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A-E QUALITY CONTROL SUMMARY REPORT FOR WELL INSTALLATION AND SAMPLING AT THE NAVAL INDUSTRIAL RESERVE ORDNANCE PLANT FRIDLEY, MINNESOTA

OCTOBER 1988

CONTRACT NO. DACA45-86-C-0015
MODIFICATION NO. P00003

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1. INTRODUCTION

1.1 Project Description and Background

RMT, Inc., (RMT) was retained by the Omaha District of the U.S. Army Corps of Engineers (USACE) in June 1986 to conduct the Remedial Investigation/Feasibility Study (RI/FS) for the Naval Industrial Reserve Ordnance Plant (NIROP) located in Fridley, Minnesota. This project is conducted under the Navy Installation Restoration Program (IRP), under Contract No. DACA45-86-C-0015.

The NIROP is a government-owned, contractor-operated facility. The plant is operated by the Northern Ordnance Division of FMC Corporation. The NIROP manufactures advanced naval weapons systems. The plant is located in the northern portion of the Minneapolis/St. Paul, Minnesota metropolitan area within the city limits of Fridley, Minnesota (Figure 1-1). It is situated approximately one-half mile east of the Mississippi River and less than one mile south of Interstate 694. The facility is bordered on the west by East River Road and on the east by the Burlington Northern Railroad. The government-owned, contractor-operated portion of the plant occupies about 83 acres. The plant is located in an industrial area which has a number of adjacent manufacturing facilities.

In previous years, the storage yard in the northern quarter of the site had been used for the disposal of drummed waste by burial in 8- to 10-foot-deep trenches or in pits. The materials disposed were thought to include waste oil, plating sludge, paint sludge, cleaning solvents, and degreasing solvents, which may have contained hazardous substances

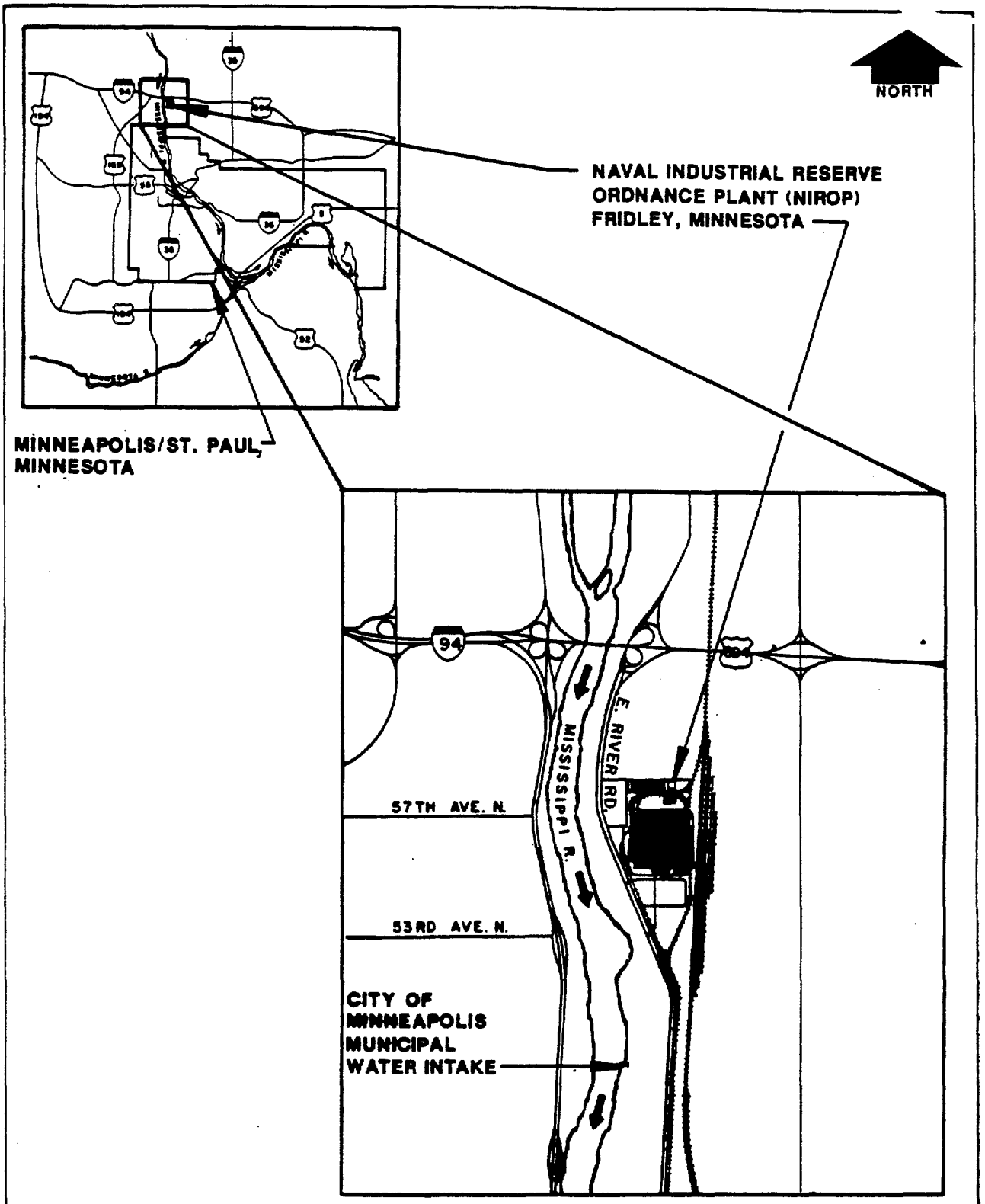

FIGURE 1-1
GENERAL VICINITIES MAP

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such as cyanide, trichloroethylene (TCE), methyl ethyl ketone (MEK), and 1,1,1-trichloroethane (RMT, 1987). Ground water contamination was initially detected in 1981 in a production well at the NIROP. The main ground water contaminant identified was trichloroethylene.

Fourteen (14) monitoring wells were installed by the USACE at the NIROP between May and August 1983. Initial remedial action in the north storage yard area began in November 1983. Nine areas were excavated, and 43 drums and approximately 1,200 cubic yards of soil were removed. The majority of the drums contained inert solids; others contained PCB wastes, flammable solids, base solids, and inert liquids; and some were empty. The hazardous soils and drums were disposed in an EPA-approved landfill. Soil samples were subsequently taken from the bottom of the excavations and analyzed for volatile organics. Two trenches showed total VOCs above one part per million. No further testing was done at that time. The trenches were backfilled with clean fill, and removal activities were completed in March 1984. However, ground water VOC contaminant concentrations have remained above desirable levels despite the excavation and removal of drums and soil from the trenches.

Seven (7) additional on-site monitoring wells were installed by the USACE in May and June 1985, and installation of twelve (12) off-site monitoring wells was completed by the USACE in February 1986. The purpose of these wells was to provide additional information on ground water flow directions, the general extent of ground water contamination, and concentrations of contaminants. Water level measurements and samples have been collected from these wells on an intermittent basis through February 1988. Results have indicated that multiple sources of contamination may exist, both on-site and off-site.

Investigations have continued under the present contract to further define the extent and source(s) of contamination, and to provide information for the development and evaluation of remedial alternatives. Soil pore-gas sampling was conducted in November 1987 to assist in this effort (RMT, 1988b), and to guide the placement of additional monitoring wells. Sixteen (16) additional monitoring wells were installed by RMT on and adjacent to NIROP property between November 1987 and February 1988 (this report). Two (2) large-diameter pumping wells were also installed, one for identifying aquifer characteristics for potential design of a ground water extraction and treatment system (RMT, 1988e), and the other for evaluating the likelihood of off-site contamination sources. Water quality samples were collected and analyzed from monitoring wells and storm sewers.

1.2 Purpose and Scope

The purpose of this report is to summarize well installation and sampling activities conducted at the NIROP between December 1987 and February 1988. This work consisted of the following tasks:

- Installation of 16 monitoring wells and two pumping wells.
- Water level measurements in all 18 newly constructed wells plus all 34 existing wells (52 total).
- Water quality analysis of samples from all 52 wells.
- Water quality analysis of samples from two storm sewer outfalls.
- Five-day, time-series analysis of TCE concentrations in ground water near production well AT-1.
- Bench-scale testing of ground water collected from well AT-2 during a 72-hour pumping test at that location.

Additional ground water monitoring wells were installed to supplement existing information on hydrogeology and to allow better characterization of ground water quality. Ground water quality was analyzed in order to supplement existing information and to better characterize the extent and magnitude of ground water contamination for subsequent remediation. Storm sewer outfalls were sampled to characterize the quality of discharge water originating from the NIROP facility and to evaluate the potential impact on the Mississippi River. The TCE time-series test was conducted to assess the likelihood that a significant off-site source of contamination was impacting the NIROP. Bench-scale tests were conducted to determine whether the chemical characteristics of ground water would result in potential operation or maintenance problems for remediation equipment.

This report is one of three Quality Control Summary Reports (QCSRs) required by the USACE. The other QCSRs describe additional field activities conducted by RMT at the NIROP from November 1987 through February 1988. These other two QCSRs are as follows:

- A-E Quality Control Summary Report for the Soil Gas Survey (RMT, 1988b).
- A-E Quality Control Summary Report for Aquifer Tests (RMT, 1988e).

This report includes the following information:

- Summary of field activities and data collection procedures.
- Summary of data analysis procedures and presentation of results.
- Documentation of QA/QC activities.
- Evaluation of the reliability and utility of data for use in preparing addendums to the Remedial Investigation and Feasibility Study reports.

coincident to well installation, testing, and sampling activities. Because this report incorporates information from the DQCRs, DQCRs are included for reference (Appendix A), but are not discussed or further summarized in this report.

2. FINDINGS AND CONCLUSIONS

Data acquired through these investigations are suitable for further use in defining the extent and magnitude of ground water contamination, and in the development and selection of remedial alternatives.

3. RECOMMENDATIONS

If additional monitoring or production wells are planned for the NIROP, careful consideration should be given to the selection of drilling and soil sampling techniques given the fine-grained sandy materials typically encountered at the site, and the drilling restrictions commonly imposed at contamination sites, e.g., restricted use of drill muds, and no air-rotary drilling allowed. Drilling activities should be rescheduled to avoid winter conditions. Drilling delays should be anticipated and incorporated into the overall schedule.

If future investigative work is planned, the Scope of Services should include provisions to familiarize drill crews with drilling specifications, including the A-E Quality Control and Sampling Plan (RMT, 1988a). Pertinent sections of ASTM methods should be reproduced and incorporated into this document for easy reference in the field.

Access agreements should be aggressively pursued early in any investigative program, given the delays experienced with Burlington Northern Railroad in gaining access to their property for well installation.

4. WELL INSTALLATION

4.1 Planned Procedures

Eighteen (18) wells were installed by RMT at the NIROP between December 1987 and February 1988. Well construction details as originally outlined in the A-E QCP (RMT, 1988a) are shown in Table 4-1. Well locations are shown on Figure 4-1. Of the 18 wells, 5 were water table wells (S-suffix), 5 were intermediate-depth piezometers (I-suffix), 5 were deep piezometers (D-suffix), 1 was a bedrock piezometer (PC-suffix), and 2 were production wells (AT-suffix), which also function as monitoring wells.

Well installation procedures included the following activities:

- Setting up a decontamination zone and decontaminating equipment and materials.
- Drilling and well construction.
- Split-spoon soil sampling.
- Plumbness and alignment tests.
- Well development.
- Site restoration.

Detailed procedures for these activities are contained in the A-E QCP (RMT, 1988a) and are incorporated here by reference.

The remainder of this section focuses on changes to planned procedures or items requiring further explanation. These are summarized as follows:

- Well 22-S could not be installed off-site, upgradient of well AT-1, as originally planned (RMT, 1988a) because of inaccessible terrain on the Burlington Northern Railroad property located immediately east of the NIROP, and the inability to obtain access permission from the BNR. Instead, this well was installed on-site, upgradient of well AT-1, as shown on Figure 4-1.

TABLE 4-1
CONSTRUCTION DATA FOR PLANNED MONITORING WELLS

Conceptual Workplan Well Identifier	Proposed Well Identifier*	Estimated Depth (ft)	Depth to Bedrock (ft)	Screen Length (ft)	Riser Length (ft)	Nominal Well Diameter (in)	Depth Interval Requiring 5-Foot Samples	Filter Pack (ft)	Cement Bentonite Grout (ft)
E	21-S	35	--	15	20	2	0	17	10
I	22-S	35	--	15	20	2	0	17	10
J	23-S	35	--	15	20	2	0-35	17	10
M	24-S	35	--	15	20	2	0	17	10
O	25-S	35	--	15	20	2	0	17	10
C	1-I	75	--	10	65	2	0	12	55
F	2-I	75	--	10	65	2	0-75	12	55
K	3-I	75	--	10	65	2	0	12	55
N	4-I	75	--	10	65	2	0	12	55
G	5-I	60	--	10	50	2	0	12	48
Subtotal		535		125	410		110	145	318
B	10-D	130	130	10	120	3	0-130	12	110
D	11-D	130	130	10	120	3	35-130	12	110
L	12-D	130	130	10	120	3	3-130	12	110
P	13-D	130	130	10	120	3	0-130	12	110
H	14-D	100	100	10	90	3	30-100	12	80
Subtotal		620		50	570		525	60	520
A	5-PC	200	130	**	180	4	200' = 12" hole w/8" casing to br; 4" casing to P.C., 20' open hole; cont. core from top of rock; 5' sample intervals in overburden.		

* S = water table
I = intermediate depth
D = deep
PC = bedrock

** open hole

- Water rotary drilling with SW casing (RMT, 1988a) was not used by the drilling subcontractor for the following reasons:

  - The drilling subcontractor concluded that this technique could not be used with two-inch (nominal) diameter well casing without the use of drill muds, given the required volume of fluid and circulation rate.

  - SW casing brought to the site for use in constructing three-inch (nominal) diameter wells was unusable because the inner drill bit attached to the wireline could not be coupled to the outer portion of the drill bit and casing.

  Two alternate drilling techniques (in addition to mud-rotary at well PC-5) were used instead: hollow-stem auger and cable-tool.

- Water table well and piezometer construction details were altered with respect to the amount and location of grout, bentonite, and silica-sand backfill materials (RMT, 1988a). These changes, which were approved by the USACE, were made primarily to ensure that fine clay particles from the bentonite seal would not be washed into the filter-pack material during well development or purging operations. Two additional feet of silica-sand were placed above the sand filter pack for water table wells, for a total of four (4) feet of sand above the well screen (Appendix B). A two-foot bentonite seal was placed above the silica-sand, and the annular space above this point to the base of the cement pad was grouted with a cement/bentonite grout mixture. Similarly for piezometers, two additional feet of silica-sand was placed between the top of the sand filter-pack material and the bentonite seal, for a total of four feet of sand above the well screen.

- Procedures for collecting soil samples from the borehole (RMT, 1988a) were modified and approved by the USACE. Soil samples were collected with two- and three-inch split-spoon samplers using a 300-lb. hammer. Strict adherence to the ASTM method was not necessary, since blow counts were not required.

- Well AT-2 was installed to a depth of 65 feet rather than 85 feet as originally planned (RMT, 1988a) because a thick clay lens was encountered.

- Atterberg limits were not determined for soil samples submitted for grain-size analysis and moisture testing. All 21 soil samples submitted for testing were visually determined to be nonplastic or noncohesive and, therefore, did not require determination of Atterberg limits.

4.2 Quality Control Activities

The following quality control activities were conducted during drilling and well construction:

- USACE specifications and the A-E QCP (RMT, 1988a) were frequently consulted during field operations to ensure that proper procedures were being followed.

- All phases of drilling and well construction were supervised by RMT or a Layne-Northwest geologist. A Layne-Northwest geologist was on-site for a several week period in late January to early February, when additional assistance was required to supervise three drill rigs. RMT checked the field notes prepared by the supervising Layne-Northwest geologist during this period for completeness and accuracy.

- Newly constructed wells were checked for plumbness and alignment in accordance with USACE specifications.

- A sample of the water supply used in drilling was collected by RMT and shipped to the USACE-MRD laboratory for analysis of VOCs. The sample was collected from a NIROP fire hydrant that served as the source of drilling water. A trip blank was included with the field sample sent to the MRD laboratory. Analysis results showed a TCE concentration of 9.4 parts per billion in the water supply sample. This result was reported immediately to the USACE project manager for public health reasons, but was not considered significant in relation to the current field work.

- During well development, discharge water temperature, pH, and specific conductance were periodically measured until a minimum of four successive readings varied less than ten percent. At the conclusion of well development, a water sample was collected, turbidity was visually evaluated, and the sample clarity was photographed.

4.3 Implementation Problems and Corrective Actions

Problem	Corrective Action
The drilling subcontractor (Layne-Northwest) was not able to mobilize and begin work at the site until December 1, 1987. The target date was November 9. This extended drilling activities into winter and contributed to the extended drilling period, which lasted through mid-	No corrective action was possible.

Problem	Corrective Action
February 1988. This delay also affected the schedule for other field activities, including sampling and pumping tests.	
Winter conditions (freezing temperatures) began affecting mechanical parts on the cable-tool drilling rig as early as December 2, 1987, the second day of drilling. Cold winter conditions worsened thereafter, and affected the operation of mechanical, hydraulic, air, and water systems, resulting in significant drilling delays.	Propane torches were used extensively throughout the winter to periodically thaw these systems in order to continue drilling.
Heaving sands were encountered early and frequently in the drilling program, significantly impacting drilling and split-spoon sampling operations. The drilling subcontractor was not always able to supply the proper accessories for drilling and sampling. SW casing, originally specified for use with water rotary drilling, was not available for use on the project.	Different drilling techniques were used with the hollow-stem auger in attempting to control the heaving sands during drilling and to allow split-spoon sampling. None were entirely successful, and a cable-tool drill rig was ultimately used where heaving sands were encountered. Two- and three-inch split-spoon samplers with various accessories were used to attempt recovery of fine-grained material. Only partial recovery was possible in some instances.
Access to the Burlington Northern Railroad (BNR) property was very difficult to obtain. This hindered early efforts to effectively site the location for wells 22-S and 23-S, originally planned for installation on BNR property, and postponed installation of well 23-S until just before the driller was preparing to demobilize.	Well 22-S was installed on NIROP property prior to gaining access to BNR property because it appeared unlikely that a suitable location on BNR property could be found that would satisfy all the siting requirements for well 22-S, and because this well was required for the TCE time-series test. Access approval was finally obtained in late January, and well 23-S was drilled in February.

Problem	Corrective Action
Excessive bentonite grout was lost to the formation on several occasions during the grouting process, depleting the grout supply, and causing this task to be continued the following day. This added to schedule delays because additional grout had to be ordered and scheduled through the grout vendor.	No corrective action was taken.
An underground steel pipe was encountered approximately 2.5 feet below ground surface while drilling at the AT-2 well location. An initial check for underground utilities at this location did not show the presence of this pipe.	FMC was contacted for another underground utility check, and the borehole location was moved several feet off to one side.
An apparent thick clay lens was encountered while drilling well AT-2 approximately 28 feet below the water table or 41 feet below ground surface at elevation 793.5 feet MSL. This was a significant departure in geology based on the borehole log 6-D located less than 30 feet to the south, where a homogeneous sand aquifer more than 100 feet thick was indicated. The effect of this thick clay lens is to reduce the unconfined aquifer thickness in this region compared to other regions at the NIROP. Hydraulic properties of the aquifer determined by the pumping test at well AT-2 may not be representative of the approximate 100-foot-thick homogeneous sand aquifer to the south.	No corrective action was taken for the following reasons: • The well screen vendor stated that the design yield could be obtained. • The quality of geologic samples obtained while drilling well AT-2 was not high enough to accurately characterize lithology. • Schedule constraints made relocation unrealistic.
Standard, off-the-shelf pipe material was not available to construct the five-foot section of pipe used to conduct the plumbness and alignment test. USACE specifications required that this	The five-foot section of test pipe had to be custom-built, using a combination of one-foot pipe sections, couplings, and steel washers. The steel washers provided the correct outside

Problem	Corrective Action
five-foot section of test pipe have an outside diameter not less than 1/4 inch smaller than the diameter of the well casing. This would allow a maximum tolerance of 1/8 inch.	diameter of the test pipe, and were welded in place at approximately one-foot intervals.
An "internal seam" was encountered in several two-inch I.D. monitoring wells, which prevented the contractor's two-inch submersible pump from being used to develop these wells.	A submersible pump with a slightly smaller outside diameter was obtained for these wells. Since each of these wells passed the plumbness and alignment test, the problem probably resulted because of the excessively close tolerances occasionally encountered when attempting to place a two-inch submersible pump inside the two-inch I.D. pipe.
FMC conducted several flow capacity tests of sanitary sewer laterals in the plant over a period of several weeks. These tests were conducted to determine whether the sewer laterals had sufficient flow capacity to receive the discharge water from pumping tests at AT-1 and AT-2. FMC eventually concluded that the sewers did have marginally sufficient capacity. However, shortly before the pumping test at AT-2 was scheduled to begin, FMC advised RMT that the discharge hose from AT-2 could not be laid directly on the plant floor for routing to the inside manhole; they required that the discharge line be routed overhead through the plant. This would have required considerable labor, time, and additional feet of hose or piping to support the discharge line from existing overhead structures, pipe racks, etc. The delays in receiving authorization from FMC to discharge test water to the plant sewers would also affect planning and scheduling for the TCE time-series test at AT-1.	RMT evaluated alternatives for discharging the test water to other sanitary sewer access points, due to these restrictions imposed by FMC. The alternative recommended by RMT, which was implemented, involved routing the discharge hose from AT-2 to a storm sewer manhole on NIROP property, then into the manhole and through the storm sewer which crossed under East River Road over 600 feet of storm sewer), then exiting the storm sewer on west side of East River Road and continuing on to a sanitary sewer manhole owned by the MWCC.

Problem	Corrective Action
Horizontal survey coordinates could not be obtained for well 23-S because of railroad yard activity east of the NIROP. As a result, this well location could not be accurately plotted on the base map (Figure 4-1).	No corrective action was possible.

4.4 Data Presentation

Eighteen (18) wells were installed by RMT between December 1987 and February 1988. Well construction data for each well are presented in Table 4-2, and well locations are shown on Figure 4-1. Of the 18 wells, 5 were water table wells (S-suffix), 5 were intermediate-depth piezometers (I-suffix), 5 were deep piezometers (D-suffix), 1 was a bedrock piezometer (PC-suffix), and 2 were production wells (AT-suffix) which also function as monitoring wells. Borehole logs and well construction diagrams are contained in Appendix B. Borehole logs were prepared for each monitoring well unless a borehole log was already available for a deeper well at that location, with the exception of wells AT-1 and AT-2.

Table 4-3 summarizes grain-size distributions and natural moisture content of 21 samples analyzed by the RMT Soils Laboratory. Atterberg limits were not determined for these samples because they were visually determined to be nonplastic or noncohesive. Grain-size distribution curves are shown in Appendix C.

These results were further analyzed and incorporated into the RI Addendum Report (RMT, 1988d).

TABLE 4-2
WELL CONSTRUCTION DATA

Well Number	Installation Date	Top of Well Casing Elevation[c]	Top of Screen Elevation	Bottom of Screen Elevation	Well Depth[a]
21-S	12-16-87	837.67	815.6	800.6	37.1
22-S	12-11-87	837.76	816.5	801.5	36.3
23-S	2-15-88	847.11	819.1	804.1	45.5
24-S	12-18-87	836.33	814.6	799.6	36.7
25-S	12-21-87	835.31	813.3	798.3	37.0
1-I	1-15-88	835.28	767.0	757.0	78.3
2-I	1-28-88	838.05	770.6	760.6	77.5
3-I	12-10-87	837.38	770.0	760.0	77.4
4-I	12-22-87	833.46	766.6	756.6	76.9
5-I	12-17-87	838.02	785.2	775.2	62.8
10-D	2-2-88	834.77	741.1	731.1	103.7
11-D	2-10-88	837.52	714.6	704.6	132.9
12-D	1-22-88	837.79	714.9	704.9	132.9
13-D	2-8-88	835.77	743.3	733.3	102.5
14-D	1-20-88	837.92	753.3	745.3	99.6
5-PC	1-14-88	834.49	669.2[b]	641.7[b]	192.8
AT-1	12-10-87	838.53	793.3	773.3	67.2
AT-2	12-30-87	836.45	798.5	769.5	88.0

[a] From top of casing.
[b] Open hole.
[c] Elevations are tied to the previously existing well network (wells 1-D, 2-S, 3-S, 3-D, 6-S) with the exception of well 23-S. Well 23-S elevation was tied to a City of Fridley benchmark. All elevations are relative to MSL.

TABLE 4-3
SUMMARY OF SOIL PHYSICAL ANALYSES

Borehole Location	Sample No.	Depth Below Ground (ft)	% Gravel	% Sand	% Silt	% Clay	Percent Natural Moisture
2-I	S-8	35 - 36.5	0	90	9	1	23.6
2-I	S-10	45 - 46.5	0	70	23	8	21.0
2-I	S-15	70 - 71.5	0	95	3	2	17.1
10-D	S-3	10 - 11.5	2	80	11	7	19.5
10-D	S-11	50 - 51.5	7	81	11	1	16.7
10-D	S-20	95 - 96.5	4	87	5	4	21.4
11-D	S-8	35 - 36.5	0	97	2	1	18.7
11-D	S-17	80 - 81.5	7	92	0	1	14.9
11-D	S-25	120 - 121.5	0	96	2	1	16.2
12-D	S-4	20 - 21.5	1	93	3	3	8.9
12-D	S-13	65 - 66.5	14	83	2	1	11.3
12-D	S-25	125 - 126.5	32	67	1	1	14.4
13-D	S-4	15 - 16.5	6	93	0	1	21.9
13-D	S-9	40 - 41.5	0	3	74	23	20.3
13-D	S-20	95 - 96.5	30	67	2	1	10.2
14-D	S-2	35 - 36.5	0	95	3	2	20.9
14-D	S-4	45 - 46.5	0	78	9	13	16.5
14-D	S-12	85 - 86.5	0	98	2	1	17.7
23-S	S-6	10 - 11	1	96	0	2	4.2
23-S	S-9	20 - 21	6	91	2	1	11.8
23-S	S-13	30 - 31	0	99	0	1	15.1

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5. GROUND WATER LEVELS

5.1 Planned Procedures

A detailed procedure for measuring ground water levels is contained in the A-E QCP (RMT, 1988a), and is incorporated here by reference. There were no deviations from the planned procedure.

5.2 Quality Control Activities

Foot markers for the first 100 feet of water-level-measurement-device cable were checked for accuracy against a steel tape prior to measuring water levels.

A single measurement device was used to measure water levels, thereby avoiding potential discrepancies with the use of multiple measurement devices.

5.3 Implementation Problems and Corrective Actions

Problem	Corrective Action
Total depth of PC-5 could not be measured with the water-level indicator or plopper tape, a measurement typically attempted whenever water levels are measured. Some type of obstruction (e.g., piece of fractured bedrock wedged in bedrock borehole) may be preventing the probe from reaching to the bottom.	No corrective action was taken. Total depth of the well was accurately determined and recorded during well construction by the supervising geologist.

5.4 Data Presentation

Ground water elevations are listed in Table 5-1 for 52 wells, including production wells FMC-33, AT-1, and AT-2. All water level measurements were taken on February 19, 1988, except for well FMC-33 which was measured the previous day.

These results were further analyzed and incorporated into the RI Addendum Report (RMT, 1988d).

TABLE 5-1
GROUND WATER ELEVATIONS
(February 19, 1988)

Well No.	Top of Well Casing Elevation (ft MSL)	Depth to Water (ft)	Water Elevation (ft MSL)
1-S	837.14	24.08	813.06
1-I	835.28	21.94	813.34
1-D	836.75	23.40	813.35
1-PC	837.63	23.58	814.05
2-S	836.07	23.05	813.02
2-I	838.05	25.07	812.98
2-D	836.04	22.96	813.08
2-PC	838.05	24.53	813.52
3-S	836.75	23.81	812.94
3-I	837.38	24.36	813.02
3-D	837.48	24.69	812.79
3-PC	839.21	25.47	813.74
4-S	837.45	24.35	813.10
4-I	833.46	27.81	805.65
4-D	834.79	29.09	805.70
4-PC	834.75	21.56	813.19
5-S	835.06	22.72	812.34
5-I	838.02	25.23	812.79
5-D	836.00	22.94	813.06
5-PC	834.49	21.08	813.41
6-S	835.73	23.49	812.24
6-D	835.69	28.94	806.75
7-S	835.97	22.93	813.04
7-D	835.63	32.11	803.52
8-S	835.76	22.77	812.99
8-D	834.02	28.38	805.64
9-S	836.68	23.66	813.02
9-D	834.30	33.35	800.95
10-S	835.89	23.43	812.46
10-D	834.77	21.39	813.38
11-S	835.89	29.28	806.61
11-D	837.52	24.32	813.20
12-S	838.51	25.52	812.99
12-D	837.79	24.48	813.31
13-S	834.59	21.59	813.00
13-D	835.77	22.57	813.20
14-S	835.99	23.00	812.99
14-D	837.92	25.19	812.73
15-S	834.83	21.74	813.09
16-S	837.26	24.21	813.05
17-S	835.75	26.92	808.83
18-S	834.08	28.56	805.52
19-S	834.56	33.19	801.37

TABLE 5-1 (CONT'D)
GROUND WATER ELEVATIONS
(February 19, 1988)

Well No.	Top of Well Casing Elevation (ft MSL)	Depth to Water (ft)	Water Elevation (ft MSL)
20-S	837.62	24.91	812.71
21-S	837.67	24.43	813.24
22-S	837.76	29.80	812.96
23-S	847.11	33.84	813.27
24-S	836.33	24.12	812.21
25-S	835.31	22.42	812.89
FMC-33	837.05	24.52*	837.05*
AT-1	838.53	25.70	812.83
AT-2	836.45	24.22	812.23

*Measured February 18, 1988.

6. WATER QUALITY

6.1 Planned Procedures

Four different types of water samples were collected according to planned procedures during January and February 1988. These are summarized as follows:

- All 52 monitoring wells, including production wells FMC-33, AT-1, and AT-2, were sampled and analyzed for VOCs and metals (Table 6-1) to supplement existing data and to better characterize the extent and magnitude of ground water contamination for subsequent remediation. Field and QC samples were analyzed by the USACE-WES laboratory. QA samples were analyzed by the USACE-MRD lab.

- Two storm sewer samples were collected and analyzed to characterize the quality of discharge water originating from the NIROP facility and to evaluate the potential impact on the Mississippi River. These samples were included with monitoring well samples and were analyzed for the same list of constituents (Table 6-1). Samples were analyzed by the USACE-WES laboratory.

- Samples collected during the five-day TCE time-series test were analyzed for TCE to assess the likelihood that a significant off-site source of contamination was impacting the NIROP. Samples were analyzed by RMT Laboratories, Inc.

- Samples collected from well AT-2 for bench-scale testing were analyzed to determine whether the chemical characteristics of ground water would result in potential operation or maintenance problems for remediation equipment. Samples were analyzed by RMT Laboratories, Inc.

Common elements of water quality sampling and analysis included the following:

- Well purging (for ground water wells).
- In-field measurements of temperature, pH, and specific conductance.
- Sample collection.
- Sample filtration.
- Sample container, preservative, and holding-time criteria.
- Documentation and chain-of-custody procedures.
- Sample shipment.
- Sample analysis.

TABLE 6-1
CHEMICAL PARAMETERS ANALYZED[c] IN GROUND WATER SAMPLES

Volatile Organic Compounds[a]	Metals[b] (Dissolved)
Vinyl Chloride	Barium
Methylene Chloride	Selenium
Trichlorofluoromethane	Manganese
1,1 Dichloroethylene	Zinc
1,1 Dichloroethane	
Cis- and Trans- 1,2 dichloroethylene	
Chloroform	
1,1,1 Trichloroethane	
Trichloroethylene	
Benzene	
Tetrachloroethylene	
Toluene	
Ethylbenzene	
Xylene	

[a]VOCs selected for analyses were based on the list of VOCs detected to date as reported in the June 1987 RI Report (RMT, 1987). Parameters recommended for analysis in the report also included xylene due to its detection in pits/trenches, and vinyl chloride which was added to the list because it is a breakdown product of TCE.

[b]Metals selected for analyses were based on Table 7-2 of the June 1987 RI Report (RMT, 1987). Parameters selected are those metals that exhibited a determinable off-site health risk. Selenium was added due to its detection at well 9-S at a concentration exceeding its Maximum Contaminant Level.

[c]Analysis methods followed USEPA SW-846 methods, 3rd edition, November 1986.

Detailed procedures for these activities are contained in the A-E QCP (RMT, 1988a) and are incorporated here by reference. A-E QCP procedures for conducting bench-scale tests on water samples collected from well AT-2 (RMT, 1988a) were followed. A summary of the bench-scale tests is contained in Appendix D.

6.2 Quality Control Activities

6.2.1 Field Measurements

Battery checks and field calibrations were performed daily on each instrument while in use in accordance with the A-E QCP (RMT, 1988a). pH Meters were checked several times each day with fresh buffer solutions. Calibration data were recorded in field log books.

6.2.2 Laboratory Data

Samples from 52 monitoring wells and two storm sewers were sampled and shipped to the USACE-WES laboratory for analysis. In addition, trip blanks, field blanks, and field duplicates were submitted to the USACE-WES laboratory for quality control purposes, and to the USACE-MRD laboratory for quality assurance checks (RMT, 1988a). Subsequent discussions focus on USACE and RMT quality control activities, since quality assurance reports from the MRD lab are not available.

Laboratory reports received from the WES laboratory were first checked against sample collection and shipping records to confirm that results were received for each sample that was shipped. Test results were also compared to the parameter list originally requested for analysis to check for completeness.

Trip Blanks

Thirteen (13) trip blanks were submitted to the WES laboratory and were analyzed along with the field samples. A trip blank was generated by adding deionized water to an empty sample container in the laboratory and transporting the sealed container with the other sample bottles to the field and back to the laboratory for analysis. Results for the 13 trip blanks are shown in Table 6-2. Results were below the analytical detection limit for all constituents, except for five trip blanks that contained traces of methylene chloride. Methylene chloride is used during bottle preparation. Detection of this constituent in a trip blank indicates laboratory contamination. Therefore, any trace amounts of methylene chloride detected in field samples or field blanks can be assumed to originate in the laboratory and not in the ground water.

Field Blanks

Five (5) field blanks were collected along with the field samples. However, as explained in Section 6.3, results were received for only three of the five samples. Field blanks consist of sampler rinsate and are intended to demonstrate the effectiveness of sampler decontamination between sample collections. Table 6-3 summarizes results for the three field blanks, and shows that only methylene chloride was detected in two of the three samples. Since methylene chloride was detected in 5 of the 13 trip blanks as well, the source of this contaminant can be assumed to originate from the laboratory and not from the ground water. Decontamination procedures were, therefore, effective.

TABLE 6-2
ANALYSIS OF TRIP BLANKS[a] FROM THE JANUARY-FEBRUARY 1988 SAMPLING ROUND

Constituent	TRIP BLANK NO. 1	2	3	4	5	6	7	8	9	10	11	12	13
Benzene	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Chloroform	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
1,1-Dichloroethane	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
1,1-Dichloroethylene	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Cis-1,2-Dichloroethylene	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Trans-1,2-Dichloroethylene	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Ethylbenzene	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Methylene Chloride	< 0.005	< 0.005	< 0.005	0.016	< 0.005	0.067	< 0.006	0.021	0.007	0.081	< 0.005	< 0.005	< 0.005
Tetrachloroethylene	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Toluene	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Trichloroethylene	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
1,1,1-Trichloroethane	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Trichlorofluoromethane	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Vinyl Chloride	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Xylene (Total)	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005

[a] VOCs only. Sample was generated by adding deionized water to an empty sample container in the laboratory, and transporting the sealed container to the field and back to the laboratory for analysis. Results are in mg/l.

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TABLE 6-3
ANALYSIS OF FIELD BLANKS[a,c] FROM THE
JANUARY - FEBRUARY 1988 SAMPLING ROUND

Constituent	Field Blank No. 3	Field Blank No. 4	Field Blank No. 5
Barium[b]	< 0.005	< 0.010	< 0.010
Manganese[b]	< 0.030	< 0.030	< 0.030
Selenium[b]	< 0.005	< 0.005	< 0.005
Zinc[b]	< 0.030	< 0.030	< 0.030
Benzene	< 0.005	< 0.005	< 0.005
Chloroform	< 0.005	< 0.005	< 0.005
1,1-Dichloroethane	< 0.005	< 0.005	< 0.005
1,1-Dichloroethylene	< 0.005	< 0.005	< 0.005
Cis,1,2-Dichloroethylene	< 0.005	< 0.005	< 0.005
Trans-1,2,Dichloroethylene	< 0.005	< 0.005	< 0.005
Ethylbenzene	< 0.005	< 0.005	< 0.005
Methylene Chloride	< 0.005	0.035	< 0.005
Tetrachloroethylene	< 0.005	< 0.005	< 0.005
Toluene	< 0.005	< 0.005	< 0.005
Trichloroethylene	< 0.005	< 0.005	< 0.005
1,1,1-Trichloroethane	< 0.005	< 0.005	< 0.005
Vinyl Chloride	< 0.010	< 0.010	< 0.010
Xylene (Total)	< 0.005	< 0.005	< 0.005

[a] Sampler rinsate. Results are in mg/l.

[b] Metals are dissolved, not total.

[c] Data for field blanks No. 1 and No. 2 are not available as explained in Section 6.3.

Duplicate Samples

Five (5) duplicate monitoring well samples were collected and submitted for analysis. Analysis results were then used to measure laboratory precision, which is a measure of the variability in repeated measurements of the same sample compared to the average value. Results are shown in Table 6-4. Where possible, results are compared to the historical precision range as determined by USEPA for SW-846 methods (USEPA, 1987a). Table 6-4 lists historical precision ranges of five (5) constituents. In general, laboratory precision was within the historic precision range determined by USEPA. The upper precision range for TCE (33.7 percent) was slightly outside of the historical limit of 28 percent, but this is not considered significant. All mean precision data are within the historic precision range.

Surrogate-Spiked Samples

Laboratory accuracy was evaluated by analyzing percent recovery data supplied by the WES laboratory for surrogate-spiked samples (Table 6-5). Laboratory accuracy measures the average or systematic error of an analytical method. A surrogate-spiked sample were created by adding known quantities of several organic compounds to the sample. Seventy-five (75) field and QC samples were analyzed for three (3) surrogate parameters (Table 6-5). Mean accuracies were very high, with results close to 100 percent recovery. Minimum and maximum values for all three (3) surrogates analyzed were outside of USEPA guidance levels established for these constituents, based on SW-846 and Contract Laboratory Program methods (USEPA, 1987b; USEPA, 1987a). Given the high degree of accuracy for mean values, however, laboratory accuracy is considered acceptable.

TABLE 6-4
LABORATORY PRECISION[a] BASED ON
DUPLICATE SAMPLES FROM THE JANUARY - FEBRUARY 1988
SAMPLING ROUND

Constituent	No. of Precision Pairs[c]	Range[b] of Precision (% RSD)	Mean (% RSD)	Historical Precision (% RSD)
Barium	5	1.1-6.7	3.5	--
Manganese	5	0-5.7	1.7	--
Selenium	1	1.8	1.8	--
Zinc	5	0-18.6	4.3	--
Benzene	--	--	--	--
Chloroform	--	--	--	--
1,1-Dichloroethane	1	28.3	28.3	9-28
1,1-Dichloroethylene	--	--	--	--
Cis-1,2-Dichloroethylene	2	4.0-13.7	8.9	9-28
Trans-1,2-Dichloroethylene	--	--	--	--
Ethylbenzene	--	--	--	--
Methylene Chloride	--	--	--	--
Tetrachloroethylene	1	0	0	9-28
Toluene	--	--	--	--
Trichloroethylene	3	8.6-33.7	21.4	9-28
1,1,1-Trichloroethane	1	14.0	14.0	9-28
Trichlorofluoromethane	--	--	--	--
Vinyl Chloride	--	--	--	--
Xylene (total)	--	--	--	--

[a] Precision (laboratory) is a measure of the variability in reported measurements of the same sample compared to the average value, and is reported as percent Relative Standard Deviation (percent RSD). The lower the percent RSD, the more precise the data (USEPA, 1987a, p. F-2).

[b] For Level III analytical levels based on SW-846 methods (USEPA, 1987a, p. F-7).

[c] Indicates the number of duplicate pairs collected in the field for which quantifiable concentrations of the indicated constituents were detected in both samples.

TABLE 6-5
ACCURACY[a] OF SURROGATE-SPIKED SAMPLES FROM THE
JANUARY - FEBRUARY 1988 SAMPLING ROUND

Constituent	No. of Samples[b]	Range of Accuracy (% Recovery)	Mean Accuracy (% Recovery)	USEPA CLP Accuracy Acceptance Range Criteria[c] (% Recovery)	USEPA SW-846 Historic Accuracy[d] (% Recovery)
4-Bromofluorobenzene	75	86 - 116	97.3	86 - 115	95 - 107
1,2-Dichloroethane-D4	75	76 - 116	97.7	76 - 114	95 - 107
Toluene-D8	75	82 - 116	100.0	88 - 110	95 - 107

a Accuracy (laboratory) measures the average or systematic error of an analytical method. Accuracy is measured as percent recovery. The closer the value is to 100 percent, the greater the accuracy.

b Includes the field and field QC samples.

c USEPA, Contract Laboratory Program - Statements of Work for Organics (USEPA, 1987b, p. 13-37).

d Data Quality Objectives for Remedial Response Activities, SW-846 Method for volatile organic compounds (USEPA, 1987a, p. F-7).

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Sample Splits

Samples from monitoring wells 4-I and 14-D were split with the Minnesota Pollution Control Agency (MPCA), at their request, for quality assurance purposes. Results are shown in Table 6-6 for constituents that were detected by at least one of the laboratories. The MPCA reported concentrations were 1.5 to 2.2 times greater than the WES results when both laboratories reported quantifiable concentrations.

6.3 Implementation Problems and Corrective Actions

Problem	Corrective Action
RMT originally planned to install wells 22-S and 23-S off-site and upgradient of the planned location for pumping well AT-1, collect a ground water sample from each well, and analyze for VOCs (RMT, 1988a). If the results did not indicate an off-site source or were inconclusive, pumping well AT-1 would be installed and a five-day TCE time-series pumping test would be conducted. Instead, RMT was unable to locate well 22-S off-site because of inaccessible terrain on the railroad yard to the east. In addition, the USACE was unable obtain access to BNR property for installation of well 23-S until late January 1988.	To avoid the risk of extending field time and postponing the pumping test scheduled for AT-2, which was planned to occur concurrently with the TCE time-series test at AT-1, RMT proceeded with the drilling schedule independent of the original plan and without benefit of the VOC results for 22-S and 23-S. This decision was made under the assumption that conducting the TCE time-series would prove to be necessary and beneficial.
QC field blank #1 was lost in shipment, and results were not available for this sample.	No corrective action was possible, since this was first discovered after receiving the WES laboratory report on May 6, 1988. Field activities had concluded in mid-February.
QC field blank #2 was inadvertently shipped to the MRD lab for analysis, and analysis results could not be retrieved in time for evaluation of water quality data.	No corrective action was possible.

TABLE 6-6
SPLIT SAMPLE RESULTS[c]

Constituent	WELL 4-I		WELL 14-D	
	USACE-WES[a]	MPCA[b,d]	USACE-WES[a]	MPCA[b,d]
1,1-Dichloroethane	< 0.005	0.003	--	--
1,1-Dichloroethylene	< 0.005	0.0034	--	--
Cis-1,2-dichloroethylene	0.092	0.21	--	--
Tetachloroethylene	< 0.005	0.0029	--	--
Trans-1,2-dichloroethylene	0.22	0.32	--	--
Trichloroethylene	8.1	13.0	< 0.005	0.009

[a] U.S. Army Corps of Engineers - Waterways Experiment Station.

[b] Minnesota Pollution Control Agency.

[c] Results are in mg/l.

[d] MPCA field blank contained 0.0027 mg/l methylene chloride.

Problem	Corrective Action
The initial lab report received from the WES laboratory on May 6, 1988, did not include results for trichlorofluoromethane, which hindered further data analysis until a complete report was received on May 12, 1988.	Following receipt of the initial laboratory report, RMT contacted the WES laboratory and requested a copy of the complete report that included results for trichlorofluoromethane.

6.4 Data Presentation

6.4.1 Monitoring Wells

All 52 monitoring wells shown on Figure 4-1 (including production wells FMC-33, AT-1, and AT-2) were sampled and analyzed for the constituents listed in Table 6-1. Field and QC samples were analyzed by the USACE-WES laboratory. QA samples were analyzed by the USACE-MRD laboratory. Table 6-7 lists sampling dates and summarizes the results of in-field measurements. Laboratory results are summarized in Table 6-8, and original lab reports are contained in Appendix E.

These results were added to the existing water quality database and were further analyzed during preparation of the RI Addendum Report (RMT, 1988d).

6.4.2 Storm Sewer Samples

Samples were collected by RMT from two storm sewers on February 9, 1988, and were analyzed for the parameter list in Table 6-1 by the USACE-WES laboratory. Samples were collected from the discharge outfalls to the Mississippi River at the locations shown on Figure 4-1. Laboratory results are listed in Table 6-8 following the monitoring well results. In-field measurements are included in Table 6-7.

TABLE 6-7
SUMMARY OF SAMPLING DATES AND WATER QUALITY IN-FIELD MEASUREMENTS

Well No.	Sampling Date	pH (S.U.)	Temp. (°C)	SEC @ 25°C (umho/cm)	Color[a]	Turbidity[b]	Odor[b]
1-S	2-07-88	7.1	14	610	None	Yes	Iron
1-I	2-10-88	7.5	9.5	1,050	None	None	None
1-D	2-09-88	7.6	10	710	None	Slight	None
1-PC	2-15-88	7.4	13	740	None	None	Sulfide
2-S	2-07-88	6.9	10	780	None	Extreme	Sour
2-I	2-09-88	7.1	11	1,020	None	Extreme	
2-D	2-09-88	7.3	9	920	None	None	None
2-PC	2-16-88	7.6	14	850	None	None	None
3-S	2-09-88	7.2	10	850	None	Extreme	Slight sulfide
3-I	2-10-88	7.2	9	920	None	Extreme	None
3-D	2-10-88	7.2	11	900	None	None	None
3-PC	2-16-88	7.4	11	900	None	None	None
4-S	1-27-88	7.5	10	480	None	Moderate	None
4-I	1-28-88	7.4	13	990	None	None	None
4-D	2-10-88	7.4	9	920	None	None	None
4-PC	2-16-88	7.5	15	720	None	None	None
5-S	1-26-88	6.9	11	1,150	None	Extreme	None

[a] Based on filtrate.

[b] Based on unfiltered portion.

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TABLE 6-7 (CONT'D)
SUMMARY OF SAMPLING DATES AND WATER QUALITY IN-FIELD MEASUREMENTS

Well No.	Sampling Date	pH (S.U.)	Temp. (°C)	SEC @ 25°C (umho/cm)	Color[a]	Turbidity[b]	Odor[b]
5-I	1-26-88	6.9	11	1,220	None	Extreme	None
5-D	2-09-88	7.4	10	980	None	None	None
5-PC	2-09-88	7.4	9	630	None	None	None
6-S	1-26-88	6.8	12	1,070	None	Moderate	None
6-D	1-27-88	7.3	13	870	None	None	None
7-S	2-10-88	6.9	10	1,040	None	Extreme	Sulfide
7-D	2-16-88	7.5	14	980	None	None	None
8-S	1-28-88	6.9	13	870	None	Extreme	None
8-D	2-17-88	7.5	13.5	860	None	None	Slight sulfur odor
9-S	1-27-88	7.1	13	990	None	Extreme	None
9-D	2-17-88	7.5	13.5	920	None	None	None
10-S	1-25-88	6.9	12	1,010	None	Yes	None
10-D	2-17-88	7.6	13	620	None	Extreme	Fuel oil-like
11-S	1-25-88	7.2	13	870	None	Slight	None
11-D	2-16-88	7.5	14.5	850	None	None	None
12-S	2-10-88	7.5	10	630	None	None	None
12-D	2-18-88	7.4	11	900	None	None	None
13-S	2-08-88	7.3	14	730	None	None	None
13-D	2-10-88	7.5	10	530	None	Slight	None
14-S	2-08-88	7.2	14	730	None	Slight	None

[a] Based on filtrate.
[b] Based on unfiltered portion.

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TABLE 6-7 (CONT'D)
SUMMARY OF SAMPLING DATES AND WATER QUALITY IN-FIELD MEASUREMENTS

Well No.	Sampling Date	pH (S.U.)	Temp. (°C)	SEC @ 25°C (umho/cm)	Color[a]	Turbidity[b]	Odor[b]
14-D	1-28-88	7.4	14	1,040	None	None	None
15-S	2-08-88	7.0	15	960	None	Slight	None
16-S	2-11-88	7.2	10	780	None	None	None
17-S	1-26-88	6.9	12	1,130	None	None	None
18-S	1-26-88	7.2	11	1,150	None	Slight	None
19-S	2-11-88	7.3	8	570	None	Extreme	None
20-S	2-10-88	7.3	9	550	None	Slight	None
21-S	2-10-88	7.1	10	910	None	None	None
22-S	1-25-88	7.1	10	520	None	Extreme	None
23-S	2-17-88	7.5	14	550	None	None	None
24-S	1-25-88	7.2	13	1,240	None	Yes	None
25-S	1-27-88	7.2	12	570	None	Extreme	None
FMC-33	2-18-88	7.0	12.5	870	None	None	Oil-like
AT-1	2-18-88	6.8	14	1,100	None	None	Strong solvent-like
AT-2	2-18-88	7.2	16.5	1,170	None	None	Strong solvent-like
Storm Sewer North	2-19-88	7.8	12	500	None	None	None
Storm Sewer South	2-19-88	7.8	8	400	None	None	None

[a] Based on filtrate.
[b] Based on unfiltered portion.

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TABLE 6-8

CONSTITUENTS ANALYZED JANUARY-FEBRUARY 1988

Date	Parameter	1-S	1-D	1-I	1-PC	2-S	2-D	2-I	2-PC	3-S	3-D	3-I	3-PC	4-S	4-D	4-I	4-PC	5-I	5-PC
Jan-88	1,1,1-Trichloroethane	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.297	< 0.005
Jan-88	1,1-Dichloroethane	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.104	< 0.005
Jan-88	1,1-Dichloroethene	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.014	< 0.005
Jan-88	Barium, Diss.	0.06	0.047	0.256	0.132	0.118	0.087	0.232	0.06	0.142	0.069	0.12	0.05	0.063	0.107	0.15	0.088	0.143	0.09
Jan-88	Benzene	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Jan-88	Chloroform	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Jan-88	Cis-1,2-Dichloroethylene	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.31	< 0.005	0.7	< 0.005	< 0.005	< 0.005	< 0.092	< 0.005	1.41	< 0.005
Jan-88	Ethylbenzene	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Jan-88	Manganese, Diss.	0.754	0.189	0.735	0.056	0.767	0.332	1.52	0.083	0.907	0.041	0.501	0.034	0.009	0.36	0.719	0.078	0.68	0.177
Jan-88	Methylene Chloride	< 0.005	< 0.005	< 0.004	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.1	< 0.005	< 0.005	< 0.005	< 0.005
Jan-88	Selenium, Diss.	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Jan-88	Tetrachloroethene	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.033	< 0.0058	< 0.005	< 0.005	< 0.005	< 0.005	< 0.141	< 0.005
Jan-88	Toluene	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.0057	< 0.005
Jan-88	Total Xylenes	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.026	< 0.005
Jan-88	Trans 1,2-Dichloroethene	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.22	< 0.005	< 0.005	< 0.005
Jan-88	Trichloroethene	< 0.005	< 0.005	< 0.005	< 0.005	0.05	0.031	< 0.005	0.01	0.41	0.008	2.7	0.003	0.077	0.002	0.1	< 0.005	7.1	< 0.005
Jan-88	Trichlorofluoromethane	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Jan-88	Vinyl Chloride	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Jan-88	Zinc, Diss.	0.052	1.62	0.129	1.44	0.03	0.572	0.129	0.063	0.033	0.762	0.097	0.642	0.232	0.703	0.033	2.12	0.189	0.07

< means not detected using detection limit shown; P means present but below detection limit; I means insufficient sample; J means estimated value; B means broken.

TABLE 6-8

CONSTITUENTS ANALYZED JANUARY-FEBRUARY 1988

Date	Parameter	5-S	5-D	6-S	6-D	7-S	7-D	8-S	8-D	9-S	9-D	10-D	10-S	11-D	11-S	12-D	12-S	13-D	13-S
Jan-88	1,1,1-Trichloroethane	< 0.005	0.005	0.005	0.005	0.003	0.005	0.042	0.005	0.05	0.0086	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Jan-88	1,1-Dichloroethane	< 0.005	0.005	0.005	0.005	0.005	0.005	0.009	0.005	0.018	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Jan-88	1,1-Dichloroethene	< 0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.003	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Jan-88	Barium, Diss.	0.072	0.078	0.077	0.075	0.076	0.108	0.184	0.112	0.097	0.084	0.097	0.092	0.051	0.082	0.104	0.08	0.09	0.132
Jan-88	Benzene	< 0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Jan-88	Chloroform	< 0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Jan-88	Cis-1,2-Dichloroethylene	< 0.005	0.005	0.028	0.005	0.005	0.005	0.16	0.037	0.17	0.012	0.005	0.045	0.005	0.011	0.012	0.005	0.005	0.005
Jan-88	Ethylbenzene	< 0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Jan-88	Manganese, Diss.	1.72	0.095	0.934	0.37	2.51	0.112	1.01	0.44	0.013	0.071	0.256	1.00	0.210	0.03	0.138	0.776	0.278	1.73
Jan-88	Methylene Chloride	< 0.005	0.005	0.037	0.005	0.036	0.005	0.005	0.005	0.005	0.005	0.005	0.020	0.005	0.005	0.005	0.043	0.005	0.15
Jan-88	Selenium, Diss.	< 0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.00	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Jan-88	Tetrachloroethene	< 0.005	0.005	0.026	0.005	0.005	0.005	0.031	0.005	0.11	0.005	0.005	0.021	0.005	0.005	0.001	0.005	0.005	0.005
Jan-88	Toluene	< 0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Jan-88	Total Xylenes	< 0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Jan-88	Trans 1,2-Dichloroethene	< 0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.017	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Jan-88	Trichloroethene	< 0.005	0.005	0.32	0.0092	0.066	0.005	6.0	10.0	1.32	0.15	0.005	0.23	0.004	0.035	0.33	0.005	0.005	0.092
Jan-88	Trichlorofluoromethane	< 0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Jan-88	Vinyl Chloride	< 0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Jan-88	Zinc, Diss.	0.497	1.00	0.338	0.357	0.129	0.082	0.032	0.476	0.339	1.00	0.505	0.195	0.282	0.069	0.098	0.708	0.11	1.42

< means not detected using detection limit shown; P means present but below detection limit; I means insufficient sample; J means estimated value; B means broken.

TABLE 6-8

CONSTITUENTS ANALYZED JANUARY-FEBRUARY 1988

Date	Parameter	14-D	14-S	15-S	16-S	17-S	18-S	19-S	20-S	21-S	22-S	23-S	24-S	25-S	AT-1	AT-2	FMC33	STORM SEWER OUTFALL NORTH	STORM SEWER OUTFALL SOUTH
Jan-88	1,1,1-Trichloroethane	< 0.005	< 0.005	0.005 J	0.001	< 0.005	< 0.005	0.005	< 0.005	0.023	0.017 J	0.002	< 0.005	0.005	0.75	< 0.005	< 0.005	< 0.005	< 0.005
Jan-88	1,1-Dichloroethane	< 0.005	< 0.005	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005 J	0.004	< 0.005	< 0.005	< 0.005	< 0.005	0.007	< 0.005	< 0.014	< 0.005	< 0.005
Jan-88	1,1-Dichloroethene	< 0.005	< 0.005	0.005	< 0.005	< 0.005	0.007	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.021	< 0.005	< 0.005	< 0.005	< 0.005
Jan-88	Barium, Diss.	0.101	0.216	0.101	0.076	0.062	0.110	0.038	0.094	0.253	0.123	0.079	0.149	0.092	0.097	0.125	0.102	0.116	0.123
Jan-88	Benzene	< 0.005	< 0.005	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Jan-88	Chloroform	< 0.005	< 0.005	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Jan-88	Cis-1,2-Dichloroethylene	< 0.005	< 0.005	0.005	< 0.005	0.026	2.44	< 0.005	< 0.005 J	0.004	0.049	< 0.005	0.17	< 0.005	1.2	0.0072	0.14	< 0.005	< 0.005
Jan-88	Ethylbenzene	< 0.005	< 0.005	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005 J	0.004	< 0.005	< 0.005	< 0.005	< 0.005
Jan-88	Manganese, Diss.	0.907	0.728	2.33	1.41	0.333	1.12	0.009	0.149	0.907	0.372	0.043	1.74	0.52	1.05	1.01	1.82	0.314	0.127
Jan-88	Methylene Chloride	0.035	< 0.005	0.005 J	0.004	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.026	< 0.005
Jan-88	Selenium, Diss.	< 0.005	< 0.005	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Jan-88	Tetrachloroethene	< 0.005	< 0.005	0.005 J	0.001	0.021	< 0.005	< 0.005	< 0.005	0.030	0.041	< 0.005	< 0.005	< 0.005	0.37	< 0.005	< 0.005	< 0.005	< 0.005
Jan-88	Toluene	< 0.005	< 0.005	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.0074	< 0.005	< 0.005	< 0.005	< 0.005
Jan-88	Total Xylenes	< 0.005	< 0.005	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.063	< 0.005	< 0.005	< 0.005	< 0.005
Jan-88	Trans 1,2-Dichloroethene	< 0.005	< 0.005	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005 J	0.0047	< 0.005	< 0.005
Jan-88	Trichloroethene	< 0.005 J	0.002	0.011	0.16	0.276	12.7	0.0062	< 0.005	0.4	0.4 J	0.004	0.023	< 0.005	11.3	0.6	1.3	< 0.005	< 0.005
Jan-88	Trichlorofluoromethane	< 0.005	< 0.005	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Jan-88	Vinyl Chloride	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Jan-88	Zinc, Diss.	< 0.03	1.58	1.33	2.10	2.01	1.97	1.25	0.022	0.033	< 0.03	0.121	0.033	< 0.03	< 0.03	0.065	0.206	0.052	< 0.03

<means not detected using detection limit shown; P means present but below detection limit; I means insufficient sample; J means estimated value; B means broken.

These results were further analyzed during preparation of the RI Addendum Report (RMT, 1988d).

6.4.3 TCE Time-Series Analysis

The TCE time-series pumping test at well AT-1 began on February 3, 1988, and concluded five days later on February 8. Figure 6-1 shows the approximate location of wells used in the time-series test. Samples were collected from each well at startup, once each day, and again at shutdown for a total of six samples per well. Samples were analyzed for TCE by RMT Laboratories, Inc. Laboratory reports are contained in Appendix F and results are shown on Figure 6-2.

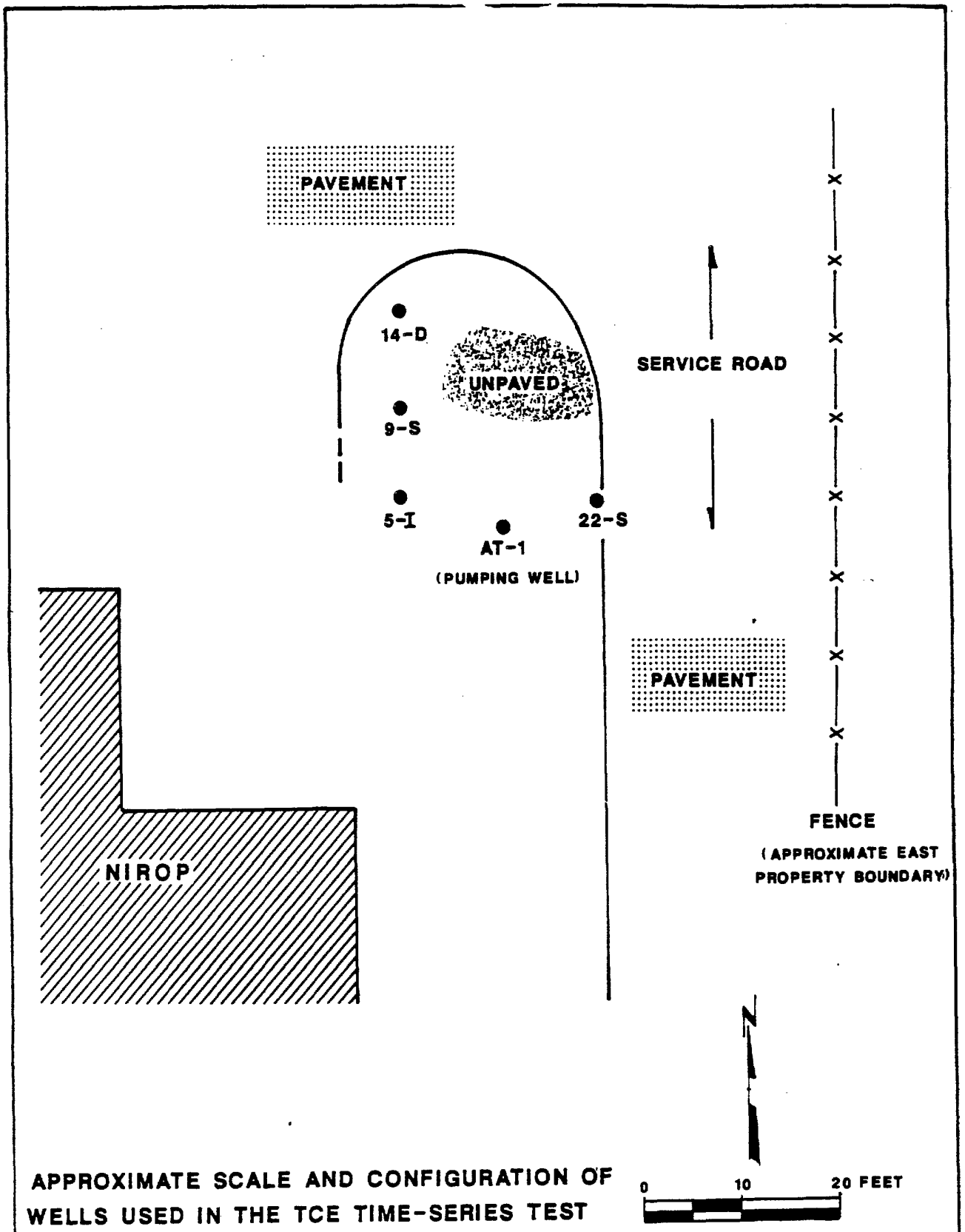
These results were further analyzed during preparation of the RI Addendum Report (RMT, 1988d).

6.4.4 Bench-Scale Testing

On-site, bench-scale tests of ground water were conducted to determine whether the chemical characteristics of the ground water would result in potential operation or maintenance problems if implementation of certain remedial technologies was pursued.

To test the potential for calcium carbonate and iron hydroxide precipitation, five samples of ground water were collected from the discharge of well AT-2 during the aquifer pumping test conducted in February 1988. The samples were analyzed by RMT Laboratories, Inc., for various constituents before and after equilibration with the atmosphere.

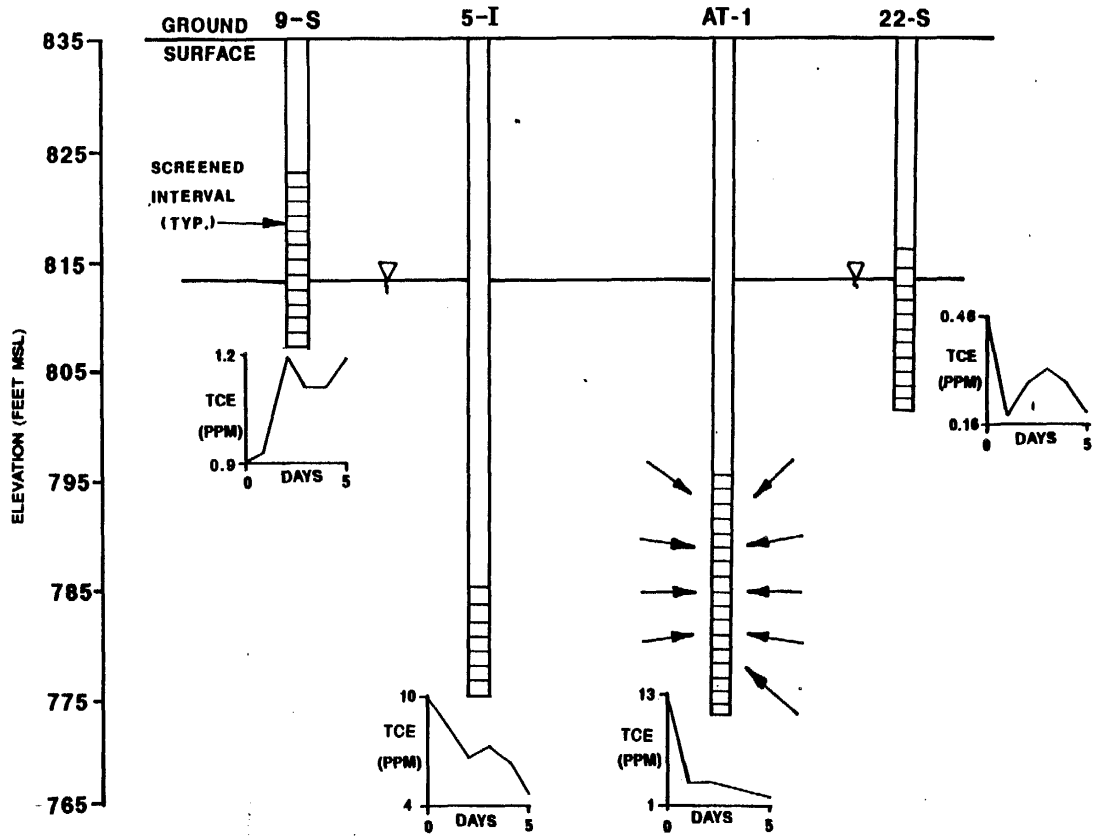
A description of the tests conducted is given in Table 6-9. The results of the bench-scale tests are presented in Table 6-10. Additional information describing the bench-scale tests is included in Appendix D.



APPROXIMATE SCALE AND CONFIGURATION OF WELLS USED IN THE TCE TIME-SERIES TEST

RMT INC	Dwn by	DRB
	Date	10/88
	Proj #	1332.52

FIGURE 6-1



HORIZONTAL SCALE: CONCEPTUAL ONLY

TCE TIME SERIES TEST RESULTS

RMT INC

Dwn. by.:	DRB
Date:	10/88
Proj. #:	1332.52

FIGURE 6-2

TABLE 6-9
DESCRIPTION OF BENCH-SCALE GROUND
WATER TREATABILITY TESTS

Test No.	Test Description
1	Untreated, unfiltered
2	Untreated, filtered
3	Aerated 1 minute, settled 10 minutes, unfiltered supernatant
4	Aerated 1 minute, settled 10 minutes, filtered supernatant
5	Aerated 5 minutes, settled 10 minutes, unfiltered supernatant
6	Aerated 5 minutes, settled 10 minutes, filtered supernatant
7	Aerated 10 minutes, settled 10 minutes, unfiltered supernatant
8	Aerated 10 minutes, settled 10 minutes, filtered supernatant
9	Aerated 10 minutes, settled 60 minutes, unfiltered supernatant
10	Aerated 10 minutes, settled 60 minutes, filtered supernatant

TABLE 6-10
RESULTS OF BENCH-SCALE GROUND
WATER TREATABILITY TESTS

Test No.	1	2	3	4	5	6	7	8	9	10
Aeration time, minutes	0	0	1	1	5	5	10	10	10	10
Post-aeration settling time, minutes	0	0	10	10	10	10	10	10	60	60
Post-settling filtration										
Yes		X		X		X		X		X
No	X		X		X		X		X	
pH - Initial	7.3	-	7.3	-	7.3	-	7.3	-	7.3	-
Post-aeration	-	-	7.8	-	8.3	-	8.4	-	8.4	-
Post-settling, supernatant	-	-	7.8	-	8.3	-	8.5	-	8.3	-
Temperature, °C										
Initial	14	-	14	-	14	-	14	-	14	-
Post-aeration	-	-	11.5	-	11.5	-	12	-	12	-
Post-settling, supernatant	-	-	11.5	-	11.5	-	12	-	12	-
Specific conductance, (umhos/cm @ temp. noted above)										
Initial	100	-	100	-	100	-	100	-	100	-
Post-aeration	-	-	100	-	95	-	95	-	95	-
Post-settling, supernatant	-	-	98	-	98	-	95	-	95	-

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TABLE 6-10 (CONT'D)
RESULTS OF BENCH-SCALE GROUND
WATER TREATABILITY TESTS

Test No.	1	2	3	4	5	6	7	8	9	10
Total suspended solids, mg/l in supernatant after settling	220*	-	590	-	50	-	28	-	130	-
Total alkalinity @ pH 4.5, mg/l as $CaCO_3$, after filtration	-	440	-	420	-	390	-	340	-	340
Calcium, mg/l										
Total - supernatant after settling	220*	-	220	-	220	-	220	-	200	-
Dissolved - supernatant after filtration	-	250	-	240	-	220	-	230	-	230
Iron, mg/l										
Total - supernatant after settling	1.7*	-	1.8	-	1.8	-	1.8	-	1.4	-
Dissolved - supernatant after filtration	-	1.0	-	0.53	-	<0.04	-	<0.04	-	<0.04
Langelier Saturation Index	-	0.78	-	1.24	-	1.67	-	1.74	-	1.74

*Value is for untreated, well-mixed sample without settling.

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7. REFERENCES

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APPENDIX A

A-E DAILY QUALITY CONTROL REPORTS

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: December 1, 1987 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of twentyeight degrees F., cloudy, no precipitaion,winds out of the northwest @ 5-10 mph.

WORK PERFORMED:

Layne-Northwest arrived on site with the following equipment: semi-trailer with miscellaneous supplies and drilling equipment, cable tool rig, flat bed truck with water tank, steam cleaner and welder, hollow stem auger rig, small flat bed truck, and small office trailer. Arranged for Tom Oman of FMC to meet with RMT and Layne to clear underground utilities in the vicinity of well 9-S. Restaked wells 5-I, 14-D, 22-S, and AT-1 based on the utility information supplied by Tom Oman. Talked with Mel Vojvodich of NAVPRO about employee clearances for Layne and agreed to contact him by late morning of changes in Layne personnel in order to obtain the necessary clearances. Talked with Doug Fullen of FMC with regards to the status of the sewer line cleaning, flow checks through the lines to be used during the Aquifer pump test. Arranged for Sam Brown of Layne to meet and talk with Paul VanBrunt of FMC to obtain names of approved cement truck and fuel suppliers. The COE geologist, Tomiann McDaniel arrived on site this afternoon.

SAMPLING PERFORMED:

None

FIELD ANALYSIS PERFORMED:

None

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

None

QUALITY CONTROL ACTIVITIES INITIATED:

None

Site Coordinator Signature: Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: 12-2-87 AUTHOR: Ron Vaughn

WEATHER: Note: Attach Additional Sheets as Necessary

High of twentyfive, F., cloudy, some light snow, winds out of the northwest @ 10-15 mph.

WORK PERFORMED:

Both hollow stem auger and cable-tool drilling rigs were decontaminated. Cable-tool rig was set up at AT-1 and has drilled to 20 feet. Six (6) Layne employees received their 'picture' IDs. I received my 'picture' ID as well. Contacted Paul VanBrunt of FMC to discuss the location for the disposal of the drill cuttings on the "North 40" and the area for draining the water out of the drillers water tanks, additional vehicle passes for the drillers, a source of sand for the areas that develop ice while steam cleaning, and the place to store the drillers steam cleaner at night.

SAMPLING PERFORMED:

Took periodic Hnu readings at the AT-1 location in the drill hole and in the breathing zone of drillers and myself.

FIELD ANALYSIS PERFORMED:

None.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

The high pressure hose on Layne's steam cleaner burst and was repaired with tape. Cable-tool rig had some problems with mechanical pieces freezing. This problem was corrected by using a propane torch to heat parts affected by ice.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature: Ronald H. Vaughn

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: December 3, 1987 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of thirtytwo degrees F., cloudy in the morning and sunny in the afternoon, snow off and on all day with an accumulation of about one inch, winds out of the northwest at about 10 to 15 mph.

WORK PERFORMED:

Background and periodic air monitoring was performed with the HNU. Work zones were delineated and flagged. Site health and safety guidelines to be followed by all staff on site involved in drilling activities were discussed with staff on site and implemented. The hollow stem auger rig mobilized and set up on site 12-D. The Layne-Northwest drilling crew supervisor cleared the onsite underground utilities with FMC. Both hollow stem auger and cable tool rigs began drilling. The cable tool was advanced to a depth of about forty five feet and the hollow stem auger was advanced to a depth of twentyfive feet.

SAMPLING PERFORMED:

Split spoon samples were taken at 12-D at the intervals specified up to twentyfive feet.

FIELD ANALYSIS PERFORMED:

HNU readings for air quality were taken and recorded.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

Drilling activities were interrupted in order to implement the proper level of protection required. Initially the hollow stem auger was to drill at site 13-D but there were FMC employee cars parked in the area of the fence. We were unable to get enough of the cars moved to clear an area large enough for the drill rig and the support truck so we moved to the 12-D site. When we are through at the 12-D site Security Department will barricade the area we need in order to drill 13-D.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature: Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: 12-4-87 AUTHOR: Ron Vaughn

WEATHER: Note: Attach Additional Sheets as Necessary

High of thirty degrees F., cloudy in the morning, sunny in the midafternoon, and cloudy again in the late afternoon. Winds out of northwest at 5-10 mph.

WORK PERFORMED:

Background and periodic air monitoring was performed with the Hnu at both drill sites. Both cable tool and hollow stem auger rigs began drilling. The cable tool rig advanced to a depth of fiftyeight feet and the hollow stem auger was advanced to a depth of thirty feet.

SAMPLING PERFORMED:

Split spoon samples were taken at 12-D at the intervals specified up to a depth of theiry feet. Grab samples were taken at AT-1 at random interval. A total of five samples were taken.

FIELD ANALYSIS PERFORMED:

Hnu readings for air quality were taken and recorded.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

The hollow stem auger rig encountered heaving sand problems at 12-D. Water was addded to create a head within the well in an attempt to force the heaving sand down. This was unsuccessful and consequently we were unable to collect a split spoon sample at the thirty foot interval. The heaving sand also caused the auger plug to get stuck in the hollow stem auger. Additional water was added to the drill hole to free the auger plug. The Layne-Northwest drilling supervisor consulted with his office to come up with a solution to the heaving problem. No solution was decided on today.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature Ronald H. Vaughn

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: December 7, 1987 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of thirtytwo degrees F., cloudy, no precipitaion, winds out of the northwest at 10-15 mph.

WORK PERFORMED:

Background and periodic air monitoring was performed with the HNU. Sam Brown of Layne-Northwest met with the various utilities to clear the offsite underground utilities for the wells to be drilled on Maxwell Graphics and Anoka County Park property. Both cable tool and hollow stem auger crews begin drilling. The cable tool rig advanced to 65 feet.

SAMPLING PERFORMED:

The crew on the cable tool rig collected samples to be used in the determination of the screen slot size for the AT-1 well.

FIELD ANALYSIS PERFORMED:

HNU readings for air quality were taken and recorded.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

In an attempt to alleviate the sand heaving problem encountered at 12-D Layne-Northwest installed a water swivel to the drill head. The stem and small auger broke off inside the hole. Layne was unable to fish it out so the decision was made to move the hole and start again. The hollow stem auger advanced to 35 feet on the second hole and attempted to collect samples with the split spoon. This was unsuccessful because the sand is very fine and saturated and runs out of the split spoon. Layne tried several methods to collect a sample. These methods included the use of a liner in the split spoon. They need to go to a different size split spoon.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature: Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: December 8, 1987 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of thirtyeight degrees F., cloudy, light drizzle in the morning and rain showers in the afternoon with periods of hard rains, winds out the northwest at 10-15 mph.

WORK PERFORMED:

Layne delivered samples taken from AT-1 to Johnson Division for screen size determination. The hollow stem auger crew at 12-D advances hole to a depth of approximately 85 feet. Split spoon samples are taken at intervals of 5 feet. The cable tool rig crew leaves the site to go to LaCrosse to pick up a hydraulic jack needed to extract the pipe out of the ground at AT-1. The 3 inch pipe needed arrived on site today and the drilling crew unloaded it.

SAMPLING PERFORMED:

Background and periodic air monitoring was performed at drill site 12-D. Split spoon samples were collected at 5 foot intervals at 12-D.

FIELD ANALYSIS PERFORMED:

None.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

Split spoon sampling at drill site 12-D continues to be a problem. The recovery at the 40-45 foot depth was 10-15%. In an attempt to gain better recovery a small plastic bag was inserted in the split spoon prior to sampling. This increased the recovery to 35-40% at the 50-55 foot depth. Layne had a 3 inch split spoon sent and by using this split spoon they recieved a recovery of about 50% at the 65 foot depth.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature: Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
HMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: December 9, 1987 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary
High of thirty degrees F., cloudy, no precipitation, winds out of the northwest at about 10-15 mph.

WORK PERFORMED:
The crew on the cable tool rig steam clean the screen and the riser pipe to be used for the construction of well AT-1. They also steam cleaned the hydraulic jack to be used to extract the pipe out of the ground at AT-1. Plastic dropcloths were spread around the AT-1 borehole before placing the hydraulic jack at AT-1. One of the Layne employees leaves the site to go pick up the sand to be used for the sand pack at well AT-1. Construction of well AT-1 begins. The screen is placed at a depth of 43.5-63.5 feet and the place the sand pack. The crew on the hollow stem auger rig advance the hole for 12-D to a depth of 85 feet with split spoon sampling done at 5 foot intervals.

SAMPLING PERFORMED:
Background and periodic air monitoring with the HNU is performed. Split spoon sampling at 5 foot intervals at borehole 12-D is done.

FIELD ANALYSIS PERFORMED:
None.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:
The crew on the hollow stem auger rig had switched to a 3 inch split spoon today but problems were encountered with it. They didn't have proper catchers nor a check valve for it. So they constructed a check valve for it This was unsuccessful and they went back to using the 2 inch split spoon. They were then able to collect samples with it without any problems. At the 85 foot depth the hex shank drive cap on the auger broke due to excessive torque. The drillers attempted to get another one either from their shop or from a local driller. They locate one by the end of the day and also request to switch to SW casing. Both items may possibly be here by Monday.

QUALITY CONTROL ACTIVITIES INITIATED:
None.

Site Coordinator Signature: Catherine Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc, Project No, 1332 Contract No, DACA45-86-C-0015, Mod, No, P00003

DATE: December 10, 1987 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of forty degrees F., sunny to partly cloudy, no precipitation, winds out of the northwest at about 20-35 mph.

WORK PERFORMED:

The crew on the cable tool rig assemble a tremie pipe to be used for grouting and begin constructing well AT-1. They completed constructing AT-1 today and began preparing to move the rig to the AT-2 site.
The SW casing and/or the new swivel (hex shank drive cap) to be used during the drilling of the deep wells has not arrived yet. It is decided to move to site 3-I and begin drilling that well. The hollow stem auger crew pulls back the augers from borehole 12-D and steam cleans the rig and augers and sets up on 3-I. They also steam clean the screen and riser pipe to be used for the construction of well 3-I. RHV established and set up the necessary work zones around the hollow stem auger rig. The hollow stem auger rig crew drills and constructs well 3-I.
The crew for the rotary rig to be used to drill the bedrock well (5-PC) arrived on site this morning. The crew spends approximately 5 1/2 hours repairing the rig. After repairing the rotary rig the crew steam cleans it and moves off site to set up on drill site 5-PC.

SAMPLING PERFORMED:

Background and periodic air monitoring is performed throughout the day with the HNU.

FIELD ANALYSIS PERFORMED:

None.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

None.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature: Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: December 11, 1987 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of forty degrees F., sunny, no precipitation, winds out of the northwest at about 15-20 mph.

WORK PERFORMED:

After completion of well AT-1 the crew form the cable tool rig breaks down and steam cleaned the rig and mobilize to drill site location AT-2. The crew on the hollow stem auger rig steam clean the rig after the completion of well 3-I and mobilized to drill site location 22-S. The crew on the hollow stem auger rig drills and constructs well 22-S.

SAMPLING PERFORMED:

Background and periodic air monitoring is performed throughout the day with the HNU.

FIELD ANALYSIS PERFORMED:

None.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

While drilling the starter hole at location AT-2 the crew came in contact with a steel pipe located approximately 2 1/2 feet below the ground surface. No damage was done to the pipe or the rig. Sam Brown of Layne contacted FMC to provide additional assistance in defining underground utilities in that area. Further checking showed that if we moved approximately 2 feet east of the original staked location there would be no problem.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: December 14, 1987 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of twentytwo degrees F., light snowfall in the afternoon, cloudy, winds out of the north northwest at about 15-25 mph.

WORK PERFORMED:

The hollow stem auger crew steam cleaned their rig and mobilized to drill site 5-I. They begin drilling and advance to a depth of approximately 45 feet. The cable tool rig crew moved their rig approximately 2 1/2 feet east of the original staked location for AT-2. The crew from the cable tool rig steam clean the drive casing and begin. Layne made arrangements with the general contractor, Becklin Bros. to dig a mud pit for them near the drill site for 5-PC. The crew on the mud rotary rig mixed their mud and begin drilling. They advance to a depth of approximately 50 feet.

SAMPLING PERFORMED:

Background and periodic air monitoring was performed throughout the day at all three drill sites with the HNU. Samples were collected at 5-PC.

FIELD ANALYSIS PERFORMED:

None.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

The hollow stem auger crew encountered heaving sands at a depth of approximately 40 feet while drilling 5-I. They added the water swivel to the rig and attempted to create a head to keep the sands down so they could sample with the split spoon. This method was unsuccessful. Tomorrow they are going to try adding the water directly from the hydrant. By using the hydrant directly they would be able to add water at a faster rate than they can from the water tank on the truck.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: December 15, 1987 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of twentysix degrees F., snow all day, cloudy, winds out of the northwest at about 15-25 mph.

WORK PERFORMED:

The appropriate work zones were delineated and set up at drill sites AT-2 and at the offsite well PC-5. The crew on the cable tool rig constructed had to construct a holding vessel for the bailing of the AT-2 borehole.
The hollow stem auger crew hook up the water swivel and drill out the sand that heaved in borehole 5-I overnight. Cleaned out the hole to 45 feet. Had to stop because of the heaving sand problems. Relocated the hollow stem auger rig to 21-S. This borehole was advanced to the final estimated depth of 35 feet. They will construct the well tomorrow.
The crew on the cable tool rig steam cleaned the casing they would be using to drive into the AT-2 borehole. They advanced to a depth of 51 feet by the end of the day.
The mud rotary crew located at 5-PC remixed their mud and advanced their borehole to a depth of 110 feet. Bedrock was determined to be at a depth of 102 feet.
Arrangements were made with Security to rope off the area needed to place the hollow stem auger rig and its support truck on the west end of the parking lot.

SAMPLING PERFORMED:

Background and periodic air monitoring was performed at all three drill sites. Samples were collected during drilling at 5-PC.

FIELD ANALYSIS PERFORMED:

None.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

The heaving sands encountered while trying to take split spoon samples from the intermediate and deep wells with the hollow stem auger continues to be a problem. We encountered this problem at 5-I and it caused a binding problem serious enough to force us to stop. The SW casing Layne wants to switch to here has been held up in Michigan because of the snowstorm. The casing should be able to leave Michigan tomorrow and arrive Thursday afternoon or Friday morning.
The hollow stem auger rig was shut down for about 2 to 2 1/2 hours because they were experiencing fuel problems with the rig and the rig would not stay running. It was determined that they needed to purchase new fuel filters and replace them. Replacing the filters solved the problem.
The mud rotary crew experienced problems with their mud pump which was not

working well. It was determined that the flapper valves needed to be replaced. They were down about 3 to 3 1/2 hours because of this problem.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: 12-16-87 AUTHOR: Ron Vaughn

WEATHER: Note: Attach Additional Sheets as Necessary

High of twentyone degrees F., some snow periodically, cloudy, winds out of the northwest at about 20-30 mph.

WORK PERFORMED:

The appropriate work zone was delineated and set up at drill site 5-I. The cable tool crew went to PC-5 help the mud rotary crew. Mud rotary crew drilled to 110 feet, installed the 8" well casing into PC-5 borehole, and grouted to the surface. Hollow auger crew installed well 21-S, then steam cleaned augers and rig before relocating on drill site 5-I and drilled sand that heaved in 5-I overnight. 5-I was advanced to the final estimated depth of 60 feet. They will construct the well tomorrow.

SAMPLING PERFORMED:

Background and periodic air monitoring was performed at drilling sites PC-5, 21-S, and 5-I. Samples were collected during drilling at PC-5.

FIELD ANALYSIS PERFORMED:

None.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

Todays low tempertures caused many freezing problems. Frozen systems included: hydrualics, air, and water. All frozen systems were thawed by use of large propane torches.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature: Ronald H. Vaughn

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: 12-17-87 AUTHOR: Ron Vaughn

WEATHER: Note: Attach Additional Sheets as Necessary

High of twelve degrees F., partly cloudy, winds out of the northwest at about 5-10 mph.

WORK PERFORMED:

Mud rotary crew cleaned up drill site 5-PC, before leaving for the weekend they came over to drill site 5-I to help set up the grout pump and hoses. A member of the mud rotary crew left the site to pick up an order of filter pack sand. Hollow stem auger crew installed well 5-I. Cable tool crew advanced to a depth of 60 feet.

SAMPLING PERFORMED:

Cable tool crew collected grab samples for grain size determination for AT-2 well screen.

FIELD ANALYSIS PERFORMED:

None.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

Todays low tempertures caused many freezing problems. This slowed todays progress, because many metal items had to be thawed before being conneted.Cable tool crew's sediment pond had over flowed. The crew then started to dump thier bailings into 55 gallon drums and dispose of the drums at the choosen site for the drill cuttings. The local cement company was shut down for the day and cement orders were directed to a different branch therefore the order for 5-I was late to arrive at the plant.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature Ronald H. Vaughn

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: 12-18-87 AUTHOR: Ron Vaughn

WEATHER: Note: Attach Additional Sheets as Necessary
High of twentyeight degrees F., sunny, winds out of the west at about 5-10 mph.

WORK PERFORMED:
Hollow stem auger crew moved off of 5-I and mobilized to 24-S. 24-S was drilled to the estimated depth of 35 feet, the well was installed and grouted to the surface. Cable tool crew welded on casing and advanced to a depth of about 70 feet.

SAMPLING PERFORMED:
Cable tool crew collected grab samples from AT-2 for grain size determination. Background and periodic air monitoring was performed at drilling sites AT-1 and 24-S.

FIELD ANALYSIS PERFORMED:
None.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:
Cement and grout pump often froze up however was easily thawed by use of a propane torch.

QUALITY CONTROL ACTIVITIES INITIATED:
None.

Site Coordinator Signature: Ronald H. Vaughn

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: 12-21-87 AUTHOR: Ron Vaughn

WEATHER: Note: Attach Additional Sheets as Necessary
High of thirtythree degrees F.,sunny, winds out of the northwest at about 5-10 mph.

WORK PERFORMED:
Mud rotary crew advanced to 111 feet, included drilling through the concrete plug and about 1 foot of the St. Peters sandstone. Cable tool crew advanced to a depth of 85 feet.Hollow auger rig was switched to SW casing however SW casing could not be used therefore the rig was changed back to hollow stem augers. Hollow stem auger rig then moblized to 4-I (in the Park) and drilled to depth of 25 feet.

SAMPLING PERFORMED:
Cable tool crew collected grab samples from AT-2 for grain size determination. Background and periodic air monitoring was performed at drilling sites AT-2,5-PC, and 4-I.

FIELD ANALYSIS PERFORMED:
None.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:
Mud rotary rig broke three fan blade belts, will try to locate a place which will sell the belts tonight. When changing hollow stem auger rig over to the SW casing the Lanye personnel noticed the pilot wire line drilling bit was not locking into the casing. A new pilot bit is to be sent up here tommrow. The SW casing rig was changed back to the hollow stem augers and began to drill at 4-I with the augers. Frozen water problems was encountered again today because of the low tempertures. A propane torch was used to thaw the frozen items.

QUALITY CONTROL ACTIVITIES INITIATED:
None.

Site Coordinator Signature: Ronald H. Vaughn

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: 12-22-87 AUTHOR: Ron Vaughn

WEATHER: Note: Attach Additional Sheets as Necessary

High of thirtyfive degrees F., sunny in the AM. and cloudy in the PM., winds out of the northwest at about 5-10 mph.

WORK PERFORMED:

Hollow stem auger crew drilled to the estimated depth of 75 feet at 4-I, then installed the well and grouted to the surface. Hollow stem auger crew deconed at 4-I, then the rig moblized to 25-S and drilled to 35 feet. Mud rotory crew found and bought fan belts for thier rig and installed the belts. The crew then drilled to about 133 feet. Cable tool crew took the grab samples to Johnson's for grain size determination.

SAMPLING PERFORMED:

Samples were collected during drilling at 5-PC. Background and periodic air monitoring was performed at drill sites 5-PC, 4-I, and 25-S.

FIELD ANALYSIS PERFORMED:

None.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

1/2 day of down time at 5-PC due to time spent locating and installing the mud rotory rig's fan belts.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature: Ronald H. Vaughn

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: 12-23-87 AUTHOR: Ron Vaughn

WEATHER: Note: Attach Additional Sheets as Necessary

High of thirtysix degrees F., cloudy, winds out of the northwest at about 5-10 mph.

WORK PERFORMED:

Hollow stem auger crew installed well 25-S and grouted to the surface, then deconed thier rig and tools. Crew then moblized to the office trailers and parked the rig for the weekend. Mud rotory crew advanced to a depth of 163 feet, which is the depth at which the tricone bit is no longer to be used.

SAMPLING PERFORMED:

Samples were collected during drilling at 5-PC. Background and periodic air monitoring was performed at drill sites 25-S and 5-PC.

FIELD ANALYSIS PERFORMED:

None.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

None.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature: Ronald H. Vaughn

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: December 28, 1987 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of thirty degrees F., sunny, no precipitation, winds out of the northwest at approximately 2-5 mph.

WORK PERFORMED:

Background and periodic air monitoring was performed with the HNU at drill sites 5-PC and 14-D.
The crew from the mud rotary rig unloaded the four inch black iron pipe to be set through the St. Peter Sandstone and into the Prairie du Chien Dolomite. The four inch pipe was steam cleaned before installation. The crew from the cable tool rig assisted the mud rotary crew with welding the pipe as it was being installed. One hundred sixty feet of pipe was installed at 5-PC and grouting was done.
The crew from the hollow stem auger rig installed a new valve on their rig for the wire line winch and mobilized to drill site 14-D. The appropriate work zones were delineated and set up around the hollow stem auger rig. They also set up the rig for use with an inner reverse pilot bit. They advanced the boring to a depth of 30 feet by the end of the day.
One Layne employee left the site to pick up the sand to be used for backfilling at well AT-2.

SAMPLING PERFORMED:

None.

FIELD ANALYSIS PERFORMED:

HNU readings for air quality were taken and recorded.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

While using the inner reverse pilot bit on the hollow stem auger rig it was determined that the pilot bit did not match up in length with the augers as it should and that they did not have the correct type of water swivel to be used with the pilot bit. It was decided to drill without the inner bit and to just keep the maximum amount of head of water in the hole while drilling. This was unsuccessful because the auger became plugged after drilling to a depth of 5 feet. A crossbar was used to unplug the auger. A more extensive search of the equipment that was brought on site yeilded an inner pilot bit stem that would work. After it was installed the hollow stem auger rig was able to advance to the depth of 30 feet by the end of the day.
During grouting at 5-PC it was noted that there was a certain amount of the grout being lossed into the formation. They will need to order more cement than they originally intended.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature: Catherine A. Kurzkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: December 29, 1987 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of twentyseven degrees F., cloudy, no precipitation, winds out of the south southeast at approximately 20-25 mph.

WORK PERFORMED:

Background and periodic air monitoring was performed with the HNU at all three drill sites throughout the day.
The crew on the mud rotary rig completed the grouting process at 5-PC and began to clean and pack up to pull off site. One of the crew members from the mud rotary rig left site to pick up the screen for well AT-2.
The hollow stem auger crew advances the borehole at drill site 14-D to a depth of 45 feet by the end of the day.
The cable tool rig crew began to pull back the casing at AT-2 and backfilled the bottom 20 feet of the borehole (65-85 feet). They steam cleaned the screen and some of the pipe to be used for the construction of the well. The crew set the screen and 20 feet of pipe.

SAMPLING PERFORMED:

Soil sampling was done at the specified intervals at drill site 14-D.
A sample of the potable water supply being used during the drilling process was collected. A portion was field filtered for dissolved metals analysis. The sample was preserved, iced and shipped to the MRED-Laboratory by Federal Express overnight service. A trip blank for VOC analysis was also sent.

FIELD ANALYSIS PERFORMED:

HNU readings for air quality were taken and recorded.
Field pH, specific conductance, and temperature of the potable water suppy were taken. Infield observations for odor, color, and turbidity were made and noted if any were present.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

The cable tool rig crew experienced problems with the pump motor on the hydraulic jack system used to pull the casing out of the ground. They installed new washers and got the pump motor running.
The boom truck Layne is using developed a short in the starter. They were able to fix it. Although the solution is only temporary and will need to be taken to a garage to be properly fixed.
The crew on the hollow stem auger rig continues to have problems with heaving sands which is making split spoon sampling extremely difficult. They used a plastic liner in the split spoon but this method was unsuccessful. So they made a flap valve for the split spoon in an attempt to help retain the sand inside the spoon. This method was also unsuccessful. We consulted with the RMT Madison office and were given temporary permission to use a sand pump

bailer. This method was successful and they were able to collect soil samples.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature: Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: December 30, 1987 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of twentytwo degrees F., cloudy in the morning, freezing rain and snow in the afternoon, winds out of the south-southeast at 20-25 mph.

WORK PERFORMED:

The cable tool rig crew continue to pull casing out of the AT-2 borehole. They start to construct the well and complete the construction of well AT-2 by the end of the day.
The mud rotary crew pull off 5-PC, clean up and head home.
The hollow stem auger crew continue to drill at 14-D.

SAMPLING PERFORMED:

None.

FIELD ANALYSIS PERFORMED:

Background and periodic HNU readings were taken for air quality.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

Heaving sands continue to be a problem at 14-D. They drilled to a depth of 47 feet and were ordered to stop drilling and pull off of that borehole by the Layne-Northwestg office.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature: Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: January 4, 1988 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of seventeen degrees F. below zero, partly sunny, no precipitation, winds out of the west at about 20-30 mph.

WORK PERFORMED:

The cable tool rig crew welded a cap onto well AT-2 and finished cleaning up the drill site. The hollow stem auger rig crew mobilized to well 5-PC. They steam cleaned the drill rod needed for the coring at 5-PC. The crew placed the rod in well 5-PC to a depth of 165 feet.

SAMPLING PERFORMED:

None.

FIELD ANALYSIS PERFORMED:

None.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

Due to the extremely cold temperatures the length of time people were able to spend outside was decreased. Additional problems that were encountered due to the cold temperatures and their solutions are as follows: the rigs would not start--vehicles that could be were plugged in, on others the oil pans were heated, batteries charged and then jump started; tools were frozen and they had to use a propane torch to heat them in order to get them to work; the welder would not start so they heated the oil pan and then jump started it; during setting of the rod in 5-PC the threads were frozen from steam cleaning and needed to be heated with a torch; the crisco used for threading compound froze and needed to be heated in order to use it.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: January 11, 1988 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of twentyfive with a low of eighteen degrees F., cloudy, light freezing rain in the afternoon, winds out of the north-northwest at about 5 mph.

WORK PERFORMED:

The cable tool rig crew bailed the residual sand out of well AT-2. They then mobilized to drill site 14-D and began steam cleaning the materials to be used downhole.
The hollow stem auger crew continued to prepare for coring at well 5-PC. After some problems they were able to core to a depth of 5 feet.
The pump and pipe to be used for the development of the wells was steam cleaned. Well 3-I was developed.

SAMPLING PERFORMED:

Samples from well 3-I were collected for pH, conductivity, temperature, and turbidity.

FIELD ANALYSIS PERFORMED:

Field pH, conductivity, and temperature were performed on the water discharged from well 3-I after pumping until there was less than a 10% change in the measured parameters. After the final development of the well a sample was collected in a clear glass jar for the determination of the nephelometric turbidity of the water and for photographic purposes.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

The steam cleaner was not functioning properly and needed to be disassembled and cleaned.
Coring at 5-PC was a problem because water was not passing through the annular space because the adjustable clearance range between the annular space around the drill bit was not adjusted properly.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature: Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: January 12, 1988 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of twentynine degrees with temperatures dropping to minus eight degrees below by early afternoon, blizzard conditions in the morning with a snow accumulation of 5 inches, winds from 35-45 mph out of the north-west all day.

WORK PERFORMED:

The hollow stem auger crew continued coring at well 5-PC. They cored an additional 7 feet.
The cable tool rig crew advanced pipe to a depth of 50 feet.
Well 21-S was developed.

SAMPLING PERFORMED:

Samples from 21-S were collected for pH, conductivity, temperature, and turbidity measurements.

FIELD ANALYSIS PERFORMED:

Field pH, conductivity, and temperature measurements were performed on the water being discharged from well 21-S until these measurements agreed to within 10%. Visual observations of the water being discharged throughout development were also made. After development was complete a sample was collected for the determination of the nephelometric turbidity of the water and for photographic purposes.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

Problems were encountered during the coring operations at well 5-PC. The water ports on the core bit became clogged with a shale-type material. They attempted to pull out the bit with the wireline winch but were unsuccessful so all the pipe had to be pulled out of the hole. They were then able to unclog the core bit.
The bit used during cable tool drilling broke off into borehole 14-D. The crew was successful in "fishing" the bit out of the hole.
Freezing conditions were encountered throughout the day wherever water needed to be used so hoses and tools needed to be thawed with a torch before using.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature: Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: January 13, 1988 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of minus eight degrees and a low of minus twelve degrees F., sunny all day, winds at about 2-5 mph out of the west shifting to a southerly direction in the afternoon at about 10-20 mph.

WORK PERFORMED:

The hollow stem auger crew continued to core at well 5-PC and completed coring by the end of the day.
The cable tool rig crew attempted to develop wells but were unable to get the pump into the wells. So they returned to 14-D to resume drilling at that location. They advanced to a depth of 57 feet.
Individual well response tests were performed on wells 11-S, 10-S, 6-S, and 5-S.

SAMPLING PERFORMED:

Split spoon samples were collected at the specified intervals at borehole 14-D

FIELD ANALYSIS PERFORMED:

Periodic HNU readings were taken and recorded throughout the day.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

In attempting to develop wells it was discovered that in some of the 2-inch wells there is some sort of internal seam in the black iron pipe. Consequently there was not enough clearance for the submersible pump to fit into the 2-inch wells. Layne notified their office to send a smaller diameter pump to the site by overnight delivery.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature: Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: January 14, 1988 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of minus five degrees F., partly cloudy in the morning to sunny in the afternoon, heavy snow flurries in the morning, winds at 15-20 mph out of the north northwest.

WORK PERFORMED:

The hollow stem auger crew pulled out the remaining core and pipe at well 5-PC. They mobilized to borehole 1-I. The appropriate work zones were delineated and set up at 1-I. The crew steam cleaned the augers, screen and black iron riser pipe to be used for 1-I. They constructed the well and began pulling the augers out.
The cable tool rig advanced the borehole at 14-D to a depth of 73 feet. They also checked wells 3-I, 21-S, and 24-S for plumbness and alignment. The crew also steam cleaned the submersible pump to be used for the development of the 2-inch wells and set the pump in well 24-S.
Well 24-S was developed and individual well response tests were performed on wells 6-D, 17-S, and 18-S.

SAMPLING PERFORMED:

Split spoon samples were collected at the specified intervals at borehole 14-D.
Samples were collected from well 24-S for pH, conductivity, temperature, and turbidity measurments.

FIELD ANALYSIS PERFORMED:

Background and periodic HNU readings were taken for air quality throughout the day.
Field pH, conductivity, and temperature measurements were performed on the water being discharged from well 24-S until these measurements agreed to within 10%. Visual observations of the water being discharged throughout development were also made. After development was complete a sample was collected for the determination of the nephelometric turbidity of the water and for photographic purposes.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

The augers became stuck while they were pulling them out of borehole 1-I. Since it was late in the day it was decided to wait till morning to continue to try to get them out.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: January 15, 1988 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary
High of twentyfive degrees F., sunny, no precipitation, winds calm.

WORK PERFORMED:

The hollow stem auger crew complete constructing well 1-I and prepare to move the rig off site.
The cable tool rig crew checked well 4-I for plumbness and alignment. They also steam cleaned the pump and pipe used for well development and set the pump in well 4-I. They continue drilling at 14-D and advance the borehole to a depth of 85 feet by the end of the day.
Individual well response tests were performed on the following wells: 8-S, 5-D, 4-D, 7-D, and 8-D.

SAMPLING PERFORMED:

Split spoon samples were collected at the specified intervals at borehole 14-D.
Samples were collected from well 4-I for pH, conductivity, temperature, and turbidity measurements.

FIELD ANALYSIS PERFORMED:

Background and periodic HNU readings were taken for air quality throughout the day.
Field pH, conductivity, and temperature measurements were performed on the water being discharged from well 4-I until these measurements agreed to within 10%. Visual observations of the water being discharged throughout development were also made. After development was complete a sample was collected for the determination of the nephelometric turbidity of the water and for photographic purposes.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

The hollow stem auger crew successfully freed the augers that were stuck in borehole 1-I.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature: Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: January 18, 1988 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of twentyeight degrees F., partly sunny, no precipitation, winds out of the south at about 5-10 mph.

WORK PERFORMED:

The second cable tool rig (cable tool rig-B) arrived on site today. The crew that had previously operated the hollow stem auger rig will be operating the second cable tool rig. The rig and some of the pipe to be used downhole was steam cleaned. Cable tool rig-B mobilized to drill site 12-D. The appropriate work zones were deliniated and set up. They advanced their hole to a depth of 40 feet by the end of the day.
The first cable tool rig (cable tool rig-A) continued to drill at borehole 14-D. They advanced to a depth of 93 feet by the end of the day.
Individual well response tests were performed on wells 4-PC and 24-S.

SAMPLING PERFORMED:

Split spoon samples were taken at the specified intervals at both drill sites.

FIELD ANALYSIS PERFORMED:

Background and periodic HNU readings were taken and recorded throughout the day.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

None.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature: Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: January 19, 1988 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of twentyeight degrees F., mostly cloudy, heavy snow in the afternoon, winds out of the north-northwest at about 25-30 mph.

WORK PERFORMED:

Cable tool rig-A advanced to a depth of 93 feet and hit sandstone. It was decided to stop and set the well screen at about 90 feet. The crew steam cleaned the screen and riser pipe and begin constructing well 14-D. The crew also checked steam cleaned the pipe and pump used for development and the alignment tool. They checked well 22-S for plumbness and alignment. The pump was set in well 22-S and was developed.
Cable tool rig-B advanced their hole to a depth of 95 feet by the end of day.

SAMPLING PERFORMED:

Split spoon samples were taken at the specified intervals at boreholes 12-D and 14-D.
Samples were collected from well 22-S for pH, conductivity, temperature, and turbidity measurements.

FIELD ANALYSIS PERFORMED:

Background and periodic HNU readings were taken for air quality throughout the day.
Field pH, conductivity, and temperture measurements were performed on the water being discharged from well 22-S until these measurements agreed to within 10%. Visual observations of the water being discharged throughout development were also made. After development was complete a sample was collected for the determination of the nephelometric turbidity of the water and for photographic purposes.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

None.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coodinator Signature: Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: January 20, 1988 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of twentytwo degrees F., snow continuing in the morning, overnight snowfall of about 12 inches, cloudy, winds out of the north-northwest at about 20-25 mph.

WORK PERFORMED:

Cable tool rig-A set the screen and riser pipe at well location 14-D and began grouting. They ran out of cement and a small amount of grout will need to be added tomorrow.
Cable tool rig-B advanced borehole 12-D to a depth of 115 feet by the end of the day.

SAMPLING PERFORMED:

Split spoon samples were collected at the specified intervals at borehole 12-D.

FIELD ANALYSIS PERFORMED:

Background and periodic HNU readings were taken for air quality throughout the day.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

The drillers don't have a compressor to operate the grout pump so they had to find a rental. Due to the freezing temperatures the grout pump kept freezing and periodically had to be thawed with a torch.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: January 21, 1988 AUTHOR: Ron Vaughn

WEATHER: Note: Attach Additional Sheets as Necessary

High of twentyfive degrees F., partly sunny, no precipitation, winds out of the south at about 5-10 mph.

WORK PERFORMED:

Cable tool rig-A completed grouting well 14-D. They mobilized to drill site 2-I and drilled to about 4 feet.They checked wells 5-I and 25-S for plumbness and alignment. The pump was set in wells 5-I and 25-S and were developed. Cable tool rig-B advanced borehole to its estimated depth of 130 feet. they set the screen and well casing into 12-D. They added the filter pack also at 12-D.

SAMPLING PERFORMED:

Split spoon samples were collected at the specified intervals at borehole 12-D and borehole 2-I.
Water samples were collected from wells 5-I and 25-S for pH, conductivity, temperature, and turbidity measurements.

FIELD ANALYSIS PERFORMED:

Background and periodic HNU readings were taken for air quality throughout the day.
Field pH, conductivity, and temperature measurements were performed on the water being discharged from wells 5-I and 25-S until these measurements agreed to within 10%. Visual observations of the water being discharged throughout development were also made. After development was complete samples were collected for the determination of the nephelometric turbidity of the water and for photographic purposes.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

None.

QUALITY CONTROL ACTIVITIES INITIATED:

None

Site Coordinator Signature Ronald H. Vaughn

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: January 22, 1988 AUTHOR: Ron Vaughn

WEATHER: Note: Attach Additional Sheets as Necessary

High of twenty degrees F., partly sunny, light snow most of the day, winds out of the west at about 10-25 mph.

WORK PERFORMED:

Cable tool rig-A drilled to about 12 feet at borehole 2-I. Cable tool rig-B grouted well 12-D and installed the protective casing.

SAMPLING PERFORMED:

Split spoon samples were collected at the specified intervals at borehole 2-I.

FIELD ANALYSIS PERFORMED:

Background and periodic HNU readings were taken for air quality throughout the day. Water well baildowns were performed at wells 15-S, 22-S, and 25-S.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

Cable tool rig-A encountered broken concrete at a depth of about 4-5 feet. The drill rig will be moved a few inches on Monday morning.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature: Ronald H. Vaughn

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: January 25, 1988 AUTHOR: Ron Vaughn

WEATHER: Note: Attach Additional Sheets as Necessary

High of zero degrees F., partly sunny, winds out of the northwest at about 25-30 mph.

WORK PERFORMED:

Cable tool rig-A repositioned their rig over borehole 2-I. They advanced to a depth of 35 feet.
Cable tool rig-B loaded up their rig and mobilized to drill site 10-D. They advanced to a depth of 13 feet.

SAMPLING PERFORMED:

Split spoon samples were collected at the specified intervals at boreholes 10-D and 2-I.
Ground water monitoring was performed at wells 10-S, 11-S, 22-S and 24-S.

FIELD ANALYSIS PERFORMED:

Background and periodic HNU readings were taken for air quality throughout the day.
Field pH, conductivity, and temperature measurements were performed on the water being sampled for ground water monitoring until these measurements agreed to within 10%.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

Due to freezing temperatures most of the engines were difficult to start in the morning also many items of the drillers were freezing and had to be thawed by use a propane torch.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Ronald H. Vaughn

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: January 26, 1988 AUTHOR: Ron Vaughn

WEATHER: Note: Attach Additional Sheets as Necessary

High of five degrees F., partly sunny, winds out of the west at about 10-20 mph.

WORK PERFORMED:

Cable tool rig-A advanced to a depth of 65 feet.
Cable tool rig-B deconed additional materials for borehole 10-D and advanced to a depth of 32 feet.
RMT personnel installed 600 feet of nylon rope down a manhole at FMC and up a manhole in the nearby city park.

SAMPLING PERFORMED:

Split spoon samples were collected at the specified intervals at boreholes 2-I and 10-D.
RMT personnel performed ground water sampling at wells 5-I, 5-S, 6-S, 17-S, and 18-S.

FIELD ANALYSIS PERFORMED:

Background and periodic HNU readings were taken for air quality throughout the day.
Field pH, conductivity, and temperature measurements were performed on the water being sampled for ground water monitoring until these measurements agreed to within 10%.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

Due to freezing temperatures most of the engines were difficult to start in the morning also many items of the drillers were freezing and had to be thawed by use of a propane torch.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Ronald H. Vaughn

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: January 27, 1988 AUTHOR: Ron Vaughn

WEATHER: Note: Attach Additional Sheets as Necessary

High of eight degrees F., partly sunny, winds out of the west northwest at about 5-10 mph.

WORK PERFORMED:

Cable tool rig-A drilled to the estimated depth of 75 feet at borehple 2-I. They set the screen and well pipe down the borehole and added the filter pack. They deconed the pump materials for developement for 14-D. They then set pump and pipe down well 14-D. Cable tool rig-A also pulled developement pump and pipe out of the well.
Cable tool rig-B advanced borehole 10-D to a depth of 65 feet.
RMT personnel performed ground water sampling at wells 4-S, 6-D, 9-S and 25-S.
A baildown test was performed at well 14-D.

SAMPLING PERFORMED:

Split spoon samples were taken at the specified depths at boreholes 2-I and 10-D.
Samples were collected from well 14-D for pH, conductivity, temperature, and turbidity measurements.
Ground water sampling was performed at wells 4-S, 6-D, 9-S, and 25-S.

FIELD ANALYSIS PERFORMED:

Background and periodic HNU readings were taken for air quality throughout the day.
Field pH, conductivity, and temperature measurements were performed on the water being sampled for ground water monitoring and the water being discharged from 14-D until the measurements agreed to within 10%.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

The Layne pump crew was off the FMC property forb about 5.5 hours to pick up a pump rig. The pump crew's flatbed truck is down due to a starter failure.

QUALITY CONTROL ACTIVITIES INITIATED:

Daily notes of the supervising geologist were reviewed for accuracy and completeness.

Site Coordinator Ronald H. Vaughn

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: January 28, 1988 AUTHOR: Ron Vaughn

WEATHER: Note: Attach Additional Sheets as Necessary

High of ten degrees F., partly sunny, winds out of the west at about 5-10 mph.

WORK PERFORMED:

Cable tool rig-A grouted and installed the protective casing for well 2-I. They cleaned up site and prepared the drill rig to mobilize to drill site 13-D tomorrow morning.
Cable tool rig-B advanced to a depth of 96 feet.
Pump crew deconed pump materials for pump installation at AT-1. They installed the pump into well AT-1. Performed electrical work on electrical wires for AT-1 and AT-2 pumps. They installed 550 feet of fire hose down into a manhole on FMC property and out a manhole of a nearby park.

SAMPLING PERFORMED:

Split spoon samples were collected at the specified intervals at borehole 10-D.
RMT personnel performed ground water sampling at wells 4-S, 8-S, and 14-D.
Photographs were taken of Lanye's fire hose before being installed into the storm sewer.

FIELD ANALYSIS PERFORMED:

Background and periodic HNU readings were taken for air quality throughout the day.
Field pH, conductivity, and temperature measurements were performed on the water being sampled for ground water monitoring until these measurements agreed to within 10%.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

The air compressor which Layne rented to grout borehole 2-I did not work resulting in additional down time for cable tool rig-A because the compressor had to be returned. The rental company did not have another compressor. Therefore another rental company had to be located and another compressor rented.
Pump crew's flatbed truck still does not have a working starter therefore the truck must be pulled started resulting in additional down time.

QUALITY CONTROL ACTIVITIES INITIATED:

Daily notes of the supervising geologist were reviewed for accuracy and completeness.

Site Coordinator Signature Ronald H. Vaughn

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: January 29, 1988 AUTHOR: Ron Vaughn

WEATHER: Note: Attach Additional Sheets as Necessary

High of thrity degrees F., sunny, winds out of the southwest at about 2-5 mph.

WORK PERFORMED:

Cable tool rig-A steam cleaned materials for drilling borehole 13-D. They moblized to 13-D and had to shovel about 5 cubic yards of snow to get the rig backed over the drill site. The 'hot zone' was set up around the rig. They drilled to a depth of 12 feet. They loaded their flatbed truck up with materials to be taken to Layne's shop in Wausau, WI.
Cable tool rig-B advanced to a depth of 101 feet at borehole 10-D. At 101 feet they encountered bedrock (sandstone). They placed the deconed screen and pipe down into the borehole. They covered the casing and well pipe for the weekend.
The pump crew installed the pump and pipe for well AT-2. These materials were steam cleaned. A water level gauge was installed at AT-2 also.

SAMPLING PERFORMED:

Split spoon samples were collected at the specified intervals at boreholes 10-D and 13-D.

FIELD ANALYSIS PERFORMED:

Background and periodic HNU readings were taken for air quality throughout the day.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

Continued problem of the Layne flatbed truck with a bad starter motor. The truck developed some overheating problems. The truck is being driven back to Milwaukee, WI. to get repaired over the weekend.

QUALITY CONTROL ACTIVITIES INITIATED:

Daily notes of the supervising geologist were reviewed for accuracy and completeness.

Site Coordinator Signature Ronald H. Vaughn

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: February 1, 1988 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of minus five degrees F., sunny, light snow flurries in the morning, winds out of the northwest at about 10-15 mph.

WORK PERFORMED:

The crew on cable tool rig "A" continued drilling at borehole 13-D and advanced the hole to a depth of 31 feet by the end of the day.
The crew on cable tool rig "B" began pulling the pipe out of borehole 10-D and began constructing the well.
Layne-Northwest's pump crew and hydrologists arrived and began preparing for the pump tests. They installed the totalizers on both "AT" wells, completed wiring AT-1 and put the firehose in place for that well. At well AT-2 they placed a portion of the hose.

SAMPLING PERFORMED:

Split spoon samples were collected at 13-D at the specified intervals.

FIELD ANALYSIS PERFORMED:

Background and periodic HNU readings were taken throughout the day for air quality.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

Due to the cold temperatures it took some time to start the rigs and support trucks. The power steering hose on the support truck for cable tool rig "A" broke and will need to be repaired before proceeding with any work tomorrow.

QUALITY CONTROL ACTIVITIES INITIATED:

The notes and boring logs of both supervising geologists were reviewed to assure that they were accurate and complete.

Site Coordinator Signature Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: February 2, 1988 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of minus ten degrees F., sunny, winds out of the northwest at about 5-10 mph.

WORK PERFORMED:

Cable tool rig "A" continues to drill at borehole 13-D and advanced that hole to a depth of 55 feet. The crew on cable tool rig "B" pulled the pipe out of borehole 10-D and constructed the well at that location. They began cleaning up the site at 10-D and mobilized to site 11-D. The pump crew finished laying hose at AT-2 and completed wiring the pump at that location. Pressure transducers were installed in the following wells:
AT-2, 24-S, 6-D, 11-S, 6-S, 10-S, 5-S, 4-D, 17-S, and 7-D. Protective barricades were set up over all manholes being used for the pump test. Wells AT-1 and AT-2 were developed. A step drawdown analysis was performed on well AT-2 to define its pumping capacity.

SAMPLING PERFORMED:

Split spoon samples were collected at the specified intervals at drill site 13-D.
Samples were collected from wells AT-1 and AT-2 for pH, conductivity, temperature, and turbidity as part of the development process. After development was completed samples were also collected from these wells for VOC analysis.

FIELD ANALYSIS PERFORMED:

Background and periodic HNU readings were taken for air quality throughout the day.
Field pH, conductivity, and temperature measurements were performed on the water discharged (from a sampling valve at well head) from wells AT-1 and AT-2 until these measurements agreed to within 10%. Visual observations of the water during development were also made. After development was complete samples were collected for the determination of the nephelometric turbidity of the water and for photographic purposes.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

During the development of the "AT" wells several severe leaks in the pipes occurred. These were fixed by the use of teflon tape and tightening of the connections. During the pumping of AT-2 we experienced a shutdown due to some sort of blockage in the hose. The hose above ground was inspected and it was found that there were several kinks in the hose.

QUALITY CONTROL ACTIVITIES INITIATED:

Field notes of both supervising geologists were reviewed for completeness and accuracy.

Site Coordinator Signature Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: February 3, 1988 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of minus eight degrees F., sunny, no precipitaion, winds out of the north at about 10-15 mph.

WORK PERFORMED:

The crew on cable tool rig "A" continued to drill at borehole 13-D. They advanced that hole to a depth of 95 feet by the end of the day.
The necessary work zones were delineated and set up at drill site 11-D for cable tool rig "B". The drill casing to be used for drilling at 11-D was steam cleaned. They advanced to a depth of 11 feet.
Preparations continued for the start of the aquifer pump tests. The pump tests started at 10 A.M. today.
The tool used for the alignment checks and the pipe and pump used for well development was steam cleaned before its use. Well 2-I was checked for plumbness and alignment. Welln 2-I was also developed.

SAMPLING PERFORMED:

Split spoon samples were collected at the specified intervals at borehole 13-D.
Samples were collected at well 2-I for pH, conductivity, temperature, and turbidity as part of the development process.
At the start of the pump test at AT-1 samples were collected at wells 9-S, 22-S, 5-I, 14-D, and AT-1 for the TCE time series analysis.

FIELD ANALYSIS PERFORMED:

Background and periodic HNU readings were taken for air quality throughout the day.
Field pH, conductivity, and temperature measurements were performed on the water being discharged from well 2-I until these measurements agreed to within 10%. Visual observations of the water being discharged throughout development were also made. After development was complete a sample was collected from 2-I for the determination of the nephelometric turbidity of the water and for photographic purposes.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

The totalizer and flow meter on AT-1 malfunctioned. The Layne pump crew was able to locate another and replace it.

QUALITY CONTROL ACTIVITIES INITIATED:

As part of the TCE time series analysis a duplicate, a field blank, and a trip blank were collected and sent to the lab.
The field notes of both supervising geologists were reviewed for completeness and accuracy.

Site Coordinator Signature Catherine A. Kuratkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: February 4, 1988 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of minus five degrees F., snow in the morning with an accumulation of approximately one inch, partly cloudy to sunny in the afternoon, winds out of the northwest at about 12-18 mph.

WORK PERFORMED:

The crew on cable tool rig "A" drilled borehole 13-D to a final depth of approximately 99 feet which is the depth at which they encountered bedrock. They then steam cleaned the screen and riser pipe for the construction of well 13-D. The screen and riser pipe were set and they began constructing the well.
The crew on cable tool rig "B" advanced borehole 11-D to a depth of approximately 77 feet by the end of the day.
The pump crew steam cleaned the alignment tool and the pump and pipe used for the development of wells. They checked wells 10-D and 12-D for plumbness and alignment and also developed wells 10-D and 12-D.
Both pump tests continue to run without problems. Water levels were taken at the specified time intervals at wells AT-2, 24-S, 6-D, 11-S, 6-S, 10-S, 4-D, 17-S, 7-D, 4-PC, 8-S, 5-D, 18-S, 4-I, and 8-D.
Water levels were taken and samples were collected from AT-1, 9-S, 5-I, 14-D, and 22-S for the TCE time series analysis.

SAMPLING PERFORMED:

Split spoon samples were collected at the specified intervals at boreholes 13-D and 11-D.
Samples were collected from wells 10-D and 12-D for pH, conductivity, temperature and turbidity as part of the development process.
Samples were also collected for the TCE time series analysis from wells AT-1, 9-S, 5-I, 14-D, and 22-S.
Samples were collected from AT-2 for the purpose of the bench scale analysis.

FIELD ANALYSIS PERFORMED:

Background and periodic HNU readings were taken for air quality throughout the day.
Field pH, conductivity and temperature measurments were performed on the water being discharged from wells 10-D and 12-D until these measurements agreed to within 10%. Visual observations of the water being discharged throughout the development process were also made. After development was complete a sample was collected from wells 10-D and 12-D for the determination of the nephelometric turbidity of the water and for photographic purposes.
Bench scale testing of the pumped water from AT-2 was performed according to the procedures written.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

The flap valve on the sand pump being used bey cable tool rig "B" malfunctioned and could not be fixed. They had to switch to a flat bottom bailer.

QUALITY CONTROL ACTIVITIES INITIATED:

Field notes of both supervising geologists and the technicians taking water levels as part of the pump test were reviewed for completeness and accuracy.

Site Coordinator Signature Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: February 5, 1988 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of minus 15 degrees F., sunny, no precipitation, winds out of the northwest at 20 25 mph.

WORK PERFORMED:

The crew on cable tool rig "B" advanced borehole 11-D to a depth of approximately 80 feet before quiting for the day.
In conjuction with the AT-2 pump test water levels were taken and recorded at wells AT-2, 24-S, 6-D, 11-S, 6-S, 10-S, 4-D, 17-S, 7-D, 4-PC, 8-S, 5-D, 18-S, 4-I, and 8-D at the specified intervals.
Water levels and samples were taken from wells AT-1, 5-I, 9-S, 14-D, and 22-S as part of the time series analysis for TCE.

SAMPLING PERFORMED:

Split spoon samples were taken at the specified intervals at borehole 11-D.
Samples were taken from wells AT-1, 5-I, 9-S, 14-D, and 22-S for the TCE time series analysis being performed.

FIELD ANALYSIS PERFORMED:

Background and periodic HNU readings were taken for air quality throughout the day.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

Due to the extremely cold temperatures and low windchill temperatures grouting could not be done at 13-D. The extended forecast for Monday is for temperatures above zero. They should be able to grout then.
Also because of the cold temperatures it took a couple of hours to get cable tool rig "B" started.

QUALITY CONTROL ACTIVITIES INITIATED:

As part of the TCE time series analysis a duplicate, field blank, and a trip blank were collected and sent to the lab.
The field notes of both supervising geologists and the technicians taking water levels as part of the pump test were reviewed for completeness and accuracy.

Site Coordinator Signature Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: February 6, 1988 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of minus three degrees F., sunny, no precipitation, winds out of the northwest at about 10-15 mph.

WORK PERFORMED:

The AT-2 aquifer pump test reached the minimum 72 hour point and was terminated at 10:15 a.m. this morning. Following the termination of the test the measurement of recovery in wells AT-2, 24-S, 6-D, 11-S, 6-S, 10-S, 4-D, 17-S, 7-D, 4-PC, 8-S, 5-D, 18-S, 4-I, and 8-D began. The frequency of measurements followed the frequency specified in the procedures written. The measurement of recovery continued until the water levels in wells AT-2, 24-S, 6-D, 11-S, and 6-S recovered to within 80% of their prepumping levels. The automated recorders were left in place.
The AT-1 aquifer test continues to proceed without any problems. Water levels were taken and samples collected from wells AT-1, 5-I, 9-S, 14-D, and 22-S for the time series analysis.

SAMPLING PERFORMED:

Samples were collected from AT-1, 5-I, 9-S, 14-D, and 22-S for the TCE time series analysis.

FIELD ANALYSIS PERFORMED:

Background and individual HNU readings were taken at wells AT-1, 5-I, 9-S, 14-D, and 22-S before the start of the sampling process at these wells.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

None.

QUALITY CONTROL ACTIVITIES INITIATED:

None.

Site Coordinator Signature Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: February 7, 1988 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of five degrees F., sunny, no precipitation, winds out of the north at about 15-20 mph.

WORK PERFORMED:

Water levels were taken and samples were collected at wells AT-1, 5-I, 9-S, 14-D, and 22-s.

SAMPLING PERFORMED:

Samples were collected from AT-1, 5-I, 9-S, 14-D, and 22-S for the TCE time series analysis.
Samples were also collected from wells 1-S and 2-S.

FIELD ANALYSIS PERFORMED:

Field pH, conductivity, and temperature measurements were taken after each well volume was removed during the purging process at wells 1-S and 2-S until three successive readings yielded equivalent values as specified in the A-E QCP.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

None.

QUALITY CONTROL ACTIVITIES INITIATED:

A duplicate, field blank, and trip blank were collected and shipped to the lab for analysis as part of the TCE time series analysis.
A trip blank accompanied the sampler during collection of samples from wells 1-S and 2-S and will be sent to the lab for analysis.

Site Coordinator Signature Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: February 8, 1988 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

High of ten degrees F., partly cloudy, snow in the morning with an accumulation of 2.5 inches, winds out of the northwest at about 5-10 mph.

WORK PERFORMED:

The crew on cable tool rig "A" grouted and completed well 13-D.
Cable tool rig "B" advanced borehole 11-D to a depth of 125 feet by the end of the day.
Aquifer test AT-1 was terminated this morning. Water levels and a final round of samples were collected at wells 5-I, 9-S, 14-D, 22-S, and AT-1 for the time series analysis.
Groundwater samples were collected from wells 13-S, 14-S, and 15-S.
Borehole 23-S was located and staked.

SAMPLING PERFORMED:

Samples were collected from AT-1, 5-I, 9-S, 14-D, and 22-S for the TCE time series analysis.
Groundwater samples were collected from wells 13-S, 14-S, and 15-S.

FIELD ANALYSIS PERFORMED:

Field pH, conductivity, and temperature measurements were taken after each well volume was removed during the purging process at wells 13-S, 14-S, and 15-S untill three successive readings yielded equivalent values as specified in the A-E QCP.
Split spoon samples were collected at the specified intervals at borehole 13-D.
Background and periodic HNU readings were taken for air quality throughout the day.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

None.

QUALITY CONTROL ACTIVITIES INITIATED:

As part of the quality control procedures for the groundwater monitoring activities QA and QC duplicate sample # 3 was collected. Also QC trip blank # 6 accompanied the samples and QA field blank # 2 was collected. The field notes of the supervising geologist and the groundwater sampler were reviewed for completeness and accuracy.

Site Coordinator Signature Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: February 9, 1988 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

A high of minus five degrees F., sunny, no precipitation, winds out of the northwest at about 10-15 mph.

WORK PERFORMED:

The crew from cable tool rig "A" began cleaning up around some of the drill sites and began dissassembling the fire hose used during the pump test.
Cable tool rig "B" advanced borehole 11-D to its final depth of 130 feet and began pulling the drill casing out of the hole. They steam cleaned the screen and riser pipe to be used for constructing 11-D and began constructing that well.
The tool used to check wells for plumbness and alignment and the pump to develop wells was steam cleaned before its use. Well 5-PC was checked for plumbness and alignment and developed today.
Groundwater samples were collected from wells 1-D, 2-I, 2-D, 3-S, 5-D, and 5-PC. The storm sewer outfalls were located and sampled also.

SAMPLING PERFORMED:

Samples were collected from wells 1-D, 2-I, 2-D, 3-S, 5-D, and 5-PC following the procedures specified in the A-E QCP. The two storm sewer outfalls were sampled and labeled as storm sewer outfall north and south.

FIELD ANALYSIS PERFORMED:

Field pH, conductivity, and temperature measurements were taken after each well volume was removed during the purging process at all wells sampled until three successive readings yielded equivalent values as specified in the A-E QCP.
Field pH, coductivity,and temperature measurements were performed on the water being discharged from well 5-PC as part of the development process until these measurements agreed to within 10%. Visual observations of the water being discharged at well 5-PC were made throughout the development process. After development was complete a sample was collected from 5-PC for the determination of the nephelometric turbidity of the water and for photographic purposes.
Background and periodic HNU readings were taken throughout the day for the determination of air quality.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

None.

QUALITY CONTROL ACTIVITIES INITIATED:

QC trip blank number seven accompanied the samplers throughout the day and was sent to the lab for analysis along with the samples collected during the day.
The field notes of the supervising geologist and samplers were reviewed for completeness and accuracy.

Site Coordinator Signature Catherine A. Kurzkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: February 10, 1988 AUTHOR: Catherine A. Kwiatkowski

WEATHER: Note: Attach Additional Sheets as Necessary

A high of minus seven degrees F., sunny, no precipitation, winds out of the northwest at about 15-20 mph.

WORK PERFORMED:

The crew from cable tool rig "A" continued to clean up around the drill sites, packing fire hose from the pump test, and loading up some of their equipment.
The crew on cable tool rig "B" grouted and completed well 11-D. They began preparations to move off of that site and mobilize to drill site 23-S.
The plumbness/alignment tool and pump used for well development was steam cleaned in preparation to develop wells. Wells 1-I and 13-D were checked for plumbness and alignment and developed today.
Groundwater samples were collected from wells 1-I, 3-I, 3-D, 4-D, 7-S, 12-S, 13-D, 20-S, and 21-S.

SAMPLING PERFORMED:

Samples were collected from wells 1-I, 3-I, 3-D, 4-D, 7-S, 12-S, 13-D, 20-S, and 21-S following the procedures specified in the A-E QCP.

FIELD ANALYSIS PERFORMED:

Background and periodic HNU readings were taken throughout the day for the determination of air quality.
Field pH, conductivity, and temperature measurements were taken after each well volume was removed during the purging process at all wells sampled until three successive readings yielded the equivalent values as specified in the A-E QCP.
Field pH, conductivity, and temperature measurements were performed on the water being discharged from wells 1-I and 13-D as part of the development process until these measurements agreed to within 10%. Visual observations of the water being discharged from wells 1-I and 13-D were made and recorded throughtout the development process. After development was complete a sample was collected from 1-I and 13-D for the determination of the nephelometric turbidity of the water and for photographic purposes.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

None.

QUALITY CONTROL ACTIVITIES INITIATED:

As part of the quality control procedures for the groundwater monitoring activities QA and QC field blanks number 3 were collected and sent to the appropriate labs. Trip blank number eight accompanied the sampler throughout the day and was also sent to the lab for analysis.
The field notes of the supervising geologist and samplers were reviewed for completeness and accuracy.

Site Coordinator Signature Catherine A. Kwiatkowski

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: February 11, 1988 AUTHOR: Ronald H. Vaughn

WEATHER: Note: Attach Additional Sheets as Necessary

A high of minus five degrees F., sunny, no preciptatoin, winds out the northwest at about 5-10 mph.

WORK PERFORMED:

The crew from cable tool rig "A" continued to clean up around the drill sites, and loading up additational equipment into their semi trailer.
Cable tool rig "B" crew steam cleaned drilling materials for 23-S and then moblized to the off base drill site 23-S. The crew drilled to a depth of 8 feet.
Ground water samples were collected from wells 16-S and 19-S.
The work zones were delinated at the 23-S drill site.

SAMPLING PERFORMED:

Samples were collected from wells 16-S and 19-S following the procedures specified in the A-E QCP.

FIELD ANALYSIS PERFORMED:

Background and periodic HNU readings were taken throughout the day for the determination of air quality.
Field pH, conductivity, and temperature measurements were taken after each well volume was removed during the purging process at all wells sampled until three successive readings yielded the equivalent values as specified in the A-E QCP.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

None.

QUALITY CONTROL ACTIVITIES INITIATED:

As part of the quality control procedures for the ground water monitoring activities a QC field blank was collected and sent to the appropriate lab. The field notes of the supervising geologist and sampler were reviewed for completeness and accuracy.

Site Coordinator Signature Ronald H. Vaughn

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: February 15, 1988 AUTHOR: Ronald H. Vaughn

WEATHER: Note: Attach Additional Sheets as Necessary

A high of fifteen degrees F., partly sunny, no precipitation, winds out of the west at about 5-10 mph.

WORK PERFORMED:

Cable tool rig "B" crew added the filter pack, installed the steam cleaned screen and pipe. They ordered cement and grouted the 23-S well. The crew cleaned up at the site , loaded up their materials and moblized back to the office trailer area.
Groundwater samples were collected from 1-PC.

SAMPLING PERFORMED:

Water samples were collected from well 1-PC following the procedures specifed in the A-E QCP.

FIELD ANALYSIS PERFORMED:

Field pH, conductivity, and temperature measurements were taken after each well volume was removed during the purging process at the well sampled until three successive readings yielded the equivalent value as specified in the A-E QCP.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

None.

QUALITY CONTROL ACTIVITIES INITIATED:

As part of the quality control procedures for the groundwater monitoring activities QA and QC field blanks number 4 were collected and sent to the appropriate labs. Trip blank number 10 accompanied the samplers throughout the day and was sent to the lab for analysis.
The field notes of the supervising geologist and samplers were reviewed for completeness and accuracy.

Site Coordinator Signature Ronald H. Vaughn

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: February 16, 1988 AUTHOR: Ronald H. Vaughn

WEATHER: Note: Attach Additional Sheets as Necessary

A high of thirty degrees F., partly sunny, no precipitation, winds out of the northwest at about 5-10 mph.

WORK PERFORMED:

Cable tool rig "B" crew steam cleaned developement pump and pipe before and after developing 11-D. The pump was then installed into well 23-S to be developed on 2/17/88. The 23-S well was then secured.
The crew cleaned up office trailer site, loaded up thier materials, and hooked up thier trailer. One of the crew drove the drill rig "B" back to Wausau, WI. Another crew member drove a small flatbed and office trailer back to Milwaukee, WI. The crew boss flagged the wells and placed well caps and plugs on the remaining wells. Left site to go to the hardware store to get materials.
Groundwater samples were collected from wells 2-PC, 3-PC, 4-PC, 7-D, and 11-D. All groundwater sampling materials were cleaned as specified in the A-E QCP before sampling at each well.

SAMPLING PERFORMED:

Water samples were collected from wells 2-PC, 3-PC, 4-PC, 7-D, and 11-D following the procedures specified in the A-E QCP.

FIELD ANALYSIS PERFORMED:

Field pH, conductivity, and temperature measurements were taken after each well volume was removed during the purging process at the wells sampled until three successive readings yielded the equivalent value as specified in the A-E QCP.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

None.

QUALITY CONTROL ACTIVITIES INITIATED:

As part of the quality control procedures for the groundwater monitoring activities a QC Trip blank number 11 accompanied the samplers throughout the day and was sent to the appropiate lab.
Field notes of the samplers were reviewed for completeness and accuracy.

Site Coordinator Signature Ronald H. Vaughn

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: February 17, 1988 AUTHOR: Ronald H. Vaughn

WEATHER: Note: Attach Additional Sheets as Necessary

A high of thirtysix degrees F., sunny, no precipitation, winds out of southwest at about 5-15 mph.

WORK PERFORMED:

The last remaining Layne employee finished installing well caps and plugs. He also developed well 23-S and checked for well plumness and alignment. He picked up plastic tubing in the park. A water sample was collected from 23-S for determination of turbidity measurement and photographic proposes. Groundwater samples were collected from wells 8-D, 9-D, 10-D, and 23-S. all groundwater sampling materials were cleaned as specified in the A-E QCP before sampling at each well. Testing equipment was calibrated thoughout the day.

SAMPLING PERFORMED:

Water samples were collected from wells 8-D, 9-D, 10-D, and 23-S following the procedures specified in the A-E QCP.
A water sample was taken from well 23-S for a turbidity measurement and photograph.

FIELD ANALYSIS PERFORMED:

Field pH, conductivity, and temperature measurements were taken after each well volume was removed during the purging process at the wells sampled until three successive readings yielded the equivalent value as specified in the A-E QCP.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

Had trouble placing the purging pump down the new 3" wells. Alteration to the steel cable assembly where it attaches to the pump allowed the pump to pass freely down the well.
Well 10-D would not recover as fast as the pump rate (10 gal/min.) resulting having to shut off the pump to allow the well recover.

QUALITY CONTROL ACTIVITIES INITIATED:

As part of the quality control procedures for the groundwater monitoring activites QC and QA duplicates number 5, QC and QA field blanks number 5 were collected and sent to the appropriate labs. Trip blank number 12 accompanied the samplers thoughout the day and was also sent to the lab for analysis. Field notes of the samplers and chain of custody forms were reviewed for completeness and accuracy.

Site Coordinator Signature Ronald D. Vaughn

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: February 18, 1988 AUTHOR: Ronald H. Vaughn

WEATHER: Note: Attach Additional Sheets as Necessary

A high of forty degrees F., sunny, no precipitation, winds out of the southwest at about 5-15 mph.

WORK PERFORMED:

Groundwater samples were collected from wells 12-D, FMC-33, AT-1, and AT-2. All groundwater sampling materials were cleaned as specified in the A-E QCP before sampling at each well. Testing equipment was calibrated throuthout the day. Packed up materials in the office trailer

SAMPLING PERFORMED:

Water samples were collected from wells 12-D, FMC-33, AT-1, and AT-2 following the procedures specified in the A-E QCP.

FIELD ANALYSIS PERFORMED:

Field pH, conductivity, and temperature measurements were taken after each well volume was removed during the purging process at the wells sampled until three successive readings yielded the equivalent value as specified in the A-E QCP.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

Well FMC-33 has a restriction in the well casing several feet below the static water level this resulted in having to shut the pump off several times in order to allow the well to recover.

QUALITY CONTROL ACTIVITIES INITIATED:

As part of the quality control procedures for the groundwater monitoring activites a Trip blank number 13 accompanied the samplers throughout the day and was sent to the lab for analysis.
Field notes of the samplers and chain of custody forms were reviewed for completeness and accuracy.

Site Coordinator Signature Ronald H. Vaughn

A-E DAILY QUALITY CONTROL REPORT (DQCR)
COE-NIROP, Fridley, Minnesota
RMT, Inc. Project No. 1332 Contract No. DACA45-86-C-0015, Mod. No. P00003

DATE: February 19, 1988 AUTHOR: Ronald H. Vaughn

WEATHER: Note: Attach Additional Sheets as Necessary

A high of thirtysix degrees F., sunny, some light snow, winds out of the southwest at about 10-15 mph.

WORK PERFORMED:

A round of water levels was recorded from all 52 wells. Trash was picked up from all drill sites. Labled all new wells with a yellow paint stick. Returned the rental generator to Central Rental. Notified the following people:
Jerry Peavo from Hilltop Trailer Sales to pick up the office trailer on 2/26/88. The damaged steps were disscussed and Layne Northwest's address was given to Hilltop Trailer Sales.
Bill Gould from Collins Electric Co. to disconnect the electricity on 2/26/88.
Northwestern Bell to disconnect phone service also on 2/26/88.
Horizontal distances from AT-2 to 4-D, 6-D, 7-D, 5-S, 10-S, 11-S, 17-S, 24-S were measured.
In-situ hydraulic conductivity tests were preformed on wells 1-I, 4-I, 5-PC, 10-D, and 23-S.
Continued packing of the RMT office trailer.

SAMPLING PERFORMED:

None.

FIELD ANALYSIS PERFORMED:

None.

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

None

QUALITY CONTROL ACTIVITIES INITIATED:

Field notes of the In-situ hydraulic conductivity tests were reviewed for completeness and accuracy.

Site Coordinator Signature Ronald H. Vaughn

APPENDIX B

BOREHOLE LOGS AND WELL CONSTRUCTION DIAGRAMS

KEY TO BOREHOLE LOGS AND WELL CONSTRUCTION DIAGRAMS

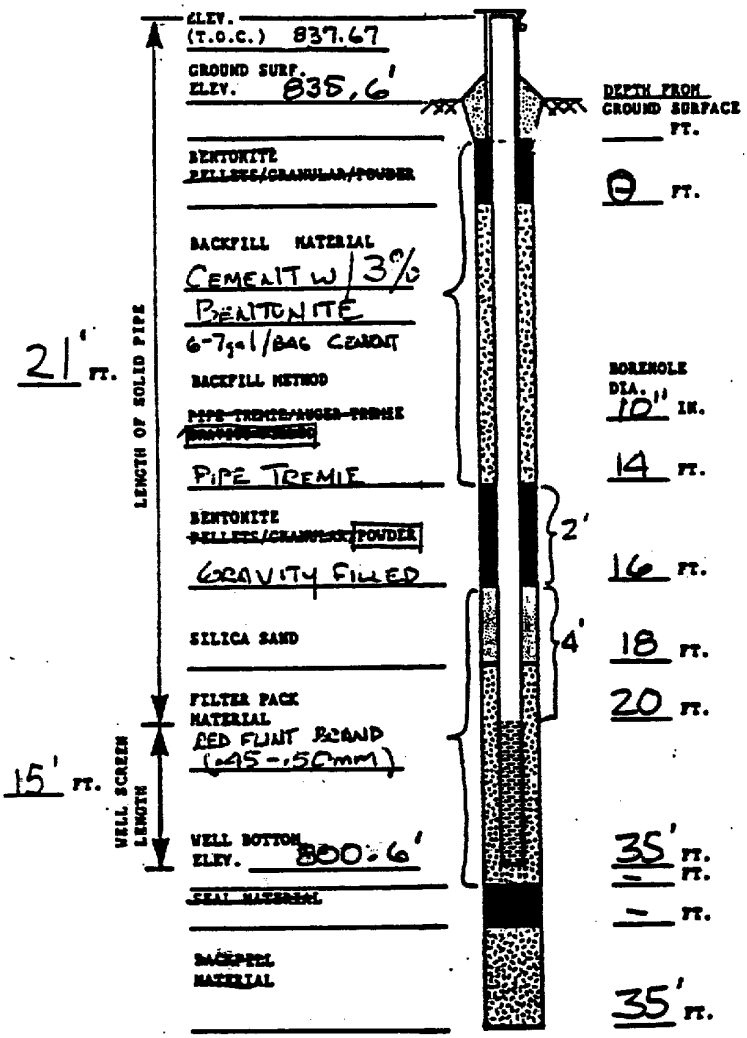
WELL NO.	BOREHOLE LOG	CONSTRUCTION DIAGRAM
21-S	NO*	YES
22-S	NO	YES
23-S	YES	YES
24-S	NO	YES
25-S	NO	YES
1-I	NO	YES
2-I	YES	YES
3-I	NO	YES
4-I	NO	YES
5-I	NO	YES
10-D	YES	YES
11-D	YES	YES
12-D	YES	YES
13-D	YES	YES
14-D	YES	YES
5-PC	YES	YES
AT-1	YES	YES
AT-2	YES	YES

* Borehole logs were prepared for each monitoring well unless a borehole log was already available for a deeper well at that location, with the exception of production wells AT-1 and AT-2.

RMT

Well Diagram
F-17 (8 11-85)

PROJECT NAME: NIROP #: 1332.32
WELL NO. MW 21S
DATE INSTALLED 12-16-87



1) CASING DETAILS

A) TYPE OF PIPE:

~~BLK, STAINLESS, TEFLON, OTHER~~ BLACK IRON

PIPE SCHEDULE 40

B) TYPE OF PIPE JOINTS:

COUPLINGS, THREADED (W/TAPE?) YES: TEFLON, OTHER

C) WAS SOLVENT USED? ~~YES OR~~ NO

D) TYPE OF WELL SCREEN:

PVC, STAINLESS, TEFLON, OTHER

E) WELL SCREEN SLOT SIZE .010"

F) PIPE DIA: ID IN. 2" OD IN. 2 5/16

G) INSTALLED PROTECTOR PIPE W/LOCK? YES OR NO

PROTECTOR PIPE DIA. ~~6 5/16~~ IN. 6.5"

2) WELL DEVELOPMENT

A) METHOD

BAILING, PUMPING, SURGING, COMPRESSED AIR

OTHER —

(NOTE ADDITIONAL COMMENTS BELOW)

B) TIME SPENT FOR DEVELOPMENT? 3 HRS

C) APPROXIMATE WATER VOLUME: REMOVED 540 gal

ADDED —

D) WATER CLARITY BEFORE DEVELOPMENT?

CLEAR, TURBID, OPAQUE

E) WATER CLARITY AFTER DEVELOPMENT?

CLEAR, SLIGHTLY TURBID, TURBID, OPAQUE

NTU = 1.8 (KEB 7-5-88)

F) ODOR? YES OR NO

3) WATER LEVEL SUMMARY

A) DEPTH FROM TOP OF CASING AFTER DEVELOPMENT?

— FT. OR DRY

B) OTHER MEASUREMENTS (T.O.C.):

DATE/TIME 2-19-88 (24.43') FT

DATE/TIME FT

DATE/TIME FT

ADDITIONAL COMMENTS: ≈12 BAGS OF CEMENT IN THE HOLE.
MIXED 15 BAGS ~~of~~ OF CEMENT PLUS 1 BAG OF BENTONITE
CEMENT = 100 lb. BAGS
BENTONITE = 50 lb. BAGS.
USED 2 CENTRALIZERS.

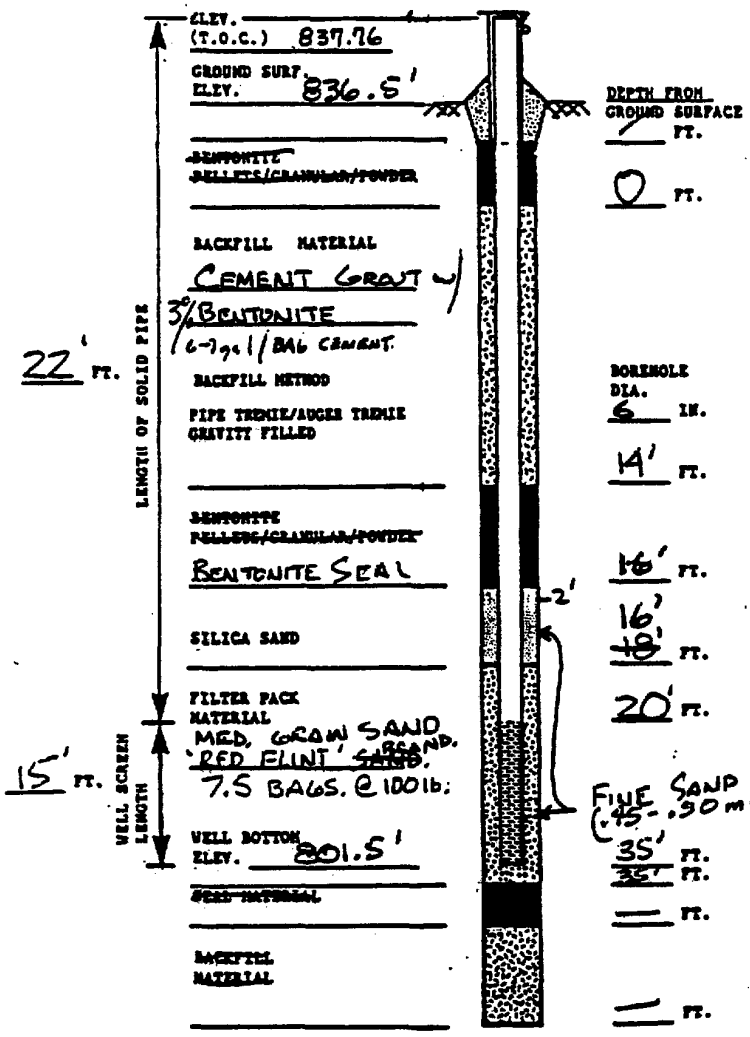
VCAK
3/22/88

elevations checked 5/9/88 CAK

RMT

Well Diagram
F-17 (R 11-85)

PROJECT NAME: NIROP NO. 133232
WELL NO. MW 77 S
DATE INSTALLED 12-11-87



1) CASING DETAILS

A) TYPE OF PIPE:

~~PVC, STAINLESS, TEFLON, OTHER~~ BLACK IRON

PIPE SCHEDULE 40

B) TYPE OF PIPE JOINTS:

~~COUPLINGS, THREADED (W/TAPE?)~~ YES-TEFLON ~~OTHER~~

C) WAS SOLVENT USED? ~~YES OR~~ NO

D) TYPE OF WELL SCREEN:

~~PVC,~~ STAINLESS ~~TEFLON, OTHER~~

E) WELL SCREEN SLOT SIZE .010"

F) PIPE DIA: ID IN. 2" OD IN. 2 5/16"

G) INSTALLED PROTECTOR PIPE W/LOCK? YES OR NO
PROTECTOR PIPE DIA. 6.5" IN. O.D.

2) WELL DEVELOPMENT

A) METHOD

BAILING, PUMPING, SURGING, COMPRESSED AIR

OTHER —

(NOTE ADDITIONAL COMMENTS BELOW)

B) TIME SPENT FOR DEVELOPMENT? 2.5 HRS.

C) APPROXIMATE WATER VOLUME: REMOVED 450 gal
ADDED —

D) WATER CLARITY BEFORE DEVELOPMENT?

CLEAR, TURBID, OPAQUE

E) WATER CLARITY AFTER DEVELOPMENT?

CLEAR, SLIGHTLY TURBID, TURBID, OPAQUE NTU = 2.0 (KEB 7/5/8

F) ODOR? YES OR NO

3) WATER LEVEL SUMMARY

A) DEPTH FROM TOP OF CASING AFTER DEVELOPMENT?

— FT. OR DRY

B) OTHER MEASUREMENTS (T.O.C.):

DATE/TIME 2-19-88 (24.80') FT

DATE/TIME FT

DATE/TIME FT

ADDITIONAL COMMENTS: 12 BAGS OF CEMENT PLACED IN THE ANNULAR SPACE OUTSIDE OF WELL.
1 BAG OF BENTONITE ~~WERE~~ WAS ADDED.
2-CENTRALIZERS.

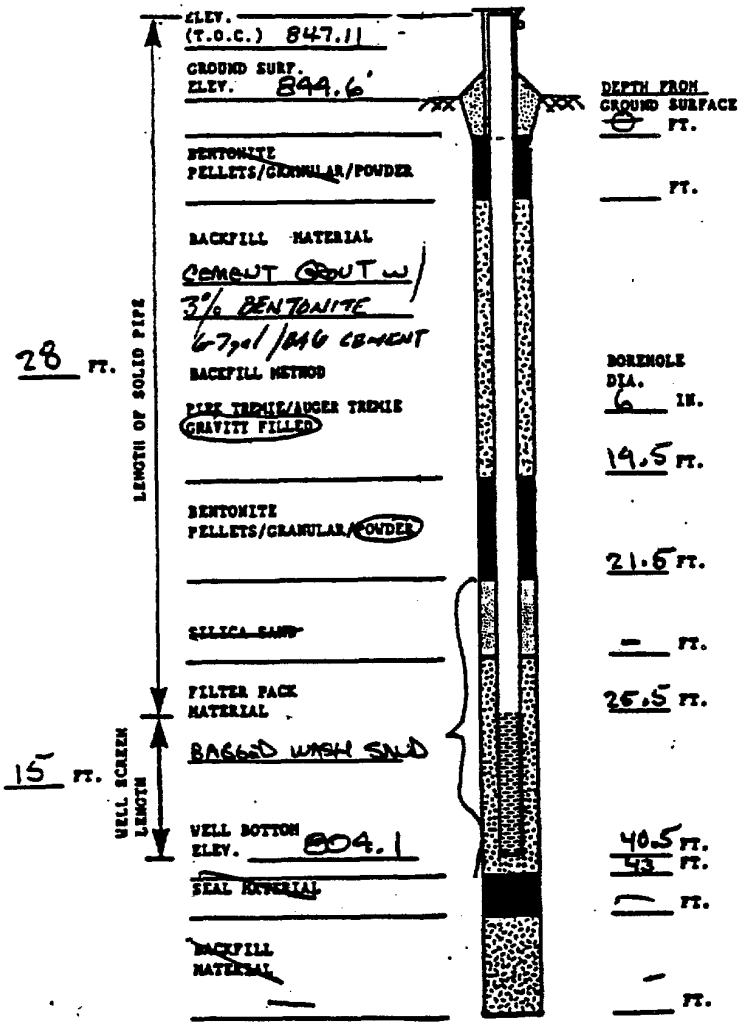
elevations checked 5/9/88 CAK

CAK 3/22/88

RMT

Well Diagram
P-17 (R 11-85)

PROJECT NAME: COE - NIROP NO. 1332.32
WELL NO. 23S
DATE INSTALLED 2-15-88 1:00pm



1) CASING DETAILS

A) TYPE OF PIPE:

PVC, STAINLESS, TEFLON, (OTHER) BLACK IRON

PIPE SCHEDULE 40

B) TYPE OF PIPE JOINTS:

(COUPLINGS), THREADED (W/TAPE?), OTHER W/TEFLON TAI

C) WAS SOLVENT USED? YES OR (NO)

D) TYPE OF WELL SCREEN:

PVC, (STAINLESS), TEFLON, OTHER

E) WELL SCREEN SLOT SIZE .010"

F) PIPE DIA: ID IN. 2 OD IN. 2 5/16

G) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO
PROTECTOR PIPE DIA. 6 IN.

2) WELL DEVELOPMENT

A) METHOD

~~BAILING~~, (PUMPING), ~~SURGING~~, ~~COMPRESSED AIR~~

OTHER —

(NOTE ADDITIONAL COMMENTS BELOW)

B) TIME SPENT FOR DEVELOPMENT? 2HRS

C) APPROXIMATE WATER VOLUME: REMOVED 480 gal
ADDED —

D) WATER CLARITY BEFORE DEVELOPMENT?

CLEAR, [TURBID], OPAQUE

E) WATER CLARITY AFTER DEVELOPMENT?

[CLEAR], SLIGHTLY TURBID, TURBID, OPAQUE NTU = 1.1 (KEB 7/5/88)

F) ODOR? ~~YES OR~~ [NO]

3) WATER LEVEL SUMMARY

A) DEPTH FROM TOP OF CASING AFTER DEVELOPMENT?

— FT. OR DRY

B) OTHER MEASUREMENTS (T.O.C.):

DATE/TIME 31' 9:30AM 2-15-88 FT

DATE/TIME _____ FT

DATE/TIME _____ FT

ADDITIONAL COMMENTS: 2 STAINLESS STEEL STABILIZERS PUT ON WELL CASING. ~~ONE ABOVE SCREEN AT ABOUT 16' FROM BOTTOM, AND ANOTHER AT 37' FROM BOTTOM.~~ RAI 2-22-88

elevations checked 5/9/88 CAK

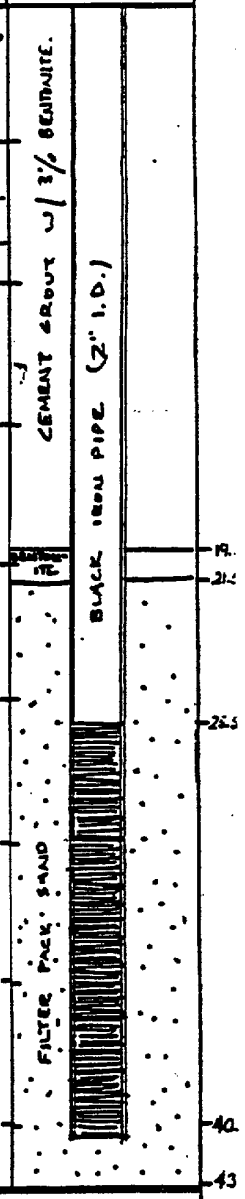
CAK 3/23/

LOG OF TEST BORING

BORING NO.:	23-S
SHEET	of
PROJECT:	COE-NIROP
PROJECT NO.:	1332.32
LOCATION:	Fridley, MN
SURFACE ELEVATION:	844.6
DRILLED BY:	Layne-Northwest - Milwaukee
DATE STARTED:	2/11/88
DATE COMPLETED:	2/15/88
CREW CHIEF:	Ross Goldbeck
LOGGED BY:	MSM
CHECKED BY:	BWR/ 3/7/88

SAMPLING NOTES INTERVAL NO.	TYPE	RECOVERY BLOWS	%	DEPTH (ft.)	VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
1	1" Grab				Dk. brown, SAND, fine to med., some silt, trace of clay (topsoil)
2	Grab				
				5	Brown, SAND, fine, trace of silt
	6"				Black SAND, fine to med, trace of clay
3	Grab				
4	Grab			10	Brown, SAND, fine to coarse, little fine gravel (alluvium)
5	11" SS				
6				15	Brown, SAND, fine to coarse, and fine gravel
7	16" SS				
8				20	Brown, SAND, fine to coarse, and fine gravel
9	21" SS				
10				25	Brown, SAND, fine to med.
11	26" SS				
12				30	Brown, SAND, fine to med., trace coarse sand
13	31" SS				
14				35	Brown, SAND, fine to coarse.
15	36" SS				
16					Brown, SAND, fine to coarse.
17	41" SS			40	
18					EOB @ 43'

GENERAL WELL CONSTRUCTION



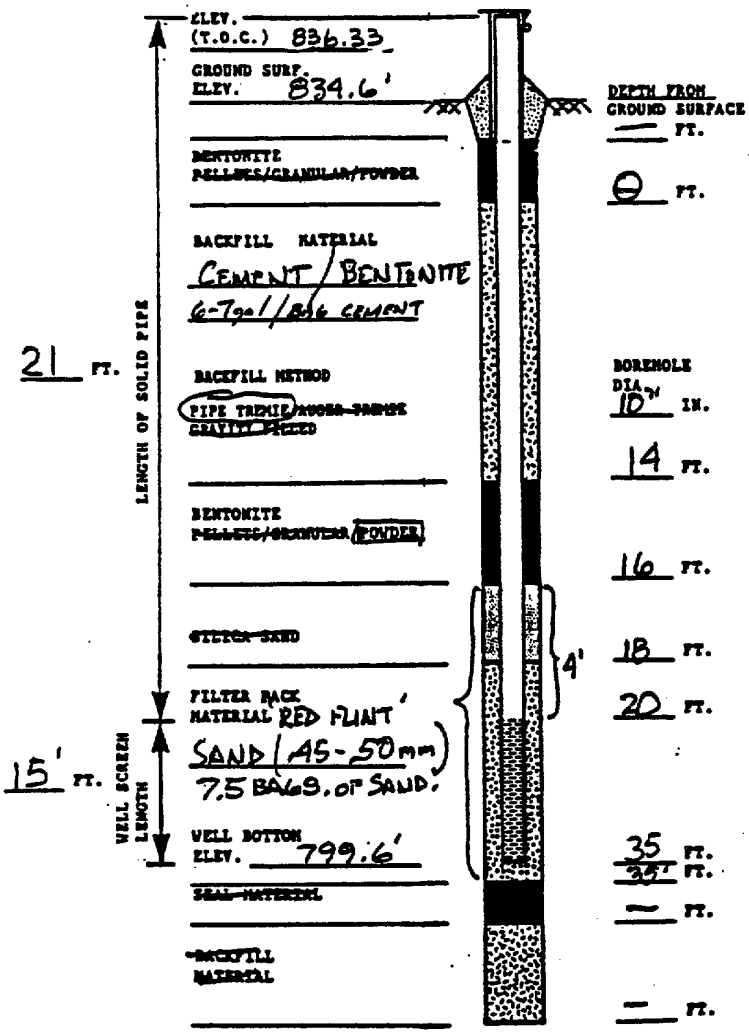
NOTES	WATER LEVEL OBSERVATIONS			
DRILLING METHODS: Cable tool	FIRST OCCURENCE:			
	DATE/TIME	2/12/88 - 12:40p	2/15/88 9:30a	
BOREHOLE DIAMETER: 8.0"	DEPTH TO WATER	35'	31'	
DRILL RIG: Bucyrus - Erie 20R	DEPTH TO CAVE IN			

F-204A (R 09-87)

RMT

Well Diagram
F-17 (R 11-85)

PROJECT NAME: NIROP NO. 1332.32
WELL NO. MW-24S
DATE INSTALLED 12-18-87



1) CASING DETAILS

A) TYPE OF PIPE:

~~PVC, STAINLESS, TEFLON,~~ OTHER BLACK IRON

PIPE SCHEDULE 40

B) TYPE OF PIPE JOINTS:

COUPLINGS, THREADED (W/TAPE?), ~~YES: TEFLON~~ OTHER

C) WAS SOLVENT USED? ~~YES OR~~ NO

D) TYPE OF WELL SCREEN:

~~PVC,~~ STAINLESS, ~~TEFLON, OTHER~~

E) WELL SCREEN SLOT SIZE .010"

F) PIPE DIA: ID IN. 2" OD IN. 2 5/16"

G) INSTALLED PROTECTOR PIPE W/LOCK? ~~YES OR NO~~
PROTECTOR PIPE DIA. 6.5 IN.

2) WELL DEVELOPMENT

A) METHOD

BAILING, PUMPING, SURGING, COMPRESSED AIR

OTHER —

(NOTE ADDITIONAL COMMENTS BELOW)

B) TIME SPENT FOR DEVELOPMENT? 2.5 HRS

C) APPROXIMATE WATER VOLUME: REMOVED 450 gal
ADDED

D) WATER CLARITY BEFORE DEVELOPMENT?

CLEAR, TURBID, OPAQUE

E) WATER CLARITY AFTER DEVELOPMENT?

CLEAR, SLIGHTLY TURBID, TURBID, ~~OPAQUE~~ SLIGHTY

F) ODOR? YES OR NO NTU = 0.62 KEB 7/5/88

3) WATER LEVEL SUMMARY

A) DEPTH FROM TOP OF CASING AFTER DEVELOPMENT?

← FT. OR DRY

B) OTHER MEASUREMENTS (T.O.C.):

DATE/TIME 2-19-88 (24.12') F

DATE/TIME F

DATE/TIME F

ADDITIONAL COMMENTS: 2 CENTRALIZERS USED.
12 BAGS OF CEMENT / 1.3 ~~BENTONITE~~ BAGS OF BENTONITE.

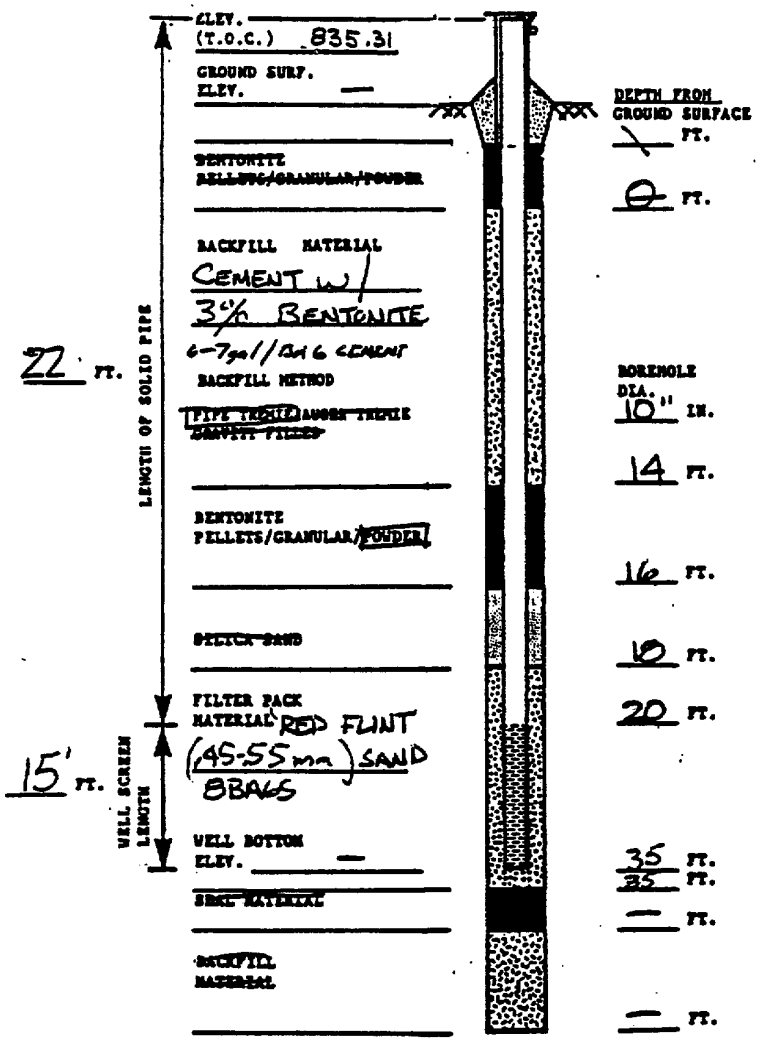
elevations checked 5/9/88 CK

VCAK 3/22/

RMT

Well Diagram
F-17 (2 11-85)

PROJECT NAME: NIRDP NO. 1332.32
WELL NO. MW 25-S
DATE INSTALLED 12-21-87



1) CASING DETAILS

A) TYPE OF PIPE:

~~PVC, STAINLESS, TEFLON, OTHER~~ BLACK IRON

PIPE SCHEDULE 40

B) TYPE OF PIPE JOINTS;

COUPLINGS, THREADED (W/TAPE?) YES: TEFLON OTHER

C) WAS SOLVENT USED? ~~YES OR~~ NO

D) TYPE OF WELL SCREEN:

~~PVC,~~ STAINLESS, ~~TEFLON, OTHER~~

E) WELL SCREEN SLOT SIZE .010"

F) PIPE DIA: ID IN. 2" OD IN. 2 5/16"

G) INSTALLED PROTECTOR PIPE W/LOCK? YES OR NO
PROTECTOR PIPE DIA. 6.5 IN.

2) WELL DEVELOPMENT

A) METHOD

BAILING, PUMPING, SURGING, COMPRESSED AIR

OTHER —

(NOTE ADDITIONAL COMMENTS BELOW)

B) TIME SPENT FOR DEVELOPMENT? 3.0 HRS

C) APPROXIMATE WATER VOLUME: REMOVED 540 gal

ADDED

D) WATER CLARITY BEFORE DEVELOPMENT?

CLEAR, TURBID, OPAQUE

E) WATER CLARITY AFTER DEVELOPMENT?

CLEAR, SLIGHTLY TURBID, TURBID, OPAQUE

F) ODOR? YES OR NO NTU = 0.42 (KEB, 7/5/88

3) WATER LEVEL SUMMARY

A) DEPTH FROM TOP OF CASING AFTER DEVELOPMENT?

— FT. OR DRY

B) OTHER MEASUREMENTS (T.O.C.):

DATE/TIME 2-19-88 (22.42') FT.

DATE/TIME FT.

DATE/TIME FT.

ADDITIONAL COMMENTS: 2 CENTRALIZERS INSTALLED.
1 BAG BENTONITE / 11 BAGS CEMENT @ (6-7 gals/BAG OF CEM)

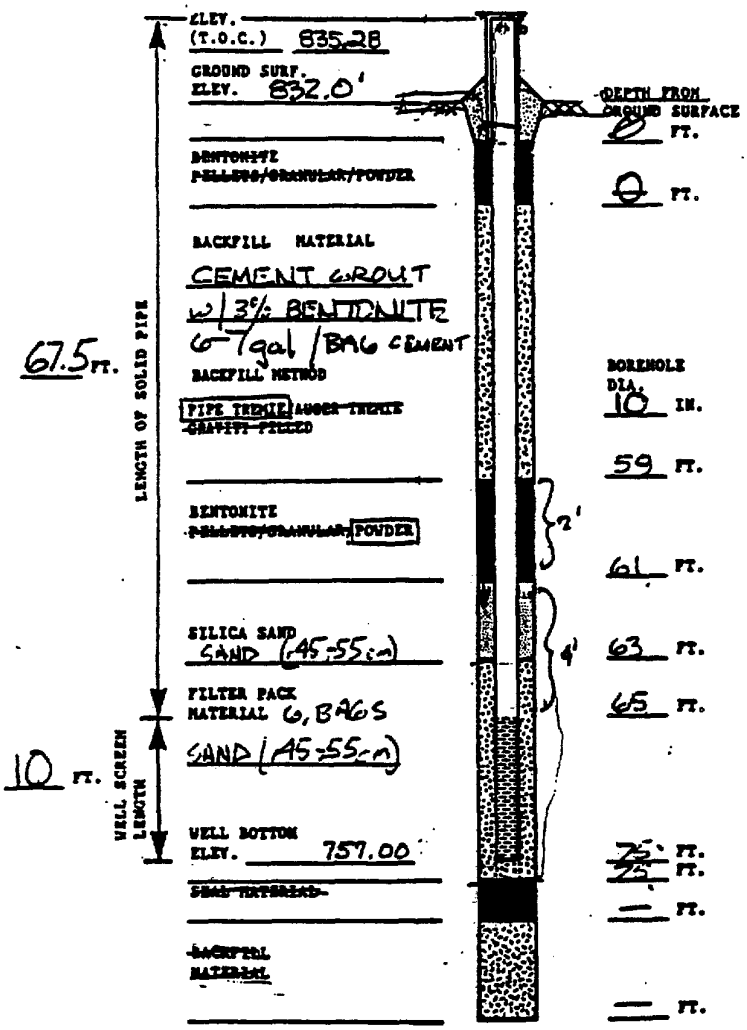
elevations checked 5/9/88 CAK

VCAK 3/22/88

RMT

Well Diagram
F-17 (R 11-85)

PROJECT NAME: NIROP NO. 1332.32
WELL NO. 1-1
DATE INSTALLED 1-15-88



1) CASING DETAILS

A) TYPE OF PIPE:

~~PVC, STAINLESS, TEFLON, OTHER~~ BLACK IRON

PIPE SCHEDULE 40

B) TYPE OF PIPE JOINTS;

~~COUPLINGS,~~ THREADED (W/TAPE?) YES ; TEFLON ~~OTHER~~

C) WAS SOLVENT USED? YES OR NO

D) TYPE OF WELL SCREEN:

~~PVC,~~ STAINLESS, ~~TEFLON, OTHER~~

E) WELL SCREEN SLOT SIZE .010"

F) PIPE DIA: ID IN. 2 OD IN. 2 5/16

G) INSTALLED PROTECTOR PIPE W/LOCK? YES ~~OR NO~~
PROTECTOR PIPE DIA. 6" IN.

2) WELL DEVELOPMENT

A) METHOD

~~BAILING,~~ PUMPING ~~SURGING, COMPRESSED AIR~~

OTHER —

(NOTE ADDITIONAL COMMENTS BELOW)

B) TIME SPENT FOR DEVELOPMENT? 2.5 HRS

C) APPROXIMATE WATER VOLUME: REMOVED 450 gal
ADDED —

D) WATER CLARITY BEFORE DEVELOPMENT?

CLEAR, TURBID, OPAQUE

E) WATER CLARITY AFTER DEVELOPMENT?

CLEAR, SLIGHTLY TURBID, TURBID, ~~OPAQUE~~ SLIGHTLY

F) ODOR? YES OR NO NTU = 3.4 (KEB 7/5/88)

3) WATER LEVEL SUMMARY

A) DEPTH FROM TOP OF CASING AFTER DEVELOPMENT?

— FT. OR DRY

B) OTHER MEASUREMENTS (T.O.C.):

DATE/TIME 2-9-88 (21.94') FT

DATE/TIME — FT

DATE/TIME — FT

ADDITIONAL COMMENTS: 3 CENTRALIZERS INSTALLED.
40 ~~35~~ BAGS CEMENT PUT DOWN HOLE @ 6-7gals/BAG.
~~40 BAGS~~

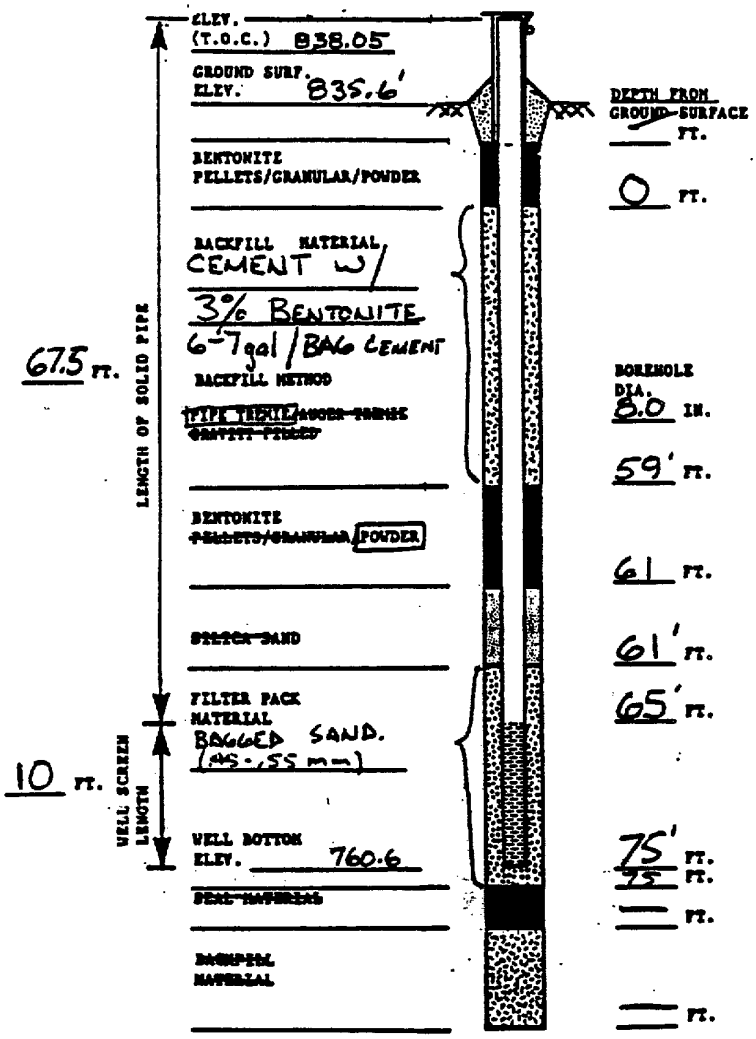
elevations checked 5/9/88 CAK

✓CAK
3/22/88

RMT

Well Diagram
F-17 (R 11-85)

PROJECT NAME: COE-NIPOP(FRIDLEY) NO. 1332.32
WELL NO. 2-I
DATE INSTALLED 1-28-88



1) CASING DETAILS

A) TYPE OF PIPE:

~~PVC, STAINLESS, TEFLON, OTHER~~ BLACK IRON

PIPE SCHEDULE 40

B) TYPE OF PIPE JOINTS:

COUPLINGS, THREADED (W/TAPE?) YES: TEFLON OTHER

C) WAS SOLVENT USED? ~~YES OR~~ NO

D) TYPE OF WELL SCREEN:

~~PVC~~, STAINLESS ~~TEFLON, OTHER~~

E) WELL SCREEN SLOT SIZE .010"

F) PIPE DIA: ID IN. 2 OD IN. 2 5/16

G) INSTALLED PROTECTOR PIPE W/LOCK? YES ~~OR NO~~
PROTECTOR PIPE DIA. 6" IN.

2) WELL DEVELOPMENT

A) METHOD

BAILING, PUMPING, SURGING, COMPRESSED AIR

OTHER —

(NOTE ADDITIONAL COMMENTS BELOW)

B) TIME SPENT FOR DEVELOPMENT? 3.0 HRS

C) APPROXIMATE WATER VOLUME: REMOVED 540 gal
ADDED —

D) WATER CLARITY BEFORE DEVELOPMENT?

CLEAR, TURBID, OPAQUE

E) WATER CLARITY AFTER DEVELOPMENT?

CLEAR, SLIGHTLY TURBID, TURBID, OPAQUE

F) ODOR? YES OR NO NTU = 14.8 (KEG 7/5/88)

3) WATER LEVEL SUMMARY

A) DEPTH FROM TOP OF CASING AFTER DEVELOPMENT?

— FT. OR DRY

B) OTHER MEASUREMENTS (T.O.C.):

DATE/TIME 2-19-88 (25.07') FT

DATE/TIME — FT

DATE/TIME — FT

ADDITIONAL COMMENTS: 3 CENTRALIZERS WERE INSTALLED.

elevations checked 5/9/88 CAK

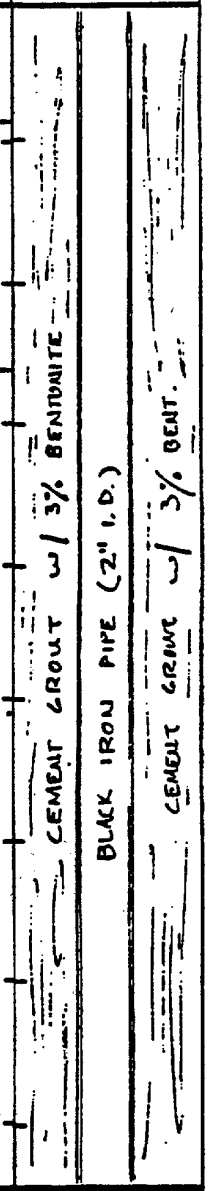
✓CA
3/22/8

LOG OF TEST BORING

BORING NO.:	2-I
SHEET	1 of 2
PROJECT:	C.O.E. - NIROP
PROJECT NO.:	1332.32
LOCATION:	FRIDLEY, MN
SURFACE ELEVATION:	835.6'
DRILLED BY:	LAYNE NORTHWEST, MILWAUKEE
DATE STARTED:	1-21-88
DATE COMPLETED:	1-28-88
CREW CHIEF:	D. HORNBERG
LOGGED BY:	RON VAUGN
CHECKED BY:	BWR/ 1/28/88

SAMPLING NOTES NO.	INTERVAL TYPE	RECOVERY BLOWS	RECOVERY %	DEPTH (ft.)	VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
1	1' Grab	* --	--		BLK, SANDY, vegetative matter, some fine gravel (top soil).
				5	
2	6.5' SS	20	100		DK brown silty SAND, fine to med., (fill).
				10	
3	11.6' SS	22	100		DK brown silty SAND, fine to med., (fill).
				15	
4	16.5' SS	35	100		Brown, SAND, fine to med., trace fine gravel.
				20	
5	21.5' SS	35	100		Brown, SAND, med. to coarse, little coarse gravel and cobbles.
				25	
6	26.5' SS	29	100		Brown, SAND, fine to med., trace cobble.
				30	
7	31.5' SS	31	100		Brown, SAND, fine grained.
				35	
8	36.5' SS	35	100		Brown, SAND, fine, trace silt and clay
				40	

GENERAL WELL CONSTRUCTION



NOTES	WATER LEVEL OBSERVATIONS			
DRILLING METHODS: Cable tool, using a *300 lb hammer and a 3" split-spoon sampler (SS)	FIRST OCCURENCE:			
	DATE/TIME			
BOREHOLE DIAMETER: 8.0 in,	DEPTH TO WATER			
DRILL RIG: Bucyrus-Erie ZZW	DEPTH TO CAVE IN			

F-204A (R 09-87)

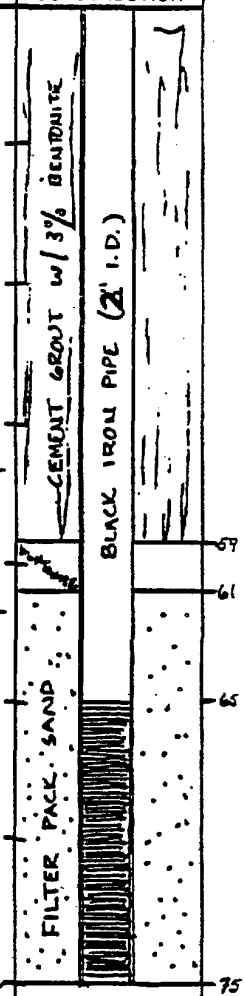
LOG OF TEST BORING

RMT

BORING NO.: 2-I	
SHEET 2 of 2	
PROJECT: COE-NIROP	PROJECT NO.: 1332.32
LOCATION: FRIDLEY, MN	SURFACE ELEVATION: -----

SAMPLING NOTES INTERVAL NO.	TYPE	RECOVERY BLOWS	%	DEPTH (ft.)	VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
9	41.5 SS	37	100	40'	Brown, SAND, fine trace SILT and clay.
				45	Brown, SAND, fine, some silt and clay.
10	46.5 SS	41	100		
				50	Brown, SAND, fine.
11	51.5 SS	39	100		
				55	Brown, SAND, fine.
12	56.5 SS	51	95		
				60	Brown, silty SAND, fine trace clay. (till)
13	61.5 SS	58	100		
				65	Brown, SAND, fine to med. trace clay.
14	66.5 SS	61	95		
				70	Brown, SAND, fine.
15	71.5 SS	60	95		
				75	Brown SAND fine to med.
16	76.5 SS	65	100		
					EOB at 75.0'

GENERAL WELL CONSTRUCTION

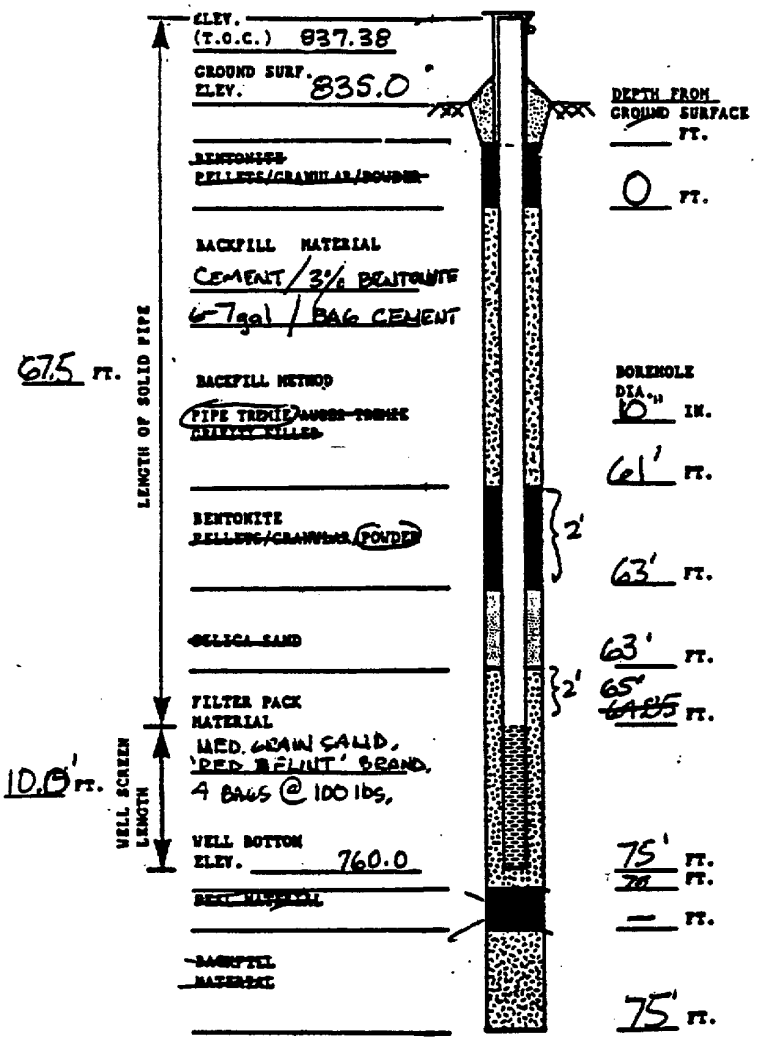


F-204B (R 09-87)

RMT

Well Diagram
F-17 (2 11-85)

PROJECT NAME: NIRCP NO. 1332.32
WELL NO. MW-3T
DATE INSTALLED 12-10-87



1) CASING DETAILS

A) TYPE OF PIPE:

~~PVC, STAINLESS, TEFLON, OTHER~~ BLACK IRON

PIPE SCHEDULE 40

B) TYPE OF PIPE JOINTS: ~~MECHANICAL CHEMICAL~~

COUPLINGS, THREADED (W/TAPE?) YES OTHER _____

C) WAS SOLVENT USED? ~~YES OR~~ NO

D) TYPE OF WELL SCREEN:

~~PVC,~~ STAINLESS, ~~TEFLON, OTHER~~ _____

E) WELL SCREEN SLOT SIZE .010"

F) PIPE DIA: ID IN. 2" OD IN. 2 5/16"

G) INSTALLED PROTECTOR PIPE W/LOCK? YES ~~OR NO~~
PROTECTOR PIPE DIA. 6.5" IN.

2) WELL DEVELOPMENT

A) METHOD

BAILING, PUMPING, SURGING, COMPRESSED AIR

OTHER —

(NOTE ADDITIONAL COMMENTS BELOW)

B) TIME SPENT FOR DEVELOPMENT? 2.5 HRS

C) APPROXIMATE WATER VOLUME: REMOVED — gal
ADDED —

D) WATER CLARITY BEFORE DEVELOPMENT?

CLEAR, TURBID, OPAQUE

E) WATER CLARITY AFTER DEVELOPMENT?

CLEAR, SLIGHTLY TURBID, TURBID, ~~OPAQUE~~ SLIGHTLY

F) ODOR? YES OR NO NTU = 2.0 (KEB 7/5/88)

3) WATER LEVEL SUMMARY

A) DEPTH FROM TOP OF CASING AFTER DEVELOPMENT?

— FT. OR DRY

B) OTHER MEASUREMENTS (T.O.C.):

DATE/TIME 2-10-88 / 2:30 (24.23') FT
DATE/TIME 2-17-88 / (24.36') FT
DATE/TIME _____ FT

ADDITIONAL COMMENTS: 46.7 BAGS OF CEMENT & 3 BAGS OF BENTONITE.
2- CENTRALIZERS

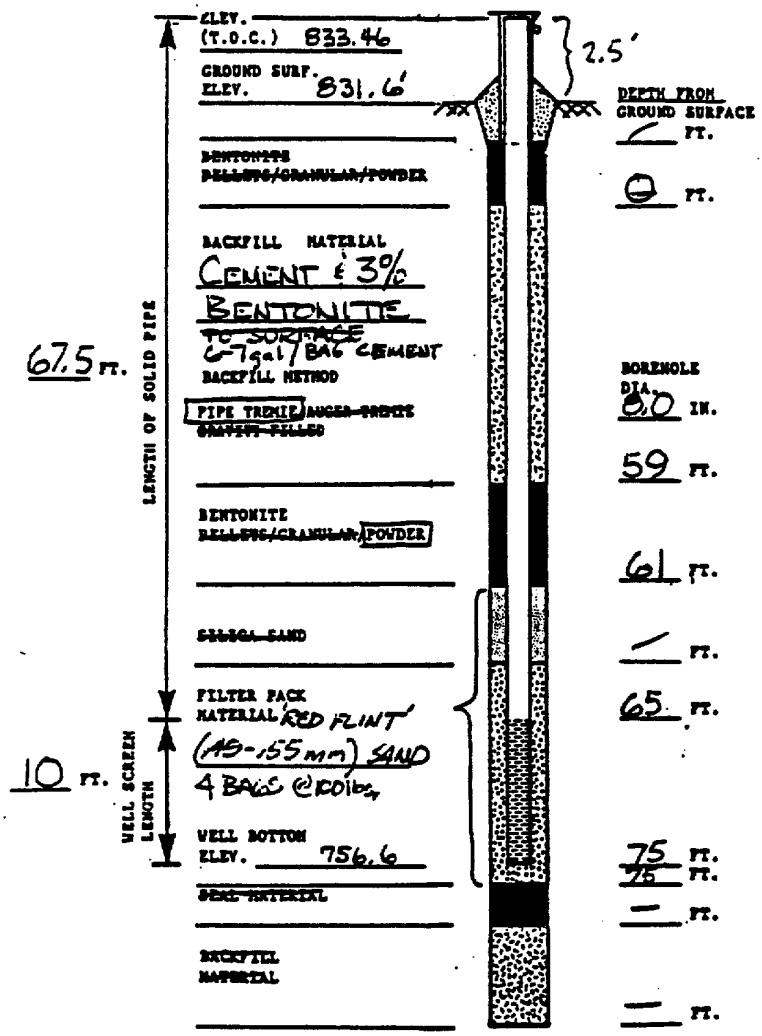
elevations checked 5/9/88 CHK

✓CAR 3/22/88

RMT

Well Diagram
F-17 (R 11-85)

PROJECT NAME: NIROP NO. 1332.32
WELL NO. MW 4-I
DATE INSTALLED 12-22-87



1) CASING DETAILS

A) TYPE OF PIPE:

~~PVC, STAINLESS, TEFLON, OTHER~~ BLACK IRON

PIPE SCHEDULE 40

B) TYPE OF PIPE JOINTS;

COUPLINGS, THREADED (W/TAPE?) → YES: TEFLON., ~~OTHER~~

C) WAS SOLVENT USED? ~~YES OR~~ NO

D) TYPE OF WELL SCREEN:

~~PVC~~, STAINLESS, ~~TEFLON, OTHER~~

E) WELL SCREEN SLOT SIZE .010"

F) PIPE DIA: ID IN. 2.0 OD IN. 2 5/16

G) INSTALLED PROTECTOR PIPE W/LOCK? YES ~~OR NO~~
PROTECTOR PIPE DIA. 6.5 IN.

2) WELL DEVELOPMENT

A) METHOD

BAILING, PUMPING, SURGING, COMPRESSED AIR

OTHER —

(NOTE ADDITIONAL COMMENTS BELOW)

B) TIME SPENT FOR DEVELOPMENT? 3 HRS

C) APPROXIMATE WATER VOLUME: REMOVED 540 gals
ADDED —

D) WATER CLARITY BEFORE DEVELOPMENT?

CLEAR, TURBID, OPAQUE

E) WATER CLARITY AFTER DEVELOPMENT?

CLEAR, SLIGHTLY TURBID, TURBID, ~~OPAQUE~~ SLIGHTLY

F) ODOR? YES OR NO NTU = 1.0 (KED 7/5/88)

3) WATER LEVEL SUMMARY

A) DEPTH FROM TOP OF CASING AFTER DEVELOPMENT?

— FT. OR DRY

B) OTHER MEASUREMENTS (T.O.C.):

DATE/TIME 2-19-88 (27.81') FT.

DATE/TIME _____ FT.

DATE/TIME _____ FT.

ADDITIONAL COMMENTS: 1.5 BAGS OF BENTONITE MIXED INTO 45 BAGS @ 6-7gal/BAG; USED ~3/ BAGS.

3 CENTRALIZERS USED ON WELL CASING.

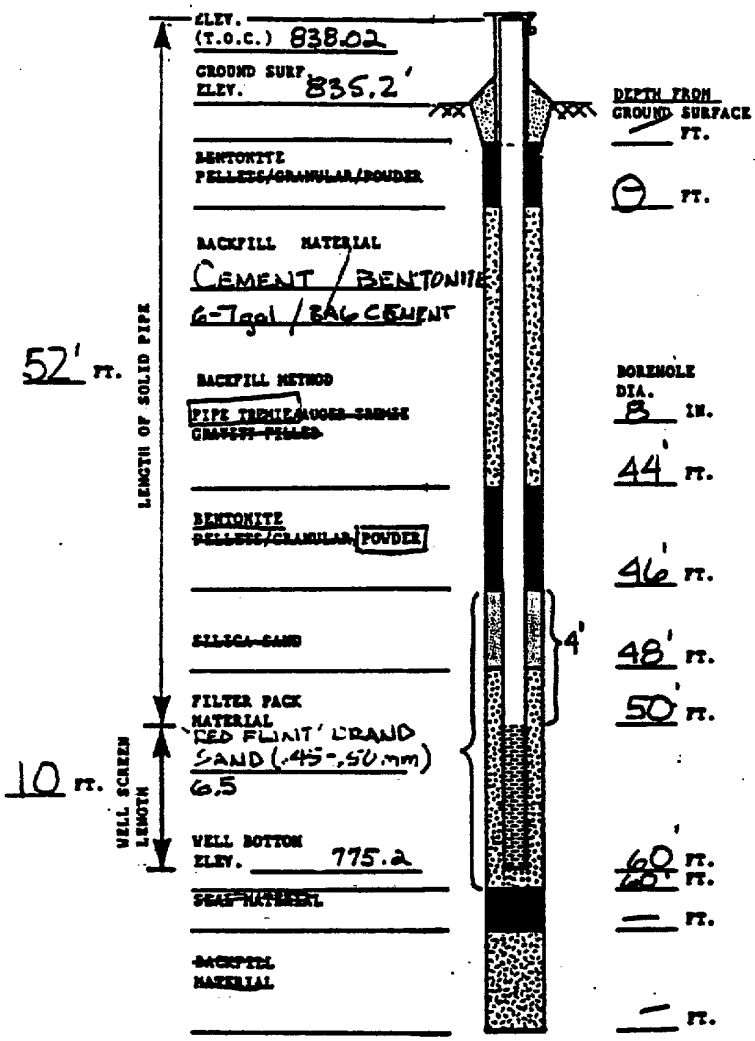
elevations checked 5/9/88 CAK

JCAK 3/22/02

RMT

Well Diagram
F-17 (R 11-85)

PROJECT NAME: NIROP NO. 1332.37
WELL NO. MW-5-T
DATE INSTALLED 12/17/87



1) CASING DETAILS

A) TYPE OF PIPE:

~~PVC, STAINLESS, TEFLON, OTHER~~ BLACK IRON

PIPE SCHEDULE 40

B) TYPE OF PIPE JOINTS: → yes : TEFLON

COUPLINGS, [THREADED (W/TAPE?)], OTHER

C) WAS SOLVENT USED? ~~YES OR~~ [NO]

D) TYPE OF WELL SCREEN:

~~PVC,~~ [STAINLESS], ~~TEFLON, OTHER~~

E) WELL SCREEN SLOT SIZE .010"

F) PIPE DIA: ID IN. 2" OD IN. 2 5/16"

G) INSTALLED PROTECTOR PIPE W/LOCK? [YES] ~~OR NO~~
PROTECTOR PIPE DIA. 6.5 IN.

2) WELL DEVELOPMENT

A) METHOD

BAILING, [PUMPING, SURGING], COMPRESSED AIR

OTHER —

(NOTE ADDITIONAL COMMENTS BELOW)

B) TIME SPENT FOR DEVELOPMENT? 3 HRS

C) APPROXIMATE WATER VOLUME: REMOVED 540 gal
ADDED —

D) WATER CLARITY BEFORE DEVELOPMENT?

CLEAR, TURBID, [OPAQUE]

E) WATER CLARITY AFTER DEVELOPMENT?

[CLEAR], SLIGHTLY TURBID, TURBID, OPAQUE

F) ODOR? YES OR [NO] NTU = 22.0 (KEB 7/5/88)

3) WATER LEVEL SUMMARY

A) DEPTH FROM TOP OF CASING AFTER DEVELOPMENT?

— FT. OR DRY

B) OTHER MEASUREMENTS (T.O.C.):

DATE/TIME 2-17-88 (25.23') FT

DATE/TIME FT

DATE/TIME FT

ADDITIONAL COMMENTS: 30 } 15 bags/yd. @ 2 yd.
~~15~~ BAGS OF CEMENT + 2 BAGS OF BENTONITE
2 CENTRALIZERS.

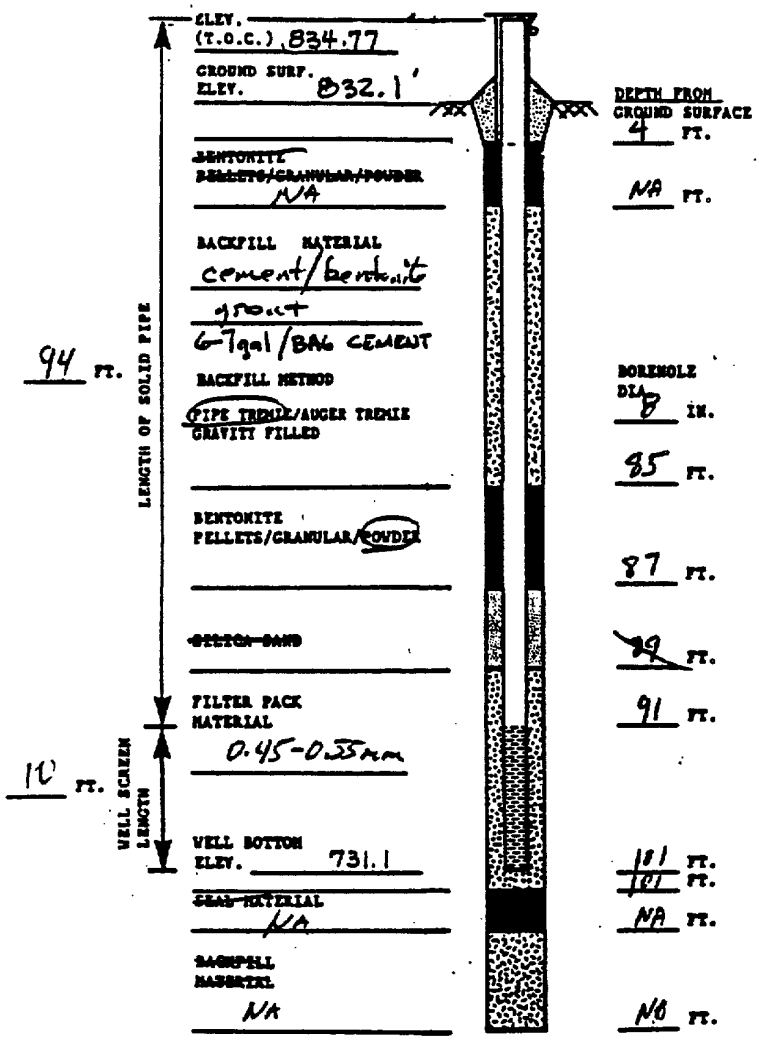
elevations checked 5/9/88 CK

VCK 3/22/88

FMT

Well Diagram
F-17 (8 11-85)

PROJECT NAME: CLE-NIROP/FINDLEY NO. 1332.32
WELL NO. UD
DATE INSTALLED 2-1-88, 2-2-88



1) CASING DETAILS

A) TYPE OF PIPE:

PVC, STAINLESS, TEFLON, OTHER Black steel

PIPE SCHEDULE 40

B) TYPE OF PIPE JOINTS:

COUPLINGS, THREADED (W/TAPE?), OTHER

C) WAS SOLVENT USED? YES OR NO

D) TYPE OF WELL SCREEN:

PVC, STAINLESS, TEFLON, OTHER

E) WELL SCREEN SLOT SIZE .010"

F) PIPE DIA: ID IN. 3.0" OD IN. 3.5"

G) INSTALLED PROTECTOR PIPE W/LOCK? YES OR NO
PROTECTOR PIPE DIA. 6 IN.

2) WELL DEVELOPMENT

A) METHOD

BAILING, PUMPING, SURGING, COMPRESSED AIR

OTHER —

(NOTE ADDITIONAL COMMENTS BELOW)

B) TIME SPENT FOR DEVELOPMENT? 2.5 HRS

C) APPROXIMATE WATER VOLUME: REMOVED 450 gal
ADDED —

D) WATER CLARITY BEFORE DEVELOPMENT?

CLEAR, TURBID, OPAQUE

E) WATER CLARITY AFTER DEVELOPMENT?

CLEAR, SLIGHTLY TURBID, TURBID, OPAQUE

F) ODOR? YES OR NO NTU = 40.0 (KEB 7/5/8

3) WATER LEVEL SUMMARY

A) DEPTH FROM TOP OF CASING AFTER DEVELOPMENT?

— FT. OR DRY

B) OTHER MEASUREMENTS (T.O.C.):

DATE/TIME 2-19-88 (21.39') FT

DATE/TIME FT

DATE/TIME FT

ADDITIONAL COMMENTS: 4 centralizers - Above screen, then 25' centers

elevations checked 5/9/88 CAK

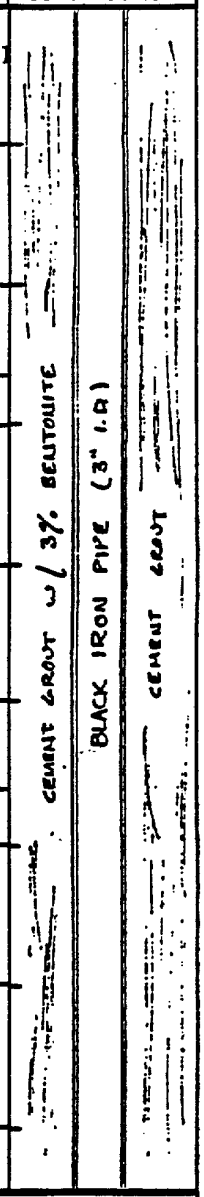
JCAK
3/22/88

LOG OF TEST BORING

BORING NO.:	10-D
SHEET	1 of 3
PROJECT:	COE-NIROP
PROJECT NO.:	1332.32
LOCATION:	Fridley, MN
SURFACE ELEVATION:	832.1'
DRILLED BY:	Layne Northwest-Milwaukee
DATE STARTED:	1-28-88
DATE COMPLETED:	2-2-88
CREW CHIEF:	Ross Goldbeck
LOGGED BY:	R. Vaughn
CHECKED BY:	BWR/9 Mar. 88

SAMPLING NOTES NO.	INTERVAL TYPE	RECOVERY BLOWS	RECOVERY %	DEPTH (ft.)	VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
1	1.5' Grab	--	--	0	Dark brown, SANDY TOP SOIL, vegetative matter, trace of fill material (brick, metal and glass).
				5	Dark brown, SAND, fine to coarse, trace fine gravel.
2	6.5' Grab	--	--		
				10	Dark brown, SAND, fine to coarse, trace fine gravel.
3	11.5' SS	--	--		
				15	Grey brown, SAND, med to coarse.
4	16.5' SS	--	--		
				20	Grey brown, SAND, med to coarse, trace of fine gravel.
5	21.5' SS	--	--		
				25	Grey brown, SAND, med to coarse, trace of fine gravel.
6	26.5' SS	--	--		
				30	Lt. grey brown, SAND, fine to med. poorhigh graded
7	31.5' SS	--	--		
				35	Lt. grey brown, SAND, fine to med. poorhigh graded
8	36.5' SS	--	--		
				40	Lt. grey brown, SAND, fine to med. poorhigh graded
9	41.5' SS	--	--		

GENERAL WELL CONSTRUCTION



NOTES	WATER LEVEL OBSERVATIONS			
DRILLING METHODS: Cable tool rig using a 300 lb split-spoon hammer and a 3" split-spoon sampler	FIRST OCCURENCE:			
	DATE/TIME			
BOREHOLE DIAMETER: 8"	DEPTH TO WATER			
DRILL RIG: Bucyrus-Erie ZOR	DEPTH TO CAVE IN			

F-204A (R 09-87)

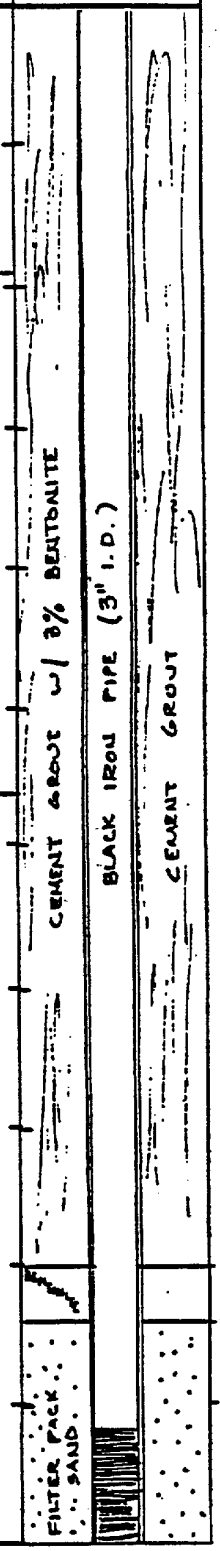
LOG OF TEST BORING

RMT

BORING NO.:	10 D
SHEET	2 of 3
PROJECT: COE-NIROP	PROJECT NO.: 1332.32
LOCATION: FRIDLEY, MN	SURFACE ELEVATION: ------

SAMPLING NOTES INTERVAL NO.	TYPE	RECOVERY BLOWS	%	DEPTH (ft.)	VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
				45	Lt. grey brown, SAND, fine to med. little silt.
10	46.5' SS	--	--		
				50	Brown, SAND, fine, some coarse sand, trace of silt. (till)
11	51.5' SS	--	--		
				55	Brown, SAND, med. some clay and gravel, trace of silt.
12	56.5' SS	--	--		
				60	Brown, SAND, med. some clay and gravel, trace of silt.
13	61.5 SS	--	--		
				65	
14	66.5' SS	--	--		
				70	Brown, sand, fine to med.
15	71.5' SS	--	--		
				75	Brown, SAND, med. to coarse trace of cobble.
16	76.5' SS	--	--		
				80	Brown, SAND, med. to coarse, trace of silt. *
17	91.5' SS	--	--		
				85	Brown, SAND, coarse.
18	86.5' SS	--	--		
				90	Dark brown, SAND, med to coarse trace of fine to coarse gravel, and little silt **
19	91.5' SS	--	--		

GENERAL WELL CONSTRUCTION



F-2048 (R 09-87)

LOG OF TEST BORING

BORING NO.:	10-D
SHEET	3 of 3
PROJECT:	COE-NIROP
PROJECT NO.:	1332.32
LOCATION:	FRIDLEY, MN
SURFACE ELEVATION:	-----

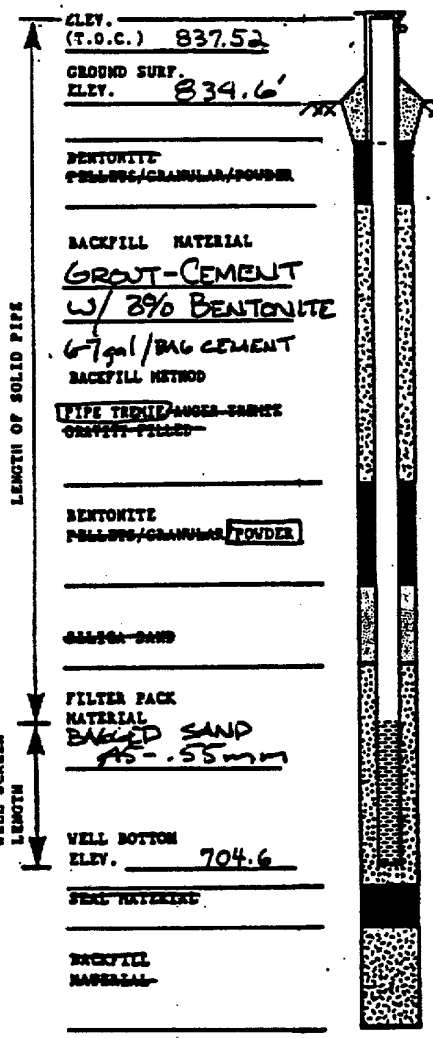
SAMPLING NOTES INTERVAL NO.	TYPE	RECOVERY BLOWS	%	DEPTH (ft.)	VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCTION
				95	Dark brown, SAND, med to coarse trace of fine gravel.	FILTER PACK SAND
20	96.5 SS	--	--			
				100	Lt. brown, SAND, med. to coarse, trace of sandstone fragments (St. Peter Sandstone)	
21	101.5 SS	--	--			
					EOB at 101'	
					*Top half of split-spoon sample contained a petroleum-like odor after allowing the sample to warm in the office.	
					**Same odor as above noted in the bottom half of split-spoon sample.	

F-204B (R 09-87)

RMT

Well Diagram
F-17 (R 11-85)

PROJECT NAME: COE-NIROP NO. 1332.32
WELL NO. 11 D
DATE INSTALLED 2-10-88



1) CASING DETAILS

A) TYPE OF PIPE:

~~PVC, STAINLESS, TEFLON, OTHER~~ BLACK IRON

PIPE SCHEDULE 40

B) TYPE OF PIPE JOINTS;

COUPLINGS ~~THREADED (W/TAPE?), OTHER~~

C) WAS SOLVENT USED? ~~YES OR~~ NO

D) TYPE OF WELL SCREEN:

~~PVC~~, STAINLESS, ~~TEFLON, OTHER~~

E) WELL SCREEN SLOT SIZE .010"

F) PIPE DIA: ID IN. 3.0 OD IN. 3.5"

G) INSTALLED PROTECTOR PIPE W/LOCK? YES ~~OR NO~~
PROTECTOR PIPE DIA. 6 IN.

2) WELL DEVELOPMENT

A) METHOD

BAILING, PUMPING, SURGING, COMPRESSED AIR

OTHER —

(NOTE ADDITIONAL COMMENTS BELOW)

B) TIME SPENT FOR DEVELOPMENT? 20 HRS

C) APPROXIMATE WATER VOLUME: REMOVED 360 HRS
ADDED —

D) WATER CLARITY BEFORE DEVELOPMENT?

CLEAR, TURBID, OPAQUE

E) WATER CLARITY AFTER DEVELOPMENT?

CLEAR, SLIGHTLY TURBID, TURBID, ~~OPAQUE~~ SLIGHTLY

F) ODOR? YES OR NO NTU = 23.0 (KEB 7/5/88)

3) WATER LEVEL SUMMARY

A) DEPTH FROM TOP OF CASING AFTER DEVELOPMENT?

— FT. OR DRY

B) OTHER MEASUREMENTS (T.O.C.):

DATE/TIME 2-17-88 (24.32') FT

DATE/TIME _____ FT

DATE/TIME _____ FT

ADDITIONAL COMMENTS: 5 CENTRALIZERS WERE INSTALLED

elevations checked 5/9/88 CAK

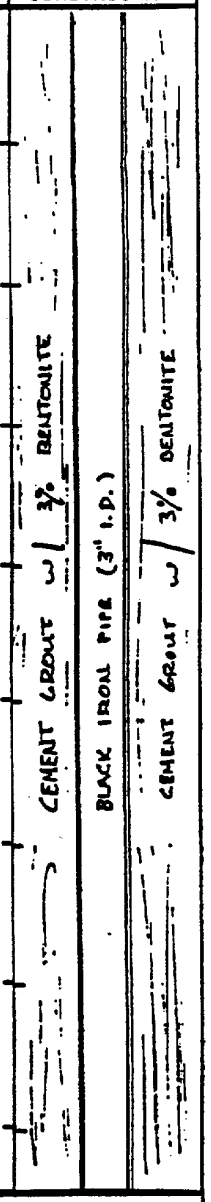
VCAK 3/22/88

LOG OF TEST BORING

BORING NO.:	11-D
SHEET	1 of 3
PROJECT:	COE-NIROP
PROJECT NO.:	1332.32
LOCATION:	FRIDLEY, MN
SURFACE ELEVATION:	834.6'
DRILLED BY:	Layne Northwest-Milwaukee
DATE STARTED:	2-3-88
DATE COMPLETED:	2-10-88
CREW CHIEF:	Ross Goldbeck
LOGGED BY:	Ron Vaughn
CHECKED BY:	BWR/ 4 mar 88

SAMPLING NOTES NO.	INTERVAL TYPE	RECOVERY BLOWS	RECOVERY %	DEPTH (ft.)	VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
1	2' Grab	--	--	0'	Dk. Brown, SILT, trace of fill material (top soil).
				5'	Dark brown, SANDY SILT
2	Grab	--	--		
				10'	Dk. brown, SILTY SAND, med. to coarse, some coarse gravel, dense trace, clay
3	11.2' SS	200 / 1.2'	85		
				15'	Brown, SILTY SAND, coarse, trace of fine gravel, dense
4	15.8' SS	200 / .8'	50		
				20'	Brown, SILTY SAND, trace of fine gravel very dense.
5	20.9' SS	200 / .9'	100		
				25'	Brown, SILTY SAND, med.
6	25.9' SS	100 / .9	90		
				30'	Brown, SILTY SAND, med.
7	31.5' SS	50 / 1.5'	90		
				35'	Brown, SILTY SAND, med., med. dense.
8	36' SS	150 / 1.0'	100		
				40'	

GENERAL WELL CONSTRUCTION



NOTES	WATER LEVEL OBSERVATIONS			
DRILLING METHODS: Cable tool using a 3' split-spoon sampler w/a 300 lb. hammer	FIRST OCCURENCE:			
	DATE/TIME			
BOREHOLE DIAMETER: 8"	DEPTH TO WATER			
DRILL RIG: Bucyrus-Erie 20R	DEPTH TO CAVE IN			

F-204A (R 09-87)

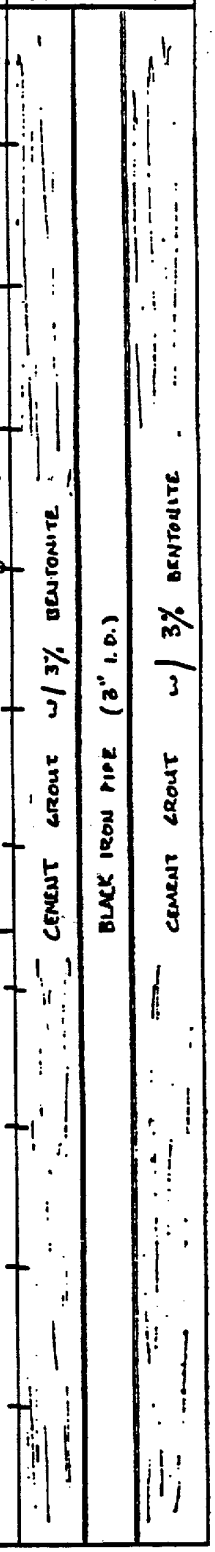
LOG OF TEST BORING

RMT

BORING NO.:	11-D
SHEET	2 of 3
PROJECT:	COE-NIROP
PROJECT NO.:	1332.32
LOCATION:	FRIDLEY, MN
SURFACE ELEVATION:	-----

SAMPLING NOTES INTERVAL NO.	TYPE	RECOVERY BLOWS	%	DEPTH (ft.)	VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
9	41' SS	100/1'	100	40	Grey Brown, SAND, fine to coarse, trace of silt, trace of fine gravel, med. dense
10	46' SS	110/1'	80	45	Grey Brown, SAND, fine to coarse, med. dense.
11	51' SS	125/1'	100	50	Grey Brown, SAND, med. to coarse, trace of silt, med. dense.
12	56' SS	105/1'	100	55	Grey Brown, SAND, med. to coarse, trace of fine gravel, trace of silt med. dense.
13	60.9 SS	150	80	60	Grey Brown, GRAVELLY SAND, med. to coarse some fine gravel, poorly sorted, dense.
14	66' SS	55/1'	75	65	Grey Brown, SAND, med. to coarse, fine gravel, low dense, little.
15	71' SS	20/1'	50	70	Grey Brown, SAND, med. to coarse, trace of fine gravel, soft.
16	76' SS	75/1'	75	75	Brown, SAND, med., med. dense.
17	81' SS	100/1'	100	80	Brown, SAND, med., well sorted.
18	86.5 SS	25/1.5'	100	85	Brown, SAND, fine, low dense.
19	90.9 SS	145/.9'	90	90	Brown, SAND, med, dense.

GENERAL WELL CONSTRUCTION



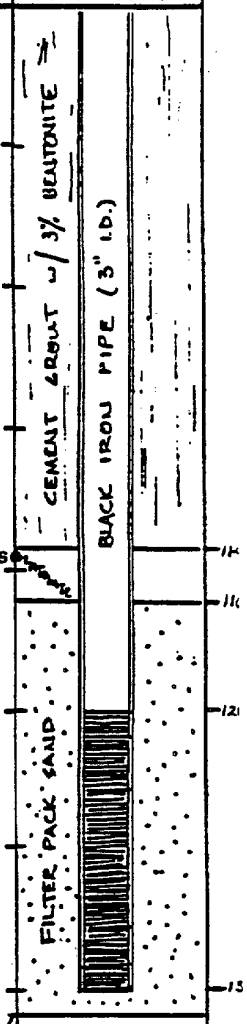
F-204B (R 09-87)

LOG OF TEST BORING

BORING NO.: 11-D	
SHEET: 3 of 3	
PROJECT: COE-NIROP	PROJECT NO.: 1332.32
LOCATION: FRIDLEY, MN	SURFACE ELEVATION: ------

SAMPLING NOTES NO.	INTERVAL TYPE	RECOVERY BLOWS	RECOVERY %	DEPTH (ft.)	VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
20	95.9 SS	140 / .9'	80	95'	Brown, SAND, med. to coarse, dense.
				100'	
21	101' SS	160 / 1'	80		Brown, SAND, med. to coarse, dense.
				105'	
22	106' SS	109 / 1'	90		Brown, SAND, med., dense.
				110'	
23	SS	105 / 1'	80		Brown, SAND, med. trace fine gravel dense.
				115'	Brown, SAND, med. trace fine gravel, dense
24	116.5 SS	135 / 1.5'	80		
				120'	
25	121.4 SS	120 / 1.4'	80		Brown, SAND, med. trace fine gravel dense.
				125'	Brown, silty SAND, fine to med.
26	126' SS	105 / 1'	90		
				130'	Brown, SAND, med. to coarse, some fragments of sandstone (St. Peter Sandstone)
27	130.9' SS	130 / .9	90	135'	
					EOB at 130.9'

GENERAL WELL CONSTRUCTION

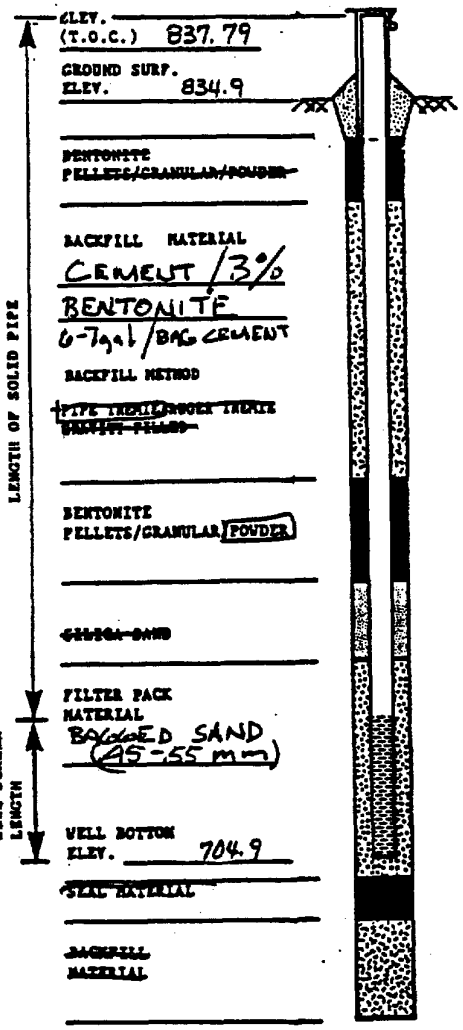


F-2048 (R 09-87)

RMT

Well Diagram
F-17 (R 11-85)

PROJECT NAME: COE-NIROP NO. 1332.32
WELL NO. 12-D
DATE INSTALLED 1/22/88



1) CASING DETAILS

A) TYPE OF PIPE:

~~PVC, STAINLESS, TEFLON~~, OTHER BLACK IRON

PIPE SCHEDULE 40

B) TYPE OF PIPE JOINTS: YES; TEFLON

COUPLINGS, THREADED (W/TAPE?), OTHER

C) WAS SOLVENT USED? ~~YES OR~~ NO

D) TYPE OF WELL SCREEN:

~~PVC~~, STAINLESS, ~~TEFLON, OTHER~~

E) WELL SCREEN SLOT SIZE .010"

F) PIPE DIA: ID IN. 3 OD IN. 3½

G) INSTALLED PROTECTOR PIPE W/LOCK? YES OR NO

PROTECTOR PIPE DIA. 6 IN.

2) WELL DEVELOPMENT

A) METHOD

BAILING, PUMPING, SURGING, COMPRESSED AIR

OTHER —

(NOTE ADDITIONAL COMMENTS BELOW)

B) TIME SPENT FOR DEVELOPMENT? 2 HRS

C) APPROXIMATE WATER VOLUME: REMOVED ~~240~~ 360 gal

ADDED —

D) WATER CLARITY BEFORE DEVELOPMENT?

CLEAR, TURBID, OPAQUE

E) WATER CLARITY AFTER DEVELOPMENT?

CLEAR, SLIGHTLY TURBID, TURBID, ~~SLIGHTLY OPAQUE~~

F) ODOR? YES OR NO NTU = 2760 (RCG 7/5/88)

3) WATER LEVEL SUMMARY

A) DEPTH FROM TOP OF CASING AFTER DEVELOPMENT?

— FT. OR DRY

B) OTHER MEASUREMENTS (T.O.C.):

DATE/TIME 2-19-88 (29.48') FT

DATE/TIME FT

DATE/TIME FT

ADDITIONAL COMMENTS: 5 CENTRALIZERS WERE INSTALLED.

elevations checked 5/9/88 CAK

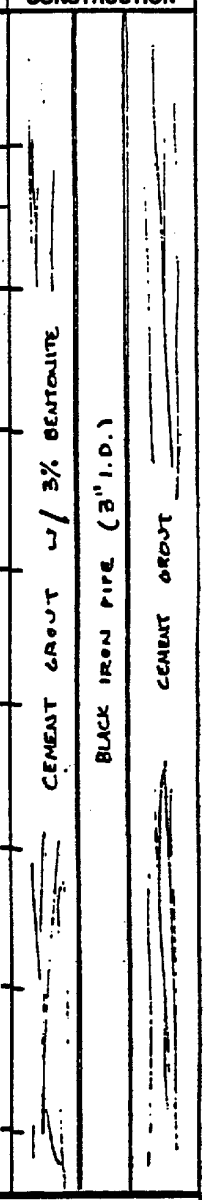
VCAK 3/22/

LOG OF TEST BORING

BORING NO.:	12-D
SHEET	1 of 3
PROJECT:	COE-NIROP
PROJECT NO.:	1332.32
LOCATION:	FRIDLEY, MN
SURFACE ELEVATION:	834.9'
DRILLED BY:	Layne Northwest-Milwaukee
DATE STARTED:	1-18-88
DATE COMPLETED:	1-22-88
CREW CHIEF:	Ross Goldbeck
LOGGED BY:	R. Vaughn
CHECKED BY:	BWR/ 9 mar 88

SAMPLING NOTES INTERVAL NO.	TYPE	RECOVERY BLOWS	%	DEPTH (ft.)	VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
					Brown, SILTY TOPSOIL, trace fill material (brick, glass)
				5	Light brown, SAND, fine to med. trace of clay and silt
1	6.5' Grab	--	--		
				10	Light brown, SAND, med to coarse, trace of fine gravel.
2	11.5' Grab	--	--		
				15	Light brown, SAND, med to coarse, trace of fine gravel.
3	16.5' SS	--	--		
				20	Light grey brown, SILTY SAND, fine
4	21.5' SS	--	--		
				25	Brown, SAND, med. to coarse, trace of fine gravel.
5	26.5' SS	--	--		
				30	[0% recovery after 3 attempts]
6	SS	--	--		
				35	Brown, SAND, med. to coarse, trace of fine gravel
7	36.5' SS	--	--		
				40	

GENERAL WELL CONSTRUCTION



NOTES	WATER LEVEL OBSERVATIONS			
DRILLING METHODS: Cable tool rig using a 300 lb hammer with a 3" split-spoon sampler.	FIRST OCCURENCE:			
	DATE/TIME			
BOREHOLE DIAMETER: 8"	DEPTH TO WATER			
DRILL RIG: Bucyrus-Erie ZOR	DEPTH TO CAVE IN			

F-204A (R 09-87)

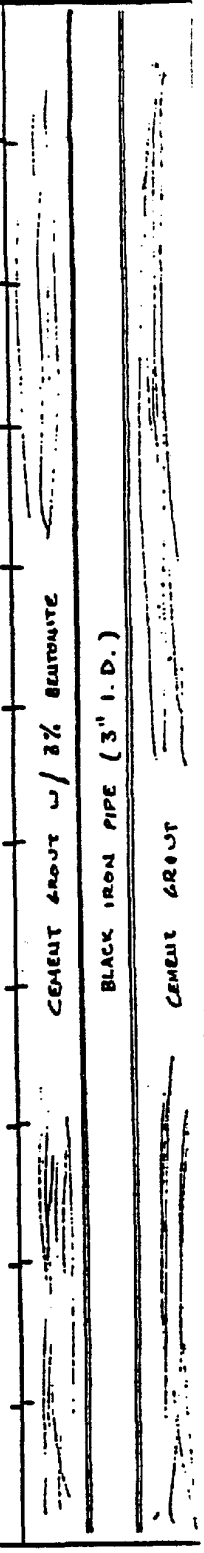
LOG OF TEST BORING

RMT

BORING NO.:	12-D
SHEET	2 of 3
PROJECT: COE-NIROP	PROJECT NO.: 1332.32
LOCATION: FRIDLEY, MN	SURFACE ELEVATION: ----

SAMPLING NOTES NO.	INTERVAL TYPE	RECOVERY BLOWS	RECOVERY %	DEPTH (ft.)	VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
8	41.5 SS	--	--	40'	Brown, SAND, med. to coarse, trace of fine gravel.
9	46.5 SS	--	--	45'	Brown, SAND, fine to coarse trace of fine gravel.
10	51.5 SS	--	--	50'	Brown, SAND, fine to med. trace of fine gravel.
11	56.5 SS	--	--	55'	Brown, SAND, fine to coarse, little fine gravel.
12	61.5 SS	--	--	60'	Brown, SAND, coarse, little fine gravel.
13	66.5 SS	--	--	65'	Brown, SAND, med. to coarse, little fine gravel.
14	71.5 SS	--	--	70'	Brown, SAND, med. to coarse, little fine gravel.
15	76.5 SS	--	--	75'	Brown, SAND, med. to coarse, trace of fine gravel.
16	81.5 SS	--	--	80'	Brown, SAND, Fine to med.
17	86.5 SS	--	--	85'	Brown, SAND, coarse, trace fine gravel.
18	91.5 SS	--	--	90'	Brown, SAND, coarse trace fine gravel.

GENERAL WELL CONSTRUCTION



F-204B (R 09-87)

LOG OF TEST BORING

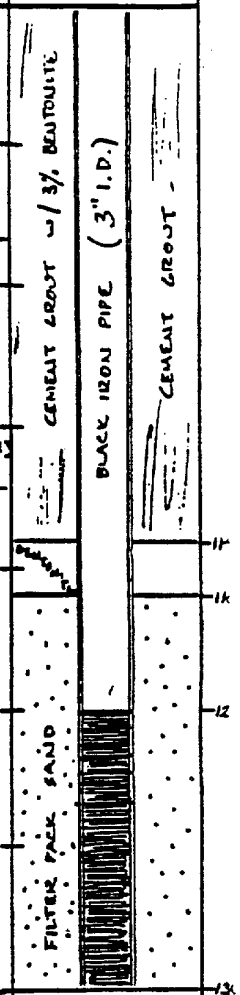
RMT

BORING NO.: 12-L	
SHEET 3 of 3	
PROJECT: COE-NIROP	PROJECT NO.: 1332.32
LOCATION: FRIDLEY, MN	SURFACE ELEVATION: -----

SAMPLING NOTES NO.	INTERVAL TYPE	RECOVERY BLOWS	RECOVERY %	DEPTH (ft.)	VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
19	96.5 SS	--	--	95'	Brown, SAND, med. to coarse, and coarse gravel.
20	101.5 SS	--	--	100	Dark Brown, SAND, fine to coarse trace fine gravel.
21	106.5 SS	--	--	105	Brown, silty SAND, fine to med., coarse sand, trace fine gravel little, trace clay
22	111.5 SS	--	--	110	Brown, silty SAND, fine to med., coarse sand, trace fine gravel little, trace clay
23	116.5 SS	--	--	115	Brown, SAND, fine to coarse.
24	121.5 SS	--	--	120	Brown SAND, fine to coarse trace fine gravel.
25	126.5 SS	--	--	125	Brown, SAND, med. to coarse, trace fine gravel.
26	131.5 SS	--	--	130	Brown, SAND, med. to coarse.

EOB at 130'

GENERAL WELL CONSTRUCTION

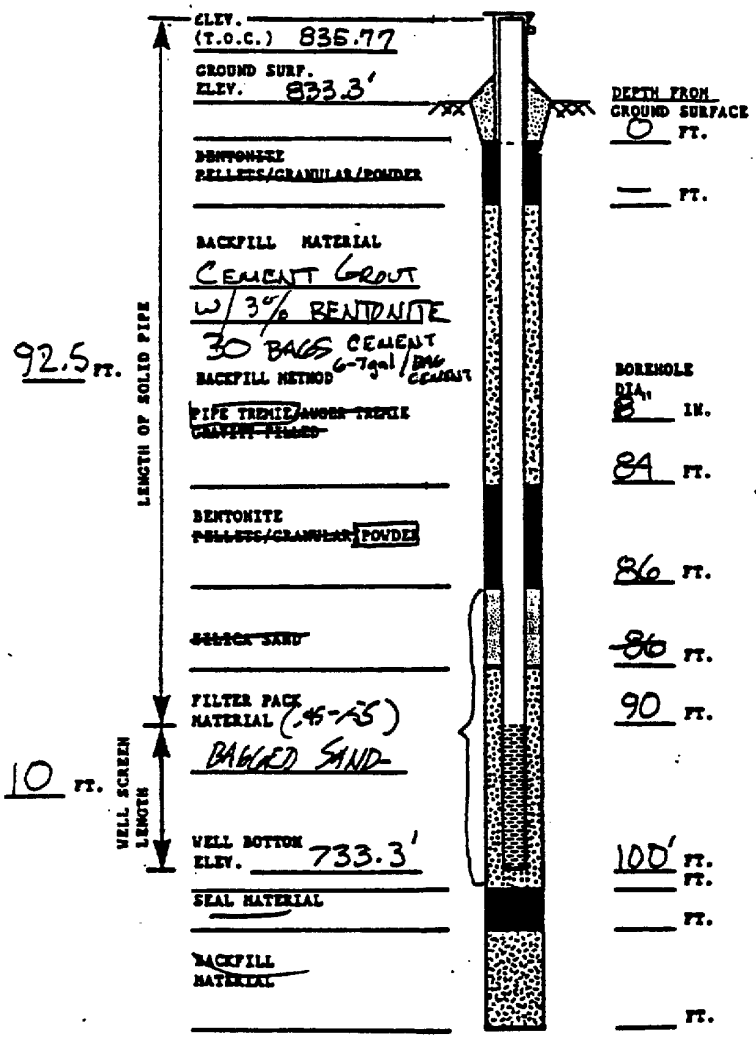


F-204B (R 09-87)

FMT

Well Diagram
F-17 (R 11-85)

PROJECT NAME: COE-NIROP NO. ~~13-D~~ 13SC.SC
WELL NO. 13-D
DATE INSTALLED 2-8-88



1) CASING DETAILS

A) TYPE OF PIPE:

PVC, STAINLESS, TEFLON, OTHER BLACK IRON

PIPE SCHEDULE 40

B) TYPE OF PIPE JOINTS:

~~COUPLINGS~~, THREADED (Y/~~NO~~), ~~OTHER~~ NO

C) WAS SOLVENT USED? YES OR NO

D) TYPE OF WELL SCREEN:

~~PVC~~, STAINLESS, ~~TEFLON, OTHER~~

E) WELL SCREEN SLOT SIZE .010"

F) PIPE DIA: ID IN. 3" OD IN. 3½"

G) INSTALLED PROTECTOR PIPE W/LOCK? YES OR NO

PROTECTOR PIPE DIA. 6" IN.

2) WELL DEVELOPMENT

A) METHOD

BAILING, PUMPING, SURGING, COMPRESSED AIR

OTHER —

(NOTE ADDITIONAL COMMENTS BELOW)

B) TIME SPENT FOR DEVELOPMENT? 2.0 HRS

C) APPROXIMATE WATER VOLUME: REMOVED 360 gal.

ADDED —

D) WATER CLARITY BEFORE DEVELOPMENT?

CLEAR, TURBID, OPAQUE

E) WATER CLARITY AFTER DEVELOPMENT?

CLEAR, SLIGHTLY TURBID, TURBID, ~~OPAQUE~~ SLIGHTLY

F) ODOR? YES OR NO NTU = 6.0 (KEB 7/5/88)

3) WATER LEVEL SUMMARY

A) DEPTH FROM TOP OF CASING AFTER DEVELOPMENT?

— FT. OR DRY

B) OTHER MEASUREMENTS (T.O.C.):

DATE/TIME 2-19-88 (22.57') FT

DATE/TIME _____ FT

DATE/TIME _____ FT

ADDITIONAL COMMENTS: 4 CENTRALIZERS

30 BAGS OF CEMENT @ 6-7 gal/bag

elevations checked 5/9/88 CAK

VCAK 3/22/88

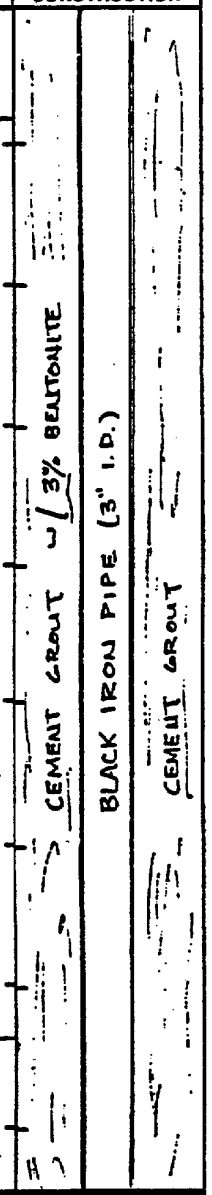
LOG OF TEST BORING

RMT INC

BORING NO.: 13-D	
SHEET 1 of 3	
PROJECT: COE-NIROP	PROJECT NO.: 1332.32
LOCATION: Fridley, MN	SURFACE ELEVATION: 833.3'
DRILLED BY: Layne Northwest - Milwaukee	DATE STARTED: 1-29-88 / DATE COMPLETED: 2-8-88
CREW CHIEF: Dick Hornburg	LOGGED BY: Ron Vaughn / CHECKED BY: BWR/3-4-88

SAMPLING NOTES: INTERVAL NO.	INTERVAL TYPE	RECOVERY BLOWS	RECOVERY %	DEPTH (ft.)	VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
1	Grab	* -	-		Black, SILTY SANDY CLAY, and fill materials, soft
				5'	
2	Grab	-	-		Light brown sand, fine to med.
				10'	
3	SS	35	80		Light brown SAND, fine to med.
				15'	
4	16.3' SS	38	95		Light brown, SAND, little fine gravel
				20'	
5	21.5' SS	82	95		Brown, SAND, med to coarse, some coarse gravel
				25'	
6	26.5' SS	88	60		Brown SAND, med to coarse, some coarse gravel
				30'	
7	31.5' SS	85	80		Grey brown, sand, fine to med. trace of fine gravel
				35'	
8	36.5' SS	83	90		Light brown, SAND, med to coarse. (Trace fine gravel @37')
				40'	
9	41.5' SS	100/.8'	100		Dark grey, CLAYEY SILT, dense

GENERAL WELL CONSTRUCTION



NOTES	WATER LEVEL OBSERVATIONS			
DRILLING METHODS: Cable tool w/Split Spoon (S.S.) Sampler *300lb. Hammer and 3" Split Spoon	FIRST OCCURENCE:			
	DATE/TIME			
BOREHOLE DIAMETER: 8"	DEPTH TO WATER			
DRILL RIG: BUCYRUS-ERIE 22R	DEPTH TO CAVE IN			

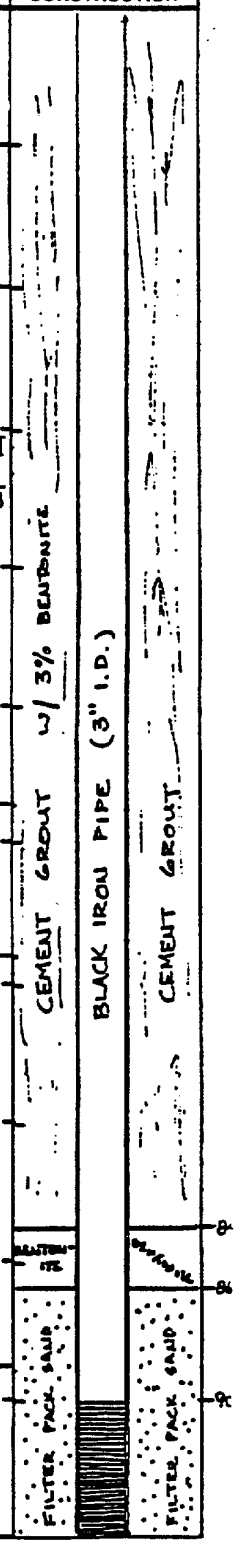
F-204A (R 09-87)

LOG OF TEST BORING

BORING NO.: 13-D	
SHEET 2 of 3	
PROJECT: COE-NIROP	PROJECT NO.: 1332.32
LOCATION: Fridley, MN	SURFACE ELEVATION: ----

SAMPLING NOTES INTERVAL NO.	TYPE	RECOVERY BLOWS	%	DEPTH (ft.)	VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
-	-	-	-	40	See page 1 @44'
				45'	
10	46.5' SS	100/ .6'	100		Brown CLAYEY SILTY SAND, little coarse gravel, dense
				50'	
11	51.5' SS	200/ .5'	100		Brown SILTY CLAY, trace coarse sand, trace fine gravel @55.5'
				55'	
12	56.5' SS	200/ 1.5'	80		Dark grey, SANDY SILT, little fine sand uniform Brown SAND, little clay @56.3
				60'	
13	61.5' SS	190/ 1.5'	90		Brown, SAND, fine
				65'	
14	66.6' SS	180/ 1.6'	80		Brown SAND, fine to med. @68.5
				70'	
15	71.5' SS	180/ 1'	80		Brown SAND, med to coarse, trace fine gravel, trace of cobbles @74'
				75'	
16	76.5' SS	200/ 1.5	80		Brown, SAND, med to coarse
				80'	
17	81.5 SS	215/ 1.5'	80		Brown, SAND, med to coarse
				85'	
18	86.5' SS	190/ 1.5'	70		Brown, SAND, fine to coarse Trace fine gravel. @89'
				90'	
19	91.5' SS	202/ .3'	50		Brown, GRAVELLY SAND, little cobbles, trace sandstone fragments
				95'	

GENERAL WELL CONSTRUCTION



F-204B (R 09-87)

LOG OF TEST BORING

BORING NO.: 13-D	
SHEET 3 of 3	
PROJECT: COE-NIROP	PROJECT NO.: 1332.32
LOCATION: Fridley, MN	SURFACE ELEVATION: ____

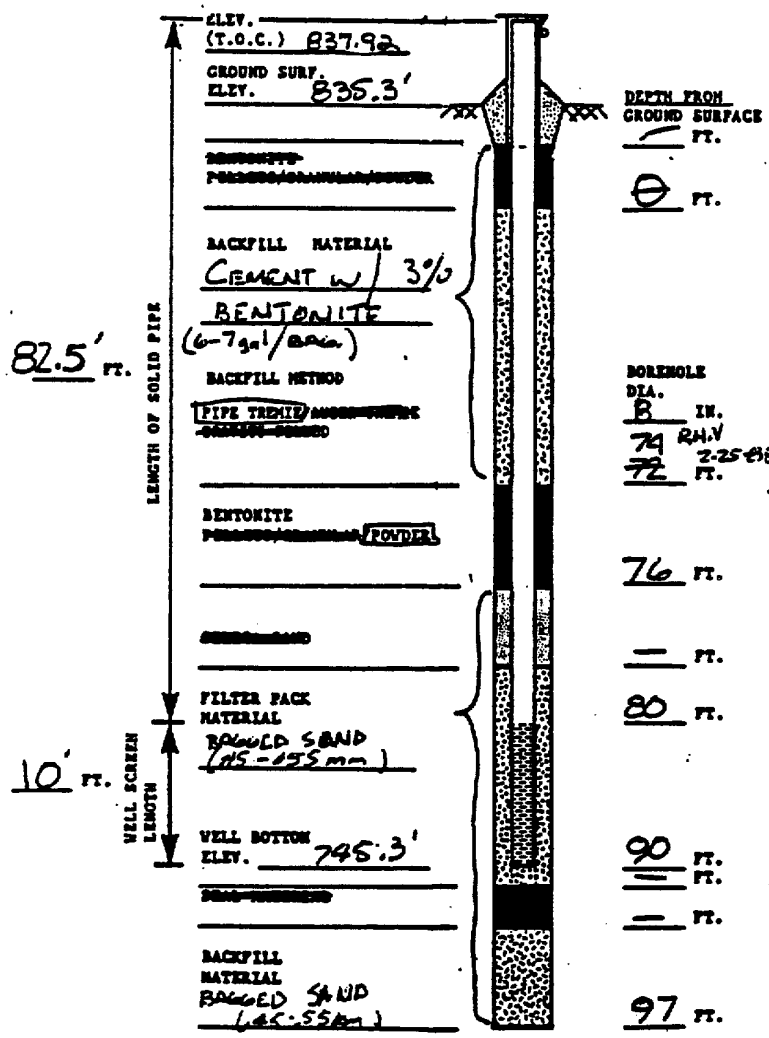
SAMPLING NOTES INTERVAL NO.	TYPE	RECOVERY BLOWS	%	DEPTH (ft.)	VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCTION
				95'		
20	96.5' SS	204/ .8'	40		Brown, GRAVELLY SAND, little cobbles, trace of fragmented sandstone.	FILTER PACK SAND
				100'		100
21	Grab	-	-		Yellow brown, SANDSTONE, soft, well sorted, fine to med., trace med sand. (St. Peter Sandstone)	101
				105'		
					E.O.B. 101'	

F-204B (R 09-87)

FMT

Well Diagram
F-17 (R 11-85)

PROJECT NAME: COE-NIKOF (RIDLEY) NO. 1332.32
WELL NO. 14-D
DATE INSTALLED 1-20-88



1) CASING DETAILS

A) TYPE OF PIPE:

~~PVC, STAINLESS, TEFLON,~~ OTHER BLACK IRON

PIPE SCHEDULE 40

B) TYPE OF PIPE JOINTS;

COUPLINGS, THREADED (W/TAPE?), OTHER YES - TEFLON

C) WAS SOLVENT USED? YES OR NO

D) TYPE OF WELL SCREEN:

~~PVC~~, STAINLESS ~~TEFLON, OTHER~~

E) WELL SCREEN SLOT SIZE .010"

F) PIPE DIA: ID IN. 3 OD IN. 3.5

G) INSTALLED PROTECTOR PIPE W/LOCK? YES OR NO

PROTECTOR PIPE DIA. 6 IN.

2) WELL DEVELOPMENT

A) METHOD

BAILING, PUMPING, SURGING, COMPRESSED AIR

~~OTHER~~ —

(NOTE ADDITIONAL COMMENTS BELOW)

B) TIME SPENT FOR DEVELOPMENT? 2.5 HRS.

C) APPROXIMATE WATER VOLUME: REMOVED 450 gal

ADDED —

D) WATER CLARITY BEFORE DEVELOPMENT?

CLEAR, TURBID, OPAQUE

E) WATER CLARITY AFTER DEVELOPMENT?

CLEAR, SLIGHTLY TURBID, TURBID, OPAQUE SLIGHTLY

F) ODOR? YES OR NO NTU = 2.9 (KED 7/5/88)

3) WATER LEVEL SUMMARY

A) DEPTH FROM TOP OF CASING AFTER DEVELOPMENT?

— FT. OR DRY

B) OTHER MEASUREMENTS (T.O.C.):

DATE/TIME 2-19-88 (25.19') FT

DATE/TIME _____ FT

DATE/TIME _____ FT

ADDITIONAL COMMENTS: 4 CENTRALIZERS INSTALLED.

elevation checked 5/9/88 CAK

VCAK 3/22/

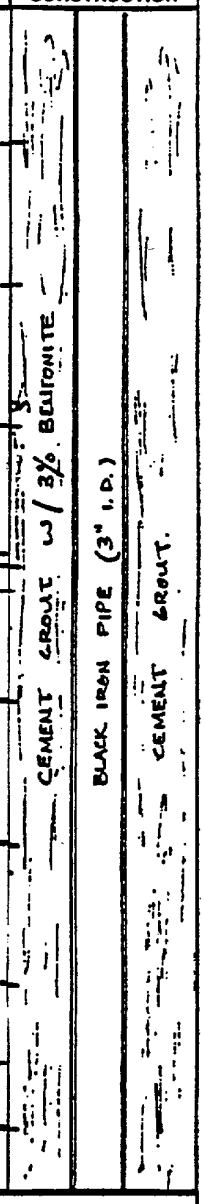
LOG OF TEST BORING

RMT INC

BORING NO.:	14-D
SHEET	1 of 2
PROJECT: COE-NIROP	PROJECT NO.: 1332.32
LOCATION: FRIDLEY, MN	SURFACE ELEVATION: 835.3'
DRILLED BY: Layne-Northwest-Milwaukee	DATE STARTED: 1-11-88 / DATE COMPLETED: 1-20-88
CREW CHIEF: Dick Hornburg	LOGGED BY: Ron Vaughn / CHECKED BY: BWR/ 4 Mar 88

SAMPLING NOTES INTERVAL NO.	TYPE	RECOVERY BLOWS	%	DEPTH (ft.)	VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
--	--	--	--	0	(No samples collected 0' - 30', see log for 9S and 5I)
1	31.5' SS	--	80	30	Brown, SAND, fine
2	36.5' SS	--	70	35	Brown, SAND, fine
3	41.5' SS	--	--	40	Brown, SAND, fine to coarse, little fine gravel
4	46.5' SS	--	80	45	Brown, GRAVELLY SAND, fine to coarse, Brown, CLAYEY SAND, fine sand, uniform
				50	At 50' Drilling methods changed from hollow stem augers to cable-tool rig.
5	SS	--	40	50	Dark red brown, CLAYEY SAND, fine sand, Brown, GRAVELLY SAND, fine to coarse, trace of cobbles.
6	55.5' SS		10	55	Ban, SAND, fine to coarse, trace fine gravel — Change to hard drilling at 56.8'
				60	

GENERAL WELL CONSTRUCTION



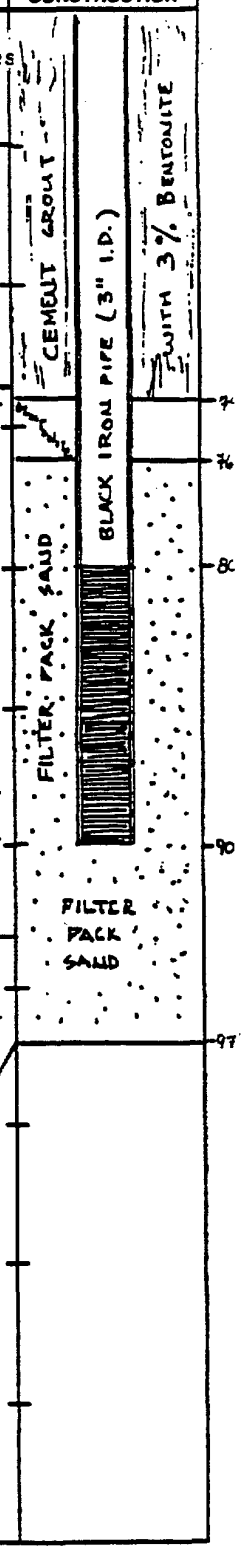
NOTES	WATER LEVEL OBSERVATIONS			
DRILLING METHODS: Hollow stem augers to 50' cable tool after 50': w/ 3" split-spoon sampler using a 300lb hammer.	FIRST OCCURENCE:			
	DATE/TIME			
BOREHOLE DIAMETER: 8"	DEPTH TO WATER			
DRILL RIG: Bucyrus-Erie 22R	DEPTH TO CAVE IN			

F-204A (R 09-87)

RMT	LOG OF TEST BORING	BORING NO.: 14-D
		SHEET 2 of 2
PROJECT: COE-NIROP		PROJECT NO.: 1332.32
LOCATION: FRIDLEY, MN		SURFACE ELEVATION: ----

SAMPLING NOTES INTERVAL NO.	TYPE	RECOVERY BLOWS	%	DEPTH (ft.)	VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
7	60.3 SS	--	100	60	Brown, SAND, fine to coarse sand, trace silty gravel, track of clay, trace cobbles (till). (Very hard to drill in.)
8	65.5 SS	200/.5'	100	65	Brown, Silty SAND, fine to coarse, trace coarse gravel (till)
9	SS	--	100	70	Brown, silty SAND, fine to coarse, trace coarse gravel, trace cobbles (till) @73.5'
10	76.4 SS	200/1.4'	100	75	Red brown, SAND, fine to med., trace of fine gravel.
11	81.2 SS	200/1.2'	100	80	Red brown, SAND, fine to med., trace of fine gravel. Yellow brown, SAND, fine.
12	86.5 SS	196/1.4'	50	85	Redish brown, SAND, fine at 88' Gravelly SAND at 90'
13	90.7 SS	200/.7'	60	90	Red brown, SAND med. to coarse, some clay, some gravel. at 93'
14	95.5 SS	200/.5'	70	95	Brown, SAND, fine to coarse, some gravel
				100	EOB 97'

GENERAL WELL CONSTRUCTION



F-204B (R 09-87)

Well Diagram

PROJECT NAME: COE.-NIROP NO. 1332.32
WELL NO. 5-PC
DATE INSTALLED 1/14/88

1.) CASING DETAILS
A.) Type of pipe: BLACK IRON PIPE
pipe schedule 8" DIA : 30
4" DIA : 40

B) Type of pipe joints welded.

c) was solvent used? NO

d) Type of well screen: open borehole.

E) PIPE DIA: EXTERNAL: 8" ID.
INTERNAL: 4" ID.

F.) EXTERNAL 8" Pipe used as protective pipe w/LOCK.

2) WELL DEVELOPMENT

A) METHOD

BAILING, [PUMPING], SURGING, COMPRESSED AIR

OTHER _____

(NOTE ADDITIONAL COMMENTS BELOW)

B) TIME SPENT FOR DEVELOPMENT? 5 HRS.

C) APPROXIMATE WATER VOLUME: REMOVED 900 gals.

ADDED —

D) WATER CLARITY BEFORE DEVELOPMENT?

CLEAR, [TURBID], OPAQUE

E) WATER CLARITY AFTER DEVELOPMENT?

[CLEAR], SLIGHTLY TURBID, TURBID, OPAQUE

F) ODOR? YES OR [NO] NTU = 1.4 (KEB 7/5/88)

3) WATER LEVEL SUMMARY

A) DEPTH FROM TOP OF CASING AFTER DEVELOPMENT?

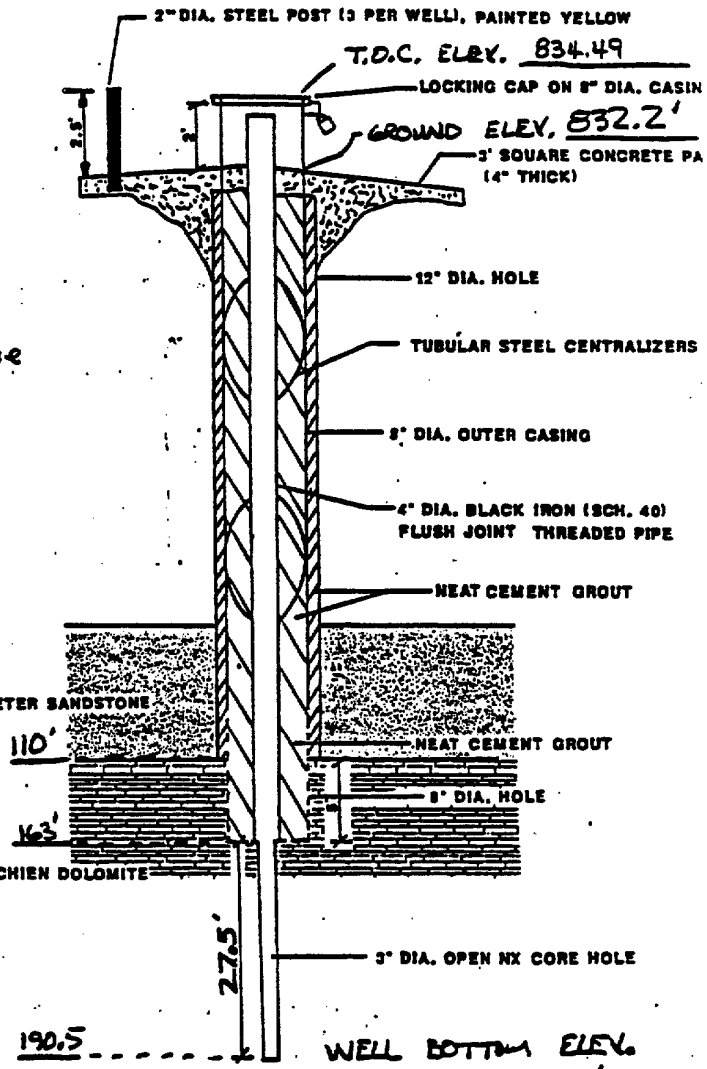
— FT. OR DRY

B) OTHER MEASUREMENTS (T.O.C.):

DATE/TIME 2-19-88 / 21.08' FT.

DATE/TIME _____ FT.

DATE/TIME _____ FT.



ADDITIONAL COMMENTS: _____

elevations checked 5/2/88 CAK

C.K'd CAK 5-4-8

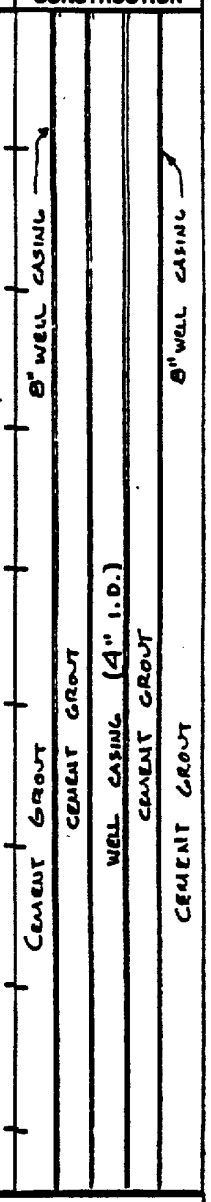
LOG OF TEST BORING

RMT INC

BORING NO.:	5-PC
SHEET	1 of 4
PROJECT: COE-NIROP	PROJECT NO.: 1332.32
LOCATION: FRIDLEY, MN	SURFACE ELEVATION: 832.2'
DRILLED BY: Layne Northwest - Milwaukee	DATE STARTED: / DATE COMPLETED:
CREW CHIEF:	LOGGED BY: Mark McColloch / CHECKED BY: BWR 9 Mar. 88

SAMPLING NOTES INTERVAL NO.	TYPE	RECOVERY BLOWS	IN	DEPTH (ft.)	VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
1	WS	0 2 3		0	Black, SAND, fine to med. some to little fine gravel, trace of silt and clay, plant roots.
2				5	Brown, SAND, and GRAVEL, med. to coarse pieces of wood.
3	WS	5.5 9.5		10	
4	WS	10.5 14.5			Brown, SAND and GRAVEL, med. to coarse, pieces of wood.
5	WS	15.5 19.5		15	Light brown, SAND, fine to coarse.
6	WS	20.5 25.5		20	Light brown, SAND, fine to coarse.
7	WS	26.5 30.5		25	Light brown, SAND, fine to coarse.
8	WS	31.5 35.5		30	Light brown, SAND, fine to coarse.
9	WS	36.5 40.5		35	Light brown, SAND, fine to coarse.
		41.5		38'	More coarse sand and fine gravel
				40	

GENERAL WELL CONSTRUCTION



NOTES	WATER LEVEL OBSERVATIONS			
DRILLING METHODS: Mud rotary grab samples composited of wash cuttings over 5 ft. intervals.	FIRST OCCURENCE:			
	DATE/TIME			
BOREHOLE DIAMETER: 8" to 6.5" to 3"	DEPTH TO WATER			
DRILL RIG: TH-60: Well Casing Gus Peck Bratt 22R: Rock Core	DEPTH TO CAVE IN			

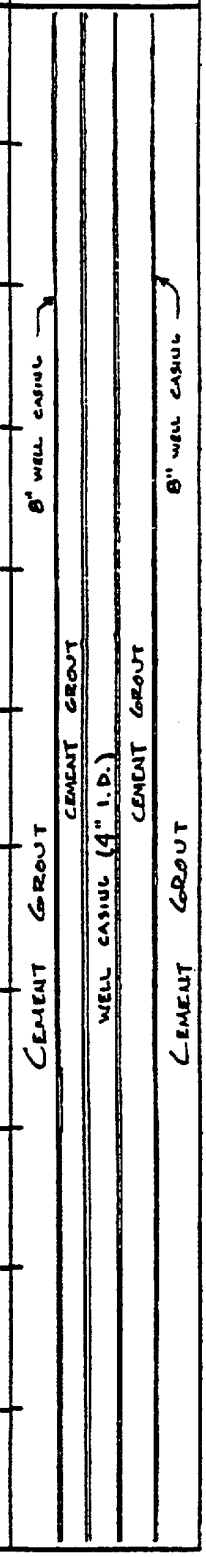
F-204A (R 09-87)

LOG OF TEST BORING

BORING NO.:	5-PC
SHEET	2 of 7
PROJECT:	COE-NIROP
PROJECT NO.:	1332.32
LOCATION:	FRIDLEY, MN
SURFACE ELEVATION:	

SAMPLING NOTES INTERVAL NO.	TYPE	RECOVERY BLOWS	%	DEPTH (ft.)	VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
10	WS			40	Brown, SAND, Med. to coarse, trace cobbles.
11	WS			45	Brown, SAND, med. to coarse little silt and clay.
				49	No clay present at 49'
12	WS			50	Brown SAND and GRAVEL, med to coarse, little silt and clay.
13	WS			55	Brown, SAND, some clay and fine gravel.
14	WS			60	Brown, SAND, some clay and fine gravel.
				63' – 65'	Clay becoming more abundant.
15	WS			65	Brown, SAND, some clay and fine gravel.
16	WS			70	Brown, SAND, some clay and fine gravel.
				72' – 73'	Clay becoming less abundant.
17	WS			75	Brown, SAND, med. to coarse, little fine gravel.
18	WS			80	Brown, SAND, med. to coarse, little fine gravel.
19	WS			85	Brown, SAND, med. to coarse, little fine gravel.
20	WS			90	Brown, SAND, med. to coarse, little fine gravel.
				95	

GENERAL WELL CONSTRUCTION



F-204B (R 09-87)

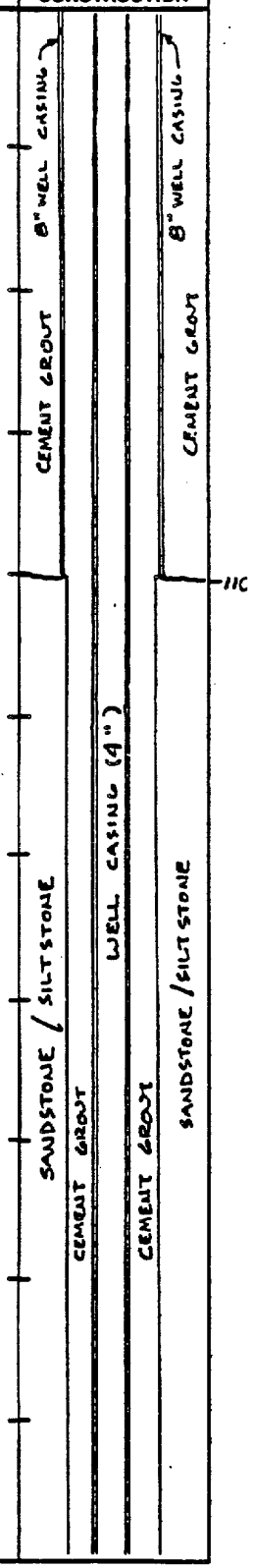
LOG OF TEST BORING

RMT

BORING NO.:	5-PC
SHEET	3 of 4
PROJECT: COE-NIROP	PROJECT NO.: 1332.32
LOCATION: FRIDLEY, MN	SURFACE ELEVATION:

SAMPLING NOTES INTERVAL NO.	TYPE	RECOVERY BLOWS	%	DEPTH (ft.)	VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
				95	Dark brown, SAND, med to coarse, trace of siltstone with interbedded shale.
21	G				
				100	Yellow brown, SILTSTONE, interbedded with soft pale yellow shale.
22	G				
				103	Yellow brown, SILTSTONE.
	G			105	
24	G				Yellow brown, SILTSTONE.
				110	8" casing grouted. Begain 6.5" borehole.
				110	Yellow brown, SILTSTONE and greenish grey siltstone.
25	G			112	
26	G				
				115	
27	G				Yellow brown, SILTSTONE and greenish grey siltstone.
				120	
28	G				Yellow brown, SILTSTONE and greenish grey siltstone.
				125	
29	G				Yellow brown, SILTSTONE and greenish grey siltstone.
				130	Tan, SANDSTONE/SILTSTONE, very fine
30	G			133	
31	G			135	Tan, SANDSTONE/SILTSTONE, some greenish white shale. Fractured zone, drilling method losing water into bedrock.
32	G			140	Reddish brown, SILTSTONE, and white SANDSTONE/SILTSTONE.
	G			145	

GENERAL WELL CONSTRUCTION



F-204B (R 09-87)

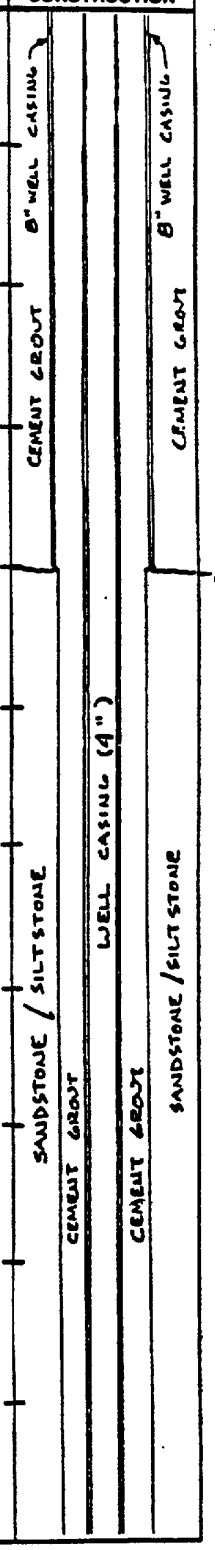
LOG OF TEST BORING

RMT

BORING NO.:	5-PC
SHEET	3 of 4
PROJECT:	COE-NIROP
PROJECT NO.:	1332.32
LOCATION:	FRIDLEY, MN
SURFACE ELEVATION:	

SAMPLING NOTES INTERVAL NO.	TYPE	RECOVERY BLOWS	%	DEPTH (ft.)	VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
21	G			95	Dark brown, SAND, med to coarse, trace of siltstone with interbedded shale.
				100	Yellow brown, SILTSTONE, interbedded with soft pale yellow shale.
22	G			103	Yellow brown, SILTSTONE.
	G			105	
24	G				Yellow brown, SILTSTONE.
				110	8" casing grouted. Begain 6.5" borehole.
				110	Yellow brown, SILTSTONE and greenish grey siltstone.
25	G			112	
26	G			115	
27	G				Yellow brown, SILTSTONE and greenish grey siltstone.
				120	
28	G				Yellow brown, SILTSTONE and greenish grey siltstone.
				125	
29	G				Yellow brown, SILTSTONE and greenish grey siltstone.
				130	Tan, SANDSTONE/SILTSTONE, very fine
30	G			133	
31	G			135	Tan, SANDSTONE/SILTSTONE, some greenish white shale. Fractured zone, drilling method losing water into bedrock.
32	G			140	Reddish brown, SILTSTONE, and white SANDSTONE/SILTSTONE.
	G			145	

GENERAL WELL CONSTRUCTION



F-204B (R 09-87)

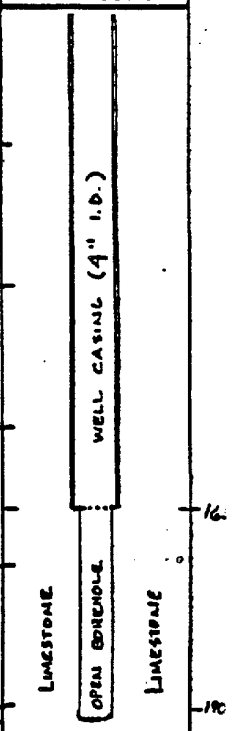
LOG OF TEST BORING

RMT

BORING NO.:	5-PC
SHEET	4 of 4
PROJECT: COE-NIROP	PROJECT NO.: 1332.32
LOCATION: FRIDLEY, MN	SURFACE ELEVATION:

SAMPLING NOTES INTERVAL NO.	TYPE	RECOVERY BLOWS	%	DEPTH (ft.)	VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
33	G			145	Reddish brown, SILTSTONE, and white, SANDSTONE/SILTSTONE.
34	G			150	Orange brown, SANDSTONE. White, SANDSTONE/SILTSTONE.
				155	Orange brown, SANDSTONE. White, SANDSTONE/SILTSTONE.
35	G			160	
36					
	Rock Core				Yellow orange brown, LIMESTONE, interbedded with siltstone, few interbeds of sand, fractured, vugs lined with chalcopynte, pyrite, and calcite.
				190	EOB at 190.5'

GENERAL WELL CONSTRUCTION

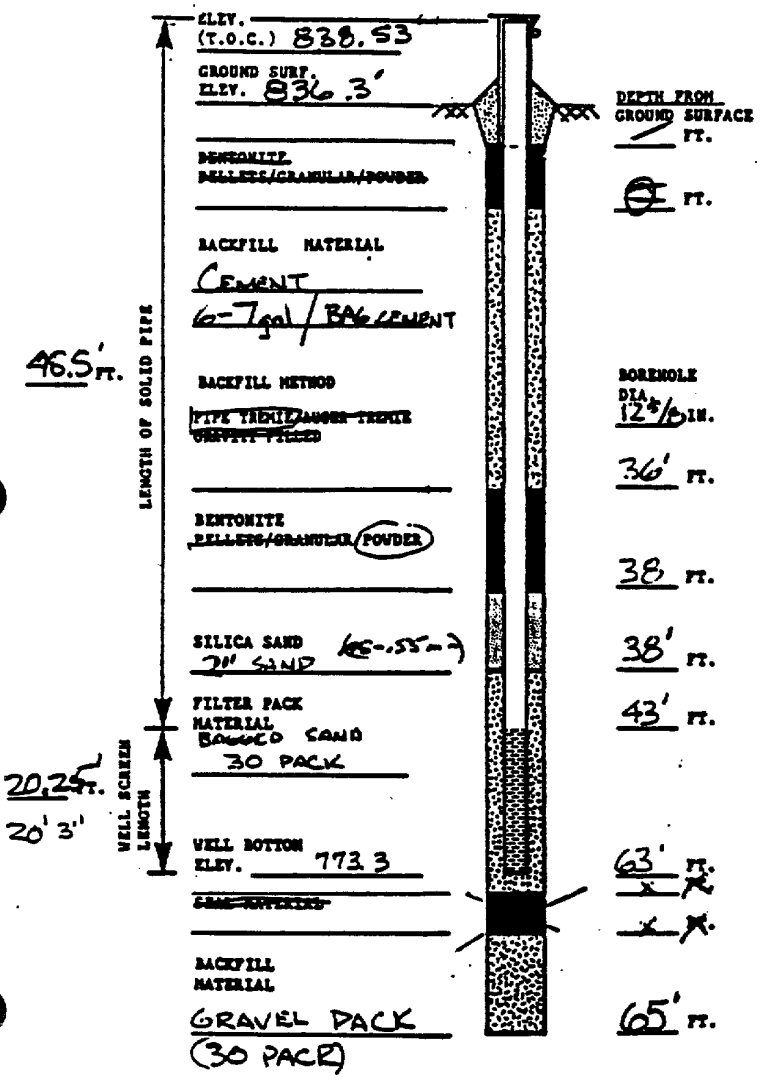


F-204B (R 09-87)

RMT

Well Diagram
F-17 (2 11-85)

PROJECT NAME: ~~FRIDLEY~~ COE/NIROP NO. 1332.32
WELL NO. AT-1
DATE INSTALLED 12-10-87



1) CASING DETAILS

A) TYPE OF PIPE:

~~PVC, STAINLESS, TEFLON~~, OTHER BLACK IRON

PIPE SCHEDULE 40

B) TYPE OF PIPE JOINTS:

~~COUPLINGS, THREADED (W/TAPE)~~, OTHER WELDED

C) WAS SOLVENT USED? ~~YES~~ OR (NO)

D) TYPE OF WELL SCREEN:

~~PVC~~, (STAINLESS), ~~TEFLON, OTHER~~

E) WELL SCREEN SLOT SIZE .040"

F) PIPE DIA: ID IN. 6 1/8" OD IN. 6 5/8"

G) INSTALLED PROTECTOR PIPE W/LOCK? (YES) ~~OR~~ NO
PROTECTOR PIPE DIA. — IN.

2) WELL DEVELOPMENT

A) METHOD

BAILING, ~~PUMPING~~, (SURGING), ~~COMPRESSED AIR~~

OTHER

(NOTE ADDITIONAL COMMENTS BELOW)

B) TIME SPENT FOR DEVELOPMENT? 2.5 HR

C) APPROXIMATE WATER VOLUME: REMOVED 7,500 gal
ADDED —

D) WATER CLARITY BEFORE DEVELOPMENT?

CLEAR, TURBID, [OPAQUE]

E) WATER CLARITY AFTER DEVELOPMENT?

[CLEAR], SLIGHTLY TURBID, TURBID, ~~SLIGHTLY OPAQUE~~

F) ODOR? YES OR [NO] NTU = 4.64 KEB 7/5/88

3) WATER LEVEL SUMMARY

A) DEPTH FROM TOP OF CASING AFTER DEVELOPMENT?

— FT. OR DRY

B) OTHER MEASUREMENTS (T.O.C.):

DATE/TIME 2-19-88 (25.70') FT.

DATE/TIME — FT.

DATE/TIME — FT.

ADDITIONAL COMMENTS: WELDED ON CENTRALIZERS @ 20'

elevations checked 5/9/88 CAK

3-22-88
CK'D CAK

BOREHOLE LOG WELL AT-1

CABLE-TOOL CUTTINGS

DEPTH (ft)	DESCRIPTION
0-1.5	Fill
1.5-5	Clay & rocks
5-18	Sand & gravel; lg. gravel & cobbles (13'-16')
18-45	Fine silty sand, brown
45-48	Fine very silty sand, brown
48-51	clay brown & grey mixed no water
51-55	sand & gravel silty to muddy brown
55-58	Sand & gravel course gravel very silty brown little heave
58-63	Sand & gravel tight had to drill won't sand pump silty (grey water?)
63-65	Sandy gravel tight muddy no water, no heave, brown, open hole

S.W.L. 25' 1:00 PM 12-7-87

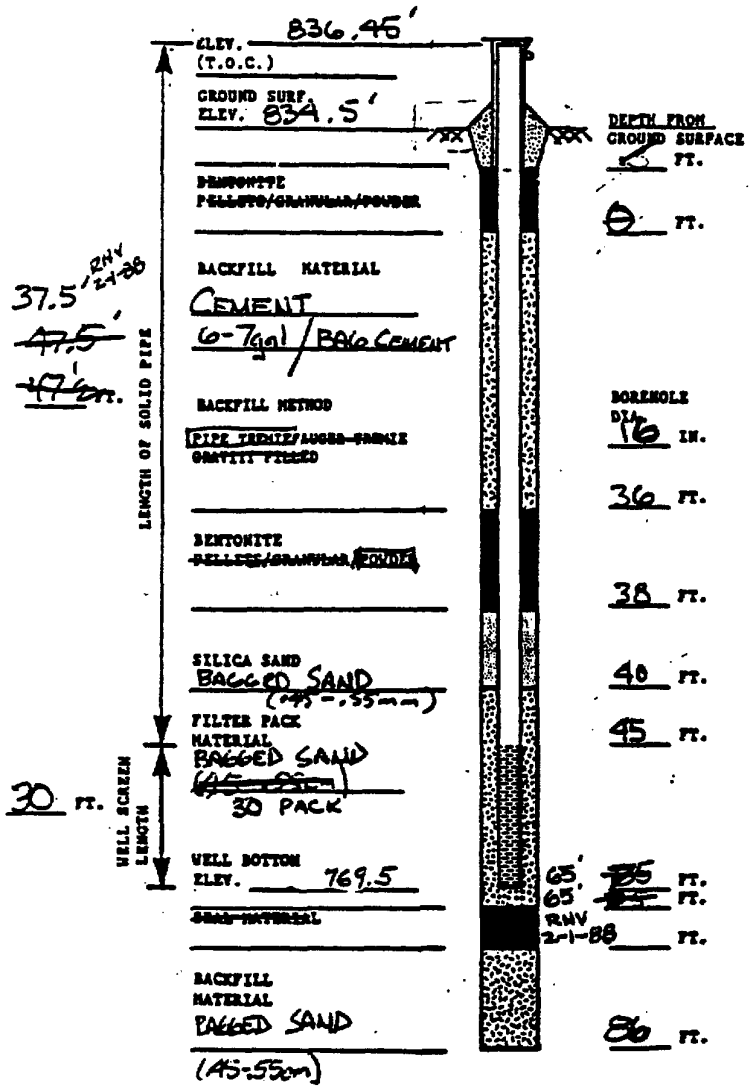
RMT

Well Diagram
F-17 (R 11-85)

PROJECT NAME: COE-NIROP ~~FRIDLEY, MN~~ NO. 1332.32

WELL NO. AT-2

DATE INSTALLED 12-30-87



1) CASING DETAILS

A) TYPE OF PIPE:

~~PVC, STAINLESS, TEFLON, OTHER~~ BLACK IRON

PIPE SCHEDULE (3/8 WALL) 30

B) TYPE OF PIPE JOINTS;

~~COUPLINGS, THREADED (W/TAPE?), OTHER~~ WELDED

C) WAS SOLVENT USED? YES OR [NO]

D) TYPE OF WELL SCREEN:

~~PVC?~~ [STAINLESS] ~~TEFLON, OTHER~~ _____

E) WELL SCREEN SLOT SIZE .040"

F) PIPE DIA: ID IN. 10 OD IN. 10 3/4

G) INSTALLED PROTECTOR PIPE W/LOCK? [YES] OR NO

PROTECTOR PIPE DIA. — IN.

2) WELL DEVELOPMENT

A) METHOD

BAILING, [PUMPING], SURGING, COMPRESSED AIR

OTHER —

(NOTE ADDITIONAL COMMENTS BELOW)

B) TIME SPENT FOR DEVELOPMENT? 2.5 HRS

C) APPROXIMATE WATER VOLUME: REMOVED 15,000 gal

ADDED —

D) WATER CLARITY BEFORE DEVELOPMENT?

CLEAR, TURBID, [OPAQUE]

E) WATER CLARITY AFTER DEVELOPMENT?

[CLEAR], SLIGHTLY TURBID, TURBID, ~~OPAQUE~~

F) ODOR? YES OR [NO] NTU = 3.20 (REB 7/5/88)

3) WATER LEVEL SUMMARY

A) DEPTH FROM TOP OF CASING AFTER DEVELOPMENT?

— FT. OR DRY

B) OTHER MEASUREMENTS (T.O.C.):

DATE/TIME 2-17-88 (24.22') FT.

DATE/TIME _____ FT.

DATE/TIME _____ FT.

ADDITIONAL COMMENTS: WELDED CENTRALIZERS
LOCKING WELL CAP

elevations checked 5/9/88

✓CAK 3/22/88

BOREHOLE LOG WELL AT-2

CABLE-TOOL CUTTINGS

DEPTH (ft)	DESCRIPTION
0-5	Black organic top soil
5-40	Brown fine to coarse sand and rounded gravel
40-41	Sand & gravel; lg. gravel & cobbles (40'-41')
41-85	Brown sandy silty clay with little to some gravel

S.W.L. 22' 3:30 PM. 12-21-87

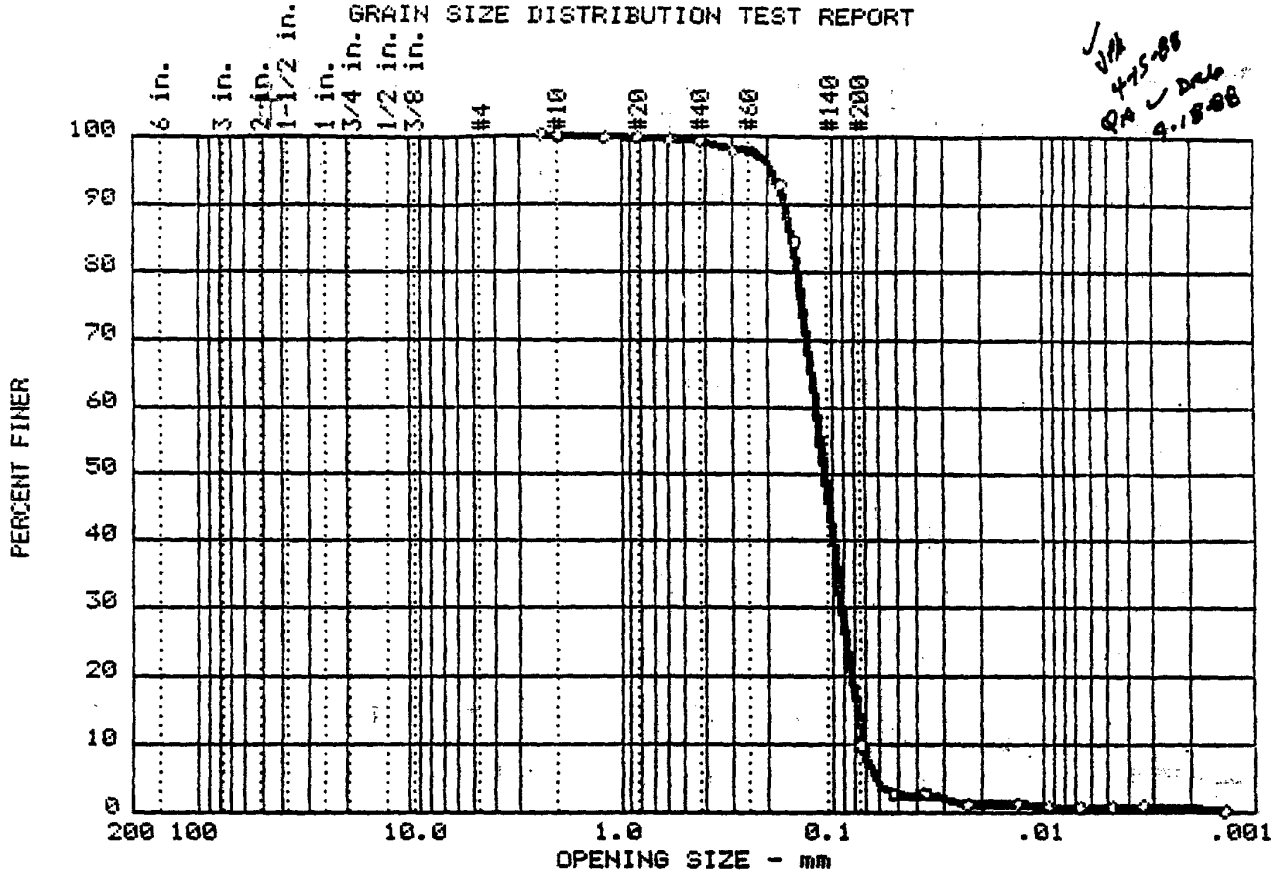
APPENDIX C

GRAIN-SIZE DISTRIBUTION REPORTS

KEY TO GRAIN SIZE DISTRIBUTION REPORTS

BOREHOLE LOCATION	SAMPLE NO.	DEPTH BELOW GROUND (FT)
2-I	S-8	35 - 36.5
2-I	S-10	45 - 46.5
2-I	S-15	70 - 71.5
10-D	S-3	10 - 11.5
10-D	S-11	50 - 51.5
10-D	S-20	95 - 96.5
11-D	S-8	35 - 36.5
11-D	S-17	80 - 81.5
11-D	S-25	120 - 121.5
12-D	S-4	20 - 21.5
12-D	S-13	65 - 66.5
12-D	S-25	125 - 126.5
13-D	S-4	15 - 16.5
13-D	S-9	40 - 41.5
13-D	S-20	95 - 96.5
14-D	S-2	35 - 36.5
14-D	S-4	45 - 46.5
14-D	S-12	85 - 86.5
23-S	S-6	10 - 11
23-S	S-9	20 - 21
23-S	S-13	30 - 31

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.0	90.3	9.0	0.7

	Classification		LL	PI	D_{60}	D_{30}	D_{10}	C_c	C_u
	USCS	AASHTO							
○					0.12	0.091	0.0740	0.94	1.6

MATERIAL DESCRIPTION	TYPE OF TEST
○	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis

Project No.: 1332.32
Project: COE-NIROP
○ Location: 2I, S-8, 35'-36.5'

Date: 4/6/88

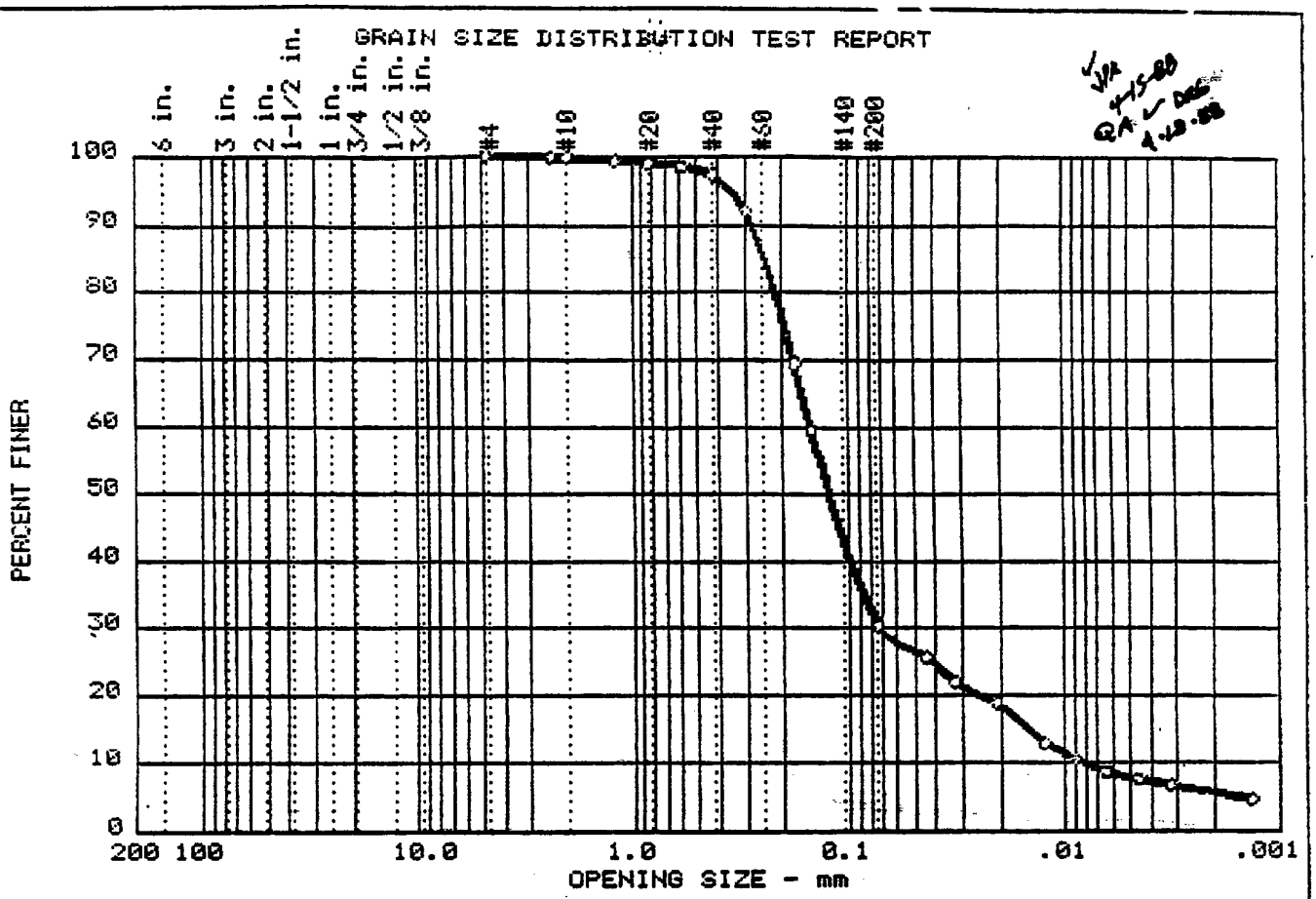
Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Fig. No. ____

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
◇	0.0	0.0	69.6	22.6	7.8

	Classification		LL	PI	D_{60}	D_{30}	D_{10}	C_c	C_u
	USCS	AASHTO							
◇					0.15	0.072	0.0081	4.32	18.4

MATERIAL DESCRIPTION	TYPE OF TEST
◇	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis

Project No.: 1332.32
Project: COE-NIROP
◇ Location: 2I, S-10, 45'-46.5'

Date: 4/6/88

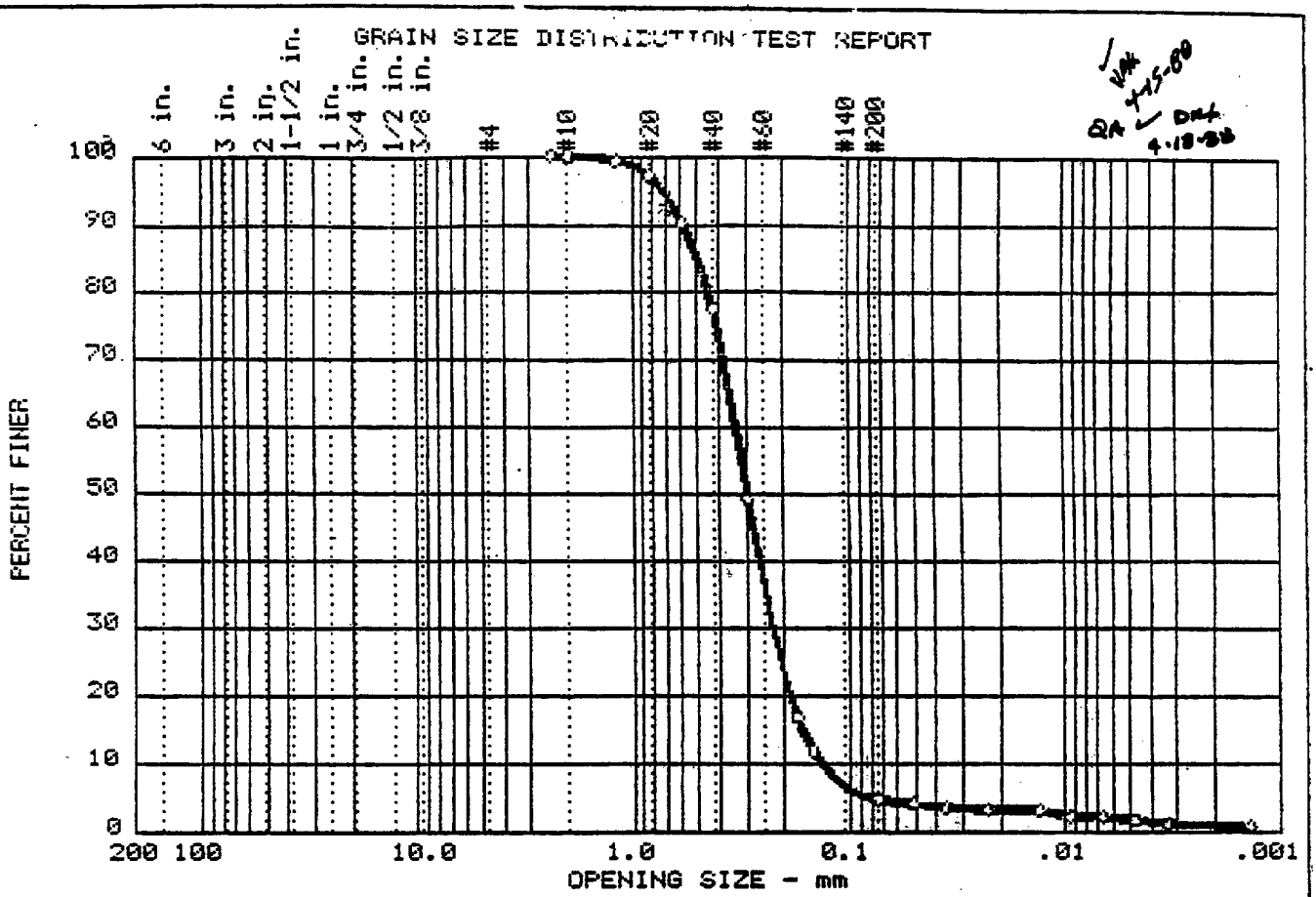
Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Fig. No. ____

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
◇	0.0	0.0	95.3	3.0	1.7

	Classification		LL	PI	D_{60}	D_{30}	D_{10}	C_c	C_u
	USCS	AASHTO							
◇					0.34	0.227	0.1351	1.13	2.5

MATERIAL DESCRIPTION	TYPE OF TEST
◇	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis

Project No.: 1332.32
Project: COE-NIROP
◇ Location: 2I, S-15, 70'-71.5'

Date: 4/6/88

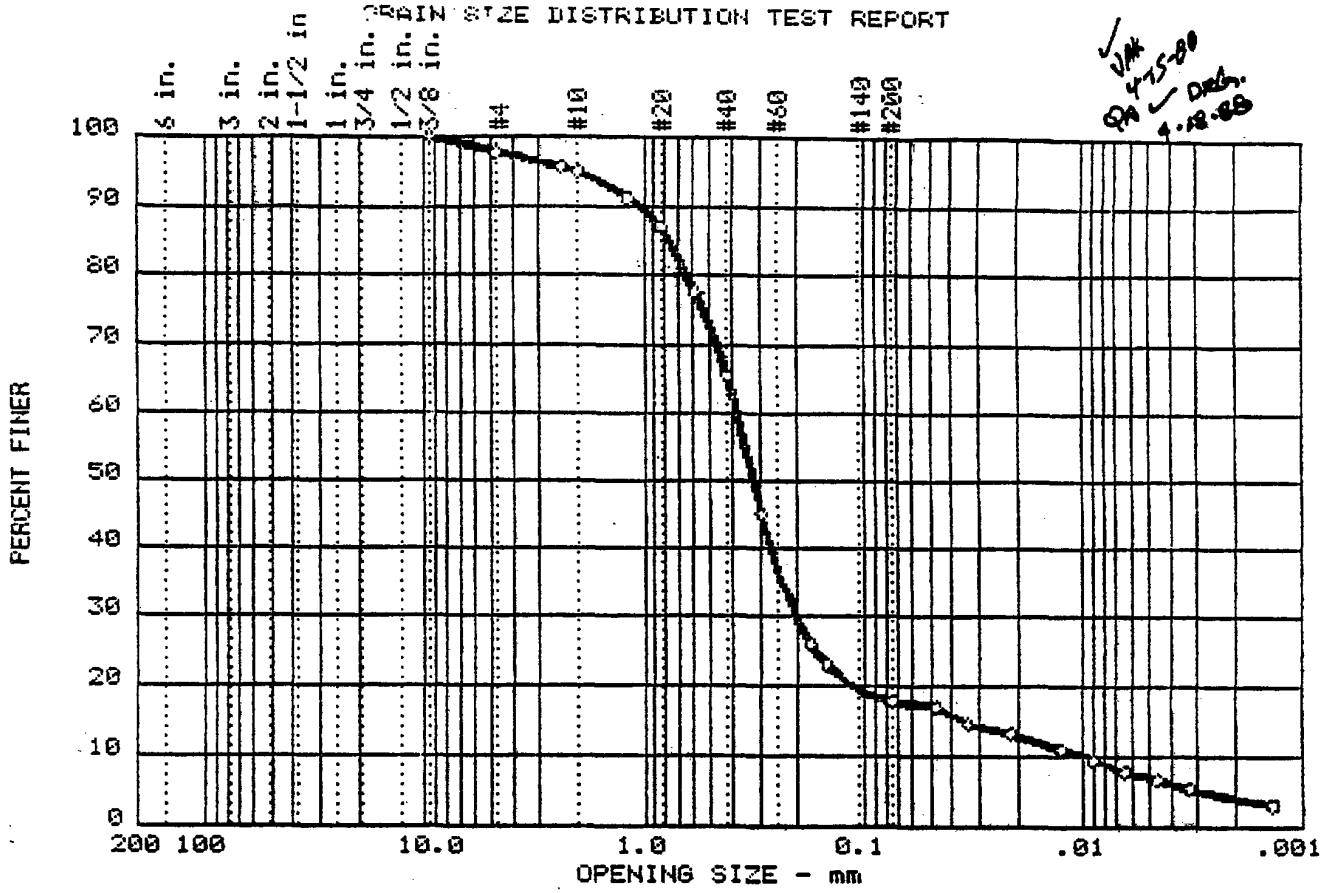
Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Fig. No. ____

GRAIN SIZE DISTRIBUTION TEST REPORT



✓ JAK 4-25-88 QA ✓ DRG. 4-28-88

	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	2.3	80.0	10.8	6.9

	Classification		LL	PI	D_{60}	D_{30}	D_{10}	C_c	C_u
	USCS	AASHTO							
○					0.38	0.204	0.0100	10.96	38.0

MATERIAL DESCRIPTION	TYPE OF TEST
○	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis

Project No.: 1332.32
Project: COE-NIROP
○ Location: 10D, S-3, 10'-11.5'

Date: 4/6/88

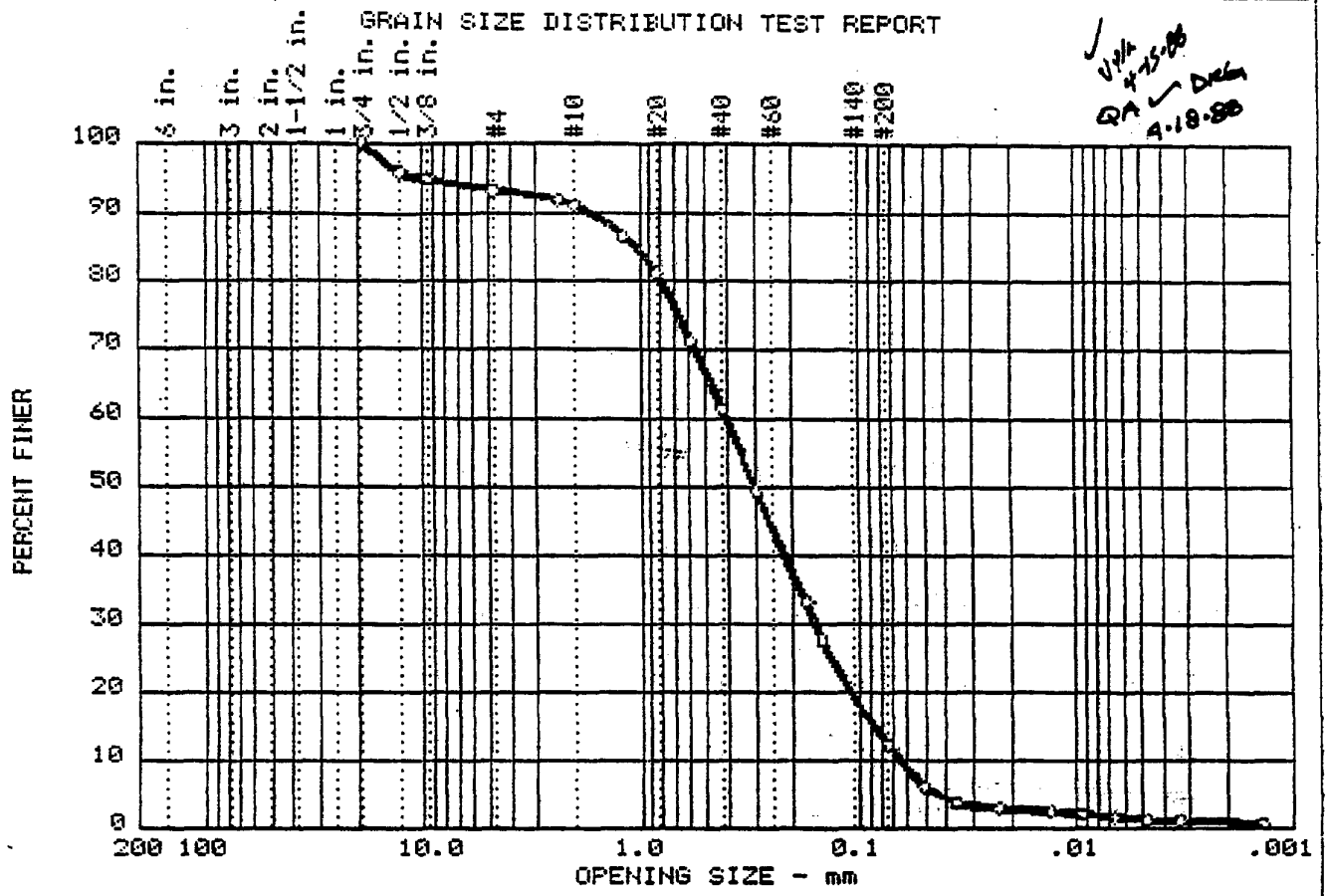
Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Fig. No. ____

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
◇	0.0	6.7	80.9	11.3	1.1

	Classification		LL	PI	D_{60}	D_{30}	D_{10}	C_c	C_u
	USCS	AASHTO							
◇					0.40	0.149	0.0650	0.85	6.2

MATERIAL DESCRIPTION	TYPE OF TEST
◇	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis

Project No.: 1332.32
Project: COE-NIROP
◇ Location: 10D, S-11, 50'-51.5'

Date: 4/6/88

Remarks:

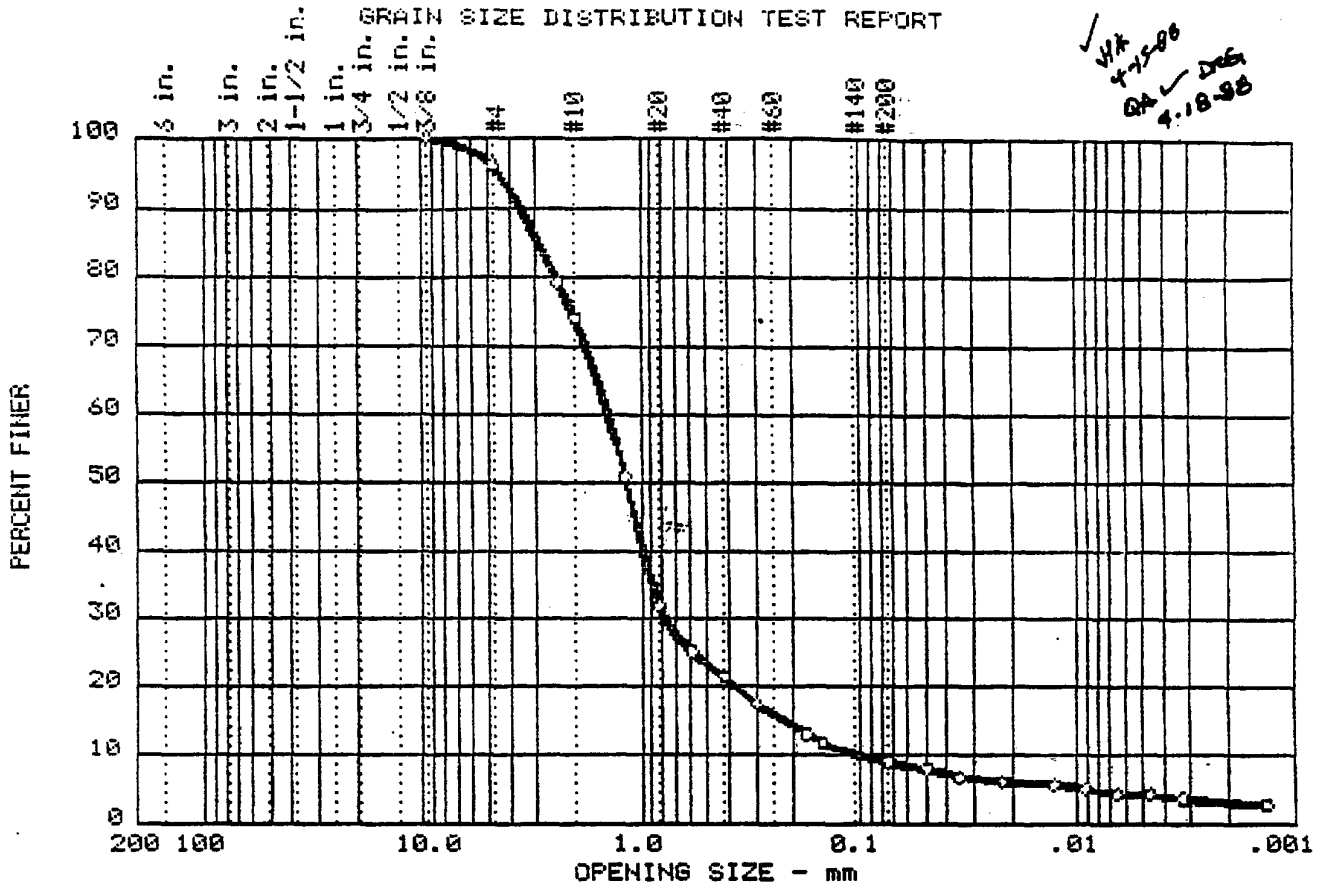
GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Fig. No. ____

GRAIN SIZE DISTRIBUTION TEST REPORT

✓ JH 4-15-88
QA ✓ DEG 4-18-88



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	3.9	87.3	4.7	4.2

	Classification		LL	PI	D_{60}	D_{30}	D_{10}	C_c	C_u
	USCS	AASHTO							
○					1.43	0.775	0.1058	3.98	13.5

MATERIAL DESCRIPTION	TYPE OF TEST
○	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis

Project No.: 1332.32
Project: COE-NIROP
○ Location: 10D, S-20, 95'-96.5'

Date: 4/6/88

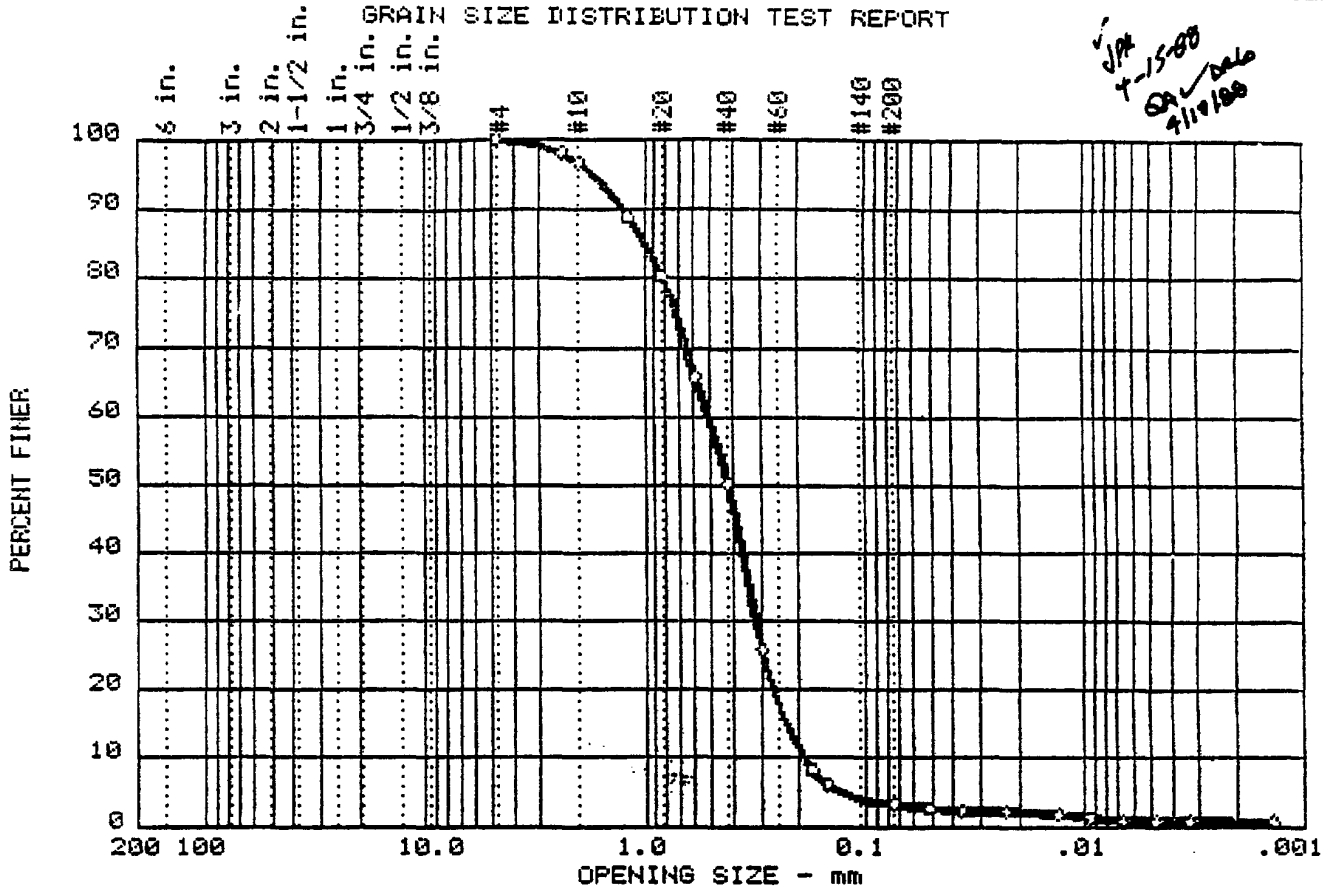
Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Fig. No. ____

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
◇	0.0	0.0	96.8	2.4	0.7

	Classification		LL	PI	D_{60}	D_{30}	D_{10}	C_c	C_u
	USCS	AASHTO							
◇					0.51	0.297	0.1940	0.89	2.6

MATERIAL DESCRIPTION	TYPE OF TEST
	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis

Project No.: 1332.32
Project: COE-NIROP
◇ Location: 11D, ~~#8~~ S-8, 35-36.5'

Date: MARCH 25, 1988

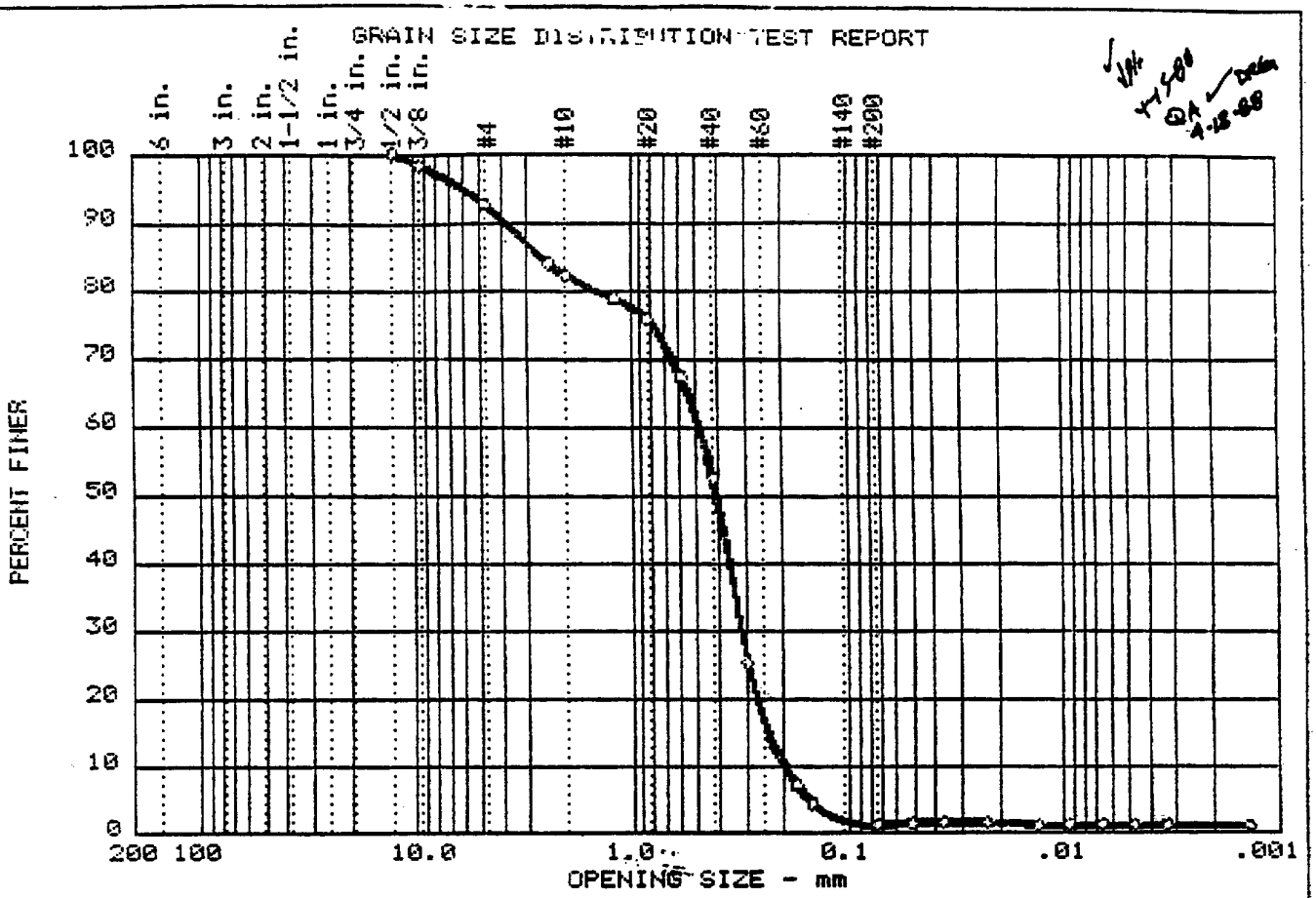
Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Fig. No. ____

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
◇	0.0	7.4	91.6	0.0	1.0

	Classification		LL	PI	D_{60}	D_{30}	D_{10}	C_c	C_u
	USCS	AASHTO							
◇					0.48	0.315	0.2011	1.02	2.4

MATERIAL DESCRIPTION	TYPE OF TEST
◇	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis

Project No.: 1332.32
Project: COE-NIROP
◇ Location: 11D, S-17, 80'-81.5'

Date: 4/6/88

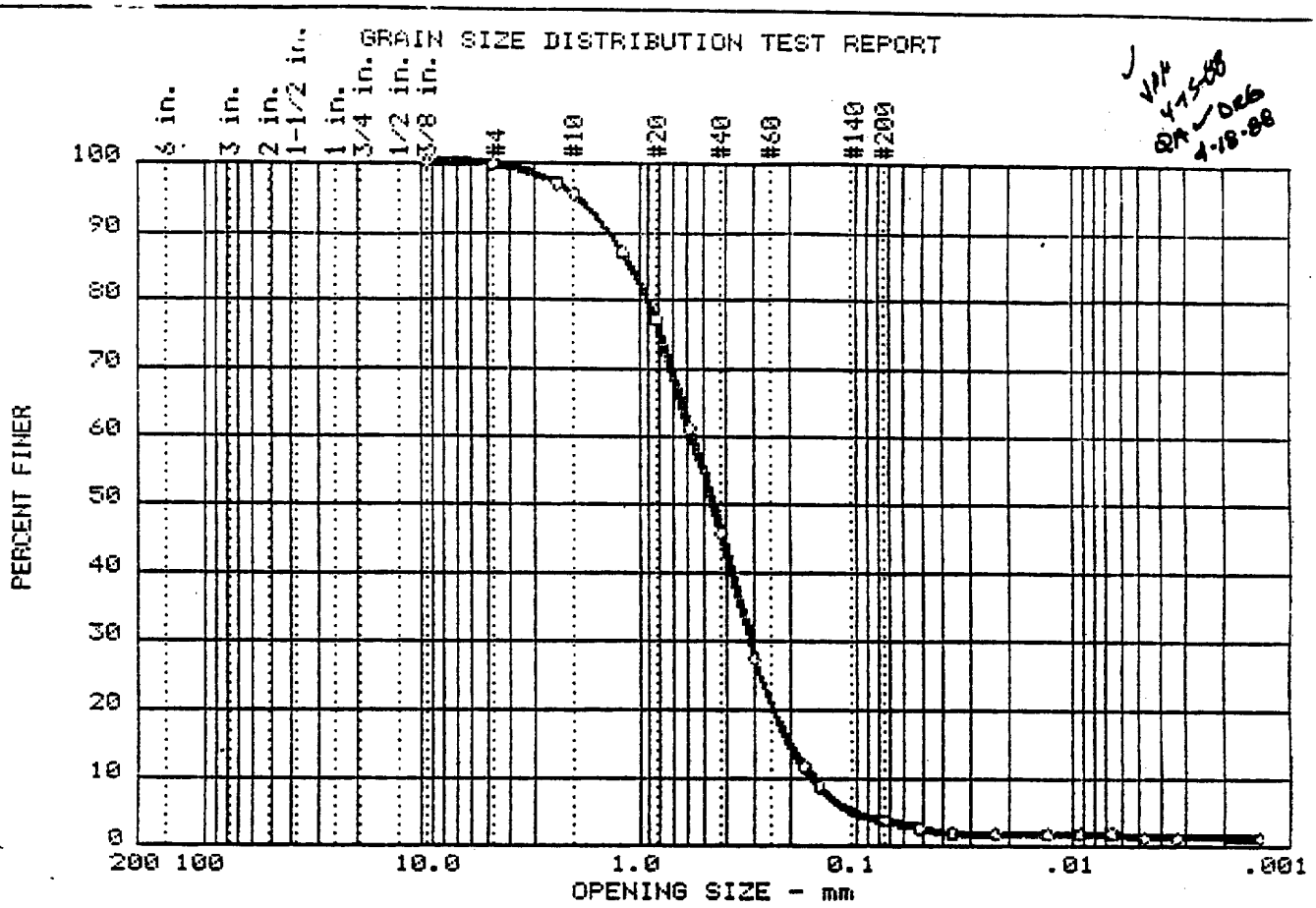
Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Fig. No. ____

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
◇	0.0	0.2	96.1	2.4	1.3

	Classification		LL	PI	D_{60}	D_{30}	D_{10}	C_c	C_u
	USCS	AASHTO							
◇					0.57	0.297	0.1490	1.03	3.8

MATERIAL DESCRIPTION	TYPE OF TEST
◇	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis

Project No.: 1332.32
Project: COE-NIROP
◇ Location: 11D, S-25, 120'-121.5'

Date: 4/6/88

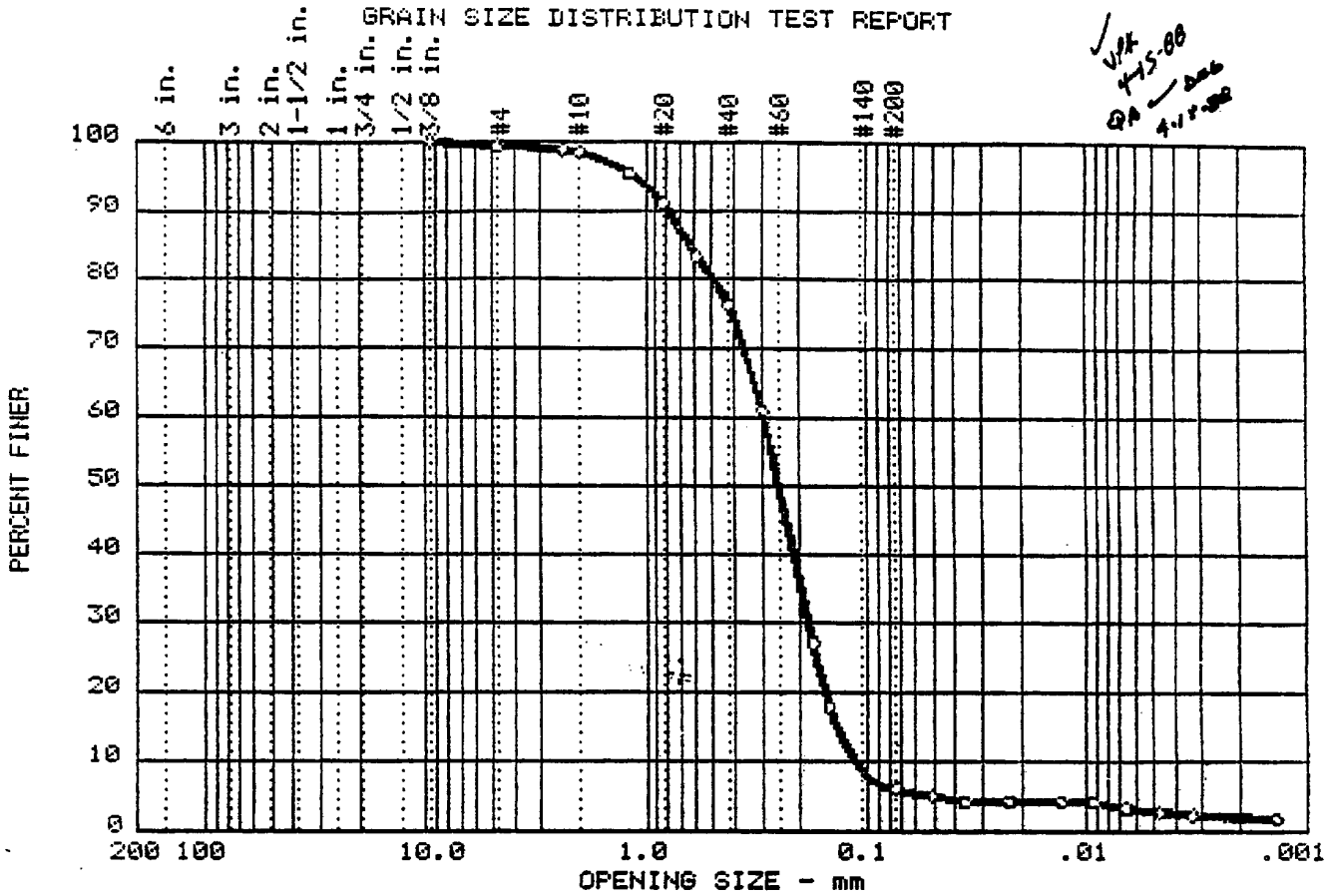
Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Fig. No. _____

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
◇	0.0	0.7	93.3	3.3	2.7

	Classification		LL	PI	D_{60}	D_{30}	D_{10}	C_c	C_u
	USCS	AASHTO							
◇					0.29	0.184	0.1148	1.01	2.5

MATERIAL DESCRIPTION	TYPE OF TEST
◇	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis

Project No.: 1332.32
Project: COE-NIROP
◇ Location: 12D, S-4, 20'-21.5'

Date: 4/6/88

Remarks:

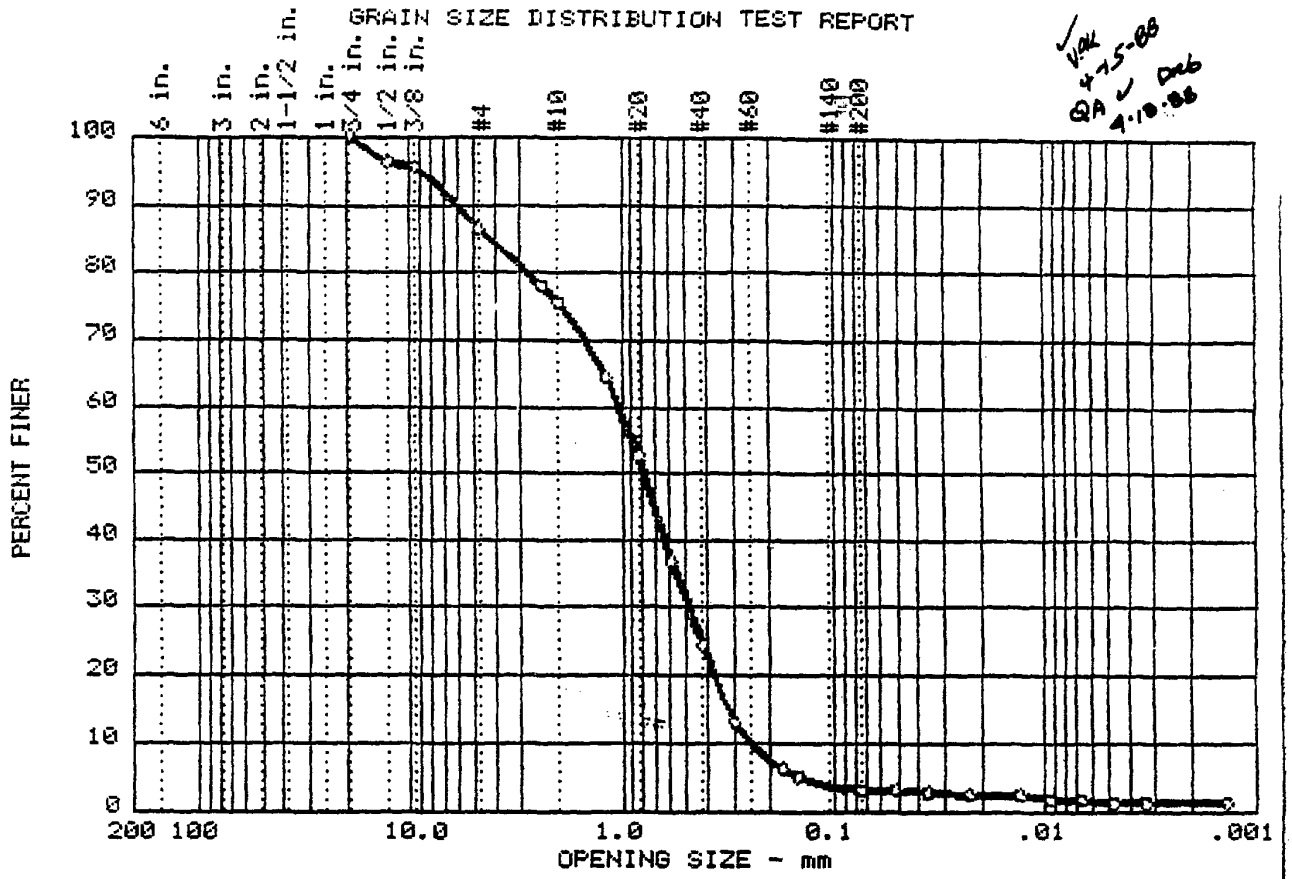
GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Fig. No. ____

GRAIN SIZE DISTRIBUTION TEST REPORT

✓ JAK 4-15-88
QA ✓ DAB 4-18-88



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	13.5	83.4	1.7	1.3

	Classification		LL	PI	D_{60}	D_{30}	D_{10}	C_c	C_u
	USCS	AASHTO							
○					1.02	0.493	0.2526	0.94	4.1

MATERIAL DESCRIPTION	TYPE OF TEST
○	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis

Project No.: 1332.32
Project: COE-NIROP
○ Location: 12D, S-13, 65'-66.5'

Date: 4/6/88

Remarks:

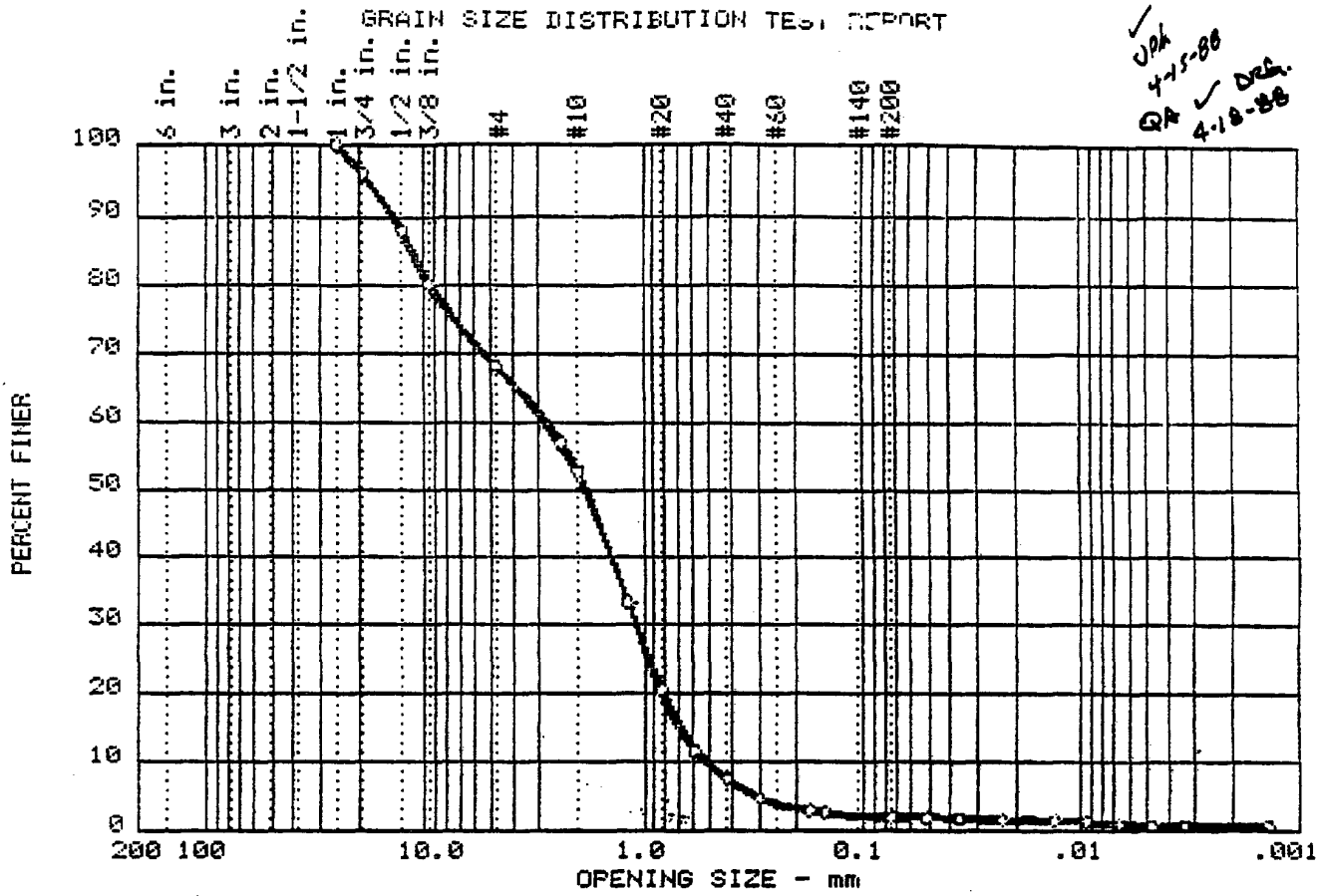
GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Fig. No. ____

GRAIN SIZE DISTRIBUTION TEST REPORT

✓ JPK 4-15-88 QA ✓ DRG. 4-18-88



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
⊘	0.0	31.7	66.5	1.1	0.6

	Classification		LL	PI	D_{60}	D_{30}	D_{10}	C_c	C_u
	USCS	AASHTO							
⊘					2.79	1.091	0.5284	0.81	5.3

MATERIAL DESCRIPTION	TYPE OF TEST
⊘	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis

Project No.: 1332.32
Project: COE-NIROP
⊘ Location: 12D, S-25, 125'-126.5'

Date: 4/5/88

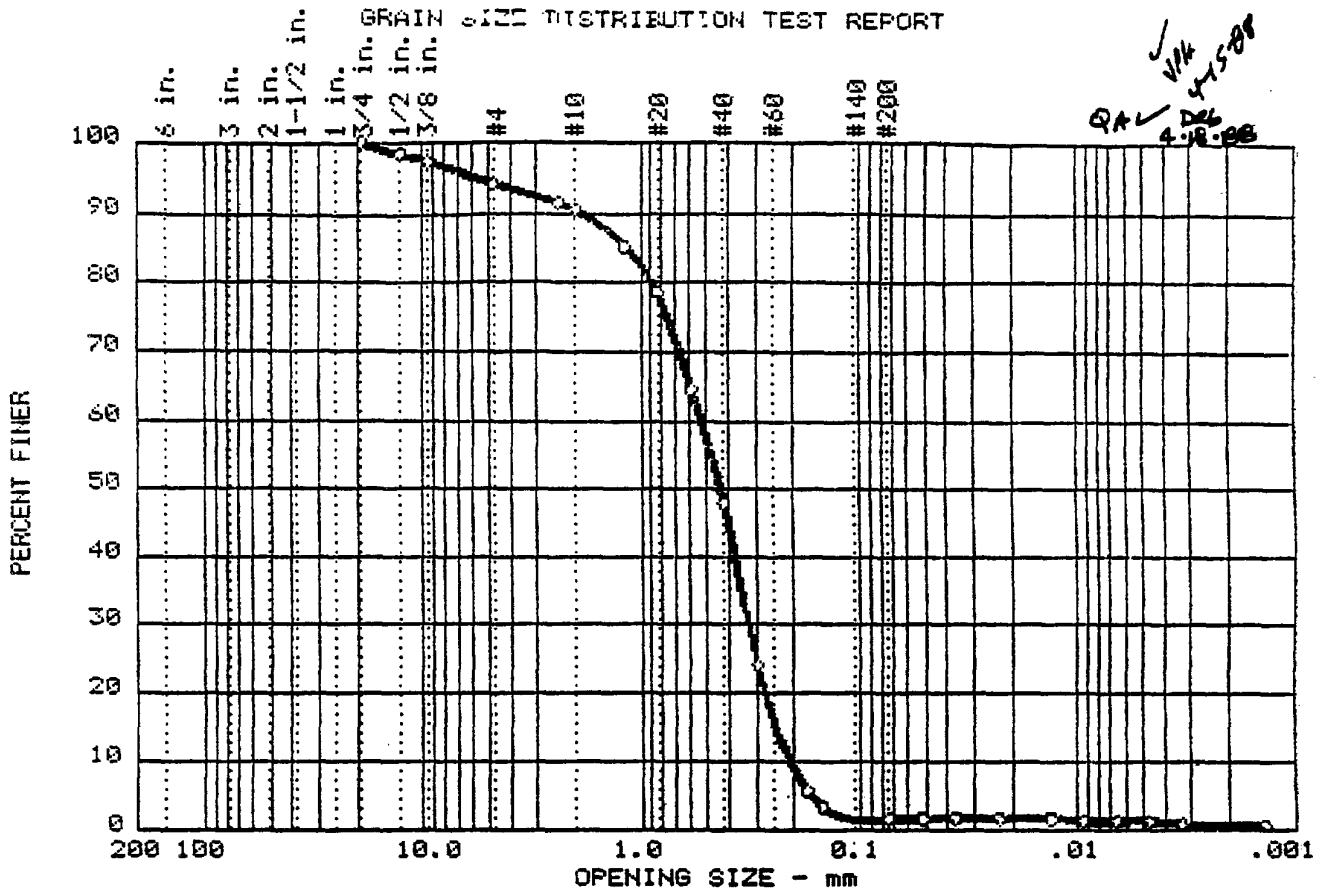
Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Fig. No. ____

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	5.9	92.7	0.3	1.2

	Classification		LL	PI	D_{60}	D_{30}	D_{10}	C_c	C_u
	USCS	AASHTO							
○					0.53	0.325	0.2118	0.94	2.5

MATERIAL DESCRIPTION	TYPE OF TEST
○	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis

Project No.: 1332.32
Project: COE-NIROP
○ Location: 13D, S-4, 15'-16.5'

Date: 4/6/88

Remarks:

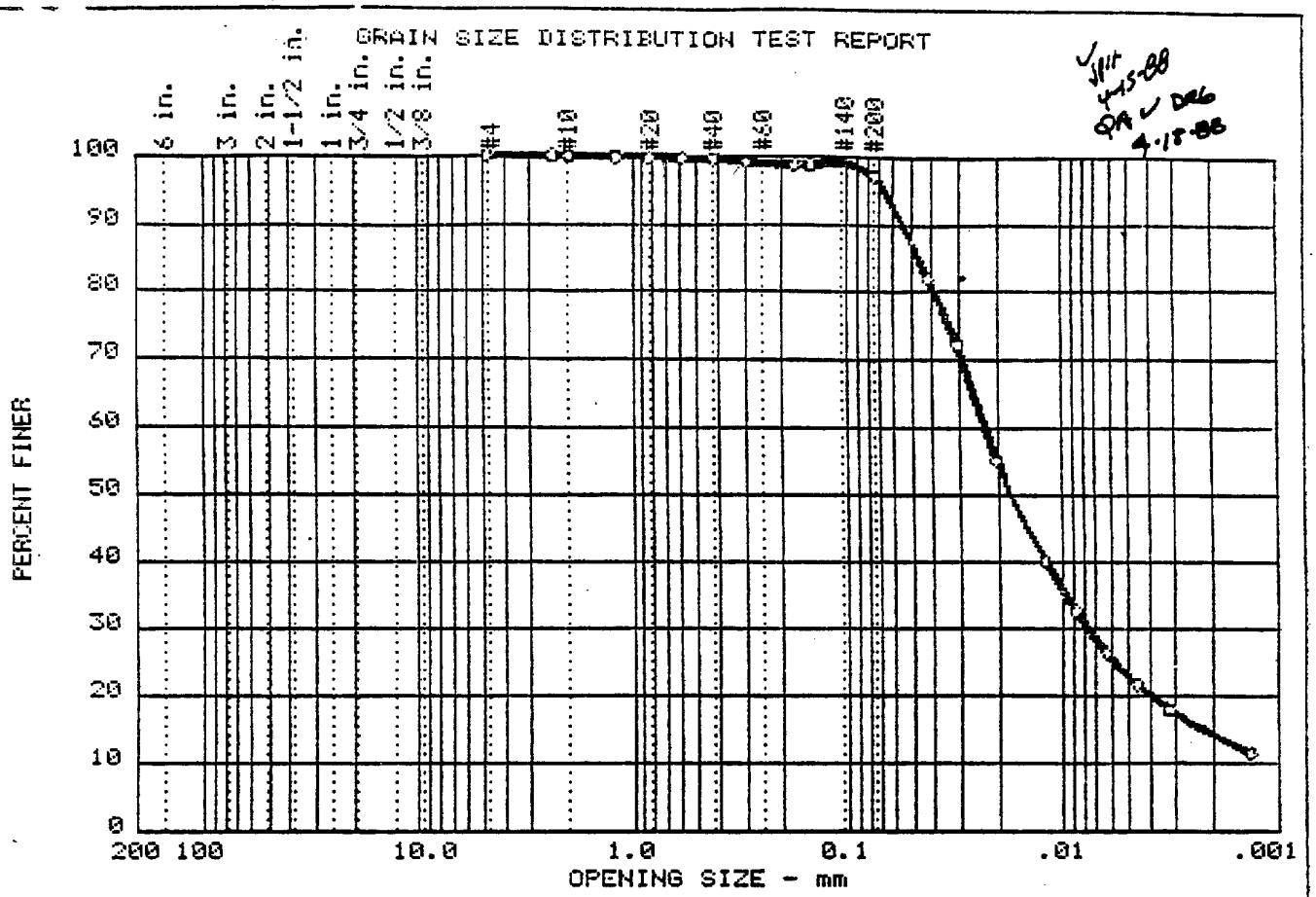
GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Fig. No. ____

GRAIN SIZE DISTRIBUTION TEST REPORT

✓ JHT 4-15-88
QA ✓ DAG 4-18-88



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.0	2.9	74.1	23.0

	Classification		LL	PI	D_{60}	D_{30}	D_{10}	C_c	C_u
	USCS	AASHTO							
○									

MATERIAL DESCRIPTION	TYPE OF TEST
○	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis

Project No.: 1332.32
Project: COE-NIROP
○ Location: 13D, S-9, 40'-41.5'

Date: 4/6/88

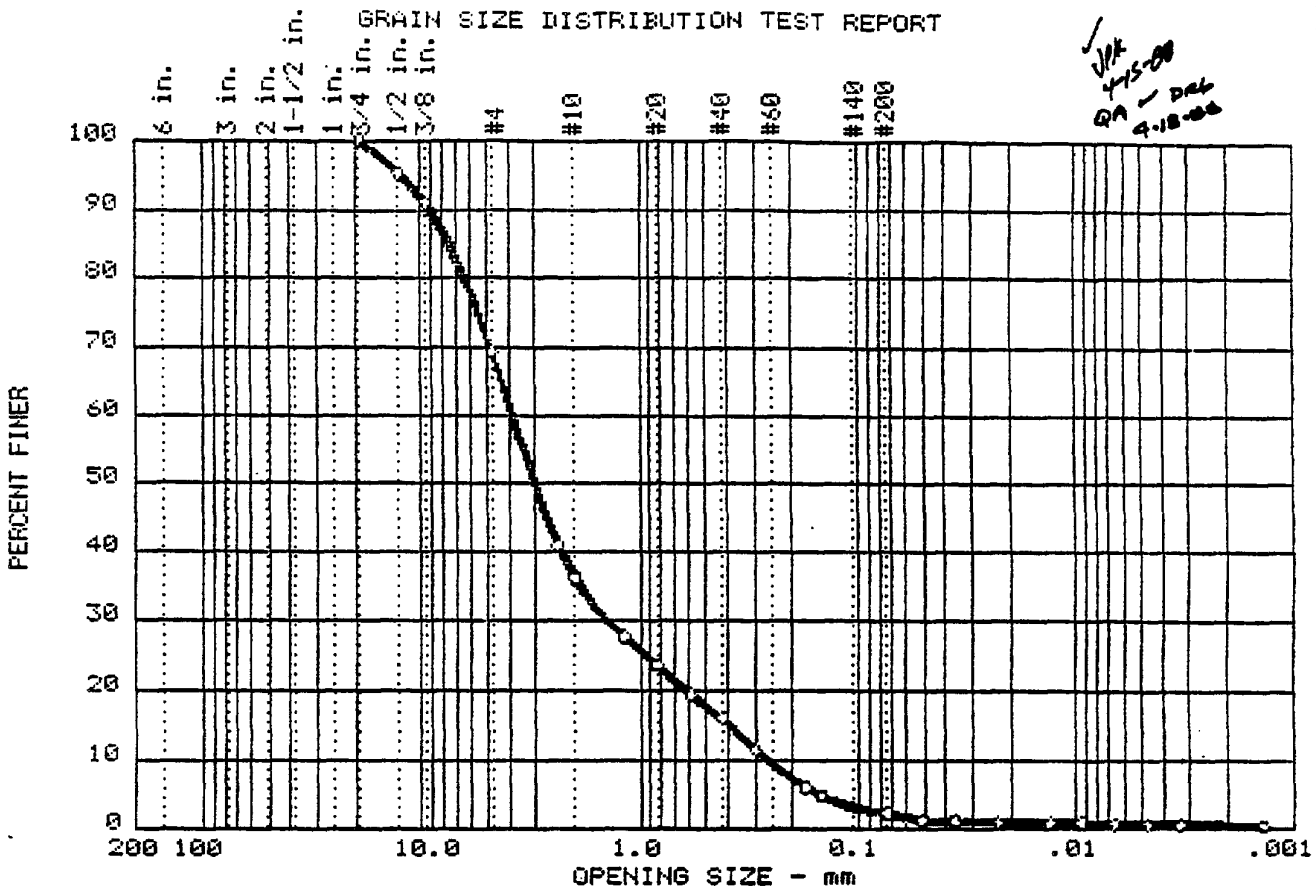
Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Fig. No. ____

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	30.5	67.5	1.6	0.5

	Classification		LL	PI	D_{60}	D_{30}	D_{10}	C_c	C_u
	USCS	AASHTO							
○					3.82	1.403	0.2612	1.97	14.6

MATERIAL DESCRIPTION	TYPE OF TEST
○	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis

Project No.: 1332.32
Project: COE-NIROP
○ Location: 13D, S-20, 95'-96.5'

Date: 4/6/88

Remarks:

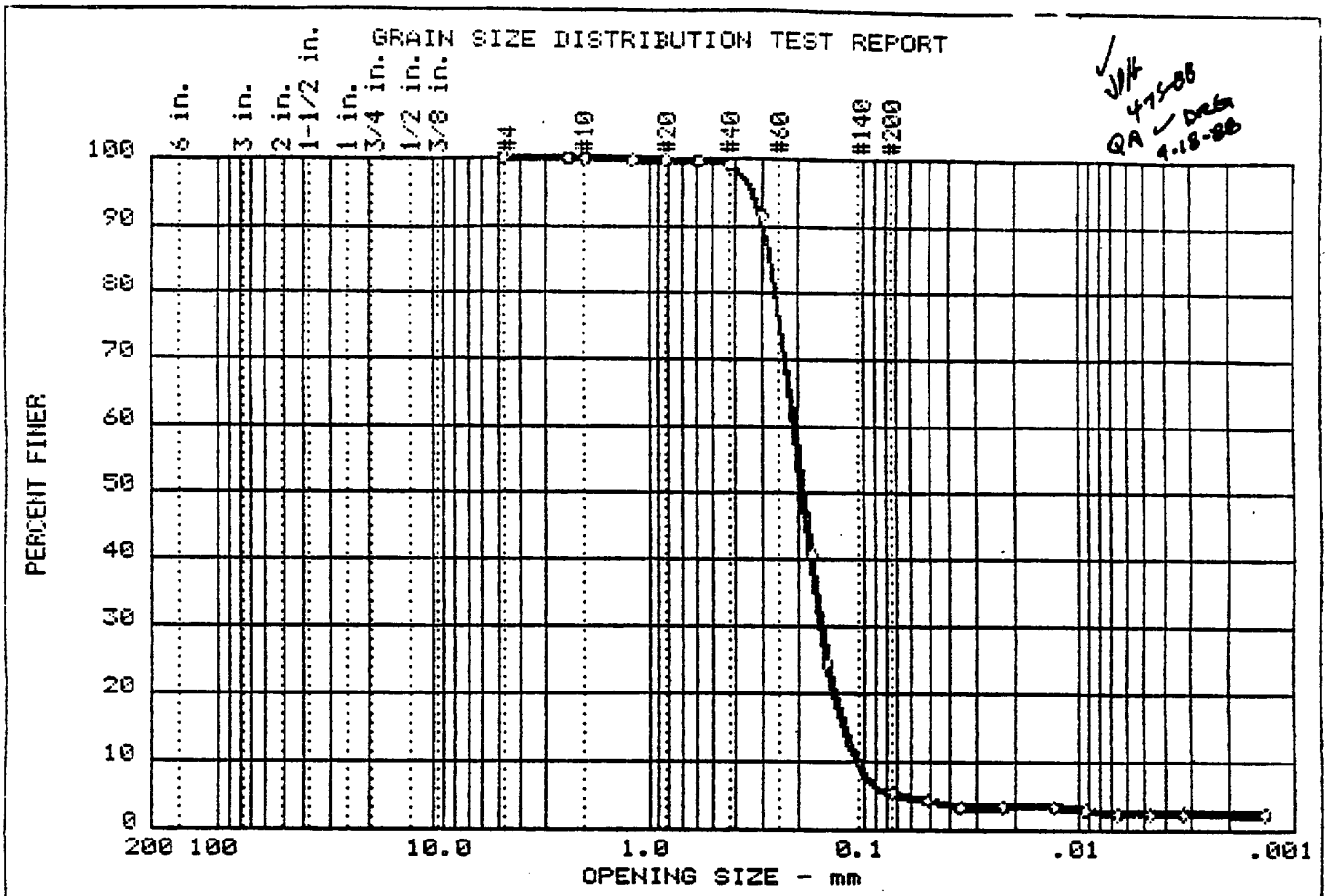
GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Fig. No. ____

GRAIN SIZE DISTRIBUTION TEST REPORT

✓ JH 4/5/88 QA ✓ DRG 4-18-88



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.0	94.7	3.0	2.2

	Classification		LL	PI	D_{60}	D_{30}	D_{10}	C_c	C_u
	USCS	AASHTO							
○					0.21	0.158	0.1096	1.09	1.9

MATERIAL DESCRIPTION	TYPE OF TEST
○	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis

Project No.: 1332.32
Project: COE-NIROP
○ Location: 14D, S-2, 35'-36.5'

Date: 4/6/88

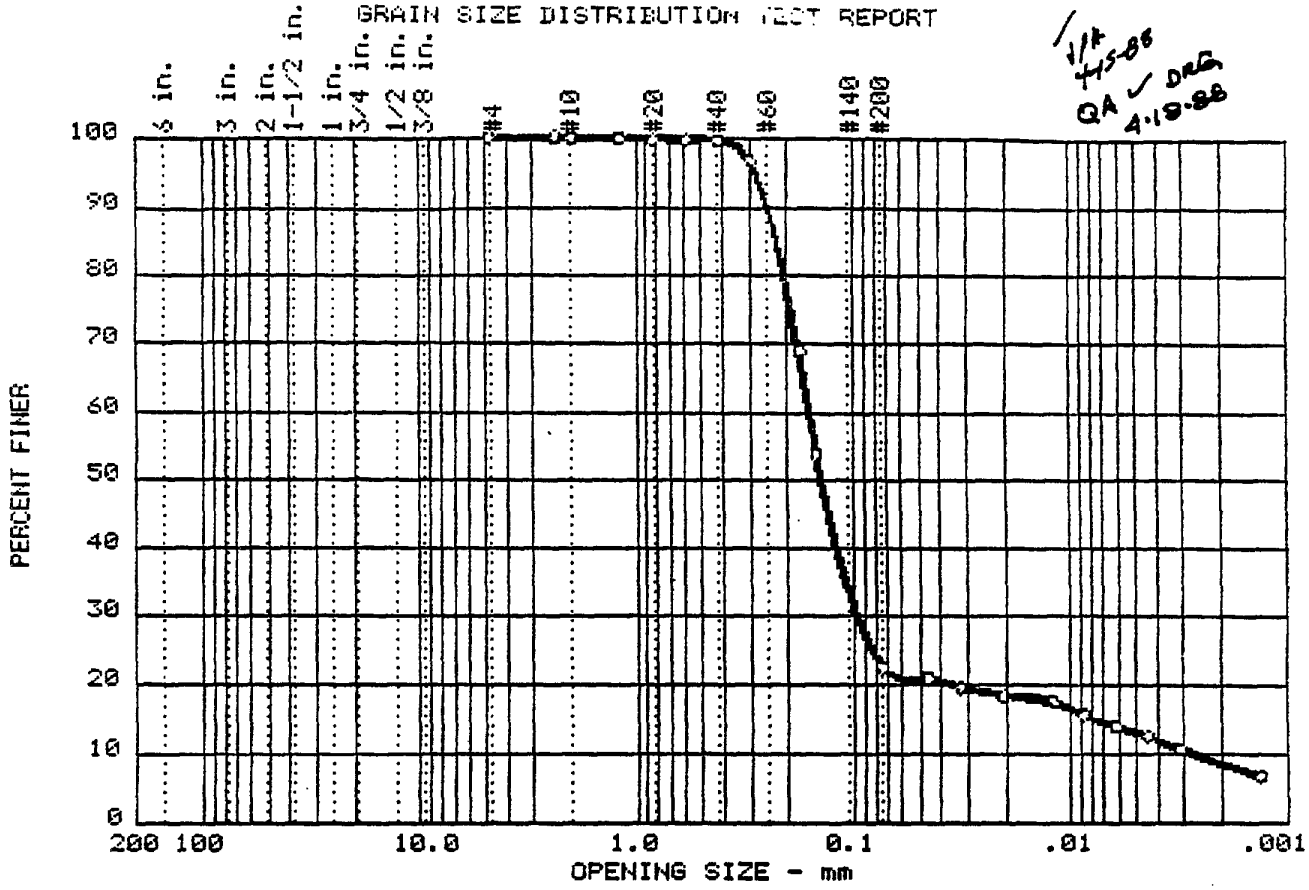
Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Fig. No. ____

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
◇	0.0	0.0	77.6	9.2	13.2

	Classification		LL	PI	D_{60}	D_{30}	D_{10}	C_c	C_u
	USCS	AASHTO							
◇					0.15	0.098	0.0028	23.36	53.9

MATERIAL DESCRIPTION	TYPE OF TEST
◇	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis

Project No.: 1332.32
Project: COE-NIROP
◇ Location: 14D, S-4, 45'-46.5'

Date: 4/6/88

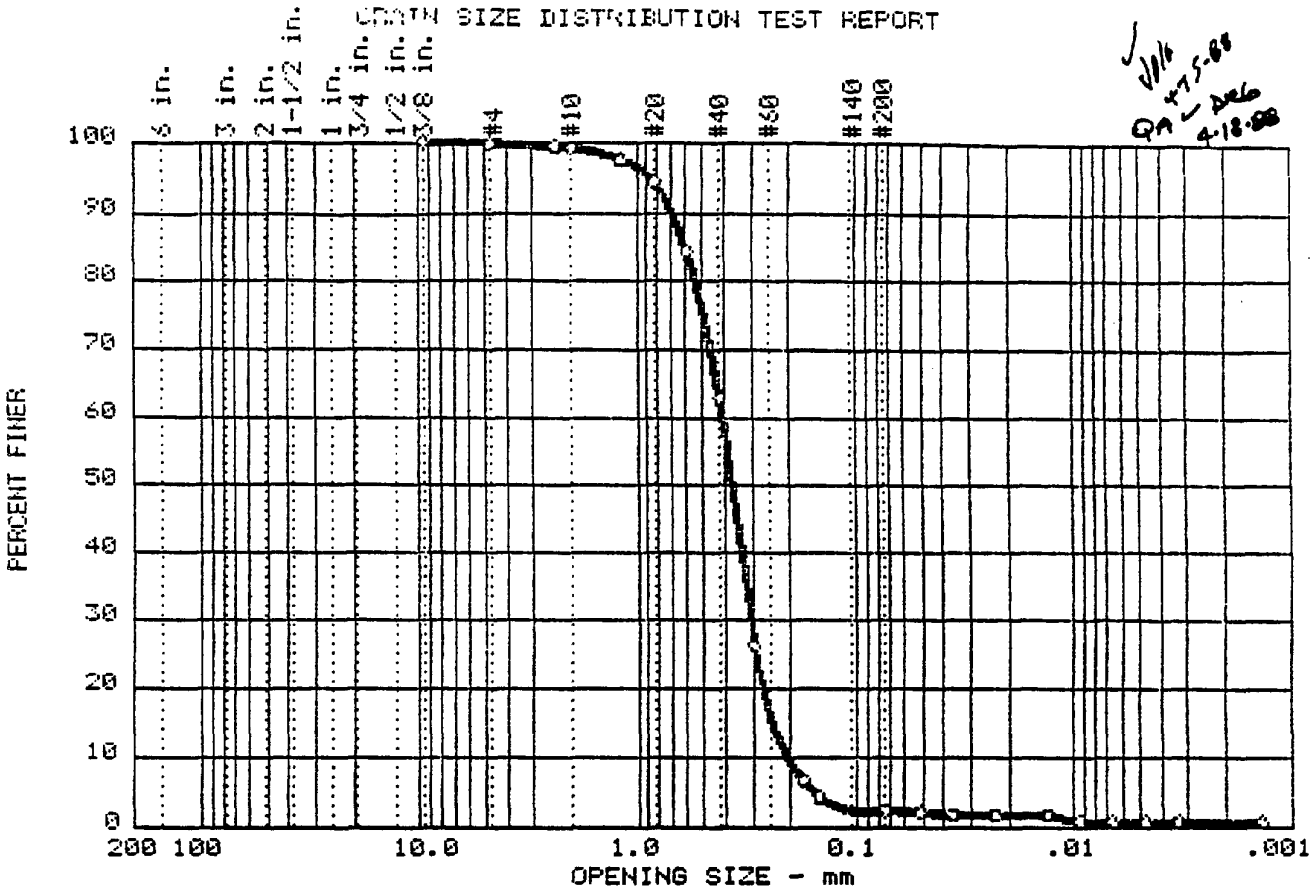
Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Fig. No. ____

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
◇	0.0	0.2	97.5	1.6	0.7

	Classification		LL	PI	D_{60}	D_{30}	D_{10}	C_c	C_u
	USCS	AASHTO							
◇					0.41	0.297	0.2098	1.03	1.9

MATERIAL DESCRIPTION	TYPE OF TEST
◇	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis

Project No.: 1332.32
Project: COE-NIROP
◇ Location: 14D, S-12, 85'-86.5'

Date: 4/6/88

Remarks:

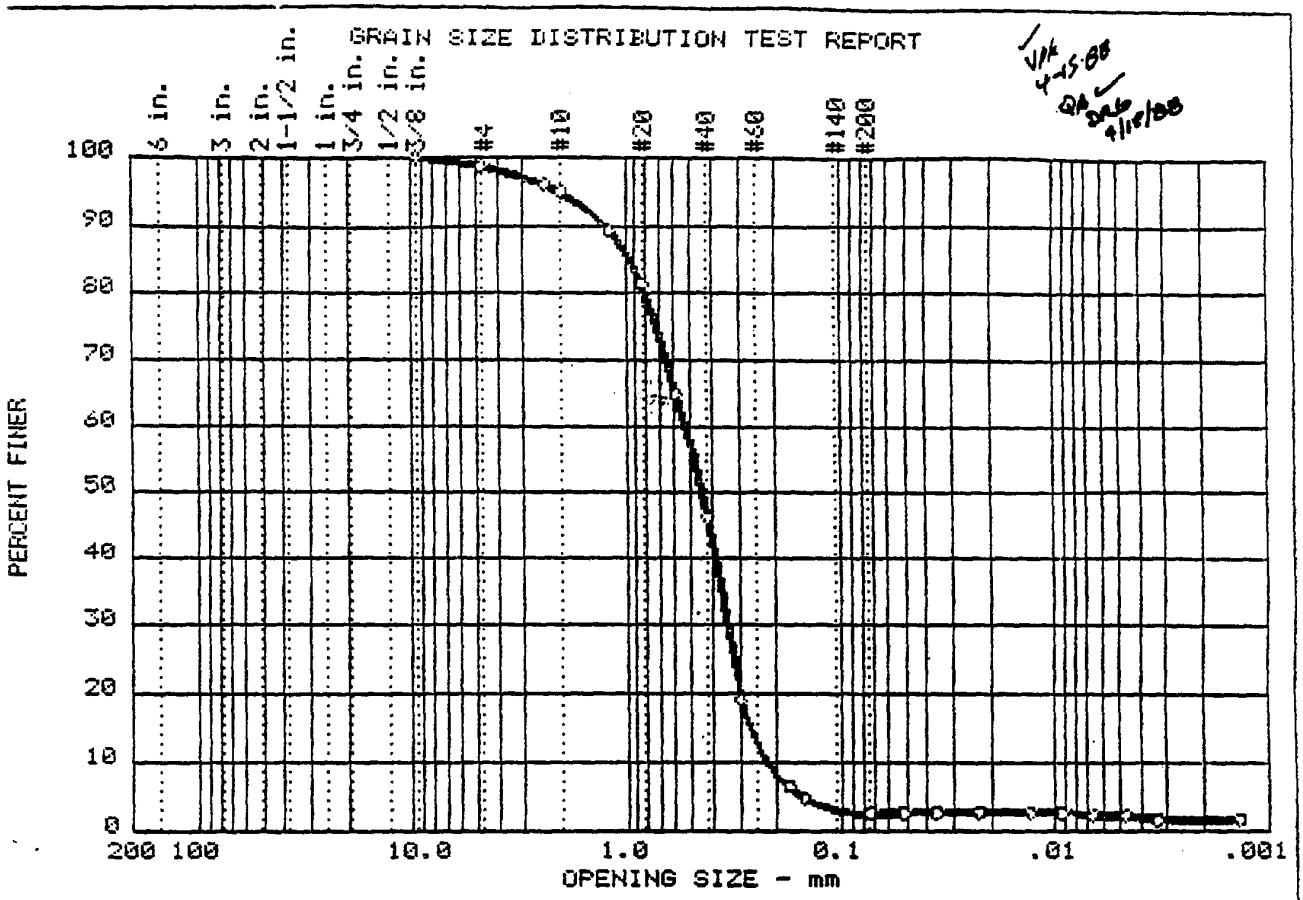
GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Fig. No. ____

GRAIN SIZE DISTRIBUTION TEST REPORT

JPK 4-15-88
QA DRB 4/18/88



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	1.4	96.2	0.2	2.2

	Classification		LL	PI	D_{60}	D_{30}	D_{10}	C_c	C_u
	USCS	AASHTO							
○					0.53	0.344	0.2270	0.97	2.4

MATERIAL DESCRIPTION	TYPE OF TEST
	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis

Project No.: 1332.32
Project: COE-NIROP
○ Location: 23S, ~~#6~~ S-6 10-11'

Date: MARCH 25, 1988

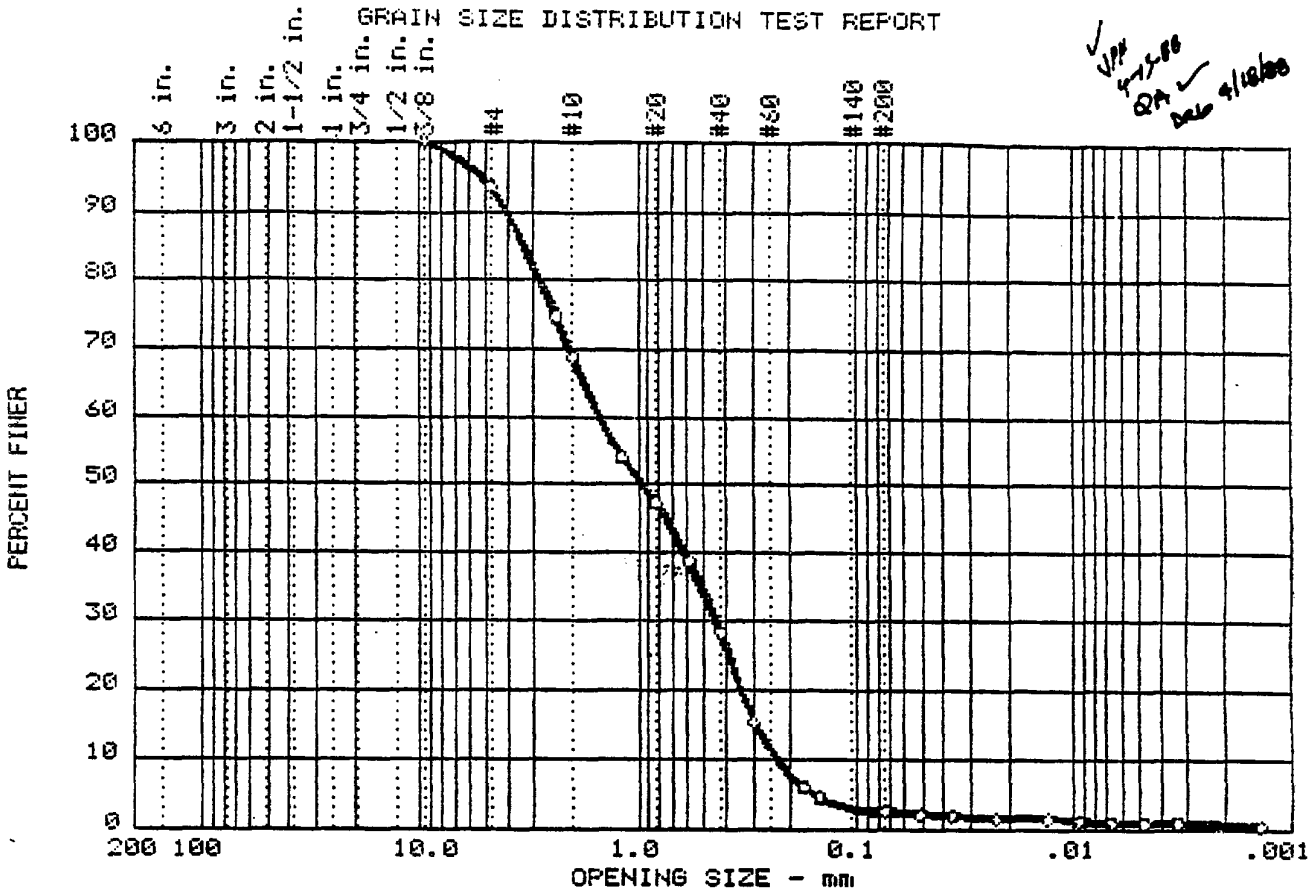
Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Fig. No. ____

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
◇	0.0	6.4	91.1	1.6	0.9

	Classification		LL	PI	D_{60}	D_{30}	D_{10}	C_c	C_u
	USCS	AASHTO							
◇					1.51	0.440	0.2333	0.55	6.5

MATERIAL DESCRIPTION	TYPE OF TEST
	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis

Project No.: 1332.32
Project: COE-NIROP
Q Location: 23S, ~~#9 & 10~~ S-9, 20-21'

Date: MARCH 25, 1988

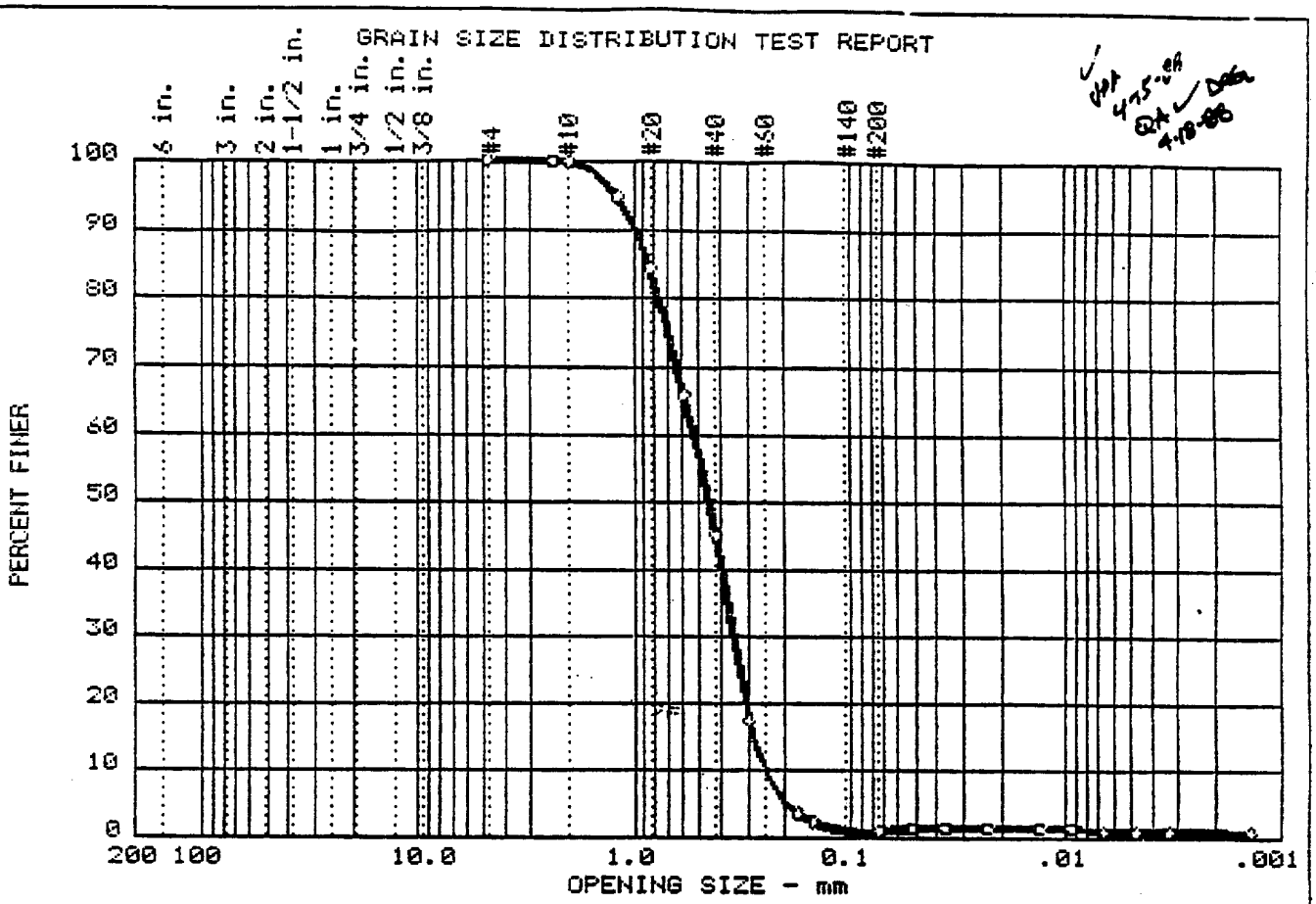
Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Fig. No. ____

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.0	99.2	0.0	0.8

	Classification		LL	PI	D_{60}	D_{30}	D_{10}	C_c	C_u
	USCS	AASHTO							
○					0.53	0.350	0.2497	0.93	2.1

MATERIAL DESCRIPTION	TYPE OF TEST
	ASTM D 422-63(72) Hydrometer analysis Mechanical analysis

Project No.: 1332.32
Project: COE-NIROP
○ Location: 23S, ~~#13~~ S-13, 30-31'

Date: MARCH 25, 1988

Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Fig. No. ____

APPENDIX D

BENCH-SCALE TESTS

BENCH-SCALE TESTS

Packed-bed air stripping columns and carbon adsorption were evaluated as potential technologies for remediation of ground water at the NIROP. On-site, bench-scale tests of the ground water were conducted to determine whether the chemical characteristics of the ground water would result in potential operation or maintenance problems if implementation of either of these technologies was pursued.

Based on previous ground water quality data, it was anticipated that ground water in the vicinity of the NIROP may be in a chemically reduced condition. If so, the water may contain dissolved iron at sufficient concentrations to cause precipitation of iron hydroxide and subsequent fouling of treatment equipment if the iron is oxidized by oxygen absorbed from the atmosphere. Similarly, it was anticipated that precipitation of calcium carbonate from the ground water could foul remediation equipment. Calcium carbonate precipitation could occur if the ground water is supersaturated with carbon dioxide with respect to the atmosphere. As the water loses carbon dioxide to the atmosphere, the pH rises and calcium carbonate may precipitate, causing scaling and fouling of treatment equipment and piping.

To test the potential for calcium carbonate and iron hydroxide precipitation, five samples of pumped ground water were collected from the discharge of well AT-2 during the aquifer pumping test conducted in February 1988. The samples were collected after allowing the discharge water quality to stabilize, as determined by constant pH, temperature, and specific conductance. Samples were drawn from a tap on the pump

discharge header through a Tygon© tube inserted directly into the sample container, to minimize air contact during sampling.

The samples were analyzed for various constituents before and after equilibration with the atmosphere. To speed up equilibration, air was bubbled through the samples for varying time durations. The samples were also analyzed for various constituents after allowing the precipitated solids formed during the aeration step to settle for varying amount of time. Lab analyses for the bench-scale tests were conducted by RMT Laboratories, Inc., of Madison, Wisconsin.

A description of the tests conducted is given in Table 6-9. The results of the bench-scale tests are presented in Table 6-10.

The results indicate the ground water is characterized by high concentrations of dissolved calcium (250 mg/l), and is supersaturated with respect to calcium carbonate (Langelier Saturation Index greater than zero). The dissolved calcium concentration in the ground water decreased with increasing aeration time, indicating precipitation of calcium carbonate. this was confirmed by the significant increase in total suspended solids after aeration, which was also visually observed by the analyst as increased turbidity of the samples. Calcium carbonate precipitation is further confirmed by decreasing alkalinity with increased aeration. The decrease in calcium and alkalinity concentrations was found to be a linear relationship with time of aeration. The sample also contained 1.7 mg/l total iron, which was almost completely precipitated after five minutes of aeration.

The bench-scale test results indicate that aeration of ground water from the NIROP site will cause precipitation of significant amounts of iron hydroxide and calcium carbonate. The precipitated solids would

cause potential operation or maintenance problems for certain types of ground water treatment equipment. These conclusions were used in the re-evaluation of remedial alternatives conducted for the Feasibility Study Addendum Report.

APPENDIX E

USACE-WES LABORATORY REPORTS AND CHAIN-OF-CUSTODY RECORDS

JOB DESCRIPTION:NIROP - OMAHA
REPORT DATE:11 May 88

NIROP0000000000 HN03
RECEIPT DATE:26 JAN 88

JOB FILE:99059
EST. COMP. DATE:04 Mar 89

B : DENOTES PPB

LAB ID	PROJECT ID		COLUMN.... 1	2	3	4	ROW
			ANALYSIS.. 12	15	17	23	
			PPM..... SE	ZN	BA	MN	
99059	24S	CONC	<0.005	0.033	0.149	1.74	
		%REC	84	97.8	98.8	93.7	1
		DUPL	<0.005	0.032	0.154	1.76	
		OID	01308064	51208040	51208041	51208041	
						HGA AUTH	
99060	10S	CONC	<0.005	0.195	0.092	1.08	
		%REC					2
		DUPL					
		OID	01308064	51208040	51208041	51208041	
						HGA AUTH	
99061	11S	CONC	<0.005	0.069	0.082	<0.030	
		%REC					3
		DUPL					
		OID	01308064	51208040	51208041	51208041	
						HGA AUTH	
99062	QC DUPLICATE #1	CONC	<0.005	0.043	0.156	1.73	
		%REC					4
		DUPL					
		OID	01308064	51208040	51208041	51208041	
						HGA AUTH	
99063	22S	CONC	<0.005	<0.030	0.123	0.372	
		%REC					5
		DUPL					
		OID	01308064	51208040	51208041	51208041	
						HGA AUTH	

SE SELENIUM ZN ZINC BA BARIUM
MN MANGANESE

JOB DESCRIPTION:*NIROP - OMAHA
REPORT DATE:11 May 88

NIROP0000000000
RECEIPT DATE:26 JAN 88

JOB FILE:99053
EST. COMP. DATE:04 Mar 88

B : DENOTES PPB

LAB ID	PROJECT ID		COLUMN.... 1	2	3	4	5	6	7	8	9	ROW
			ANALYSIS.. 72	73	74	75	76	77	78	79	80	
			PPM..... CLME	BRME	VICL	CLET	MECL	DCLETE	11DCE	+DICLE	CHCL3	
99053	24S	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										1
		DUPL										
		DID	089580293	089580293	089580293	089580293	089580293	089580293	089580293	089580293	089580293	
99054	10S	CONC	<0.010	<0.010	<0.010	<0.010	0.028	<0.005	<0.005	<0.005	<0.005	
		%REC										2
		DUPL										
		DID	089580293	089580293	089580293	089580293	089580293	089580293	089580293	089580293	089580293	
99055	11S	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										3
		DUPL										
		DID	089580293	089580293	089580293	089580293	089580293	089580293	089580293	089580293	089580293	
99056	QC DUPLICATE #1	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										4
		DUPL										
		DID	089580293	089580293	089580293	089580293	089580293	089580293	089580293	089580293	089580293	
99057	QC TRIP BLANK #1	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										5
		DUPL										
		DID	089580293	089580293	089580293	089580293	089580293	089580293	089580293	089580293	089580293	
99058	22S	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										6
		DUPL										
		DID	089580293	089580293	089580293	089580293	089580293	089580293	089580293	089580293	089580293	

CLME	CHLOROMETHANE	BRME	BROMOMETHANE	VICL	VINYL CHLORIDE
CLET	CHLOROETHANE	MECL	METHYLENE CHLORIDE	DCLETE	1 1-DICHLOROETHENE
11DCE	1 1-DICHLOROETHANE	+DICLE	TRANS-1 2-DICHLOROETHENE	CHCL3	CHLOROFORM

JOB DESCRIPTION:%NIROP - OMAHA
REPORT DATE:11 May 88

NIROP0000000000
RECEIPT DATE:26 JAN 88

JOB FILE:99053
EST. COMP. DATE:04 Mar 88

_
B : DENOTES PPB

LAB ID	PROJECT ID		10	11	12	13	14	15	16	17	18	ROW
		COLUMN....	10	11	12	13	14	15	16	17	18	
		ANALYSIS..	81	82	83	84	85	86	87	88	89	
		PPM.....	12DCE	111TCA	C CL 4	BRCL2M	DICLPR	+CLPRE	TCE	DBRCLM	CCLPRE	
99053	24S	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.023	<0.005	<0.005	1
		%REC										
		DUPL										
		OID	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958059	08958029	
99054	10S	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.23	<0.005	<0.005	2
		%REC										
		DUPL										
		OID	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958059	08958029	
99055	11S	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.035	<0.005	<0.005	3
		%REC										
		DUPL										
		OID	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958059	08958029	
99056	QC DUPLICATE #1	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.026	<0.005	<0.005	4
		%REC										
		DUPL										
		OID	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958059	08958029	
99057	QC TRIP BLANK #1	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	5
		%REC										
		DUPL										
		OID	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958059	08958029	
99058	22S	CONC	<0.005	0.017	<0.005	<0.005	<0.005	<0.005	0.40	<0.005	<0.005	6
		%REC										
		DUPL										
		OID	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958059	08958029	

12DCE	1 2-DICHLOROETHANE	111TCA	1 1 1-TRICHLOROETHANE	C CL 4	CARBON TETRACHLORIDE
BRCL2M	BROMODICHLOROMETHANE	DICLPR	1 2 DICHLOROPROPANE	+CLPRE	TRANS-1 3-DICHLOROPROPENE
TCE	TRICHLOROETHENE	DBRCLM	DIBROMOCHLOROMETHANE	CCLPRE	CIS-1 3-DICHLOROPROPENE

JOB DESCRIPTION: NIROP - OMAHA
REPORT DATE: 11 May 88

NIROP0000000000
RECEIPT DATE: 26 JAN 88

JOB FILE: 99053
EST. COMP. DATE: 04 Mar 88

B : DENOTES PPB

LAB ID	PROJECT ID		COLUMN....	19	20	21	22	23	24	25	26	27	ROW
			ANALYSIS..	90	91	92	93	94	95	96	97	98	
			PPM.....	112TCA	BENZEN	CLETRE	CHBR3	TCLETA	TCLETE	TOLUEN	CLBEN	ETBEN	
99053	24S		CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
			%REC										1
			DUPL										
			DID	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	
99054	10S		CONC	<0.005	<0.005	<0.010	<0.005	<0.005	0.021	<0.005	<0.005	<0.005	
			%REC										2
			DUPL										
			DID	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	
99055	11S		CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
			%REC										3
			DUPL										
			DID	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	
99056	QC DUPLICATE #1		CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
			%REC										4
			DUPL										
			DID	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	
99057	QC TRIP BLANK #1		CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
			%REC										5
			DUPL										
			DID	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	
99058	22S		CONC	<0.005	<0.005	<0.010	<0.005	<0.005	0.041	<0.005	<0.005	<0.005	
			%REC										6
			DUPL										
			DID	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	

112TCA	1 1 2-TRICHLOROETHANE	BENZEN	BENZENE	CLETRE	2-CHLOROETHYLVINYLETHER
CHBR3	BROMOFORM	TCLETA	1 1 2 2-TETRACHLOROETHANE	TCLETE	TETRACHLOROETHENE
TOLUEN	TOLUENE	CLBEN	CHLOROBENZENE	ETBEN	ETHYLBENZENE

JOB DESCRIPTION: NIROP - OMAHA
REPORT DATE: 11 May 88

NIROP0000000000
RECEIPT DATE: 26 JAN 88

JOB FILE: 99053
EST. COMP. DATE: 04 Mar 88

B : DENOTES PPB

LAB ID	PROJECT ID	COLUMN....	28	29	30	31	32	33	34	35	36	ROW
		ANALYSIS..	99	100	156	157	158	159	160	161	162	
		PPM.....	ACRO	ACRY	ACETON	CARDIS	2-BUTN	VYLACT	2-HEXN	METPEN	STYREN	
99053	24S	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	1
		%REC										
		DUPL										
		OID	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	
99054	10S	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	2
		%REC										
		DUPL										
		OID	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	
99055	11S	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	3
		%REC										
		DUPL										
		OID	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	
99056	QC DUPLICATE #1	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	4
		%REC										
		DUPL										
		OID	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	
99057	QC TRIP BLANK #1	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	5
		%REC										
		DUPL										
		OID	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	
99058	22S	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	6
		%REC										
		DUPL										
		OID	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	08958029	

ACRO	ACROLEIN	ACRY	ACRYLONITRILE	ACETON	ACETONE
CARDIS	CARBON DISULFIDE	2-BUTN	2-BUTANONE	VYLACT	VINYL ACETATE
2-HEXN	2-HEXANONE	METPEN	4-METHYL-2-PENTANONE	STYREN	STYRENE

JOB DESCRIPTION:NIROP - OMAHA
REPORT DATE:11 May 88

NIROP0000000000
RECEIPT DATE:26 JAN 88

JOB FILE:99053
EST. COMP. DATE:04 Mar 88

B : DENOTES PPB

LAB ID	PROJECT ID	COLUMN....	37	38	39	40	41	42	ROW
		ANALYSIS..	163	164	165	166	167	168	
		PPM.....	T-XYL	CISDIC	TOL-D8	12ED4	BFB	TRCLME	
99053	24S	CONC	<0.005	0.17	96.2%	94.2%	100%	<0.005	1
		%REC							
		DUPL							
		OID	089580293	089580293	089580293	089580293	089580293	089580293	
99054	10S	CONC	<0.005	0.045	94.7%	106%	99.6%	<0.005	2
		%REC							
		DUPL							
		OID	089580293	089580293	089580293	089580293	089580293	089580293	
99055	11S	CONC	<0.005	0.011	96.1%	84.6%	93.9%	<0.005	3
		%REC							
		DUPL							
		OID	089580293	089580293	089580293	089580293	089580293	089580293	
99056	QC DUPLICATE #1	CONC	<0.005	0.18	96.4%	96.4%	95.7%	<0.005	4
		%REC							
		DUPL							
		OID	089580293	089580293	089580293	089580293	089580293	089580293	
99057	QC TRIP BLANK #1	CONC	<0.005	<0.005	95.6%	97.2%	97.8%	<0.005	5
		%REC							
		DUPL							
		OID	089580293	089580293	089580293	089580293	089580293	089580293	
99058	22S	CONC	<0.005	0.049	98.5%	99.4%	97.4%	<0.005	6
		%REC							
		DUPL							
		OID	089580293	089580293	089580293	089580293	089580293	089580293	

T-XYL TOTAL XYLENES
12ED4 12-DICHLOROETHANE-D4
CISDIC CIS-12-DICHLOROETHYLENE
BFB 4-BROMOFLUOROBENZENE
TOL-D8 TOLUENE-D8
TRCLME TRICHLOROFLUOROMETHANE

JOB DESCRIPTION:NIROP - OMAHA
REPORT DATE:11 May 88

NIROP0000000000
RECEIPT DATE:27 JAN 88

JOB FILE:99070
EST. COMP. DATE:04 Mar 88

B : DENOTES PPB

LAB ID	PROJECT ID		COLUMN.... 1	2	3	4	ROW
			ANALYSIS.. 12	15	17	23	
			PPM..... SE	ZN	BA	MN	
99070	5I	CONC	<0.005	0.189	0.143	0.680	
		%REC	84	103	106	97.1	1
		DUPL	<0.005	0.194	0.146	0.675	
		OID	01308064	51208040	51208041	51208041	
						HGA AUTH	
99071	5S	CONC	<0.005	0.497	0.072	1.72	
		%REC					2
		DUPL					
		OID	01308064	51208040	51208041	51208041	
						HGA AUTH	
99072	6S	CONC	<0.005	0.338	0.077	0.934	
		%REC					3
		DUPL					
		OID	01308064	51208040	51208041	51208041	
						HGA AUTH	
99073	17S	CONC	<0.005	2.01	0.062	0.333	
		%REC					4
		DUPL					
		OID	01308064	51208040	51208041	51208041	
						HGA AUTH	
99074	18S	CONC	<0.005	1.97	0.118	1.12	
		%REC					5
		DUPL					
		OID	01308064	51208040	51208041	51208041	
						HGA AUTH	

SE SELENIUM ZN ZINC BA BARIUM
MN MANGANESE

ENVIRONMENTAL LABORATORY ANALYTICAL LABORATORY GROUP DATA REPORTING SHEET (SHEET 1 OF 5)

JOB DESCRIPTION: NIROP - OMAHA | NIROP0000000000 | JOB FILE: 99064
REPORT DATE: 11 May 88 | RECEIPT DATE: 27 JAN 88 | EST. COMP. DATE: 11 Mar 88

B : DENOTES PPB

LAB ID	PROJECT ID		COLUMN.... 1	2	3	4	5	6	7	8	9	ROW
			ANALYSIS.. 72	73	74	75	76	77	78	79	80	
			PPM..... CLME	BRME	VICL	CLET	MECL	DCLETE	11DCE	+DICLE	CHCL3	
99064	5I	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	0.014	0.106	<0.005	<0.005	
		%REC										1
		DUPL							0.097			
		OID	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	
99065	5S	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										2
		DUPL										
		OID	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	
99066	6S	CONC	<0.010	<0.010	<0.010	<0.010	0.037	<0.005	<0.005	<0.005	<0.005	
		%REC						105.5	84.5	83.3	80.1	3
		DUPL					0.038			<0.005		
		OID	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	
99067	17S	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										4
		DUPL										
		OID	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	
99068	18S	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	0.009	<0.005	<0.005	<0.005	
		%REC										5
		DUPL								<0.005		
		OID	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	
99069	QC TRIP BLANK #2	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										6
		DUPL										
		OID	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	

CLME	CHLOROMETHANE	BRME	BROMOMETHANE	VICL	VINYL CHLORIDE
CLET	CHLOROETHANE	MECL	METHYLENE CHLORIDE	DCLETE	1 1-DICHLOROETHENE
11DCE	1 1-DICHLOROETHANE	+DICLE	TRANS-1 2-DICHLOROETHENE	CHCL3	CHLOROFORM

JOB DESCRIPTION: NIROP - OMAHA | NIROP0000000000 | JOB FILE: 99064
REPORT DATE: 11 May 88 | RECEIPT DATE: 27 JAN 88 | EST. COMP. DATE: 11 Mar 88

B : DENOTES PPB

LAB ID	PROJECT ID	COLUMN....	10	11	12	13	14	15	16	17	18	ROW
		ANALYSIS..	81	82	83	84	85	86	87	88	89	
		PPM.....	12DCE	111TCA	C CL 4	BRCL2M	DICLPR	+CLPRE	TCE	DBRCLM	CCLPRE	
99064	5I	CONC	<0.005	0.287	<0.005	<0.005	<0.005	<0.005	7.1	<0.005	<0.005	
		%REC										1
		DUPL		0.286								
		OID	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	
99065	5S	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										2
		DUPL										
		OID	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	
99066	6S	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.32	<0.005	<0.005	
		%REC	94.45	103.3	102.6	102.45			104.5			3
		DUPL										
		OID	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	
99067	17S	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.276	<0.005	<0.005	
		%REC										4
		DUPL							0.279			
		OID	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	
99068	1BS	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	12.7	<0.005	<0.005	
		%REC										5
		DUPL										
		OID	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	
99069	QC TRIP BLANK #2	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										6
		DUPL										
		OID	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	

12DCE 1 2-DICHLOROETHANE
BRCL2M BROMODICHLOROMETHANE
TCE TRICHLOROETHENE
111TCA 1 1 1-TRICHLOROETHANE
DICLPR 1 2 DICHLOROPROPANE
DBRCLM DIBROMOCHLOROMETHANE
C CL 4 CARBON TETRACHLORIDE
+CLPRE TRANS-1 3-DICHLOROPROPENE
CCLPRE CIS-1 3-DICHLOROPROPENE

JOB DESCRIPTION:$NIROP - OMAHA NIROP0000000000 JOB FILE:99064
REPORT DATE:11 May 88 RECEIPT DATE:27 JAN 88 EST. COMP. DATE:11 Mar 88

B : DENOTES PPB

LAB ID	PROJECT ID		112TCA (19, 90)	BENZEN (20, 91)	CLETRE (21, 92)	CHBR3 (22, 93)	TCLETA (23, 94)	TCLETE (24, 95)	TOLUEN (25, 96)	CLBEN (26, 97)	ETBEN (27, 98)	ROW
		PPM.....										
99064	5I	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	0.141	0.0057	<0.005	<0.005	
		%REC										1
		DUPL						0.132				
		OID	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	
99065	5S	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										2
		DUPL										
		OID	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	
99066	6S	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	0.026	<0.005	<0.005	<0.005	
		%REC	100.9	101.55		107.6	103.1	100.95	100.7	102.15		3
		DUPL						0.026				
		OID	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	
99067	17S	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	0.021	<0.005	<0.005	<0.005	
		%REC										4
		DUPL						0.020				
		OID	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	
99068	18S	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										5
		DUPL										
		OID	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	
99069	QC TRIP BLANK #2	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										6
		DUPL										
		OID	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	08958032	

112TCA 1 1 2-TRICHLOROETHANE
BENZEN BENZENE
CLETRE 2-CHLOROETHYLVINYLETHER
CHBR3 BROMOFORM
TCLETA 1 1 2 2-TETRACHLOROETHANE
TCLETE TETRACHLOROETHENE
TOLUEN TOLUENE
CLBEN CHLOROBENZENE
ETBEN ETHYLBENZENE

JOB DESCRIPTION: NIROP - OMAHA
REPORT DATE: 11 May 88

NIROP0000000000
RECEIPT DATE: 27 JAN 88

JOB FILE: 99064
EST. COMP. DATE: 11 Mar 88

B : DENOTES PPB

LAB ID	PROJECT ID	COLUMN....	28	29	30	31	32	33	34	35	36	ROW
		ANALYSIS..	99	100	156	157	158	159	160	161	162	
		PPM.....	ACRO	ACRY	ACETON	CRBNDI	2-BUTN	VNLACT	2-HEXN	METPET	SYTREN	
99064	5I	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	1
		%REC										
		DUPL										
		OID	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	
99065	5S	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	2
		%REC										
		DUPL										
		OID	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	
99066	6S	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	3
		%REC										
		DUPL										
		OID	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	
99067	17S	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	4
		%REC										
		DUPL										
		OID	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	
99068	18S	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	5
		%REC										
		DUPL										
		OID	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	
99069	QC TRIP BLANK #2	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	6
		%REC										
		DUPL										
		OID	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	089580 32	

ACRO	ACROLEIN	ACRY	ACRYLONITRILE	ACETON	ACETONE
CRBNDI	CARBON DISULLFIDE	2-BUTN	2-BUTANONE	VNLACT	VINYL ACETATE
2-HEXN	2-HEXANONE	METPET	4-METHYL-2-PENTANONE	SYTREN	STYRENE

JOB DESCRIPTION: NIROP - OMAHA
REPORT DATE: 11 May 88

NIROP0000000000
RECEIPT DATE: 27 JAN 88

JOB FILE: 99064
EST. COMP. DATE: 11 Mar 88

B : DENOTES PPB

LAB ID	PROJECT ID		COLUMN.... 37	38	39	40	41	42	ROW
			ANALYSIS.. 163	164	165	166	167	168	
			PPM..... T-XYL	CISDIC	TOL-D8	12ED4	BFB	TRCLME	
99064	5I	CONC	0.036	1.41	102%	106%	103%	<0.005	
		%REC							1
		DUPL							
		DID	08958032	08958032	08958032	08958032	08958032	08958032	
99065	5S	CONC	<0.005	<0.005	103%	89.7%	97.8%	<0.005	
		%REC							2
		DUPL							
		DID	08958032	08958032	08958032	08958032	08958032	08958032	
99066	6S	CONC	<0.005	0.028	99.4%	85.8%	109%	<0.005	
		%REC		83.3	103	97.6	93.6	83.95	3
		DUPL		0.024					
		DID	08958032	08958032	08958032	08958032	08958032	08958032	
99067	17S	CONC	<0.005	0.026	103%	88.2%	92.7%	<0.005	
		%REC							4
		DUPL							
		DID	08958032	08958032	08958032	08958032	08958032	08958032	
99068	18S	CONC	<0.005	2.44	102%	93.6%	105%	<0.005	
		%REC							5
		DUPL		2.20					
		DID	08958032	08958032	08958032	08958032	08958032	08958032	
99069	QC TRIP BLANK #2	CONC	<0.005	<0.005	102%	108%	100%	<0.005	
		%REC							6
		DUPL							
		DID	08958032	08958032	08958032	08958032	08958032	08958032	

T-XYL TOTAL XYLENES
12ED4 12-DICHLOROETHANE-D4
CISDIC CIS-12-DICHLOROTHYLENE
BFB 4-BROMOFLUOROBENZENE
TOL-D8 TOLUENE-D8
TRCLME TRICHLOROFLUOROMETHANE

**********. ENVIRONMENTAL LABORATORY ANALYTICAL LABORATORY GROUP DATA REPORTING SHEET (SHEET 1 OF 1) **********

JOB DESCRIPTION:NIROP - OMAHA
REPORT DATE:11 May 88

NIROP0000000000 HN03
RECEIPT DATE:28 JAN 88

JOB FILE:99081
EST. COMP. DATE:11 Mar 88

B : DENOTES PPB

LAB ID	PROJECT ID		COLUMN.... 1	2	3	4	ROW
			ANALYSIS.. 12	15	17	23	
			PPM..... SE	ZN	BA	MN	
99081	6D	CONC	<0.005	0.357	0.095	0.370	
		ZREC	84	103	100	98	1
		DUPL	<0.005	0.357	0.093	0.368	
		OID	01308064	51208040	51508042	51208042	
						HGA AUTH	
99082	9S	CONC	0.080	0.339	0.097	0.013	
		ZREC					2
		DUPL					
		OID	01308064	51208040	51508042	20558070	
						HGA AUTH	
99083	25S	CONC	<0.005	<0.030	0.092	0.520	
		ZREC					3
		DUPL					
		OID	01308064	51208040	51508042	51208042	
						HGA AUTH	
99084	4S	CONC	<0.005	0.232	0.063	0.009	
		ZREC					4
		DUPL					
		OID	01308064	51208040	51508042	20558070	
						HGA AUTH	
99085	QC DUPLICATE #2	CONC	0.078	0.343	0.101	0.012	
		ZREC					5
		DUPL					
		OID	01308064	51208040	51508042	20558070	
						HGA AUTH	

SE SELENIUM ZN ZINC BA BARIUM
MN MANGANESE

JOB DESCRIPTION: NIROP - OMAHA
NIROP0000000000
JOB FILE: 99075
REPORT DATE: 11 May 88
RECEIPT DATE: 28 JAN 88
EST. COMP. DATE: 11 Mar 88

B : DENOTES PPB

LAB ID	PROJECT ID	COLUMN....	1	2	3	4	5	6	7	8	9	ROW
		ANALYSIS..	72	73	74	75	76	77	78	79	80	
		PPM.....	CLME	BRME	VICL	CLET	MECL	DCLETE	11DCE	+DICLE	CHCL3	
99075	6D	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										1
		DUPL	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		OID	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	
99076	9S	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	0.018	<0.005	<0.005	
		%REC										2
		DUPL							<0.005			
		OID	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	
99077	25S	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										3
		DUPL										
		OID	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	
99078	4S	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										4
		DUPL										
		OID	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	
99079	QC DUPLICATE #2	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	0.012	<0.005	<0.005	
		%REC										5
		DUPL							<0.005			
		OID	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	
99080	TRIP BLANK #3	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										6
		DUPL										
		OID	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	

CLME	CHLOROMETHANE	BRME	BROMOMETHANE	VICL	VINYL CHLORIDE
CLET	CHLOROETHANE	MECL	METHYLENE CHLORIDE	DCLETE	1 1-DICHLOROETHENE
11DCE	1 1-DICHLOROETHANE	+DICLE	TRANS-1 2-DICHLOROETHENE	CHCL3	CHLOROFORM

JOB DESCRIPTION: NIROP - OMAHA
REPORT DATE: 11 May 88

NIROP0000000000
RECEIPT DATE: 28 JAN 88

JOB FILE: 99075
EST. COMP. DATE: 11 Mar 88

B : DENOTES PPB

LAB ID	PROJECT ID		COLUMN....	10	11	12	13	14	15	16	17	18	ROW
			ANALYSIS..	81	82	83	84	85	86	87	88	89	
			PPM.....	12DCE	111TCA	C CL 4	BRCL2M	DICLPR	+CLPRE	TCE	DBRCLM	CCLPRE	
99075	6D		CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0092	<0.005	<0.005	
			%REC										1
			DUPL	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0089	<0.005	<0.005	
			DID	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	
99076	9S		CONC	<0.005	0.050	<0.005	<0.005	<0.005	<0.005	1.32	<0.005	<0.005	
			%REC										2
			DUPL		0.047					1.39			
			DID	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	
99077	25S		CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
			%REC										3
			DUPL										
			DID	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	
99078	4S		CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.077	<0.005	<0.005	
			%REC										4
			DUPL										
			DID	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	
99079	QC DUPLICATE #2		CONC	<0.005	0.041	<0.005	<0.005	<0.005	<0.005	1.8	<0.005	<0.005	
			%REC										5
			DUPL		0.042								
			DID	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	
99080	TRIP BLANK #3		CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
			%REC										6
			DUPL										
			DID	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	089580341	

12DCE	1 2-DICHLOROETHANE	111TCA	1 1 1-TRICHLOROETHANE	C CL 4	CARBON TETRACHLORIDE
BRCL2M	BROMODICHLOROMETHANE	DICLPR	1 2 DICHLOROPROPANE	+CLPRE	TRANS-1 3-DICHLOROPROPENE
TCE	TRICHLOROETHENE	DBRCLM	DIBROMOCHLOROMETHANE	CCLPRE	CIS-1 3-DICHLOROPROPENE

JOB DESCRIPTION: NIROP - OMAHA | NIROP0000000000 | JOB FILE: 99075
REPORT DATE: 11 May 88 | RECEIPT DATE: 28 JAN 88 | EST. COMP. DATE: 11 Mar 88

B : DENOTES PPB

LAB ID	PROJECT ID		COLUMN....	19	20	21	22	23	24	25	26	27	ROW
			ANALYSIS..	90	91	92	93	94	95	96	97	98	
			PPM.....	112TCA	BENZEN	CLETRE	CHBR3	TCLETA	TCLETE	TOLUEN	CLBEN	ETBEN	
99075	6D	CONC		<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	1
		%REC											
		DUPL		<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		DID		08958034	08958034	08958034	08958034	08958034	08958034	08958034	07988034	08958034	
99076	9S	CONC		<0.005	<0.005	<0.010	<0.005	<0.005	0.11	<0.005	<0.005	<0.005	2
		%REC											
		DUPL							0.11				
		DID		08958034	08958034	08958034	08958034	08958034	08958034	08958034	07988034	08958034	
99077	25S	CONC		<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	3
		%REC											
		DUPL											
		DID		08958034	08958034	08958034	08958034	08958034	08958034	08958034	07988034	08958034	
99078	4S	CONC		<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	4
		%REC											
		DUPL											
		DID		08958034	08958034	08958034	08958034	08958034	08958034	08958034	07988034	08958034	
99079	QC DUPLICATE #2	CONC		<0.005	<0.005	<0.010	<0.005	<0.005	0.11	<0.005	<0.005	<0.005	5
		%REC											
		DUPL							0.12				
		DID		08958034	08958034	08958034	08958034	08958034	08958034	08958034	07988034	08958034	
99080	TRIP BLANK #3	CONC		<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	6
		%REC											
		DUPL											
		DID		08958034	08958034	08958034	08958034	08958034	08958034	08958034	07988034	08958034	

112TCA 1 1 2-TRICHLOROETHANE
CHBR3 BROMOFORM
TOLUEN TOLUENE
BENZEN BENZENE
TCLETA 1 1 2 2-TETRACHLOROETHANE
CLBEN CHLOROBENZENE
CLETRE 2-CHLOROETHYLVINYLETHER
TCLETE TETRACHLOROETHENE
ETBEN ETHYLBENZENE

JOB DESCRIPTION: NIROP - OMAHA
NIROP0000000000
JOB FILE: 99075
REPORT DATE: 11 May 88
RECEIPT DATE: 28 JAN 88
EST. COMP. DATE: 11 Mar 88

B : DENOTES PPB

LAB ID	PROJECT ID	COLUMN....	28	29	30	31	32	33	34	35	36	ROW
		ANALYSIS..	99	100	156	157	158	159	160	161	162	
		PPM.....	ACRO	ACRY	ACETON	CRBDIS	2-BUTN	VNLACT	2-HEXN	METPEN	STYREN	
99075	6D	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		%REC										1
		DUPL	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		DID	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	
99076	9S	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		%REC										2
		DUPL										
		DID	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	
99077	25S	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		%REC										3
		DUPL										
		DID	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	
99078	4S	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		%REC										4
		DUPL										
		DID	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	
99079	QC DUPLICATE #2	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		%REC										5
		DUPL										
		DID	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	
99080	TRIP BLANK #3	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		%REC										6
		DUPL										
		DID	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	089580 34	

ACRO	ACROLEIN	ACRY	ACRYLONITRILE	ACETON	ACETONE
CRBDIS	CARBON DISULFIDE	2-BUTN	2-BUTANONE	VNLACT	VINYL ACETATE
2-HEXN	2-HEXANONE	METPEN	4-METHYL-2-PENTANONE	STYREN	STYRENE

JOB DESCRIPTION:#NIROP - OMAHA
REPORT DATE:11 May 88

NIROP0000000000
RECEIPT DATE:28 JAN 88

JOB FILE:99075
EST. COMP. DATE:11 Mar 88

B : DENOTES PPB

LAB ID	PROJECT ID		COLUMN.... 37	38	39	40	41	42	ROW
			ANALYSIS.. 163	164	165	166	167	168	
			PPM..... T-XYL	CISDIC	TOL-D8	12ED4	BFB	TRCLME	
99075	6D	CONC	<0.005	<0.005	101%	107%	109%	<0.005	
		%REC							1
		DUPL	<0.005	<0.005	101%	97.2%	101%	<0.005	
		OID	08958034	08958034	07988034	08958034	08958034	08958034	
99076	9S	CONC	<0.005	0.17	95.2%	98.5%	98.9%	<0.005	
		%REC							2
		DUPL		0.15	90.6%	87.1%	87.8%		
		OID	08958034	08958034	07988034	08958034	08958034	08958034	
99077	25S	CONC	<0.005	<0.005	99.6%	96.8%	98.2%	<0.005	
		%REC							3
		DUPL							
		OID	08958034	08958034	07988034	08958034	08958034	08958034	
99078	4S	CONC	<0.005	<0.005	101%	86.0%	97.3%	<0.005	
		%REC							4
		DUPL							
		OID	08958034	08958034	08958034	08958034	08958034	08958034	
99079	QC DUPLICATE #2	CONC	<0.005	0.14	102%	99.8%	97.6%	<0.005	
		%REC							5
		DUPL		0.15	101%	97.9%	98.6%		
		OID	08958034	08958034	07988034	08958034	08958034	08958034	
99080	TRIP BLANK #3	CONC	<0.005	<0.005	94.7%	90.0%	93.2%	<0.005	
		%REC							6
		DUPL							
		OID	08958034	08958034	07988034	08958034	08958034	08958034	

T-XYL TOTAL XYLENES
12ED4 12-DICHLORDETHANE-D4
CISDIC CIS-12-DICHLORDETHYLENE
BFB 4-BROMOFLUORDBENZENE
TOL-D8 TOLUENE-D8
TRCLME TRICHLOROFLUOROMETHANE

JOB DESCRIPTION:NIROP - OMAHA
REPORT DATE:11 May 88

NIROP0000000000 HNO3
RECEIPT DATE:29 JAN 88

JOB FILE:99090
EST. COMP. DATE:25 Mar 88

B : DENOTES PPB

LAB ID	PROJECT ID		COLUMN.... 1	2	3	4	ROW
			ANALYSIS.. 12	15	17	23	
			PPM..... SE	ZN	BA	MN	
99090	4I	CONC	<0.005	0.033	0.150	0.319	
		%REC	84	97.99999	100	92	1
		DUPL	<0.005	0.032	0.154	0.310	
		OID	01308064	51208040	51208040	51208040	
						HGA AUTH	
99091	14D	CONC	<0.005	<0.030	0.181	0.907	
		%REC					2
		DUPL					
		OID	01308064	51208040	51208040	51208040	
						HGA AUTH	
99092	8S	CONC	<0.005	0.032	0.104	1.81	
		%REC					3
		DUPL					
		OID	01308064	51208040	51208040	51208040	
						HGA AUTH	

SE SELENIUM ZN ZINC BA BARIUM
MN MANGANESE

JOB DESCRIPTION: NIROP - OMAHA | NIROP0000000000 | JOB FILE: 99086
REPORT DATE: 11 May 88 | RECEIPT DATE: 29 JAN 88 | EST. COMP. DATE: 01 Apr 88

B : DENOTES PPB

LAB ID	PROJECT ID	COLUMN....	1	2	3	4	5	6	7	8	9	ROW
		ANALYSIS..	72	73	74	75	76	77	78	79	80	
		PPM.....	CLME	BRME	VICL	CLET	MECL	DCLETE	11DCE	+DICLE	CHCL3	
99086	4I	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	0.22	<0.005	1
		%REC										
		DUPL										
		OID	089580361	089580361	089580361	089580361	089580361	089580361	089580361	089580361	089580361	
99087	14D	CONC	<0.010	<0.010	<0.010	<0.010	0.035	<0.005	<0.005	<0.005	<0.005	2
		%REC										
		DUPL										
		OID	089580361	089580361	089580361	089580361	089580361	089580361	089580361	089580361	089580361	
99088	8S	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	0.009	<0.005	<0.005	3
		%REC										
		DUPL										
		OID	089580361	089580361	089580361	089580361	089580361	089580361	089580361	089580361	089580361	
99089	QC TRIP BLANK #4	CONC	<0.010	<0.010	<0.010	<0.010	0.016	<0.005	<0.005	<0.005	<0.005	4
		%REC										
		DUPL										
		OID	089580361	089580361	089580361	089580361	089580361	089580361	089580361	089580361	089580361	

CLME	CHLOROMETHANE	BRME	BROMOMETHANE	VICL	VINYL CHLORIDE
CLET	CHLOROETHANE	MECL	METHYLENE CHLORIDE	DCLETE	1 1-DICHLOROETHENE
11DCE	1 1-DICHLOROETHANE	+DICLE	TRANS-1 2-DICHLOROETHENE	CHCL3	CHLOROFORM

JOB DESCRIPTION:*NIROP - OMAHA NIROP0000000000 JOB FILE:99086
REPORT DATE:11 May 88 RECEIPT DATE:29 JAN 88 EST. COMP. DATE:01 Apr 88

B : DENOTES PPB

LAB ID	PROJECT ID	COLUMN....	10	11	12	13	14	15	16	17	18	ROW
		ANALYSIS..	81	82	83	84	85	86	87	88	89	
		PPM.....	12DCE	111TCA	C CL 4	BRCL2M	DICLPR	+CLPRE	TCE	DBRCLM	CCLPRE	
99086	4I	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	8.1	<0.005	<0.005	
		%REC										1
		DUPL										
		OID	089580361	089580361	089580361	089580361	089580361	089580361	089580361	089580361	089580361	
99087	14D	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										2
		DUPL										
		OID	089580361	089580361	089580361	089580361	089580361	089580361	089580361	089580361	089580361	
99088	8S	CONC	<0.005	0.042	<0.005	<0.005	<0.005	<0.005	6.8	<0.005	<0.005	
		%REC										3
		DUPL		0.041								
		OID	089580361	089580361	089580361	089580361	089580361	089580361	089580361	089580361	089580361	
99089	QC TRIP BLANK #4	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										4
		DUPL										
		OID	089580361	089580361	089580361	089580361	089580361	089580361	089580361	089580361	089580361	

12DCE	1 2-DICHLORDETHANE	111TCA	1 1 1-TRICHLORDETHANE	C CL 4	CARBON TETRACHLORIDE
BRCL2M	BROMODICHLOROMETHANE	DICLPR	1 2 DICHLORDPROPANE	+CLPRE	TRANS-1 3-DICHLOROPROPENE
TCE	TRICHLORDETHENE	DBRCLM	DIBROMOCHLOROMETHANE	CCLPRE	CIS-1 3-DICHLOROPROPENE

JOB DESCRIPTION:*NIROP - OMAHA
REPORT DATE:11 May 88

NIROP0000000000
RECEIPT DATE:29 JAN 88

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EST. COMP. DATE:01 Apr 88

B : DENOTES PPB

LAB ID	PROJECT ID		112TCA	BENZEN	CLETRE	CHBR3	TCLETA	TCLETE	TOLUEN	CLBEN	ETBEN	ROW
		COLUMN....	19	20	21	22	23	24	25	26	27	
		ANALYSIS..	90	91	92	93	94	95	96	97	98	
		PPM.....	112TCA	BENZEN	CLETRE	CHBR3	TCLETA	TCLETE	TOLUEN	CLBEN	ETBEN	
99086	4I	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										1
		DUPL										
		OID	08958036	08958036	08958036	08958036	08958036	08958036	08958036	08958036	08958036	
99087	14D	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										2
		DUPL										
		OID	08958036	08958036	08958036	08958036	08958036	08958036	08958036	08958036	08958036	
99088	8S	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	0.031	<0.005	<0.005	<0.005	
		%REC										3
		DUPL						0.032				
		OID	08958036	08958036	08958036	08958036	08958036	08958036	08958036	08958036	08958036	
99089	QC TRIP BLANK #4	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										4
		DUPL										
		OID	08958036	08958036	08958036	08958036	08958036	08958036	08958036	08958036	08958036	

112TCA 1 1 2-TRICHLOROETHANE
CHBR3 BROMOFORM
TOLUEN TOLUENE
BENZEN BENZENE
TCLETA 1 1 2 2-TETRACHLOROETHANE
CLBEN CHLOROBENZENE
CLETRE 2-CHLOROETHYLVINYLETHER
TCLETE TETRACHLOROETHENE
ETBEN ETHYLBENZENE

JOB DESCRIPTION: NIROP - OMAHA
NIROP0000000000
JOB FILE: 99086
REPORT DATE: 11 May 88
RECEIPT DATE: 29 JAN 88
EST. COMP. DATE: 01 Apr 88

B : DENOTES PPB

LAB ID	PROJECT ID	COLUMN....	28	29	30	31	32	33	34	35	36	ROW
		ANALYSIS..	99	100	156	157	158	159	160	161	162	
		PPM.....	ACRO	ACRY	ACETON	CARDIS	2-BUTN	VYLACT	2-HEXN	METPEN	STYREN	
99086	4I	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		%REC										1
		DUPL										
		OID	08958036	08958036	08958036	08958036	08958036	08958036	08958036	08958036	08958036	
99087	14D	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		%REC										2
		DUPL										
		OID	08958036	08958036	08958036	08958036	08958036	08958036	08958036	08958036	08958036	
99088	8S	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		%REC										3
		DUPL										
		OID	08958036	08958036	08958036	08958036	08958036	08958036	08958036	08958036	08958036	
99089	QC TRIP BLANK #4	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		%REC										4
		DUPL										
		OID	08958036	08958036	08958036	08958036	08958036	08958036	08958036	08958036	08958036	

ACRO	ACROLEIN	ACRY	ACRYLONITRILE	ACETON	ACETONE
CARDIS	CARBON DISULFIDE	2-BUTN	2-BUTANONE	VYLACT	VINYL ACETATE
2-HEXN	2-HEXANONE	METPEN	4-METHYL-2-PENTANONE	STYREN	STYRENE

JOB DESCRIPTION:*NIROP - OMAHA | NIROP0000000000 | JOB FILE:99086
REPORT DATE:11 May 88 | RECEIPT DATE:29 JAN 88 | EST. COMP. DATE:01 Apr 88

B : DENOTES PPB

LAB ID	PROJECT ID		COLUMN.... 37	38	39	40	41	42	ROW
			ANALYSIS.. 163	164	165	166	167	168	
			PPM..... T-XYL	CISDIC	TOL-D8	12ED4	BFB	TRCLME	
99086	4I	CONC	<0.005	0.092	96.3%	85.7%	93.4%	<0.005	
		%REC							1
		DUPL							
		DID	079880363	079880363	089580363	089580363	089580363	089580363	
99087	14D	CONC	<0.005	<0.005	100%	103%	98.7%	<0.005	
		%REC							2
		DUPL							
		DID	079880363	079880363	089580363	089580363	089580363	089580363	
99088	8S	CONC	<0.005	0.16	99.3%	101%	93.8%	<0.005	
		%REC							3
		DUPL							
		DID	079880363	079880363	089580363	089580363	089580363	089580363	
99089	QC TRIP BLANK #4	CONC	<0.005	<0.005	99.0%	98.0%	101%	<0.005	
		%REC							4
		DUPL							
		DID	079880363	079880363	089580363	089580363	089580363	089580363	

T-XYL TOTAL XYLENES
12ED4 12-DICHLOROETHANE-D4
CISDIC CIS-12-DICHLOROETHYLENE
BFB BROMOFLUOROBENZENE
TOL-D8 TOLUENE-D8
TRCLME TRICHLOROFLUOROMETHANE

JOB DESCRIPTION:NIROP - OMAHA
REPORT DATE:11 May 88

NIROP0000000000 HN03
RECEIPT DATE:09 FEB 88

JOB FILE:99098
EST. COMP. DATE:25 Mar 88

B : DENOTES PPB

LAB ID	PROJECT ID		COLUMN.... 1	2	3	4	ROW
			ANALYSIS.. 12	15	17	23	
			PPM..... SE	ZN	BA	MN	
99098	1S	CONC	<0.005	0.052	0.060	0.754	
		%REC	92	104	93	101	1
		DUPL	<0.005	0.057	0.058	0.762	
		OID	01308077	51208062	51208062	51208062	
						HGA AUTH	
99099	2S	CONC	<0.005	<0.030	0.118	0.767	
		%REC					2
		DUPL					
		OID	01308077	51208062	51208062	51208062	
						HGA AUTH	
99100	13S	CONC	<0.005	1.42	0.132	1.73	
		%REC					3
		DUPL					
		OID	01308077	51208062	51208062	51208062	
						HGA AUTH	
99101	14S	CONC	<0.005	1.58	0.216	0.728	
		%REC					4
		DUPL					
		OID	01308077	51208062	51208062	51208062	
						HGA AUTH	
99102	15S	CONC	<0.005	1.33	0.101	2.33	
		%REC					5
		DUPL					
		OID	01308077	51208062	51208062	51208062	
						HGA AUTH	
99103	QC DUPLICATE #3	CONC	<0.005	1.42	0.120	1.71	
		%REC					6
		DUPL					
		OID	01308077	51208062	51208062	51208062	
						HGA AUTH	

SE SELENIUM ZN ZINC BA BARIUM
MN MANGANESE

JOB DESCRIPTION:NIROP - OMAHA
NIROP0000000000
JOB FILE:99093
REPORT DATE:11 May 88
RECEIPT DATE:09 FEB 88
EST. COMP. DATE:01 Apr 88

B : DENOTES PPB

LAB ID	PROJECT ID	COLUMN....	1	2	3	4	5	6	7	8	9	ROW
		ANALYSIS..	72	73	74	75	76	77	78	79	80	
		PPM.....	CLME	BRME	VICL	CLET	MECL	DCLETE	11DCE	+DICLE	CHCL3	
99093	13S	CONC	<0.010	<0.010	<0.010	<0.010	0.15	<0.005	<0.005	<0.005	<0.005	
		%REC						101.95	97.4	104.15		1
		DUPL										
		DID	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958041	
99094	14S	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										2
		DUPL										
		DID	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958041	
99095	15S	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										3
		DUPL	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		DID	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958041	
99096	QC DUPLICATE #3	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										4
		DUPL										
		DID	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958041	
99097	QC TRIP BLANK #6	CONC	<0.010	<0.010	<0.010	<0.010	0.067	<0.005	<0.005	<0.005	<0.005	
		%REC										5
		DUPL										
		DID	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958041	

CLME	CHLOROMETHANE	BRME	BROMOMETHANE	VICL	VINYL CHLORIDE
CLET	CHLOROETHANE	MECL	METHYLENE CHLORIDE	DCLETE	1 1-DICHLOROETHENE
11DCE	1 1-DICHLOROETHANE	+DICLE	TRANS-1 2-DICHLOROETHENE	CHCL3	CHLOROFORM

JOB DESCRIPTION: NIROP - OMAHA
NIROP0000000000
JOB FILE: 99093
REPORT DATE: 11 May 88
RECEIPT DATE: 09 FEB 88
EST. COMP. DATE: 01 Apr 88

B : DENOTES PPB

LAB ID	PROJECT ID	COLUMN....	10	11	12	13	14	15	16	17	18	ROW
		ANALYSIS..	81	82	83	84	85	86	87	88	89	
		PPM.....	12DCE	111TCA	C CL 4	BRCL2M	DICLPR	+CLPRE	TCE	DBRCLM	CCLPRE	
99093	13S	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.002J	<0.005	<0.005	
		%REC	101.5	102.05		97.15	95.8	98.91026	108	99.7		1
		DUPL										
		OID	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958084	08958041	
99094	14S	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.002J	<0.005	<0.005	
		%REC										2
		DUPL										
		OID	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958084	08958041	
99095	15S	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.011	<0.005	<0.005	
		%REC										3
		DUPL	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.011	<0.005	<0.005	
		OID	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958084	08958041	
99096	QC DUPLICATE #3	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										4
		DUPL										
		OID	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958084	08958041	
99097	QC TRIP BLANK #6	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										5
		DUPL										
		OID	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958084	08958041	

12DCE	1 2-DICHLOROETHANE	111TCA	1 1 1-TRICHLOROETHANE	C CL 4	CARBON TETRACHLORIDE
BRCL2M	BROMODICHLOROMETHANE	DICLPR	1 2 DICHLOROPROPANE	+CLPRE	TRANS-1 3-DICHLOROPROPENE
TCE	TRICHLOROETHENE	DBRCLM	DIBROMOCHLOROMETHANE	CCLPRE	CIS-1 3-DICHLOROPROPENE

JOB DESCRIPTION: NIROP - OMAHA | NIROP0000000000 | JOB FILE: 99093
REPORT DATE: 11 May 88 | RECEIPT DATE: 09 FEB 88 | EST. COMP. DATE: 01 Apr 88

B : DENOTES PPB

LAB ID	PROJECT ID		112TCA	BENZEN	CLETRE	CHBR3	TCLETA	TCLETE	TOLUEN	CLBEN	ETBEN	ROW
		COLUMN....	19	20	21	22	23	24	25	26	27	
		ANALYSIS..	90	91	92	93	94	95	96	97	98	
		PPM.....	112TCA	BENZEN	CLETRE	CHBR3	TCLETA	TCLETE	TOLUEN	CLBEN	ETBEN	
99093	13S	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC	102.9	104.15		112.25	106.5		101.15			1
		DUPL										
		OID	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958041	
99094	14S	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										2
		DUPL										
		OID	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958041	
99095	15S	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										3
		DUPL	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		OID	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958041	
99096	QC DUPLICATE #3	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										4
		DUPL										
		OID	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958041	
99097	QC TRIP BLANK #6	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										5
		DUPL										
		OID	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958041	08958041	

112TCA 1 1 2-TRICHLOROETHANE
CHBR3 BROMOFORM
TOLUEN TOLUENE
BENZEN BENZENE
TCLETA 1 1 2 2-TETRACHLOROETHANE
CLBEN CHLOROBENZENE
CLETRE 2-CHLOROETHYLVINYLETHER
TCLETE TETRACHLOROETHENE
ETBEN ETHYLBENZENE

JOB DESCRIPTION: NIROP - OMAHA
REPORT DATE: 11 May 88

NIROP0000000000
RECEIPT DATE: 09 FEB 88

JOB FILE: 99093
EST. COMP. DATE: 01 Apr 88

B : DENOTES PPB

LAB ID	PROJECT ID		COLUMN.... 28	29	30	31	32	33	34	35	36	ROW
			ANALYSIS.. 99	100	156	157	158	159	160	161	162	
			PPM..... ACRO	ACRY	ACETON	CARDIS	2-BUTN	VYLACT	2-HEXN	METPEN	STYREN	
99093	13S	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	1
		%REC										
		DUPL										
		OID	089580411	089580411	089580411	089580411	089580411	089580411	089580411	089580411	089580411	
99094	14S	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	2
		%REC										
		DUPL										
		OID	089580411	089580411	089580411	089580411	089580411	089580411	089580411	089580411	089580411	
99095	15S	CONC	<0.10	<0.10	<0.10	0.070	<0.10	<0.050	<0.050	<0.050	<0.005	3
		%REC										
		DUPL	<0.10	<0.10	<0.10	0.090	<0.10	<0.050	<0.050	<0.050	<0.005	
		OID	089580411	089580411	089580411	089580411	089580411	089580411	089580411	089580411	089580411	
99096	QC DUPLICATE #3	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	4
		%REC										
		DUPL										
		OID	089580411	089580411	089580411	089580411	089580411	089580411	089580411	089580411	089580411	
99097	QC TRIP BLANK #6	CONC	<0.10	<0.10	<0.10	<0.005	0.016J	<0.050	<0.050	<0.050	<0.005	5
		%REC										
		DUPL										
		OID	089580411	089580411	089580411	089580411	089580411	089580411	089580411	089580411	089580411	

ACRO	ACROLEIN	ACRY	ACRYLONITRILE	ACETON	ACETONE
CARDIS	CARBON DISULFIDE	2-BUTN	2-BUTANONE	VYLACT	VINYL ACETATE
2-HEXN	2-HEXANONE	METPEN	4-METHYL-2-PENTANONE	STYREN	STYRENE

JOB DESCRIPTION:NIROP - OMAHA | NIROP0000000000 | JOB FILE:99093
REPORT DATE:11 May 88 | RECEIPT DATE:09 FEB 88 | EST. COMP. DATE:01 Apr 88

B : DENOTES PPB

LAB ID	PROJECT ID		COLUMN.... 37	38	39	40	41	42	ROW
			ANALYSIS.. 163	164	165	166	167	168	
			PPM..... T-XYL	CISDIC	TOL-D8	12ED4	BFB	TRCLME	
99093	13S	CONC	<0.005	<0.005	98.4%	94.6%	91.0%	<0.005	
		%REC			99.2	100	101	98.15	1
		DUPL							
		DID	08958041	08958041	08958041	08958041	08958041	08958041	
99094	14S	CONC	<0.005	<0.005	100%	95.2%	105%	<0.005	
		%REC							2
		DUPL							
		DID	08958041	08958041	08958041	08958041	08958041	08958041	
99095	15S	CONC	<0.005	<0.005	100%	97.7%	105%	<0.005	
		%REC							3
		DUPL	<0.005	<0.005	103%	96.0%	91.4%	<0.005	
		DID	08958041	08958041	08958041	08958041	08958041	08958041	
99096	QC DUPLICATE #3	CONC	<0.005	<0.005	105%	108%	101%	<0.005	
		%REC							4
		DUPL							
		DID	08958041	08958041	08958041	08958041	08958041	08958041	
99097	QC TRIP BLANK #6	CONC	<0.005	<0.005	109%	86.4%	88.8%	<0.005	
		%REC							5
		DUPL							
		DID	08958041	08958041	08958041	08958041	08958041	08958041	

T-XYL TOTAL XYLENES
12ED4 12-DICHLOROETHANE-D4
CISDIC CIS-12-DICHLOROETHYLENE
BFB BROMOFLUOROBENZENE
TOL-D8 TOLUENE-D8
TRCLME TRICHLOROFLUOROMETHANE

JOB DESCRIPTION:NIROP - OMAHA
REPORT DATE:11 May 88

NIROP0000000000 HNO3
RECEIPT DATE:09 FEB 88

JOB FILE:99098
EST. COMP. DATE:25 Mar 88

B : DENOTES PPB

LAB ID	PROJECT ID		COLUMN.... 1	2	3	4	ROW
			ANALYSIS.. 12	15	17	23	
			PPM..... SE	ZN	BA	MN	
99098	1S	CONC	<0.005	0.052	0.060	0.754	
		ZREC	92	104	93	101	1
		DUPL	<0.005	0.057	0.058	0.762	
		OID	01308077	51208062	51208062	51208062	
						HGA AUTH	
99099	2S	CONC	<0.005	<0.030	0.118	0.767	
		ZREC					2
		DUPL					
		OID	01308077	51208062	51208062	51208062	
						HGA AUTH	
99100	13S	CONC	<0.005	1.42	0.132	1.73	
		ZREC					3
		DUPL					
		OID	01308077	51208062	51208062	51208062	
						HGA AUTH	
99101	14S	CONC	<0.005	1.58	0.216	0.728	
		ZREC					4
		DUPL					
		OID	01308077	51208062	51208062	51208062	
						HGA AUTH	
99102	15S	CONC	<0.005	1.33	0.101	2.33	
		ZREC					5
		DUPL					
		OID	01308077	51208062	51208062	51208062	
						HGA AUTH	
99103	QC DUPLICATE #3	CONC	<0.005	1.42	0.120	1.71	
		ZREC					6
		DUPL					
		OID	01308077	51208062	51208062	51208062	
						HGA AUTH	

SE SELENIUM ZN ZINC BA BARIUM
MN MANGANESE

JOB DESCRIPTION:NIROP - OMAHA
REPORT DATE:11 May 88

NIROP0000000000 HN03
RECEIPT DATE:10 FEB 88

JOB FILE:99116
EST. COMP. DATE:25 Mar 88

B : DENOTES PPB

LAB ID	PROJECT ID		1	2	3	4	ROW
		COLUMN....	1	2	3	4	
		ANALYSIS..	12	15	17	23	
		PPM.....	SE	ZN	BA	MN	
99116	1D	CONC	<0.005	1.62	0.047	0.109	
		%REC	97.9999	91.5	98.6		1
		DUPL	<0.005	1.62	0.048	0.106	
		DID	01308077	51208057	51208048	51208047	
						HGA AUTH	
99117	2D	CONC	<0.005	0.572	0.087	0.332	
		%REC					2
		DUPL					
		DID	01308077	51208057	51208048	51208047	
						HGA AUTH	
99118	2I	CONC	<0.005	0.129	0.232	1.52	
		%REC					3
		DUPL					
		DID	01308077	51208057	51208048	51208047	
						HGA AUTH	
99119	3S	CONC	<0.005	0.033	0.142	0.907	
		%REC					4
		DUPL					
		DID	01308077	51208057	51208048	51208047	
						HGA AUTH	
99120	5D	CONC	<0.005	1.00	0.078	0.095	
		%REC					5
		DUPL					
		DID	01308077	51208057	51208048	51208047	
						HGA AUTH	
99121	5PC	CONC	<0.005	0.070	0.083	0.177	
		%REC					6
		DUPL					
		DID	01308077	51208057	51208048	51208047	
						HGA AUTH	
99122	STORM SEWER OUTFALL-NORTH	CONC	<0.005	0.032	0.116	0.314	
		%REC					7
		DUPL					
		DID	01308077	51208057	51208048	51208047	
						HGA AUTH	
99123	STORM SEWER OUTFALL-SOUTH	CONC	<0.005	<0.030	0.123	0.327	
		%REC					8
		DUPL					
		DID	01308077	51208057	51208048	51208047	
						HGA AUTH	

SE SELENIUM
MN MANGANESE
ZN ZINC
BA BARIUM

JOB DESCRIPTION:*NIROP - OMAHA
REPORT DATE:11 May 88

NIROP0000000000 HCL
RECEIPT DATE:10 FEB 88

JOB FILE:99104
EST. COMP. DATE:01 Apr 88

_
B : DENOTES PPB

LAB ID	PROJECT ID		COLUMN.... 1	2	3	4	5	6	7	8	9	ROW
			ANALYSIS.. 72	73	74	75	76	77	78	79	80	
			PPM..... CLME	BRME	VICL	CLET	MECL	DCLETE	11DCE	+DICLE	CHCL3	
99104	1S	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										1
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99105	2S	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										2
		DUPL	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99106	TRIP BLANK #5	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										3
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99107	1D	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										4
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99108	2D	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										5
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99109	2I	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										6
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99110	3S	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC				110	83.7		115.5	101.75		7
		DUPL							<0.005			
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99111	5D	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										8
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	

CLME	CHLOROMETHANE	BRME	BROMOMETHANE	VICL	VINYL CHLORIDE
CLET	CHLOROETHANE	MECL	METHYLENE CHLORIDE	DCLETE	1 1-DICHLOROETHENE
11DCE	1 1-DICHLOROETHANE	+DICLE	TRANS-1 2-DICHLOROETHENE	CHCL3	CHLOROFORM

JOB DESCRIPTION: NIROP - OMAHA
REPORT DATE: 11 May 88

NIROP0000000000 HCL
RECEIPT DATE: 10 FEB 88

JOB FILE: 99104
EST. COMP. DATE: 01 Apr 88

B : DENOTES PPB

LAB ID	PROJECT ID		1	2	3	4	5	6	7	8	9	ROW
		COLUMN....	1	2	3	4	5	6	7	8	9	
		ANALYSIS..	72	73	74	75	76	77	78	79	80	
		PPM.....	CLME	BRME	VICL	CLET	MECL	DCLETE	11DCE	+DICLE	CHCL3	
99112	5PC	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										9
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99113	STORM SEWER OUTFALL-NORTH	CONC	<0.010	<0.010	<0.010	<0.010	0.026	<0.005	<0.005	<0.005	<0.005	
		%REC										10
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99114	STORM SEWER OUTFALL-SOUTH	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										11
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99115	QA TRIP BLANK #7	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										12
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	

CLME	CHLOROMETHANE	BRME	BROMOMETHANE	VICL	VINYL CHLORIDE
CLET	CHLOROETHANE	MECL	METHYLENE CHLORIDE	DCLETE	1 1-DICHLOROETHENE
11DCE	1 1-DICHLOROETHANE	+DICLE	TRANS-1 2-DICHLOROETHENE	CHCL3	CHLOROFORM

JOB DESCRIPTION:*NIROP - OMAHA NIROP0000000000 HCL JOB FILE:99104
REPORT DATE:11 May 88 RECEIPT DATE:10 FEB 88 EST. COMP. DATE:01 Apr 88

B : DENOTES PPB

LAB ID	PROJECT ID	COLUMN....	10	11	12	13	14	15	16	17	18	ROW
		ANALYSIS..	B1	B2	B3	B4	B5	B6	B7	B8	B9	
		PPM.....	12DCE	111TCA	C CL 4	BRCL2M	DICLPR	+CLPRE	TCE	DBRCLM	CCLPRE	
99104	1S	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										1
		DUPL										
		OID	08958047	08958047	08895804	08958047	08958047	08958047	08958047	08958047	08958047	
99105	2S	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.050	<0.005	<0.005	
		%REC										2
		DUPL	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.038	<0.005	<0.005	
		OID	08958047	08958047	08895804	08958047	08958047	08958047	08958047	08958047	08958047	
99106	TRIP BLANK #5	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										3
		DUPL										
		OID	08958047	08958047	08895804	08958047	08958047	08958047	08958047	08958047	08958047	
99107	1D	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										4
		DUPL										
		OID	08958047	08958047	08895804	08958047	08958047	08958047	08958047	08958047	08958047	
99108	2D	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.031	<0.005	<0.005	
		%REC										5
		DUPL							0.029			
		OID	08958047	08958047	08895804	08958047	08958047	08958047	08958047	08958047	08958047	
99109	2I	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										6
		DUPL										
		OID	08958047	08958047	08895804	08958047	08958047	08958047	08958047	08958047	08958047	
99110	3S	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.41	<0.005	<0.005	
		%REC	95.4	89.8		95.9		98.78206	104.5		84.05738	7
		DUPL										
		OID	08958047	08958047	08895804	08958047	08958047	08958047	08958047	08958047	08958047	
99111	5D	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										8
		DUPL										
		OID	08958047	08958047	08895804	08958047	08958047	08958047	08958047	08958047	08958047	

12DCE	1 2-DICHLOROETHANE	111TCA	1 1 1-TRICHLOROETHANE	C CL 4	CARBON TETRACHLORIDE
BRCL2M	BROMODICHLOROMETHANE	DICLPR	1 2 DICHLOROPROPANE	+CLPRE	TRANS-1 3-DICHLOROPROPENE
TCE	TRICHLOROETHENE	DBRCLM	DIBROMOCHLOROMETHANE	CCLPRE	CIS-1 3-DICHLOROPROPENE

JOB DESCRIPTION:*NIROP - OMAHA NIROP0000000000 HCL JOB FILE:99104
REPORT DATE:11 May 88 RECEIPT DATE:10 FEB 88 EST. COMP. DATE:01 Apr 88

B : DENOTES PPB

LAB ID	PROJECT ID		10	11	12	13	14	15	16	17	18	ROW
		COLUMN....	10	11	12	13	14	15	16	17	18	
		ANALYSIS..	81	82	83	84	85	86	87	88	89	
		PPM.....	12DCE	111TCA	C CL 4	BRCL2M	DICLPR	+CLPRE	TCE	DBRCLM	CCLPRE	
99112	SPC	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										9
		DUPL										
		OID	08958047	08958047	08895804	08958047	08958047	08958047	08958047	08958047	08958047	
99113	STORM SEWER OUTFALL-NORTH	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										10
		DUPL										
		OID	08958047	08958047	08895804	08958047	08958047	08958047	08958047	08958047	08958047	
99114	STORM SEWER OUTFALL-SOUTH	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										11
		DUPL										
		OID	08958047	08958047	08895804	08958047	08958047	08958047	08958047	08958047	08958047	
99115	QA TRIP BLANK #7	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										12
		DUPL										
		OID	08958047	08958047	08895804	08958047	08958047	08958047	08958047	08958047	08958047	

12DCE	1 2-DICHLOROETHANE	111TCA	1 1 1-TRICHLOROETHANE	C CL 4	CARBON TETRACHLORIDE
BRCL2M	BROMODICHLOROMETHANE	DICLPR	1 2 DICHLOROPROPANE	+CLPRE	TRANS-1 3-DICHLOROPROPENE
TCE	TRICHLOROETHENE	DBRCLM	DIBROMOCHLOROMETHANE	CCLPRE	CIS-1 3-DICHLOROPROPENE

JOB DESCRIPTION: NIROP - OMAHA
REPORT DATE: 11 May 88

NIROP0000000000 HCL
RECEIPT DATE: 10 FEB 88

JOB FILE: 99104
EST. COMP. DATE: 01 Apr 88

B : DENOTES PPB

LAB ID	PROJECT ID	COLUMN....	19	20	21	22	23	24	25	26	27	ROW
		ANALYSIS..	90	91	92	93	94	95	96	97	98	
		PPM.....	112TCA	BENZEN	CLETRE	CHBR3	TCLETA	TCLETE	TOLUEN	CLBEN	ETBEN	
99104	1S	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										1
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99105	2S	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										2
		DUPL	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99106	TRIP BLANK #5	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										3
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99107	1D	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										4
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99108	2D	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										5
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99109	2I	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										6
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99110	3S	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC		111.75	99.8	82.05	96.6	96.9	101.8	98.5	102.35	7
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99111	5D	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										8
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	

112TCA	1 1 2-TRICHLOROETHANE	BENZEN	BENZENE	CLETRE	2-CHLOROETHYLVINYLETHER
CHBR3	BROMOFORM	TCLETA	1 1 2 2-TETRACHLOROETHANE	TCLETE	TETRACHLOROETHENE
TOLUEN	TOLUENE	CLBEN	CHLOROBENZENE	ETBEN	ETHYLBENZENE

JOB DESCRIPTION: NIROP - OMAHA NIROP0000000000 HCL JOB FILE:99104
REPORT DATE:11 May 88 RECEIPT DATE:10 FEB 88 EST. COMP. DATE:01 Apr 88

B : DENOTES PPB

LAB ID	PROJECT ID	COLUMN....	19	20	21	22	23	24	25	26	27	ROW
		ANALYSIS..	90	91	92	93	94	95	96	97	98	
		PPM.....	112TCA	BENZEN	CLETRE	CHBR3	TCLETA	TCLETE	TOLUEN	CLBEN	ETBEN	
99112	SPC	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										9
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99113	STORM SEWER OUTFALL-NORTH	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										10
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99114	STORM SEWER OUTFALL-SOUTH	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										11
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99115	QA TRIP BLANK #7	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										12
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	

112TCA 1 1 2-TRICHLOROETHANE
BENZEN BENZENE
CLETRE 2-CHLOROETHYLVINYLETHER
CHBR3 BROMOFORM
TCLETA 1 1 2 2-TETRACHLOROETHANE
TCLETE TETRACHLOROETHENE
TOLUEN TOLUENE
CLBEN CHLOROBENZENE
ETBEN ETHYLBENZENE

JOB DESCRIPTION:NIROP - OMAHA
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LAB ID	PROJECT ID		COLUMN.... 28	29	30	31	32	33	34	35	36	RDW
			ANALYSIS.. 99	100	156	157	158	159	160	161	162	
			PPM..... ACRO	ACRY	ACETON	CARDIS	2-BUTN	VYLACT	2-HEXN	METPEN	STYREN	
99104	1S	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		%REC										1
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99105	2S	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		%REC										2
		DUPL	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99106	TRIP BLANK #5	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		%REC										3
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99107	1D	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		%REC										4
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99108	2D	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		%REC										5
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99109	2I	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		%REC										6
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99110	3S	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		%REC										7
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99111	5D	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		%REC										8
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	

ACRO ACROLEIN
CARDIS CARBON DISULFIDE
2-HEXN 2-HEXANONE
ACRY ACRYLONITRILE
2-BUTN 2-BUTANONE
METPEN 4-METHYL-2-PENTANONE
ACETON ACETONE
VYLACT VINYL ACETATE
STYREN STYRENE

JOB DESCRIPTION:NIROP - OMAHA NIROP0000000000 HCL JOB FILE:99104
REPORT DATE:11 May 88 RECEIPT DATE:10 FEB 88 EST. COMP. DATE:01 Apr 88

B : DENOTES PPB

LAB ID	PROJECT ID	COLUMN....	28	29	30	31	32	33	34	35	36	ROW
		ANALYSIS..	99	100	156	157	158	159	160	161	162	
		PPM.....	ACRO	ACRY	ACETON	CARDIS	2-BUTN	VYLACT	2-HEXN	METPEN	STYREN	
99112	SPC	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		%REC										9
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99113	STORM SEWER OUTFALL-NORTH	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		%REC										10
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99114	STORM SEWER OUTFALL-SOUTH	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		%REC										11
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	
99115	QA TRIP BLANK #7	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		%REC										12
		DUPL										
		OID	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	08958047	

ACRO ACROLEIN
CARDIS CARBON DISULFIDE
2-HEXN 2-HEXANONE
ACRY ACRYLONITRILE
2-BUTN 2-BUTANONE
METPEN 4-METHYL-2-PENTANONE
ACETON ACETONE
VYLACT VINYL ACETATE
STYREN STYRENE

JOB DESCRIPTION:NIROP - OMAHA
REPORT DATE:11 May 88

NIROP0000000000 HCL
RECEIPT DATE:10 FEB 88

JOB FILE:99104
EST. COMP. DATE:01 Apr 88

B : DENOTES PPB

LAB ID	PROJECT ID	COLUMN....	37	38	39	40	41	42	ROW
		ANALYSIS..	163	164	165	166	167	168	
		PPM.....	T-XYL	CISDIC	TOL-D8	12ED4	BFB	TRCLME	
99104	1S	CONC	<0.005	<0.005	102%	102%	101%	<0.005	
		%REC							1
		DUPL							
		DID	08958047	08958047	08958047	08958047	08958047	08958047	
99105	2S	CONC	<0.005	<0.005	99.4%	97.1%	86%	<0.005	
		%REC							2
		DUPL	<0.005	<0.005	100%	95.9%	91.6%	<0.005	
		DID	08958047	08958047	08958047	08958047	08958047	08958047	
99106	TRIP BLANK #5	CONC	<0.005	<0.005	103%	82.2%	88.9%	<0.005	
		%REC							3
		DUPL							
		DID	08958047	08958047	08958047	08958047	08958047	08958047	
99107	1D	CONC	<0.005	<0.005	99.4%	99.9%	104%	<0.005	
		%REC							4
		DUPL							
		DID	08958047	08958047	08958047	08958047	08958047	08958047	
99108	2D	CONC	<0.005	<0.005	99.5%	96.4%	97.6%	<0.005	
		%REC							5
		DUPL			96.9%	99.5%	96.8%		
		DID	08958047	08958047	08958047	08958047	08958047	08958047	
99109	2I	CONC	<0.005	<0.005	99.3%	96.4%	97.4%	<0.005	
		%REC							6
		DUPL							
		DID	08958047	08958047	08958047	08958047	08958047	08958047	
99110	3S	CONC	<0.005	0.31	101%	102%	98.8%	<0.005	
		%REC			102	96.8	99.2		7
		DUPL		0.32					
		DID	08958047	08958047	08958047	08958047	08958047	08958047	
99111	5D	CONC	<0.005	<0.005	101%	90.8%	115%	<0.005	
		%REC							8
		DUPL							
		DID	08958047	08958047	08958047	08958047	08958047	08958047	

T-XYL TOTAL XYLENES
12ED4 12-DICHLOROETHANE-D4
CISDIC CIS-12-DICHLOROETHYLENE
BFB BROMOFLUOROBENZENE
TOL-D8 TOLUENE-D8
TRCLME TRICHLOROFLUOROMETHANE

JOB DESCRIPTION:‡NIROP - OMAHA
REPORT DATE:11 May 88

NIROP0000000000 HCL
RECEIPT DATE:10 FEB 88

JOB FILE:99104
EST. COMP. DATE:01 Apr 88

_
F : DENOTES PPB

LAB ID	PROJECT ID		COLUMN.... 37	38	39	40	41	42	ROW
			ANALYSIS.. 163	164	165	166	167	168	
			PPM..... T-XYL	CISDIC	TOL-D8	12ED4	BFB	TRCLME	
99112	SFC	CONC	<0.005 ‡	<0.005 ‡	103% ‡	109% ‡	114% ‡	<0.005 ‡	
		%REC	‡	‡	‡	‡	‡	‡	9
		DUPL	‡	‡	‡	‡	‡	‡	
		OID	089580 47‡	089580 47‡	089580 47‡	089580 47‡	089580 47‡	089580 47‡	
99113	STORM SEWER OUTFALL-NORTH	CONC	<0.005 ‡	<0.005 ‡	101% ‡	92.2% ‡	99.0% ‡	<0.005 ‡	
		%REC	‡	‡	‡	‡	‡	‡	10
		DUPL	‡	‡	‡	‡	‡	‡	
		OID	089580 47‡	089580 47‡	079880 47‡	089580 47‡	089580 47‡	089580 47‡	
99114	STORM SEWER OUTFALL-SOUTH	CONC	<0.005 ‡	<0.005 ‡	100% ‡	79.4% ‡	101% ‡	<0.005 ‡	
		%REC	‡	‡	‡	‡	‡	‡	11
		DUPL	‡	‡	‡	‡	‡	‡	
		OID	089580 47‡	089580 47‡	089580 47‡	089580 47‡	089580 47‡	089580 47‡	
99115	QA TRIP BLANK #7	CONC	<0.005 ‡	<0.005 ‡	104% ‡	97.6% ‡	115% ‡	<0.005 ‡	
		%REC	‡	‡	‡	‡	‡	‡	12
		DUPL	‡	‡	‡	‡	‡	‡	
		OID	089580 47‡	089580 47‡	089580 47‡	089580 47‡	089580 47‡	089580 47‡	

T-XYL TOTAL XYLENES
12ED4 12-DICHLORDETHANE-D4
CISDIC CIS-12-DICHLORDETHYLENE
BFB BROMOFLUOROBENZENE
TOL-D8 TOLUENE-D8
TRCLME TRICHLOROFLUOROMETHANE

JOB DESCRIPTION:NIROP - OMAHA | NIROP0000000000 HNO3 | JOB FILE:99135
REPORT DATE:11 May 88 | RECEIPT DATE:11 FEB 88 | EST. COMP. DATE:29 Mar 88

E : DENOTES PPB

LAB ID	PROJECT ID		COLUMN.... 1	2	3	4	ROW
			ANALYSIS.. 12	15	17	23	
			PPM..... SE	ZN	BA	MN	
99135	1I	CONC	<0.005	0.129	0.256	0.735	
		%REC	97.99999	96.2	98.4	102	1
		DUPL	<0.005	0.122	0.260	0.730	
		OID	01308077	51208060	51208050	51208047	
						HGA AUTH	
99136	3I	CONC	<0.005	0.097	0.120	0.501	
		%REC					2
		DUPL					
		OID	01308077	51208060	51208050	51208047	
						HGA AUTH	
99137	3D	CONC	<0.005	0.762	0.069	0.041	
		%REC					3
		DUPL					
		OID	01308077	51208060	51208050	51208047	
						HGA AUTH	
99138	4D	CONC	<0.005	0.783	0.107	0.360	
		%REC					4
		DUPL					
		OID	01308077	51208060	51208050	51208047	
						HGA AUTH	
99139	7S	CONC	<0.005	0.129	0.076	2.51	
		%REC					5
		DUPL					
		OID	01308077	51208060	51208050	51208047	
						HGA AUTH	
99140	12S	CONC	<0.005	0.708	0.080	0.936	
		%REC					6
		DUPL					
		OID	01308077	51208060	51208050	51208047	
						HGA AUTH	
99141	13D	CONC	<0.005	0.110	0.090	0.298	
		%REC					7
		DUPL					
		OID	01308077	51208060	51208050	51208047	
						HGA AUTH	
99142	20S	CONC	<0.005	0.822	0.094	0.149	
		%REC					8
		DUPL					
		OID	01308077	51208060	51208050	51208047	
						HGA AUTH	

SE SELENIUM ZN ZINC BA BARIUM
MN MANGANESE

JOB DESCRIPTION:NIROP - OMAHA
REPORT DATE:11 May 88

NIROP0000000000 HNO3
RECEIPT DATE:11 FEB 88

JOB FILE:99135
EST. COMP. DATE:29 Mar 88

B : DENOTES PPB

LAB ID	PROJECT ID		COLUMN.... 1	2	3	4	ROW
			ANALYSIS.. 12	15	17	23	
			PPM..... SE	ZN	BA	MN	
99143	21S	CONC	<0.005	0.033	0.253	0.987	
		%REC	96	106	101	103	9
		DUPL	<0.005	0.032	0.256	0.990	
		OID	01308077	51208060	51208050	51208047	
						HGA AUTH	
99144	QC FIELD BLANK #3	CONC	<0.005	<0.030	<0.005	<0.030	
		%REC					10
		DUPL					
		OID	01308077	51208060	51208050	51208047	
						HGA AUTH	

SE SELENIUM
MN MANGANESE
ZN ZINC
BA BARIUM

JOB DESCRIPTION:*NIROP - OMAHA
REPORT DATE:11 May 88

NIROP0000000000 HCL
RECEIPT DATE:11 FEB 88

JOB FILE:99124
EST. COMP. DATE:01 Apr 88

B : DENOTES PPB

LAB ID	PROJECT ID		COLUMN.... 1	2	3	4	5	6	7	8	9	ROW
			ANALYSIS.. 72	73	74	75	76	77	78	79	80	
			PPM..... CLME	BRME	VICL	CLET	MECL	DCLETE	11DCE	+DICLE	CHCL3	
99124	1I	CONC	<0.010	<0.010	<0.010	<0.010	0.004J	<0.005	<0.005	<0.005	<0.005	
		%REC										1
		DUPL										
		DID	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	
99125	3I	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	0.003J	0.0089	<0.005	<0.005	
		%REC										2
		DUPL								<0.005		
		DID	08958049	08958049	08958049	08958049	08958049	08958047	08958049	08958049	08958049	
99126	3D	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										3
		DUPL	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		DID	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	
99127	4D	CONC	<0.010	<0.010	<0.010	<0.010	0.10	<0.005	<0.005	<0.005	<0.005	
		%REC										4
		DUPL										
		DID	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	
99128	7S	CONC	<0.010	<0.010	<0.010	<0.010	0.036	<0.005	<0.005	<0.005	<0.005	
		%REC										5
		DUPL										
		DID	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	
99129	12S	CONC	<0.010	<0.010	<0.010	<0.010	0.043	<0.005	<0.005	<0.005	<0.005	
		%REC										6
		DUPL										
		DID	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	
99130	13D	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										7
		DUPL										
		DID	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	
99131	20S	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										8
		DUPL										
		DID	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	

CLME	CHLOROMETHANE	BRME	BROMOMETHANE	VICL	VINYL CHLORIDE
CLET	CHLOROETHANE	MECL	METHYLENE CHLORIDE	DCLETE	1 1-DICHLOROETHENE
11DCE	1 1-DICHLOROETHANE	+DICLE	TRANS-1 2-DICHLOROETHENE	CHCL3	CHLOROFORM

JOB DESCRIPTION: NIROP - OMAHA
REPORT DATE: 11 May 88

NIROP0000000000 HCL
RECEIPT DATE: 11 FEB 88

JOB FILE: 99124
EST. COMP. DATE: 01 Apr 88

	COLUMN....	1	2	3	4	5	6	7	8	9	
	ANALYSIS..	72	73	74	75	76	77	78	79	80	
B : DENOTES PPB	PPM.....	CLME	BRME	VICL	CLET	MECL	DCLETE	11DCE	+DICLE	CHCL3	
LAB ID	PROJECT ID										ROW
99132	219	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	0.004J	<0.005	<0.005	
		%REC									9
		DUPL									
		DID	089580491	089580491	089580491	089580491	089580491	089580491	089580491	089580491	
99133	QC FIELD BLANK #3	CONC	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	
		%REC									10
		DUPL									
		DID	089580491	089580491	089580491	089580491	089580491	089580491	089580491	089580491	
99134	QC TRIP BLANK #8	CONC	<0.010	<0.010	<0.010	<0.010	0.021	<0.005	<0.005	<0.005	
		%REC									11
		DUPL									
		DID	089580491	089580491	089580491	089580491	089580491	089580491	089580491	089580491	

CLME	CHLOROMETHANE	BRME	BROMOMETHANE	VICL	VINYL CHLORIDE
CLET	CHLOROETHANE	MECL	METHYLENE CHLORIDE	DCLETE	1 1-DICHLOROETHENE
11DCE	1 1-DICHLOROETHANE	+DICLE	TRANS-1 2-DICHLOROETHENE	CHCL3	CHLOROFORM

JOB DESCRIPTION:NIROP - OMAHA NIROP0000000000 HCL JOB FILE:99124
REPORT DATE:11 May 88 RECEIPT DATE:11 FEB 88 EST. COMP. DATE:01 Apr 88

B : DENOTES PPB

LAB ID	PROJECT ID	COLUMN....	10	11	12	13	14	15	16	17	18	ROW
		ANALYSIS..	81	82	83	84	85	86	87	88	89	
		PPM.....	12DCE	111TCA	C CL 4	BRCL2M	DICLPR	+CLPRE	TCE	DBRCLM	CCLPRE	
99124	1I	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										1
		DUPL										
		DID	08958049	08958049	08958049	08958041	08958049	08958049	08958049	08958049	08958049	
99125	3I	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	2.7	<0.005	<0.005	
		%REC										2
		DUPL							2.7			
		DID	08958049	08958049	08958049	08958041	08958049	08958049	08958049	08958049	08958049	
99126	3D	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0080	<0.005	<0.005	
		%REC										3
		DUPL	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0076	<0.005	<0.005	
		DID	08958049	08958049	08958049	08958041	08958049	08958049	08958049	08958049	08958049	
99127	4D	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.002J	<0.005	<0.005	
		%REC										4
		DUPL										
		DID	08958049	08958049	08958049	08958041	08958049	08958049	08958049	08958049	08958049	
99128	7S	CONC	<0.005	0.003J	<0.005	<0.005	<0.005	<0.005	0.066	<0.005	<0.005	
		%REC										5
		DUPL							0.066			
		DID	08958049	08958049	08958049	08958041	08958049	08958049	08958049	08958049	08958049	
99129	12S	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										6
		DUPL										
		DID	08958049	08958049	08958049	08958041	08958049	08958049	08958049	08958049	08958049	
99130	13D	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										7
		DUPL										
		DID	08958049	08958049	08958049	08958041	08958049	08958049	08958049	08958049	08958049	
99131	20S	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										8
		DUPL										
		DID	08958049	08958049	08958049	08958041	08958049	08958049	08958049	08958049	08958049	

12DCE	1 2-DICHLOROETHANE	111TCA	1 1 1-TRICHLOROETHANE	C CL 4	CARBON TETRACHLORIDE
BRCL2M	BROMODICHLOROMETHANE	DICLPR	1 2 DICHLOROPROPANE	+CLPRE	TRANS-1 3-DICHLOROPROPENE
TCE	TRICHLOROETHENE	DBRCLM	DIBROMOCHLOROMETHANE	CCLPRE	CIS-1 3-DICHLOROPROPENE

JOB DESCRIPTION:*NIROP - OMAHA NIROP0000000000 HCL JOB FILE:99124
REPORT DATE:11 May 88 RECEIPT DATE:11 FEB 88 EST. COMP. DATE:01 Apr 88

E : DENOTES PPB

LAB ID	PROJECT ID	COLUMN....	10	11	12	13	14	15	16	17	18	FOW
		ANALYSIS..	81	82	83	84	85	86	87	88	89	
		PPM.....	12DCE	111TCA	C CL 4	BRCL2M	DICLPR	+CLPRE	TCE	DBRCLM	CCLPRE	
99132	216	CONC	<0.005	0.023	<0.005	<0.005	<0.005	<0.005	0.40	<0.005	<0.005	
		%REC										9
		DUPL							0.40			
		DID	08958049	08958049	08958049	08958041	08958049	08958049	08958049	08958049	08958049	
99133	QC FIELD BLANK #3	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										10
		DUPL										
		DID	08958049	08958049	08958049	08958041	08958049	08958049	08958049	08958049	08958049	
99134	QC TRIP BLANK #8	CONC	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										11
		DUPL										
		DID	08958049	08958049	08958049	08958041	08958049	08958049	08958049	08958049	08958049	

12DCE	1 2-DICHLOROETHANE	111TCA	1 1 1-TRICHLOROETHANE	C CL 4	CARBON TETRACHLORIDE
BRCL2M	BROMODICHLOROMETHANE	DICLPR	1 2 DICHLOROPROPANE	+CLPRE	TRANS-1 3-DICHLOROPROPENE
TCE	TRICHLOROETHENE	DBRCLM	DIBROMOCHLOROMETHANE	CCLPRE	CIS-1 3-DICHLOROPROPENE

JOB DESCRIPTION:%NIROP - OMAHA NIROP0000000000 HCL JOB FILE:99124
REPORT DATE:11 May 88 RECEIPT DATE:11 FEB 88 EST. COMP. DATE:01 Apr 88

B : DENOTES PPB

LAB ID	PROJECT ID		19	20	21	22	23	24	25	26	27	ROW
		COLUMN....	19	20	21	22	23	24	25	26	27	
		ANALYSIS..	90	91	92	93	94	95	96	97	98	
		PPM.....	112TCA	BENZEN	CLETRE	CHBR3	TCLETA	TCLETE	TOLUEN	CLBEN	ETBEN	
99124	1I	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										1
		DUPL										
		OID	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	
99125	3I	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	0.033	<0.005	<0.005	<0.005	
		%REC										2
		DUPL										
		OID	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	
99126	3D	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										3
		DUPL	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		OID	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	
99127	4D	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										4
		DUPL										
		OID	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	
99128	7S	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										5
		DUPL										
		OID	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	
99129	12S	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										6
		DUPL										
		OID	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	
99130	13D	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										7
		DUPL										
		OID	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	
99131	20S	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										8
		DUPL										
		OID	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	

112TCA 1 1 2-TRICHLOROETHANE
CHBR3 BROMOFORM
TOLUEN TOLUENE
BENZEN BENZENE
TCLETA 1 1 2 2-TETRACHLOROETHANE
CLBEN CHLOROBENZENE
CLETRE 2-CHLOROETHYLVINYLETHER
TCLETE TETRACHLOROETHENE
ETBEN ETHYLBENZENE

JOB DESCRIPTION:#NIROP - OMAHA NIROP0000000000 HCL JOB FILE:99124
REPORT DATE:11 May 88 RECEIPT DATE:11 FEB 88 EST. COMP. DATE:01 Apr 88

B : DENOTES PPB

LAB ID	PROJECT ID	COLUMN....	19	20	21	22	23	24	25	26	27	ROW
		ANALYSIS..	90	91	92	93	94	95	96	97	98	
		PPM.....	112TCA	BENZEN	CLETRE	CHBR3	TCLETA	TCLETE	TOLUEN	CLBEN	ETBEN	
99133	218	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	0.038	<0.005	<0.005	<0.005	
		%REC										9
		DUPL						0.038				
		DID	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	
99133	QC FIELD BLANK #3	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										10
		DUPL										
		DID	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	
99134	QC TRIP BLANK #8	CONC	<0.005	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		%REC										11
		DUPL										
		DID	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	08958049	

112TCA 1 1 2-TRICHLOROETHANE
BENZEN BENZENE
CLETRE 2-CHLOROETHYLVINYLETHER
CHBR3 BROMOFORM
TCLETA 1 1 2 2-TETRACHLOROETHANE
TCLETE TETRACHLOROETHENE
TOLUEN TOLUENE
CLBEN CHLOROBENZENE
ETBEN ETHYLBENZENE

JOB DESCRIPTION:NIROP - OMAHA NIROP0000000000 HCL JOB FILE:99124
REPORT DATE:11 May 88 RECEIPT DATE:11 FEB 88 EST. COMP. DATE:01 Apr 88

B : DENOTES PPB

LAB ID	PROJECT ID	COLUMN....	28	29	30	31	32	33	34	35	36	ROW
		ANALYSIS..	99	100	156	157	158	159	160	161	162	
		PPM.....	ACRO	ACRY	ACETON	CARDIS	2-BUTN	VYLACT	2-HEXN	METPEN	STYREN	
99124	1I	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	1
		%REC										
		DUPL										
		OID	089580491	089580491	089580491	089580491	089580491	089580491	089580491	089580491	089580491	
99125	3I	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	2
		%REC										
		DUPL										
		OID	089580491	089580491	089580491	089580491	089580491	089580491	089580491	089580491	089580491	
99126	3D	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	3
		%REC										
		DUPL	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	
		OID	089580491	089580491	089580491	089580491	089580491	089580491	089580491	089580491	089580491	
99127	4D	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	4
		%REC										
		DUPL										
		OID	089580491	089580491	089580491	089580491	089580491	089580491	089580491	089580491	089580491	
99128	7S	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	5
		%REC										
		DUPL										
		OID	089580491	089580491	089580491	089580491	089580491	089580491	089580491	089580491	089580491	
99129	12S	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	6
		%REC										
		DUPL										
		OID	089580491	089580491	089580491	089580491	089580491	089580491	089580491	089580491	089580491	
99130	13D	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	7
		%REC										
		DUPL										
		OID	089580491	089580491	089580491	089580491	089580491	089580491	089580491	089580491	089580491	
99131	20S	CONC	<0.10	<0.10	<0.10	<0.005	<0.10	<0.050	<0.050	<0.050	<0.005	8
		%REC										
		DUPL										
		OID	089580491	089580491	089580491	089580491	089580491	089580491	089580491	089580491	089580491	

ACRO ACROLEIN
CARDIS CARBON DISULFIDE
2-HEXN 2-HEXANONE
ACRY ACRYLONITRILE
2-BUTN 2-BUTANONE
METPEN 4-METHYL-2-PENTANONE
ACETON ACETONE
VYLACT VINYL ACETATE
STYREN STYRENE