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NIROP FRIDLEY, MN
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LETTER AND COMMENTS FROM MINNESOTA POLLUTION CONTROL AGENCY
REGARDING ANNUAL MONITORING REPORT 2000 AND REMEDIAL ACTION WORK PLAN
MARCH 2000 NIROP FRIDLEY MN (PUBLIC DOCUMENT)
7/12/2000
MINNESOTA POLLUTION CONTROL AGENCY

Minnesota Pollution Control Agency

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

July 12, 2000

Commanding Officer
Southern Division
Naval Facilities Engineering Command
Attn.: Joel R. Sanders, Code 1868
P.O. Box 190010
North Charleston, SC 29419-9010

RE: Naval Industrial Reserve Ordnance Plant Superfund Site

Dear Mr. Sanders:

The Minnesota Pollution Control Agency (MPCA) staff has reviewed the documents entitled "1999 Annual Monitoring Report " (AMR), dated March 2000 and "Remedial Action Work Plan," (RAWP) dated March 2000. The AMR and RAWP are for Operable Unit 1 (OU1) of the Naval Industrial Reserve Ordnance Plant (NIROP) Superfund Site and were submitted pursuant to the Federal Facility Agreement, dated March 27, 1991, between the MPCA, the U.S. Environmental Protection Agency (U.S. EPA), and the U.S. Navy (Navy).

The MPCA staff hereby modifies the AMR pursuant to Attachment I of this letter. The MPCA staff will formally approve the AMR when the MPCA staff modifications are made.

The MPCA staff hereby modifies the RAWP pursuant to Attachment II of this letter.

If you have any questions regarding this letter, please contact me at (651) 296-7818.

Sincerely,

David N. Douglas, Project Manager
RCRA/Superfund Unit
Site Remediation Section
Metro District

DND:csa

Enclosure

cc: Thomas Bloom, U.S. Environmental Protection Agency (w/enclosures)
Mark Sladic, Tetra Tech NUS, Inc. (w/enclosures)

Attachment I

Modifications to the Report Entitled,
"1999 Annual Monitoring Report" (AMR),
Dated March 2000"

1. **Section 1.4 Purpose and Scope, Bullet 5**: The Navy did not attach the Minnesota Pollution Control Agency (MPCA) staff review letter for the 1998 AMR to the 1999 AMR as the Navy indicated that it would do in Mark Sladic's letter of February 7, 2000. The MPCA staff believes that attaching the previous year's MPCA and United States Environmental Protection Agency (U.S. EPA) AMR review comments helps provide continuity on AMR issues. The MPCA staff again requests that the Navy attach comments to the 1999 AMR.

2. **Section 1.5 Potential Source Areas, Bullet 6**: The characterizations made about the dumping of contaminated foundry sands in Anoka County Park (ACP) differ qualitatively and quantitatively from the United Defense LP (UDLP) response to the U.S. EPA CERCLA 104(e) Request for Information, dated July 28, 1999. The MPCA staff believes that the UDLP response more accurately characterizes the disposal activities in the park. U.S. EPA is still evaluating the consequences of this disposal.

3. **Section 4.1.1.1 Groundwater Flow**, page 4-2, paragraph 1: This section references Figures 4-1 through 4-4 which present potentiometric contour maps for pumping conditions for the shallow, intermediate, deep and bedrock aquifers from measured water levels in monitoring wells. The MPCA staff has reviewed the maps and has noted some areas where it believes different interpretations better fit the regional model in the site area and in some areas may have different interpretations of the data. The modified MPCA staff maps have previously been provided to TtNUS. Copies of the marked maps are included in the modifications (Figures 4-1, 4-2, 4-3 and 4-4).

4. **Section 4.1.1.1 Groundwater Flow** - Pumping Conditions, pages 4-3, paragraph 1: The ground water mound discussed in this section is a very unusual ground water feature for which there appears to be no satisfactory geologic/hydrogeologic explanation. Modified draft MPCA staff maps have previously been provided to TtNUS (see MPCA marked Figures 4-1 through 4-4 included as part of these modifications) and indicate a different interpretation of the data that may better fit the regional model in the site area. The alternative interpretation provided shows more direct flow to the river. It is unlikely that a ground water mound exists that would limit flow of contaminated ground water to the river as stated in the report. It is more likely that beyond the capture zone of the pumpout system ground water flow is directly towards the river.

   Resolution of the ground water flow regime in this area is important for the implementation of any ACP remedy. Introduction of reactants for enhanced bioremediation options will require an understanding of the basic ground water flow direction. The flow direction will also determine where monitoring will need to be installed to monitor bioremediation progress and potential breakdown products.

The MPCA staff requests that an adequate number of monitoring wells be installed prior to implementation of the ACP pilot test to determine the groundwater flow direction in ACP. Resolution of this issue is an important factor in the design of the enhanced bioremediation pilot study. The monitoring well work could be included as an early part of the pilot study or as part of the drilling required for the installation of new pumping wells prior to the pilot test.

5. **Section 4.1.1.1 Groundwater Flow** - Pumping Conditions, page 4-3, paragraph 2: The hydraulic head values measured in FMC-31 seems to indicate a large cone of depression in the Prairie du Chien aquifer. The hydraulic head in this well is not consistent with the hydraulic heads in other Prairie du Chien wells in the area and becomes the dominant influence for drawing equipotentials for the aquifer. For such a depression as depicted in Figure 4-4 to be present, a large quantity of ground water would need to be removed from the aquifer (such as a high capacity pumping well). There is no indication that there is high capacity pumping of the magnitude required to support this feature. There is reasonable doubt that the hydraulic head measured in this well is accurate. There may be a problem with the well due to a measurement error, surveying error, well condition or well construction.

   If the hydraulic head from this well is eliminated from the map a more reasonable contour map can be drawn. The map shows a south to southwestern component of flow. It is documented in other regional studies that the Prairie du Chien discharges to the Mississippi River in this area. Equipotential lines need to bend parallel near the river for this discharge to occur.

   The staff requests that the Navy review of this map and monitoring well FMC-31 data to determine if a more reasonable map, consistent with the regional relationship of the Prairie du Chien and the Mississippi River, could be constructed. The draft MPCA staff marked map showing an alternative interpretation has been provided to TetraTech and is included as part of the modifications included in this letter.

6. **Section 4.1.1.1 Groundwater Flow** Non-Pumping Conditions and Effect of Extraction Wells, pages 4-5, paragraph 2: The report indicates that under non-pumping conditions a natural depression is observed in the AT-5A area. It is possible that the depression observed might be, in part, because not all of the monitoring wells had a chance to come completely to equilibrium in the limited time that the pumps were shut off. Monitoring control in this area is also limited north of AT-5A making contouring of equipotential lines highly interpretive. Any interpretations of the ground water flow regime that rely on this depression should be viewed with caution considering these factors.

7. **Section 4.1.1.2 Interaction between the Aquifer System and Mississippi River**, page 4-5: It should be noted in this section that the regional model for this area and the site hydraulic head data indicates that the NIROP aquifers all discharge to the Mississippi River. The hydraulic contours presented in Figures 4-1 through 4-4 should all reflect this concept. For some of the maps the hydraulic contours need to be drawn parallel to the river to accommodate this flow. The MPCA staff requests that the hydraulic head maps be modified to reflect this. Modified draft MPCA staff maps (Figures 4-1 through 4-4) have previously been provided to TtNUS and are included as part of the modifications in this letter.

8. **Compliance Monitoring Wells**: The MPCA staff will use the following wells to monitor the progress of reducing the NIROP plume to meet surface water quality standards for the Mississippi River: USGS-5, MS-43S, MS-43I, MS-43D, MS-44S, MS-44I, MS-44D, 27-S, 16-IS, 16-D, MS-47S, MS-47I, MS-47D, MS-49S, MS-49I, MS-49D, 19-S, MS-51I, 9-D, MS –52S, MS-52I and MS-52D.

   The staff requests that the Navy include this monitoring well network in future AMRs and compare the concentrations observed in these monitoring wells to the applicable surface water quality standards for the Mississippi River. The staff requests that exceedances of water quality standards in the wells be identified in the report and an annual evaluation of trends for compounds for which there are surface water quality standards be included. If ground water contaminants are present for which there are no surface water quality standards, the MPCA staff will develop site-specific, water-quality standards.

9. **Section 4.5 Air Emission Monitoring Data**: In this and future AMRs, the MPCA staff requests that the Navy provides data on air emission monitoring. The Navy agreed to do this for the 1999 AMR (see Item 6 of Mark Sladic's letter to the MPCA staff dated February 7, 2000).

10. **Section 5.1 Plume Animation**: It is not clear that the plume is shrinking based on the animation. The MPCA staff believes that the apparent increase in the size of the plume is a function of adding more monitoring wells to a wider sampling area. It is not clear what importance should be attributed to this animation.

11. **Section 6.1 Summary and Conclusions,** pages 6-1 and 6-2: Several references are made that "[b]ased upon hydraulic data, it is believed that contamination in the southern end of ACP may have originated from the UDLP site (see Section 4.3.2.2)." The MPCA requests that the Navy and UDLP negotiate and voluntarily agree on a division of responsibility in the southern portion of the plume area.

    The agreement would define a boundary north of which the Navy would agree to be responsible for remediation of contaminated ground water and south of which UDLP would be responsible for remediation of contaminated ground water. The MPCA staff requests that the Navy provide us with a signed letter of agreement regarding this issue that includes the technical justification for the establishment of the boundary and a map which shows the agreed upon division of responsibility.

12. **Section 6.1 Summary and Conclusions,** pages 6-1 and 6-3: The report states in various places that "[b]oth hydraulic and chemical data suggest that elevated concentrations in the ACP are likely a remnant of contamination present before the extraction wells were in place and persist due to natural hydraulic conditions." The MPCA staff agrees in part with this statement. Also, the Navy needs to acknowledge in the AMR that a portion of the contamination that exists in the ACP is the result of the flow of contaminated ground water from the NIROP that is not presently being captured by the current pumpout system. Current data indicates that that is the case and the need for additional pumping wells to achieve capture is part of the report recommendations. The MPCA staff requests that the text be modified to reflect this.

13. **Section 6.1 Summary and Conclusions, Deep Monitored Interval**, page 6-3: In the deep aquifer interval, the MPCA staff notes that concentrations are increasing in wells 9-D, 15-D and 17-D. Concentrations in 12-D have apparently stabilized since increases in the well since 1995. The MPCA staff requests that the Navy evaluate the increase in concentration in deep wells to attempt to determine causes for increases in contaminant concentrations in the wells. In particular, the evaluation is to determine the timeframe for increases in these wells in relation to the startup of pumping well AT-5B. Also, the evaluation is to determine if increases in deep wells may be a result of contamination from the shallow or intermediate aquifer zones being pulled deeper by pumping at AT-5B. Higher concentrations of VOC contamination exist in the shallow and intermediate aquifer zones in general at the NIROP Site. If the Navy determines that pumping at AT-5A is pulling contamination from above, the staff requests that the Navy evaluate reductions of pumping rates in AT-5A to reduce or eliminate this problem.

14. **6.2 Recommendations**, Item 2, pages 6-4 and 6-5: Well AT-2 is screened largely in low permeability silty clay and has produced only a small portion of the designed pumping rates. According to TetraTech, the upper 15 feet of the well is open to the shallow unconfined sand aquifer in the well location. It is assumed that the majority of the water pumped from this well comes from the shallow unconfined sand screened by the upper 15 feet of the well screen. If this is the case, the well provides little if any capture in the intermediate zone south of the AT-2 location. As such, the well does little to compliment AT-3A to capture the intermediate plume as originally designed and is essentially operating as a shallow unconfined aquifer recovery well. In discussions with TtNUS, the MPCA staff has recommended that AT-2 be abandoned and that the pumping capacity be reallocated to another area. TtNUS has not supported this idea.

    It may be possible that the two new wells proposed by TtNUS for the area between AT-2 and AT-3A will provide effective shallow capture such that AT-2 may not be needed. In Scenario 2b, TtNUS has recommended reducing the pumping rate in AT-2 from 34 to 20 gallons per minute (gpm). At 20 gpm, the capture zone of AT-2 would be relatively small.

    If the pumping rate in AT-8 were increased somewhat, the capture zone of AT-8 may eliminate the need for AT-2. Well AT-2 could then be abandoned. Given the pumping capacity concerns and the limited hookups available in the existing treatment, building well abandonment should be considered. An additional available hookup in the treatment building would allow for the potential addition of another pumping well in an area where additional pumping is needed to achieve capture of the NIROP plume.

    TtNUS has proposed two new shallow pumping wells between AT-2 and AT-3A at the compliance boundary to provide shallow plume capture. The MPCA staff agrees that additional pumping is needed in this area to capture the shallow plume. Monitoring data will be reviewed to determine if the new wells have improved the capture in the shallow aquifer. If monitoring shows that the new well modifications do not achieve capture of the shallow plume in the area between AT-2 and AT-3A, the MPCA staff requests that additional modifications to the pumping system be evaluated.

15. **6.2 Recommendations**, Item 2, pages 6-4 and 6-5: The MPCA staff has provided the Navy with an alternative interpretation for the area between AT-3A and AT5-A in the intermediate zone equipotential map (see MPCA staff draft map for the intermediate zone). The MPCA staff map and other supporting data indicates an area of non-capture in the intermediate zone in the vicinity of monitoring wells 12-I and 13-I (see marked draft MPCA staff equipotential map, Figure 4-3). The AT-5A pumping test evaluation indicated that "[a]ll the wells screened below the clay layer showed very little, if any, effect from the pumping..." Well 12-I showed a weak response during the AT-3A pump test. The weak response is possibly from the long distance between the pumping well and 12-IS and the high permeability of the gravelly sand in which 12-IS is screened. The data from both pumping tests and the MPCA staff draft equipotential maps strongly suggest an area of non-capture.

    In the ground water model the highest residual errors (i.e., the predicted minus the measured hydraulic head values) occurred in both the November and the January head measurements in monitoring wells 12-IS and 13-IS. In both events the predicted hydraulic heads were between –6.4 and –5.33 feet for well 12IS and between –7.60 and –5.66 feet for well 13-IS. In both cases the predicted water levels were considerably lower than the measured hydraulic heads. The residual errors for these two wells are the largest disagreement between measured and predicted hydraulic heads and indicates that the model is in the largest disagreement with actual conditions in this area. It is possible that the model therefore likely indicates that there is a much greater influence from pumping than is actually observed in the measured water levels. Due to the lack of calibration in this area, the model is most likely not a good predictor of potential capture in this area and may be overly optimistic with regards to predicting capture in the area of 12-IS and 13-IS. The MPCA staff recommends that additional modifications be performed to the ground water model to reach a better agreement between measured and predicted solutions.

    Relatively high Volatile Organic Compound (VOC) concentrations exist in ground water in both wells 12-IS and 13-IS. If capture is poor or does not exist in this area, ground water with relatively high VOC concentrations would be allowed to flow into Anoka County Park.

    An area of relatively high concentration ground water exists in ACP in an area downgradient of the current pumpout system. This area of high concentration in ACP may be the result of non-capture of the intermediate plume in the area of 12-IS and 13-IS.

    In NIROP technical subcommittee meetings and in partnering meetings there has been agreement that a site goal is to achieve capture of the plume before applying a remedial technology in ACP. Based on the previous discussions, the MPCA staff feels that there is sufficient technical information available that indicates there is an area of non-capture in the intermediate aquifer zone in the area of 12-IS and 13-IS. This information includes: interpretation of measured hydraulic head data; the lack of response of the two wells to the AT-5A pump test; the poor response to the AT-3A pump test; the distance of 12-IS and 13-IS from AT-3A; the high permeability of the materials in which 12-IS is screened; and the existence of high concentrations of VOCs in the ground water downgradient of this area in ACP. Based on this information, the MPCA staff recommends that an additional pumping well be installed in the intermediate zone in the area of 12-IS and 13-IS to augment the capture of AT-3A.

In the technical memorandum, Extraction Well Evaluation – Naval Industrial Reserve Ordnance Plant, Fridley, Minnesota, prepared by TtNUS, blocking off the lower 30 feet of the AT-3A well screen was evaluated. The evaluation indicates that by blocking the screen the pumping of Prairie du Chien water is reduced by approximately 17%. The evaluation does not indicate that the change will result in providing additional capture in the 12-IS and 13-IS area. In the evaluation it appears that the model was used to in the evaluation. Given the high calibration errors in the model in this area it is doubtful that the model can be used to accurately predict the effects of the modification to AT-3A to the 12-IS, 13-IS area. As stated above, the MPCA staff recommends that an additional pumping well be installed in the intermediate zone in the area of 12-IS and 13-IS to augment the capture of AT-3A.

16. **6.2 Recommendations**, Item 2, pages 6-5 and 6-6: The MPCA staff agrees that the highest VOC contamination in ground water at the site is present in the shallow and intermediate intervals. The MPCA staff agrees that changes to the current extraction system should focus on achieving capture of the relatively higher VOC levels found in the shallow and intermediate intervals. At present deep pumping by wells AT-3A and AT5B may be pulling shallow and intermediate contamination into deeper portions of the Quaternary aquifer. An evaluation of the pumping system should be done to determine if there is a possible way to minimize these impacts.

17. **6.2 Recommendations**, Item 2, page 6-5: The evaluation of VOC leaching from OU2 soils to ground water resulted in agreement that well AT-4 be retained to capture VOCs migrating from the soil to the ground water. The MPCA staff requests that the Navy re-evaluate the impacts of AT-4 in remedy decisions for OU2 soil (see page 39 of meeting minutes from Partnering Meeting #2, dated February 27, 1997). The MPCA staff realizes that for the current system there are limitations regarding capacity. Well AT-4 is not as an effective use of well capacity as might be realized in other pumping locations. The MPCA staff supports reallocation of AT-4 pumping to another location but requests that the Navy completes an evaluation of the impacts of discontinuing pumping AT-4.

18. **6.2 Recommendations**, Item 5, page 6-5: The Navy has requested changes in the analyte list based on cost savings, but the Navy has not provided the staff with any information regarding potential cost savings for reducing the analyte list. At this time, the MPCA staff does not support the reduction in the present analyte list. In some of the monitoring wells significant VOC contamination other than TCE exists that should continue to be monitored.

19. **6.2 Recommendations**, Item 6, page 6-5: The MPCA staff has proposed modification of the sampling scheme recommended in Table 6-1 to include only one chemical sampling round in October. The monitoring wells to be sampled are indicated on an MPCA staff modified Table 6-1 that is included as part of the modifications in this letter. The MPCA staff requests that water level measurements be collected twice a year at the same level of effort used to produce equipotential maps for the 1999 AMR.

20. **6.2 Recommendations**, Item 7, page 6-5: The MPCA staff can consider the approval of abandonment of monitoring wells on an annual basis as part of the AMR review. At this time, the MPCA staff does not approve abandonment of any monitoring wells.

21. **6.2 Recommendations**, pages 6-4 through 6-6: Any remedial changes carried out by the Navy should be monitored as part of the AMR yearly evaluation of site remedies and as part of the Five-Year Review process. If these evaluations indicate that site remedies are not achieving Site ARARs; are not protective of human health and the environment; or do not satisfy ROD requirements, the MPCA staff requests that additional remedial actions be evaluated by the Navy.

22. **Generalized Cross Section A-A'**: The MPCA staff requests that cross section A-A' be modified to show a more accurate location of the screened interval and geology at the AT-2 pumping well location. The current cross section does not reflect the geologic information found in the well driller's log. In the area between USGS 9 and AT-5A, the United States Geological Survey (USGS) pump test report has a different interpretation of the location of the silty clay layer than that shown on the cross section. The pump test seems to support the USGS interpretation. The MPCA staff requests that the Navy modify the cross section consistent with the USGS interpretation.

23. **General Modification**: For future AMRs and other major deliverables, the MPCA staff requests that for major data collection efforts (chemical sampling and water levels), the Navy share the data with the regulatory agencies as soon as possible. In addition, the staff requests that initial data reporting, initial interpretations of the data and preliminary conclusions and recommendations be discussed by the technical subcommittee in routine scheduled meetings prior to the issuance of the draft AMR or other similar reports. The staff anticipates that the sharing of data and prior review and discussion of the data will result in more streamlined reviews of the final reports and will lead to fewer comments and disputes that result from the current arrangement for regulatory review of final reports. The MPCA staff is willing to discuss development of a working model to implement this change in report review with the Navy, U.S. EPA and site contractors.

Attachment II

Comments to the Report Entitled,
"Remedial Action Work Plan," (RAWP),
Dated March 2000

1. **General Comment**: The MPCA staff requests that the Navy modify the RAWP to be consistent with the MPCA staff review comments to the 1999 AMR.

2. **General Comment**: As Mark Sladic and I discussed on July 11, 2000, the Navy is working on a updated Site Quality Assurance Project Plan (QAPP). The QAPP is a component of the RAWP. In the future some of the contents of the present RAWP will be transferred to the QAPP, with the QAPP becoming the document that explains the requirements for all site sampling for all operable units and all media. It is my understanding that the Navy agrees to this comment.

TABLE 6-1

PROPOSED CHEMICAL MONITORING PLAN FOR LONG TERM MONITORING
NIROP FRIDLEY
FRIDLEY, MINNESOTA
PAGE 1 OF 4

Well Number	Continue or Add Well to ~~LTM~~ October 2000 Samp.	Eliminate Well from Existing LTM	Do Not Include Well in LTM	Sample Schedule of Proposed LTM		Rationale for Recommendation[3]
				Sample Semi-annually and Re-evaluate[1]	Sample Annually and Re-evaluate[2]	
Wells in the Shallow Monitoring Zone (Shallow Unconfined Aquifer)						
1-S		X				5 background wells (1-S, 13-S, 15-S, 16-S, and 23-S) not needed; TCE below MCL for 7 out of 8 sample rounds
2-S		X				Replace with USGS 2. Provides little value now that we know the groundwater flow direction is to the southwest.
3-S	X			X		Elevated TCE remains at this location.
5-S	X				X	TCE has not been detected above the MCL for TCE (5 µg/L) since the 2nd quarter of 1993
7-S	X	X				7-S may indicate a potential offsite contaminant source that is unrelated to the NIROP
8-S	X				X	Concentrations have continued to decrease through 1997, but have stagnated since.
9-S	X			X (see rationale)		If AT-1A is shut down continue to monitor bi-annually to see if TCE levels increase; if AT-1A continues reduce sampling to 4th quarter only
13-S	X	X				5 background wells (1-S, 13-S, 15-S, 16-S, and 23-S) not needed; TCE below MCL for 8 out of 8 sample rounds
15-S	X			X		background well; TCE spike in fall 1999 sample round
16-S	X	X				Concentrations have remained stagnant since it was added in 1995.
17-S	X	X				TCE has remained relatively constant between 1995 and 1999. Lateral extent in ACP is better determined by MS-43S
18-S	X			X		Continue to monitor for major fluctuations in ACP
19-S	X			X		Continue to monitor for sporadic TCE fluctuations; unclear if contamination in this well is from UDLP
20-S	X				X	TCE has not been detected above the MCL for TCE (5 µg/L), a TCE spike of 9.1 µg/L was detected in the fall of 1999.
21-S	X				X	Defines the upgradient extent of NIROP contamination
23-S	X				X	23-S may indicate a potential upgradient contaminant source that is unrelated to the NIROP
24-S	X			X		continue to monitor in the vicinity of AT-2 (this well may show marked improvements if AT-2 is redrilled in permeable material
25-S	X	X				TCE was only detected once (0.4 µg/L in October 1997) since 1994; that is, TCE was non-detect in the last 11 of 12 sample rounds
26-S	X			X		26-S has shown a steady increase in concentration since 1994
27-S	X			X		Continue to monitor as a compliance point well
MS-28S	X			X		define the separation between the northern and southern plumes
MS-29S	X		X			MS-28S will define the separation between the northern and southern plumes
MS-30S			X			plume defined; no added value with additional data
MS-31S	X			X		will help define the separation between the northeastern and southwestern plumes shown on Figure 4-19
MS-32S	X			X		assist in defining the upgradient edge of the southwestern plume
MS-33S	X		X			MS-31S will define the separation between the northeastern and southwestern plumes
MS-34S	X		X			MS-35S should monitor the data gap here
MS-35S	X			X		Determine if any TCE is slipping by above and/or between extraction wells AT-3a and AT-5a.
MS-36S	X			X		Evaluate what TCE levels are slipping by extraction wells.
MS-37S	X			X		Determine if any TCE is slipping by above and/or between extraction wells AT-3a and AT-5a.
MS-38S			X			MS-37S should monitor the data gap here
MS-39S			X			MS-37S should monitor the data gap here
MS-40S				X		Determine if any TCE at this well is collected by AT-5a.
MS-41S	X				X	Determine if there is a separation in the TCE plumes at East River Road.
MS-43S	X			X		7-S was eliminated. Lateral extent in ACP is better determined by MS-43S
MS-44S	X		X		X	

TABLE 6-1

PROPOSED CHEMICAL MONITORING PLAN FOR LONG TERM MONITORING
NIROP FRIDLEY
FRIDLEY, MINNESOTA
PAGE 2 OF 4

Well Number	Continue or Add Well to LTM October 2000 Samp.	Eliminate Well from Existing LTM	Do Not Include Well in LTM	Sample Schedule of Proposed LTM		Rationale for Recommendation[3]
				Sample Semi-annually and Re-evaluate[1]	Sample Annually and Re-evaluate[2]	
MS-45S	X		X			sampling MS-46S will provide sufficient coverage of this hot spot
MS-46S	X			X		Highest concentration in ACP. Monitor to determine concentration over time.
MS-47S	X			X		Monitor as a compliance point well. Important because it is downgradient from MS-46S highest concentration in the ACP
MS-49S	X				X	Monitor as a compliance point well. Sample once per year to see if it increases. If so increase it to twice per year.
MS-52S	X		X			Due to groundwater flow direction, TCE in this well may be coming from UDLP
FMC-20	X		X			Due to groundwater flow direction, TCE in this well may be coming from UDLP
USGS-2	X			X		Due to the southwesterly groundwater flow direction USGS-2 would provide more useful information than 2-S.
USGS-4			X			Two sample rounds determined the well contains no TCE
USGS-5	X				X	Two rounds determined that near non-detect levels of TCE are present, yet additional results will delinate lateral extent of the plume; compliance point well
USGS-8	X		X			Two rounds determined that near non-detect levels of TCE are present, yet additional results will delinate lateral extent of the plume; compliance point well
AT-2	X			(4)		Determine amount of TCE extracted from the aquifer system
AT-4	X			(4)		Determine amount of TCE extracted from the aquifer system.
Subtotal	**28**	**1**	**12**	**18**	**9**	
Wells in the Intermediate Monitoring Zone (Shallow Unconfined Aquifer)						
1-IS	X				X	continue to monitor background conditions; reduce sample frequency because contamination has stabilized.
2-IS	X				X	Continue to sample to determine if TCE is emanating onsite from an upgradient offsite source; reduce sample frequency because contamination has stabilized.
3-IS	X				X	TCE remained relatively stable (within the same order of magnitude) since 1997 where it ranged from 37 to 77 µg/L
4-IS	X			X		monitor minor fluctuations of TCE in ACP
5-IS	X			X (see rationale)		If AT-1A is shut down continue to monitor bi-annually to see if TCE levels increase; if AT-1A continues reduce sampling to 4th quarter only
10-IS	X	X				TCE not detected or detected below MCL's for 9 out of 9 sample rounds
12-IS	X			X		monitor TCE
14-IS	X			X		monitor TCE drawn toward AT-5A
15-IS	X			X		monitor minor fluctuations of TCE in ACP
16-IS	X			X		compliance point well; monitor minor fluctuations of TCE in ACP
MS-28I	X			X		verify OU3 results and define the northern upgradient extent of the northeastern plume
MS-29I	X			X		verify OU3 results and define the northwest upgradient extent of the northeastern plume
MS-30I	X			X		verify OU3 results and define the eastern upgradient extent of the northeastern plume
MS-31I			X			this well would be a good well define the extent of elevated TCE to the south but the MPCA doesn't believe concentrations in this well represent true conditions
MS-32I	X			X		verify OU3 results (that TCE in this well is 59,000 µg/L) and monitor
MS-33I	X			X		verify OU3 results (that TCE in this well is 14,000 µg/L) and monitor
MS-34I			X			well MS-35I will determine if contamination is not be contained
MS-35I	X			X		contamination may not be contained; data from this well will assist in evaluation of extraction well modifications

TABLE 6-1

PROPOSED CHEMICAL MONITORING PLAN FOR LONG TERM MONITORING
NIROP FRIDLEY
FRIDLEY, MINNESOTA
PAGE 3 OF 4

Well Number	Continue or Add Well to ~~LTM~~ October 2000 Sampling	Eliminate Well from Existing LTM	Do Not Include Well in LTM	Sample Schedule of Proposed LTM		Rationale for Recommendation[3]
				Sample Semi-annually and Re-evaluate[1]	Sample Annually and Re-evaluate[2]	
MS-36I	X			X		data from this well will assist in determining if there is blowby past the extraction wells
MS-40I	X				X	continue to evaluate lateral extent of plume
MS-41I	X				X	determine what contamination is slipping past AT-5A; possibly evaluate the separation between NIROP and ACP plumes.
MS-42I	X		X			lateral extent of plume established; additional monitoring will provide no value in evaluating plume containment
MS-43I	X				X	continue to evaluate lateral extent of plume and establish concentration at compliance point
MS-44I	X			X		compliance point well
MS-45I	X			X		well immediately below highest concentration in the shallow aquifer in ACP. Monitor to determine concentration over time.
MS-46I	X		X			sampling MS-45I will provide sufficient coverage of this hot spot
MS-47I	X			X		compliance point well and highest contamination determined in intermediate zone in ACP
MS-49I	X			X		compliance point well
MS-51I	X		X			Due to groundwater flow direction, TCE in this well may be coming from UDLP
MS-52I	X		X			Due to groundwater flow direction, TCE in this well may be coming from UDLP
AT-1A	X			(4)		Determine amount of TCE extracted from the aquifer system.
AT-5A	X			(4)		Determine amount of TCE extracted from the aquifer system.
Subtotal	**25**	**1**	**6**	**17**	**6**	

Wells in the Deep Monitoring Zone (Deep Confined Aquifer)

1-D	X				X	continue to monitor background conditions; reduce sample frequency because contamination has stabilized.
2-D	X	X				TCE concentrations have stabilized (between 3.7 and 6.4 µg/L) for all of 9 sample rounds
4-D		X				TCE remained below MCLs since it was first sampled in 1994 (14 rounds)
6-D	X				X	TCE has remained below MCLs for the last two years but it is needed to define separation between the two deep aquifer plumes
7-D	X				X	TCE remained relatively stable (within the same order of magnitude) since 1997 where it ranged from 22 to 36 µg/L
8-D	X			X		TCE has decrease slightly (120 to 70 µg/L) since 1997 but remain above MCLs
9-D	X	X				Due to the groundwater flow direction, TCE in this well may be coming from UDLP
12-D	X				X	TCE remained relatively stable (within the same order of magnitude) since 1997 where it ranged from 11 to 31 µg/L
13-D		X				TCE remained below MCLs since it was first sampled in 1994 (14 rounds)
14-D	X	X				No TCE has been detected in the last 8 sample rounds (since '96) Upgradient Source
15-D	X				X	continue to sample due to minor fluctuations
16-D	X				X	compliance point well; TCE has stabilized between 14 and 65 µg/L since 1993 (19 sample rounds)
17-D	X			X		monitor TCE drawn toward AT-5B; TCE has remained within the same order of magnitude since 1996 (6 sample rounds); highest concentration in deep aquifer
MS-28D	X				X	monitor downgradient end of the northeastern plume
MS-29D			X			the plume has been defined; no valued added by sampling this point
MS-30D	X		X			the plume has been defined; no valued added by sampling this point
MS-31D			X			the plume has been defined; no valued added by sampling this point; MPCA doesn't believe concentrations in this well represent true conditions
3-D	X					Monitor E. edge of plume Potential off-site sources
10-D	X					Monitor potential off-site sources.

TABLE 6-1

PROPOSED CHEMICAL MONITORING PLAN FOR LONG TERM MONITORING
NIROP FRIDLEY
FRIDLEY, MINNESOTA
PAGE 1 OF 4

Well Number	Continue or Add Well to ~~LTM~~ October 2000 Sampling	Eliminate Well from Existing LTM	Do Not Include Well in LTM	Sample Schedule of Proposed LTM		Rationale for Recommendation[3]
				Sample Semi-annually and Re-evaluate[1]	Sample Annually and Re-evaluate[2]	
MS-32D	X				X	sampled to define separation between the two deep aquifer plumes; monitor contamination migrating downward from the intermediate zone
MS-33D	X				X	define the upgradient extent of the southwestern plume; monitor contamination migrating downward from the intermediate zone
MS-34D			X			lateral extent of plume established; MS-35D will evaluate contamination in this area
MS-35D	X				X	evaluate any contamination migrating downward form the intermediate zone
MS-36D	X		X			MS-35D will evaluate any contamination migrating downward form the intermediate zone
MS-40D	X				X	TCE level was unexpectedly high at 120 µg/L; this may be coming from the UDLP based on hydraulic data (?)
MS-41D			X			coverage sufficient by 8-D and 15-D in this area
MS-43D	X		X			lateral extent of plume established; additional monitoring will provide no value in evaluating plume containment
MS-44D	X			X		compliance point well
MS-47D	X				X	compliance point well
MS-49D	X				X	compliance point well
MS-52D	X		X			Due to the groundwater flow direction, TCE in this well may be coming from UDLP
AT-3A	X			(4)		Determine amount of TCE extracted from the aquifer system.
AT-5B	X			(4)		Determine amount of TCE extracted from the aquifer system.
Subtotal	18	5	8	8	13	
Wells in the PC Bedrock Aquifer						
1-PC		X				TCE was detected below MCL for 5 of the last 5 sample rounds
2-PC		X				TCE was detected below MCL for 5 of the last 5 sample rounds
3-PC		X				TCE was detected below MCL for 5 of the last 5 sample rounds
4-PC		X				TCE was detected below MCL for 5 of the last 5 sample rounds
5-PC	X				X	monitor groundwater quality (particularly PCE and TCE) from upgradient site
MS-48PC	X				X	determine if TCE remains above MCL
MS-50PC	X		X			TCE detected below MCL
MS-53PC	X				X	determine if TCE remains above MCL
FRIDLEY WELL NO. 13	X				X	continue to monitor to confirm that potable water from this well is unaffected by contamination
Subtotal	4	4	1	0	4	

Notes:
(1) Sample twice per year (2nd and 4th quarters). Reevaluate after 1 year of sampling is complete.
(2) Sample once per year (4th quarter round only). Reevaluate after 1 year of sampling is complete.
(3) See Section 4.3.2 and Appendix A-1 and A-2 for historical groundwater analytical results.
(4) Continue current sample schedule documented in the RAMP (TtNUS, 2000e). Eliminate if any of the wells are taken out of operation.
LTM - long term monitoring
PCE = Tetrachloroehene
TCE = Trichloroethene
ND = Not detected