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NIROP FRIDLEY
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DEPARTMENT OF THE NAVY
NORTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
PHILADELPHIA, PENNSYLVANIA 19112-5094

IN REPLY REFER TO

5090
Ser 5126/1421/JS

MAR 15 1990

U. S. Environmental Protection Agency
Region V
Remedial and Enforcement Response Branch
OH/MN Section, Unit 1 (5HS-11)
230 South Dearborn Street
Chicago, IL 60604

RE: USEPA COMMENTS ON THE REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) REPORTS FOR THE NAVAL INDUSTRIAL RESERVE ORDNANCE PLANT (NIROP), FRIDLEY, MN

Dear Mr. Bloom:

The enclosed document is the response to the comments provided by your memorandum and the Black & Veatch Report regarding the RI/FS reports for NIROP. We will discuss the enclosed response and any comments with you at the meeting scheduled for 29 March 1990 at our consultants (RMT) office in Madison Wisconsin.

If you have any questions about the meeting or the enclosed document please contact Mr. James Shafer at (215) 897-6433.

Sincerely,

T. G. SHECKELS
Head, Restoration Management Section
By direction of the Commanding Officer

Encl:
(1) Draft Proposed Plan

Copy to:
CO NIROP
MPCA, St. Paul

DISTRIBUTION LIST

Response to USEPA Comments Regarding the Remedial Investigation/Feasibility Study Reports March 15, 1990

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RESPONSE TO USEPA COMMENTS REGARDING THE REMEDIAL INVESTIGATION/FEASIBILITY STUDY REPORTS

NAVAL INDUSTRIAL RESERVE ORDNANCE PLANT
FRIDLEY, MINNESOTA

MARCH 15, 1990

PREPARED BY RMT, INC.
FOR THE U.S. ARMY CORPS OF ENGINEERS

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1. INTRODUCTION

1.1 Background

RMT was retained in 1986 by the Omaha District of the U.S. Army Corps of Engineers (USACE) to complete a Remedial Investigation (RI) and Feasibility Study (FS) initiated by the USACE in 1982 at the Naval Industrial Reserve Ordnance Plant (NIROP), Fridley, Minnesota.

A Remedial Investigation Report (RMT, 1987), summarizing the first phase of the RI, was issued in June 1987. Additional ground water investigations were completed in January 1988, and an addendum to the RI Report (RMT, 1988a) was issued in July 1988. A Feasibility Study Report (RMT, 1988b), based on the June 1987 RI Report was issued in July 1988. An addendum to the FS Report (RMT, 1988c), addressing the findings of the addendum to the RI Report, was issued in August 1988.

The NIROP was placed on the final National Priorities List in November 1989. The USEPA provided comments on the RI and FS reports in an undated memorandum received in December 1989. An evaluation of the RI and FS reports by a USEPA ARCS contractor (Black & Veatch, undated) was received with the USEPA memorandum.

1.2 Purpose

The purpose of this report is to respond to the comments made in the USEPA memorandum and by the ARCS contractor.

1.3 Scope

This report provides responses to the comments contained in the following documents:

Undated memorandum from T.R. Bloom, USEPA Remedial and Enforcement Response Branch, OH/MN Section to J. Shafer, Naval Facilities Engineering Command, Northern Division.

Black & Veatch, undated. Evaluation of the Remedial Investigation/Feasibility Study Reports, Naval Industrial Reserve Ordnance Plant, Fridley, Minnesota, 20 pp.

2. RESPONSE TO COMMENTS ON THE RI

2.1 Off-Site Sources

2.1.1 North of the NIROP

In general, the review comments question the presence of upgradient TCE sources(s). The ARCS report (Black & Veatch, undated) suggests that well 7-S may, at times, be downgradient of potential volatile organic compound (VOC) sources on the NIROP. There was some variability in ground water flow directions just below the water table from July 1986 to February 1988. However, the observed changes in gradient did not place well 7-S downgradient of potential on-site sources of contamination. Also, well 15-S, approximately 650 feet upgradient of the NIROP, has yielded ground water samples containing 0.011 to 0.071 mg/L of TCE. This well is clearly unaffected by potential sources on the NIROP. The intent of this RI is not to locate the upgradient sources, but rather to clearly identify the contributions of upgradient contaminant sources to the ground water beneath the NIROP.

The ARCS report cites MPCA personnel when noting that Kurt Manufacturing and Dealers Manufacturing are not upgradient of the NIROP. The Health Assessment prepared for Kurt Manufacturing (ATSDR, 1989) states that "... shallow ground water flow across the site appeared to be north to northeast ...." The assessment states that "deeper ground water" flow is southwestward (first paragraph of page 5) and northward (third paragraph of page 5). It is premature to state with certainty that Kurt Manufacturing and Dealers Manufacturing could not have contributed or continue to contribute to the observed ground water contamination, given the apparent uncertainty in ground water flow directions evident in the

Kurt Manufacturing studies, the proximity of the Kurt and Dealers sites to a regional discharge area (the Mississippi River 3,000 feet to the west), and the proximity of the Kurt and Dealers sites to the NIROP wells that clearly show ground water flow to the southwest.

2.1.2 East of the NIROP

The ARCS report stated that the lack of VOCs in samples from well 23-S indicates the absence of a source of VOCs upgradient of the Burlington Northern Railroad yards. The low concentration of VOCs observed at well 23-S does not rule out a contaminant source upgradient of the wells clustered in the southeast corner of the NIROP study area. As shown on Figure 4-4 of the FS Addendum (RMT, 1988c), an upgradient projection of a plume from the southeast corner shows well 23-S to be south of the plume. Additional monitoring wells to evaluate the projected plume are planned for the summer of 1990, if access can be gained from the property owner.

The ARCS report goes on to suggest that historical weed control practices along the railroad tracks is a potential source for TCE observed in the wells on the upgradient edge of the NIROP. Six shallow wells located on the upgradient edge of the study area yield samples that range in TCE concentrations from typically less than 0.005 mg/L (well 1-S) to 2.6 mg/L (well 9-S). Wells adjacent to and 40 feet deeper than 9-S yield samples with TCE concentrations on the order of 10 mg/L. This pattern of TCE occurrence does not conform to a source model where the TCE was sprayed on the ground surface along the length of the eastern property boundary security fence 20 years ago.

2.2 On-site Sources

2.2.1 Outside of Plant

The USEPA review memorandum requests that additional soil investigations be carried out on the NIROP. Additional investigations of soil in the northern portion of the site and around Hazardous Waste Storage Area C are being planned for the summer of 1990. The objective of these investigations is to improve the delineation of residual soil contamination that has been identified by past RI and RCRA closure activities. The scope of this investigation will be presented to the USEPA and MPCA in a workplan, currently scheduled to be available in June 1990.

Pore gas surveys conducted in the southeast corner of the site in 1987 near the current aboveground 1,1,1-trichloroethane storage tank and underground fuel storage tanks did not identify significant concentrations of VOCs. Additional soil investigations will be carried out in the vicinity of the underground tanks, and one boring will be placed near the aboveground tank to confirm the pore gas survey results. The details of this investigation will also be included in the workplan submitted to the USEPA and MPCA.

2.2.2 Degreasers

The USEPA requests that the degreasing units be investigated further. The physical setting of the facility and operation changes suggest that no additional investigation of the degreaser units is warranted. The degreaser units that may have contributed to past trichloroethene (TCE) releases are no longer in service, and many have

been physically removed. In addition, TCE use at the NIROP was discontinued in March 1987.

TCE in the unsaturated zone beneath the degreasers will not be transported into the ground water because the building prevents infiltration of any water into the soil. Abiotic and biologically mediated transformations (Vogel and others, 1987) and volatilization and diffusive transport to the atmosphere (Sleep & Sykes, 1989) will slowly reduce residual organic compound concentrations in the unsaturated soils beneath the building.

2.2.3 Sewers

The USEPA requests that sewers be investigated further. Investigation of potential sewer line leaks is not warranted. Plant processes have been modified (e.g., sealing of floor drains) in order to minimize potential inadvertent future releases of VOCs to the sewer system. Residual VOCs in the unsaturated zone that may have been released from sewer leaks in the past will degrade and volatilize as noted above. Any future leakage of the VOC-free water from the sewers will also flush residual VOCs to the ground water, where they will be collected and treated by the proposed remedial alternative. Also, sanitary sewer lines within the NIROP will no longer be used to receive contaminated ground water in the proposed remedial action because of concerns regarding sewer capacity and the implementability of well-head connections. Therefore, VOC-contaminated water will not have the opportunity to re-enter the ground water if sanitary sewer leaks exist.

The storm sewers are permitted under the NPDES program (Permit No. MN0000710) and sampled monthly for temperature (Hildre, 1990). According to FMC, the sewers discharge storm water and non-contact cooling water. Efforts have been made in recent years to review plant processes and isolate the sewer system from inadvertent inputs of VOCs. The most recent analyses of the storm sewer discharge did not identify any hazardous constituents that are associated with the NIROP operations. Any future action related to the storm sewers is therefore most appropriately handled under Minnesota Pollution Control Agency (MPCA) Clean Water Act authority.

2.3 Geology

The stratigraphic interpretation of the unconsolidated sediments is supported by the data, but it is not straightforward because the data are lacking beneath the buildings and the till and outwash deposits are highly heterogeneous. We were, however, able to integrate various data available for the site to arrive at a working model of site conditions that is sufficient to design the remedial action.

The following steps provide a further description for how site data were integrated to arrive at the interpretation presented in the report.

1. We did not reinterpret the data or update the geologic cross-sections for the FMC consultants work (i.e., cross-section A-A' FMC 42 to FMC 28). We did try to correlate the existing interpretation (with which remedial work had begun) with the NIROP data.

2. We reviewed the history of glacial depositions in the vicinity and evaluated various depositional models and stratigraphic interpretations that could account for the pattern of sediments found.

3. We reviewed the boring logs, soil samples (in some cases), and soils laboratory data to look for correlations not previously noted. It was important to examine the logs closely for

subtle indications of units that were likely to correlate horizontally. The logs were somewhat deceiving because there were several different people recording descriptions over time. Also, some of the holes were drilled and sampled with water wash techniques making precise logging difficult (this was especially noted with the sandy till which tended to lose its fines with the water wash).

4. We interpreted the distribution of water levels horizontally and vertically and how that distribution inferred probable zones of lower and higher permeability. For example, the lower water level in well 11-S as compared to wells 21-S and 17-S was correlated with the lack of a till layer in that area.

5. We evaluated the horizontal and vertical distribution of chemicals observed in the monitoring wells and postulated various pathways from the source areas (including potential DNAPL pooling and residual migration.) Again, this stratigraphic interpretation presented in the RI Addendum (RMT, 1988a) seems to fit best.

We think that the data, when considered as a whole, fully support the interpretation of existing conditions and are sufficient to make necessary remedial action decisions.

2.4 Ground Water

2.4.1 Production Wells and the Prairie du Chien Aquifer

The USEPA review document requests that the effects of ground water withdrawals from the FMC production wells and Fridley well no. 13 be evaluated. A brief summary of the information presented in the RI (RMT, 1987 and 1988) follows. According to FMC (Hildre, 1990), the Navy production wells (nos. 2 and 3) were taken out of service on April 24, 1981, and the FMC production well was shut down in June 1983. The RI Report (RMT, 1987) stated that all three wells were taken out of service by April, 1984. Prior to June 1983, withdrawals from the FMC wells may have lowered the potentiometric levels in the Prairie du Chien Aquifer

sufficiently to result in downward hydraulic gradients, drawing TCE-bearing water from the unconsolidated sediments past poor well seals or through the aquitard at the base of the St. Peter Sandstone into the Prairie du Chien Aquifer. The St. Peter Sandstone directly overlying the dolomite is predominantly siltstone and shale and forms an aquitard between the ground water in the unconsolidated sediments and the Prairie du Chien Aquifer (Kanivetsky & Walton, 1979).

Under current conditions, the vertical gradients are upward between the Prairie du Chien Aquifer and the water table aquifer in the unconsolidated sediments (see Table 5-3 in RMT, 1987 and Figures 5-6 and 5-7 in RMT, 1988a). Well 3-PC, located between production wells Navy-2 and Navy-3, has yielded samples with steadily decreasing TCE concentrations since October 1983. Well 2-PC, located in the northcentral portion of the NIROP, has also shown a decrease in TCE concentrations since 1983. The decrease has not, however, been as consistent or to as low a concentration as observed at 3-PC. These decreases suggest that TCE migration into the Prairie du Chien Aquifer is no longer occurring at significant levels.

The lack of ground water use downgradient of the NIROP, the decreasing TCE concentrations (to levels near or below MCLs), and the upward gradients from the Prairie du Chien Aquifer suggest that further investigation of the hydrogeological interconnection between the unconsolidated sediments targeted for remediation and the underlying Prairie du Chien Aquifer is not warranted since it does little to clarify the decisions regarding remedial actions.

An aquifer test using Fridley well no. 13 was performed in 1984 (Papadopulos, 1984). Drawdowns of 0.1 to 0.9 foot were observed in the Prairie du Chien Aquifer beneath the NIROP in response to 24 hours of pumping at 1,000 gallons per minute. Historically, this well has been used intermittently to produce an average of 20,000 to 40,000 gallons of water per day. The 24-hour test, therefore, provided a reasonable approximation to the typical pumping cycles imposed on well no. 13. The observed drawdowns are not sufficient to cause downward flows at three of four measurement points. Given the conservative (longer than typical) pumping duration of the 1984 test, it appears that the current practice of intermittent pumping will not induce downward gradients across the aquitard in the future. Further evaluation of Fridley well no. 13 is therefore not needed.

2.4.2 Water Table

The ARCS report requests further discussion of the water table gradient in the vicinity of AT-2. The distinct dip in the water table observed near well AT-2 does not have a substantive effect on the proposed remedial alternative. The increased gradient may be the result of decreased transmissivity due to the occurrence of clayey soils in this area (see Figure 5-2, 5-3, and 5-4A; RMT 1988a). The presence of the sandier (more permeable) channel deposits south of the dip (Figure 5-4B; RMT, 1988a) may also serve to accentuate this gradient increase.

2.4.3 Numerical Modeling

The ARCS report states that ground water flow and transport models be considered as "... a possible aid to understanding the ground water flow system, identifying potential source locations, and evaluating remedial alternatives." It is RMT's opinion that numerical modeling will do little to identify relatively small source areas (e.g., degreasers, individual trenches) within the NIROP and will not aid in identifying off-site (upgradient) sources because of the current sparseness of upgradient data. Further refinement of ground water flow patterns through numerical modeling will contribute little additional information regarding the extent and migration of the contaminants below the NIROP. Numerical modeling would be useful in optimizing the design of the ground water extraction system and projecting the duration of the remediation once additional information on aquifer hydraulic properties is obtained from the pumping tests planned for the summer of 1990.

2.5 Ground Water Sampling and Analyses

2.5.1 Chemical Baseline

The USEPA review memorandum states that "... additional water sampling needs to be completed to establish a ground water chemical baseline." The ground water chemistry data base is currently adequate to meet the objectives of the RI/FS. The ground water monitoring well network has been expanded several times since 1983. The earliest wells have been sampled up to seven times between October 1983 and January 1988 for the primary constituents of concern at the NIROP (i.e., VOCs). Wells installed in December 1987 have only been sampled once as part of a

comprehensive sampling round. Additional ground water investigations are planned for 1990, including two rounds of sampling and analyses of all existing monitoring wells and several additional monitoring wells planned for installation in 1990. The list of constituents to be analyzed will be included in the workplan that is scheduled to be submitted to the USEPA and MPCA for review in June 1990. The long period of record, combined with the recent and proposed monitoring well network sampling rounds, will provide an adequate data base for the evaluation of the extent of VOC occurrence, of temporal trends in VOC concentrations, and of the effectiveness of future remedial actions.

2.5.2 Xylenes

The ARCS report recommends that xylenes be included in future ground water analyses, because these compounds were observed in the drums excavated from the northern portion of the NIROP. At that time, xylenes were included in the January 1988 ground water sampling program. Xylenes were only detected in monitoring well 5-I and extraction well AT-1, both in the southeast corner of the site. Historical xylene releases from the drum burial area are not evident. The ground water analyses planned for 1990 will include xylenes to confirm this observation.

2.5.3 Manganese

The ARCS report requests further evaluation of manganese because concentrations observed in ground water exceeded Safe Drinking Water Act SMCLs. The USEPA review memorandum also requests that manganese be included in future ground water sampling. Further investigation with

regard to manganese in ground water is not warranted. Manganese (dissolved) concentrations in ground water north of the NIROP average 1.15 mg/L (standard deviation of 0.63 mg/L). None of the downgradient samples of ground water exceed the upper 95 percent confidence limit of the mean background concentration (2.38 mg/L). Only 10 percent of the nonbackground samples even exceed the background mean concentration. This pattern suggests that manganese is related to regional geochemical phenomena and not to the NIROP.

2.5.4 Sulfate

The USEPA review memorandum requests that sulfate be included in future ground water sampling and analyses. Further evaluation of sulfate concentrations in ground water is not warranted. Sulfate concentrations in ground water north of the NIROP average 163 mg/L (standard deviation of 111 mg/L). Three of the seven highest observed sulfate concentrations were in upgradient wells. Only one nonbackground sample (well 18-S) exceeds the upper 95 percent confidence limit of the mean background concentration (380 mg/L). This pattern suggests that sulfate concentrations are related to regional geochemical phenomena and not to the NIROP.

2.5.5 Selenium

The ARCS report states that the RI Addendum report (RMT, 1988a) attributes the occurrence of selenium "... solely to an off-site source..." Page 5-17 of the RI Addendum actually states that "... (t)he continued presence of selenium only in well 9-S is an indication of a

possible off-site source..." The report does not rule out an on-site source; however, there is no information suggesting that potential sources of selenium are or have been present within the NIROP.

2.6 Surface Water Sampling

2.6.1 Mississippi River

The USEPA requests that additional sampling of the Mississippi River be undertaken in conjunction with future ground water sampling. No purpose or objective is provided with the request. Given the size of the river and the resulting complexity of sampling, a clear statement of purpose is necessary before a specific response can be prepared. In general, the value of sampling the river is somewhat uncertain. The primary potential risk is to users of the Minneapolis water supply (see response to Risk Assessment for further discussion). Sampling and analysis of the river water at the intake is being addressed (see next paragraph). In addition, the observed and estimated concentrations of TCE in river water, the primary hazardous constituent, are currently below the 10^{-6} incremental carcinogenic risk level (Figure 7-1, RMT, 1988a) and below the 5 µg/L minimum quantitation limit established by the USEPA Contract Laboratory Program (USEPA, 1987).

2.6.2 Treatment Plant Intake

Sampling of the raw water at the Minneapolis water treatment plant intake is currently being performed twice per year under the FMC Ground Water Response Action Plan (FMC, 1989). No VOCs were detected at the intake in the December 1987 and November 1988 samples (method detection

limit of 0.005 mg/L for TCE). Additional sampling by the U.S. Navy at this location is not necessary.

2.7 Risk Assessment

2.7.1 Data Accuracy

The USEPA requests that "more accurate" data be used in the completion of the risk assessment. Further clarification of this request is required before a response can be formulated. Evaluations of recovery of spikes and replicate samples found the laboratory analyses to be within USEPA quality control limits (RMT, 1987 and RMT, 1988c).

2.7.2 Risk Assessment Accuracy

The USEPA requests that a "more accurate" risk assessment be performed. Further clarification of this request is required before a response can be formulated.

The ARCS report states that Figure 7-1 (RMT, 1988a) does not support the statement that "risks at the ... intake ... are generally in the range of acceptable levels ...." This comment is incorrect; the observed concentrations of TCE, as well as the estimated concentrations based on dilution, all result in estimated incremental carcinogenic risk levels of less than or equal to 1×10^{-6}.

The ARCS report states that the RI underestimates the risk at the water treatment plant intake because the mean annual Mississippi River flow is used to estimate dilution rather than the 5-year, 1-day flow. The use of the 5-year, 1-day flow is not justified, because it is a short-term flow condition which does not represent a realistic long-term exposure

scenario. The concentrations observed in the ground water do not represent an acute toxicity risk; therefore, long-term exposures resulting in potential carcinogenic risks were evaluated. This scenario assumes an "average" exposure over a 70-year lifetime. The use of a flow rate that would occur only 14 days over a 25,550-day lifetime does not yield a representative exposure concentration.

The ARCS report also states that the risk assessment should be applied to ground water beneath and downgradient of the NIROP. Under current USEPA terminology (USEPA, 1989), the NIROP RI risk assessment addressed the current risk. Previous guidance (USEPA, 1986; USEPA, 1985) in use at the time the RI was performed did not include the assessment of future risks (i.e., ground water use beneath and downgradient of the NIROP) which is included in current risk assessment guidance (USEPA, 1989). However, the current guidance also requires the evaluation of the likelihood of the future scenarios. Given that all the on-site and downgradient lands are currently under the institutional control of federal and local government, it is highly unlikely that water supply wells would be allowed in these areas. The evaluation of potential risks from future ground water use is therefore not appropriate.

3. RESPONSE TO COMMENTS ON THE FS

3.1 FS Scope

Additional investigations are planned for 1990. Changes to the proposed remedial action will be made if the new data warrant such changes. The additional investigation activities will be presented in a workplan for USEPA and MPCA review.

3.2 Ground Water Chemical Data

The evaluation of TCE concentration trends provides a reasonable hypothesis for the observed changes. The very flat and slightly variable gradients indicate that wells 3-S and FMC-33 were downgradient of the trench area in 1986, prior to the trend analysis. The significant point of the trend evaluation is the one to two order of magnitude decrease in TCE concentrations after the excavation and removal activity in the trench area. Further investigations planned for 1990 will assess whether additional soil remediation is warranted in the trench area. The TCE concentration trend evaluation for well 6-S provided a workable hypothesis at the time of the RI Report (RMT, 1987). Sampling subsequent to the evaluation found a TCE concentration of 0.32 mg/L (RMT, 1988a), suggesting that the general trend postulated may be correct.

3.3 Remedial Response Objectives

3.3.1 Risk Assessment

The risk assessment, and its application at the Minneapolis water treatment plant, have been addressed in Section 2 of this document.

3.3.2 Ground Water Control

The ARCS report refers to MPCA concerns regarding the downgradient extent of the projected capture zones for the ground water recovery wells. The remedial action is designed to primarily contain and treat the ground water contaminant plume leaving the NIROP. The proposed pumping system will capture at least some of the plume that is within the 650-foot length of aquifer between the NIROP and the Mississippi River as shown on Figure 4-4 (RMT, 1988c). The placement of the wells is intended to balance the need to capture the plume downgradient of the NIROP to the greatest extent possible without impairing the long-term efficiency of the system in capturing the larger plume still in existence beneath the NIROP. The proposed pumping system is also designed on the NIROP to minimize potential problems associated with well head security and operations and maintenance costs.

The fraction of the downgradient plume that is not captured will continue to migrate toward the Mississippi River. The primary receptors are the users of the Minneapolis water supply system. The risk assessments completed to date indicate that the ongoing potential exposures result in risks below the 1×10^{-6} level for incremental carcinogenic risks. It is also reasonable to assume that institutional controls can prevent the use of ground water beneath the East River Road right-of-way and the County Park until the aquifer is remediated by naturally occurring flushing and degradation.

The capture zone for well AT-1 is narrow because the information collected to date suggests that the plume is narrow. As with all of the proposed recovery wells, the pumping rate can be increased if it is

determined that this will expedite the remediation of the facility. Start-up of the recovery system will include evaluation of performance. Modifications to the pumping rates will be made as necessary to improve both the lateral and vertical extent of ground water capture.

There were three production wells on the NIROP. None are in use; therefore, the evaluation of the effects of these wells on the proposed remedial alternative is not warranted.

3.3.3 Point-of-Application of ARARs

The application of ARARs at the downgradient property line of the NIROP are currently not applicable. They are relevant but will only be appropriate if a public water supply well is placed within the East River Road right-of-way or within the approximate 15-acre portion of the Anoka County Park beneath which the plume moves. Given that the land above the entire ground water flow path downgradient of the NIROP is currently under governmental control, it is unreasonable to suppose that ground water use is likely to occur.

3.3.4 Chemical Response Objective

The ARCS report indicates that the "... level of cleanup be better defined so that specific remedial response objectives can be established." Recent guidance (USEPA, 1989b) recommends that, where it is not practicable to attain health-based cleanup levels designed to meet potable ground water use, it may be appropriate to develop a contingent remedy in the Record of Decision (ROD). The USEPA (1989b) goes on to note that ground water extraction systems at nineteen sites generally did not meet

health-based cleanup goals because the contaminant concentrations in the extracted ground water tended to asymptotically approach a concentration above the goals. Concentrations from the NIROP extraction wells are expected to behave in a similar fashion. Given this expectation, the remedial goals in the ROD will be addressed in a form that provides for the contingency that VOC concentrations in ground water may approach an asymptotic level.

3.4 Monitoring Program

3.4.1 Ground Water

Two rounds of ground water sampling are planned for 1990, prior to the start of the ground water extraction system. The first round will include the 52 wells that were sampled in 1988. The second round of sampling will also include the 3 wells proposed for installation in 1990, for a total of 55 wells.

The proposed ground water monitoring system was provided in the FS Addendum (RMT, 1988c). The 10 long-term monitoring wells include the following:

Upgradient:	7-S and three proposed wells (See Figure 4-1, RMT 1988c).
On-site:	8-S and 3-I in the north area and 9-S and 5-I in the southeast area (the FS Addendum mistakenly listed wells 9-S and 3-I in the southeast area).
Downgradient:	18-S and 8-D.

Bedrock well 2-PC will be added to the monitoring program, unless future sampling and analyses show that TCE concentrations have decreased to less than 0.005 mg/L.

The constituents to be analyzed during the long-term monitoring program were noted on page 4-7 of the FS Addendum (RMT, 1988c). It was proposed that ground water samples be analyzed for volatile organic compounds.

A Minnesota Pollution Control Agency policy that became effective in September 1988 (1 month after completion of the FS Addendum [RMT, 1988c]) outlines requirements for Air Quality Analysis. These requirements (including baseline air monitoring and dispersion modeling) will be addressed during the design of the on-site treatment system that is proposed to be in operation by December 1993.

3.5 Ground Water Discharge System

The limitations on sanitary sewer capacity at the NIROP do not affect the ground water remedial action plan. The ground water will now be discharged to a 96-inch diameter sanitary sewer main located immediately west of East River Road during Phase I of the remedial action. Existing plant sanitary sewers will not receive ground water from the extraction wells.

4. RESPONSE TO COMMENTS ON QUALITY CONTROL SUMMARY REPORTS (QCSRs)

4.1 Grout Losses (RMT, 1988d)

The grout "losses" were noted during the construction of well 5-PC. The daily reports indicate the drillers reported that the well required more grout to seal the well than was estimated based on calculations of annular volumes. The most likely explanation for the apparent losses is that the borehole was larger than the nominal drill bit diameter as a result of caving or wash-out along the length of the boring.

4.2 Chemistry Quality Control (RMT, 1988d)

Five field blanks and five duplicate samples were collected with 52 ground water samples which is consistent with USEPA guidance. The MPCA results of split samples were not provided to the U.S. Navy before the RI Addendum was completed, and therefore were not evaluated. The ARCS comments regarding differences in accuracy between the MPCA analyses and the RI analyses are unclear. The mean accuracy, expressed as percent recovery of surrogate-spike samples, for the 1988 sampling round was 98.3 percent. The MPCA data regarding accuracy were not provided to the U.S. Navy. Therefore, the magnitude and potential significance of the RI and MPCA accuracy differences cannot be assessed.

4.3 Soil Pore-Gas Survey (RMT, 1988e)

4.3.1 Hazardous Waste Storage Area C

The ARCS report suggests that the pore-gas survey results may not be valid because RMT (1988e) concluded that there was "low level contamination" in the area, while the ARCS report concludes that the

contamination is "... more extensive than originally expected." TCE concentrations in soil samples from beneath Hazardous Waste Storage Area C are on the order of 0 to 10 mg/kg (Lukas, 1989). This is a low level of contamination relative to that found in the soils beneath the trench area (RMT, 1987). The report also suggests that the "high contaminant concentrations" observed at SG-21 were not confirmed by deeper soil sample or ground water concentrations. The point of the comment is unclear since SG-21 was reported to yield a concentration of < 1 ppm (vol.) of VOCs.

4.4 Aquifer Tests (RMT, 1988f)

4.4.1 Slug Tests

The fact that the water level response during some "slug tests" was too fast to measure with the equipment used does not make the hydraulic conductivity data determined by the slug tests unreliable. As stated in the QCSR, the hydraulic conductivity results of those tests that yielded very rapid recovery rates can only be determined to be greater than the conductivity associated with the fastest recovery that could be measured.

4.4.2 Geologic Definition at AT-2

Well AT-2 was drilled with cable tool methods, and samples were recovered with the sand bailer on the drill rig. The samples recovered were very disturbed, and the exact depth of lithologic changes could not be clearly defined. The sample was adequate to define the occurrence of a "clay-rich" zone at the AT-2 location.

4.4.3 AT-2 Pumping Test

The U.S. Navy agrees that the aquifer pumping test completed at AT-2 is not representative of conditions likely to be encountered where the remedial actions are proposed for implementation. An additional aquifer pumping test is planned for the area south of AT-2.

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