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A-E FIELD QUALITY CONTROL AND SAMPLING PLAN FOR GROUND WATER SAMPLING AT THE NAVAL INDUSTRIAL RESERVE ORDNANCE PLANT FRIDLEY, MINNESOTA

NOVEMBER 1986

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I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.

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1. PROJECT DESCRIPTION AND ORGANIZATION

1.1 Introduction

This A-E Field Quality Control and Sampling Plan has been prepared in support of the anticipated sampling of 34 ground water monitoring wells at the Naval Industrial Reserve Ordnance Plant (NIROP) in Fridley, Minnesota (Figure 1). The purpose of the plan is two-fold. First, it outlines the project data collection needs covering sampling, sample handling and custody, documentation, and analytical procedures for field activities at the NIROP. Second, the plan outlines the quality control (QC) interactions and related responsibilities for a comprehensive round of ground water sampling at the NIROP facility.

1.2 Background

The A-E Field Quality Control and Sampling Plan has been prepared by RMT, Inc., of Madison, Wisconsin for the U.S. Army Corps of Engineers (COE) under Modification No. P00001 to Contract DACA45-86-C-0015 dated September 10, 1986. The NIROP is a Department of Defense-owned, privately operated facility. This project is part of the Department of Defense Installation Restoration Program (IRP) effort. RMT, Inc.'s involvement at the NIROP began in June 1986. Primary objectives at that time were to 1) summarize previous investigations and develop preliminary remedial alternatives by preparing an Interim Report; 2) outline proposed activities and schedules in a Conceptual Workplan; and 3) complete a COE document regarding waste excavation. The issuance of Contract Modification P00001 to perform a comprehensive sampling round is the first step in meeting the major recommendations presented in the Draft Conceptual Workplan.

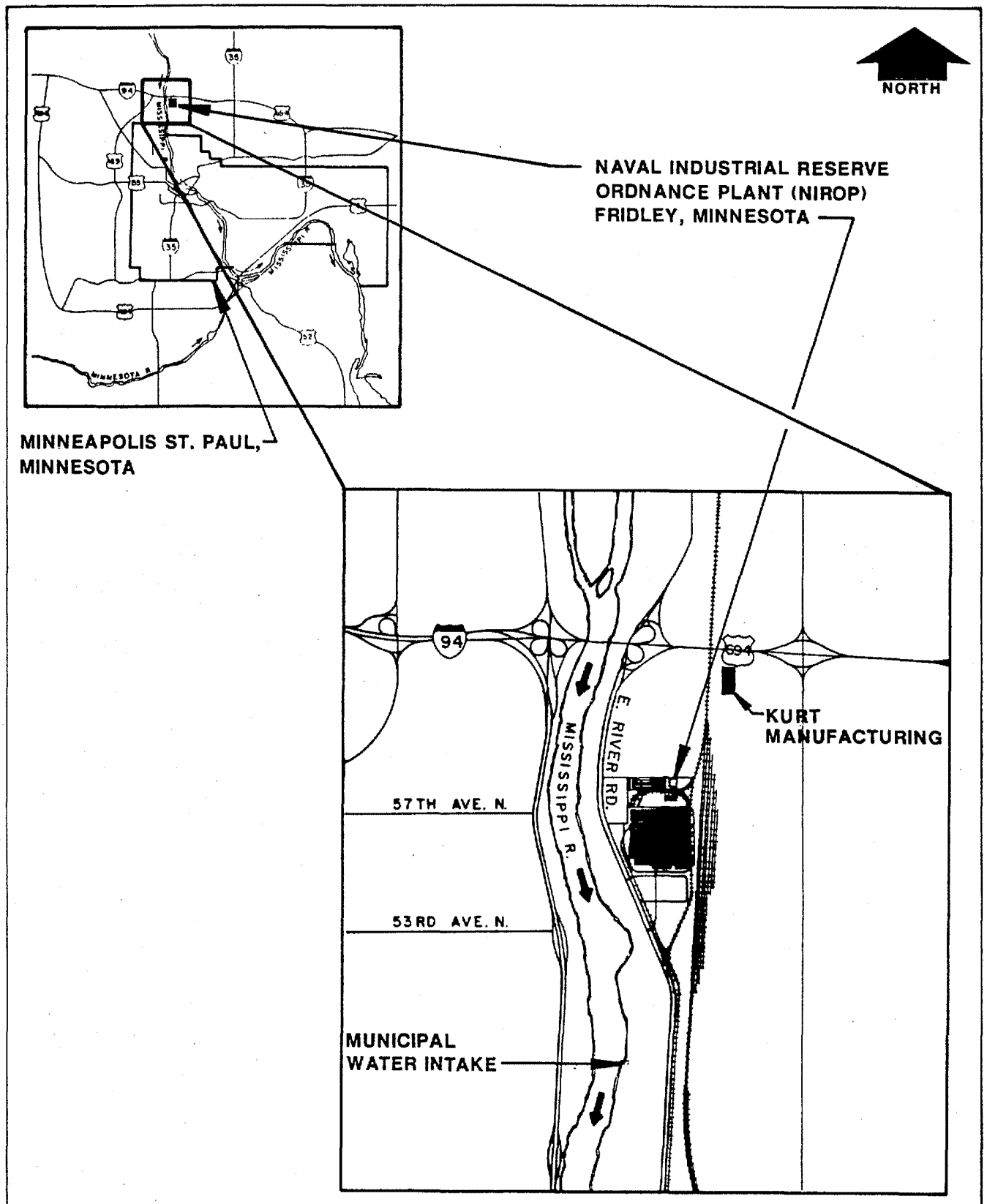

FIGURE 1
GENERAL VICINITIES MAP

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Details of specific items to be performed by RMT, Inc., under this contract modification include the following:

a. Take and prepare 34 monitoring well water samples for shipment to the Corps of Engineers Waterways Experiment Station (WES). Samples will be analyzed by the WES for the following parameters:

   (1) Volatile Organics - EPA Method 8240 (plus quantitation of CIS-1,2-dichloroethylene, methyl ethyl ketone, and total xylenes, plus tentative identification and concentration estimation of the five (5) non-list peaks of greatest apparent concentration using a comparison of sample spectra and their nearest library matches).

   (2) Cations (Dissolved) - calcium, magnesium, sodium, and potassium.

   (3) Anions - sulfate, nitrate, and chloride.

   (4) Alkalinity.

   (5) Dissolved metals - arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, copper, manganese, nickel, zinc.

   (6) Total metals - arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, copper, manganese, nickel, zinc. Samples will be split into total and dissolved metals aliquots for three samples.

   (7) Total cyanide.

b. Observe repair of the riser pipe on well 8-S to allow for sampling (repairs to be provided by the COE).

c. Prepare detailed Quality Control Plan covering the above described work.

d. Prepare a Health and Safety Plan for the above described work. Included in the Plan shall be a description of hazards related to this work, required personnel protective equipment, and air monitoring.

e. Prepare a Quality Control Summary Report.

The Scope of Services is limited to contract DACA45-86-C-0015, Modification P00001 and appropriate guidance documents provided by the COE.

The intended uses of data gathered during this sampling round are as follows:

- Provide additional information regarding contaminant migration.
- Provide additional information regarding potential contaminant sources.
- Provide additional information regarding changes in contaminant concentrations with time.
- Provide additional information on representativeness of well locations.
- Provide additional information on specific chemical contaminants that may not have been detected or analyzed for in previous phases of the site investigation.
- Provide additional information regarding partitioning of specific metal contaminants between the dissolved and non-dissolved phases.

1.3 Toxic Substances On-Site

Seven rounds of ground water sampling have been performed at the NIROP since October 1983. Results from those seven rounds have been used to prepare a list of toxic substances which have been detected (Table 1). The list of toxic substances previously detected on-site differs somewhat from the parameters selected for analysis in the proposed Sampling Plan. Section 2.2 of this plan explains the rationale for the selection of parameters for analysis.

1.4 Project Organization

The project team assembled to execute this project include personnel from three organizations. Overall project management and laboratory services will be provided by U.S. Army Corps of Engineers

TABLE 1

LIST OF CONSTITUENTS DETECTED ON-SITE
AND POTENTIAL BREAKDOWN PRODUCTS OF CONCERN

INORGANIC CONSTITUENTS	ORGANIC CONSTITUENTS	POTENTIAL DEGRADATION PRODUCTS OF CONCERN
Arsenic	1,1,1 Trichloroethane	1,1 Dichloroethane Chloroethane
Cadmium	1,1 Dichloroethane	Chloroethane
Chromium	1,1 Dichloroethene	Vinyl Chloride
Copper	Benzene	
Lead	Bis (2ethylhexyl) Phthalate	
Manganese	Chloroform	
Mercury	Cis 1,2 Dichloroethene	
Nickel	Ethyl benzene	
Silver	Methylene Chloride	
Zinc	PCB 1242	
	PCB 1248	
	PCB 1254	
	PCB 1260	
	Tetrachloroethene	1,2 Dichloroethene 1,1 Dichloroethene Trichloroethene Vinyl Chloride
	Toluene	
	Trans 1,2 Dichloroethene	Vinyl Chloride
	Trichloroethene	1,2 Dichloroethene 1,1 Dichloroethene Vinyl Chloride

personnel. Preparation of project planning documents, performance of field activities, and data review are the responsibilities of RMT, Inc. In addition, close cooperation regarding site access and plant-related activities will be provided by the U.S. Navy. All questions and comments regarding various elements of this project will be channeled through the COE project manager, who has lead responsibility for the project. Figure 2 shows the organizational structure for this project. Resumes of key RMT personnel are included in Appendix A. Personnel assignments for this project are summarized in Table 2.

1.5 Project Schedule

A project schedule has been prepared as shown in Figure 3.

FIGURE 2

PROJECT ORGANIZATION

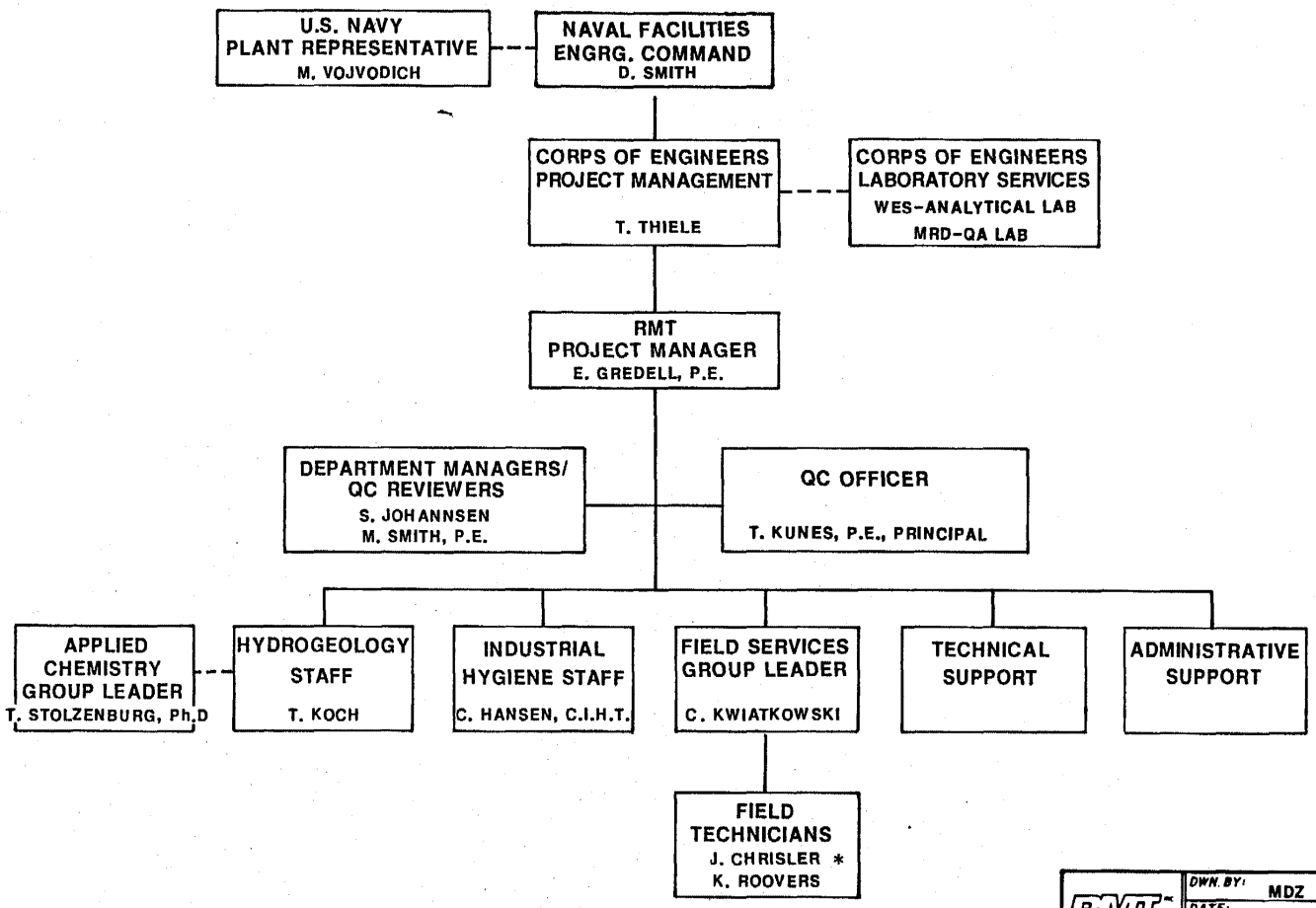


TABLE 2

KEY RMT PERSONNEL

Project Manager: Eric Gredell

Site Sampling Task Leader: Jeff S. Chrisler

Hydrogeologist: Thomas E. Koch

On-Site Health and Safety Coordinator: Jeff S. Chrisler

Technician: Karl P. Roovers

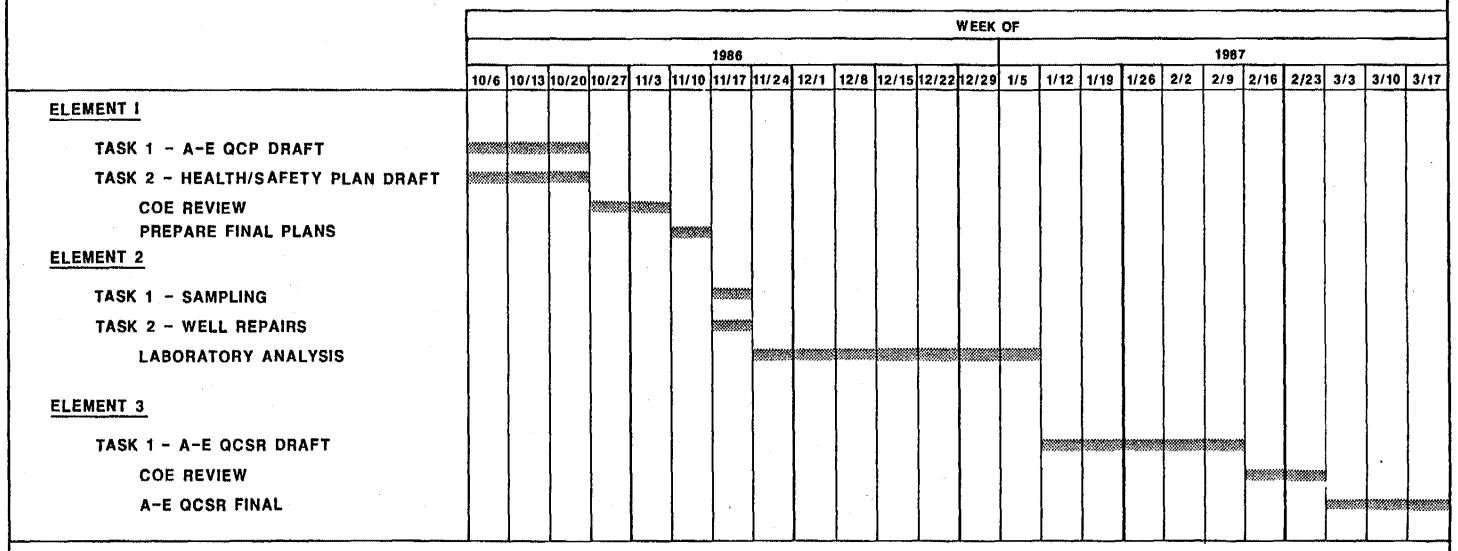
Quality Control Officer: Thomas P. Kunes, Principal

Quality Control Reviewers:

Mark E. Smith, Technical Operations
Stephen D. Johannsen, Hydrogeology
Chris Hansen, Health and Safety

FIGURE 3

PROPOSED PROJECT SCHEDULE



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2. SAMPLING PLAN

2.1 Introduction

This Sampling Plan addresses the field activities associated with the collection of one round of ground water samples at the NIROP facility. All field activities will be conducted in accordance with this Sampling Plan, the Field Quality Control Plan (Section 3), and a separate Site-Specific Health and Safety Plan.

Locations of the 34 monitoring wells to be sampled are shown on Plate 1. Monitoring wells to be sampled have been installed by the COE during previous phases of this investigation.

2.2 Selection of Parameters for Analysis

This section discusses the selection of parameters for analysis for this sample round. Volatile organics have been the majority of hazardous substances detected at the NIROP to date. In addition to the EPA method 8240 volatile organics (included in Appendix B), the following volatile organics have been added for analysis:

- CIS 1,2 Dichloroethylene - previously detected at the NIROP.
- Methyl ethyl ketone - used in plant processes.
- Xylene - typically associated with petroleum-based products; could serve as indicator of fuel leaks.

PCBs have not been included for analysis for the following reasons:

- All reported concentrations of PCBs detected were of questionable significance (all were at or near detection limits).
- No consistent measurable concentrations were found for any well or aroclor mixture.

- Wells in which PCB aroclors were detected were diverse in location.

- No PCB aroclors were detected in the last three sample rounds.

Bis (2 ethyl hexyl) phthalate has not been included for analysis in this sample round. This constituent has been detected in every sampling round and in every well at least once. Bis (2 ethyl hexyl) phthalate is a common sampling and laboratory contaminant causing false positive values in ground water samples (Barcelona et al. 1983). This particular compound is a plasticizer which occurs in a wide variety of products, including the liners of screw cap sampling bottles (Albro, 1979). For this reason low levels of this compound are commonly found in samples and blanks taken during ground water sampling.

In reviewing data, the most reliable method to accept or reject values for bis (2 ethyl hexyl) phthalate is to compare measured concentrations against other organics. When the phthalate concentrations are viewed in this context, the only samples which are clearly correlated with other organic contamination are the samples collected in April 1984 at monitoring wells 3-S and 6-S. However, concentrations at these wells and at all other wells decreased dramatically in subsequent sampling rounds.

All of the concentrations of bis (2 ethyl hexyl) phthalate detected at NIROP are below the human health criteria of 15 mg/l for that compound (FR November 28, 1980. 79339). The highest concentration detected at the NIROP site was 0.22 mg/l in April 1984 at well 6-S. Since then, the concentration at well 6-S decreased to 0.00062 mg/l in June 1985. In the most recent round of sampling and analysis for bis (2 ethyl hexyl) phthalate the highest concentration observed was 0.0059 mg/l which is 2500 times below the water quality criteria for

this compound. Hence, there is little reason to continue monitoring for this compound.

Inorganics included for analysis are the Primary Drinking Water Standard trace elements (As, Ba, Cd, Cr, Pb, Hg, Ag, Se) and nickel, zinc, manganese, copper, and cyanide. The last five constituents were added to reflect the presence of plating operations at the facility.

Every well will be sampled for dissolved metals to evaluate actual constituent migration in the ground water. Past sampling has included only total metals analyses. Therefore, in order to assess comparability between the past and the proposed sampling results, three wells (3-S, 9-S, and 15-S) will be analyzed for both dissolved and total metals.

Analyses of the major ions will provide a comparison of the overall ground water chemistry in the bedrock and alluvial aquifers, and thus should aid in the interpretation of spatial and/or temporal trends in ground water quality data. These analyses may also assist in determining whether past or present leaks in the NIROP sewer systems are currently contributing to observed ground water concentrations on the southwest side of the facility.

2.3 Sampling Procedures

This section outlines field procedures to be used by RMT personnel from equipment preparation through sample shipment to COE's laboratories. Procedures used by RMT have been developed based on USEPA methods. (Gibb, et al., 1981; Scalf, et al., 1981; USEPA, 1976a; USEPA, 1976b: USEPA, 1982; USEPA, 1977)

2.3.1 Specific Sampling and Field Analytical Procedures

Ground Water Level Measurement

The measurement of ground water level in wells will be conducted in conjunction with ground water sampling. The data from such measurements are needed to determine well purging requirements, establish ground water gradients, and ultimately, to determine the direction of ground water flow.

All ground water level measurements will be made using the established reference point on the well casing. This reference point shall be documented in field records.

A battery-operated water level indicator will be the primary device for water level measurements. The indicator is a self-contained transistorized instrument equipped with a cable and sensor which activates a buzzer and a light when it comes in contact with the water. The depth to water is read from permanent one-foot increment markings on the cable. A one-foot engineer's rule is then used to measure the depth to the nearest 0.01 foot.

In case of instrument failure, depth to ground water will be measured by a popper tape which is a bell- or cup-shaped weight attached to a measuring tape. When lowered into the well, a "plopping" or "popping" sound is made when the weight strikes the surface of the water. An accurate reading can be determined by lifting and lowering the weight in short strokes, and reading the tape when the weight barely strikes the water. Depth to water will be recorded to the nearest 0.01 foot. The water level indicator and/or popper will be decontaminated between each well by rinsing with methenol and rinsing several times with deionized water. Deionized water will be laboratory graded.

Well Purging

Well purging will be performed to remove stagnant water from the well casing because it is not representative of actual ground water chemistry. The purging will draw in water from the surrounding area which is more representative of the water quality.

Well purging will be accomplished by removing either 5 well volumes or until stable pH, conductivity, and temperature readings are reached. The well volumes will be calculated by subtracting the depth to water from the depth of well and multiplying the difference by the cross-sectional area of the well bore, with appropriate conversion factors. In the field, RMT personnel use pre-calculated conversion formulas to determine the number of gallons that must be removed to reach the five well volumes criteria. The well data needed to determine the purge volumes are shown in Table 3. Specific conductance, pH, and temperature measurements will be taken after each well volume is removed until three successive readings yield equivalent values within the following ranges: specific conductance (temperature corrected): ± 10 umhos/cm; pH: ± 0.1 pH unit; temperature: ± 0.5°C. Methods for determining pH and conductivity are detailed in later sections of this plan.

Purging will be accomplished by one of two methods - bailing or pumping. For small diameter wells, a bailer will be used. A submersible pump can be used with 4-inch diameter and larger wells. A calibrated bucket is used to measure the volumes of water removed. Purge water will be discharged to the ground.

TABLE 3

NIROP MONITORING WELL HISTORIC DATA

WELL NUMBER	TOP OF CASING ELEVATION	WELL DEPTH *	WELL DIAMETER
1-S	837.14	34.98	2"
1-D	836.75	115.54	2"
1-PC	837.63	208.66	4"
2-S	836.07	34.65	2"
2-D	836.04	112.3	2"
2-PC	838.05	178.28	4"
3-S	836.75	34.75	2"
3-D	837.48	80.87	2"
3-PC	839.21	159.4	4"
4-S	837.45	34.85	2"
4-D	834.79	120.93	2"
4-PC	834.75	182.33	4"
5-S	835.06	34.71	2"
5-D	836.00	117.1	2"
6-S	835.73	34.65	2"
6-D	835.69	129.95	2"
7-S	835.97	29.94	2"
7-D	835.63	118	4"
8-S	835.76	29.9	2"
8-D	834.02	128	4"
9-S	836.68	29.3	2"
9-D	834.30	124	4"
10-S	835.89	31.3	2"
11-S	835.89	31.3	2"
12-S	838.51	35.9	2"
13-S	834.59	33.9	2"
14-S	835.99	34.4	2"
15-S	834.83	34.5	2"
16-S	837.26	35.8	2"
17-S	835.75	39	2"
18-S	834.08	40.75	2"
19-S	834.56	45	2"
20-S	837.62	35.6	2"
FMC-33	837.05	73.0	4"

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* From top of casing as installed

Sampling of Wells

It is important not to contaminate or alter the sample during collection. The sampling device should be clean and constructed of a material which is compatible with the well construction material and the laboratory testing program (i.e., organics, metals, etc.). The most chemically inert material available for sampling organics is Teflon. RMT will therefore use Teflon bailers when collecting organic samples. Teflon is also an excellent choice for metals and cyanide analysis. However, since the portion of the wells that is normally in contact with the water is constructed of stainless steel, bailers constructed of stainless steel may also be used. Nylon rope attached to ten-foot-long Teflon-coated stainless steel cable leaders is used to raise and lower the bailers. New rope will be used for each well.

To ensure that samples are not contaminated by field techniques, the following steps are also taken:

- Bailers and stainless steel leaders will be cleaned between wells with methanol and distilled water.
- A new, clean plastic dropcloth will be used at each well to protect equipment from contact with soil around the well.
- A field blank sample consisting of distilled water which has been subjected to the same field methods (sampler rinsate) as the samples (discussed elsewhere) will be used.

Filtering

Filtering in the field is required for some parameters to prevent changes due to precipitation or biological activity and to collect a more representative sample of the water moving through the ground. In

many cases, there may be a small amount of silt or clay in the water after purging the well. This sediment is not representative of constituent transport in ground water flow systems in porous media. The filtering is performed in the field because even short delays may drastically change the water chemistry. The field filtering apparatus consists of a battery-powered vacuum pump and membrane filters with a 0.45 micron opening.

The parameters to be analyzed which will be field-filtered include the dissolved metals, cations, anions, and alkalinity, as noted below. Samples collected for total metals will not be filtered. Filtering is not appropriate for trace organics because of the possible loss through adsorption on the filter or volatilization. Table 4 summarizes which sample portions will be filtered.

The USEPA method for preservation of cyanide in water, wastewater, and leachates has recently changed. The new preservation technique requires removal of sulfide interference at the time of sample collection and before addition of sodium hydroxide. Below is a description of the procedures to be used:

- Field technicians will use lead acetate paper to check for sulfides.
- If no sulfide is present, NaOH is added until the pH is greater than 12.
- If sulfide is present, a small amount of cadmium nitrate is added, mixed, and the precipitate that forms is allowed to settle. The field technician checks for sulfide again and, if it is still present, cadmium nitrate treatments are repeated until the test is negative.
- After treatment, the sample is filtered and the pH is adjusted to greater than 12.

TABLE 4

SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

PARAMETER	CONTAINERS PER MONITORING WELL*	PRESERVATIVE	FIELD FILTERING**	HOLDING TIME
VOCs (EPA 8240) plus methyl ethyl ketone cis 1,2 dichloroethylene	2-40 ml Glass vials with Teflon lined septum	Cool, 4°C	No	14 Days
METALS (Dissolved)				
Arsenic				
Barium	one-250 ml polyethylene (one-500 ml polyethylene)	Nitric Acid to pH less than 2	Yes	6 Months
Cadmium				
Chromium				
Lead				
Mercury				
Selenium				
Silver				
Copper				
Manganese				
Nickel				
Zinc				
Cations (Dissolved)				
Calcium	Included with metals		Yes	
Magnesium				
Sodium				
Potassium				
Anions				
Sulfate	one-250 ml polyethylene (one-500 ml polyethylene)		Yes	28 Days
Alkalinity		Cool, 4°C		14 Days
Chloride				28 Days
Nitrate	one-100 ml polyethylene (one-500 ml polyethylene)	Sulfuric Acid, pH less than 2	Yes	48 Hours
Cyanide	one-200 ml polyethylene (one-500 ml polyethylene)	Sodium Hydroxide, pH greater than 12	No***	14 Days
TOTAL METALS	one-200 ml polyethylene (one-500 ml polyethylene)	Nitric Acid, pH less than 2	No	6 Months

* Bottle requirements shown are those supplied by WES. Bottles in parentheses are those supplied by MRD-ED-L.

** Using 0.45 micron filter.

- Field notes and the chain-of-custody form will be noted for those samples which require treatment.
- Treatment will be done at the time of sample collection.

Measurement of pH

The pH measurements will be made electrometrically using a combination electrode and portable pH meter. The measurements will be recorded to the nearest 0.1 pH unit. Portable meters with provisions for temperature compensation will be used. Combination electrodes will be used in conjunction with the meters. Reference will be made to the instrument operator's manual for pH measurement procedures and instrument operation instructions.

The meter will be checked before each field trip and daily while in the field for any mechanical or electrical failures, weak batteries, and cracked or fouled electrodes. The meter and electrode also will be checked against standard buffer solutions of known pH values (e.g., 4, 7, and 10). While in the field, the meter will be checked several times per day with fresh buffers. In case of an apparent discrepancy in a pH measurement, the electrode will be checked with pH 7.0 buffer and rebuffered to the closest reference buffer. Then the sample will be re-analyzed. Duplicate analyses must agree within 0.1 pH units. The buffer solution containers will be refilled each day from fresh stock solution.

Decontamination of the pH probe and cup will be done by rinsing each three times with distilled water. Additionally, the cup will be rinsed three times with the next sample prior to obtaining a reading.

A log book will be maintained and will contain the property number of each pH meter. All calibrations and repairs will be noted in the log book indicating the date, the repairs made, the person making repairs, calibration records, and the time used in the field for each meter.

Measurement of Conductivity

A portable specific conductance meter, wheatstone bridge type or equivalent, will be used.

Each meter will be checked before each field trip and daily while in the field. Batteries will be checked, and conductivity cells will be cleaned and checked against known standards.

Reference will be made to the instrument instruction manual for temperature - conductance calculations. Duplicate field analyses should agree within ± 15 percent.

A log book will be maintained with all specific conductance meter property numbers. All repairs, calibrations, and field time usage will be noted. The log book will include dates, repairs made, and the name of the person making the repairs.

Results will be expressed in micromhos/centimeter (umhos/cm) corrected to 25°C, and reported to the nearest ten units.

Measurement of Temperature

All field thermometers will be initially calibrated against a National Bureau of Standards (NBS) certified thermometer. Field readings will be recorded to the nearest 1°C.

Each field thermometer will be inspected before each field trip to see that it is not cracked and that there are no air spaces or bubbles in the mercury. A cross-check with a calibrated NBS certified thermometer will be made semi-annually. Before using a thermometer in the field, field personnel will make a visual observation to ensure that it has not been damaged. Cross-checks and duplicate field analysis will agree to within ± 0.5°C.

A log book will be maintained with each thermometer property number recorded. All calibration information, individuals making the calibrations, and dates will be recorded. Each field calibration will be noted in the field notebooks indicating the temperature readings observed.

2.3.2 Sample Containers, Preservatives, and Holding Times

Table 4 summarizes the requirements for sample containers, sample preservatives, and holding times for the parameters to be analyzed in this sampling round. Sample containers for field samples, QC duplicates and QC field blanks will be supplied by WES. Sample containers and QA analysis for QA splits and QA field blanks will be supplied by the Army Corps of Engineers, Missouri River Division (MRD-ED-L). A summary of ground water sampling is provided in Table 5.

2.3.3 Documentation

Field Records. This section describes requirements and procedures for documentation of field activities. Documentation of the sampling team's field activities provides the basis for technical site

TABLE 5

NIROP GROUND WATER SAMPLING SUMMARY

Parameters	Field Samples	QC Duplicates	QC Field Blanks	QA Splits	QA Field Blanks
1. Volatile Organics	34	3	6***	3	3****
2. Cations, Dissolved Metals and Total Metals	37*	3	3**	3	3**
3. Nitrate	34	3	3**	3	3**
4. Alkalinity, Sulfate and Chloride	34	3	3**	3	3**
5. Total Cyanide	34	3	3**	3	3**

* Includes 34 samples for cations and dissolved metals and 3 samples for total metals.
** Includes 1 trip blank and 2 sampler rinsate blanks.
*** Includes 4 trip blanks and 2 sampler rinsate blanks.
**** Includes 2 trip blanks and 1 sampler rinsate blank.

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evaluations and related written reports. Additionally, all records and notes generated in the field may be considered pertinent in the discovery process as part of potential future litigation. It is essential that all field documentation provide a clear, unbiased picture of field activities. Field records of activities at the NIROP site shall be in the form of an A-E Daily Quality Control Report (A-E DQCR) and daily logs.

Daily logs will be used to document site activities. The Site Sampling Task Leader will be responsible for providing bound, serialized field notebooks and documenting the assignment of each field notebook to be used for the daily logs. Entries into field notebooks will be legibly written in indelible ink and will provide a clear record of all field activities.

The following information must be provided on the inside front cover or first page of the field notebooks:

- Project Name (site name)
- Site Location
- RMT Project Number
- COE Contract Number
- Date of Issue
- Name of the individual to whom the notebook is assigned
- Authors of the notes (daily entries will be initialed by the respective author)

Examples of the type of information for inclusion in the daily log are weather, work performed, field calibration information, water levels, pH, conductivity, visitor information, and air monitoring data.

The site Sampling Task Leader will distribute and keep track of users of bound and numbered field notebooks. Transfers of field notebooks to other individuals who have been designated to perform specific tasks on the project will be recorded. None of the documents are to be destroyed or thrown away, even if they are illegible or contain inaccuracies. Voided documents will be returned to the originator and sent to the project file. The A-E DQCR is a separate record sent to the COE project manager upon completion of sampling.

The A-E DQCR will include information such as:

1. Date.
2. Weather (temperature, wind speed and direction, precipitation, etc.).
3. Work performed.
4. Sampling performed (specifics as to location, type of sample, log number, etc.).
5. Field analysis performed, including instrument checks, calibration, etc.
6. Problems encountered and corrective actions taken (specifics regarding sampling problems and alternate sampling methods utilized)
7. Quality control activities initiated.
8. Signature.

Any problems encountered which are not immediately corrected and/or which could jeopardize the integrity of the data will be reported to the COE Project Manager (and chemist) immediately.

Sample Identification. Each sample will be identified as to its source (well or blank). Monitoring well designations will be the same as those shown in Table 3.

Sample identification numbers will be included on chain-of-custody forms. Additionally, sample containers will be prelabeled with the anticipated sample identification number and the laboratory control number. A copy of the chain-of-custody form with its assigned sample numbers shall be kept in the laboratory to help identify lost or missing samples.

2.3.4 Chain-of-Custody Procedures

The possession of samples must be traceable from the time of collection through the use of chain-of-custody procedures. Specific chain-of-custody forms must accompany all sample shipping containers to document the transfer of the shipping containers and samples from the field collection to the laboratory receiving the samples for analysis. The procedures to be implemented are as follows:

- Preparation of proper sample containers (by the WES).
- Shipment of sample containers to RMT, Inc., by the WES, with chain-of-custody seals on shipping containers.
- Proper identification and labeling of each sample in the field.
- Completion of chain-of-custody forms in the field, indicating sample identification, containers filled, sampling date, sampling time, and sample collector.
- Repacking of shipping container with samples, chain-of-custody forms, and ice packs. Each set of containers to be shipped together is assigned a chain-of-custody form which travels with the sample container.
- Sealing and shipping of containers to the appropriate laboratory. Common carriers or intermediate individuals shall be identified on the chain-of-custody form and copies of all bills-of-lading will be retained.

- Receiving and checking of shipping containers in the laboratory for broken seals or damaged sample containers. If no problems are noted, samples are logged into the laboratory and the chain-of-custody form is completed.

- Inclusion of copies of the chain-of-custody form with the analytical data.

- Unused sample containers are returned to the laboratory with the chain-of-custody forms.

The chain-of-custody forms to be used will be sent by RMT to the WES laboratory, to be included in the sample shipping containers to be sent by the WES to RMT. An example form is shown on Figure 4.

If an error is discovered on a sample chain-of-custody record, the person who made the error should correct it when possible. Corrections or insertions are made by inserting the correction needed. The date and the correcting person's initials will be written beside the correction. This procedure applies to words or figures inserted or added to a previously recorded statement.

If a chain-of-custody form is lost in shipment, a written statement shall be prepared by the RMT field technician detailing the pertinent information including how the sample was collected. The statement should include information such as field logbook entries regarding the sample. Copies of the statement will be distributed to the COE's Project Manager and put into the RMT project files.

2.3.5 Sample Transportation

Samples will be shipped by overnight service to the Corps of Engineers Waterways Experiment Station (WES) in coolers provided by the WES (no Saturday deliveries). Sample packaging, provided by WES, will be consistent with COE sample handling protocol. The primary laboratory shipping address is as follows:

RMT, INC.

CHAIN-OF-CUSTODY RECORD

PROJECT NO.	PROJECT NAME
SAMPLERS: (Signature)	

RMT NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NUMBER OF CONTAINERS							REMARKS

Relinquished by: (Signature) 1	Date/Time	Received by: (Signature) 2	Relinquished by: (Signature) 3	Date/Time	Received by: (Signature) 4
Relinquished by: (Signature) 5	Date/Time	Received by: (Signature) 6	Relinquished by: (Signature) 7	Date/Time	Received by: (Signature) 8
Relinquished by: (Signature) 9	Date/Time	Received by: (Signature) 10	Relinquished by: (Signature) 11	Date/Time	Received by: (Signature) 12
Relinquished by: (Signature) 13	Date/Time	Received for Laboratory by: (Signature) 14	Date/Time	Remarks	

FIGURE 4

RMT, INC.

CHAIN-OF-CUSTODY RECORD

PROJECT NO.	PROJECT NAME
SAMPLERS: (Signature)	

RMT NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NUMBER OF CONTAINERS							REMARKS

Relinquished by: (Signature) ①	Date/Time	Received by: (Signature) ②	Relinquished by: (Signature) ③	Date/Time	Received by: (Signature) ④
Relinquished by: (Signature) ⑤	Date/Time	Received by: (Signature) ⑥	Relinquished by: (Signature) ⑦	Date/Time	Received by: (Signature) ⑧
Relinquished by: (Signature) ⑨	Date/Time	Received by: (Signature) ⑩	Relinquished by: (Signature) ⑪	Date/Time	Received by: (Signature) ⑫
Relinquished by: (Signature) ⑬	Date/Time	Received for Laboratory by: (Signature) ⑭	Date/Time	Remarks	

FIGURE 4

U.S. Army Corps of Engineers
Waterways Experiment Station
3909 Halsferry Road
Vicksburg, MS 39180
Attn: Ann Strong
(601) 634-2726

Samples for external quality assurance will be sent to the following address:

U.S. Army Engineer Division, Missouri River
Attn: MRDED-L (Joe Solsky)
427 S. 18th Street
Omaha, NE 68102

Completed chain-of-custody forms will be placed in a plastic bag, sealed, and taped to the inside cover of the cooler. After icing the samples, the coolers will be sealed, dated, and shipped to the appropriate laboratories using an overnight delivery service.

2.3.6 Background Wells

Background wells for sampling purposes are those wells which are upgradient of the NIROP facility. Ground water flow has been shown to be toward the southwest and west, Draft Interim Report (1986). Therefore, wells which would be considered background (Plate 1) include wells 12-S, 13-S, 14-S, 15-S, and 16-S.

3. FIELD QUALITY CONTROL PLAN

3.1 Introduction

The overall objective of the Field Quality Control Plan is to develop and implement procedures for field sampling, chain-of-custody, and reporting that will provide legally defensible results and ensure representative samples. Specific procedures to be used for sampling, chain-of-custody, instrument calibration, reporting, internal quality control, preventive maintenance, and audits are described in various sections of this plan.

3.2 Organization/Qualifications

Project organization and qualifications of key personnel are outlined in Section 1.

3.3 Quality Control Responsibilities

The site investigation activities will be performed by RMT, Inc.

RMT, Inc.
1406 E. Washington Avenue
Suite 124
Madison, WI 53703

Quality control responsibilities for the field activities will be shared by RMT office personnel and field technicians. In general, typical responsibilities for the various personnel include:

- Site Sampling Task Leader: Technical supervision, oversight, and review for daily on-site operations. Responsible for conformance with project plans, schedule, and procedures on-site. Daily review and signing of notes and logs. Ongoing coordination with the RMT project manager on study progress, interim results, and problems.

- Peer Review: Ongoing checking in the field of calculations, procedures, issues, and logic.

- Project Manager: Responsible for meeting the sampling program objectives and identifying major project issues. Provides quality control review and conformance with project plans, and reviews performance of the project group regularly. Ongoing review for logic and reasonability of interim results. Approves and signs all reports. Coordinates activities of the QA officer and other QA reviewers to provide objective oversight.

- Quality Assurance Officer: Provides overall independent quality assurance oversight for the project. Follows the project closely to audit QA/QC procedures and ensure conformance with quality assurance objectives. Coordinates his activities with discipline-specific quality assurance reviewers for review of project methods and performance.

- Quality Assurance Reviewers: Discipline-specific reviewers of portions of the project workplans, progress, problems, and outputs. Used systematically for some reviews, but primarily when called upon by the QA officer.

3.4 Sampling Procedures

The quality of ground water samples must be reliable. It is essential that proper quality control measures be utilized during sampling.

During sampling, several activities require attention to proper quality control measures, including the following:

- Sample collection
- Sample handling
- Sample preservation
- Field measurements
- Verification of quality assurance/quality control

Measures to ensure proper QA/QC during sample collection are discussed in Section 2.3.1. QA/QC measures regarding sample handling and preservation are discussed in Sections 2.3.1 and 2.3.2. A discussion of QA/QC measures for field measurements can be found in

various subsections of 2.3.1. Verification of quality assurance/quality control will be accomplished throughout the field activities by completion of the A-E DQCR and chain-of-custody procedures as detailed in Section 2.3.4.

3.5 Field Analytical Methods and Procedures

Proper field analytical methods and procedures will be adhered to at all times during field activities at the NIROP. The following steps are taken in order to ensure that all data gathered in the field are both valid and unbiased:

- Field technicians are thoroughly trained in the use of each piece of equipment.
- Operation manuals accompany each piece of equipment in the field.
- Preventive maintenance programs are carried out on a scheduled basis.
- Spare key components will be taken into the field in case of equipment failure.
- Instruments will be calibrated on a daily basis and rechecked at various times daily.
- All readings and calibrations will be documented in the A-E DQCR.
- Daily QC checks on field notes will be performed.
- All A-E DQCRs will be reviewed upon completion of field activities.

Specific procedures for each field instrument to be used at the NIROP have been discussed in Section 2.3.1.

3.6 Analytical/Statistical/Control Parameters

3.6.1 Accuracy, Sensitivity, and Precision

The accuracy, sensitivity, and precision of the field analytical techniques (pH, temperature, and specific conductance) are dependent upon the specifications for the instruments used, as well as the QC techniques employed during their use (see Section 3.7). The following specifications have been excerpted from the instrument instruction manuals.

Orion Research Analysis pH Meter

pH range: 0 to 14 with + 0.02 pH repeatability and ± 0.05 accuracy.

pH EXP range: -1.4 to +1.4 pH about any pH value from 0 to 14, with +0.005 repeatability and ±0.01 accuracy.

mV range: ±700 MV, with ± 2.0 mV repeatability and ±5 mV accuracy.

YSI 33 S-C-T Meter

Conductivity

Range: 0-500, 0-5,000, 0-50,000 umhos/cm.

Accuracy: ±2.5% max. error at 500, 5,000, and 50,000 plus probe.

±3.0% max error at 250, 2,500, and 25,000 plus probe.

Readability: 2.5 umhos/cm on 500 umhos/cm range.
25 umhos/cm on 5,000 umhos/cm range.
250 umhos/cm on 50,000 umhos/cm range.

Temperature

Range: -2 to +50°C

Accuracy: ±0.1°C at -2°C
±0.6°C at 45°C

Readability: ±0.5°C at -2° to ±0.37°C at 45°C.

Probe

Accuracy: ±2% of reading for conductivity. Error of ±0.1°C at 0°C and ±0.3°C at 40°C.

Instrument

Range: A maximum error of ±0.1% of the reading per °C change in instrument temperature can occur.

3.6.2 Quantity and Types of Samples

Several types of samples are to be collected at the NIROP and analyzed for the parameters listed in Section 1. The various types of samples to be collected and quantities of each are listed below.

Samples - A total of 34 primary samples representative of a portion of the ground water medium will be collected.

Duplicate Samples - Duplicate samples are samples collected simultaneously from the same source under identical conditions into separate containers. A total of three duplicate samples will be collected. These samples represent 10 percent of the total number of primary samples and will be used for external quality control. External quality control samples will be sent to the U.S. Army Corps of Engineers Missouri River Division laboratory.

Control or Background Samples - Background or control samples are taken in an area known or thought to be free from the constituents of concern. Wells considered to be background wells include the following: 12-S, 13-S, 14-S, 15-S, and 16-S.

Sample Aliquot - A sample aliquot is a portion of a sample that is representative of the entire sample. Sample aliquots will be used to determine various field parameters (e.g., pH).

Trip Blank - A trip blank is a set of sample bottles which will be filled in the field by the field technician directly from a deionized water source. One trip blank will be prepared for each laboratory. The trip blank will be a complete set of containers as summarized in Table 4. Additionally, each day that volatile organic samples are submitted to the WES, a separate trip blank consisting of two 40-ml glass vials will accompany the samples.

Field Blank - A field blank is a set of sample bottles that is filled with deionized water in the field. The deionized water is handled in the same manner as the sample (e.g., if the sample is ground water that has been filtered, the deionized water will be poured into a bailer and then filtered). Three field blanks (10%) will be prepared in the field for shipment to WES; one field blank will accompany the external quality control samples to the U.S. Army Corps of Engineers Missouri River Division Laboratory.

3.6.3 Internal QC Checks and External QA Samples

Internal quality control checks of ground water sampling will be provided by the use of trip blanks, field blanks, duplicate samples, and background samples. Definitions and quantities of each have been provided in the previous section.

External quality assurance will be provided by the use of duplicate samples, trip blanks and field blanks. Duplicate samples will be collected at wells 3-S, 9-S, and 15-S and sent to a separate laboratory as discussed in Section 3.4.2.

3.6.4 Representative Samples

All measurements will be made so that results are representative of the media and conditions being measured. The evaluation of representativeness includes the analytical techniques, sample collection techniques, and the sampling site locations. The analytical techniques and sample collection techniques described in the Sampling Plan (Section 2) have been developed to ensure representative samples. As noted in Section 2.3.1, the sampling site locations were predetermined by the location of previously installed ground water monitoring wells. One objective of this project is to assess how well these sampling locations represent the media and conditions being studied.

3.6.5 Data Comparability

Data must be comparable between this sample round and previous sampling activities. The intended uses of data gathered during this sample round are discussed in Section 1.2. The four objectives listed

were to provide additional information regarding contaminant sources, migration, temporal trends, and representativeness. In order to ensure data comparability, the primary laboratory services will be provided by the U.S. Army Corps of Engineers Waterways Experiment Station Laboratory. The WES has performed analytical services for the seven previous NIROP ground water sampling events. Additionally, total metals will be analyzed at three wells to ensure comparability with previous data. No problems with data comparability are anticipated.

3.7 Calibration Procedures and Frequency

Field instruments are calibrated on a daily basis with additional checks performed at various times during use. Calibration procedures are discussed in Section 2.3.1.

3.8 Preventive Maintenance

Field preventive maintenance will include a cursory check of instrument operation without the need to disassembly or test equipment. If any of these preliminary checks proves negative, the instrument is not functioning properly and the back-up meter will be used. Field check procedures for the various instruments are described below.

pH Meter

1. Remove electrodes (and recorder, if used). Insert ORION shorting strap (Cat. No. 040030) securely to input and reference jacks.

2. With function switch in OFF position, check that the meter needle reads exactly center scale; if not, adjust the zero adjust screw in the center of the panel for exactly center scale.

3. Make sure that the line cord is securely attached to the instrument. If batteries are being used, check their condition before plugging cord into a power outlet. Turn the function switch to BATT. The needle should read in or to the right of the green BATT OK arc. If meter reads to the left of the BATT OK arc, leave instrument plugged into power outlet for twenty-four hours to recharge batteries. Continue checkout with line cord plugged into power outlet.

4. Zero Check: Turn function switch to the mV mode. The meter needle should be at exactly center scale.

   Stability Check: Turn function switch to the pH EXP mode. Adjust the calibration control so that the needle is at center scale. The needle should remain stable.

   Slope Check: Turn function switch to the pH mode. Turn temperature compensator knob fully counterclockwise. Adjust calibration control so that the needle is at exactly zero pH (zero on the left side of meter). Turn temperature compensator knob fully clockwise. The meter needle should be at 2.9 ± 0.2 on the black pH scale.

5. Set slope indicator dial to 100% and turn temperature compensator knob until white arrow points to 29°C. Turn calibration control counterclockwise to check for full-scale left deflection of the needle. Repeat in a clockwise direction to check for full-scale right deflection.

pH Electrode

1. Testing electrode operation:

   a. Connect electrode to a working meter.

   b. Set function switch to absolute mV mode.

   c. Immerse electrode in fresh pH 7 buffer.

   d. Displayed value should be 0 ± 30 mV.

   e. Rinse electrode and immerse in fresh pH 4 buffer.

   f. Displayed value should be approximately 160 mV greater than in Step d.

2. If electrode fails this procedure; clean thoroughly as directed in the maintenance section of the operating manual. Then heat cycle as for new electrode and repeat test procedure.

3. If cleaning and maintenance fail to rejuvenate the electrode:

   a. For separate pH and reference half cells, substitute each electrode (one at a time) with a known working electrode and repeat test procedure. By process of elimination, determine which electrode should be replaced.

      Note: The appropriate portion of a working combination pH electrode may be used for test purposes. To substitute for the reference half cell, connect only the small pin tip connector of the combination electrode; for the pH half cell, connect only the larger U.S. standard connector.

   b. For combination electrodes, replace the entire electrode.

Conductivity Meter

The only maintenance required is battery replacement. Two "D" size alkaline flashlight cells, such as Eveready E95 or equivalent, will provide 200 hours of operation. Accuracy will not be maintained if zinc-carbon "D" cells are used. Battery replacement is indicated when the redline adjustment cannot be accomplished.

Replace batteries every six months to reduce the danger of corrosion due to leaky batteries. To replace batteries, remove the six screws from the rear plate. The battery holders are color coded. The Positive (+ button) end must go on red.

Conductivity Probe

When the cell test indicates low readings, the probable cause is dirty electrodes. Hard water deposits, oils, and organic matter are the most likely contaminants.

For convenient normal cleaning, soak the electrodes for 5 minutes with a locally available bathroom tile cleaning preparation such as: Dow Chemical "Bathroom Cleaner"; Horizon Industries "Rally, Tile,

Porcelain, and Chrome Cleaner"; Johnson Wax, "Envy, Instant Cleaner"; or Lysol Brand "Basin, Tub, Tile Cleaner."

For stronger cleaning, a 5-minute soak in a solution made of 10 parts distilled water, 10 parts isopropyl alcohol and 1 part HCl can be used.

Always rinse the probe after cleaning and before storage.

CAUTION: Do not touch the electrodes inside the probe. Platinum black is soft and can be scraped off.

If cleaning does not restore the probe performance, re-platinizing is required.

Re-Platinizing - Equipment required:

1. YSI #3140 Platinizing Solution, 2 fl. oz. (3% platinum chloride dissolved in 0.025% lead acetate solution).

2. YSI Model 33 or 33M S-C-T Meter.

3. 50-ml glass breaker or equivalent bottle.

4. Distilled water.

Procedure:

1. Clean the probe as in Section (a) of the operating manual using either method.

2. Place the cell in the beaker and add sufficient YSI #3140 solution to cover the electrodes. Do not cover the top of the probe.

3. Plug the probe into the Model 33 or 33M, and switch to the X100 scale to platinize the electrode. Move the probe slightly to obtain the highest meter reading and continue platinizing for the approximate time shown below:

Meter Reading umhos/cm	mS/M	Time (minutes)
30,000	3,000	5
25,000	2,500	6
20,000	2,000	8
15,000	1,500	11
10,000	1,000	16

4. After the elapsed time, remove the probe and rinse in fresh water.

5. Return the solution to its container. Two ounces of solution should be sufficient for 50 treatments.

Storage: It is best to store conductivity cells in deionized water. Cells stored in water require less frequent platinization. Any cell that has been stored dry should be soaked in deionized water for 24 hours before use.

Probe Use

1. Obstructions near the probe can disturb readings. At least two inches of clearance must be allowed from non-metallic underwater objects. Metallic objects such as piers or weights should be kept at least 6 inches from the probe.

2. Weights are attached to the cable of the YSI 3310 and 3311 Probes. The YSI 3327 Weights are supplied in pairs with a total weight of 4 ounces per pair. Should it become necessary to add more weight to overcome water currents, the total weight should be limited to two pounds (8 pairs). For weights in excess of two pounds, use an independent suspension cable. In either case, weights must be kept at least 6 inches away from the probe.

3. Gentle agitation by raising and lowering the probe several times during a measurement ensures flow of specimen solution through the probe and improves the time response of the temperature sensor.

3.9 Field Data Analysis and Reporting

Field data analysis and reporting procedures are been discussed under individual instrument field procedures in Section 2.3.1. Reporting is also covered in Section 2.3.4.

4. MONITORING WELL REPAIRS

Two monitoring wells require repairs prior to sampling (8-S and 4-PC). Repairs to well 8-S will be accomplished by others and overseen by RMT personnel. Repair techniques and contractor will be arranged by the U.S. Navy Plant Representative office. Repairs made to well 8-S will be overseen by RMT, Inc., personnel to assure that no foreign substances (petroleum-based oils, etc.) are introduced to the well during repair.

Repairs to well 4-PC will be performed by RMT, Inc., personnel. The cap on well 4-PC cannot be removed. The PVC cap will be cracked or sawed and removed. Extra bailing may be required to remove PVC particles.

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APPENDIX A

RESUMES FOR KEY RMT, INC., PERSONNEL

THOMAS P. KUNES, P.E.
President, Northern Region

ROLE AT RMT: Directs and supervises RMT's solid and hazardous waste management, environmental audit and landfill development projects, which include: industrial waste characterization, analysis and testing; environmental compliance audits; evaluation of waste handling alternatives; landfill site selection, design, and monitoring; economic analysis; assistance in expediting approvals and permits from state regulatory agencies; expert testimony.

Mr. Kunes has provided technical consultation to Cast Metals Federation, and several state foundry industry organizations.

At RMT, Mr. Kunes was an appointed member of The Wisconsin Legislative Council's Special Committee on Groundwater Management which has drafted AB595, the major groundwater bill which was introduced in the Legislature's Spring 1984 Session.

EXPERIENCE: As Assistant Chief of the Solid Waste Management Section at the Wisconsin Department of Natural Resources, Mr. Kunes served as an advisor to the Wisconsin Legislative Council Committees and helped draft revisions to new state solid and hazardous waste laws (Chapter 377), including:

- regulations for closure and long-term care of waste disposal sites,
- a complete revision of the landfill siting and approval process,
- a program for the regulation of toxic and hazardous wastes.

Mr. Kunes also spent a year at the University of Wisconsin-Extension where he provided technical assistance and training in solid waste management to engineers and representatives of industry, and local and county governments.

EDUCATION: Master of Science in civil and environmental engineering from the University of Wisconsin-Madison. Mr. Kunes' thesis project on foundry waste leachability was conducted under the sponsorship of the American Foundrymen's Society. It addresses the environmental aspects of foundry waste

RES:kunes

EDUCATION (Continued): disposal and represents the first major work on foundry solid wastes available nationally.

Bachelor of Science in civil engineering from the University of Wisconsin-Madison.

OTHER:

- Member of American Foundrymen's Society Water Quality and Waste Disposal Committee and Sand Reclamation Committee; National Solid Waste Management Association; American Society of Civil Engineers; American Society for Testing and Materials, Solid Waste Committee; National Society of Professional Engineers; Chi Epsilon Civil Engineering Honor Fraternity. Member of Wisconsin Legislative Council Special Committee on Ground Water Management.

- Registered Professional Engineer in Wisconsin, Minnesota, Tennessee, Michigan, Oklahoma, Washington, Mississippi, Oregon, and New Jersey.

- Published many articles and technical papers and lectured in University Solid Waste Engineering Courses at the University of Wisconsin-Madison.

- Completed graduate research at the University of Wisconsin-Madison which resulted in the development of a foundry waste leaching test procedure for the American Foundrymen's Society.

- Southwest Chapter Wisconsin Society of Professional Engineers 1981 recipient of Young Engineer of the Year award.

RES:kunes

CHRIS HANSEN
Industrial Hygienist

ROLE AT RMT: Responsible for developing health and safety plans for industrial, municipal and RMT employees. Completes airborne toxic dust, fume, and gas sampling surveys; noise surveys; and personal protection programs.

EXPERIENCE: Health and Safety Plan Development - served as on-site health and safety officer for a major RI/FS project in New York. Conducted training on the use of respirators and SCBA equipment for personnel involved in the clean up of PCB and organic waste. Evaluates employee exposure to chemical contaminants, noise, and heat stress to determine compliance with OSHA standards.

Air Pollution - conducts surveys for indoor air pollution including monitoring for formaldehyde, carbon monoxide, carbon dioxide, and organics. Performs maintenance and calibration of equipment used for air monitoring, noise monitoring, and ventilation measurements.

Chemical Handling - recommends control methods, ventilation systems, personal protection equipment, and routine and emergency procedures.

Health Hazards - develops promotional programs for target health hazards including hazard communication and asbestos exposure.

EDUCATION: Associate degree in applied sciences-industrial hygiene. Extensive course work in the field of industrial hygiene.

OTHER: Member of American Conference of Governmental Industrial Hygienists and the American Industrial Hygiene Association (AIHA). Serves as Secretary of the Wisconsin Chapter of AIHA.

RES:CH

MARK E. SMITH, P.E.
Technical Director of Operations

ROLE AT RMT: Responsible for day-to-day direction and coordination of technical operations, including:

- Project management and coordination.
- Work production and QA/QC.
- Work planning and scheduling, scoping, and pricing; resource allocation and general supervision of technical staff; and business development and marketing by technical staff.

Responsible for quality control/quality assurance company-wide in the following areas:

- Land disposal field investigations and soil testing programs.
- Land disposal facility design.
- Landfill leachate and gas management design.
- Contract documents, plans, and specifications for construction projects.
- Hazardous waste land disposal remedial engineering.

EXPERIENCE: <u>Preliminary Assessments of Waste Disposal Facilities and Remedial Action Sites</u>

Mr. Smith has worked as part of RMT's engineering and hydrogeological teams assigned to perform preliminary investigations of the environmental impact of existing hazardous, industrial and municipal waste disposal sites. These investigations include:

- Initial site surveys/problem definition
- Development of site investigation program
- Data analysis and development of remedial action programs.

<u>Waste Characterization and Analysis</u>

Part of Mr. Smith's experience with land disposal projects includes designing and supervising waste sampling and testing programs to identify the types of waste to manage in order to identify and assess waste. Mr. Smith has designed waste handling and disposal systems for both industrial and municipal clients.

RES:smith

EXPERIENCE (Continued):

Design of Industrial and Municipal Waste Land Disposal Facility

Mr. Smith has prepared engineering designs for new land disposal facilities and surface impoundments and the expansion or improvement projects at existing sites. Special projects have included the preparation of state of the art leachate collection and liner system designs. Other design specialties include drainage control, gas control, and long-term care and closure plans.

Design and Construction Supervision of Remedial Action Programs at Waste Disposal Sites

Mr. Smith's staff at RMT, performs construction observation of disposal facility construction projects to insure that they are being completed according to the engineer's specifications and in keeping with applicable permit conditions.

RMT staff engineers under the direction of Mr. Smith have performed on-site construction, land based industrial wastewater treatment and settling facility construction and remedial action construction including hazardous waste disposal impoundment and removal.

Contract Preparation

Contract and technical specification preparation and review for potential liability are a part of Mr. Smith's expertise in land disposal facility design and remedial action work.

Regulatory Liaison and Public Relations

As engineering manager, Mr. Smith is responsible for large land disposal facility design and remedial action projects. Mr. Smith reviews design and construction procedures for compliance with federal, state, and local regulations. He also assists clients with negotiations with regulatory agencies and public information programs.

EDUCATION: Bachelor of Science in civil and environmental engineering from the University of Wisconsin - Madison. Registered Professional Engineer in the State of Wisconsin.

RES:smith

THOMAS R. STOLZENBURG, Ph.D.
Water Chemist

ROLE AT RMT: Directs research involving ground water sampling and unsaturated zone sampling. Designs waste treatability testing programs for hazardous wastes. Participates in research of leaching of utility solid residue and industrial waste.

EXPERIENCE: Provided Quality Assurance review of laboratory procedures for analysis of water and soil samples collected as part of a RI/FS field investigation for a New York site, CERCLA.

Designed and conducted an evaluation of ground water sampling devices in a controlled laboratory experiment. Both sampling mechanisms and sample handling procedures were studied for their effects on the chemistry of ground water samples. Potential effects were quantified and samplers were ranked by measurement accuracy. This project was funded by the Electric Power Research Institute.

Studied leaching patterns of chemical constituents from four fly ash types in a project for Wisconsin Power and Light Company. Compared batch leach test results with column methods. Determined primary physical and chemical mechanisms controlling leachate and extrapolated to field conditions.

Designed and directed several hazardous waste treatment testing programs. Identified chemical treatment alternatives to render both solid waste and wastewater nonhazardous.

Developed a procedure and apparatus for evaluating reactivity of wastes to water. A standard method has been proposed and used for wastes from foundries.

Conducted research on the physical and chemical processes which determine the fate of persistent organic chemicals in aqueous environments, and the structural characteristics of organic molecules which favor bioaccumulation. This project was funded by the University of Wisconsin Sea Grant Institute.

Developed a technique for measuring the aqueous solubility of persistent organic compounds (e.g., PCBs, dioxins, etc.).

Prepared an air monitoring program on the Menomonee River Watershed to study the atmospheric deposition of lead and phosphorus. This project was funded by the USEPA and the International Joint Commission on Pollution from Land Use Activities Reference Group.

RES:stolzenbur

EXPERIENCE (Continued): Developed a simple acid digestion method for the determination of ten elements in ambient aerosols by flame atomic absorption spectrometry.

EDUCATION: Doctor of Philosophy in water chemistry from the University of Wisconsin - Madison. Thesis: Metallic Composition of Aerosols over the Menomonee River Watershed.

Bachelor of Science degrees in biology and resource management from the University of Wisconsin, Stevens Point.

RES:stolzenbur

CATHERINE A. KWIATKOWSKI
Hydrogeologic Technician

ROLE AT RMT: Responsible for scheduling and coordinating ground water sampling trips. Specially trained in sampling methods for county, municipal, and industrial landfills, including all types of purging, filtration and preservation techniques. Provides training of others in ground water monitoring techniques. Assists in the selection of field equipment and the design of sampling procedures. Also responsible for hydrogeologic computations and interpretations.

A representative project involved conducting ground water and surface water sampling as part of a Remedial Investigation/Feasiblity Study for a New York CERCLA site.

EXPERIENCE: Seven years experience as a lab technician in water quality laboratories and six years experience in sampling. Assisted in the development of the ground water monitoring program at RMT. As a technician at a research and development lab at a large industry, worked with infrared, ultraviolet, atomic absorption spectroscopy, and wet chemical methods for testing wastewaters, metals, oils, coal and cement.

EDUCATION: Bachelor of Arts in psychology with a minor in chemistry, University of Wisconsin - Eau Claire. Associate of Arts in Chemical Technology, Milwaukee Area Technical College, Milwaukee, Wisconsin.

OTHER: Has attended national seminars, conferences, and workshops around the country on ground water quality monitoring, ground water quality protection and environmental laboratory technology which included in-depth workshops on all phases of hazardous waste analysis in the laboratory, including sampling, site assessment, safety, handling and disposal of hazardous wastes, and workshops on the design and implementation of a quality assurance program. Completed several hydrogeology and geology courses at the University of Wisconsin - Madison.

STEPHEN D. JOHANNSEN
Hydrogeology Manager

ROLE AT RMT: Directs the hydrogeology group at RMT's Madison office. Responsible for management of staff work load and quality control/quality assurance for group outputs. Group projects include ground water monitoring research, ground water quality sampling, Remedial Investigation/Feasibility Studies, geophysical investigations, regulatory strategy and permitting, disposal facility siting and feasibility investigations, pump tests and ground water quality assessments.

Project management liaison with clients and regulatory agencies, and project budgeting and scheduling. Manages comprehensive RI/FS, ground water, hazardous waste and land disposal projects.

EXPERIENCE: Installation of ground and surface water monitoring systems to evaluate the environmental impact of landfilling and surface disposal of wastes; design of borings and piezometer layout; supervision of geologic borings and installation of monitoring equipment; analysis of boring logs, results from soil samples analyses, and piezometer data. Design of water quality monitoring programs and evaluation of existing programs. Collection of water quality samples, analysis of water quality data, and site selection studies for expanding old landfills and developing new ones.

Representative projects involved in Quality Assurance review of hydrogeological and geological investigations for RI/FS projects in New York and Indiana.

Ground water and surface water quality consulting, research, presentations, and papers. This water quality monitoring experience includes sampling and interpretation of data for inorganic and organic contaminants on industrial spill sites and hazardous waste landfills, and planning for and use of safety equipment in potentially dangerous investigations.

Hydrogeologic project planning, supervision, and technical review. Experienced in use and interpretation of ground water models. Also experienced in interpretation of maps, air photos, remote sensing data, and glacial stratigraphy. Other related environmental investigation work has included wetland assessment, water balances, ecological evaluations and the interpretation of regulations.

RES:SDJ

EDUCATION: M.S. Soil Science, University of Wisconsin - Madison.

M.S. Water Resources Management, University of Wisconsin - Madison.

B.S. Biology, University of Minnesota.

PUBLICATIONS: Johannsen, S.D. 1979. Ground water quality beneath two sandy barnyards in Wisconsin. M.S. Thesis, Department of Soils Science, University of Wisconsin - Madison.

RES:SDJ

THOMAS E. KOCH
Hydrogeologist

ROLE AT RMT: Project manager for remedial investigation projects including hydrogeologic investigations, well installation, and soil sampling.

EXPERIENCE: Mr. Koch's experience includes serving as a project manager for remedial investigation studies, including site inspection coordination and ground water contamination studies. He has acted as team leader for many investigations involving site inspections, monitoring and private well sampling, soil sampling, and subsurface water sampling. Mr. Koch has also utilized and supervised the use of portable tripods, submersible pumps, field filters, air drive bailers, surveying equipment, conductivity meters, pH meters, hollow-stem drilling, self-contained breathing apparatuses, air compressors, respirators, HNU, explosimeters, radiation detectors, various surface water and bottom sediment sampling devices, and numerous other pieces of safety and work equipment.

As hydrogeologist for the Unites States Geological Survey, Mr. Koch collected and logged samples of well sites and observed well drilling operations, prepared graphic representations of hydrologic data, utilized and prepared standard computer programs, and utilized a variety of methods and equipment to collect hydrogeological data.

EDUCATION: Master of Science degree in natural environmental systems and a Bachelor of Science degree in environmental systems from Northern Illinois University.

PROFESSIONAL AFFILIATIONS: Member of the National Water Well Association.

RES:TEK

JEFFREY S. CHRISLER
Ground Water Monitoring Technician

ROLE AT RMT: Performs in-field ground water sampling for county, municipal, and industrial landfills, including all types of purging, filtration, and preservation techniques. Also performs wastewater and solid waste sampling.

EXPERIENCE: Two years of ground water sampling. One year of wastewater sampling and solid waste sampling. Assists in the maintenance of meters and equipment used in the field. Specially trained to conduct sampling in accordance with state and federal agency requirements such as EPA List Methods for Evaluating Solid Waste, Physical Chemical Methods (EPA SW [530] - 846).

RES:chrisler

APPENDIX B

LABORATORY DETECTION LIMITS

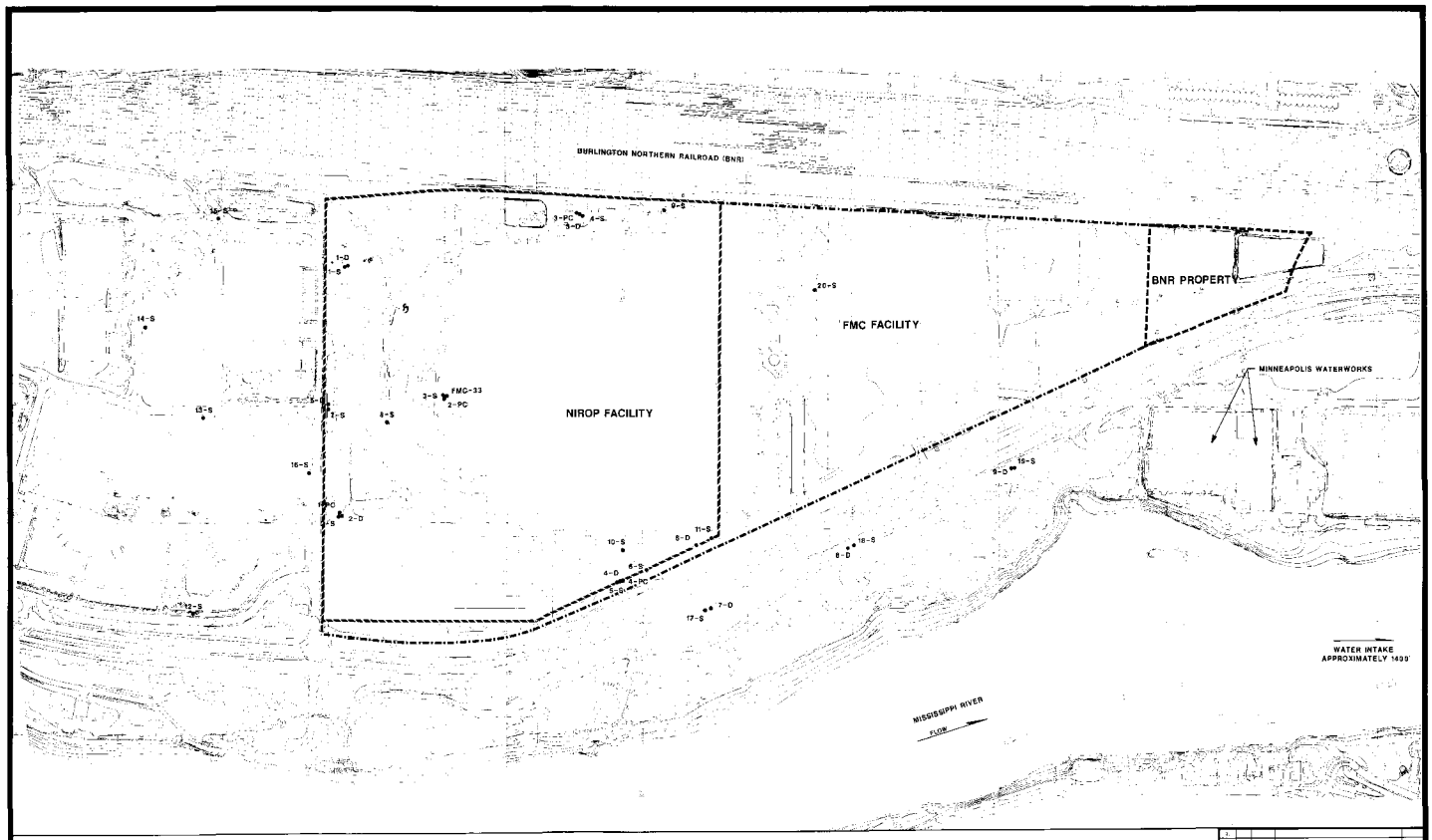
PARAMETER	DETECTION LIMIT (mg/l)
VOLATILES	
Chloromethane	0.005
Bromomethane	0.005
Vinyl chloride	0.005*
Chloroethane	0.005
Methylene chloride	0.005
Trichlorofluoromethane	0.005
1,1 Dichloroethene	0.005
1,1 Dichloroethane	0.005
trans 1,2 Dichloroethene	0.005
Chloroform	0.005
1,2 Dichloroethane	0.005
1,1,1 Trichloroethane	0.005
Carbon tetrachloride	0.005
Bromodichloromethane	0.005
1,2 Dichloropropane	0.005
trans 1,3 Dichloropropene	0.005
Trichloroethene	0.005
Benzene	0.005
Dibromochloromethane	0.005
1,1,2 Trichloroethane	0.005
Cis 1,3 Dichloropropene	0.005
2 Chloroethylvinyl ether	0.005
Bromoform	0.005
1,1,2,2 Tetrachloroethane	0.005
Tetrachloroethene	0.005
Toluene	0.005
Chlorobenzene	0.005
Ethyl benzenene	0.005
1,3 Dichlorobenzene	0.005
1,2 Dichlorobenzene	0.005
1,4 Dichlorobenzene	0.005
Methyl ethyl ketone	0.01
Cis 1,2 Dichloroethylene	0.001
Xylene	0.015
Metals (Dissolved and Total)	
Arsenic	0.005
Barium	0.2
Cadmium	0.0002
Chromium	0.0005
Lead	0.001
Mercury	0.0004
Selenium	0.050**
Silver	0.001
Copper	0.001
Manganese	0.01
Nickel	0.04
Zinc	0.050

1120.09 926:RPT:frid1010

Cyanide	0.02
Cations	
Calcium	0.05
Magnesium	0.01
Sodium	0.05
Potassium	0.05
Anions	
Sulfate	10.0
Nitrate	0.1
Chloride	1.0
Alkalinity	5.0

* State of Minnesota Standard for Vinyl Chloride is 0.00015. This detection level will be met if possible.

** State of Minnesota Standard for Selenium is 0.045. This detection level will be met if possible.



LEGEND

- EXISTING PAVED ROAD
- EXISTING UNPAVED ROAD
- EXISTING BUILDING
- EXISTING FENCE
- EXISTING 5' CONTOUR
- EXISTING 1' CONTOUR
- 885.1 EXISTING SPOT ELEVATION
- TREES AND / OR BRUSH
- EDGE OF WATER
- WET AREA
- 16-S MONITORING WELL LOCATION
- NIROP PROPERTY LINE (APPROXIMATE)
- FMC PROPERTY LINE (APPROXIMATE)
- BNR PROPERTY LINE (APPROXIMATE)

SCALE 1" = 200'
0 200 400 EXCHILT

NO.	BY	DATE	REVISION	APPD.
1				
2				
3				

PROJECT: A-E QCP
RI/FS AT NIROP
FRIDLEY, MINNESOTA

SHEET TITLE: MONITORING WELL LOCATIONS

DRAWN BY: MBZ	SCALE: 1" = 200'	PROJ. NO. 1186.09	
CHECKED BY:		DRWG. NO.	
APPROVED BY:	DATE PRINTED:	SHEET OF	
DATE: 10/13/89			

RMT

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PLATE 1