diagram

Well No. T-24

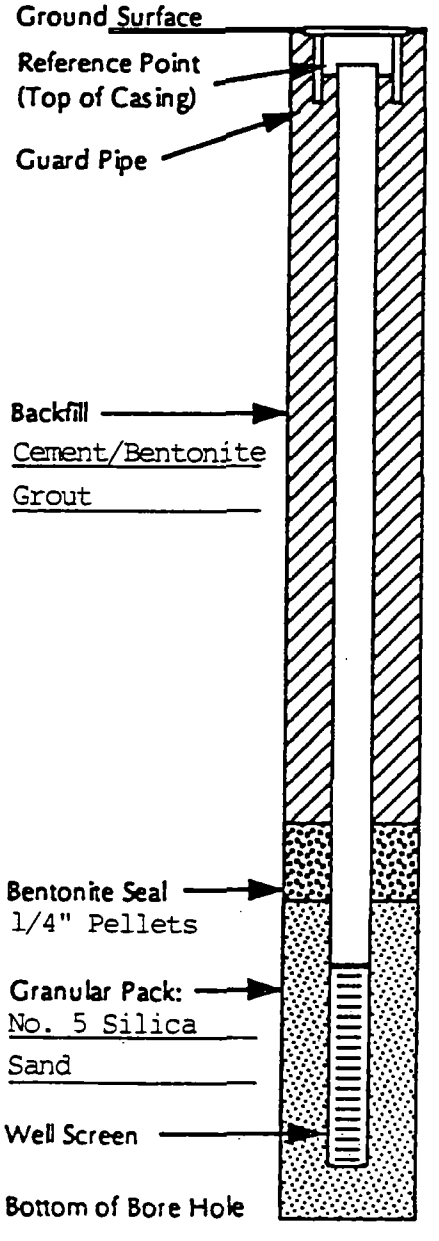
Project: Keystone Steel & Wire Company

Time & Date: Started 3:00PM 6-2-92
Completed 8:45AM 6-3-92

Location: N 20,928.39'; E 8,553.81'

Installed By: B. Crachy/Fox Drilling

Inspected By: J.A. Duwelius



455.86 FT. (MSL)

455.70 FT. (MSL)

Drilling Method: Diedrich D-50
3 3/4" ID / 7 1/4" OD HSA

Screen:
Type 2" 304 Stainless Steel
Slot Size 10 slot
Top Blank 0.26' (Mid Blank 0.38')
Bottom Blank 0.39'
Total Screen 4.99' + 4.97' = 9.96'
Total Length 10.99'

Stand Pipe:
Type 2" 304 SS + Sch. 40 PVC
Total Length 5.05' + 30.05' = 35.10'

25.00 FT.

27.00 FT.

28.65 FT. 427.21 FT. (MSL)

38.99 FT. = 46.09' (Tot. Pipe) - 6.87' (Cut Off) - 0.39' (Bot. Blk.) - (-0.16') (Stick)

40.40 FT.

Not to Scale

002.1

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Well Completion Diagram

Well No. T-25A

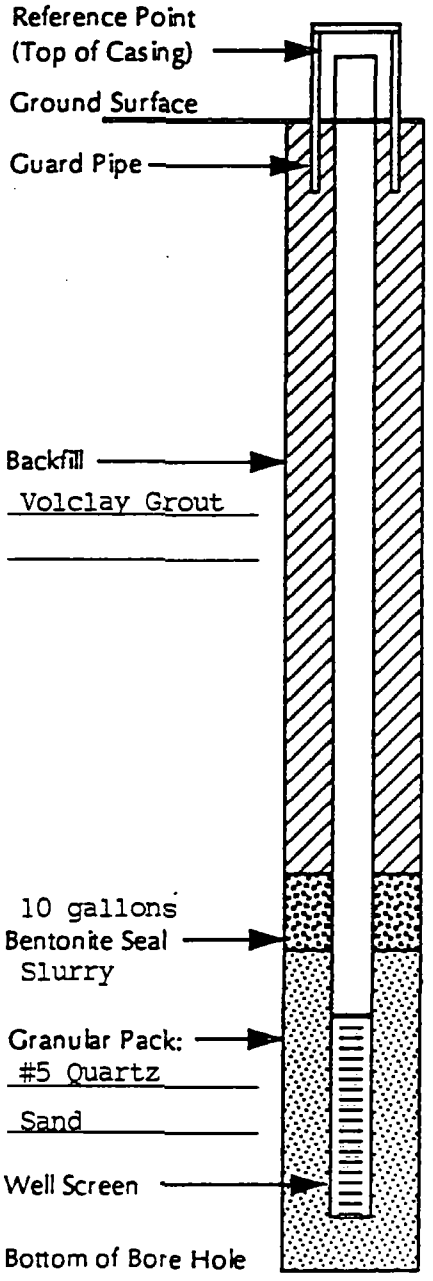
Project: Keystone Steel & Wire Company

Time & Date: Started 11:30AM 7-20-92
Completed 4:30PM 7-20-92

Location: N 22,635.24 ft.; E 10,257.07 ft.

Installed By: R. Edger/Fox Drilling

Inspected By: M. Lytle



Drilling Method: Mobile B-51 ATV
3 3/4" ID HSA

Screen:

Type 2" 304 Stainless Steel
Slot Size 0.010
Top Blank 0.24
Bottom Blank 0.37
Total Screen 4.99
Total Length 5.60

Stand Pipe:

Type 2" 304 SS + Sch 40 PVC
Total Length 5.0' + 35.30' = 40.30'

39.58 FT. = 45.90 (Tot. Pipe) - 3.40 (Cut Off) - 0.37 (Bot. Blk.) - 2.55 (Stick)

Not to Scale Water Level: 7-21-92 7:45AM 17.48

WW Engineering & Science
5010 Stone Mill Road
Bloomington, Indiana 47408 • (812) 336-0972
A Summit Environmental Group Company

Well Completion Diagram

Well No. T-25B

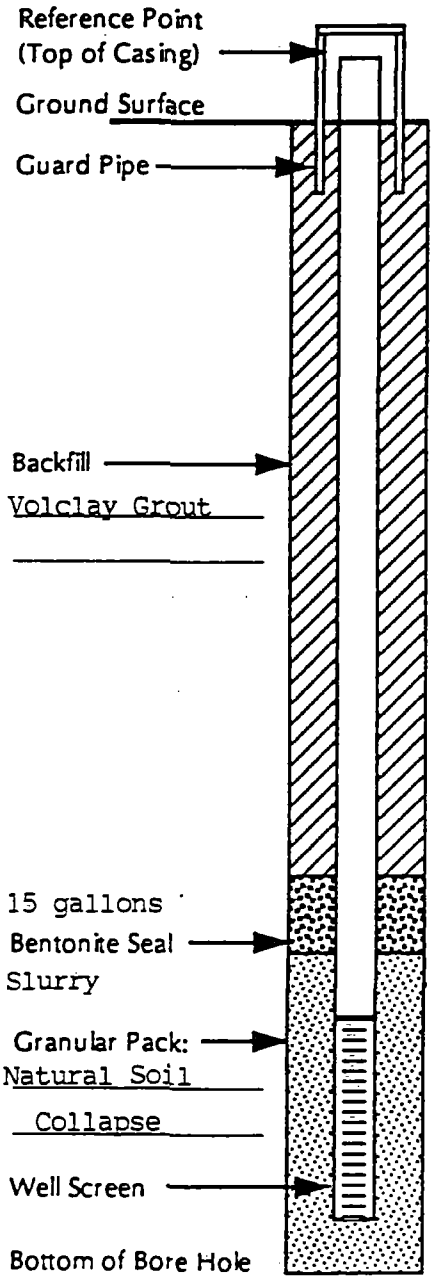
Project: Keystone Steel & Wire Company

Time & Date: Started 7-17-92 12:15PM
Completed 7-17-92 3:00PM

Location: N 22,634.31 ft.; E 10,265.09 ft.

Installed By: R. Edger/Fox Drilling

Inspected By: M. Lytle



453.54 FT. (MSL)

450.00 FT. (MSL)

67.00 FT.

70.00 FT.

89.11 FT. 360.89 FT. (MSL)

94.23 FT. = 101.23 (Tot. Pipe) - 3.21 (Cut Off) - 0.25 (Bot. Blk.) - 3.54 (Stick)

95.50 FT.

Drilling Method: 3 1/2" Rotary Wash
Mobile B-51 ATV

Screen:
Type 2" 304 Stainless Steel
Slot Size 0.010
Top Blank 0.13'
Bottom Blank 0.25'
Total Screen 5.12'
Total Length 5.50'

Stand Pipe:
Type 2" 304 SS + Sch 40 PVC
Total Length 5.0' + 90.73' = 95.73

Not to Scale

002