N91192.AR.000072
NIROP FRIDLEY
5090.3a

PROPOSED PLAN FOR GROUND WATER REMEDIATION

NAVAL INDUSTRIAL RESERVE ORDNANCE PLANT
FRIDLEY, MINNESOTA

MAY 1990

TABLE OF CONTENTS

Title	Page
OVERVIEW	i
1. PROJECT HISTORY	1-1
2. SITE BACKGROUND	2-1
3. SCOPE OF RESPONSE ACTION	3-1
4. SUMMARY OF SITE RISKS	4-1
Exposed Populations/Pathways	4-1
Possible Future Effects	4-2
5. SUMMARY OF ALTERNATIVES	5-1
No-Action Alternative	5-1
Alternative A: Capping	5-1
Alternative B1: Excavation and Disposal in an Off-site Landfill	5-2
Alternative D: Soil Treatment Using In-situ Vacuum Extraction	5-2
Alternative F: Ground Water Pumping, Treatment, and Disposal	5-2
6. EVALUATION OF ALTERNATIVES	6-1
7. THE PREFERRED ALTERNATIVE	7-1
Design and Performance Criteria	7-3
Permits and Agreements	7-4
Operations and Effectiveness Monitoring	7-4
8. COMMUNITY PARTICIPATION	8-1
9. GLOSSARY OF TERMS	9-1

List of Figures

Figure 1 - Location Map	2-2
Figure 2 - Site Plan	2-3
Figure 3 - Typical East-West Cross Section	2-4
Figure 4 - Process Flow Diagram	7-2

OVERVIEW

This Proposed Plan identifies the preferred alternative for responding to ground water contamination at the Naval Industrial Reserve Ordnance Plant in Fridley, Minnesota. The objective of the preferred alternative is to contain the movement of contaminated ground water from the site to the Mississippi River, and to remove constituents over time. In addition, the plan includes summaries of other alternatives analyzed for this site. This document is issued by the U.S. Department of the Navy, the lead agency for site activities. The Navy, in consultation with the U.S. Environmental Protection Agency (USEPA) and the Minnesota Pollution Control Agency (MPCA), will select a final remedy for the site after the public comment period has ended, and the information submitted during this time has been reviewed and considered.

This document is being issued by the Navy consistent with the public participation requirements of Section 117(a) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The Proposed Plan summarizes information that can be found in greater detail in the Remedial Investigation and Feasibility Study (RI/FS) Reports and other documents contained in the Administrative Record file for this site. The Administrative Record file, which contains the complete file upon which the selection of the final remedy will be based, is available at the following location:

Naval Facilities Engineering Command, Northern Division
Bldg. 77L, Code 1421
Philadelphia Naval Base
Philadelphia, PA 19112

and

Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155

Contact: Mark Lahtinen
Telephone No. 612/296-7775

The RI/FS reports are also available at the project Information Repository at the following location:

Anoka County Library, Fridley Branch
410 N.E. Mississippi Street
Fridley, MN 55432

OPPORTUNITIES FOR PUBLIC INVOLVEMENT

The U.S. Navy, the USEPA, and the MPCA have set a public comment period May 1, 1990, through May 30, 1990, to encourage public participation in the selection process. A public meeting will be held on May 9, 1990, from 6:30 to 9:30 PM, at the following location:

Fridley Community Education Center
6085 Seventh St., NE
Fridley, Minnesota

Comments received will be summarized and responses provided in the Responsiveness Summary section of the Record of Decision (ROD). The ROD is the document that presents the final alternative selection for cleanup. The public can send written comments or obtain further information from:

Northern Division
Naval Facilities Engineering Command
Bldg. 77L, Code 1421
Attn: James Shafer
Philadelphia Naval Base
Philadelphia, PA 19112

Comments must be postmarked no later than May 30, 1990. Comments are being solicited on, not only the identified preferred alternative, but also on all alternatives described in the Proposed Plan and Feasibility Study.

Information can also be obtained from:

Mark Lahtinen
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155
Telephone: 612-296-7775

1. PROJECT HISTORY

The United States Department of the Navy has completed a Remedial Investigation and Feasibility Study (RI/FS) at the Naval Industrial Reserve Ordnance Plant (NIROP) in Fridley, Minnesota. The Navy has performed this work under the Navy Installation Restoration (IR) Program, which identifies and controls environmental conditions resulting from past use and disposal practices at naval facilities. Because of concern over past disposal at the site, the Minnesota Pollution Control Agency issued a Request for Response Action at the site on May 22, 1984. The site was listed on the state Permanent List of Priorities in October 1984.

The IR program is designed to conform to the scope and purposes of the National Oil and Hazardous Substances Contingency Plan (NCP) established by the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), and as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. The NCP establishes a national list of sites requiring investigative and remedial activities known as the National Priorities List (NPL). The NIROP facility was placed on the final NPL by the United States Environmental Protection Agency (USEPA) on November 21, 1989. As a result, the USEPA and the MPCA have reviewed the RI/FS activities at the facility, and will approve the selected remedial action for ground water cleanup after public comments are considered. The MPCA and the USEPA have also participated in several planning meetings initiated by the Navy for future investigative work at the site.

To date, the RI has consisted of nine rounds of ground water sampling over the period of October 1983 to January 1988. Additional monitoring wells were installed periodically during this time period to supplement the ground water quality data base.

An RI Report and RI Addendum have been submitted to MPCA in June 1987 and July 1988, respectively. The RI formed the basis for the FS Report and FS Addendum submitted in July 1988 and August 1988, respectively.

In addition to the remedial activity proposed herein, the Navy is also proceeding with two additional rounds of ground water sampling and with soil sampling at on-site locations. The results of the ground water sampling work will complement the proposed remedial activity by providing additional baseline data against which future remedial performance can be compared.

2. SITE BACKGROUND

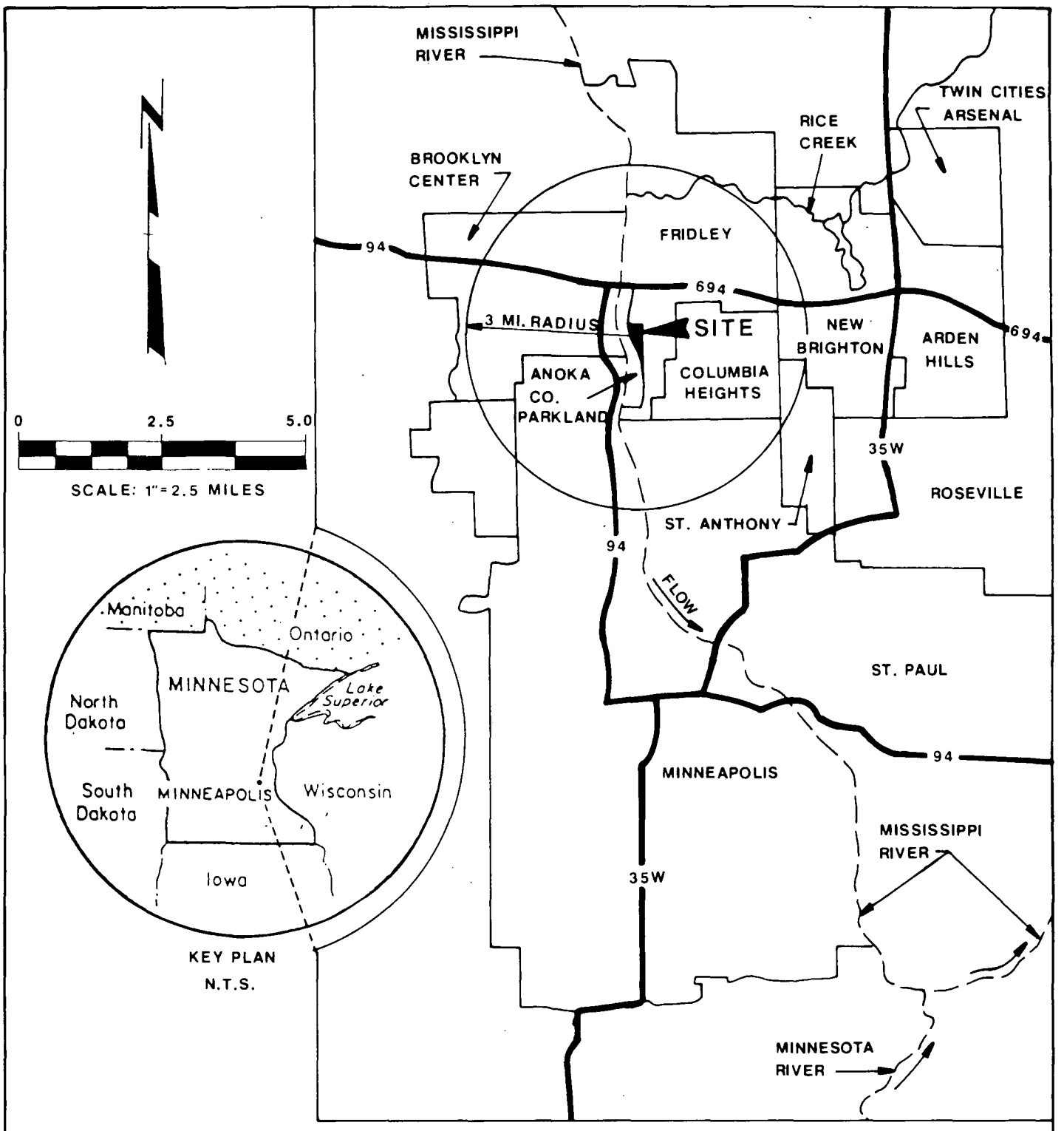
The NIROP is located in an industrial area in the northern portion of the Minneapolis/St. Paul Metropolitan Area within the city limits of Fridley, Minnesota (Figure 1). Advanced naval weapons systems are designed and manufactured at the NIROP. The northern portion of the facility is government owned and operated by a private contractor (FMC Corporation - Northern Systems Division), and the remainder of the facility is owned independently by FMC (Figure 2).

The City of Minneapolis water supply intake in the Mississippi River is less than 1 mile downstream from the NIROP. A portion of the Anoka County Islands of Peace Mississippi River Front Park is located west of the NIROP adjacent to the river.

Ground water use in the vicinity of the NIROP consists primarily of high-capacity industrial production wells which draw water from the Prairie du Chien/Jordan (PCJ) aquifer system. The City of Fridley maintains a backup well which also draws water from the PCJ immediately north of the NIROP.

An aquifer within unconsolidated sediments overlies the PCJ in the vicinity of the NIROP. The unconsolidated aquifer is hydraulically separated from the PCJ by a silty to shaly layer of the St. Peter Sandstone, except for an area where the St. Peter Sandstone has been eroded. The unconsolidated aquifer is in contact with the PCJ in the eroded area, at the southern side of the NIROP. A conceptual representation of the aquifer and geology beneath the NIROP is shown on Figure 3.

In December 1981, an anonymous phone call to the MPCA led to the discovery of trichloroethylene (TCE) in three NIROP supply wells drawing water from the PCJ. TCE is a common industrial solvent formerly used at the NIROP. Grab samples obtained from NIROP storm sewer outfalls at the Mississippi River also showed the presence of TCE and other volatile organic compounds (VOCs) at the time. Subsequent sampling at the City of



LOCATION MAP

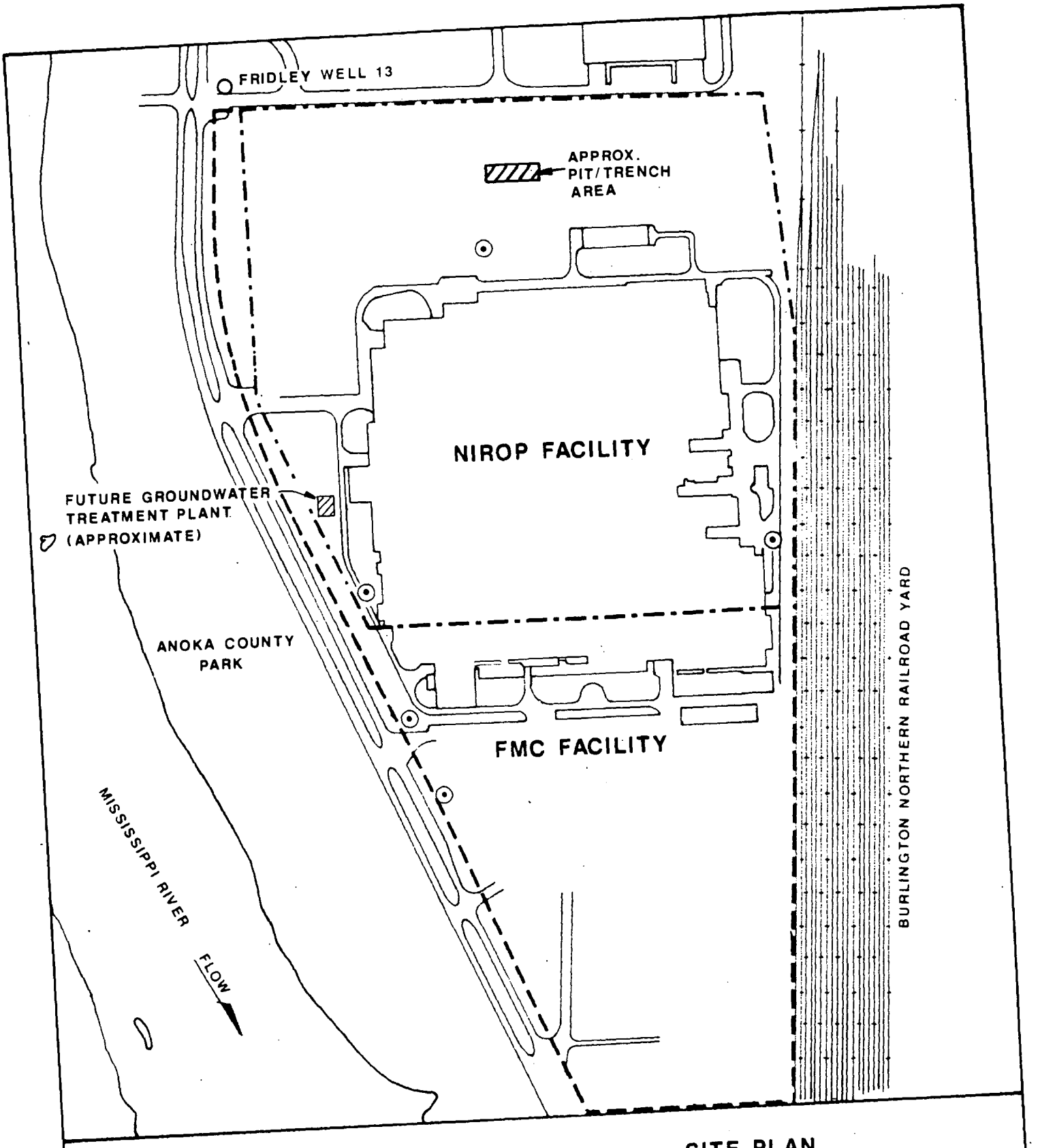
RMT

Drawn by DM

Date

Proj # 1801.10

FIGURE 1



SITE PLAN

LEGEND

- NIROP PROPERTY BOUNDARY
- FMC FACILITY BOUNDARY
- PROPOSED GROUNDWATER RECOVERY WELL

ADAPTED FROM FMC DRAWING 4252 (1984), ENVIRODYNE (1983) AND HICKOK (1981)

N

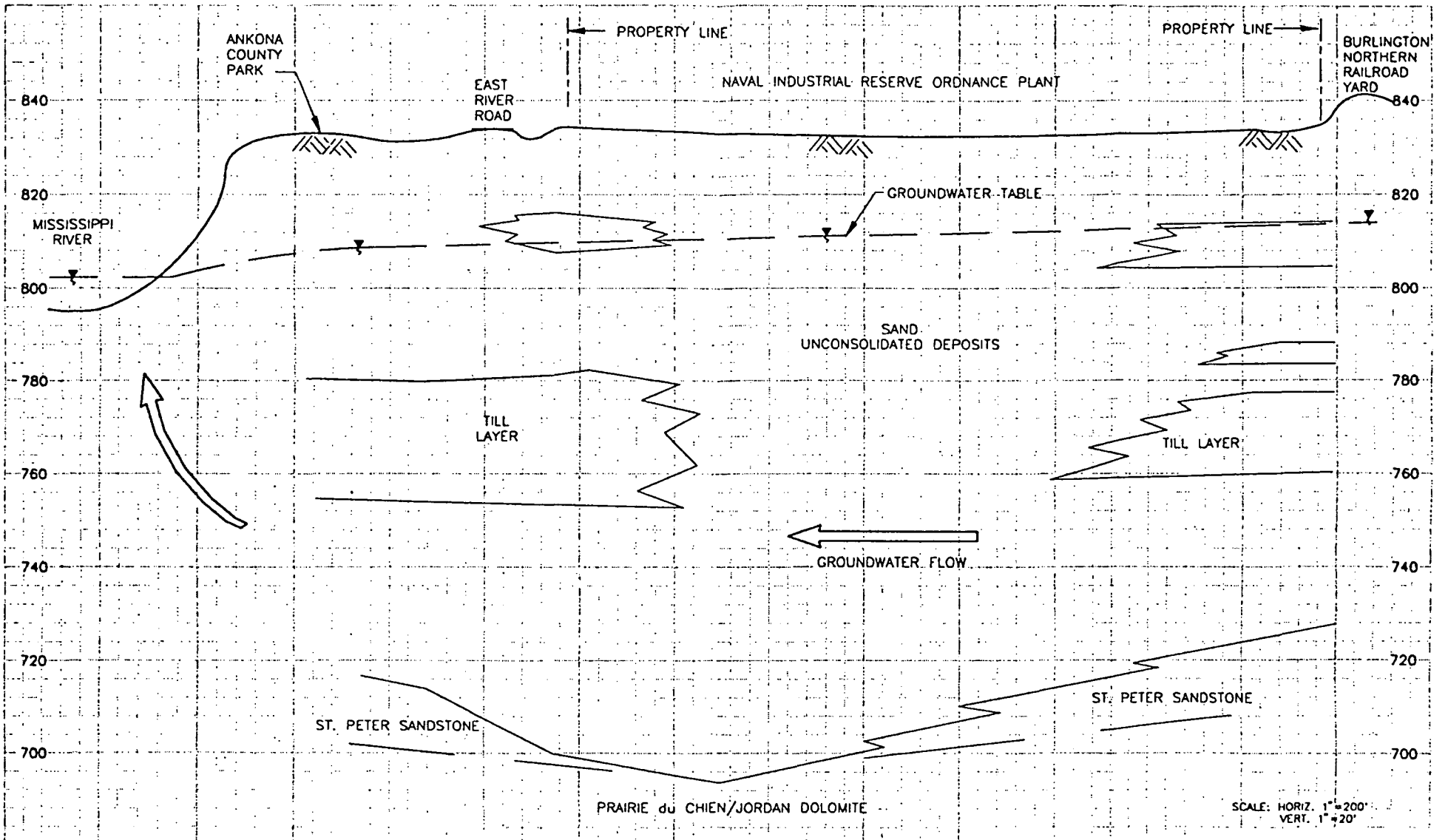
0 500

1" = 500'

RMT

DWN. BY: SKB
DATE: 3/15/90
PROJ.#: 1801.20

FIGURE 2



TYPICAL EAST–WEST CROSS SECTION

RMT INC.

DWN. BY:	DRB
DATE:	APRIL, 1990
PROJ. /	1801.50
FILE /	18015001

APR 3 0 1990 FIGURE 3

Minneapolis Mississippi River water intake also revealed measurable but very low concentrations of TCE.

Investigations into potential problems at the NIROP began immediately by FMC Corporation and the Navy. Two separate areas of concern were identified as the South Study Area (FMC-owned property) and the North Study Area (government-owned property). The South Study Area is listed on the final NPL. FMC pursued investigation of the South Study Area separately from the government-owned North Study Area. An agreement was reached between FMC and the MPCA for the South Study Area, with a Record of Decision signed by the USEPA in September 1987. That agreement called for pumping and discharging untreated ground water to the Pig's Eye Wastewater Treatment Plant. Cleanup levels for the ground water were set at 0.270 mg/L TCE. [Note: 1 mg/L represents 1 milligram of constituent dissolved in 1 liter of water, or 1 part in a million.]

On March 31, 1982, U.S. Navy officials implemented the Navy Assessment and Control of Installation Pollutants (NACIP) Program to identify and control environmental contamination from past use and disposal practices. An Initial Assessment Study (IAS) was completed in June 1983. The IAS determined that drummed wastes had occasionally been buried in the northern portion of the NIROP, an accepted practice in the past, and, that such wastes may be contributing to ground water contamination. As a result of IAS recommendations, the Navy contracted the U.S. Army Corps of Engineers (USACE) to continue investigations.

Through various geophysical and remote sensing techniques, nine areas were selected for excavation based on their likelihood for containing drummed wastes. These areas were excavated in the fall of 1983. Forty-three excavated drums and underlying soils were found to contain VOCs, PCBs, oil and grease, pesticides, and metal-bearing wastes. The 43 excavated drums and 1,200 cubic yards of soil were disposed at USEPA-approved landfills.

Four phases of ground water monitoring well installation began in June 1983. The current network consists of 51 monitoring wells installed under the USACE's direction and one

FMC-installed monitoring well. Wells have been finished in the shallow, intermediate, and deep portions of the unconsolidated aquifer, as well as the PCJ aquifer in the bedrock. The monitoring well network has been used to determine physical and chemical characteristics of the unconsolidated and PCJ aquifers underlying the NIROP and some adjacent areas. The most recent ground water sampling round was conducted in January 1988, as part of the RI.

Analysis of information gathered during the Remedial Investigation indicates the following:

- All use of TCE at the NIROP was discontinued by the end of the first quarter of 1987. Plant operations which previously used TCE now use 1,1,1-trichloroethane. A solvent management program is currently in place at the NIROP and disposal of solvents is in accordance with state and federal regulations.

- Elevated concentrations of TCE and dichloroethylene were found in soil pore gas near the former pit/trench disposal area, a decontamination pad previously used during the drum excavation, and at several locations near the north property boundary.

- Ground water flow in the unconsolidated aquifer is generally from the northeast to the southwest across the NIROP.

- Ground water in the unconsolidated aquifer beneath the NIROP contains VOCs. , including the following: TCE, 1,1,1-trichloroethane, 1,2-dichloroethylene, tetrachloroethylene, 1,1-dichloroethane, toluene, xylene, and ethylbenzene. TCE was found more frequently and at higher concentrations than any other VOC, and is therefore the best indicator chemical. Specific locations where TCE and/or VOCs have been identified include the following:

  - An unidentified TCE source upgradient (northeast) of the NIROP.

  - The former pit/trench disposal area (and immediate vicinity) in the north region of the NIROP. This is considered an on-site source area. Findings from the soil pore gas survey and ongoing occurrence of TCE in the ground water suggest it is likely that some VOC residuals and/or VOC-contaminated soils still exist in this area.

  - Unidentified sources either on-site near the eastern NIROP property boundary or off-site (east of the property). The additional investigations showed TCE at the intermediate depth of the unconsolidated aquifer in the southeast corner of the NIROP.

  - The off-site area immediately north of the northwest portion of the NIROP. Ground water level data collected indicate that flow direction is variable, and therefore identification of the TCE source (on-site or off-site) is inconclusive.

- The southwest region of the NIROP, which may be registering contamination that originates from the former pit/trench disposal area (and immediate vicinity), based on contamination characteristics. This contamination was previously thought to originate from the former TCE storage tank location or from within the building envelope.

- TCE concentrations downgradient of the former pit/trench disposal area continue to decrease as a result of the removal action completed in 1984.

- Concentrations of TCE in ground water reaching the Mississippi River are probably on the order of 1 to 10 mg/L. This range of TCE concentrations can be expected to continue, given the TCE levels detected at the southeast corner of the NIROP.

- The investigations continue to show concentrations of VOCs below drinking water standards in the Prairie du Chien bedrock aquifer.

- One round of samples were collected from storm sewers serving the NIROP. No VOCs were found.

- Because TCE is present in upgradient wells, upgradient sources may also be contributing to ground water contamination.

3. SCOPE OF RESPONSE ACTION

The excavation of wastes and soils from the pits and trenches area in 1983 by the Navy constituted an immediate response measure designed to quickly mitigate an identified source area. With the completion of a detailed RI/FS, the Navy is now able to propose a more comprehensive response action for the facility.

The objective of the proposed response action is to prevent current and future human and environmental exposure to organic constituents derived from the NIROP which are migrating via ground water. The scope of the response action includes the removal of ground water containing the higher concentrations of organics beneath suspected or past source areas, as well as the recovery of ground water containing lower concentrations which is downgradient of the facility. Implementation of the response action will mitigate future migration of constituents to off-site locations and the Mississippi River.

Concurrent with the implementation of this response action, the Navy will perform additional investigative work to characterize potential sources of organics remaining within the soil. If determined to be appropriate, the Navy will propose an additional source control response action for soils as a result of this investigative work.

FMC Corporation has also completed additional source control work at Hazardous Waste Storage Area C, under the closure requirements of the Resource Conservation and Recovery Act (RCRA). To date, approximately 317 tons of soil, concrete, and debris from this area have been excavated and disposed at a permitted off-site landfill.

4. SUMMARY OF SITE RISKS

Exposed Populations/Pathways

During the RI/FS, an assessment was performed to determine potential impacts to public health as a result of constituents migrating from the NIROP. The assessment followed USEPA guidelines for performing risk assessments at Superfund sites in effect at the time the RI was prepared. The assessment focused on TCE, since it represents the predominant constituent of concern at the facility and has been widely detected in significant concentrations in ground water. Other constituents pose considerably lower risks in comparison to TCE; therefore, TCE provides a good indicator of total risk.

The results of the assessment indicate that the likely point of human exposure would be via ingestion of drinking water from the Minneapolis water treatment plant. The intake for the plant is located on the Mississippi River and may be affected by ground water discharging to the river near the NIROP. It was estimated that ground water entering the river would be diluted from 10 to 100 percent before reaching the city water treatment plant intake farther downstream. It was also assumed that there would be no volatilization or other losses of TCE during the treatment process within the city water treatment plant.

Under these scenarios and assumptions, the excess lifetime cancer risk to the exposed population would be approximately 1×10^{-6} and 1×10^{-7}, respectively, under 10 and 100 percent dilution conditions. (A 1×10^{-6} risk means that one additional person in one million exposed persons has a chance of contracting cancer as a result of drinking 2 liters of contaminated water daily over a 70-year lifetime.) These values are well within the typical target range of acceptable risk of 10^{-4} to 10^{-6} established by USEPA in the National Contingency Plan.

It is important to note that these risk estimates are based on the assumed presence of TCE in the city water treatment plant intake resulting from releases from the NIROP. In reality, results of samples collected annually by FMC at the intake for the past 3 years have been

below the detection limit of 5 μg/L. Therefore, if an exposed population does not exist, the actual risk would be zero.

As described earlier, additional soils characterization will also be performed. The results of this investigation will be used to determine if there is an exposure risk via inhalation of, or dermal contact with, these soils, or if soil contamination is shown to be a significant source of ground water contamination. Remedial alternatives will be proposed to mitigate these risks, as appropriate.

Possible Future Effects

Possible future effects on public health would vary depending on whether the concentration of TCE in ground water discharging to the river increases or decreases. For example, if ground water concentrations decrease over time due to a reduction in the mass of the TCE source, the calculated risk at the city intake would decrease proportionately.

Possible future effects may also include the creation of a completely new exposure pathway. At the present time, there is no consumption of ground water or surface water between the NIROP property line and the city water treatment plant intake on the Mississippi River. The installation of a new water supply well downgradient of the NIROP, before ground water discharges to the river, would create a new exposure pathway. The United States Geological Survey has investigated the suitability of this area for water supply purposes for the City of Minneapolis. Although no decisions have been made yet on whether or not to use ground water from this area, the existing contamination is one factor that would influence the selection of this potential water source. Since ground water in this location contains higher concentrations of TCE than have been observed at or calculated for the city intake, the risk level would increase under such an exposure scenario. If water supply wells were installed in this area, additional water treatment may be required to remove contaminants.

However, this land currently serves as a county park and future uses may be restricted. As a result, it is assumed that state and/or local governments have existing authorities which would preclude the installation of a new water supply well in the narrow strip of land between the NIROP property and the river. Access to existing potable water supplies provided along East River Road may also be available, which would eliminate the necessity for installation of any new water supply well immediately downgradient of the NIROP. However, if institutional control is relinquished in the future, development of the land is possible.

5. SUMMARY OF ALTERNATIVES

The feasibility study developed a total of eight remedial alternatives to respond to the site conditions defined during the remedial investigation. These alternatives addressed both soils and ground water at the facility, although the preferred alternative presently addresses only ground water, pending additional investigation of site soils. A screening evaluation of the alternatives was performed on the basis of four criteria: environmental protection, environmental effects, technical feasibility, and cost. Alternatives were eliminated from further consideration if they were technically infeasible, did not provide protection to public health and the environment, or were not cost-effective.

Based on the screening evaluation, four alternatives were retained for detailed analysis. To comply with USEPA guidance, a "no-action" alternative was also considered. Each of these alternatives are summarized below:

No-Action Alternative

Capital Cost:	$37,000
Annual Operation and Maintenance (O&M)(for 30 years):	$48,000
Present Worth*:	$486,000

The Superfund program requires that the "no-action" alternative be considered to provide a "baseline" for comparison. Under such baseline conditions, no specific action would be taken to prevent exposure to soils or ground water at the NIROP. A long-term ground water monitoring program would be developed and implemented to further assess present and future conditions.

Alternative A: Capping

Capital Cost:	$210,000
Annual O&M (for 30 years):	$11,000
Present Worth:	$310,000

This alternative consists of the construction of a 6,000-square-foot concrete cap over two potential source areas on the NIROP facility. The areas would be graded to promote surface water drainage away from the cap. Precipitation which accumulates on the cap would be drained via modifications to the facility's storm water collection system. A long-term ground water monitoring program would also be implemented.

* NOTE: Present Worth is the sum of initial capital cost and ongoing annual costs expressed in 1988 dollars. Annual costs in future years are discounted based on an interest rate of 10%. For example: for a 30-year O&M period, the discount factor is 9.43. The annual cost times the discount factor equals the present worth of annual costs.

Alternative B1: Excavation and Disposal in an Off-site Landfill

Capital Cost:*
Annual O&M:
Present Worth:

This alternative consists of the excavation of approximately 300 cubic yards of soil containing residual concentrations of VOCs, and disposal in an off-site RCRA Subtitle C landfill. Excavation would be centered around the trench locations originally excavated in 1983. The excavation would be backfilled with clean soil. A long-term ground water monitoring program would be implemented.

Alternative D: Soil Treatment Using In-situ Vacuum Extraction

Capital Cost:	$741,000
Annual O&M (for 1 year):	$262,000
Present Worth:	$1,000,000

This alternative involves treatment of soils in the vicinity of the former disposal trenches. In-situ vacuum extraction technology would be used to remove residual concentrations of VOCs by inducing a negative pressure on the unsaturated soils. Enhanced airflow through the soil would volatilize adsorbed constituents, and the recovered air would be vented to the atmosphere. If necessary, the system could be equipped with air treatment equipment to meet local discharge requirements. A long-term ground water monitoring program would be implemented.

Alternative F: Ground Water Pumping, Treatment, and Disposal

Capital Cost:	$1,100,000
Annual O&M (for 30 years):	$168,000
Present Worth:	$3,700,000

This alternative involves the pumping of ground water from source area and downgradient locations. Five recovery wells would operate at a combined flow rate of approximately 650 gpm. During Phase I of the pumping program, ground water would be discharged to the Metropolitan Waste Control Commission sanitary sewer system where it would be treated at the Pig's Eye Wastewater Treatment Plant.

During Phase II, one of three treatment process options would be incorporated into the pumping program:

Option A: On-site treatment of ground water by two-stage air stripping, with disposal through an existing NPDES-permitted storm sewer outfall, and treatment of air emissions using vapor-phase granular activated carbon.

*NOTE: Costs not evaluated. The alternative was retained only in response to Agency guidance.

Option B: On-site treatment of ground water using aqueous-phase granular activated carbon, with disposal through an existing NPDES-permitted storm sewer outfall.

Option C: Continued discharge to the sanitary sewer, with off-site treatment at the Pig's Eye Wastewater Treatment Plant.

The recovery system performance data obtained during Phase I of Alternative F would be used to finalize and optimize the design of the treatment process option, for Phase II operations. The estimated costs presented above for Alternative F are based on the assumption that treatment process Option A would be selected. Throughout Phases I and II, a long-term ground water monitoring program would be implemented.

6. EVALUATION OF ALTERNATIVES

The preferred alternative to address the presence and migration of TCE and other constituents at the NIROP is Alternative F: Ground Water Pumping, Treatment, and Disposal. Based on current information, this alternative provides the best balance among the alternatives with respect to five evaluation criteria that were used at the time the FS was prepared. These criteria include the following:

Technical Feasibility - The technical feasibility of an alternative consists of five general considerations: performance, reliability, constructability, timing, and safety.

Environmental Effects - The evaluation of environmental effects addresses any potential adverse environmental impacts that may result from implementation of the remedial action alternative. The no-action alternative provides the baseline by which other alternatives may be evaluated.

Institutional Requirements - Institutional requirements are based on the CERCLA mandate that remedial actions comply with applicable or relevant and appropriate requirements (ARARs) at the state and federal level. ARARs include chemical-, location-, and action-specific requirements.

Public Health Effects - The public health evaluation considers the degree of protection provided in the absence of a response action (i.e., no action), during remediation, and after remediation is complete.

Cost Comparison - Cost estimates were prepared with an order of magnitude accuracy and included capital costs, annual O&M costs, and present worth costs. A sensitivity analysis was performed to examine the potential impact on present worth costs resulting from a change in interest rates.

The preferred alternative addresses ground water cleanup at the site. It was found that insufficient data existed to determine which, if any, alternative was required to address site soils. The Navy is collecting additional data and will use it to determine further remedial actions, as appropriate.

A comparison among the four remedial alternatives which passed the initial screening evaluation with respect to these criteria is summarized below:

Technical Feasibility

All of the alternatives are technically feasible. Each alternative consists of straightforward technologies which are readily constructable. Implementation would not pose outstanding safety problems beyond those associated with conventional construction practices.

Alternative F, Ground Water Pumping and Treatment, is the most technically complex alternative, although the components are well demonstrated and generally reliable. Design and permitting of the treatment system for this alternative require the longest lead time. Alternative D, Soil Vacuum Extraction, is somewhat less complex than Alternative F, as far as treatment alternatives are concerned; but it is also somewhat less reliable since it involves an innovative and not widely demonstrated technology. Similarly, the performance of the treatment alternatives is, by nature, somewhat less certain than the capping and excavation alternatives.

Environmental Effects

The no-action alternative has the greatest potential to create adverse environmental effects since the discharge of VOCs to the Mississippi River would continue unabated. Alternative F would mitigate potential aquatic effects within the river in the most timely manner by recovering ground water prior to discharge. Alternatives A, B1, and D would reduce the source strength by capping, removal, or extraction, but the corresponding improvements in ground water quality, and reduced potential threat to the river, would not be as quickly manifested.

Alternative D involves the transfer of volatile constituents from the soil media to the air media. The discharge of constituents to the air would be maintained within emission limits set by the state to insure that adverse effects are not created. If necessary, emission control equipment would be added to limit air discharges.

Institutional Requirements

There are no federal or state chemical-specific ARARs for soils. For ground water, the maximum contaminant level (MCL) for TCE of 5 μg/L is potentially relevant. MCLs are applied at the point of use, which in this case would be the city water treatment plant intake, since there is no present or planned use of ground water for drinking purposes. It is therefore required that conditions at the NIROP not contribute to the exceedance of the MCL at the city water treatment plant intake.

To the extent that no such exceedance has been documented through monitoring, all of the alternatives may meet this ARAR. Alternative F provides the greatest protection against potential future exceedances by precluding further migration of TCE to the river in the most timely manner.

Alternatives D and F would be subject to the substantive requirements of state air and water discharge permits, respectively. During Phase I of Alternative F, a permit for sanitary sewer discharge would be required from the Metropolitan Waste Control Commission. These permits and approvals would be pursued during the remedial design process.

Public Health Effects

Based on reasonable assumptions, the no-action alternative was calculated to result in a carcinogenic risk at the city intake of just above 10^{-6}. This is well within the USEPA target risk range of 10^{-4} to 10^{-6}.

Alternative F would provide the greatest protection against potential risks and public health effects by directly precluding the continued discharge of TCE from the NIROP to the river. Some ground water containing TCE has already migrated from the NIROP to the adjacent parkland. Pumping rates for the recovery wells along the NIROP property line would be adjusted as necessary to optimize the capture of this water. Alternatives A, B1, and D

would provide somewhat less protection by removing a source of TCE, but without direct and immediate mitigation of TCE already present and migrating via ground water.

As discussed above, Alternative D would result in the air discharge of volatile constituents. Public health would be protected by operating the system within health-based emission units established by the state.

Upon completion, Alternative D would provide a high degree of permanence in the protection of public health because TCE concentrations in future ground water discharges to the river should eventually be reduced to acceptable levels. Alternatives A, B1, and D would provide permanent source control and/or removal but would not directly remove TCE already present in ground water.

Cost Comparison

The estimated cost for each alternative is contained in Section 5. The cost of the preferred alternative is the highest among those evaluated. There is some variability among the three treatment process options within Alternative F, but, because of potential changes in the rate structure at MWCC for sewer discharges, it is not possible at this time to provide more definitive estimates. The final cost of the preferred option will also be contingent on specific process decisions made during remedial design.

Because Alternative F involves substantial annual costs, the present worth is highly sensitive to changes in the interest rate. To achieve cost-effectiveness, decisions will be made during remedial design to minimize operational costs by selecting appropriate process options.

Summary of Preferred Alternative

The preferred alternative will provide long-term effectiveness in satisfying the objective of reducing future exposures to TCE in ground water. The alternative provides a high degree

of permanence by removing TCE from the aquifer and treating contaminated ground water using approved methods. In this manner, both the mobility and volume of TCE are reduced.

The preferred alternative will also provide short-term effectiveness by halting the flow of contaminated ground water to the Mississippi River. With the objective of restoring ground water quality to drinking water standards, the alternative complies with ARARs.

Both the MPCA and the USEPA have provided comments on the preferred alternative and concur with the Proposed Plan. Community acceptance will be determined after the public comment period.

7. THE PREFERRED ALTERNATIVE

System Components

The design concepts for the preferred alternative as developed in the FS are illustrated on Figure 4 and include the following:

Phase I

- **Installation and operation of five ground water recovery wells at a combined design flow rate of 650 gpm.** Two wells with design pumping rates of 50 gpm each would be installed at source locations to capture the ground water plume containing higher concentrations of TCE. The three remaining wells would be installed at the downgradient side of the facility property to control migration and recover ground water which has already moved off-site to the fullest extent possible. The design pumping rates for the downgradient wells would be 150, 200, and 200 gpm respectively.

- **Discharge of ground water during Phase I to the local sanitary sewer.** The discharge will meet local regulations and the water will be treated at the Metropolitan Waste Control Commission treatment facility. During this time, treatability testing will be performed on pumped water to establish design parameters for the full-scale on-site treatment system. The phased approach to the ground water remediation will allow the startup of ground water recovery operations while treatability work, remedial design, permitting, and construction of the treatment system proceed.

Phase II

- **Construction and operation of a ground water treatment system during Phase II, with discharge of treated ground water through an existing NPDES-permitted outfall to the Mississippi River.** The unit operations for the treatment system as described in the FS include two-stage air stripping with treatment of the off-gas using granular activated carbon. The final unit operations will be determined during remedial design based on the discharge requirements established by the state during the NPDES permit process, and based on the results of treatability testing performed during Phase I.

- **Long-term monitoring of ground water quality changes and capture effectiveness.** A network of monitoring wells will be established and sampled to determine ground water quality changes during remediation and the effectiveness of ground water capture. Based on determinations of capture effectiveness, the pumping rates for individual wells will be adjusted as needed to optimize recovery.

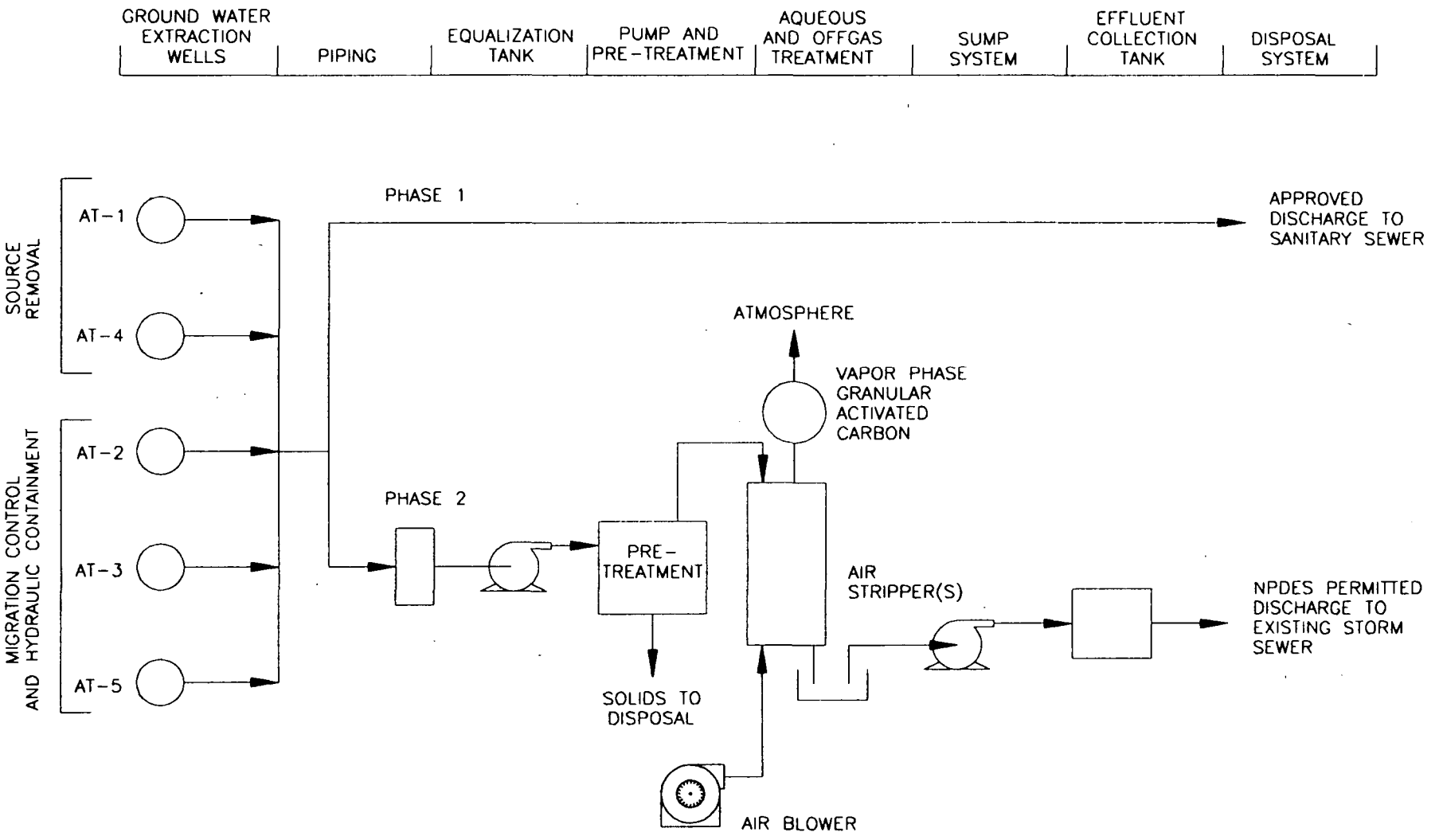


FIGURE 4
PREFERRED ALTERNATIVE: GROUND WATER PUMPOUT, TREATMENT AND DISPOSAL PROCESS FLOW DIAGRAM

RMT INC.

DWN. BY:	SRC
DATE:	FEBRUARY, 1990
PROJ.#	1801.10
FILE #	18011001

Design and Performance Criteria

The design and performance of the preferred alternative will be based on two broad criteria: the cleanup level for TCE in the aquifer and the treatment performance level achieved by the treatment system. Each of these is discussed below:

1. Cleanup Level

Cleanup levels for ground water are set based on applicable or relevant and appropriate requirements (ARARs), or alternatively, on risk-driven considerations. At NIROP, the ARAR of concern is the MCL for TCE, which is 5.0 μg/L. MCLs are applicable requirements for drinking water supplies, such as the Minneapolis water supply system. At present, the MCL for TCE is not exceeded for TCE at the City's water intake on the Mississippi River.

The MCL is also an appropriate requirement (ARAR) for ground water at or downgradient of the NIROP property line, even though at present there are no ground water users downgradient of the facility. The MCLs are relevant and appropriate for any aquifer that is a potential drinking water source. A cleanup target level of 5.0 μg/L for TCE would be protective of potential future ground water users in the event that a supply well is constructed downgradient of the facility within the county park land. Therefore, the cleanup objective will be to pump ground water until the MCL for TCE (5.0 μg/L) is met.

The achievable concentration of any constituent in ground water cannot be predicted with certainty, and despite extensive recovery efforts, very low concentrations of dissolved constituents may persist in the aquifer, and concentrations may decline to a low level beyond which future reduction cannot be reasonably achieved.

During the remedial design phase, a ground water monitoring plan will be developed and submitted for agency approval. The plan will specify the location and sampling frequency of a ground water monitoring network. If, as a result of this monitoring, a situation is reached where low levels of TCE persist and further reduction cannot be achieved, the NIROP will request that an alternate concentration be set or may request that the system operation be ceased.

TCE and other constituents have also been detected in wells upgradient of known and potential contaminant sources at the NIROP. Since there may be upgradient sources contributing TCE to the ground water, monitoring data from on-site wells will be compared to upgradient "background" wells. If it can be proven, based on the facts at the time, that upgradient sources are contributing TCE to the ground water, the NIROP will request approval of an alternate treatment target level or approval to terminate recovery operations.

2. Treatment Performance Level

The treatment performance level achieved by the ground water treatment system will be based on the discharge limits specified in the NPDES permit. After final permit limits are provided by the MPCA, the design of the treatment system will be finalized. The design process will incorporate the results of treatability testing on pumped ground water to ensure that an adequate level of treatment is provided.

Permits and Agreements

The Navy will be responsible for obtaining all federal, state, and local permits which are necessary for the performance of all work under CERCLA. The following requirements have been discussed with the USEPA and MPCA for the remedial action at the NIROP.

- Minnesota Department of Health approval for all ground water recovery well installations.
- Minnesota Department of Natural Resources approval for ground water resource appropriation.
- Minnesota Pollution Control Agency permit for an NPDES discharge.
- Minnesota Pollution Control Agency agreement with respect to the state nondegradation policy for surface water discharges.
- Minnesota Pollution Control Agency permit for a point source air discharge.
- Metropolitan Waste Control Commission approval for temporary discharge of ground water to the sanitary sewer.
- Metropolitan Waste Control Commission, Anoka County, and City of Fridley approvals for access to and construction of sewer tie-ins as needed.

Operations and Effectiveness Monitoring

The recovery and treatment systems will be monitored for proper operation during the course of the remediation. This will include the following:

- Periodic evaluation of the capture effectiveness of the recovery well network.
- Periodic inspection of the ground water pumps, piping, and controls, and routine maintenance as required.
- Recording flow rates from individual wells and computing cumulative recovery volumes for sewer use payment.
- Collection of individual wellhead samples for analysis of TCE and other indicator constituents.
- Periodic inspection of pumps, blowers, piping, and other mechanical components of the treatment system and routine maintenance as required.
- Collection of effluent samples and analysis for permit parameters.

A ground water monitoring program will be implemented to determine the effectiveness of the remediation. This will include the following:

- Measurement of water levels in local monitoring wells to calculate the effective ground water capture zone.
- Adjustment of pumping rates as necessary to optimize ground water capture.
- Collection of ground water samples and analysis for TCE and other indicator constituents.
- Calculation methods for determining if and when asymptotic levels have been reached and further removal is not technically practicable.

A detailed operation, maintenance, and monitoring plan will be developed during the remedial design phase. The plan will document specific operations and effectiveness monitoring techniques. The plan will be submitted for state and federal review and approval prior to implementation.

8. COMMUNITY PARTICIPATION

The Department of the Navy has and will maintain open communications with the public and governmental oversight agencies throughout the course of site remediation. This will include the following:

- Public announcements and formal public comment periods at critical decision points in the project as required by CERCLA and state law.
- A public meeting during the public comment period for the Proposed Plan.
- An additional public meeting(s), if necessary, to convey project updates for general informational purposes.
- Active participation in Technical Review Committee (TRC) meetings which bring together affected local, county, state, and federal officials for effective project coordination.
- Placement of project documents in the local repository, the Anoka County Public Library, for public review and use.

The Navy encourages community participation, and welcomes public input on the Proposed Plan, the preferred alternative, and other project components. Notices for future public meetings will be placed in the local media. A formal Community Relations Plan will also be placed in the Administrative Record repository noted previously.

GLOSSARY OF TERMS

Applicable or Relevant and Appropriate Requirements (ARARs) -

Remedial actions under CERCLA must comply with "applicable" federal or state requirements or regulations. In addition, the action must also comply with requirements which are both "relevant and appropriate" (although not applicable).

Asymptotic Level -

When the concentrations of a constituent in ground water are graphed versus time, the resulting curve may decline towards a particular concentration without ever reaching it. This "asymptotic level" represents the lowest concentration which can practically be achieved.

Carcinogenic Risk -

When a person consumes or is exposed to a cancer causing substance, his/her chance of contracting cancer is increased. Risk is expressed as the number of excess cancer deaths in an exposed population, such as one in a million (10^{-6}). It is calculated based on the amount of exposure and the concentration of the substance.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) -

"CERCLA" is the federal law which requires investigation and cleanup at sites where hazardous substances have been released to the environment.

Downgradient -

When describing the movement of ground water, "downgradient" is the direction in which flow is occurring.

Ground Water -

Below a certain depth, water fills the pores in soil and openings in rocks to the point of saturation. This "ground water" may contain substances which have percolated downward from the ground surface. Ground water flows through soil or rock before it discharges to a river or lake, and may transport these substances with it.

Maximum Contaminant Level (MCL) -

"MCLs" are drinking water standards established by the USEPA above which unacceptable health effects may occur.

Migration -

"Migration" refers to the movement of substances with the flow of ground water.

National Priorities List (NPL) -

The list of sites designated by the USEPA for priority investigative work and remedial action is known as the "NPL".

Trichloroethylene (TCE) -

TCE is a commonly used industrial solvent and cleaner. It is a probable human carcinogen.

Volatile Organic Compounds (VOCs) -

VOCs are a class of chemicals which readily evaporate and dissipate into the environment. TCE is a VOC.