Project Completion Report

Revision No. 00

Modification to the Groundwater Extraction System and Abandonment of Production Wells

Naval Industrial Reserve Ordnance Plant

Fridley, Minnesota

Contract No. N62467-98-D-0995
Contract Task Order No. 0024

October 2001

PREPARED FOR

Department of the Navy, Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

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Submitted to:

U.S. Naval Facilities
Engineering Command
Southern Division

Prepared by:

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October 2001

CERTIFICATION OF TECHNICAL DATA CONFORMITY (SEPTEMBER 2001)

The contractor, CH2M HILL Constructors, Inc., hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-98-D-0995, Contract Task Order No. 0024 is complete and accurate and complies with all requirements of this contract.

DATE: 10/4/01

NAME AND TITLE OF CERTIFYING OFFICIAL:

Darrel Miller
Project Quality Control Manager

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Acronyms

ACRP	Anoka County Riverfront Park
ASTM	American Society for Testing Materials
bgs	below ground surface
CCI	CH2M HILL Constructors, Inc.
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
COD	Chemical Oxygen Demand
CTO	Contract Task Order
DFOW	Definable Feature of Work
gpm	gallons per minute
GWTF	Groundwater Treatment Facility
HAP	Hazardous Air Pollutants
MCES	Metropolitan Council of Environmental Services
MDH	Minnesota Department of Health
mg/L	milligrams per liter
ml/L	milliliters per liter
MPCA	Minnesota Pollution Control Agency
NIROP	Naval Industrial Reserve Ordnance Plant
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Unit
O&M	Operations and Maintenance
ppb	parts per billion
PPE	Personal Protective Equipment
ppm	parts per million
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SDS	State Disposal System
TCE	Trichloroethene
TtNUS	TetraTech NUS
UDLP	United Defense Limited Partnership
US EPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

Executive Summary

This report summarizes the remedial activities performed by CH2M HILL Constructors, Inc. (CCI) at the Naval Industrial Reserve Ordnance Plant (NIROP) in Fridley, Minnesota. This work was performed for Southern Division, Naval Facilities Engineering Command, under contract number N62467-98-D-0995, Contract Task Order 0024.

The remedial actions described in this report were completed to enhance the existing groundwater extraction system and to abandon unused production wells at NIROP Fridley. The scope of work included the following:

- Demolition of production wellhouse Buildings 12B and 12C
- Abandonment of unused water-supply production wells Numbers 2 and 3 (Unique Numbers 206695 and 234001)
- Abandonment of extraction wells AT-1A, AT-2, and AT-4
- Installation of extraction wells AT-7, AT-8, AT-9, and AT-10
- Placement of packer in existing extraction well AT-3A
- Electrical, civil, and mechanical/plumbing for newly installed extraction wells
- Groundwater Treatment Facility system startup
- Perform theoretical air emission calculations based on newly installed extraction wells
- Sampling and analysis for disposal characterization
- Disposal of generated wastes

The work was performed in accordance with the approved Work Plan and complied with all applicable federal, state, and local regulations, codes and standards. A final inspection of the areas was performed by the Navy Technical Representative and representatives of CCI. The work was determined to be satisfactory.

1.0 Introduction

CH2M HILL Constructors, Inc. (CCI) has been contracted by the Department of the Navy, Southern Division, Naval Facilities Engineering Command (SOUTHDIV), under Contract No. N62467-98-D-0995, Contract Task Order (CTO) 0024 to perform remediation activities at Naval Industrial Reserve Ordnance Plant (NIROP) in Fridley, Minnesota.

The purpose of this Project Completion Report is to document the completion of the well abandonments and well installations at NIROP Fridley. The work was performed in accordance with the following documents:

- Management approach outlined in the CCI *Contract Management Plan* (July 1998)
- CCI *Basewide Work Plan* Revision 00 (May 2000)
- CCI *Work Plan, Modification to the Extraction System and Abandonment of Production Wells, Addendum 1* Revision 00 (August 2000)

CCI provided project management, health and safety oversight and quality control. CCI's primary subcontractors were: (1) E.H Renner & Sons, who performed the well installation, well abandonment, and well packer placement and (2) Bay West, Inc (Bay West), who performed remedial services. Johnson Screen, Bráun Intertec Corporation, and EnChem, Incorporated provided geotechnical testing and/or analytical services under contract to E.H. Renner & Sons or Bay West. Waste Management provided disposal services for special waste soil. The Navy Technical Representative from the Navy's Environmental Field Activity (EFA) Midwest office provided oversight of field activities.

1.1 Document Organization

This Project Completion Report is organized into six sections and four appendices. A brief description of each section is presented below. Pertinent information not contained in the body of the report is contained in the appendices.

Section 1.0 Introduction includes a summary of the scope of the project, site setting, and regulatory framework for the work described in this report.

Section 2.0 Field Work Execution provides a summary of the activities undertaken during the performance of the work described in this report.

Section 3.0 Waste Management provides a summary of waste management activities, including waste collection, storage, characterization, transportation, and disposal.

Section 4.0 Health and Safety documents the implementation of the Site Safety and Health program during the performance of the work described in this report.

Section 5.0 Conclusions and Recommendations provides information on any conclusions and recommendations drawn by CCI during the performance of the work described in this report.

Section 6.0 References lists the references used in completing the work described in this report.

Pertinent information not contained in the body of this report is contained in the following appendices:

- Appendix A Notifications and Records
  - Appendix A1: Demolition Notification
  - Appendix A2: Borehole Sealing Records
  - Appendix A3: Well Abandonment Notifications and Sealing Verifications
  - Appendix A4: Well Abandonment Records
  - Appendix A5: Extraction Well Installation Notifications and Construction Verifications
  - Appendix A6: Extraction Well Installation Records
- Appendix B Boring Logs and Pump Test Data
  - Appendix B1: Gamma Logs
  - Appendix B2: Report of Subsurface Borings and Borehole Logs
  - Appendix B3: Extraction Well Logs
  - Appendix B4: Pump Test Data for Extraction Wells – AT-7, AT-8, AT-9, & AT-10
  - Appendix B5: AT-3A Pump Test Data
- Appendix C Analytical Results
  - Appendix C1: Asbestos Analytical Data
  - Appendix C2: Lead Based Paint Analytical Data
  - Appendix C3: Sieve Analyses Analytical Data
  - Appendix C4: Waste Soil Analytical Data Summary
  - Appendix C5: Waste Liquids Analytical Data Summary
  - Appendix C6: Chain of Custody Forms
- Appendix D Waste Disposal Documentation
  - Appendix D1: Waste Log
  - Appendix D2: Waste Soil Profile
  - Appendix D3: Waste Soil Manifest
  - Appendix D4: Construction Debris Truck Tickets
- Appendix E As-built Drawings, Air Emission Calculations, and Operation & Maintenance Manual
  - Appendix E1: As-Built Drawings
  - Appendix E2: Packer Assembly Details for AT-3A
  - Appendix E3: Air Emission Estimates Memo
  - Appendix E4: Operation & Maintenance Manual for Pumps
- Appendix F Representative Project Photographs

1.2 Project Scope

The scope of work for the project consisted of the following activities:

- Mobilization

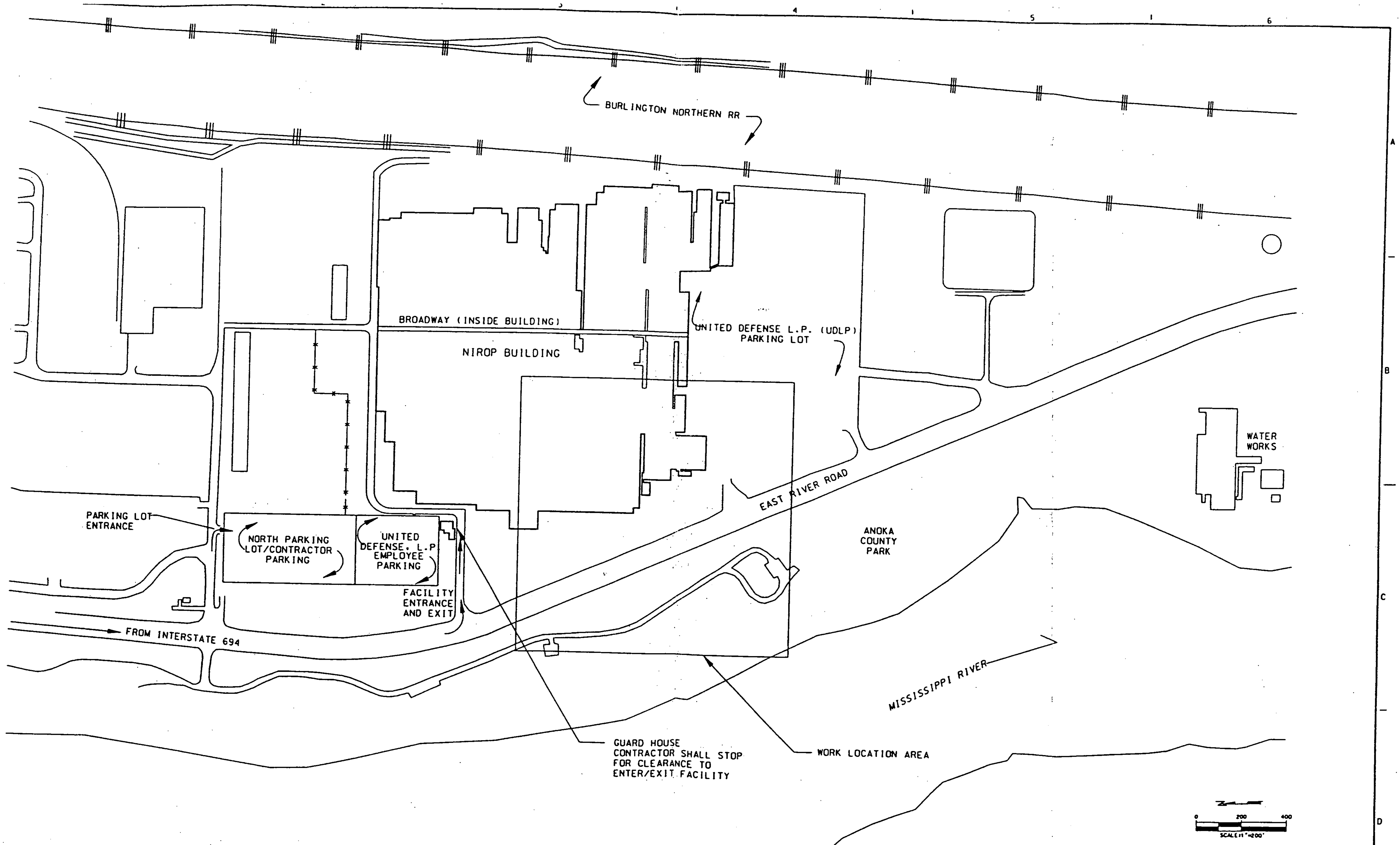
- Demolition of production wellhouse Buildings 12B and 12C
- Abandonment of extraction wells AT-1A, AT-2, and AT-4
- Abandonment of unused water-supply production wells Numbers 2 and 3 (Unique Numbers 206695 and 234001)
- Installation of extraction wells AT-7, AT-8, AT-9, and AT-10
- Placement of packer in extraction well AT-3A
- Electrical, civil, and mechanical/plumbing for newly installed extraction wells
- Groundwater treatment facility (GWTF) system startup
- Perform theoretical air emission calculations based on newly installed extraction wells
- Sampling and analysis of soil for disposal characterization
- Disposal of generated wastes
- Restoring disturbed areas
- Demobilization

1.3 Site History

NIROP Fridley is located near the twin cities of Minneapolis and St. Paul, Minnesota. As shown in Figure 1-1, the site is approximately 1,000 feet east of the Mississippi River and less than 1 mile south of Interstate 694. It lies on a broad, flat outwash terrace, and is largely covered by pavement, structures, and other facilities. Out of the total plant size of 138 acres, the federal government owns 83 acres, which are operated by United Defense. The remaining 55 acres are owned and operated by United Defense. Figure 1-1 also shows the layout of the facility and the existing monitoring wells and extraction wells.

The Record of Decision (ROD) for groundwater remediation at the NIROP Fridley site was signed in September 1990 by representatives of the U.S. Navy (Navy), the United States Environmental Protection Agency - Region V (US EPA), and the Minnesota Pollution Control Agency (MPCA). The remedial action in the ROD specified hydraulic containment and recovery of all future migration of contaminated groundwater from the NIROP Fridley and the recovery, to the extent feasible, of contamination downgradient of the NIROP Fridley site. The selected remedy included the installation and operation of groundwater extraction wells, with a two-phased plan for disposal of groundwater from the well extraction system. It was planned at that time, that contaminated groundwater located off site and downgradient of the NIROP Fridley site in Anoka County Riverfront Park (ACRP) would be allowed to naturally dissipate. However, this plan is currently under review.

Under the Phase I Plan, groundwater from the extraction system would be discharged to an existing sanitary sewer with treatment provided at a local wastewater treatment facility. Under the Phase II Plan, a groundwater treatment facility (GWTF) would be constructed and operated at the NIROP to provide long-term groundwater treatment. Treated



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CH2MHILL

NIROP FRIDLEY
GROUNDWATER EXTRACTION SYSTEM
FRIDLEY, MINNESOTA

SITE PLAN

SHEET	6
DWG	FIGURE 1-1
DATE	FEB 2001
PROJ	153691.31.01.03.30

FILENAME: d153691c001.dgn PLOT DATE: 22-FEB-01 groundwater from the on-site groundwater treatment facility would then be discharged to the Mississippi River via a National Pollutant Discharge Elimination System (NPDES)/ Metropolitan Council of Environmental Services (MCES) State Disposal System (SDS) storm sewer discharge permit.

A groundwater extraction and treatment system was constructed based on design documents approved by the USEPA and the MPCA. Construction of the original groundwater extraction system included the installation of four extraction wells (AT-1A, AT-2, AT-3A, and AT-4) and a specific capacity test on each of these extraction wells to determine sustainable pumping rates in each well. Additional analysis, which included groundwater sampling and analysis indicated that groundwater pretreatment was required prior to discharge to the sanitary sewer owned by the MCES to meet discharge limits set by the MCES. As a result, a pretreatment system was also constructed at the NIROP Fridley site for use during the interim Phase I discharge to the sanitary sewer.

The groundwater extraction system and pretreatment facilities began operating in September 1992. Monitoring of the extraction system performance and groundwater via an extensive monitoring well network has been performed since startup according to the procedures described in the Remedial Action Work Plan for Groundwater Remediation, which was approved by the MPCA and the USEPA. The latest version of this plan was issued in January 2000.

As required by the ROD, an evaluation of the effectiveness of the groundwater extraction system in achieving hydraulic containment of contaminated groundwater from the site during the initial 90-day operating period was submitted to the USEPA and the MPCA in December 1992. The document concluded that additional groundwater extraction well(s) would be needed to achieve effective capture and hydraulic containment of contaminated groundwater. A work plan for upgrading the original groundwater extraction system was prepared and approved by the USEPA and the MPCA. As provided in that work plan, two additional extraction wells (AT-5A and AT-5B) were constructed and were placed into operation in June 1995. The combined groundwater extraction system, consisting of six extraction wells, is currently in operation.

The concentrations of trichloroethene (TCE) and other volatile organic compounds (VOCs) in the combined discharge from the extraction wells have decreased as much as two orders of magnitude since startup of the system in 1992. The concentrations decreased to levels where pretreatment of the groundwater was no longer necessary to comply with the MCES discharge criteria of March 1995, and the combined discharge from the extraction wells was discharged directly to the sanitary sewer from March 1995 to December 10, 1998.

Construction of the Phase II onsite groundwater treatment facility began in September 1997 and was completed and operating in December 1998. When the onsite treatment facility was placed into operation, discharge to the MCES sanitary sewer system was terminated. The combined discharge from the extraction system is now fed through a feed system and air stripping units for treatment before the effluent groundwater is discharged to the Mississippi River through Outfall 020 (NPDES/SDS Permit MN0000710). The effluent discharge is monitored to ensure that the NPDES/SDS requirements are met.

1.4 Regulatory Framework

The installation and construction actions were conducted pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). A ROD for implementation of a groundwater remediation system was signed in 1990 by representatives of the U.S. Navy, US EPA - Region V, and the MPCA.

Installation of extraction wells and abandonment of production wells was performed by a state-licensed well contractor. All drilling and well installations conformed to Minnesota Department of Health (MDH) Rules, Chapter 4725, Wells and Borings. Well sealing notifications were submitted to the MDH prior to abandoning the production wells. Upon completion of well abandonment, copies of well sealing records were submitted to the MDH.

2.0 Field Work Execution

2.1 Definable Features of Work

The work performed at the site is described using 10 definable features of work (DFOW). Each DFOW is described in the following sections.

- Mobilization and site preparatory work
- Demolition of production wellhouse Buildings 12B and 12C
- Abandonment of extraction well AT-1A, AT-2, and AT-4
- Abandonment of unused water-supply production wells Number 2 and Number 3 (Unique Numbers 206695 and 234001
- Installation of extraction wells AT-7, AT-8, AT-9, and AT-10
- Placement of packer in extraction well AT-3A
- GWTF startup
- Theoretical air emission calculations based on newly installed extraction wells
- Sampling and analysis for disposal characterization
- Site restoration and demobilization

2.2 Mobilization and Site Preparatory Work

Upon CCI approval of all required submittals, the subcontractor mobilized all resources necessary to efficiently and completely perform this scope of work task. The resources included, but were not limited to, personnel, equipment, materials, supplies, lower-tier Subcontractors, and support facilities (e.g., project support trailer, decontamination facilities, waste containment facilities, material and equipment storage, cellular phones, water, portable sanitary facilities, etc.) to support the work activities at the site.

Site preparatory work was the first physical activity at the site and involved the staging of material and equipment, demarcation of work zones and identification and location of utilities. Site preparation also included moving designated materials to provide access for excavation operations. Temporary barricades and caution signs were provided around the work areas.

Coordination and scheduling of work activities with the various plant operations were also addressed during site preparation. Since the facility remained active throughout the duration of the work, the work areas were arranged to minimize disruption of the ongoing operations.

2.3 Demolition of Production Wellhouse Buildings

Prior to demolition of Buildings 12B and 12C , a Notification of Intent to Perform a Demolition was filed with the MPCA. A copy of the Notification is provided in Appendix A. Prior to demolition of Buildings 12B and 12C, the following utility work was performed:

- Samples of paint and roof material were collected and analyzed for lead and asbestos (see Section 2.9 for details).
- 480V electrical power to south well building was disconnected.
- The 480V feeder in Building 12A was cut and conductors between Building 12A and the south well building were removed.
- The 480 V conductors feeding the north well building were removed.
- The 240V conductors at the panel located in the main building were removed, and the 240V/120V panel in the pump building was disconnected.
- The photo switch from the south well building was removed and saved.

The brick buildings enclosing the production wells 2 and 3 were demolished and all generated material was managed and disposed of as discussed in Section 3.0. During the demolition operations, the generation of dust, mist, and particulate matter was minimized. Dust was controlled by wetting with a mist of water.

The two floor slabs (measuring approximately 8ft x 12ft x 6inches) under Buildings 12B and 12C were removed. The area was excavated to uncover two 12-inch water lines and a blind flange was installed. Additionally, the area was also excavated to uncover two 1-inch steam lines, and a blind flange was installed. The excavated area was backfilled and restored.

United Defense Limited Partnership (UDLP) requested that a 10-inch butterfly valve inside Building 12A be removed and the water line be blind flanged. During the field work at this location, it was discovered that an incorrect valve was identified. UDLP fixed the valve and it was decided that UDLP would install the required blind flange at the appropriate valve.

2.4 Abandonment of Production Wells and Extraction Wells

The abandonment of production wells No. 2 and 3 and extraction wells No. AT-1A, AT-2, AT-4 was performed in accordance with applicable federal, state and local laws and regulations.

The abandonment of all wells was performed by E.H. Renner & Sons, a state-licensed well contractor (License #71015). All well abandonment conformed to Minnesota Department of Health (MDH) rules and regulations. A well sealing notification was submitted to the MDH prior to abandoning the extraction and production wells. Upon completion of well abandonment, copies of well sealing records were submitted to the MDH. A copy of the well sealing notification and well sealing records is provided in Appendix A.

Prior to abandoning the wells, all pumps and accessories in the wells were removed. The wells were abandoned by filling the casing from the bottom to the surface with neat cement.

Upon completion, the abandoned wells were checked for 48 hours to determine whether curing was occurring properly. Specific curing specifications and/or quality assurance checks recommended by the manufacturer were followed.

2.5 Installation of Extraction Wells

Prior to installation of extraction wells AT-7, AT-8, AT-9, and AT-10, a test boring was performed for each of the extraction wells at the specified location to collect lithologic information. Each well location was surveyed prior to well installation.

Borehole diameters were a minimum of 4-inches larger than the outside diameter of the casing and well screen. The installed extraction wells were plumb within 1 degree of vertical where the water level was greater than 30 feet below land surface (bls). A single-shot declination tool was used to demonstrate plumbness.

Borings were completed by American Engineering Testing, Incorporated, a state-licensed well contractor (License #M0171). The borehole for extraction well AT-7 was completed using a hollow stem auger to a depth of 24 feet and mud rotary drilling to a final depth of 37 feet. The borehole for extraction well AT-8 was completed using a hollow stem auger to a depth of 24 feet and mud rotary drilling to a final depth of 36 feet. The borehole for extraction well AT-9 was completed using a hollow stem auger to a depth of 24 feet and mud rotary drilling to a final depth of 85.5 feet. The borehole for extraction well AT-10 was completed using a hollow stem auger to a depth of 54 feet and mud rotary drilling to a final depth of 84.5 feet.

Summit Envirosolutions performed gamma logging of the boreholes to determine subsurface geology information. This information was used to select the placement of the well screens at each location. Upon completion of the gamma logging, all boreholes were grouted to land surface with bentonite. Well and Boring Sealing Records were submitted to MDH. Copies are provided in Appendix A.

Extraction wells AT-7, AT-8, AT-9 and AT-10 were completed using mud-rotary methods. The drilling mud.was composed of 100 percent sodium bentonite. Extraction well AT-7 extended 38 feet 6 inches, AT-8 extended 37 feet 6 inches, AT-9 extended 51 feet 6 inches, and AT-10 extended 83 feet 10 inches. Well and Boring Sealing Records as well as Construction Verification Forms were submitted to MDH. Copies are provided in Appendix A.

All well casings were new, constructed of carbon steel and were straight and plumb. Well screens were factory slotted and sized to prevent 90 percent of the filter pack from entering the well. In wells where no filter pack was used, the screen slot size was such that 60 to 70 percent of the formation materials was retained within the screened zone. The bottom of the screens were capped and the cap was joined to the screen by threads.

The annular space in each well was filled with a filter pack, a bentonite seal, and casing grout between the well string and the borehole wall. The filter pack consisted of formation materials and extended from the bottom of the hole to at least 2 feet above the top of the well screen. After the filter pack was emplaced, the well was surged with a surge block for 10 minutes. The top of the sand pack was sounded to verify its depth during placement. Additional filter pack was placed as required to return the level of the pack to 2 feet above the screen. As the annular space was being filled, the well string was centered and suspended so that it did not rest on the bottom of the hole. For extraction well AT-10, two centralizers were used; one at the bottom and one at the top of the screen.

2.5.1 Well Sealing Methods

The bentonite seal in each extraction well consisted of at least 2 feet of bentonite between the filter pack and the casing grout. The bentonite was hydrated before placement and was installed by tremie pump methods. Only 100 percent sodium bentonite was used.

The casing grout in each extraction well extended from the top of the bentonite seal to the ground surface. The grout was mixed in the following proportions: 94 pounds of neat Type I Portland cement, no more than 4 pounds of 100 percent sodium bentonite powder, and no more than 8 gallons of potable water. All grout was pumped using a side-discharge tremie pipe, and continued until 20 percent of the grout was returned to the surface to ensure that the grout job was placed properly and surface contaminants did not enter the annulus. The excess grout (20 percent) was removed and cleaned from the site prior to installing the surface pad.

Completed wells were seated in a 3-foot by 3-foot by 4-inch concrete surface pad that was reinforced with ¼-inch-diameter steel reinforcing bars. The pad was sloped away from the well sleeve and a lockable lid was installed on the guard pipe. The identity of the well was permanently marked on the electrical control box and the protective sleeve. Four 3-inch diameter concrete-filled steel guard posts were installed around each well. The guard posts were 5 feet in total length and installed radially from each well head. The guard posts were recessed approximately 2 feet into the ground and set in concrete. All wells were secured with corrosion-resistant locks.

Installed extraction wells were developed no sooner than 24 hours after installation to allow for grout curing. Wells were developed by pumping until the suspended sediment content of the water was less than 0.75 milliliters per liter (ml/L), as measured in an Imhoff® cone according to EPA method E160.5; the turbidity remained within a 10 nephelometric turbidity unit (NTU) range for at least 4 hours, and the design pumping rates were maintained.

All development equipment was decontaminated as described in the Site Specific Health and Safety Plan. Characterization, management, and disposal of generated development water was performed in accordance with the approved *Modification to the Extraction System and Abandonment of Production Wells Work Plan, Addendum 1* [CCI, 2000].

2.5.2 Step Draw-down Testing

Step draw-down testing was conducted in each extraction well. Pumping was maintained at a constant rate ($\pm$ 10 percent) for at least 3 hours at specified pumping rates for each 1-hour interval.

Water levels in the extraction wells were measured and recorded during each step every minute for the first 10 minutes and every 5 minutes for the following 50 minutes. A separate access tube set to a point 2 feet above the pump intake was used for measuring water levels.

The specified pumping rates were maintained for wells having sufficient capacity to produce at those rates for the required time periods. For those wells where the pumping rate could not be maintained prior to completion of each 1 hour time step, subsequent steps at higher rates were not be attempted. Instead, the flow rates were reduced until the water level (while pumping) stabilized at least 2 feet above the pump intake, and the test was continued for 1 hour.

Based on the results of the step-draw-down testing, the approximate sustainable capacity of each extraction well was determined and each extraction well was pumped at the chosen rate for 4 hours following full recovery after the step-draw-down test. A water level measurement was taken and recorded at time intervals specified in the step-draw-down testing. A copy of the step-draw-down testing for each of the extraction wells is included in Appendix B.

Sand content was measured at hourly intervals from a sample of water representative of the entire flow in the pump discharge line from each well. Average sand content over 4 hours did not exceed 2 milligrams per liter (mg/L).

Table 2-1 provides the size of extraction wells, size and length of screen, and pumping rates for each of the extraction wells. Well documentation records and borehole logs are located in Appendix B.

TABLE 2-1
Details of Extraction Wells

Extraction Well No.	Approximate Location	Well Diameter (inches)	Pumping Rate (gpm)	Well Depth (feet - bgs)	Screen Interval (feet – bgs)	Screen Slot Size (inch)
AT-7	Next to cluster MS-35	8	50	38.5	28.5 - 38.5	0.010
AT-8	Next to cluster MS-34	8	15	37.5	27.5 – 37.5	0.013
AT-9	Adjacent to well 6D	8	150	51.5	34.5 – 51.5	0.014
AT-10	Between wells 12I and 13I	8	20	83.83	65-81	0.010

NOTES:
bgs – below ground surface
gpm – gallons per minute

2.6 Placement of Packer in Extraction Well AT-3A

A durable stainless steel-reinforced permanent formation packer assembly was installed in extraction well AT-3A to pack the screened interval from approximately 124.8 feet to 105 feet. The pump intake pipe was set in the center of the remaining screened interval of 105 feet to 69.4 feet. The packer was designed and placed by E.H. Renner & Sons, a state-licensed well contractor (License #71015). A copy of packer assembly is included in Appendix B.

The pump was adjusted to achieve maximum sustainable pumping rate with the reduced screened interval based on the following procedure:

- Start by pumping at the design pumping rate.
- Pump for 10 to 15 minutes, or until too much draw-down is observed. Too much draw-down will be defined as having the groundwater elevation fall below the top of the well screen.
- If too much draw-down is not observed, the test will be over after the 10- to 15-minute time period and the original pump will be permanently installed in the middle of the remaining screened interval.
- If too much draw-down is encountered, reduce flow by approximately 10 percent and measure the affect of reduced pumping on draw-down.
- Reduction in flow by 10 percent increments will continue until the depth to groundwater stabilizes at an elevation above the top of the screen for a 10- to 15-minute time period. Once this objective has been achieved, the test will be finished.

The pump is now set at 183 gpm based on the above procedure. A copy of the test results and recommendations of E.H. Renner & Sons, who performed the above test is included in Appendix B. A new pump for AT-3A will not be installed until the existing pump fails.

2.7 GWTF Startup

Prior to startup of the GWTF, all requirements for electrical, civil, mechanical/plumbing, and piping and instrument design (P&ID) to connect the newly installed extraction wells (AT-7, AT-8, AT-9, and AT-10) were performed in accordance with the as-built drawings provided in Appendix E.

The software/hardware system used for the operation of the GWTF was upgraded as follows:

- Upgraded the existing PC hardware to the most advanced, industry-standard workstation equipped with a recordable CD.
- Upgraded the operating system from Windows NT® to Windows 2000®.
- Upgraded the SCADA software from Fix32 to Dynamics version.
- Upgraded PC Anywhere® software for remote access.
- Installed Intellution IFIX HMI Pak Unlimited Development Version 2.21
- Installed ABR Allen Bradley RS Linx Ver 7.X.
- Installed RS Linx for Windows NT (Rockwell Software) Version 2.10.18.

A startup test was performed in the presence of CCI to demonstrate and confirm that the modifications made to the GWTF met the performance requirements specified in the Operations and Maintenance (O&M) Manual. Startup of entire facility was considered complete when the facility had operated for 5 continuous days without significant interruption.

2.8 Air Emission Calculations

An assessment of previously developed air emission calculations was performed to estimate the maximum potential air emissions from the GWTF. This assessment was performed to determine if the changes would trigger any regulatory and/or permit requirements and to determine if the estimated emissions from the system would remain below the calculated site-specific, allowable emission rates for each of the individual hazardous air pollutants (HAPs) of concern. A copy of this assessment is included in Appendix E.

Based on these calculations, it is not anticipated that any additional regulatory and/or permitting will be required and it is recommended that this system continue to operate under the guidelines determined by the MPCA. Quarterly actual emissions estimates required by MPCA operating guidelines will still need to be provided to MPCA by the Navy.

2.9 Sampling and Analysis

Sampling, sample handling and storage, chain-of-custody, shipment, and sample analyses were performed in accordance with the procedures provided in the Quality Assurance Project Plan (QAPP) included in the *Remedial Action Work Plan, June 2000, Rev. 6*, developed by TetraTech NUS for NIROP Fridley, Minnesota.

Prior to demolition of pumphouse Buildings 12B and 12C, samples of paint were collected from inside the buildings and analyzed for total lead at Braun Intertec Corporation. Analytical results showed the levels of lead to be 0.11 to 0.16 percent by weight, which is below the MPCA action level of 0.5 percent. Samples of building roofing material were also collected and analyzed for asbestos content. Analytical results revealed no detectable levels of asbestos in the roofing material. The building debris was classified as demolition debris.

Analytical results for lead and asbestos testing are provided in Appendix C.

Sieve analyses were performed by U. S. Filter for each extraction well to determine the proper screen size. Analyses showed the proper screen size for extraction wells AT-7 and AT-10 to be 0.10 slot screen, AT-8 to be 0.013 slot screen, and AT-9 to be 0.014 slot screen. Sieve analysis data are provided in Appendix C.

Waste characterization samples were collected to evaluate the handling, transportation, and disposal requirements of wastes (soil and water) generated during extraction well installation activities.

Soil, decontamination water, and quality control samples were collected using disposable sampling equipment in accordance with procedures outlined in the *Remedial Action Work Plan* [TetraTech, 2000]. Analytical parameters for soil samples collected for disposal characterization and combined decontamination and well development water were based on disposal facility requirements. The soil sample collected for disposal characterization was collected using a stainless steel hand auger from a roll-off container. After the decontamination and well development water was combined in the temporary storage tank, one water sample was collected. The soil and water samples were shipped to EnChem, Inc. for analysis. Analytical results of the soil sample revealed no hazardous constituents and the soil was classified as special waste. Results of the water sample also revealed no hazardous constituents and the water was discharged to the on-site GWTF for treatment and disposal.

Analytical results are presented in Appendix C. A summary of waste characterization and disposal documentation is presented in Appendix D.

2.10 Site Restoration and Demobilization

Pavement that was cut and removed during construction was replaced. The replaced pavement and base course material conformed to existing construction.

Areas requiring seeding were restored by placing 6 inches of topsoil to match existing grades and slopes. The topsoil was uniform in quality and gradation and was free of roots, sod, weeds, and stones larger than 2 inches.

After topsoil placement was completed, the surface was raked and native grass seed was applied. The areas were then mulched.

Asphalt was placed over designated compacted backfill areas. The bituminous asphalt mix was consistent with the material currently present at the site. After placement, the mixture was thoroughly and uniformly compacted by rolling.

Upon completion of the work at each location, all field equipment, temporary facilities, and other miscellaneous items (e.g., barricades, caution tapes and signs) resulting from or used in the field operations, were removed

Personnel and equipment were decontaminated prior to leaving the area to avoid the possibility of inadvertently spreading contamination. Equipment was decontaminated to remove all contamination that may have adhered to the equipment components as a result of the remedial action. Decontamination was performed in accordance with the approved *Modification to the Extraction System and Abandonment of Production Wells Work Plan, Addendum 1* [CCI, 2000] and the applicable provisions of 29 Code of Federal Regulations (CFR) 1910.120.

3.0 Waste Management

The following types of waste were generated during the remedial activities:

- Soil, concrete and gravel
- Decontamination/well development water
- Disposable personal protective equipment

All wastes were handled, stored, transported, and disposed of in accordance with the approved *Modification to the Extraction System and Abandonment of Production Wells Work Plan, Addendum 1* [CCI, 2000] and all applicable federal, state and local waste management regulations. The wastes were characterized in accordance with the requirements of 40 CFR 261 using generator knowledge of the materials and sample analytical results.

Four truckloads of material from the demolition of pumphouse Buildings 12B and 12C were transported to Murlowski Properties, Inc. in New Brighton, Minnesota, for disposal as construction debris. Although the lead analysis of the paint showed the paint itself to be hazardous, the debris was not classified as such since the concentration of lead over the mass did not exceed hazardous levels.

Removed soil, concrete and PPE were placed in one roll-off container and transported to Waste Management, Elk River Landfill, Inc., in Elk River, Minnesota, for disposal as non-hazardous special waste. A total of 7 cubic yards of soil, concrete and PPE were disposed of as special waste.

All excavated soil generated during trenching for installation of piping and electrical was used as backfill material. Excavated soil was stockpiled on-site at CCI-designated locations. Stockpiled soils were placed on and covered by two layers (10 mil each) polyethylene sheeting and provided with erosion control devices.

Water generated from the step-draw-down and constant rate tests and decontamination water was contained in portable holding tanks prior to being discharged to the on-site GWTF for treatment and disposal. A total of 27,205 gallons of water was discharged to the GWTF. The subcontractors provided polyethylene sheeting and temporary berming materials for the temporary storage tank. The containment/storage area was maintained, and damaged lining material were replaced when observed. Daily inspections of the containment/storage area were performed to verify there were no ruptures to containers or other conditions that could result in a release, and to ensure all containers were properly labeled, with labels visible, and to maintain good housekeeping.

Prior to scheduling any waste shipment, a waste disposal approval package for each waste stream was submitted to the on-site Navy technical representative. The package included a waste profile naming NIROP Fridley as the generator of the waste, analytical summary tables applicable to the waste, and a completed waste manifest. Shipping papers for all waste streams were prepared in accordance with regulations established in 49 CFR 172. Waste disposal documentation is located in Appendix D.

All miscellaneous office waste and general non-contaminated construction debris (such as caution tapes, barricades, signs, packing materials) were disposed of as special waste with accumulated soil.

A log of all generated wastes was maintained at the site. A copy of the waste log is included in Appendix D.

4.0 Health and Safety

The Site-Specific Health and Safety Plan, provided in Appendix B of the approved *Modification to the Extraction System and Abandonment of Production Wells Work Plan, Addendum 1* [CCI, 2000] was satisfactorily implemented during the remedial action at NIROP Fridley. Daily tailgate safety meetings were conducted prior to the start of field work. In addition, weekly safety inspections were performed by CCI.

5.0 Conclusions and Recommendations

The installation and construction actions were conducted in accordance with CERCLA and the ROD for implementation of a groundwater remediation system signed in 1990 by representatives of the U.S. Navy, US EPA - Region V, and the MPCA.

The installation of extraction wells and abandonment of wells were performed by a state-licensed well contractor. All drilling and well installations conformed to established MDH rules. Well sealing notifications were submitted to the MDH prior to abandoning the wells, and upon completion of well abandonment, copies of well sealing records were submitted to the MDH.

The work was performed in accordance with the approved *Work Plan* and complied with all applicable federal, state, and local regulations, codes and standards. A final inspection of the areas was performed by the Navy Technical Representative and representatives of CCI. The work was determined to be satisfactory.

It is recommended that quarterly actual emissions estimates required by MPCA operating guidelines be provided to MPCA by the Navy. It is also recommended that the system continue to operate as it is currently being operated. However, Navy should consider operating the system via remote means to reduce the long-term operating costs.

6.0 References

U.S. Army Corps of Engineers. September 1996. *Safety and Health Requirements Manual*, EM 385-1-1.

CH2M HILL Constructors, Inc. July 1998. *Contract Management Plan*, U.S. Naval Facilities Engineering Command Southern Division. Contract Number N62467-98-D-0095

CH2M HILL Constructors, Inc. May 2000. *Basewide Work Plan*. Naval Industrial Reserve Ordnance Plant Fridley, Fridley, Minnesota.

TetraTech NUS. June 2000. *Remedial Action Work Plan, Rev. 6*, Naval Industrial Reserve Ordnance Plant, Fridley, Minnesota.

CH2M HILL Constructors, Inc. August 2000. *Modification to the Extraction System and Abandonment of Production Wells Work Plan, Addendum 1*. Naval Industrial Reserve Ordnance Plant Fridley, Fridley, Minnesota.

Appendix A

Notifications and Records

Appendix A1

Demolition Notification

Minnesota Pollution Control Agency

Minnesota Pollution Control Agency
Notification of Intent to Perform a Demolition

Type of Notification: [x] Original [ ] Amended [ ] Project Cancellation

Demolition Contractor:

Name: Belair Excavating

Address: 2200 Old Hwy 8

City, State, Zip: New Brighton MN 55112

Contact Person: Russell J. Thole

Phone Number(s): (651) 786-1300

Building Owner:

Name: US Navy (Southern Division)

Address: 2155 Eagle Drive

Naval Facility Fac. Eng. Command

City, State, Zip: N.Charleston, South Carolina 29406

Contact person: Joe Sanders

Phone Number(s): 843.820.5562

Building Information:

Building Name: Pump House

Address/Location: 4800 East River Road

City, State, Zip: Fridley MN

County: Hennepin

Phone Number(s): 612.572.6782

Age of Bldg. (years): 45 Size of Bldg. (sq. ft.): 432

Number of Floors Including Basement Level(s): 1

Present Use of Bldg.: Pump House

Prior Use of Bldg.: Pump House

Dates when demolition or intentional burning will Begin 10/18/00 & End 11/18/00

Notification must be postmarked or received ten (10) working days before demolition begins. *See item #5 for emergency demolitions. Both Beginning and Ending dates should be amended in writing as necessary to reflect current project dates.

If there is >260 linear feet or >160 square feet of Regulated Asbestos-Containing Material (RACM) in the building to be demolished, it must be removed by a licensed asbestos contractor prior to demolition. The State of MN-Notice of Intent to Perform an Asbestos Abatement Project must be used to notify for the asbestos removal.

Is nonfriable ACM present in the structure to be demolished ? [ ] YES [x] NO
If YES complete items 1-9. If NO complete items 3-9.

1. If ACM will be left in place for the demolition indicate the amount of Category I and/or Category II nonfriable ACM left in place.

Categ. I ______ Linear Feet
______ Square Feet
______ Cubic Feet

Category I nonfriable ACM means asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing products containing more than one percent asbestos.
*Category I nonfriable ACM is not allowed to remain in place for demolition if it is in poor condition.

Categ. II ______ Linear Feet
______ Square Feet
______ Cubic Feet

Category II nonfriable ACM means any material, excluding Category I nonfriable ACM, containing more than one percent Asbestos that, when dry, cannot be crumbled, pulverized, or reduced to a powder by hand pressure.
*Category II nonfriable ACM is not allowed to remain in place for demolition if it has a high probability of becoming crumbled, pulverized, or reduced to a powder during demolition, transport, or disposal. (ex transite, cement, slate roofing)

2. Description & Location of ACM remaining in place (including floor # and room #): ______

Revised 3/00

3. Company and/or individual that conducted the building inspection and the procedure used to determine the presence or absence of ACM (including analytic method): **Prior to demolition all buildings must be inspected by an U. S. Environmental Protection Agency (EPA) accredited inspector.*

Bay West: Brandon Juran, PLM Method

4. Description of planned demolition and the specific method(s) that will be used: Machine Demolition

5. If the demolition was ordered by a government agency, please identify the agency and attach a copy of the order:

Name:________ Title:________ Authority:________

Date of Order (M/D/Y):________ Date Ordered to Begin (M/D/Y):________

* Notification for an emergency demolition must be submitted as early as possible before demolition begins, but not later than the following working day. A demolition is considered an emergency ONLY when the facility has been deemed structurally unsound and in danger of imminent collapse. If the structurally unsound building is known to contain any regulated ACM or is suspected to contain any regulated ACM, special procedures MUST be followed. If you are unaware of the special procedures, instructions/regulations can be obtained by contacting the MPCA at the address or phone number listed below.

6. Description of procedure to be followed in the event that unexpected RACM is found or Cat. II nonfriable ACM becomes crumbled, pulverized or reduced to powder:

Stop Demolition! Contact MPCA,EPA,Owner,General Contractor and take safety Measures

7. Waste Transporter(s) Information:

Transporter Name: Buckingham Trucking
Transporter Contact: Tom Buckingham
Transporter Address: 5980 Credit River Road
City, State, Zip: Prior Lake,MN 55372
Phone Number: 612.226.6443

8. Waste Disposal Information:

Landfill Name: Dem-con Landfill, Inc.
Owner/Operator: Joe Pahl
Address/Location: 3601 West 130th Street
City, State, Zip: Shakopee MN
Phone Number: (952) 445-1848

9. I certify that the above information is correct and I am a bonafide representative of the demolition contractor or building owner and have authority to enter into agreements for my employer.

Signature of Contractor/Owner________ Date________

Send to: Minnesota Pollution Control Agency Metro Districts – Regular Facilities Section 520 Lafayette Road North St. Paul, MN 55155-4194	For questions call: 651-296-7300 1-800-657-3864 FAX: 651-215-1593

PCB Removal Information *Polychlorinated biphenyls (PCBs) must be removed from the building prior to demolition. PCBs may be found in light ballasts, small capacitors found in old appliances, and transformer oils. For questions call the MPCA Hazardous Waste (HW) business assistance unit at 1-800-657-3724.*

PCB remover name/address/phone number: Owner
PCB receiver name/address/phone number: Owner

Mercury Removal Information *Mercury containing material must be removed from the building prior to demolition. Mercury containing materials may include fluorescent, metal halide, high pressure sodium, neon, mercury vapor lamps, mercury switches, thermostat probes, manometers, and gages. For questions call the MPCA HW business assistance unit at 1-800-657-3724.*

Mercury remover name/address/phone number: Owner
Mercury receiver name/address/phonenumber: Owner

Refrigerants/CFCs/HCFCs Recovery Information *A certified technician must recover refrigerants from refrigeration equipment and systems in the building prior to demolition. For questions call the CFC program at 1-800-657-3864.*

Refrigerant recoverer name/address/phone number:________Owner
Refrigerant receiver name/address/phone number:__________Owner

Appendix A2

Borehole Sealing Records

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING SEALING RECORD

Minnesota Statutes, Chapter 103I

Minnesota Well and Boring Sealing No.
Minnesota Unique Well No. or W-series No. (Leave blank if not known)

H 176057

WELL OR BORING LOCATION

County Name: Anoka

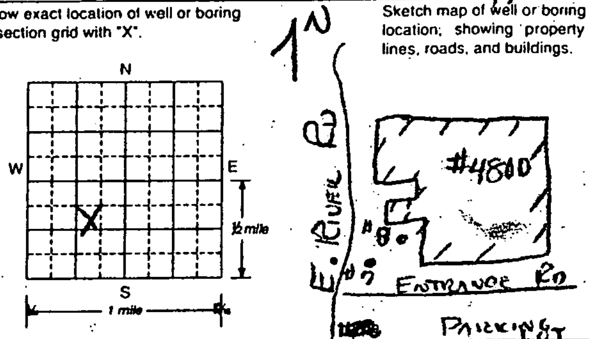
Township Name	Township No.	Range No.	Section No.	Fraction (sm. → lg.)	Date Sealed	Date Well or Boring Constructed
	30	24	27	SW NE SW	10/19/00	10/13/00

Numerical Street Address or Fire Number and City of Well or Boring Location: 4800 East River Rd Fridley, MN

Depth Before Sealing: 38 1/2 ft. Original Depth: 38 1/2 ft.

Show exact location of well or boring in section grid with "X".

Sketch map of well or boring location; showing property lines, roads, and buildings.



AQUIFER(S): [X] Single Aquifer [ ] Multiaquifer

STATIC WATER LEVEL: [X] Measured [ ] Estimated

20.6 ft. [X] below [ ] above land surface

WELL/BORING: [ ] Water Supply Well [ ] Monit. Well [X] Env. Bore Hole [ ] Other

CASING TYPE(S) N/A: [ ] Steel [ ] Plastic [ ] Tile [ ] Other 3 1/4" HSA

CASING(S) N/A

Diameter	Depth	Set in oversize hole?	Annular space initially grouted?
3 1/4" in. from 0 to 24 ft.		[ ] Yes [ ] No	[ ] Yes [ ] No [ ] Unknown
in. from to ft.		[ ] Yes [ ] No	[ ] Yes [ ] No [ ] Unknown
in. from to ft.		[ ] Yes [ ] No	[ ] Yes [ ] No [ ] Unknown

PROPERTY OWNER'S NAME: FMC/United Defense

Property owner's mailing address if different than well location address indicated above.

4800 E River Rd
Fridley, MN 55421

SCREEN/OPEN HOLE N/A

Screen from ____ to ____ ft. Open Hole from ____ to ____ ft.

OBSTRUCTIONS: [ ] Rods/Drop Pipe [ ] Check Valve(s) [ ] Debris [ ] Fill [X] No Obstruction

Type of Obstructions (Describe)

Obstructions removed? [ ] Yes [ ] No Describe

WELL OWNER'S NAME: US Navy So Division

Well owner's mailing address if different than property owner's address indicated above.

Naval Facility
Engineering Command
2155 Eagle Dr
No. Charleston, S.C. 29406

PUMP N/A

Type

[ ] Removed [ ] Not Present [ ] Other

GEOLOGICAL MATERIAL	COLOR	HARDNESS OF FORMATION	FROM	TO
Concrete			0	7 1/2"
Fill Silty Sand	Black		7 1/2"	4'
Sand w/ Silt	Brown	Loose	4	7
Sand	Light Brown	Loose	7	38 1/2

If not known, indicate estimated formation log from nearby well or boring.

METHOD USED TO SEAL ANNULAR SPACE BETWEEN 2 CASINGS, OR CASING AND BORE HOLE:

[X] No Annular Space Exists
[ ] Annular space grouted with tremie pipe
[ ] Casing Perforation/Removal

____ in. from ____ to ____ ft. [ ] Perforated [ ] Removed
____ in. from ____ to ____ ft. [ ] Perforated [ ] Removed

Type of perforator

[ ] Other

GROUTING MATERIAL(S) (One bag of cement = 94 lbs., one bag of bentonite = 50 lbs.)

Grouting Material: Bentonite Grout from 0 to 38 1/2 ft. ____ yards 1 bags

from ____ to ____ ft. ____ yards ____ bags
from ____ to ____ ft. ____ yards ____ bags
from ____ to ____ ft. ____ yards ____ bags

REMARKS, SOURCE OF DATA, DIFFICULTIES IN SEALING

AET 01-00535
Borings AT-7 & AT-8
Typical Log Presented Above
AT 7 - 38.5'
AT-8 - 37.5'

OTHER WELLS AND BORINGS: Unknown

Other unsealed and unused well or boring on property? [ ] Yes [ ] No How many?

LICENSED OR REGISTERED CONTRACTOR CERTIFICATION

This well or boring was sealed in accordance with Minnesota Rules, Chapter 4725. The information contained in this report is true to the best of my knowledge.

American Engineering Testing — M0171
Contractor Business Name — License or Registration No.

Kathryn J Kleiter — 10/25/00
Authorized Representative Signature — Date

Shaun Graski
Name of Person Sealing Well or Boring

LOCAL COPY H 176057

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING SEALING RECORD

Minnesota Statutes, Chapter 103I

Minnesota Well and Boring Sealing No.
Minnesota Unique Well No. or W-series No. (Leave blank if not known)

H 176056

WELL OR BORING LOCATION

County Name: ANOKA

Township Name	Township No.	Range No.	Section No.	Fraction (sm. → lg.)
	30	24	27	SW NE SW

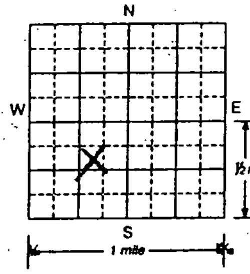
Date Sealed: 10/19/00

Date Well or Boring Constructed: 10/18/00

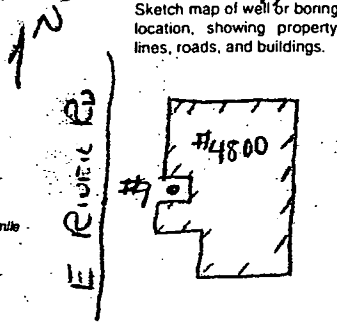
Numerical Street Address or Fire Number and City of Well or Boring Location: 4800 E RIVER RD FRIDLEY, MN

Depth Before Sealing 86 ft. Original Depth 86 ft.

Show exact location of well or boring in section grid with "X".



Sketch map of well or boring location, showing property lines, roads, and buildings.



AQUIFER(S)
☒ Single Aquifer ☐ Multiaquifer

WELL/BORING
☐ Water Supply Well ☐ Monit. Well
☒ Env. Bore Hole ☐ Other

STATIC WATER LEVEL
☒ Measured ☐ Estimated
20.7 ft. ☒ below ☐ above land surface

CASING TYPE(S) ~~N/A~~
☐ Steel ☐ Plastic ☐ Tile ☒ Other 3¼" HSA

CASING(S) N/A

Diameter	Depth	Set in oversize hole?	Annular space initially grouted?
3¼ in.	from 0 to 24 ft.	☐ Yes ☐ No	☐ Yes ☐ No ☐ Unknown
in.	from to ft.	☐ Yes ☐ No	☐ Yes ☐ No ☐ Unknown
in.	from to ft.	☐ Yes ☐ No	☐ Yes ☐ No ☐ Unknown

SCREEN/OPEN HOLE N/A
Screen from ______ to ______ ft. Open Hole from ______ to ______ ft.

PROPERTY OWNER'S NAME
US NAVY SO. DIVISION

Property owner's mailing address if different than well location address indicated above.
NAVAL FACILITY
ENGINEERING COMMAND
2155 EAGLE DR
NO. CHARLESTON, S.C. 29406

WELL OWNER'S NAME
US NAVY SO. DIVISION

Well owner's mailing address if different than property owner's address indicated above.

OBSTRUCTIONS
☐ Rods/Drop Pipe ☐ Check Valve(s) ☐ Debris ☐ Fill ☒ No Obstruction

Type of Obstructions (Describe)

Obstructions removed? ☐ Yes ☐ No Describe

PUMP N/A
Type
☐ Removed ☐ Not Present ☐ Other

GEOLOGICAL MATERIAL	COLOR	HARDNESS OF FORMATION	FROM	TO
If not known, indicate estimated formation log from nearby well or boring.				
FILL SILTY SAND	DARK BROWN		0	4
SAND W/ SILT	LIGHT BROWN	LOOSE	4	7
SAND	LIGHT BROWN	LOOSE	7	27
SAND	LIGHT GRAY	LOOSE	27	48
FAT CLAY	RED/BR	STIFF	48	56
SAND	LIGHT GRAY	MED DENSE	56	58
SAND W/SILT	BROWN	MED DENSE	58	62
GRAVEL	BROWN	MED DENSE	62	64
LEAN CLAY	BROWN	STIFF	64	78
SILTY SAND	BROWN	DENSE	78	82
LEAN CLAY	BROWN	VERY STIFF	82	84
SAND W/ SILT	BROWN	MED DENSE	84	86

METHOD USED TO SEAL ANNULAR SPACE BETWEEN 2 CASINGS, OR CASING AND BORE HOLE:
☒ No Annular Space Exists
☐ Annular space grouted with tremie pipe
☐ Casing Perforation/Removal
______ in. from ______ to ______ ft. ☐ Perforated ☐ Removed
______ in. from ______ to ______ ft. ☐ Perforated ☐ Removed
Type of perforator
☐ Other

GROUTING MATERIAL(S) (One bag of cement = 94 lbs., one bag of bentonite = 50 lbs.)

Grouting Material BENTONITE GROUT from 0 to 86 ft. ______ yards 1½ bags
______ from ______ to ______ ft. ______ yards ______ bags
______ from ______ to ______ ft. ______ yards ______ bags
______ from ______ to ______ ft. ______ yards ______ bags

REMARKS, SOURCE OF DATA, DIFFICULTIES IN SEALING
AET 01-00535
BORING AT-9

OTHER WELLS AND BORINGS UNKNOWN
Other unsealed and unused well or boring on property? ☐ Yes ☐ No How many?

LICENSED OR REGISTERED CONTRACTOR CERTIFICATION

This well or boring was sealed in accordance with Minnesota Rules, Chapter 4725. The information contained in this report is true to the best of my knowledge.

AMERICAN ENGINEERING TESTING — M0171
Contractor Business Name — *License or Registration No.*

Kathryn J Kleiter — 10/25/00
Authorized Representative Signature — *Date*

SHAWN GRISKI
Name of Person Sealing Well or Boring

LOCAL COPY H176056

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING SEALING RECORD

Minnesota Statutes, Chapter 103I

Minnesota Well and Boring Sealing No.
Minnesota Unique Well No. or W-series No. (Leave blank if not known)

H 176058

WELL OR BORING LOCATION

County Name: ANOKA

Township Name	Township No.	Range No.	Section No.	Fraction (sm. → lg.)
	30	24	27	SW NE SW

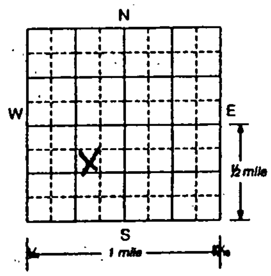
Date Sealed: 10/19/00

Date Well or Boring Constructed: 10/17/00

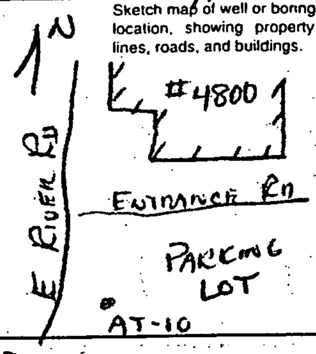
Numerical Street Address or Fire Number and City of Well or Boring Location: 4800 E RIVER RD FRIDLEY, MN

Depth Before Sealing: 84 1/2 ft. Original Depth: 84 1/2 ft.

Show exact location of well or boring in section grid with "X".



Sketch map of well or boring location, showing property lines, roads, and buildings.



AQUIFER(S)
☒ Single Aquifer ☐ Multiaquifer

STATIC WATER LEVEL
☒ Measured ☐ Estimated
51.2 ft. ☒ below ☐ above land surface

WELL/BORING
☐ Water Supply Well ☐ Monit. Well
☒ Env. Bore Hole ☐ Other

CASING TYPE(S)
☐ Steel ☐ Plastic ☐ Tile ☒ Other 3 1/4" HSA

CASING(S)

Diameter	Depth	Set in oversize hole?	Annular space initially grouted?
3 1/4 in.	from 0 to 54 ft.	☐ Yes ☐ No	☐ Yes ☐ No ☐ Unknown
in.	from to ft.	☐ Yes ☐ No	☐ Yes ☐ No ☐ Unknown
in.	from to ft.	☐ Yes ☐ No	☐ Yes ☐ No ☐ Unknown

PROPERTY OWNER'S NAME
FMC / UNITED DEFENSE

Property owner's mailing address if different than well location address indicated above.
4800 E RIVER RD
FRIDLEY, MN 55421

SCREEN/OPEN HOLE N/A
Screen from ____ to ____ ft. Open Hole from ____ to ____ ft.

OBSTRUCTIONS
☐ Rods/Drop Pipe ☐ Check Valve(s) ☐ Debris ☐ Fill ☒ No Obstruction
Type of Obstructions (Describe)
Obstructions removed? ☐ Yes ☐ No Describe

WELL OWNER'S NAME
US NAVY SO DIVISION

Well owner's mailing address if different than property owner's address indicated above.
NAVAL FACILITY
ENGINEERING COMMAND
2155 EAGLE DR
NO CHARLESTON, SC. 29406

PUMP N/A
Type
☐ Removed ☐ Not Present ☐ Other

If not known, indicate estimated formation log from nearby well or boring.

GEOLOGICAL MATERIAL	COLOR	HARDNESS OF FORMATION	FROM	TO
BIT PAVEMENT			0	3"
FILL SILTY SAND	BROWN		3"	4 1/2
SAND	BROWN	LOOSE	4 1/2	39
CLAYEY SAND	BROWN	STIFF	39	65
SAND W/ SILT	BROWN	MED DENSE	65	81
CLAYEY SAND	GRAY/ BROWN	HARD	81	84 1/2

METHOD USED TO SEAL ANNULAR SPACE BETWEEN 2 CASINGS, OR CASING AND BORE HOLE:
☒ No Annular Space Exists
☐ Annular space grouted with tremie pipe
☐ Casing Perforation/Removal
____ in. from ____ to ____ ft. ☐ Perforated ☐ Removed
____ in. from ____ to ____ ft. ☐ Perforated ☐ Removed
Type of perforator
☐ Other

GROUTING MATERIAL(S) (One bag of cement = 94 lbs., one bag of bentonite = 50 lbs.)

Grouting Material	from	to	ft.	yards	bags
BENTONITE GROUT	0	84 1/2			2 1/2

REMARKS, SOURCE OF DATA, DIFFICULTIES IN SEALING
AET 01-00535
BORING AT-10

OTHER WELLS AND BORINGS UNKNOWN
Other unsealed and unused well or boring on property? ☐ Yes ☐ No How many?

LICENSED OR REGISTERED CONTRACTOR CERTIFICATION
This well or boring was sealed in accordance with Minnesota Rules, Chapter 4725. The information contained in this report is true to the best of my knowledge.

AMERICAN ENGINEERING TESTING — Contractor Business Name
M0171 — License or Registration No.
Kathryn J Kleider — Authorized Representative Signature
10/25/00 — Date
SHAWN GRASKI — Name of Person Sealing Well or Boring

LOCAL COPY H176058

Appendix A3

Well Abandonment Notifications and Sealing Verifications

Send notification form and payment (check, money order, or credit card information) to:
Minnesota Department of Health, Well Management Section, P.O. Box 64975, St. Paul, Minnesota 55164-0975.

462989	H	173140

ATTN: CASHIER

Well Management Section Fax Number: (651) 215-0978

[redacted]

Exempt from paying fee ☒ Yes ❑ No

❑ $20 Well Sealing Notification (4933) Well AT-2

Check well type:

❑ Water-Supply Well ❑ Monitoring Well ❑ Other

WELL LOCATION	County: Anoka	Township Name: Fridley	Township No.: 30	Range No.: 24	Section No.: 27	Fraction (sm. → lg.): SW 1/4 NE 1/4 SW 1/4
	Well Location Address: 4800 East River Rd	City: Fridley	State: MN	Zip Code: 55421	Fire Number:	Est. Depth: 65 / Casing Diameter: 10"
WELL OWNER	Well Owner Name (Print): U.S. Navy / Southern Division				Daytime Telephone Number: 843 820-5562	
	Well Owner Street Address: Naval Fac. Eng. Command, 2155 Eagle Drive	City: N. Charleston	State: MN	Zip Code: 29406		
	Well Owner Signature				Date	
WELL CONTRACTOR	Licensed or Registered Contractor (Print): E.H. RENNER & SONS, INC.	Contractor Signature: [signature]	Date: 9/25/00	Lic. or Reg. No.: 71015		

Failure to provide proper identification and fee prior to the beginning of well sealing is a violation of Minnesota Statutes, Chapter 103I, and may result in the assessment of an administrative penalty. Notification is not required to seal a boring.

WELL SEALING NOTIFICATION-WELL SEALING NOTIFICATION IS VALID FOR 18 MONTHS

Send notification form and payment (check, money order, or credit card information) to:
Minnesota Department of Health, Well Management Section, P.O. Box 64975, St. Paul, Minnesota 55164-0975.

Minnesota Unique Well No. or W-series No. (Leave blank if not known)		Minnesota Well and Boring Sealing No.
206695	H	173139

ATTN: CASHIER

Well Management Section Fax Number: (651) 215-0978

[redacted]

Exempt from paying fee ☒ Yes ❑ No

❑ $20 Well Sealing Notification (4933) Well ~~#~~ 2

Check well type:

❑ Water-Supply Well ❑ Monitoring Well ❑ Other

WELL LOCATION	County: Anoka	Township Name: Fridley	Township No.: 30	Range No.: 24	Section No.: 27	Fraction (sm. → lg.): SW 1/4 NE 1/4 SW 1/4
	Well Location Address: 4800 East River Rd	City: Fridley	State: MN	Zip Code: 55421	Fire Number:	Est. Depth: 288 / Casing Diameter: 16"
WELL OWNER	Well Owner Name (Print): U.S. Navy (Southern Division)				Daytime Telephone Number: 843 820-5562	
	Well Owner Street Address: Naval Fac. Eng. Command, 2155 Eagle Drive	City: N. Charleston	State: SC	Zip Code: 29406		
	Well Owner Signature				Date	
WELL CONTRACTOR	Licensed or Registered Contractor (Print): E.H. RENNER & SONS, INC.	Contractor Signature: [signature]	Date: 9/25/00	Lic. or Reg. No.: 71015		

Failure to provide proper identification and fee prior to the beginning of well sealing is a violation of Minnesota Statutes, Chapter 103I, and may result in the assessment of an administrative penalty. Notification is not required to seal a boring.

WELL SEALING NOTIFICATION-WELL SEALING NOTIFICATION IS VALID FOR 18 MONTHS

Send notification form and payment (check, money order, or credit card information) to:
Minnesota Department of Health, Well Management Section, P.O. Box 64975, St. Paul, Minnesota 55164-0975.

Minnesota Unique Well No. or W-series No. (Leave blank if not known)		Minnesota Well and Boring Sealing No.
234001	H	173138

ATTN: CASHIER

Well Management Section Fax Number: (651) 215-0978

[redacted]

Exempt from paying fee ☒ Yes ❑ No

❑ $20 Well Sealing Notification (4933) Well ~~#~~ 3

Check well type:

❑ Water-Supply Well ❑ Monitoring Well ❑ Other

WELL LOCATION	County: Anoka	Township Name: Fridley	Township No.: 30	Range No.: 24	Section No.: 27	Fraction (sm. → lg.): SW 1/4 NE 1/4 SW 1/4
	Well Location Address: 4800 East River Road	City: Fridley	State: MN	Zip Code: 55421	Fire Number:	Est. Depth: 288 / Casing Diameter: 16"
WELL OWNER	Well Owner Name (Print): U.S. Navy / Southern Division				Daytime Telephone Number: 843 820-5562	
	Well Owner Street Address: Naval Fac. Eng. Command 2155 Eagle Drive	City: N. Charleston	State:	Zip Code: 29406		
	Well Owner Signature				Date	
WELL CONTRACTOR	Licensed or Registered Contractor (Print): E.H. RENNER & SONS, INC.	Contractor Signature: [signature]	Date: 9/26/00	Lic. or Reg. No.: 71015		

Failure to provide proper identification and fee prior to the beginning of well sealing is a violation of Minnesota Statutes, Chapter 103I, and may result in the assessment of an administrative penalty. Notification is not required to seal a boring.

710_5 MN DEPT. OF HEALTH - WELL MANAGEMENT SECTION - SEALING VERIFICATION 00206695

This is to verify that this office has received notification that a well (Minnesota Unique Well Number 00206695 to be sealed is located at:

County: ANOKA Township Name: FRIDLEY Received: 09/25/2000
Township No.: 030 Range: 24 Section: 27 ¼ SW¼ NE¼ SW¼
Street Address: 4800 EAST RIVER ROAD, FRIDLEY 55421 well 2

This well must be sealed in accordance with the Minnesota Rules on Wells and Borings. MDH staff may be on site to inspect the well sealing.

ROGER E. RENNER
E.H. RENNER AND SONS, INC.
15688 JARVIS STREET, N.W.
ELK RIVER, MN 55330-6220

WELL OWNER AND ADDRESS

US NAVY/SOUTHERN DIVISION
NAVAL FAC. ENG. COMMAND
2155 EAGLE DRIVE
NORTH CHARLESTON, SC 29406

71015 MN DEPT. OF HEALTH - WELL MANAGEMENT SECTION - SEALING VERIFICATION 00234001

This is to verify that this office has received notification that a well (Minnesota Unique Well Number 00234001 to be sealed is located at: well 3

County: ANOKA Township Name: FRIDLEY Received: 09/25/2000
Township No.: 030 Range: 24 Section: 27 ¼ SW¼ NE¼ SW¼
Street Address: 4800 EAST RIVER ROAD, FRIDLEY 55421

This well must be sealed in accordance with the Minnesota Rules on Wells and Borings. MDH staff may be on site to inspect the well sealing.

ROGER E. RENNER
E.H. RENNER AND SONS, INC.
15688 JARVIS STREET, N.W.
ELK RIVER, MN 55330-6220

WELL OWNER AND ADDRESS

US NAVY/SOUTHERN DIVISION
NAVAL FAC. ENG. COMMAND
2155 EAGLE DRIVE
NORTH CHARLESTON, SC 29406

71015 MN DEPT. OF HEALTH - WELL MANAGEMENT SECTION - SEALING VERIFICATION 00462989

This is to verify that this office has received notification that a well (Minnesota Unique Well Number 00462989 to be sealed is located at: AT2

County: ANOKA Township Name: FRIDLEY Received: 09/25/2000
Township No.: 030 Range: 24 Section: 27 ¼ SW¼ NE¼ SW¼
Street Address: 4800 EAST RIVER ROAD, FRIDLEY 55421

This well must be sealed in accordance with the Minnesota Rules on Wells and Borings. MDH staff may be on site to inspect the well sealing.

ROGER E. RENNER
E.H. RENNER AND SONS, INC.
15688 JARVIS STREET, N.W.
ELK RIVER, MN 55330-6220

WELL OWNER AND ADDRESS

US NAVY/SOUTHERN DIVISION
NAVAL FAC. ENG. COMMAND
2155 EAGLE DRIVE
NORTH CHARLESTON, SC 29406

Appendix A4

Well Abandonment Records

MINNESOTA DEPARTMENT OF HEALTH
WELL AND BORING SEALING RECORD
Minnesota Statutes, Chapter 103I

Minnesota Well and Boring Sealing No. H 173139

Minnesota Unique Well No. or W-series No. (Leave blank if not known) 206695

WELL OR BORING LOCATION

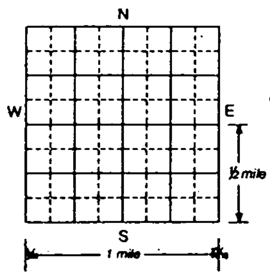
County Name: ANOKA

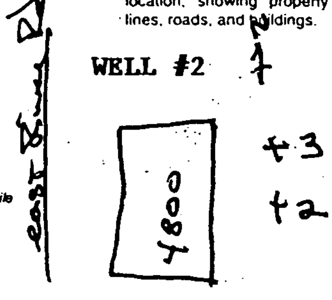
Township Name	Township No.	Range No	Section No.	Fraction (sm. → lg.)	Date Sealed	Date Well or Boring Constructed
FRIDLEY	30	24	27	sw ne sw	12/20/00	1942

Numerical Street Address or Fire Number and City of Well or Boring Location: 4800 East River Rd, Fridley, MN 55433

Depth Before Sealing 284 ft. Original Depth 288 ft

Show exact location of well or boring in section grid with "X". Sketch map of well or boring location, showing property lines, roads, and buildings.





AQUIFER(S)
☒ Single Aquifer ☐ Multiaquifer

WELL/BORING
☒ Water Supply Well ☐ Monit. Well ☐ Env. Bore Hole ☐ Other

STATIC WATER LEVEL
☒ Measured ☐ Estimated
22 ft. ☒ below ☐ above land surface

CASING TYPE(S)
☒ Steel ☐ Plastic ☐ Tile ☐ Other

CASING(S)

Diameter	Depth	Set in oversize hole?	Annular space initially grouted?
16 in.	from 0 to 119 ft.	☐ Yes ☒ No	☐ Yes ☒ No ☐ Unknown
12 in.	from 0 to 151 ft.	☒ Yes ☐ No	☒ Yes ☐ No ☐ Unknown
in.	from to ft.	☐ Yes ☐ No	☐ Yes ☐ No ☐ Unknown

SCREEN/OPEN HOLE
Screen from ____ to ____ ft. Open Hole from 151 to 284 ft.

OBSTRUCTIONS
☐ Rods/Drop Pipe ☐ Check Valve(s) ☐ Debris ☐ Fill ☒ No Obstruction
Type of Obstructions (Describe)
Obstructions removed? ☐ Yes ☐ No Describe

PUMP
Type
☐ Removed ☒ Not Present ☐ Other

PROPERTY OWNER'S NAME
U.S. NAVY (Southern Division)

Property owner's mailing address if different than well location address indicated above.

NAVAL FACILITY ENG. COMMAND
2155 Eagle Drive
N. Charleston, SC 29406

WELL OWNER'S NAME
SAME

Well owner's mailing address if different than property owner's address indicated above.

Jimmy Jones
Joel Sanders
(843) 820-5562

GEOLOGICAL MATERIAL	COLOR	HARDNESS OF FORMATION	FROM	TO
If not known, indicate estimated formation log from nearby well or boring.				
CLAY		M	0	5
SAND		S	5	70
HARD GRAVEL		H	70	80
ST PETER		M	80	115
S.S. & DOLO		MH	115	146
SHAKOPEE		VH	146	237
JORDON		S	237	288

METHOD USED TO SEAL ANNULAR SPACE BETWEEN 2 CASINGS, OR CASING AND BORE HOLE:
☐ No Annular Space Exists
☐ Annular space grouted with tremie pipe
☐ Casing Perforation/Removal
____ in. from ____ to ____ ft. ☐ Perforated ☐ Removed
____ in. from ____ to ____ ft. ☐ Perforated ☐ Removed
Type of perforator
☐ Other

GROUTING MATERIAL(S) (One bag of cement = 94 lbs., one bag of bentonite = 50 lbs.)

Grouting Material	from	to	ft.	yards	bags
NEAT	0	284		25	

REMARKS, SOURCE OF DATA, DIFFICULTIES IN SEALING

OTHER WELLS AND BORINGS
Other unsealed and unused well or boring on property? ☐ Yes ☐ No How many?

LICENSED OR REGISTERED CONTRACTOR CERTIFICATION
This well or boring was sealed in accordance with Minnesota Rules, Chapter 4725. The information contained in this report true to the best of my knowledge.

E.H. RENNER & SONS, INC — 71015
Contractor Business Name — License or Registration No.

Roger E. Renner — 12/26/00
Authorized Representative Signature — Date

KEVIN SCHIETERLIEN/ROGER E. RENNER
Name of Person Sealing Well or Boring

MINN. DEPT. OF HEALTH COPY H 173139

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING SEALING RECORD

Minnesota Statutes, Chapter 103I

Minnesota Well and Boring Sealing No. **H 173138**

Minnesota Unique Well No. or W-series No. (Leave blank if not known) **234001**

WELL OR BORING LOCATION

County Name: ANOKA

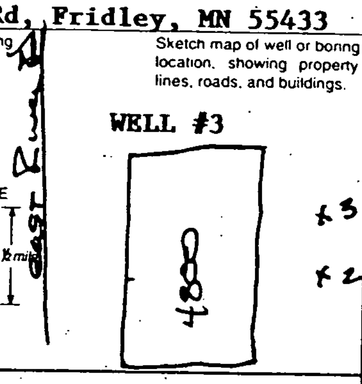
Township Name	Township No.	Range No.	Section No.	Fraction (sm. → lg.)	Date Sealed	Date Well or Boring Constructed
FRIDLEY	30	24	27	sw ¼ ne ¼ sw	12/22/00	1942

Numerical Street Address or Fire Number and City of Well or Boring Location: 4800 E River Rd, Fridley, MN 55433

Depth Before Sealing: 277 ft. Original Depth: 288 ft.

Show exact location of well or boring in section grid with "X". (N, S, E, W; ½ mile; 1 mile)

Sketch map of well or boring location, showing property lines, roads, and buildings.



AQUIFER(S): ☒ Single Aquifer ☐ Multiaquifer

WELL/BORING: ☒ Water Supply Well ☐ Monit. Well ☐ Env. Bore Hole ☐ Other

STATIC WATER LEVEL: ☒ Measured ☐ Estimated — 24 ft. ☒ below ☐ above land surface

CASING TYPE(S): ☒ Steel ☐ Plastic ☐ Tile ☐ Other

CASING(S)

Diameter	Depth	Set in oversize hole?	Annular space initially grouted?
16 in.	from 0 to 93 ft.	☐ Yes ☒ No	☐ Yes ☒ No ☐ Unknown
12 in.	from 0 to 158 ft.	☒ Yes ☐ No	☒ Yes ☐ No ☐ Unknown
in.	from to ft.	☐ Yes ☐ No	☐ Yes ☐ No ☐ Unknown

SCREEN/OPEN HOLE: Screen from ___ to ___ ft. Open Hole from 158 to 277 ft.

OBSTRUCTIONS: ☐ Rods/Drop Pipe ☐ Check Valve(s) ☐ Debris ☐ Fill ☒ No Obstruction

Type of Obstructions (Describe)

Obstructions removed? ☐ Yes ☐ No Describe

PUMP

Type

☐ Removed ☒ Not Present ☐ Other

PROPERTY OWNER'S NAME: U.S. NAVY SOUTHERN DIVISION

Property owner's mailing address if different than well location address indicated above.

NAVAL FACILITY ENG. COMMAND
2155 Eagle Drive
North Charleston, SC 29406

WELL OWNER'S NAME: U.S. NAVY ~~JIMMY JONES/ Joel Sanders~~

Well owner's mailing address if different than property owner's address indicated above.

(843) 820-5562

GEOLOGICAL MATERIAL	COLOR	HARDNESS OF FORMATION	FROM	TO
CLAY		M	0	5
SAND		S	5	70
HARD GRAVEL		H	70	80
ST PETER		M	80	115
S.S. & DOLO		MH	115	146
SHAKOPEE		MH	146	237
JORDAN		S	237	288

If not known, indicate estimated formation log from nearby well or boring.

METHOD USED TO SEAL ANNULAR SPACE BETWEEN 2 CASINGS, OR CASING AND BORE HOLE:

☐ No Annular Space Exists

☐ Annular space grouted with tremie pipe

☐ Casing Perforation/Removal

___ in. from ___ to ___ ft. ☐ Perforated ☐ Removed

___ in. from ___ to ___ ft. ☐ Perforated ☐ Removed

Type of perforator

☐ Other

GROUTING MATERIAL(S) (One bag of cement = 94 lbs., one bag of bentonite = 50 lbs.)

Grouting Material	from	to	ft.	yards	bags
NEAT	64	277		31	
NEAT	0	64			64

REMARKS, SOURCE OF DATA, DIFFICULTIES IN SEALING

OTHER WELLS AND BORINGS

Other unsealed and unused well or boring on property? ☐ Yes ☐ No How many?

LICENSED OR REGISTERED CONTRACTOR CERTIFICATION

This well or boring was sealed in accordance with Minnesota Rules, Chapter 4725. The information contained in this report is true to the best of my knowledge.

E.H. RENNER & SONS, INC. — Contractor Business Name

71015 — License or Registration No.

Roger E. Renner — Authorized Representative Signature

12/26/00 — Date

KEVIN SCHIETERLIEN/ROGER E. RENNER — Name of Person Sealing Well or Boring

MINN. DEPT. OF HEALTH COPY **H173138**

HE-01434-06

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING SEALING RECORD

Minnesota Statutes, Chapter 103I

Minnesota Well and Boring Sealing No. **H 177390**

Minnesota Unique Well No. or W-series No. (Leave blank if not known) **462952**

WELL OR BORING LOCATION

County Name: ANOKA

Township Name	Township No	Range No	Section No	Fraction (sm → lg)
FRIDLEY	30	24	27	NW SE NW

Date Sealed: MAY 9, 2001

Date Well or Boring Constructed: 5/5/92

Numerical Street Address or Fire Number and City of Well or Boring Location: 4800 EAST RIVER ROAD

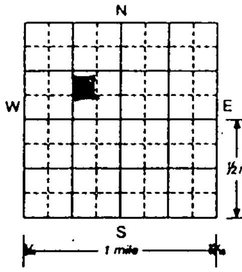
Depth Before Sealing: 47' ft

Original Depth: 47.17 ft

Show exact location of well or boring in section grid with "X"

Sketch map of well or boring location, showing property lines, roads, and buildings.

N



1 of 2

AQUIFER(S): ☒ Single Aquifer ☐ Multiaquifer

WELL/BORING: ☒ Water Supply Well ☐ Monit. Well ☐ Env. Bore Hole ☐ Other

STATIC WATER LEVEL: ☒ Measured ☐ Estimated

20' ft. ☒ below ☐ above land surface

CASING TYPE(S): ☒ Steel ☐ Plastic ☐ Tile ☐ Other

CASING(S)

Diameter	From	To	Set in oversize hole?	Annular space initially grouted?
8" in.	0	11.5 ft.	☐ Yes ☒ No	☐ Yes ☐ No ☐ Unknown
in.		ft.	☐ Yes ☐ No	☐ Yes ☐ No ☐ Unknown
in.		ft.	☐ Yes ☐ No	☐ Yes ☐ No ☐ Unknown

PROPERTY OWNER'S NAME

U.S. NAVY / SOUTHERN DIVISION

Property owner's mailing address if different than well location address indicated above.

NAVAL FACILITY ENG. COMMAND
2155 EAGLE DRIVE

N. CHARLESTON, SC 29406

SCREEN/OPEN HOLE

Screen from 11.5 to 47.15 ft. Open Hole from ______ to ______ ft.

OBSTRUCTIONS

☐ Rods/Drop Pipe ☐ Check Valve(s) ☐ Debris ☐ Fill ☒ No Obstruction

Type of Obstructions (Describe) ______

Obstructions removed? ☐ Yes ☐ No Describe ______

WELL OWNER'S NAME

SAME

Well owner's mailing address if different than property owner's address indicated above.

PUMP

Type: SUBMERSIBLE

☒ Removed ☐ Not Present ☐ Other

GEOLOGICAL MATERIAL	COLOR	HARDNESS OF FORMATION	FROM	TO
CLASS V	BROWN		0	1
FILL	BLACK		1	8
SAND	BROWN		8	19
SAND/GRAVEL	BROWN		19	31
COARSE SAND	BROWN		31	40
SAND/GRAVEL	BROWN		40	42
GRAVEL	BROWN		42	47
CLAY	BLUE/GRAY		47	47.17

If not known, indicate estimated formation log from nearby well or boring.

METHOD USED TO SEAL ANNULAR SPACE BETWEEN 2 CASINGS, OR CASING AND BORE HOLE:

☒ No Annular Space Exists

☐ Annular space grouted with tremie pipe

☐ Casing Perforation/Removal

______ in. from ______ to ______ ft. ☐ Perforated ☐ Removed

______ in. from ______ to ______ ft. ☐ Perforated ☐ Removed

Type of perforator ______

☐ Other

GROUTING MATERIAL(S) (One bag of cement = 94 lbs., one bag of bentonite = 50 lbs.)

Grouting Material: PORTLAND from 47 to ______ ft. ______ yards 15 bags

REMARKS, SOURCE OF DATA, DIFFICULTIES IN SEALING

REMARKS:
GEOLOGY FROM: UNQ #462952
WATER LEVEL IN ABOVE WELL: 20
DATE WATER LEVEL TAKEN: 5/5/92
MAP CODE: [illegible]

SEALED
According to MN State Regulations

OTHER WELLS AND BORINGS

Other unsealed and unused well or boring on property? ☐ Yes ☒ No How many? ______

LICENSED OR REGISTERED CONTRACTOR CERTIFICATION

This well or boring was sealed in accordance with Minnesota Rules, Chapter 4725. The information contained in this report is true to the best of my knowledge.

E. H. RENNER & SONS, INC. — 71015

Contractor Business Name — License or Registration No.

Roger E. Renner

Authorized Representative Signature — Date: May 14, 2001

ROGER E. RENNER/ KEVIN SCHEITERLEIN

Name of Person Sealing Well or Boring

H177390

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING SEALING RECORD

Minnesota Statutes, Chapter 103I

Minnesota Well and Boring Sealing No. H 177391

Minnesota Unique Well No. or W-series No. (Leave blank if not known) 462987

WELL OR BORING LOCATION

County Name: ANOKA

Township Name: FRIDLEY | Township No: 30 | Range No: 24 | Section No: 27 | Fraction (sm → lg): NW SE NW

Date Sealed: MAY 9, 2001

Date Well or Boring Constructed: 5/5/92

Numerical Street Address or Fire Number and City of Well or Boring Location: 4800 EAST RIVER ROAD

Depth Before Sealing: 65' ft. | Original Depth: 65.2 ft

Show exact location of well or boring in section grid with "X"

Sketch map of well or boring location, showing property lines, roads, and buildings.

N

N W E S ½ mile 1 mile

2 OF 2

AQUIFER(S): ☒ Single Aquifer ☐ Multiaquifer

WELL/BORING: ☒ Water Supply Well ☐ Monit. Well ☐ Env. Bore Hole ☐ Other

STATIC WATER LEVEL: ☒ Measured ☐ Estimated — 20' ft. ☒ below ☐ above land surface

CASING TYPE(S): ☒ Steel ☐ Plastic ☐ Tile ☐ Other

CASING(S)

Diameter	From	To (Depth)	Set in oversize hole?	Annular space initially grouted?
6" in.	0	44.5 ft.	☐ Yes ☒ No	☐ Yes ☐ No ☐ Unknown
in.		ft.	☐ Yes ☐ No	☐ Yes ☐ No ☐ Unknown
in.		ft.	☐ Yes ☐ No	☐ Yes ☐ No ☐ Unknown

PROPERTY OWNER'S NAME

U.S. NAVY / SOUTHERN DIVISION

NAVAL FACILITY ENG. COMMAND

Property owner's mailing address if different than well location address indicated above.

2155 EAGLE DRIVE

N. CHARLESTON, SC 29406

SCREEN/OPEN HOLE: Screen from 44.5 to 65.3 ft. Open Hole from ___ to ___ ft.

OBSTRUCTIONS: ☐ Rods/Drop Pipe ☐ Check Valve(s) ☐ Debris ☐ Fill ☒ No Obstruction

Type of Obstructions (Describe)

Obstructions removed? ☐ Yes ☐ No Describe

WELL OWNER'S NAME: SAME

Well owner's mailing address if different than property owner's address indicated above.

PUMP Type: SUBMERSIBLE — ☒ Removed ☐ Not Present ☐ Other

GEOLOGICAL MATERIAL	COLOR	HARDNESS OF FORMATION	FROM	TO
If not known, indicate estimated formation log from nearby well or boring.				
CLASS V	BROWN		0	1
FILL	BLACK		1	8
SAND	BROWN		8	19
SAND/GRAVEL	BROWN		19	31
COARSE SAND	BROWN		31	40
SAND/GRAVEL	BROWN		40	42
GRAVEL	BROWN		42	47
CLAY	BLUE/GRAY		47	47.17

METHOD USED TO SEAL ANNULAR SPACE BETWEEN 2 CASINGS, OR CASING AND BORE HOLE:

☒ No Annular Space Exists

☐ Annular space grouted with tremie pipe

☐ Casing Perforation/Removal

___ in. from ___ to ___ ft. ☐ Perforated ☐ Removed

___ in. from ___ to ___ ft. ☐ Perforated ☐ Removed

Type of perforator

☐ Other

GROUTING MATERIAL(S) (One bag of cement = 94 lbs., one bag of bentonite = 50 lbs.)

Grouting Material	from	to	ft.	yards	bags
PORTLAND		65			8

REMARKS, SOURCE OF DATA, DIFFICULTIES IN SEALING

REMARKS:

GEOLOGY FROM: UNQ #462952

WATER LEVEL IN ABOVE WELL: 20

DATE WATER LEVEL TAKEN: 5/5/92

MAP CODE: C-21

SEALED

According to MN State Regulations

OTHER WELLS AND BORINGS

Other unsealed and unused well or boring on property? ☐ Yes ☒ No How many?

LICENSED OR REGISTERED CONTRACTOR CERTIFICATION

This well or boring was sealed in accordance with Minnesota Rules, Chapter 4725. The information contained in this report is true to the best of my knowledge.

E. H. RENNER & SONS, INC. — 71015

Contractor Business Name — License or Registration No.

Roger E. Renner — May 14, 2001

Authorized Representative Signature — Date

ROGER E. RENNER/ KEVIN SCHEITERLEIN

Name of Person Sealing Well or Boring

H 177391

Appendix A5

Extraction Well Installation Notifications and Construction Verifications

Send notification form and payment (check, money order, or credit card information) to:
Minnesota Department of Health, Well Management Unit, P.O. Box 64975, St. Paul, Minnesota 55164-0975.
ATTN: CASHIER

611099
Minnesota Unique Well No.

Exempt from paying fee ☒ Yes ☐ No **WELL AT-7**

☐ $100 Water Supply Well
Check well type: ☐ Single Family/Other ______ (Specify) (4926) ☐ Irrigation (4923)
☒ Remedial (4925) ☐ Community PWS (4922) ☐ Noncommunity PWS (4924)
☐ Dewatering Well(s) Total number of dewatering wells ______ ☐ $100/well–1 to 4 wells (4873) ☐ $500/site–5 or more wells (4867)

Credit Card Type: ☐ Visa ☐ Mastercard Exp. Date ______
Print Cardholder Name ______
Credit Card Number ______
Authorized Signature ______

WELL LOCATION	County: ANOKA	Township Name: FRIDLEY	Township No: 30	Range No.: 24	Section No.: 27	Fraction: sw ne sw ¼ ¼
	Well Location Address: 4800 East River Rd	City: FRIDLEY	State: MN	Zip Code: 55421	Fire Number:	
PROPERTY OWNER	Well/Property Owner Name (Print): U.S. NAVY (Southern Div)	Daytime Telephone Number: (843 820-5562				
	Property Owner Street Address: NAVAL FAC. ENG. COMMAND, 2155 EAGLE DRIVE	City: N CHARLESTON	State: SC	Zip Code: 29406		
	Property Owner Signature:	Date:				
WELL CONTRACTOR	Well Contractor (Print): E.H. RENNER & SONS, INC.	Well Contractor Signature: Roger E. Renner	Date: 9/25/00	License No.: 71015		

Failure to provide proper notification and fee prior to the beginning of well contrstruction is a violation of Minnesota Statutes, Chapter 103I, and may result in the assessment of an administrative penalty.

WELL NOTIFICATION

Send notification form and payment (check, money order, or credit card information) to:
Minnesota Department of Health, Well Management Unit, P.O. Box 64975, St. Paul, Minnesota 55164-0975.
ATTN: CASHIER

611098
Minnesota Unique Well No.

Exempt from paying fee ☒ Yes ☐ No **WELL AT-8**

☐ $100 Water Supply Well
Check well type: ☐ Single Family/Other ______ (Specify) (4926) ☐ Irrigation (4923)
☒ Remedial (4925) ☐ Community PWS (4922) ☐ Noncommunity PWS (4924)
☐ Dewatering Well(s) Total number of dewatering wells ______ ☐ $100/well–1 to 4 wells (4873) ☐ $500/site–5 or more wells (4867)

Credit Card Type: ☐ Visa ☐ Mastercard Exp. Date ______
Print Cardholder Name ______
Credit Card Number ______
Authorized Signature ______

WELL LOCATION	County: ANOKA	Township Name: FRIDLEY	Township No.: 30	Range No.: 24	Section No.: 27	Fraction: sw ¼ ne sw ¼
	Well Location Address: 4800 East River Rd	City: FRIDLEY	State: MN	Zip Code: 55421	Fire Number:	
PROPERTY OWNER	Well/Property Owner Name (Print): U.S. NAVY (Southern Div)	Daytime Telephone Number: (843 820-5562				
	Property Owner Street Address: NAVAL FAC. ENG. COMMAND, 2155 EAGLE DRIVE	City: N CHARLESTON	State: SC	Zip Code: 29406		
	Property Owner Signature:	Date:				
WELL CONTRACTOR	Well Contractor (Print): E.H. RENNER & SONS, INC.	Well Contractor Signature: Roger E. Renner	Date: 9/25/00	License No.: 71015		

Failure to provide proper notification and fee prior to the beginning of well contrstruction is a violation of Minnesota Statutes, Chapter 103I, and may result in the assessment of an administrative penalty.

WELL NOTIFICATION

Send notification form and payment (check, money order, or credit card information) to:
Minnesota Department of Health, Well Management Unit, P.O. Box 64975, St. Paul, Minnesota 55164-0975.
ATTN: CASHIER

611097
Minnesota Unique Well No.

Exempt from paying fee ☒ Yes ☐ No **WELL AT-9**

☐ $100 Water Supply Well
Check well type: ☐ Single Family/Other ______ (Specify) (4926) ☐ Irrigation (4923)
☒ Remedial (4925) ☐ Community PWS (4922) ☐ Noncommunity PWS (4924)
☐ Dewatering Well(s) Total number of dewatering wells ______ ☐ $100/well–1 to 4 wells (4873) ☐ $500/site–5 or more wells (4867)

Credit Card Type: ☐ Visa ☐ Mastercard Exp. Date ______
Print Cardholder Name ______
Credit Card Number ______
Authorized Signature ______

WELL LOCATION	County: ANOKA	Township Name: FRIDLEY	Township No.: 30	Range No.: 24	Section No.: 27	Fraction: sw ne sw ¼ ¼
	Well Location Address: 4800 East River Rd	City: FRIDLEY	State: MN	Zip Code: 55421	Fire Number:	
PROPERTY OWNER	Well/Property Owner Name (Print): U.S. NAVY (Southern Div)	Daytime Telephone Number: (843 820-5562				
	Property Owner Street Address: NAVAL FAC. ENG. COMMAND, 2155 EAGLE DRIVE	City: N CHARLESTON	State: SC	Zip Code: 29406		
	Property Owner Signature:	Date:				
WELL CONTRACTOR	Well Contractor (Print): E.H. RENNER & SONS, INC.	Well Contractor Signature: Roger E. Renner	Date: 9/25/00	License No.: 71015		

Failure to provide proper notification and fee prior to the beginning of well contrstruction is a violation of Minnesota Statutes, Chapter 103I, and may result in the assessment of an administrative penalty.

WELL NOTIFICATION

Send notification form and payment (check, money order, or credit card information) to:
Minnesota Department of Health, Well Management Unit, P.O. Box 64975, St. Paul, Minnesota 55164-0975.
ATTN: CASHIER

611096
Minnesota Unique Well No.

Exempt from paying fee ☐ Yes ☐ No **WELL AT-10**

☐ $100 Water Supply Well
Check well type: ☐ Single Family/Other ______ (Specify) (4926) ☐ Irrigation (4923)
☒ Remedial (4925) ☐ Community PWS (4922) ☐ Noncommunity PWS (4924)
☐ Dewatering Well(s) Total number of dewatering wells ______ ☐ $100/well–1 to 4 wells (4873) ☐ $500/site–5 or more wells (4867)

Credit Card Type: ☐ Visa ☐ Mastercard Exp. Date ______
Print Cardholder Name ______
Credit Card Number ______
Authorized Signature ______

WELL LOCATION	County: ANOKA	Township Name: FRIDLEY	Township No.: 30	Range No.: 24	Section No.: 27	Fraction: sw ne sw ¼ ¼
	Well Location Address: 4800 East River Rd	City: FRIDLEY	State: MN	Zip Code: 55421	Fire Number:	
PROPERTY OWNER	Well/Property Owner Name (Print): U.S. NAVY (Southern Div)	Daytime Telephone Number: (843 820-5562				
	Property Owner Street Address: NAVAL FAC. ENG. COMMAND, 2155 EAGLE DRIVE	City: N CHARLESTON	State: SC	Zip Code: 29406		
	Property Owner Signature:	Date:				
WELL CONTRACTOR	Well Contractor (Print): E.H. RENNER & SONS, INC.	Well Contractor Signature:	Date: 9/25/00	License No.:		

Failure to provide ...

71015 MN DEPT. OF HEALTH - WELL MANAGEMENT SECTION -- CONSTRUCTION VERIFICATION 611096

This is to verify that this office has received notification that a water well (Minnesota Unique Well Number 611096) is to be located at: AT 10

County: ANOKA Township Name: FRIDLEY Received: 09/25/2000
Township No.: 030 Range: 24 Section: 27 ¼ SW¼ NE¼ SW¼
Street Address: 4800 EAST RIVER ROAD FRIDLEY 55421-

This well must be constructed in accordance with Minnesota Rules on Wells and Borings. If withdrawing more than 10,000 gal/day or 1 million gal/year, a Water Appropriation Permit is required from the Dept. of Natural Resources at 612/296-4800. Any unused well on this property must be sealed by a licensed water well contractor. MDH staff may be on site to inspect the well construction.

ROGER E. RENNER
E.H. RENNER AND SONS, INC.
15688 JARVIS STREET, N.W.
ELK RIVER, MN 55330-6220

WELL OWNER AND ADDRESS

US NAVY/SOUTHERN DIVISION
NAVAL FAC. ENG. COMMAND
2155 EAGLE DRIVE
NORTH CHARLESTON, SC 29406

If well is for a public water supply, this should not be construed as approval of plans.

71015 MN DEPT. OF HEALTH - WELL MANAGEMENT SECTION -- CONSTRUCTION VERIFICATION 611097

This is to verify that this office has received notification that a water well (Minnesota Unique Well Number 611097) is to be located at: AT-9

County: ANOKA Township Name: FRIDLEY Received: 09/25/2000
Township No.: 030 Range: 24 Section: 27 ¼ SW¼ NE¼ SW¼
Street Address: 4800 EAST RIVER ROAD FRIDLEY 55421-

This well must be constructed in accordance with Minnesota Rules on Wells and Borings. If withdrawing more than 10,000 gal/day or 1 million gal/year, a Water Appropriation Permit is required from the Dept. of Natural Resources at 612/296-4800. Any unused well on this property must be sealed by a licensed water well contractor. MDH staff may be on site to inspect the well construction.

ROGER E. RENNER
E.H. RENNER AND SONS, INC.
15688 JARVIS STREET, N.W.
ELK RIVER, MN 55330-6220

WELL OWNER AND ADDRESS

US NAVY/SOUTHERN DIVISION
NAVAL FAC. ENG. COMMAND
2155 EAGLE DRIVE
NORTH CHARLESTON, SC 29406

If well is for a public water supply, this should not be construed as approval of plans.

71015 MN DEPT. OF HEALTH - WELL MANAGEMENT SECTION -- CONSTRUCTION VERIFICATION 611098

This is to verify that this office has received notification that a water well (Minnesota Unique Well Number 611098) is to be located at: AT 8

County: ANOKA Township Name: FRIDLEY Received: 09/25/2000
Township No.: 030 Range: 24 Section: 27 ¼ SW¼ NE¼ SW¼
Street Address: 4800 EAST RIVER ROAD FRIDLEY 55421-

This well must be constructed in accordance with Minnesota Rules on Wells and Borings. If withdrawing more than 10,000 gal/day or 1 million gal/year, a Water Appropriation Permit is required from the Dept. of Natural Resources at 612/296-4800. Any unused well on this property must be sealed by a licensed water well contractor. MDH staff may be on site to inspect the well construction.

ROGER E. RENNER
E.H. RENNER AND SONS, INC.
15688 JARVIS STREET, N.W.
ELK RIVER, MN 55330-6220

WELL OWNER AND ADDRESS

US NAVY/SOUTHERN DIVISION
NAVAL FAC. ENG. COMMAND
2155 EAGLE DRIVE
NORTH CHARLESTON, SC 29406

If well is for a public water supply, this should not be construed as approval of plans.

71015 MN DEPT. OF HEALTH - WELL MANAGEMENT SECTION -- CONSTRUCTION VERIFICATION 611095

This is to verify that this office has received notification that a water well (Minnesota Unique Well Number 611099) is to be located at: AT-7

County: ANOKA Township Name: FRIDLEY Received: 09/25/2000
Township No.: 030 Range: 24 Section: 27 ¼ SW¼ NE¼ SW¼
Street Address: 4800 EAST RIVER ROAD FRIDLEY 55421-

This well must be constructed in accordance with Minnesota Rules on Wells and Borings. If withdrawing more than 10,000 gal/day or 1 million gal/year, a Water Appropriation Permit is required from the Dept. of Natural Resources at 612/296-4800. Any unused well on this property must be sealed by a licensed water well contractor. MDH staff may be on site to inspect the well construction.

ROGER E. RENNER
E.H. RENNER AND SONS, INC.
15688 JARVIS STREET, N.W.
ELK RIVER, MN 55330-6220

WELL OWNER AND ADDRESS

US NAVY/SOUTHERN DIVISION
NAVAL FAC. ENG. COMMAND
2155 EAGLE DRIVE
NORTH CHARLESTON, SC 29406

If well is for a public water supply, this should not be construed as approval of plans.

Appendix A6

Extraction Well Installation Records

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 103I

MINNESOTA UNIQUE WELL NO. 611095

WELL LOCATION

County Name: ANOKA

Township Name	Township No.	Range No.	Section No.	Fraction
FRIDLEY	30	24	27	SW ¼ NE ¼ SW ¼

House Number, Street Name, City, and Zip Code of Well Location: 4800 EAST RIVER RD, FRIDLEY

or Fire Number:

Show exact location of well in section grid with "X". Sketch map of well location. Showing property lines, roads and buildings.

WELL AT-7

WELL DEPTH (completed): 38.5 ft.

Date Work Completed: 29 DEC, 2000

DRILLING METHOD
☐ Cable Tool ☐ Driven ☐ Dug
☐ Auger ☒ Rotary ☐ Jetted
☐ STARDRILL-200

DRILLING FLUID: BENTONITE/WATER

WELL HYDROFRACTURED? ☐ YES ☐ NO
FROM ____ ft. to ____ ft.

USE
☐ Domestic ☐ Monitoring ☐ Heating/Cooling
☐ Irrigation ☐ Community PWS ☐ Industry/Commercial
☐ Test Well ☐ Noncommunity PWS ☒ Remedial
☐ Dewatering ☐

CASING Drive Shoe? ☐ Yes ☒ No
☒ Steel ☐ Threaded ☒ Welded
☐ Plastic ☐

HOLE DIAM.

CASING DIAMETER	WEIGHT	HOLE DIAM.
8 in. to 30.5 ft.	28.55 lbs./ft.	12 in. to 38.5 ft.
in. to ft.	lbs./ft.	in. to ft.
in. to ft.	lbs./ft.	in. to ft.

SCREEN: JOHNSON
Make: STAINLESS STEEL
Type: 10-SLOT
Slot/Gauze:
Set between 28.5 ft. and 38.5 ft.

OPEN HOLE
from 8" ft. to PS ft.
Diam. 10 FT
Length WR X PB
FITTINGS:

STATIC WATER LEVEL: 20.6 toc ft. ☒ below ☐ above land surface Date measured 10/13/00

PUMPING LEVEL (below land surface): 29.0 ft. after 3.0 hrs. pumping 40 g.p.m.

WELL HEAD COMPLETION
☒ Pitless adapter manufacturer BAKER MONITOR Model 7PS810
☐ Casing Protection ☒ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

GROUTING INFORMATION
Well grouted? ☒ Yes ☐ No
Grout Material ☒ Neat cement ☐ Bentonite ☐ Concrete ☐ High Solids Bentonite
from 6 to 24 ft. 15.0 ☐ yds. ☒ bags
from ____ to ____ ft. ____ ☐ yds. ☐ bags
from ____ to ____ ft. ____ ☐ yds. ☐ bags

NEAREST KNOWN SOURCE OF CONTAMINATION
52 feet NORTH direction SEWER type
Well disinfected upon completion? ☐ Yes ☒ No

PUMP
☐ Not installed Date installed
Manufacturer's name GRUNDFOS
Model number 60S30-5 HP 3 Volts 460V
Length of drop pipe 22.5 of 2"PVC ft. Capacity 40 g.p.m.
Type: ☒ Submersible ☐ L.S. Turbine ☐ Reciprocating ☐ Jet ☐

ABANDONED WELLS
Does property have any not in use and not sealed well(s)? ☐ Yes ☒ No

VARIANCE
Was a variance granted from the MDH for this well? ☐ Yes ☒ No

PROPERTY OWNER'S NAME: U.S. DEPT OF NAVY (NIROP)

Property owner's mailing address if different than well location address indicated above.

NAVAL FAC. ENG. COMMAND
2155 EAGLE DRIVE
NORTH CHARLESTON, NC 29406

WELL OWNER'S NAME: SAME

Well owner's mailing address if different than property owner's address indicated above.

ATTN: JIMMY JONES
JOEL SANDERS
(843) 820-5562

GEOLOGICAL MATERIALS	COLOR	HARDNESS OF MATERIAL	FROM	TO
SANDY CLAY	BROWN	S	0	2
SAND	BROWN	M	2	38.5

Use a second sheet, if needed

REMARKS, ELEVATION, SOURCE OF DATA, etc.

CODE # -__
M.G.S. QUAD NUMBER ___ -
ELEVATION ____.0 +/- 5FT
ENGINEER: CH2M HILL CONSTRUCTORS
MR. B. VENK VENKATESH (216) 623-0402
WORK COMPLETED WITH CHRIS ADAMS
ROGER E. RENNER MGR

WELL CONTRACTOR CERTIFICATION

This well was drilled under my supervision and in accordance with Minnesota Rules, Chapter 4725. The information contained in this report is true to the best of my knowledge.

E.H. RENNER & SONS, INC 71015
Licensee Business Name / Lic. or Reg. No.

12/29/00
Authorized Representative Signature / Date

VICTOR PRAUGHT 12/29/00
Name of Driller / Date

IMPORTANT - FILE WITH PROPERTY PAPERS
WELL OWNER COPY 611095

HE-01205-06 (Rev. 9/96)

MINNESOTA DEPARTMENT OF HEALTH
WELL AND BORING RECORD
Minnesota Statutes Chapter 103I

MINNESOTA UNIQUE WELL NO. 611098

WELL LOCATION
County Name: ANOKA

Township Name	Township No.	Range No.	Section No.	Fraction
FRIDLEY	30	24	27	SW NE SW ¼

House Number, Street Name, City, and Zip Code of Well Location: 4800 EAST RIVER RD, FRIDLEY
or Fire Number:

Show exact location of well in section grid with "X". Sketch map of well location. Showing property lines, roads and buildings.

N / W / E / S — ½ Mile — 1 Mile

WELL AT-8

WELL DEPTH (completed): 37.5 ft.
Date Work Completed: 29 DEC, 2000

DRILLING METHOD: ☐ Cable Tool ☐ Driven ☐ Dug ☐ Auger ☒ Rotary ☐ Jetted ☐ STARDRILL-200

DRILLING FLUID: BENTONITE/WATER
WELL HYDROFRACTURED? ☐ YES ☐ NO FROM ____ ft. to ____ ft.

USE: ☐ Domestic ☐ Irrigation ☐ Test Well ☐ Monitoring ☐ Community PWS ☐ Noncommunity PWS ☐ Dewatering ☐ Heating/Cooling ☐ Industry/Commercial ☒ Remedial ☐

CASING: ☒ Steel ☐ Plastic — Drive Shoe? ☐ Yes ☒ No — ☐ Threaded ☒ Welded ☐

CASING DIAMETER		WEIGHT	HOLE DIAM.
8 in. to 29.5 ft.		28.55 lbs./ft.	12 in. to 37.5 ft.

SCREEN: JOHNSON
Make: STAINLESS STEEL
Type: 13-SLOT
Slot/Gauze / Length: 27.5 ft. and 37.5 ft.
Set between
OPEN HOLE from: 8" PS ft.
Diam.: 10 FT
FITTINGS: WR X PB

STATIC WATER LEVEL: 20.6 toc ft. ☒ below ☐ above land surface. Date measured: 10/13/00

PUMPING LEVEL (below land surface): 29.0 ft. after 3.0 hrs. pumping 40 g.p.m.

WELL HEAD COMPLETION: ☒ Pitless adapter manufacturer BAKER MONITOR Model 8PS810
☐ Casing Protection ☒ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

GROUTING INFORMATION
Well grouted? ☒ Yes ☐ No
Grout Material: ☒ Neat cement ☐ Bentonite ☐ Concrete ☐ High Solids Bentonite
from 6 to 16 ft. 10.0 ☐ yds. ☒ bags
from ____ to ____ ft. ____ ☐ yds. ☐ bags
from ____ to ____ ft. ____ ☐ yds. ☐ bags

NEAREST KNOWN SOURCE OF CONTAMINATION: 52 feet NORTH direction SEWER type
Well disinfected upon completion? ☐ Yes ☐ No

PUMP
☐ Not installed Date installed ____
Manufacturer's name: GRUNDFOS
Model number: 16S07-8 HP 3/4 Volts 460V
Length of drop pipe: 22 FT of 1-1/4" ft. Capacity 15 g.p.m.
Type: ☒ Submersible ☐ L.S. Turbine ☐ Reciprocating ☐ Jet ☐

PROPERTY OWNER'S NAME: U.S. DEPT OF NAVY (NIROP)

Property owner's mailing address if different than well location address indicated above.
NAVAL FAC. ENG. COMMAND
2155 EAGLE DRIVE
NORTH CHARLESTON, NC 29406

WELL OWNER'S NAME: SAME

Well owner's mailing address if different than property owner's address indicated above.
ATTN: JIMMY JONES
JOEL SANDERS
(843) 820-5562

GEOLOGICAL MATERIALS	COLOR	HARDNESS OF MATERIAL	FROM	TO
SAND	BROWN	S	0	33
SAND	GRAY	M	33	37.5

Use a second sheet, if needed

ABANDONED WELLS
Does property have any not in use and not sealed well(s)? ☐ Yes ☒ No

VARIANCE
Was a variance granted from the MDH for this well? ☐ Yes ☒ No

REMARKS, ELEVATION, SOURCE OF DATA, etc.
CODE # -
M.G.S. QUAD NUMBER -
ELEVATION .0 +/- 5FT
ENGINEER: CH2M HILL CONSTRUCTORS
MR. B. VENK VENKATESH (216) 623-0402
WORK COMPLETED WITH CHRIS ADAMS
ROGER E RENNER MGWC

WELL CONTRACTOR CERTIFICATION
This well was drilled under my supervision and in accordance with Minnesota Rules, Chapter 4725. The information contained in this report is true to the best of my knowledge.

E.H. RENNER & SONS, INC 71015
Licensee Business Name — Lic. or Reg. No.

12/29/00
Authorized Representative Signature — Date

VICTOR PRAUGHT 12/29/00
Name of Driller — Date

IMPORTANT - FILE WITH PROPERTY PAPERS
WELL OWNER COPY

611098

HE-01205-06 (Rev. 9/96)

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 103I

MINNESOTA UNIQUE WELL NO. 611097

WELL LOCATION

County Name: ANOKA

Township Name	Township No.	Range No.	Section No.	Fraction
FRIDLEY	30	24	27	SW 1/4 NE 1/4 SW 1/4

House Number, Street Name, City, and Zip Code of Well Location: 4800 EAST RIVER RD, FRIDLEY

or Fire Number:

Show exact location of well in section grid with "X". Sketch map of well location. Showing property lines, roads and buildings.

N / S / E / W — 1/2 Mile — 1 Mile

WELL AT-9

WELL DEPTH (completed): 51.5 ft.

Date Work Completed: 29 DEC, 2000

DRILLING METHOD: ☐ Cable Tool ☐ Driven ☐ Dug ☐ Auger ☐ Rotary ☐ Jetted ☐ STARDRILL-200

DRILLING FLUID: BENTONITE/WATER

WELL HYDROFRACTURED? ☐ YES ☐ NO FROM ____ ft. to ____ ft.

USE: ☐ Domestic ☐ Irrigation ☐ Test Well ☐ Monitoring ☐ Community PWS ☐ Noncommunity PWS ☐ Dewatering ☐ Heating/Cooling ☐ Industry/Commercial ☐ Remedial ☐

CASING: Drive Shoe? ☐ Yes ☐ No — ☐ Steel ☐ Threaded ☐ Welded ☐ Plastic ☐

HOLE DIAM.

CASING DIAMETER: 8 in. to 36.5 ft. WEIGHT: 28.55 lbs./ft. — 12 in. to 51.5 ft.

SCREEN: JOHNSON
Make: STAINLESS STEEL
Type: 14-SLOT TOP 10FT
Slot/Gauze ____ Diam. 17 FT
Length ____
Set between 34.5 ft. and 51.5 ft. FITTINGS: WR X PB

OPEN HOLE: from 8" ft. to PS ft.

PROPERTY OWNER'S NAME

U.S. DEPT OF NAVY (NIROP)

Property owner's mailing address if different than well location address indicated above.

NAVAL FAC. ENG. COMMAND
2155 EAGLE DRIVE
NORTH CHARLESTON, NC 29406

STATIC WATER LEVEL: 20.7 toc ft. ☐ below ☐ above land surface Date measured 10/18/00

PUMPING LEVEL (below land surface): 29.0 ft. after 3.0 hrs. pumping 40 g.p.m.

WELL OWNER'S NAME

SAME

Well owner's mailing address if different than property owner's address indicated above.

ATTN: JIMMY JONES
JOEL SANDERS
(843) 820-5562

WELL HEAD COMPLETION: BAKER MONITOR 7PS810
☐ Pitless adapter manufacturer ____ Model ____
☐ Casing Protection ____ ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

GROUTING INFORMATION
Well grouted? ☐ Yes ☐ No
Grout Material ☐ Neat cement ☐ Bentonite ☐ Concrete ☐ High Solids Bentonite
from 6 to 12 ft. 15.5 ☐ yds. ☐ bags
51.5 to 86 ft. 2.0 ☐ yds. ☐ bags
from ____ to ____ ft. ____ ☐ yds. ☐ bags

GEOLOGICAL MATERIALS	COLOR	HARDNESS OF MATERIAL	FROM	TO
SAND	BLACK	S	0	4
SAND	BROWN	S	4	27
SAND	GRAY	S	27	48
SAND	BROWN	S	48	62
GRAVEL	BROWN	S	62	64
CLAY	BROWN	M	64	78
SAND	BROWN	S	78	82
CLAY	BROWN	M	82	84
SAND	BROWN	S	84	86

Use a second sheet, if needed.

NEAREST KNOWN SOURCE OF CONTAMINATION: 102 feet NORTH direction STORAGE type
Well disinfected upon completion? ☐ Yes ☐ No

PUMP
☐ Not installed Date installed ____
Manufacturer's name: GRUNDFOS
Model number: 150S75-4 HP 7.5 Volts 460V
Length of drop pipe: 40 FT of 2" ft. Capacity 150 g.p.m.
Type: ☐ Submersible ☐ L.S. Turbine ☐ Reciprocating ☐ Jet ☐

ABANDONED WELLS
Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

VARIANCE
Was a variance granted from the MDH for this well? ☐ Yes ☐ No

REMARKS, ELEVATION, SOURCE OF DATA, etc.
CODE # -
M.G.S. QUAD NUMBER -
ELEVATION .0 +/- 5FT
ENGINEER: CH2M HILL CONSTRUCTORS
MR. B. VENK VENKATESH (216) 623-0402
WORK COMPLETED WITH CHRIS ADAMS
ROGER E. RENNER, MGWC

WELL CONTRACTOR CERTIFICATION
This well was drilled under my supervision and in accordance with Minnesota Rules, Chapter 4725. The information contained in this report is true to the best of my knowledge.

E.H. RENNER & SONS, INC 71015
Licensee Business Name — Lic. or Reg. No.

12/29/00
Authorized Representative Signature — Date

VICTOR PRAUGHT 12/29/00
Name of Driller — Date

IMPORTANT - FILE WITH PROPERTY PAPERS
WELL OWNER COPY

611097

HE-01205-06 (Rev. 9/96)

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 103I

MINNESOTA UNIQUE WELL NO. 611096

WELL LOCATION

County Name: ANOKA

Township Name	Township No.	Range No.	Section No.	Fraction
FRIDLEY	30	24	27	SW ¼ NE SW ¼

House Number, Street Name, City, and Zip Code of Well Location: 4800 EAST RIVER RD, FRIDLEY

or Fire Number:

Show exact location of well in section grid with "X". Sketch map of well location. Showing property lines, roads and buildings.

N / W / E / S / ½ Mile / 1 Mile

WELL AT-10

WELL DEPTH (completed): 83.83 ft.

Date Work Completed: 29 DEC, 2000

DRILLING METHOD: ☐ Cable Tool ☐ Driven ☐ Dug ☐ Auger ☒ Rotary ☐ Jetted ☐ STARDRILL-200

DRILLING FLUID: BENTONITE/WATER

WELL HYDROFRACTURED? ☐ YES ☐ NO FROM ____ ft. to ____ ft.

USE: ☐ Domestic ☐ Irrigation ☐ Test Well ☐ Monitoring ☐ Community PWS ☐ Noncommunity PWS ☐ Dewatering ☐ Heating/Cooling ☐ Industry/Commercial ☒ Remedial ☐

CASING: ☒ Steel ☐ Plastic — Drive Shoe? ☐ Yes ☒ No — ☐ Threaded ☒ Welded ☐

HOLE DIAM.

CASING DIAMETER / WEIGHT: 8 in. to 70.83 ft. — 28.55 lbs./ft. — 12 in. to 70.83 ft.

SCREEN: JOHNSON
Make: STAINLESS STEEL
Type: 10-SLOT
Slot/Gauze
Set between 68.83 ft. and 83.83 ft.

OPEN HOLE: from 8" ft. to PS ft.
Diam.
Length 15 FT
FITTINGS: WR X PB

STATIC WATER LEVEL: 24.4 toc ft. ☒ below ☐ above land surface. Date measured 10/22/00

PUMPING LEVEL (below land surface): 48.0 ft. after 3.0 hrs. pumping 30 g.p.m.

WELL HEAD COMPLETION: ☒ Pitless adapter manufacturer BAKER MONITOR Model 8PS810
☐ Casing Protection ☒ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

GROUTING INFORMATION
Well grouted? ☒ Yes ☐ No
Grout Material: ☒ Neat cement ☐ Bentonite ☐ Concrete ☐ High Solids Bentonite
from 6 to 12 ft. 12.5 ☐ yds. ☒ bags
from ____ to ____ ft. ____ ☐ yds. ☐ bags
from ____ to ____ ft. ____ ☐ yds. ☐ bags

NEAREST KNOWN SOURCE OF CONTAMINATION: 375 feet NORTH direction STEWER type
Well disinfected upon completion? ☐ Yes ☒ No

PUMP
☐ Not installed Date installed
Manufacturer's name: GRUNDFOS
Model number: 25S10-7 HP 1.0 Volts 460V
Length of drop pipe: 40 FT of 1.5" ft. Capacity 30 g.p.m.
Type: ☒ Submersible ☐ L.S. Turbine ☐ Reciprocating ☐ Jet ☐

ABANDONED WELLS
Does property have any not in use and not sealed well(s)? ☐ Yes ☒ No

VARIANCE
Was a variance granted from the MDH for this well? ☐ Yes ☒ No

PROPERTY OWNER'S NAME: U.S. DEPT OF NAVY (NIROP)

Property owner's mailing address if different than well location address indicated above.
NAVAL FAC. ENG. COMMAND
2155 EAGLE DRIVE
NORTH CHARLESTON, NC 29406

WELL OWNER'S NAME: SAME

Well owner's mailing address if different than property owner's address indicated above.
ATTN: JIMMY JONES
JOEL SANDERS
(843) 820-5562

GEOLOGICAL MATERIALS	COLOR	HARDNESS OF MATERIAL	FROM	TO
SANDY	BROWN	S	0	34
CLAY-TILL	GRAY	M	34	65
SAND	BROWN	S	65	81
CALY	BROWN	M	81	84.5

Use a second sheet, if needed

REMARKS, ELEVATION, SOURCE OF DATA, etc.
CODE # -
M.G.S. QUAD NUMBER -
ELEVATION .0 +/- 5FT
ENGINEER: CH2M HILL CONSTRUCTORS
MR. B. VENK VENKATESH (216) 623-0402
WORK COMPLETED WITH CHRIS ADAMS
ROGER E. RENNER, MGWC

WELL CONTRACTOR CERTIFICATION
This well was drilled under my supervision and in accordance with Minnesota Rules, Chapter 4725. The information contained in this report is true to the best of my knowledge.

E.H. RENNER & SONS, INC — 71015
Licensee Business Name — Lic. or Reg. No.

12/29/00
Authorized Representative Signature — Date

VICTOR PRAUGHT — 12/29/00
Name of Driller — Date

IMPORTANT: FILE WITH PROPERTY PAPERS
WELL OWNER COPY — 611096

HE-01205-06 (Rev. 9/96)

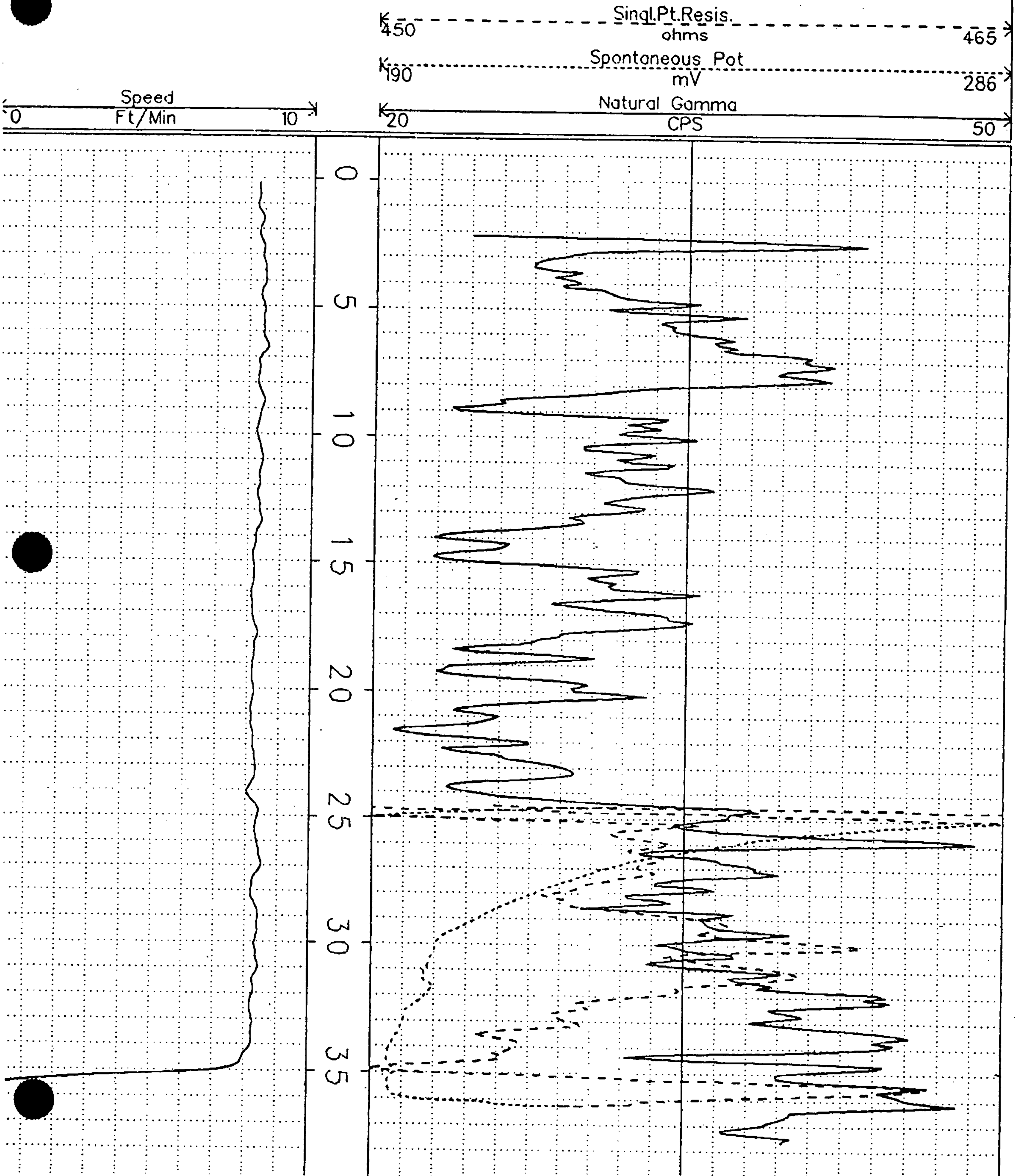
Appendix B

Boring Logs and Pump Test Data

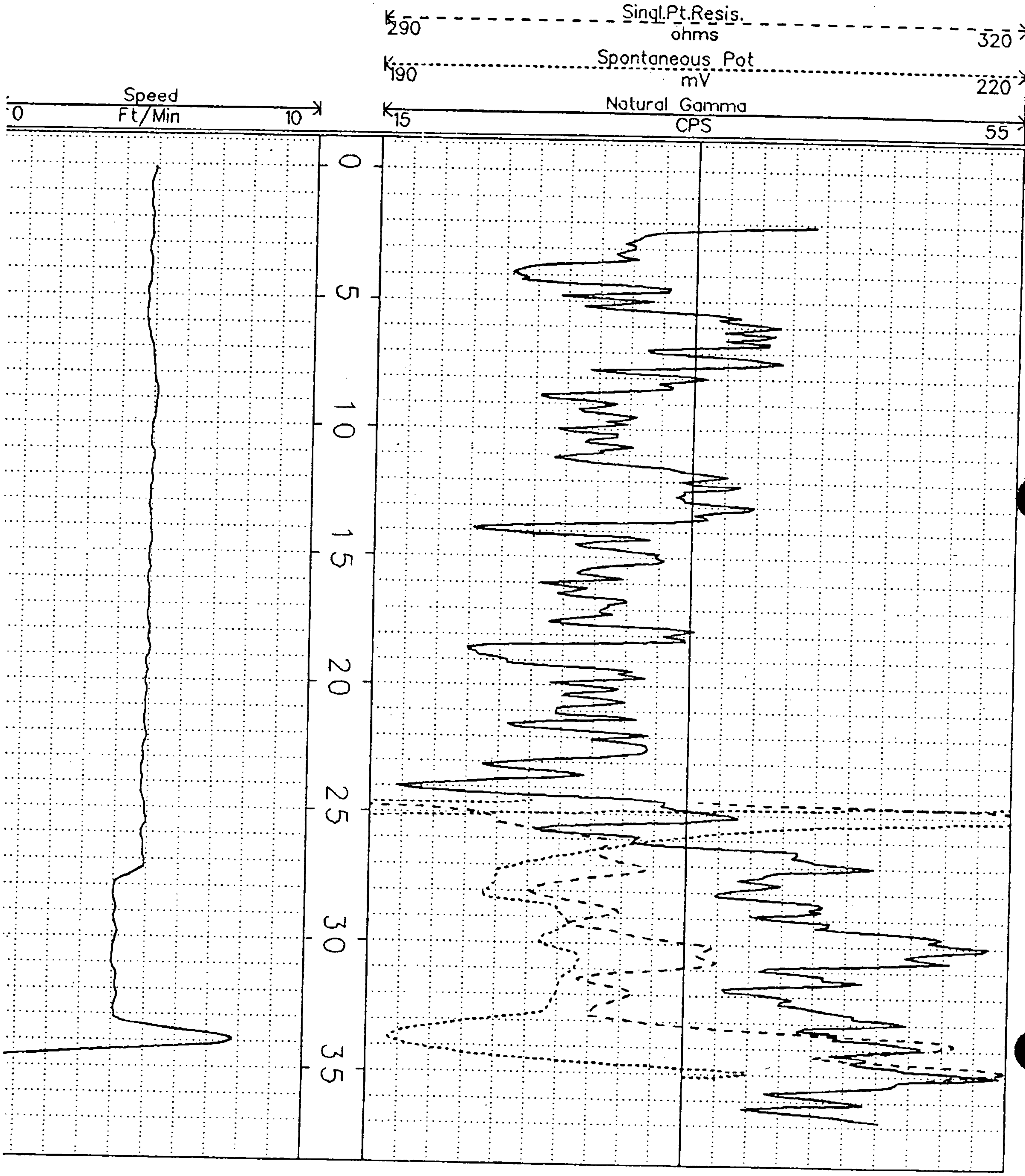
Appendix B1

Gamma Logs

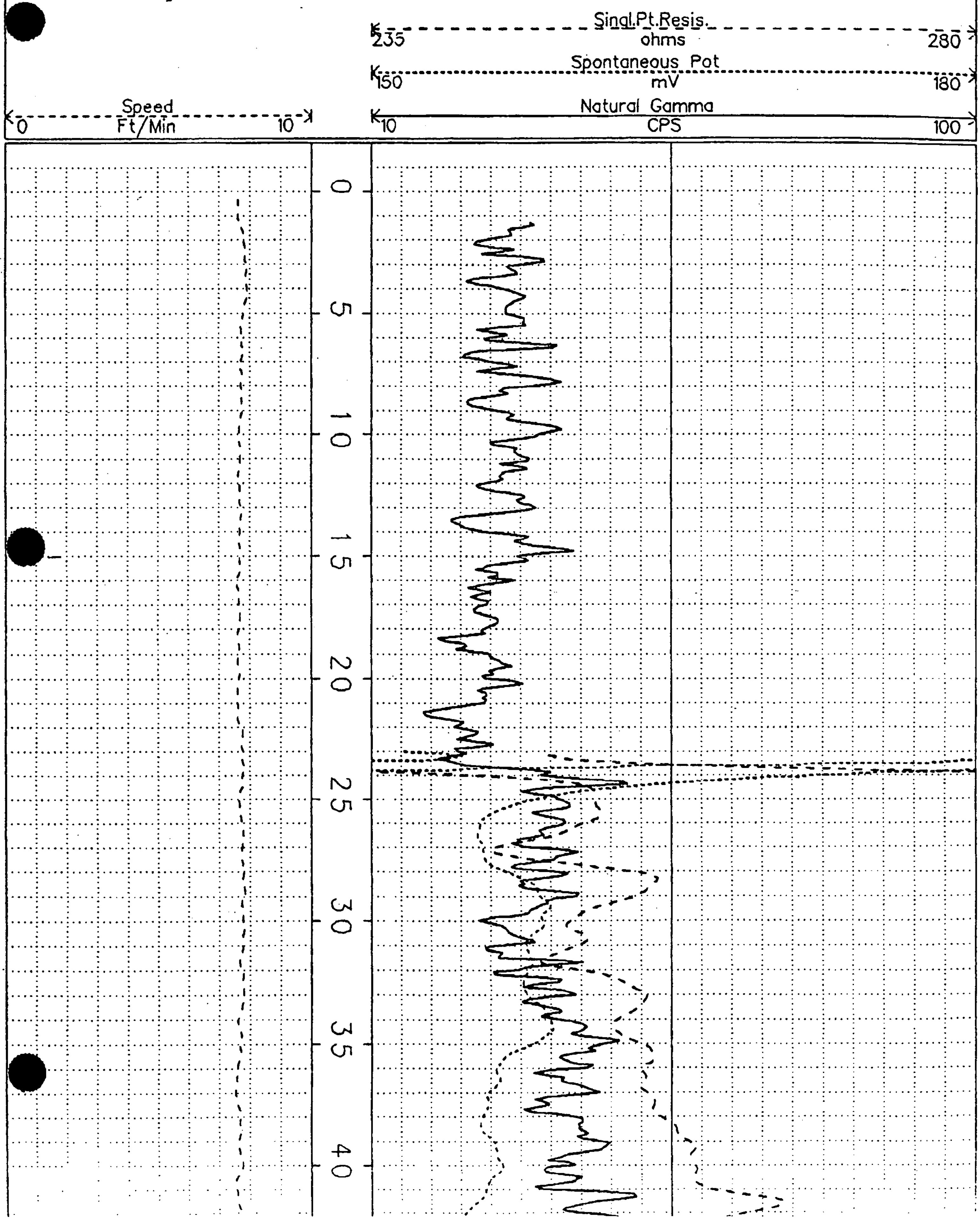
NIROP Fridley — AT-7 — October 13, 2000

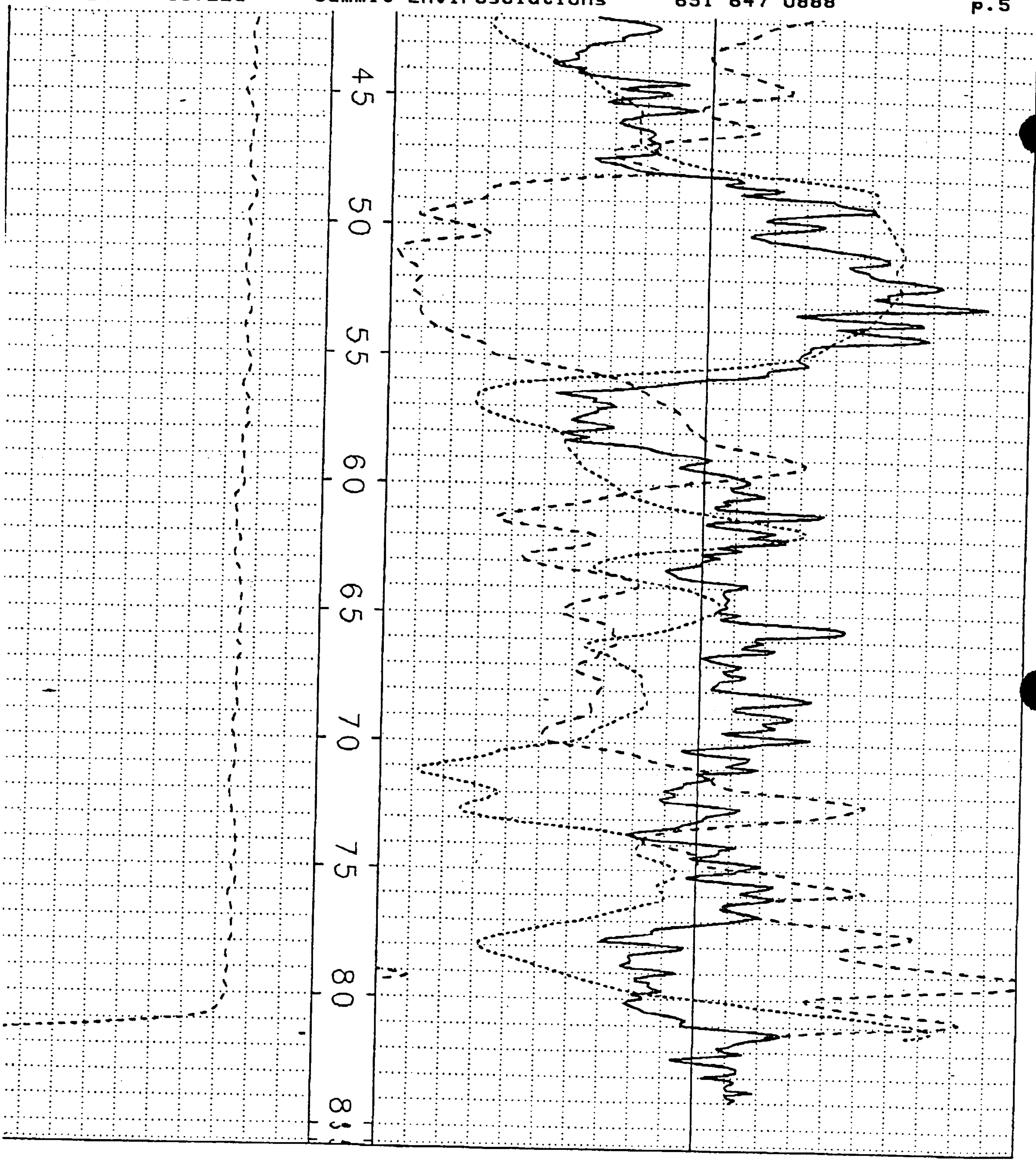


NIROP Fridley – Boring AT--8 – October 13, 2000

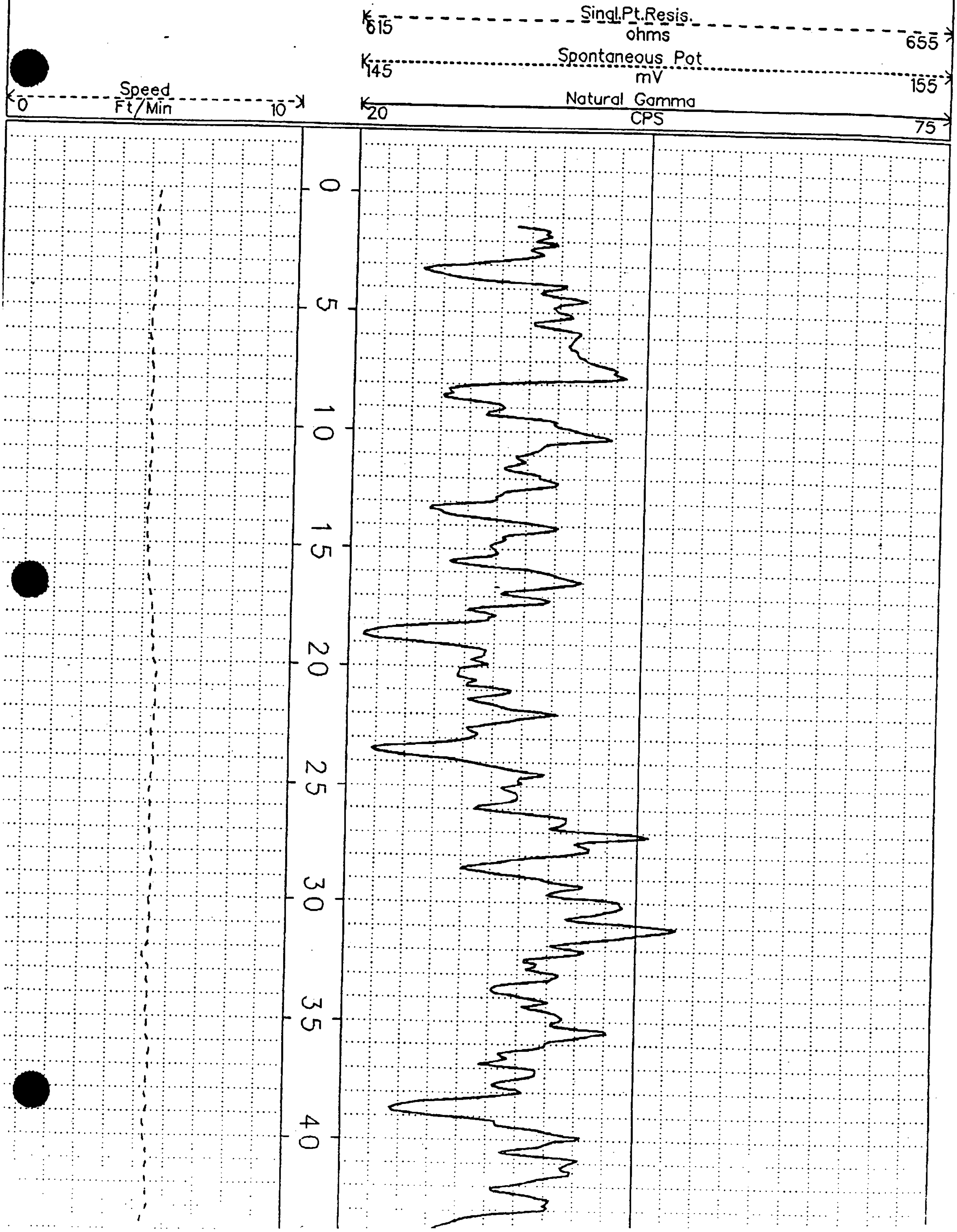


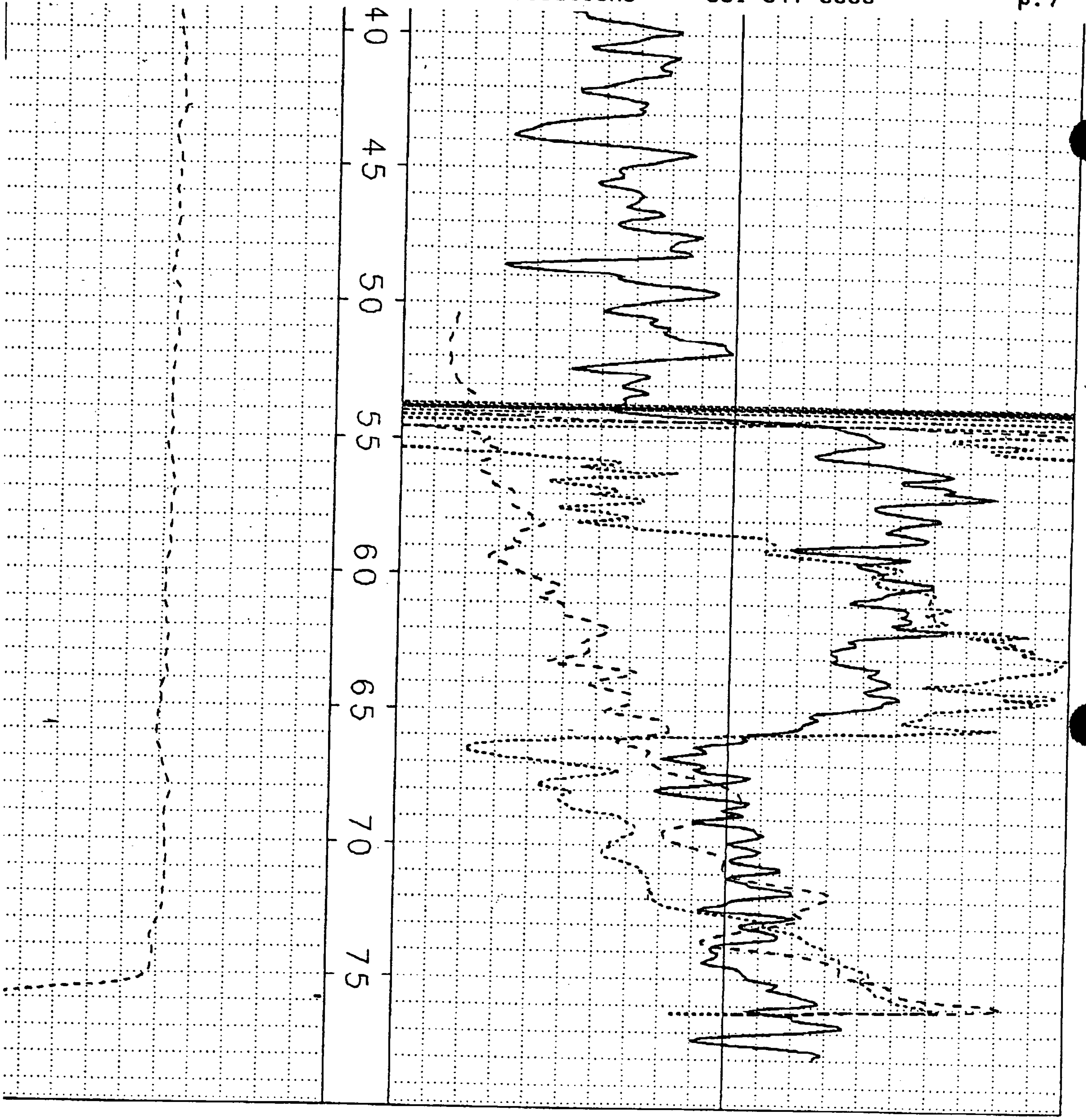
NIROP Fridley – Boring AT-9 – October 18, 2000




45
50
55
60
65
70
75
80
83

NIROP Fridley – Boring At-10 – October 18, 2000




40
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70
75

Appendix B2

Borehole Logs

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: 01-00535 LOG OF BORING NO. AT-7 (p. 1 of 2)

PROJECT: NIROP; Fridley, MN

DEPTH IN FEET	SURFACE ELEVATION: MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	WC	DEN	LL	PL	% 200
0	7½" Concrete										
1–2	Fill, mixture of silty sand and clayey sand, black and brown	FILL	10	M	SS	12					
2–4	Fill, mostly silty sand, black	FILL	9	M	SS	17					
4–7	Sand with silt, fine to medium grained, brown mottled, moist, loose (SP-SM)	COARSE ALLUVIUM	6	M	SS	15					
7–9	Sand, medium to fine grained, light brown, moist, loose (SP)		7	M	SS	15					
9–12	Sand, fine to medium grained, light brown, moist, loose (SP)		10	M	SS	15					
12–17	Sand, a little gravel, a cobble at about 13½', medium to fine grained, light brown, moist, medium dense (SP)		16	M	SS	14					
			15	M	SS	13					
17–19	Sand, fine to medium grained, light brown, moist, medium dense (SP)		16	M	SS	15					
19–	Sand, a little gravel, medium grained, light brown, moist to about 20½' then waterbearing, medium dense to loose (SP)		15	M/W	SS	14					

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-24'	3.25" HSA							
24-37'	RD w/DM	10/13/00	1:59	23.0	21.0	20.7		20.6
		10/13/00	2:11	23.0	21.0	20.7		20.6
BORING COMPLETED: 10/13/00		10/13/00	4:25	38.5	24.0	37.6	0.5	-
CC: SG CA: BR Rig: 33R		10/19/00	10:15	38.5	24.0	37.0	15.4	

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

2/99

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: 01-00535 LOG OF BORING NO. AT-7 (p. 2 of 2)

PROJECT: NIROP; Fridley, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	% 200
	Sand, a little gravel, medium grained, light brown, moist to about 20½' then waterbearing, medium dense to loose (SP)	COARSE ALLUVIUM	9	W	SS	17					
23											
24			8	W	SS	18					
25											
26			9	W	SS	11					
27											
28	Sand, a little gravel, medium to fine grained, light brown, waterbearing, medium dense (SP)		14	W	SS	13					
29											
30	Sand, fine to medium grained, light brown, waterbearing, loose (SP)		8	W	SS	12					
			9	W	SS	13					
31											
32	Sand, a little gravel, medium grained, light brown, waterbearing, loose (SP)										
33											
34			9	W	SS	10					
35											
36	Sand, fine to medium grained, light gray, waterbearing, loose (SP)		7	W	SS	9					
37											
38			9	W	SS	11					
	END OF BORING										

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: 01-00535 LOG OF BORING NO. AT-8 (p. 1 of 2)

PROJECT: NIROP; Fridley, MN

DEPTH IN FEET	SURFACE ELEVATION: ______ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	WC	DEN	LL	PL	% 200
	6" Concrete										
1 – 2	Fill, mostly sand, brown	FILL	7	M	SS	7					
2 – 4	Fill, mostly clayey sand, black		4	M	SS	8					
4 – 7	Fill, mixture of silty sand and sand, a little lean clay, brown, dark brown and a little black		10	M	SS	15					
7 – 9	Sand with silt, a little gravel, medium to fine grained, brown, moist, medium dense (SP-SM)	COARSE ALLUVIUM	16	M	SS	15					
9 – 12	Sand, fine to medium grained, light brown, moist, loose (SP)		9	M	SS	13					
12 – 14	Sand, a little gravel, medium to fine grained, light brown, moist, medium dense (SP)		11	M	SS	13					
14 – 17	Sand, fine grained, light brown, moist, loose (SP)		10	M	SS	16					
17 – 19	Sand, medium to fine grained, light brown, moist, medium dense (SP)		14	M	SS	16					
19 – 21	Sand, fine to medium grained, light brown, moist, loose (SP)		7	▼	SS	16					
21	Sand, a little gravel, medium grained, brown, waterbearing, loose (SP)										

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-24'	3.25" HSA							
24-36'	RD w/DM	10/13/00	10:16	23.0	21.0	20.8		20.5
		10/13/00	10:32	23.0	21.0	20.8		20.5
BORING COMPLETED:	10/13/00	10/13/00	11:57	37.5	24.0	36.0	1.5	-
CC: SG	CA: BR Rig: 33R	10/18/00	11:00	37.5	24.0	35.0	15.0	

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: 01-00535

LOG OF BORING NO. AT-8 (p. 2 of 2)

PROJECT: NIROP; Fridley, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	WC	DEN	LL	PL	% 200
			9	W	SS	17					
23											
24			6	W	SS	16					
25											
26	Sand, a little gravel, medium grained, brown, waterbearing, loose (SP)		9	W	SS	13					
27											
28		COARSE ALLUVIUM	10	W	SS	4					
29											
30			10	W	SS	8					
31											
32			10	W	SS	14					
33											
34			10	W	SS	3					
35	Sand, a little gravel, medium grained, light gray, waterbearing, loose to medium dense (SP)		18	W	SS	2					
36											
37			19	W	SS	4					
	END OF BORING										

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: 01-00535 LOG OF BORING NO. AT-9 (p. 1 of 4)

PROJECT: NIROP; Fridley, MN

SURFACE ELEVATION: ______

MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	WC	DEN	LL	PL	% 200
Fill, mostly silty sand, a little gravel, dark brown	FILL	6	D	SS	20					
Fill, mostly silty sand, black		5	M	SS	17					
Sand, fine to medium grained, light brown, moist, loose (SP)	COARSE ALLUVIUM	5	M	SS	16					
Sand, fine grained, light brown, moist, loose (SP)		10	M	SS	16					
Sand, a little gravel, medium grained, light brown, moist, medium dense (SP)		12	M	SS	13					
		11	M	SS	17					
Sand, a little gravel, fine to medium grained, light brown, moist to 20½' then waterbearing, loose to medium dense to loose (SP)		7	M	SS	17					
		7	M	SS	17					
		9	M	SS	17					
		11	M/W	SS	19					

DEPTH	DRILLING METHOD
0-24'	3.25" HSA
24-85½'	RD w/DM

BORING COMPLETED: 10/18/00

CC: SG CA: BR Rig: 33R

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
10/12/00	10:53	24.0	22.0	21.8		20.7
10/12/00	11:25	24.0	22.0	21.8		20.7
10/12/00	3:38	60.0	24.0	-	2.7	-
10/19/00	8:30	86.0	24.0	84.0	21.2	-

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: 01-00535 LOG OF BORING NO. AT-9 (p. 2 of 4)

PROJECT: NIROP; Fridley, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	% 200
23	Sand, a little gravel, fine to medium grained, light brown, moist to 20½' then waterbearing, loose to medium dense to loose (SP)		6	W	SS	16					
24											
25	Sand, a little gravel, medium grained, light brown, waterbearing, loose (SP)		5	W	SS	10					
26											
27											
28	Sand, fine to medium grained, light gray, waterbearing, medium dense (SP)		12	W	SS	11					
29											
30	Sand, fine grained, light gray, waterbearing, loose (SP)		9	W	SS	15					
31											
32											
33			8	W	SS	8					
34		COARSE ALLUVIUM									
35			6	W	SS	11					
36											
37			7	W	SS	12					
38	Sand, a little gravel, medium grained, light gray, waterbearing, loose (SP)										
39			9	W	SS	12					
40											
41			7	W	SS	19					
42											
43			6	W	SS	13					
44											
45			7	W	SS	12					
46											
47	Sand, fine to medium grained, light gray, waterbearing, loose (SP)		7	W	SS	14					

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: 01-00535 LOG OF BORING NO. AT-9 (p. 3 of 4)

PROJECT: NIROP; Fridley, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	WC	DEN	LL	PL	% 200
49–56	Fat clay, reddish brown to grayish brown, stiff to hard to very stiff, lenses of silt and silty sand (CH/CL)	FINE ALLUVIUM	11	M	SS	12					
			34	M	SS	18					
			22	M	SS	24					
			23	M	SS	23					
57–58	Sand, fine to medium grained, light gray, waterbearing, medium dense (SP)	COARSE ALLUVIUM	15	W	SS	17					
58–62	Sand with silt and gravel, medium grained, brown, waterbearing, medium dense to loose (SP-SM)		26	W	SS	12					
			10	W	SS	10					
62–64	Gravel with sand, brown, waterbearing, medium dense (GP)		27	W	SS	3					
64–72	Lean clay, brownish gray, very stiff to hard to very stiff, lenses and layers of silt, lenses of silty sand and waterbearing sand (CL)	FINE ALLUVIUM	17	W	SS	12					
			33	W	SS	3					
			22	W	SS	20					
			26	W	SS	20					
72–	Lean clay, brownish gray, very stiff to hard, lenses of silty sand, silt and waterbearing sand (CL)		29	W	SS	17					

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: 01-00535 LOG OF BORING NO. AT-9 (p. 4 of 4)

PROJECT: NIROP; Fridley, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	WC	DEN	LL	PL	% 200
75–78	Lean clay, brownish gray, very stiff to hard, lenses of silty sand, silt and waterbearing sand (CL)	FINE ALLUVIUM	35	W	SS	18					
			32	W	SS	20					
78–79	Silty sand, fine to medium grained, brown, wet, medium dense (SM)	COARSE ALLUVIUM	26	W	SS	20					
79–80	Sand with silt, fine to medium grained, brown, waterbearing, medium dense (SP-SM)										
80–82	Silty sand, fine to medium grained, brown, wet, dense (SM)		32	W	SS	7					
82–84	Lean clay, brownish gray, very stiff, lenses of silty sand and waterbearing sand (CL)	FINE ALLUVIUM	28	W	SS	20					
84–86	Sand with silt, a little gravel, medium grained, brown, medium dense (SP-SM)	COARSE ALLUVIUM	19	W	SS	15					
86	END OF BORING										

Note: Boring temporarily terminated at a depth of 60' on 10/12/00. Set up over boring on 10/18/00 and extended boring to depth of 86'.

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: 01-00535 LOG OF BORING NO. AT-10 (p. 1 of 4)

PROJECT: NIROP; Fridley, MN

DEPTH IN FEET	SURFACE ELEVATION: MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	WC	DEN	LL	PL	% 200
0–0.25	3" Bituminous pavement										
0.25–4.5	Fill, mixture of silty sand and sand, a little gravel, brown and dark brown	FILL	5	M	SS	15					
			5	M	SS	10					
4.5–6.5	Silty sand, fine grained, dark brown to brown, moist, loose (SM)	COARSE ALLUVIUM	7	M	SS	17					
6.5–13.5	Sand, fine grained, light brown, moist, loose to very loose (SP)		6	M	SS	15					
			5	M	SS	16					
			4	M	SS	17					
13.5–17	Sand, a little gravel, medium grained, brown, moist, loose (SP)		6	M	SS	17					
17–21+	Sand, medium to fine grained, light brown, moist, loose (SP)		9	M	SS	17					
			8	M	SS	17					

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-54'	3.25" HSA							
54-83'	RD w/DM	10/16/00	12:45	26.0	24.5	25.6		None
		10/16/00	1:16	29.0	27.0	28.3		None
BORING COMPLETED: 10/17/00		10/17/00	11:18	53.5	52.0	53.1		51.2
CC: SG CA: BR Rig: 33R		10/17/00	11:23	53.5	52.0	53.1		48.6

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: 01-00535 LOG OF BORING NO. AT-10 (p. 2 of 4)

PROJECT: NIROP; Fridley, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	WC	DEN	LL	PL	% 200
23–24	Sand, fine grained, light brown, moist, loose (SP)		10	M	SS	15					
24–26.5	Sand, a little gravel, medium grained, light brown, moist, medium dense (SP)		12	M	SS	17					
26.5–39	Sand with silt and gravel, medium grained, brown, moist, dense to medium dense to dense to medium dense (SP-SM)	COARSE ALLUVIUM	36	M	SS	15					
			17	M	SS	12					
			31	M	SS	16					
			33	M	SS	15					
			27	M	SS	16					
39–	Clayey sand, a little gravel, brownish gray, stiff, lenses of waterbearing sand below about 61' (SC)	TILL	9	M	SS	20					
			13	M	SS	18					
			10	M	SS	18					

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: 01-00535 LOG OF BORING NO. AT-10 (p. 3 of 4)

PROJECT: NIROP; Fridley, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	% 200
	Clayey sand, a little gravel, brownish gray, stiff, lenses of waterbearing sand below about 61' (SC)	TILL	9	▼	SS	18					
49											
50			11	M	SS	18					
51											
52											
53			10	M	SS	18					
54											
55			11	M	SS	18					
56											
57											
58			12	M	SS	18					
59											
60			10	M	SS	18					
61											
62			15	M	SS	24					
63											
64			12	M	SS	19					
65	Sand with silt, a little gravel, fine to medium grained, grayish brown, waterbearing, medium dense to dense (SP-SM)	COARSE ALLUVIUM									
66			27	W	SS	14					
67											
68			36	W	SS	17					
69											
70			35	W	SS	17					
71	Sand with silt, a little gravel, fine grained, brown, waterbearing, dense (SP-SM)										
72			45	W	SS	15					
73											

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: 01-00535 LOG OF BORING NO. AT-10 (p. 4 of 4)

PROJECT: NIROP; Fridley, MN

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC. IN.	WC	DEN	LL	PL	% 200
			107	W	SS	0					
75											
76	Sand with silt, a little gravel, fine grained, brown, waterbearing, dense (SP-SM)	COARSE ALLUVIUM	32	W	SS	16					
77											
78			37	W	SS	17					
79											
80			62	W	SS	0					
81											
82	Clayey sand, a little gravel, grayish brown, hard, lenses of waterbearing sand (SC)	TILL	50	W	SS	20					
83											
84			148	M	SS	15					

END OF BORING

Note: N-value at 73' and 79' influenced by gravel or cobble.

Appendix B3

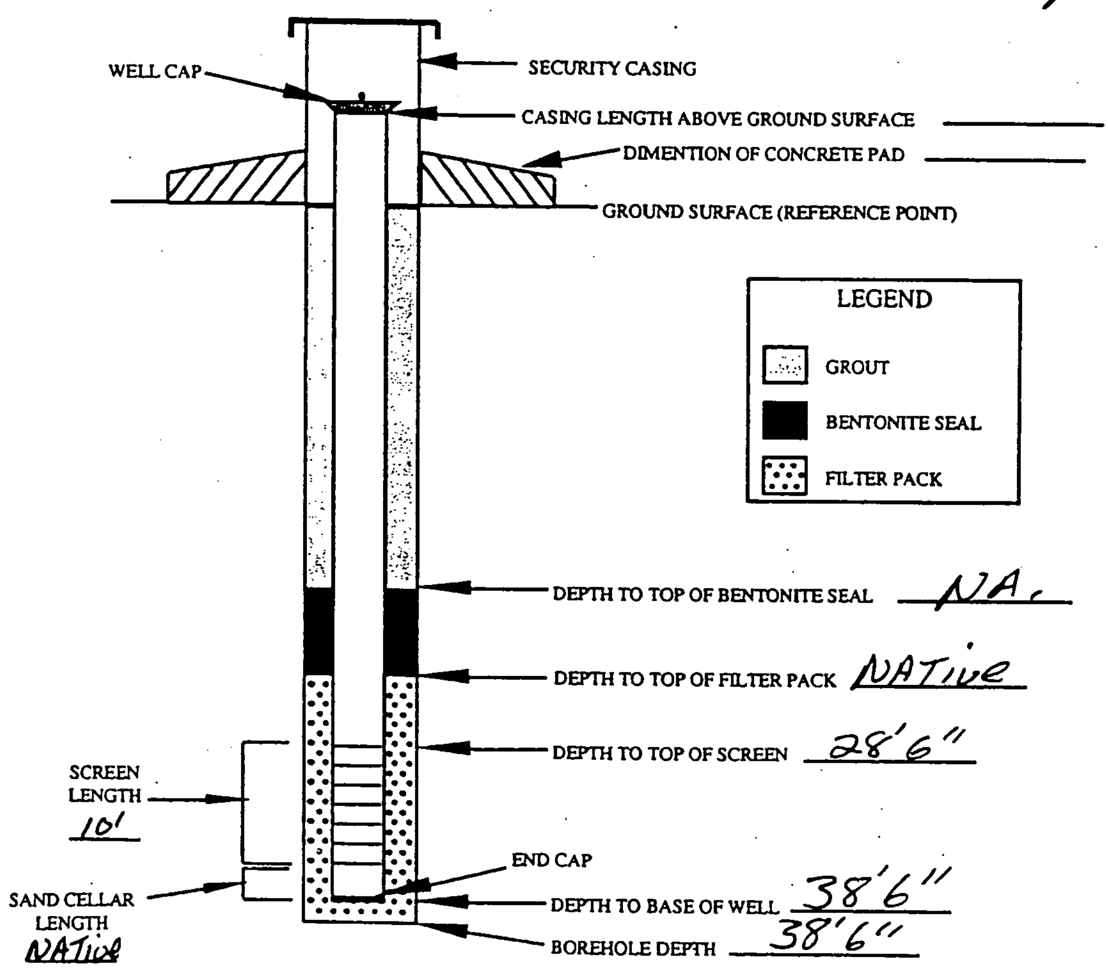
Extraction Well Logs

WELL CONSTRUCTION DETAILS AND ABANDONMENT FORM

FIELD REPRESENTATIVE: Victor Prought
DRILLING CONTRACTOR: E.H. Renner
DRILLING TECHNIQUE: Rotary mud
AUGER SIZE AND TYPE: 12" to Screen then 10"
BOREHOLE IDENTIFICATION: AT-7
BOREHOLE DIAMETER: 12" to Screen then 10"
WELL IDENTIFICATION: AT-7
WELL CONSTRUCTION START DATE: ~~10-31-00~~ 11-7-00
WELL CONSTRUCTION COMPLETE DATE: 11-21-00
SCREEN MATERIAL: S.S.
SCREEN DIAMETER: 8" P.S
STRATUM-SCREENED INTERVAL (FT):
CASING MATERIAL: Steel / .322" WAll
CASING DIAMETER: 8" ID

TYPE OF FILTER PACK: NAtive
GRADIATION:
AMOUNT OF FILTER PACK USED:
TYPE OF BENTONITE: None
AMOUNT BENTONITE USED:
TYPE OF CEMENT:
AMOUNT CEMENT USED:
GROUT MATERIALS USED:
DIMENSIONS OF SECURITY CASING: NA
TYPE OF WELL CAP: Security
TYPE OF END CAP: Walded Plate
COMMENTS: 10 Slot Screen
1¼" Pipe 28'6" To Bottom of pump

SPECIAL CONDITIONS
(describe and draw)



NOT TO SCALE

INSTALLED BY: Victor Prought
INSTALLATION OBSERVED BY: J. G. Johnson

DISCREPANCIES:

WELL CONSTRUCTION DETAILS AND ABANDONMENT FORM

FIELD REPRESENTATIVE: Victor Prought

DRILLING CONTRACTOR: E.H. Renner

DRILLING TECHNIQUE: Rotary mud

AUGER SIZE AND TYPE: 12" to Screen then 10"

BOREHOLE IDENTIFICATION: AT-8

BOREHOLE DIAMETER: 12" to Screen then 10"

WELL IDENTIFICATION: AT-8

WELL CONSTRUCTION START DATE: 10-30-00

WELL CONSTRUCTION COMPLETE DATE: 11-21-00

SCREEN MATERIAL: S.S.

SCREEN DIAMETER: 8" P.S.

STRATUM-SCREENED INTERVAL (FT): —

CASING MATERIAL: Steel .322" WAll

CASING DIAMETER: 8" I.D.

TYPE OF FILTER PACK: NATive

GRADIATION: —

AMOUNT OF FILTER PACK USED: —

TYPE OF BENTONITE: NA

AMOUNT BENTONITE USED: —

TYPE OF CEMENT:

AMOUNT CEMENT USED:

GROUT MATERIALS USED:

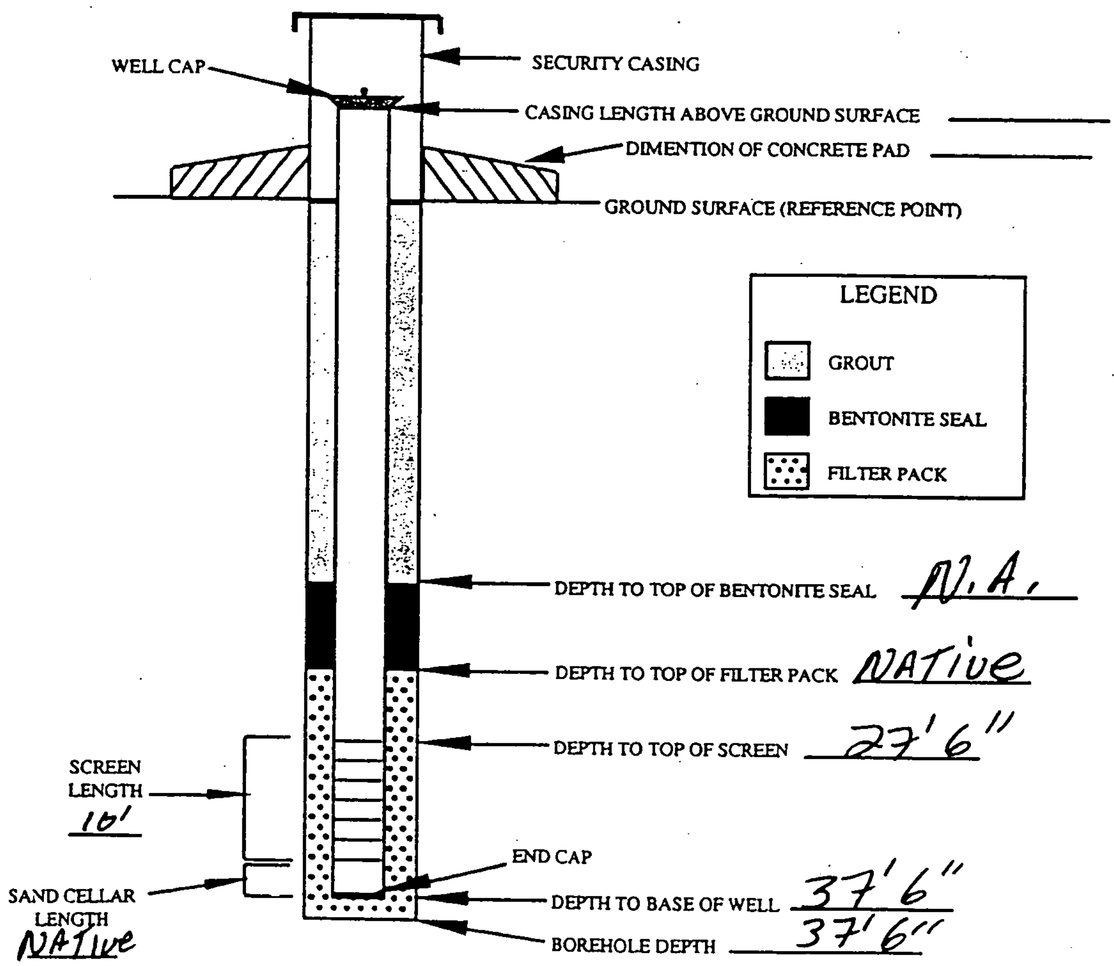
DIMENSIONS OF SECURITY CASING: NA

TYPE OF WELL CAP: Security

TYPE OF END CAP: Welded CAP

COMMENTS: 13 Slot Screen
1½" Drop pipe 31' Long

SPECIAL CONDITIONS
(describe and draw)



NOT TO SCALE

INSTALLED BY: Victor Prought INSTALLATION OBSERVED BY: J. G. Johnson

DISCREPANCIES:

WELL CONSTRUCTION DETAILS AND ABANDONMENT FORM

FIELD REPRESENTATIVE: Victor Prought
DRILLING CONTRACTOR: E.H. Renner
DRILLING TECHNIQUE: Rotary mud
AUGER SIZE AND TYPE: 12" to Screen 10" at screen
BOREHOLE IDENTIFICATION: AT-9
BOREHOLE DIAMETER: 12" to Screen then 10"
WELL IDENTIFICATION: AT 9

WELL CONSTRUCTION START DATE: 11-13-00
WELL CONSTRUCTION COMPLETE DATE: 11-21-00

SCREEN MATERIAL: S.S.
SCREEN DIAMETER: 8" P.S
STRATUM-SCREENED INTERVAL (FT):

CASING MATERIAL: Steel .322" wall
CASING DIAMETER: 8" ID

TYPE OF FILTER PACK: Native
GRADIATION:
AMOUNT OF FILTER PACK USED: N/A

TYPE OF BENTONITE: NON-used
AMOUNT BENTONITE USED:

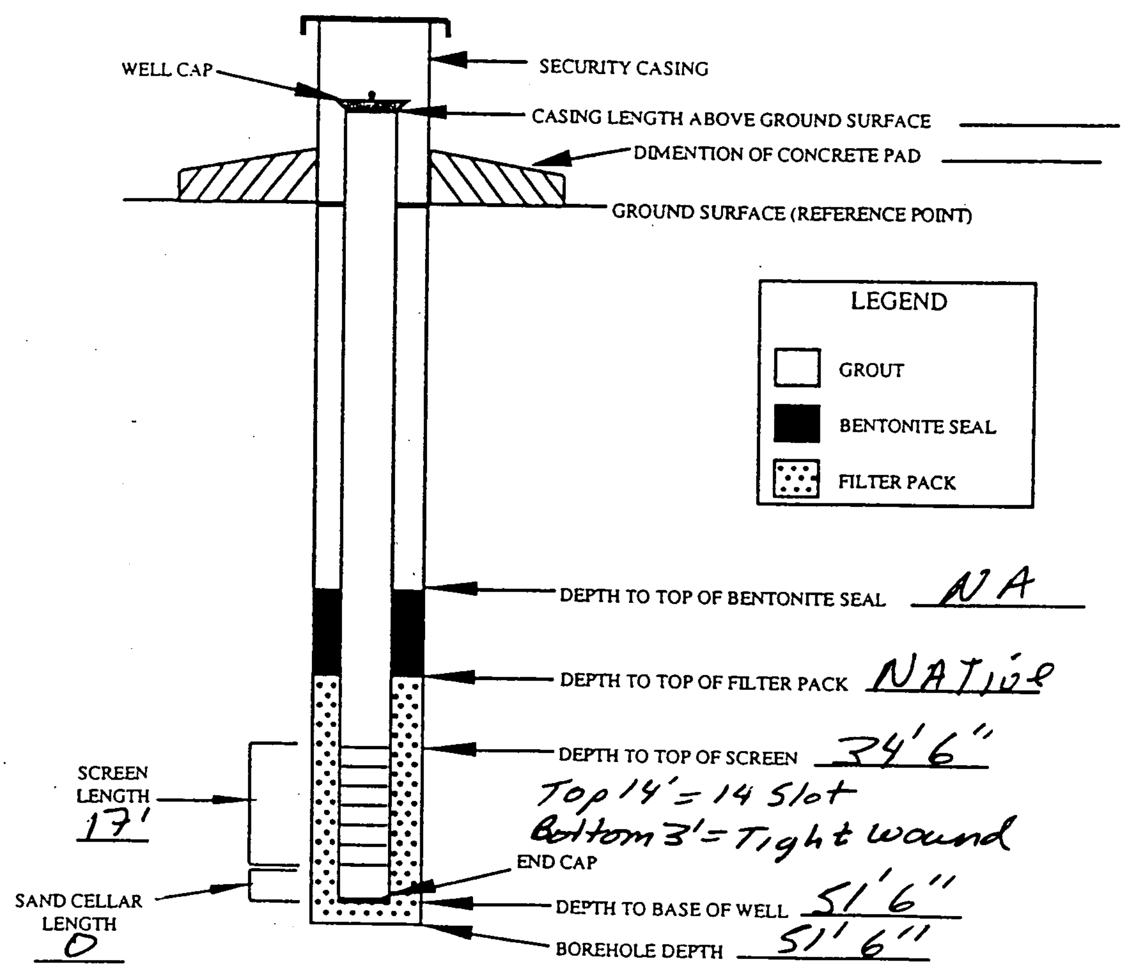
TYPE OF CEMENT:
AMOUNT CEMENT USED:
GROUT MATERIALS USED:

DIMENSIONS OF SECURITY CASING: Not installed

TYPE OF WELL CAP: Locking Security
TYPE OF END CAP: Wellded Plate

COMMENTS: Pump at 48' Bottom of 2" Pipe + Pump.

SPECIAL CONDITIONS
(describe and draw)



NOT TO SCALE

INSTALLED BY: Victor Prought
INSTALLATION OBSERVED BY: J.G. Johnson

DISCREPANCIES:

WELL CONSTRUCTION DETAILS AND ABANDONMENT FORM

FIELD REPRESENTATIVE: Victor Prought
DRILLING CONTRACTOR: E. H. Renner
DRILLING TECHNIQUE: Rotary mud
AUGER SIZE AND TYPE: 12" to Screen then 10"

BOREHOLE IDENTIFICATION: AT 10
BOREHOLE DIAMETER: 12" to Screen then 10"
WELL IDENTIFICATION: AT 10

WELL CONSTRUCTION START DATE:
WELL CONSTRUCTION COMPLETE DATE: 11-21-00

SCREEN MATERIAL: SS
SCREEN DIAMETER: 8" P.S
STRATUM-SCREENED INTERVAL (FT): ——

CASING MATERIAL: Steel .322" WAll
CASING DIAMETER: 8" ID

TYPE OF FILTER PACK:
GRADIATION:
AMOUNT OF FILTER PACK USED:

TYPE OF BENTONITE:
AMOUNT BENTONITE USED:

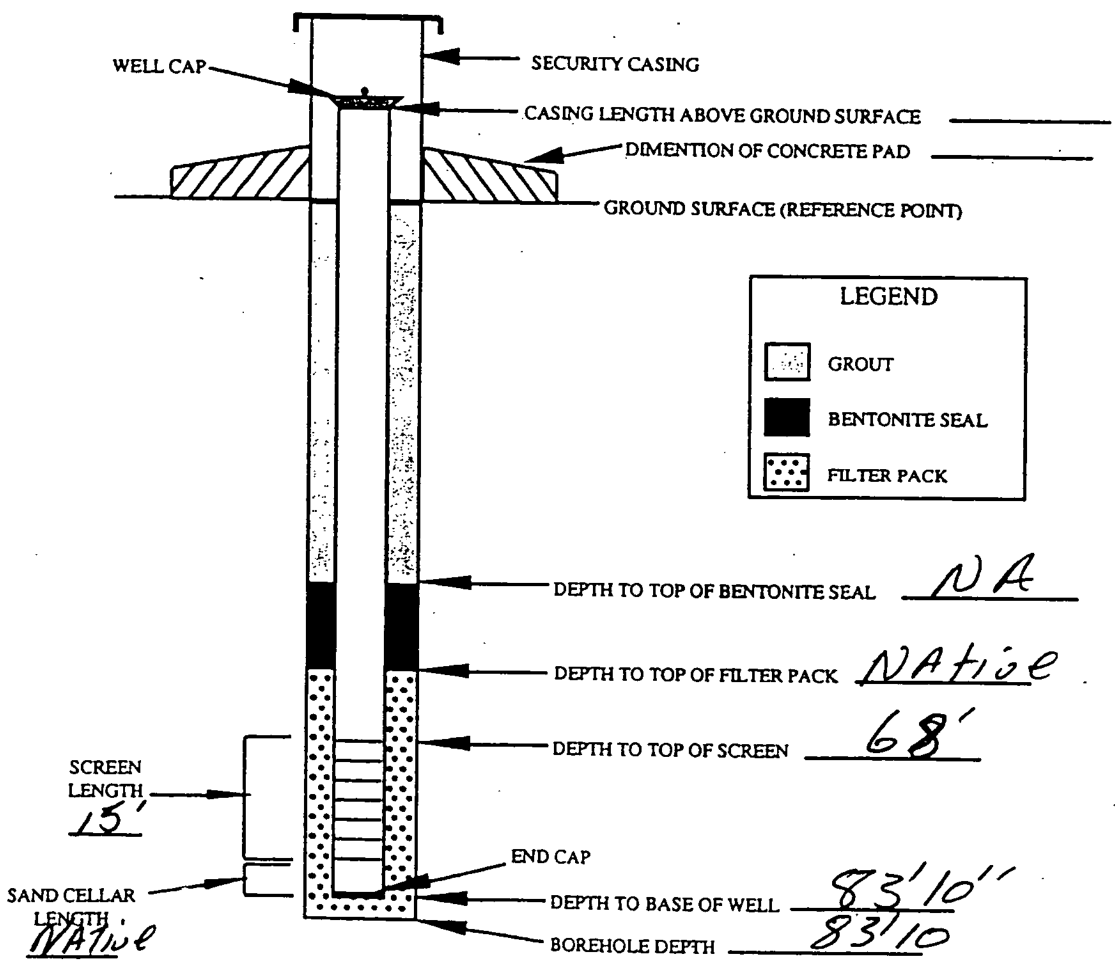
TYPE OF CEMENT:
AMOUNT CEMENT USED:
GROUT MATERIALS USED:

DIMENSIONS OF SECURITY CASING: To be Placed

TYPE OF WELL CAP:
TYPE OF END CAP: Welded Plate

COMMENTS: 10 5/or

SPECIAL CONDITIONS
(describe and draw)



NOT TO SCALE

INSTALLED BY: Victor Prought
INSTALLATION OBSERVED BY: J. G. JOHNSON

DISCREPANCIES:

REPORT OF SUBSURFACE BORINGS

PROJECT:

NIROP
4800 EAST RIVER ROAD
FRIDLEY, MINNESOTA

REPORTED TO:

EH RENNER AND SONS
15688 JARVIS STREET NW
ELK RIVER, MN 55330

ATTN: ROGER RENNER

AET JOB NO.: 01-00535

DATE: OCTOBER 25, 2000

INTRODUCTION

During the period of October 11-18, 2000, American Engineering Testing drilled 4 test borings at the referenced project site. The scope of services (boring, location, depth, etc.) was requested by EH Renner & Sons.

AUTHORIZED WORK SCOPE

Soil Borings

Procedures

The boring locations were made at locations selected by EH Renner & Sons.

We have not included a sketch indicating the boring locations or ground surface elevations at the boring locations as it is our understanding this information will be supplied by others.

The boring and sampling was done using the split-spoon and auger methods. Refer to the attached sheet (Boring Log Notes) for additional information.

All boreholes were backfilled with bentonite grout.

A field log was maintained for each soil boring. Information on field logs includes: contacts between soil layers; geologic identification (driller's opinion) of materials; notes; and other information.

Soil samples were then examined in the laboratory, and soil classification information was added to the field logs. Soil identifications and descriptions are in accordance (generally) with the ASTM Visual-Manual (D2488) system as shown on the attached sheet. The samples will be discarded or returned to the Client at AET's discretion; unless within 30 days' of the report date, the client provides a written request that AET store or ship the samples, at the client's expense.

Typed logs were then prepared from field logs. The typed logs may not contain all information shown on field logs. (Field logs are available for inspection by our client.)

Results

Typed copies of the field logs are enclosed. Refer to the attached logs for a description of the subsurface conditions encountered in the borings. The logs show: the depths to the contacts between the soil layers; the identification and geology of the soils; water level measurements; standard penetration resistance (N-column); and other information. Refer to the attached sheets (Boring Log Notes, Classification of Soils for Engineering Purposes, and General Terminology Notes) for descriptions of terminology used on the logs.

DECONTAMINATION

The drill rig and tools were steam-cleaned before being brought on the site.

Drilling tools and down-hole equipment and materials were steam-cleaned before drilling each boring.

REMARKS

Subsurface soil and ground water conditions can vary from that encountered in the borings at other locations, depths and times. Refer to the attached sheet for more information regarding limitations of subsurface exploration.

As requested by EH Renner & Sons, this is a factual report only.

To protect the addressee, the public, and ourselves, this report (and all supporting information) is provided for the addressee's own use. No representations are made to parties other than the addressee.

American Engineering Testing, Inc. appreciates this opportunity to be of service to you. If you have any questions or need further help, please call me at (651) 659-1356.

Report Prepared By:

Patrick Francis

Pat Francis
Drilling Manager

EXPLORATION/CLASSIFICATION METHODS

Sampling Methods

Split-Spoon Samples (SS)

Standard penetration (split-spoon) samples were collected in general accordance with ASTM:D1586. This method consists of driving a 2" O.D. split barrel sampler into the in-situ soil with a 140-pound hammer dropped from a height of 30". The sampler is driven a total of 18" into the soil. After an initial set of 6", the number of hammer blows to drive the sampler the final 12" is known as the standard penetration resistance or N-value.

Disturbed Samples (DS)

Sample types described as "DS" on the boring logs are disturbed samples, which are taken from the flights of the auger. Because the auger disturbs the samples, possible soil layering and contact depths should be considered approximate.

Sampling Limitations

Unless actually observed in a sample, contacts between soil layers are estimated based on the spacing of samples and the action of drilling tools. Cobbles, boulders, and other large objects generally cannot be recovered from test borings, and they may be present in the ground even if they are not noted on the boring logs.

Classification Methods

Soil classifications shown on the boring logs are based on the Unified Soil Classification (USC) system. The USC system is described in ASTM:D2487 and D2488. Where laboratory classification tests (sieve analysis or Atterberg Limits) have been performed, accurate classifications per ASTM:D2487 are possible. Otherwise, soil classifications shown on the boring logs are visual-manual judgments. Charts are attached which provide information on the USC system, the descriptive terminology, and the symbols used on the boring logs.

The boring logs include descriptions of apparent geology. The geologic depositional origin of each soil layer is interpreted primarily by observation of the soil samples, which can be limited. Observations of the surrounding topography, vegetation, and development can sometimes aid this judgment.

Water Level Measurements

The ground water level measurements are shown at the bottom of the boring logs. The following information appears under "Water Level Measurements" on the logs:

- Date and Time of measurement
- Sampled Depth: lowest depth of soil sampling at the time of measurement
- Casing Depth: depth to bottom of casing or hollow-stem auger at time of measurement
- Cave-in Depth: depth at which measuring tape stops in the borehole
- Water Level: depth in the borehole where free water is encountered
- Drilling Fluid Level: same as Water Level, except that the liquid in the borehole is drilling fluid

The true location of the water table at the boring locations may be different than the water levels measured in the boreholes. This is possible because there are several factors that can affect the water level measurements in the borehole. Some of these factors include: permeability of each soil layer in profile, presence of perched water, amount of time between water level readings, presence of drilling fluid, weather conditions, and use of borehole casing.

Sample Storage

Unless notified to do otherwise, we routinely retain representative samples of the soils recovered from the borings for a period of 30 days.

BORING LOG NOTES

DRILLING AND SAMPLING SYMBOLS

Symbol	Definition
B,H,N:	Size of flush-joint casing
BX:	BX double tube core barrel
AC:	At completion of boring
CA:	Crew assistant
CAS:	Pipe casing, number indicates nominal diameter in inches
CC:	Crew chief
COT:	Clean-out tube
DC:	Drive casing; number indicates diameter in inches
DM:	Drilling mud or bentonite slurry
DS:	Disturbed sample from auger flights
FA:	Flight auger; number indicates outside diameter in inches
HA:	Hand auger; number indicates outside diameter
HSA:	Hollow-stem auger; number indicates inside diameter in inches
JW:	Jetting water
MC:	Column used to describe moisture condition of samples and for the ground water level symbols
N (BPF):	Standard penetration resistance (N-value) in blows per foot (see notes)
NQ:	NQ wireline core barrel
PQ:	PQ wireline core barrel
RD:	Rotary drilling with fluid and roller or drag bit
REC:	In split-spoon (see notes) and thin-walled tube sampling, the recovered length (in inches) of sample. In rock coring, the length of core recovered (expressed as percent of the total core run). Zero indicates no sample recovered.
REV:	Revert drilling fluid
SS:	Standard split-spoon sampler (steel; 1⅜" is inside diameter; 2" outside diameter); unless indicated otherwise
TW:	Thin-walled tube; number indicates inside diameter in inches
WASH:	Sample of material obtained by screening returning rotary drilling fluid or by which has collected inside the borehole after "falling" through drilling fluid
WAT:	Water
WH:	Sampler advanced by static weight of drill rod and 140-pound hammer
WR:	Sampler advanced by static weight of drill rod
94 mm:	94 millimeter wireline core barrel
▼:	Water level directly measured in boring
▽:	Estimated water level based solely on sample appearance

TEST SYMBOLS

Symbol	Definition
CONS:	One-dimensional consolidation test
DEN:	Dry density, pcf
DST:	Direct shear test
E:	Pressuremeter Modulus, tsf
HYD:	Hydrometer analysis
LL:	Liquid limit, %
LP:	Pressuremeter Limit Pressure, tsf
PERM:	Coefficient of permeability (K) test; F - Field; L - Laboratory
PL:	Plastic limit, %
q_p:	Pocket penetrometer strength, tsf (approximate)
q_c:	Static cone bearing pressure, tsf
q_u:	Unconfined compressive strength, psf
R:	Electrical resistivity, ohm-cms
RQD:	Rock Quality Designator in percent (aggregate length of core pieces 4" or more in length as a percent of total core run)
SA:	Sieve analysis
TRX:	Triaxial compression test
VSR:	Vane shear strength, remoulded (field), psf
VSU:	Vane shear strength, undisturbed (field), psf
WC:	Water content, as percent of dry weight
%-200:	Percent of material finer than #200 sieve

STANDARD PENETRATION TEST NOTES

The standard penetration test consists of driving the sampler with a 140-pound hammer and counting the number of blows applied in each of three 6" increments of penetration. If the sampler is driven less than 18" (usually in highly resistant material), permitted in ASTM:D1586, the blows for each complete 6" increment and for each partial increment is on the boring log. For partial increments, the number of blows is shown to the nearest inch below the slash.

The length of sample recovered, as shown on the "REC" column, may be greater than the distance indicated in the N column. The disparity is because the N-value is recorded below the initial 6" set (unless partial penetration defined in ASTM:D1586 is encountered) whereas the length of sample recovered is for the entire sampler drive (which may even extend more than 18").

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES ASTM Designation: D 2487 (Based on Unified Soil Classification System)	AMERICAN ENGINEERING TESTING, INC.

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification	
				Group Symbol	Group Name[B]
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$[E]	GW	Well graded gravel[F]
			$Cu < 4$ and/or $1 > Cc > 3$[E]	GP	Poorly graded gravel[F]
		Gravels with Fines More than 12% fines[C]	Fines classify as ML or MH	GM	Silty gravel[F,G,H]
			Fines classify as CL or CH	GC	Clayey gravel[F,G,H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$[E]	SW	Well-graded sand[I]
			$Cu < 6$ and/or $1 > Cc > 3$[E]	SP	Poorly graded sand[I]
		Sands with Fines More than 12% fines[D]	Fines classify as ML or MH	SM	Silty sand[G,H,I]
			Fines classify as CL or CH	SC	Clayey sand[G,H,I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	PI>7 and plots on or above "A" line[J]	CL	Lean clay[K,L,M]
			PI<4 or plots below "A" line[J]	ML	Silt[K,L,M]
		organic	$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$	OL	Organic clay[K,L,M,N] Organic silt[K,L,M,O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat clay[K,L,M]
			PI plots below "A" line	MH	Elastic silt[K,L,M]
		organic	$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} < 0.75$	OH	Organic clay[K,L,M,P] Organic silt[K,L,M,Q]
Highly organic soils		Primarily organic matter, dark in color, and organic odor		PT	Peat

[A]Based on the material passing the 3-in. (75-mm) sieve.

[B]If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C]Gravels with 5 to 12% fines require dual symbols:
- GW-GM well-graded gravel with silt
- GW-GC well-graded gravel with clay
- GP-GM poorly graded gravel with silt
- GP-GC poorly graded gravel with clay

[D]Sands with 5 to 12% fines require dual symbols:
- SW-SM well-graded sand with silt
- SW-SC well-graded sand with clay
- SP-SM poorly graded sand with silt
- SP-SC poorly graded sand with clay

[E]$Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F]If soil contains ≥15% sand, add "with sand" to group name.

[G]If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H]If fines are organic, add "with organic fines" to group name.

[I]If soil contains ≥15% gravel, add "with gravel" to group name.

[J]If Atterberg limits plot in hatched area, soil is a CL-ML silty clay.

[K]If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L]If soil contains ≥30% plus no. 200, predominantly sand, add "sandy" to to group name.

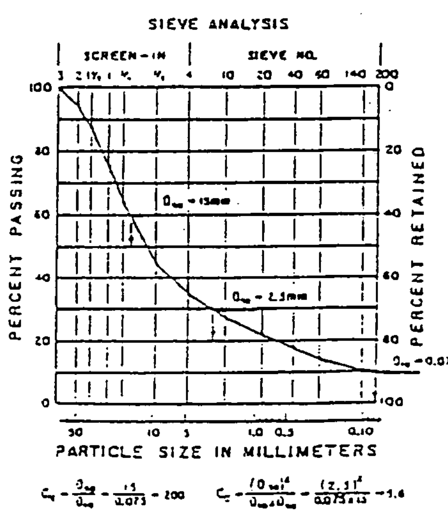
[M]If soil contains ≥30% plus No. 200, predominantly gravel, add "gravelly" to group name.

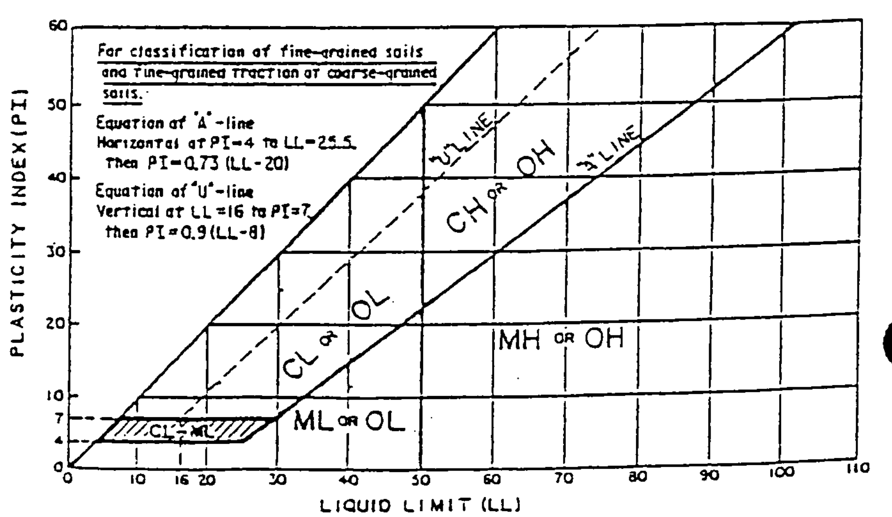
[N]PI≥4 and plots on or above "A" line.

[O]PI<4 or plots below "A" line.

[P]PI plots on or above "A" line.

[Q]PI plots below "A" line.





GENERAL TERMINOLOGY NOTES FOR SOIL IDENTIFICATION AND DESCRIPTION

GRAIN SIZE

Term	ASTM
Boulders	Over 12"
Cobbles	3" to 12"
Gravel	#4 sieve to 3"
Sand	#200 to #4 sieve
Fines (silt & clay)	Pass #200 sieve

GRAVEL PERCENTAGES

Term	Percent
A Little Gravel	3%-15%
With Gravel	15%-30%
Gravelly	30%-50%

CONSISTENCY OF PLASTIC SOILS

Term	N-Value, BPF
Very Soft	less than 2
Soft	2-4
Medium	5-8
Stiff	9-15
Very Stiff	16-30
Hard	Greater than 30

RELATIVE DENSITY OF NON-PLASTIC SOILS

Term	N-Value, BPF
Very Loose	0-4
Loose	5-10
Medium Dense	11-30
Dense	31-50
Very Dense	Greater than 50

MOISTURE/FROST CONDITION
(MC Column)

D (Dry):	Absence of moisture, dusty, dry to touch.
M (Moist):	Damp, although free water not visible. Soil may still have a high water content (over "optimum").
W (Wet/ Waterbearing):	Free water visible. Intended to describe non-plastic soils.
F (Frozen):	Soil frozen.

LAYERING NOTES

Laminations:	Layers less than ½" thick of differing material or color.
Lenses:	Pockets or layers greater than ½" thick of differing material or color.

FIBER CONTENT OF PEAT

Term	Fiber Content (Visual Estimate)
Fibric:	Greater than 67%
Hemic:	33-67%
Sapric:	Less than 33%

ORGANIC DESCRIPTION

Non-peat soils are described as organic, if soil is judged to have sufficient organic content to influence the soil properties.

Appendix B4

Pump Test Data
Extraction Wells AT-7, AT-8, AT-9 and AT-10

11/30/00
WELL#AT7
CONSTANT RATE TESTING

WELL DEVELOPMENT RECORD
Constant Rate Testing

Well AT-7
WELL/PIEZOMETER ID ______
SHEET 1 of 3

CT# 0024

PROJECT NAME: NIROP PROJECT NO.: N62467-98-D DATE: 11/30/00

LOCATION: FRIDLEY MN DATE INSTALLED: ____________

TOTAL DEPTH (FTOC) ____________ CASING DIAMETER ____________

METHODS OF DEVELOPMENT

☐ Swabbing ☐ Bailing ☐ Pumping ☐ Describe ____________

Equipment decomtaminated prior to development ☐ Yes ☐ NO

Describe ____________

EQUIPMENT NUMBERS:

pH Meter ____________ EC Meter ____________ Turbidity Meter ____________ Thermometer ____________

CASING VOLUME INFORMATION:

Casing ID (inch)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume (A) (gal/ft)	0.04	0.09	0.16	0.2	0.37	0.65	0.75	1.0	1.5	2.0	2.6

PURGING INFORMATION:

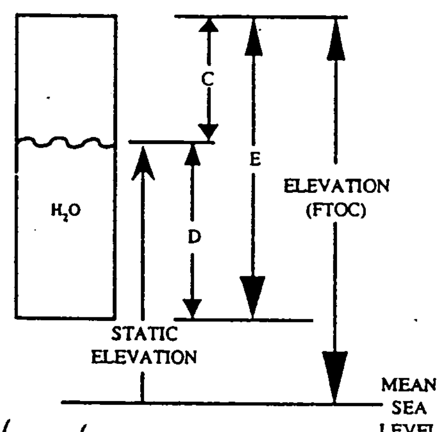
Measured Well Depth (B) ____________ ft.

Measured Water Level Depth (C) Initial level 23.06 ft.

Length of Static Water Column (D) ______ (B) - ______ (C) = ______ ft.

Casing Water Volume (E) + ______ (A) x ______ (D) = ______ gal

Total Purge Volume = ______ (gal)



Deduct 2.50' From Table for ground level measurements

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments
11-30-00	9:16	26.70	40 GPM					
	9:17	27.00						
	9:18	27.05						
	9:19	26.95						
	9:20	27.10						
	9:21	27.22						
	9:22	27.25						
	9:23	27.25						
	9:24	27.27						
	9:25	27.29					NO SAND	10 minute sample NO SAND or Setiment.

11/30/00
WELL #AT7
CONSTANT RATE TESTING

Deduct 2.50' From table for ground level reading

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments
11/30/00	9:30	27.29	40 GPM					
	9:35	27.33						
	9:40	27.29						
	9:45	22.28						
	9:50	27.30						
	9:55	27.32						
	10:00	27.33						
	10:05	27.37						
	10:10	27.37						
	10:15	27.39						
	10:20	27.39						
	10:25	27.38					NO SAND	Tested for Sand (None found)
	10:30	27.38						10 minute Test
	10:35	27.40						
	10:40	27.44						
	10:45	27.42						
	10:50	27.44						
	10:55	27.43						
	11:00	27.42						
	11:05	27.42						
	11:10	27.43						
	11:15	27.45						
	11:20	27.44						
	11:25	27.44					NO SAND	Tested for Sand
	11:30	27.44						(NONE FOUND)
	11:35	27.46						10 Minute test
	11:40	27.45						
	11:45	27.46						
	11:50	27.45						
	11:55	27.47						
	12:00	27.47						
	12:05	27.45						
	12:10	27.47						
	12:15	27.45						
	12:20	27.47						
	12:25	27.47					NO SAND	TESTED FOR SAND
	12:30	27.47						IN FLOWSTREAM
	12:35	27.47						10 Minute Test
	12:40	27.49						
	12:45	27.49						
	12:50	27.49						
	12:55	27.49						

11/30/00
WELL # AT 7
CONSTANT RATE TESTING

Deduct 2.50' from table for Ground level reading

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments
11/30/00	13:00	27.49	40 GPM					
	13:05	27.51						
	13:10	27.51						
	13:15	27.51						

WELL DEVELOPMENT RECORD
CONSTANT RATE TEST

WELL/PIEZOMETER ID AT-8
SHEET ______ of ______

CT#5024

PROJECT NAME: Nikop Fridlg PROJECT NO.: N62467-98D-0995 DATE: 12-07-00

LOCATION: ______ DATE INSTALLED: ______

TOTAL DEPTH (FTOC) ______ CASING DIAMETER ______

METHODS OF DEVELOPMENT

☐ Swabbing ☐ Bailing ☐ Pumping ☐ Describe ______

Equipment decomtaminated prior to development ☐ Yes ☐ NO

Describe ______

EQUIPMENT NUMBERS:

pH Meter ______ EC Meter ______ Turbidity Meter ______ Thermometer ______

CASING VOLUME INFORMATION:

Casing ID (inch)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume (A) (gal/ft)	0.04	0.09	0.16	0.2	0.37	0.65	0.75	1.0	1.5	2.0	2.6

PURGING INFORMATION:

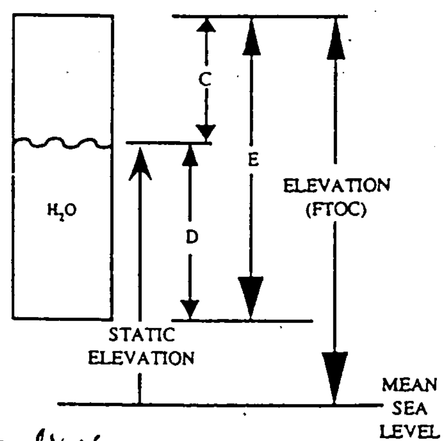
Measured Well Depth (B) ______ ft.

Measured Water Level Depth (C) 22.69 ft. Deduct 2.20 for ground level

Length of Static Water Column (D) ______ (B) - ______ (C) = ______ ft.

Casing Water Volume (E) + ______ (A) x ______ (D) = ______ gal

Total Purge Volume = ______ (gal)



Deduct 2.20 for ground level readings

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments
12-07	9:17	26.52	15gpm					
	9:18	25.90						
	9:19	26.50						
	9:20	26.49						
	9:21	26.62						
	9:22	26.55						
	9:23	26.55						
	9:24	26.55						
	9:25	26.60						
	9:26	26.60						

NIROP
FRIDLEY
CONSTANT RATE TEST
Deduct 2.20' For Ground level readings

WELL #AT8
Page 2 of 3
12-07-00

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments
12-07-00	9:31	26.65	15 GPM					
	9:36	26.66						
	9:41	26.66						
	9:46	26.69						
	9:51	27.70						
	9:56	27.75						
	10:01	27.79						
	10:06	27.79						
	10:11	27.79						
	10:16	27.79						10 minute Test
	10:21	27.79						for Sand no-sand
	10:26	27.81						
	10:31	27.81						
	10:36	27.86						
	10:41	27.88						
	10:46	27.89						
	10:51	27.90						
	10:56	27.91						
	11:01	27.91						
	11:06	27.91						Sand test-No sand
	11:11	27.91						
	11:16	27.96						
	11:21	27.99						
	11:26	28.00						
	11:31	28.00						
	11:36	28.01						
	11:41	28.01						
	11:46	28.08						
	11:51	28.10						
	11:56	28.11						
	12:01	28.15						
	12:06	28.18						
	12:11	28.19						
	12:16	28.23						
	12:21	28.25						
	12:26	28.26						
	12:31	28.27						
	12:36	28.27						
	12:41	28.32						
	12:46	28.33						
	12:51	28.33						
	12:56	28.35						

NSTANT RATE TEST
ELL #AT-8

Ending Meter reading - 0345048

Deduct 2.20' for ground level reading

Page 3 of 3
12-07-00

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments
12-07-00	13:01	28.38	15 gpm					
	13:06	28.40						Sand test no-Sand
	13:11	28.40						
	13:16	28.42						
	13:21	28.43						

WELL DEVELOPMENT RECORD
Constant Rate Testing

WELL/PIEZOMETER ID AT-9
SHEET 1 of 3

PROJECT NAME: NIROP PROJECT NO.: N 62467-980-0995 CT-0074 BWJ003479 DATE: 11/29/00

LOCATION: FRIDLEY MN DATE INSTALLED: ______

TOTAL DEPTH (FTOC) ______ CASING DIAMETER ______

METHODS OF DEVELOPMENT

☐ Swabbing ☐ Bailing ☐ Pumping ☐ Describe ______

Equipment decomtaminated prior to development ☐ Yes ☐ NO

Describe ______

EQUIPMENT NUMBERS:

pH Meter ______ EC Meter ______ Turbidity Meter ______ Thermometer ______

CASING VOLUME INFORMATION:

Casing ID (inch)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume (A) (gal/ft)	0.04	0.09	0.16	0.2	0.37	0.65	0.75	1.0	1.5	2.0	2.6

PURGING INFORMATION:

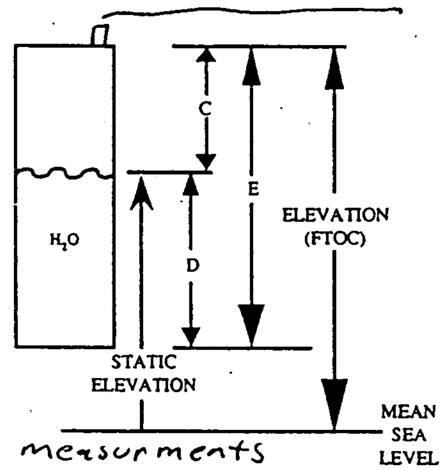
Measured Well Depth (B) ______ ft.

Measured Water Level Depth (C) 23.10 ft. Initial Reading START OF TEST Less 2.55' to ground

Length of Static Water Colume (D) ______ (B) - ______ (C) = ______ ft.

Casing Water Volume (E) + ______ (A) x ______ (D) = ______ gal

Total Purge Volume = ______ (gal)



* Deduct 2.55' from table for ground level measurments

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments
11-29-00	8:59	27.25	100 GPM					Flow Rate 100 GPM
	9:00	27.30					No SAND	No Sediments Found 10 minutes
	9:01	27.33	FLOW drop to 80 GPM					FLOW DROP TO 80 GPM
	9:02	27.36						
	9:03	27.36	100 GPM					Adjust to 100 GPM
	9:04	27.60						
	9:05	27.60						
	9:06	27.63						
	9:07	27.63						
	9:08	27.69						

11/29/00
well AT-9
Deduct 2.55' From table for ground level measurments

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments
11/29	9:09	27.65	100 GPM					
	9:14	27.73	FlowRate					
	9:19	27.77						
	9:24	27.78						
	9:29	27.82						
	9:34	27.83						
	9:39	27.87						
	9:44	27.88						
	9:49	27.89						
	9:54	27.90						
	9:59	27.90					NONE	NO SAND or setiment
	10:04	27.93						found
	10:09	27.93						10 minutes run test
	10:14	27.96						
	10:19	27.96						
	10:24	28.00						
	10:29	28.00						
	10:34	28.00						
	10:39	28.00						
	10:44	28:00						
	10:49	28.00						
	1054	28.00						
	1059	28.00					NONE	NO Sand or Setiment
	11:04	28.00						Found
	11:09	28.00						10 minutes run test
	11:14	28.09						
	11:19	28.09						
	11:24	28.10						
	11:29	28.10						
	11:34	28.10						
	11:39	28.10						
	11:44	28.11						
	11:49	28.12						
	11:54	28.23						
	1159	28.23					NONE	NO SAND OR
	12:04 PM	28.23						SETIMENT FOUND.
	12:09 PM	28.23						10 minutes run test
	12:14	28.23						
	12:19	28.15						
	12:24	28.15						
	12:29	28.15						
	12:34	28.15						

11/29/00
Well AT-9
Deduct 2.55' From Table for ground level measurements

NIKOI FRIDLEY

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments
11/29/00	12:39	PM 28.17	100GPM					
	12:44	PM 28.18						
	12:49	PM 28.20						
	12:54	PM 28.20						
	12:59	PM 28.20						

Water Volume meter start

End

B.W.

WELL DEVELOPMENT RECORD

Well AT-10 CONSTANT RATE TEST
12-05-00

CT-0024

WELL/PIEZOMETER ID AT-10
SHEET 1 of 3

PROJECT NAME: NIROP PROJECT NO.: N62467-98-D-0995 DATE: 12-05-00

LOCATION: FRIDLEY MN DATE INSTALLED: ______

TOTAL DEPTH (FTOC) ______ CASING DIAMETER ______

METHODS OF DEVELOPMENT

☐ Swabbing ☐ Bailing ☐ Pumping ☐ Describe ______

Equipment decomtaminated prior to development ☐ Yes ☐ NO

Describe ______

EQUIPMENT NUMBERS:

pH Meter ______ EC Meter ______ Turbidity Meter ______ Thermometer ______

CASING VOLUME INFORMATION:

Casing ID (inch)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume (A) (gal/ft)	0.04	0.09	0.16	0.2	0.37	0.65	0.75	1.0	1.5	2.0	2.6

PURGING INFORMATION:

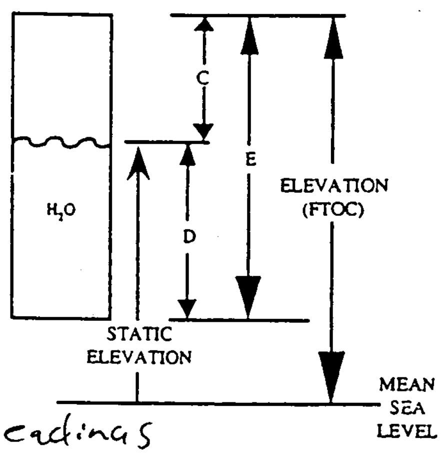
Measured Well Depth (B) ______ ft.

Measured Water Level Depth (C) 27.10 ft. Deduct 2.75

Length of Static Water Column (D) ______ (B) - ______ (C) = ______ ft.

Casing Water Volume (E) + ______ (A) x ______ (D) = ______ gal

Total Purge Volume = ______ (gal)



Deduct 2.75' for ground level readings

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments
12-05	11:11	52.50	31GPM					
	11:12	51.90						
	11:13	49.40						
	11:14	48.00						
	11:15	50.60						
	11:16	50.60						
	11:17	50.60						
	11:18	50.70						
	11:19	50.80						
	11:20	50.90					10 min	Sand test - No SAND

Well A11U
12-05-00
CONSTANT RATE TEST

Deduct 2.75' for ground level Readings

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments
12-05-00	11:25	51.52	31GPM					
	11:30	51.82						
	11:35	51.94						
	11:40	52.22						
	11:45	52.25						
	11:50	52.25						
	11:55	52.00						
	12:00	51.94						
	12:05	51.68						
	12:10	51.62						
	12:15	51.35						
	12:20	51.32						Sandtest No Sand
	12:25	51.36						10 minute
	12:30	51.25						Rosco Sampler
	12:35	51.35						
	12:40	51.34						
	12:45	51.42						
	12:50	51.50						
	12:55	51.62						
	13:00	51.65						
	13:05	52.12						
	13:10	52.14						
	13:15	52.18						
	13:20	52.24						Sand test - No Sand
	13:25	52.32						10 minute test.
	13:30	52.30						
	13:35	52.42						
	13:40	52.48						
	13:45	52.52						
	13:50	52.62						
	13:55	52.62						
	14:00	52.62						
	14:05	52.62						
	14:10	52.69						
	14:15	52.74						
	14:20	52.74						Sand test - No Sand
	14:25	52.74						10 minute test.
	14:30	52.74						
	14:35	52.74						
	14:40	52.74						
	14:45	52.75						
	14:50	52.76						

well AT-10
.ONSTANT RATE TEST
12-05-00

Deduct 2.75' For ground level readings

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments
12-05-00	14:55	52.76	31 GPM					
	15:00	52.80						
	15:05	52.84						
	15:10	52.84						
		Test Done						

WELL DEVELOPMENT RECORD

Step - Drawdown test

WELL/PIEZOMETER ID AT-7
SHEET 1 of 3

CT-0024

PROJECT NAME: NIROP PROJECT NO.: N62467-98D-0995 DATE: 11/29/00

BWI003471

LOCATION: FRIDLEY MN DATE INSTALLED: ____________

TOTAL DEPTH (FTOC) ____________ CASING DIAMETER ____________

METHODS OF DEVELOPMENT

☐ Swabbing ☐ Bailing ☐ Pumping ☐ Describe ____________

Equipment decontaminated prior to development ☐ Yes ☐ NO

Describe ____________

EQUIPMENT NUMBERS:

pH Meter ____________ EC Meter ____________ Turbidity Meter ____________ Thermometer ____________

CASING VOLUME INFORMATION:

Casing ID (inch)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume (A) (gal/ft)	0.04	0.09	0.16	0.2	0.37	0.65	0.75	1.0	1.5	2.0	2.6

PURGING INFORMATION:

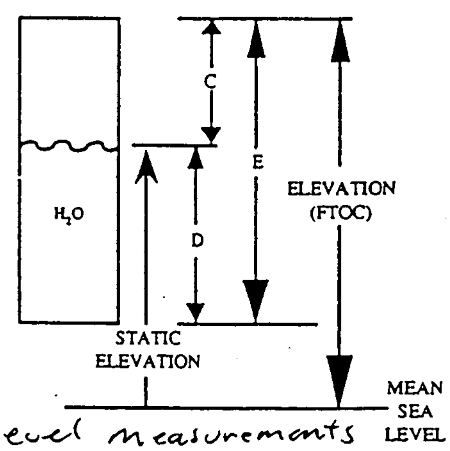
Measured Well Depth (B) ____________ ft.

Measured Water Level Depth (C) ____________ ft.

Length of Static Water Column (D) ______ - ______ = ______ ft.
(B) (C)

Casing Water Volume (E) + ______ x ______ = ______ gal
(A) (D)

Total Purge Volume = ______ (gal)



Deduct 2.50' From table for ground level measurements

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments
11-29-00	13:39	25.90	30 GPM					
	13:40	25.85						
	13:41	25.85					NONE	NO SAND
	13:42	26.50						EVIDENT IN
	13:43	26.20						SIGHT GLASS
	13:44	26.15						
	13:45	26.15						
	13:46	26.16						
	13:47	26.19						
	13:48	26.19						

well AT-7
11-29-99
Deduct 2.50' to Groundlevel

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments
11-29-00	13:49	26.17	30 GPM				No Sand	No sand measurable
	13:54	26.17						10 minute test
	13:59	26.20						captured water show
	14:04	26.20						no signs of sand
	14:09	26.23						
	14:14	26.25						
	14:19	26.25						
	14:24	26.25						
	14:29	26.25						
	14:34	26.25						
	14:39	26.27						
								14:39 to 14:40 time used
	14:40	27.25	40 GPM					to calibrate flow to 40 GPM
	14:45	27.25	40 GPM					
	14:46	27.35						
	14:47	27.37						
	14:48	27.37						
	14:49	27.35					No Sand	No sand measurable
	14:50	27.38						10 minute test
	14:51	27.38						
	14:52	27.38						
	14:53	27.38						
	14:54	27.37						
	14:55	27.38						
	15:00	27.39						
	15:05	27.39						
	15:10	27.40						
	15:15	27.40						
	15:20	27.41						
	15:25	27.42						
	15:30	27.44						
	15:35	27.44						15:38 to 15:39 time used
	15:38	28.26						to calibrate flow to 48 GPM
	15:39	28.27	48 GPM					
	15:40	28.28						
	15:41	28.29					No Sand	No Sand measurable
	15:42	28.30						10 minute test time.
	15:43	28.30						
	15:44	28.30						
	15:45	28.30						
	15:46	28.30						
	15:47	28.30						

We were only capable of providing 48 GPM with the pump in well AT-7 due to the 323' run to the outlet for water. This long run provided back pressure, therefore limiting the pumps output capabilities.

Well AT-7
11-29-99
Deduct 2.50' To Ground level

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments
11-29-00	15.48	28.33	48 GPM					
	15.49	28.35						
	15.54	28.31						
	15.59	28.33						
	16:04	28.33						
	16:09	28.34						
	16:14	28.36						
	16:19	28.36						
	16:24	28.36						
	16:29	28.38					NO SAND	No sand measurable
	16:34	28.36						10 minute test
	16:35	28.37						

WELL DEVELOPMENT RECORD

STEP TEST WELL #AT-8 WELL/PIEZOMETER ID AT-8

SHEET 1 of 2

PROJECT NAME: NIROP PROJECT NO.: N62467-98-D-0995 DATE: 12-06-00

LOCATION: FRIDLEY MN DATE INSTALLED: ____

TOTAL DEPTH (FTOC) ____ CASING DIAMETER ____

METHODS OF DEVELOPMENT

☐ Swabbing ☐ Bailing ☐ Pumping ☐ Describe ____

Equipment decomtaminated prior to development ☐ Yes ☐ NO

Describe ____

EQUIPMENT NUMBERS:

pH Meter ____ EC Meter ____ Turbidity Meter ____ Thermometer ____

CASING VOLUME INFORMATION:

Casing ID (inch)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume (A) (gal/ft)	0.04	0.09	0.16	0.2	0.37	0.65	0.75	1.0	1.5	2.0	2.6

PURGING INFORMATION:

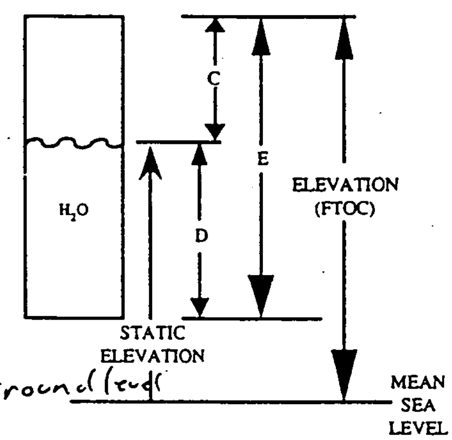
Measured Well Depth (B) ____ ft.

Measured Water Level Depth (C) 22.76' ft. Deduct 2.20 ft for ground level

Length of Static Water Column (D) ____ (B) - ____ (C) = ____ ft.

Casing Water Volume (E) + ____ (A) x ____ (D) = ____ gal

Total Purge Volume = ____ (gal)



Deduct 2.20' for ground level

Meter reading start 33 8838

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments
12-06	9:55	29.11	30 GPM					
	9:56	31.15						
	9:57	32.00						
	9:58	32.55						
	9:59	32.90						
	10:00	33.27						
	10:01	29.00						
	10:02	29.10						
	10:03	27.20						
	10:10	27.92						

WELL AT-0
STEP TEST

N62467-98D-0995 CT0024
NIROP FRIDLEY

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments
12-06-09	10:18	27.92	30 GPM					
	10:19	27.92	17 GPM					
	10:20	27.92						
	10:22	27.92						
	10:31	27.92						Sand test no-sand
	10:57	27.92						
	11:06	27.96						
	11:23	28.00						
	11:24	27.96	Drop to 15 GPM					
	12:12	28.10						
	12:30	28.12						STOP TEST FOR RECOVERY
								END METER READING
								341920

WELL DEVELOPMENT RECORD

WELL/PIEZOMETER ID ______
SHEET 1 of 3

BW-J003471 #CT0024

PROJECT NAME: NIROP PROJECT NO.: N62 467-98D-0995 DATE: 11/28/00

LOCATION: AT-9 DATE INSTALLED: ______

TOTAL DEPTH (FTOC) ______ CASING DIAMETER ______

METHODS OF DEVELOPMENT

☐ Swabbing ☐ Bailing ☐ Pumping ☐ Describe STEP-DRAWDOWN TEST

Equipment decomtaminated prior to development ☐ Yes ☐ NO

Describe ______

EQUIPMENT NUMBERS:

pH Meter ______ EC Meter ______ Turbidity Meter ______ Thermometer ______

CASING VOLUME INFORMATION:

Casing ID (inch)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume (A) (gal/ft)	0.04	0.09	0.16	0.2	0.37	0.65	0.75	1.0	1.5	2.0	2.6

PURGING INFORMATION:

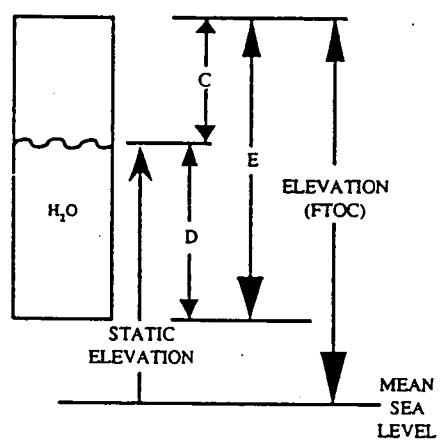
Measured Well Depth (B) Initial depth 23.1 ft. ← water level

Measured Water Level Depth (C) Initial 23.1 ft. Depth to water

Length of Static Water Column (D) ______ (B) - ______ (C) = ______ ft.

Casing Water Volume (E) + ______ (A) x ______ (D) = ______ gal

Total Purge Volume = ______ (gal)



Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments
11-28	10:36	26.30	70 GPM				"0" Sand	Water clear
	10:37	26.30						
	10:38	26.30						
	10:39	26.33						
	10:40	26.38						
	10:41	26.38						
	10:42	26.38						
	10:43	26.38						
	10:44	26.40						
	10:45	26.41						

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments
10-28-00	10:46	26.42	70 GPM					
	10:51	26.45						
	10:56	26.47						
	11:01	26.50						
	11:06	26.51						
	11:11	26.55						
	11:16	26.55						
	11:21	26.56						
	11:26	26.56						
	11:31	26.60						
	11:36	26.62					"0" Sand	Water Clear
	11:38	27.46	100 GPM					
	11:39	27.46						
	11:40	27.46						
	11:41	27.46						
	11:42	27.48						
	11:43	27.48						
	11:44	27.48						
	11:45	27.48						
	11:46	27.50						
	11:47	27.50						
	11:48	27.50						
	11:53	27.50						
	11:58	27.53						
	12:02	27.55						
	12:07	27.57						
	12:12	27.59						
	12:17	27.59						
	12:22	27.60						
	12:27	27.61						
	12:32	27.61						
	12:37	27.65					"0" Sand	Water Clear
	12:39	29.30	125 GPM					
	12:40	29.35						
	12:41	29.37						
	12:42	29.38						
	12:43	29.40						
	12:44	29.40						
	12:45	29.40						
	12:46	29.43						
	12:47	29.45						
	12:48	29.46						

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments
10-28-00	12:49	29.46 ~~125 GPM~~	125 GPM					
	12:50	29.46						
	12:55	29.50						
	13:00	29.51						
	13:05	29.53						
	13:10	29.53						
	13:15	29.54						
	13:20	29.55						
	13:25	29.56						
	13:30	29.59						
	13:35	29.60					"0" sand	Water Clear
	13:40	29.60						

WELL DEVELOPMENT RECORD

WELL/PIEZOMETER ID AT-10
SHEET 1 of 3

PROJECT NAME: NIROP PROJECT NO.: N62467-98D-0995 CT0024 DATE: 12-01-00

LOCATION: FRIDLEY MN DATE INSTALLED: ______

TOTAL DEPTH (FTOC) ______ CASING DIAMETER ______

METHODS OF DEVELOPMENT

☐ Swabbing ☐ Bailing ☐ Pumping ☐ Describe ______

Equipment decomtaminated prior to development ☐ Yes ☐ NO

Describe ______

EQUIPMENT NUMBERS:

pH Meter ______ EC Meter ______ Turbidity Meter ______ Thermometer ______

CASING VOLUME INFORMATION:

Casing ID (inch)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume (A) (gal/ft)	0.04	0.09	0.16	0.2	0.37	0.65	0.75	1.0	1.5	2.0	2.6

PURGING INFORMATION:

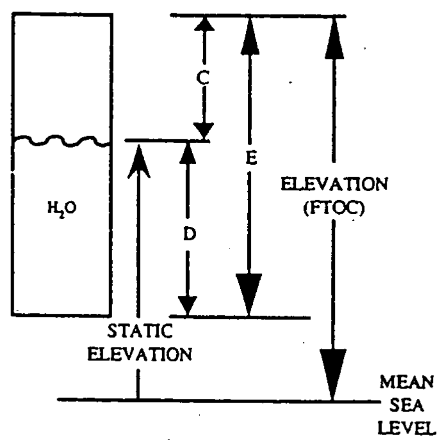
Measured Well Depth (B) ______ ft.

Measured Water Level Depth (C) 27.14 ft. - 2.75' for ground level

Length of Static Water Colume (D) ______ (B) - ______ (C) = ______ ft.

Casing Water Volume (E) + ______ (A) x ______ (D) = ______ gal

Total Purge Volume = ______ (gal)



Deduct 2.75' For ground level

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments

See page 2 for measurements.

12-01-00
WELL AT-10

CTO 0024
N-62467-98-D-0995
Deduct 2.75' From Table for ground level

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments
12-01-00	11:18	34.00	20 GPM					Start of Sand test
	11:19	37.80						10 minute test
	11:20	40.04						
	11:21	41.90						
	11:22	43.00						
	11:23	43.60						
	11:24	44.25						
	11:25	44.45						
	11:26	44.60						
	11:27	44.80						
	11:28	45.10					NO SAND	Sand test complete
	11:33	45.20						NO SAND
	11:38	47.25						
	11:43	47.65						
	11:48	47.73						
	11:53	47.80						
	11:58	47.76						
	12:03	47.76						
	12:08	47.80						
	12:13	47.85						
	12:18	47.85						
	12:19	49.93	30 GPM				NO SAND	Sand test
	12:20	51.42						(40) minute test
	12:21	52.73						
	12:22	53.92						
	12:23	54.25						
	12:24	54.39						
	12:25	54.44						
	12:26	54.76						
	12:27	54.82						
	12:28	55.10						
	12:33	56.20						
	12:38	56.30						
	12:43	56.43						
	12:48	56.42						
	12:53	56.48						
	12:58	56.46						
	13:03	56.48						
	13:08	56.49						
	13:13	56.49						
	13:18	56.50						
	13:19	57.20	40 GPM				NO SAND	Sand Test

12-01-00
Well AT-10

CTO 0024
N-62467-98-D-0995

Date	Time	Water Level (FTOC)	Volume Removed (gal)	pH	EC	Temperature F or C	Turbidity/ Sand (ppm)	Comments
12-01-00	13:20	58.32	40GPM					
	13:21	58.93						
	13:22	59.96						
	13:23	59.96						
	13:24	60.51						
	13:25	61.54						
	13:26	62.58						
	13:27	63.65						
	13:28	64.55						
	13:33	64.96						
	13:38	65.03						
	13:43	65.33						
	13:48	65.57						
	13:53	65.83						
	13:58	66.54						
	14:03	66.90						
	14:08	67.50						
	14:13	67.13						
	14:18	67.21					NO SAND	Sand test
	14:19	67.10						

Appendix B5

Pump Test Data
Extraction Well AT-3A

E. H. Renner & Sons
INCORPORATED

WELL DRILLING FOR FOUR GENERATIONS
15688 JARVIS STREET N.W. / ELK RIVER, MN 55330
PHONE: (612) 427-6100 / FAX: (612) 427-0533

7 August, 2001

BAY WEST INC.
FIVE EMPIRE DRIVE
ST PAUL, MINNESOTA 55103-1867

ATTN: Paul Walz (651) 291-3491 OFF
(651) 291-0099 FAX

SUBJECT: **NIROP AT-3A**

RE: **PUMP TEST**

Dear Sir:

E.H. RENNER & SONS, INC. recently completed the pump test on well AT-3A. The following table was produced:

TIME	GPM	WATER LEVEL	DRAW DOWN	GAL/ FT DD	COMMENTS
9:00	0	27.375			
9:05	245	81.250	53.875		
9:10	245	81.333	53.958	4.54	BACK OFF 10%
9:11	225	78.000	50.625		
9:12	225	77.750	50.375		
9:13	225	77.580	50.205		
9:14	225	77.580	50.205		
9:15	225	77.667	50.292	4.47	BACK OFF 10%
9:16	206				
9:22	206	73.000	45.625		
9:27	206	66.580	39.205		
9:30	206	66.416	39.041	5.28	BACK OFF 10%
9:31	183				
9:36	183	66.500	39.125		
9:37	183	66.416	39.041		
9:39	183	66.416	39.041	4.69	

END OF TEST

The above test pump data provides you characteristics on the well capacity and specific yield.

The top of the screen is located at 69.4ft. The top 4.6ft is stainless steel leader before the screen portion begins to 130ft. The 225 gpm pump was then throttled back to 183 gpm to obtain a 63ft pumping level. . The pressure in the treament building was 47 psi.

The tdh of the pump with a 69ft pumping level is 182.57 feet AT 187GPM. The voltage on the system is 475 volts and the amps on the three legs is even at 22.7 amps. The calculated horsepower is 14.13 for the 15hp motor.

All indications are that the pump is extremely worn out and the motor is dragging. Normal amps is 20.7. The pump is running at 22.7 amps. This is running well into the service factor. Maximum amps or overload amps is 23.7 . Full load pumping capacity is 225 gallons per minute. It is only pumping 187 gpm. The amp load should be lower than full load of 20.7 amps since the pump is not at full capacity.

Once the pump is turned on, it will run non-stop 7 days a week. We have the following recommendations:

1. **Order out new pump and motor for delivery to the stripper building.**

2. Change the new pump either when the old pump fails.
   Or change the pump out immediately per contract.

Down time on the system would be only one day rather than two to three weeks.

I have looked at the Grundfos line of pump that the Navy has been using for the past 10 years with great success. We can either use the 150 gallon per minute series or the 230 gallon per minute series (bid pump).

The 150 gpm pump is a 15 hp unit but only has an efficiency of 63% (brake horse power of 13.6). Cost of this pump is $386 more than the 230 gpm pump. The higher cost is due to the seven stage design vs the 4 stage design of the 230 gpm pump. The 230S150-4 pump is also a 15hp unit that has a higher efficiency of 73% and a brake horse power of only 12.63.

Due to cost alone, I recommend changing the pump out on AT-5a with the 230S150-4 model pump. I recommend that you ***order the pump out immediately*** but it is the Navy choice as to when the pump is installed. The cost to change the pump out will be kept firm for the Navy for a period of two years. I do not think this pump will last out the summer of 2001.

Sincerely Submitted,

Roger E. Renner, President
CERTIFIED Master Ground Water Contractor
E.H. RENNER & SONS, INC.
MINNESOTA LICENSE #71015

Appendix C

Analytical Results

Appendix C1

Asbestos Analytical Data Summary

Asbestos Analytical Data Summary						
Sample ID	**J003471-1/NIROP**	**J003471-2/NIROP**	**J003471-3/NIROP**	**J003471-4/NIROP**	**J003471-6/NIROP**	**J003471-6/NIROP**
Lab ID	**00-7292-01**	**00-7292-02**	**00-7292-03**	**00-7292-04**	**00-7292-05**	**00-7292-06**
Asbestos Content by Method 600/R-93/116C	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected

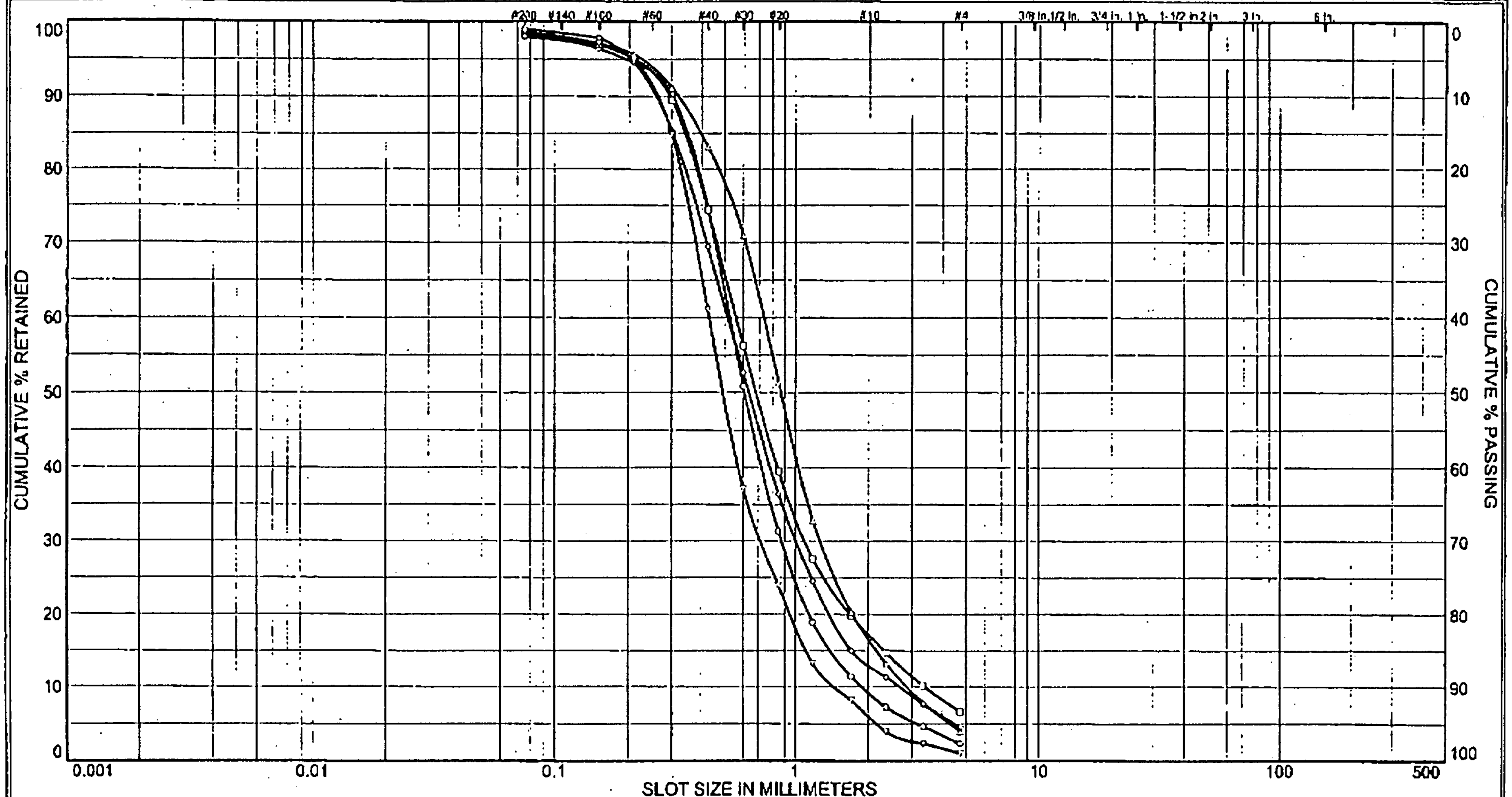
Appendix C2

Lead Based Paint Analytical Data Summary

Lead Based Paint Analytical Data Summary			
Sample ID	J003471-7/NIROP	J003471-8/NIROP	J003471-9/NIROP
Lab ID	00-7291-01	00-7291-02	00-7291-03
Total Lead by Method 7420C	0.11 % weight	0.12 % weight	0.16 % weight

Appendix C3

Sieve Analysis Data



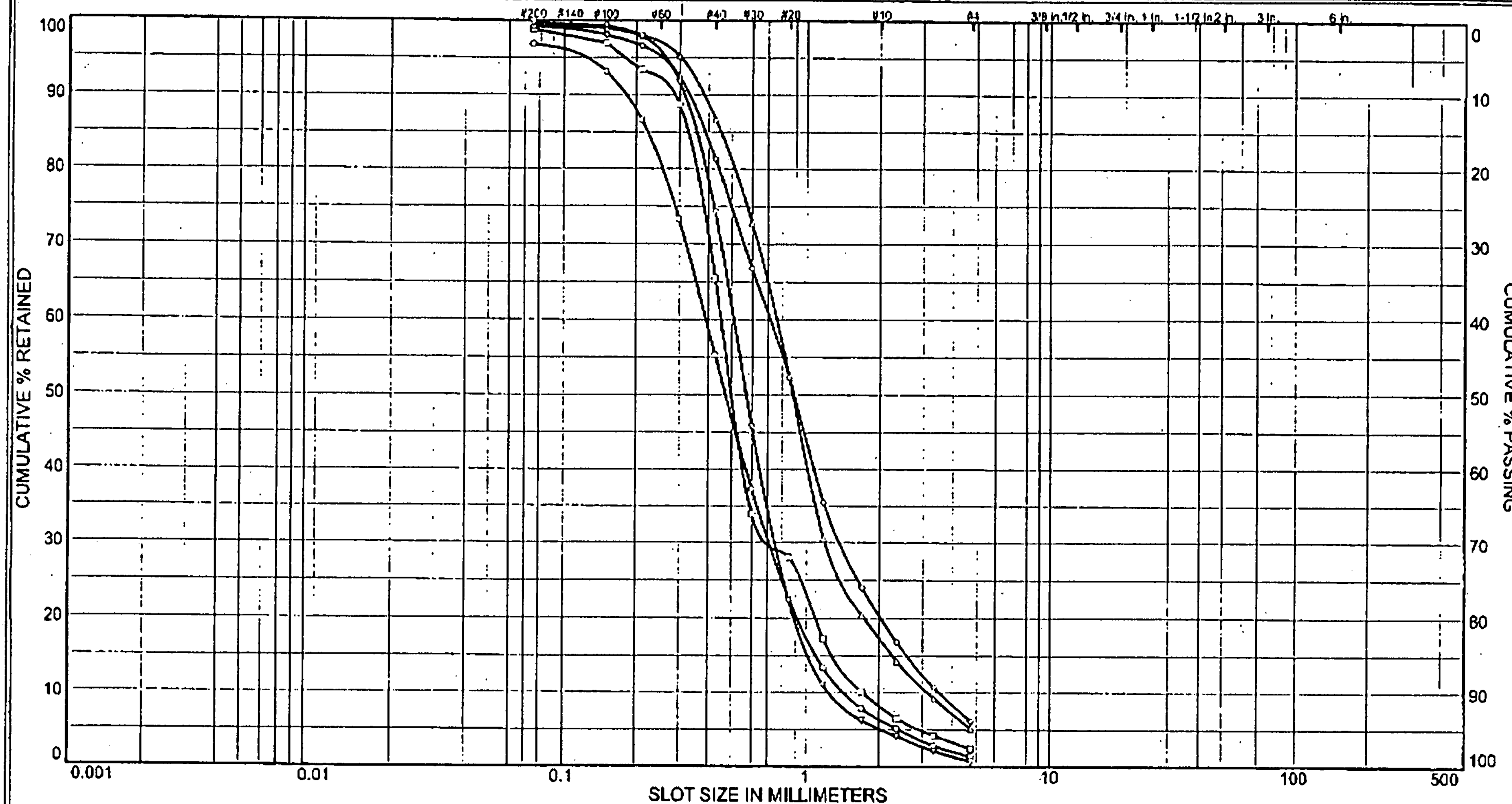
	LOCATION	SOURCE	SAMPLE #	DEPTH/ELEV.	MATERIAL DESCRIPTION
○	Fridley, MN	AT 7	2	19.5-21 ft	Beige silt to fine ang to subrnd gravel
□		AT 7	3	21-23 ft	Beige silt to fine ang to subrnd gravel, 7% > 3/8"
△		AT 7	4	23-25 ft	Beige silt to fine ang to subrnded gravel, 5% > 3/8"
◇		AT 7	5	25-27 ft	Beige silt to fine ang to subrnded gravel, 2% > 3/8"
▽		AT 7	6	27-29 ft	Beige silt to fine ang to subrnded gravel

Project No. 001016-1 **Client** Roger Renner, E.H. Renner & Sons, Elk River, MN **Date** 10-18-00

Particle Size Distribution Report

NIROP AT7

U.S. FILTER



	LOCATION	SOURCE	SAMPLE #	DEPTH/ELEV.	MATERIAL DESCRIPTION
○	Fridley, MN	AT 7	7	29-31 ft	Beige silt to fine ang to subrnded gravel, 1% > 3/8"
□		AT 7	8	31-33 ft	Beige silt to fine ang to subrnd gravel
△		AT 7	9	33-35 ft	Beige silt to fine ang to subrnd gravel, 2% > 3/8"
◇		AT 7	10	35-37 ft	Beige silt to fine ang to subrnd gravel, 8% > 3/8"
▽		AT 7	11	37-38.5 ft	Beige silt to fine ang to subrnd gravel

Project No. 001016-1 Client Roger Renner, E.H. Renner & Sons, Elk River, MN Date 10-20-00

Particle Size Distribution Report

NIROP AT7

U.S. FILTER

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT7
Project Number: 001016-1

Client: Roger Renner, E.H. Renner & Sons, Elk River, MN

Sample Data

Source: AT 7
Sample No.: 2
Elev. or Depth: 19.5-21 ft
Sample Length (in./cm.):
Location: Fridley, MN
Description: Beige silt to fine ang to subrnd gravel

Mechanical Analysis Data

	Initial
Dry sample and tare=	307.00
Tare =	0.00
Dry sample weight =	307.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	7.00	97.7
# 6	14.00	95.4
# 8	22.00	92.8
# 12	35.00	88.6
# 16	58.00	81.1
# 20	96.00	68.7
# 30	156.00	49.2
# 40	229.00	25.4
# 50	277.00	9.8
# 70	290.00	5.5
# 100	296.00	3.6
# 200	301.00	2.0

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 95.7
% FINES = 2.0

D_{85}= 1.38 D_{60}= 0.72 D_{50}= 0.61
D_{30}= 0.46 D_{15}= 0.35 D_{10}= 0.30
C_c= 0.9606 C_u= 2.3697

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT7
Project Number: 001016-1
Client: Roger Renner, E.H. Renner & Sons, Elk River, MN

Sample Data

Source: AT 7
Sample No.: 3
Elev. or Depth: 21-23 ft
Sample Length (in./cm.):
Location:
Description: Beige silt to fine ang to subrnd gravel, 7% > 3/8"

Mechanical Analysis Data

	Initial
Dry sample and tare=	258.00
Tare =	0.00
Dry sample weight =	258.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	17.00	93.4
# 6	26.00	89.9
# 8	38.00	85.3
# 12	51.00	80.2
# 16	71.00	72.5
# 20	102.00	60.5
# 30	145.00	43.8
# 40	192.00	25.6
# 50	231.00	10.5
# 70	245.00	5.0
# 100	250.00	3.1
# 200	254.00	1.6

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 91.8
% FINES = 1.6

D_{85}= 2.31 D_{60}= 0.84 D_{50}= 0.68
D_{30}= 0.46 D_{15}= 0.34 D_{10}= 0.29
C_c= 0.8626 C_u= 2.8506

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT7
Project Number: 001016-1
Client: Roger Renner, E.H. Renner & Sons, Elk River, MN

Sample Data

Source: AT 7
Sample No.: 4
Elev. or Depth: 23-25 ft
Sample Length (in./cm.):
Location:
Description: Beige silt to fine ang to subrnded gravel, 5% > 3/8"

Mechanical Analysis Data

	Initial
Dry sample and tare=	296.00
Tare =	0.00
Dry sample weight =	296.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	12.00	96.0
# 6	23.00	92.2
# 8	39.00	86.8
# 12	60.00	79.7
# 16	97.00	67.2
# 20	152.00	48.7
# 30	210.00	29.1
# 40	246.00	16.9
# 50	270.00	8.8
# 70	283.00	4.4
# 100	287.00	3.0
# 200	291.00	1.7

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 94.3
% FINES = 1.7

D_{85}= 2.15 D_{60}= 1.03 D_{50}= 0.87
D_{30}= 0.61 D_{15}= 0.40 D_{10}= 0.32
C_c= 1.1392 C_u= 3.2151

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT7
Project Number: 001016-1 **Client:** Roger Renner, E.H. Renner & Sons, Elk River, MN

Sample Data

Source: AT 7
Sample No.: 5
Elev. or Depth: 25-27 ft **Sample Length (in./cm.):**
Location:
Description: Beige silt to fine ang to subrnded gravel, 2% > 3/8"

Mechanical Analysis Data

	Initial
Dry sample and tare=	327.00
Tare =	0.00
Dry sample weight =	327.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	15.00	95.4
# 6	25.00	92.4
# 8	37.00	88.7
# 12	49.00	85.0
# 16	80.00	75.5
# 20	119.00	63.6
# 30	172.00	47.4
# 40	227.00	30.6
# 50	279.00	14.7
# 70	309.00	5.5
# 100	320.00	2.1
# 200	324.00	0.9

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 94.5
% FINES = 0.9

D_{85}= 1.70 D_{60}= 0.78 D_{50}= 0.63
D_{30}= 0.42 D_{15}= 0.30 D_{10}= 0.26
C_c= 0.8693 C_u= 3.0181

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT7
Project Number: 001016-1

Client: Roger Renner, E.H. Renner & Sons, Elk River, MN

Sample Data

Source: AT 7
Sample No.: 6
Elev. or Depth: 27-29 ft
Sample Length (in./cm.):
Location:
Description: Beige silt to fine ang to subrnded gravel

Mechanical Analysis Data

	Initial
Dry sample and tare=	310.00
Tare =	0.00
Dry sample weight =	310.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	3.00	99.0
# 6	7.00	97.7
# 8	12.00	96.1
# 12	25.00	91.9
# 16	41.00	86.8
# 20	74.00	76.1
# 30	115.00	62.9
# 40	189.00	39.0
# 50	263.00	15.2
# 70	294.00	5.2
# 100	301.00	2.9
# 200	306.00	1.3

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 97.7
% FINES = 1.3

D_{85}= 1.10 D_{60}= 0.57 D_{50}= 0.49
D_{30}= 0.38 D_{15}= 0.30 D_{10}= 0.26
C_c= 0.9496 C_u= 2.1595

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NTROP AT7
Project Number: 001016-1

Client: Roger Renner, E.H. Renner & Sons, Elk River, MN

Sample Data

Source: AT 7
Sample No.: 7
Elev. or Depth: 29-31 ft
Location: Fridley, MN
Sample Length (in./cm.):
Description: Beige silt to fine ang to subrnded gravel, 1% > 3/8"

Mechanical Analysis Data

	Initial
Dry sample and tare=	217.00
Tare =	0.00
Dry sample weight =	217.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	3.00	98.6
# 6	6.00	97.2
# 8	11.00	94.9
# 12	17.00	92.2
# 16	29.00	86.6
# 20	49.00	77.4
# 30	81.00	62.7
# 40	120.00	44.7
# 50	159.00	26.7
# 70	188.00	13.4
# 100	202.00	6.9
# 200	210.00	3.2

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = % GRAVEL = % SAND = 95.4
% FINES = 3.2

D_{85}= 1.10 D_{60}= 0.57 D_{50}= 0.47
D_{30}= 0.32 D_{15}= 0.22 D_{10}= 0.18
C_c= 0.9998 C_u= 3.1223

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT7
Project Number: 001016-1
Client: Roger Renner, E.H. Renner & Sons, Elk River, MN

Sample Data

Source: AT 7
Sample No.: 8
Elev. or Depth: 31-33 ft
Sample Length (in./cm.):
Location:
Description: Beige silt to fine ang to subrnd gravel

Mechanical Analysis Data

	Initial
Dry sample and tare=	168.00
Tare =	0.00
Dry sample weight =	168.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	4.00	97.6
# 6	7.00	95.8
# 8	11.00	93.5
# 12	17.00	89.9
# 16	29.00	82.7
# 20	47.00	72.0
# 30	57.00	66.1
# 40	110.00	34.5
# 50	149.00	11.3
# 70	157.00	6.6
# 100	163.00	3.0
# 200	166.00	1.2

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 96.4
% FINES = 1.2

D_{85}= 1.28 D_{60}= 0.55 D_{50}= 0.49
D_{30}= 0.40 D_{15}= 0.33 D_{10}= 0.29
C_c= 1.0387 C_u= 1.9129

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT7
Project Number: 001016-1
Client: Roger Renner, E.H. Renner & Sons, Elk River, MN

Sample Data

Source: AT 7
Sample No.: 9
Elev. or Depth: 33-35 ft
Sample Length (in./cm.):
Location:
Description: Beige silt to fine ang to subrnd gravel, 2% > 3/8"

Mechanical Analysis Data

	Initial
Dry sample and tare=	294.00
Tare =	0.00
Dry sample weight =	294.00

Tare for cumulative weight retained= .00

Sieve	**Cumul. Wt. retained**	**Percent finer**
# 4	15.00	94.9
# 6	27.00	90.8
# 8	42.00	85.7
# 12	60.00	79.6
# 16	90.00	69.4
# 20	154.00	47.6
# 30	214.00	27.2
# 40	255.00	13.3
# 50	280.00	4.8
# 70	288.00	2.0
# 100	291.00	1.0
# 200	292.00	0.7

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 94.2
% FINES = 0.7

D_{85}= 2.27 D_{60}= 1.01 D_{50}= 0.88
D_{30}= 0.63 D_{15}= 0.45 D_{10}= 0.38
C_c= 1.0442 C_u= 2.6544

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT7
Project Number: 001016-1

Client: Roger Renner, E.H. Renner & Sons, Elk River, MN

Sample Data

Source: AT 7
Sample No.: 10
Elev. or Depth: 35-37 ft
Sample Length (in./cm.):
Location:
Description: Beige silt to fine ang to subrnd gravel, 8% > 3/8"

Mechanical Analysis Data

	Initial
Dry sample and tare=	262.00
Tare =	0.00
Dry sample weight =	262.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	16.00	93.9
# 6	28.00	89.3
# 8	44.00	83.2
# 12	63.00	76.0
# 16	93.00	64.5
# 20	137.00	47.7
# 30	175.00	33.2
# 40	213.00	18.7
# 50	242.00	7.6
# 70	253.00	3.4
# 100	257.00	1.9
# 200	260.00	0.8

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 93.1
% FINES = 0.8

D_{85}= 2.59 D_{60}= 1.07 D_{50}= 0.89
D_{30}= 0.56 D_{15}= 0.39 D_{10}= 0.33
C_c= 0.8686 C_u= 3.2518

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT7
Project Number: 001016-1
Client: Roger Renner, E.H. Renner & Sons, Elk River, MN

Sample Data

Source: AT 7
Sample No.: 11
Elev. or Depth: 37-38.5 ft
Sample Length (in./cm.):
Location:
Description: Beige silt to fine ang to subrnd gravel

Mechanical Analysis Data

	Initial
Dry sample and tare=	291.00
Tare =	0.00
Dry sample weight =	291.00

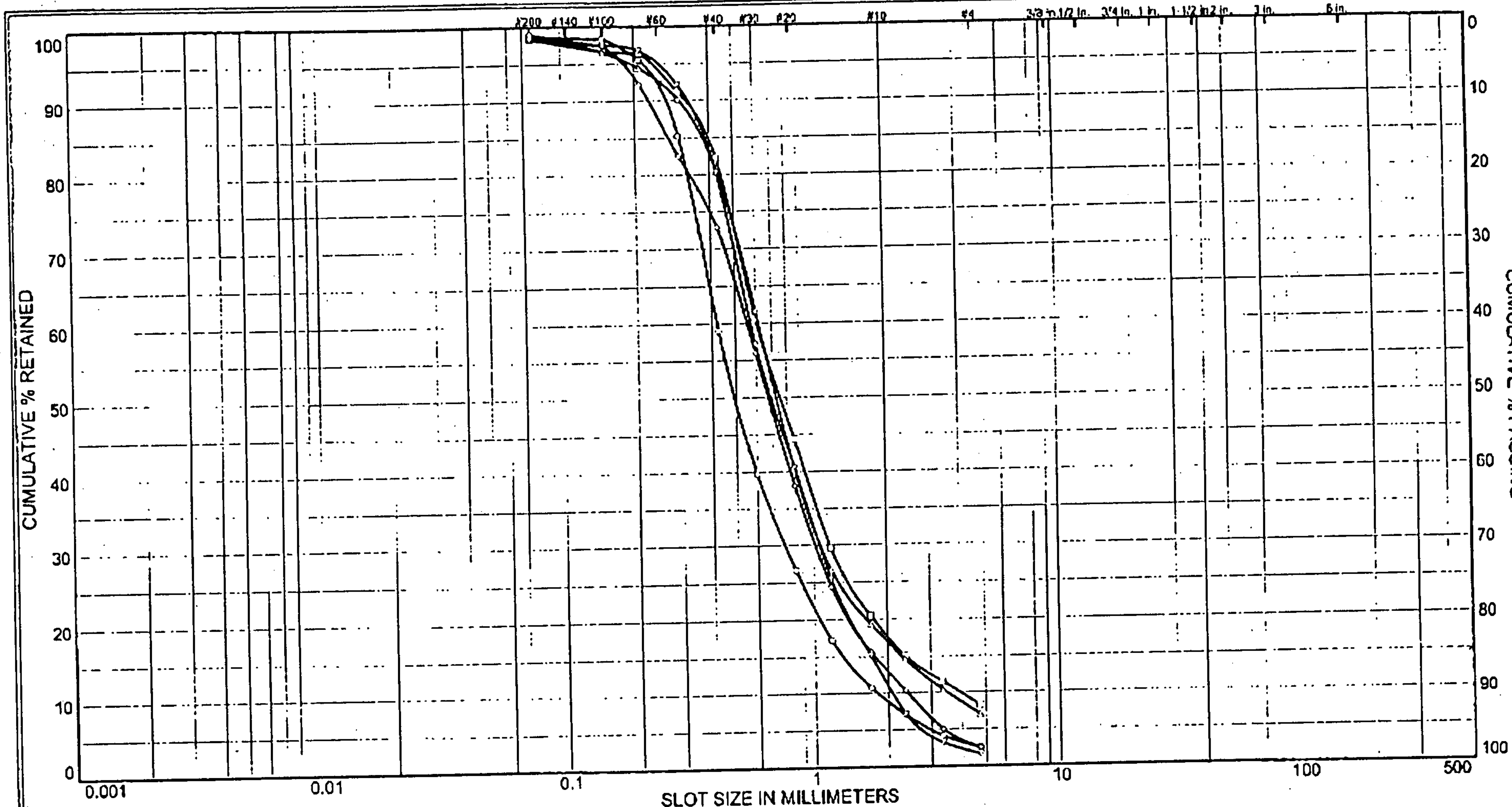
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	2.00	99.3
# 6	6.00	97.9
# 8	12.00	95.9
# 12	18.00	93.8
# 16	32.00	89.0
# 20	65.00	77.7
# 30	133.00	54.3
# 40	216.00	25.8
# 50	267.00	8.3
# 70	285.00	2.1
# 100	289.00	0.7
# 200	290.00	0.3

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 99.0
% FINES = 0.3

D_{85}= 1.02 D_{60}= 0.64 D_{50}= 0.57
D_{30}= 0.45 D_{15}= 0.36 D_{10}= 0.32
C_c= 0.9931 C_u= 2.0428



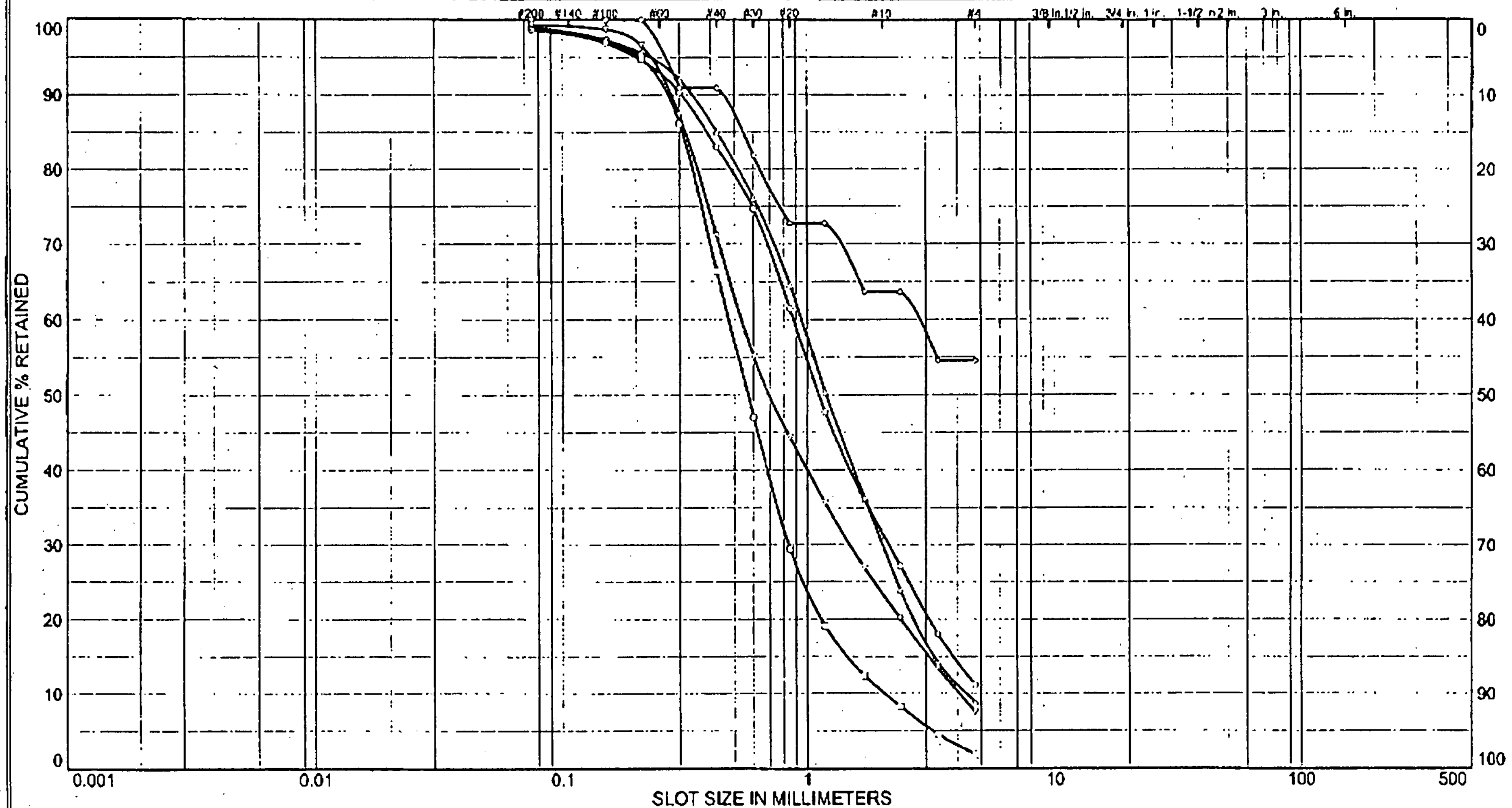
	LOCATION	SOURCE	SAMPLE #	DEPTH/ELEV.	MATERIAL DESCRIPTION
○	Fridley, MN	AT8	13	19.5-21 ft	Beige silt to fine gravel, 2% > 3/8"
□		AT8	14	21-23 ft	Beige silt to fine gravel, 6% > 3/8"
△		AT8	15	23-25 ft	Beige silt to fine gravel, 3% > 3/8"
◇		AT8	16	25-27 ft	Beige silt to fine gravel, 4% > 3/8"
▽		AT8	17	27-29 ft	Beige silt to fine gravel, 2% > 3/8"

Project No. 001016-2 Client Roger Renner, E.H. Renner & Sons, Elk River, MN Date 10-23-00

Particle Size Distribution Report

NIROP AT8

U.S. FILTER



	LOCATION	SOURCE	SAMPLE #	DEPTH/ELEV.	MATERIAL DESCRIPTION
○	Fridley, MN	AT8	1B	29-31 ft	Beige silt to fine gravel, 8% > 3/8"
□		AT8	2B	31-33 ft	Beige silt to fine gravel, 1% > 3/8"
△		AT8	3b	33-34.5 ft	Very fine sand to gravel, 44% > 3/8"
◇		AT8	4B	34.5-36 ft	Fine sand to gravel, 92% > 3/8"
▽		AT8	5B	36-37.5 ft	Very fine sand to fine gravel, 9% > 3/8"

Project No. 001016-2 **Client** Roger Renner, E.H. Renner & Sons, Elk River, MN **Date** 10-23-00

Particle Size Distribution Report

NIROP AT8

U.S. FILTER

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT8
Project Number: 001016-2
Client: Roger Renner, E.H. Renner & Sons, Elk River, MN

Sample Data

Source: AT8
Sample No.: 13
Elev. or Depth: 19.5-21 ft
Sample Length (in./cm.):
Location: Fridley, MN
Description: Beige silt to fine gravel, 2% > 3/8"

Mechanical Analysis Data

	Initial
Dry sample and tare=	244.00
Tare =	0.00
Dry sample weight =	244.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	6.00	97.5
# 6	10.00	95.9
# 8	17.00	93.0
# 12	26.00	89.3
# 16	42.00	82.8
# 20	65.00	73.4
# 30	97.00	60.3
# 40	144.00	41.0
# 50	208.00	14.8
# 70	233.00	4.5
# 100	240.00	1.6
# 200	241.00	1.2

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 96.3
% FINES = 1.2

D_{85}= 1.31 D_{60}= 0.60 D_{50}= 0.49
D_{30}= 0.37 D_{15}= 0.30 D_{10}= 0.27
C_c= 0.848 C_u= 2.2032

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT8
Project Number: 001016-2
Client: Roger Renner, E.H. Renner & Sons, Elk River, MN

Sample Data

Source: AT8
Sample No.: 14
Elev. or Depth: 21-23 ft
Sample Length (in./cm.):
Location:
Description: Beige silt to fine gravel, 6% > 3/8"

Mechanical Analysis Data

	Initial
Dry sample and tare=	331.00
Tare =	0.00
Dry sample weight =	331.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	27.00	91.8
# 6	38.00	88.5
# 8	50.00	84.9
# 12	68.00	79.5
# 16	98.00	70.4
# 20	147.00	55.6
# 30	201.00	39.3
# 40	272.00	17.8
# 50	302.00	8.8
# 70	319.00	3.6
# 100	320.00	3.3
# 200	326.00	1.5

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 90.3
% FINES = 1.5

D_{85}= 2.38 D_{60}= 0.93 D_{50}= 0.75
D_{30}= 0.52 D_{15}= 0.40 D_{10}= 0.32
C_c= 0.8965 C_u= 2.8943

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT8
Project Number: 001016-2
Client: Roger Renner, E.H. Renner & Sons, Elk River, MN

Sample Data

Source: AT8
Sample No.: 15
Elev. or Depth: 23-25 ft
Sample Length (in./cm.):
Location:
Description: Beige silt to fine gravel, 3% > 3/8"

Mechanical Analysis Data

	Initial
Dry sample and tare=	356.00
Tare =	0.00
Dry sample weight =	356.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	25.00	93.0
# 6	37.00	89.6
# 8	52.00	85.4
# 12	69.00	80.6
# 16	95.00	73.3
# 20	143.00	59.8
# 30	220.00	38.2
# 40	287.00	19.4
# 50	321.00	9.8
# 70	336.00	5.6
# 100	344.00	3.4
# 200	351.00	1.4

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 91.6
% FINES = 1.4

D_{85}= 2.29 D_{60}= 0.85 D_{50}= 0.72
D_{30}= 0.52 D_{15}= 0.38 D_{10}= 0.30
C_c= 1.0625 C_u= 2.8113

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT8
Project Number: 001016-2

Client: Roger Renner, E.H. Renner & Sons, Elk River, MN

Sample Data

Source: AT8
Sample No.: 16
Elev. or Depth: 25-27 ft
Sample Length (in./cm.):
Location:
Description: Beige silt to fine gravel, 4% > 3/8"

Mechanical Analysis Data

	Initial
Dry sample and tare=	320.00
Tare =	0.00
Dry sample weight =	320.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	8.00	97.5
# 6	16.00	95.0
# 8	33.00	89.7
# 12	50.00	84.4
# 16	78.00	75.6
# 20	122.00	61.9
# 30	179.00	44.1
# 40	233.00	27.2
# 50	264.00	17.5
# 70	295.00	7.8
# 100	312.00	2.5
# 200	317.00	0.9

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 96.6
% FINES = 0.9

D_{85}= 1.76 D_{60}= 0.82 D_{50}= 0.67
D_{30}= 0.46 D_{15}= 0.27 D_{10}= 0.23
C_c= 1.1054 C_u= 3.5656

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT8
Project Number: 001016-2

Client: Roger Renner, E.H. Renner & Sons, Elk River, MN

Sample Data

Source: AT8
Sample No.: 17
Elev. or Depth: 27-29 ft
Sample Length (in./cm.):
Location:
Description: Beige silt to fine gravel, 2% > 3/8"

Mechanical Analysis Data

	Initial
Dry sample and tare=	126.00
Tare =	0.00
Dry sample weight =	126.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	2.00	98.4
# 6	4.00	96.8
# 8	9.00	92.9
# 12	19.00	84.9
# 16	32.00	74.6
# 20	51.00	59.5
# 30	72.00	42.9
# 40	101.00	19.8
# 50	116.00	7.9
# 70	122.00	3.2
# 100	123.00	2.4
# 200	124.00	1.6

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 96.8
% FINES = 1.6

D_{85}= 1.71 D_{60}= 0.86 D_{50}= 0.69
D_{30}= 0.50 D_{15}= 0.38 D_{10}= 0.33
C_c= 0.8722 C_u= 2.6076

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT8
Project Number: 001016-2
Client: Roger Renner, E.H. Renner & Sons, Elk River, MN

Sample Data

Source: AT8
Sample No.: 1B
Elev. or Depth: 29-31 ft
Sample Length (in./cm.):
Location: Fridley, MN
Description: Beige silt to fine gravel, 8% > 3/8"

Mechanical Analysis Data

	Initial
Dry sample and tare=	350.00
Tare =	0.00
Dry sample weight =	350.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	39.00	88.9
# 6	63.00	82.0
# 8	95.00	72.9
# 12	126.00	64.0
# 16	167.00	52.3
# 20	215.00	38.6
# 30	261.00	25.4
# 40	290.00	17.1
# 50	316.00	9.7
# 70	331.00	5.4
# 100	339.00	3.1
# 200	345.00	1.4

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 87.5
% FINES = 1.4

D_{85}= 3.86 D_{60}= 1.48 D_{50}= 1.11
D_{30}= 0.69 D_{15}= 0.39 D_{10}= 0.31
C_c= 1.0444 C_u= 4.8571

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT8
Project Number: 001016-2
Client: Roger Renner, E.H. Renner & Sons, Elk River, MN

Sample Data

Source: AT8
Sample No.: 2B
Elev. or Depth: 31-33 ft
Sample Length (in./cm.):
Location:
Description: Beige silt to fine gravel, 1% > 3/8"

Mechanical Analysis Data

	Initial
Dry sample and tare=	330.00
Tare =	0.00
Dry sample weight =	330.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	6.00	98.2
# 6	15.00	95.5
# 8	27.00	91.8
# 12	41.00	87.6
# 16	63.00	80.9
# 20	97.00	70.6
# 30	155.00	53.0
# 40	219.00	33.6
# 50	284.00	13.9
# 70	313.00	5.2
# 100	321.00	2.7
# 200	326.00	1.2

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 97.0
% FINES = 1.2

D_{85}= 1.44 D_{60}= 0.68 D_{50}= 0.57
D_{30}= 0.40 D_{15}= 0.31 D_{10}= 0.27
C_c= 0.8736 C_u= 2.5368

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT8
Project Number: 001016-2
Client: Roger Renner, E.H. Renner & Sons, Elk River, MN

Sample Data

Source: AT8
Sample No.: 3b
Elev. or Depth: 33-34.5 ft
Sample Length (in./cm.):
Location:
Description: Very fine sand to gravel, 44% > 3/8"

Mechanical Analysis Data

	Initial
Dry sample and tare=	113.00
Tare =	0.00
Dry sample weight =	113.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	10.00	91.2
# 6	16.00	85.8
# 8	27.00	76.1
# 12	41.00	63.7
# 16	57.00	49.6
# 20	73.00	35.4
# 30	86.00	23.9
# 40	96.00	15.0
# 50	104.00	8.0
# 70	108.00	4.4
# 100	110.00	2.7
# 200	112.00	0.9

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 90.3
% FINES = 0.9

D_{85}= 3.23 D_{60}= 1.54 D_{50}= 1.19
D_{30}= 0.73 D_{15}= 0.43 D_{10}= 0.34
C_c= 1.0335 C_u= 4.5711

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT8
Project Number: 001016-2

Client: Roger Renner, E.H. Renner & Sons, Elk River, MN

Sample Data

Source: AT8
Sample No.: 4B
Elev. or Depth: 34.5-36 ft
Sample Length (in./cm.):
Location:
Description: Fine sand to gravel, 92% > 3/8"

Mechanical Analysis Data

	Initial
Dry sample and tare=	11.00
Tare =	0.00
Dry sample weight =	11.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	6.00	45.5
# 6	6.00	45.5
# 8	7.00	36.4
# 12	7.00	36.4
# 16	8.00	27.3
# 20	8.00	27.3
# 30	9.00	18.2
# 40	10.00	9.1
# 50	10.00	9.1
# 70	11.00	0.0
# 100	11.00	0.0
# 200	11.00	0.0

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 45.5

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT8
Project Number: 001016-2
Client: Roger Renner, E.H. Renner & Sons, Elk River, MN

Sample Data

Source: AT8
Sample No.: 5B
Elev. or Depth: 36-37.5 ft
Sample Length (in./cm.):
Location:
Description: Very fine sand to fine gravel, 9% > 3/8"

Mechanical Analysis Data

	Initial
Dry sample and tare=	149.00
Tare =	0.00
Dry sample weight =	149.00

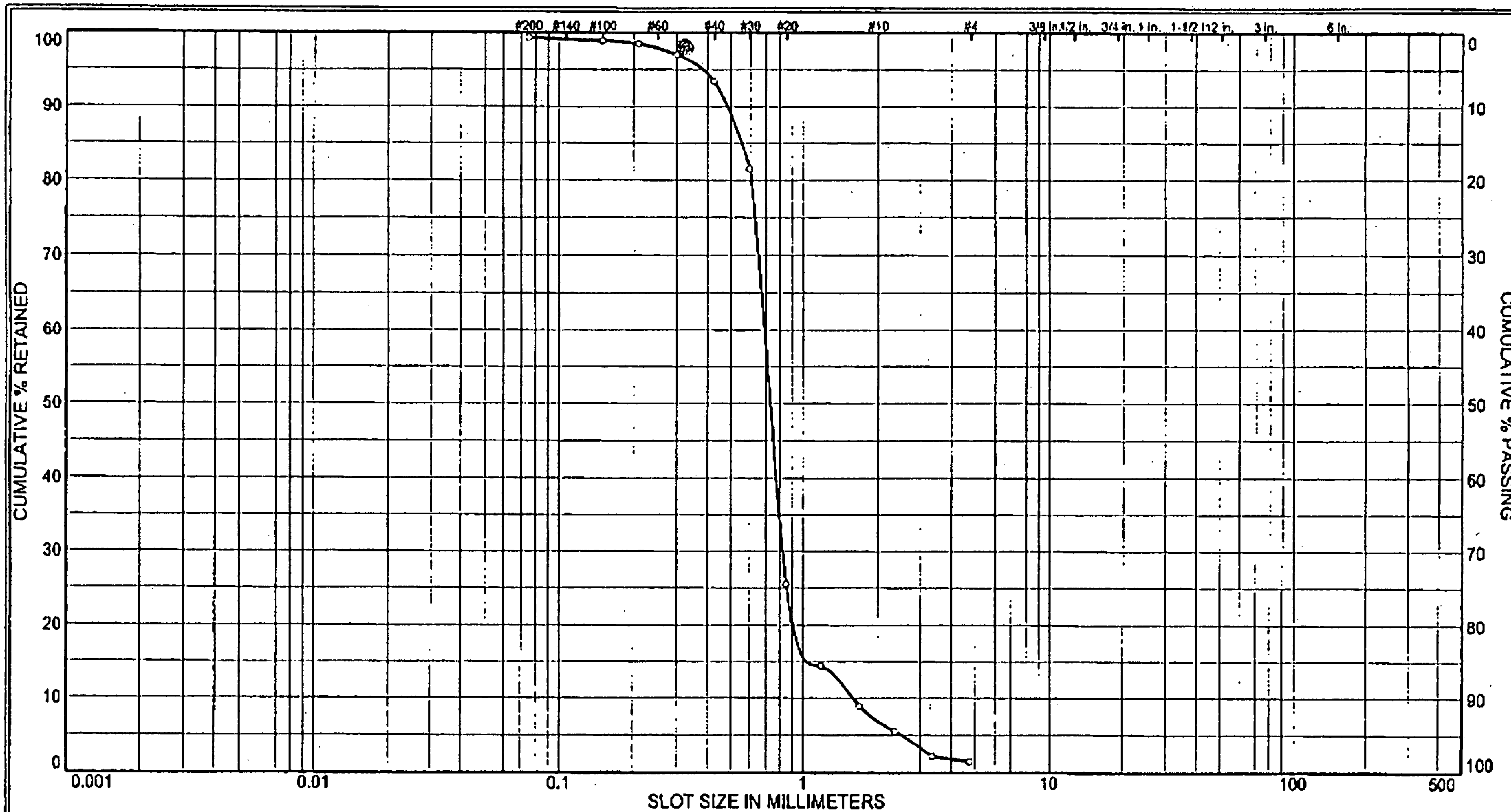
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	11.00	92.6
# 6	20.00	86.6
# 8	30.00	79.9
# 12	40.00	73.2
# 16	53.00	64.4
# 20	66.00	55.7
# 30	82.00	45.0
# 40	106.00	28.9
# 50	130.00	12.8
# 70	144.00	3.4
# 100	147.00	1.3
# 200	148.00	0.7

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 91.9
% FINES = 0.7

D_{85}= 3.07 D_{60}= 1.00 D_{50}= 0.69
D_{30}= 0.43 D_{15}= 0.32 D_{10}= 0.28
C_c= 0.6815 C_u= 3.5982



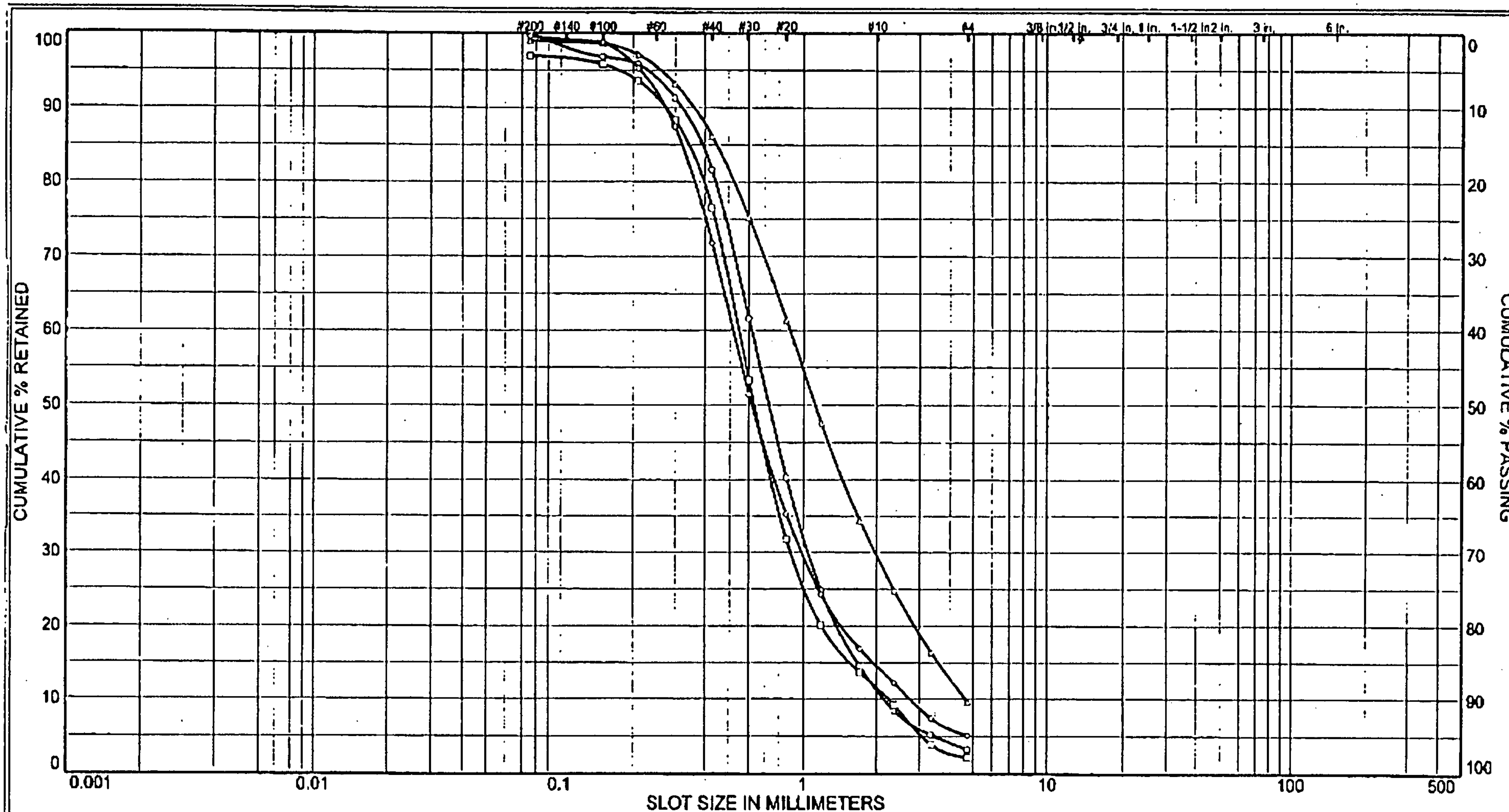
	LOCATION	SOURCE	SAMPLE #	DEPTH/ELEV.	MATERIAL DESCRIPTION
○	FRIDLEY,MN		2A=2A	34.5 36.5 FT.	SILT TO FINE GRAVEL.

Project No. 001019-2 **Client** E.H RENNER & SONS **Date** 10/24/00

Particle Size Distribution Report

NIROP AT9

U.S. FILTER



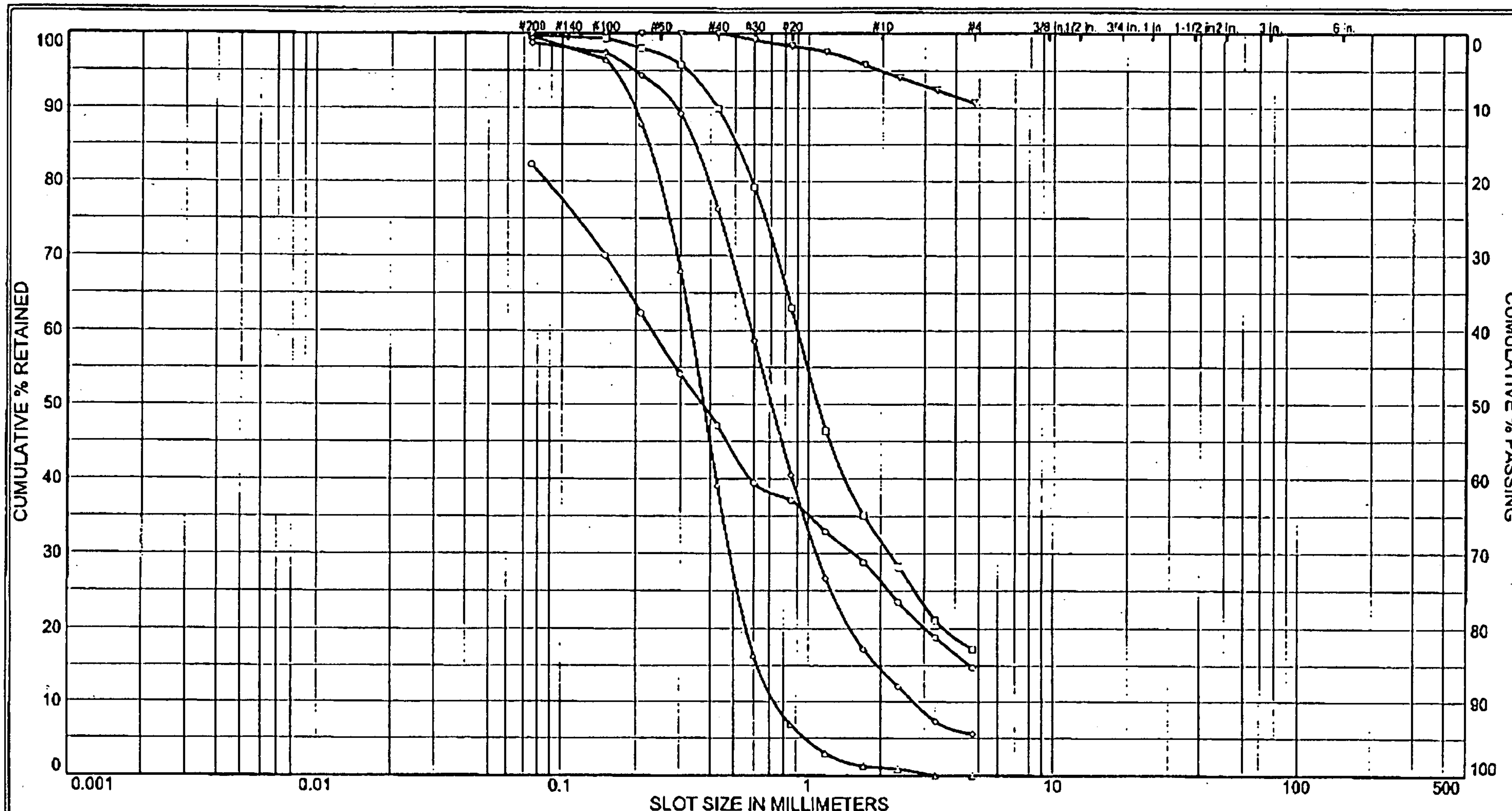
	LOCATION	SOURCE	SAMPLE #	DEPTH/ELEV.	MATERIAL DESCRIPTION
○	FRIDLEY,MN		3A	36.5 38.5 FT.	SILT TO FINE GRAVEL.
□	FRIDLEY, MN.		4A	38.5 40.5 FT.	SILT TO FINE GRAVEL.
△	FRIDLEY,MN.		5A	40.5 42.5 FT.	SILT TO FINE GRAVEL.
◇	FRIDLEY,MN.		6A	42.5 44.5 FT	SILT TO FINE GRAVEL.

Project No. 001019-2 Client E.H RENNER & SONS Date 10/24/00

Particle Size Distribution Report

NIROP AT9

U.S. FILTER



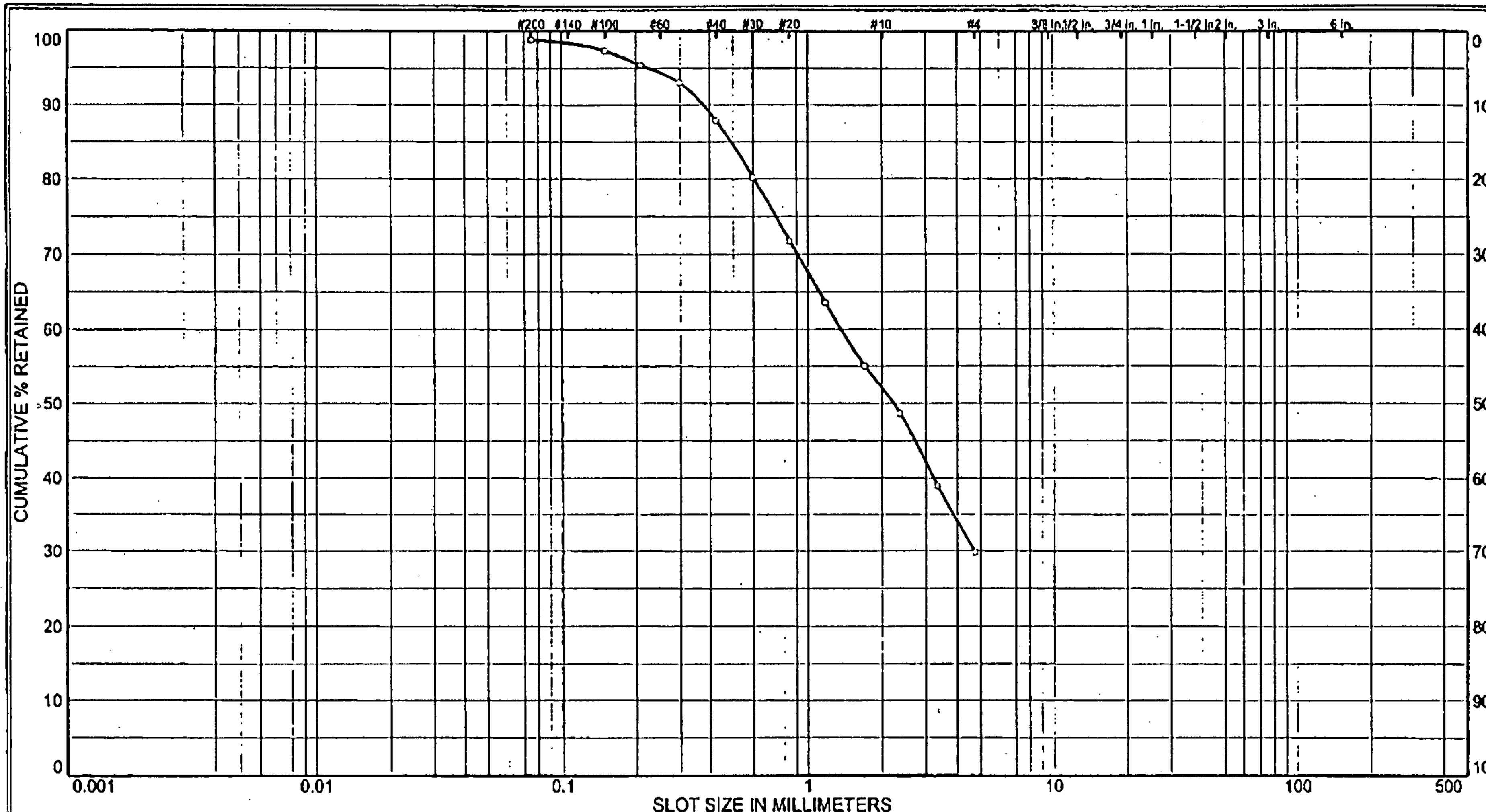
	LOCATION	SOURCE	SAMPLE #	DEPTH/ELEV.	MATERIAL DESCRIPTION
○	FRIDLEY,MN.		6B	44.5 46.5 FT.	SILT TO FINE GRAVEL.
□	FRIDLEY,MN.		8A	46.5 48.5 FT.	SILT TO FINE GRAVEL.
△	FRIDLEY,MN.		13A	56.5 58.5 FT.	SILT TO FINE GRAVEL.
◇	FRIDLEY,MN.		13C	60 62 FT.	SILT TO FINE GRAVEL.
▽	FRIDLEY,MN.		14C	58.5 60 FT.	SILT TO FINE GRAVEL.

Project No. 001019-2 **Client** E.H RENNER & SONS **Date** 10/24/00

Particle Size Distribution Report

NIROP AT9

U.S. FILTER



	LOCATION	SOURCE	SAMPLE #	DEPTH/ELEV.	MATERIAL DESCRIPTION
○	FRIDLEY,MN.		14D	62 64FT.	SILT TO FINE GRAVEL.

Project No. 001019-2 Client E.H RENNER & SONS Date 10/24/00

Particle Size Distribution Report

NIROP AT9

U.S. FILTER

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT9
Project Number: 001019-2 **Client:** E.H RENNER & SONS

Sample Data

Source:
Sample No.: 2A
Elev. or Depth: 34.5 36.5 FT. **Sample Length (in./cm.):**
Location: FRIDLEY,MN
Description: SILT TO FINE GRAVEL.

Mechanical Analysis Data

	Initial
Dry sample and tare=	271.00
Tare =	0.00
Dry sample weight =	271.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	4.00	98.5
# 6	6.00	97.8
# 8	15.00	94.5
# 12	24.00	91.1
# 16	39.00	85.6
# 20	69.00	74.5
# 30	221.00	18.5
# 40	253.00	6.6
# 50	263.00	3.0
# 70	267.00	1.5
# 100	268.00	1.1
# 200	269.00	0.7

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 97.8
% FINES = 0.7

D_{85}= 1.03 D_{60}= 0.77 D_{50}= 0.73
D_{30}= 0.65 D_{15}= 0.55 D_{10}= 0.48
C_c= 1.1389 C_u= 1.5955

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT9
Project Number: 001019-2 **Client:** E.H RENNER & SONS

Sample Data

Source:
Sample No.: 3A
Elev. or Depth: 36.5 38.5 FT. **Sample Length (in./cm.):**
Location: FRIDLEY,MN
Description: SILT TO FINE GRAVEL.

Mechanical Analysis Data

	Initial
Dry sample and tare=	310.00
Tare =	0.00
Dry sample weight =	310.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	10.00	96.8
# 6	16.00	94.8
# 8	26.00	91.6
# 12	45.00	85.5
# 16	77.00	75.2
# 20	125.00	59.7
# 30	191.00	38.4
# 40	253.00	18.4
# 50	283.00	8.7
# 70	297.00	4.2
# 100	300.00	3.2
# 200	347.00	0.0

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 96.8

D_{85}= 1.66 D_{60}= 0.85 D_{50}= 0.72
D_{30}= 0.53 D_{15}= 0.39 D_{10}= 0.32
C_c= 1.007 C_u= 2.6584

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT9
Project Number: 001019-2 **Client:** E.H RENNER & SONS

Sample Data

Source:
Sample No.: 4A
Elev. or Depth: 38.5 40.5 FT. **Sample Length (in./cm.):**
Location: FRIDLEY, MN.
Description: SILT TO FINE GRAVEL.

Mechanical Analysis Data

	Initial
Dry sample and tare=	358.00
Tare =	0.00
Dry sample weight =	358.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	8.00	97.8
# 6	14.00	96.1
# 8	33.00	90.8
# 12	49.00	86.3
# 16	72.00	79.9
# 20	114.00	68.2
# 30	191.00	46.7
# 40	274.00	23.5
# 50	316.00	11.7
# 70	335.00	6.4
# 100	343.00	4.2
# 200	347.00	3.1

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = % GRAVEL = % SAND = 94.7
% FINES = 3.1

D_{85}= 1.55 D_{60}= 0.73 D_{50}= 0.63
D_{30}= 0.47 D_{15}= 0.34 D_{10}= 0.27
C_c= 1.1164 C_u= 2.6671

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT9
Project Number: 001019-2 **Client:** E.H RENNER & SONS

Sample Data

Source:
Sample No.: 5A
Elev. or Depth: 40.5 42.5 FT. **Sample Length (in./cm.):**
Location: FRIDLEY,MN.
Description: SILT TO FINE GRAVEL.

Mechanical Analysis Data

	Initial
Dry sample and tare=	311.00
Tare =	0.00
Dry sample weight =	311.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	30.00	90.4
# 6	51.00	83.6
# 8	77.00	75.2
# 12	107.00	65.6
# 16	148.00	52.4
# 20	191.00	38.6
# 30	234.00	24.8
# 40	268.00	13.8
# 50	290.00	6.8
# 70	302.00	2.9
# 100	307.00	1.3
# 200	308.00	1.0

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 89.4
% FINES = 1.0

D_{85}= 3.58 D_{60}= 1.44 D_{50}= 1.11
D_{30}= 0.69 D_{15}= 0.44 D_{10}= 0.36
C_c= 0.9115 C_u= 4.0001

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT9
Project Number: 001019-2 **Client:** E.H RENNER & SONS

Sample Data

Source:
Sample No.: 6A
Elev. or Depth: 42.5 44.5 FT **Sample Length (in./cm.):**
Location: FRIDLEY,MN.
Description: SILT TO FINE GRAVEL.

Mechanical Analysis Data

	Initial
Dry sample and tare=	255.00
Tare =	0.00
Dry sample weight =	255.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	13.00	94.9
# 6	19.00	92.6
# 8	31.00	87.8
# 12	43.00	83.1
# 16	62.00	75.7
# 20	90.00	64.7
# 30	131.00	48.6
40	183.00	28.2
50	223.00	12.6
# 70	243.00	4.7
# 100	252.00	1.2
# 200	254.00	0.4

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 94.5
% FINES = 0.4

D_{85}= 1.93 D_{60}= 0.76 D_{50}= 0.62
D_{30}= 0.44 D_{15}= 0.32 D_{10}= 0.27
C_c= 0.9241 C_u= 2.7598

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT9
Project Number: 001019-2 **Client:** E.H RENNER & SONS

Sample Data

Source:
Sample No.: 6B
Elev. or Depth: 44.5 46.5 FT. **Sample Length (in./cm.):**
Location: FRIDLEY, MN.
Description: SILT TO FINE GRAVEL.

Mechanical Analysis Data

	Initial
Dry sample and tare=	170.00
Tare =	0.00
Dry sample weight =	170.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	25.00	85.3
# 6	32.00	81.2
# 8	40.00	76.5
# 12	49.00	71.2
# 16	56.00	67.1
# 20	63.00	62.9
# 30	67.00	60.6
# 40	80.00	52.9
# 50	92.00	45.9
# 70	106.00	37.7
# 100	119.00	30.0
# 200	140.00	17.7

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 67.6
% FINES = 17.7

D_{85}= 4.63 D_{60}= 0.58 D_{50}= 0.37
D_{30}= 0.15

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT9
Project Number: 001019-2 **Client:** E.H RENNER & SONS

Sample Data

Source:
Sample No.: 8A
Elev. or Depth: 46.5 48.5 FT. **Sample Length (in./cm.):**
Location: FRIDLEY,MN.
Description: SILT TO FINE GRAVEL.

Mechanical Analysis Data

	Initial
Dry sample and tare=	308.00
Tare =	0.00
Dry sample weight =	308.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	53.00	82.8
# 6	65.00	78.9
# 8	87.00	71.8
# 12	108.00	64.9
# 16	143.00	53.6
# 20	194.00	37.0
# 30	244.00	20.8
# 40	277.00	10.1
# 50	295.00	4.2
# 70	302.00	2.0
# 100	306.00	0.7
# 200	307.00	0.3

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 82.5
% FINES = 0.3

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT9
Project Number: 001019-2 **Client:** E.H RENNER & SONS

Sample Data

Source:
Sample No.: 13A
Elev. or Depth: 56.5 58.5 FT. **Sample Length (in./cm.):**
Location: FRIDLEY,MN.
Description: SILT TO FINE GRAVEL.

Mechanical Analysis Data

	Initial
Dry sample and tare=	232.00
Tare =	0.00
Dry sample weight =	232.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	0.00	100.0
# 6	0.00	100.0
# 8	2.00	99.1
# 12	3.00	98.7
# 16	7.00	97.0
# 20	16.00	93.1
# 30	38.00	83.6
# 40	91.00	60.8
# 50	158.00	31.9
# 70	204.00	12.1
# 100	224.00	3.5
# 200	231.00	0.4

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 99.6
% FINES = 0.4

D_{85}= 0.62 D_{60}= 0.42 D_{50}= 0.37
D_{30}= 0.29 D_{15}= 0.23 D_{10}= 0.20
C_c= 1.0248 C_u= 2.1256

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT9
Project Number: 001019-2 **Client:** E.H RENNER & SONS

Sample Data

Source:
Sample No.: 14C
Elev. or Depth: 58.5 60 FT. **Sample Length (in./cm.):**
Location: FRIDLEY,MN.
Description: SILT TO FINE GRAVEL.

Mechanical Analysis Data

	Initial
Dry sample and tare=	118.00
Tare =	0.00
Dry sample weight =	118.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	107.00	9.3
# 6	109.00	7.6
# 8	111.00	5.9
# 12	113.00	4.2
# 16	115.00	2.5
# 20	116.00	1.7
# 30	117.00	0.9
# 40	118.00	0.0
# 50	118.00	0.0
# 70	118.00	0.0
# 100	118.00	0.0
# 200	118.00	0.0

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 9.3

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT9
Project Number: 001019-2
Client: E.H RENNER & SONS

Sample Data

Source:
Sample No.: 13C
Elev. or Depth: 60 62 FT.
Sample Length (in./cm.):
Location: FRIDLEY,MN.
Description: SILT TO FINE GRAVEL.

Mechanical Analysis Data

	Initial
Dry sample and tare=	232.00
Tare =	0.00
Dry sample weight =	232.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	13.00	94.4
# 6	17.00	92.7
# 8	28.00	87.9
# 12	40.00	82.8
# 16	62.00	73.3
# 20	94.00	59.5
# 30	136.00	41.4
# 40	177.00	23.7
# 50	207.00	10.8
# 70	219.00	5.6
# 100	226.00	2.6
# 200	229.00	1.3

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 93.1
% FINES = 1.3

D_{85}= 1.94 D_{60}= 0.86 D_{50}= 0.70
D_{30}= 0.48 D_{15}= 0.34 D_{10}= 0.29
C_c= 0.9386 C_u= 2.9631

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT9
Project Number: 001019-2 **Client:** E.H RENNER & SONS

Sample Data

Source:
Sample No.: 14D
Elev. or Depth: 62 64FT. **Sample Length (in./cm.):**
Location: FRIDLEY,MN.
Description: SILT TO FINE GRAVEL.

Mechanical Analysis Data

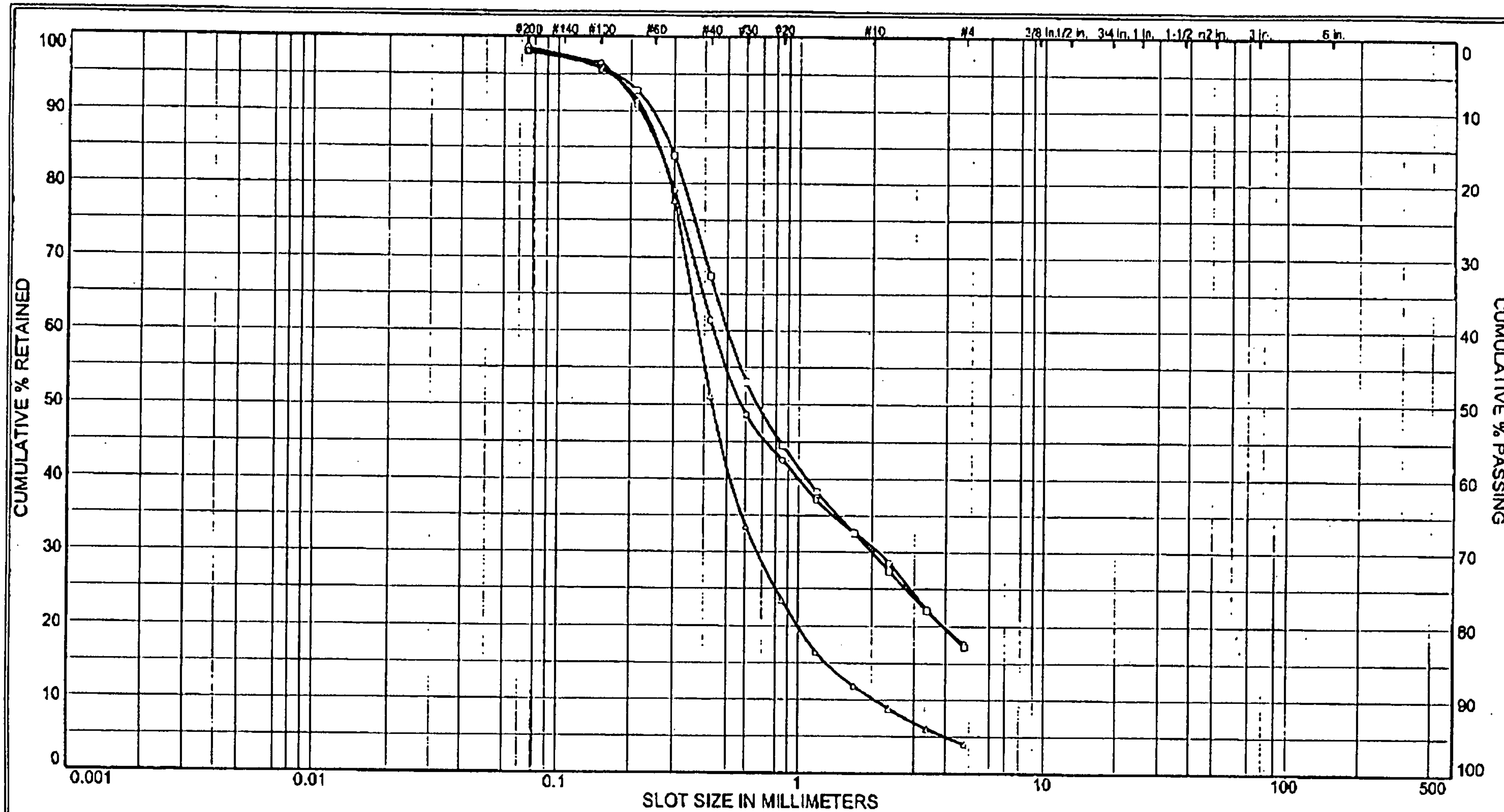
	Initial
Dry sample and tare=	329.00
Tare =	0.00
Dry sample weight =	329.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	98.00	70.2
# 6	128.00	61.1
# 8	160.00	51.4
# 12	181.00	45.0
# 16	209.00	36.5
# 20	236.00	28.3
# 30	264.00	19.8
# 40	289.00	12.2
# 50	306.00	7.0
# 70	314.00	4.6
# 100	320.00	2.7
# 200	325.00	1.2

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = % GRAVEL = % SAND = 69.0
% FINES = 1.2



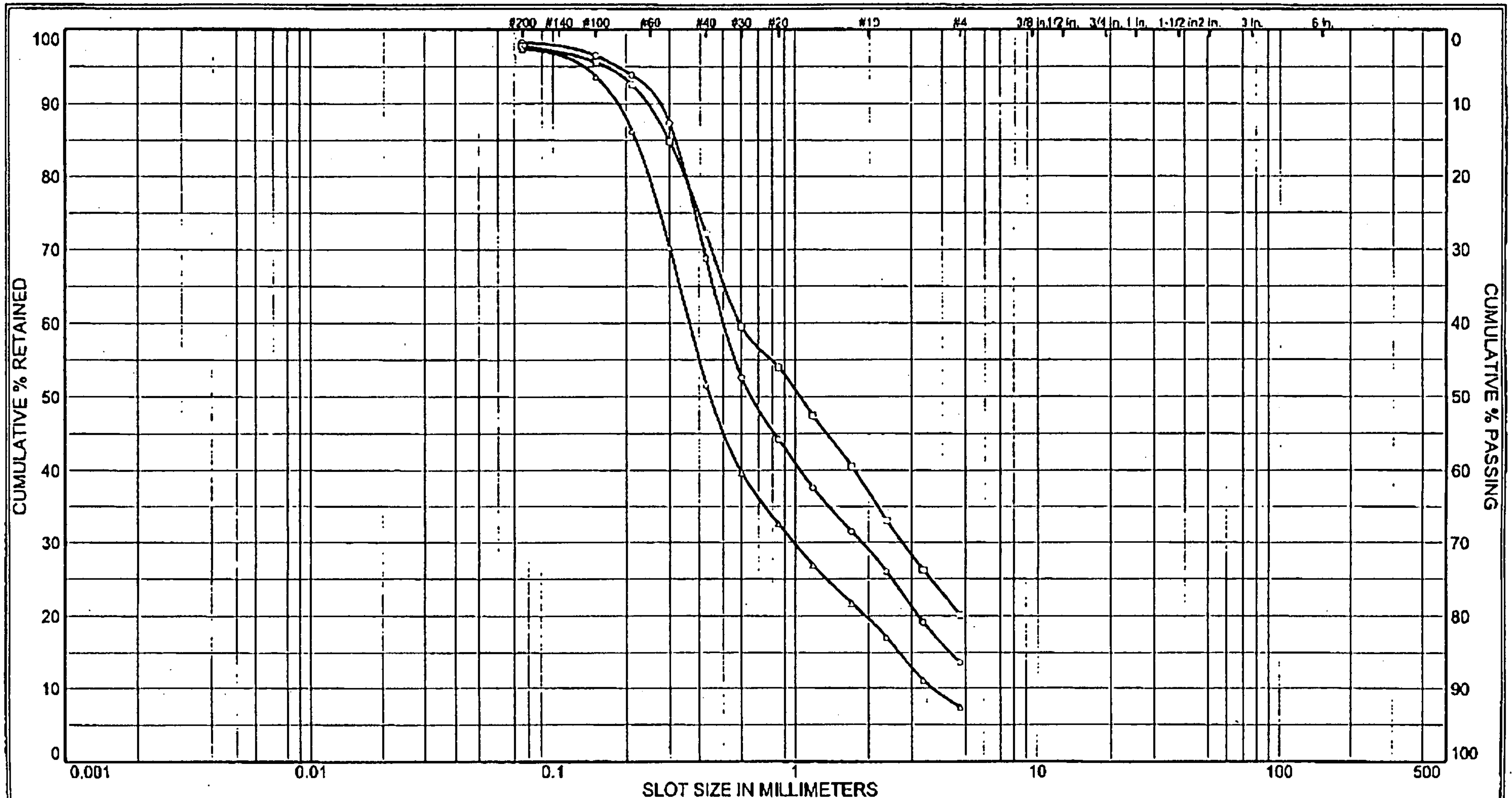
	LOCATION	SOURCE	SAMPLE #	DEPTH/ELEV.	MATERIAL DESCRIPTION
○	FRIDLEY,MN.	NIROP AT10	2C	67 69 FT.	SILT TO FINE GRAVEL.
□	FRIDLEY,MN.	NIROP AT10	2D	69 71 FT.	SILT TO FINE GRAVEL.
△	FRIDLEY,MN.	NIROP AT10	7C	65 67 FT.	SILT TO FINE GRAVEL.

Project No. 0010190-3 **Client** E.H. RENNER & SONS **Date** 10/24/00

Particle Size Distribution Report

NIROP AT10

U.S. FILTER



	LOCATION	SOURCE	SAMPLE #	DEPTH/ELEV.	MATERIAL DESCRIPTION
○	FRIDLEY,MN.	NIROP AT10	8C	71 73 FT.	SILT TO FINE GRAVEL.
□	FRIDLEY,MN.	NIROP AT10	15C	75 77 FT.	SILT TO FINE GRAVEL.
△	FRIDLEY,MN.	NIROP AT10	16C	77 79 FT.	SILT TO FINE GRAVEL.

Project No. 0010190-3 **Client** E.H. RENNER & SONS **Date** 10/24/00

Particle Size Distribution Report

NIROP AT10

U.S. FILTER

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT10
Project Number: 0010190-3 **Client:** E.H. RENNER & SONS

Sample Data

Source: NIROP AT10
Sample No.: 7C
Elev. or Depth: 65 67 FT. **Sample Length (in./cm.):**
Location: FRIDLEY,MN.
Description: SILT TO FINE GRAVEL.

Mechanical Analysis Data

	Initial
Dry sample and tare=	328.00
Tare =	0.00
Dry sample weight =	328.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	13.00	96.0
# 6	20.00	93.9
# 8	29.00	91.2
# 12	39.00	88.1
# 16	54.00	83.5
# 20	77.00	76.5
# 30	110.00	66.5
# 40	168.00	48.8
# 50	255.00	22.3
# 70	300.00	8.5
# 100	314.00	4.3
# 200	322.00	1.8

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 94.2
% FINES = 1.8

D_{85}= 1.30 D_{60}= 0.51 D_{50}= 0.43
D_{30}= 0.33 D_{15}= 0.26 D_{10}= 0.22
C_c= 0.9692 C_u= 2.2925

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT10
Project Number: 0010190-3 **Client:** E.H. RENNER & SONS

Sample Data

Source: NIROP AT10
Sample No.: 2C
Elev. or Depth: 67 69 FT. **Sample Length (in./cm.):**
Location: FRIDLEY,MN.
Description: SILT TO FINE GRAVEL.

Mechanical Analysis Data

	Initial
Dry sample and tare=	358.00
Tare =	0.00
Dry sample weight =	358.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	63.00	82.4
# 6	80.00	77.7
# 8	102.00	71.5
# 12	117.00	67.3
# 16	133.00	62.9
# 20	152.00	57.5
# 30	174.00	51.4
# 40	220.00	38.6
# 50	283.00	21.0
# 70	325.00	9.2
# 100	345.00	3.6
# 200	353.00	1.4

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = % GRAVEL = % SAND = 81.0
% FINES = 1.4

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT10
Project Number: 0010190-3 **Client:** E.H. RENNER & SONS

Sample Data

Source: NIROP AT10
Sample No.: 2D
Elev. or Depth: 69 71 FT. **Sample Length (in./cm.):**
Location: FRIDLEY,MN.
Description: SILT TO FINE GRAVEL.

Mechanical Analysis Data

	Initial
Dry sample and tare=	402.00
Tare =	0.00
Dry sample weight =	402.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	69.00	82.8
# 6	89.00	77.9
# 8	110.00	72.6
# 12	131.00	67.4
# 16	154.00	61.7
# 20	179.00	55.5
# 30	213.00	47.0
# 40	271.00	32.6
# 50	337.00	16.2
# 70	373.00	7.2
# 100	385.00	4.2
# 200	394.00	2.0

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 80.8
% FINES = 2.0

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT10
Project Number: 0010190-3 **Client:** E.H. RENNER & SONS

Sample Data

Source: NIROP AT10
Sample No.: 8C
Elev. or Depth: 71 73 FT. **Sample Length (in./cm.):**
Location: FRIDLEY, MN.
Description: SILT TO FINE GRAVEL.

Mechanical Analysis Data

	Initial
Dry sample and tare=	346.00
Tare =	0.00
Dry sample weight =	346.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	47.00	86.4
# 6	66.00	80.9
# 8	90.00	74.0
# 12	109.00	68.5
# 16	130.00	62.4
# 20	153.00	55.8
# 30	182.00	47.4
# 40	238.00	31.2
# 50	302.00	12.7
# 70	325.00	6.1
# 100	334.00	3.5
# 200	340.00	1.7

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 84.7
% FINES = 1.7

D_{85}= 4.32 D_{60}= 1.04 D_{50}= 0.65
D_{30}= 0.42 D_{15}= 0.32 D_{10}= 0.28
C_c= 0.6033 C_u= 3.7963

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT10
Project Number: 0010190-3 **Client:** E.H. RENNER & SONS

Sample Data

Source: NIROP AT10
Sample No.: 15C
Elev. or Depth: 75 77 FT. **Sample Length (in./cm.):**
Location: FRIDLEY,MN.
Description: SILT TO FINE GRAVEL.

Mechanical Analysis Data

	Initial
Dry sample and tare=	363.00
Tare =	0.00
Dry sample weight =	363.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	73.00	79.9
# 6	95.00	73.8
# 8	120.00	66.9
# 12	147.00	59.5
# 16	172.00	52.6
# 20	196.00	46.0
# 30	216.00	40.5
# 40	262.00	27.8
# 50	308.00	15.2
# 70	336.00	7.4
# 100	347.00	4.4
# 200	355.00	2.2

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = % GRAVEL = % SAND = 77.7
% FINES = 2.2

GRAIN SIZE DISTRIBUTION TEST DATA

Project: NIROP AT10
Project Number: 0010190-3 **Client:** E.H. RENNER & SONS

Sample Data

Source: NIROP AT10
Sample No.: 16C
Elev. or Depth: 77 79 FT. **Sample Length (in./cm.):**
Location: FRIDLEY,MN.
Description: SILT TO FINE GRAVEL.

Mechanical Analysis Data

	Initial
Dry sample and tare=	350.00
Tare =	0.00
Dry sample weight =	350.00

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 4	26.00	92.6
# 6	39.00	88.9
# 8	60.00	82.9
# 12	76.00	78.3
# 16	94.00	73.1
# 20	114.00	67.4
# 30	139.00	60.3
# 40	181.00	48.3
# 50	246.00	29.7
# 70	302.00	13.7
# 100	328.00	6.3
# 200	341.00	2.6

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = % GRAVEL = % SAND = 90.0
% FINES = 2.6

D_{85}= 2.66 D_{60}= 0.59 D_{50}= 0.44
D_{30}= 0.30 D_{15}= 0.22 D_{10}= 0.18
C_c= 0.8335 C_u= 3.2206

Appendix C4

Waste Soil Analytical Data Summary

Sample ID		**NIROP110200C1 Soil Composite**
Lab ID		**904181-001**
TCLP Semivolatiles by Method 1311/8270C	**UNITS**	
2,4,5-Trichlorophenol	mg/L	<0.12
2,4,6-Trichlorophenol	mg/L	<0.050
2,4-Dinitrotoluene	mg/L	<0.050
Hexachlorobenzene	mg/L	<0.050
Hexachlorobutadiene	mg/L	<0.050
Hexachloroethane	mg/L	<0.050
Cresols	mg/L	<0.050
Nitrobenzene	mg/L	<0.050
Pentachlorophenol	mg/L	<0.12
Pyridine	mg/L	<0.050
TCLP Volatiles by Method 1311/8260B		
1,1-Dichloroethene	mg/L	<0.10
1,2-Dichloroethane	mg/L	<0.10
2-Butanone	mg/L	<0.20
Benzene	mg/L	<0.10
Carbon tetrachloride	mg/L	<0.10
Chlorobenzene	mg/L	<0.10
Chloroform	mg/L	<0.10
Tetrachloroethene	mg/L	<0.10
Trichloroethene	mg/L	<0.10
Vinyl chloride	mg/L	<0.050
TCLP Pesticides by Method 1311/8081A		
Chlordane	mg/L	<0.010
Endrin	mg/L	<0.0010
Lindane	mg/L	<0.00050
Heptachlor	mg/L	<0.00050
Heptachlor epoxide	mg/L	<0.00050
Methoxychlor	mg/L	<0.0050
Toxaphene	mg/L	<0.050
TCLP Metals by Method 1311/6010B/7470A		
TCLP Silver	mg/L	<0.010
TCLP Arsenic	mg/L	<0.70
TCLP Barium	mg/L	0.50
TCLP Cadmium	mg/L	<0.010
TCLP Chromium	mg/L	<0.010
TCLP Mercury	mg/L	<0.00020
TCLP Lead	mg/L	<0.20
TCLP Selenium	mg/L	<0.70

Sample ID		**NIROP110200C1 Soil Composite**
Lab ID		**904181-001**
Various Inorganic Analyses	**UNITS**	
Ignitability by Method 1020A	deg.	>210 F
Corrosivity by Method 9045C		8.7
Reactive Sulfide by Method SW-846 7.3.4.1	mg/kg	<25.0
Reactive Cyanide by Method SW-846 7.3.3.2	mg/kg	<2.50

ND = The compound was not detected at the reporting limit
J = Estimated value below the reporting limit and above the method detection limit
mg/L = milligrams per liter
mg/kg = milligrams per kilogram

Appendix C5

Waste Liquids Analytical Data Summary

	Sample ID	NIROP110200C2 Water Composite
	Lab ID	
Semivolatiles by Method 8270C	**UNITS**	**RESULTS**
bis(2-Chloroethyl)ether	ug/L	<10
Phenol	ug/L	<10
2-Chlorophenol	ug/L	<10
1,3-Dichlorobenzene	ug/L	<10
1,4-Dichlorobenzene	ug/L	<10
1,2-Dichlorobenzene	ug/L	<10
2,2'-oxybis(1-chloropropane)	ug/L	<10
2-Methylphenol	ug/L	<10
Hexachloroethane	ug/L	<10
N-Nitroso-di-n-propylamine	ug/L	<10
4-Methylphenol	ug/L	<10
Nitrobenzene	ug/L	<10
Isophorone	ug/L	<10
2-Nitrophenol	ug/L	<10
2,4-Dimethylphenol	ug/L	<10
bis(2-Chloroethoxy)methane	ug/L	<10
2,4-Dichlorophenol	ug/L	<10
1,2,4-Trichlorobenzene	ug/L	<10
Naphthalene	ug/L	<10
4-Chloroaniline	ug/L	<10
Hexachlorobutadiene	ug/L	<10
4-Chloro-3-methylphenol	ug/L	<10
2-Methylnaphthalene	ug/L	<10
Hexachlorocyclopentadiene	ug/L	<10
2,4,6-Trichlorophenol	ug/L	<10
2,4,5-Trichlorophenol	ug/L	<25
2-Chloronaphthalene	ug/L	<10
2-Nitroaniline	ug/L	<25
Acenaphthylene	ug/L	<10
Dimethylphthalate	ug/L	<10
2,6-Dinitrotoluene	ug/L	<10
Acenaphthene	ug/L	<10
3-Nitroaniline	ug/L	<25
2,4-Dinitrophenol	ug/L	<25
Dibenzofuran	ug/L	<10
2,4-Dinitrotoluene	ug/L	<10
4-Nitrophenol	ug/L	<25
Fluorene	ug/L	<10
4-Chlorophenyl-phenylether	ug/L	<10
Diethylphthalate	ug/L	<10
4-Nitroaniline	ug/L	<25
4,6-Dinitro-2-methylphenol	ug/L	<25

	Sample ID	NIROP110200C2 Water Composite
	Lab ID	
N-nitrosodiphenylamine	ug/L	<10
4-Bromophenyl-phenylether	ug/L	<10
Hexachlorobenzene	ug/L	<10
Pentachlorophenol	ug/L	<25
Phenanthrene	ug/L	<10
Anthracene	ug/L	<10
Carbazole	ug/L	<10
di-n-Butylphthalate	ug/L	<10
Fluoranthene	ug/L	<10
Pyrene	ug/L	<10
Butylbenzylphthalate	ug/L	<10
3,3'-Dichlorobenzidine	ug/L	<10
Benzo(a)anthracene	ug/L	<10
Chrysene	ug/L	<10
bis(2-Ethylhexyl)phthalate	ug/L	<10
di-n-Octylphthalate	ug/L	<10
Benzo(b)fluoranthene	ug/L	<10
Benzo(k)fluoranthene	ug/L	<10
Benzo(a)pyrene	ug/L	<10
Indeno(1,2,3-cd)pyrene	ug/L	<10
Dibenzo(a,h)anthracene	ug/L	<10
Benzo(g,h,i)perylene	ug/L	<10
Volatiles by Method 8260B		
Chloromethane	ug/L	<2.0
Bromomethane	ug/L	<2.0
Vinyl chloride	ug/L	<2.0
Chloroethane	ug/L	<2.0
Methylene chloride	ug/L	<1.0
Acetone	ug/L	26
Carbon Disulfide	ug/L	<1.0
1,1-Dichloroethene	ug/L	<1.0
1,1-Dichloroethane	ug/L	<1.0
1,2-Dichloroethene	ug/L	<2.0
Chloroform	ug/L	<1.0
1,2-Dichloroethane	ug/L	<1.0
2-Butanone	ug/L	<5.0
1,1,1-Trichloroethane	ug/L	<1.0
Carbon tetrachloride	ug/L	<1.0
Bromodichloromethane	ug/L	<1.0
1,2-Dichloropropane	ug/L	<1.0
cis-1,3-Dichloropropene	ug/L	<1.0
Trichloroethene	ug/L	<1.0
Benzene	ug/L	<1.0
Dibromochloromethane	ug/L	<1.0
trans-1,3-Dichloropropene	ug/L	<1.0

		Sample ID	NIROP110200C2 Water Composite
		Lab ID	
Arsenic	ug/L		24
Barium	ug/L		1100
Beryllium	ug/L		4.2
Calcium	ug/L		120000
Cadmium	ug/L		2.9
Cobalt	ug/L		30
Chromium	ug/L		150
Copper	ug/L		140
Iron	ug/L		110000
Mercury	ug/L		<0.20
Potassium	ug/L		21000
Magnesium	ug/L		47000
Manganese	ug/L		3900
Sodium	ug/L		110000
Nickel	ug/L		96
Lead	ug/L		71
Antimony	ug/L		<10
Selenium	ug/L		<10
Thallium	ug/L		<10
Vanadium	ug/L		110
Zinc	ug/L		
Inorganic Analyses			
Total Cyanide by Method 335.4	mg/L		<0.010
Reactive Cyanide by Method 7.3.3.2	mg/kg		<2.50
Reactive Sulfide by Method 7.3.4.1	mg/kg		<2.50
pH by Method 9040/150.1	pH		5.9
Ignitability by Method 1020A	Deg. F		>210

	Sample ID	NIROP110200C2 Water Composite
	Lab ID	
1,1,2-Trichloroethane	ug/L	<1.0
Bromoform	ug/L	<1.0
4-Methyl-2-pentanone	ug/L	<5.0
2-Hexanone	ug/L	<5.0
Tetrachloroethene	ug/L	<1.0
1,1,2,2-Tetrachloroethane	ug/L	<1.0
Toluene	ug/L	<1.0
Chlorobenzene	ug/L	<1.0
Ethylbenzene	ug/L	<1.0
Styrene	ug/L	<1.0
Xylenes, Total	ug/L	<3.0
Pesticides by Method 8015 8081		
4,4'-DDD	ug/L	<0.10
4,4'-DDE	ug/L	<0.10
4,4'-DDT	ug/L	<0.10
Aldrin	ug/L	<0.050
alpha-BHC	ug/L	<0.050
alpha-Chlordane	ug/L	<0.050
beta-BHC	ug/L	<0.050
delta-BHC	ug/L	<0.050
Dieldrin	ug/L	<0.10
Endosulfan I	ug/L	<0.050
Endosulfan II	ug/L	<0.10
Endosulfan sulfate	ug/L	<0.10
Endrin	ug/L	<0.10
Endrin ketone	ug/L	<0.10
Endrin aldehyde	ug/L	<0.10
Endrin ketone	ug/L	<0.10
gamma-BHC (Lindane)	ug/L	<0.050
gamma-Chlordane	ug/L	<0.050
Heptachlor	ug/L	<0.050
Heptachlor epoxide	ug/L	<0.050
Methoxychlor	ug/L	<0.50
Toxaphene	ug/L	<5.0
Total PCBs by Method 8082		
Aroclor 1016	ug/L	<1.00
Aroclor 1221	ug/L	<1.00
Aroclor 1232	ug/L	<1.00
Aroclor 1242	ug/L	<1.00
Aroclor 1248	ug/L	<1.00
Aroclor 1254	ug/L	<1.00
Aroclor 1260	ug/L	<1.00
Total Metals by Method 6010B/7470A		
Silver	ug/L	<5.0
Aluminum	ug/L	93000

Appendix C6

Chain of Custody Forms

BRAUN INTERTEC

Braun Intertec Corporation
6875 Washington Ave. S.
Edina, MN 55439-0108

Bottle orders and sampling inquires:
labservices@brauncorp.com
Phone: 612-942-4930 Fax: 612-942-4844

REQUEST FOR LABORATORY ANALYTICAL SERVICES

IMPORTANT
Date Results Requested: 10/2/00
Time A.M.
Rush Charges Authorized? ___ Yes X No
Rush / Quote # ______

For Braun Intertec Use Only
Braun Intertec Project No.
OC-0292
CVXX-99-AGH

J0015-74-X175

REPORT RESULTS TO
Contact Name: Brandon Juran
Company: Bay West
Mailing Address: Five Empire Drive
City, State, Zip: St. Paul MN 55103
Telephone #: 651-291-0456 Fax #: 651-291-0099

Project ID/Project Name: J003471 / NIROP
P.O. #

SEND INVOICE TO
Contact Name: Accounting Company: Bay West
Address: Five Empire Drive
City, State, Zip: St. Paul MN 55103
Telephone #: 651-291-0456 Fax #: 651-291-0099

Special Instructions and/or Specific Regulatory Requirements:
(method, limit of detection, petrofund, reporting units)

Circle metals that require low detection limits
Ag As Be Cd Cr Pb Ni Sb Se Tl V Other

ANALYSIS REQUESTED
(Enter an 'X' in the box below to indicate request)

	CLIENT SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	MATRIX/ MEDIA	AIR VOLUME (specify units)	Number of Containers	Metals Field Filtered Y/N	Asbestos (PLM)									FOR LAB USE ONLY
1	J003471-1	9/25/00	3:06	roofing	—	1		X									
2	J003471-2	9/25/00	2:53	roofing	—	1		X									
3	J003471-3	9/25/00	3:10	roofing	—	1		X									
4	J003471-4	9/25/00	2:45	wall covering	—	1		X									
5	J003471-5	9/25/00	2:47	wall covering	—	1		X									
6	J003471-6	9/25/00	3:00	wall covering	—	1		X									
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	

CHAIN OF CUSTODY
Collected by: (Print) Brandon Juran
Collector's Signature: [signature]
Relinquished by: [signature] Date/Time 9/25/00 1605
Received by: Date/Time
Relinquished by: Date/Time
Received Contents Not Verified: [signature] Date/Time 9/26/00 [illegible]
Received Contents Verified: Date/Time

Evidence Tape Intact ☐ Yes ☐ No ☐ N/A
Sample Condition Upon Receipt: ☐ Acceptable ☐ Other ______
Temperature ______ °C ☐ Received on Ice
Matrix Spike Samples Received: ☐ Yes ☐ No ☐ N/A

Comments:

BRAUN INTERTEC

Braun Intertec Corporation
6875 Washington Ave. S.
Edina, MN 55439-0108

Bottle orders and sampling inquires:
labservices@brauncorp.com
Phone: 612-942-4930 Fax: 612-942-4844

REQUEST FOR LABORATORY ANALYTICAL SERVICES

IMPORTANT
Date Results Requested: 10/2/00
Time A.M.
Rush Charges Authorized? ___ Yes X No
Rush / Quote # ______

For Braun Intertec Use Only
Braun Intertec Project No.
TEMP517 00-07291
CVXX-98-19011

REPORT RESULTS TO
Contact Name Brandon Juran
Project ID/Project Name J003471 / NIROP
P.O. #
Company Bay West
Mailing Address Five Empire Drive
City, State, Zip St. Paul MN 55103
Telephone # 651-291-0456
Fax # 651-291-0099

SEND INVOICE TO
Contact Name Accounting
Company Bay West
Address Five Empire Drive
City, State, Zip St. Paul MN 55103
Telephone # 651-291-0456
Fax # 651-291-0099

Special Instructions and/or Specific Regulatory Requirements:
(method, limit of detection, petrofund, reporting units)

Circle metals that require low detection limits
Ag | As | Be | Cd | Cr | Pb | Ni | Sb | Se | Tl | V | Other

ANALYSIS REQUESTED
(Enter an 'X' in the box below to indicate request)

	CLIENT SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	MATRIX/ MEDIA	AIR VOLUME (specify units)	Number of Containers	Metals Field Filtered Y/N	Lead										FOR LAB USE ONLY
1	J003471 - 7	9/25/00	2:40	Paint	—	1		X										
2	J003471 - 8	9/25/00	2:42	Paint	—	1		X										
3	J003471 - 9	9/25/00	2:58	Paint	—	1		X										
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		

CHAIN OF CUSTODY
Collected by: (Print) Brandon Juran
Collector's Signature: [signature]
Relinquished by: [signature] Date/Time 9/25/00 1605
Received by: Date/Time
Relinquished by: Date/Time
Received Contents Not Verified: [signature] 9-25-00 1610 Date/Time
Received Contents Verified: Date/Time
Evidence Tape Intact ☐ Yes ☐ No ☐ N/A
Sample Condition Upon Receipt: ☐ Acceptable ☐ Other ______
Temperature ______ °C ☐ Received on Ice
Matrix Spike Samples Received: ☐ Yes ☐ No ☐ N/A
Comments:

CH2MHILL Constructors, Inc.

115 Perimeter Center Place, Suite 700
Atlanta, GA 30346-1278
Tel No: (770) 604-9182
Fax No: (770) 604-9282

CHAIN-OF-CUSTODY RECORD

[1] COC NUMBER: NIROP [illegible]15

[2] PROJECT NAME: NIROP-Fridley, MN	[5] PROJECT NUMBER: N62467-98D-0995	[8] LAB NAME AND CONTACT: ENCHEM / Gary	[11] FAX AND MAIL REPORTS/EDD TO:: RECIPIENT 1 (Name and Company): Paul Walz - Bay West	[14] RECIPIENT 1 (Address, Tel No., and Fax No.): 5 Empire Dr, St. Paul, MN 55103 #651-291-0456 / Fax 651-291-0099
[3] PROJECT PHASE/SITE/TASK: Test Bores & Well installation	[6] CTO OR DO NUMBER: CT#0024	[9] LAB PO NUMBER:	[12] FAX AND MAIL REPORTS/EDD TO:: RECIPIENT 2 (Name and Company)	[15] RECIPIENT 2 (Address, Tel No., and Fax No.):
[4] PROJECT CONTACT: Paul Walz	[7] PROJECT TEL NO AND FAX NO: 651-291-3491 651-291-0099	[10] LAB TEL NO AND FAX NO: 612-719-7000	[13] FAX AND MAIL REPORTS/EDD TO:: RECIPIENT 3 (Name and Company)	[16] RECIPIENT 3 (Address, Tel No., and Fax No.):

[25] ANALYSES REQUIRED (Include Method Numbers)

[17] ITEM	[18] SAMPLE IDENTIFIER	[19] SAMPLE DESCRIPTION/LOCATION	[20] MATRIX (see codes on SOP)	[21] DATE COLLECTED	[22] TIME COLLECTED	[23] DATA PKG LEVEL (see codes on SOP)	[24] TAT (calendar days)	8260B VOC	8270C Semi VOC	8081A Pesticides	6010B TAL metals	~~7470A~~ Mercury	~~9010~~ Cyanide	9045A Corrosivity	Reactivity	335.3 Cyanide	8082 PCB	[26] SAMPLE TYPE (see codes on SOP)	[27] COMMENTS/ SCREENING READINGS	[28] LAB ID (for lab's use)
1	NIROP110200C1	Soil Composite	Soil	11/02/00	15:00			✓	✓	✓	✓	✓	✓	✓	✓			Comp		904181-001
2	NIROP110200C2	Water Composite	W	11/02/00	15:30			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Comp		002
3	NIROP110200MS/MSD	Matrix Spike MS Dup	W	11/02/00	15:35			✓										Comp		003,004
4		Trip Blank		11/02/00				✓												005
5																				
6																				
7																				
8																				
9																				
10																				

[29] SAMPLER(S) AND COMPANY: (please print) Justin Eibenholzl / Bay West

[30] COURIER AND SHIPPING NUMBER:

[31] SAMPLES TEMPERATURE AND CONDITION UPON RECEIPT (for lab's use): ROI 1°C pH ✓

[32] RELINQUISHED BY Printed Name and Signature:	DATE	TIME	[33] RECEIVED BY Printed Name and Signature:	DATE	TIME
Justin Eibenholzl [signature]	11/3/00	8:45	[signature]	11-3 1900	
[signature]	11-3-00	1600	~~Fed Ex~~ (BFN) UPS		
UPS	11/4/00	1030	Bill Voltemeyer	11/4/00 1030	

Distribution: [ ] Original - Laboratory (To be returned with Analytical Report); [ ] Copy 1 - Project File; [ ] Copy 2 - PMO

Form CC1001, Rev 06/00

ENVIRONMENTAL COMPLIANCE CHAIN - OF - CUSTODY RECORD

FAX-651-291-0099

Bay West

LAB: Johnson Screen

SEND RESULTS TO: BayWest Paul Walz

CHAIN-OF-CUSTODY NO. EC - 4150

PROJECT NUMBER	PROJECT MANAGER	TURNAROUND REQUEST	SAMPLE RETENTION: RETURN	SAMPLE RETENTION: DISPOSE
N62467-98D-0995	PW	Std		X

ITEM NO.	SAMPLE ID NUMBER	SAMPLE DATE / SAMPLE TIME	MATRIX	NUMBER AND TYPE OF CONTAINER	ANALYSIS CODE	DESCRIPTION / COMMENTS
1	AT7-1	10.13.00 / 1308	O	1- 7oz Glass	11	1/2" to 2' Held On Account
2	AT7-2	10.13.00 / 1318	O	1-	11	2' to 3.5' Above Water
3	AT7-3	10.13.00 / 1322	O	1-	11	4.5 to 6' Level
4	AT7-4	10.13.00 / 1326	O	1-	11	7' to 8.5'
5	AT7-5	10.13.00 / 1329	O	1-	11	9.5' to 11'
6	AT7-6	10.13.00 / 1335	O	1-	11	12' to 13.5'
7	AT7-7	10.13.00 / 1338	O	1-	11	14.5' to 16'
8	AT7-8	10.13.00 / 1344	O	1-	11	17' to 18.5"

SAMPLER	AFFILIATION	DATE	TIME
Shawn Garski	AET	10-13-00	1520

TRANS NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE	TIME
1	8-18	[signature]	[signature]	10/16/00	1240
2	8-18	[signature]		10/16/00	1245
3		[signature]	[signature]	10/16/00	1355
4					
5					

PRESERVATION:

All samples must be preserved on ice (4°C), unless specified otherwise.
*NOTE: Some waste water parameters may require special preservation.

Matrix:
W = Water
L = Liquid Sample
S = Solid Sample
SD = Solids Sample
SL = Sludge Sample
O = Other (specify Soil Bores)

ANALYSIS CODES
- Cross out any unwanted parameter.
- List any extra parameters in section below.

01 pH
02 PCB
03 Incineration Parameters: Total Metals (Ag, As, Ba, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, Tl, Zn); Flash Point: % Cyanide; % Sulfur; % Ash; % Moisture; % Phenols; Viscosity; BTU / LB; EOX; TX; Specific Gravity / Bulk Density.
04 Reactives: Sulfides / Cyanides.
05 TOX / EOX.
06 BTEX (benzene, ethyl benzene, toluene, total xylenes); TPH (total petroleum hydrocarbons) as DRO/ GRO; Lead.
07 TCLP Leach: Metals (Ag, As, Ba, Cd, Cr, Hg, Pb, Se); Volatiles; Semi-Volatiles; Pesticides; Herbicides.
08 * Waste Water Characteristics: Metals (Cd, Cr, Cu, Hg, Ni, Pb, Zn); Cyanide; pH; COD; BOD; TSS; Oil and Grease.
09 EPA Waste Oil: Metals (As, Cd, Cr,Pb); Flash Point; TX; PCB.
10 Fuel Blending Parameters: Ash; BTU; Flash Point; Metal Analysis (As, Ba, Cd, Cr, Pb, Hg, Se, Ag); Moisture; TX.
11 SIV
12
13
14

ENVIRONMENTAL COMPLIANCE CHAIN - OF - CUSTODY RECORD

2 of 2

Bay West

LAB:		SEND RESULTS TO:			CHAIN-OF-CUSTODY NO.
PROJECT NUMBER N62467-98D-0995	PROJECT MANAGER	TURNAROUND REQUEST Std	SAMPLE RETENTION RETURN	DISPOSE ✓	EC - 4151

ITEM NO.	SAMPLE ID NUMBER	SAMPLE DATE / SAMPLE TIME	MATRIX	NUMBER AND TYPE OF CONTAINER	ANALYSIS CODE	DESCRIPTION / COMMENTS
1	AT7-9	10.13.00 / 1349	O	1-	11	19.5' to 21'
2	AT7-10	10.13.00 / 1352	O	1-	11	21' to 23'
3	AT7-11	10.13.00 / 1416	O	1-	11	23' to 25'
4	AT7-12	10.13.00 / 1438	O	1-	11	25' to 27'
5	AT7-13	10.13.00 / 1445	O	1-	11	27' to 29'
6	AT7-14	10.13.00 / 1450	O	1-	11	29' to 31'
7	AT7-15	10.13.00 / 1456	O	1-	11	31' to 33'
8	AT7-16	10.13.00 / 1506	O	1-	11	33 to 35'

SAMPLER	AFFILIATION	DATE	TIME
Shawn Garski	AET	10.13.00	1520

TRANS NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE	TIME
1	8-18	Shawn Garski	[illegible]	10/16/00	1240
2	8-18	[illegible] 22	[illegible]	10/16/00	1245
3		[illegible]	[illegible]	10/16/00	1455
4					
5					

PRESERVATION:

All samples must be preserved on ice (4°C), unless specified otherwise.

***NOTE:** Some waste water parameters may require special preservation.

Matrix:
W = Water
L = Liquid Sample
S = Solid Sample
SD = Solids Sample
SL = Sludge Sample
O = Other (specify Soil Borings)

ANALYSIS CODES
- Cross out any unwanted parameter.
- List any extra parameters in section below.

01 pH
02 PCB
03 Incineration Parameters: Total Metals (Ag, As, Ba, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, Tl, Zn); Flash Point: % Cyanide; % Sulfur; % Ash; % Moisture; % Phenols; Viscosity; BTU / LB; EOX; TX; Specific Gravity / Bulk Density.
04 Reactives: Sulfides / Cyanides.
05 TOX / EOX.
06 BTEX (benzene, ethyl benzene, toluene, total xylenes); TPH (total petroleum hydrocarbons) as DRO/ GRO; Lead.
07 TCLP Leach: Metals (Ag, As, Ba, Cd, Cr, Hg, Pb, Se); Volatiles; Semi-Volatiles; Pesticides; Herbicides.
08 * Waste Water Characteristics: Metals (Cd, Cr, Cu, Hg, Ni, Pb, Zn); Cyanide; pH; COD; BOD; TSS; Oil and Grease.
09 EPA Waste Oil: Metals (As, Cd, Cr,Pb); Flash Point; TX; PCB.
10 Fuel Blending Parameters: Ash; BTU; Flash Point; Metal Analysis (As, Ba, Cd, Cr, Pb, Hg, Se, Ag); Moisture; TX.
11 SIV
12
13
14

ENVIRONMENTAL COMPLIANCE CHAIN - OF - CUSTODY RECORD

Bay West

LAB:	SEND RESULTS TO:	CHAIN-OF-CUSTODY NO.
PROJECT NUMBER: N62467-98D-0995 / PROJECT MANAGER:	TURNAROUND REQUEST: Std / SAMPLE RETENTION: RETURN / DISPOSE X	EC - 4152

ITEM NO.	SAMPLE ID NUMBER	SAMPLE DATE / SAMPLE TIME	MATRIX	NUMBER AND TYPE OF CONTAINER	ANALYSIS CODE	DESCRIPTION / COMMENTS
1	AT7-17	10.13.00 / 1511	O	1-	11	35' to 37'
2	AT7-18	10.13.00 / 1520	O	1-	11	37' to 38.5'
3						
4						
5						
6						
7						
8						

SAMPLER	AFFILIATION	DATE	TIME
SHAWN GARSKI	AET	10.13.00	1520

TRANS NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE	TIME
1	8/18	[signature]	[signature]	10/16/00	1240
2	8/18	[signature]	[signature]	10/16/00	1245
3		[signature]	[signature]	10/16/00	1435
4					
5					

PRESERVATION:

All samples must be preserved on ice (4°C), unless specified otherwise.

***NOTE:** Some waste water parameters may require special preservation.

Matrix:

W = Water
L = Liquid Sample
S = Solid Sample
SD = Solids Sample
SL = Sludge Sample
O = Other (specify Soil BORES)

ANALYSIS CODES

- Cross out any unwanted parameter.
- List any extra parameters in section below.

01 pH
02 PCB
03 Incineration Parameters: Total Metals (Ag, As, Ba, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, Tl, Zn); Flash Point: % Cyanide; % Sulfur; % Ash; % Moisture; % Phenols; Viscosity; BTU / LB; EOX; TX; Specific Gravity / Bulk Density.
04 Reactives: Sulfides / Cyanides.
05 TOX / EOX.
06 BTEX (benzene, ethyl benzene, toluene, total xylenes); TPH (total petroleum hydrocarbons) as DRO/ GRO; Lead.
07 TCLP Leach: Metals (Ag, As, Ba, Cd, Cr, Hg, Pb, Se); Volatiles; Semi-Volatiles; Pesticides; Herbicides.
08 * Waste Water Characteristics: Metals (Cd, Cr, Cu, Hg, Ni, Pb, Zn); Cyanide; pH; COD; BOD; TSS; Oil and Grease.
09 EPA Waste Oil: Metals (As, Cd, Cr,Pb); Flash Point; TX; PCB.
10 Fuel Blending Parameters: Ash; BTU; Flash Point; Metal Analysis (As, Ba, Cd, Cr, Pb, Hg, Se, Ag); Moisture; TX.
11 SIV
12
13
14

ENVIRONMENTAL COMPLIANCE CHAIN - OF - CUSTODY RECORD

FAX 651-291-0099 1 of 3

Bay West

LAB: Johnson Screen	SEND RESULTS TO: Bay West / Paul Walz	CHAIN-OF-CUSTODY NO.
PROJECT NUMBER: N62467.98D.0995 / PROJECT MANAGER: PW	TURNAROUND REQUEST: Std / SAMPLE RETENTION: RETURN / DISPOSE X	EC - 4153

ITEM NO.	SAMPLE ID NUMBER	SAMPLE DATE / SAMPLE TIME	MATRIX	NUMBER AND TYPE OF CONTAINER	ANALYSIS CODE	DESCRIPTION / COMMENTS
1	AT8-1	10.13.00 / 0925	O	1 - 7oz Glass	11	6" to 2' — Held on account above water level
2	AT8-2	10.13.00 / 0938	O	1 -	11	2' to 3.5'
3	AT8-3	10.13.00 / 0942	O	1 -	11	4.5' to 6'
4	AT8-4	10.13.00 / 0946	O	1 -	11	7' to 8.5'
5	AT8-5	10.13.00 / 0949	O	1 -	11	9.5' to 11'
6	AT8-6	10.13.00 / 0954	O	1 -	11	12' to 13.5'
7	AT8-7	10.13.00 / 0957	O	1 -	11	14.5' to 16'
8	AT8-8	10.13.00 / 1002	O	1 -	11	17' to 18.5'

SAMPLER	AFFILIATION	DATE	TIME
Shawn Garski	AET	10.13.00	1143

TRANS NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE	TIME
1	8-18	[signature]	[signature] 22	10/16/00	1240
2	8-18	[signature] 22	[signature]	10/16/00	1245
3	1	[signature]	[signature]	10/16/00	1435
4					
5					

PRESERVATION:

All samples must be preserved on ice (4°C), unless specified otherwise.

***NOTE:** Some waste water parameters may require special preservation.

Matrix:
W = Water
L = Liquid Sample
S = Solid Sample
SD = Solids Sample
SL = Sludge Sample
O = Other (specify Soil Bores)

ANALYSIS CODES
- Cross out any unwanted parameter.
- List any extra parameters in section below.

01 pH
02 PCB
03 Incineration Parameters: Total Metals (Ag, As, Ba, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, Tl, Zn); Flash Point: % Cyanide; % Sulfur; % Ash; % Moisture; % Phenols; Viscosity; BTU / LB; EOX; TX; Specific Gravity / Bulk Density.
04 Reactives: Sulfides / Cyanides.
05 TOX / EOX.
06 BTEX (benzene, ethyl benzene, toluene, total xylenes); TPH (total petroleum hydrocarbons) as DRO/ GRO; Lead.
07 TCLP Leach: Metals (Ag, As, Ba, Cd, Cr, Hg, Pb, Se); Volatiles; Semi-Volatiles; Pesticides; Herbicides.
08 * Waste Water Characteristics: Metals (Cd, Cr, Cu, Hg, Ni, Pb, Zn); Cyanide; pH; COD; BOD; TSS; Oil and Grease.
09 EPA Waste Oil: Metals (As, Cd, Cr,Pb); Flash Point; TX; PCB.
10 Fuel Blending Parameters: Ash; BTU; Flash Point; Metal Analysis (As, Ba, Cd, Cr, Pb, Hg, Se, Ag); Moisture; TX.
11 SIV
12
13
14

ENVIRONMENTAL COMPLIANCE CHAIN - OF - CUSTODY RECORD

Bay West

LAB:		SEND RESULTS TO:			CHAIN-OF-CUSTODY NO.
PROJECT NUMBER N62467-98D-0995	PROJECT MANAGER	TURNAROUND REQUEST Std	SAMPLE RETENTION RETURN	DISPOSE X	EC - 4154

ITEM NO.	SAMPLE ID NUMBER	SAMPLE DATE / SAMPLE TIME	MATRIX	NUMBER AND TYPE OF CONTAINER	ANALYSIS CODE	DESCRIPTION / COMMENTS
1	AT8 - 9	10-13-00 / 1005	O	1-	11	19.5' to 21'
2	AT8 - 10	10-13-00 / 1011	O	1-	11	21' to 23'
3	AT8 - 11	10-13-00 / 1037	O	1-	11	23' to 25'
4	AT8 - 12	10-13-00 / 1055	O	1-	11	25' to 27'
5	AT8 - 13	10-13-00 / 1102	O	1-	11	27' to 29'
6	AT8 - 14	10-13-00 / 1109	O	1-	11	29' to 31'
7	AT8 - 15	10-13-00 / 1116	O	1-	11	31' to 33'
8	AT8 - 16	10-13-00 / 1125	O	1-	11	33' to 34½'

SAMPLER	AFFILIATION	DATE	TIME
SHAWN GARSKI	AET	10-13-00	1143

TRANS NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE	TIME
1	8/18	Shawn Garski	[illegible] 22	10/16/00	1240
2	8/18	[illegible] 22	[illegible]	10/16/00	1245
3		[illegible]	[illegible]	10/16/00	1435
4					
5					

PRESERVATION:

All samples must be preserved on ice (4°C), unless specified otherwise.
***NOTE:** Some waste water parameters may require special preservation.

Matrix:
W = Water
L = Liquid Sample
S = Solid Sample
SD = Solids Sample
SL = Sludge Sample
O = Other (specify Soil BORES)

ANALYSIS CODES
- Cross out any unwanted parameter.
- List any extra parameters in section below.

01 pH
02 PCB
03 Incineration Parameters: Total Metals (Ag, As, Ba, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, Tl, Zn); Flash Point: % Cyanide; % Sulfur; % Ash; % Moisture; % Phenols; Viscosity; BTU / LB; EOX; TX; Specific Gravity / Bulk Density.
04 Reactives: Sulfides / Cyanides.
05 TOX / EOX.
06 BTEX (benzene, ethyl benzene, toluene, total xylenes); TPH (total petroleum hydrocarbons) as DRO/ GRO; Lead.
07 TCLP Leach: Metals (Ag, As, Ba, Cd, Cr, Hg, Pb, Se); Volatiles; Semi-Volatiles; Pesticides; Herbicides.
08 * Waste Water Characteristics: Metals (Cd, Cr, Cu, Hg, Ni, Pb, Zn); Cyanide; pH; COD; BOD; TSS; Oil and Grease.
09 EPA Waste Oil: Metals (As, Cd, Cr,Pb); Flash Point; TX; PCB.
10 Fuel Blending Parameters: Ash; BTU; Flash Point; Metal Analysis (As, Ba, Cd, Cr, Pb, Hg, Se, Ag); Moisture; TX.
11 SIV
12
13
14

ENVIRONMENTAL COMPLIANCE CHAIN - OF - CUSTODY RECORD

Bay West

LAB:	SEND RESULTS TO:	CHAIN-OF-CUSTODY NO.
PROJECT NUMBER: N62467-98D 0995	TURNAROUND REQUEST: Std.	EC - 4155
PROJECT MANAGER:	SAMPLE RETENTION: RETURN / DISPOSE X	

ITEM NO.	SAMPLE ID NUMBER	SAMPLE DATE / SAMPLE TIME	MATRIX	NUMBER AND TYPE OF CONTAINER	ANALYSIS CODE	DESCRIPTION / COMMENTS
1	AT8 - 17	10.13.00 / 1132	O	1 -	11	34.5' to 36'
2	AT8 - 18	10.13.00 / 1142	O	1 -	11	36' to 37.5'
3						
4						
5						
6						
7						
8						

SAMPLER	AFFILIATION	DATE	TIME
Shawn Garski	AET	10.13.00	1143

TRANS NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE	TIME
1	8-18	[signature]	[signature]	10/16/00	1240
2	8-18	[signature]	[signature]	10/16/00	1245
3		[signature]	[signature]	10/16/00	1435
4					
5					

PRESERVATION:

All samples must be preserved on ice (4°C), unless specified otherwise.

***NOTE:** Some waste water parameters may require special preservation.

Matrix:
W = Water
L = Liquid Sample
S = Solid Sample
SD = Solids Sample
SL = Sludge Sample
O = Other (specify Soil Bores)

ANALYSIS CODES
- Cross out any unwanted parameter.
- List any extra parameters in section below.

01 pH
02 PCB
03 Incineration Parameters: Total Metals (Ag, As, Ba, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, Tl, Zn); Flash Point: % Cyanide; % Sulfur; % Ash; % Moisture; % Phenols; Viscosity; BTU / LB; EOX; TX; Specific Gravity / Bulk Density.
04 Reactives: Sulfides / Cyanides.
05 TOX / EOX.
06 BTEX (benzene, ethyl benzene, toluene, total xylenes); TPH (total petroleum hydrocarbons) as DRO/ GRO; Lead.
07 TCLP Leach: Metals (Ag, As, Ba, Cd, Cr, Hg, Pb, Se); Volatiles; Semi-Volatiles; Pesticides; Herbicides.
08 * Waste Water Characteristics: Metals (Cd, Cr, Cu, Hg, Ni, Pb, Zn); Cyanide; pH; COD; BOD; TSS; Oil and Grease.
09 EPA Waste Oil: Metals (As, Cd, Cr,Pb); Flash Point; TX; PCB.
10 Fuel Blending Parameters: Ash; BTU; Flash Point; Metal Analysis (As, Ba, Cd, Cr, Pb, Hg, Se, Ag); Moisture; TX.
11 SIV
12
13
14

ENVIRONMENTAL COMPLIANCE CHAIN - OF - CUSTODY RECORD

Bay West

LAB: Wheelabrator L Johnson	SEND RESULTS TO: 763-572-6438 KARL (Chris) ADAMS		CHAIN-OF-CUSTODY NO. EC - 4167
PROJECT NUMBER: BW J003471 N	PROJECT MANAGER: P.W.	TURNAROUND REQUEST: STD.	SAMPLE RETENTION: RETURN / DISPOSE X

ITEM NO.	SAMPLE ID NUMBER	SAMPLE DATE / SAMPLE TIME	MATRIX	NUMBER AND TYPE OF CONTAINER	ANALYSIS CODE	DESCRIPTION / COMMENTS
1	AT-9-1	10-12-00 / 1009	O		11	Siv Screening of Test Bore AT-9 -0'-2'
2	AT-9-2	10-12-00 / 1013	O			2'-3½'
3	AT-9-3	10-12-00 / 1016	O			4-5½
4	AT-9-4	10-12-00 / 1018	O			6'-7½
5	AT9-5	10.12.00 / 1024	O			8-9½
6	AT9-6	10.12.00 / 1027	O			10-11½
7	AT9-7	10.12.00 / 1033	O			12-13½
8	AT9-8	10.12.00 / 1036	O			14-15½

SAMPLER	AFFILIATION	DATE	TIME
Shawn Garski	American Engineering	10-12-00	1500

TRANS NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE	TIME
1			[signature]	10/13/00	1630
2		Steve Brenner	Lee Trotte	10/13/00	
3					
4					
5					

PRESERVATION:

All samples must be preserved on ice (4°C), unless specified otherwise.
*NOTE: Some waste water parameters may require special preservation.

Matrix:
W = Water
L = Liquid Sample
S = Solid Sample
SD = Solids Sample
SL = Sludge Sample
O = Other (specify Soils)

ANALYSIS CODES
- Cross out any unwanted parameter.
- List any extra parameters in section below.

01 pH
02 PCB
03 Incineration Parameters: Total Metals (Ag, As, Ba, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, Tl, Zn); Flash Point; % Cyanide; % Sulfur; % Ash; % Moisture; % Phenols; Viscosity; BTU / LB; EOX; TX; Specific Gravity / Bulk Density.
04 Reactives: Sulfides / Cyanides.
05 TOX / EOX.
06 BTEX (benzene, ethyl benzene, toluene, total xylenes); TPH (total petroleum hydrocarbons) as DRO/ GRO; Lead.
07 TCLP Leach: Metals (Ag, As, Ba, Cd, Cr, Hg, Pb, Se); Volatiles; Semi-Volatiles; Pesticides; Herbicides.
08 * Waste Water Characteristics: Metals (Cd, Cr, Cu, Hg, Ni, Pb, Zn); Cyanide; pH; COD; BOD; TSS; Oil and Grease.
09 EPA Waste Oil: Metals (As, Cd, Cr, Pb); Flash Point; TX; PCB.
10 Fuel Blending Parameters: Ash; BTU; Flash Point; Metal Analysis (As, Ba, Cd, Cr, Pb, Hg, Se, Ag); Moisture; TX.
11 Siv Testing
12
13
14

ENVIRONMENTAL COMPLIANCE CHAIN - OF - CUSTODY RECORD

2 of 4

OCT-20-2000 09:01 BAY WEST INC 651 291 0099 P.26/30

Bay West

LAB:		SEND RESULTS TO:			CHAIN-OF-CUSTODY NO.
PROJECT NUMBER	PROJECT MANAGER	TURNAROUND REQUEST	SAMPLE RETENTION		
N626467-980-0795		Std	RETURN	DISPOSE X	EC - 4147

ITEM NO.	SAMPLE ID NUMBER	SAMPLE DATE / SAMPLE TIME	MATRIX	NUMBER AND TYPE OF CONTAINER	ANALYSIS CODE	DESCRIPTION / COMMENTS
1	AT9-9	10/12/00 1042	O		11	17' to 18.5'
2	AT9-10	10/12/00 1047	O		11	18.5' to 20'
3	AT9-11	10/12/00 1049	O		11	20' to 22'
4	AT9-12	10/12/00 1053	O		11	22' to 24'
5	AT9-13	10/12/00	O		11	24.5' to 26'
6	AT9-14	10/12/00	O		11	27' to 28.5'
7	AT9-15	10/12/00	O		11	29.5' to 31'
8	AT9-16	10/12/00	O		11	32' to 33.5'

SAMPLER	AFFILIATION	DATE	TIME
Shawn Garski	AET	10-12-00	1500

TRANS NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE	TIME
1		[signature]	Lee Trotta	10-13	4:10
2					
3					
4					
5					

PRESERVATION:

All samples must be preserved on ice (4°C), unless specified otherwise.

*NOTE: Some waste water parameters may require special preservation.

Matrix:
W = Water
L = Liquid Sample
S = Solid Sample
SD = Solids Sample
SL = Sludge Sample
O = Other (specify Soils)

ANALYSIS CODES

- Cross out any unwanted parameter.
- List any extra parameters in section below.

01 pH
02 PCB
03 Incineration Parameters: Total Metals (Ag, As, Ba, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, Tl, Zn); Flash Point: % Cyanide; % Sulfur; % Ash; % Moisture; % Phenols; Viscosity; BTU / LB; EOX; TX; Specific Gravity / Bulk Density.
04 Reactives: Sulfides / Cyanides.
05 TOX / EOX.
06 BTEX (benzene, ethyl benzene, toluene, total xylenes); TPH (total petroleum hydrocarbons) as DRO/ GRO; Lead.
07 TCLP Leach: Metals (Ag, As, Ba, Cd, Cr, Hg, Pb, Se); Volatiles; Semi-Volatiles; Pesticides; Herbicides.
08 * Waste Water Characteristics: Metals (Cd, Cr, Cu, Hg, Ni, Pb, Zn); Cyanide; pH; COD; BOD; TSS; Oil and Grease.
09 EPA Waste Oil: Metals (As, Cd, Cr,Pb); Flash Point; TX; PCB.
10 Fuel Blending Parameters: Ash; BTU; Flash Point; Metal Analysis (As, Ba, Cd, Cr, Pb, Hg, Se, Ag); Moisture; TX.
11 SIV
12
13
14

ENVIRONMENTAL COMPLIANCE CHAIN - OF - CUSTODY RECORD

Bay West

LAB:		SEND RESULTS TO:			CHAIN-OF-CUSTODY NO.
PROJECT NUMBER	PROJECT MANAGER	TURNAROUND REQUEST	SAMPLE RETENTION RETURN	SAMPLE RETENTION DISPOSE	
NC2467.9980.0995		Std		X	EC - 4148

ITEM NO.	SAMPLE ID NUMBER	SAMPLE DATE / SAMPLE TIME	MATRIX	NUMBER AND TYPE OF CONTAINER	ANALYSIS CODE	DESCRIPTION / COMMENTS
1	AT9-17	10-12-00 / 1240	O		11	34.5' to 36.5'
2	AT9-18	10-12-00 / 1248	O		11	36.5' to 38.5'
3	AT9-19	10-12-00 / 1256	O		11	38.5' to 40.5'
4	AT9-20	10-12-00 / 1303	O		11	40.5' to 42.5'
5	AT9-21	10-12-00 / 1310	O		11	42.5' to 44.5'
6	AT9-22	10-12-00 / 1315	O		11	44.5' to 46.5'
7	AT9-23	10-12-00 / 1322	O		11	46.5' to 48.5'
8	AT9-24	10-12-00 / 1333	O		11	48.5' to 50.5'

SAMPLER	AFFILIATION	DATE	TIME
Shawn Graski	AET	10.12.00	1500

TRANS NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE	TIME
1		[signature]	Lee Wotte	10-19	1610
2					
3					
4					
5					

PRESERVATION:

All samples must be preserved on ice (4°C), unless specified otherwise.

*NOTE: Some waste water parameters may require special preservation.

Matrix:
W = Water
L = Liquid Sample
S = Solid Sample
SD = Solids Sample
SL = Sludge Sample
O = Other (specify Soils)

ANALYSIS CODES
- Cross out any unwanted parameter.
- List any extra parameters in section below.

01 pH
02 PCB
03 Incineration Parameters: Total Metals (Ag, As, Ba, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, Tl, Zn); Flash Point; % Cyanide; % Sulfur; % Ash; % Moisture; % Phenols; Viscosity; BTU / LB; EOX; TX; Specific Gravity / Bulk Density.
04 Reactives: Sulfides / Cyanides.
05 TOX / EOX.
06 BTEX (benzene, ethyl benzene, toluene, total xylenes); TPH (total petroleum hydrocarbons) as DRO/ GRO; Lead.
07 TCLP Leach: Metals (Ag, As, Ba, Cd, Cr, Hg, Pb, Se); Volatiles; Semi-Volatiles; Pesticides; Herbicides.
08 * Waste Water Characteristics: Metals (Cd, Cr, Cu, Hg, Ni, Pb, Zn); Cyanide; pH; COD; BOD; TSS; Oil and Grease.
09 EPA Waste Oil: Metals (As, Cd, Cr,Pb); Flash Point; TX; PCB.
10 Fuel Blending Parameters: Ash; BTU; Flash Point; Metal Analysis (As, Ba, Cd, Cr, Pb, Hg, Se, Ag); Moisture; TX.
11 SIV
12
13
14

ENVIRONMENTAL COMPLIANCE CHAIN - OF - CUSTODY RECORD

4004

OCT-20-2000 09:02 BAY WEST INC 651 291 0099 P.28/30

Bay West

LAB:	SEND RESULTS TO:	CHAIN-OF-CUSTODY NO.
PROJECT NUMBER: NC2467-98D-0995	PROJECT MANAGER:	TURNAROUND REQUEST: Std	SAMPLE RETENTION: RETURN / DISPOSE X	EC - 4149

ITEM NO.	SAMPLE ID NUMBER	SAMPLE DATE / SAMPLE TIME	MATRIX	NUMBER AND TYPE OF CONTAINER	ANALYSIS CODE	DESCRIPTION / COMMENTS
1	AT9 - 25	10-12-00 / 1424	O	1 -	11	50.5' to 52.5'
2	AT9 - 26	10-12-00 / 1443	O	1 -	11	52.5' to 54.5'
3	AT9 - 27	10-12-00 / 1450	O	1 -	11	54.5' to 56.5'
4	AT9 - 28	10-12-00 / 1456	O	1 -	11	56.5' to 58.5'
5	AT9 - 29	10-12-00 / 1500	O	1 -	11	58.5' to 60'
6						
7						
8						

SAMPLER	AFFILIATION	DATE	TIME
Shawn Garski	AET	10-12-00	1500

TRANS NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE	TIME
1		Steve Brien	Lee Trotta	10-19	16:11
2					
3					
4					
5					

PRESERVATION:

All samples must be preserved on ice (4°C), unless specified otherwise.
*NOTE: Some waste water parameters may require special preservation.

Matrix:
W = Water
L = Liquid Sample
S = Solid Sample
SD = Solids Sample
SL = Sludge Sample
O = Other (specify Soils)

ANALYSIS CODES
- Cross out any unwanted parameter.
- List any extra parameters in section below.

01 pH
02 PCB
03 Incineration Parameters: Total Metals (Ag, As, Ba, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, Tl, Zn); Flash Point; % Cyanide; % Sulfur; % Ash; % Moisture; % Phenols; Viscosity; BTU / LB; EOX; TX; Specific Gravity / Bulk Density.
04 Reactives: Sulfides / Cyanides.
05 TOX / EOX.
06 BTEX (benzene, ethyl benzene, toluene, total xylenes); TPH (total petroleum hydrocarbons) as DRO/ GRO; Lead.
07 TCLP Leach: Metals (Ag, As, Ba, Cd, Cr, Hg, Pb, Se); Volatiles; Semi-Volatiles; Pesticides; Herbicides.
08 * Waste Water Characteristics: Metals (Cd, Cr, Cu, Hg, Ni, Pb, Zn); Cyanide; pH; COD; BOD; TSS; Oil and Grease.
09 EPA Waste Oil: Metals (As, Cd, Cr,Pb); Flash Point; TX; PCB.
10 Fuel Blending Parameters: Ash; BTU; Flash Point; Metal Analysis (As, Ba, Cd, Cr, Pb, Hg, Se, Ag); Moisture; TX.
11 SEV
12
13
14

ENVIRONMENTAL COMPLIANCE CHAIN - OF - CUSTODY RECORD

Bay West

LAB: Johnson Screen	SEND RESULTS TO: Bay West / Paul Walz	CHAIN-OF-CUSTODY NO.
PROJECT NUMBER: BWJ003471 NC2467.98D	PROJECT MANAGER: P.W. 0495	TURNAROUND REQUEST: STD
SAMPLE RETENTION: RETURN / DISPOSE X		EC - 4159

ITEM NO.	SAMPLE ID NUMBER	SAMPLE DATE / SAMPLE TIME	MATRIX	NUMBER AND TYPE OF CONTAINER	ANALYSIS CODE	DESCRIPTION / COMMENTS	
1	AT9-30	10-18-00 / 10:10	O	1-Glass	11	60' to 62'	10:10
2	AT9-31	10-18-00 / 10:26	O	1-Glass	11	62' to 64'	10:26
3	AT9-32	10-18-00 / 10:44	O	1-Glass	11	64' to 66'	10:44
4	AT9-33	10-18-00 / 10:58	O	1-Glass	11	66' to 68'	10:58
5	AT9-34	10-18-00 / 11:14	O	1-Glass	11	68' to 70'	11:14
6	AT9-35	10-18-00 / 11:36	O	1-Glass	11	70' to 72'	11:36
7	AT9-36	10-18-00 / 11:53	O	1-Glass	11	72' to 74'	11:53
8	AT9-37	10-18-00 / 12:05	O	1-Glass	11	74' to 76'	12:05

SAMPLER	AFFILIATION	DATE	TIME
Shawn Garski	AET	10-18-00	14:46

TRANS NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE	TIME
1		[signature]	Lee Trotter	10-19	1610
2					
3					
4					
5					

PRESERVATION:

All samples must be preserved on ice (4°C), unless specified otherwise.
*NOTE: Some waste water parameters may require special preservation.

Matrix:
W = Water
L = Liquid Sample
S = Solid Sample
SD = Solids Sample
SL = Sludge Sample
O = Other (specify Soils)

ANALYSIS CODES
- Cross out any unwanted parameter.
- List any extra parameters in section below.

01 pH
02 PCB
03 Incineration Parameters: Total Metals (Ag, As, Ba, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, Tl, Zn); Flash Point: % Cyanide; % Sulfur; % Ash; % Moisture; % Phenols; Viscosity; BTU / LB; EOX; TX; Specific Gravity / Bulk Density.
04 Reactives: Sulfides / Cyanides.
05 TOX / EOX.
06 BTEX (benzene, ethyl benzene, toluene, total xylenes); TPH (total petroleum hydrocarbons) as DRO/ GRO; Lead.
07 TCLP Leach: Metals (Ag, As, Ba, Cd, Cr, Hg, Pb, Se); Volatiles; Semi-Volatiles; Pesticides; Herbicides.
08 * Waste Water Characteristics: Metals (Cd, Cr, Cu, Hg, Ni, Pb, Zn); Cyanide; pH; COD; BOD; TSS; Oil and Grease.
09 EPA Waste Oil: Metals (As, Cd, Cr,Pb); Flash Point; TX; PCB.
10 Fuel Blending Parameters: Ash; BTU; Flash Point; Metal Analysis (As, Ba, Cd, Cr, Pb, Hg, Se, Ag); Moisture; TX.
11 SIV
12
13
14

ENVIRONMENTAL COMPLIANCE CHAIN - OF - CUSTODY RECORD

2042

Bay West

LAB: Johnson Screen		SEND RESULTS TO: Bay West / Paul Walz			CHAIN-OF-CUSTODY NO.
PROJECT NUMBER	PROJECT MANAGER	TURNAROUND REQUEST	SAMPLE RETENTION		EC - 4160
BWI 003471 N62467.98D 0495	PW	STD	RETURN	DISPOSE X	

ITEM NO.	SAMPLE ID NUMBER	SAMPLE DATE / SAMPLE TIME	MATRIX	NUMBER AND TYPE OF CONTAINER	ANALYSIS CODE	DESCRIPTION / COMMENTS
1	AT9-38	10-18-00 / 12:05	O	1- Glass		76' to 78' 12:05
2	AT9-39	10-18-00 / 13:22	O	1- Glass		78' to 80' 13:22
3	AT9-40	10-18-00 / 13:22	O	1- Glass		78' to 80' 13:22
4	AT9-41	10-18-00 / 13:44	O	1- Glass		80' to 82' 13:44
5	AT9-42	10-18-00 / 14:00	O	1- Glass		82' to 84' 14:00
6	AT9-43	10-18-00 / 14:46	O	1- Glass		84' to 86' 14:46
7			O			
8						

SAMPLER	AFFILIATION	DATE	TIME
Shawn Garski	AET	10-18-00	14:46

TRANS NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE	TIME
1		Steve Breen	Lee Trotta	10-19	16:10
2					
3					
4					
5					

PRESERVATION:

All samples must be preserved on ice (4°C), unless specified otherwise.
*NOTE: Some waste water parameters may require special preservation.

Matrix:
W = Water
L = Liquid Sample
S = Solid Sample
SD = Solids Sample
SL = Sludge Sample
O = Other (specify SOILS)

ANALYSIS CODES
- Cross out any unwanted parameter.
- List any extra parameters in section below.

01 pH
02 PCB
03 Incineration Parameters: Total Metals (Ag, As, Ba, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, Tl, Zn); Flash Point: % Cyanide; % Sulfur; % Ash; % Moisture; % Phenols; Viscosity; BTU / LB; EOX; TX; Specific Gravity / Bulk Density.
04 Reactives: Sulfides / Cyanides.
05 TOX / EOX.
06 BTEX (benzene, ethyl benzene, toluene, total xylenes); TPH (total petroleum hydrocarbons) as DRO/ GRO; Lead.
07 TCLP Leach: Metals (Ag, As, Ba, Cd, Cr, Hg, Pb, Se); Volatiles; Semi-Volatiles; Pesticides; Herbicides.
08 * Waste Water Characteristics: Metals (Cd, Cr, Cu, Hg, Ni, Pb, Zn); Cyanide; pH; COD; BOD; TSS; Oil and Grease.
09 EPA Waste Oil: Metals (As, Cd, Cr,Pb); Flash Point; TX; PCB.
10 Fuel Blending Parameters: Ash; BTU; Flash Point; Metal Analysis (As, Ba, Cd, Cr, Pb, Hg, Se, Ag); Moisture; TX.
11 SIV
12
13
14

ENVIRONMENTAL COMPLIANCE CHAIN - OF - CUSTODY RECORD

Bay West

LAB: Johnson Screen	SEND RESULTS TO: Bay West / Paul Walz		CHAIN-OF-CUSTODY NO.
PROJECT NUMBER: BWI003471 N62467.98D0495	PROJECT MANAGER: PW	TURNAROUND REQUEST: STD	SAMPLE RETENTION: RETURN / DISPOSE X
			EC - 4157

ITEM NO.	SAMPLE ID NUMBER	SAMPLE DATE / SAMPLE TIME	MATRIX	NUMBER AND TYPE OF CONTAINER	ANALYSIS CODE	DESCRIPTION / COMMENTS
1	AT10-22	10-17-00 / 11:04	O	1-Glass	11	52' to 53.5 11:04
2	AT10-23	10-17-00 / 12:19	O	1-Glass	11	54.5' To 56' 12:19
3	AT10-24	10-17-00 / 12:25	O	1-Glass	11	57' to 58.5' 12:25
4	AT10-25	10-17-00 / 12:39	O	1-Glass	11	59.5 to 61' 12:39
5	AT10-26	10-17-00 / 12:48	O	1-Glass	11	61' to 63' 12:48
6	AT10-27	10-17-00 / 13:02	O	1-Glass	11	63' to 65' 13:02
7	AT10-28	10-17-00 / 13:15	O	1-Glass	11	65' to 67' 13:15
8	AT10-29	10-17-00 / 14:19	O	1-Glass	11	67' to 69' 14:19

SAMPLER	AFFILIATION	DATE	TIME
Shawn Garski	AET	10-17-00	17:06

TRANS NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE	TIME
1					
2					
3					
4					
5					

PRESERVATION:

All samples must be preserved on ice (4°C), unless specified otherwise.
***NOTE:** Some waste water parameters may require special preservation.

Matrix:
W = Water
L = Liquid Sample
S = Solid Sample
SD = Solids Sample
SL = Sludge Sample
O = Other (specify Soils)

ANALYSIS CODES
- Cross out any unwanted parameter.
- List any extra parameters in section below.

01 pH
02 PCB
03 Incineration Parameters: Total Metals (Ag, As, Ba, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, Tl, Zn); Flash Point: % Cyanide; % Sulfur; % Ash; % Moisture; % Phenols; Viscosity; BTU / LB; EOX; TX; Specific Gravity / Bulk Density.
04 Reactives: Sulfides / Cyanides.
05 TOX / EOX.
06 BTEX (benzene, ethyl benzene, toluene, total xylenes); TPH (total petroleum hydrocarbons) as DRO/ GRO; Lead.
07 TCLP Leach: Metals (Ag, As, Ba, Cd, Cr, Hg, Pb, Se); Volatiles; Semi-Volatiles; Pesticides; Herbicides.
08 * Waste Water Characteristics: Metals (Cd, Cr, Cu, Hg, Ni, Pb, Zn); Cyanide; pH; COD; BOD; TSS; Oil and Grease.
09 EPA Waste Oil: Metals (As, Cd, Cr,Pb); Flash Point; TX; PCB.
10 Fuel Blending Parameters: Ash; BTU; Flash Point; Metal Analysis (As, Ba, Cd, Cr, Pb, Hg, Se, Ag); Moisture; TX.
11 SIV
12
13
14

ENVIRONMENTAL COMPLIANCE CHAIN - OF - CUSTODY RECORD

Bay West

LAB: Johnson Screen
SEND RESULTS TO: Bay West / Paul Walt
CHAIN-OF-CUSTODY NO. EC - 4158

PROJECT NUMBER: BWJ00
PROJECT MANAGER:
TURNAROUND REQUEST:
SAMPLE RETENTION: RETURN / DISPOSE

ITEM NO.	SAMPLE ID NUMBER	SAMPLE DATE / SAMPLE TIME	MATRIX	NUMBER AND TYPE OF CONTAINER	ANALYSIS CODE	DESCRIPTION / COMMENTS
1	AT10-30	10-17-00 / 14:53	O	1-Glass	11	69' to 71' 14:53
2	AT10-31	10-17-00 / 15:08	O	1-Glass	11	71' to 73' 15:08
3	AT10-32	10-17-00 / 15:24	O	1-Glass	11	73' to 75' 15:24
4	AT10-33	10-17-00 / 15:43	O	1-Glass	11	75' to 77' 15:43
5	AT10-34	10-17-00 / 16:16	O	1-Glass	11	77' to 79' 16:16
6	AT10-35	10-17-00 / 16:33	O	1-Glass	11	79' to 81' 16:33
7	AT10-36	10-17-00 / 16:46	O	1-Glass	11	81' to 83' 16:46
8	AT10-37	10-17-00 / 17:06	O	1-Glass	11	83' to 85' 17:06

SAMPLER: Shawn Garski
AFFILIATION: AET
DATE: 10-17-00
TIME: 17:06

TRANS NO.	ITEM NO.	RELINQUISHED BY	ACCEPTED BY	DATE	TIME
1		Steve McLain	Lee Trotta	10-19	1611
2					
3					
4					
5					

PRESERVATION:

All samples must be preserved on ice (4°C), unless specified otherwise.
*NOTE: Some waste water parameters may require special preservation.

Matrix:
W = Water
L = Liquid Sample
S = Solid Sample
SD = Solids Sample
SL = Sludge Sample
O = Other (specify Soils)

ANALYSIS CODES
- Cross out any unwanted parameter.
- List any extra parameters in section below.

01 pH
02 PCB
03 Incineration Parameters: Total Metals (Ag, As, Ba, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, Tl, Zn); Flash Point: % Cyanide; % Sulfur; % Ash; % Moisture; % Phenols; Viscosity; BTU / LB; EOX; TX; Specific Gravity / Bulk Density.
04 Reactives: Sulfides / Cyanides.
05 TOX / EOX.
06 BTEX (benzene, ethyl benzene, toluene, total xylenes); TPH (total petroleum hydrocarbons) as DRO/ GRO; Lead.
07 TCLP Leach: Metals (Ag, As, Ba, Cd, Cr, Hg, Pb, Se); Volatiles; Semi-Volatiles; Pesticides; Herbicides.
08 * Waste Water Characteristics: Metals (Cd, Cr, Cu, Hg, Ni, Pb, Zn); Cyanide; pH; COD; BOD; TSS; Oil and Grease.
09 EPA Waste Oil: Metals (As, Cd, Cr, Pb); Flash Point; TX; PCB.
10 Fuel Blending Parameters: Ash; BTU; Flash Point; Metal Analysis (As, Ba, Cd, Cr, Pb, Hg, Se, Ag); Moisture; TX.
11 SIV
12
13
14

Appendix D

Waste Disposal Documentation

Appendix D1

Waste Log

DRUM/CONTAINER SAMPLE LOG

Job Number: I 003471 Field Crew: Steve Pierson

Date: 10-19-00

N62467-98D-0995 CTO #0024

DRUM/CONTAINER INFORMATION:

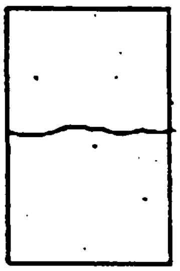
Container Number: # 14 Original Container Size: 55 gallon (specify unit)

Original Container Type (circle type): Bung Otop Plastic Fiber Metal Other: ______

Original Quantity: 55 gals or ______ lbs or 50 % Full

___ Solids	X Water	Repackage? Yes / No (circle one)	
___ Sludge	___ Frozen	Salvage Drum Size ___	Type ___
X Liquid	___ Pumpable		
___ Powder	Other (specify) ______		

Illustration and Description of Phases:



NIRAP - FRIDLEY JOB

Additional Drum/Container Information: De Con Water from Wash Pad

SAMPLE INFORMATION:

Sample ID Number: ______

Date and Time of Collection: ______ Sampler: ______

Sampling Method: ______

Sampler Container:

Type (circle one): Glass (amber/clear) Plastic Metal

Size (specify unit): ______

Percent filled: ______

Chain-of-Custody Number: ______

Sample Preservation (circle one) Yes No Other ______

Composited into: ______

Color: ______ Odor: ______ Ph: ______

Flammable:	Yes	No	NA	Not performed
Beilstein:	Yes	No	NA	Not performed
Water Miscible:	Yes	No	NA	Not performed

Additional Tests and/or Comments: ______

Signature: Steven M Pierson

DRUM/CONTAINER SAMPLE LOG

Job Number: I003471 Field Crew: Steve Pierson
Date: 10-19-00

N62467-98D-0995 CTO#0024

DRUM/CONTAINER INFORMATION:

Container Number: # 12 Original Container Size: 55 gallon (specify unit)

Original Container Type (circle type): Bung Otop Plastic Fiber Metal Other: ______

Original Quantity: 55 gals or ______ lbs or 100 % Full

____ Solids	____ Water	Repackage? Yes / No (circle one)
X Sludge	____ Frozen	Salvage Drum Size ____ Type ____
____ Liquid	____ Pumpable	
____ Powder	Other (specify) ______	

Illustration and Description of Phases:

NIRAP-FRIDLEY JOB

Additional Drum/Container Information: Rotory Mud from AT-10

SAMPLE INFORMATION:

Sample ID Number: ______
Date and Time of Collection: ______ Sampler: ______
Sampling Method: ______
Sampler Container:
Type (circle one): Glass (amber/clear) Plastic Metal
Size (specify unit): ______
Percent filled: ______

Chain-of-Custody Number: ______
Sample Preservation (circle one) Yes No Other ______
Composited into: ______

Color: ______ Odor: ______ Ph: ______

Flammable:	Yes	No	NA	Not performed
Beilstein:	Yes	No	NA	Not performed
Water Miscible:	Yes	No	NA	Not performed

Additional Tests and/or Comments: ______

Signature: Steven M Pierson

DRUM/CONTAINER SAMPLE LOG

Job Number: I003471
Date: 10-18-00

Field Crew: Steve Pierson

N62467-98D-0995 CTO#0024

DRUM/CONTAINER INFORMATION:

Container Number: #13 Original Container Size: 55 gallon (specify unit)

Original Container Type (circle type): Bung Otop Plastic Fiber Metal Other: ____

Original Quantity: 55 gals or ____ lbs or 100 % Full

X Solids ____ Water Repackage? Yes / No (circle one)
____ Sludge ____ Frozen Salvage Drum Size ____ Type ____
____ Liquid ____ Pumpable
____ Powder Other (specify) ____

Illustration and Description of Phases:

NIRAP-FRIDLEY JOB

Additional Drum/Container Information: P.P.E. + Debris from Drilling Job

SAMPLE INFORMATION:

Sample ID Number: ____
Date and Time of Collection: ____ Sampler: ____
Sampling Method: ____
Sampler Container:
Type (circle one): Glass (amber/clear) Plastic Metal
Size (specify unit): ____
Percent filled: ____

Chain-of-Custody Number: ____
Sample Preservation (circle one) Yes No Other ____
Composited into: ____

Color: ____ Odor: ____ Ph: ____

Flammable:	Yes	No	NA	Not performed
Beilstein:	Yes	No	NA	Not performed
Water Miscible:	Yes	No	NA	Not performed

Additional Tests and/or Comments: ____

Signature: Steven M Pierson

DRUM/CONTAINER SAMPLE LOG

Job Number: I003471 Field Crew: Steve Pierson
Date: 10-18-00

N62467-98D-0995 CTO #0024

DRUM/CONTAINER INFORMATION:
Container Number: # 11 Original Container Size: 55 gallon (specify unit)

Original Container Type (circle type): Bung Otop Plastic Fiber Metal Other: ______

Original Quantity: 55 gals or ______ lbs or 100 % Full

______ Solids ______ Water Repackage? Yes / No (circle one)
X Sludge ______ Frozen Salvage Drum Size ______ Type ______
______ Liquid ______ Pumpable
______ Powder Other (specify) ______

Illustration and Description of Phases:

NIRAP-FRIDLEY JOB

Additional Drum/Container Information: Drilling mud from AT-10

SAMPLE INFORMATION:
Sample ID Number: ______
Date and Time of Collection: ______ Sampler: ______
Sampling Method: ______
Sampler Container:
Type (circle one): Glass (amber/clear) Plastic Metal
Size (specify unit): ______
Percent filled: ______

Chain-of-Custody Number: ______
Sample Preservation (circle one) Yes No Other ______
Composited into: ______

Color: ______ Odor: ______ Ph: ______
Flammable: Yes No NA Not performed
Beilstein: Yes No NA Not performed
Water Miscible: Yes No NA Not performed

Additional Tests and/or Comments: ______

Signature: Steven M Pierson

10/97 DOCS#33174

DRUM/CONTAINER SAMPLE LOG

Job Number: I003471 Field Crew: Steve Pierson
Date: 10-18-00

N62467-98D-0995 CTO #0024

DRUM/CONTAINER INFORMATION:

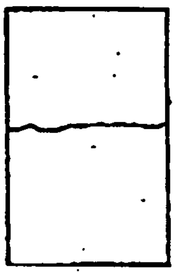
Container Number: #10 Original Container Size: 55 gallon (specify unit)

Original Container Type (circle type): Bung Otop Plastic Fiber Metal Other: ________

Original Quantity: 55 gals or ________ lbs or 50 % Full

X Solids ____ Water Repackage? Yes / No (circle one)
____ Sludge ____ Frozen Salvage Drum Size ____ Type ____
____ Liquid ____ Pumpable
____ Powder Other (specify) ________

Illustration and Description of Phases:



NIRAP-FRIDLEY JOB

Additional Drum/Container Information: Drill cuttings from AT-10

SAMPLE INFORMATION:

Sample ID Number: ________
Date and Time of Collection: ________ Sampler: ________
Sampling Method: ________
Sampler Container:
Type (circle one): Glass (amber/clear) Plastic Metal
Size (specify unit): ________
Percent filled: ________

Chain-of-Custody Number: ________
Sample Preservation (circle one) Yes No Other ________
Composited into: ________

Color: ________		Odor: ________		Ph: ________
Flammable:	Yes	No	NA	Not performed
Beilstein:	Yes	No	NA	Not performed
Water Miscible:	Yes	No	NA	Not performed

Additional Tests and/or Comments: ________

Signature: Steven M Pierson

DRUM/CONTAINER SAMPLE LOG

Job Number: I003471 Field Crew: Steve Pierson

Date: 10-17-00

N62467-98D-0995 CTO#0024

DRUM/CONTAINER INFORMATION:

Container Number: #3 Original Container Size: 55 gallon (specify unit)

Original Container Type (circle type): Bung Open Plastic Fiber Metal Other: ____

Original Quantity: 55 gals or ____ lbs or 100 % Full

____ Solids X Water Repackage? Yes / No (circle one)

____ Sludge ____ Frozen Salvage Drum Size ____ Type ____

X Liquid ____ Pumpable

____ Powder Other (specify) ____

Illustration and Description of Phases:

NIRAP-FRIDLEY JOB

Additional Drum/Container Information: De Con Water from Pad Equipment Cleaning

SAMPLE INFORMATION:

Sample ID Number: ____

Date and Time of Collection: ____ Sampler: ____

Sampling Method: ____

Sampler Container:

Type (circle one): Glass (amber/clear) Plastic Metal

Size (specify unit): ____

Percent filled: ____

Chain-of-Custody Number: ____

Sample Preservation (circle one) Yes No Other ____

Composited into: ____

Color: ____ Odor: ____ Ph: ____

Flammable:	Yes	No	NA	Not performed
Beilstein:	Yes	No	NA	Not performed
Water Miscible:	Yes	No	NA	Not performed

Additional Tests and/or Comments: ____

Signature: Steven M Pierson

DRUM/CONTAINER SAMPLE LOG

Job Number: I 003471 Field Crew: Steve Pierson
Date: 10-17-00

N62467-98D-0995 CTO #0024

DRUM/CONTAINER INFORMATION:

Container Number: # 2 Original Container Size: 55 gallon (specify unit)

Original Container Type (circle type): Bung Otop Plastic Fiber Metal Other: ______

Original Quantity: 55 gals or ______ lbs or 100 % Full

______ Solids X Water Repackage? Yes / No (circle one)
______ Sludge ______ Frozen Salvage Drum Size ______ Type ______
X Liquid ______ Pumpable
______ Powder Other (specify) ______

Illustration and Description of Phases:

NIRAP - FRIDLEY JOB

Additional Drum/Container Information: De-con Water from Wash Pad Equipment Cleaning

SAMPLE INFORMATION:

Sample ID Number: ______
Date and Time of Collection: ______ Sampler: ______
Sampling Method: ______
Sampler Container:
Type (circle one): Glass (amber/clear) Plastic Metal
Size (specify unit): ______
Percent filled: ______

Chain-of-Custody Number: ______
Sample Preservation (circle one) Yes No Other ______
Composited into: ______

Color: ______ Odor: ______ Ph: ______

Flammable:	Yes	No	NA	Not performed
Beilstein:	Yes	No	NA	Not performed
Water Miscible:	Yes	No	NA	Not performed

Additional Tests and/or Comments: ______

Signature: Steven M Pierson

DRUM/CONTAINER SAMPLE LOG

Job Number: I 003471
Date: 10-17-00

Field Crew: Steve Pierson

N62467-98D-0995 CTO#0024

DRUM/CONTAINER INFORMATION:

Container Number: #1
Original Container Size: 55 gallon (specify unit)

Original Container Type (circle type): Bung, Otop, Plastic, Fiber, Metal, Other: ______

Original Quantity: 55 gals or ______ lbs or 100 % Full

____ Solids	X Water	Repackage? Yes / No (circle one)
____ Sludge	____ Frozen	Salvage Drum Size ____ Type ____
X Liquid	____ Pumpable	
____ Powder	Other (specify) ______	

Illustration and Description of Phases:

NIRAP-FRIDLEY JOB

Additional Drum/Container Information: De-Con Water from Pad (Equip. Cle

SAMPLE INFORMATION:

Sample ID Number: ______
Date and Time of Collection: ______ Sampler: ______
Sampling Method: ______
Sampler Container:
Type (circle one): Glass (amber/clear) Plastic Metal
Size (specify unit): ______
Percent filled: ______

Chain-of-Custody Number: ______
Sample Preservation (circle one) Yes No Other ______
Composited into: ______

Color: ______ Odor: ______ Ph: ______

Flammable:	Yes	No	NA	Not performed
Beilstein:	Yes	No	NA	Not performed
Water Miscible:	Yes	No	NA	Not performed

Additional Tests and/or Comments: ______

Signature: Steven M Pierson

DRUM/CONTAINER SAMPLE LOG

Job Number: I 003471
Date: 10-13-00

Field Crew: Steve Pierson

N62467.98D-0995 CTO #0024

DRUM/CONTAINER INFORMATION:

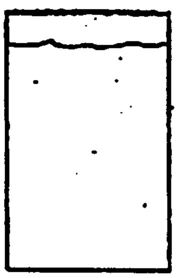
Container Number: # 9 Original Container Size: 55 gallon (specify unit)

Original Container Type (circle type): Bung Otop Plastic Fiber Metal Other: ______

Original Quantity: 55 gals or ______ lbs or 100 % Full

X Solids ______ Water Repackage? Yes / No (circle one)
______ Sludge ______ Frozen Salvage Drum Size ______ Type ______
______ Liquid ______ Pumpable
______ Powder Other (specify) ______

Illustration and Description of Phases:



NIRAP - FRIDLEY JOB

Additional Drum/Container Information: DRILL CUTTINGS FROM AT-7

SAMPLE INFORMATION:

Sample ID Number: ______
Date and Time of Collection: ______ Sampler: ______
Sampling Method: ______
Sampler Container:
Type (circle one): Glass (amber/clear) Plastic Metal
Size (specify unit): ______
Percent filled: ______

Chain-of-Custody Number: ______
Sample Preservation (circle one) Yes No Other ______
Composited into: ______

Color: ______ Odor: ______ Ph: ______

Flammable:	Yes	No	NA	Not performed
Beilstein:	Yes	No	NA	Not performed
Water Miscible:	Yes	No	NA	Not performed

Additional Tests and/or Comments: ______

Signature: Steven M Pierson

DRUM/CONTAINER SAMPLE LOG

Job Number: I003471
Date: 10-13-00

Field Crew: Steve Pierson

N62467-98D-0995 CTO#0024

DRUM/CONTAINER INFORMATION:

Container Number: #8 Original Container Size: 55 gallon (specify unit)

Original Container Type (circle type): Bung Otop Plastic Fiber Metal Other: ______

Original Quantity: 55 gals or ______ lbs or 100 % Full

X Solids ____ Water Repackage? Yes / No (circle one)
____ Sludge ____ Frozen Salvage Drum Size ____ Type ____
____ Liquid ____ Pumpable
____ Powder Other (specify) ______

Illustration and Description of Phases:

NIRAP-FRIDLEY JOB

Additional Drum/Container Information: Drill cuttings from AT-7

SAMPLE INFORMATION:

Sample ID Number: ______
Date and Time of Collection: ______ Sampler: ______
Sampling Method: ______
Sampler Container:
Type (circle one): Glass (amber/clear) Plastic Metal
Size (specify unit): ______
Percent filled: ______

Chain-of-Custody Number: ______
Sample Preservation (circle one) Yes No Other ______
Composited into: ______

Color: ______ Odor: ______ Ph: ______

Flammable:	Yes	No	NA	Not performed
Beilstein:	Yes	No	NA	Not performed
Water Miscible:	Yes	No	NA	Not performed

Additional Tests and/or Comments: ______

Signature: Steven M Pierson

DRUM/CONTAINER SAMPLE LOG

Job Number: I003471
Date: 10-13-00

Field Crew: Steve Pierson

N62467-98D-0995 CTO#0024

DRUM/CONTAINER INFORMATION:

Container Number: # 7 Original Container Size: 55 gallon (specify unit)

Original Container Type (circle type): Bung Otop Plastic Fiber Metal Other: ______

Original Quantity: 55 gals or ______ lbs or 100 % Full

______ Solids ______ Water Repackage? Yes / No (circle one)
______ Sludge ______ Frozen Salvage Drum Size ______ Type ______
______ Liquid ______ Pumpable
______ Powder Other (specify) ______

Illustration and Description of Phases:

NIRAP-FRIDLEY JOB

Additional Drum/Container Information: Drill mud from AT-7

SAMPLE INFORMATION:

Sample ID Number: ______
Date and Time of Collection: ______ Sampler: ______
Sampling Method: ______
Sampler Container:
Type (circle one): Glass (amber/clear) Plastic Metal
Size (specify unit): ______
Percent filled: ______

Chain-of-Custody Number: ______
Sample Preservation (circle one) Yes No Other ______
Composited into: ______

Color: ______ Odor: ______ Ph: ______

Flammable:	Yes	No	NA	Not performed
Beilstein:	Yes	No	NA	Not performed
Water Miscible:	Yes	No	NA	Not performed

Additional Tests and/or Comments: ______

Signature: Steven M Pierson

DRUM/CONTAINER SAMPLE LOG

Job Number: I 003471

Date: 10-13-00

Field Crew: Steve Pierson

N62467-98D-0995 CTO #0024

DRUM/CONTAINER INFORMATION:

Container Number: # 6 Original Container Size: 55 gallon (specify unit)

Original Container Type (circle type): Bung Otop Plastic Fiber Metal Other: ______

Original Quantity: 55 gals or ______ lbs or 30 % Full

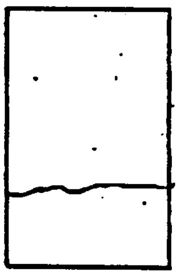
X Solids ___ Water Repackage? Yes / No (circle one)

___ Sludge ___ Frozen Salvage Drum Size ___ Type ___

___ Liquid ___ Pumpable

___ Powder Other (specify) ______

Illustration and Description of Phases:



NIRAP-FRIDLEY JOB

Additional Drum/Container Information: Drill cuttings

SAMPLE INFORMATION:

Sample ID Number: ______

Date and Time of Collection: ______ Sampler: ______

Sampling Method: ______

Sampler Container:

Type (circle one): Glass (amber/clear) Plastic Metal

Size (specify unit): ______

Percent filled: ______

Chain-of-Custody Number: ______

Sample Preservation (circle one) Yes No Other ______

Composited into: ______

Color: ______ Odor: ______ Ph: ______

Flammable:	Yes	No	NA	Not performed
Beilstein:	Yes	No	NA	Not performed
Water Miscible:	Yes	No	NA	Not performed

Additional Tests and/or Comments: ______

Signature: Steven M Pierson

DRUM/CONTAINER SAMPLE LOG

Job Number: I003471 Field Crew: Steve Pierson

Date: 10-12-00

N62467-98D-0995 CTO#0024

DRUM/CONTAINER INFORMATION:

Container Number: # 5 Original Container Size: 55 gallon (specify unit)

Original Container Type (circle type): Bung Otop Plastic Fiber Metal Other: ______

Original Quantity: 55 gals or ______ lbs or ______ % Full

X Solids ______ Water Repackage? Yes / No (circle one)

______ Sludge ______ Frozen Salvage Drum Size ______ Type ______

______ Liquid ______ Pumpable

______ Powder Other (specify) ______

Illustration and Description of Phases:

NIRAP-FRIDLEY JOB

Additional Drum/Container Information: Drill cuttings from AT-9

SAMPLE INFORMATION:

Sample ID Number: ______

Date and Time of Collection: ______ Sampler: ______

Sampling Method: ______

Sampler Container:

Type (circle one): Glass (amber/clear) Plastic Metal

Size (specify unit): ______

Percent filled: ______

Chain-of-Custody Number: ______

Sample Preservation (circle one) Yes No Other ______

Composited into: ______

Color: ______ Odor: ______ Ph: ______

Flammable:	Yes	No	NA	Not performed
Beilstein:	Yes	No	NA	Not performed
Water Miscible:	Yes	No	NA	Not performed

Additional Tests and/or Comments: ______

Signature: Steven M Pierson

DRUM/CONTAINER SAMPLE LOG

Job Number: I003471 Field Crew: Steve Pierson

Date: 10-12-00

N62467-98D-0995 CTO #0024

DRUM/CONTAINER INFORMATION:

Container Number: # 4 Original Container Size: 55 gallon (specify unit)

Original Container Type (circle type): Bung Otop Plastic Fiber Metal Other: ______

Original Quantity: 55 gals or ______ lbs or 100 % Full

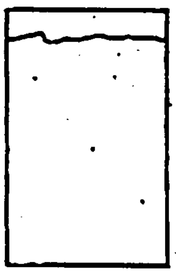
______ Solids ______ Water Repackage? Yes / No (circle one)

X Sludge ______ Frozen Salvage Drum Size ______ Type ______

______ Liquid ______ Pumpable

______ Powder Other (specify) ______

Illustration and Description of Phases:



NIRAP-FRIDLEY JOB

Additional Drum/Container Information: Drill mud AT-9

SAMPLE INFORMATION:

Sample ID Number: ______

Date and Time of Collection: ______ Sampler: ______

Sampling Method: ______

Sampler Container:

Type (circle one): Glass (amber/clear) Plastic Metal

Size (specify unit): ______

Percent filled: ______

Chain-of-Custody Number: ______

Sample Preservation (circle one) Yes No Other ______

Composited into: ______

Color: ______ Odor: ______ Ph: ______

Flammable:	Yes	No	NA	Not performed
Beilstein:	Yes	No	NA	Not performed
Water Miscible:	Yes	No	NA	Not performed

Additional Tests and/or Comments: ______

Signature: Steven M Pierson

10/97 DOCS#33174

11-7-00

WASTE INVENTORY TRACKING FORM

LOCATION: N62467·98D·0995 CT#0024 (AT8)

PROJECT NAME: NIROP-Fridley, MN - EXTRACATION Well installation

ACTIVITIES: Installation of EXTRACATION Well AT8

Date Waste Generated	Activity Generating Waste (borehole # / well #)	Description of Waste	Field Evidence of Contamination	Estimated Volume	Type of Container (storage ID#)	Location of Container	Waste Characterization	Comments
11-2	AT8	H2O Develop	N.D.	840gal	1500gal Ag Poly Tank	Decon pad	Development water	Hold FOR Analysis
11-1 & 11-2		H2O Drilling	ND	110gal			Drill water	
11-1 + 11-2		Drill mud	ND	260gal			Drill mud	
10/31 & 11-1		Drill Cuttings	ND	5-55gal (275gal)	Steel 55 Drum	Roll-off	Drill, Cuttings	
11-7	Decon From AT8	Decon Water	N.D.	25gal	1500gal Ag Poly Tank	Decon	Decon Water	

Total gal 950gal

Total: Now 975

Note: Describe whether soil or water samples have been collected for waste characterization, include date, if known.

Signature: James Glen Johnson 22

11-8-00

WASTE INVENTORY TRACKING FORM

LOCATION: N62467-98D-0995 /CT#0024 / AT8

PROJECT NAME: NEROP- FRidley, mn -ExTRACAtion Well Install

ACTIVITIES: Installation of ExTRACAtion Well AT8

Date Waste Generated	Activity Generating Waste (borehole # / well #)	Description of Waste	Field Evidence of Contamination	Estimated Volume	Type of Container (storage ID#)	Location of Container	Waste Characterization	Comments
10-31 11-1	well AT8	DRill Cuttings	N.D.	275 gAl	BulKed too Rolloff	NEAR AT9	Under Analysis	BulKed FRom 55gal
								DRums
11-1+2	Well AT-8	DRill mud	ND.	240gal	1500gAl PollyAgTnK	Decon Pad	under Analysis	mud Held SepaRate From
								WAter
11-1+2	well AT-8	DRill Water	ND	110 gal	1500gAl PollyAgTnK	Decon Pad	Under Analysis	DRill-Decon +Develope
11-2	Well AT-8	Develope WATer	ND	840 gAl				WateR Held Together
11-7	Well AT8-Decon	Decon WATer	ND	25 gAl				
11-8	well AT-7	DRill mud	ND	140 gAl	1500gAl Ag-PollyTnK			Added to AT 8
11-8	well AT7	DRill Cuttings	ND	110 gAl	Roll off	Near AT9		BulKe with AT-8

BulKed 11-8

950 gAl

Total 400gal

Note: Describe whether soil or water samples have been collected for waste characterization, include date, if known.

Signature: [signature]

11-9-00

WASTE INVENTORY TRACKING FORM

N62467-98D-0995 CNT#0024

LOCATION: Fridley, MN

PROJECT NAME: NIROP - Fridley, MN

ACTIVITIES: Instalation of Extrication Wells

BW# J003471

Date Waste Generated	Activity Generating Waste (borehole # / well #)	Description of Waste	Field Evidence of Contamination	Estimated Volume	Type of Container (storage ID#)	Location of Container	Waste Characterization	Comments
10-12 to 10-19	Test Borings AT-7,8,9,10	Drill Cuttings	ND.		Rolloff	Next to AT-9	Pending Anallysis	Consolidated From 55gal Drums Stored on Decon Pad
11-9-00	AT-7	Drill Cuttings	ND		Rolloff	Next To AT-9		on Concrete Next To AT9
11-9-00	AT-7	Drill Water.	ND	975 gal	1500gal Polly Ag Tank	inside ~~[illegible]~~		Bldg 52
10-19-00	AT-7,8,9,+ 10-Test Borings			1000gal	3000gal Steel Tank	Bldg 52		Bldg 52
~~11-9-00~~	Bldg 52	Drill Decon	ND					
11-9-00	/	Development	Water	1975 gal. Total	3000gal Steel Tank			Bldg 52

Note: Describe whether soil or water samples have been collected for waste characterization, include date, if known.

Signature: Jarvis Glen Johnson 22

~~#13-00~~
11-10-00 JJ

WASTE INVENTORY TRACKING FORM

LOCATION: NIROP-Fridley, MN / N62467-98D-0995 / CT# 0024

PROJECT NAME: NIROP-EXTRACation Well Installation

ACTIVITIES: Drilling + EXTRACation Well Installation

Date Waste Generated	Activity Generating Waste (borehole # / well #)	Description of Waste	Field Evidence of Contamination	Estimated Volume	Type of Container (storage ID#)	Location of Container	Waste Characterization	Comments
10-12 to 10-19	Test Bores AT AT 7,8,9+10	Drill Cuttings	N.D.	275 gal	55gal Steel Drum	Next To	Pending Analysis	Consolidated From 55gal
					Bulked to Rolloff	AT9		Drums on Decon Pad
10-12 to 10-19	Test Bores AT-AT7,8,9,10	Drill + Decon water	ND	1000 gal	55gal Drums + on Decon	Bldg 52		
					Pad	Steel 3000gal	Pending Analysis	Tank in Bldg 52
	Drilling	and	Well Installation			Tank		
11-9-00	AT-7 +8	Drill Cuttings	ND	550 gal	Rolloff	Next to AT9	Pending Analysis	
11-9-00	AT-7 +8	Drill Water	ND.	975 gal	1500 gal PolyTank	Decon Pad		Bulked to 3000 gal
11-9-00	AT-7 +8	Development H_2O	ND	1000 gal	at Decon Pad	Transfer To Bldg 52		Tank in Bldg #52
11-9-00	Bulking Drums to	moved	ND	measured				
	To Bldg 52	Tank		3003.9 gal in				
					Tank in	Bldg 52	Pending Analysis	
11-10-00	Drilling ~~mud~~	Drill mud	ND	480	1500 gal Ag Poly	inside Door		
	AT 7 + 8		ND	gal	Tank	18		

Estimated

Note: Describe whether soil or water samples have been collected for waste characterization, include date, if known.

Signature: [signature] 22

11-13-00

WASTE INVENTORY TRACKING FORM

LOCATION: NIROP= Fridley, MN /N62467-98D-0995 CT# 0024

PROJECT NAME: NIROP EXTRACATION Well Installation

ACTIVITIES: Drilling + Installation of EXTRACATION wells

Date Waste Generated	Activity Generating Waste (borehole # / well #)	Description of Waste	Field Evidence of Contamination	Estimated Volume	Type of Container (storage ID#)	Location of Container	Waste Characterization	Comments
10-12 to 10-19	Test Bores at AT-789+10	Drill Cuttings	ND	~~275~~ gal				
11-9 to 11-11	Well Installation AT 7+8	/	ND	550 gal				
			Total	825 gall	Rolloff	Next To AT9	Pending Anallysis	
10-12 to 10-19	Test Bore operations AT 789+10	Drill + Decon H_2O	ND	1000 gal	3500+ gal	Bldg		
11-9	Installation Water	Drill + Decon H_2O	ND	975	TANK in →	52		
11-9	AT 7+8	Flush Develope	ND	1000				
		Actual measured		3003.92 gal				
11-10	Drilling AT 7+8	Drill mud	ND	480 gal	1500 gal Polly TANK	inside Door 18		

Note: Describe whether soil or water samples have been collected for waste characterization, include date, if known.

Signature: [signature] 22 (B.W.)

WASTE INVENTORY TRACKING FORM

LOCATION: BAy 18 - NIROP - FRidley, MN

PROJECT NAME: ExTRAcation Well InstAllAtion

ACTIVITIES: DRilling & InstAllAtion of Wells For 11-14-00

	Date Waste Generated	Activity Generating Waste (borehole # / well #)	Description of Waste	Field Evidence of Contamination	Estimated Volume GAl	Type of Container (storage ID#)	Location of Container	Waste Characterization	Comments
*	11-14	Decon PAd	RAin & Decon	N.D.	800gal	2000gal PollyAgTank	BAy18	Pending Filtering	will be Run Thorough System
	〃	〃	WAter 〃	〃	750gal	System		Filter 2X	Run ThRough Treatment
									Plant
	11-14	DRilling AT9	DRill mud	ND	195	1500gal PollyAgTank	BAy18	Pending AnAlisis	TRansFered BulkForm
	11-14	Drilling AT7,8,9	DRill mud	—	Total 675gal	〃	〃	〃	Well Hub. Total on
									HAnd
*	~~11-14~~	Drilling AT9	DRill flush	ND	500gal	2000gal PollyAgTank	BAy18	Pending Filtering	ToBe Run Thorough System
*	11-14	DRilling AT-7,8,9	DRilling Decon	—	1300gal	Total on HAnd	tobe	Run	
						ThRorough	NiRop	Treatment	
						System			

Note: Describe whether soil or water samples have been collected for waste characterization, include date, if known.

Signature: [signature]

WASTE INVENTORY TRACKING FORM
For DAte 11-15-00

LOCATION: NIROP-Fridley, MN /N62467-98D-0995 = CT# 0024
BW # J00347

PROJECT NAME: Extracation Well Installation

ACTIVITIES: Drilling + Installation of AT-9
+ Water Treatment

Date Waste Generated	Activity Generating Waste (borehole # / well #)	Description of Waste	Field Evidence of Contamination	Estimated Volume GAl	Type of Container (storage ID#)	Location of Container	Waste Characterization	Comments
~~[illegible]~~ 11-15-00	Develop AT-9	0	NA	700			Filtered 1230 to 1255	Run into plant
								Treatment System
11-15-00			ND	230	1000 gal PollyAg Tank	Portable	Hold To add to NexT	
							Treatment Batch	
11-13	AT-7	Drill Cuttings	ND	85	Rolloff	Next	Pending	
11-14	AT-7	"	"	315		TO AT9	Anylisis	

Note: Describe whether soil or water samples have been collected for waste characterization, include date, if known.

Signature: [signature] 22

WASTE INVENTORY TRACKING FORM

LOCATION: NIROP - Fridley, MN (N62467-980-0995 / CT# 0024 BW# J00341

PROJECT NAME: EXTRACtion Well, Installation

ACTIVITIES: Water Treatment as of 11-20-00

Date Waste Generated	Activity Generating Waste (borehole # / well #)	Description of Waste	Field Evidence of Contamination	GAls. Estimated Volume GAL	Type of Container (storage ID#)	Location of Container	Waste Characterization	Comments
11-15				gal 700			All Water Filtered	All Water Transfered
11-14	From Decon Pad	Decon + Rain Water		gal 750			2 times 1 BAG Filter +	To on Site Treatment
							Filter + 1-CARTRIDGE	System
11-17				1000			Filter	
11-20				4000			Filtered (2X)	TRANSFORM To Treatment
								System NIROP

on 11-14 1025 gal of water was Removed From Decon Pad = about 25 gal of Decon Water + 1000 GAL. of RAIN Water that was not Removed Prior to Deconing DRill Rig - 750 gal treated + 250 GAL. to BAY 18 Holding tank

Note: Describe whether soil or water samples have been collected for waste characterization, include date, if known.

Signature: [signature] 22 (B.W.) [signature] CCI

WASTE INVENTORY TRACKING FORM

LOCATION : NIROP-Fridley, MN= N62467-98D-0995/#CT0024

PROJECT NAME: NIROP-EXTRACAtion Well installation

ACTIVITIES: DRilling FOR EXTRACAtion Well AT-10 INStallation

Date Waste Generated	Activity Generating Waste (borehole # / well #)	Description of Waste	Field Evidence of Contamination	Estimated Volume gal	Type of Container (storage ID#)	Location of Container	Waste Characterization	Comments
11-16	well install Drilling	Drill Cutting	ND	285	Steel Drum	Next To AT10		Hold to be Transfered To Rolloff

Note: Describe whether soil or water samples have been collected for waste characterization, include date, if known.

Signature: [signature] 22

WASTE INVENTORY TRACKING FORM

11-17-00

LOCATION: NIROP Fridley, MN

PROJECT NAME: EXTRACation Well installation

ACTIVITIES: Drill-Set screen-Develop Well - AT10 - Treat Development + Decon water FROM AT

Date Waste Generated	Activity Generating Waste (borehole # / well #)	Description of Waste	Field Evidence of Contamination	Estimated Volume	Type of Container (storage ID#)	Location of Container	Waste Characterization	Comments
11-17	Drilling AT-10	Drill Cuttings	ND	100 GAl	Rolloff		Pending Anylisis	
		Drill Mud	ND	600 gal	Rolloff	Next to AT9		
		Develop Water	ND	200 GAl	Rolloff ~~Polly tank~~	~~Bay 18~~ ~~Next to AT9~~		mostly Drill mud
11-17	Develop AT10	Develop Water	ND	gal	1000 gal	Portable TANK	Filtered WATER	Run Through Plant Treatment System

Note: Describe whether soil or water samples have been collected for waste characterization, include date, if known.

Signature: [signature] 22

WASTE INVENTORY TRACKING FORM
11-20-00

LOCATION: NIROP - Fridley, MN / N62467-98D-0995 / CTH 0024

PROJECT NAME: Extracation Well installation

ACTIVITIES: Water Treatment / Develop AT-10 / Solidify Drill mud in Rolloff

Date Waste Generated	Activity Generating Waste (borehole # / well #)	Description of Waste	Field Evidence of Contamination	Estimated Volume	Type of Container (storage ID#)	Location of Container	Waste Characterization	Comments
11-20	Water Treatment	Drilling Water	ND	1000 Gal	Steel 3000 gal Tank	Bldg 52		To Treatment (T)
11-20	Water Treatment	Development H2O	ND	1000 Gal	2000 gal Polly Ag Tank	2000 gal Tank Bay 18		System (T)
11-20	Develop AT-10	Development water		1200 gal	2000 gal Polly Ag Tank	Bay 18		
				200 gal	3000 gal Tank Bldg 52	Bldg 52	Development water	Added to water in Tank
11-20				1000 gal	Portable 1050 gal	1050 gal Portable	Filtered 2 times	Run Through Treatment (T)
				1000 gal	Portable 1050 gal			System (T)
11-20	Drill mud	Moved To Rolloff	ND	gal	Rolloff	Next To AT-9	Storage Tank Now Empty	Solidify For Disposal

Note: Describe whether soil or water samples have been collected for waste characterization, include date, if known.

Signature: James Glenn Johnson 22 (B.W.)

Total treated today 4,000 gal.

WASTE INVENTORY TRACKING FORM

11-21-00

LOCATION: NIROP-Fridley, MN / N62467-98D-0995 = CT#0024 (BW# J-003471)

PROJECT NAME: EXTRACation Well INSTAllATion

ACTIVITIES: Filtering Drill + Development Water Then Run Thorough Plant Treatment System

Date Waste Generated	Activity Generating Waste (borehole # / well #)	Description of Waste	Field Evidence of Contamination	GAl. Estimated Volume	Type of Container (storage ID#)	Location of Container	Waste Characterization	Comments
11-21	Filtered WATER	Development WATER	ND	1000	FROM TANK BAY	FROM BAY	All Water Filtered	All WAter Run
11-21	—	—	ND	450	18	18	FIRST Thorough	Thorough
11-21	—	—	ND	550	3000 gal TANK	FROM Bldg	Bag Filters	NIROP
11-21	—	—	/	1000	Bldg 52	52	than Thorough	Treatment
11-21	—	—	/	1000	/	All Transferred	CARTridge Filters	PlANT
						Too Portable		After
						TANK		Filtering
			Total	4000 gal				
11-21	Total	WATer	Filtered &			Run	Thorough	
	NIROP -		Treatment		PlANT	4000	gal.	
	(450 gal		FROM	TANK	in	Bldg	BAY	18
	2550 gal		FROM	TANK	in	Bldg	52)	

Note: Describe whether soil or water samples have been collected for waste characterization, include date, if known.

Signature: [signature] 22 (B.W.)

WASTE INVENTORY TRACKING FORM

11-22-00

LOCATION: NIROP-Fridley, MN / N62467-98D-0995 / CT#0024
B.W# I003471

PROJECT NAME: EXTRAcation Well INStallation

ACTIVITIES: Water Treatment / Development AT-10

Totals For Water Treated as of 11-22-00

Date Waste Generated	Activity Generating Waste (borehole # / well #)	Description of Waste	Field Evidence of Contamination	GAl Estimated Volume	Type of Container (storage ID#)	Location of Container	Waste Characterization	Comments
11-14	FROM DeconPad	Decon + RAIN WATER	ND	750 GAl			All WATER Filtered	All WATER Transfered
11-15	TANK in BAY18	Develop-ment		700 GAl			Thorough Bag Filters	Via Portable TANK too
11-17	|	WATER +		1000 gal			Then	WATER Treatment
11-20	Bay 18 & Bldg 52	Decon water		4000	Total		CARtridge Filter units	system on site
11-21	Bay 18 Bldg 52	|		4000	Total			
			Total	10,450 gal		Treated		
	All	WATER	on	SITE	HAS	NOW	Been	Treated
	and	Run	Thorough	PLANT	Treatment		System	
of	the	total	10,450 gal	Treated		1000	gal	was
RAIN	water		Not	Pumped	off	PRIOR		to
Deconing		Rig	on	11-14-00				

Note: Describe whether soil or water samples have been collected for waste characterization, include date, if known.

Signature: [signature] [signature]

WASTE INVENTORY TRACKING FORM

11-22-00

LOCATION : NIROP-Fridley, MN / N62467-98D-0995 / CT#0024
B.W# T003471

PROJECT NAME: EXTRAcation Well INSTALLation

ACTIVITIES: Water Treatment / Development AT-10

Totals For Water Treated as of 11-22-00

Date Waste Generated	Activity Generating Waste (borehole # / well #)	Description of Waste	Field Evidence of Contamination	GAl Estimated Volume	Type of Container (storage ID#)	Location of Container	Waste Characterization	Comments
11-14	From Decon pad	Decon + Rain WATER	ND	750 GAl.			All WAter Filtered	All WATer TRANSfered
11-15	TANK in BAY 18	Develop-ment		700 GAl			Thorough BAg Filters	Via PoRtAble TANK too
11-17	|	WATer +		1000 gAl			Then	WATER Treatment
11-20	BAY 18 + Bldg 52	Decon water		4000	Total		CARtridge Filter	system on site
11-21	BAY 18 + Bldg 52	|		4000	Total		unit	
			Total	10,450 gal		Treated		
	All	WATER	on	SITE	HAS	Now	Been	Treated
	and	Run	Thorough	PlANT	Treatment		System	
of	the	total	10,450 gal	Treated		1000	gal was	
RAIN	water		Not	Pumped	off		PRIOR	to
Deconing		Rig	on	11-14-00				

Note: Describe whether soil or water samples have been collected for waste characterization, include date, if known.

Signature: [signatures]

WASTE INVENTORY TRACKING FORM

LOCATION: AT-9 Well Development.

PROJECT NAME: Nirop

ACTIVITIES: Pump directional test and setiment screening

Date Waste Generated	Activity Generating Waste (borehole # / well #)	Description of Waste	Field Evidence of Contamination	Estimated Volume	Type of Container (storage ID#)	Location of Container	Waste Characterization	Comments
11-27-02	Well Development	water	NONE	600 gal	1000 gal Tank	on trailer		water from AT-9 Development.

Note: Describe whether soil or water samples have been collected for waste characterization, include date, if known.

Signature: Steven M Pierin

WASTE INVENTORY TRACKING FORM

LOCATION: NIROP FRIDLEY

PROJECT NAME: N62467-980-0995 CNT0024

ACTIVITIES: Water from dewatering the rolloff box

Date Waste Generated	Activity Generating Waste (borehole # / well #)	Description of Waste	Field Evidence of Contamination	Estimated Volume	Type of Container (storage ID#)	Location of Container	Waste Characterization	Comments
11/30	Dewater rolloff	water/silt	NONE	1000 Gallons	POLY AG TANK	NEAR AT-9		

Note: Describe whether soil or water samples have been collected for waste characterization, include date, if known.

Signature: Steven M Prein

Appendix D2

Waste Soil Profile

FAX

Tel 612-672-8438
Fax 612-672-8344

To:	John Aubert / Al Dietric	From:	Chris Adams
Company:	CH2M HILL	Date:	January 5, 2001
Fax No.:	909-620-0409	Total Pages:	3
Voice No.:			

WM
WASTE MANAGEMENT

SWDA № 2522

SPECIAL WASTE DISPOSAL APPLICATION

WASTE MANAGEMENT CODE ____ / ____ / ____ / ____

WASTE DISPOSAL REQUEST (Waste Management)

WM Initiator John Gagliano
Location Burnsville
Date 10-3-00
Telephone (952) 890 3248
Fax Number (952) 890 8556

Disposal Site Requested Elk River Landfill
Company Number
Alternate Disposal Site
Company Number

1. GENERATOR INFORMATION

a) Generator's Name United States Navy
b) Generator's Address 4800 East River Road
City Fridley
State MN
County Hennepin
c) Company Contact Tim Leisz
Title T&D Manager (Bay West)

d) Telephone Number (651) 291-3439
After Hours Number (651) 249-0452
Fax Number (651) 291-0099
e) US EPA ID. Number

2. WASTE STREAM INFORMATION

a) Common Name of Waste Drill Cuttings
b) Process Generating Waste Well Installation
c) Is this a "Hazardous Waste" as defined by Federal Statutes, Regulations, Ordinances or other law? ____ Yes or X No
If yes, enter the Waste Identification Number assigned:
d) State of Origin
e) Recommended personal protective equipment and special handling procedures
f) Anticipated Volume: ____ Tons 5-10 Cubic Yards
Frequency: X One-Time ____ Day ____ Week ____ Month ____ Year ____ Other ____ Other
g) Method of Shipment: X Bulk ____ Drums ____ Other

3. PROPERTIES OF WASTE STREAM

a) Physical State:
X Solid ____ Semi-solid
____ Liquid ____ Powder
____ Other
b) Odor:
Describe:
X None ____ Mild ____ Strong
c) Flash Point (°F): ____ ≤ 140 ____ 141-200
X ≥ 201 ____ N/A ____ N/D
d) Free Liquids: ____ Yes or X No
e) Minimum Percent Solids (%) 100

f) Density Range: 1 to 1.5
____ N/D ____ lbs./gal.
____ g./cc. ____ lbs./cu. yd.
____ Other
g) Color(s):
Describe: Brown
h) pH (standard units):
____ ≤ 2.0 ____ 2.1-5.0 X 5.1-9.0 ____ 9.1-12.4
____ ≥ 12.5 ____ N/A ____ N/D
i) Layers:
X Single Phased ____ Bi-layered
____ Multi-layered

4. WASTE COMPOSITION

List all the contents of the waste stream by volume, total must equal 100%.

Components	Minimum/Maximum
Soil - See Analytical	

5. CHEMICAL CHARACTERISTICS

List the concentrations of the constituents applicable or otherwise instructed for the proper characterization of the waste.

	Total (ppm)	TCLP (ppm)		Total (ppm)	TCLP (ppm)
pH			1,1-Dichloroethylene		
Sulfides			Methyl Ethyl Ketone		
Cyanides			Tetrachloroethylene		
Phenolics			Trichloroethylene		
PCB's			Vinyl Chloride		
TPH			O-Cresol		
BTEX			M-Cresol		
benzene			P-Cresol		
toluene			Cresol (total)		
ethyl benzene			2,4-Dinitrotoluene		
xylene			Hexachlorobenzene		
TOX			Hexachlorobutadiene		
Arsenic			Hexachloroethane		
Barium			Nitrobenzene		
Cadmium			Pentachlorophenol		
Chromium			Pyridine		
Lead			2,4,5-Trichlorophenol		
Mercury			2,4,6-Trichlorophenol		
Selenium			Chlordane		
Silver			2,4-D		
Benzene			Endrin		
Carbon Tetrachloride			Heptachlor		
Chlorobenzene			Lindane		
Chloroform			Methoxychlor		
1,4-Dichlorobenzene			Toxaphene		
1,2-Dichloroethane			2,4,5-TP (Silvex)		

Please attach lab report(s) and related information to further characterize the waste.

6. REPRESENTATIVE DATA CERTIFICATION

By signing below, the customer warrants that the analytical data presented was derived from testing of a representative sample in accordance with one of the following (check one):

☐ I have obtained a representative sample of the waste material material described in this application according to the sampling specified in 40 CFR 261 - Appendix I.

☒ I have obtained a representative sample of the waste material described in this application by a method equivalent to 40 CFR 261 - Appendix I.

☐ MSDS Attached.

Signature [signature] Date 1/4/01

7. GENERATOR CERTIFICATION

By signing this application I warrant under penalties of perjury that:

1) I am the legal generator of the waste described on this application and am authorized to prepare and submit this application on behalf of the generator.
2) This waste is not a regulated Hazardous Waste as defined by any applicable Federal, State, or Local law including but not limited to those promulgated by the USEPA or contains PCB's regulated by TSCA 40 CFR Part 761.
3) This application and its attachments contain true, correct and accurate descriptions of the waste.
4) Laboratory data used to support the validity of the data shown on this application has been obtained from a volumetrically representative sample of exactly the same waste that I will deliver to Waste Management for either hauling or disposal and analyzed according to 40 CFR Part 261 and all other applicable statutes, regulations, ordinances, orders and guidelines.

Signature of Generator's Authorized Agent [signature] Date 1/4/01

PRINT NAME, TITLE R. W. AUBERT P.E.

Appendix D3

Waste Soil Manifest

WM WASTE MANAGEMENT

NON - HAZARDOUS WASTE MANIFEST

FOR OFFICE USE ONLY
Customer Acct. No. 0203
Ticket No. 109082

GENERATOR

NO. 18824

Name U.S. NAVY / JOHN AUBERT
Address 4800 E. RIVER RD
FRIDLEY, MN 55421
Phone No.

Generating Location NIROP - FRIDLEY
4800 East River Road
Fridley, MN
Approval No. 21030

WASTE CODE	WASTE DESCRIPTION	QUANTITY	UNITS
N/A	DRILL CUTTINGS	7	Y
		10.08 ton	

CODES
D - DRUM
B - BAG
C - CARTON
P - POUNDS
Y - YARDS
O - OTHER

I hereby certify that the above listed material(s), is (are) not a hazardous waste as defined by 40 CFR Part 261 or any applicable state law: That each waste has been properly described, classified and packaged, and is in proper condition for transportation according to applicable regulation.

R. W. AUBERT — AUTHORIZED AGENT'S NAME (PRINT)
12/24/00 — DATE
[signature] — SIGNATURE

CONTRACTOR

Bill to:
Name Bay West, Inc.
Phone No. 651/291-0456
Address 5 Empire Drive, St. Paul, MN 55103

I hereby certify that the above listed material(s), is (are) not a hazardous waste as defined by 40 CFR Part 261 or any applicable state law: That each waste has been properly described, classified and packaged, and is in proper condition for transportation according to applicable regulation.

[signature] — NAME (PRINT)
12/20/00 — DATE
Tim Leisz — SIGNATURE

TRANSPORTER

Transporter's Name Veit Companies
Address 14000 Veit Place
Rogers, MN 55374
Phone No. (763) 428-2242
Driver's Name MATT GAGNE
Vehicle's No. 100

I hereby certify that the above named material was picked up at the Generator site listed above and delivered without incident to the disposal facility listed below.

1-11-01 — SHIPMENT DATE
[signature] — DRIVER'S SIGNATURE
1-11-01 — DELIVERY DATE
[signature] — DRIVER'S SIGNATURE

DISPOSAL FACILITY

14A Center

Site Name Elk River Landfill, Inc.
Phone No. 612-441-2464
Address 22460 Hwy 169 N.W., Elk River, MN 55330
Permit No. SW-74
Time

I hereby certify that the above material has been accepted and that information presented on this document is true and accurate.

1-11-01 — DATE
[signature] — SIGNATURE

WM

ELK RIVER LANDFILL, IN[C.]
A WASTE MANAGEMENT COMPA[NY]

22460 Hwy. 169 NW
Elk River, MN 55330
(612) 441-2464
(612) 441-2025 Fax

September 19, 2001

Jim Leisz
Bay West, Inc.
Five Empire Drive
St. Paul, MN 55103-1867

RE: Certificate of Disposal

Dear Mr. Leisz:

I hereby certify that on January 11, 2001, Elk River Landfill received 10.08 tons of drill cuttings from the United States Navy, located in Fridley, Minnesota. The cuttings were deposited in the lined portion of the landfill.

Sincerely,

J P Gagliano

John P. Gagliano
Industrial Waste Specialist

Appendix D4

Construction Debris Truck Tickets

MURLOWSKI PROPERTIES INC.
2200 OLD HIGHWAY 8
NEW BRIGHTON, MN 55112

Date: 11/15/2000
Plant: MURLOWSKI YARD

Ticket: 0000525149
Truck #: 1210
Vendor #:

Bill to: BELAIR BUILDERS, INC.
Address: 2200 OLD HIGHWAY 8

NEW BRIGHTON MN 55112

Job # 6406
Code

Material Description	UM	Quantity	Unit Price	Total
IMP CONC W/MESH TANDEM BELAIR	LD	1.00	30.0000	30.00
Sales Tax				.00
Total Due				

Hauler Signature ____________________
Office Approval ____________________ Yard Approval ____________________

Overweight Tickets and Fines are Driver Responsibility
I Certify That Material Dumped Contains no Contaminates

White (Billing) - Yellow (Driver) - Pink (Accounting)

MURLOWSKI PROPERTIES INC.
2200 OLD HIGHWAY 8
NEW BRIGHTON, MN 55112

Date: 11/15/2000
Plant: MURLOWSKI YARD

Ticket: 0000525137
Truck #: 1210
Vendor #:

Bill to: BELAIR BUILDERS, INC.
Address: 2200 OLD HIGHWAY 8

NEW BRIGHTON MN 55112

Job # 6406
Code

Material Description	UM	Quantity	Unit Price	Total
IMP CONC W/MESH TANDEM BELAIR	LD	1.00	30.0000	30.00
Sales Tax				.00
Total Due				

Hauler Signature ____________________
Office Approval ____________________ Yard Approval ____________________

Overweight Tickets and Fines are Driver Responsibility
I Certify That Material Dumped Contains no Contaminates

White (Billing) - Yellow (Driver) - Pink (Accounting)

MURLOWSKI PROPERTIES INC.
2200 OLD HIGHWAY 8
NEW BRIGHTON, MN 55112

Date: 11/15/2000
Plant: MURLOWSKI YARD

Ticket: 0000525132
Truck #: 1210
Vendor #:

Bill to: BELAIR BUILDERS, INC.
Address: 2200 OLD HIGHWAY 8

NEW BRIGHTON MN 55112

Job # 6406
Code

Material Description	UM	Quantity	Unit Price	Total
IMP CONC W/MESH TANDEM BELAIR	LD	1.00	30.0000	30.00
Sales Tax				.00
Total Due				

Hauler Signature ______________________
Office Approval ______________________ Yard Approval Tina

Overweight Tickets and Fines are Driver Responsibility
I Certify That Material Dumped Contains no Contaminates

White (Billing) - Yellow (Driver) - Pink (Accounting)

MURLOWSKI PROPERTIES INC.
2200 OLD HIGHWAY 8
NEW BRIGHTON, MN 55112

Date: 11/15/2000
Plant: MURLOWSKI YARD

Ticket: 0000525142

Truck #: 1210
Vendor #:

Bill to: BELAIR BUILDERS, INC.
Address: 2200 OLD HIGHWAY 8

NEW BRIGHTON MN 55112

Job # 6406
Code

Material Description	UM	Quantity	Unit Price	Total
IMP CONC W/MESH TANDEM BELAIR	LD	1.00	30.0000	30.00
Sales Tax				.00
Total Due				

Hauler Signature ______________________
Office Approval ______________________ Yard Approval Tina

Overweight Tickets and Fines are Driver Responsibility
I Certify That Material Dumped Contains no Contaminates

White (Billing) - Yellow (Driver) - Pink (Accounting)

BELAIR
EXCAVATING

September 20, 2001

Naval Ordinance Station
118 Rochester Drive
Louisville, Kentucky 40214

Re: CERTIFICATE OF DISPOSAL

Murlowski Properties Facility located at 2200 Old Hwy 8 in New Brighton, Minnesota received from Navel Ordinance in Fridley ,MN 4 loads of concrete. All of the loads were received on November 15, 2000 and have been crushed and sold off site as class v road base.

If I can be of any further assistance please feel free to contact me at (651) 786-1300.

Sincerely,

Tricia Heffner

Tricia Heffner
Scale House Operator

2200 Old Highway 8 NW, New Brighton, MN 55112
Phone: 651.786.1300 Fax: 651.786.0769
belairexcavating.com
Equal Opportunity Employer

Appendix E

As-built Drawings, Air Emissions Calculations and Operation & Maintenance Manual

Appendix E1

As-built Drawings

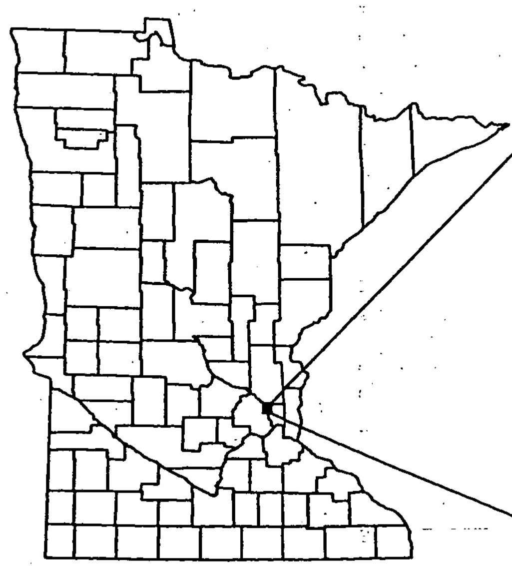
AS-BUILT DRAWINGS FOR
MODIFICATION TO GROUND WATER TREATMENT FACILITY

NAVAL INDUSTRIAL RESERVE ORDNANCE PLANT
FRIDLEY, MINNESOTA

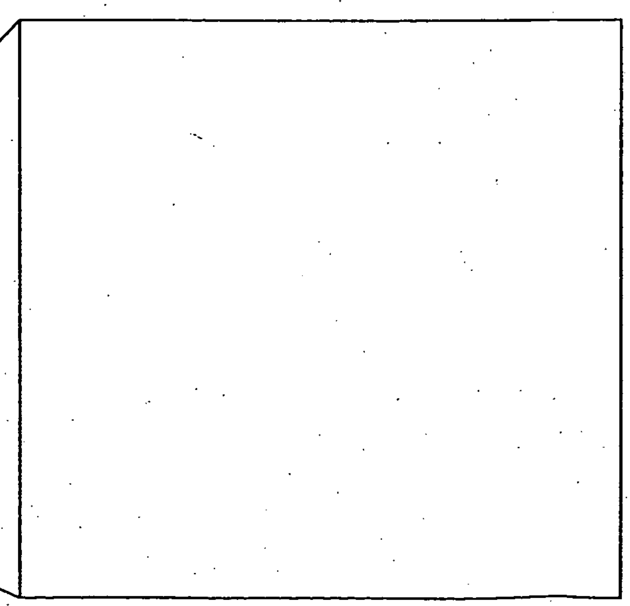
PREPARED BY: BAY WEST, INC.
5 EMPIRE DRIVE
SAINT APUL, MINNESOTA 55103

PREPARED FOR: CH2M HILL
13921 PARK CENTER ROAD, SUITE 600
HERNDON, VIRGINIA 20171

DATE: AUGUST 2001



STATE COUNTY MAP



LOCATION MAP

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DSGN ENGINEER						VERIFY SCALE	CH2MHILL	NIROP FRIDLEY GROUNDWATER EXTRACTION SYSTEM FRIDLEY, MN	GENERAL
DR DRAWN-BY						BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"			TITLE SHEET/ DRAWING INDEX/ LOCATION MAP
CHK CHECKED-BY						IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.			
APVD APPROVED-BY	NO.	DATE	REVISION	BY	APVD				

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GENERAL

1. ALL WORK AND MATERIALS SHALL COMPLY WITH ALL APPLICABLE CODES AND REGULATIONS INCLUDING BUT NOT LIMITED TO OSHA, AISC, AND LOCAL BUILDING, PLUMBING, AND ZONING CODES.
2. ALL WRITTEN DIMENSIONS ON THE DRAWINGS SHALL TAKE PRECEDENCE OVER ANY SCALED DIMENSIONS.
3. ALL CONDITIONS, LOCATIONS, AND DIMENSIONS SHALL BE FIELD VERIFIED AND THE DESIGN ENGINEER SHALL BE IMMEDIATELY NOTIFIED OF ANY DISCREPANCIES.
4. ALL CHANGES MADE TO THE DRAWINGS SHALL BE APPROVED BY THE DESIGN ENGINEER.
5. CONTRACTOR SHALL PROTECT, SHORE, BRACE, SUPPORT, AND MAINTAIN ABOVE GROUND AND UNDERGROUND PIPES, CONDUITS, DRAINS, AND OTHER UTILITY CONSTRUCTION UNCOVERED OR OTHERWISE AFFECTED BY CONSTRUCTION OPERATIONS.
6. SAFETY AND CONTINUITY OF OPERATIONS IS OF EXTREME IMPORTANCE. THE CONTRACTOR SHALL ARRANGE ITS WORK SO THAT EXISTING STRUCTURES AND EQUIPMENT ARE PROTECTED AND SAFEGAURDED AT ALL TIMES.
7. CONTRACTOR SHALL OBTAIN ALL APPLICABLE CONSTRUCTION PERMITS AND INSPECTIONS REQUIRED FOR PROJECT.
8. THE CONTRACTOR SHALL USE HEALTH AND SAFETY TRAINED WORKERS AS REQUIRED TO COMPLY WITH THE HEALTH AND SAFETY PLAN AND APPLICABLE REGULATIONS.
9. THE CONTRACTOR SHALL HAVE A TRAINED SITE HEALTH AND SAFETY COORDINATOR ON SITE DURING WORK TASKS WHERE THERE IS A RISK OF EXPOSURE. THE SITE HEALTH AND SAFETY COORDINATOR SHALL BE TRAINED IN ACCORDANCE WITH OSHA 29 CFR 1910.120, (E), (4). THE HEALTH AND SAFETY COORDINATOR SHALL BE RESPONSIBLE FOR ADMINISTRATING AND ENFORCING ALL HEALTH AND SAFETY PLAN REQUIREMENTS AS WELL AS OTHER SAFETY REQUIREMENTS OF THE CONTRACT DOCUMENTS.
10. TO THE MAXIMUM EXTENT POSSIBLE, EXCAVATED SOIL MATERIALS SHALL BE REPLACED ON-SITE IN EXCAVATIONS. EXCAVATED SOIL MATERIALS SHALL BE STOCKPILED ON-SITE AT A LOCATION DESIGNATED BY THE OWNER. THE DISPOSAL OF EXCESS EXCAVATED SOIL MATERIALS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
11. STOCKPILED SOILS SHALL BE PLACED ON AND COVERED BY 2 LAYERS, 10 MIL EACH, POLY SHEETING AND PROVIDED WITH EROSION CONTROL.
12. ANY MATERIALS AND EQUIPMENT BROUGHT ON-SITE BY THE CONTRACTOR MUST BE REMOVED FROM THE SITE UPON OR BEFORE THE COMPLETION OF WORK.
13. CONTRACTOR SHALL SUBMIT 2 COPIES OF MATERIAL SAFETY DATA SHEETS FOR ALL MATERIALS BROUGHT ON-SITE. ONE COPY SHALL BE POSTED ON-SITE.
14. CONTRACTOR SHALL PERFORM WORK IN COMPLIANCE WITH ALL OSHA REQUIREMENTS.

SUBMITTALS

1. THE CONTRACTOR SHALL SUBMIT THE FOLLOWING FOR ENGINEER'S REVIEW AND APPROVAL:
   A. ALL PERMIT APPLICATIONS AND REGULATORY SUBMITTALS PRIOR TO SUBMITTAL TO APPROPRIATE AGENCIES.
   B. HEALTH AND SAFETY PLAN.
   C. COMPACTION TEST RESULTS.
   D. MATERIAL TEST RESULTS FOR TRENCH STABILIZATION MATERIAL, GRANULAR FILL MATERIAL, AND SAND.
   E. CATALOG AND TECHNCAL INFORMATION FOR THE FOLLOWING:
      - GRANULAR FILL MATERIAL
      - SAND
      - PVC PIPING AND FITTINGS
      - CARBON STEEL PIPING AND FITTINGS
      - BUTTERFLY VALVES
      - INSULATION
      - STEEL CASING PIPE
2. ALL SUBMITTALS SHALL DEMONSTRATE CONFORMANCE TO THE CONTRACT DRAWINGS.

DEMOLITION

1. DISPOSE OF DEBRIS AND OTHER NON-SALVAGED MATERIALS OFF-SITE IN LICENSED LANDFILLS. EQUIPMENT AND MATERIALS, WITHIN THE LIMITS OF DEMOLITION, WILL BECOME THE PROPERTY OF THE CONTRACTOR.
2. EXTRACTION WELL NOS. AT-1A AND AT-4 SHALL BE ABANDONED. EXTRACTION WELL NOS. AT-1A AND AT-4 ABONDONMENT SHALL BE PERFORMED IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL LAWS AND REGULATIONS. A WELL SEALING NOTIFICATION SHALL BE SUBMITTED TO THE MINNESOTA DEPT OF HEALTH (MDH) PRIOR TO ABANDONING THE WELLS. UPON COMPLETION OF WELL ABANDONMENT, COPIES OF WELL SEALING RECORD SHALL BE SUBMITTED TO THE MDH.
3. PRIOR TO ABANDONING THE WELLS, ALL PUMPS AND ACCESSORIES IN THE WELLS SHALL BE REMOVED. THE WELLS SHALL BE ABANDONED BY FILLING THE CASING FROM THE BOTTOM TO THE SURFACE WITH NEAT CEMENT. THE NEAT CEMENT SHALL CONFORM TO MANUFACTURER'S SPECIFICATIONS. UPON COMPLETION, THE ABANDONED WELLS SHALL BE CHECKED FOR 48 HOURS TO DETERMINE WHETHER CURING IS OCCURRING PROPERLY. SPECIFIC CURING SPECIFICATIONS AND/OR QUALITY ASSURANCE CHECKS RECOMMENDED BY THE MANUFACTURER SHALL BE FOLLOWED. ADDITIONALLY, IF SIGNIFICANT SETTLING HAS OCCURRED, A SUFFICIENT AMOUNT OF NEAT CEMENT SHALL BE ADDED TO ATTAIN ITS INITIAL LEVEL. THESE CURING CHECKS AND ANY ADDITION OF NEAT CEMENT SHALL BE RECORDED IN THE FIELD LOGS.
4. EXTRACTION WELL NOS. AT-1A AND AT-4 BELOW-GRADE DISCHARGE PIPING FROM THE PITLESS ADAPTER TO THE INTERIOR OF THE NIROP BUILDING SHALL BE ABANDONED IN PLACE. THE PIPE SHALL DRAINED AND THE SPOOL PIECE REPLACED, EFFECTIVELY CAPPING THE PIPE. THE WELL WAS GRADED WITH THE SPOOL PIECE IN PLACE. 2-1
5. EXTRACTION WELL NOS. AT-1A AND AT-4 BELOW-GRADE DISCHARGE PIPING FROM THE INTERIOR OF THE NIROP BUILDING TO BUILDING 52/53 SHALL BE ABANDONED IN PLACE. PIPING SHALL BE CUT AND DRAINED AT THE LOCATION SHOWN FOR CONNECTION OF THE DISCHARGE PIPING FROM AT-7 AND AT-8. ABANDONED PIPING AT THE CONNECTION OF EXTRACTION WELL NOS. AT-7 AND AT-8 ADAPTER SHALL BE CAPPED AFTER DRAINING. CAP SHALL BE OF THE SAME MATERIAL TYPE, SIZE AND SCHEDULE AS THE EXISTING PIPING.
6. EXTRACTION WELL NOS. AT-1A AND AT-4 INTERIOR DISCHARGE PIPING FROM THE WELLS TO BUILDING 52/53 SHALL BE ABANDONED IN PLACE. INTERIOR PIPING SHALL BE DRAINED AND SEALED AT EACH END. CONTRACTOR SHALL REMOVE THE SPOOL PIECE BETWEEN THE ISOLATION VALVES AT EACH END AND INSTALL A BLIND FLANGE AT EACH VALVE.

EARTHWORK

1. EXCAVATION SAFETY: THE CONTRACTOR SHALL BE SOLEY RESPONSIBLE FOR MAKING ALL EXCAVATIONS IN A SAFE MANNER. THE CONTRACTOR SHALL PROVIDE APPROPRIATE MEASURES INCLUDING SHEETING AND SHORING TO RETAIN EXCAVATION SIDESLOPES, TO PREVENT SLOPE FAILURE, AND TO ENSURE THAT PERSONS WORKING IN OR NEAR THE EXCAVATION ARE PROTECTED. THE CONTRACTOR SHALL ADHERE TO THE HEALTH AND SAFETY PLAN, OHSA, AND OTHER APPLICABLE GOVERNMENTAL REGULATIONS AND AGENCIES' SAFETY STANDARDS.
2. TRENCH PREPARATION: THE CONTRACTOR SHALL REMOVE FOREIGN MATERIAL, SUCH AS ROOTS, ORGANIC MATTER, TRASH, DEBRIS, ROCKS LARGER THAN 3 INCHES, AND OTHER DELETERIOUS MATERIALS, AND BACKFILL CONTAMINATED WITH FOREIGN MATERIAL THAT FALLS INTO TRENCH. CONTRACTOR SHALL GRADE WITH HAND TOOLS, REMOVE LOOSE AND DISTURBED MATERIAL, AND TRIM OFF HIGH AREAS AND RIDGES LEFT BY EXCAVATING BUCKET TEETH. ALLOW SPACE FOR PIPE BASE MATERIAL AS SPECIFIED. IF SUBGRADE IS ENCOUNTERED THAT MAY REQUIRE REMOVAL TO PREVENT PIPE SETTLEMENT, CONTRACTOR SHALL OVEREXCAVATE AND BACKFILL WITH TRENCH STABILIZATION MATERIAL. TRENCH STABILIZATION MATERIAL SHALL BE PLACED OVER THE FULL WIDTH OF THE TRENCH IN 6-INCH LIFTS TO REQUIRED GRADE, PROVIDING ALLOWANCE FOR PIPE BASE THICKNESS. CONTRACTOR SHALL COMPACT EACH LIFT SO AS TO PROVIDE A FIRM, UNYIELDING SUPPORT FOR THE BEDDING MATERIAL PRIOR TO PLACING SUCCEEDING LIFTS.
3. PIPE BASE/PIPE ZONE: TRENCH STABILIZATION MATERIAL SHALL BE 3-INCH MINUS RIVER-RUN OR PIT-RUN GRAVEL, CRUSHED GRAVEL, OR CRUSHED ROCK; FREE FROM CLAY BALLS, ROOTS, AND ORGANIC MATTER; WELL-GRADED FROM COARSE TO FINE WITH LESS THAN 8 PERCENT BY WEIGHT PASSING THE 1/4-INCH SIEVE.

   GRANULAR FILL MATERIAL SHALL BE ONE AND ONE-HALF INCH MINUS CRUSHED GRAVEL OR CRUSHED ROCK; FREE FROM DIRT, CLAY BALLS, AND ORGANIC MATTER.

   SAND SHALL BE NATURAL SAND OR SAND PRODUCED FROM CRUSHED GRAVEL OR CRUSHED ROCK; MAXIMUM SIZE 3/8 INCH; FREE FROM CLAY AND ORGANIC MATERIAL.

   PIPE BASE/PIPE ZONE MATERIAL SHALL BE OF THE SAME MATERIAL HEREINBEFORE SPECIFIED AS SAND. EARTHFILL MATERIAL SHALL BE EXCAVATED MATERIAL FREE FROM ROOTS, ORGANIC MATTER, TRASH, DEBRIS, ROCKS LARGER THAN 3 INCHES, AND OTHER DELETERIOUS MATERIALS. PROVIDE IMPORTED MATERIAL OF EQUIVALENT QUALITY, IF REQUIRED TO ACCOMPLISH THE WORK.

   PIPE ZONE SHALL INCLUDE THE FULL WIDTH OF THE EXCAVATED TRENCH FROM THE BOTTOM OF THE TRENCH TO A LEVEL 6 INCHES ABOVE THE TOP OUTSIDE SURFACE OF THE PIPE BARREL. PLACE BACKFILL IN TRENCH IN HORIZONTAL LIFTS NOT EXCEEDING 6 INCHES IN UNCOMPACTED THICKNESS ON BOTH SIDES OF THE PIPE. WORK THE MATERIAL UNDER THE HAUNCHES OF THE PIPE BY SLICING WITH A SHOVEL. COMPACT WITH TAMPING BARS AND/OR MECHANICAL COMPACTORS. COMPACT MATERIAL AT THE SIDES OF THE PIPE WITH VIBRATORY PLATE COMPACTORS TO 90 PERCENT RELATIVE COMPACTION. BACKFILL SHALL BE TESTED FOR DENSITY AND MOISTURE CONTENT AT A FREQUENCY NOT LESS THAN 3 TESTS PER 500 LINEAR FEET. DO NOT OPERATE VIBRATORY COMPACTOR OVER THE TOP OF THE PIPE UNTIL THE FULL DEPTH OF THE PIPE ZONE MATERIAL HAS BEEN PLACED. ENSURE THAT FIRM SUPPORT IS OBTAINED IN THE AREA OF THE PIPE ZONE FROM THE INVERT TO THE SPRING LINE TO PREVENT ANY LATERAL MOVEMENT OF THE PIPE DURING FINAL BACKFILLING OF THE PIPE ZONE.
4. TRENCH BACKFILL ABOVE PIPE ZONE: IN TRENCHES UNDER ALL SLABS, SIDEWALKS, PAVED ROADS, AND PARKING AREAS, PIPING, AND SIMILAR FACILITIES, DEPOSIT EARTHFILL IN HORIZONTAL LIFTS NOT EXCEEDING 6 INCHES IN UNCOMPACTED THICKNESS. COMPACT TO NOT LESS THAN 95 PERCENT RELATIVE COMPACTION. REPAIR ANY SUBSEQUENT DAMAGE CAUSED BY SETTLEMENT OF TRENCHES AT THE CONTRACTOR'S SOLE EXPENSE. IN OTHER AREAS, THE EXCAVATED TRENCH MATERIAL MEETING THE REQUIREMENTS OF EARTHFILL MAY BE USED FOR BACKFILL. PLACE THE BACKFILL MATERIAL IN 8-INCH MAXIMUM LOOSE LIFTS AND COMPACT TO 90 PERCENT RELATIVE COMPACTION. AFTER EACH SECTION OF TRENCH IS BACKFILLED, CONTRACTOR SHALL MAINTAIN THE SURFACE OF THE BACKFILLED TRENCH EVEN WITH ADJACENT GROUND SURFACE UNTIL FINAL SURFACE RESTORATION IS COMPLETED. PROVIDE GRAVEL SURFACING AS A TEMPORARY SURFACE IN ALL PAVED AREAS UNTIL FINAL RESTORATION IS COMPLETE. SETTLEMENT OF TRENCH BACKFILL WILL BE CONSIDERED A RESULT OF DEFECTIVE COMPACTION OF TRENCH BACKFILL, AND SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.
5. REPLACEMENT OF TOPSOIL: CONTRACTOR SHALL REPLACE TOPSOIL IN TOP 6 INCHES OF BACKFILLED TRENCH. CONTRACTOR SHALL MAINTAIN THE FINISHED GRADE OF TOPSOIL EVEN WITH ADJACENT AREA AND GRADE AS NECESSARY TO RESTORE DRAINAGE.
6. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING GRADATION AND COMPACTION BY USE OF AN INDEPENDENT TESTING LABORATORY. RELATIVE COMPACTION IS THE RATIO, IN PERCENT, OF THE AS-COMPACTED FIELD DRY DENSITY TO THE LABORATORY MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D698.
7. SAND SHALL BE USED AS BACKFILL AROUND ALL PIPING AND CONDUITS. A MINIMUM OF 6 INCHES SHALL BE UNDER THE PIPE, AND A MINIMUM OF 12 INCHES SHALL BE OVER THE PIPE.

DSGN	J. WATERS	2-1	7/14/01	ABANDONMENT PRODCEDURES FOR AT-1A AND AT-4	
DR	D. BELLARD-BENNETT				
CHK	K. LANGE				
APVD		NO.	DATE	REVISION	BY / APVD

BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

CH2MHILL

NIROP FRIDLEY
GROUNDWATER EXTRACTION SYSTEM
FRIDLEY, MN

GENERAL

NOTES AND SPECIFICATIONS

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8. FOR EXCAVATIONS IN EXISTING VEGETATED AREAS, CONTRACTOR SHALL STOCKPILE THE TOPSOIL FOR REUSE. WHERE PLACED, THE MINIMUM THICKNESS OF TOPSOIL SHALL BE 6 INCHES. SEED TOPSOIL AREAS IN ACCORDANCE WITH THE MINNESOTA GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL.

9. ALL AREAS DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO THEIR ORIGINAL STATE.

10. INSTALL EROSION AND SEDIMENT CONTROL DEVICES, INCLUDING, BUT NOT LIMITED TO, SILT FENCE AND STORM DRAIN INLET PROTECTION TO CONTROL EROSION AND SEDIMENT RELEASES, AND TO PROTECT THE WORK AND EXISTING FACILITIES FROM FLOODING DURING THE CONSTRUCTION PERIOD. LENGTH OF OPEN PIPE TRENCHES SHALL BE LIMITED TO THAT WHICH WILL BE BACKFILLED AND STABILIZED WITHIN ONE WORKING DAY. PLUG OPEN PIPE ENDS BEFORE BACKFILLING AT THE END OF EACH DAY. EROSION AND SEDIMENT CONTROL SHALL BE IN CONFORMANCE WITH THE MINNESOTA GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL.

11. FINISH GRADES: SLOPE FINISH GRADES AWAY FROM STRUCTURES AT A MINIMUM 2% SLOPE.

12. IDENTIFICATION TAPE: 6-INCHES WIDE TERRA TAPE AS SUPPLIED BY REEF INDUSTRIES, P.O. BOX 33284, HOUSTON, TEXAS 77033: OR EQUAL. FOR NON-METALLIC UTILITIES AND PIPES, THE TAPE SHALL BE METALLIC. THE TAPE SHALL READ "CAUTION BURIED INSTALLATION BELOW" OR SHALL IDENTIFY THE APPROPRIATE UTILITY. PLACE IDENTIFICATION TAPE OVER ALL BURIED CONDUIT AND PIPING. PLACE TAPE 3 FEET ABOVE THE TOP OF THE PIPE OR 2 FEET BELOW FINISHED GRADE, WHICHEVER IS LOWER. PLACE TAPE OVER THE CENTER OF THE PIPE.

13. HORIZONTAL BORING:
UNDERGROUND, HORIZONTAL, BORING TECHNIQUES TO ADVANCE APPROPRIATELY SIZED BOREHOLES, AT DEPTHS SPECIFIED IN THE DRAWINGS WERE USED TO INSTALL THE NEW GROUNDWATER EXTRACTION LINES. A SMALL EXCAVATION AT THE BEGINNING AND END OF THE BOREHOLE RUN WAS DUG, THE BORING WAS THEN ADVANCED, GROUNDWATER EXTRACTION LINES AND ELECTRICAL CONDUIT WAS PULLED THROUGH THE HOLE AS THE BORING TOOL WAS WITHDRAWN. ONLY ONE BOREHOLE WAS ADVANCED PER STRETCH BACK TO BUILDING 52/53. ALL GELS AND CONDUIT FOR THE STRETCH WERE RUN THROUGH THE SAME BOREHOLE. 3-1

SURFACE RESTORATION

1. PIPE TRENCHES CUT ACROSS BITUMINOUS CONCRETE PAVEMENTS SHALL BE BACKFILLED WITH EARTHFILL MATERIAL AND COMPACTED IN 6-INCH LIFTS TO NOT LESS THAN 95 PERCENT OF THE MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D1557. BRING THE TRENCH TO A SMOOTH, EVEN GRADE AT THE CORRECT DISTANCE BELOW THE TOP OF THE EXISTING PAVEMENT SURFACE TO PROVIDE ADEQUATE SPACE FOR THE BASE COURSE AND PAVEMENT. TRIM EXISTING PAVEMENT TO A STRAIGHT LINE. COMPACT SUBGRADE TO 95 PERCENT OF RELATIVE COMPACTION TO A DEPTH OF 12 INCHES. PLACE SUFFICIENT BASE COURSE ON THE SUBGRADE TO OBTAIN A THICKNESS OF 6 INCHES AFTER COMPACTION. COMPACT BASE COURSE TO 95 PERCENT OF RELATIVE COMPACTION. APPLY ASPHALT TACK COAT AFTER THE BASE COURSE HAS BEEN COMPACTED AT 0.03 TO 0.10 GALLONS PER SQUARE YARD. BITUMINOUS CONCRETE SHALL BE PLACED OVER THE TRENCH TO A DEPTH OF NOT LESS THAN 6 INCHES OR THE DEPTH OF ADJACENT PAVEMENT, WHICHEVER IS GREATER. BITUMINOUS CONCRETE, SUBGRADE, BASE COURSE AND TACK COAT SHALL BE PLACED AND COMPACTED IN ACCORDANCE WITH THE MINNESOTA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR CONSTRUCTION. BITUMINOUS CONCRETE PAVEMENT SHALL BE IN ACCORDANCE WITH THE MINNESOTA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR CONSTRUCTION. BASE COURSE SHALL BE PROCESSED AGGREGATE BASE CONFORMING TO MINNESOTA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR CONSTRUCTION. TACK COAT SHALL BE LIQUID ASPHALT CONFORMING TO THE MINNESOTA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR CONSTRUCTION.

CONCRETE

1. READY MIX MEETING ASTM C94-90, OPTION A. USE PORTLAND CEMENT CONFORMING TO ASTM C150-89, TYPE II.

2. ADMIXTURES: AIR-ENTRAINING ADMIXTURE SHALL BE IN ACCORDANCE WITH ASTM C260-86. WATER-REDUCING ADMIXTURE SHALL BE IN ACCORDANCE WITH ASTM C494-90, TYPE A OR D. SUPERPLASTICIZERS SHALL BE IN ACCORDANCE WITH ASTM C494-90, TYPE F OR G. FLY ASH SHALL BE IN ACCORDANCE WITH ASTM C618-91, CLASS C OR F.

3. MIX DESIGN: MINIMUM 28-DAY COMPRESSIVE STRENGTH 4,000 PSI WHEN CURED AND TESTED IN ACCORDANCE WITH ASTM C31-90A AND C39-86. SLUMP RANGE SHALL BE 3 TO 5 INCHES. AIR ENTRAINMENT SHALL BE 3 TO 6 PERCENT BY VOLUME. MAXIMUM WATER/CEMENT RATIO SHALL BE 0.41. PROVIDE A MINIMUM OF 540 POUNDS OF CEMENT PER CUBIC YARD. USE WATER REDUCING ADMIXTURE IN CONCRETE WITHOUT PLASTICIZERS. USE 1-INCH MAXIMUM SIZE AGGREGATE MEETING GRADATION AND OTHER REQUIREMENTS OF ASTM C33. AGGREGATES SHALL BE NON-REACTIVE AS DEFINED IN APPENDIX XI OF ASTM C33.

4. PLACING CONCRETE: PLACE CONCRETE IN ACCORDANCE WITH ACI 301-89. PRIOR TO PLACING CONCRETE, REMOVE WATER FROM EXCAVATION AND DEBRIS AND FOREIGN MATERIAL FROM FORMS. BEFORE PLACING NEW CONCRETE ON OLD CONCRETE, CLEAN SURFACE USING SANDBLAST OR BUSHHAMMER OR OTHER MECHANICAL MEANS TO OBTAIN A 1/44-INCH ROUGH PROFILE, AND POUR A CEMENT-SAND GROUT TO MINIMUM DEPTH OF 1/2-INCH OVER THE SURFACE. PROPORTION 1 PART CEMENT TO 2.5 PARTS SAND BY WEIGHT. PLACE CONCRETE IN LAYERS NOT OVER 2 FEET DEEP.

5. COMPACTION: VIBRATE CONCRETE UNTIL CONCRETE BECOMES UNIFORMLY PLASTIC. VIBRATOR MUST PENETRATE FRESH PLACED CONCRETE AND INTO PREVIOUS LAYER OF FRESH CONCRETE BELOW.

6. PROTECTION AND CURING: PROTECT FRESH CONCRETE FROM DIRECT RAYS OF SUNLIGHT, DRYING WIND, AND RAIN. KEEP CONCRETE CONTINUOUSLY WET FOR A PERIOD OF 7 DAYS.

7. ACCEPTANCE AND EVALUATION OF CONCRETE STRENGTH SHALL BE IN ACCORDANCE WITH ACI 318.

METALS

1. STRUCTURAL STEEL: ASTM A36 ALL-PURPOSE CARBON GRADE STEEL. CONSTRUCT IN ACCORDANCE WITH AISC SPECIFICATIONS FOR STRUCTURAL STEEL BUILDINGS.

INSTALLATION OF EQUIPMENT

1. CONTRACTOR SHALL INSTALL EQUIPMENT ACCORDING TO MANUFACTURER'S WRITTEN RECOMMENDATIONS.

2. CONTRACTOR SHALL HAVE COMPLETE RESPONSIBILITY FOR STORING, HANDLING, INSTALLING, ADJUSTING, MAINTAINING, LUBRICATING, TESTING, AND OPERATIONAL STARTUP OF EQUIPMENT.

3. PROVIDE PRODUCTS REQUIRED TO COMPLETE THE INSTALLATION OF EQUIPMENT. SUCH PRODUCTS INCLUDE, BUT ARE NOT LIMITED TO CONCRETE PADS AND ANCHOR BOLTS. FURNISH INCIDENTAL PRODUCTS, SUCH AS GASKETS, SUPPORTS, BOLTS, AND LUBRICANTS, AS SHOWN AND AS REQUIRED FOR PROPER OPERATION OF EQUIPMENT.

MISCELLANEOUS EQUIPMENT

1. INSTALL A MECHANICAL PACKER IN THE SCREENED INTERVAL OF EXTRACTION WELL AT-3A AS SPECIFIED IN THE STATEMENT OF WORK.

2. PRESSURE GAUGES: PRESSURE GAUGES SHALL HAVE A 6-INCH DIAL. GUAGES SHALL HAVE 316 STAINLESS STEEL BOURDON TUBE AND SOCKET. GAUGE SHALL BE STEM MOUNTED WITH A 1/2 INCH NPT CONNECTION. GAUGES SHALL HAVE A RANGE OF 0 TO 70 FEET OF WATER. GAUGES SHALL BE ASHCROFT TYPE 2462 GAUGES OR APPROVED EQUAL. DIAPHRAGM SEAL HOUSING SHALL BE CONSTRUCTED OF 316 STAINLESS STEEL AND SHALL HAVE A 316 STAINLESS STEEL DIAPHRAGM. DIAPHRAGM SEALS SHALL BE ASHCROFT TYPE 100 OR APPROVED EQUAL.

PIPING AND FITTINGS

1. POLYVINYL CHLORIDE (PVC): PROVIDE PVC PIPE, FITTINGS, SUPPORTS, AND ACCESSORIES REQUIRED FOR A COMPLETE INSTALLATION AS SHOWN ON THE DRAWINGS. INSTALL PVC PIPING IN ACCORDANCE WITH MANUFACTURER'S WRITTEN RECOMMENDATIONS. PIPE SHALL BE SCHEDULE 80 PVC, TYPE I, GRADE I OR CLASS 12454-B CONFORMING TO ASTM D1784-92 AND ASTM D1785-93. FITTINGS SHALL BE SCHEDULE 80 PVC SOCKET-WELD TYPE CONFORMING TO ASTM D2466-94 AND ASTM D2467-93 OR SCHEDULE 80 PVC THREADED TYPE CONFORMING TO ASTM D2464-93. JOINTS SHALL BE SOLVENT SOCKET-WELD EXCEPT WHERE CONNECTION TO VALVES AND EQUIPMENT MAY REQUIRE FUTURE DISASSEMBLY. CONNECTIONS TO VALVES AND EQUIPMENT SHALL BE FLANGED OR THREADED AS REQUIRED TO MATCH THE VALVE OR EQUIPMENT CONNECTION. THREADED JOINTS SHALL HAVE NPT TAPER PIPE THREADS IN ACCORDANCE WITH ANSI B1.20.1-83. FLANGES SHALL BE ONE PIECE, MOLDED HUB TYPE PVC FLAT FACE FLANGE IN ACCORDANCE WITH FITTINGS ABOVE. FLANGES SHALL HAVE 125-POUND ANSI B16.1-89 DRILLING. BOLTING SHALL BE ASTM A193/A193M REV A-94 TYPE 316 STAINLESS STEEL GRADE 8M HEX HEAD BOLTS AND ASTM A194/A194M-94 GRADE 8M HEX HEAD NUTS FOR FLAT FACE MATING FLANGES OR IN CORROSIVE AREAS. BOLTING SHALL BE CARBON STEEL ASTM A307-94 GRADE B SQUARE HEAD BOLTS AND ASTM A563-93 GRADE A HEAVY HEX HEAD NUTS FOR RAISED FACE MATING FLANGES. GASKETS SHALL BE FULL FACED 1/8-INCH THICK ETHYLENE PROPYLENE (EPR) RUBBER FOR FLAT FACE MATING FLANGES. GASKETS SHALL BE FLAT RING 1/8-INCH THICK ETHYLENE PROPYLENE (EPR) RUBBER, WITH FILLER GASKET BETWEEN OUTER DIAMETER OF RAISED FACE AND FLANGE OD TO PROTECT THE FLANGE FROM BOLTING MOMENT, FOR RAISED FACE MATING FLANGES. SOLVENT CEMENT SHALL BE AS RECOMMENDED BY THE PIPE AND FITTING MANUFACTURER AND SHALL CONFORM TO ASTM D2564-93. THREAD LUBRICANT SHALL BE TEFLON TAPE.

2. CARBON STEEL PIPING: PROVIDE CARBON STEEL PIPE, FITTINGS, SUPPORTS, AND ACCESSORIES REQUIRED FOR A COMPLETE INSTALLATION AS SHOWN ON THE DRAWINGS. INSTALL CARBON STEEL PIPING IN ACCORDANCE WITH MANUFACTURER'S WRITTEN RECOMMENDATIONS. PIPE SHALL BE SCHEDULE 40 BLACK CARBON STEEL, ASTM A106, GRADE B SEAMLESS OR ASTM A53 REV A, GRADE B SEAMLESS OR ERW. JOINTS SHALL BE BUTT-WELDED OR FLANGED AT VALVES AND EQUIPMENT. FITTINGS SHALL BE WROUGHT CARBON STEEL BUTT-WELDING, ASTM A234/A234M, GRADE WPB MEETING THE REQUIREMENTS OF ANSI B16.9. FITTING WALL THICKNESS TO MATCH ADJOINING PIPE. USE LONG RADIUS ELBOWS UNLESS SHOWN OTHERWISE. FLANGES SHALL BE FORGED CARBON STEEL, ASTM A105/A105M, ANSI B16.5 CLASS 150 OR CLASS 300 SLIP-ON OR WELDING NECK, 1/16-INCH RAISED FACE. WELD NECK BORE TO MATCH PIPE INTERNAL DIAMETER. USE WELD NECK FLANGES WHEN ABUTTING BUTT-WELD FITTINGS. CAST IRON MATING FLANGES SHALL BE AWWA C207, CLASS D OR E, HUB OR RING TYPE, ANSI B16.1, 125-POUND DRILLING, AWWA C207 CLASS F HUB TYPE OR ASTM A105/A105M, ANSI B16.5 CLASS 300-POUND, DRILLING. FLANGE BOLTING SHALL BE CARBON STEEL ASTM A307, GRADE A HEX HEAD BOLTS AND ASTM A563, GRADE A HEX HEAD NUTS. GASKETS SHALL BE 1/16 INCH THICK, COMPRESSED INORGANIC FIBER WITH NITRILE BINDER, RATED TO 700 DEGREES F AND 1000 PSI. BLIND FLANGES SHALL BE GASKETED COVERING THE ENTIRE INSIDE FACE WITH THE GASKET CEMENTED TO THE BLIND FLANGE.

3. STEEL PIPING FOR PIPE CASING: PIPE FOR PIPE CASING SHALL BE SCHEDULE 40 BLACK CARBON STEEL, ASTM A106, GRADE B SEAMLESS OR ASTM A53 REV A, GRADE B SEAMLESS OR ERW.

4. TESTING: CONDUCT PRESSURE AND LEAKAGE TESTS ON ALL NEWLY INSTALLED PIPELINES. FURNISH ALL NECESSARY EQUIPMENT AND MATERIAL AND MAKE ALL CONNECTIONS TO THE PIPE, AS REQUIRED. THE OWNER WILL MONITOR THE TESTS. TEST PRESSURE SHALL BE 100 PSIG. ALL LINES SHALL BE HYDRAULICALLY TESTED. NEW PIPELINES, WHICH ARE TO BE CONNECTED TO EXISTING PIPELINES, SHALL BE TESTED BY ISOLATING THE NEW PIPE WITH GROOVED END PIPE CAPS, SPECTACLE BLINDS OR BLIND FLANGES.

DSGN	J. WATERS	3-1	7/14/01	HORIZONTAL BORING TECHNIQUE		
DR	D. BELLARD-BENNET					
CHK	K. LANGE					
APVD		NO.	DATE	REVISION	BY	APVD

BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
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CH2MHILL

NIROP FRIDLEY
GROUNDWATER EXTRACTION SYSTEM
FRIDLEY, MN

GENERAL

NOTES AND SPECIFICATIONS

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5. INSULATION: ALL INTERIOR PIPING AND EXTERIOR ABOVE-GRADE PIPING SHALL BE INSULATED.

FOR INTERIOR PIPING INSULATION MATERIAL SHALL BE UL RATED, PREFORMED, SECTIONAL RIGID FIBERGLASS WITH FACTORY APPLIED, KRAFT PAPER WITH ALUMINUM FOIL VAPOR BARRIER JACKET WITH PRESSURE-SENSITIVE, SELF-SEALING LAP. TEMPERATURE RATING SHALL BE ZERO TO 850 DEGREES F. CONDUCTIVITY SHALL BE IN ACCORDANCE WITH ASHRAE 90.1 AND A MINIMUM OF 0.27 BTU-IN/HR-FT2 DEGREES F. MINIMUM WATER VAPOR TRANSMISSION FOR JACKET SHALL BE 0.02 PERM-INCH PER ASTM E96. JOINTS SHALL BE MATCHING PRESSURE-SENSITIVE BUTT STRIPS FOR SEALING CIRCUMFERENTIAL JOINTS. FITTINGS SHALL BE WIRED IN-PLACE PREMOLDED INSULATION OR MITERED SEGMENTS, OR SOFT FIBERGLASS INSULATION INSERTS COVERED WITH PREMOLDED 20-MIL MINIMUM THICKNESS PVC FITTING COVERS. INSTALL PVC FITTING COVERS ON INSULATED INTERIOR PIPING. INSULATION SHALL BE ASJ/SSL-11 AS MANUFACTURED BY OWENS-CORNING FIBERGLASS; MICRO-LOCK 650 WITH AP-T JACKET AS MANUFACTURED BY MANVILLE; OR APPROVED EQUAL.

FOR EXTERIOR ABOVE-GRADE PIPING INSULATION MATERIAL SHALL BE CELLULAR GLASS. TEMPERATURE RATING SHALL BE MINUS 290 DEGREES F TO 900 DEGREES F. INSULATION SHALL BE FOAMGLAS AS MANUFACTURED BY PITTSBURGH CORNING; OR APPROVED EQUAL. INSTALL ALUMINUM JACKET ON EXTERIOR ABOVE-GRADE PIPING AND FITTINGS. ALUMINUM JACKET SHALL BE 0.016 INCH THICK. JACKET FITTINGS SHALL BE PREFORMED ALUMINUM JACKETS, TWO-PIECE ELBOWS AND FLANGE COVERS, SECURED WITH STAINLESS STEEL BANDS.

INSTALL INSULATIONS IN ACCORDANCE WITH MANUFACTURER'S DIRECTIONS BASED UPON TEMPERATURE OF PIPING TO BE INSULATED. INSULATE VALVE BODIES, FLANGES, AND PIPE COUPLINGS. INSTALL INSULATION AFTER PIPING SYSTEM HAS BEEN PRESSURE TESTED AND LEAKS CORRECTED. APPLY INSULATION OVER CLEAN FINISH PAINTED AND DRY SURFACES.

6. HIGH DENSITY POLYETHYLENE (HDPE): HDPE PIPE WAS USED FOR THE UNDERGROUND PORTION OF THE GROUNDWATER EXTRACTION LINES AS SHOWN ON THE DRAWINGS. THE HDPE COMPLIES WITH ASTM F 714 (PIPE) ASTM D 3261 (FITTINGS), ASTM D 3350-345444C, AND HAS A PPI DESIGNATION OF PE3408. THE PIPE AND FITTINGS WERE JOINED USING HEAT FUSION TECHNIQUES. 4-1

VALVES

1. GENERAL: VALVES SHALL INCLUDE OPERATOR AND ALL ACCESSORIES NECESSARY FOR A COMPLETE INSTALLATION. VALVE SHALL BE THE SAME SIZE AS ADJACENT PIPING. OPERATOR SHALL BE SIZED TO OPERATE VALVE FOR THE FULL RANGE OF PRESSURES AND VELOCITIES. VALVE TO OPEN BY TURNING COUNTERCLOCKWISE. FACTORY MOUNT OPERATOR, ACTUATOR, AND ACCESSORIES.

2. BUTTERFLY VALVES: VALVES SHALL BE LUGGED BODY TYPE. VALVES SHALL MODEL 52AHH71 AS MANUFACTURED BY MUELLER STEAM SPECIALTY; OR APPROVED EQUAL.

3. BALL VALVES: BALL VALVES SHALL HAVE STAINLESS STEEL BODY, BALL, AND STEM. VALVES SHALL BE TOP-ENTRY TYPE AND SHALL BE RATED 150-POUND WOG, WITH FLANGED ENDS. SEAT, BODY SEAL, AND STEM PACKING SHALL BE REINFORCED TFE. VALVES SHALL HAVE LEVER OPERATORS. VALVES SHALL BE CONBRACO INDUSTRIES, APOLLO TOP-ENTRY FLANGED SERIES; McCANNA CO., McCANNASEAL; OR APPROVED EQUAL.

DSGN	J. WATERS	4-1	7/14/01	HIGH DENSITY POLYETHYLENE SPECIFICATIONS		
DR	D. BELLARD-BENNETT					
CHK	K. LANGE					
APVD		NO.	DATE	REVISION	BY	APVD

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NIROP FRIDLEY
GROUNDWATER EXTRACTION SYSTEM
FRIDLEY, MN

GENERAL
NOTES AND SPECIFICATIONS

SHEET	4
DWG NO.	G-3
DATE	FEB 2001
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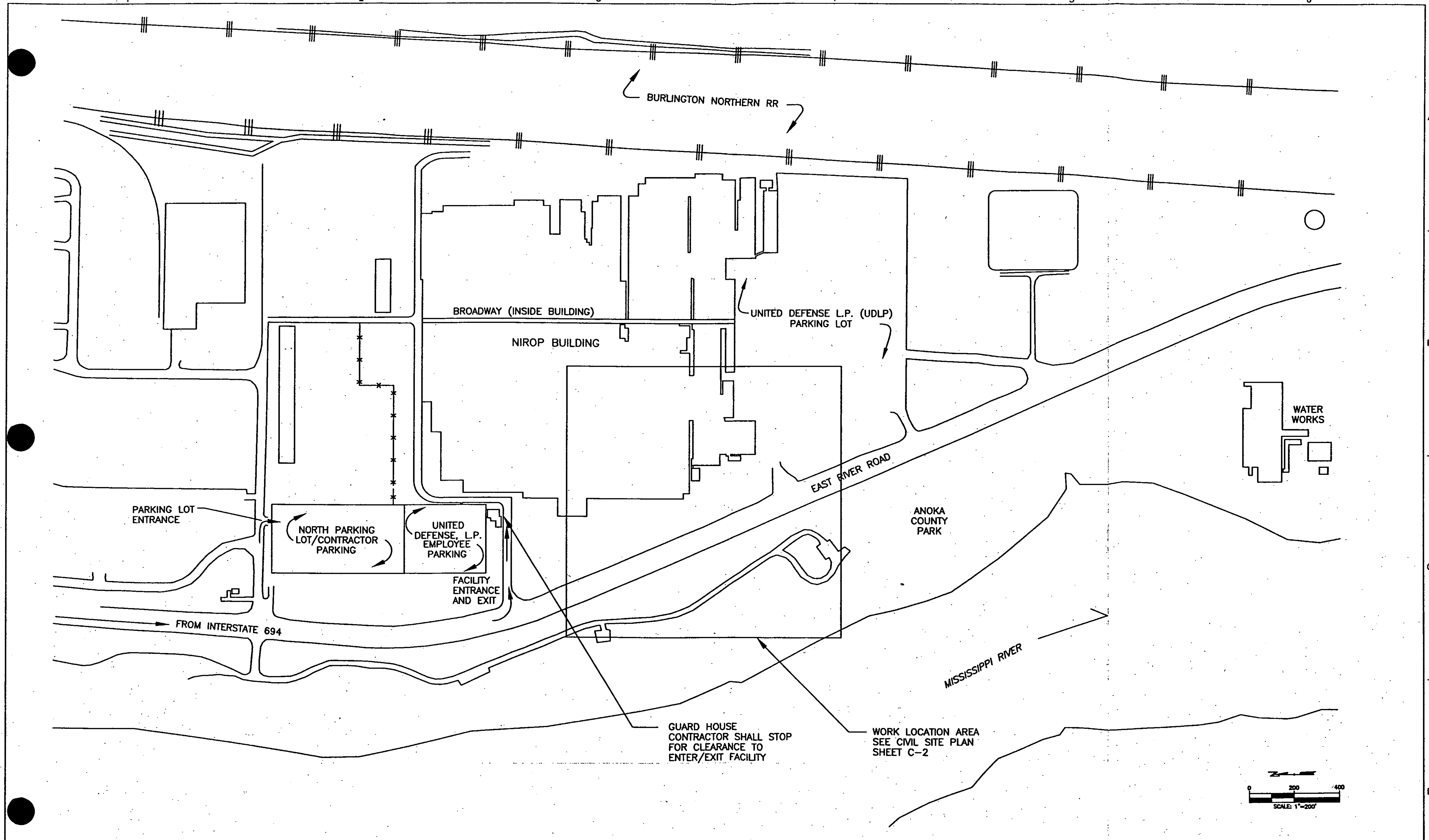

DSGN	J. WATERS				
DR	D. BELLARD-BENNET				
CHK	K. LANGE				
APVD					
	NO.	DATE	REVISION	BY	APVD

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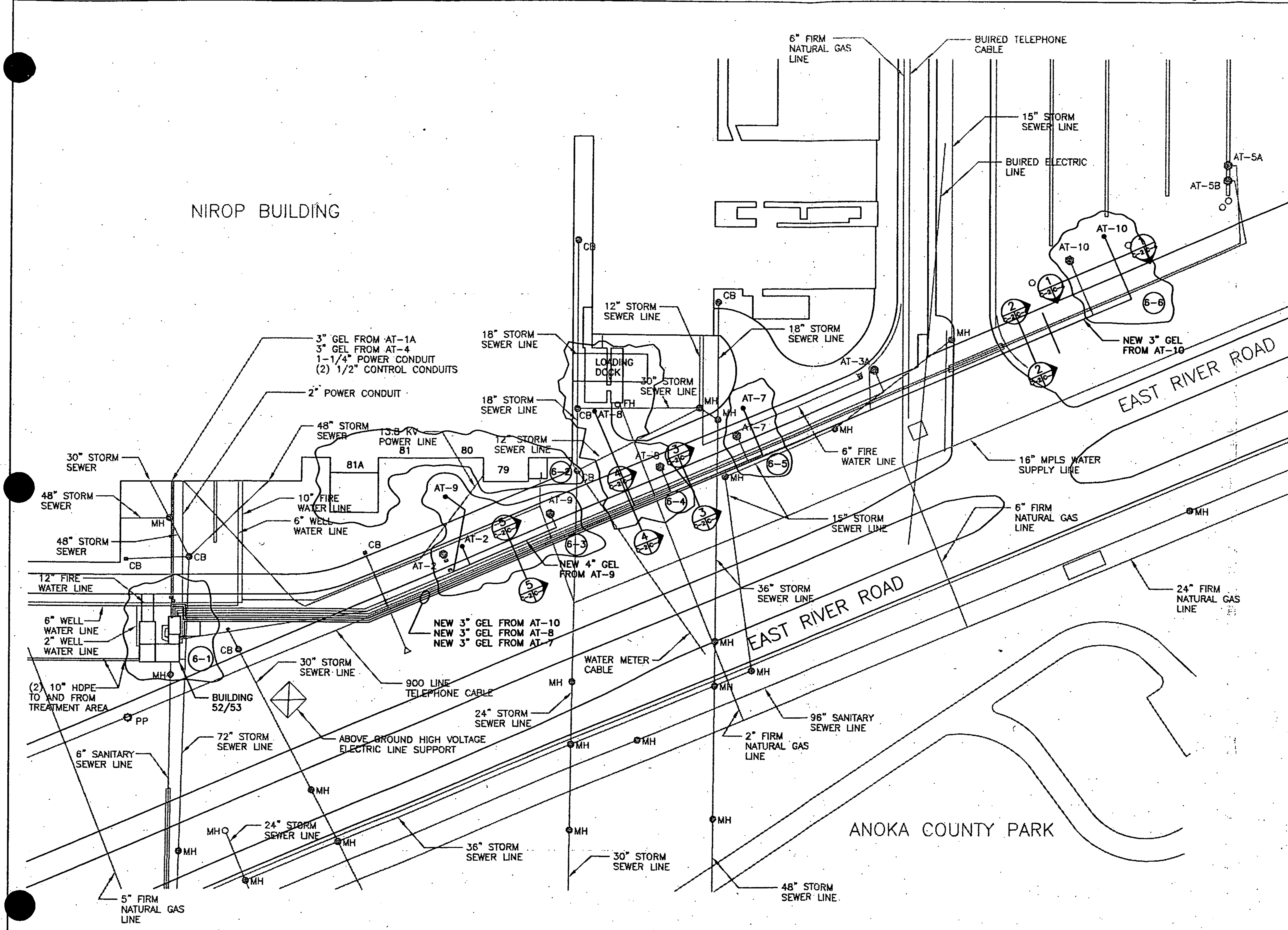
NIROP FRIDLEY
GROUNDWATER EXTRACTION SYSTEM
FRIDLEY, MN

CIVIL
SITE PLAN

SHEET	5
DWG	C-1
DATE	FEB 2001
PROJ	153691.31.01.03.30



NOTES:

1. UTILITY LOCATIONS BASED ON THE FOLLOWING DRAWINGS:
   - "NIROP, GROUNDWATER EXTRACTION SYSTEM", AS-BUILT PLAN SET, DATED APRIL 1993, U.S. ARMY CORPS OF ENGINEERS
   - "RECORD DRAWING – FIREMAIN AND WATER MAIN PLAN", FMC CORP., NAVAL SYSTEMS DIVISION, RECEIVED FROM UNITED DEFENSE ON 9/26/96
   - "RECORD DRAWING – GAS DISTRIBUTION PIPING FOR FIRM GAS, INTERRUPTABLE GAS AND PROPANE", FMC CORP., NAVAL SYSTEMS DIVISION, 2/15/92
   - "PLUMBING PLAN", U.S. NAVY-NORD (F)1349, 2/15/48
   - "FY-1990 STORM SEWER DESIGN, EXISTING STORM SEWER PLAN", FMC CORP., NAVAL SYSTEMS DIVISION, 10/17/91
   - "FY-1990 DRAINAGE UPGRADE – NORTH 40 AREA SITE PLAN", FMC CORP., NAVAL SYSTEMS DIVISION, 7/31/91
   - "HAZARDOUS WASTE STORAGE AREA, PERMIT "B", APPLICATION, STORM AND SANITARY SEWER LOCATION MAP", FMC CORP., NORTHERN ORDNANCE DIVISION 3/7/83
   - "1995 UTILITIES UPGRADE, PART "C" – MANHOLE REPAIR, MANHOLE LOCATION PLAN AND SCHEDULE", UNITED DEFENSE, ARMAMENT SYSTEMS DIVISION, 5/16/96
   - "RECORD DRAWING – STORM SEWER PLAN", UNITED DEFENSE, ARMAMENT SYSTEMS DIVISION, 5/8/95
2. BASE MAP FROM "INTERIOR FEATURES SURVEY, FMC-4800 EAST RIVER ROAD – MINNEAPOLIS, MN", KEMPER AND ASSOCIATES, INC., FMC CORP., NAVAL SYSTEMS DIV., JUNE 1993.
3. LOCATIONS OF EXISTING UTILITIES ARE APPROXIMATE AS SHOWN. DOCUMENT LOCATIONS PRIOR TO START OF CONSTRUCTION.

		NO.	DATE	REVISION	BY	APVD
DSGN	J. WATERS	6-1	7/14/01	BUILDING 52/53 OUTLINE AND PIPING ENTRANCE		
		6-2	7/14/01	BUILDING OUTLINE		
DR	D. BELLARD-BENNETT	6-3	7/14/01	AT-9 AND AT-2 LOCATIONS		
		6-4	7/14/01	AT-8 LOCATION		
CHK	K. LANGE	6-5	7/14/01	AT-7 LOCATION		
APVD		6-6	7/14/01	AT-10 LOCATION		

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NIROP FRIDLEY
GROUNDWATER EXTRACTION SYSTEM
FRIDLEY, MN

CIVIL

PARTIAL YARD PIPING PLAN

SHEET	6
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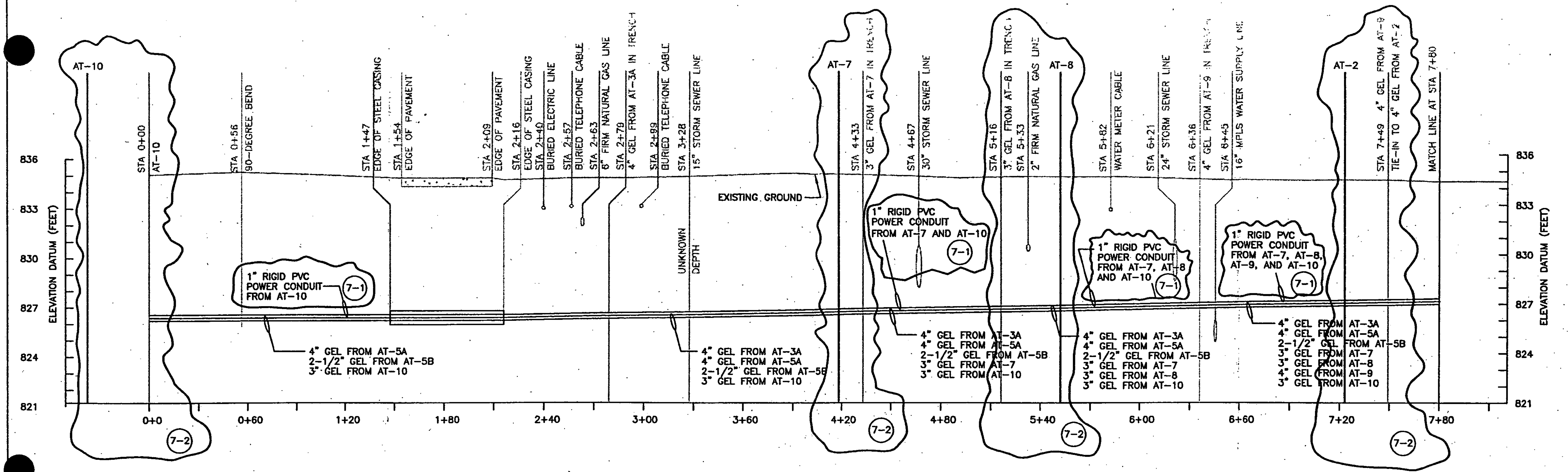
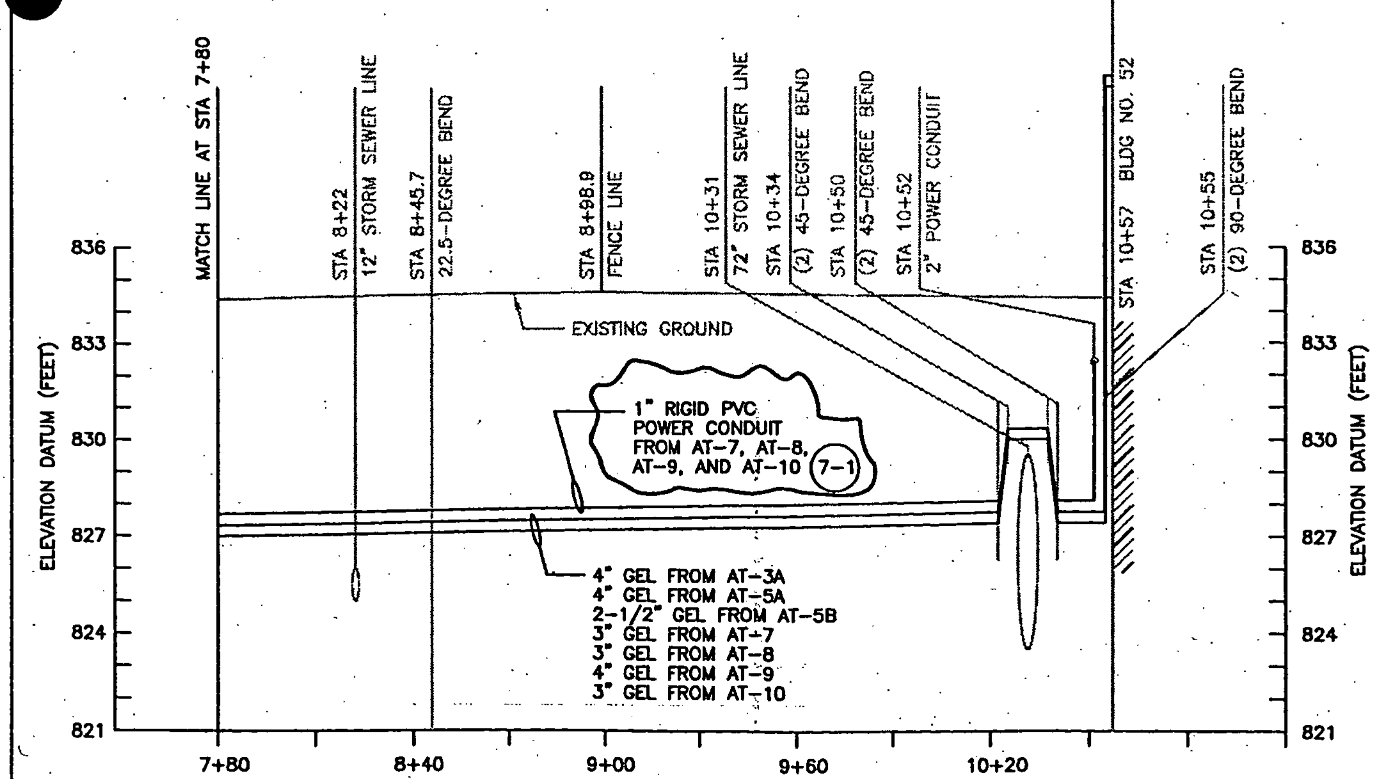


SCALE: HORIZ: 1"=30'
VERT: 1"=3'



SCALE: HORIZ: 1"=30'
VERT: 1"=3'

NOTES

1. DEPTH OF EXISTING UTILITIES BASED ON THE FOLLOWING DRAWINGS:
   - "NIROP, GROUNDWATER EXTRACTION SYSTEM", AS-BUILT PLAN SET, DATED APRIL 1993, U.S. ARMY CORPS OF ENGINEERS.
   - FY-1990 STORM SEWER DESIGN, EXISTING STORM SEWER PLAN", FMC CORP., NAVAL SYSTEMS DIVISION, 10/17/91.
   - "NIROP ,FRIDLEY, GROUNDWATER EXTRACTION SYSTEM, EXTRACTION WELLS AT-5A AND AT-5B", RMT, INC., APRIL 1995.
2. LOCATE UTILITIES WITH UNKNOWN DEPTH AND/OR UNKNOWN LOCATIONS BY HAND EXCAVATION PRIOR TO EXCAVATION AND/OR ADVANCEMENT OF DIRECTIONAL BORINGS. (7-3)
3. NEW POWER CONDUIT AND AT-10 GEL NOT INSTALLED IN STEEL CASING. (7-4)

NO.	DATE	REVISION	BY	APVD
7-1	7/14/01	1" PVC CODUIT FOR WIRING ALL NEW WELLS		
7-2	7/14/01	AT-10, AT-7, AT-8, OR AT-9 LOCATION		
7-3	7/14/01	DIRECTIONAL BORING USED NOT TRENCHING		
7-4	7/14/01	NEW POWER CONDUIT AND AT-10 GEL NOT IN STEEL CASING		

DSGN J. WATERS
DR D. BELLARD-BENNETT
CHK K. LANCE
APVD

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NIROP FRIDLEY
GROUNDWATER EXTRACTION SYSTEM
FRIDLEY, MN

CIVIL

MAIN GEL TRENCH PROFILE

SHEET	7
DWG NO.	C-3
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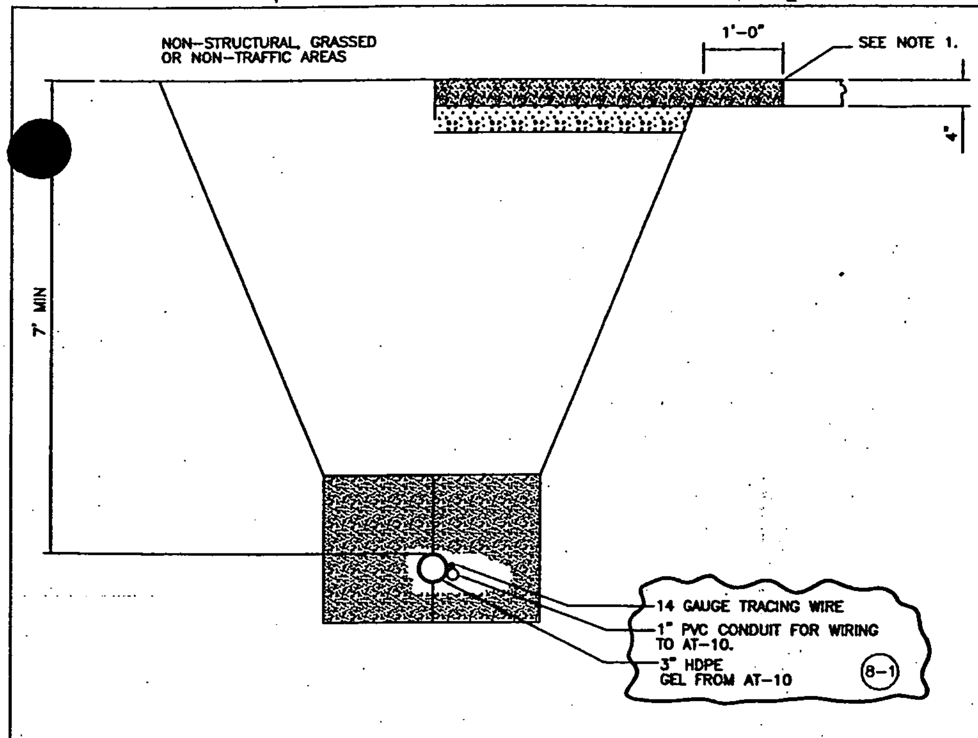
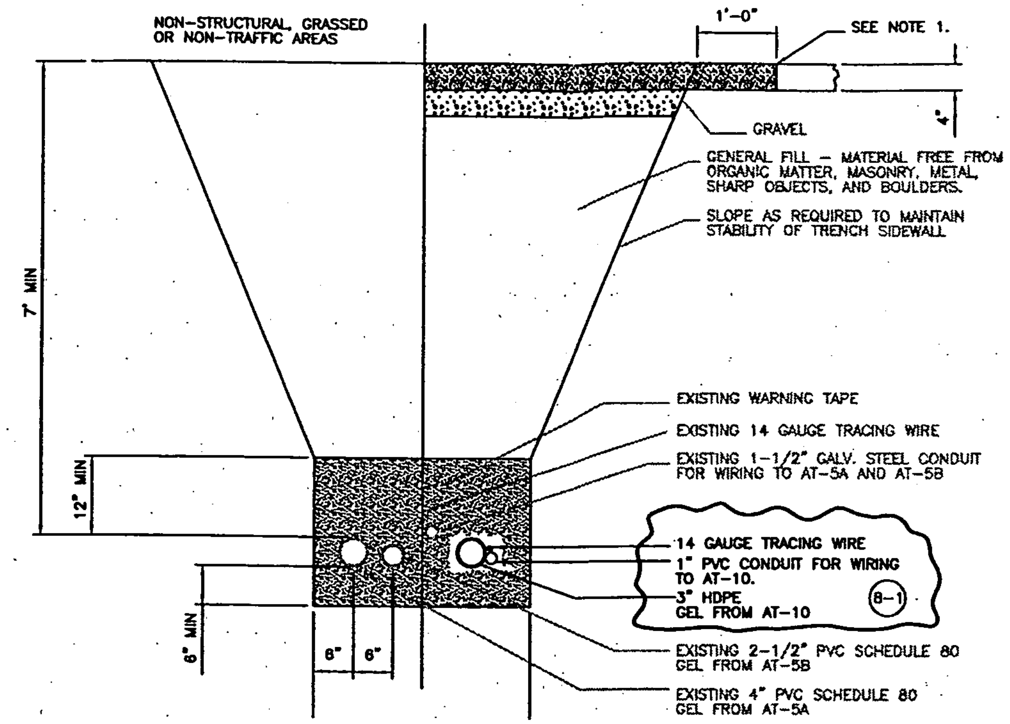
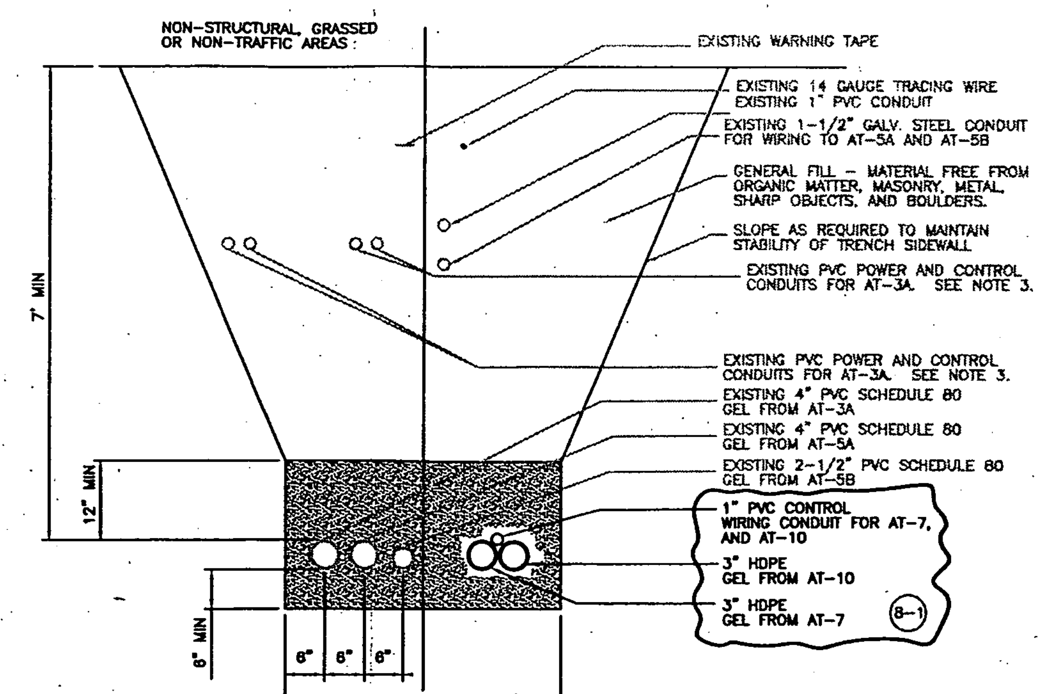
PROJ NO.	153691.31.01.03.30



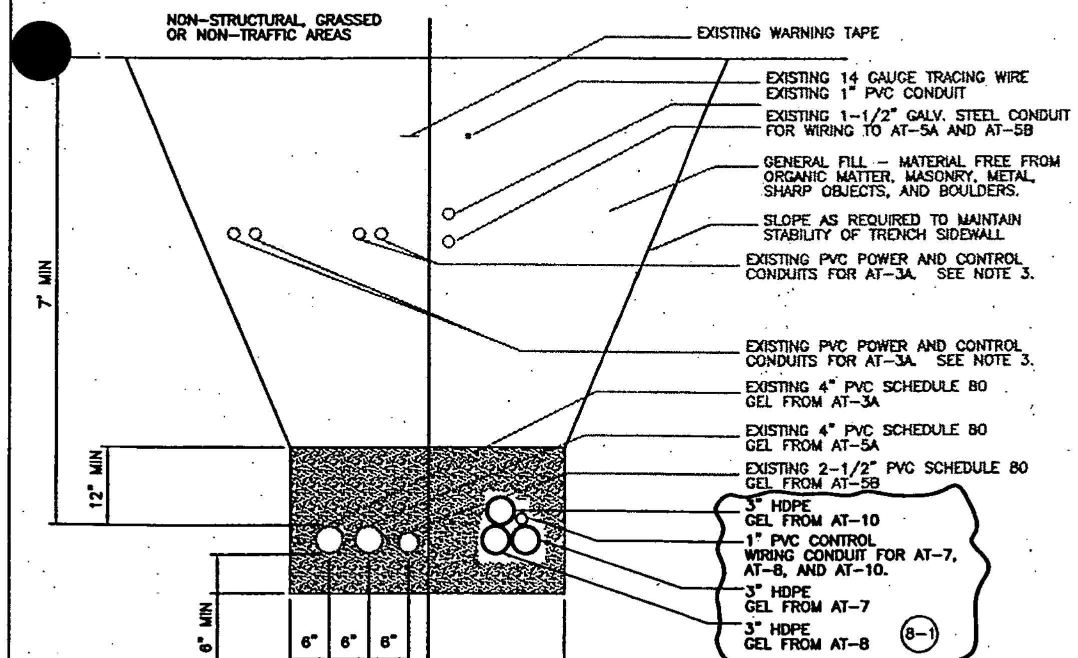
1 C-2-4
GROUNDWATER EXTRACTION LINE TRENCH GEL FROM AT-10
(NOT TO SCALE)



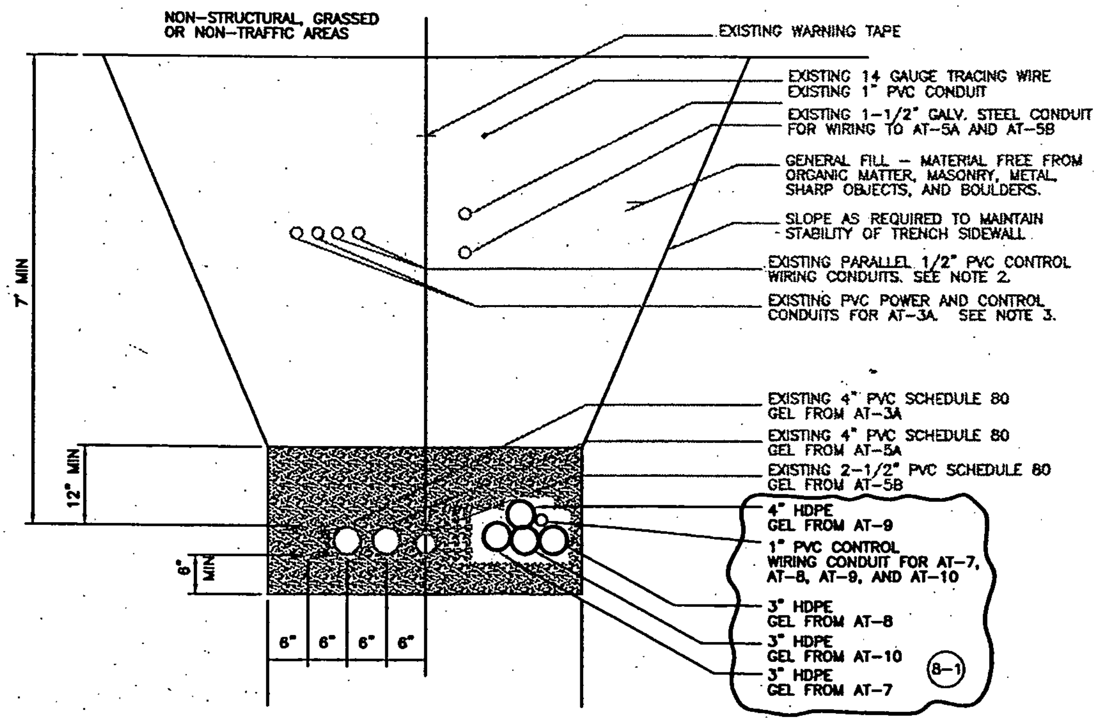
2 C-2-4
GROUNDWATER EXTRACTION LINE TRENCH GEL FROM AT-5A, AT-5B, AND AT-10
(NOT TO SCALE)



3 C-2-4
GROUNDWATER EXTRACTION LINE TRENCH GEL FROM AT-3A, AT-5A, AT-5B, AT-7, AND AT-10
(NOT TO SCALE)



4 C-2-4
GROUNDWATER EXTRACTION LINE TRENCH GEL FROM AT-3A, AT-5A, AT-5B, AT-7, AT-8, AND AT-10
(NOT TO SCALE)



5 C-2-4
GROUNDWATER EXTRACTION LINE TRENCH GEL FROM AT-3A, AT-5A, AT-5B, AT-7, AT-8, AT-9, AND AT-10
(NOT TO SCALE)

NOTES:

1. FOR EXCAVATIONS IN AREAS WITH EXISTING PAVING, SAWCUT 1 FOOT BEYOND EXCAVATION LIMITS. ALL PAVEMENT AND SURFACES SHALL BE RESTORED PER SPECIFICATIONS.
2. LOCATION OF EXISTING CONDUITS FOR CONTROL WIRES IS UNKNOWN. APPROXIMATE DEPTH IS 2 FEET BELOW GRADE.
3. LOCATION OF EXISTING CONDUITS FOR POWER AND CONTROL FOR PUMP AT-3A IS UNKNOWN. APPROXIMATE DEPTH IS 2 FEET BELOW GRADE.
4. NEW PIPING DID NOT FOLLOW EXISTING GEL TRENCH LINE.
5. GEL INSTALLED BY DIRECTIONAL BORING TECHNIQUES. TRENCH SIDEWALL SLOPING NOT REQUIRED. FILL NOT REQUIRED.

8-2

DSGN	J. WATERS	8-1	7/14/01	HDPE USED FOR ALL NEW GELS AND 1" CONDUIT FOR ALL NEW WIRING		
DR	D. BELLARD-BENNETT	8-2	7/14/01	DIRECTIONAL BORING USED NOT FOLLOWING TRENCH LINE		
CHK	K. LANGE					
APVD		NO.	DATE	REVISION	BY	APVD

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NIROP FRIDLEY
GROUNDWATER EXTRACTION SYSTEM
FRIDLEY, MN

CIVIL
DETAILS

SHEET	8
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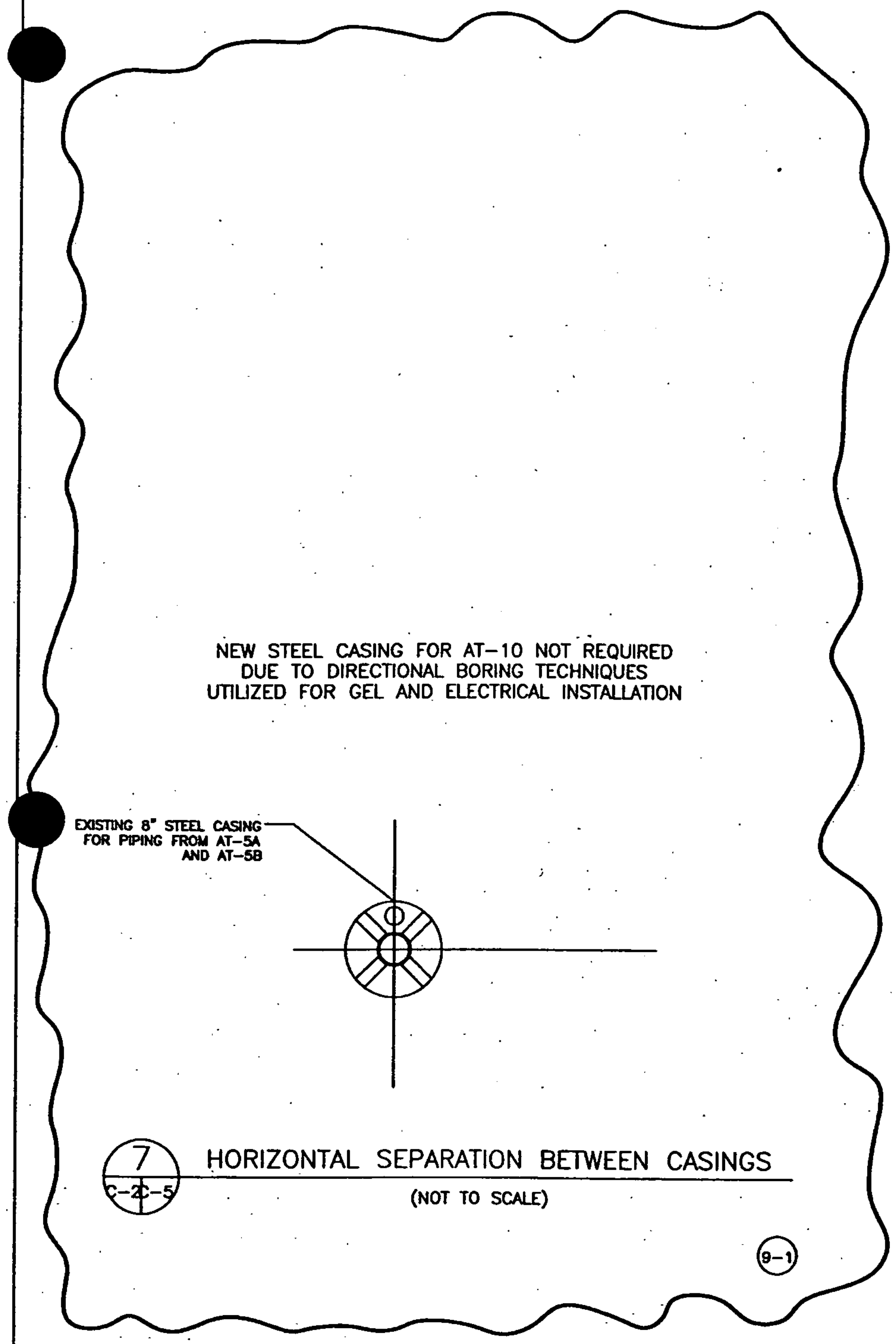
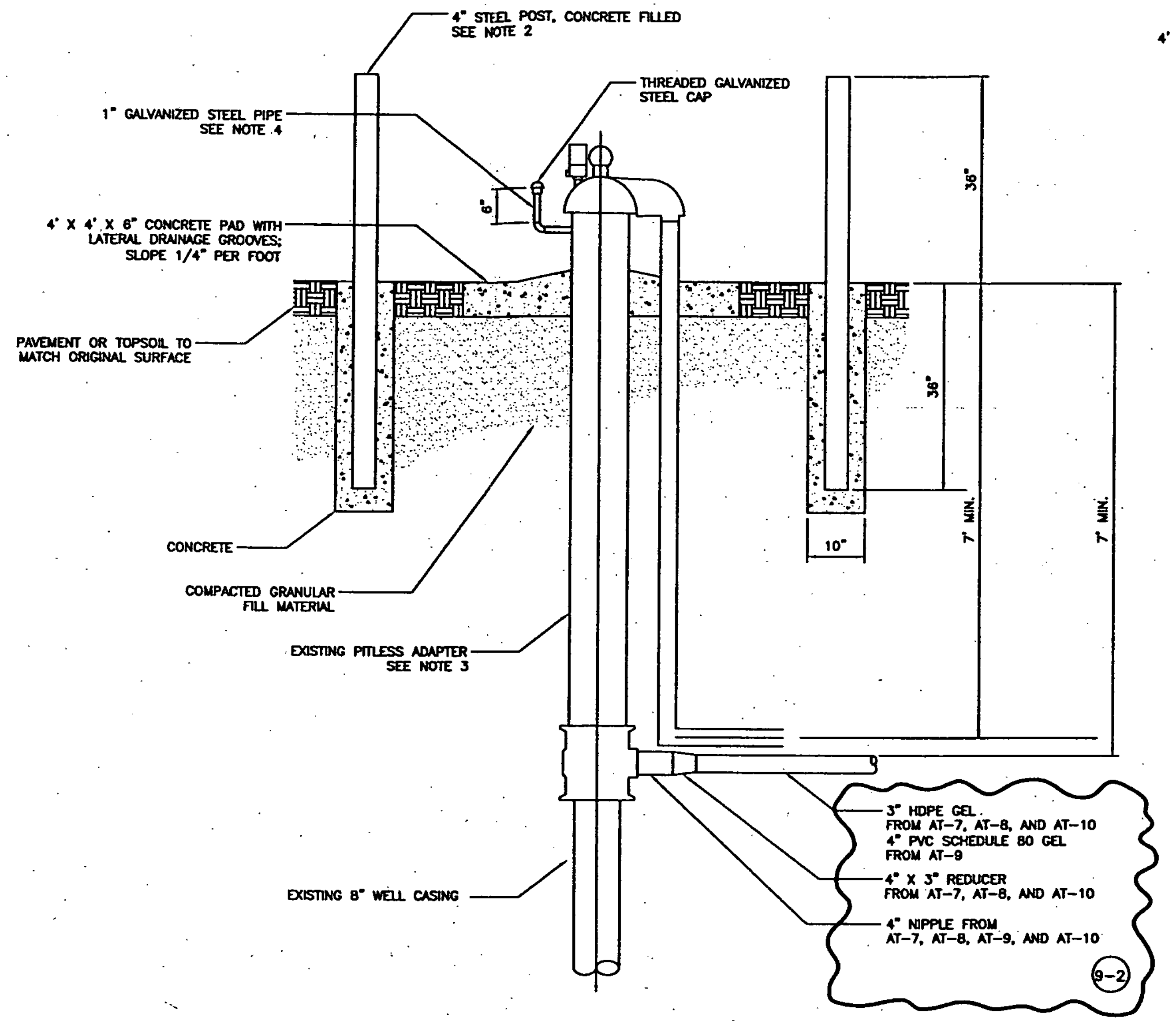


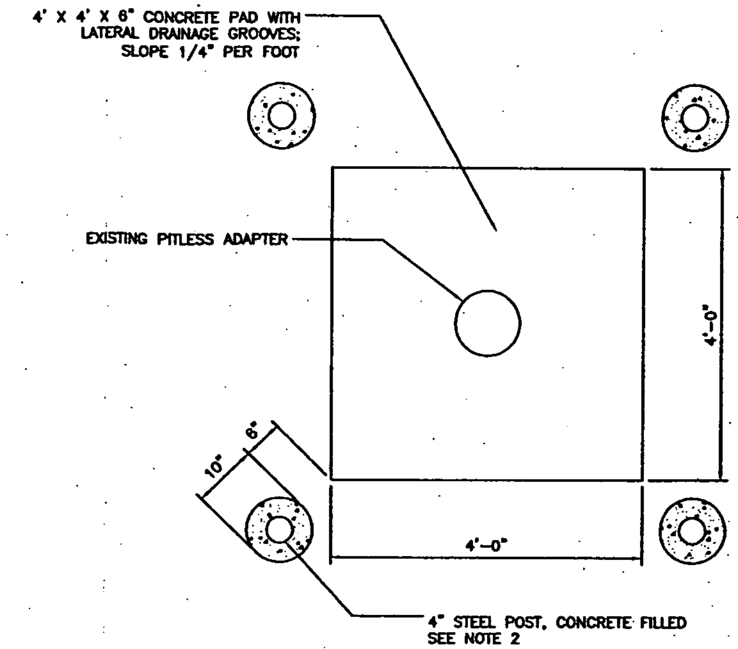
7 C-2 C-5 HORIZONTAL SEPARATION BETWEEN CASINGS

(NOT TO SCALE)



8 C-2 C-5 WELLHEAD CONNECTION FOR GROUNDWATER EXTRACTION WELLS AT–7, AT–8, AT–9, AND AT–10

(NOT TO SCALE)



NOTES:

1. SURFACES SHALL BE RESTORED TO ORIGINAL CONDITION USING LIKE MATERIAL.
2. PROVIDE FOUR (4) STEEL POSTSFOR EACH EXTRACTION WELL. POSTS TO BE FIELD POSITIONED BY CONTRACTOR TO OPTIMIZE PROTECTION OF WELLHEADS. STEEL POSTS SHALL BE PAINTED ORANGE.
3. EXISTING PITLESS ADAPTER IS BAKER MODEL NUMBER 7PS–810WB–W–E04–T4. TYPICAL FOR ALL WELLS.
4. DRILL HOLE IN PITLESS ADAPTER CASING AND WELD 1" PIPE COUPLING TP CASING. CONTINUATION OF AIR PURGE PIPING INSIDE PITLESS ADAPTER CASING TO BE BY OTHERS.

DSGN	J. WATERS	9–1	7/14/01	A STEEL CASING NOT REQUIRED WITH HORIZONTAL BORING		
DR	D. BELLARD-BENNET	9–2	7/14/01	NOTES		
CHK	K. LANGE					
APVD		NO.	DATE	REVISION	BY	APVD

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GROUNDWATER EXTRACTION SYSTEM
FRIDLEY, MN

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DETAILS

SHEET	9
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ABBREVIATIONS

A	AMPS	G	GROUND
A.F.F.	ABOVE FINISHED FLOOR	MH	MOUNTING HEIGHT
BLDG	BUILDING	P	POLE
		PNL	PANEL, PANELBOARD
C	CONDUIT	R	RELOCATED
CB	CIRCUIT BREAKER	RCPT	RECEPTACLE
E	EXISTING TO REMAIN	TYP	TYPICAL
ER	RELOCATE EXISTING	U.O.N.	UNLESS OTHERWISE NOTED
EXST	EXISTING	V	VOLTAGE
FSS	FUSIBLE SAFETY SWITCH	W	WIRE
		WP	WEATHERPROOF

SPECIFICATIONS

1. THE ELECTRICAL CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS PRIOR TO COMMENCING WORK AND SHALL NOTIFY THE ARCHITECT AND/OR ENGINEER IF A CONDITION EXISTS WHICH PREVENTS THE CONTRACTOR FROM ACCOMPLISHING THE INTENT OF THESE PLANS.

2. EXAMINE THE ARCHITECTURAL, STRUCTURAL, MECHANICAL AND PLUMBING DRAWIINGS AND SPECIFICATIONS AND BECOME FAMILIAR WITH ALL CONDITIONS AFFECTING ELECTRICAL WORK.

3. INSTALLATION OF ALL ELECTRICAL WORK SHALL BE PERFORMED IN STRICT ACCORDANCE WITH THE FOLLOWING REGULATIONS, CODES, ETC:

   A. LOCAL CODES AND ORDINANCES

   B. THE NATIONAL ELECTRICAL CODE (NFPA 70)

   C. THE NATIONAL BOARD OF FIRE UNDERWRITERS

   D. ADA

4. PRIOR TO BEGINNING ANY WORK SECURE ANY NECESSARY PERMITS OR CLEARANCES FROM THE AUTHORITIES HAVING JURISDICTION.

5. THE WORD "PROVIDE" IS A DIRECTIVE TO FURNISH AND INSTALL.

6. BASE CONTRACT DRAWINGS AND SPECIFICATIONS, INSOFAR AS THEY APPLY, SHALL BE BINDING FOR ALL WORK AND MATERIALS SHOWN OR NOTED ON THESE DRAWINGS.

7. THE WORK TO BE DONE SHALL INCLUDE THE FURNISHING OF ALL LABOR, MATERIALS, EQUIPMENT AND SERVICES REQUIRED TO CONSTRUCT AND INSTALL THE ELECTRICAL SYSTEMS AS SHOWN ON THESE DRAWINGS. COORDINATE WORK TO BE PERFORMED OR INSTALLED BY OTHERS AFFECTING ELECTRICAL WORK AND PROVIDE AND INSTALL ALL NECESSARY APPURTENCES FOR ATTACHING OR CONNECTING ELECTRICAL WORK TO RELATED WORK OF OTHER TRADES.

8. ALL ELECTRICAL MATERIALS SHALL BE NEW EXCEPT WHERE SPECIFICALLY NOTED AS EXISTING TO BE REUSED AND SHALL BE LISTED BY THE UNDERWRITERS LABORATORIES, INC. (UL). EQUIPMENT FOUND TO BE DEFECTIVE SHALL BE DOCUMENTED BY ELECTRICAL CONTRACTOR. EQUIPMENT DAMAGED IN THE COURSE OF INSTALLATION OR TEST SHALL BE REPLACED OR REPAIRED IN A MANNER MEETING THE APPROVAL OF THE ARCHITECT AND ENGINEER. WHERE APPLICABLE, ALL EQUIPMENT SHALL BE IN ACCORDANCE WITH NEMA STANDARDS.

9. ALL WORK SHALL BE SUBJECT TO THE APPROVAL OF THE OWNER OR HIS AUTHORIZED REPRESENTATIVE.

10. THE DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF CIRCUITS AND OUTLETS, LOCATIONS OF SWITCHES, PANELBOARDS, CONDUIT AND OTHER WORK. ALL ITEMS NOT SPECIFICALLY NOTED, BUT NECESSARY FOR A COMPLETE WORKING INSTALLATION SHALL BE INCLUDED AT NO EXTRA COST.

11. THE ELECTRICAL CONTRACTOR SHALL LEAVE THE ENTIRE ELECTRICAL SYSTEM UNDER THIS CONTRACT IN PROPER WORKING ORDER AND SHALL, WITHOUT CHARGE, REPLACE ANY WORK OR MATERIALS WHICH DEVELOP DEFECTS, EXCEPT FROM ORDINARY WEAR AND TEAR, WITHIN ONE (1) YEAR FROM THE DATE OF FINAL ACCEPTANCE. BENEFICIAL USE SHALL NOT BE CONSTRUED AS FINAL ACCEPTANCE.

12. MAINTAIN AT THE SITE ONE COPY OF ALL DRAWINGS MARKED TO RECORD ALL CHANGES MADE DURING CONSTRUCTION. THE SET OF DRAWINGS SHALL BE DELIVERED TO THE OWNER UPON COMPLETION OF WORK.

13. CUTTING AND PATCHING OF ANY PART OF THE BUILDING SHALL BE DONE BY THE ELECTRICAL CONTRACTOR WHERE SUCH CUTTING IS REQUIRED IN THE CONNECTION WITH ANY ELECTRICAL WORK. RETURN ALL AFFECTED AND SURROUNDING AREAS TO THEIR ORIGINAL APPEARANCE AND FUNCTION.

14. CONDUCTORS SHALL BE AS FOLLOWS:

   A. COPPER (AWG), CONFORMING TO THE LATEST REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE, STRANDED FOR #8 AWG AND LARGER, SOLID FOR #10 AWG AND SMALLER. THE USE OF ALUMINUM CONDUCTORS FOR ANY PURPOSE SHALL NOT BE ACCEPTABLE.

   B. MINIMUM WIRE SIZES SHALL BE AS FOLLOWS:

      1. BRANCH CIRCUITS ON 120/208 VOLT SYSTEMS, USE #12 GAUGE EXCEPT ON HOME RUNS LONGER THAN 100 FEET ACTUAL WIRE LENGTH FROM THE CENTER OF THE CIRCUIT TO THE PANEL SHALL BE #10 GAUGE MINIMUM.

      2. CONTROL WIRING- #14 GAUGE EXCEPT ON RUNS LONGER THAN 50 FEET, ACTUAL WIRE LENGTH SHALL BE #12 GAUGE.

   C. CONDUCTORS SHALL BE THERMOPLASTIC TYPE DUAL RATED THHN/THWN WITH MINIMUM OF 75 DEGREE CELSIUS INSULATION RATING.

15. WIRING SHALL BE INSTALLED IN RIGID (STEEL OR AL) OR FLEXIBLE METAL CONDUIT. MINIMUM DIAMETER SHALL BE 1/2". CONDUIT AND WIRING (WITH THE EXCEPTION OF FEEDERS IN ELECTRICAL CLOSET) SHALL BE EXPOSED. UNDERGROUND CONDUIT SHALL BE PVC SCHEDULE 80.

16. DEVICE COVERPLATES SHALL MATCH EXISTING

17. EXISTING PANELBOARDS ARE NOTED AND SHALL BE ALTERED AS INDICATED IN THE CONTRACT.

18. PROVIDE NEW CIRCUIT BREAKERS AS INDICATED ON THE DRAWINGS. NEW EQUIPMENT SHALL MATCH EXISTING INSTALLED EQUIPMENT SHALL BE OF THE SAME MANUFACTURERS AND TYPE AS SIMILAR EXISTING EQUIPMENT. INTERRUPTING RATING OF EQUIPMENT SHALL BE THE SAME AS THAT OF EXISTING EQUIPMENT.

19. COORDINATE ALL WORK REQUIRING INTERRUPTION OF ELECTRICAL POWER WITH THE BUILDING OWNER AND OBTAIN WRITTEN PERMISSION FROM THE BUILDING OWNER PRIOR TO SHUTTING DOWN POWER TO ANY SWITCHBOARD. ADDITIONALLY, PROVIDE NOTICE TO ALL OTHER TRADES OF ALL SCHEDULED INTERRUPTIONS.

20. HOMERUNS TO THE PANELBOARD MAY BE RUN TOGETHER IN ONE CONDUIT, PROVIDED THAT THE MAXIMUM UNBALANCED CURRENT IN THE NEUTRAL DOES NOT EXCEED THE CAPACITY OF THE WIRE. NO MORE THAN THREE SINGLE PHASE CIRCUITS SERVED FROM DIFFERENT PHASES OR ONE THREE PHASE CIRCUIT SHALL BE INSTALLED IN ONE RACEWAY. WHERE SINGLE CIRCUIT HOMERUNS ARE INDICATED ON PLAN, DO NOT SHARE HOME RUN WITH OTHER CIRCUITS.

21. CLEARLY LABEL ALL CIRCUIT BREAKERS WITH AN UPDATED DIRECTORY CARD IN ALL PANELBOARDS SERVING THESE FLOORS AS TO DEVICES AND THEIR ROOMS SERVED.

22. THE ELECTRICAL PLANS ARE DIAGRAMMATIC ONLY. COORDINATE ELECTRICAL EQUIPMENT LOCATION AND INSTALLATION WITH EQUIPMENT BEING SERVED.

23. ALL CONDUCTORS SHALL BE IDENTIFIED.

24. ELECTRICAL SYSTEM SHALL BE GROUNDED. PROVIDE GROUND WIRE FOR EACH CONDUIT AND EACH PIECE OF EQUIPMENT.

25. CONTRACTOR SHALL COORDINATE AND ADJUST RECEPTACLES AND/ OR CIRCUITS WITH ACTUAL EQUIPMENT PURCHASE WHEN APPROVED EQUIPMENT DIFFERS FROM ORIGINAL CONTRACT DRAWINGS.

26. THE ELECTRICAL CONTRACTOR SHALL SUBMIT TO THE OWNER, (1) SET OF AS BUILT DRAWINGS, APPROVED SHOP DRAWINGS AND ANY MODIFICATIONS THAT HAVE BEEN MADE DURING CONSTRUCTION BEFORE FINAL PAYMENT.

DEMOLITION NOTES

1. ALL DEMOLISHED MATERIAL SHALL BE REMOVED FROM THE JOB SITE U.O.N. OR AS REQUIRED BY THE OWNER.

LEGEND

G	BRANCH CIRCUIT IN CONDUIT. NO TICK MARKS INDICATE 2 #12 CONDUCTORS & 1 #12 GND IN 1/2" CONDUIT UON. TICK MARKS, WHEN SHOWN, INDICATE NUMBER OF #12 CONDUCTORS IF OTHER THAN THREE; INDICATES GROUND. CONDUIT LARGER THAN 1/2" & WIRE LARGER THAN #12 SHALL BE AS INDICATED. CONCEAL CONDUIT U.O.N.
G	HOMERUNS TO PANEL. PANEL & CIRCUIT DESIGNATIONS AS INDICATED.
J	4"x4" JUNCTION BOX
UG	EXISTING UNDERGROUND CONDUIT
	DENOTES EXISTING EQUIPMENT
	DENOTES NEW EQUIPMENT

GENERAL NOTE:

1. UNLESS OTHERWISE INDICATED ALL ELECTRICAL WORK AND MATERIAL SHALL BE PROVIDED BY THE CONTRACTOR.

GENERAL CONTROLS NOTES:

1. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL PLC HARDWARE AND WIRING REQUIRED. PRIOR TO SUBMITTING BID VERIFY THAT EXISTING SPARE IO POINTS WILL BE SUITABLE FOR ALL NEW WORK.

2. CH2M HILL WILL PROVIDE ALL PROGRAMING OF EXISTING ALLEN BRADLEY PLC'S AND HMI PACKAGE.

3. CONTROL WIRING ASSOCIATED WITH AT-1 AND AT-4 SHALL BE REMOVED EXCEPT FOR ANALOG WIRING FROM EXISTING FIT'S. EXISTING IO POINTS AT PLC SHALL BE RE-USED FOR NEW PUMPS.

4. CONTROL WIRING ASSOCIATED WITH AT-2 WILL REMAIN IN PLACE AND SHALL BE RE-USED FOR NEW AT-7.

DSGN	P. DEJESUS		
DR	L. SHAFFER		
CHK	D. DOAR		
APVD			
NO.	DATE	REVISION	BY	APVD

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

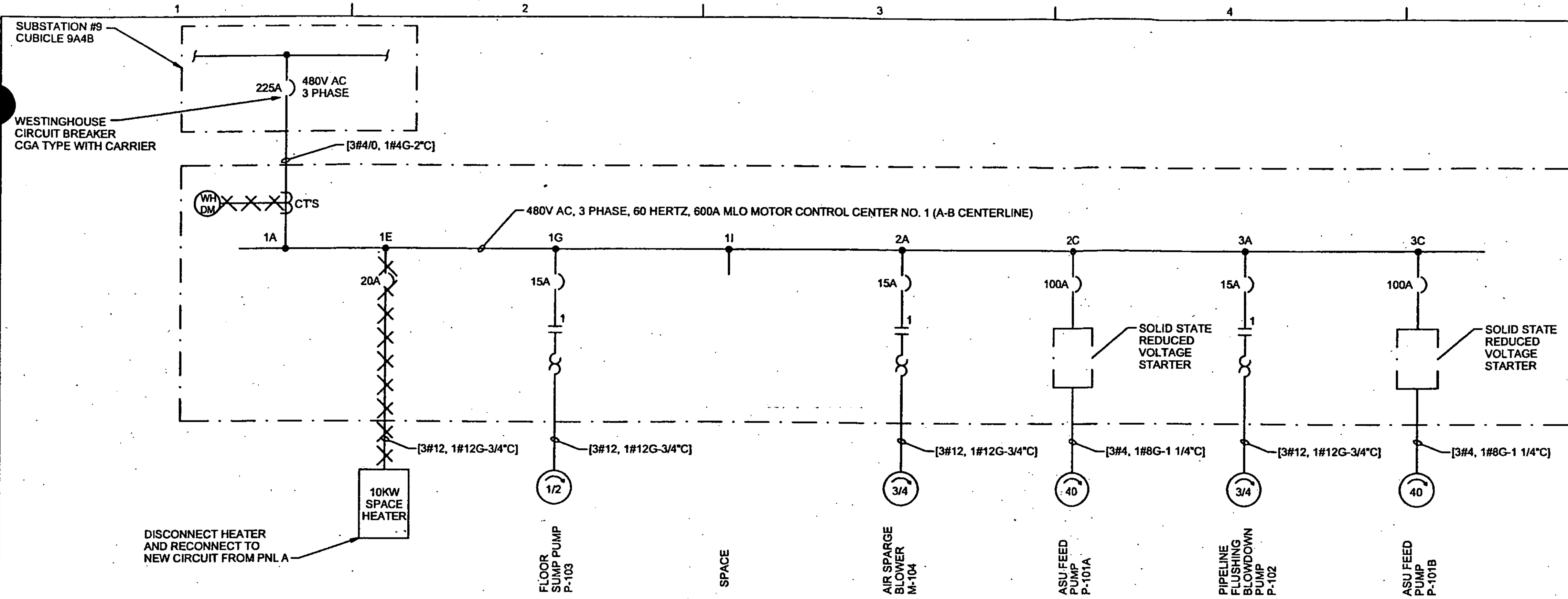
CH2MHILL

NIROP FRIDLEY
GROUNDWATER EXTRACTION SYSTEM
FRIDLEY, MN

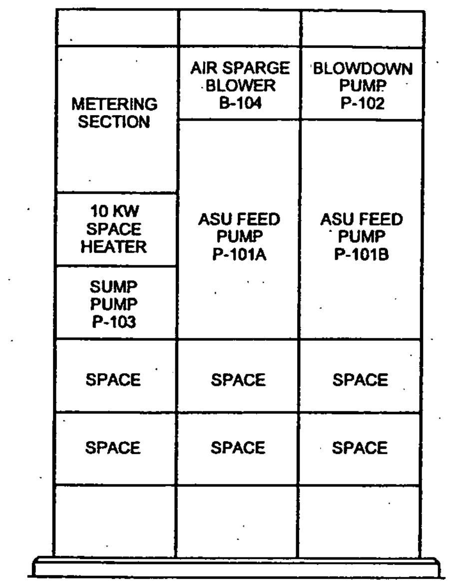
ELECTRICAL

ELECTRICAL NOTES AND LEGENDS

SHEET	10
DWG	E-1
DATE	FEB 2001
PROJ	153691.31.01.03.30

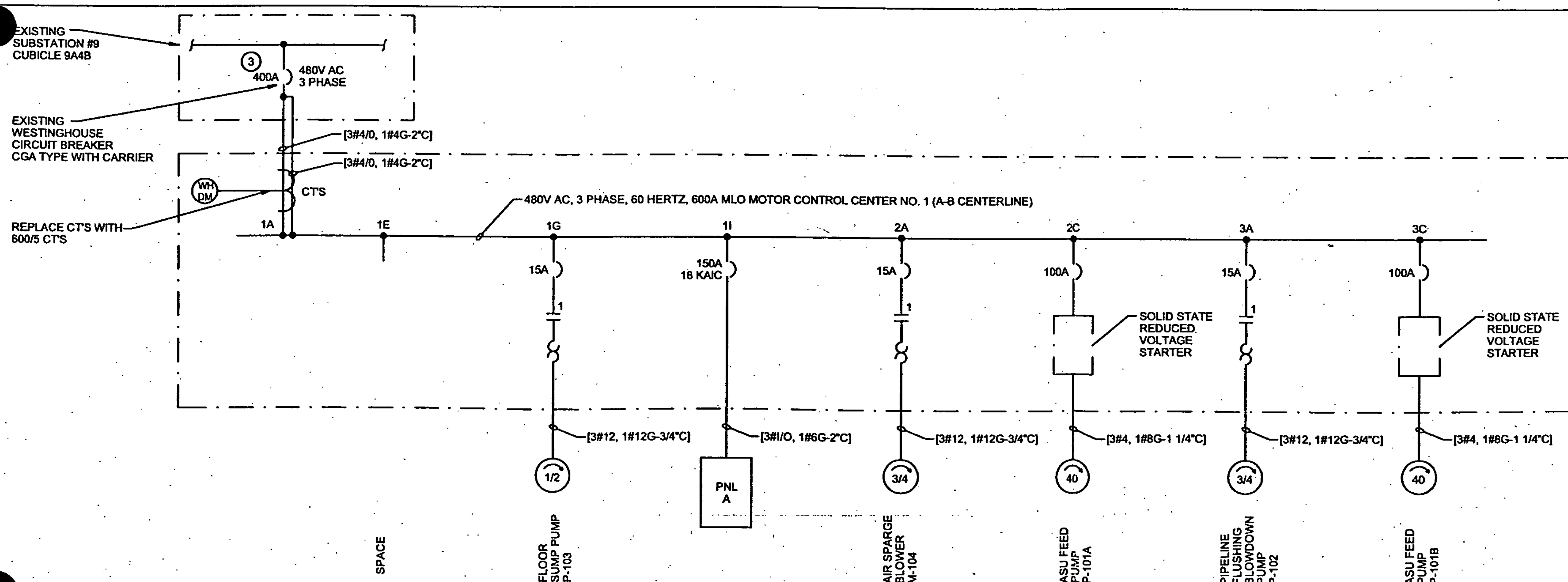


EXISTING BUILDING NO. 52/53 MCC NO. 1 ONE LINE DIAGRAM



EXISTING MCC NO. 1 ELEVATION

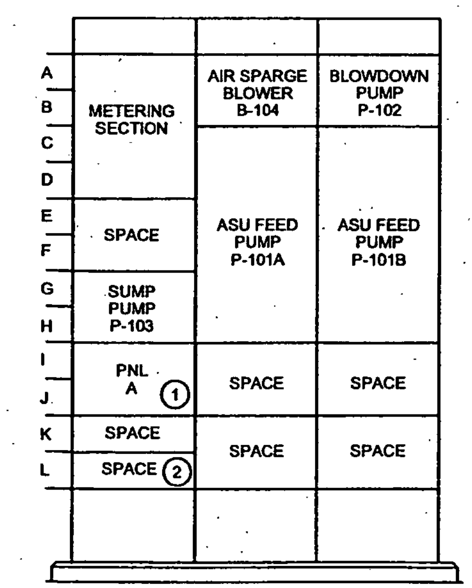
NTS



NEW BUILDING NO. 52/53 MCC NO. 1 ONE LINE DIAGRAM

WORK NOTES:

1. PROVIDE 150A, 18 KAIC CIRCUIT BREAKER INCLUDING NEW DOOR, PLUG-IN UNIT AND DISCONNECT HANDLE. RELOCATE EXISTING SUPPORT PAN AND REMOVE EXISTING DOOR.
2. REPLACE EXISTING 1 S.F. DOOR WITH 1/2 S.F. DOOR.
3. REPLACE RATING PLUG ON EXISTING 400 AF CB. SEE NOTE 1 ON SHEET E-6.



NEW MCC NO. 1 ELEVATION

NTS

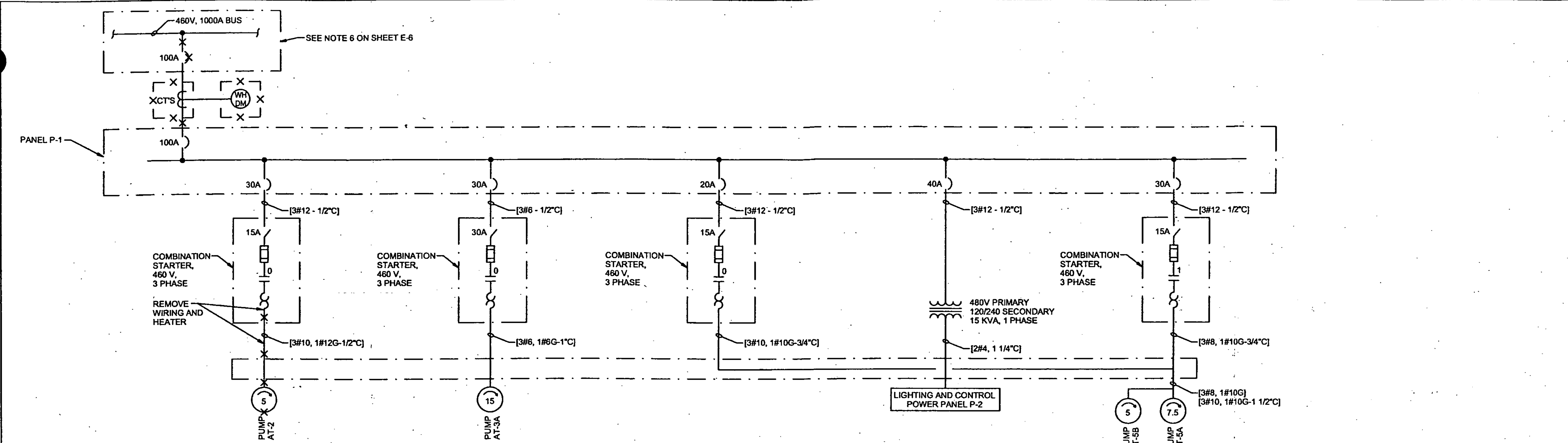
DSGN P. DEJESUS	NO.	DATE	REVISION	BY	APVD	VERIFY SCALE: BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1". IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.
DR S. KORCSMAROS						
CHK D. DOAR						
APVD						

CH2MHILL

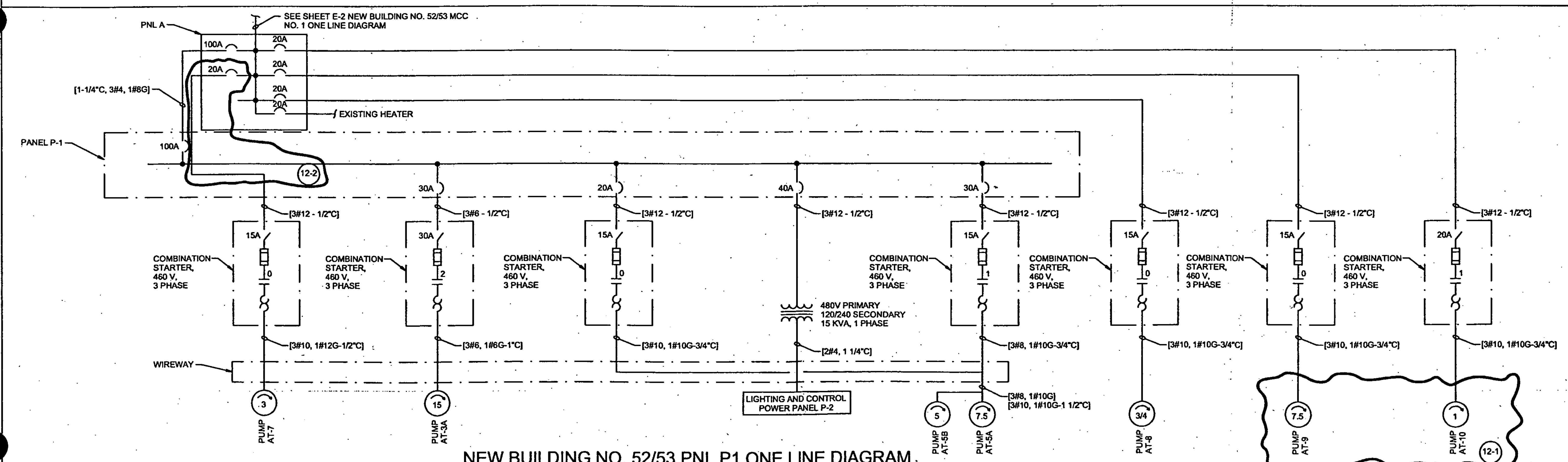
NIROP FRIDLEY
GROUNDWATER EXTRACTION SYSTEM
FRIDLEY, MN

ELECTRICAL
MCC No.1 ONE-LINE DIAGRAMS AND ELEVATION

SHEET	11
DWG	E-2
DATE	FEB 2001
PROJ	153691.31.01.03.30



EXISTING BUILDING NO. 52/53 PNL P1 ONE LINE DIAGRAM



NEW BUILDING NO. 52/53 PNL P1 ONE LINE DIAGRAM

DSGN P. DEJESUS	12-1	7/14/01	HORSEPOWERS FOR PUMPS AT-9 AND AT-10 PREVIOUSLY REVERSED. CORRECT ON THIS DRAWING.			
DR S. KORCSMAROS						
CHK D. DOAR	12-2	8/1/01	AT-7 CIRCUIT BRAKER/MCC CONNECTIONS			
APVD	NO.	DATE	REVISION	BY	APVD	

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

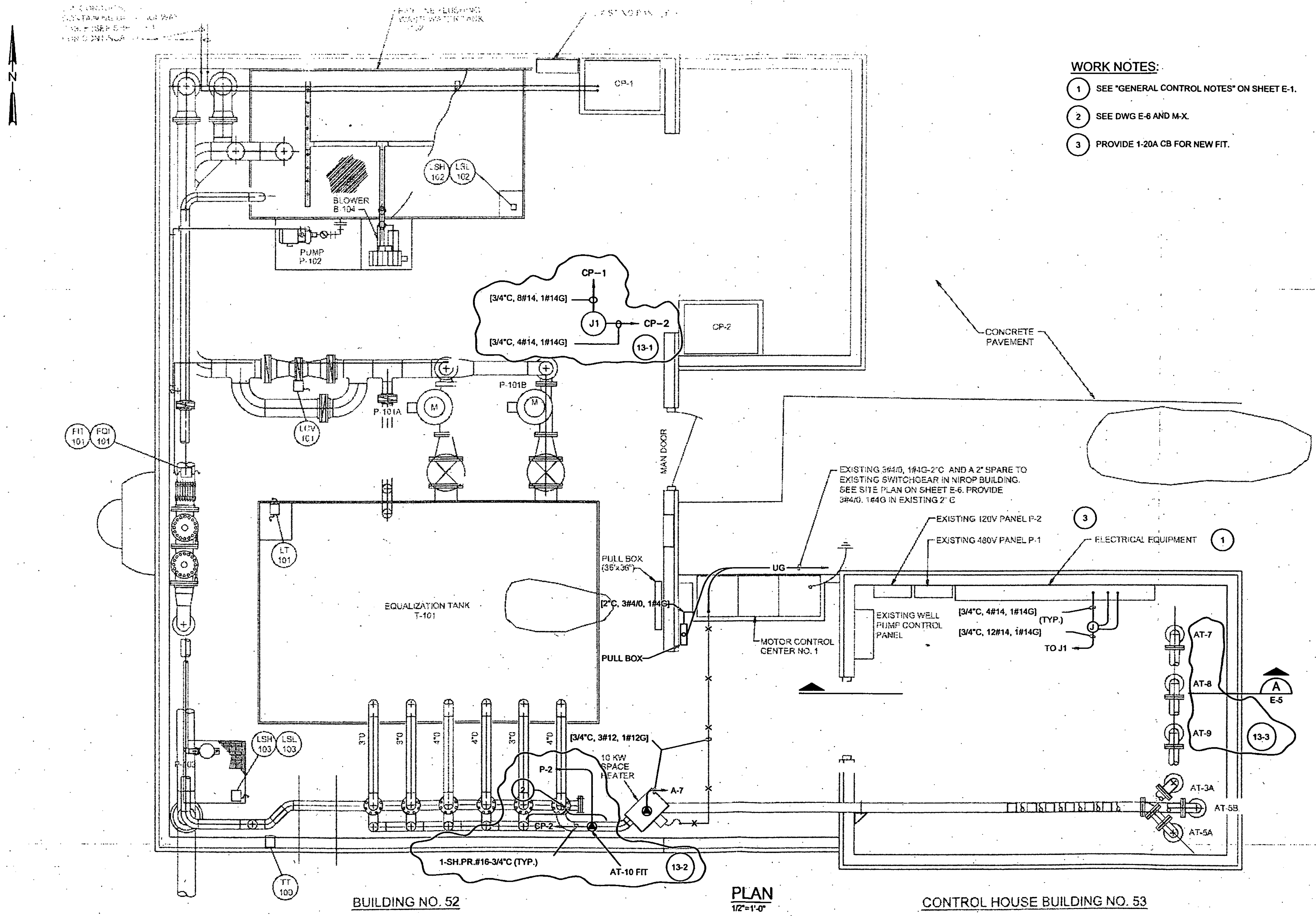
CH2MHILL

NIROP FRIDLEY
GROUNDWATER EXTRACTION SYSTEM
FRIDLEY, MN

ELECTRICAL
PNL P1 ONE-LINE DIAGRAMS AND ELEVATION

SHEET	12
DWG	E-3
DATE	FEB 2001
PROJ	153691.31.01.03.30

FILENAME: d153691e002.dgn PLOT DATE: 29-MAY-2001



BUILDING NO. 52

PLAN
1/2"=1'-0"

CONTROL HOUSE BUILDING NO. 53

WORK NOTES:

1. SEE "GENERAL CONTROL NOTES" ON SHEET E-1.
2. SEE DWG E-6 AND M-X.
3. PROVIDE 1-20A CB FOR NEW FIT.

NO.	DATE	REVISION	BY	APVD
13-1	7/14/01	CONDUIT LOCATIONS		
13-2	7/14/01	FLOW METER AT AT-10 MOVED TO CORRECT LOCATION		
13-3	8/1/01	CORRECT LOCATIONS OF AT-7, AT-8, AT-9		

DSGN P. DEJESUS
DR L. SHAFFER
CHK D. DOAR
APVD

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 — 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

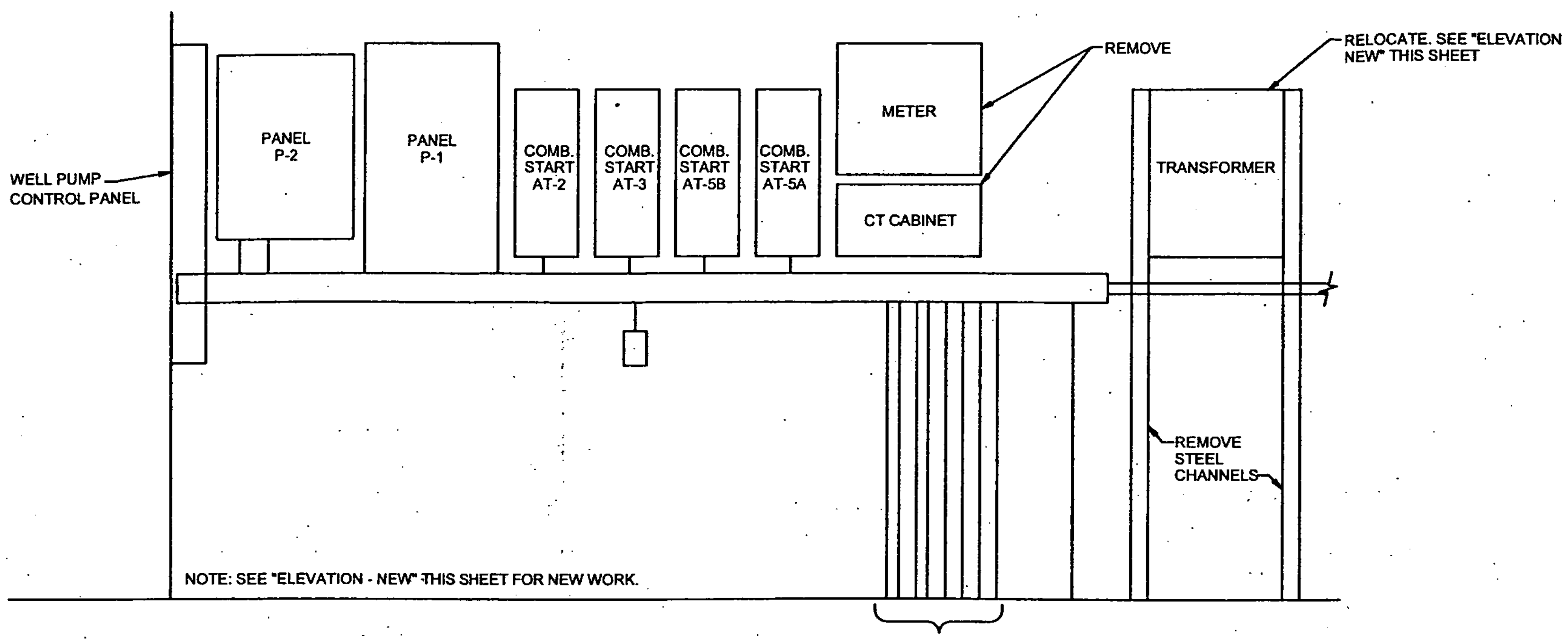
CH2MHILL

NIROP FRIDLEY
GROUNDWATER EXTRACTION SYSTEM
FRIDLEY, MN

ELECTRICAL
BUILDING 52/53
PLAN

SHEET 13
DWG E-4
DATE FEB 2001
PROJ 153691.31.01.03.30

1 2 3 4 5 6

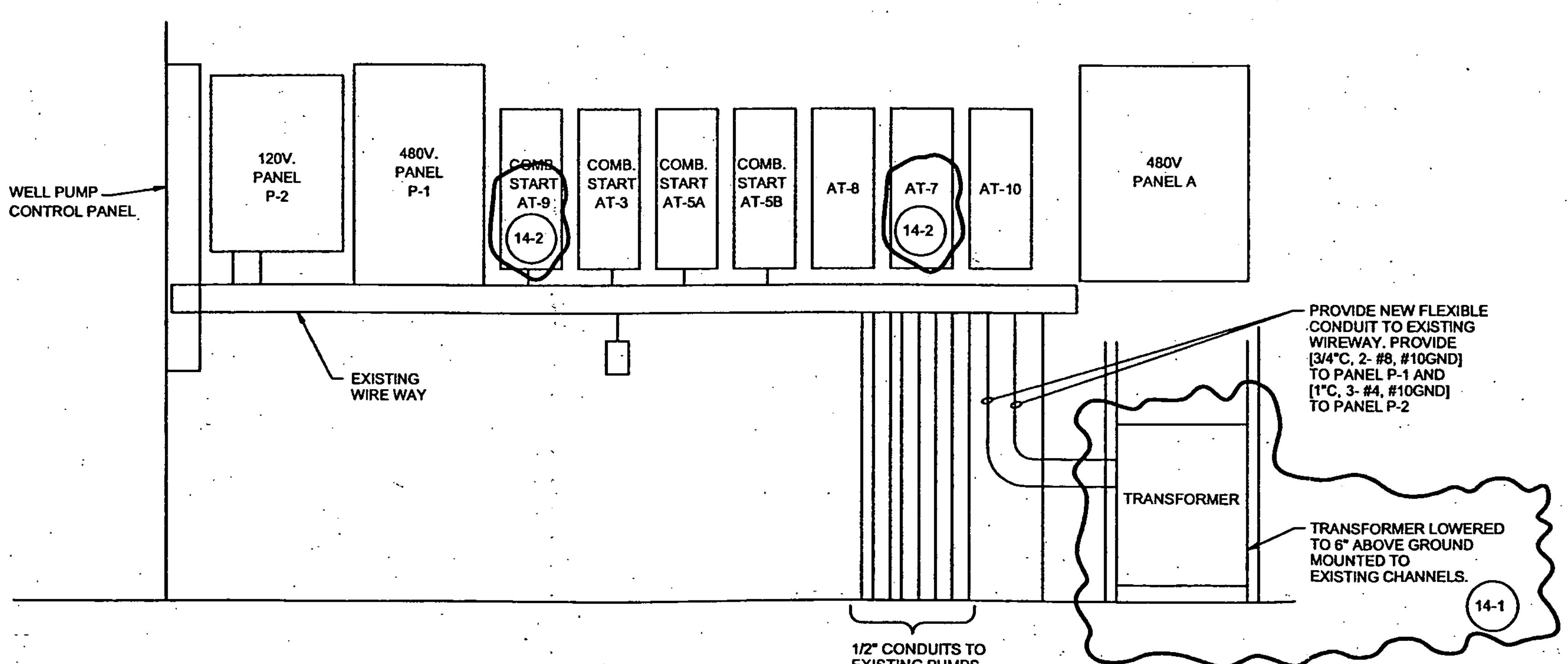


A ELEVATION - EXISTING
E-5 NTS

LOAD (AMP) A	B	C	CIRCUIT DESCRIPTION	BKR A/P	CKT NO.	CKT NO.	BKR A/P		LOAD (AMP) A	B	C
60			PANEL P-1	90/3	1A	2A	20/3	AT - 7	4.8		
	60		14-3		3B	4B				4.8	
		60			5C	6C					4.8
12			10KW HEATER	20/3	7A	8A	20/3	AT - 8	1.6		
	12				9B	10B				1.6	
		12			11C	12C					1.6
			SPACE		13A	14A	20/3	AT - 9	2.1		
					15B	16B				2.1	
					17C	18C					2.1
					19A	20A	20/3	AT - 10	11		
					21B	22B				11	
					23C	24C					11
								TOTAL	92	92	92

PANEL : PNL- A
SERVICE VOLTAGE: 480V, 3P, 3W
18 KAIC
MAIN: 225AMLO
BUS SIZE: 225 A
MOUNTING: SURFACE
REMARKS:

PANEL A SCHEDULE



A ELEVATION - NEW
E-5 NTS

PANEL SCHEDULE P-1

MNFR. & TYPE ITE CABINET SUR. MOUNTED MAINS 100A. SERVICE 240 /480 V.
3 PHASE 3W. 60HZ CONNECTED LOADS (KVA)- A0 X B0 X C0 X TOTAL X INTERGRADED SYSTEM INTERR.
ENGRAVE NAMEPLATE P-1 RATING 10,000 A. RMS SYM

LOADS SERVED	BRK AMP	KW	CKT NO.	GND. BAR (S/N)	CKT NO.	KW	BRK AMP	LOADS SERVED
SPARE	30		1		2	2.2	30	PUMP AT-3
14-4			3		4			
			5		6			
PUMP AT-5	20	2.2	7		8		30	PUMP AT-5B
			9		10			
			11		12			
PUMP AT-5A	20		13		14	9.5	30	PANEL P-2 (SERVES I PHASE LOAD)
			15		16			
			17		18			
SPARE	50		19		20		20	SUMP
			21		22			
			23		24			

PANEL P-1 SCHEDULE

NO.	DATE	REVISION	BY	APVD
14-1	7/14/01	TRANSFORMER LOCATION		
14-2	8/1/01	CORRECT LOCATIONS OF AT-7, AT-9		
14-3	8/1/01	CIRCUIT BREAKER CHANGED TO 90A FROM 100A		
14-4	8/1/01	PUMP AT-2 CIRCUIT BREAKER CHANGED TO SPARE		

DSGN P. DEJESUS
DR L. SHAFFER
CHK D. DOAR
APVD

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

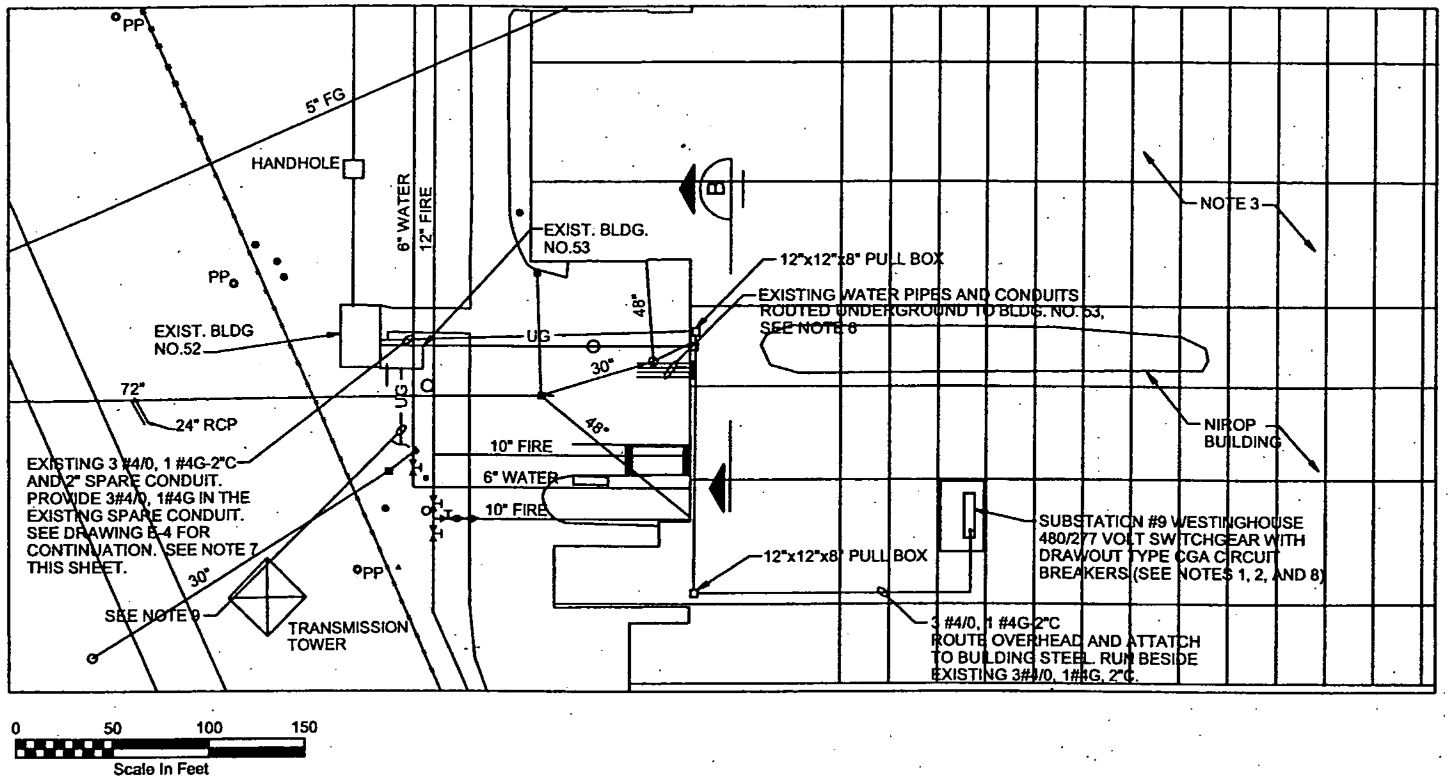
CH2MHILL

NIROP FRIDLEY
GROUNDWATER EXTRACTION SYSTEM
FRIDLEY, MN

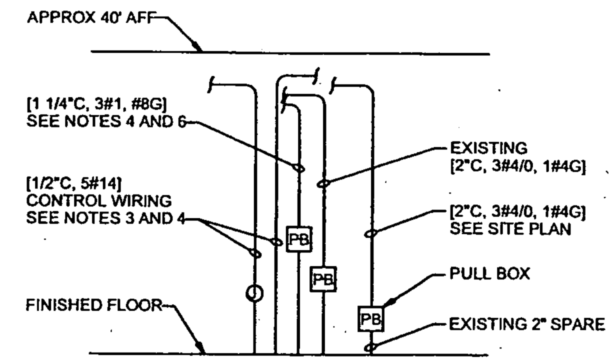
ELECTRICAL

ELEVATION AND SCHEDULES

SHEET 14
DWG E-5
DATE FEB 2001
PROJ 153691.31.01.03.30



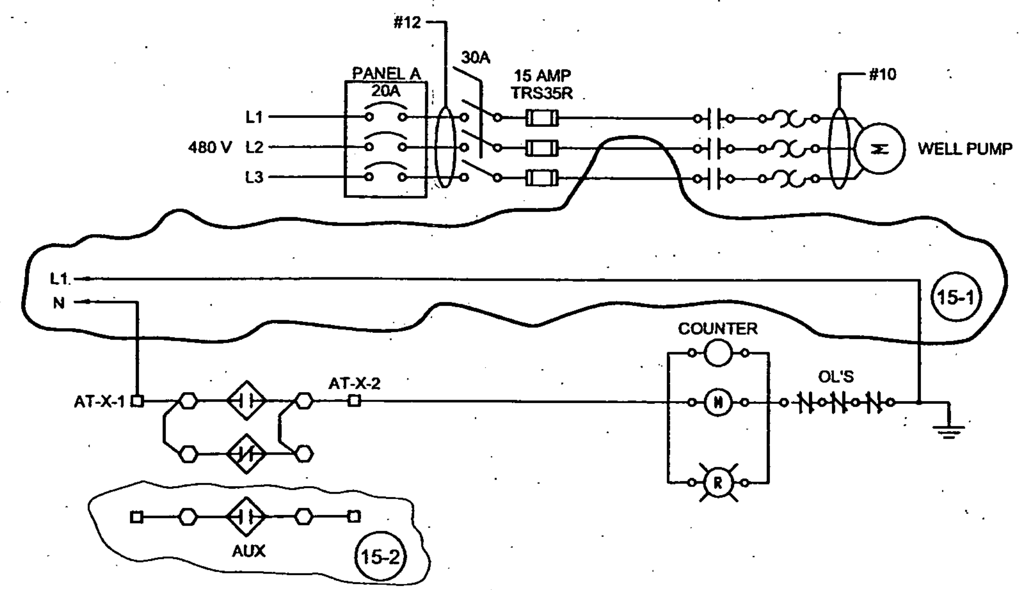
SITE PLAN
1"=50'



SECTION B
NTS

NOTES:

1. EXISTING CIRCUIT BREAKER IN CUBICLE 9A4B IS A WESTINGHOUSE TYPE HLCGA CIRCUIT BREAKER MOUNTED ON A DRAW OUT CABINET. REPLACE EXISTING 225 A PLUG WITH NEW 400A PLUG MODEL No. 4LC 400. MODIFY LINE AND LOAD TERMINALS AS NEEDED FOR 400A SERVICE.
2. TERMINATE NEW SET OF 3-#4/0 CABLES TO CIRCUIT BREAKER AT CUBICLE 9A4B.
3. REMOVE ALL ELECTRICAL EQUIPMENT, WIRING AND CONDUIT ASSOCIATED WITH AT-1 AND AT-4. SEE NOTES 4 AND 5. CONTROL WIRING SHALL BE REMOVED BACK TO PLC IN BLDG 52.
4. SEE REFERENCE SHEET DER 25-400E22 FOR LOCATION AND DESCRIPTION.
5. REMOVE EXISTING 20A CIRCUIT BREAKER LOCATED AT EACH TAP. BURIED CONDUIT SHALL REMAIN.
6. REMOVE ALL ELECTRICAL WIRING, CONDUIT AND ASSOCIATED 100A CIRCUIT BREAKER GOING FROM B2-13S/2W-28W TRUMBULL 1000A BUS AND PANEL P-1 LOCATED IN BUILDING 53. BURIED CONDUIT SHALL REMAIN. SEE NOTE 4.
7. IT IS ASSUMED THAT THE EXISTING SPARE CONDUIT IS USABLE. CONTRACTOR SHALL PROVIDE A PRICED OPTION FOR PROVIDING ON NEW 2" SCHEDULE 80 CONDUIT FROM MCC-1 TO PULL BOX IN NIROP BUILDING IN CASE EXISTING SPARE IS NOT USABLE.
8. CONTRACTOR IS REQUIRED TO FIELD VERIFY WORK REQUIRED TO TERMINATE CABLE AND MODIFY CIRCUIT BREAKER ARRANGEMENT FOR 400A SERVICE.
9. PROVIDE DIRECT BURIED PVC SCHEDULE 40 CONDUIT FOR POWER CIRCUITS SERVING PUMPS AT-7, AT-8, AT-9, AND AT-10. SEE SHEET E-3 FOR CIRCUIT DISCRIPTION. SEE M-X FOR LOCATION OF PUMPS.



○ TERMINAL IN PNL CP2
□ TERMINAL IN PUMP CONTROLLER

PUMP CONTROL SCHEMATIC (TYPICAL FOR AT-8, AT-9, AND AT-10)
NTS

DSGN P. DEJESUS	15-1	8/1/01	WIRING DETAILS, TRANSFORMER REMOVED			VERIFY SCALE	
DR L. SHAFFER	15-2	8/1/01	AUXILIARY CONNECTION ADDED			BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.	
CHK D. DOAR							
APVD	NO.	DATE	REVISION	BY	APVD		

CH2MHILL

NIROP FRIDLEY
GROUNDWATER EXTRACTION SYSTEM
FRIDLEY, MN

ELECTRICAL

SITE PLAN AND SECTION

SHEET	15
DWG	E-6
DATE	FEB 2001
PROJ	153691.31.01.03.30

LEGEND:

FIT — ULTROSONIC FLOW INDICATING TRANSMITTER. PANAMETRICS MODEL XMT-868 WITH LCD DISPLAY. CLAMP ON PIPE.

FE — FLOW ELEMENT. SEE THIS SHEET.

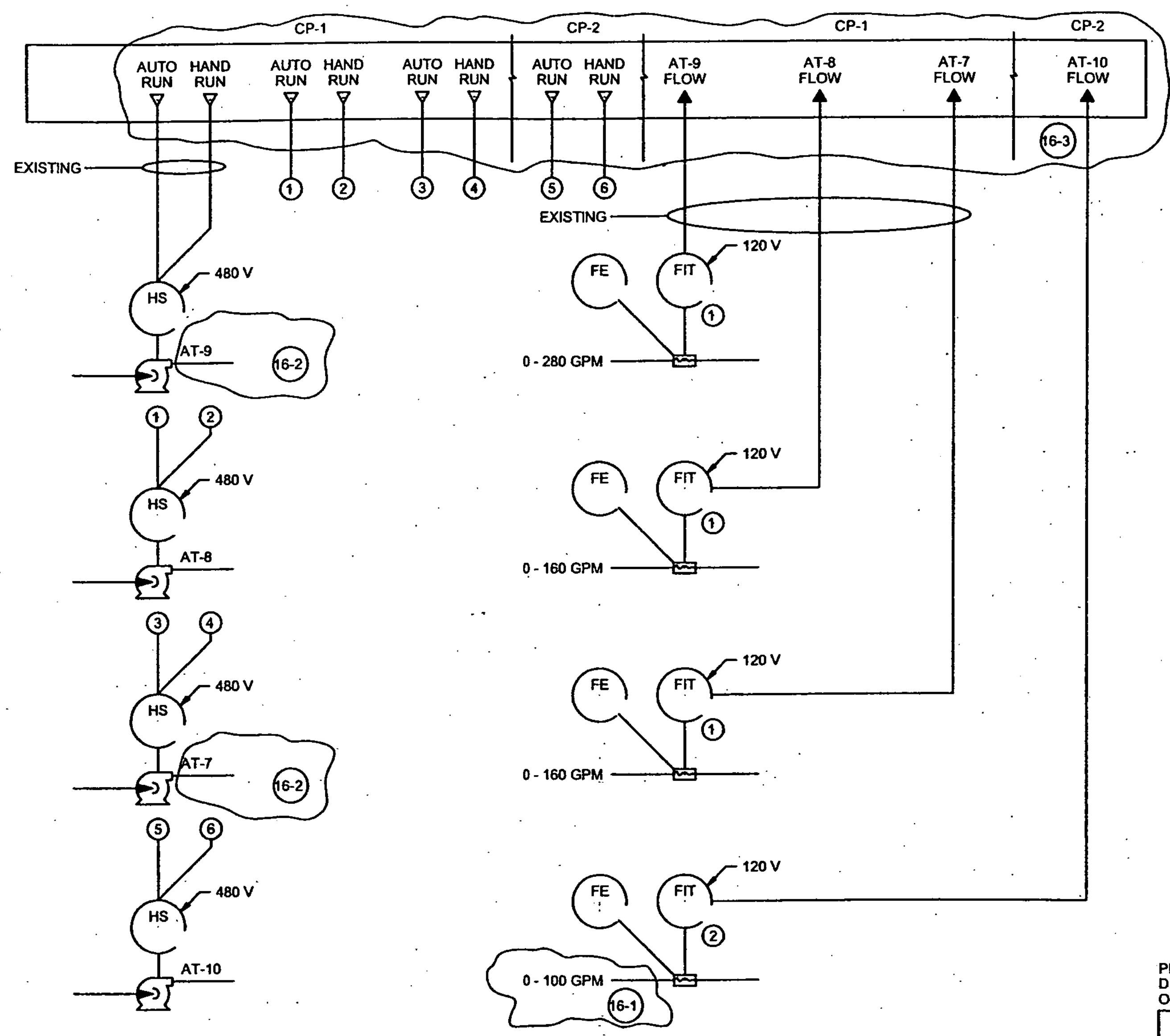
HS — FIELD MOUNTED COMBINATION MOTOR STARTER

▽ DISCRETE OUTPUT

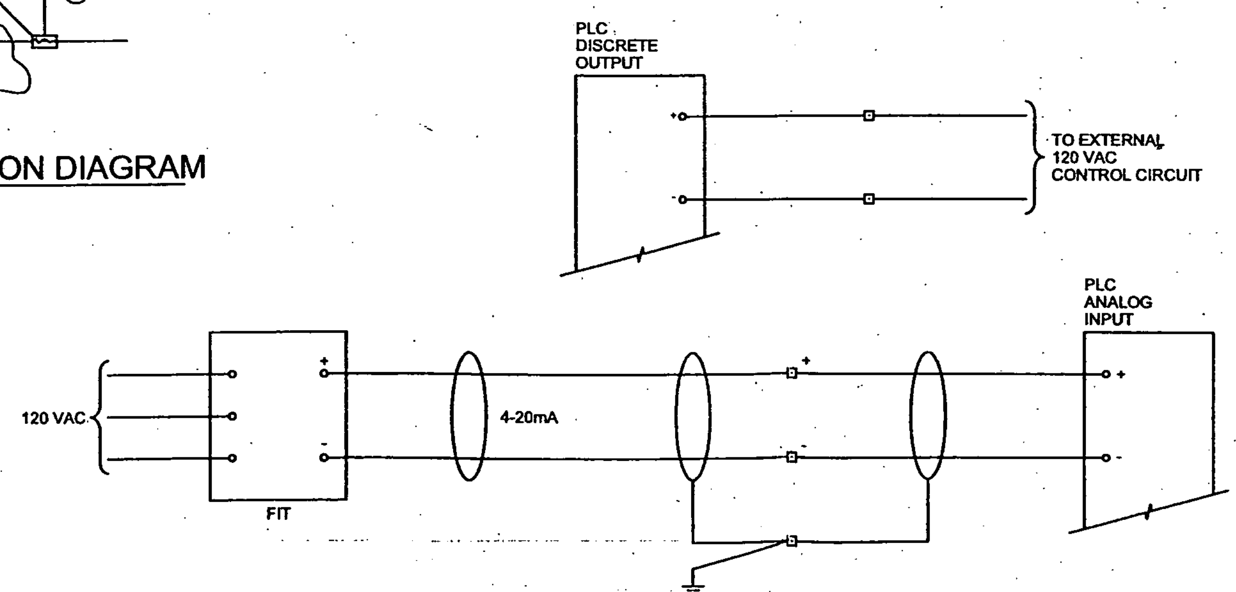
▲ ANALOG INPUT (4-20 MA)

WORK NOTE:

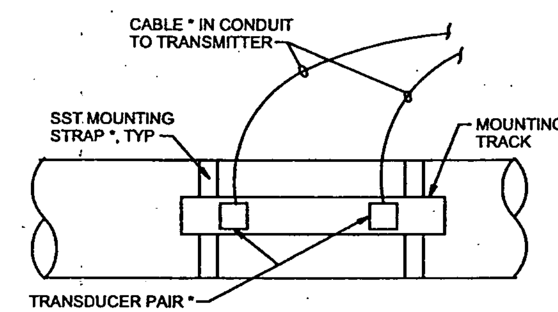
1. RE-USE EXISTING AT-2, AT-1, AND AT-4 FE AND FIT. RELOCATE AS NEEDED.
2. PROVIDE NEW FIT AND FE.



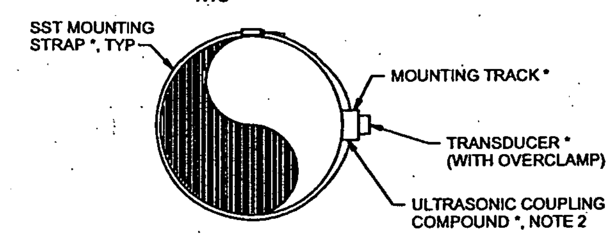
PROCESS AND INSTRUMENTATION DIAGRAM
NTS



PLC I/O WIRING - TYPICAL
NTS



PROCESS PIPE ELEVATION
NTS



PROCESS PIPE CROSS SECTION
NTS

NOTES:

1. COMPONENTS DESIGNATED BY * ARE SUPPLIED BY INSTRUMENT MANUFACTURER.
2. BEFOR APPLING COUPLING COMPOUND, CLEAN PIPE TO BARE METAL.
3. INSTALL TRANSDUCERS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
4. REFLECT MODE MOUNTING SHOWN. IF NECESSARY CONVERT TO DIRECT MODE.

ULTRASONIC FLOW ELEMENT (TRANSIT TIME) INSTALLATION
900

NO.	DATE	REVISION	BY	APVD
16-1	7/14/01	CHANGE AT-10 FLOW FROM 0-160GPM TO 0-100 GPM		
16-2	8/1/01	CORRECT LOCATIONS OF AT-7, AT-9		
16-3	8/1/01	CORRECT LOCATIONS OF AT-7, AT-9 AND LOCATIONS OF CP-1 AND CP-2		

DSGN P. DEJESUS
DR M. DUNN II
CHK D. DOAR
APVD

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

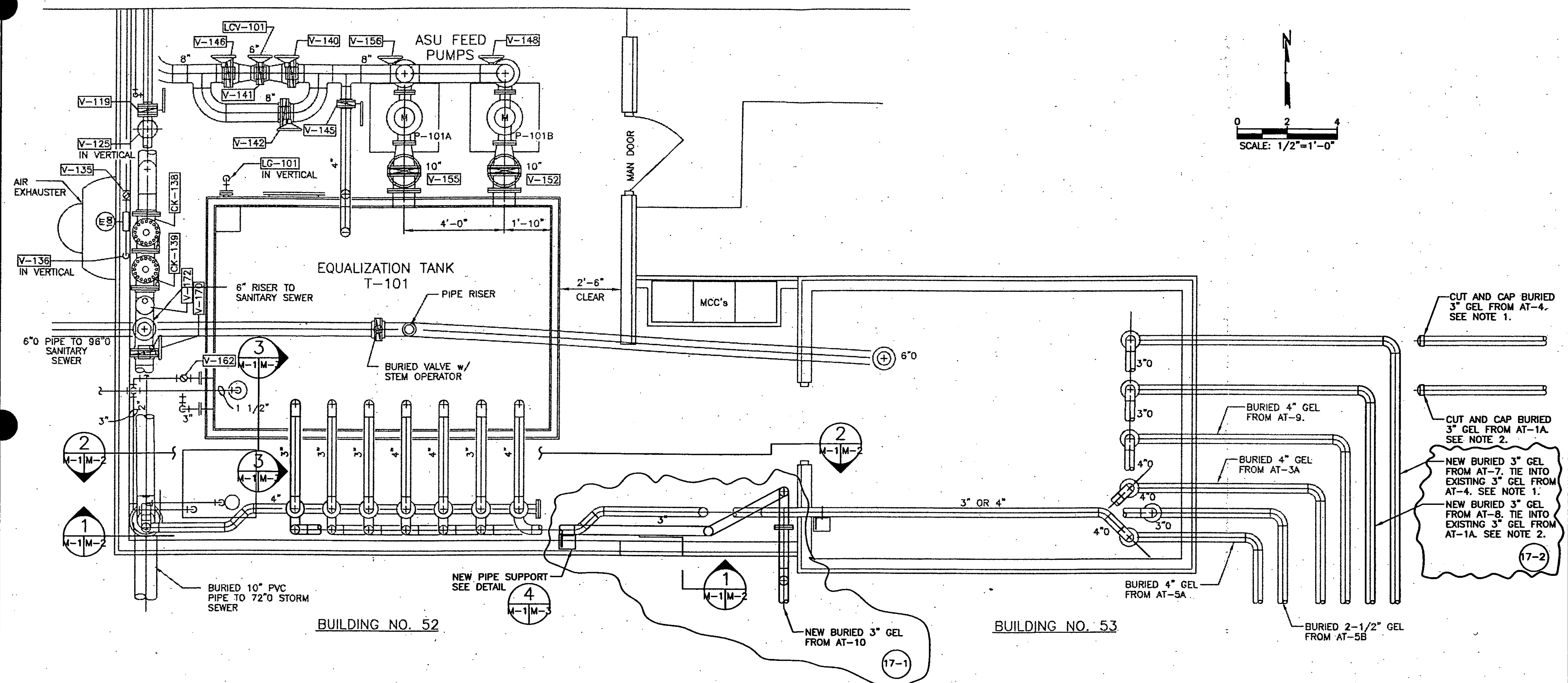
CH2MHILL

NIROP FRIDLEY
GROUNDWATER EXTRACTION SYSTEM
FRIDLEY, MN

ELECTRICAL

DETAILS

SHEET 16
DWG E-7
DATE FEB 2001
PROJ 153691.31.01.03.30



NOTES:

1. CUT EXISTING BURIED 3" PVC GEL FROM AT-4. REMOVE A SECTION OF PIPING OF SUFFICIENT LENGTH TO CONNECT NEW 3" PVC SCHEDULE 80 GEL FROM AT-8. DRAIN EXISTING PIPING PRIOR TO CUTTING PIPING. CAP LINE CAP EXISTING LINE FROM AT-4.

2. CUT EXISTING BURIED 3" PVC GEL FROM AT-1A. REMOVE A SECTION OF PIPING OF SUFFICIENT LENGTH TO CONNECT NEW 3" PVC SCHEDULE 80 GEL FROM AT-7. DRAIN EXISTING PIPING PRIOR TO CUTTING PIPING. CAP LINE CAP EXISTING LINE FROM AT-1A.

		NO.	DATE	REVISION	BY	APVD
DSGN	J. WATERS	17-1	7/14/01	AT-10 PIPING LOCATION		
DR	D. BELLARD-BENNETT	17-2	7/14/01	AT-7 AND AT-8 PIPES SWITCHED AROUND		
CHK	K. LANGE					
APVD						

BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

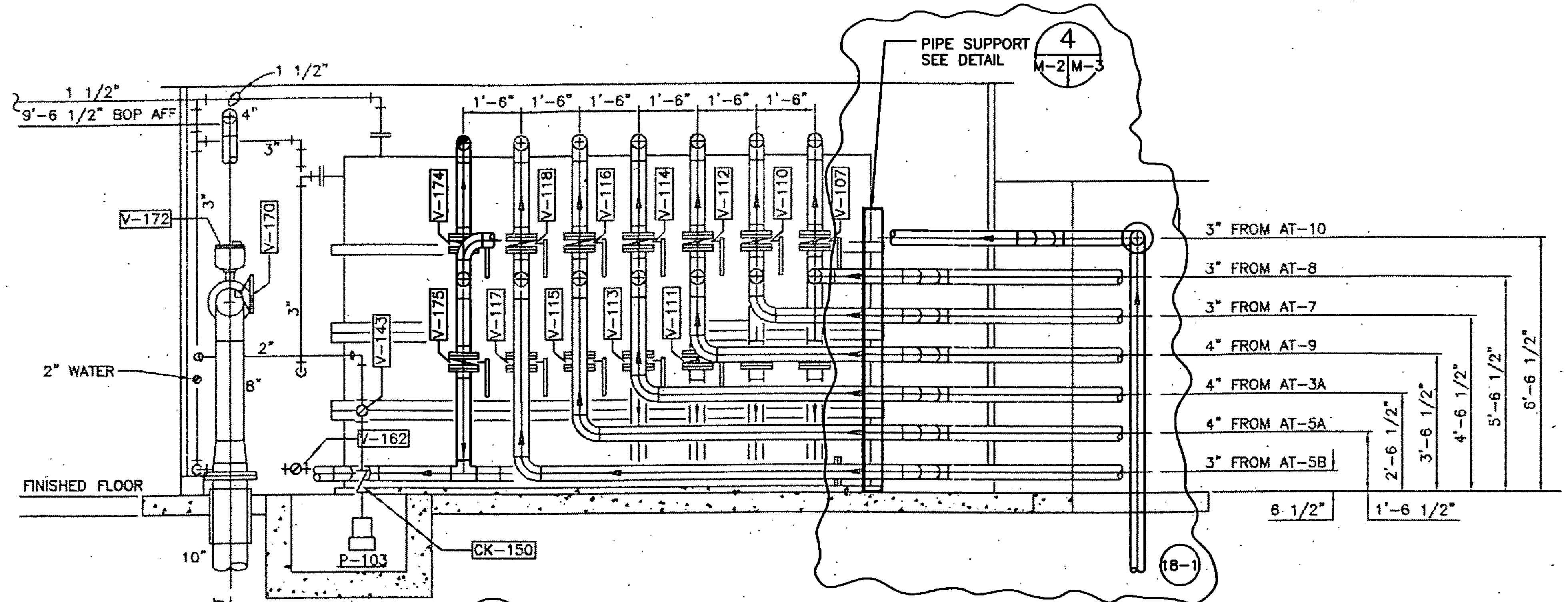
CH2MHILL

NIROP FRIDLEY
GROUNDWATER EXTRACTION SYSTEM
FRIDLEY, MN

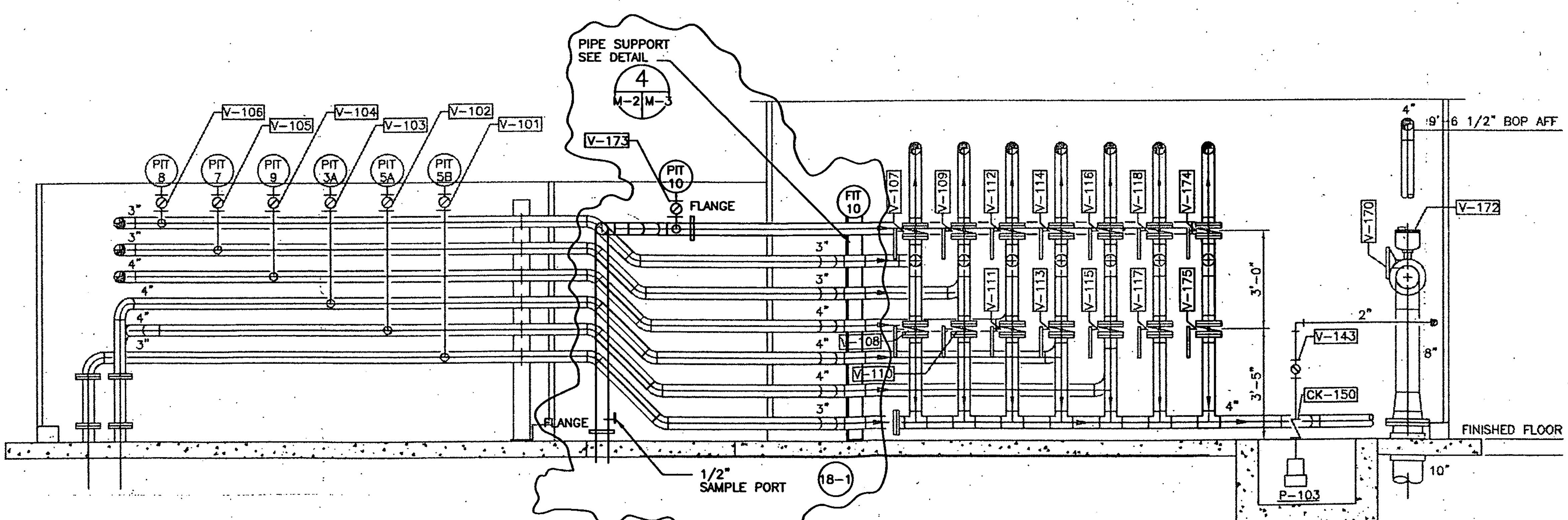
MECHANICAL

BUILDING 52/53
PARTIAL PLAN

SHEET	17
DWG NO.	M-1
DATE	FEB 2001
PROJ NO.	153691.31.01.03.30



1 M-1 M-2 SECTION
SCALE: 1/2"=1'-0"



2 M-1 M-2 SECTION
SCALE: 1/2"=1'-0"

0 2 4
SCALE: 1/2"=1'-0"

DSGN J. WATERS	18-1	7/14/01	AT-10 PIPE AND CORRECT SUPPORT LOCATION		
DR D. BELLARD-BENNETT					
CHK K. LANGE					
APVD	NO.	DATE	REVISION	BY	APVD

BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

CH2MHILL

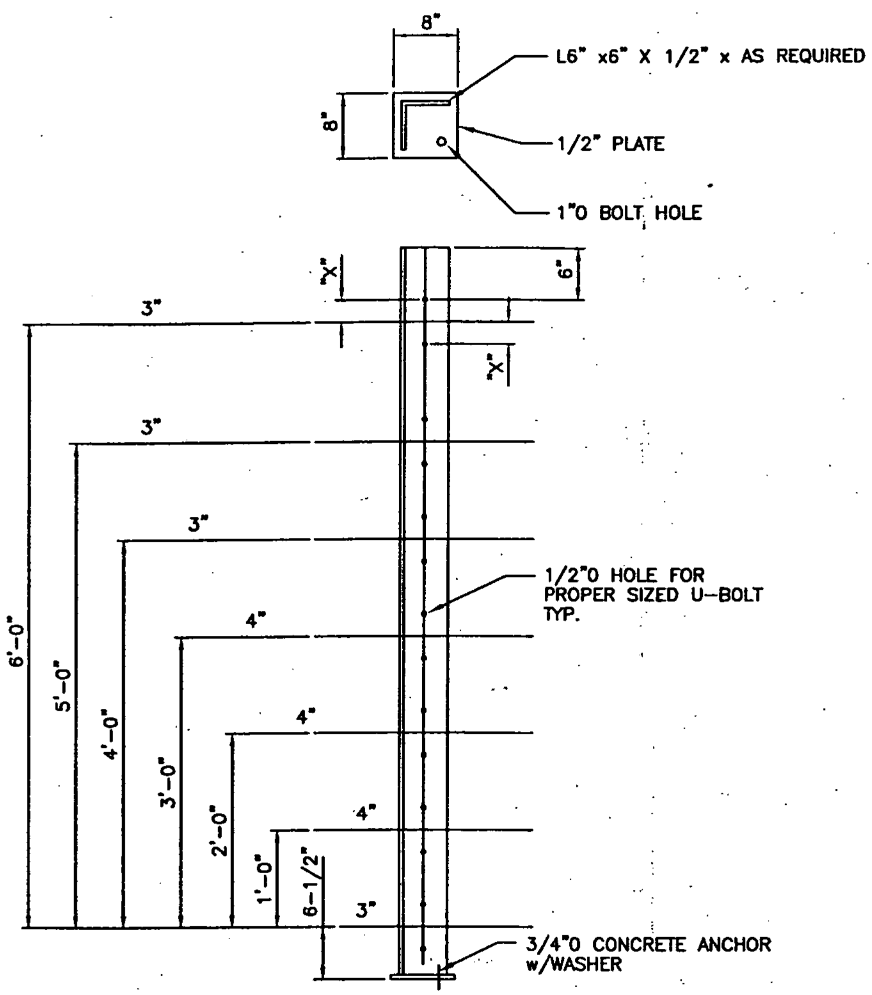
NIROP FRIDLEY
GROUNDWATER EXTRACTION SYSTEM
FRIDLEY, MINNESOTA

MECHANICAL

BUILDING 52/53
SECTIONS

SHEET 18
DWG NO. M-2
DATE FEB 2001
PROJ NO. 153691.31.01.03.30

1 2 3 4 5 6

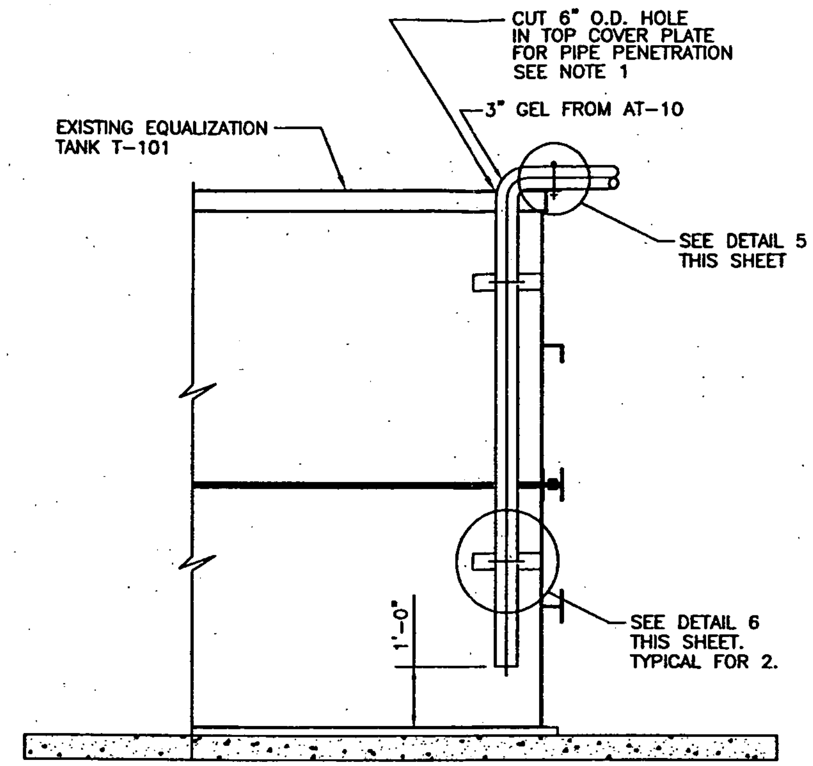


	"X"
3" PIPE	2 1/4"
4" PIPE	2 3/4"

4 M-1 | M-3

PIPE SUPPORT DETAIL

SCALE: NONE



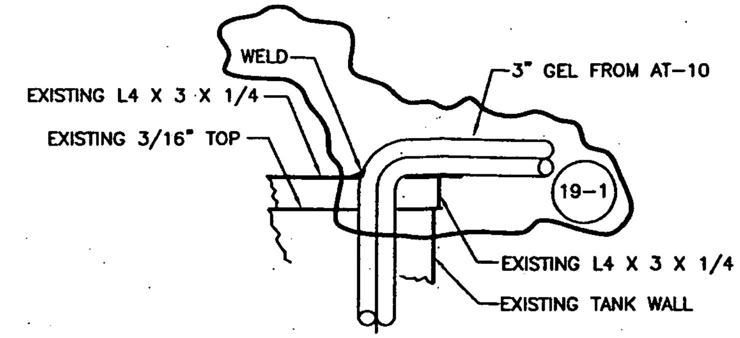
3 M-1 | M-3

SECTION

SCALE: 3/4"=1'-0"

NOTES:

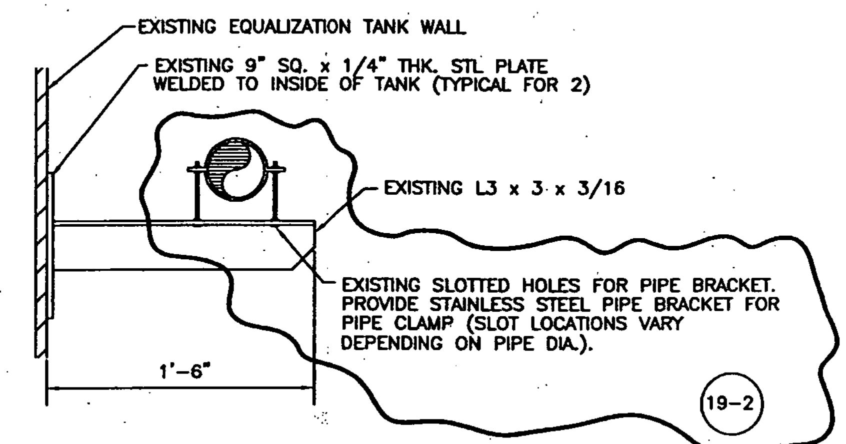
1. CONTRACTOR TO PROVIDE IMPERMEABLE SEAL BETWEEN PIPE O.D. AND 6" DIA. HOLE IN TOP COVER PLATE.



5 M-3 | M-3

DETAIL

SCALE : NTS



6 M-3 | M-3

DETAIL (PLAN VIEW)

SCALE : NTS

DSGN	J.WATERS	19-1	7/14/01	PIPE/TANK CONNECTION
DR	D. BELLARD-BENNETT	19-2	7/14/01	PIPE SUPPORT DETAIL
CHK	K. LANGE			
APVD		NO.	DATE	REVISION

BY APVD

BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

CH2MHILL

NIROP FRIDLEY
GROUNDWATER EXTRACTION SYSTEM
FRIDLEY, MN

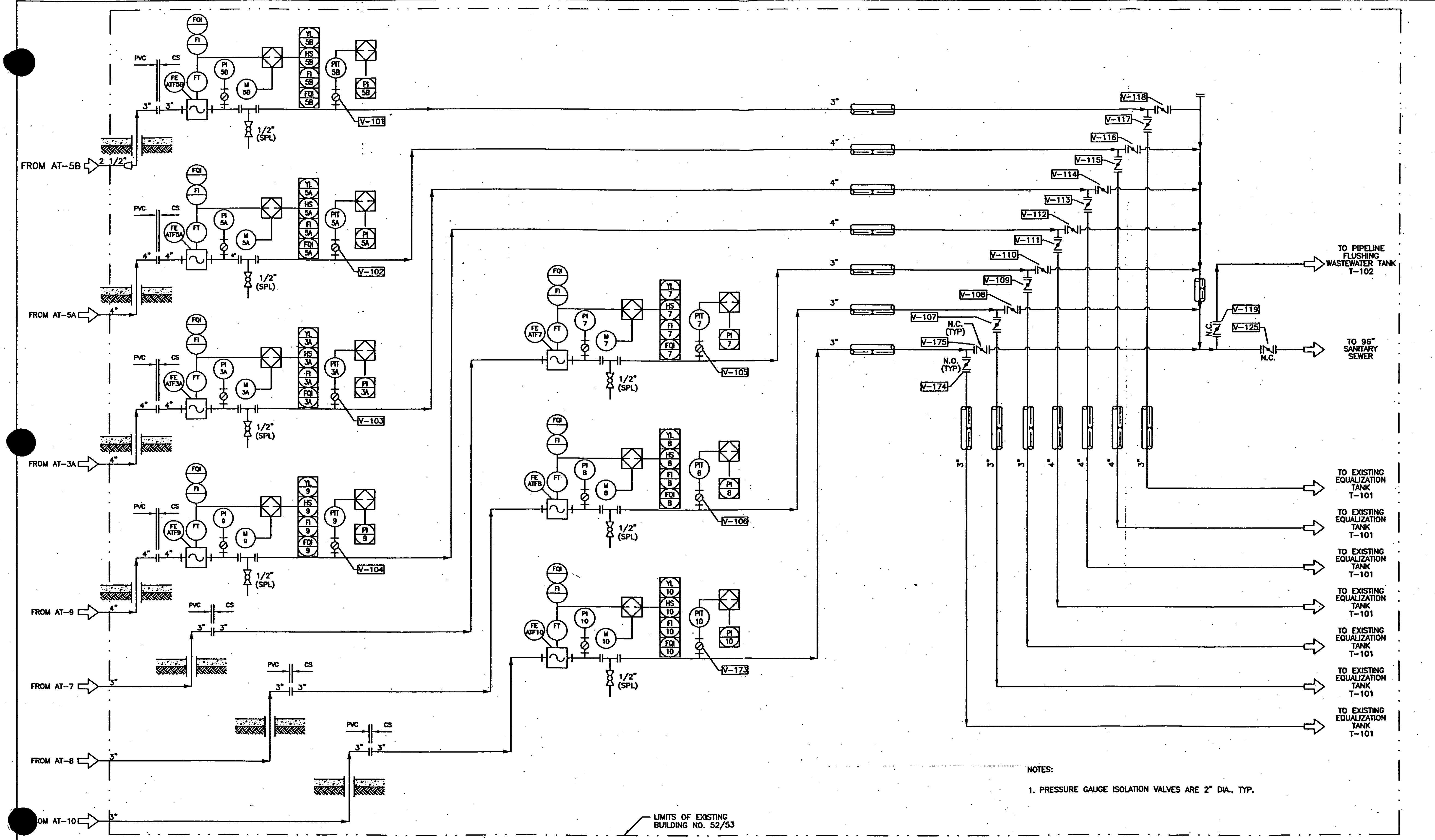
MECHANICAL

DETAILS

SHEET	19
DWG NO.	M-3
DATE	FEB 2001
PROJ NO.	153691.31.01.03.30

FILENAME: d153691m003.dgn PLOT DATE: 6-APR-2001

A B C D



NOTES:

1. PRESSURE GAUGE ISOLATION VALVES ARE 2" DIA., TYP.

DSGN	J. WATERS				
DR	D. BELLARD-BENNETT				
CHK	K. LANGE				
APVD		NO.	DATE	REVISION	BY	APVD

BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

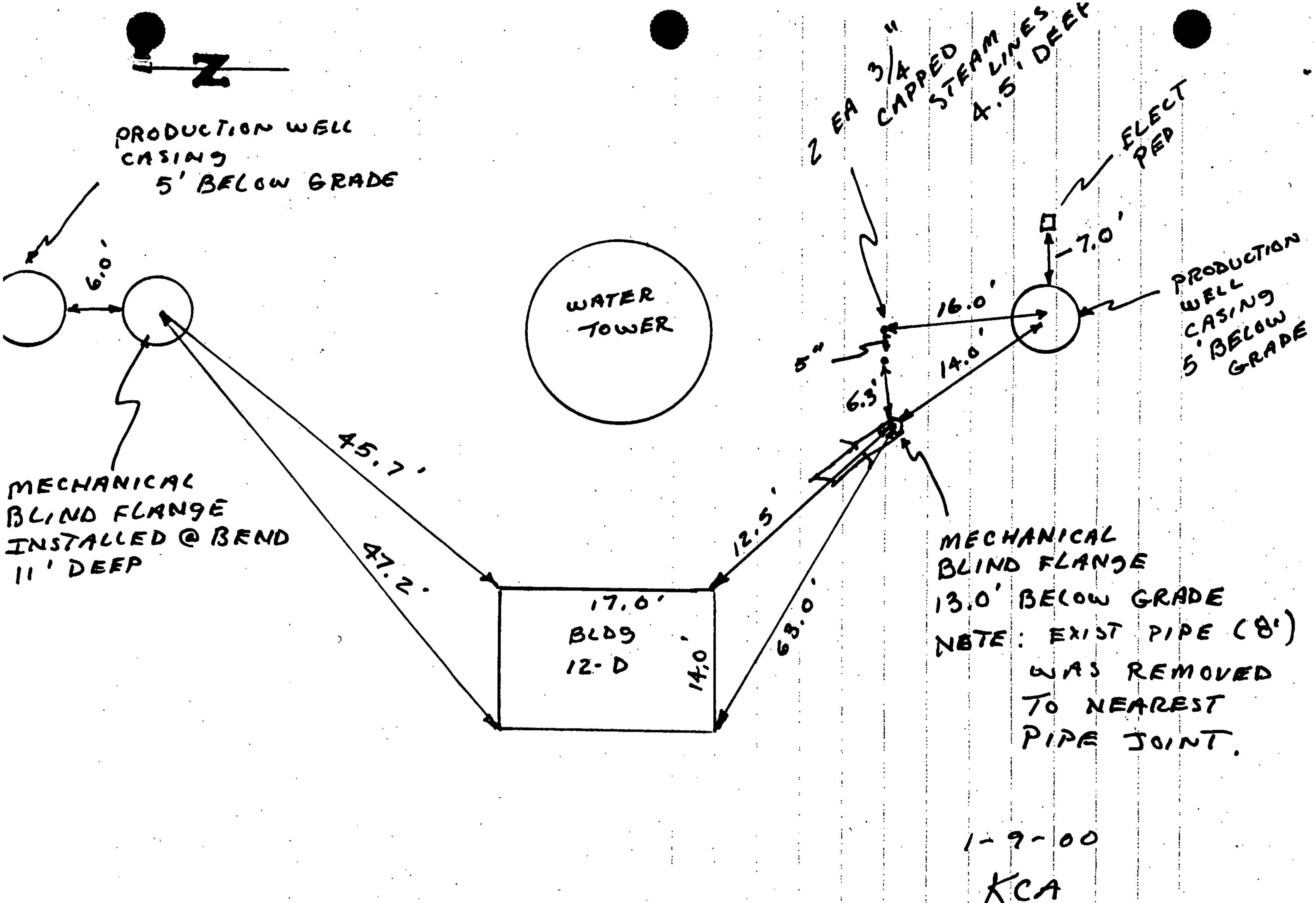
CH2MHILL

NIROP FRIDLEY
GROUNDWATER EXTRACTION SYSTEM
FRIDLEY, MINNESOTA

MECHANICAL

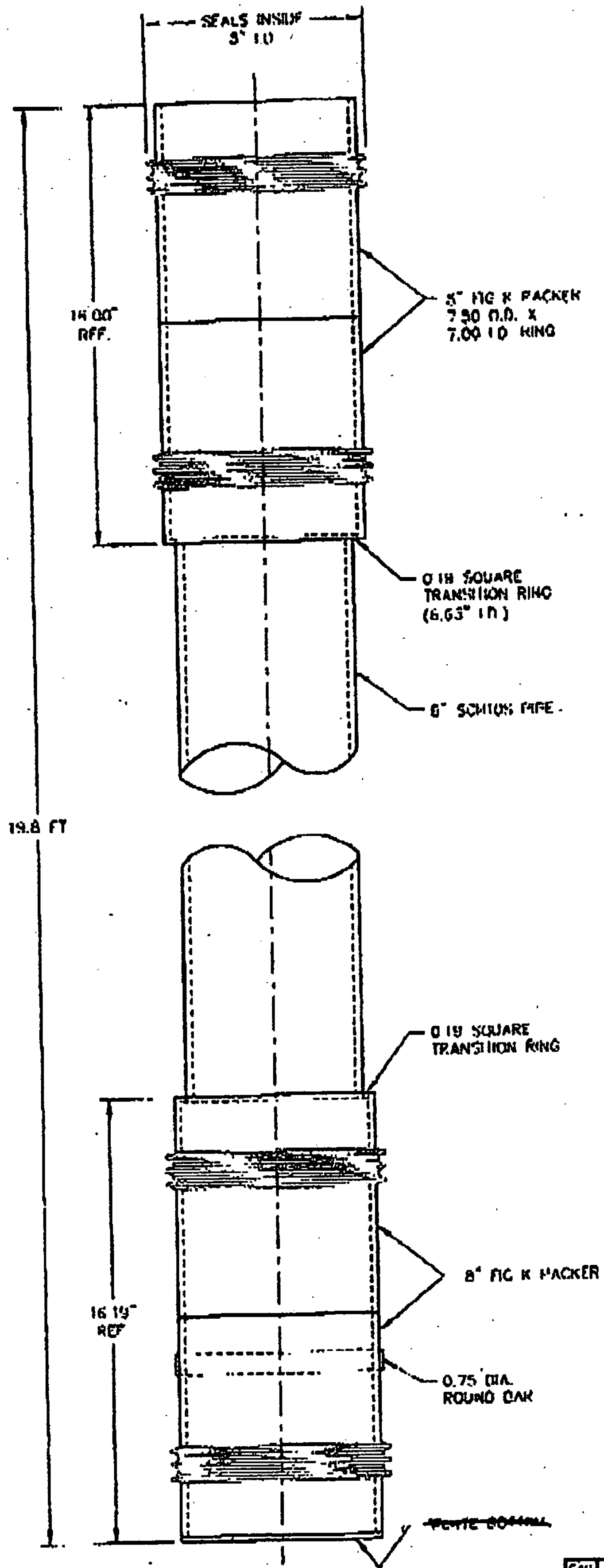
GROUNDWATER EXTRACTION SYSTEM
PARTIAL P&ID

SHEET	20
DWG NO.	M-4
DATE	FEB 2001
PROJ NO.	153691.31.01.03.30


N
PRODUCTION WELL CASING 5' BELOW GRADE
6.0'
MECHANICAL BLIND FLANGE INSTALLED @ BEND 11' DEEP
45.7'
47.2'
WATER TOWER
17.0'
BLDG 12-D
14.0'
2 EA 3/4" CAPPED STEAM LINES 4.5' DEEP
ELECT PED
7.0'
16.0'
14.0'
5"
6.3'
PRODUCTION WELL CASING 5' BELOW GRADE
12.5'
63.0'
MECHANICAL BLIND FLANGE 13.0' BELOW GRADE
NOTE: EXIST PIPE (8') WAS REMOVED TO NEAREST PIPE JOINT.
1-9-00
KCA

Appendix E2

Packker Assembly Details for AT-3A



NOTE:

MATERIAL TO BE 304 SS.

DO NOT SCALE THIS DRAWING

WORK TO DIMENSIONS

LINEAR DIMENSIONS ARE INCHES

8" FIG K PACKER ASSEMBLY

E.H. RENNER & SONS

U.S.

JOHNSON SCREENS

D. SCHULK 13 APR 01

SHEET 1 OF 1

C-28686-0

C-28686

Appendix E3

Air Emission Estimates Memo

Revised Air Emission Estimates from the Groundwater Treatment Facility at NIROP Fridley, MN

PREPARED FOR: Naval Facilities Engineering Command

PREPARED BY: CH2M HILL

DATE: May 31, 2001

The groundwater treatment system at the NIROP facility in Fridley, MN will be pumping from several new extraction wells and will cease pump from several existing wells. Based on these changes CH2M HILL performed an assessment to estimate the maximum potential air emissions from the groundwater treatment system at the NIROP Facility in Fridley, MN. This assessment was performed to determine if the changes would trigger any regulatory and/or permit requirements and to determine if the estimated emissions from the system would remain below the calculated site specific, allowable emission rates for each of the individual hazardous air pollutants (HAPs) of concern.

In Minnesota additional permit requirements and/or modifications are typically triggered by modifications that would cause the source to exceed the state and/or federal regulatory thresholds. The applicable state and federal regulatory thresholds for this source are 25 tons per year for total HAPs and/or 10 tons per year for any individual HAP. However, site-specific allowable emission rates for five individual HAPS were previously calculated for this site[1]. The revised emission estimates for the groundwater treatment facility were calculated and compared to both the regulatory thresholds and to the site-specific allowable emission rates based on the previously approved document[1].

Estimated emissions were calculated by multiplying the maximum concentration of each HAP by the current, projected and maximum flow rates. The total current flow rate for this system is 599 gpm (gallons per minute). The projected flow rate for this system is 725 gpm. The total maximum flow rate for this system is assumed to be 1000 gpm based on the specifications of the system. The maximum concentrations for each of the five HAPs were determined by reviewing historical analytical data available since 1995, from each of the individual extraction wells that will be used in the news system configuration. These calculations are provided in Attachment A. A summary of these emission estimates is shown in Table 1.

TABLE 1
Summary of Emission Estimates

[1] Reference: "Calculation of Site-Specific Allowable Emission Rates, Groundwater Treatment Facility, NIROP Fridley, Fridley, Minnesota, Unit Identification Code: N91192, Contract No. N62467-93-D-1106, September 1998, Southern Division, Naval Facilities Engineering Command, North Charleston, South Carolina, 29419-9010"

Parameter	Regulatory Threshold (tons/yr)	Site-Specific Allowable Emission Rate (ug/sec)[1]	Current Emission Rate[1]		Projected Emission Rate[2]		Maximum Emission Rate[3]	
			(ug/sec)	(tons/yr)	(ug/sec)	(tons/yr)	(ug/sec)	(tons/yr)
Trichloroethylene	10	1.6×10^6	7.7×10^4	2.68	8.7×10^4	3.02	2.5×10^5	8.33
Methylene Chloride	10	5.4×10^6	8.6×10^1	0.003	8.6×10^1	0.003	3.2×10^2	0.011
Perchloroethylene	10	4.6×10^6	1.4×10^2	0.005	1.2×10^2	0.004	6.3×10^2	0.022
1,1, Dichloroethylene	10	5.4×10^6	5.8×10^1	0.002	2.9×10^1	0.001	4.9×10^2	0.017
1,1, Dichloroethane	10	1.35×10^8	1.4×10^2	0.005	1.2×10^2	0.002	1.4×10^3	0.048
Total VOCs	25			2.94		3.22		9.06

[1]Based on results obtained in reference 1 below.
[2]Calculated using current and projected flow rates and maximum historical concentrations.
[3]Calculated using the maximum flow rate and maximum historical concentrations.

This memo documents that the "worst case" emission estimate based on historical data and maximum flow rates do not exceed either the regulatory thresholds or the site-specific allowable emission estimates. Therefore, based on these comparisons CH2M HILL does not anticipate any additional regulatory and/or permitting requirements and recommends that this system can continue to operate under the guidelines determined by the MPCA. Quarterly actual emissions estimates required by MPCA operating guidelines will still need to be provided to MPCA by the Navy.

		From Modeling Report		Revised Emission Rates, Current and Projected			
Parameter	Threshold per Federal Regulations (tons/yr)	Allowable Emission Rate (tons/yr) (1)	Maximum Anticipated Emission Rate (tons/yr) (1)	Current Emission Rate (tons/yr) (2)	Projected Emission Rate (tons/yr) (2)	Maximum Current Emission Rate (tons/yr) (2)	Maximum Projected Emission Rate (tons/yr) (2)
Trichloroethylene	10	56	6.58	2.68	3.02	8.33	8.33
methylene chloride	10	188	0.09	0.003	0.003	0.011	0.011
perchloroethylene (tetrachloroethylene)	10	160	0.02	0.005	0.004	0.022	0.022
1,1-dichloroethylene (1,1-dichlorethene)	10	2	0.01	0.002	0.001	0.017	0.017
1,1-dichloroethane	10	4,694	0.02	0.005	0.002	0.048	0.048
Total VOCs	25	5,100	6.72	2.94	3.22	9.06	9.06

Notes:

(1) Total VOCs for Allowable Emissions Rate and Maximum Anticipated Emission Rate is equal to the sum of the 5 individual VOCs.

(2) Total VOCs for Revised Maximum Anticipated Emission Rate is based on available analytical data for Total VOCs..

Parameter	Allowable Emission Rate (ug/sec)	Allowable Emission Rate (lbs/day)	Allowable Emission Rate (tons/yr)	Allowable Groundwater Treatment Concentration (mg/L)	Flow rate (gpm)	Allowable Emission Rate (lbs/day)	Allowable Emission Rate (tons/yr)	Maximum Anticipated Groundwater Concentration (mg/L)	Maximum Anticipated Emission Rate (lbs/day)	Maximum Anticipated Emission Rate (tons/yr)
Trichloroethylene	1.60E+06	305	56	25	1000	300	54.82	3	36.05	6.58
methylene chloride	5.40E+06	1029	188	85	1000	1,021	186.40	0.04	0.48	0.09
perchloroethylene (tetrachloroethylene)	4.60E+06	876	160	73	1000	877	160.08	0.01	0.12	0.02
1,1-dichloroethylene (1,1-dichlorethene)	5.40E+04	10	2	0.85	1000	10	1.86	0.005	0.06	0.01
1,1-dichloroethane	1.35E+08	25719	4694	2100	1000	25,233	4,605	0.01	0.12	0.02

This data is based on information provided in the following document: "*Calculation of Site-Specific Allowable Emission Rates - Groundwater Treatment Facility,* NIROP Fridley, Fridley, Minnesota September 1998, Southern Division Naval Facilities Engineering Command, North Charleston, South Carolina 29419-9010."

Extraction Well No.	Avg. Flow Rate (gpm)		VOC Data available	
	Current	Projected	from Extraction Well	from nearby Monitoring Well
AT-1A	52	0	NR	
AT-2	34	0	NR	
AT-3A	235	245	Total VOCs = 1244 ug/L (Sampled on 10/1/00 by Baywest)	
AT-4	38	0	NR	
AT-5A	156	175	Total VOCs = 636 ug/L (Sampled on 10/1/00 by Baywest)	
AT-5B	84	70	Total VOCs = 522.4 ug/L (Sampled on 10/1/00 by Baywest)	
AT-6	0	0	NA	
AT-7	0	50	NA	At well MS-35S a TCE concentration of 220 ug/l (Sampled date:10/13/00 by Baywest)
AT-8	0	15	NA	At well MS-34S a TCE concentration of 32 ug/l (Sampled date:10/12/00 by Baywest)
AT-9	0	150	NA	At well MS-32I a TCE concentration of 1400 ug/l (Sampled date:10/18/00 by Baywest)
AT-10	0	20	NA	At well 12-IS a TCE concentration of 34 ug/l (Sampled date:10/16/00 by Baywest)
Total Flow Rate (gpm)	599	725		

NR - Not required
NA - Not applicable/Not available
gpm - gallons per minute

Wells operating at current vs. projected flows and latest available concentrations.

Extraction Well No.	Avg. Flow Rate (gpm)		Avg. Flow Rate (gpd)		Latest Data 10/00 (1)	Current VOC Emissions			Projected VOC Emissions		
	Current	Projected	Current	Projected	VOC (ug/L) (2)	lbs/day	lbs/year	tons/year	lbs/day	lbs/year	tons/year
AT-1A	52	0	74,880	0	20.2	0.01			0.00		
AT-2 (1)	34	0	48,960	0	825	0.34			0.00		
AT-3A	235	245	338,400	352,800	1244.2	3.51			3.66		
AT-4	38	0	54,720	0	336.3	0.15			0.00		
AT-5A	156	175	224,640	252,000	636.3	1.19			1.34		
AT-5B	84	70	120,960	100,800	522.4	0.53			0.44		
AT-6	0	0	0	0	NR						
AT-7	0	50	0	72,000	220	0.00			0.13		
AT-8	0	15	0	21,600	32	0.00			0.01		
AT-9	0	150	0	216,000	1400	0.00			2.52		
AT-10	0	20	0	28,800	34	0.00			0.01		
Total	599	725	862,560	1,044,000		5.74	2094	**1.05**	8.11	2960	**1.48**
Max flow rate & max conc	1000	1,000	1,440,000	1,440,000	1400	16.82	6140	**3.07**	16.82	6140	**3.07**

Wells operating at current vs. projected flows and historical concentrations (maximum values since 1995).

Extraction Well No.	Avg. Flow Rate (gpm)		Avg. Flow Rate (gpd)		Historical Data	Current VOC Emissions			Projected VOC Emissions		
	Current	Projected	Current	Projected	VOC (ug/L) (2)	lbs/day	lbs/year	tons/year	lbs/day	lbs/year	tons/year
AT-1A	52	0	74,880	0	80.9	0.05			0.00		
AT-2	34	0	48,960	0	4130	1.69			0.00		
AT-3A	235	245	338,400	352,800	3300	9.32			9.71		
AT-4	38	0	54,720	0	1193	0.54			0.00		
AT-5A	156	175	224,640	252,000	1900	3.56			4.00		
AT-5B	84	70	120,960	100,800	957	0.97			0.80		
AT-6	0	0	0	0	NR						
AT-7	0	50	0	72,000	220	0.00			0.13		
AT-8	0	15	0	21,600	32	0.00			0.01		
AT-9	0	150	0	216,000	1400	0.00			2.52		
AT-10	0	20	0	28,800	2000	0.00			0.48		
Total	599	725	862,560	1,044,000		16.13	5887	**2.94**	17.66	6445	**3.22**
Max flow rate & max conc	1000	1,000	1,440,000	1,440,000	4130	49.63	18113	**9.06**	49.63	18113	**9.06**

Notes:

NR - Not required
gpm - gallons per minute, gpd - gallons per day
(1) Latest data available for AT-2 is from 5/00, all other data is from 10/00.
(2) VOC data for AT-7, AT-8, AT-9 and AT-10 based on TCE concentrations, no other VOC data are available at these locations. Total VOCs for AT-1A, 2, 3A, 4, 5A and 5B is equal to the sum of the following VOCs:
Chloromethane, Bromomethane, Dichlorodifluoromethane, Vinyl chloride, Chloroethane, Methylene chloride, Trichlorofluoromethane, 1,1-Dichloroethylene, 1,1-Dichloroethane, Total 1,2-Dichloroethylene, (If 8010 -cis) Chloroform, 1,2-Dichloroethane, 1,1,1-Trichloroethane, Carbon tetrachloride, Bromodichloromethane, 1,2-Dichloropropane, cis-1,3-Dichloro-1-propene, Trichlorethylene, Dibromochloromethane, 1,1,2-Trichloroethane, trans-1,3-Dichloro-1-propene, 2-Chloroethylvinyl ether, Bromoform, 1,1,2,2-Tetrachloroethane, Tetrachloroethylene, Chlorobenzene, 1,3-Dichlorobenzene, 1,2-Dichlorobenzene, 1,4-Dichlorobenzene, Acetone carbon disulfide 2 Butanone Benzene 4-methyl-2-pentanone 2-Hexanone Toluene ethylbenzene Styrene Xylene

Wells operating at current vs. projected flows and latest available concentrations.

Extraction Well No.	Avg. Flow Rate (gpm)		Avg. Flow Rate (gpd)		Latest Data 10/00 (1)	Current TCE Emissions			Projected TCE Emissions		
	Current	Projected	Current	Projected	TCE (ug/L)	lbs/day	lbs/year	tons/year	lbs/day	lbs/year	tons/year
AT-1A	52	0	74,880	0	15	0.01			0.00		
AT-2(1)	34	0	48,960	0	490	0.20			0.00		
AT-3A	235	245	338,400	352,800	1000	2.82			2.94		
AT-4	38	0	54,720	0	110	0.05			0.00		
AT-5A	156	175	224,640	252,000	570	1.07			1.20		
AT-5B	84	70	120,960	100,800	470	0.47			0.40		
AT-6	0	0	0	0	NR						
AT-7	0	50	0	72,000	220	0.00			0.13		
AT-8	0	15	0	21,600	32	0.00			0.01		
AT-9	0	150	0	216,000	1400	0.00			2.52		
AT-10	0	20	0	28,800	34	0.00			0.01		
Total	599	725	862,560	1,044,000		4.63	1689	0.84	7.21	2631	1.32
Max flow rate & max conc	1000	1,000	1,440,000	1,440,000	1400	16.82	6140	3.07	16.82	6140	3.07

Wells operating at current vs. projected flows and historical concentrations (maximum values since 1995).

Extraction Well No.	Avg. Flow Rate (gpm)		Avg. Flow Rate (gpd)		Historical Data	Current TCE Emissions			Projected TCE Emissions		
	Current	Projected	Current	Projected	TCE (ug/L)	lbs/day	lbs/year	tons/year	lbs/day	lbs/year	tons/year
AT-1A	52	0	74,880	0	56	0.03			0.00		
AT-2	34	0	48,960	0	3800	1.55			0.00		
AT-3A	235	245	338,400	352,800	3000	8.47			8.83		
AT-4	38	0	54,720	0	680	0.31			0.00		
AT-5A	156	175	224,640	252,000	1800	3.37			3.79		
AT-5B	84	70	120,960	100,800	920	0.93			0.77		
AT-6	0	0	0	0	NR						
AT-7	0	50	0	72,000	220	0.00			0.13		
AT-8	0	15	0	21,600	32	0.00			0.01		
AT-9	0	150	0	216,000	1400	0.00			2.52		
AT-10	0	20	0	28,800	2000	0.00			0.48		
Total	599	725	862,560	1,044,000		14.67	5355	2.68	16.53	6034	3.02
Max flow rate & max conc	1000	1,000	1,440,000	1,440,000	3800	45.66	16666	8.33	45.66	16666	8.33

Notes:

NR - Not required
gpm - gallons per minute, gpd - gallons per day
(1) Latest data available for AT-2 is from 5/00, all other data is from 10/00.

Wells operating at current vs. projected flows and latest available concentrations.

Extraction Well No.	Avg. Flow Rate (gpm)		Avg. Flow Rate (gpd)		Latest Data 10/00[1] methylene chloride (ug/L)	Current Methylene Chloride Emissions			Projected Methylene Chloride Emissions		
	Current	Projected	Current	Projected		lbs/day	lbs/year	tons/year	lbs/day	lbs/year	tons/year
AT-1A	52	0	74,880	0	0	0.00			0.00		
AT-2[1]	34	0	48,960	0	0	0.00			0.00		
AT-3A	235	245	338,400	352,800	0	0.00			0.00		
AT-4	38	0	54,720	0	0	0.00			0.00		
AT-5A	156	175	224,640	252,000	0	0.00			0.00		
AT-5B	84	70	120,960	100,800	0	0.00			0.00		
AT-6	0	0	0	0	NR						
AT-7	0	50	0	72,000	NA						
AT-8	0	15	0	21,600	NA						
AT-9	0	150	0	216,000	NA						
AT-10	0	20	0	28,800	NA						
Total	599	725	862,560	1,044,000		0.00	0	0.00	0.00	0	0.00
Max flow rate & max conc	1000	1,000	1,440,000	1,440,000	0	0.00	0	0.00	0.00	0	0.00

Wells operating at current vs. projected flows and historical concentrations (maximum values since 1995).

Extraction Well No.	Avg. Flow Rate (gpm)		Avg. Flow Rate (gpd)		Historical Data methylene chloride (ug/L)	Current Methylene Chloride Emissions			Projected Methylene Chloride Emissions		
	Current	Projected	Current	Projected		lbs/day	lbs/year	tons/year	lbs/day	lbs/year	tons/year
AT-1A	52	0	74,880	0	1.4	0.00			0.00		
AT-2	34	0	48,960	0	0.93	0.00			0.00		
AT-3A	235	245	338,400	352,800	4.8	0.01			0.01		
AT-4	38	0	54,720	0	0.98	0.00			0.00		
AT-5A	156	175	224,640	252,000	0	0.00			0.00		
AT-5B	84	70	120,960	100,800	0	0.00			0.00		
AT-6	0	0	0	0	NR						
AT-7	0	50	0	72,000	NA						
AT-8	0	15	0	21,600	NA						
AT-9	0	150	0	216,000	NA						
AT-10	0	20	0	28,800	NA						
Total	599	725	862,560	1,044,000		0.02	5.6	0.003	0.01	5.2	0.003
Max flow rate & max conc	1000	1,000	1,440,000	1,440,000	4.8	0.06	21.1	0.011	0.06	21.1	0.011

Notes:

NR - Not required
NA - Not applicable/Not available
gpm - gallons per minute, gpd - gallons per day
(1) Latest data available for AT-2 is from 5/00, all other data is from 10/00.

Wells operating at current vs. projected flows and latest available concentrations.

	Avg. Flow Rate (gpm)		Avg. Flow Rate (gpd)		Latest Data 10/00 (1)	Current PERC Emissions			Projected PERC Emissions		
Extraction Well No.	Current	Projected	Current	Projected	PERC (ug/L)	lbs/day	lbs/year	tons/year	lbs/day	lbs/year	tons/year
AT-1A	52	0	74,880	0	1.6	0.001			0.000		
AT-2 (1)	34	0	48,960	0	0.0	0.000			0.000		
AT-3A	235	245	338,400	352,800	4.8	0.014			0.014		
AT-4	38	0	54,720	0	3.7	0.002			0.000		
AT-5A	156	175	224,640	252,000	2.4	0.004			0.005		
AT-5B	84	70	120,960	100,800	3.2	0.003			0.003		
AT-6	0	0	0	0	NA						
AT-7	0	50	0	72,000	NA						
AT-8	0	15	0	21,600	NA						
AT-9	0	150	0	216,000	NA						
AT-10	0	20	0	28,800	NA						
Total	599	725	862,560	1,044,000		0.024	8.7	**0.004**	0.022	8.0	**0.004**
Max flow rate & max conc	1000	1,000	1,440,000	1,440,000	4.8	0.06	21	**0.011**	0.06	21	**0.01**

Wells operating at current vs. projected flows and historical concentrations (maximum values since 1995).

	Avg. Flow Rate (gpm)		Avg. Flow Rate (gpd)		Historical Data	Current PERC Emissions			Projected PERC Emissions		
Extraction Well No.	Current	Projected	Current	Projected	PERC (ug/L)	lbs/day	lbs/year	tons/year	lbs/day	lbs/year	tons/year
AT-1A	52	0	74,880	0	4.0	0.00			0.00		
AT-2	34	0	48,960	0	0.0	0.00			0.00		
AT-3A	235	245	338,400	352,800	4.8	0.01			0.01		
AT-4	38	0	54,720	0	10	0.00			0.00		
AT-5A	156	175	224,640	252,000	2.4	0.00			0.01		
AT-5B	84	70	120,960	100,800	4.0	0.00			0.00		
AT-6	0	0	0	0	NR						
AT-7	0	50	0	72,000	NA						
AT-8	0	15	0	21,600	NA						
AT-9	0	150	0	216,000	NA						
AT-10	0	20	0	28,800	NA						
Total	599	725	862,560	1,044,000		0.03	10.6	**0.005**	0.02	8.2	**0.004**
Max flow rate & max conc	1000	1,000	1,440,000	1,440,000	10	0.12	43.9	**0.022**	0.12	43.9	**0.022**

Notes:

NR - Not required
NA - Not applicable/Not available
gpm - gallons per minute, gpd - gallons per day
(1) Latest data available for AT-2 is from 5/00, all other data is from 10/00.

Wells operating at current vs. projected flows and latest available concentrations.

Extraction Well No.	Avg. Flow Rate (gpm)		Avg. Flow Rate (gpd)		Latest Data 10/00 [1]	Current 1,1 DCE Emissions			Projected 1,1 DCE Emissions		
	Current	Projected	Current	Projected	1,1 DCE (ug/L)	lbs/day	lbs/year	tons/year	lbs/day	lbs/year	tons/year
AT-1A	52	0	74,880	0	0	0.000			0.000		
AT-2[1]	34	0	48,960	0	0	0.000			0.000		
AT-3A	235	245	338,400	352,800	1.3	0.004			0.004		
AT-4	38	0	54,720	0	0	0.000			0.000		
AT-5A	156	175	224,640	252,000	0	0.000			0.000		
AT-5B	84	70	120,960	100,800	0	0.000			0.000		
AT-6	0	0	0	0	NR						
AT-7	0	50	0	72,000	NA						
AT-8	0	15	0	21,600	NA						
AT-9	0	150	0	216,000	NA						
AT-10	0	20	0	28,800	NA						
Total	599	725	862,560	1,044,000		0.004	1.3	0.001	0.004	1.4	0.001
Max flow rate & max conc	1000	1,000	1,440,000	1,440,000	1.3	0.016	5.7	0.003	0.016	5.7	0.003

Wells operating at current vs. projected flows and historical concentrations (maximum values since 1995).

Extraction Well No.	Avg. Flow Rate (gpm)		Avg. Flow Rate (gpd)		Historical Data	Current 1,1 DCE Emissions			Projected 1,1 DCE Emissions		
	Current	Projected	Current	Projected	1,1 DCE (ug/L)	lbs/day	lbs/year	tons/year	lbs/day	lbs/year	tons/year
AT-1A	52	0	74,880	0	0	0.00			0.00		
AT-2	34	0	48,960	0	7.6	0.00			0.00		
AT-3A	235	245	338,400	352,800	1.5	0.00			0.00		
AT-4	38	0	54,720	0	1.5	0.00			0.00		
AT-5A	156	175	224,640	252,000	1	0.00			0.00		
AT-5B	84	70	120,960	100,800	0	0.00			0.00		
AT-6	0	0	0	0	NR						
AT-7	0	50	0	72,000	NA						
AT-8	0	15	0	21,600	NA						
AT-9	0	150	0	216,000	NA						
AT-10	0	20	0	28,800	NA						
Total	599	725	862,560	1,044,000		0.010	3.6	0.002	0.007	2.4	0.001
Max flow rate & max conc	1000	1,000	1,440,000	1,440,000	7.6	0.091	33.3	0.017	0.091	33.3	0.017

Notes:

NR - Not required
NA - Not applicable/Not available
gpm - gallons per minute, gpd - gallons per day
(1) Latest data available for AT-2 is from 5/00, all other data is from 10/00.

Wells operating at current vs. projected flows and latest available concentrations.

Extraction Well No.	Avg. Flow Rate (gpm) Current	Avg. Flow Rate (gpm) Projected	Avg. Flow Rate (gpd) Current	Avg. Flow Rate (gpd) Projected	Latest Data 10/00[1] 1,1 DCA (ug/L)	Current 1,1 DCA Emissions lbs/day	Current 1,1 DCA Emissions lbs/year	Current 1,1 DCA Emissions tons/year	Projected 1,1 DCA Emissions lbs/day	Projected 1,1 DCA Emissions lbs/year	Projected 1,1 DCA Emissions tons/year
AT-1A	52	0	74,880	0	0	0.000			0.000		
AT-2[1]	34	0	48,960	0	12	0.005			0.000		
AT-3A	235	245	338,400	352,800	2.1	0.006			0.006		
AT-4	38	0	54,720	0	0	0.000			0.000		
AT-5A	156	175	224,640	252,000	1.9	0.004			0.004		
AT-5B	84	70	120,960	100,800	1.2	0.001			0.001		
AT-6	0	0	0	0	NR						
AT-7	0	50	0	72,000	NA						
AT-8	0	15	0	21,600	NA						
AT-9	0	150	0	216,000	NA						
AT-10	0	20	0	28,800	NA						
Total	599	725	862,560	1,044,000		0.016	5.7	0.003	0.011	4.1	0.002
Max flow rate & max conc	1000	1,000	1,440,000	1,440,000	12.0	0.144	52.6	0.026	0.144	52.6	0.026

Wells operating at current vs. projected flows and historical concentrations (maximum values since 1995).

Extraction Well No.	Avg. Flow Rate (gpm) Current	Avg. Flow Rate (gpm) Projected	Avg. Flow Rate (gpd) Current	Avg. Flow Rate (gpd) Projected	Historical Data 1,1 DCA (ug/L)	Current 1,1 DCA Emissions lbs/day	Current 1,1 DCA Emissions lbs/year	Current 1,1 DCA Emissions tons/year	Projected 1,1 DCA Emissions lbs/day	Projected 1,1 DCA Emissions lbs/year	Projected 1,1 DCA Emissions tons/year
AT-1A	52	0	74,880	0	2.0	0.00			0.00		
AT-2	34	0	48,960	0	22	0.01			0.00		
AT-3A	235	245	338,400	352,800	2.3	0.01			0.01		
AT-4	38	0	54,720	0	11	0.01			0.00		
AT-5A	156	175	224,640	252,000	2.0	0.00			0.00		
AT-5B	84	70	120,960	100,800	1.2	0.00			0.00		
AT-6	0	0	0	0	NR						
AT-7	0	50	0	72,000	NA						
AT-8	0	15	0	21,600	NA						
AT-9	0	150	0	216,000	NA						
AT-10	0	20	0	28,800	NA						
Total	599	725	862,560	1,044,000		0.027	9.8	0.005	0.012	4.4	0.002
Max flow rate & max conc	1000	1,000	1,440,000	1,440,000	22.0	0.264	96.5	0.048	0.264	96.5	0.048

Notes:

NR - Not required
NA - Not applicable/Not available
gpm - gallons per minute, gpd - gallons per day
(1) Latest data available for AT-2 is from 5/00, all other data is from 10/00.

Appendix E4

Operation and Maintenance Manual for Pumps

F. H. Renner & Sons
INCORPORATED

WELL DRILLING FOR FOUR GENERATIONS
15688 JARVIS STREET N.W. / ELK RIVER, MN 55330
PHONE: (612) 427-6100 / FAX: (612) 427-0533

CH2M HILL Constructor's Inc.
NIROP

14 JANUARY, 2001

PUMP DESIGN

	WELL #			
	AT7	AT8	AT9	AT10
DESIGN RATE	40	40	100	30
CURRENT PLAN RATE	50	15	150	20
PUMPING LEVEL @ PLAN RATE	29	29	30.92	48
DROP PIPE MATERIAL	PVC	PVC	PVC	PVC
DROP PIPE SIZE/LENGTH	2"/22.5FT	1.25"/22FT	3"/30	1.5"/30FT
DISCHARGE SIZE/LENGTH	3/300	3/300	4/200	3/850
FRICTION LOSS DROP PIPE	1.27	1.07	2.48	.88
FRICTION LOSS DISCHARGE	4.27	<1	10.44	3.8
LIFT	8	8	8	8
BACK PRESSURE (25PSI)	58	58	58	58
HORESPOWER	3	¾	1	7.5
WIRE SIZE AGW#	12	12	12	12
PUMP MODEL #	60S30	16S07	150S75	25S10
STAGES	5	8	4	7
DEMAND FLOW RATE	50	15	150	20
DEMAND TDH	100.54	97.07	110	119
PUMP FLOW RATE	50	15	150	20
SUPPLY TDH	125	165	145	165
RUNNING PRESSURE (PSI	35	54	40	44.91

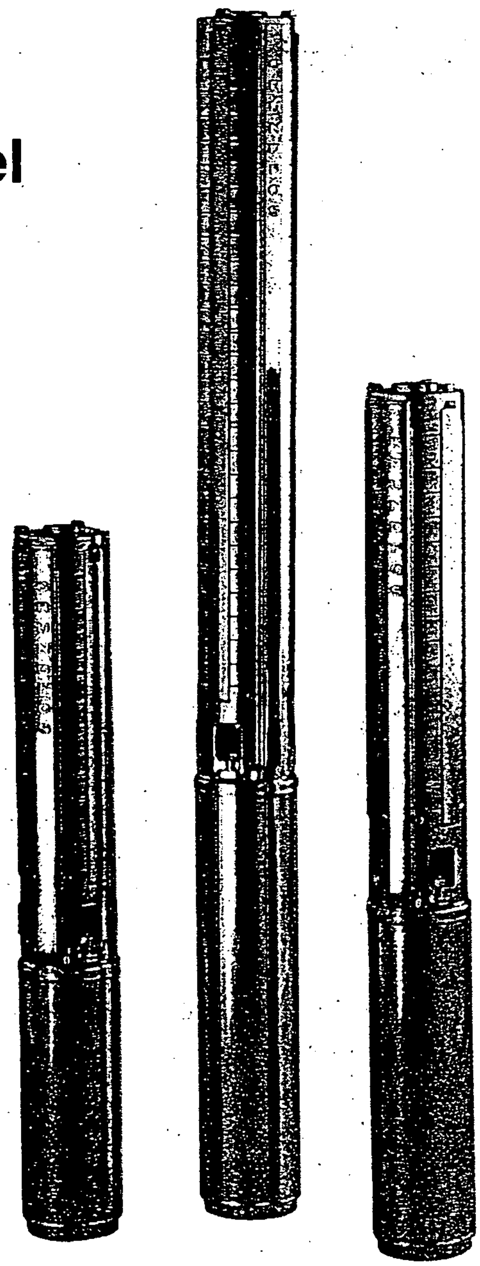
Current nominal discharge pressure on the existing system is as follows:

WELL #	PSI
AT-1A	43.9
AT-2	OFF
AT3A	7.7
AT4A	3.1
AT5A	6.0
AT5B	7.2

SP4"

Installation and Operating Instructions

4-Inch Stainless Steel Submersible Pumps



DRINKING WATER SYSTEM COMPONENTS
ANSI/NSF 61 - 1999
65 GM

SAFETY WARNING

Electrical Work

WARNING: Reduced risk of electric shock during operation of this pump requires the provision of acceptable grounding. If the means of connection to the supply connected box is other than grounded metal conduit, ground the pump back to the service by connecting a copper conductor (at least the size of the circuit supplying the pump) to the grounding screw provided within the wiring compartment.

Pre-Installation Checklist

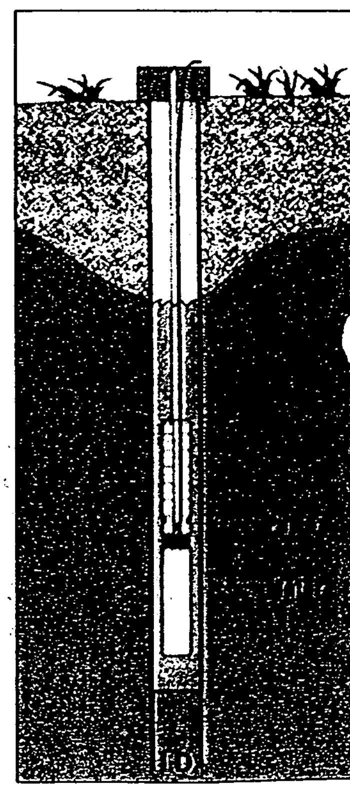
1. Well Preparation

If the pump is to be installed in a new well then the well should be fully developed and bailed or blown free of cuttings and sand. The stainless steel construction of the GRUNDFOS submersibles make it resistant to abrasion; however, no pump made of any material can forever withstand the destructive wear that occurs when constantly pumping sandy water.

If this pump is used to replace an oil-filled submersible or oil-lubricated line-shaft turbine in an existing well, the well must be blown or bailed clear of oil.

2. Make Sure You Have The Right Pump

Determine the maximum depth of the well, and the draw-down level at the pump's maximum capacity. Pump selection and setting depth should be based on this data.



3. Pumped Fluid Requirements

CAUTION: Submersible well pumps are designed for pumping clear, cold water; free of air or gases. Decreased pump performance and life expectancy can occur if the water is not cold, clear or contains air or gasses. Water temperature should not exceed 102°F.

A check should be made to ensure that the installation depth of the pump will always be at least three feet below the maximum drawdown level of the well. The bottom of the motor should never be installed lower than the top of the screen or within five feet of the well bottom.

Ensure that the requirement for minimum flow past the motor is met, as shown in the table below:

Minimum Water Flow Requirements for Submersible Pump Motors

NOTES:

4. Splicing the Motor Cable

If the splice is carefully made, it will be as efficient as any other portion of the cable, and will be completely watertight. There are a number of cable splicing kits available today - epoxy filled, rubber-sealed and so on. Many perform well if the manufacturer's directions are followed carefully. If one of these kits is not used, we recommend the following method for splicing the motor cable:

Examine the motor cable and drop cable carefully for damage. Cut the motor leads off in a staggered manner. Cut the ends of the drop cable so that the ends match up with the motor leads. Be sure to match the colors. Strip back and trim off one-half inch of insulation from each lead, making sure to scrape the wire bare to obtain a good connection. Be careful not to damage the copper conductor when stripping off the insulation. Insert a properly sized Sta-Kon-type connector on each pair of leads, again making sure that colors are matched. Using Sta-Kon crimping pliers, indent the lugs. Be sure to squeeze down hard on the pliers, particularly when using large cable. Form a piece of electrical insulation putty tightly around each Sta-Kon. The putty should overlap on the insulation of the wire. Use a good quality tape such as ***#33 Scotch Waterproof*** or ***Plymouth Rubber Company Slipknot Grey***. Wrap each wire and joint tightly for a distance of about 2 1/2" inches on each side of the joint. Make a minimum of four passes over each joint and overlap each pass approximately one inch to assure a completely watertight seal.

Installation Procedures

1. Attach the Pump to the Pipe

A back-up wrench should be used when riser pipe is attached to the pump. The pump should only be gripped by the flats on the top of the discharge chamber. Under no circumstances grip the body of the pump, cable guard or motor. When tightened down, the threaded end of the first section of the riser pipe or the nipple must not come in contact with the check valve retainer in the discharge chamber of the pump. After the first section of the riser pipe has been attached to the pump, the lifting cable or elevator should be clamped to the pipe. Do not clamp the pump. When raising the pump and riser section, be careful not to place bending stress on the pump by picking it up by the pump-end only. It is recommended that plastic-type riser pipe be used only with the smaller domestic submersibles. The manufacturer or representative should be contacted to ensure the pipe type and physical characteristics are suitable for this use. Use the correct joint compound recommended by the specific pipe manufacturer. Besides making sure that joints are fastened, we recommend the use of a torque arrestor when using plastic pipe.

Do not connect the first plastic riser section directly to the pump. Always attach a metallic nipple or adapter into the discharge chamber. The threaded end of the nipple or adapter must not come in contact with the check valve retainer in the discharge chamber when tightened down.

(continued on next page)

2. Lower the Pump Into the Well

Make sure the electrical cables are not cut or damaged in any way when the pump is being lowered in the well. Do not use the power cables to support the weight of the pump.

To protect against surface water entering the well and contaminating the water source, the well should be finished off above grade utilizing a locally approved well seal or pitless adaptor unit. We recommend that steel riser pipes always be used with the larger submersibles. A pipe thread compound should be used on all joints. Make sure that the joints are adequately tightened in order to resist the tendency of the motor to loosen the joints when stopping and starting.

The drop cable should be secured to the riser pipe at frequent intervals to prevent sagging, looping and possible cable damage. Nylon cable clips or waterproof tape may be used. The cable splice should be protected by securing it with clips or tape just above each joint.

Fig.1

Fig.2

IMPORTANT: *Plastic pipe tends to stretch under load. This stretching must be taken into account when securing the cable to the riser pipe. Leave three to four inches of slack between clips or taped points. This tendency for plastic pipe to stretch will also affect the calculation of the pump setting depth. As a general rule, you can estimate that plastic pipe will stretch to approximately 2% of its length. When plastic riser pipe is used, it is recommended that a safety cable be attached to the pump to lower and raise it. The discharge chamber of GRUNDFOS 4-inch submersibles is designed to accommodate this cable.*

(See Figures 1 & 2)

Check Valves: A check valve should always be installed at the surface of the well and one at a max. of 25' above static water level. In addition, for installations deeper than 200 feet, check valves should be installed at no more than 200 foot intervals.

3. Electrical Connections

WARNING: Reduced risk of electric shock during operation of this pump requires the provision of acceptable grounding. If the means of connection to the supply connected box is other than grounded metal conduit, ground the pump back to the service by connecting a copper conductor (at least the size of the circuit supplying the pump) to the grounding screw provided within the wiring compartment.

Verification of the electrical supply should be made to ensure the voltage, phase and frequency match that of the motor. Motor electrical data can be found on page 6. If voltage variations are larger than ± 10%, do not operate the pump. Single-phase motor control boxes should be connected as shown on the wiring diagram mounted on the inside cover of the control box supplied with the motor. The type of wire used between the pump control boxes should be approved for submersible pump application. The conductor insulation should be type RW, RUW, TW or equivalent.

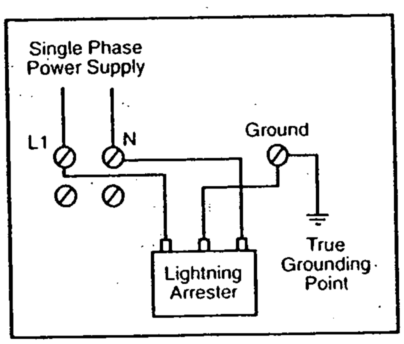
A high-voltage surge arrestor should be used to protect the motor against lightning and switching surges. Lightning voltage surges in power lines are caused when lightning strikes somewhere in the area. Switching surges are caused by the opening and closing of switches on the main high-voltage distribution power lines.

The correct voltage-rated surge arrestor should be installed on the supply (line) side of the control box or starter (see Figure 3a & 3b). The arrestor must be grounded in accordance with the National Electric Code and local governing regulations.

PUMPS SHOULD NEVER BE STARTED UNLESS THE PUMP IS TOTALLY SUBMERGED. SEVERE DAMAGE MAY BE CAUSED TO THE PUMP AND MOTOR IF THEY ARE RUN DRY.

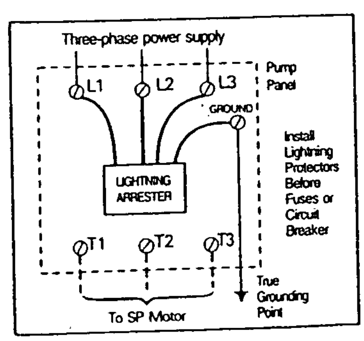
The control box shall be permanently grounded in accordance with the National Electric Code and local governing codes or regulations. The ground wire should be a bare stranded copper conductor at least the same size as the drop cable wire size. Ground wire should be as short a distance as possible and securely fastened to a true grounding point. True grounding points are considered to be: a grounding rod driven into the water strata; steel well casing submerged into the water lower than the pump setting level; and steel discharge pipes without insulating couplings. If plastic discharge pipe and well casing are used, a properly sized bare copper wire should be connected to a stud on the motor and run to the control panel. Do not ground to a gas supply line. Connect the grounding wire to the ground point first, then to the terminal in the control box.

Fig.3a



Single Phase Hookup

Fig.3b



Three Phase Hookup

Single-Phase 2-Wire Wiring Diagram for Submersible Motors

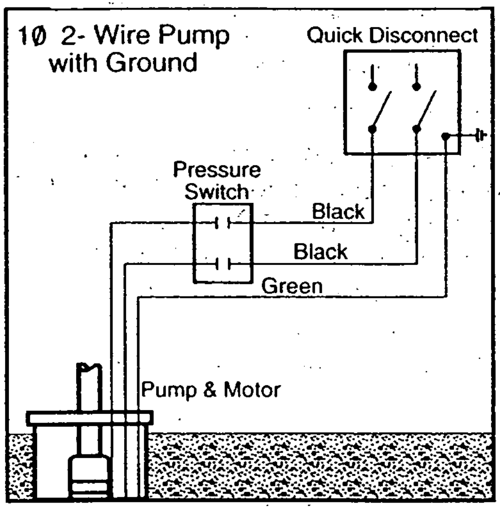


Fig.4

Three-Phase Wiring Diagram for Submersible Motors

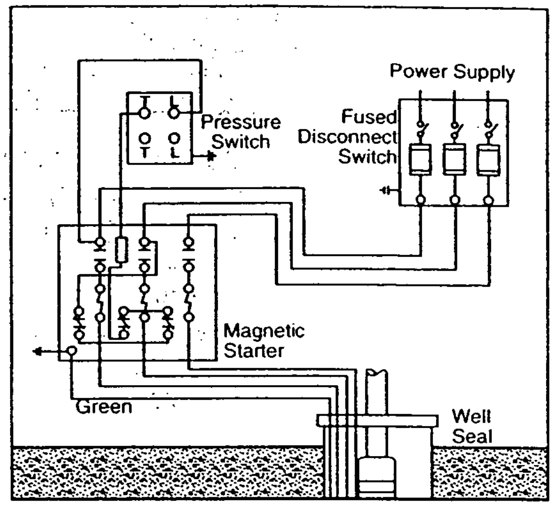


Fig.5

Single-Phase 3-Wire Control Box for Submersible Motors

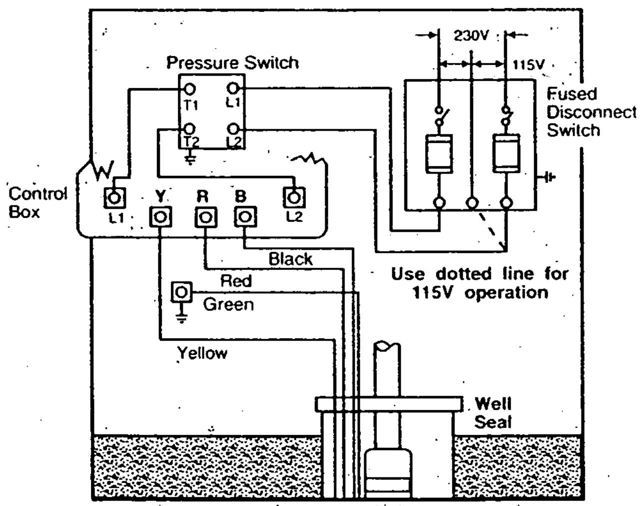


Fig.6

4. Starting the Pump for the First Time

- **A.** Attach a temporary horizontal length of pipe to the riser pipe.
- **B.** Install a gate valve and another short length of pipe to the temporary pipe.
- **C.** Adjust the gate valve one-third of the way open.
- **D.** Verify that the electrical connections are in accordance with the wiring diagram.
- **E.** After proper rotation has been checked, start the pump and let it operate until the water runs clear of sand, silt and other impurities.
- **F.** Slowly open the valve in small increments as the water clears until the valve is all the way open. The pump should not be stopped until the water runs clear.
- **G.** If the water is clean and clear when the pump is first started, the valve should still be opened until it is all the way open.

HP	Ph	VOLT	Ser. Fact.	Circ. Brk. or Stnd. Fuse	Dual Element Fuse	AMPERAGE Full Load	Lock Rotor	S.F. Amps	FULL LOAD Eff.	Power Factor	Line-to-Line Resistance(Ohms) Delta	KVA Code **	Max. Thrust (lbs)

Grundfos 4 Inch (Two-Wire) Motors 60 Hz

SINGLE-PHASE **Control Box Not Required**

HP	Ph	VOLT	Ser. Fact.	Circ. Brk. or Stnd. Fuse	Dual Element Fuse	Full Load	Lock Rotor	S.F. Amps	Eff.	Power Factor	Line-to-Line Resistance(Ohms)	KVA Code	Max. Thrust (lbs)
1/3	1	230	1.75	15	5	3.4	25.7	4.6	59.0	77.0	6.3-7.6	S	750
1/2	1	230	1.60	15	7	4.55	34.5	6.0	62.0	76.0	4.0-4.7	R	750
3/4	1	230	1.50	20	9	6.9	40.5	8.4	62.0	75.0	3.1-3.7	N	750
1	1	230	1.40	25	12	8.0	48.4	9.8	63.0	82.0	2.6-3.1	M	750
1 1/2	1	230	1.30	35	15	10.0	62.0	13.1	64.0	85.0	2.0-2.3	L	750

Grundfos 4 Inch (Three-Wire*) Motors

SINGLE-PHASE **Control Box Required**

HP	Ph	VOLT	Ser. Fact.	Circ. Brk. or Stnd. Fuse	Dual Element Fuse	Full Load	Lock Rotor	S.F. Amps	Eff.	Power Factor	Blk-Yel / Red-Yel	KVA Code	Max. Thrust (lbs)
1/3	1	230	1.75	15	5	3.4	14.0	4.6	59.0	77.0	6.3-7.6/17.0-20.6	L	750
1/2	1	230	1.60	15	7	4.55	21.5	6.0	62.0	76.0	3.8-4.6/15.9-19.3	L	750
3/4	1	230	1.50	20	9	6.9	31.4	8.4	62.0	75.0	3.1-3.6/13.5-16.5	L	750
1	1	230	1.40	25	12	8.0	37.0	9.8	63.0	82.0	2.6-3.2/ 9.9-12.1	K	750
1 1/2	1	230	1.30	30	15	9.4	45.9	11.6	69.0	89.0	2.0-2.4/ 8.3-10.0	H	750

THREE-PHASE

HP	Ph	VOLT	Ser. Fact.	Circ. Brk. or Stnd. Fuse	Dual Element Fuse	Full Load	Lock Rotor	S.F. Amps	Eff.	Power Factor	Three Phase Overload Protection Starter Size	Furnas Amb. Comp.	Line to Line Resist. (Ohms)	KVA Code	Max. Thrust (lbs)
1.5	3	230	1.30	20	10	5.6	40.3	7.3	75.0	72.0	0	K42	3.25	M	750
		460	1.30	10	5	2.8	20.1	3.65	75.0	72.0	00	K32	12.3	M	750
		575	1.30	8	4	2.2	16.1	2.9	75.0	72.0	00	K29	21.5	M	750
2	3	230	1.25	25	10	7.0	48.0	8.7	76.0	75.0	0	K49	2.25	L	750
		460	1.25	12	6	3.5	24.0	4.35	76.0	75.0	0	K34	9.2	L	750
		575	1.25	10	5	2.8	19.2	3.5	76.0	75.0	00	K32	13.8	L	750
3	3	230	1.15	30	15	9.6	55.7	11.6	68.5	83.8	0	K54	2.2	H	1000
		460	1.15	15	7	4.8	26.5	5.6	68.5	83.8	0	K37	9.0	H	1000
		575	1.15	15	6	3.8	22.0	4.8	68.5	83.8	0	K36	13.0	H	1000
5	3	230	1.15	40	25	15.2	107.9	17.4	71.9	80.0	1	K61	1.2	H	1000
		460	1.15	20	12	7.6	51.0	8.7	71.9	80.0	0	K50	5.0	H	1000
		575	1.15	15	9	6.1	42.6	6.9	71.9	80.0	0	K43	7.3	H	1000

*All Grundfos 4" motors have a ground (green) wire.

Franklin Motors

(Refer to the Franklin Submersible Motors Application Maintenance Manual)

Maximum Cable Length
Motor Service to Entrance
(Length in feet)

SINGLE-PHASE 60 HZ

Motor Rating		Copper Wire Size								
VOLTS	HP	14	12	10	8	6	4	2	0	00
115	1/3	[illegible]	210	[illegible]	540	[illegible]	1300	[illegible]	2910	
	1/2	[illegible]	160	[illegible]	390	[illegible]	960	[illegible]	2160	
230	1/3	[illegible]	880	[illegible]	2190	[illegible]	5250	[illegible]		
	1/2	[illegible]	650	[illegible]	1610	[illegible]	3880	[illegible]		
	3/4	[illegible]	480	[illegible]	1200	[illegible]	2890	[illegible]	6470	
	1	[illegible]	400	[illegible]	990	[illegible]	2380	[illegible]	5360	[illegible]
	1 1/2	[illegible]	310	[illegible]	770	[illegible]	1870	[illegible]	4280	[illegible]
	2	[illegible]	250	[illegible]	620	[illegible]	1530	[illegible]	3620	[illegible]
	3	[illegible]	190	[illegible]	470	[illegible]	1190	[illegible]	2890	[illegible]
	5	[illegible]		[illegible]	280	[illegible]	710	[illegible]	1740	[illegible]

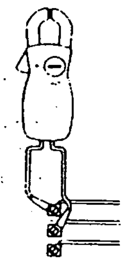
THREE-PHASE 60 HZ

VOLTS	HP	14	12	10	8	6	4	2
208	1 1/2	[illegible]	500	[illegible]	1260			
	2	[illegible]	390	[illegible]	970	[illegible]		
	3	[illegible]	290	[illegible]	740	[illegible]	1810	
		[illegible]	280	[illegible]	1080			[illegible]
230	1 1/2	[illegible]	580	[illegible]	1450			
	2	[illegible]	450	[illegible]	1110	[illegible]		
	3	[illegible]	340	[illegible]	860	[illegible]	2080	
	5	[illegible]	200	[illegible]	510	[illegible]	1240	[illegible]
460	1 1/2	700						
	2	[illegible]	2070					
	3	1000	1600	[illegible]				
	5	[illegible]	950	[illegible]	2360			
575	1 1/2	[illegible]						
	2	[illegible]						
	3	[illegible]	2530					
	5	[illegible]	1480	[illegible]				

FOOTNOTES:

1. If aluminum conductor is used, multiply lengths by 0.5. Maximum allowable length of aluminum is considerably shorter than copper wire of same size.
2. The portion of the total cable which is between the service entrance and a 3Ø motor starter should not exceed 25% of the total maximum length to ensure reliable starter operation. Single-phase control boxes may be connected at any point of the total cable length.
3. Cables #14 to #0000 are AWG sizes, and 250 to 300 are MCM sizes.

SUPPLY VOLTAGE



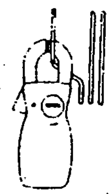
How to Measure

By means of a voltmeter, which has been set to the proper scale, measure the voltage at the control box. On single-phase units, measure between line and neutral.

What it Means

When the motor is under load, the voltage should be within 10% of the nameplate voltage. Larger voltage variation may cause winding damage. Large variations in the voltage indicate a poor electrical supply and the pump should not be operated until these variations have been corrected.
If the voltage constantly remains high or low, the motor should be changed to the correct supply voltage.

CURRENT MEASUREMENT



How to Measure

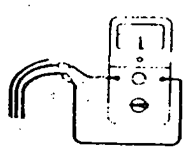
By use of an ammeter, set on the proper scale, measure the current on each power lead at the control box. See page 6, for motor amp draw information.
Current should be measured when the pump is operating at a constant discharge pressure with the motor fully loaded.

What it Means

If amp draw exceeds the listed service factor amps (SFA), check for the following:

1. Loose terminals in control box or possible cable defect. Check winding and insulation resistances.
2. Too high or low supply voltage.
3. Motor windings are shorted.
4. Pump is damaged causing a motor overload.

WINDING RESISTANCE



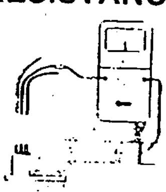
How to Measure

Turn off power and disconnect the drop cable leads in the control box. Using an ohmmeter, set scale selectors to Rx1 for values under 10 ohms and Rx10 for values over 10 ohms.
Zero-adjust the meter and measure the resistance between leads. Record the values. Motor resistance values can be found on page 6.

What it Means

If all the ohm values are normal, and the cable colors are correct, the windings are not damaged. If any one ohm value is less than normal, the motor may be shorted. If any one ohm value is greater than normal, there is a poor cable connection or joint. The windings or cable may also be open.
If some of the ohm values are greater than normal and some less, the drop cable leads are mixed. To verify lead colors, see resistance values on page 6.

INSULATION RESISTANCE



How to Measure

Turn off power and disconnect the drop cable leads in the control box. Using an ohm or mega ohmmeter, set the scale selector to Rx100k and zero-adjust the meter. Measure the resistance between the lead and ground(discharge pipe or well casing,if steel).

What it Means

For ohm values, refer to table below. Motors of all Hp, voltage, phase and cycle duties have the same value of insulation resistance.

OHM VALUE	MEGOHM VALUE	CONDITION OF MOTOR AND LEADS
		Motor not yet installed:
2,000,000(or more)	2.0	New Motor
1,000,000(or more)	1.0	Used motor which can be reinstalled in the well.
		Motor in well (Ohm readings are for drop cable plus motor):
500,000-1,000,000	0.5-1.0	A motor in reasonably good condition.
20,000-50,000	0.02-0.5	A motor which may have been damaged by lightning or with damaged leads. Do not pull the pump for this reason.
10,000-20,000	0.01-0.02	A motor which definitely has been damaged or with damaged cable. The pump should be pulled and repairs made to the cable or the motor replaced. The motor will still operate, but probably not for long.
less than 10,000	0-0.01	A motor which has failed or with completely destroyed cable insulation. The pump must be pulled and the cable repaired or the motor replaced. The motor will not run.

Troubleshooting

Pump Won't Start

Possible Cause	Check This By . . .	Correct This By . . .
No power at the motor	Check for voltage at the control box or panel.	If there is no voltage at the control panel, check the feeder panel for tripped circuits and reset those circuits.
Fuses are blown or the circuit breakers have tripped.	Turn off the power and remove the fuses. Check for continuity with an ohmmeter.	Replace the blown fuses or reset the circuit breaker. If the new fuses blow or the circuit breaker trips, the electrical installation, motor, and wires must be checked for defects.
(3-phase motors only) **Motor starter overloads are burned or have tripped**	Check for voltage on the line and load side of the starter. Check the amp draw and make sure the heater is sized correctly.	Replace any burned heaters or reset. Inspect the starter for other damage. If the heater trips again, check the supply voltage. Ensure that heaters are sized correctly and the trip setting is appropriately adjusted.
(3-phase motors only) **Starter does not energize**	Energize the control circuit and check for voltage at the holding coil.	If there is no voltage, check the control circuit fuses. If there is voltage, check the holding coil for weak connections. Ensure that the holding coil is designed to operate with the available control voltage. Replace the coil if defects are found.
Defective controls	Check all safety and pressure switches for defects. Inspect the contacts in control devices.	Replace worn or defective parts or controls.
Motor or cable is defective	Turn off the power and disconnect the motor leads from the control box. Measure the lead-to-lead resistance with an ohmmeter (set to R x 1). Measure the lead-to-ground values with an ohmmeter (set to R x 100K).	If an open or grounded winding is found, remove the motor from the well and recheck the measurements with the lead separated from the motor. Repair or replace the motor or cable.
(1-phase motors only) **Defective capacitor**	Turn off the power and discharge the capacitor by shorting the leads together. Check it with an analog ohmmeter (set to R x 100K).	When the meter is connected to the capacitor, the needle should jump toward 0 (zero) ohms and slowly drift back to infinity (∞). Replace capacitor if it is defective.
Defective pressure switch or the tubing to it is plugged.	Watch the pressure guages as the pressure switch operates. Remove the tubing and blow through it.	Replace as neccessary.
The pump is mechanically bound or stuck	Turn off the power and manually rotate the pump shaft. Also check the motor shaft rotation, the shaft height, and the motor's amp draw (to see if it indicates a locked rotor).	If the pump shaft doesn't rotate, remove the pump and examine it. If necessary, dismantle it and check the impellers and seal for obstruction. Check for motor corrosion.

Pump Does Not Produce Enough Flow (GPM)

Possible Cause	Check This By . . .	Correct This By . . .
(3-phase motors only) **Shaft is turning in the wrong direction.**	Check to make sure the electrical connections in the control panel and correct.	Correct the wiring. For single phase motors, check the wiring diagram on the motor. For three phase motors, simply switch any two power leads.
Pump is operating at the wrong speed (too slow)	Check for low voltage and phase imbalance	Replace defective parts or contact power company, as applicable.
Check valve is stuck (or installed backwards)	Remove the check valve.	Re-install or replace.
Parts or fittings in the pump are worn **or** **Impellers or Inlet Strainer is clogged**	Install a pressure gauge near the discharge port, start the pump, and gradually close the discharge valve. Read the pressure at shutoff. (Do not allow the pump to operate for an extended period at shutoff).	Convert the PSI you read on the gauge to Feet of Head by: $\frac{\text{PSI} \times 2.31\ \text{ft/PSI}}{\text{Specific Gravity}} = \_\_\_\_\_\ \text{ft.}$ Add to this number the number of feet (vertically) from the guage down to the water's pumping level. Refer to the pump curve for the model you are working with to determine the shutoff head to should expect for that model. If that head is close to the figure you came up with (above), the pump is probably OK. If not, remove the pump and inspect impellers, chambers, etc.
The water level in the well may be too low to supply the flow desired **or** **Collapsed well**	Check the drawdown in the well while the pump is operating.	If the pumping water level (including drawdown) is not **AT LEAST 3 FEET** above the pump's inlet strainer, either: 1. Lower the pump further down the well. 2. Throttle back the discharge valve to decrease the flow, thereby reducing drawdown.
Broken shaft or coupling	Pull pump and inspect	Replace as necessary.
There are leaks in the fittings or piping	Pull the pump out of the well.	The suction pipe, valves, and fittings must be made tight. Repair any leaks and retighten all loose fittings.

Fuses Blow or Heaters Trip

Possible Cause	Check This By ...	Correct This By ...
Improper voltage	Check the voltage at the control box or panel.	If the voltage varies by more than 10% (+ or -), contact the power company.
	If the incoming voltage is OK, check the wire size and the distance between the pump motor and the pump control panel.	Rewire with correct guage. Undersized wire and a great distance between the control panel and the pump motor increases resistance and decreases the voltage by the time it reaches the pump motor.
The starter overloads are set too low.	Cycle the pump and measure the amperage.	Increase the heater size or adjust the trip setting. Do not, however, exceed the recommended rating.
(3-phase motors only) **The three-phase current is imbalanced.**	Check the current draw on each lead to the motor.	The current draw on each lead must be within 5% of eachother (+ or -). If they are not, check the wiring.
The wiring or connections are faulty.	Check to make sure the wiring is correct and there are no loose terminals.	Tighten any loose terminals and replace any damaged wire.
(1-phase motors only) **Capacitor is defective**	Turn off the power and discharge the capacitor. Check the capacitor with an ohmmeter (set at R x 100K). See page 15 for instructions.	When the meter is connected to the capacitor, the needle should jump towards 0 (zero) ohms and then slowly drift back to infinity (∞). Replace the capacitor if it is defective.
Fuse, heater, or starter are the wrong size	Check the fuses and heaters against the motor manufacturer's specification charts.	Replace as necessary.
The control box location is too hot	Touch the box with your bare hand during the hottest part of the day – you should be able to keep your hand on it without burning.	Shade, ventilate, or move the control box so its environment does not exceed 120°F.
(1-phase motors only) **Wrong control box**	Check requirements for the motor against the control box specificatons.	Replace as necessary.
Defective pressure switch	Watch guages as pressure switch operates	Replace as necessary.
The motor is shorted or grounded.	Turn off the power and disconnect the wiring. Measure the lead-to-lead resistance with an ohmmeter (set to R x 1). Measure the lead-to-ground resistance with an ohmmeter (set to R x 100K) or a megaohmmeter. Compare these measurements to the rated values for your motor.	If you find an open or grounded winding, remove the motor and recheck the leads. If OK, check the leads for continuity and for bad splice.
Poor motor cooling	Find the internal diameter of the well casing (or sleeve, if used). For proper cooling, the flow of water **must not be less than the GPM shown across the bottom scale on page ___.**	Throttle up the pump flow (GPM) so proper cooling is possible. or Pull the pump out of the well and add a sleeve with a smaller internal diameter.

Pump Cycles Too Often

Possible Cause	Check This By ...	Correct This By ...
The pressure switch is defective or is not properly adjusted.	Check the pressure setting on the switch. Check the voltage across closed contacts.	Readjust the pressure switch or replace it if defective.
The tank is too small	Check the tank size and amount of air in the tank. The tank volume should be approximately 10 gallons for each Gallon-Per-Minute of pump capacity. At the pump cut-in pressure, the tank should be about 2/3 filled with air.	Replace the tank with one that is the correct size.
There is insufficient air charging of the tank or piping is leaking.	Pump air into the tank or diaphragm chamber. Check the diaphragm for leaks. Check the tank and piping for leaks with soapy water. Check the air-to-water ratio in the tank.	Repair as necessary.
Plugged snifter valve or bleed orifice (causing pressure tank to be waterlogged)	Examine them for dirt or erosion.	Repair or replace as neccessary.
Leak in the pressure tank or piping.	Apply soapy water to pipes and tank, then watch for bubbles, indicating leaks.	Repair or replace as necessary.
The level control is defective or is not properly set.	Check the setting and operation of the level control.	Readjust the level control setting (according to the manufacturer's instructions) or replace it if defective.
Pump is oversized for the application. It is outpumping the yield of the well and pumping itself dry.	Check the yield of the well (determined by the well-test) against the pump's performance curve.	Reduce the flow by throttling back the valve. or Change the pump.

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Submersible Motors

Application ◆ Installation ◆ Maintenance

60 Hz, Single and Three Phase Motors

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The Company You Trust Deep Down

pump start, water moving at very high velocity fills the void and strikes the closed check valve and the stationary water in the pipe above it, causing a hydraulic shock. This shock can split pipes, break joints and damage the pump and/or motor. Water hammer is an easily detected noise. When discovered, the system should be shut down and the pump installer contacted to correct the problem.

Wells-Large Diameter, Uncased, Top Feeding & Screened Sections

Franklin Electric submersible motors are designed to operate with a cooling flow of water over the motor.

If the pump installation does not provide the minimum flow shown in Table 6, a flow inducer sleeve (flow sleeve) must be used. The conditions requiring a flow sleeve are:

- Well diameter is too large to meet Table 6 flow requirements.
- Pump is in an open body of water.
- Pump is in a rock well or below the well casing.
- The well is "top-feeding".
- Pump is set in or below screens or perforations.

Water Temperature and Flow

Franklin Electric submersible motors, except 8" SEVERE DUTY (see note below), are designed to operate up to maximum service factor horsepower in water up to 86°F (30°C). A flow of 0.25 ft/sec for 4" High Thrust motors and 0.5 ft/sec for 6 and 8 inch motors is required for proper cooling. Table 6 shows minimum flow rates, in GPM, for various well diameters and motor sizes.

If the motor is operated in water over 86°F (30°C), water flow past the motor must be increased to maintain safe motor operating temperatures. See HOT WATER APPLICATIONS on Page 7.

NOTE: 8" SEVERE DUTY motors are designed to operate with loading up to maximum service factor horsepower in water up to 90°C (195°F) with water flow past motor of 0.5 ft/sec (0.15 m/sec).

Table 6 Required Cooling Flow

Minimum GPM required for motor cooling in water up to 86°F (30°C).			
Casing or Sleeve I.D. Inches (mm)	4" High Thrust Motor .25 ft/sec. GPM (l/m)	6" Motor .50 ft/sec. GPM (l/m)	8" Motor .50 ft/sec. GPM (l/m)
4 (102)	1.2 (4.5)	-	-
5 (127)	[illegible]	[illegible]	[illegible]
6 (152)	13 (49)	9 (34)	-
7 (178)	[illegible]	[illegible]	[illegible]
8 (203)	30 (114)	45 (170)	10 (40)
10 (254)	[illegible]	[illegible]	[illegible]
12 (305)	80 (303)	140 (530)	110 (420)
14 (356)	[illegible]	[illegible]	[illegible]
16 (406)	150 (568)	280 (1060)	245 (930)

.25 ft/sec = 7.62 cm/sec .50 ft/sec = 15.24 cm/sec
1 inch = 2.54 cm

Flow Inducer Sleeve

If the flow rate is less than specified or coming from above the pump, then a flow inducer sleeve must be used. A flow sleeve is always required in an open body of water. FIG 1 shows a typical flow inducer sleeve construction.

EXAMPLE : A six-inch motor and pump that delivers 60 GPM will be installed in a 10" well.

From Table 6, 90 GPM would be required to maintain proper cooling. In this case adding an 8" or smaller flow sleeve provides the required cooling.

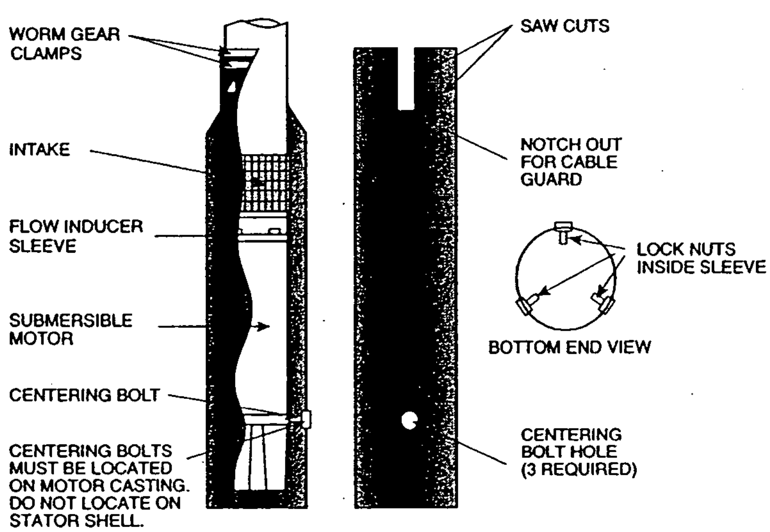


FIG. 1

Table 18 Three Phase 75°C Cable, 60 Hz (Service Entrance to Motor) Maximum Length in Feet

Motor Rating			75°C Insulation - AWG Copper Wire Size													MCM Copper Wire Size				
Volts	HP	KW	14	12	10	8	6	4	3	2	1	0	00	000	0000	250	300	350	400	500
	1/2	0.37	710	1140	1800	2840	4420													
200 V	3/4	0.55	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
60Hz	1	0.75	430	690	1080	1710	2670	4140	5140											
Three	1 1/2	1.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Phase	2	1.5	240	390	610	970	1520	2360	2940	3610	4430	5420								
3 - Lead	3	2.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	5	3.7	110	170	280	440	690	1080	1350	1660	2040	2490	3050	3670	4440	5030				
	7 1/2	5.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	10	7.5	0	0	150	230	370	570	720	880	1090	1330	1640	1970	2390	2720	3100	3480	3800	4420
	15	11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	20	15	0	0	0	0	190	300	380	460	570	700	860	1050	1270	1440	1650	1850	2020	2360
	25	18.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	30	22	0	0	0	0	0	200	250	310	380	470	580	700	850	970	1110	1250	1360	1590
	1/2	0.37	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
230V	3/4	0.55	670	1080	1700	2580	4190	6490	8060	9860										
60 Hz	1	0.75	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Three	1 1/2	1.1	420	670	1060	1670	2610	4050	5030	6160	7530	9170								
Phase	2	1.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3 - Lead	3	2.2	240	390	620	990	1540	2400	2980	3660	4480	5470	6690	8020	9680					
	5	3.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	7 1/2	5.5	0	160	260	420	650	1020	1270	1560	1920	2340	2870	3440	4160	4710	5340	5970	6500	7510
	10	7.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	15	11	0	0	0	210	330	520	650	800	980	1200	1470	1780	2150	2440	2780	3110	3400	3940
	20	15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	25	18.5	0	0	0	0	200	320	400	500	610	750	920	1120	1360	1540	1760	1980	2160	2520
	30	22	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	1/2	0.37	2690	4290	6730															
380V	3/4	0.55	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
60 Hz	1	0.75	1620	2580	4060	6390	9980													
Three	1 1/2	1.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Phase	2	1.5	870	1390	2180	3450	5400	8380												
3 - Lead	3	2.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	5	3.7	400	640	1010	1590	2490	3870	4780	5870	7230	8830								
	7 1/2	5.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	10	7.5	200	320	510	800	1250	1930	2380	2910	3570	4330	5230	6260	7390	8280	9340			
	15	11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	20	15	0	0	280	440	700	1090	1350	1670	2060	2530	3090	3760	4500	5110	2840	6510	7120	8190
	25	18.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	30	22	0	0	0	290	470	730	910	1120	1380	1700	2080	2520	3020	3430	3920	4360	4770	5490
	40	30	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	50	37	0	0	0	0	0	440	540	660	820	1000	1220	1480	1770	2010	2290	2550	2780	3190
	60	45	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	75	55	0	0	0	0	0	0	0	460	570	700	860	1050	1270	1440	1660	1850	2030	2350
	100	75	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	125	90	0	0	0	0	0	0	0	0	0	0	510	620	740	840	950	1060	1160	1330
	150	110	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	175	130	0	0	0	0	0	0	0	0	0	0	0	0	560	650	750	840	920	1070
	200	150	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Continued on page 19

Application - Three Phase Motors

Table 21 Three Phase Motor Specifications (60 Hz)

Type	Motor Model Prefix	Rating					Full Load Amps	Maximum (S.F. Load) Amps	Line to Line Resistance Ohms	Efficiency %			Locked Rotor Amps	KVA Code	Circuit Breakers or Fuse Amps		
		HP	KW	Volts	Hz	S.F.				S.F.	F.L.	3/4			Nontime Delay (Std.) Fuse	Dual Element Time Delay Fuse	Inverse Time Breaker
4 Inch	234501	1/2	0.37	200	60	1.60	2.8	3.4	6.6-7.3	70	64	58	17.5	N	10	5	8
	[illegible]	1/2	0.37	230	60	1.60	[illegible]	[illegible]	[illegible]	70	64	58	[illegible]	N	[illegible]	[illegible]	[illegible]
	234541	1/2	0.37	380	60	1.60	1.5	1.8	23.2-23.4	70	64	58	9.2	N	5	3	4
	[illegible]	1/2	0.37	460	60	[illegible]	[illegible]	[illegible]	[illegible]	70	[illegible]	[illegible]	[illegible]	N	[illegible]	[illegible]	[illegible]
	234502	3/4	0.55	200	60	1.50	3.7	4.4	4.6-5.1	73	69	65	23.1	M	15	8	10
	[illegible]	3/4	0.55	230	60	1.50	[illegible]	[illegible]	[illegible]	[illegible]	69	65	[illegible]	M	10	[illegible]	[illegible]
	234542	3/4	0.55	380	60	1.50	1.9	2.3	16.6-20.3	73	69	65	12.2	M	6	4	5
	[illegible]	3/4	0.55	[illegible]	60	[illegible]	[illegible]	[illegible]	[illegible]	73	[illegible]	[illegible]	[illegible]	M	[illegible]	[illegible]	[illegible]
	234503	1	0.75	200	60	1.40	4.6	5.4	4.1-4.5	72	70	66	30.9	M	15	10	15
	[illegible]	1	0.75	230	60	1.40	[illegible]	[illegible]	[illegible]	72	70	66	[illegible]	M	15	[illegible]	[illegible]
	234543	1	0.75	380	60	1.40	2.4	2.8	12.2-14.9	72	70	66	16.3	M	8	5	8
	[illegible]	1	0.75	460	60	[illegible]	[illegible]	[illegible]	[illegible]	72	70	66	[illegible]	M	[illegible]	[illegible]	[illegible]
	234504	1 1/2	1.1	200	60	1.30	5.6	6.8	2.5-3.0	76	76	74	38.2	K	20	10	15
	[illegible]	1 1/2	1.1	230	60	1.30	[illegible]	[illegible]	[illegible]	76	76	74	33.2	K	[illegible]	10	15
	234544	1 1/2	1.1	380	60	1.30	3.0	3.6	8.5-10.4	76	76	74	20.1	K	10	6	8
	[illegible]	1 1/2	1.1	460	60	[illegible]	2.5	[illegible]	[illegible]	76	76	74	[illegible]	K	[illegible]	[illegible]	[illegible]
	234534	1 1/2	1.1	575	60	1.30	2.0	2.4	20.3-25.0	76	76	74	13.3	K	6	4	5
	[illegible]	2	1.5	200	60	1.25	7.9	[illegible]	[illegible]	69	69	67	[illegible]	[illegible]	25	15	[illegible]
	234315	2	1.5	230	60	1.25	6.9	8.1	2.4-3.0	69	69	67	46.6	L	25	15	20
	[illegible]	2	1.5	380	60	1.25	[illegible]	[illegible]	[illegible]	69	69	67	[illegible]	[illegible]	15	[illegible]	[illegible]
	234325	2	1.5	460	60	1.25	3.5	4.1	9.7-12.0	69	69	67	23.3	L	15	8	10
	[illegible]	2	1.5	575	60	[illegible]	[illegible]	[illegible]	[illegible]	69	69	67	[illegible]	[illegible]	10	[illegible]	[illegible]
	234306	3	2.2	200	60	1.15	11.3	12.4	1.3-1.7	75	75	73	71.2	K	35	20	30
	[illegible]	3	2.2	230	60	[illegible]	[illegible]	[illegible]	[illegible]	75	75	73	[illegible]	K	30	20	[illegible]
	234346	3	2.2	380	60	1.15	5.9	6.5	4.7-6.0	75	75	73	37.5	K	20	15	15
	[illegible]	3	2.2	460	60	[illegible]	[illegible]	[illegible]	[illegible]	75	75	[illegible]	[illegible]	K	15	[illegible]	[illegible]
	234336	3	2.2	575	60	1.15	3.9	4.3	10.9-13.6	75	75	73	24.8	K	15	8	10
	[illegible]	5	3.7	200	60	[illegible]	[illegible]	[illegible]	[illegible]	74	74	72	[illegible]	K	[illegible]	35	[illegible]
	234317	5	3.7	230	60	1.15	16.0	17.7	.93-1.2	74	74	72	106.0	K	50	30	40
	[illegible]	5	3.7	380	60	[illegible]	[illegible]	[illegible]	[illegible]	74	74	72	[illegible]	[illegible]	[illegible]	[illegible]	25
	234327	5	3.7	460	60	1.15	8.0	8.9	3.6-4.4	74	74	72	53.2	K	25	15	20
	[illegible]	5	3.7	575	60	1.15	[illegible]	[illegible]	[illegible]	74	74	72	[illegible]	K	20	15	20
	234308	7 1/2	5.5	200	60	1.15	27.1	29.9	.46-.57	76	76	74	188.0	K	90	50	70
	[illegible]	7 1/2	5.5	230	60	1.15	[illegible]	[illegible]	[illegible]	76	76	74	[illegible]	[illegible]	[illegible]	[illegible]	60
	234348	7 1/2	5.5	380	60	1.15	14.3	15.7	1.6-2.3	76	76	74	99.1	K	45	25	40
	[illegible]	7 1/2	5.5	460	60	1.15	[illegible]	[illegible]	[illegible]	76	76	74	[illegible]	K	[illegible]	25	[illegible]
	234338	7 1/2	5.5	575	60	1.15	9.4	10.4	3.5-5.1	76	76	74	65.5	K	30	20	25
	[illegible]	10	7.5	380	60	1.15	20.6	[illegible]	[illegible]	75	[illegible]	72	[illegible]	[illegible]	[illegible]	[illegible]	60
	234329	10	7.5	460	60	1.15	17.0	18.5	1.8-2.3	75	75	72	116.0	L	60	30	45
	234339	10	7.5	575	60	1.15	13.6	[illegible]	2.8-3.5	[illegible]	75	72	[illegible]	[illegible]	[illegible]	25	35

Submersible Pump Installation Check List

1. Motor Inspection

- ❑ A. Verify that the model, HP or KW, voltage, phase and hertz on the motor nameplate match the installation requirements.
- ❑ B. Check that the motor lead assembly is not damaged.
- ❑ C. Measure insulation resistance using a 500 or 1000 volt DC megohmmeter from each lead wire to the motor frame. Resistance should be at least 20 megohms with out drop cable.
- ❑ D. Keep a record of motor model number, HP or KW, voltage, and serial number (S/N). (S/N is stamped in shell above the nameplate. A typical example, S/N 98A18 01-0123)

2. Pump Inspection

- ❑ A. Check that the pump rating matches the motor.
- ❑ B. Check for pump damage and verify that the pump shaft turns freely.

3. Pump/Motor Assembly

- ❑ A. If not yet assembled, check that pump and motor mounting faces are free from dirt, debris and uneven paint thickness.
- ❑ B. Pumps and motors over 5HP should be assembled in the vertical position to prevent stress on pump brackets and shafts. Assemble the pump and motor together so their mounting faces are in contact and then tighten assembly bolts or nuts evenly to manufacturer specifications.
- ❑ C. If accessible, check that the pump shaft turns freely.
- ❑ D. Assemble the pump lead guard over the motor leads. Do not cut or pinch lead wires during assembly or installation.

4. Power Supply and Controls

- ❑ A. Verify that the power supply voltage, hertz, and KVA capacity match motor requirements.
- ❑ B. Verify control box HP and voltage matches motor (3-wire only).
- ❑ C. Check that the electrical installation and controls meet all safety regulations and match the motor requirements, including fuse or circuit breaker size and motor overload protection. Connect all metal plumbing and electrical enclosures to the power supply ground to prevent shock hazard. Comply with national and local codes.

5. Lightning and Surge Protection

- ❑ A. Use properly rated surge (lightning) arrestors on all submersible pump installations. Motors 5HP and smaller, which are marked "Equipped with Lightning Arrestors", contain internal arrestors.
- ❑ B. Ground all above ground arrestors with copper wire directly to the motor frame, or to metal drop pipe or casing which reaches below the well pumping level. Connecting to a ground rod does not provide good surge protection.

6. Electrical Drop Cable

- ❑ A. Use submersible cable sized in accordance with local regulations and the cable charts, see Pages 11 and 15-20. Ground motor per national and local codes.
- ❑ B. Include a ground wire to the motor and surge protection, connected to the power supply ground if required by codes. Always ground any pump operated outside a drilled well.

7. Motor Cooling

- ❑ A. Ensure at all times the installation provides adequate motor cooling; see Page 6 for details.

8. Pump/Motor Installation

- ❑ A. Splice motor leads to supply cable using electrical grade solder or compression connectors, and carefully insulate each splice with watertight tape or adhesive-lined shrink tubing, as shown in motor or pump installation data.
- ❑ B. Support the cable to the delivery pipe every 10 feet (3 meters) with straps or tape strong enough to prevent sagging. Use padding between cable and any metal straps.
- ❑ C. A check valve in the delivery pipe is recommended. More than one check valve may be required, depending on valve rating and pump setting; see Page 5 for details.
- ❑ D. Assemble all pipe joints as tightly as practical, to prevent unscrewing from motor torque. Torque should be at least 10 pound feet per HP (2 meter-KG per KW).
- ❑ E. Set the pump far enough below the lowest pumping level to assure the pump inlet will always have at least the Net Positive Suction Head (NPSH) specified by the pump manufacturer. Pump should be at least 10 feet (3 meters) from the bottom of the well to allow for sediment build up.
- ❑ F. Check insulation resistance as pump/motor assembly is lowered into the well. Resistance may drop gradually as more cable enters the water, but any sudden drop indicates possible cable, splice or motor lead damage; see Page 39.

9. After Installation

- ❑ A. Check all electrical and water line connections and parts before starting the pump.
- ❑ B. Start the pump and check motor amps and pump delivery. If normal, continue to run the pump until delivery is clear. If three phase pump delivery is low, it may be running backward. Rotation may reversed (with power off) by interchanging any two motor lead connections to the power supply.
- ❑ C. Check three phase motors for current balance within 5% of average, using motor manufacturer instructions. Imbalance over 5% will cause higher motor temperatures and may cause overload trip, vibration, and reduced life.
- ❑ D. Verify that starting, running and stopping cause no significant vibration or hydraulic shocks.
- ❑ E. After at least 15 minutes running time, verify that pump output, electrical input, pumping level, and other characteristics are stable and as specified.

Date ______________________ Filled In By ____

Notes____

____

____

____

____

____

____

____

Submersible Motor Installation Record

RMA No. ____________

INSTALLER'S NAME ____________________________ OWNER'S NAME ____________________________

ADDRESS ____________________________ ADDRESS ____________________________

CITY ______________ STATE_____ ZIP_______ CITY ______________ STATE_____ ZIP__________

PHONE (___) __________ FAX (___) ________ PHONE (___) __________ FAX (___)__________

CONTACT NAME ____________________________ CONTACT NAME ____________________________

WELL NAME/ID ____________________________ DATE INSTALLED __________ DATE FAILED__________

WATER TEMPERATURE ________°F or ________°C

MOTOR:

Motor No. ______________ Date Code ______________ HP _______ Voltage ________ Phase ________

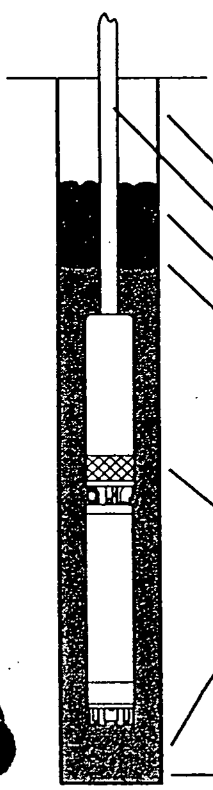
PUMP:

Manufacturer ______________ Model No. __________ Curve No. __________ Rating: ______ GPM@______ft. TDH

NPSH Required __________ ft. NPSH Available__________ ft. Actual Pump Delivery__________GPM@ ______ PSI

Operating Cycle ______________ON (Min./Hr.) ______________ OFF (Min./Hr.) (Circle Min. or Hr. as appropriate)

YOUR NAME ____ DATE _____/_____/_____



WELL DATA:

Total Dynamic Head ______________ft.

Casing Diameter______________in.

Drop Pipe Diameter ______________in.

Static Water Level ______________ft.

Drawdown (pumping) Water Level_______ft.

Checkvalves at __________&__________&

__________&__________ft.

❑ Solid ❑ Drilled

Pump Inlet Setting ______________ft.

Flow Sleeve: ____No____ Yes, Dia. _____in.

Casing Depth______________________ft.

❑ Well Screen ❑ Perforated Casing

From______to_____ft. & ______to______ft.

Well Depth______________________ft.

TOP PLUMBING:
Please sketch the plumbing after the well head (check valves, throttling valves, pressure tank, etc.) and indicate the setting of each device.

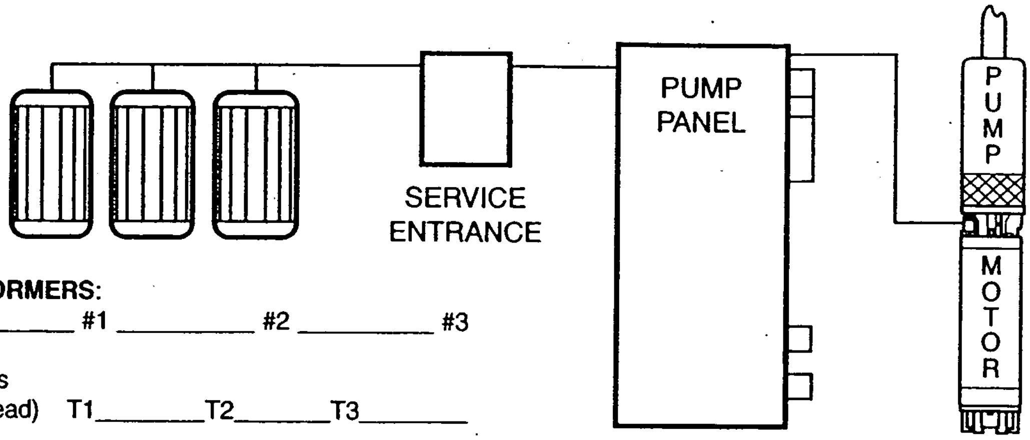
Form No. 2207 8/00

Submersible Motor Installation Record

POWER SUPPLY:

Cable: Service Entrance to Control ____________ft.________ AWG/MCM ☐ Copper ☐ Aluminum ☐ Jacketed ☐ Individual Conductors

Cable: Control to Motor ____________ft.________ AWG/MCM ☐ Copper ☐ Aluminum ☐ Jacketed ☐ Individual Conductors



TRANSFORMERS:

KVA __________ #1 __________ #2 __________ #3

Initial Megs
(motor & lead) T1________T2________T3________

Final Megs
(motor, lead & cable) T1______T2______T3______

INCOMING VOLTAGE:

No Load L1-L2______ L2-L3_______L1-L3_______
Full Load L1-L2______ L2-L3_______L1-L3_______

RUNNING AMPS:

HOOKUP 1:
Full Load L1______L2_______L3_______
%Unbalance______

HOOKUP 2:
Full Load L1______L2_______L3_______
%Unbalance______

HOOKUP 3:
Full Load L1______L2_______L3_______
%Unbalance______

Ground Wire Size __________________AWG/MCM
DC Ground Current ________________________mA
Motor Surge Protection ☐ Yes ☐ No

CONTROL PANEL:

Panel Manufacturer______________________________
Short Circuit Device
☐ Circuit Breaker Rating________Setting______
☐ Fuses Rating___________ Type___________
☐ Standard ☐ Delay

Starter Manufacturer____________________________
Starter Size ___________________________________
Type of Starter ☐ Full Voltage ☐ Autotransformer
☐ Other:___________Full Voltage in _____sec.

Heater Manufacturer____________________________
Number______________Adjustable Set at ________amps.
Subtrol-Plus ☐ No ☐ Yes Registration No. __________
If yes, Overload Set? ☐ No ☐ Yes Set at _______amps.
Underload Set? ☐ No ☐ Yes Set at _______amps.

Controls are Grounded to:
☐ Well Head ☐ Motor ☐ Rod ☐ Power Supply

VARIABLE FREQUENCY DRIVES:

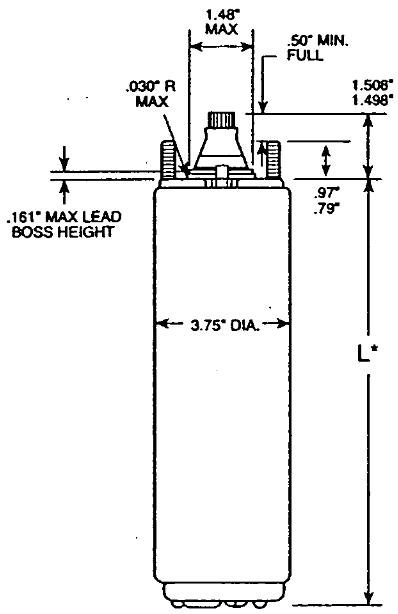
Manufacturer_________________ Model ______________ Output Frequency: _________ Hz Min _________ Hz Max
Cooling Flow at Min. Freq. ____________________________ Cooling Flow at Max. Freq.__________________________
Approved Overload: ☐ Built-in ________ ☐ External Model: (per above) ☐ Cables: (per above) Set Amps ___________
Start Time ____________sec. Stop Mode ☐ Coast __________sec. ☐ Ramp ___________ sec.
☐ Output filter ___________ ☐ Reactor _______________% Make __________ Model ___________ ☐ None

MAXIMUM LOAD AMPS:

Drive Meter Input Amps Line 1 __________ Line 2 __________ Line 3 __________
Drive Meter Output Amps Line 1 __________ Line 2 __________ Line 3 __________
Test Ammeter Output Amps Line 1 __________ Line 2 __________ Line 3 __________
Test Ammeter Make ________________________ Model ________________________

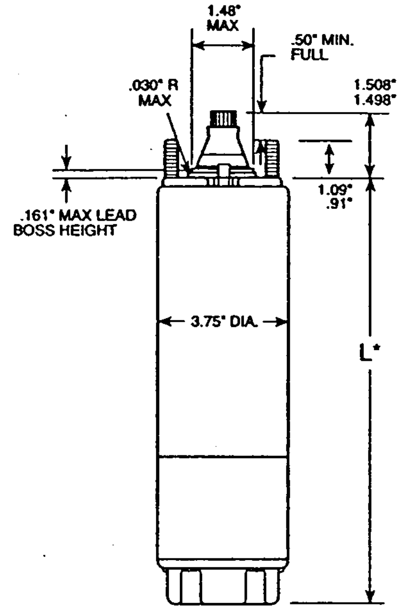
4" Super Stainless — Dimensions

(Standard Water Well)



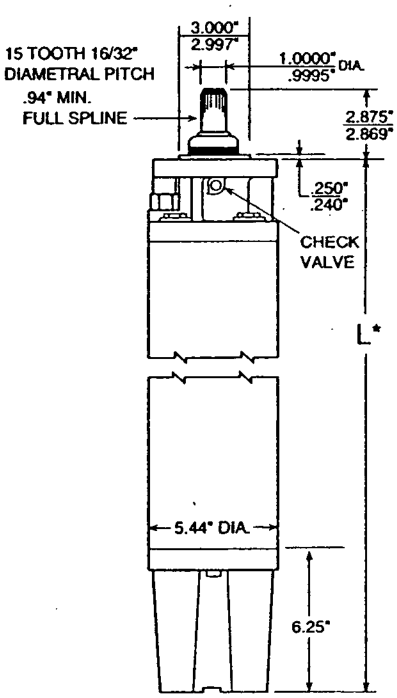
4" High Thrust — Dimensions

(Standard Water Well)



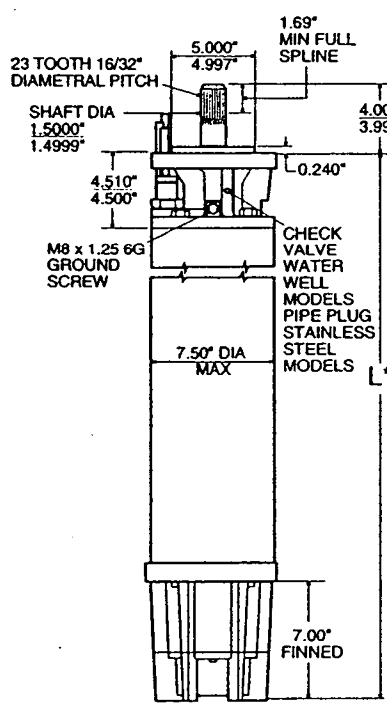
6"— Dimensions

(Standard Water Well)

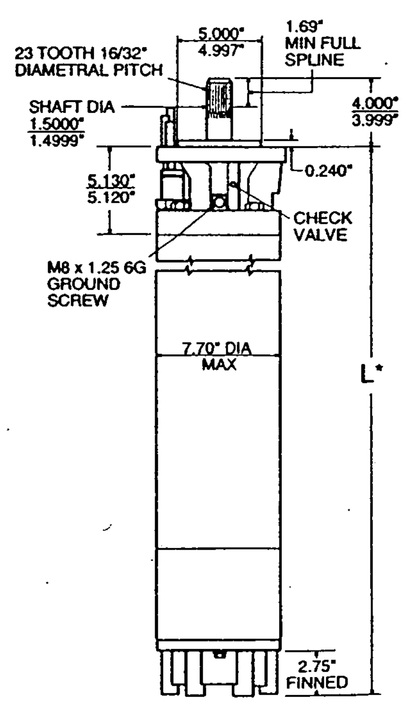


8"— Dimensions

(Standard Water Well)



40 to 100 HP



125 to 200 HP

*** Motor lengths and shipping weights are available on Franklin Electric's web page (www.franklin-electric.com) or by calling Franklin's submersible hotline (800-348-2420).**

Splicing Submersible Cables

When the drop cable must be spliced or connected to the motor leads, it is necessary that the splice be watertight. This splice can be made with commercially available potting, heat shrink splicing kits, or by careful tape splicing.

Tape splicing should use the following procedure.

A) Strip individual conductor of insulation only as far as necessary to provide room for a stake type connector. Tubular connectors of the staked type are preferred. If connector outside diameter (OD) is not as large as cable insulation, build up this area with rubber electrical tape.

B) Tape individual joints with rubber electrical tape, using two layers, with the first layer extending two inches beyond each end of the conductor insulation end, and the second layer extending two inches beyond the ends of the first layer. Wrap tightly, eliminating air spaces as much as possible.

C) Tape over the rubber electrical tape with #33 Scotch electrical tape, (3M) or equivalent, using two layers as in step "B" and making each layer overlap the end of the preceding layer by at least two inches.

In the case of a cable with three conductors encased in a single outer sheath, tape individual conductors as described, staggering joints.

Total thickness of tape should be no less than the thickness of the conductor insulation.

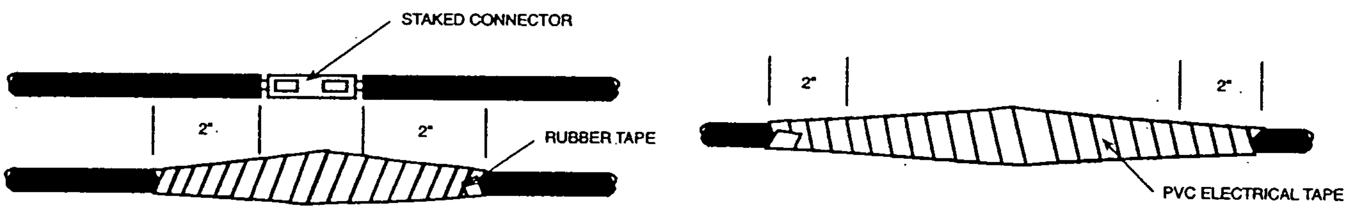


FIG. 12

System Trouble Shooting

Motor Does Not Start

Possible Cause	Checking Procedures	Corrective Action
A. No power or incorrect voltage.	Check voltage at line terminals. The voltage must be ± 10% of rated voltage.	Contact power company if voltage is incorrect.
B. Fuses blown or circuit breakers tripped.	Check fuses for recommended size and check for loose, dirty or corroded connections in fuse receptacle. Check for tripped circuit breakers.	Replace with proper fuse or reset circuit breakers.
C. Defective pressure switch.	Check voltage at contact points. Improper contact of switch points can cause voltage less than line voltage.	Replace pressure switch or clean points.
D. Control box malfunction.	For detailed procedure, see pages 40-41.	Repair or replace.
E. Defective wiring	Check for loose or corroded connections or defective wiring.	Correct faulty wiring or connections.
F. Bound pump.	Check for misalignment between pump and motor or a sand bound pump. Amp readings will be 3 to 6 times higher than normal until the overload trips.	Pull pump and correct problem. Run new installation until the water clears.
G. Defective cable or motor.	For detailed procedure, see pages 38-40.	Repair or replace.

Motor Starts Too Often

A. Pressure switch.	Check setting on pressure switch and examine for defects.	Reset limit or replace switch.
B. Check valve - stuck open.	Damaged or defective check valve will not hold pressure.	Replace if defective.
C. Waterlogged tank.	Check air charge.	Repair or replace.
D. Leak in system.	Check system for leaks.	Replace damaged pipes or repair leaks.

System Trouble Shooting

Motor Runs Continuously

Possible Cause	Checking Procedures	Corrective Action
A. Pressure switch.	Check switch for welded contacts. Check switch adjustments.	Clean contacts, replace switch, or adjust setting.
B. Low water level in well.	Pump may exceed well capacity. Shut off pump, wait for well to recover. Check static and drawdown level from well head.	Throttle pump output or reset pump to lower level. Do not lower if sand may clog pump.
C. Leak in system.	Check system for leaks.	Replace damaged pipes or repair leaks.
D. Worn pump.	Symptoms of worn pump are similar to those of drop pipe leak or low water level in well. Reduce pressure switch setting, if pump shuts off worn parts may be the fault.	Pull pump and replace worn parts.
E. Loose coupling or broken motor shaft.	Check for loose coupling or damaged shaft.	Replace worn or damaged parts.
F. Pump screen blocked.	Check for clogged intake screen.	Clean screen and reset pump depth.
G. Check valve stuck closed.	Check operation of check valve.	Replace if defective.
H. Control box malfunction.	See pages 40-41 for single phase.	Repair or replace.

Motor Runs But Overload Protector Trips

A. Incorrect voltage.	Using voltmeter, check the line terminals. Voltage must be within ± 10% of rated voltage.	Contact power company if voltage is incorrect.
B. Overheated protectors.	Direct sunlight or other heat source can raise control box temperature causing protectors to trip. The box must not be hot to touch.	Shade box, provide ventilation or move box away from source.
C. Defective control box.	For detailed procedures, see pages 40-41.	Repair or replace.
D. Defective motor or cable.	For detailed procedures, see pages 38-40.	Repair or replace.
E. Worn pump or motor.	Check running current. See pages 13 & 21-23.	Replace pump and/or motor.

TOLL FREE HELP FROM A FRIEND

1-800-348-2420

1-219-827-5102 FAX

Phone Franklin's toll free SERVICE HOTLINE for answers to your installation questions on submersible pump motors. When you call, a Franklin expert will offer assistance in troubleshooting submersible systems and provide immediate answers to your motor application questions. Technical support is also available online. Visit our website at:

www.franklin-electric.com

Franklin Electric
Bluffton, Indiana 46714

M-1311

ATTENTION!
IMPORTANT INFORMATION FOR INSTALLERS OF THIS EQUIPMENT!

THIS EQUIPMENT IS INTENDED FOR INSTALLATION BY TECHNICALLY QUALIFIED PERSONNEL. FAILURE TO INSTALL IT IN COMPLIANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES, AND WITH FRANKLIN ELECTRIC RECOMMENDATIONS, MAY RESULT IN ELECTRICAL SHOCK OR FIRE HAZARD, UNSATISFACTORY PERFORMANCE, AND EQUIPMENT FAILURE. FRANKLIN INSTALLATION INFORMATION IS AVAILABLE FROM PUMP MANUFACTURERS AND DISTRIBUTORS, AND DIRECTLY FROM FRANKLIN ELECTRIC. CALL FRANKLIN TOLL FREE 800-348-2420 FOR INFORMATION. RETAIN THIS INFORMATION SHEET WITH THE EQUIPMENT FOR FUTURE REFERENCE.

WARNING

SERIOUS OR FATAL ELECTRICAL SHOCK MAY RESULT FROM FAILURE TO CONNECT THE MOTOR, CONTROL ENCLOSURES, METAL PLUMBING, AND ALL OTHER METAL NEAR THE MOTOR OR CABLE, TO THE POWER SUPPLY GROUND TERMINAL USING WIRE NO SMALLER THAN MOTOR CABLE WIRES. TO REDUCE RISK OF ELECTRICAL SHOCK, DISCONNECT POWER BEFORE WORKING ON OR AROUND THE WATER SYSTEM. DO NOT USE MOTOR IN SWIMMING AREAS.

ATTENTION!
INFORMATIONS IMPORTANTES POUR L'INSTALLATEUR DE CET EQUIPEMENT.

CET EQUIPEMENT DOIT ETRE INSTALLE PAR UN TECHNICIEN QUALIFIE. SI L'INSTALLATION N'EST PAS CONFORME AUX LOIS NATIONALES OU LOCALES AINSI QU'AUX RECOMMANDATIONS DE FRANKLIN ELECTRIC, UN CHOC ELECTRIQUE, LE FEU, UNE PERFORMANCE NON ACCEPTABLE, VOIRE MEME LE NON-FONCTIONNEMENT PEUVENT SURVENIR. UN GUIDE D'INSTALLATION DE FRANKLIN ELECTRIC EST DISPONIBLE CHEZ LES MANUFACTURIERS DE POMPES, LES DISTRIBUTEURS, OU DIRECTEMENT CHEZ FRANKLIN. POUR DE PLUS AMPLES RENSEIGNEMENTS, APPELEZ SANS FRAIS LE 1-800-348-2420. CONSERVEZ CETTE FEUILLE D'INFORMATION AVEC L'EQUIPEMENT POUR CONSULTATION FUTURE.

AVERTISSEMENT

UN CHOC ELECTRIQUE SERIEUX OU MEME MORTEL EST POSSIBLE, SI L'ON NEGLIGE DE CONNECTER LE MOTEUR, LA PLOMBERIE METALLIQUE, BOITES DE CONTROLE ET TOUT METAL PROCHE DU MOTEUR A UN CABLE ALLANT VERS UNE ALIMENTATION D'ENERGIE AVEC BORNE DE MISE A LA TERRE UTILISANT AU MOINS LE MEME CALIBRE QUE LES FILS DU MOTEUR. POUR REDUIRE LE RISQUE DE CHOC ELECTRIQUE. COUPER LE COURANT AVANT DE TRAVAILLER PRES OU SUR LE SYSTEM D,EAU. NE PAS UTILISER CE MOTEUR DANS UNE ZONE DE BAIGNADE.

ATENCION!
INFORMACION PARA EL INSTALADOR DE ESTE EQUIPO.

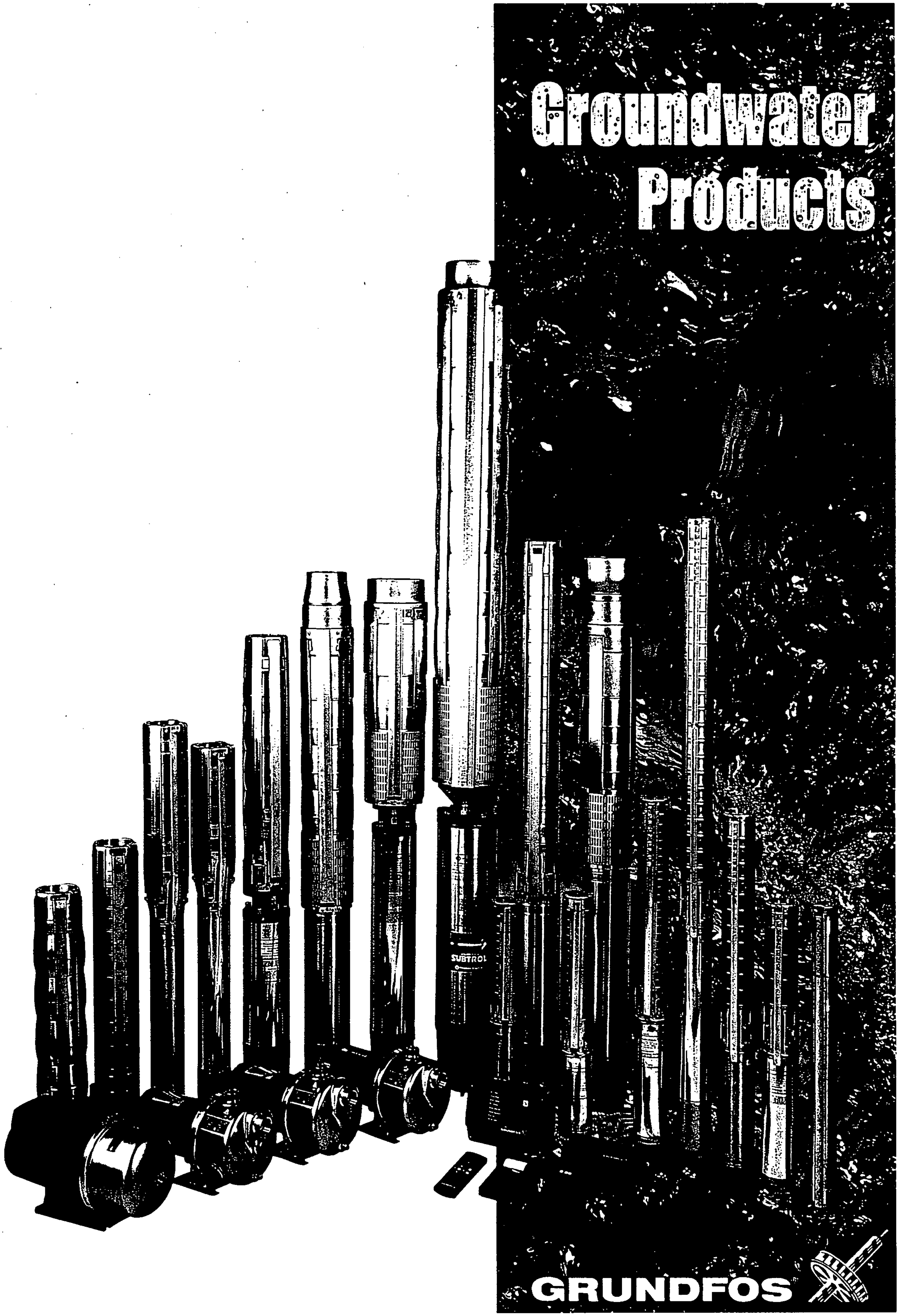
PARA LA INSTALACION DE ESTE EQUIPO, SE REQUIERE DE PERSONAL TECNICO CALIFICADO. EL NO CUMPLIR CON LAS NORMAS ELECTRICAS NACIONALES Y LOCALES, ASI COMO CON LAS RECOMENDACIONES DE FRANKLIN ELECTRIC DURANTE SU INSTALACION, PUEDE OCASIONAR: UN CHOQUE ELECTRICO, PELIGRO DE UN INCENDIO, OPERACION DEFECTUOSA E INCLUSO LA DESCOMPOSTURA DEL EQUIPO. LOS MANUALES DE INSTALACION Y PUESTA EN MARCHA DE LOS EQUIPOS, ESTAN DISPONIBLES CON LOS DISTRIBUIDORES, FABRICANTES DE BOMBAS O DIRECTAMENTE CON FRANKLIN ELECTRIC. PUEDE LLAMAR GRATUITAMENTE PARA MAYOR INFORMACION AL TELEFONO 800-348-2420. GUARDAR ESTA INFORMACION JUNTO AL EQUIPO PARA FUTURAS CONSULTAS.

ADVERTENCIA

PUEDE OCURRIR UN CHOQUE ELECTRICO, SERIO O FATAL DEBIDO A UNA ERRONEA CONECCION DEL: MOTOR, DE LOS TABLEROS ELECTRICOS, DE LA TUBERIA, DE CUALQUIER OTRA PARTE METALICA QUE ESTA CERCA DEL MOTOR O POR NO UTILIZAR UN CABLE PARA TIERRA DE CALIBRE IGUAL O MAYOR AL DE LA ALIMENTACION. PARA REDUCIR EL RIESGO DE CHOQUE ELECTRICO. DESCONECTAR LA ALIMENTACION ELECTRICA ANTES DE INICIAR A TRABAJAR EN EL SISTEMA HIDRAULICO. NO UTILIZAR ESTE MOTOR EN ALBERCAS O AREAS EN DONDE SE PRACTIQUE NATACION.

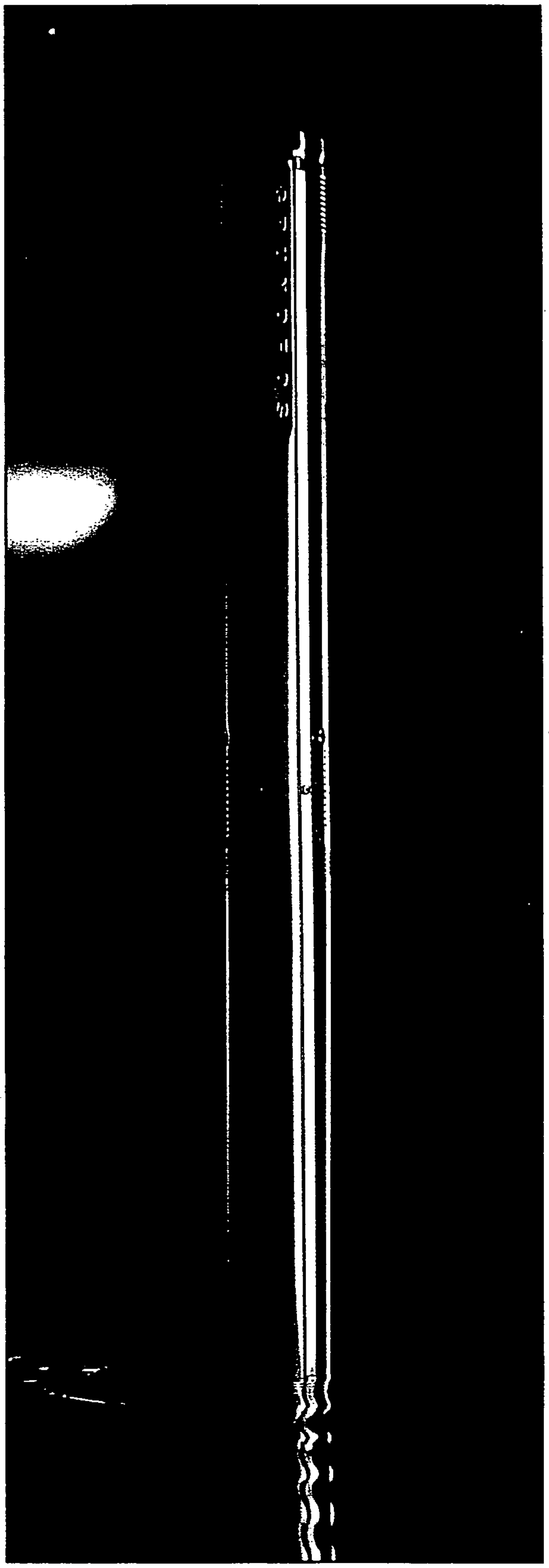
Franklin Electric
Bluffton, Indiana 46714

Groundwater Products



GRUNDFOS

SQ/SQE



Features/Benefits:

SQ:

- Rugged Design
- 1/3 - 1.5 Hp Integral Motors
- Excellent Sand Handling Capabilities
- High Motor and Pump Efficiencies
- Built in Dry-Run Protection
- Overload / Locked Rotor Protection
- Overvoltage / Undervoltage Protection
- Over Temperature Protection
- No Control Box Required
- Soft-Start
- Multiple Frequency Input (50 - 60 Hz)
- Two Voltage Variants:
  - 1 x 100 - 115V
  - 1 x 200 - 230V
- Pump and Motor Can Be Separated
- High Starting Torque (Even at Low Voltages)
- Easy to Install
- Serviceable Pump and Motor
- Replaceable Motor Lead

SQE:

All of the SQ Features, PLUS:

- Constant Pressure Regulation
- Advanced Communication
- Telephone Modem Surveillance
- Pump Status Readout Through Drop Cable (While Pump is Installed in the Well)
- Failure Analysis Stores Failure Data
- Parameters Programmable by the R100
- Programmable Speed Change
- Multiple Pump Curves With One Unit
- Sensor Connection (3 Signals)

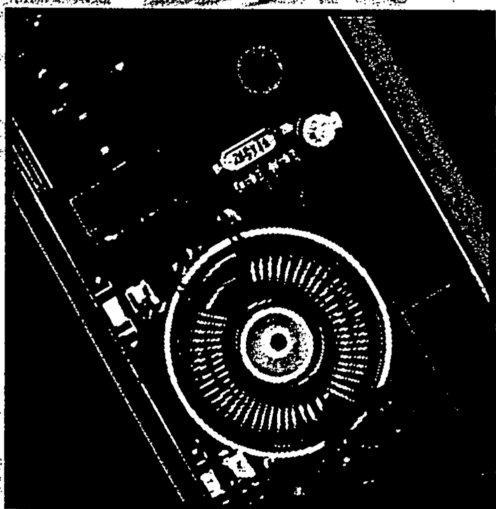
SQE-NE:

All of the Features of the SQE, But Designed for Environmental Applications:

- All 316 SS Construction
- Inert Composites for Environmental Applications

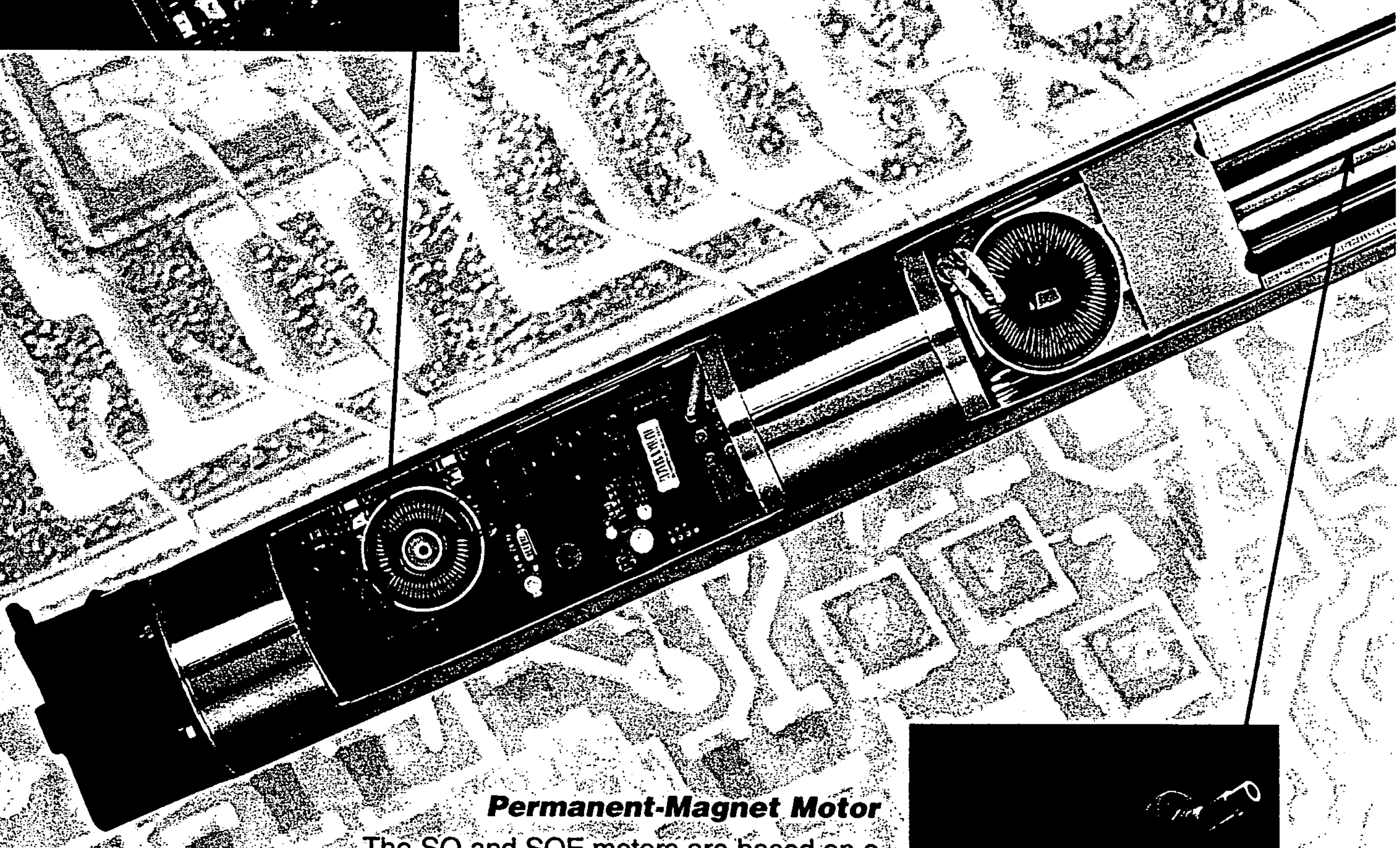
UL c UL LISTED

Rugged by Design



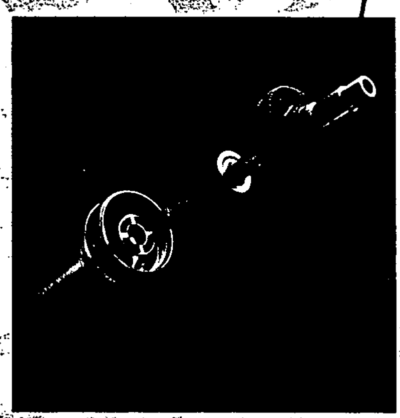
Advanced Electronics

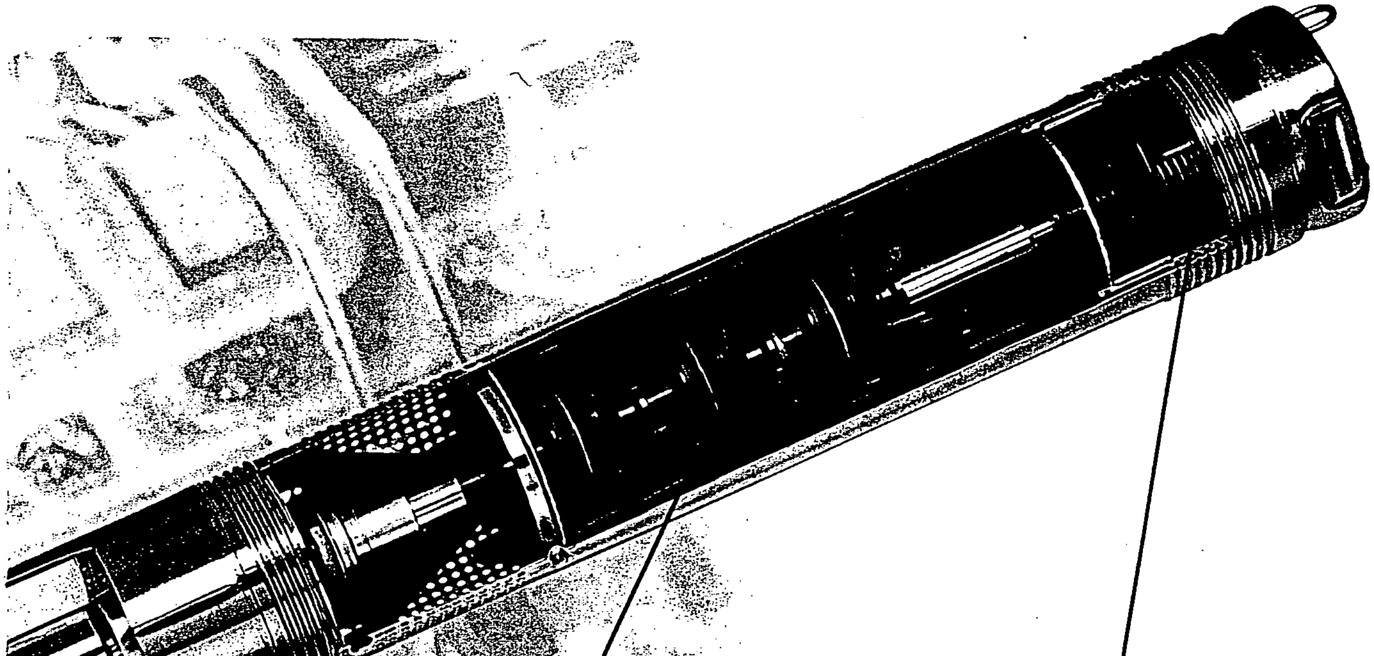
By combining advanced electronics, permanent-magnet motors, and Grundfos' own micro-frequency converter, we are now able to control and communicate with pumps in ways never before possible. A few of the features that come out of this combination are Constant Pressure Control, Soft-Start and integrated Dry-Run Protection.

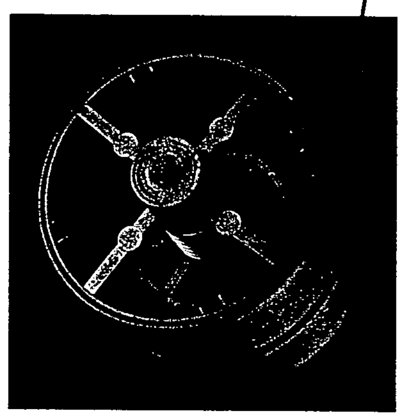


Permanent-Magnet Motor

The SQ and SQE motors are based on a permanent-magnet rotor which produces high efficiency output within a wide load range. The high and flat efficiency curve of the permanent-magnet motor allows us to cover a wide power range with the same motor, as compared to conventional AC motors. For SQE pumps, this means three motors to cover the horsepower range from 1/3 to 1.5 Hp.







Reliable Check Valve

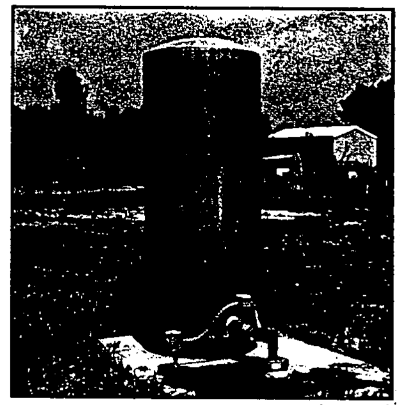
Reliable built-in spring loaded check valve lets you operate the pump in any position from vertical to horizontal.

Rugged Design

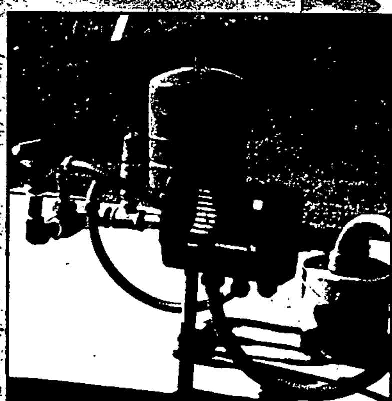
The SQ/SQE pump design uses "floating" impellers. Each impeller has its own tungsten carbide/ceramic bearing. This design and the high quality of materials make the pump very wear resistant, especially in sandy conditions.

Applications

Today's Pump System

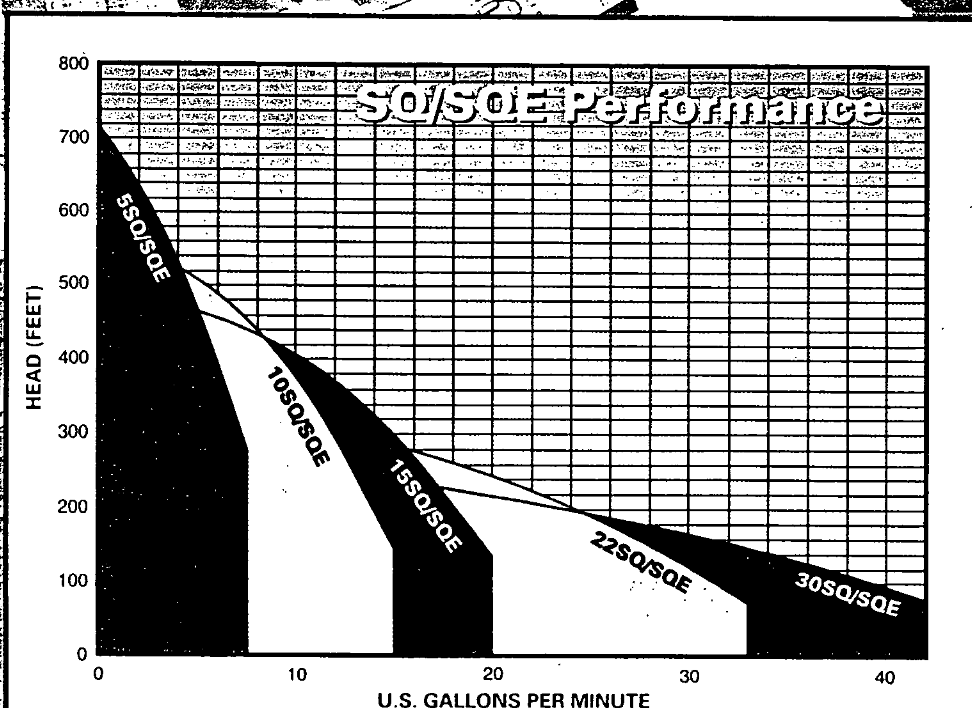


SQ pumps operate at a constant speed much like today's 4" conventional submersible pumps. The difference between it and today's pump is that you get all the added benefits of an electronically controlled permanent-magnet motor, which cannot be accomplished with a standard 4" induction motor. The SQ pumps are available for single-phase power and use a simple 2-wire design, making installation easy.



Constant Pressure

SQE pumps include the high efficiency permanent-magnet motor, and also offer you the ability to communicate with the motor. The "smart" motor communicates through the power leads into the CU300 status box. (It is not necessary to run any additional wires down the well.) By being able to communicate with the pump, you have Constant Pressure Control and the ability to change the pump performance. As with the SQ motor, this is also a 2-wire motor designed for single-phase operation.

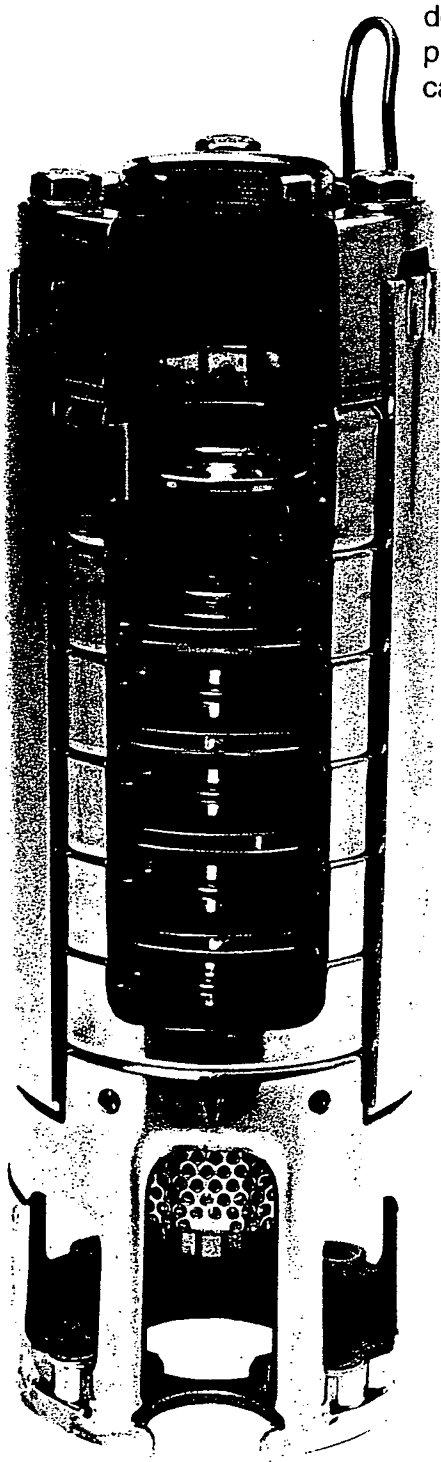


4-Inch Submersibles

Grundfos' 4" submersibles feature corrosion-resistant stainless steel construction and are designed to provide years of trouble free performance.

With built-in sand bearing protection, the 4" submersible can handle the sandy conditions often found in domestic wells. Built-in, jam-free check valves and special upthrust protection guarantee smooth running, fail-safe operation. A user friendly cable guard aids in ease of installation.

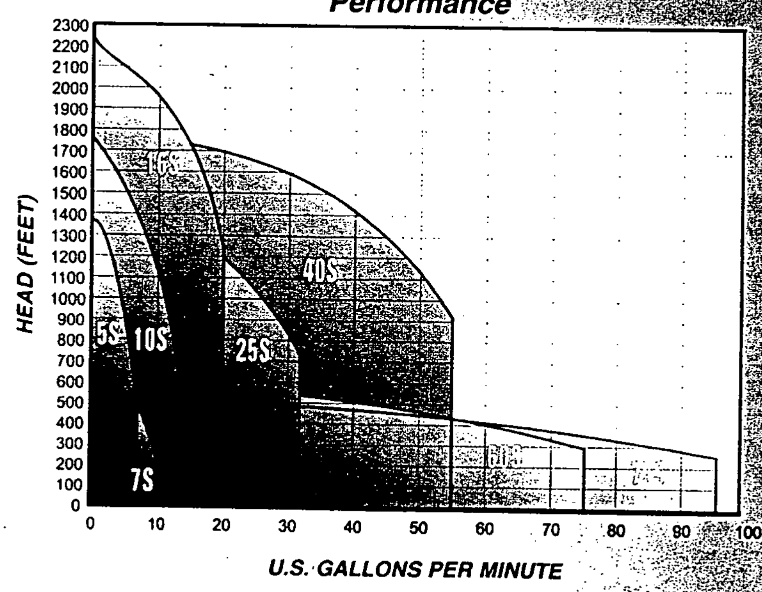
Grundfos 4" submersibles are available with a rugged Franklin® submersible motor manufactured of stainless steel. The two units together result in a quality pumping unit built to last.



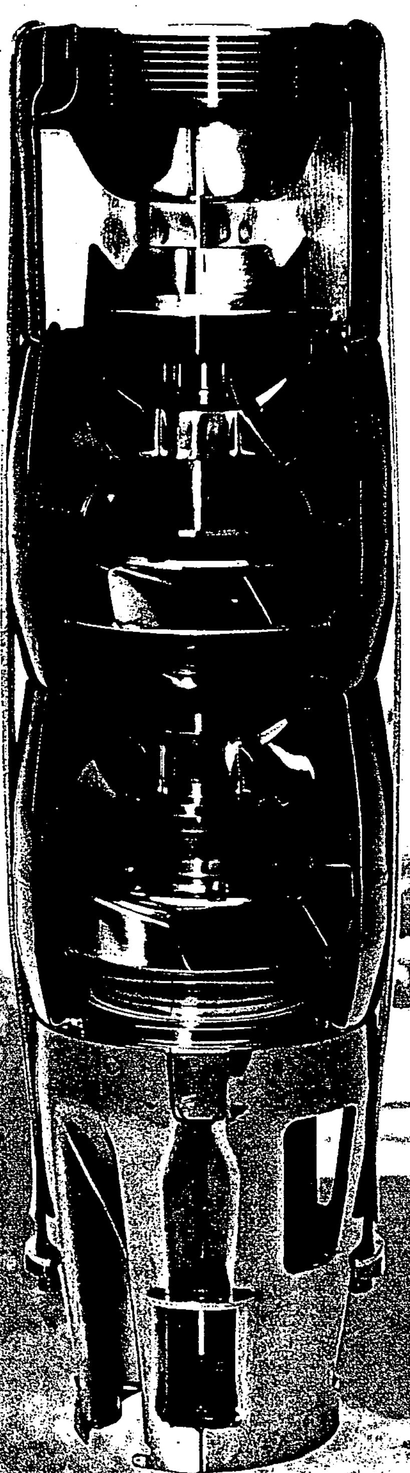
New Radial Thrust Top Bearing handles sand and increases pump life.

The Redi-Flo4®, constructed of stainless steel and virgin Teflon® is designed for environmental monitoring and clean-up operations.

Performance



6, 8 and 10-Inch Submersibles

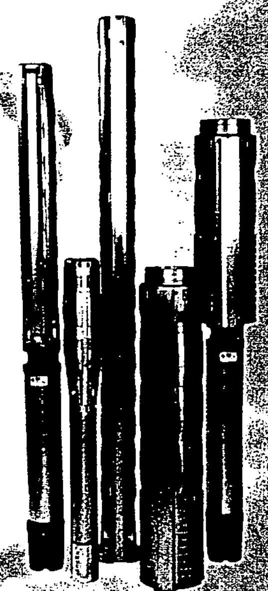


Grundfos now offers a generation of "smart" submersible pumps designed to reduce operating costs and improve efficiencies. The new high efficiency line is designed to deliver during periods of high demand with better efficiencies and fewer losses.

Built with the same high quality, corrosion-resistant stainless steel components as other Grundfos groundwater products, these pumps feature a state-of-the-art impeller design which allows for outstanding performance at depths over 2000 feet.

This new line of submersibles is also "smart". Incorporated into the design is the revolutionary CU3 control system which automatically monitors your pump's performance.

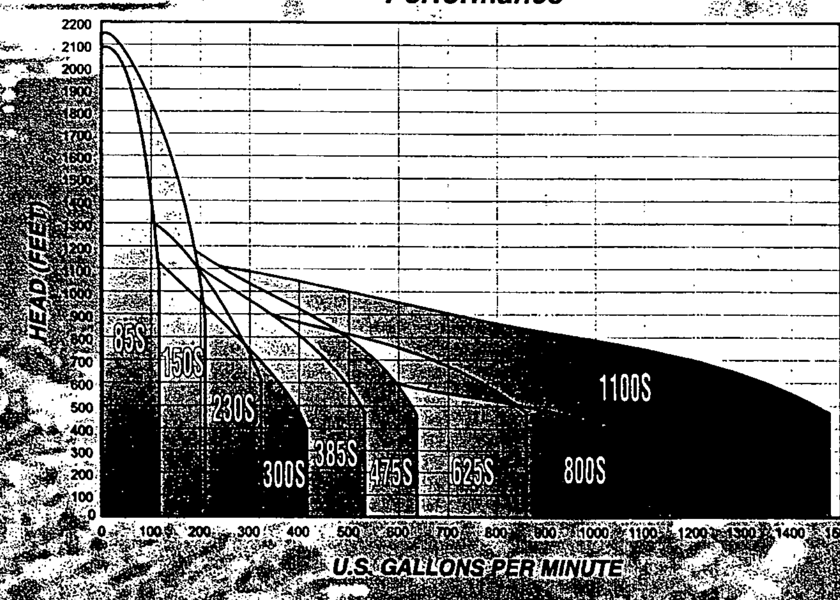
Grundfos 6", 8" and 10" submersibles are available with a rugged Franklin® submersible motor. Manufactured of stainless steel, the two units together result in a quality pumping unit built to last.



Features/Benefits:

- **High efficiencies** – Due to less horsepower utilized, operating costs drop significantly.
- **Built-in check valve** – Protects pump from water hammer.
- **Built-in upthrust protection** – Protects the pump during periods of high demand.
- **Quality construction** – Built of rugged, corrosion-resistant stainless steel.

Performance



CU3 Control System

The CU3 is an electronic control system which monitors the overall performance of your pump's motor, machines, cables and cable joints, up to and including 400 A at 50 and 60 Hz.

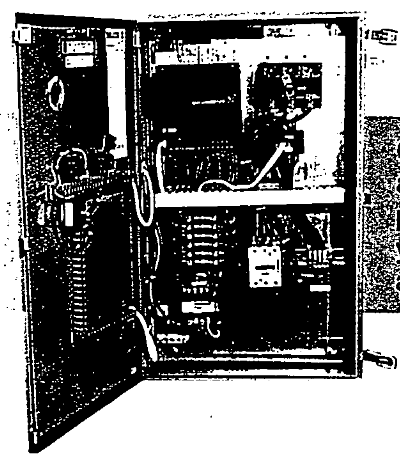
Working in conjunction with a Grundfos pump, the technologically advanced CU3 monitors insulation resistance before start-up; motor temperature (for motors with built-in temperature sensor); motor current consumption and phase asymmetry; voltage supply; phase sequence; installation; operating hours and power consumption.

The CU3 offers protection against:

- Dry-run
- Overload
- Operation against a closed valve/frozen discharge pipe
- Insufficient liquid circulation past the motor
- High temperatures
- Deposits on the motor
- Under/Overvoltage
- Phase asymmetry
- Incipient motor failure
- Motor overheating
- Motor burn-out

Options for the CU3:

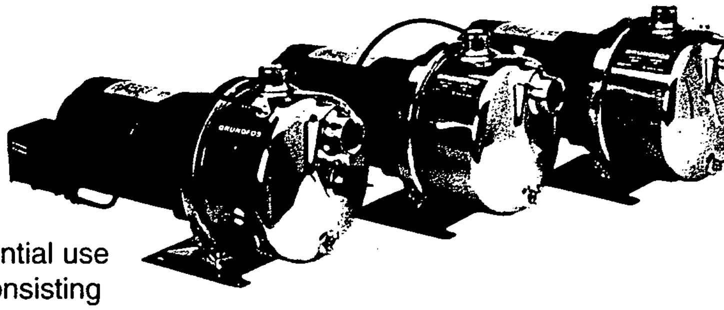
With the use of a Grundfos R100 infra-red remote control, you can monitor your pump's operational data including: current, voltage, running hours, power input, energy consumption and fault indications. The R100 remote control can be configured to meet exact specifications and is capable of monitoring an entire pumping system independently, keeping maintenance to a minimum.



Grundfos also has a complete line of pump panels making your installation fast and easy.

A printer is also available to allow for the R100 data to be downloaded directly for quick output of current data.

JetStar™



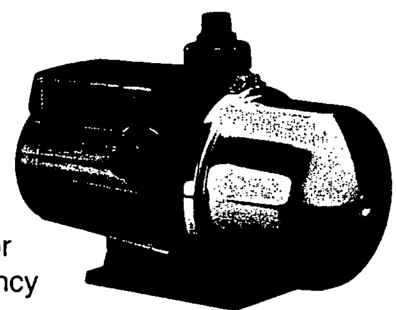
Grundfos Jet pumps are perfectly suited for residential use for both shallow well and booster applications. Consisting of both booster and shallow well models, these units can pump up to 40 gpm. Constructed of quality stainless steel components, the Jet pumps are designed to be durable, non-corrosive and virtually maintenance-free. All models consist of a top discharge opening for ease of installation and a streamlined, lightweight design. Also available from Grundfos is the convertible *JetStar* pump for domestic, commercial/industrial, and agricultural deep and shallow well applications.

Features/Benefits:

- **Versatile** – Can be used for both shallow well and booster applications.
- **Quality Components** – Stainless steel components make the Jet pumps corrosion-resistant and built for long life.
- **Various Models** – Six different models to fit your specific application (3 shallow well and 3 booster).
- **Heavy-Duty Motor** – Dual compartment motors available in either 1/2, 3/4, or 1 Hp, designed to provide continuous operation and uniform flow at specified pressures.
- **Built-In Ejector** – Constructed of Noryl® for maximum efficiency and corrosion resistance.

Approved

JetpaQ®

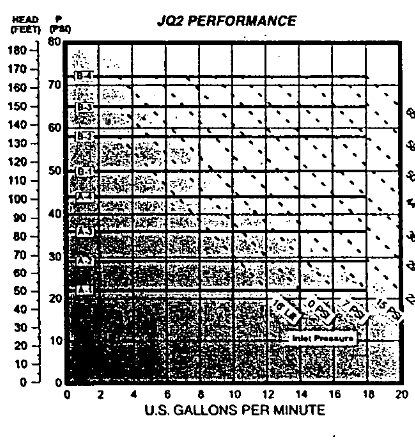


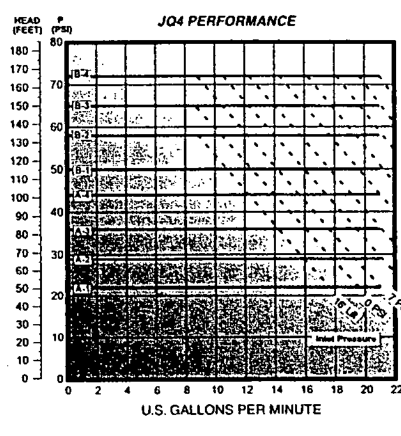
The Grundfos JetpaQ® is the first completely integrated pumping system for domestic water supply consisting of the pump, diaphragm tank and frequency control all integrated into one compact unit providing constant pressure. It is constructed of durable, corrosion-resistant stainless steel and composite materials, and is the perfect pump for pressure boosting applications or for boosting water out of a shallow well. No matter how much water is being used, the JetpaQ® keeps the water pressure constant with the use of a Grundfos micro-frequency converter which continually adjusts speed to meet the pre-set pressure setting.

LISTED

Features/Benefits:

- Quiet operation due to a built-in water cooling system.
- Built-in pressure sensor signals the pump to deliver the desired capacity at the right pressure.
- State-of-the-art electronics with the Grundfos micro-frequency converter provide constant pressure.
- Built-in dry-run protection, motor protection, overload protection, automatic reset and soft-start make the JetpaQ® virtually maintenance-free.





Grundfos Groundwater Products

Models	Well Size	Hp Range	Discharge Size	Flow Range GPM	Heads To: (Ft.)
SQ/SQE					
5SQ/SQE	3"	⅓ - 1	1"	1.5 - 8	710
10SQ/SQE	3"	⅓ - 1½	1¼"	3 - 15	560
15SQ/SQE	3"	⅓ - 1½	1¼"	4 - 20	470
22SQ/SQE	3"	⅓ - 1½	1½"	7 - 33	320
30SQ/SQE	3"	½ - 1½	1½"	8 - 42	260
4" Submersibles					
5S	4"	⅓ - 3	1"	1.2 - 7	1360
7S	4"	⅓ - 1½	1"	3 - 10	700
10S	4"	⅓ - 5	1¼"	5 - 14	1740
16S	4"	½ - 10	1¼"	10 - 20	2220
25S	4"	½ - 10	1½"	18 - 32	1560
40S	4"	1 - 20	2"	24 - 55	1900
60S	4"	2 - 10	2"	40 - 75	570
75S	4"	2 - 10	2"	45 - 95	510
6", 8" and 10" Submersibles					
85S	6"	1½ - 50	3"	18 - 118	2090
150S	6"	2 - 75	3"	30 - 220	2145
230S	6"	7½ - 75	3"	45 - 320	1440
300S	6"	7½ - 75	3" & 4"	60 - 410	1220
385S	8"	7½ - 100	4"	75 - 550	1280
475S	8"	10 - 125	6"	95 - 680	1340
625S	10"	15 - 150	6"	125 - 850	990
800S	10"	20 - 125	6"	160 - 1080	780
1100S	10"	30 - 250	6"	220 - 1400	1140
JetStar			*Suction and Discharge Size*		
Shallow Well	3"	½ - 1	1¼" x 1"	1 - 20	158
Deep Well Convertible	4"	½ - 1	1¼" x 1"	1 - 20	158
Booster Jet	N/A	½ - 1	1¼" x 1"	1 - 40	152
JetpaQ®					
JQ2	3"	N/A	1" x 1"*	0 - 18	166
JQ4	3"	N/A	1" x 1"*	0 - 22	166

* denotes Male NPT

GRUNDFOS®

Leaders in Pump Technology

Grundfos Pumps Corporation

National Support Center
Grundfos Pumps Corporation
3131 N. Business Park Avenue, Fresno, CA 93727
(559) 292-8000 FAX (559) 291-1357

Customer Service Centers
Allentown, PA • Fresno, CA
(800) 333-1366 FAX (800) 333-1363

Franklin Electric

Grundfos Canada, Inc.
2941 Brighton Rd.
Oakville, Ontario L6H 6C9, Canada
(905) 829-9533 FAX (905) 829-9512

Bombas Grundfos de Mexico, S.A. de C.V.
Ave. E No. 306 Fracc. Industrial Milimex
66600 Apodaca, N.L. Mexico
52-8-369-3900 FAX 52-8-369-3665

www.us.grundfos.com

Available from:

Performance curves and technical information listed as a range only and subject to change without notice. Consult a Grundfos product submittal data sheet for exact pump specifications.

L-GRD-SL-001 | Rev. 6/99

EXPLANATION OF PITLESS UNIT ORDERING NUMBERS

The diagram illustrates the meaning of the various letters and numerals used in Monitor Industrial Pitless Unit ordering numbers. A typical order number and the pitless unit it stands for are shown.

3 **A.** The first numeral in the order number indicates the bury depth, in feet, of the unit. Bury depth on all units is measured from the center of the discharge line to ground level. The top of the pitless case extends 12" above ground level as is required by many codes.

PS These letters indicate the type of pump the pitless unit is designed for. The unit shown is a PS for submersible pumps.

8 **B.** This numeral indicates the well casing size. The 6 is 6" I.D. wells, 6.6 for 7" O.D. wells, and 8 for 8" I.D. wells.

10 **C.** This numeral indicates the upper pitless case size. The 7 is for the 7" I.D. case, and 10 for 10" I.D. case.

W **D.** Indicates the attachment to the well casing is a welded joint ("N" for KwiKonect - 6" I.D. & 8" I.D. only).

B **E.** The presence of the letter "B" in the order number indicates the upper pitless case is black pipe.

W **F.** Indicates the unit has a watertight cap with screened vent installed.

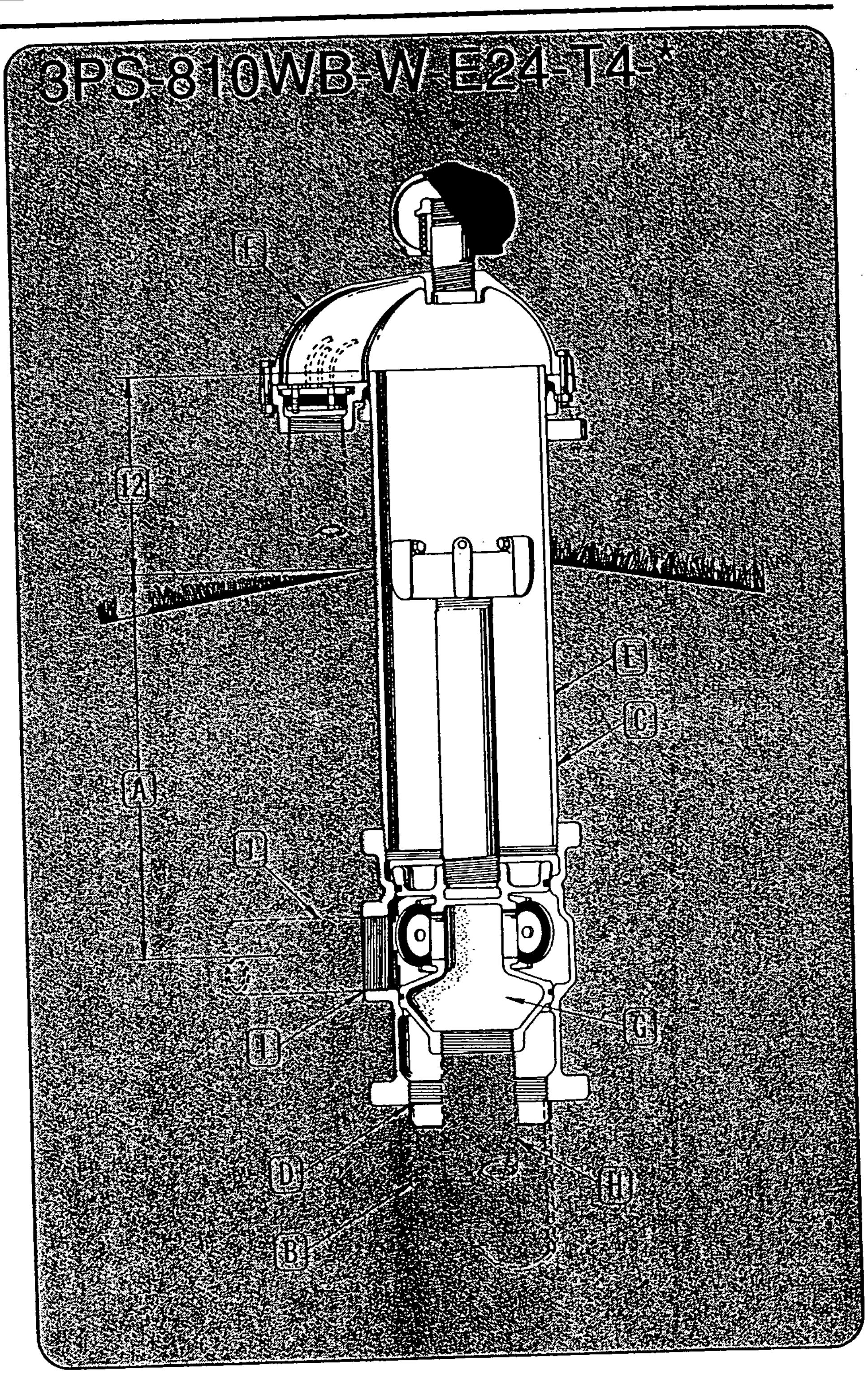
E **G.** Indicates spool has pressure equalizing passages.

08 This numeral indicates the type of spool which the pitless unit has. In this case it is a spool having two silent check valves.

4 **H.** Indicates the size of drop pipe in inches.

T **I.** Indicates the discharge connection is threaded.

4 **J.** Indicates the size of discharge pipe in inches.



ACCESSORY LIST

* Accessory(s) may be ordered by placing accessory letter at end of pitless model number. (Protected screen well vent is standard equipment, as is weld nipple).

S Sealed Conduit Connection.

BAKER
133 Enterprise St.
Evansville, WI 53536

Monitor

Monitor PS
Industrial Pitless Units for Submersible Pumps 6", 6.6", & 8" I.D. Well Sizes

e Monitor PS Industrial Pitless Unit for ubmersible pumps forms a watertight extension of the well casing which starts below the frostline, where it is buried permanently, and continues upward 12 or more inches above grade, where the pitless case is closed with a watertight cap.

TO INSTALL A PS INDUSTRIAL UNIT:

An excavation around the well casing below the frost line is made and well casing cut off at a prescribed level. The well cap is removed and the spool assembly lifted out of the pitless case with a hoist and set aside.* The pitless case is then welded or threaded tightly onto the well casing. The submersible motor, pump, and cable are attached to the drop pipe which is lowered into the well with a hoist; when the top of the last section of the drop pipe is one foot or more above the pitless case, the spool assembly is screwed onto the drop pipe. The spool assembly and drop pipe with motor, pump and cable are lowered into place; then finally the electrical service and well cap are installed.

The spool assembly includes: A spool with two or no silent check valves; two O-ring seals; lift-out pipe and hold-down spider.

FEATURES:

CORROSION PROTECTION . . . All water passages are either hot-dipped galvanized or constructed of corrosion resistant material.

EASY TO SERVICE . . . Well cap can be removed without disconnecting cables. O-ring seals on spool permit withdrawal of the entire inner assembly simply by lifting. Replacement is equally simple. Spool support eliminates vertical adjustment and any possibility of dropping the inner assembly into the well.

RELIABLE SEAL . . . Neoprene O-rings between accurately machined hot-dipped galvanized surfaces on the spool and and within the unit provide positive seals.

O-RING SEAL PROTECTION . . . Monitor seal protection prevents seal damage during installation and service.

FROST PROOF . . . No heating is required. All water passages are below the frost line.

QUICK TO INSTALL . . . A quality pump installation can be made easily and economically without delay for masonry or building construction.

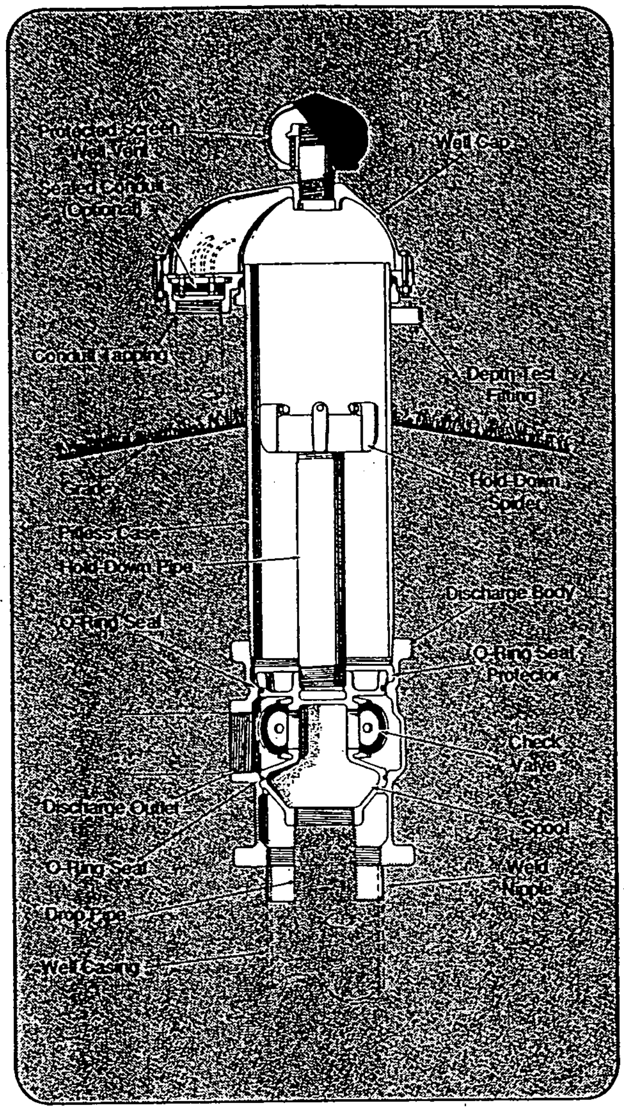
ALTERNATIVE SPOOLS Spools are available plain (EO) ~~or with silent check valves (E2 double)~~. The Monitor Silent Check Valve has its operating parts automatically exposed when the spool is withdrawn. Complication and cost of installing separate check valve in the drop pipe are eliminated. Spools are supplied with tapping for either a pressure relief valve, or a pressure control.

WATERTIGHT WELL CAP . . . Designed to permit removal without disconnecting cables. Separate Junction Box is eliminated. Watertight cable and conduit sealing is optional. Alternate ventilated cap is available.

HOLD-DOWN . . . Supplied with each unit. Hold-down pipe also serves as lift-out pipe for installation and servicing.

DEPTH TEST BLOCK . . . Standard on all units.

~~FLOWING WELL . . . Units available.~~



ONE YEAR LIMITED WARRANTY

Any PS Pitless Unit discharge body, spool, upper case or well cap used in potable water applications, found defective in workmanship or material will be replaced without charge provided the defective item is returned prepaid to the distributor from whom purchased within one year from date of shipment. The Company does not assume responsibility for labor or consequential damage. All other terms and conditions of sale are as stated on the Baker Factory Sales Order Terms and Conditions–Form AD 100.

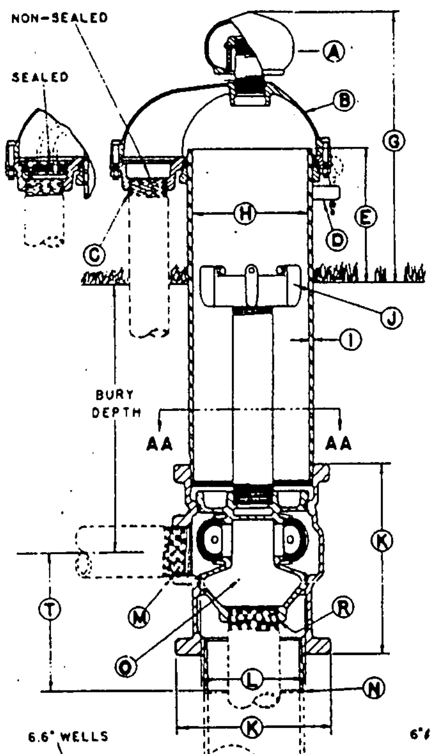
608-882-5100
FAX: 608-882-6776

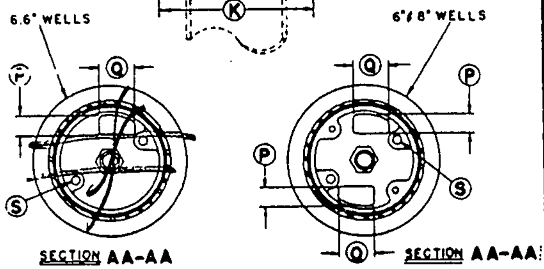
BAKER
133 Enterprise Street
Evansville, Wisconsin 53536

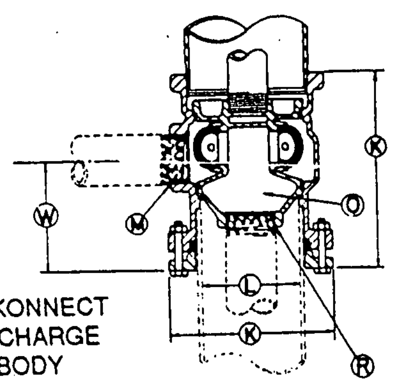
Monitor

Catalog AD74 6-1-90

Monitor PS STANDARD INDUSTRIAL PITLESS UNITS FOR SUBMERSIBLE PUMPS - 6, 6.6 & 8" WELLS







KWIKONNECT DISCHARGE BODY

	SPECIFICATIONS	6" I.D.	6.6" I.D. 7" O.D.	8" I.D.
A	Screened Well Vent Size:	~~1-1/2" F.I.P.~~	~~1-1/2" F.I.P.~~	2-1/2" F.I.P.
B	Seal Cap: *The Watertight cap bolts to a compression seal ring securing around the pitless case and comes with the screened well vent installed.*			
C	Conduit Tapping Size: *Watertight conduit seals for most common cable sizes are available for watertight cap*	1-1/2" F.I.P.	1-1/2" F.I.P.	3" F.I.P.
D	Depth Tester Tapping:	1/4" F.I.P.	1/4" F.I.P.	1/4" F.I.P.
E	Distance from ground level to top of pitless case:	12"	12"	12"
G	Distance from ground level to top of screened well vent. *(Vent height may be increased if necessary)*	19-1/12"	19-1/2"	24-5/16"
H	Pitless Case size:	7"	7"	10"
I	Pitless Case wall thickness:	.300"	.300"	.365"
J	"Hold-Down"-"Lift-Out" Mechanism *Three set screws in a spider atop the "Hold-Down", "Lift-Out" pipe brace against the interior of the pitless casing, locking the spool in place.*			
	Hold-Down, Lift-Out pipe size:	2"	2"	3"
	Designed "Lift-Out" Mechanism load:	10,000 lbs.	10,000 lbs.	20,000 lbs.
	DISCHARGE BODY-STD.			
K	Discharge Body Width:	9-7/16 O.D.	9-7/16 O.D.	13-1/8" O.D.
K	Discharge Body Length:	13-1/16" L	13-1/16" L	(Welded to Upper Casing)
	DISCHARGE BODY-KWIKONNECT			
K	Discharge Body Width:	8-7/8" O.D.	———	12-1/16" O.D.
K	Discharge Body Length:	12-9/32" L.	———	——
L	Pitless unit minimum I.D.:	6-3/8"	6-3/8"	9-1/8"
M	Discharge connection tapping size:	3" F.I.P.	3" F.I.P.	4" F.I.P.
N	Pitless unit to well casing connection:	6" Weld	6.6" Weld	8" Weld
O	***SPOOL ASSEMBLY**			
	Spool design load:	64,000 lbs.	64,000 lbs.	88,000 lbs.
	-WITHOUT CHECK VALVES-			
	Area of water passage(s):	10 sq. in.	10 sq. in.	15.8 sq. in.
	Percent area of water passages to area of drop pipe:	135%	135%	124%
	~~-WITH TWO CHECK VALVES-~~			
	~~Area of valve passages~~:	6.28 sq. in.	6.28 sq. in.	~~12.6 sq. in.~~
	~~Percent area of valve passages to area of drop pipe.~~	89%	89%	100%
	Motor Cable Passages Through Spool			
P		13/16"	13/16"	1-5/8"
Q		1-3/4"	1-3/4"	3-3/16"
R	Spool to drop pipe connection:	3" F.I.P.	3" F.I.P.	4" F.I.P.
S	Pressure switch tapping: 3/8 - 18 N.P.T.	(2) available	(2) available	(2) available
T	Dimension from center of discharge outlet to bottom of weld nipple:	8-3/8"	8-3/8"	11"
U	Overall length of seal cap:	12-3/8"	12-3/8"	18-1/2"
V	Dimension from center of discharge to bottom of discharge body.:	6-5/8"	6-5/8"	9-1/4"
W	Dimension from center of discharge to			

FIRST

Choose well size then make-up basic ordering number from proper column in specifications

ORDERING NUMBER SELECTION GUIDE

Bury Depth (Select One)	Pitless Submersible	Well Size - Inches	Upper Case Size - Inches	Attachment to Well Casing (Welded or Kwikonect)	Black Upper Case	Watertight Cap (Vent Installed)	Pressure Equalizing Spool Passages	Number of Check Valves (Select One)*	Drop Pipe I.D. Inches	Discharge Connect (Threaded)	Discharge I.D. - Inches
2 to 9	PS	6.6 6 8	7 7 10	W N	B	W	E	0 [illegible]	[illegible] [illegible] 4	T	[illegible] [illegible] 4

SECOND

Add desired accessory symbol

Accessory	Symbol
Sealed Conduit Connection	S

COMPONENT MATERIALS

Well Vent - cast iron, green enamel finish.
Cap & Conduit Box - cast iron, green enamel finish.
Hold-Down Spider - cast iron, green enamel finish.
Hold-Down Pipe, 2" - steel, black.
Hold Down Pipe, 3" - steel galvanized.
Pitless Case - steel, black.
Spool - cast iron, galvanized.
Discharge Body - cast iron, galvanized.
Check Valve Body & Arms - brass.
Check Valve Seat - Brass.
Check Valve Spring - Monel.
Compression Seal Ring & Check Valve Facing - Neoprene.
Conduit Seal & O-Rings - Neoprene.
Discharge Body - 8" x 10" - Ductile Iron

Specifications Subject to Change Without Notice.

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CUSTOM INDUSTRIAL PITLESS UNITS

Monitor

CUSTOM INDUSTRIAL PITLESS UNITS
FOR SUBMERSIBLE PUMPS
26" WELL SIZES

SPECIFICATIONS

(See drawing on Page 38)

A **Pitless Unit to well casing connection:** Chamfered for butt weld.
B **Pitless Unit with Black Upper Case:** 27 in. I.D., 28 in. O.D.
C **Discharge Body minimum I.D. 25".**
D **Hold-Down Mechanism and Locator:** Locks spool in place and prevents lifting and turning during pump start-up. Four adjustable hooks on lift-out pipe hook into side of pitless case.
DD Probe Tube Standard 1 in. PVC Pipe. (Standard).
E **Lift-Out Pipe:** 8 in. I.P.S. with standard lift-out bail.
F **Lift-Out Bail:** Lift-out pipe and bail assembly designed for a 218,000 lb. load.
G 2 -1/2 in. F.I.P. Tapping.
H **Well Vent:** Screws into a 2-1/2 in. F.I.P. Tapping.

CAP CABLE SEALS (SECTION BB-BB)

I **Conduit Tapping:** 2 in. and 1 in. Std. Also available with single 2 in., 3 in., or 4 in. F.I.P. All tapping sizes available with or without electrical cable seal.
J **Depth Tester Block Tappings:** 1/4 in. F.I.P. Std.
K Three 1 in. N.P.T. Tappings ported to Drop Pipe.
L **Pressure switch tapping:** 3/8 in. N.P.T. Std.

MOTOR CABLE PASSAGES THROUGH SPOOL (SECTION AA-AA)

M 7-3/16 in.
N 3-3/8 in.
O 2 in.
P **Dimension from center of Discharge Outlet to bottom of Discharge Body:** 17-7/16 in.
Q **Distance from ground level to top of the pitless case:** 12 in.
R **Distance from ground level to top of the vent cap:** 30-13/16 in. (Vent Height may be increased if necessary).
S **3/4 in. F.I.P Tapping:** used for optional Water Sampler.

		8 in. M.I.P.	10 in. M.I.P.	12 in. M.I.P.
T	**SPOOL TO DROP PIPE CONNECTION SIZES:**			
U	Dimension from center of discharge outlet to bottom of Spool:	18-13/16 in.	~~20-15/16 in.~~	~~22-15/16 in.~~
	DISCHARGE CONNECTIONS AND SIZES:			
V	For Butt Weld (I.P.S.):	8 in. I.D.	~~10 in. I.D.~~	~~12 in. I.D.~~
W	For Flanged (A.S.A. Std. 150 lb.):	8 in. I.D.	~~10 in. I.D.~~	~~12 in. I.D.~~
X	For Threaded (M.I.P.):	8 in. I.D.	~~10 in. I.D.~~	~~12 in. I.D.~~
Y	For Transition Sleeve (I.P.S.):	8 in. I.D.	~~10 in. I.D.~~	~~12 in. I.D.~~
Z	Dimension from center of Well Casing to the end of Discharge Outlet.			
	With [V] Butt Weld Discharge:	34-1/4 in.	~~34-1/4 in.~~	~~26-1/4 in.~~
	With [W] Flanged Discharge:	38-5/16 in.	~~38-5/16 in.~~	~~30-3/4 in.~~
	With [X] Threaded Discharge:	38-5/16 in.	~~39-5/16 in.~~	~~33-5/16 in.~~
	With [Y] Transition Sleeve:	40-1/4 in.	~~40-1/4 in.~~	~~32-1/4 in.~~
CC	**SPOOL ASSEMBLY - WITHOUT CHECK VALVES -**			
	Area of Water Passage(s):	120.26 sq. in.	~~120.26 sq. in.~~	~~120.26 sq. in.~~
	Percent area of water passages to area of drop pipe	240%	~~152%~~	~~106%~~

Monitor

INDUSTRIAL AND CUSTOM INDUSTRIAL PITLESS UNITS FOR SUBMERSIBLE PUMPS 6" through 26" WELL SIZES

INSTALLATION INSTRUCTIONS:

All pitless unit cases are joined by welding or threading the unit to the well casing, or kwikonect style by slipping the unit onto the top of the well casing and tightening the bolts.

Establish ground level at the well location. It is desirable to have the ground slope away, from pitless unit case, in all directions.

The pitless unit case should extend above the ground level according to state well code. To accomplish this the well casing must be cut off at a distance below the ground level equal to the overall pitless unit length less the length unit is to be above the ground.

In order to do work, excavate around the well casing clearing a diameter of at least 4' to a depth of 2' below point where well casing is to be cut off.

Cut off the well casing PERPENDICULAR to the well casing center line.

Remove the pitless unit cap then loosen the hold-down hooks or spider and remove spool assembly and set aside.
NOTE: (the spool assembly includes a spool with two or no silent check valves; two o-ring seals, lift-out pipe and bail, or hold down spider.

Lower the pitless case into place and rotate the discharge outlet to the desired location and weld the pitless case to the well casing. THIS JOINT MUST BE WATERTIGHT AND IT IS ESSENTIAL THAT THE CENTER LINE OF THE PITLESS CASE AND WELL CASING BE THE SAME.

The submersible motor, pump and cable are attached to the drop pipe and then lowered into the well. When the top of the last section of the drop pipe is one foot or more above the pitless case screw the spool assembly onto the drop pipe.

Wipe the rubber o-ring seals with a clean cloth and then coat with a heavy layer of petroleum jelly (vaseline) for proper seating of rings. Lower the spool assembly, drop pipe with motor, pump and cable into place.

Install and tighten hold-down hooks/hold down spider.

Complete electrical service and install pitless cap.

Connect discharge outlet to distribution line and complete all wiring.

The unit is now ready to operate under power and should be run a sufficiently long time to see that there are no leaks present.

The hole should not be filled in until the unit is running satisfactorily. Care should be exercised to fill under discharge line properly before back filling.

Appendix F

Representative Project Photographs

1. Production Well House Building 12B Prior to Demolition, Facing South

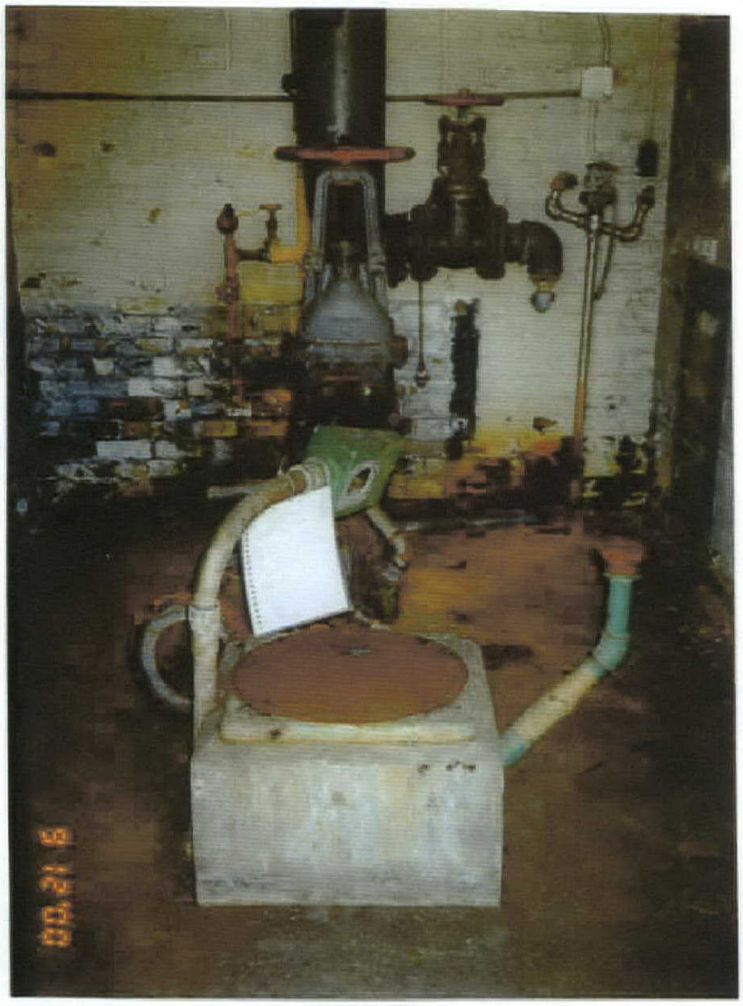
2. Production Well House Building 12B During Demolition, Facing East

3. Production Well House Building 12B After Demolition, Facing South

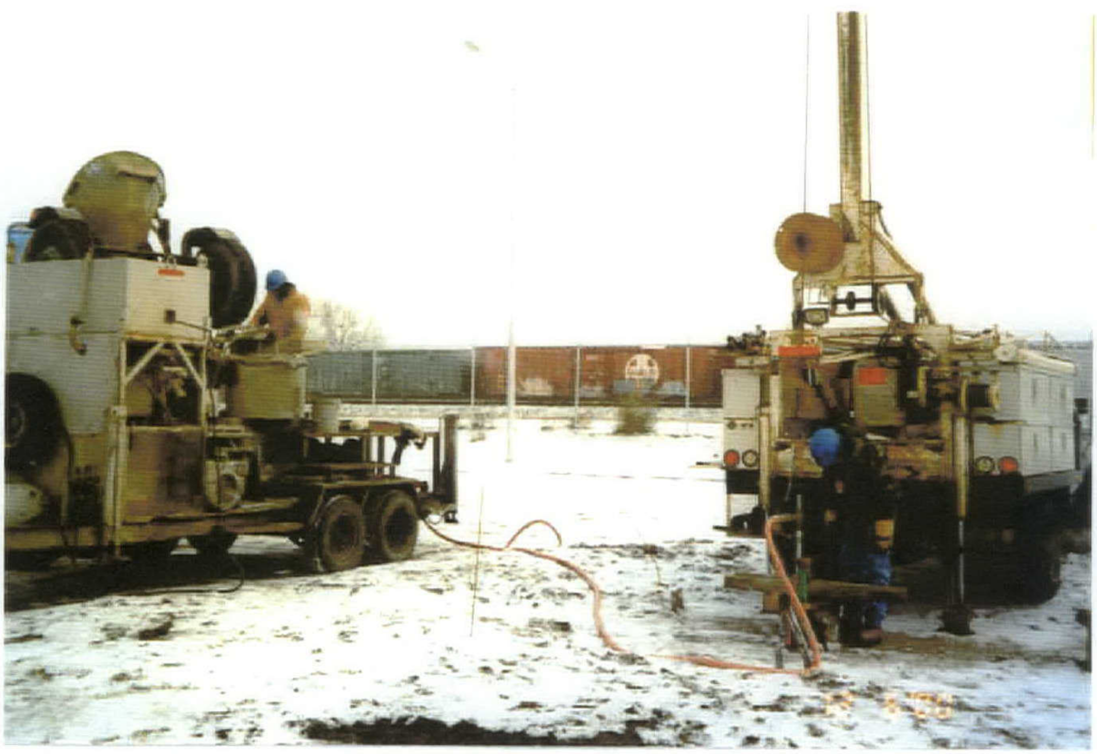
4. Extraction Well AT-8 Prior to Installation, Facing North

5. Extraction Well AT-8 During Installation, Facing North

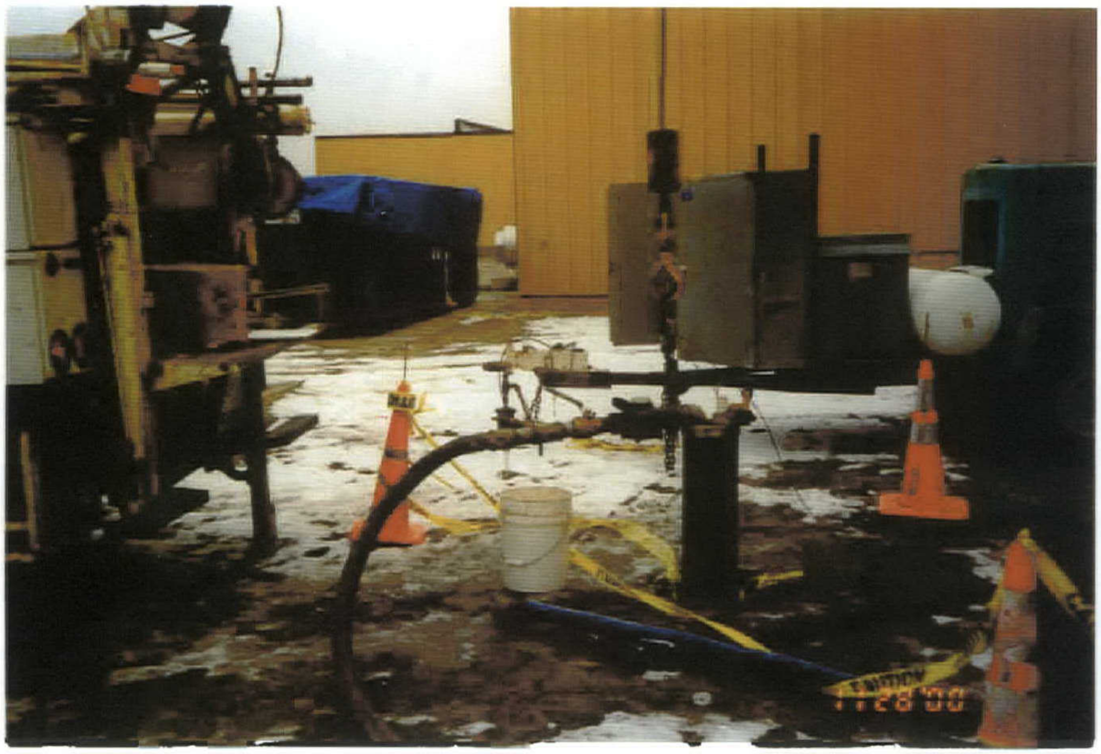
6. Extraction Well AT-8 After Installation, Facing North



7. Production Well 3 Prior to Abandonment, Facing South



8. Production Well 3 During Abandonment, Facing Northeast



9. Flow Rate Testing of Extraction Well AT-9, Facing North

10. Installation of Electrical Piping/Re-routing Electrical Circuit (Pump House), Facing South