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**INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT**

**FIVE-YEAR REVIEW REPORT OF THE FINAL REMEDY FOR
THE NEW BRIGHTON/ARDEN HILLS SUPERFUND SITE**

**Distribution is limited to
U.S. Government Agencies only for
protection of privileged information.
Other requests for the documents
must be referred to:**

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**SEPTEMBER 1999
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**SEPTEMBER 1999
FINAL REPORT**

**U.S. ARMY CORPS OF ENGINEERS
WENCK ASSOCIATES, INC.**

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TCAAP

Five-Year Review Report

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List of Acronyms

| | |
|---------|---|
| Alliant | - Alliant Techsystems Inc. |
| APR | - Annual Performance Report |
| ARAR | - Applicable or Relevant and Appropriate Requirements |
| CAMU | - Corrective Action Management Unit |
| CERCLA | - Comprehensive Environmental Response, Compensation, and Liability Act |
| CRA | - Conestoga-Rovers & Associates, Inc. |
| EE/CA | - Engineering Evaluation/Cost Analysis |
| ESD | - Explanation of Significant Difference |
| FFA | - Federal Facilities Agreement |
| FY | - Fiscal Year |
| GAC | - Granular Activated Carbon |
| gpm | - Gallons per Minute |
| IRA | - Interim Remedial Action |
| MCES | - Metropolitan Council Environmental Services |
| MDH | - Minnesota Department of Health |
| MERLA | - Minnesota Environmental Response and Liability Act |
| MPCA | - Minnesota Pollution Control Agency |
| NB/AH | - New Brighton/Arden Hills |
| NBM | - New Brighton Municipal |
| NPL | - National Priorities List |
| O&M | - Operation and Maintenance |
| OU | - Operable Unit |
| PCBs | - Polychlorinated Biphenyls |
| PGAC | - Permanent Granular Activated Carbon |
| PGRS | - Plume Groundwater Recovery System |
| POTW | - Publicly-Owned Treatment Works |

List of Acronyms (Cont.)

| | |
|-------|--|
| RCRA | - Resource Conservation and Recovery Act |
| ROD | - Record of Decision |
| SDWA | - Safe Drinking Water Act |
| SVE | - Soil Vapor Extraction |
| SWCA | - Special Well Construction Area |
| TCAAP | - Twin Cities Army Ammunition Plant |
| TGRS | - TCAAP Groundwater Recovery System |
| µg/l | - Micrograms per liter |
| USAEC | - U.S. Army Environmental Center |
| USEPA | - U.S. Environmental Protection Agency |
| VOCs | - Volatile Organic Compounds |
| Wenck | - Wenck Associates, Inc. |

1.0 Introduction

A five-year review was performed for the New Brighton/Arden Hills Superfund (NB/AH) Site, which consists of three operable units. Records of Decision were signed between 1992 and 1997. Operable Unit 3 triggered this five-year review. Although five-years has not elapsed for all operable units, the decision was made to review all three operable units at the same time for the sake of efficiency and completeness. Data available before October 1998 was primarily used for the five-year review.

This report is organized into the following sections:

- I. Introduction
- II. Operable Unit 1
- III. Operable Unit 2
- IV. Operable Unit 3
- V. Other Removal Actions
- VI. Schedule for Next Five-Year Review
- VII. Approvals

1.1 AUTHORITY AND PURPOSE

The U.S. Army performed this statutory five-year review under Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), for review by the U.S. Environmental Protection Agency (U.S. EPA), Region 5, and the Minnesota Pollution Control Agency (MPCA). The purpose of a statutory five-year review is to evaluate whether a completed remedial action remains protective of human health and the environment at sites where hazardous waste remains on-site at levels that do not allow for unlimited use and unrestricted exposure. The Type I review conducted for this site, as requested by the U.S. EPA,

is applicable to a site at which construction is generally complete and there are no factors which suggest a higher level of review is necessary.

1.2 DOCUMENTS CONSULTED

The primary references used in preparation of this report were:

- Record of Decision (ROD) - Groundwater Remediation, Operable Unit 1, September 1993
- Record of Decision - Operable Unit 2, October 1997
- Record of Decision - Groundwater Remediation, Operable Unit 3, September 1992
- TCAAP Fiscal Year 1998 (FY 1998) Annual Performance Report (APR), Draft, February 1999
- TCAAP FY 1997 APR, August 1998
- TCAAP Annual Monitoring Reports - FY 1994, 1995, and 1996

1.3 SITE BACKGROUND

From 1941 to 1976, the mission of the Twin Cities Army Ammunition Plant (TCAAP) was the production of ammunition for the United States during World War II, the Korean Conflict, and the Southeast Asia Conflict. Today TCAAP is in modified caretaker status and is implementing a comprehensive environmental cleanup program under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), and Minnesota Environmental Response and Liability Act (MERLA). The U.S. Army, Department of Defense contractor Alliant Techsystems Inc. (Alliant), the U.S. Army Reserves, and the Minnesota National Guard operate on the installation.

The 2,340-acre installation is located on top of the Prairie du Chien-Jordan aquifer, the Twin Cities metropolitan area's major source of drinking water. The site is a rare "prairie pothole" wetland, is on a Mississippi River tributary, hosts a state fishery site, and supports an abundant number of wildlife species, including some that are threatened. TCAAP lies in a metropolitan area with a population of three million and is surrounded by five cities that are suburbs of the Minneapolis-St. Paul area. It is located in northwest Ramsey County and is in Minnesota's Fourth Congressional District. TCAAP's location is shown on Figure 1-1.

During the approximately 22 years of ammunition production, TCAAP generated industrial wastes that were disposed of using the accepted practices of the times, which included on-site dumping, burial, and open-burning. Between 1978 and 1982, contamination of the regional aquifer was discovered and it was determined that 14 different source areas at TCAAP contained groundwater contamination, soil contamination, or both. These contaminants included volatile organic compounds (VOCs) commonly used as industrial solvents or degreasers (especially trichloroethene), polychlorinated biphenyls (PCBs), and ammunition-related heavy metals. The drinking water supply to three communities, with a total population of approximately 33,000, was directly impacted by VOCs.

Based upon the information gathered between 1978 and 1982, TCAAP was placed on the National Priorities List (NPL) in September 1983 and was designated as the New Brighton/Arden Hills Superfund Site. It is ranked as the number one Superfund site in Minnesota. The Superfund site consists of TCAAP and those areas outside of the plant boundaries that are affected by contamination from the plant. The TCAAP "site" has been divided into three operable units, principally due to the nature and extent of the contaminated groundwater plume on and off TCAAP. The plume is approximately 2-miles wide and 6-miles long.

The three operable units are depicted on Figure 1-2 and are defined as follows:

- Operable Unit 1 (OU1) consists of the north portion of the off-TCAAP contaminated groundwater plume. A Record of Decision (ROD) was issued for OU1 in September 1993.
- Operable Unit 2 (OU2) consists of on-TCAAP soil and groundwater contamination within 14 source areas designated as Sites A, B, C, D, E, F, G, H, I, J, K, 129-3, 129-5, and 129-15 (see Figure 1-3). Site J has already been closed and Site F closure is pending. A ROD was issued for OU2 in October 1997.
- Operable Unit 3 (OU3) consists of the south portion of the off-TCAAP contaminated groundwater plume. A ROD was issued for OU3 in September 1992.

OU1

After TCAAP-related contamination was found in their drinking water supply, a permanent groundwater treatment system was completed for the City of St. Anthony in December 1990. In December 1992, the U.S. Army provided municipal water supply hookup at the Lowry Grove Trailer Park.

The U.S. Army provided a permanent groundwater treatment system for the City of New Brighton in June 1990: the Permanent Granular Activated Carbon (PGAC) treatment facility. Since that time, the system has treated over 6 billion gallons of contaminated groundwater, has removed over 11,000 pounds of VOCs, and has served as a municipal water source for New Brighton residents.

In 1995, the U.S. Army provided the City of New Brighton with funding for the permanent groundwater treatment system modifications required to implement the terms of the OU1 ROD. The U.S. Army also provided the Arden Manor Trailer Park with a municipal water line hookup to replace a contaminated supply well.

OU2

Some soil cleanup activities have already been conducted at the installation. Interim Remedial Action (IRAs) at Sites D and G, implemented in January 1986 and February 1986 respectively, included the installation of soil vapor extraction (SVE) systems at both sites to remove VOCs from the soils, effectively reducing VOC migration to the groundwater. Since startup, the SVE systems at Sites D and G have removed more than 220,000 pounds of VOCs from the soil. In September 1989, the thermal treatment of 1,400 cubic yards of PCB-contaminated soil from Site D was completed. In 1995, the installation completed an innovative soil washing and soil leaching action as part of the cleanup of Site F. More than 25,000 tons of metal-contaminated soil were treated over a period of three years. Site J is a portion of TCAAP's underground sanitary sewer that was investigated and cleaned out. The Final Site J Closure Report (1994) documented the absence of contaminants above background levels and no further action was recommended.

Many actions have also been undertaken to clean up the contaminated groundwater. In 1986, groundwater extraction treatment systems were installed at Sites I and K as IRAs. In October 1987, the installation constructed the Boundary Groundwater Recovery System (BGRS) to contain and treat VOC-contaminated groundwater at the installation's southwest boundary. In January 1989, the system was modified and expanded and became the TCAAP Groundwater Recovery System (TGRS). To date, this system has treated over 13 billion gallons of contaminated water and removed over 167,000 pounds of VOCs.

In September 1988, the installation conducted an IRA at Site A to treat shallow VOC-contaminated groundwater at the north boundary. In 1994, the installation replaced the Site A IRA remedy with a boundary plume containment system designed to prevent the off-post migration of VOCs in shallow groundwater. To date, this system has pumped over 70 million gallons of contaminated groundwater containing over 25 pounds of VOCs.

OU3

In April 1994, the OU3 Plume Groundwater Recovery System (PGRS) was completed. To date, this system has treated over 1.8 billion gallons of water, removing over 100 pounds of VOCs. Alliant is responsible for the capital costs and operation and maintenance costs for this system.

In July 1994, the OU1/OU3 New Brighton/Fridley municipal drinking water interconnection became operational. This system allows New Brighton to pump water, treated by the PGAC and the PGRS and not needed for its municipal use, to the City of Fridley for use in its municipal water system.

2.0 Operable Unit 1 (OU1)

2.1 REMEDIAL ACTION OBJECTIVES

The objective of the OU1 remedial action is to protect human health and the environment through containment of the north plume until restoration of the aquifer is completed. The point of compliance for containment is the containment boundary created by the combined pumping of New Brighton wells NBM #4, NBM #14, and NBM #15. In addition to the containment component, protection of human health is also facilitated through the remedy components of GAC treatment of extracted groundwater, offering an alternate water supply to owners of impacted private wells, and designation of the Minnesota Department of Health (MDH) Special Well Construction Area (SWCA).

A human health risk assessment for TCAAP was performed by the USEPA in 1991. The risk assessment evaluated the carcinogenic and non-carcinogenic risks associated with exposure to contaminated groundwater through exposure pathways of ingestion, inhalation during showering, and absorption through the skin during showering or bathing. Estimated increases in carcinogenic and non-carcinogenic risks that would result from exposure to contaminated groundwater exceeded acceptable levels as defined by the USEPA and MPCA. The remedial action achieves substantial risk reduction by eliminating private well users, containing the plume, and providing effective treatment of the extracted groundwater prior to its beneficial use for municipal water supply.

2.2 SUMMARY OF THE SELECTED REMEDY

For OU1, the components of the selected remedy are:

- Providing an alternative water supply to residents with private wells within the north plume.
- Implementing drilling advisories that would regulate the installation of new private wells within the north plume as a SWCA.
- Extracting groundwater at the containment boundary in the north plume near County Road E.
- Pumping the extracted groundwater to the PGAC water treatment facility in New Brighton for removal of VOCs by a pressurized GAC system.
- Discharging all of the treated water to the New Brighton municipal distribution system.
- Monitoring the groundwater to verify the effectiveness of the remedy.

2.3 SITE VISIT

A site inspection was conducted on March 16, 1999, by the USEPA, MPCA, U.S. Army, Alliant Techsystems, and other parties as shown on the list of attendees presented as Appendix A.1. A site inspection checklist for OU1 was completed and is included as Appendix A.2. Much of the information was obtained prior to the site inspection through phone interviews and review of available documents, including the OU1 ROD and the FY 1998 APR. The nearly complete checklists were then verified as the site inspection was conducted and any data gaps or

modifications were discussed. (This approach was utilized for all site inspection checklists completed for this five-year review.)

The OU1 site inspection started with the PGAC water treatment facility, then the pumphouses for the three containment wells (NBM #4, NBM #14, and NBM #15). The treatment plant operator (Bob Hertenstein, City of New Brighton) and two people from the city's engineering consultant (Teri Perry and Greg Keil, Barr Engineering) were present to answer questions and guide the inspection. The plant was observed to be well maintained. Photographs of the plant are included as Appendix B. The computerized recordkeeping system for the OU1 groundwater recovery system was demonstrated for the inspectors. (As a matter of convenience, the recordkeeping system for the OU3 groundwater recovery system was also demonstrated at that time.) Pumping records, effluent sampling results, maintenance information, and other data are routinely entered and can be viewed graphically to facilitate data analysis.

The most significant operational difficulty discussed at the site inspection was maintaining a balance between water demand (which naturally varies) and continual pumping of containment wells (which is ideally a continual, constant rate). The interconnection between City of New Brighton and City of Fridley municipal water systems that was completed in 1994 has helped in that this added water demand has allowed more consistent pumping from OU1 containment wells. Unfortunately, the interconnection has its own operational difficulties due to variation of water demand and differences in the chlorination systems of the two cities and has resulted in an operational learning curve. Given the learning curve for the interconnection and the very recent completion of the remedial action construction (August 1998), the OU1 containment wells have only been brought up to design operating level at about the time of this site visit.

2.4 REMEDIAL ACTION RESULTS

The status of remedial actions is summarized in Table 1-1.

The first remedy component, the alternate water supply program, has resulted in connection of one residence to an alternate water supply. As part of this program, eight impacted private wells have also been properly abandoned. Installation of two alternate water supply connections and two well abandonments is scheduled for FY 1999. After this work is completed, all known private wells needing an alternate supply and/or well abandonment will have been addressed (well owners who have been offered an alternate water supply and/or well abandonment but who refused to participate in this program are deemed to have been addressed).

The Special Well Construction Area (SWCA) designated by MDH satisfies remedy component #2 and is accomplishing its purpose of notifying water well installers of the contaminated groundwater in the area. Adjustments to the SWCA boundaries to more closely match the area of concern are anticipated to be completed in 1999.

Groundwater containment (remedy component #3) is being accomplished through continual pumping of wells NBM #4, NBM #14, and NBM #15. Well NBM #3 is designated as an alternate containment well if a primary well is temporarily out of service. Wells NBM #5 and NBM #6 are secondary alternates that will be used only when wells NBM #3 and NBM #4 are both out of service.

NBM #4 was an existing well and has been pumping throughout the period of this five-year review. NBM #14 and NBM #15 were constructed as part of the remedy and have only been pumping since December 1996 and March 1998, respectively. Since NBM #15 just started pumping in March 1998, evaluation of containment and optimum pumping for the "full-scale" system is currently in progress. Preliminary evaluation was discussed in the FY 1998 APR; however, additional operational evaluation will be performed.

Figure 2-1 shows water level data, groundwater elevation contours, and approximate capture limits based on data from Summer 1998. Note that "Upper Unit 4" is a hydrogeologic unit (Prairie du Chien Group). The hydrogeologic units at this site are discussed in the FY 1998 APR and other TCAAP documents, and the reader is referred to these documents for detailed hydrogeologic information. The contours on Figure 2-1 clearly show the influence of pumping. Figure 2-2 shows the trichloroethene plume for OU1 and also for OU3 based on data from Summer 1998. The approximate capture boundary from Figure 2-1 is also shown on Figure 2-2. Pumping volumes and VOC mass removal for FY 1998 are shown in Table 2-1. Influent/effluent water quality data for the PGAC is shown in Table 2-2. Table 2-2 shows that over this five-year review period, NBM #4 has declined from total VOC levels of 214 to 386 $\mu\text{g}/\text{l}$ in 1994 to total VOC levels of 30 to 97 $\mu\text{g}/\text{l}$ in 1998. NBM #14 and NBM #15 have not been pumping long enough to show a clear trend.

Treatment of extracted groundwater in the PGAC water treatment facility (remedy component #4) continues to provide effective treatment prior to its discharge into the City of New Brighton municipal water distribution system (remedy component #5). PGAC effluent water quality is documented in Table 2-2, clearly showing the effectiveness of the treatment system. The treatment system is comprised of eight GAC vessels plumbed in parallel. Another eight GAC vessels are plumbed in series with the first eight to provide back-up treatment. Routine sampling occurs between the two sets of GAC vessels, such that when a detection occurs, a clean set of GAC vessels is present downstream of the sampling point. Upon detection, change-out of carbon in the lead vessels is conducted as soon as possible (typically about 1 month later). Upon changing carbon, the direction of flow is reversed so that the eight vessels with the new carbon become the downstream vessels (the "clean" vessels are always rotated into the downstream position).

Remedy component #6, groundwater monitoring, continues to be conducted to verify the performance of the remedy. Each fiscal year, a revolving, five-year monitoring plan is prepared by the U.S. Army and submitted to the USEPA and MPCA for approval. Although it covers five

years, it is submitted on an annual basis to allow for minor changes to be made which streamline or improve the quality of the monitoring data to be collected.

Based on OU1 groundwater quality data presented in the FY 1998 APR, two VOCs exceed the cleanup levels specified in the OU1 ROD: Trichloroethene and 1,1-dichloroethene. Trichloroethene concentrations range up to 530 micrograms per liter ($\mu\text{g/l}$) with a cleanup level of 5 $\mu\text{g/l}$. 1,1-Dichloroethene concentrations range up to 36 $\mu\text{g/l}$ with a cleanup level of 6 $\mu\text{g/l}$.

2.5 ARARs REVIEW

The ARARs identified in the OU1 ROD (pages 19 and 20) are still applicable. No new ARARs have been identified that are believed to be applicable to the OU1 remedy. ARARs are being met with the exception of groundwater cleanup standards. The remedy provides containment of the VOC plume until aquifer restoration is complete (i.e., until cleanup standards are met).

2.6 RECOMMENDED CHANGES TO REMEDIAL ACTIONS

The only recommendation is to conduct additional evaluation of containment and optimum pumping rates. As discussed previously, since the OU1 containment wells were just reaching their design operating levels at the time of this site visit, evaluation of the "full-scale" system could not be completed in this five-year review.

2.7 STATEMENT OF PROTECTIVENESS

The components of the OUI remedy remain protective of human health and the environment. The alternate water supply and well abandonment program, along with the SWCA, are mitigating potential risks associated with private wells. The PGAC is effectively providing a safe municipal water supply. As of March 1998, the third containment well is now pumping and influence from pumping is evident in the groundwater contour map. As discussed above, additional evaluation is to be conducted to ensure that adequate containment is being achieved.

3.0 Operable Unit 2 (OU2)

It should be noted that less than 1½ years has elapsed since signing of the OU2 ROD. Consequently, not all components of the remedies have been fully implemented. Therefore, this five-year review serves more as a status report on implementation. Substantial activity is planned for the next two years.

3.1 REMEDIAL ACTION OBJECTIVES

The objectives for OU2 are as follows:

- 1) Shallow Soil Sites:
 - a) *Sites A, C, E, H, 129-3, and 129-5:* Removal and off-site disposal of contaminated soils and ordnance/debris such that no hazardous substances remain on-site above health-based levels (specifically, the cleanup levels indicated in Table 1 of the OU2 ROD). Since Site A soils also have VOC contamination, an SVE system is also planned to be constructed in the latter part of 1999, which will provide in-situ treatment of soils to the required VOC cleanup levels.
 - b) *Sites B and 129-15:* Characterize the contents of the dumps to determine if any remedial actions are required.
- 2) Deep Soil Sites (D and G): Attain soil cleanup levels for VOCs, as specified in Table 1 of the OU2 ROD (both within the area of influence of the existing shallow SVE systems and in the deeper soils, i.e., between the lower reach of existing SVE systems and the water table) and minimize infiltration of precipitation by maintaining existing site caps and surface controls. Also,

characterize Site D shallow soils (non-VOC contaminants may be present) and the Site G dump to determine if any remedial actions are required.

- 3) Shallow Groundwater Sites (A, I, and K): Provide plume containment until groundwater cleanup levels are attained (as specified in Table 1 of the OU2 ROD).
- 4) Deep Groundwater: Protect human health and the environment by providing plume containment until groundwater cleanup levels are attained (as specified in Table 1 of the OU2 ROD).

The human health risk assessment for TCAAP (USEPA 1991) found that carcinogenic and non-carcinogenic risks exceed acceptable levels at most sites in OU2. The exposure pathways that were evaluated were based on an industrial use scenario and included the following two assumptions:

- People who might be at risk from exposure to contaminated soil include TCAAP workers or occupants. Incidental ingestion and dermal contact are the only significant routes for receptors exposed to contaminants in surface soils at the site. During excavation activities, workers may be exposed to contaminants by inhaling vapors or dust, as well as through incidental ingestion and dermal contact.
- People who might be at risk from exposure to contaminated groundwater include TCAAP workers and local residents who rely on private drinking wells that extract contaminated groundwater. The potential pathways by which these receptors might be exposed include ingestion, inhalation during showering, and adsorption through the skin during showering or bathing with contaminated groundwater.

The remedial actions for Sites A, C, E, H, 129-3, and 129-5, when complete, will have removed contamination that exceeded the health-based cleanup levels presented in Table 1 of the OU2

ROD. Thus, the risks that were associated with these soils will have been eliminated for industrial property uses. This may or may not be the case for Sites B, 129-15, D, and G, depending on the results of additional characterization work and/or any additional remedial actions that may be conducted at these sites.

Containment of shallow groundwater plumes (Sites A, I, and K), and the deep groundwater plume minimizes risks by preventing further plume migration. The containment systems will remain in place until plume concentrations reach the specified cleanup levels (i.e., until the risks reach acceptable levels).

3.2 SUMMARY OF THE SELECTED REMEDY

The components of the selected remedy for OU2 are as follows:

- 1) Shallow Soil Sites: Sites A, C, E, H, 129-3, and 129-5 have inorganic and organic contaminants above site cleanup goals. No contamination was found to exist at Site B. Unpermitted landfills, or dumps, exist within Sites A, B, E, H, and 129-15. Sites B and 129-15 are included solely as dumps. The selected remedy for the shallow soil sites will attain the site cleanup levels specified in the OU2 ROD and includes the following activities:
 - Identification/characterization of contaminated soil boundaries, surface and subsurface debris for Sites A, C, E, H, 129-3, and 129-5;
 - Excavation and sorting of hazardous and non-hazardous materials, debris and ordnance for Sites A, C, E, H, 129-3 and 129-5;
 - Removal and disposal of ordnance, debris and oversized material for Sites A, C, E, H, 129-3, and 129-5;

- On-site treatment (stabilization) of hazardous soils from Sites A, C, E, H, 129-3, and 129-5 in the TCAAP Corrective Action Management Unit (CAMU);
- Off-site disposal of contaminated soils above site specific cleanup goals from Sites A, C, E, H, 129-3, and 129-5;
- Backfill/regrade excavations on Sites A, C, E, H, 129-3, and 129-5;
- Restrict site access and use during remedy implementation;
- Five-year period of groundwater monitoring to verify no adverse remedy impacts at Sites A, C, E, H, 129-3, and 129-5; and
- Characterization of dumps at Sites B and 129-15 to determine their contents. If contents are found to be toxic, hazardous, or contaminated, then a remedy for the landfill will be utilized and documented through a post-ROD Amendment or Explanation of Significant Difference (ESD). If the contents are not toxic, hazardous, or contaminated, a no further action remedy would be employed.

2) Deep Soil Sites (D and G): These sites have been impacted primarily by VOC contaminants at depths of 50 to 170 feet. Some additional shallow soil contaminants may exist at Site D. Site G also contains a dump. The selected remedy for these sites will attain the site cleanup levels specified in Table 1 of the OU2 ROD and includes the following activities:

- Groundwater monitoring;
- Restrict site access and use during remedy implementation;
- Install and operate deep soil vapor extraction (SVE) systems with a modified shallow SVE system;
- Evaluate and potentially use enhancements to the SVE systems;
- Maintain existing site caps;
- Maintain surface controls; and

- Following the completion of the SVE remediation of deep soils, characterize the Site D shallow soils and the Site G dump to determine the appropriate action.

3) Shallow Groundwater Sites (A, I, and K): These sites have been primarily impacted by VOCs. The selected remedy for Site A shallow groundwater will attain the site cleanup levels specified in Table 1 of the OU2 ROD and includes the following activities:

- Groundwater monitoring to track plume migration and remedy performance;
- Use of existing gradient control wells to contain the contaminant plume and remove mass;
- Institutional controls to restrict new well installations and provide alternate water supplies and well abandonment as necessary;
- Discharge of extracted groundwater to a publicly owned treatment works (POTW); and
- Source characterization/remediation.

The selected remedy for Site I shallow groundwater will attain the site cleanup levels specified in Table 1 of the OU2 ROD and includes the following:

- Groundwater monitoring to track remedy performance;
- Use of an existing well to remove impacted Unit 1 groundwater;
- POTW discharge of extracted groundwater; and
- Additional characterization of the Unit 1 and Unit 2 soil and groundwater.

The selected remedy for Site K shallow groundwater will attain the site cleanup levels specified in Table 1 of the OU2 ROD and includes the following activities:

- Groundwater monitoring to track remedy performance;
- Installation of sentinel wells at the bottom of Unit 1 and to the top of Unit 3;
- Use of the existing interceptor/recovery trench to contain the plume and remove impacted groundwater;
- Treatment of extracted groundwater using air stripping;
- Discharge of treated groundwater to Rice Creek;
- Monitoring to track compliance with discharge requirements; and
- Additional characterization of the unsaturated Unit 1 soil.

4) Deep Groundwater: Includes the deep groundwater plume that underlies the southwestern portion of OU2 and originated primarily from Sites D, G, and I. The selected remedy for Deep Groundwater will attain the site cleanup levels specified in Table 1 of the OU2 ROD and includes the following activities:

- Groundwater extraction to hydraulically contain the contaminated groundwater source area to the 5 µg/l trichloroethene concentration contour and optimize the removal of contaminants from the source area through pumping of selected wells;
- Groundwater treatment using air stripping;
- Discharge of treated groundwater to the on-site gravel pit;
- Institutional controls to restrict access to contaminated aquifers and prevent exposure to contaminated groundwater;
- Reviews of new and emerging technologies that have the potential to cost-effectively accelerate the timeframe for aquifer restoration. Reviews shall be performed by Army and reported on annually in

accordance with the consistency provisions of the TCAAP Federal Facility Agreement; and

- Groundwater monitoring to track remedy performance.

3.3 SITE VISIT

A site visit was conducted on March 16, 1999, by the USEPA, MPCA, U.S. Army, Alliant Techsystems, and other parties (see list of attendees presented as Appendix A.1). Inspection checklists are included in Appendices A.3 through A.8. Results of the site visits were as follows:

1) Shallow Soil Sites

Some of the sites were not readily accessible due to snow covered roads. The group stopped at Sites A and H and drove by Sites C, E, 129-3, and 129-15. The group also stopped at the CAMU. Potential plans for constructing a stormwater retention pond were briefly discussed. CAMU operation was conducted in 1998 without a separate retention pond and could continue in this manner if so desired. However, if the pond could improve the cost effectiveness of CAMU operation by eliminating the problems resulting from standing water within the existing bermed CAMU area, construction of the retention pond may be pursued.

2) Deep Soil Sites (D and G)

Site D was visited by the group and Site G was observed from the road. Existing shallow soil SVE systems at both sites were off at the time of the inspection (see Section 3.4 for additional discussion regarding the shutdown). The blowers inside the treatment building were observed as was a portion of the aboveground piping. Pilot study vents for the deep soil SVE pilot study were observed. A photograph of the Site D SVE system is included in Appendix B.

3) Site A Shallow Groundwater

The Site A control building and the eight extraction well locations were observed during the site visit. The approximate location of VOC-contaminated soils (the 1945 trench) was also observed.

4) Site I Shallow Groundwater

Since no remediation system has been constructed, this site was not visited.

5) Site K Shallow Groundwater

The existing treatment building at Site K and the approximate location of the groundwater extraction trench were observed. Construction of a replacement treatment system was in progress at the time of the site visit (see Section 3.4 for discussion of the replacement system). The potential location of an additional monitoring well was also briefly discussed. A photograph of the existing treatment system is included in Appendix B.

6) Deep Groundwater

The treatment plant was inspected and some of the extraction well locations were observed (SC-2 through 5). The control panel, transfer pumps, piping, air stripping towers and associated blowers were also observed. Photographs of the treatment system are included in Appendix B.

3.4 REMEDIAL ACTION RESULTS

A summary of remedy component status for OU2 sites is presented in Table 1-1.

1) Shallow Soil Sites

- a) *Sites A, C, E, H, 129-3, and 129-5*: A work plan for remedial actions at these sites was approved in FY 1998. In calendar year 1998, remedial action was initiated at

the first of these sites, as 10,761 tons of soil was excavated from Site A, transported to the TCAAP CAMU, treated (stabilized), and transported off-site as non-hazardous waste for disposal at a permitted facility (Laidlaw Environmental Services, Inc., Rosemount, Minnesota). Work was suspended for the winter and will resume in spring 1999. There have been no significant problems in conducting this remedial action thus far. No changes to the remedial design are needed, though a stormwater retention pond is anticipated to be added to the CAMU in 1999, as discussed at the site visit (see Section 3.3). An Engineering Evaluation/Cost Analysis (EE/CA) for an SVE system to remediate VOC-contaminated soils at Site A was approved in FY 1998. Construction is scheduled for the latter part of FY 1999. A phytoremediation demonstration project was initiated at Sites C and 129-3 in FY 1998 and is scheduled to continue through FY 1999. The primary objective of the project is to determine the effectiveness of lead removed using one corn crop and one mustard crop that is grown and harvested each year. Note that remedy components 1 through 7 collectively address characterization, excavation, sorting, treatment, disposal, site restoration, and site access restrictions for these six sites. Removal actions initiated at Site A comply with these remedy components. Completion of removal actions at Site A and the other 5 sites are expected to continue to satisfy these remedy components.

Following all soil removal actions, a five-year period of groundwater monitoring is required to be conducted at these six sites (remedy component #8) to verify that soil characterization and/or remediation activities did not cause impacts to groundwater. Since removal actions are just getting started, this five-year period has not yet started.

- b) *Sites B and 129-15*: Remedy component #9 specifies characterization of these two dumps. A work plan for characterization of these two sites was approved in FY 1998. Field work was conducted in early FY 1999 and a documentation report is currently being prepared.

2) Deep Soil Sites (D and G)

Remedy component #1 for deep soil sites requires groundwater monitoring in the vicinity of the sites. Groundwater quality trend graphs show that the most dramatic decreases in concentrations occurred between 1987 and 1991-1993. Since then, the concentrations generally appear to be decreasing, but at a much slower rate (asymptotic behavior). The declining concentrations (asymptotic behavior) could also be described in terms of a first order decay process. A semilog regression of concentration versus time for wells 03U094 and 03U096 reveals a steady rate constant since 1987. Four of the five groundwater monitoring wells still exceed the cleanup level for trichloroethene and one well exceeds the cleanup levels for 1,1-dichloroethene and 1,1,1-trichloroethane (Table 3-1). Trichloroethene is the furthest from reaching cleanup levels (three wells with concentrations between 202 and 500 $\mu\text{g/l}$ versus the 5 $\mu\text{g/l}$ cleanup level). Groundwater monitoring will continue to be conducted to monitor cleanup progress.

Control of site access (remedy component #2) is accomplished through maintenance of the existing TCAAP facility fence and locking gates.

The third remedy component is to install and operate deep SVE systems with modified shallow SVE. The existing shallow SVE systems (Figures 3-1 and 3-2) began operation in 1986 as Interim Remedial Actions to address VOC contamination in the soils. The existing system at Site D consists of 39 shallow vents (depths of 33 to 54 feet) and one deep vent (depth of 150 feet). At Site G there are 89 shallow vents (depths of 23 to 55 feet).

The existing shallow soil SVE systems have been very effective in removing VOCs from soils. The systems have removed a combined total of over 220,000 pounds of VOCs from startup in 1986 through FY 1998. However, mass removal rates have declined to lower rates, as evidenced by the FY 1998 mass removal data in Table 3-2. The Site D and G SVE systems were shutdown on July 24 and August 6, 1998, respectively, to allow

for additional system investigation. A report recommending that the systems remain off is currently under review.

To address the deeper soils (below the lower reach of the existing SVE systems and above the water table), a pilot study was conducted in FY 1998 with new deep vents constructed at Site D (this pilot study was to be completed prior to deciding whether to conduct a pilot study at Site G). A pilot study report is currently being prepared.

Remedy component #4 is to evaluate enhancements to the SVE systems, which is being accomplished with preparation of the above-mentioned reports.

Remedy components #5 and #6 are to maintain existing clay caps and existing surface drainage controls. These items are routinely inspected by Alliant Techsystems to ensure their integrity is maintained. No significant problems have been observed in these inspections nor were any problems evident at the site visit.

Characterization of Site D shallow soils and the Site G dump (remedy component #7) has not yet been completed. Some characterization work has been completed, but more investigation will be required to satisfy this component.

3) Site A Shallow Groundwater

Groundwater monitoring (remedy component #1) continues to be conducted to evaluate plume migration and remedy performance.

Groundwater containment and mass removal (remedy component #2) is being accomplished through operation of eight extraction wells. The extraction well capture boundary is shown on Figure 3-3 (groundwater contour map). The plume extent is shown on Figure 3-4. Comparison of these two figures shows that the capture boundary encompasses the portion of the plume that is above cleanup levels. Pumping rates for the eight extraction wells during FY 1998 are shown in Table 3-3. The FY 1998 average

flow rate was 29.5 gpm which exceeds the target rate of 25 gpm. The Site A groundwater extraction system removed 5.7 pounds of VOCs in FY 1998 and has reached 26.3 pounds as a cumulative total (Table 3-4).

Groundwater quality data from monitoring wells and extraction wells shows that tetrachloroethene and trichloroethene are above cleanup goals in and near the source area, but are below cleanup levels at the first line of extraction wells and are non-detectable in the second line of extraction wells. 1,2-Dichloroethene is below cleanup levels in the source area, but is above cleanup levels in two of the first-line extraction wells, suggesting that biodegradation of tetrachloroethene and trichloroethene is occurring. The second line of extraction wells only show detection of 1,2-dichloroethene and all detections are about an order of magnitude below cleanup levels, suggesting that they could potentially be shut off. The two outermost extraction wells in the first line are also below cleanup goals.

With regard to system performance, iron fouling has been a significant problem for this recovery system. Extraction well pumps and other components require frequent cleaning and/or replacement.

The SWCA includes the off-site portion of the site A groundwater plume. Also, the OU1 Alternate Water Supply and Well Abandonment Program is underway and was expanded to cover the area affected by the OU2 Site A shallow groundwater plume (both on-site and off-site). Remedy component #3 is therefore in place. Currently, there are no well owners that need to be contacted and there are no pending water supply hookups or well abandonments. The established program continues to meet the intent of this remedy component.

Extracted groundwater is discharged to the city of Shoreview's sanitary sewer in accordance with remedy component #4. Effluent water quality results for FY 1998 are shown in Table 3-5 and have consistently met the discharge limits, as specified in

Industrial Discharge Permit Number 2194 from the Metropolitan Council Environmental Services (MCES).

The fifth remedy component, source characterization and remediation, is currently in progress. Site A was characterized in 1997. Removal of metals-contaminated soils was initiated in 1998 (as previously discussed) and should be completed in 1999. The source of chlorinated VOCs (the 1945 trench) was identified and will be remediated in-situ through installation of an SVE system in the latter part of 1999.

4) Site I Shallow Groundwater

Groundwater monitoring continues to be conducted as required by remedy component #1. Monitoring results continue to show chlorinated VOCs above cleanup levels in Site I shallow groundwater. The Site I trichloroethene plume is depicted in Figure 3-5.

Remedy components #2 and #3 (groundwater extraction and discharge to sanitary sewer), have not been completed. A pump and treat system to address site contamination has not yet been designed.

Remedy component #4, additional characterization of soil and groundwater, has been completed. This work led to proposed construction of a dual-phase extraction remedy (combining groundwater extraction and soil vapor extraction). The proposed remedy has been approved and a pilot test is scheduled to be conducted in FY 1999. Pilot study results will be evaluated prior to construction of any full-scale system(s).

5) Site K Shallow Groundwater

Groundwater monitoring continues to be conducted at Site K (remedy component #1). Results continue to show that chlorinated VOCs are present above cleanup levels (specifically, trichloroethene and cis-1,2-dichloroethene range up to 44,000 µg/l and 15,000 µg/l, respectively, versus cleanup levels of 30 and 70 µg/l).

Remedy component #2 requires installation of sentinel wells at the bottom of Unit 1 and the top of Unit 3 (to determine if any vertical migration is occurring). Potential well locations were briefly discussed at the site visit. The Predesign Investigation Work Plan for Site K is under review and these wells have not yet been installed.

Hydraulic containment (remedy component #3) is being achieved as shown by comparison of Figure 3-6 (groundwater contour map) and Figure 3-7 (plume map). The trench extracts groundwater at an approximate rate of 8 gpm (quarterly volumes of groundwater extracted during FY 1998 are shown in Table 3-6).

Groundwater treatment is accomplished via an air stripping treatment system. The existing air stripper has been providing adequate treatment; however, it is extremely maintenance-intensive due to iron-fouling problems (packing must be replaced every 4 to 6 weeks). As a cost saving measure, a new air stripping treatment system is currently being constructed and will utilize a fluidized-bed that should be much more resistant to fouling problems.

Discharge of treated water to Rice Creek and the associated discharge monitoring are required by remedy components #5 and #6. The treated water consistently meets the substantive requirements of Document No. MNU000579 (MPCA). Ineffluent and effluent analytical data for FY 1998 is shown in Table 3-7. The Site K system removed 10.2 pounds of VOCs from the aquifer in FY 1998.

Additional investigation (remedy component #7) is underway. The Predesign Investigation Work Plan is currently being reviewed.

6) Deep Groundwater

Hydraulic containment and source area contaminant removal (remedy component #1) is being accomplished through operation of the TGRS. The TGRS system layout is shown on Figure 3-8. Groundwater contour maps showing the capture boundary in the three

impacted hydrogeologic units are shown on Figures 3-9, 3-10, and 3-11. A plume map for Upper Unit 3 is shown on Figure 3-12, which depicts the greatest overall extent of contamination for on-TCAAP areas (OU2). Comparison of capture boundaries with Figure 3-12 clearly shows that the TGRS achieves containment at the TCAAP boundary. The system pumped at an average rate of 2,322 gpm in FY 1998 (2,054 gpm from boundary wells and 268 gpm from source area wells). Table 3-8 shows monthly volumes pumped for FY 1998 and also shows annual volumes since FY 1989. The TGRS removed 6,132 pounds of VOCs in FY 1998, reaching a cumulative total of 167,289 pounds. Annual mass removal totals are shown in Table 3-9, with a well by well breakdown for FY 1998. It is evident that the source area wells (SC-1, SC-3, SC-4, and SC-5) are very effective at mass removal: they are removing 45% of the VOC mass while accounting for only 12% of the water volume pumped (SC-5 removed 42% of the mass at less than 5% of the volume). Optimization of mass removal (while maintaining capture) is currently being studied with a report expected in FY 1999. Annual mass removal has been on a declining trend since the maximum of 26,760 pounds in 1991 (Table 3-9).

Groundwater treatment is accomplished through treatment in four air strippers, followed by discharge to the Arsenal Sand & Gravel Pit (remedy components #2 and #3). Treatment has been very effective as shown on the influent/effluent trichloroethene trend graphs (Figure 3-13). This figure also shows that trichloroethene in the influent is slowly declining (1,500 to 2,000 µg/l during the early operational period (late 1980's) to about 500 µg/l now). The gravel pit continues to be an effective means of treated water disposal.

Although the SWCA does not cover the TCAAP facility, the OU1 Alternate Water Supply and Well Abandonment Program is underway, which also covers the TCAAP facility itself. This program continues to meet the intent of remedy component #4.

Reviews of new technologies (remedy component #5) are presented in the Annual Performance Report, as applicable. A study is currently being conducted to evaluate the effects of natural attenuation on deep groundwater contaminants.

Groundwater monitoring (remedy component #6) continues to be conducted to track remedy performance. Monitoring has shown that along the TCAAP boundary, the plume width (as defined by exceedance of the trichloroethene cleanup level of 5 µg/l) has been shrinking since 1993. Extraction well B-12 was shutdown (with MPCA approval) in November 1996, in response to this shrinking plume width. Based on FY 1998 data, the shrinking plume width now suggests that shutting off extraction well B-7 could also be considered.

3.5 ARARs REVIEW

The ARARs identified in the OU2 ROD (pages 53 to 59) are still applicable. ARARs are being met with the exception of groundwater cleanup standards. Groundwater recovery systems for Site A, Site K, and OU2 Deep Groundwater provide containment of contaminant plumes until the cleanup standards are met (the Site I system, when completed, will perform this same function).

No new ARARs have been identified that are believed to be applicable to the OU2 remedies.

3.6 RECOMMENDED CHANGES TO REMEDIAL ACTIONS

The following recommendations are made:

- 1) Shallow Soils: None
- 2) Deep Soil Sites (D and G): Consider terminating operation of the shallow SVE systems.
- 3) Site A Shallow Groundwater: Consider shutting off some of the clean extraction wells. If their operation is no longer required, significant O&M cost savings could be realized from reductions in well and component cleaning/replacement, electricity usage, sampling requirements, and sewer use fees.
- 4) Site I Shallow Groundwater: None
- 5) Site K Shallow Groundwater: None
- 6) Deep Groundwater: Consider shutting off additional recovery well(s) and implement the recommendations of the mass removal optimization study, when finalized.

3.7 STATEMENT OF PROTECTIVENESS

The components of the OU2 remedy remain protective of human health and the environment.

4.0 Operable Unit 3 (OU3)

4.1 REMEDIAL ACTION OBJECTIVES

The objective of the OU3 remedial action is to protect human health and the environment through containment of the south plume until restoration of the aquifer is completed. Containment is provided at the southern edge of the plume through pumping of City of New Brighton well NBM #13. In addition to the containment component, protection of human health is also facilitated through the remedy components of GAC treatment of extracted groundwater, offering of alternate water supply to any impacted private well owners, and designation of the SWCA.

A human health risk assessment for TCAAP was performed by the USEPA in 1991 evaluating carcinogenic and non-carcinogenic risks associated with OU3 contaminated groundwater. Exposure pathways that were evaluated included ingestion, inhalation during showering, and absorption through the skin during showering or bathing. Carcinogenic risk was found to exceed acceptable levels, as defined by the USEPA and MPCA. Non-carcinogenic risk was found to have very slight exceedances of acceptable levels. The remedial action achieves substantial risk reduction by eliminating private well users, containing the plume, and providing effective treatment of extracted groundwater prior to its beneficial use for municipal water supply.

4.2 SUMMARY OF THE SELECTED REMEDY

The components of the selected remedy for OU3 are as follows:

- Extraction of groundwater at the leading edge of the south plume.
- Treatment of extracted groundwater for the removal of VOCs by a pressurized GAC system.
- Discharge of treated groundwater to the potable water supply of the City of New Brighton.
- Monitoring of the groundwater to verify the effectiveness of the remedy.

4.3 SITE VISIT

On March 16, 1999, a site visit was conducted by the USEPA, MPCA, U.S. Army, Alliant Techsystems, and other parties as shown on the list of Attendees presented as Appendix A.1. The site inspection checklist that was completed for OU3 is included as Appendix A.9. The inspection included the PGRS treatment plant and NBM #13, which is located inside the PGRS treatment building. Two of the City's engineering consultants (Teri Perry and Greg Keil, Barr Engineering), were present to answer questions and to guide the inspection. The plant was observed to be well maintained (see Appendix B for photographs).

4.4 REMEDIAL ACTION RESULTS

Status of the OU3 remedial action components is summarized in Table 1-1.

Groundwater extraction (remedy component #1) is being accomplished through continual pumping of well NBM #13. Pumping volumes are shown in Table 4-1. Figure 2-1 shows groundwater contours and the approximate capture limit based on data from summer 1998. The

contours clearly show the influence of pumping. The trichloroethene plume for OU3 (and OU1) is shown on Figure 2-2, including the capture boundary from Figure 2-1. The capture zone clearly encompasses the southern edge of the plume. Trichloroethene concentrations in well NBM #13 have been gradually declining. Initial concentrations in 1994 were about 10 to 15 $\mu\text{g/l}$ and have declined to less than 2 $\mu\text{g/l}$ in 1998 (Figure 4-1). Mass removal was only 5.1 pounds in FY 1998 (Table 4-1).

Treatment of extracted groundwater in the PGRS treatment plant prior to discharge into the City of New Brighton municipal water distribution system (remedy component #2) continues to be very effective, as evidenced on Figure 4-1 and Table 4-2. The treatment system consists of three GAC vessels plumbed in parallel. Another three GAC vessels are plumbed in series with the first three to provide backup treatment. Sampling between carbon vessels is routinely conducted (in a similar manner to that described for the OU1 PGAC system) to determine when a carbon change-out is needed.

In accordance with remedy component #3, treated water is used by the City of New Brighton (and also the City of Fridley through the interconnection) for municipal water supply.

Groundwater monitoring, as required by remedy component #4, continues to be conducted to verify performance of the remedy. The U.S. Army prepares a monitoring plan each fiscal year for approval by the USEPA and MPCA. Based on groundwater monitoring data from the FY 1998 APR, trichloroethene concentrations are about 300 $\mu\text{g/l}$ just off the TCAAP boundary (in Unit 3). In the Prairie du Chien (Upper Unit 4), trichloroethene concentrations range up to about 80 $\mu\text{g/l}$ just off the TCAAP boundary. Concentrations near NBM #13 are near the cleanup level of 5 $\mu\text{g/l}$.

4.5 ARARs REVIEW

The ARARs identified in the OU3 ROD (pages 25 to 28) are still applicable. No new ARARs have been identified that are believed to be applicable to the OU3 remedy. ARARs are being met with the exception of groundwater cleanup standards. The remedy provides containment of the VOC plume until aquifer restoration is complete (i.e., until cleanup standards are met).

4.6 RECOMMENDED CHANGES TO REMEDIAL ACTIONS

The VOC plume in OU3 appears to be stable or shrinking with time. Given that the concentrations in NBM #13 have declined to below the cleanup levels (and the degree of plume stability), the current level of hydraulic containment within OU3 should be re-evaluated. Plume stability may be the result of natural attenuation, which could also be further evaluated.

4.7 STATEMENT OF PROTECTIVENESS

The components of the OU3 remedy remain protective of human health and the environment.

5.0 Other Removal Actions

In addition to the remedial actions prescribed in the OU2 ROD, other areas of TCAAP will be addressed through removal actions. For the time period covered by this five-year review, there were no removal actions performed at other areas. Note: the Site A groundwater extraction system was installed as a removal action in 1994; however, it was incorporated into the final remedy in the OU2 ROD.

At present time, there is not a regulatory requirement to address removal actions in five-year reviews. New guidance is being developed by USEPA to expand five-year reviews to encompass removal actions where contaminants above unrestricted use levels will remain on-site. Therefore, it is anticipated that future five-year reviews for TCAAP will address removal actions.

Areas where removal actions are planned for TCAAP include the grenade range and outdoor firing range.

6.0 Schedule for Next Five-Year Review

The next five-year review for the NB/AH Superfund Site must be completed within five years of this review and will be due approximately July 2003.

7.0 Approvals

The remedies reviewed in this report remain protective of human health and the environment, continue to comply with ARARs, and continue to be cost-effective.

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION V

Signature: _____ Date: _____
Printed Name: _____
Title: _____

MINNESOTA POLLUTION CONTROL AGENCY

Signature: _____ Date: _____
Printed Name: _____
Title: _____

U.S. ARMY

Signature: Michael P. Fix Date: 30 Sept 99
Printed Name: MICHAEL P. FIX
Title: Commander's Representative

7.0 Approvals

The remedies reviewed in this report remain protective of human health and the environment, continue to comply with ARARs, and continue to be cost-effective.

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION V

Signature: _____ Date: _____
Printed Name: _____
Title: _____

MINNESOTA POLLUTION CONTROL AGENCY

Signature: Michael Kanner Date: 9/29/99
Printed Name: Michael Kanner
Title: Manager of MPCA Metro Remediation

U.S. ARMY

Signature: _____ Date: _____
Printed Name: _____
Title: _____

7.0 Approvals

The remedies reviewed in this report remain protective of human health and the environment, continue to comply with ARARs, and continue to be cost-effective.

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION V

Signature: W. E. Muno Date: 9/30/99
Printed Name: William E. Muno
Title: Director, Superfund Division

MINNESOTA POLLUTION CONTROL AGENCY

Signature: _____ Date: _____
Printed Name: _____
Title: _____

U.S. ARMY

Signature: _____ Date: _____
Printed Name: _____
Title: _____

TABLES

Tables

Table 1-1

Status of Remedial Actions: FY 1998
Twin Cities Army Ammunition Plant

| Remedy Component | Is the component being implemented? | Is the component doing what it is suppose to? | Comments |
|--|-------------------------------------|---|---|
| Operable Unit 1: Deep Groundwater | | | |
| #1: Alternate Water Supply/Well Abandonment | Yes | Yes | -- |
| #2: Drilling Advisories | Yes | Yes | Component completed |
| #3: Groundwater Containment | Yes | Yes | -- |
| #4: Removal of VOCs by GAC (Discharge Quality) | Yes | Yes | -- |
| #5: Discharge of Treated Water | Yes | Yes | -- |
| #6: Groundwater Monitoring | Yes | Yes | -- |
| Operable Unit 2: Shallow Soil Sites | | | |
| #1-7: Soil Remediation: | | | |
| Site A | Yes | Partially | Site partially excavated in 1998; to be completed in 1999. SVE system will be installed in the latter part of 1999. |
| Site C | No | No | Excavation is scheduled for 2001. A phytoremediation proejct is currently underway. |
| Site E | No | No | Excavation is scheduled for 2000. |
| Site H | No | No | Excavation is scheduled for 2000. |
| Site 129-3 | No | No | Excavation is scheduled for 2001. A phytoremediation proejct is currently underway. |
| Site 129-5 | No | No | Excavation is scheduled for 2000. |
| #8: Groundwater Monitoring | No | No | Starts after #1-7 are completed |
| #9: Characterization of Dumps (Sites B and 129-15) | Yes | Yes | Investigation was conducted in early FY 1999. Reports currently under regulatory review. |

Table 1-1 (continued)

Status of Remedial Actions: FY 1998
Twin Cities Army Ammunition Plant

| Remedy Component | Is the component being implemented? | Is the component doing what it is suppose to? | Comments |
|---|-------------------------------------|---|--|
| Operable Unit 2: Deep Soil Sites | | | |
| #1: Groundwater Monitoring | Yes | Yes | -- |
| #2: Restrict Site Access | Yes | Yes | -- |
| #3: SVE Systems | Yes | Partially | Deep SVE pilot study completed |
| #4: Enhancements to SVE Systems | Yes | No | Optimization testing completed. A report is currently under review. |
| #5: Maintain Existing Site Caps | Yes | Yes | -- |
| #6: Maintain Surface Drainage Controls | Yes | Yes | -- |
| #7: Characterize Shallow Soils and Dump | Yes | Partially | Some characterization work has been completed. Additional characterization for non-VOC contaminants is still needed. |

Table 1-1 (continued)

Status of Remedial Actions: FY 1998
Twin Cities Army Ammunition Plant

| Remedy Component | Is the component being implemented? | Is the component doing what it is suppose to? | Comments |
|---|-------------------------------------|---|---------------------------------------|
| Operable Unit 2: Site A Shallow Groundwater | | | |
| #1: Groundwater Monitoring | Yes | Yes | |
| #2: Groundwater Containment/Mass Removal | Yes | Yes | |
| #3: Drilling Advisory/Alternate Water Supply/Well Abandonment | Yes | Yes | |
| #4: Discharge of Extracted Water | Yes | Yes | |
| #5: Source Characterization/Remediation | Yes | Yes | |
| Operable Unit 2: Site I Shallow Groundwater | | | |
| #1: Groundwater Monitoring | Partially | Partially | OU2 ROD predesign work is in progress |
| #2: Groundwater Extraction | No | No | See above |
| #3: POTW Discharge | No | No | See above |
| #4: Additional Investigation | No | No | See above |

Table 1-1 (continued)

Status of Remedial Actions: FY 1998
Twin Cities Army Ammunition Plant

| Remedy Component | Is the component being implemented? | Is the component doing what it is suppose to? | Comments |
|--|-------------------------------------|---|---|
| Operable Unit 2: Site K Shallow Groundwater | | | |
| #1: Groundwater Monitoring | Yes | Yes | |
| #2: Sentinel Wells | No | No | OU2 ROD predesign work plan in progress |
| #3: Hydraulic Containment | Yes | Yes | |
| #4: Groundwater Treatment | Yes | Yes | |
| #5: Treated Water Discharge | Yes | Yes | |
| #6: Discharge Monitoring | Yes | Yes | |
| #7: Additional Investigation | No | No | OU2 ROD predesign work plan in progress for VOC problem. Investigation for non-VOC contaminants will occur after the building is removed. |

Table 1-1 (continued)

Status of Remedial Actions: FY 1998
Twin Cities Army Ammunition Plant

| Remedy Component | Is the component being implemented? | Is the component doing what it is suppose to? | Comments |
|--|-------------------------------------|---|---|
| Operable Unit 2: Deep Groundwater | | | |
| #1: Hydraulic Containment and Contaminant Mass Removal | Yes | Yes | The work plan for optimizing the TGRS was approved in FY 1998 |
| #2: Groundwater Treatment | Yes | Yes | |
| #3: Treated Water Discharge | Yes | Yes | |
| #4: Institutional Controls | Yes | Yes | |
| #5: Review of New Technologies | Yes | Yes | MPCA Natural Attenuation Study |
| #6: Groundwater Monitoring | Yes | Yes | |
| Operable Unit 3: Deep Groundwater | | | |
| #1: Groundwater Extraction | Yes | Yes | |
| #2: Groundwater Treatment | Yes | Yes | |
| #3: Use of Water for Municipal Supply | Yes | Yes | |
| #4: Groundwater Monitoring | Yes | Yes | |

Table 2 - 2

PGAC Effluent Water Quality

Note: These results are from sampling ports after the lead GAC vessel and before the lag vessel. Notes below indicated GAC replacement.

| SAMPLE DATE | COMPOUND (PPB) | QUARTERLY INFLUENT WELL MONITORING | | | | | MONTHLY OPERATIONAL PERFORMANCE MONITORING | | | | | | | | | | | | | | | | |
|-------------|----------------|------------------------------------|---------|---------|---------|----------|--|--|-----|--------------|-----|--------------|-----|--------------|-----|--------------|-----|--------------|-----|--------------|-----|--------------|-----|
| | | Well #3 | Well #4 | Well #5 | Well #6 | Well #14 | Well #15 | Contactor #1 | | Contactor #2 | | Contactor #3 | | Contactor #4 | | Contactor #5 | | Contactor #6 | | Contactor #7 | | Contactor #8 | |
| | | | | | | | | A | B | A | B | A | B | A | B | A | B | A | B | A | B | A | B |
| 04/19/93 | Total VOCs | 424 | 277 | 156 | 0 | | | GAC Replaced in contactors 1A, 2A, 3A, 4A, 5A, 6A, 7A, 8A between March 22 - March 31, 1993. "B" Vessels become the Lead Vessels. | | | | | | | | | | | | | | | |
| 05/19/93 | Total VOCs | 432 | 265 | 237 | 159 | | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 06/08/93 | Total VOCs | 301 | 340 | 191 | 159 | | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 07/28/93 | Total VOCs | 248 | 270 | 206 | 147 | | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 08/26/93 | Total VOCs | 377 | 328 | 215 | 158 | | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 09/23/93 | Total VOCs | 323 | 234 | 140 | 155 | | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 1 | NS | 3 | NS | 0 |
| 10/12/93 | Total VOCs | 297 | 290 | 181 | 139 | | | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 3 | 0 | 5 | 0 | 1 | 0 | 1 |
| 11/22/93 | Total VOCs | 410 | 313 | 215 | 169 | | | 0 | 3 | 0 | 3 | 0 | 4 | 0 | 4 | 0 | 3 | 0 | 6 | 0 | 3 | 0 | 3 |
| 12/28/93 | Total VOCs | 414 | 293 | 389 | 0 | | | GAC Replaced in contactors 1B, 2B, 3B, 4B, 5B, 6B, 7B, 8B between December 1, 1993 - January 10, 1994. "A" Vessels become the Lead Vessels. | | | | | | | | | | | | | | | |
| 01/13/94 | Total VOCs | | | | | | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 01/24/94 | Total VOCs | 159 | 292 | 269 | 182 | | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 02/23/94 | Total VOCs | 383 | 322 | 204 | 213 | | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 03/28/94 | Total VOCs | 478 | 382 | 168 | 150 | | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 04/30/94 | Total VOCs | 397 | 336 | 135 | 166 | | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 05/31/94 | Total VOCs | 404 | 386 | 168 | 135 | | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 06/30/94 | Total VOCs | 412 | 312 | 169 | 149 | | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 07/28/94 | Total VOCs | 270 | 269 | 156 | 134 | | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 08/29/94 | Total VOCs | 385 | 288 | 177 | 132 | | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 09/30/94 | Total VOCs | 209 | 214 | 158 | 121 | | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 10/31/94 | Total VOCs | 203 | 226 | 156 | 126 | | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 1 | NS | 0 | NS | 0 | NS |
| 11/29/94 | Total VOCs | 203 | 226 | 156 | 126 | | | GAC Replaced in contactors 1A, 2A, 3A, 4A, 5A, 6A, 7A, 8A between October 26 - December 6, 1994. "B" Vessels become the Lead Vessels. | | | | | | | | | | | | | | | |
| 12/07/94 | Total VOCs | 197 | 239 | 154 | 131 | | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 01/31/95 | Total VOCs | 212 | 240 | 135 | 113 | | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 02/28/95 | Total VOCs | 219 | 240 | 132 | 109 | | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 03/31/95 | Total VOCs | 241 | 240 | 170 | 123 | | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 04/30/95 | Total VOCs | 258 | 280 | 145 | 108 | | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 05/31/95 | Total VOCs | 230 | 232 | 133 | 107 | | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 06/30/95 | Total VOCs | 216 | 237 | 136 | 127 | | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 07/31/95 | Total VOCs | 225 | 188 | 135 | 105 | | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 08/31/95 | Total VOCs | 215 | 159 | 148 | 110 | | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 09/30/95 | Total VOCs | 225 | 188 | 135 | 105 | | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 10/31/95 | Total VOCs | 174 | 184 | 182 | 181 | | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 11/30/95 | Total VOCs | 154 | 177 | 136 | 106 | | | NS | 2.3 | NS | 3.7 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 12/31/95 | Total VOCs | 206 | 212 | 158 | 126 | | | GAC Replaced in contactors 1B, 2B, 3B, 4B, 5B, 6B, 7B, 8B between December 5 - December 20, 1995. "A" Vessels become the Lead Vessels. | | | | | | | | | | | | | | | |
| 01/31/96 | Total VOCs | 201 | 200 | 173 | 135 | | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 02/28/96 | Total VOCs | 189 | 203 | 191 | 177 | | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 03/31/96 | Total VOCs | 177 | 179 | 198 | 177 | | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 04/30/96 | Total VOCs | 174 | 173 | 159 | 125 | | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 05/31/96 | Total VOCs | 162 | 218 | 144 | 134 | | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 06/30/96 | Total VOCs | 135 | 254 | 147 | 133 | | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 07/31/96 | Total VOCs | 123 | 205 | 143 | 121 | | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 08/31/96 | Total VOCs | 177 | 234 | 181 | 125 | | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 09/30/96 | Total VOCs | 104 | 221 | 173 | 123 | | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 10/31/96 | Total VOCs | 113 | 158 | 153 | 108 | | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 11/30/96 | Total VOCs | 95 | 202 | 130 | 109 | | | 0 | NS | 1.4 | NS | 1.1 | NS | 3 | NS | 2.3 | NS | 1.1 | NS | 0 | NS | 0 | NS |
| 12/31/96 | Total VOCs | 103 | 193 | 155 | 100 | 279 | | 1.3 | 0 | 3 | 0 | 1.8 | 0 | 4.2 | 0 | 4.8 | 0 | 1.9 | 0 | 1.6 | 0 | 1.2 | 0 |
| 01/31/97 | Total VOCs | 105 | 135 | 218 | 132 | 306 | | GAC Replaced in contactors 1A, 2A, 3A, 4A, 5A, 6A, 7A, 8A between January 7, 1997 - January 21, 1997. "B" Vessels become the Lead Vessels. | | | | | | | | | | | | | | | |
| 02/28/97 | Total VOCs | 112 | 110 | 192 | 107 | 279 | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 03/31/97 | Total VOCs | 97 | 98 | 182 | 104 | 252 | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 04/30/97 | Total VOCs | 51 | 151 | 197 | 110 | 284 | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 05/31/97 | Total VOCs | 52 | 150 | 197 | 115 | 285 | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 06/30/97 | Total VOCs | 98 | 120 | 250 | 150 | 300 | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 07/31/97 | Total VOCs | 62 | 95 | 222 | 132 | 268 | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 08/31/97 | Total VOCs | 44 | 122 | 247 | 197 | 240 | | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 |
| 09/30/97 | Total VOCs | 47 | 146 | 202 | 137 | 214 | | 0 | 1.8 | 0 | 1.9 | 0 | 2.6 | 0 | 6.2 | 0 | 0 | 0 | 3 | 0 | 4.9 | 0 | 1.7 |
| 10/31/97 | Total VOCs | 75 | 82 | 262 | 171 | 298 | | 0 | 4.9 | 0 | 6 | 0 | 7.7 | 0 | 9.8 | 0 | 3.3 | 0 | 7.8 | 0 | 11 | 0 | 5.1 |
| 11/30/97 | Total VOCs | 34 | 101 | 197 | 102 | 216 | | GAC Replaced in contactors 1B, 2B, 3B, 4B, 5B, 6B, 7B, 8B between November 5, 1997 - November 21, 1997. "A" Vessels become the Lead Vessels. | | | | | | | | | | | | | | | |
| 12/31/97 | Total VOCs | 54.5 | 91.5 | 136 | 100 | 193 | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 01/31/98 | Total VOCs | 45 | 97 | 220 | 137 | 245 | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 02/28/98 | Total VOCs | 45 | 90 | 200 | 125 | 252 | | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 03/31/98 | Total VOCs | 45 | 77 | 160 | 131 | 210 | 110 | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 04/30/98 | Total VOCs | 56 | 76 | 180 | 131 | 210 | 140 | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 05/31/98 | Total VOCs | 38 | 87 | 144 | 131 | 173 | 340 | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | NS |
| 06/30/98 | Total VOCs | 23 | 30 | 150 | 95 | 230 | 146 | 0 | NS | 0 | NS | 0 | NS | 0 | NS | 0 | | | | | | | |

Table 3-1

Deep Groundwater Data Near Sites D and G: FY1998

| | | | Tetrachloroethene (ug/l) | Trichloroethene (ug/l) | 1,1- Dichloroethene (ug/l) | Cis-1,2- Dichloroethene (ug/l) | 1,1- Dichloroethane (ug/l) | 1,1,1- Trichloroethane (ug/l) | 1,2- Dichloroethane (ug/l) |
|-----------------------|--------|-----------|-----------------------------|---------------------------|----------------------------------|--------------------------------------|----------------------------------|-------------------------------------|----------------------------------|
| OU2 Cleanup Level (1) | | | 5 | 5 | 7 | 70 | 70 | 200 | 5 |
| Site D | 03U096 | 17-Jun-98 | <0.75 | 49.10 | 2.12 | <0.76* | 3.11 | 14.50 | <1.10 |
| | 03U093 | 16-Jun-98 | <0.75 | 202.00 | 6.76 | 1.03* | 4.76 | 39.20 | <1.10 |
| | 03U018 | 12-Jun-98 | <0.75 | 230.00 | 3.76 | 2.97* | 2.93 | 25.40 | <1.10 |
| Site G | 03U094 | 15-Jun-98 | <0.75 | 500.00 | 30.10 | 2.20* | 4.20 | 320.00 | <1.10 |
| | 03U014 | 08-Jun-98 | <0.75 | <0.56 | <1.70 | <0.76* | <0.73 | <0.76 | <1.10 |

Notes:

(1) Cleanup levels for Deep Groundwater from Table 1 of the OU2 ROD. Shading indicates exceedance of the cleanup level.

* Data is total 1,2-Dichloroethene, not the cis- isomer.

Table 3 - 2

Sites D and G
SVE System Flow Rates and Mass Removal
FY 1998

| Site D- Laboratory Analysis and Mass Removal Calculations | | | | | | | | | | |
|---|--|----------------------------------|---------------------------|-----------------------|---|-------------------------|---|---|---|-------------------------------|
| Date | Days of Operation in Monitoring Period | Flow Rate (ft ³ /min) | Liters of Air Sampled (L) | 1,1,1-Trichloroethane | | 1,1,2-Trichloroethylene | | Total VOCs | | Cumulative VOCs Removed (lbs) |
| | | | | Mass in Sample (ug) | Weight Removed During Monitoring Period (lbs) | Mass in Sample (ug) | Weight Removed During Monitoring Period (lbs) | Weight Removed During Monitoring Period (lbs) | Weight Removed During Monitoring Period (lbs) | |
| 10/07/97 | 24 | 6570 | 10.04 | 7.4 | 6.75 | 48.0 | 43.78 | 50.53 | 115,679 | |
| 11/01/97 | 20 | 6160 | 4.18 | <4.4 | 0.00 | 22.0 | 39.49 | 39.49 | 115,719 | |
| 12/05/97 | 23 | 6670 | 10.20 | 12.0 | 10.48 | 67.0 | 58.32 | 69.00 | 115,788 | |
| 01/06/98 | 22 | 6610 | 11.52 | 13.0 | 10.26 | 78.0 | 57.18 | 67.44 | 115,855 | |
| 02/01/98 | 21 | 6550 | 10.32 | 11.0 | 8.51 | 63.0 | 48.76 | 57.28 | 115,913 | |
| 03/03/98 | 19 | 6130 | 11.52 | 12.0 | 7.05 | 61.0 | 35.82 | 42.86 | 115,955 | |
| 04/07/98 | 25 | 6200 | 10.80 | 8.1 | 6.75 | 47.0 | 39.17 | 45.92 | 116,001 | |
| 05/06/98 | 21 | 6440 | 11.52 | 11.0 | 7.50 | 61.0 | 41.59 | 49.09 | 116,050 | |
| 06/02/98 | 19 | 6240 | 13.70 | 15.0 | 7.54 | 77.0 | 38.70 | 46.24 | 116,097 | |
| 07/07/98 | 25 | 6230 | 10.86 | 12.0 | 9.99 | 64.0 | 53.30 | 63.30 | 116,160 | |
| 08/01/98 | 20 | 6340 | 15.15 | 12.0 | 5.83 | 69.0 | 33.54 | 39.37 | 116,199 | |
| 09/02/98 | 2 | No Sample (1) | No Sample (1) | No Sample (1) | No Sample (1) | No Sample (1) | No Sample (1) | No Sample (1) | No Sample (1) | |

| Site G- Laboratory Analysis and Mass Removal Calculations | | | | | | | | | | | |
|---|--|----------------------------------|---------------------------|-----------------------|---|-------------------------|---|--------------------------|---|---|---|
| Date | Days of Operation in Monitoring Period | Flow Rate (ft ³ /min) | Liters of Air Sampled (L) | 1,1,1-Trichloroethane | | 1,1,2-Trichloroethylene | | cis-1,2-Dichloroethylene | | Total VOCs | |
| | | | | Mass in Sample (ug) | Weight Removed During Monitoring Period (lbs) | Mass in Sample (ug) | Weight Removed During Monitoring Period (lbs) | Mass in Sample (ug) | Weight Removed During Monitoring Period (lbs) | Weight Removed During Monitoring Period (lbs) | Weight Removed During Monitoring Period (lbs) |
| 10/07/97 | 24 | 7630 | 10.04 | <4.4 | 0.00 | 7.7 | 8.16 | <3.2 | 0.00 | 8.16 | 104,364 |
| 11/01/97 | 20 | 8360 | 4.18 | <4.4 | 0.00 | <4.2 | 0.00 | <3.2 | 0.00 | 0.00 | 104,364 |
| 12/05/97 | 23 | 7530 | 10.30 | <4.4 | 0.00 | 7.7 | 7.59 | 3.5 | 3.45 | 11.04 | 104,375 |
| 01/06/98 | 22 | 7340 | 11.52 | <4.4 | 0.00 | 7.6 | 6.19 | <3.2 | 0.00 | 6.19 | 104,382 |
| 02/01/98 | 21 | 7910 | 10.32 | <4.4 | 0.00 | 6.8 | 6.36 | <3.2 | 0.00 | 6.36 | 104,388 |
| 03/03/98 | 19 | 7240 | 11.52 | <4.4 | 0.00 | 5.4 | 3.74 | <3.2 | 0.00 | 3.74 | 104,391 |
| 04/07/98 | 25 | 5790 | 10.80 | <4.4 | 0.00 | 5.6 | 4.36 | <3.2 | 0.00 | 4.36 | 104,396 |
| 05/06/98 | 21 | 7240 | 11.52 | <4.4 | 0.00 | 6.3 | 4.98 | <3.2 | 0.00 | 4.98 | 104,401 |
| 06/02/98 | 19 | 6720 | 17.40 | <4.4 | 0.00 | 9.4 | 4.01 | <3.2 | 0.00 | 4.98 | 104,407 |
| 07/07/98 | 25 | 7240 | 10.86 | <4.4 | 0.00 | 8.3 | 8.03 | 3.4 | 3.29 | 11.32 | 104,418 |
| 08/01/98 | 13 | No Sample (1) | No Sample (1) | No Sample (1) | No Sample (1) | No Sample (1) | No Sample (1) | No Sample (1) | No Sample (1) | No Sample (1) | No Sample (1) |

NOTES:

- 1 Site G was shut down for evaluation on 07/21/98; therefore, no sample was taken in August.
 2 Site D was shut down for evaluation on 08/06/98; therefore, no sample was taken in September.

Table 3-3

Site A Groundwater Pumping Data: FY 1998

Average Flow Rate (GPM)

| Month | 01U351 | 01U352 | 01U353 | 01U354 | 01U355 | 1-5 Subtotal | 01U356 | 01U357 | 01U358 | 6-8 Subtotal | Total |
|---------------------|------------|------------|------------|------------|------------|--------------|------------|------------|------------|--------------|-------------|
| Target GPM | | | | | | 15.0 | | | | 10.0 | 25.0 |
| Oct-97 | 4.7 | 4.0 | 4.3 | 4.1 | 4.6 | 21.7 | 4.8 | 1.6 | 4.6 | 11.0 | 32.7 |
| Nov-97 | 4.4 | 3.7 | 4.1 | 3.4 | 4.2 | 19.8 | 3.4 | 1.5 | 4.5 | 9.4 | 29.2 |
| Dec-97 | 3.3 | 2.8 | 4.1 | 3.5 | 4.1 | 17.8 | 4.2 | 1.3 | 4.2 | 9.7 | 27.5 |
| Jan-98 | 1.4 | 3.6 | 4.5 | 4.2 | 4.6 | 18.3 | 3.8 | 1.5 | 4.5 | 9.8 | 28.1 |
| Feb-98 | 3.1 | 3.7 | 4.3 | 3.8 | 4.3 | 19.2 | 4.5 | 1.6 | 4.3 | 10.4 | 29.6 |
| Mar-98 | 4.4 | 3.0 | 4.0 | 3.6 | 4.4 | 19.4 | 4.3 | 1.8 | 5.2 | 11.3 | 30.7 |
| Apr-98 | 4.1 | 3.4 | 3.6 | 4.2 | 4.3 | 19.6 | 4.0 | 1.2 | 4.2 | 9.4 | 29.0 |
| May-98 | 5.0 | 3.7 | 3.9 | 4.8 | 3.6 | 21.0 | 4.5 | 1.5 | 5.1 | 11.1 | 32.1 |
| Jun-98 | 4.4 | 3.6 | 3.2 | 4.2 | 3.4 | 18.8 | 4.2 | 1.3 | 4.6 | 10.1 | 28.9 |
| Jul-98 | 2.7 | 3.7 | 3.6 | 4.5 | 3.4 | 17.9 | 4.3 | 1.5 | 4.5 | 10.3 | 28.2 |
| Aug-98 | 3.5 | 3.3 | 3.6 | 3.8 | 3.6 | 17.8 | 4.8 | 1.6 | 5.5 | 11.9 | 29.7 |
| Sep-98 | 2.8 | 3.7 | 4.3 | 3.9 | 3.2 | 17.9 | 4.2 | 1.6 | 4.1 | 9.9 | 27.8 |
| FY98 Average | 3.7 | 3.5 | 4.0 | 4.0 | 4.0 | 19.1 | 4.3 | 1.5 | 4.6 | 10.4 | 29.5 |

Table 3-4

Site A VOC Removal by Groundwater Pumping: FY 1998

| Date | Water Pumped (gal) | Conversion Factor | 1,2-DCE Effluent (µg/L) | 1,2-DCE Removed (lbs) | TRCLE Effluent (µg/L) | TRCLE Removed (lbs) | Total VOCs Removed (lbs) |
|----------------------------------|--------------------|-------------------|-------------------------|-----------------------|-----------------------|---------------------|--------------------------|
| cumulative totals up to 09/02/97 | 58,513,015 | | | 19.93 | | 0.64 | 20.57 |
| 10/07/97 | 1,345,740 | 8.35E-09 | 32.6 | 0.37 | 1.66 | 0.02 | 0.38 |
| 11/04/97 | 1,178,780 | 8.35E-09 | 47.2 | 0.46 | 1.40 | 0.01 | 0.48 |
| 12/02/97 | 1,355,040 | 8.35E-09 | 25.8 | 0.29 | 1.07 | 0.01 | 0.30 |
| 01/06/98 | 1,394,640 | 8.35E-09 | 43.8 | 0.51 | 2.48 | 0.03 | 0.54 |
| 02/03/98 | 993,110 | 8.35E-09 | 120.0 | 1.00 | 3.38 | 0.03 | 1.02 |
| 03/03/98 | 1,350,330 | 8.35E-09 | 27.0 | 0.30 | 1.04 | 0.01 | 0.32 |
| 04/07/98 | 1,572,520 | 8.35E-09 | 32.0 | 0.42 | 2.21 | 0.03 | 0.45 |
| 05/05/98 | 1,118,250 | 8.35E-09 | 32.4 | 0.30 | 1.72 | 0.02 | 0.32 |
| 06/02/98 | 1,295,250 | 8.35E-09 | 33.6 | 0.36 | 1.29 | 0.01 | 0.38 |
| 07/28/98 | 2,286,000 | 8.35E-09 | 31.7 | 0.61 | 1.08 | 0.02 | 0.63 |
| 08/04/98 | 315,900 | 8.35E-09 | 34.8 | 0.09 | 0.82 | 0.00 | 0.09 |
| 09/09/98 | 1,430,480 | 8.35E-09 | 38.8 | 0.46 | 1.67 | 0.02 | 0.48 |
| 09/30/98 | 917,830 | 8.35E-09 | 38.8 | 0.30 | 1.67 | 0.01 | 0.31 |
| CUMULATIVE TOTALS: | 75,066,885 | | | 25.41 | | 0.87 | 26.28 |

TABLE 3-5

Site A Effluent Water Quality : FY 1998

| Site ID | Sample Date | 1,2-Dichloroethene (ug/l) | Tetrachloroethene (ug/l) | Trichloroethene (ug/l) | Mercury (ug/l) | Total Suspended Solids (ug/l) | Chemical Oxygen Demand (ug/l) |
|--------------------|-------------|------------------------------|-----------------------------|---------------------------|-------------------|----------------------------------|----------------------------------|
| DISCHARGE CRITERIA | | 3,000 | 3,000 | 3,000 | 0.2 | None | None |
| EFFLUENT-A | 07-Oct-97 | 35.10 | <0.75 | 1.82 | <0.10 | | |
| EFFLUENT-A | 04-Nov-97 | 50.80 | <0.75 | 1.54 | <0.10 | | |
| EFFLUENT-A | 02-Dec-97 | 27.70 | <0.75 | 1.18 | <0.10 | | |
| EFFLUENT-A | 06-Jan-98 | 47.10 | <0.75 | 2.73 | 0.10 | | |
| EFFLUENT-A | 03-Feb-98 | 129.00 | <0.75 | 3.71 | <0.10 | | |
| EFFLUENT-A | 03-Mar-98 | 29.00 | <0.75 | 1.14 | <0.10 | | |
| EFFLUENT-A | 07-Apr-98 | 34.40 | <0.75 | 2.43 | <0.10 | | |
| EFFLUENT-A | 05-May-98 | 34.80 | <0.75 | 1.89 | <0.10 | | |
| EFFLUENT-A | 02-Jun-98 | 36.10 | <0.75 | 1.42 | <0.10 | <4000.00 | JP 93100.00 |
| EFFLUENT-A | 07-Jul-98 | | | | <0.10 | | |
| EFFLUENT-A | 28-Jul-98 | 34.10 | <0.75 | 1.19 | <0.10 | | |
| EFFLUENT-A | 04-Aug-98 | 37.40 | <0.75 | 0.91 | <0.10 | | |
| EFFLUENT-A | 08-Sep-98 | 41.70 | <0.75 | 1.84 | 0.2 | | |

Notes: JP = The value is below the method detection level, but above the instrument detection level.

Table 3-6

Summary of Monthly VOC Removal for Fiscal Year 1998: Site K Groundwater Pumping

| <i>Month</i> | <i>VOC Influent ^{1,2}</i> <i>(µg/L)</i> | <i>Water Treated ³</i> <i>(million gallon)</i> | <i>Total VOCs Into</i> <i>Treatment Center</i> <i>(lbs/quarter)</i> | <i>VOC Effluent ¹</i> <i>(µg/L)</i> | <i>Total VOCs Out Of</i> <i>Treatment Center ²</i> <i>(lbs/quarter)</i> | <i>Total VOCs Removed</i> <i>By Stripping Towers</i> <i>(lbs/quarter)</i> |
|--------------|---|--|---|---|--|---|
| December | 344.20 | 0.91662 | 2.63 | 0.0 | 0.000 | 2.63 |
| March | 257.40 | 1.17827 | 2.53 | 0.0 | 0.000 | 2.53 |
| June | 313.01 | 0.94963 | 2.48 | 0.0 | 0.000 | 2.48 |
| September | 346.50 | 0.89840 | 2.60 | 0.0 | 0.000 | 2.60 |

Notes:

¹ VOC concentrations do not include estimated concentrations for compounds detected below the reporting limit

² VOC influent and effluent data is collected in the third month of every quarter. Data is used to calculate VOC's removed for the quarter.

³ Number reflects quarterly volume.

Table 3-7

Fiscal Year 1998
Site K Groundwater Treatment System Concentrations (Organics), TCAAAP

| Sample Location | Date | CCL4 | CHCL3 | CH2CL2 | C2H3CL | TCLEE | TRCLE | 11DCE | 11DCLE | 11ITCE | C12DCE | T12DCE | 12DCLC | 112TCE | 12DCLP | TCLTFC |
|-----------------|---------|--------|---------|--------|---------|--------|----------|---------|---------|---------|---------|---------|---------|---------|---------|--------|
| Effluent | 10/7/97 | -- | -- | -- | <0.33 | -- | <0.32 | <0.36 | <0.30 | -- | <0.29 | <0.34 | <0.32 | -- | -- | -- |
| Effluent | 11/4/97 | -- | -- | -- | <0.33 | -- | 0.68 J | <0.36 | <0.30 | -- | <0.29 | <0.34 | <0.32 | -- | -- | -- |
| Effluent | 11/4/97 | -- | -- | -- | <0.33 D | -- | 0.66 JD | <0.36 D | <0.30 D | -- | <0.29 D | <0.34 D | <0.32 D | -- | -- | -- |
| Effluent | 12/2/97 | -- | -- | -- | <0.33 | -- | <0.32 | <0.36 | <0.30 | -- | 0.40 J | <0.34 | <0.32 | -- | -- | -- |
| Effluent | 12/2/97 | -- | -- | -- | <0.33 D | -- | 0.32 JD | <0.36 D | <0.30 D | -- | 0.42 JD | <0.34 D | <0.32 D | -- | -- | -- |
| Effluent | 1/6/98 | -- | -- | -- | <0.15 | -- | <0.14 | <0.16 | <0.08 | -- | <0.23 | <0.09 | <0.04 | -- | -- | -- |
| Effluent | 1/6/98 | -- | -- | -- | <0.15 D | -- | <0.14 D | <0.16 D | <0.08 D | -- | <0.23 D | <0.09 D | <0.04 D | -- | -- | -- |
| Effluent | 2/3/98 | -- | -- | -- | <0.15 | -- | <0.14 | <0.16 | <0.08 | -- | <0.23 | <0.09 | <0.04 | -- | -- | -- |
| Effluent | 2/3/98 | -- | -- | -- | <0.15 D | -- | <0.14 D | <0.16 D | <0.08 D | -- | <0.23 D | <0.09 D | <0.04 D | -- | -- | -- |
| Effluent | 3/3/98 | -- | -- | -- | <0.15 | -- | 0.64 J | <0.16 | <0.08 | -- | <0.23 | <0.09 | <0.04 | -- | -- | -- |
| Effluent | 3/3/98 | -- | -- | -- | <0.15 D | -- | <0.14 D | <0.16 D | <0.08 D | -- | <0.23 D | <0.09 D | <0.04 D | -- | -- | -- |
| Effluent | 4/7/98 | -- | -- | -- | <0.15 | -- | <0.14 | <0.16 | <0.08 | -- | <0.23 | <0.09 | <0.04 | -- | -- | -- |
| Effluent | 4/7/98 | -- | -- | -- | <0.15 D | -- | <0.14 D | <0.16 D | <0.08 D | -- | <0.23 D | <0.09 D | <0.04 D | -- | -- | -- |
| Effluent | 5/5/98 | -- | -- | -- | <0.15 * | -- | <0.14 | <0.16 | <0.08 | -- | <0.23 | <0.09 | <0.04 | -- | -- | -- |
| Effluent | 5/5/98 | -- | -- | -- | <0.15 D | -- | <0.14 D | <0.16 D | <0.08 D | -- | <0.23 D | <0.09 D | <0.04 D | -- | -- | -- |
| Effluent | 6/2/98 | -- | -- | -- | <0.16 | -- | 0.33 J | <0.16 | <0.08 | -- | <0.23 | <0.09 | <0.04 | -- | -- | -- |
| Effluent | 6/2/98 | -- | -- | -- | <0.17 D | -- | 0.29 JD | <0.16 D | <0.08 D | -- | <0.23 D | <0.09 D | <0.04 D | -- | -- | -- |
| Effluent | 7/9/98 | <0.1 | <0.07 | <0.1 | <0.18 | <0.1 | 0.23 JP | <0.16 | <0.08 | <0.14 | <0.23 | <0.09 | <0.04 | <0.09 | <0.04 | <0.1 |
| Effluent | 7/9/98 | <0.1 D | <0.07 D | <0.1 D | <0.19 D | <0.1 D | 0.24 JPD | <0.16 D | <0.08 D | <0.14 D | <0.23 D | <0.09 D | <0.04 D | <0.09 D | <0.04 D | <0.1 D |
| Effluent | 8/4/98 | -- | -- | -- | <0.20 | -- | 0.61 J | <0.16 | <0.08 | -- | 0.44 J | <0.09 | <0.04 | -- | -- | -- |
| Effluent | 8/4/98 | -- | -- | -- | <0.21 | -- | 0.60 JD | <0.16 | <0.08 | -- | 0.45 JD | <0.09 | <0.04 | -- | -- | -- |
| Effluent | 9/8/98 | -- | -- | -- | <0.22 | -- | <0.14 | <0.16 | <0.08 | -- | <0.23 | <0.09 | <0.04 | -- | -- | -- |
| Effluent | 9/8/98 | -- | -- | -- | <0.23 D | -- | <0.14 D | <0.16 D | <0.08 D | -- | <0.23 D | <0.09 D | <0.04 D | -- | -- | -- |
| Influent | 12/2/97 | -- | -- | -- | 1.2 | -- | 260 | 0.77 J | <0.30 | -- | 71 | 12 | <0.32 | -- | -- | -- |
| Influent | 3/3/98 | -- | -- | -- | 0.89 J | -- | 200 | <0.156 | <0.08 | -- | 49 | 8.4 | <0.04 | -- | -- | -- |
| Influent | 6/2/98 | -- | -- | -- | 0.41 | -- | 260 | 0.36 J | 0.25 J | -- | 47 | 5.6 | <0.04 | -- | -- | -- |
| Influent | 9/11/98 | -- | -- | -- | 1.1 | -- | 280 | 0.67 J | 0.32 J | -- | 56 | 9.4 | <0.04 | -- | -- | -- |

Notes:

Concentrations in µg/L.

D - Duplicate analysis.

J - Value is estimated.

P - Result is less than reporting level, but greater than instrument detection limit.

TABLE 3 - 8

FISCAL YEAR 1998 EXTRACTION WELL WATER PUMPED
TGRS, TCAAP
NEW BRIGHTON, MINNESOTA

| | Volume of Water Pumped (gallons) | | | | | | | | | | | | | | | | | |
|----------------|----------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|------------|------------|-------------|------------|-------------|------------|------------|------------|------------|------------|---------------|
| | B1 | B2 | B3 | B4 | B5 | B6 | B7 | B8 | B9 | B10 | B11 | B12 | SC1 | SC2 | SC3 | SC4 | SC5 | TOTAL |
| October 1997 | 9,642,100 | 5,600,600 | 10,753,100 | 8,651,900 | 8,896,300 | 11,546,000 | 12,002,600 | 5,067,100 | 6,888,600 | 10,983,800 | 3,784,500 | 2,800 | 1,449,100 | 2,159,400 | 3,531,100 | 0 | 4,495,900 | 105,454,900 |
| November 1997 | 9,292,200 | 5,468,000 | 10,479,400 | 8,410,800 | 8,706,500 | 11,224,400 | 11,721,000 | 5,359,800 | 6,736,700 | 11,032,400 | 2,828,200 | 0 | 1,398,700 | 1,777,900 | 3,670,200 | 0 | 4,351,400 | 102,457,600 |
| December 1997 | 8,534,200 | 5,583,000 | 9,868,600 | 7,986,400 | 8,445,200 | 10,867,300 | 11,338,400 | 5,536,200 | 5,318,000 | 10,584,600 | 4,978,300 | 0 | 1,346,800 | 1,586,300 | 4,620,400 | 0 | 4,295,400 | 100,889,100 |
| January 1998 | 8,418,700 | 5,923,800 | 10,500,500 | 7,711,800 | 9,053,500 | 11,293,100 | 11,717,700 | 5,677,700 | 5,702,500 | 10,906,000 | 4,707,100 | 0 | 1,400,700 | 1,205,000 | 4,780,000 | 0 | 4,573,100 | 103,571,200 |
| February 1998 | 9,490,100 | 4,657,800 | 8,745,900 | 7,320,100 | 8,025,100 | 10,176,500 | 9,767,800 | 4,979,100 | 5,665,400 | 8,873,600 | 4,009,700 | 0 | 1,162,700 | 1,274,900 | 4,194,700 | 100 | 4,434,100 | 92,777,600 |
| March 1998 | 10,660,600 | 5,251,200 | 10,619,600 | 8,260,800 | 9,015,800 | 11,389,900 | 11,836,100 | 5,662,800 | 6,492,400 | 10,621,200 | 4,853,300 | 0 | 1,370,600 | 2,132,000 | 4,692,100 | 0 | 5,003,800 | 107,862,200 |
| April 1998 | 10,161,900 | 4,938,700 | 10,212,100 | 6,624,100 | 8,646,800 | 10,842,600 | 11,320,800 | 5,381,800 | 6,178,700 | 10,305,000 | 4,606,500 | 0 | 1,296,800 | 2,118,400 | 4,490,000 | 0 | 4,690,200 | 101,814,400 |
| May 1998 | 9,420,200 | 4,549,700 | 9,377,600 | 6,262,600 | 4,927,500 | 9,934,100 | 12,070,700 | 4,877,000 | 5,575,100 | 9,447,400 | 4,160,400 | 0 | 1,184,900 | 2,565,800 | 4,873,900 | 0 | 4,887,300 | 94,114,200 |
| June 1998 | 10,620,600 | 4,906,000 | 10,291,400 | 4,632,200 | 8,781,600 | 10,925,500 | 11,367,600 | 5,351,800 | 6,087,300 | 9,744,500 | 4,633,200 | 9,300 | 1,253,900 | 2,024,200 | 4,047,300 | 0 | 3,769,800 | 98,446,200 |
| July 1998 | 10,354,800 | 4,328,800 | 9,601,900 | 7,684,500 | 9,903,000 | 10,403,200 | 10,803,300 | 5,090,500 | 5,392,500 | 9,855,800 | 4,449,100 | 0 | 1,200,900 | 1,250,600 | 4,304,400 | 100 | 3,396,000 | 98,019,400 |
| August 1998 | 10,316,700 | 2,886,900 | 9,793,800 | 8,265,700 | 9,964,500 | 10,562,500 | 11,710,000 | 5,123,700 | 2,842,700 | 9,449,000 | 4,372,500 | 0 | 1,190,800 | 1,023,800 | 4,354,600 | 0 | 3,382,800 | 95,240,000 |
| September 1998 | 8,771,900 | 4,377,000 | 8,967,800 | 6,577,100 | 10,068,900 | 10,544,400 | 11,685,100 | 5,024,600 | 6,570,600 | 8,569,200 | 4,010,800 | 0 | 1,123,900 | 2,296,700 | 4,088,400 | 0 | 2,684,700 | 95,361,100 |
| TOTAL FY98 | 115,684,000 | 58,471,500 | 119,211,700 | 88,388,000 | 104,434,700 | 129,709,500 | 137,341,100 | 63,132,100 | 69,450,500 | 120,372,500 | 51,393,600 | 12,100 | 15,379,800 | 21,415,000 | 51,647,100 | 200 | 49,964,500 | 1,196,007,900 |
| FY89 | 67,563,900 | 69,364,850 | 72,257,490 | 75,237,700 | 76,328,500 | 100,611,510 | 138,278,100 | 42,329,200 | 60,613,300 | 54,516,600 | 93,534,437 | 60,210,340 | 13,867,660 | 20,078,880 | 36,660,309 | 12,593,300 | 39,307,600 | 1,033,353,676 |
| FY90 | 70,722,300 | 69,450,060 | 73,633,450 | 80,511,000 | 71,897,000 | 105,220,300 | 117,609,400 | 40,747,900 | 59,883,400 | 95,227,900 | 40,939,800 | 63,867,460 | 11,281,750 | 19,278,830 | 35,609,300 | 15,260,500 | 37,275,400 | 1,008,415,750 |
| FY91 | 99,482,900 | 102,399,960 | 98,521,050 | 104,674,800 | 105,191,900 | 137,181,500 | 153,080,700 | 63,386,100 | 77,083,200 | 130,044,100 | 54,094,000 | 95,329,240 | 17,111,600 | 23,724,440 | 46,611,600 | 20,228,000 | 54,182,500 | 1,382,327,590 |
| FY92 | 103,612,700 | 105,175,800 | 104,103,100 | 105,741,800 | 106,869,400 | 140,681,700 | 155,934,000 | 61,053,000 | 78,498,200 | 129,041,800 | 52,635,900 | 93,170,000 | 17,472,600 | 21,165,900 | 50,254,500 | 22,045,100 | 53,891,100 | 1,401,346,600 |
| FY93 | 104,610,228 | 97,362,300 | 102,039,200 | 102,785,395 | 105,885,800 | 140,275,000 | 153,555,300 | 60,334,400 | 78,395,400 | 129,093,800 | 49,765,700 | 90,094,600 | 16,887,368 | 24,623,700 | 51,413,200 | 25,104,180 | 55,980,600 | 1,388,206,172 |
| FY94 | 99,994,100 | 75,083,100 | 98,156,900 | 91,607,800 | 93,671,400 | 126,439,100 | 140,213,900 | 63,403,400 | 71,130,200 | 115,719,700 | 48,857,400 | 87,868,300 | 17,351,750 | 19,244,100 | 45,125,400 | 20,715,000 | 46,698,300 | 1,261,279,850 |
| FY95 | 117,949,700 | 68,908,100 | 115,358,700 | 104,187,500 | 102,308,300 | 141,348,900 | 147,788,900 | 68,183,400 | 75,017,600 | 128,802,200 | 53,372,700 | 100,424,400 | 16,572,496 | 23,173,800 | 47,176,100 | 24,037,800 | 51,323,400 | 1,385,933,996 |
| FY96 | 125,047,900 | 55,550,500 | 129,118,200 | 103,113,100 | 106,158,000 | 142,485,500 | 100,031,500 | 68,182,700 | 80,266,000 | 130,823,300 | 50,345,100 | 95,047,900 | 7,152,620 | 22,803,400 | 50,843,300 | 23,411,400 | 51,382,800 | 1,341,763,220 |
| FY97 | 103,065,700 | 63,195,800 | 116,976,600 | 91,590,200 | 103,636,700 | 141,103,600 | 133,956,600 | 60,633,500 | 77,677,200 | 129,353,600 | 47,439,800 | 10,526,600 | 15,381,400 | 24,099,800 | 48,925,600 | 3,166,500 | 51,146,000 | 1,213,035,110 |
| FY98 | 115,684,000 | 58,471,500 | 119,211,700 | 88,388,000 | 104,434,700 | 129,709,500 | 137,341,100 | 63,132,100 | 69,450,500 | 120,372,500 | 51,393,600 | 12,100 | 15,379,800 | 21,415,000 | 51,647,100 | 200 | 49,964,500 | 1,196,007,900 |

TABLE 3 - 9

VOC MASS LOADING SUMMARY
TGRS, TCAAP
NEW BRIGHTON, MINNESOTA

| <i>Well</i> | <i>% Contribution to VOC Mass Removal</i> | <i>FY 1998 Total Pounds VOC Mass Removed</i> |
|-------------------------------------|---|--|
| B1 | 3.5 | 214 |
| B2 | 0.4 | 22 |
| B3 | 0.5 | 31 |
| B4 | 20.3 | 1246 |
| B5 | 21.7 | 1329 |
| B6 | 6.6 | 406 |
| B7 | 0.0 | 2 |
| B8 | 0.3 | 17 |
| B9 | 1.7 | 107 |
| B10 | 0.1 | 7 |
| B11 | 0.0 | 2 |
| B12 | (Shut down) | 0 |
| SC1 | 2.0 | 123 |
| SC2 | 0.7 | 45 |
| SC3 | 0.1 | 8 |
| SC4 | (Shut down) | 0 |
| SC5 | 41.9 | 2571 |
| <i>Fiscal Year 1998 Total (lbs)</i> | | 6132 |
| <i>Daily Average (lbs/day)</i> | | 17 |

HISTORICAL TOTAL

| <i>Fiscal Year</i> | <i>Pounds VOC Mass Removed</i> |
|--|------------------------------------|
| 1998 | 6,132 |
| 1997 | 6,210 |
| 1996 | 10,655 |
| 1995 | 13,355 |
| 1994 | 15,070 |
| 1993 | 20,165 |
| 1992 | 24,527 |
| 1991 | 26,760 |
| 1990 | 18,005 |
| 1989 (First year of full scale system) | 19,510 |
| 1988 | 4,800 |
| 1987 | 2,100 |
| <i>Total</i> | 167,289 |

TABLE 4 - 1

SUMMARY OF MONTHLY VOC REMOVAL FOR FISCAL YEAR 1998
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

| <i>Month</i> | <i>VOC Influent^{1,2}</i> <i>(µg/L)</i> | <i>Water Treated</i> <i>(million gallon)</i> | <i>Total VOCs Into</i> <i>Treatment Center</i> <i>(lbs)</i> | <i>VOC Effluent¹</i> <i>(µg/L)</i> | <i>Total VOCs Out Of</i> <i>Treatment Center</i> <i>(lbs)</i> | <i>Total VOCs Removed</i> <i>By Carbon System</i> <i>(lbs)</i> | |
|--------------|--|---|---|--|---|--|------|
| October | 1.76 | 44.166 | 0.65 | 0.0 | 0.00 | 0.65 | |
| November | 1.45 | 47.718 | 0.58 | 0.0 | 0.00 | 0.58 | |
| December | 1.48 | 44.011 | 0.54 | 0.0 | 0.00 | 0.54 | |
| January | 1.71 | 44.277 | 0.63 | 0.0 | 0.00 | 0.63 | |
| February | 1.91 | 39.894 | 0.64 | 0.90 | 0.30 | 0.34 | |
| March | 1.29 | 42.889 | 0.46 | 0.0 | 0.00 | 0.46 | |
| April | 1.09 | 37.172 | 0.34 | 0.0 | 0.00 | 0.34 | |
| May | 0.74 | 18.045 | 0.11 | 0.0 | 0.00 | 0.11 | |
| June | 0.65 | 41.482 | 0.23 | 0.0 | 0.00 | 0.23 | |
| July | 0.98 | 28.861 | 0.24 | 0.0 | 0.00 | 0.24 | |
| August | 1.06 | 42.302 | 0.37 | 0.0 | 0.00 | 0.37 | |
| September | 1.58 | 46.951 | 0.62 | 0.0 | 0.00 | 0.62 | |
| | | | | | | Total | 5.11 |

Notes:

¹ VOC concentrations do not include estimated concentrations for compounds detected below the reporting limit

² Concentration is an average, if more than one sample was collected during the month.

² Number reflects quarterly volume.

Table 4-2

Fiscal Year 1998 Water Quality Data, PGRS, TCAAP

| Sample Date | 11TCE 200.0 | 112TCE 3.0 | 11DCE 6.0 | 11DCLE 70.0 | 12DCE ¹ 70.0 | 12DCLE | 12DCLP | C2H3CL | CCL4 | CH2CL2 | CHCL3 | TCLEE | TCLTFE | TRCLE 5.0 |
|-----------------|----------------|---------------|--------------|----------------|----------------------------|----------|---------|-----------|-----------|----------|----------|-----------|---------|--------------|
| ARAR Site ID | | | | | | | | | | | | | | |
| NB13E 10/7/97 | < 0.76 | < 0.78 | < 1.7 | < 0.73 | < 0.76 | < 1.1 | < 1 T | < 1.01 | < 0.99 | < 7.4 | < 0.5 | < 0.75 | < 1 T | < 0.56 |
| NB13E 11/4/97 | < 0.76 ? | < 0.78 ? | < 1.7 ? | < 0.73 ? | < 0.76 ? | < 1.1 ? | < 1 T? | < 1.01 ? | < 0.99 ? | < 7.4 ? | < 0.5 ? | < 0.75 ? | < 1 T? | < 0.56 ? |
| NB13E 12/2/97 | < 0.76 ? | < 0.78 ? | < 1.7 ? | < 0.73 ? | < 0.76 ? | < 1.1 ? | < 1 T? | < 1.01 ? | < 0.99 ? | < 7.4 ? | < 0.5 ? | < 0.75 ? | < 1 T? | < 0.56 ? |
| NB13E 1/6/98 | < 0.76 ? | < 0.78 ? | < 1.7 ? | < 0.73 ? | < 0.76 ? | < 1.1 ? | < 1 T? | < 1.01 ? | < 0.99 ? | < 7.4 ? | < 0.5 ? | < 0.75 ? | < 1 T? | < 0.56 ? |
| NB13E 2/3/98 | < 0.76 ? | < 0.78 ? | < 1.7 ? | < 0.73 ? | < 0.76 ? | < 1.1 ? | < 1 T? | < 1.01 ? | < 0.99 ? | < 7.4 ? | < 0.5 ? | < 0.75 ? | < 1 T? | 0.899 ? |
| NB13E 3/3/98 | < 0.76 ? | < 0.78 ? | < 1.7 ? | < 0.73 ? | < 0.76 ? | < 1.1 ? | < 1 T? | < 1.01 ? | < 0.99 ? | < 7.4 ? | < 0.5 ? | < 0.75 ? | < 1 T? | < 0.56 ? |
| NB13E 4/7/98 | < 0.76 ? | < 0.78 ? | < 1.7 ? | < 0.73 ? | < 0.76 ? | < 1.1 ? | < 1 T? | < 1.01 ? | < 0.99 ? | < 7.4 ? | < 0.5 ? | < 0.75 ? | < 1 T? | < 0.56 ? |
| NB13E 5/28/98 | < 0.76 ? | < 0.78 ? | < 1.7 ? | < 0.73 ? | < 0.76 ? | < 1.1 ? | < 1 T? | < 1.01 ? | < 0.99 ? | < 7.4 ? | < 0.5 ? | < 0.75 ? | < 1 T? | < 0.56 ? |
| NB13E 6/2/98 | < 0.76 ? | < 0.78 ? | < 1.7 ? | < 0.73 ? | < 0.76 ? | < 1.1 ? | < 1 T? | < 1.01 ? | < 0.99 ? | < 7.4 ? | < 0.5 ? | < 0.75 ? | < 1 T? | < 0.56 ? |
| NB13E 7/7/98 | < 0.76 | < 0.78 | < 1.7 | < 0.73 | < 0.76 | < 1.1 | < 1 T | < 1.01 | < 0.99 | < 7.4 | < 0.5 | < 0.75 | < 1 T | < 0.56 |
| NB13E 8/4/98 | < 0.76 ? | < 0.78 ? | < 1.7 ? | < 0.73 ? | < 0.76 ? | < 1.1 ? | < 1 T? | < 1.01 ? | < 0.99 ? | < 7.4 ? | < 0.5 ? | < 0.75 ? | < 1 T? | < 0.56 ? |
| NB13E 9/1/98 | < 0.76 ? | < 0.78 ? | < 1.7 ? | < 0.73 ? | < 0.76 ? | < 1.1 ? | < 1 T? | < 1.01 ? | < 0.99 ? | < 7.4 ? | < 0.5 ? | < 0.75 ? | < 1 T? | < 0.56 ? |
| NB13I 10/7/97 | < 0.76 | < 0.78 | < 1.7 | < 0.73 | < 0.76 | < 1.1 | < 1 T | < 1.01 | < 0.99 | < 7.4 | < 0.5 | < 0.75 | < 1 T | 1.76 |
| NB13I 11/4/97 | < 0.76 D? | < 0.78 ? | < 1.7 D? | < 0.73 D? | < 0.76 ? | < 1.1 D? | < 1 DT? | < 1.01 D? | < 0.99 D? | < 7.4 ? | < 0.5 D? | < 0.75 ? | < 1 DT? | 1.36 ? |
| NB13I 11/4/97 | < 0.76 ? | < 0.78 D? | < 1.7 ? | < 0.73 ? | < 0.76 D? | < 1.1 ? | < 1 T? | < 1.01 ? | < 0.99 ? | < 7.4 D? | < 0.5 ? | < 0.75 D? | < 1 T? | 1.54 D? |
| NB13I 12/2/97 | < 0.76 ? | < 0.78 ? | < 1.7 ? | < 0.73 ? | < 0.76 ? | < 1.1 ? | < 1 T? | < 1.01 ? | < 0.99 ? | < 7.4 ? | < 0.5 ? | < 0.75 ? | < 1 T? | 1.54 ? |
| NB13I 12/2/97 | < 0.76 ? | < 0.78 ? | < 1.7 ? | < 0.73 ? | < 0.76 ? | < 1.1 ? | < 1 T? | < 1.01 ? | < 0.99 ? | < 7.4 ? | < 0.5 ? | < 0.75 ? | < 1 T? | 1.42 ? |
| NB13I 1/6/98 | < 0.76 ? | < 0.78 ? | < 1.7 ? | < 0.73 ? | < 0.76 ? | < 1.1 ? | < 1 T? | < 1.01 ? | < 0.99 ? | < 7.4 ? | < 0.5 ? | < 0.75 ? | < 1 T? | 1.84 ? |
| NB13I 1/6/98 | < 0.76 D? | < 0.78 D? | < 1.7 D? | < 0.73 D? | < 0.76 D? | < 1.1 D? | < 1 DT? | < 1.01 D? | < 0.99 D? | < 7.4 D? | < 0.5 D? | < 0.75 D? | < 1 DT? | 1.57 D? |
| NB13I 2/3/98 | < 0.76 ? | < 0.78 ? | < 1.7 ? | < 0.73 ? | < 0.76 ? | < 1.1 ? | < 1 T? | < 1.01 ? | < 0.99 ? | < 7.4 ? | < 0.5 ? | < 0.75 ? | < 1 T? | 1.91 ? |
| NB13I 3/3/98 | < 0.76 D? | < 0.78 D? | < 1.7 D? | < 0.73 ? | < 0.76 D? | < 1.1 D? | < 1 DT? | < 1.01 ? | < 0.99 D? | < 7.4 ? | < 0.5 D? | < 0.75 D? | < 1 T? | 1.23 D? |
| NB13I 3/3/98 | < 0.76 ? | < 0.78 ? | < 1.7 ? | < 0.73 D? | < 0.76 ? | < 1.1 ? | < 1 T? | < 1.01 D? | < 0.99 ? | < 7.4 D? | < 0.5 ? | < 0.75 ? | < 1 DT? | 1.34 ? |
| NB13I 4/7/98 | < 0.76 ? | < 0.78 ? | < 1.7 ? | < 0.73 ? | < 0.76 ? | < 1.1 ? | < 1 T? | < 1.01 ? | < 0.99 ? | < 7.4 ? | < 0.5 ? | < 0.75 ? | < 1 T? | 1.07 ? |
| NB13I 4/7/98 | < 0.76 D? | < 0.78 D? | < 1.7 D? | < 0.73 D? | < 0.76 D? | < 1.1 D? | < 1 DT? | < 1.01 D? | < 0.99 D? | < 7.4 D? | < 0.5 D? | < 0.75 D? | < 1 DT? | 1.11 D? |
| NB13I 5/28/98 | < 0.76 D? | < 0.78 D? | < 1.7 D? | < 0.73 ? | < 0.76 D? | < 1.1 ? | < 1 DT? | < 1.01 D? | < 0.99 D? | < 7.4 D? | < 0.5 ? | < 0.75 D? | < 1 DT? | 0.729 D? |
| NB13I 5/28/98 | < 0.76 ? | < 0.78 ? | < 1.7 ? | < 0.73 D? | < 0.76 ? | < 1.1 D? | < 1 T? | < 1.01 ? | < 0.99 ? | < 7.4 ? | < 0.5 D? | < 0.75 ? | < 1 T? | 0.741 ? |
| NB13I 6/2/98 | < 0.76 ? | < 0.78 D? | < 1.7 D? | < 0.73 D? | < 0.76 D? | < 1.1 D? | < 1 DT? | < 1.01 D? | < 0.99 D? | < 7.4 D? | < 0.5 D? | < 0.75 D? | < 1 DT? | 0.621 D? |
| NB13I 6/2/98 | < 0.76 D? | < 0.78 ? | < 1.7 ? | < 0.73 ? | < 0.76 ? | < 1.1 ? | < 1 T? | < 1.01 ? | < 0.99 ? | < 7.4 ? | < 0.5 ? | < 0.75 ? | < 1 T? | 0.681 ? |
| NB13I 7/7/98 | < 0.76 | < 0.78 | < 1.7 | < 0.73 | < 0.76 | < 1.1 | < 1 T | < 1.01 | < 0.99 | < 7.4 | < 0.5 | < 0.75 | < 1 T | 1.01 |
| NB13I 7/7/98 | < 0.76 D | < 0.78 D | < 1.7 D | < 0.73 D | < 0.76 D | < 1.1 D | < 1 TD | < 1.01 D | < 0.99 D | < 7.4 D | < 0.5 D | < 0.75 D | < 1 TD | 0.953 D |
| NB13I 8/4/98 | < 0.76 ? | < 0.78 ? | < 1.7 ? | < 0.73 ? | < 0.76 ? | < 1.1 ? | < 1 T? | < 1.01 ? | < 0.99 ? | < 7.4 ? | < 0.5 ? | < 0.75 ? | < 1 T? | 0.98 ? |
| NB13I 8/4/98 | < 0.76 D? | < 0.78 D? | < 1.7 D? | < 0.73 D? | < 0.76 D? | < 1.1 D? | < 1 T? | < 1.01 D? | < 0.99 D? | < 7.4 D? | < 0.5 D? | < 0.75 D? | < 1 T? | 1.14 D? |
| NB13I 9/1/98 | < 0.76 ? | < 0.78 ? | < 1.7 ? | < 0.73 ? | < 0.76 ? | < 1.1 ? | < 1 T? | < 1.01 ? | < 0.99 ? | < 7.4 ? | < 0.5 ? | < 0.75 ? | < 1 T? | 1.47 ? |
| NB13I 9/1/98 | < 0.76 D? | < 0.78 D? | < 1.7 D? | < 0.73 D? | < 0.76 D? | < 1.1 D? | < 1 DT? | < 1.01 D? | < 0.99 D? | < 7.4 D? | < 0.5 D? | < 0.75 D? | < 1 DT? | 1.68 D? |

Notes:

Units in µg/l.

ARARs (Applicable or Relevant and Appropriate Regulation) from Table 2.2, TCAAP OU-3 Feasibility Study, July 1992

¹ - ARAR of 70 is for cis-1,2-dichloroethene

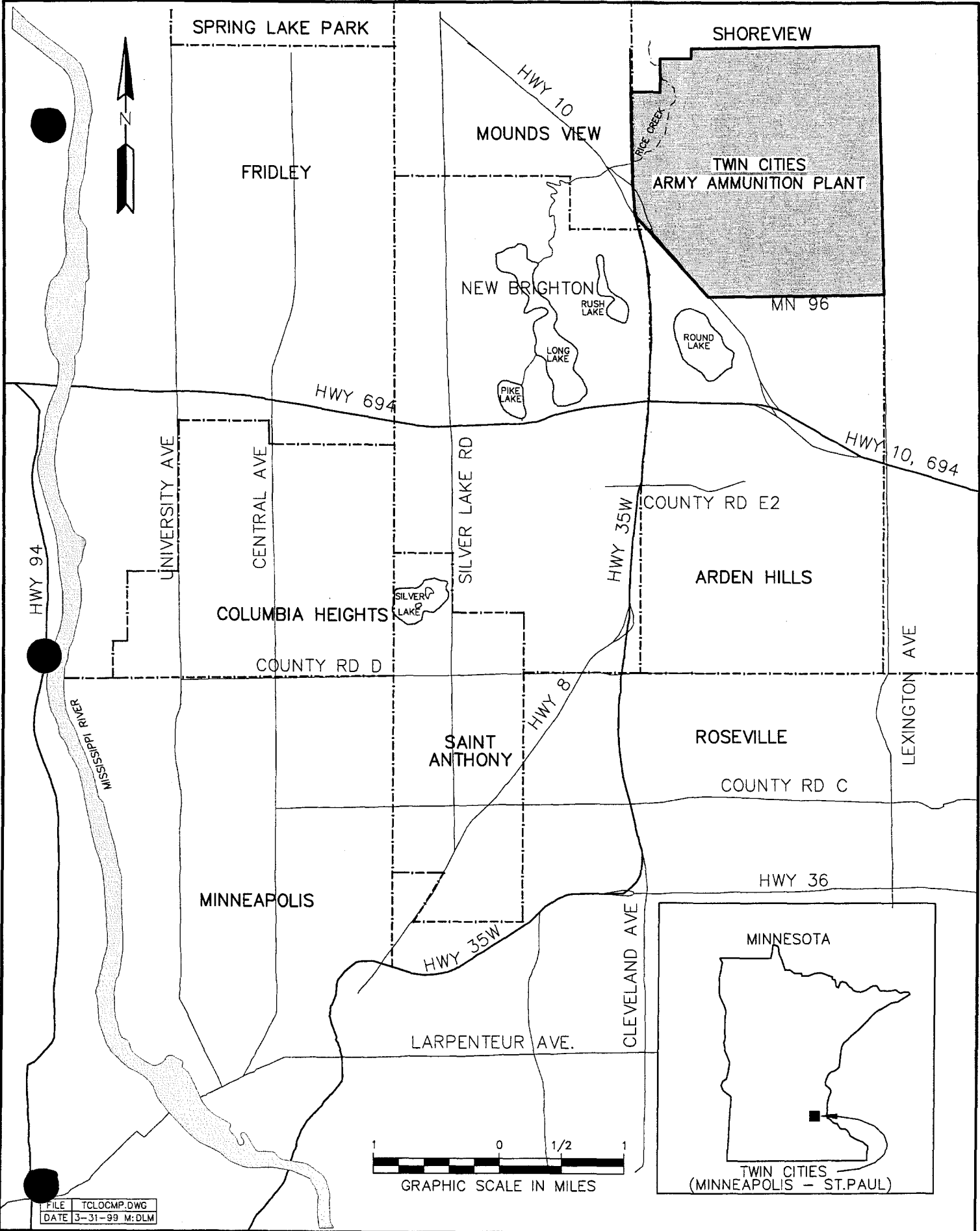
D - Duplicate analysis

T - Non-target compound analyzed for but not detected (non-GC/MS methods)

? - Control chart not yet approved by USAEC

FIGURES

Figures



| | |
|------|---------------|
| FILE | TCLOCMP.DWG |
| DATE | 3-31-99 M:DLM |

TWIN CITIES ARMY AMMUNITION PLANT

Site Location Map

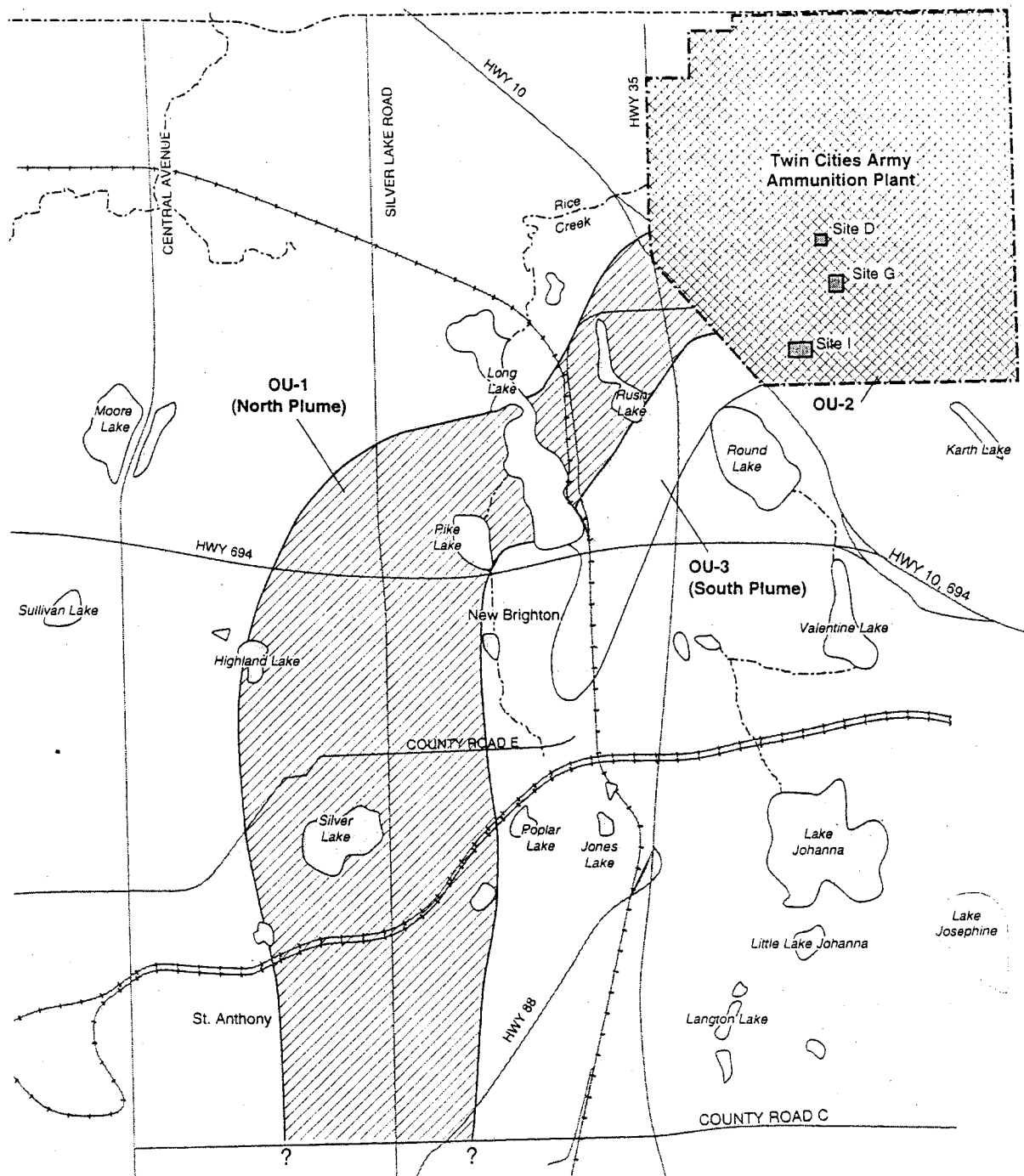
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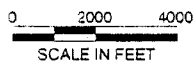
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Fig. 1-1



LEGEND:

- TCAAP Boundary
- - - - - Creek
- Road
- +— Railroad
- ▨ OU-1 (North Plume)
- ▩ OU-2 (On-Site)
- ▭ OU-3 (South Plume)



Source: OU2 Record of Decision

TWIN CITIES ARMY AMMUNITION PLANT

Locations of Operable Units

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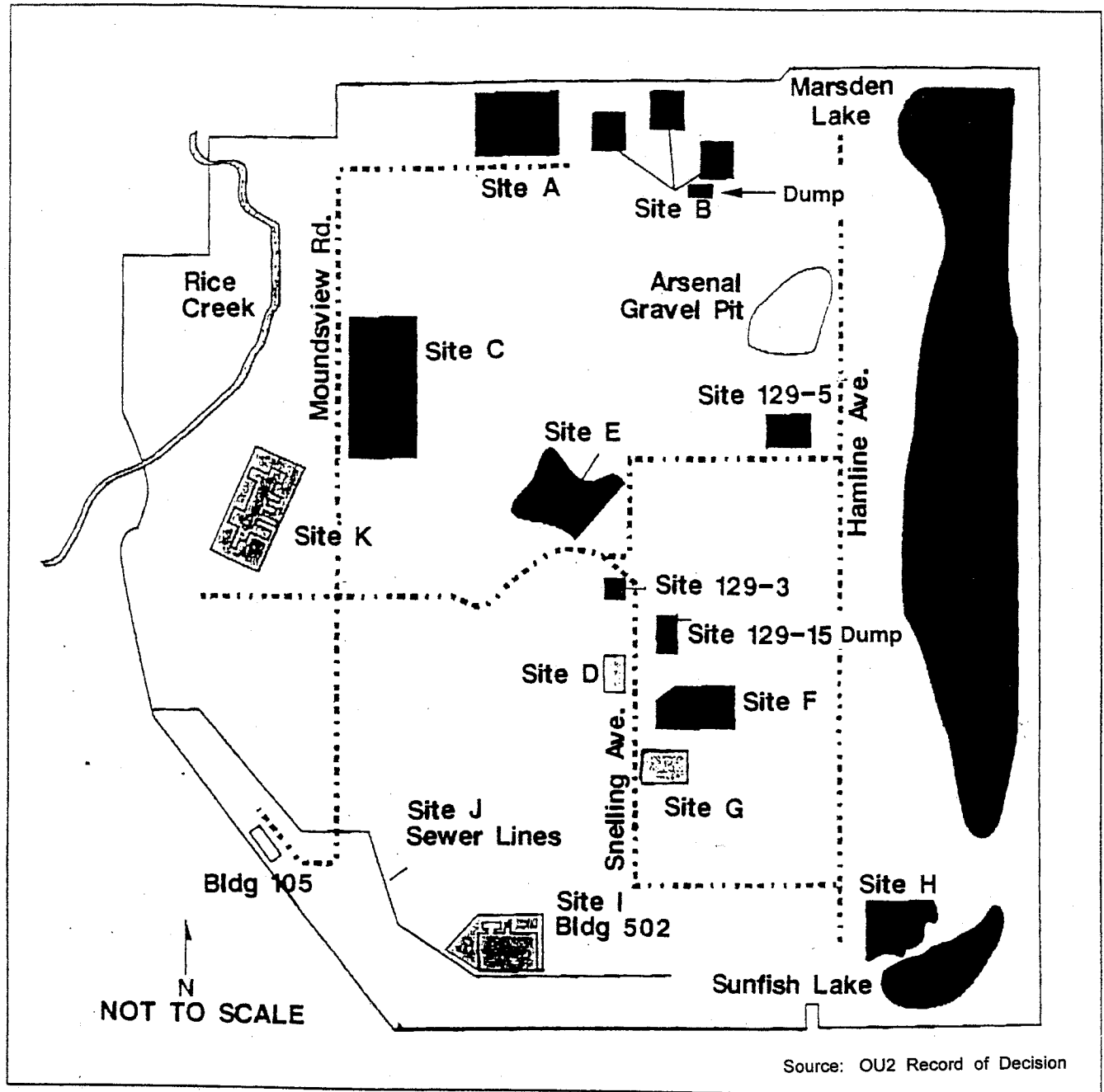


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Figure 1-2



TWIN CITIES ARMY AMMUNITION PLANT

Locations of OU2 Shallow Soil Sites

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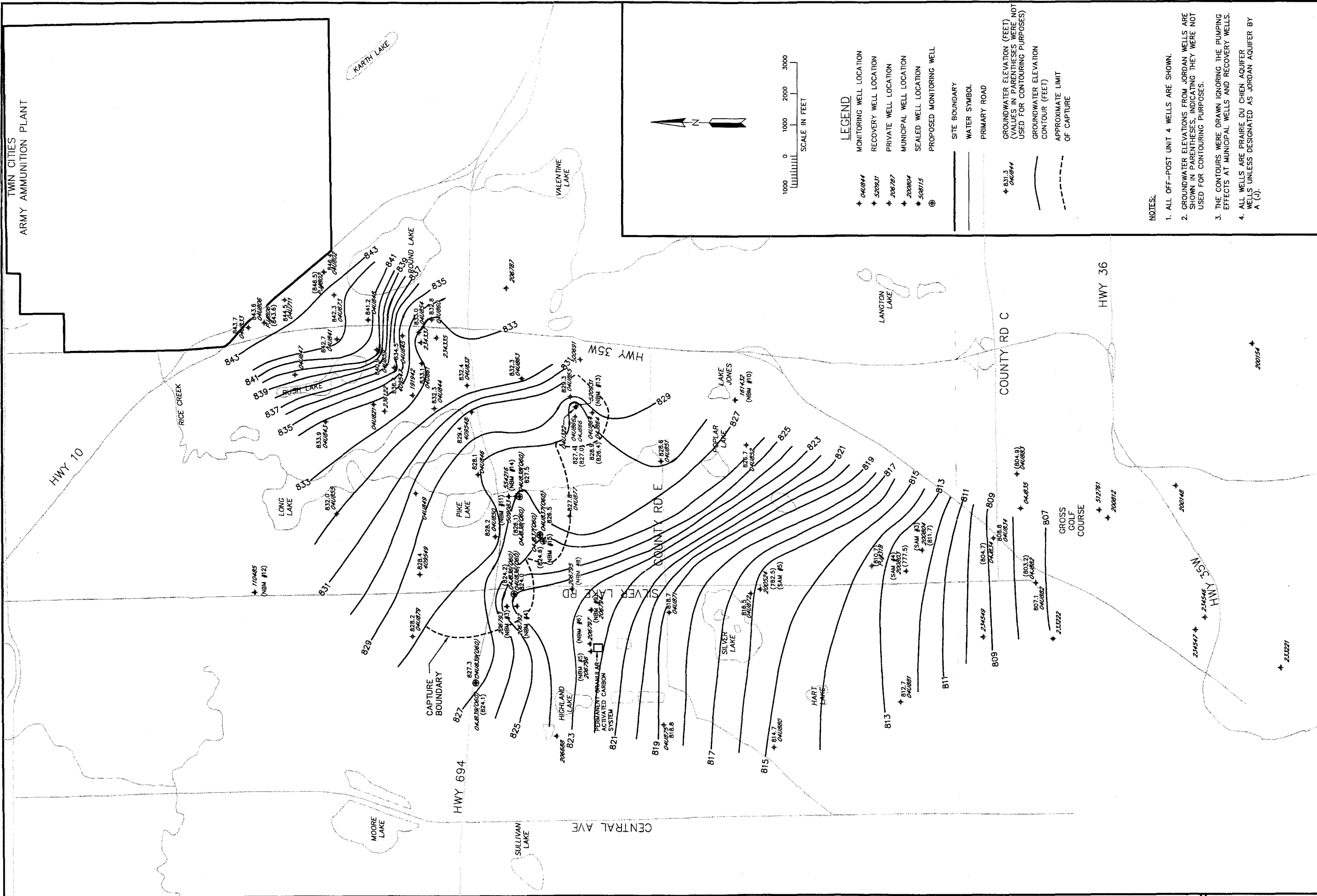


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Figure 1-3



TWIN CITIES ARMY AMMUNITION PLANT
 OU1 & OU3, Upper Unit 4 Potentiometric Map, Summer 1998 (Q59)


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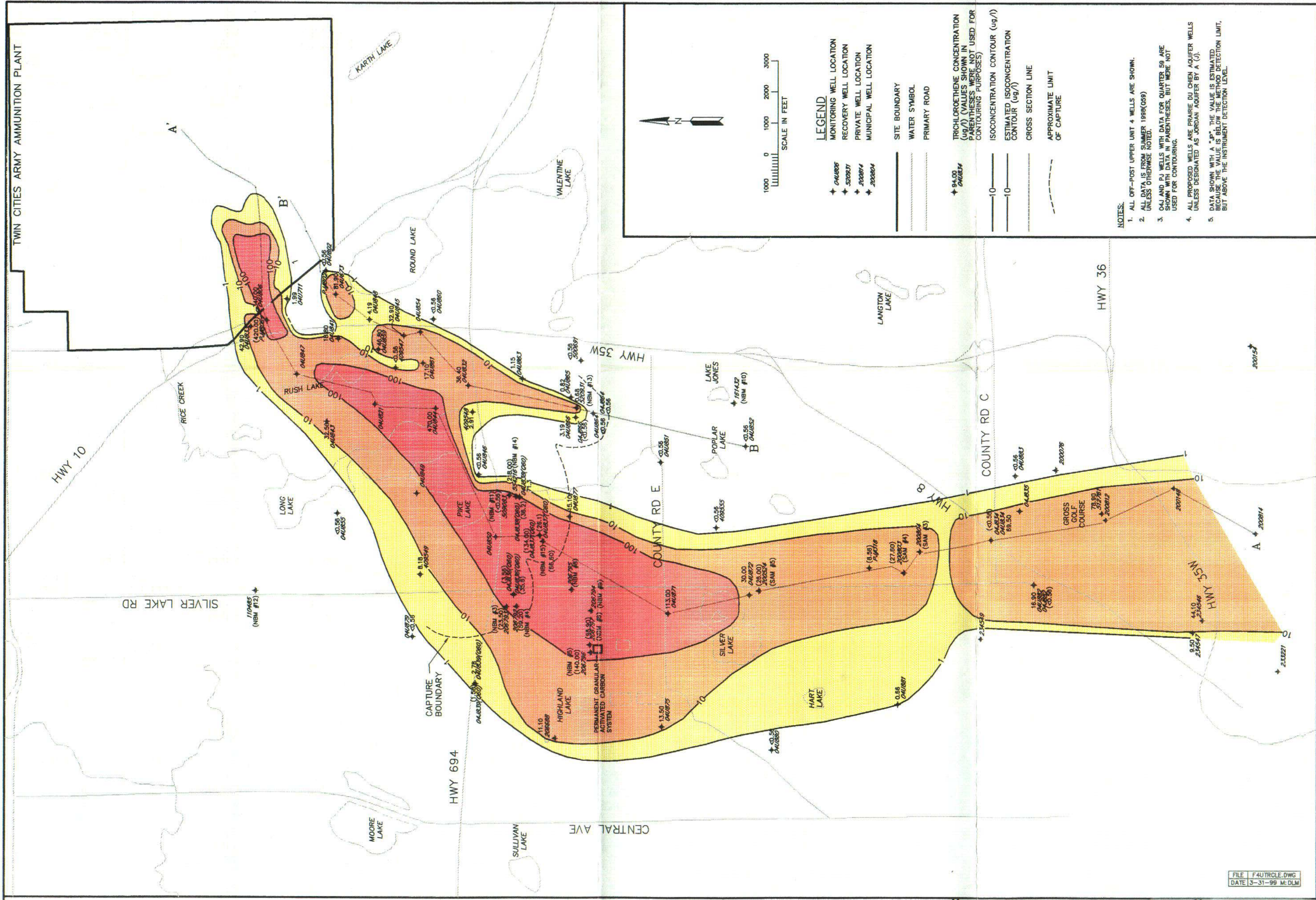
LEGEND

- ★ 04U844 MONITORING WELL LOCATION
- ★ 520937 RECOVERY WELL LOCATION
- ★ 206787 PRIVATE WELL LOCATION
- ★ 200804 MUNICIPAL WELL LOCATION
- ★ 508115 SEALED WELL LOCATION
- ⊙ PROPOSED MONITORING WELL

- SITE BOUNDARY
- WATER SYMBOL
- PRIMARY ROAD

- ★ 831.3 (240844) GROUNDWATER ELEVATION (FEET) (VALUES IN PARENTHESES WERE NOT USED FOR CONTOURING PURPOSES)
- GROUNDWATER ELEVATION CONTOUR (FEET)
- - - APPROXIMATE LIMIT OF CAPTURE

- NOTES:**
1. ALL OFF-POST UNIT 4 WELLS ARE SHOWN.
 2. GROUNDWATER ELEVATIONS FROM JORDAN WELLS ARE SHOWN IN PARENTHESES, INDICATING THEY WERE NOT USED FOR CONTOURING PURPOSES.
 3. THE CONTOURS WERE DRAWN IGNORING THE PUMPING EFFECTS AT MUNICIPAL WELLS AND RECOVERY WELLS.
 4. ALL WELLS ARE PRAIRIE DU CHIEN AQUIFER WELLS UNLESS DESIGNATED AS JORDAN AQUIFER BY A (J).



TWIN CITIES ARMY AMMUNITION PLANT

TWIN CITIES ARMY AMMUNITION PLANT

OU1 & OU3, Upper Unit 4 Trichloroethene Isoconcentration Map - Summer 1998 (Q59)

- LEGEND**
- ◆ MONITORING WELL LOCATION
 - ◆ RECOVERY WELL LOCATION
 - ◆ PRIVATE WELL LOCATION
 - ◆ MUNICIPAL WELL LOCATION

- SITE BOUNDARY
- WATER SYMBOL
- PRIMARY ROAD

- ◆ TRICHLOROETHENE CONCENTRATION (ug/l) (VALUES SHOWN IN PARENTHESES WERE NOT USED FOR CONTOURING PURPOSES)
- ISOCONCENTRATION CONTOUR (ug/l)
- ESTIMATED ISOCONCENTRATION CONTOUR (ug/l)
- CROSS SECTION LINE
- - - APPROXIMATE LIMIT OF CAPTURE

- NOTES:**
1. ALL OFF-POST UPPER UNIT 4 WELLS ARE SHOWN.
 2. ALL DATA IS FROM SUMMER 1998(Q59) UNLESS OTHERWISE NOTED.
 3. O41 AND R1 WELLS WITH DATA FOR QUARTER 59 ARE SHOWN WITH DATA IN PARENTHESES, BUT WERE NOT USED FOR CONTOURING.
 4. ALL PROPOSED WELLS ARE PRAIRIE DU CHIEN AQUIFER WELLS UNLESS DESIGNATED AS JORDAN AQUIFER BY A (J).
 5. DATA SHOWN WITH A * IS THE VALUE IS ESTIMATED BY INTERPOLATION AND IS ABOVE THE INSTRUMENT DETECTION LIMIT, BUT ABOVE THE INSTRUMENT DETECTION LEVEL.

FILE: FAUTROLE.DWG
DATE: 3-31-99 M: DLM

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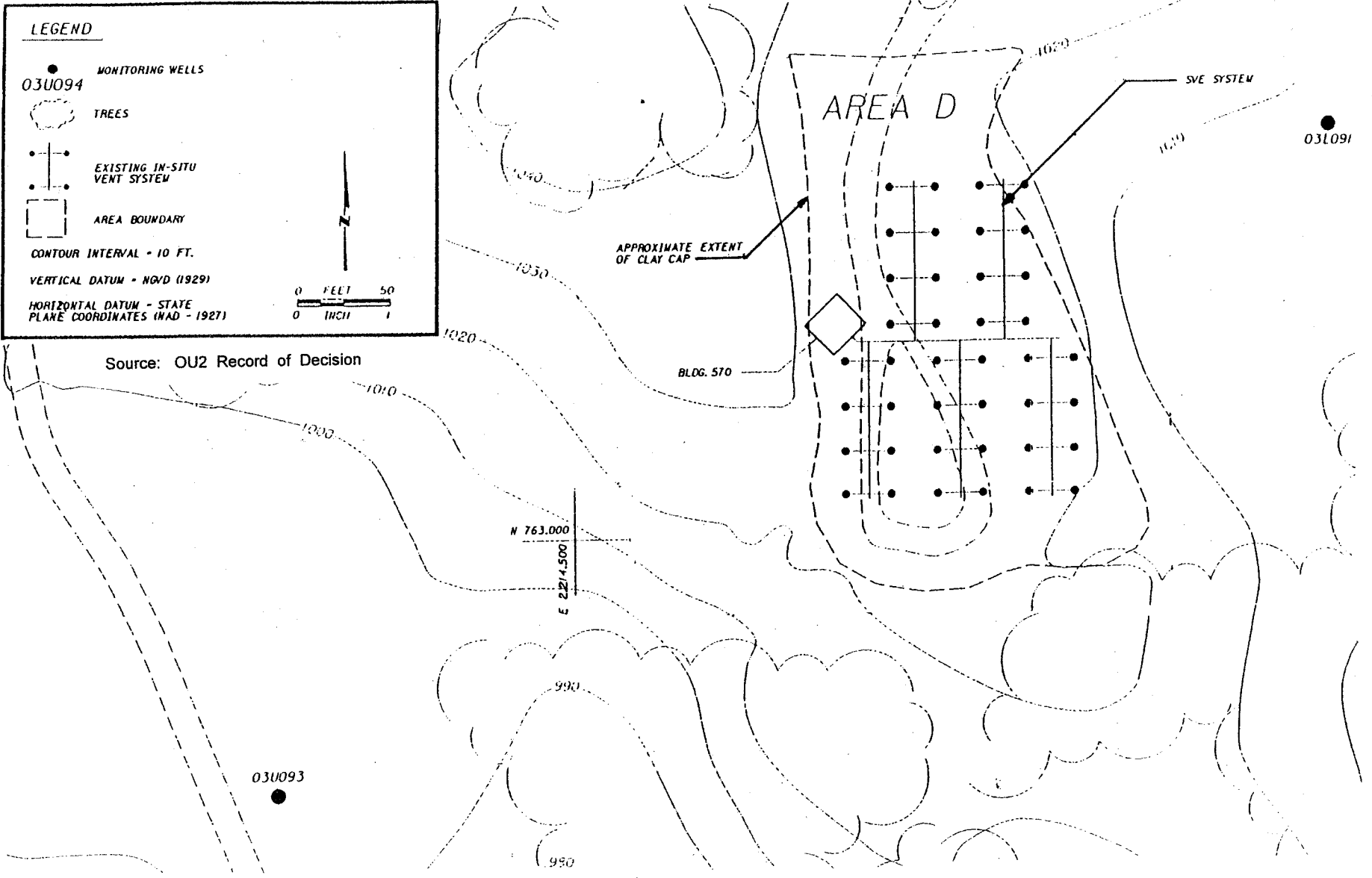
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Figure 2-2

LEGEND

- MONITORING WELLS
- 03U094
- TREES
- EXISTING IN-SITU VENT SYSTEM
- AREA BOUNDARY

CONTOUR INTERVAL - 10 FT.
 VERTICAL DATUM - NGVD (1929)
 HORIZONTAL DATUM - STATE PLANE COORDINATES (MAD - 1927)



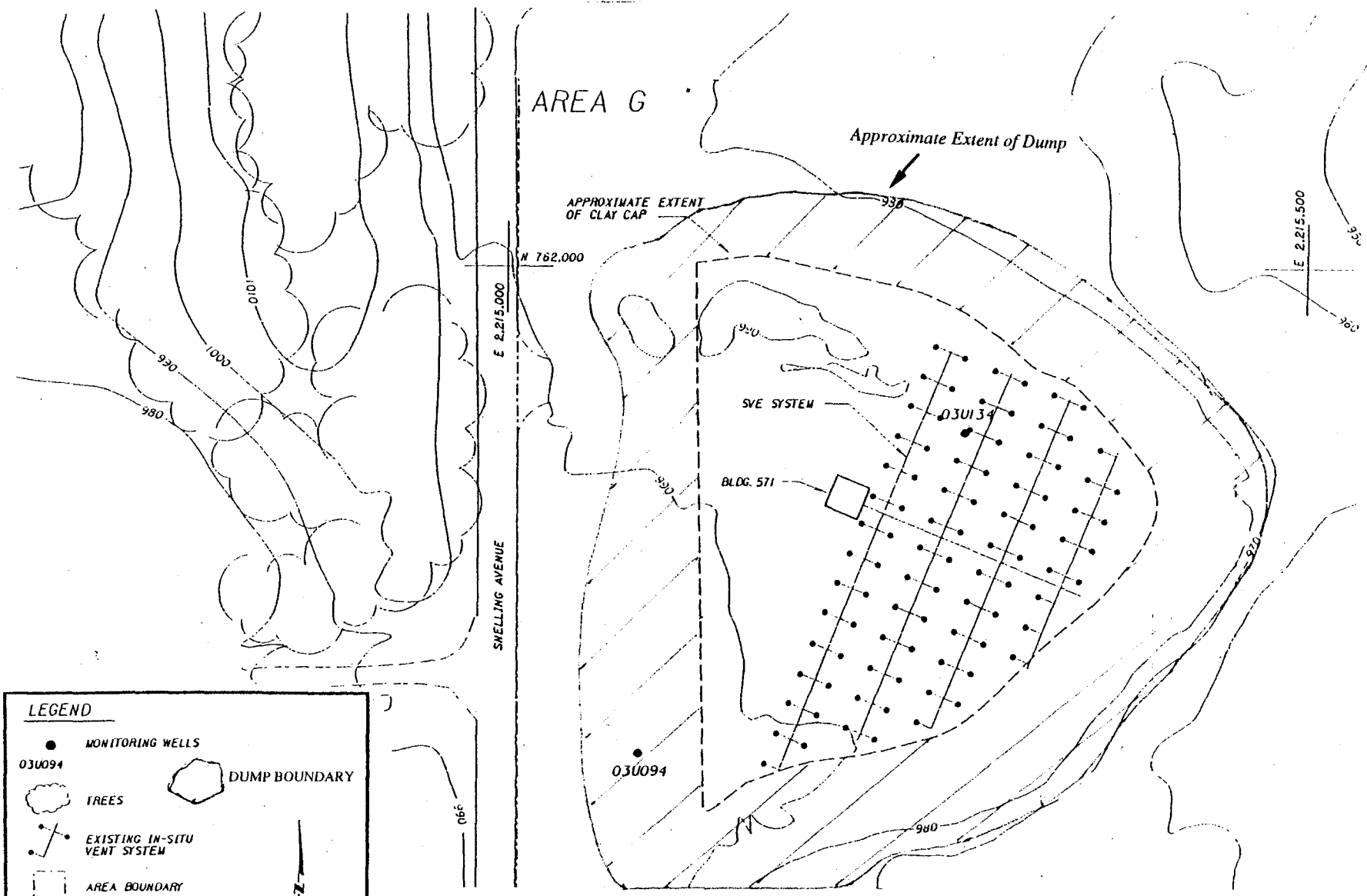
TWIN CITIES ARMY AMMUNITION PLANT

Site D SVE System

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Figure 3-1



LEGEND

- MONITORING WELLS
- DUMP BOUNDARY
- ☁ TREES
- ⋈ EXISTING IN-SITU VENT SYSTEM
- AREA BOUNDARY

CONTOUR INTERVAL - 10 FT.
 VERTICAL DATUM - NGVD (1929)
 HORIZONTAL DATUM - STATE PLANE COORDINATES (NAD - 1927)

0 FEET 60
 0 INCH 1

Source: OU2 Record of Decision

TWIN CITIES ARMY AMMUNITION PLANT

Site G SVE System

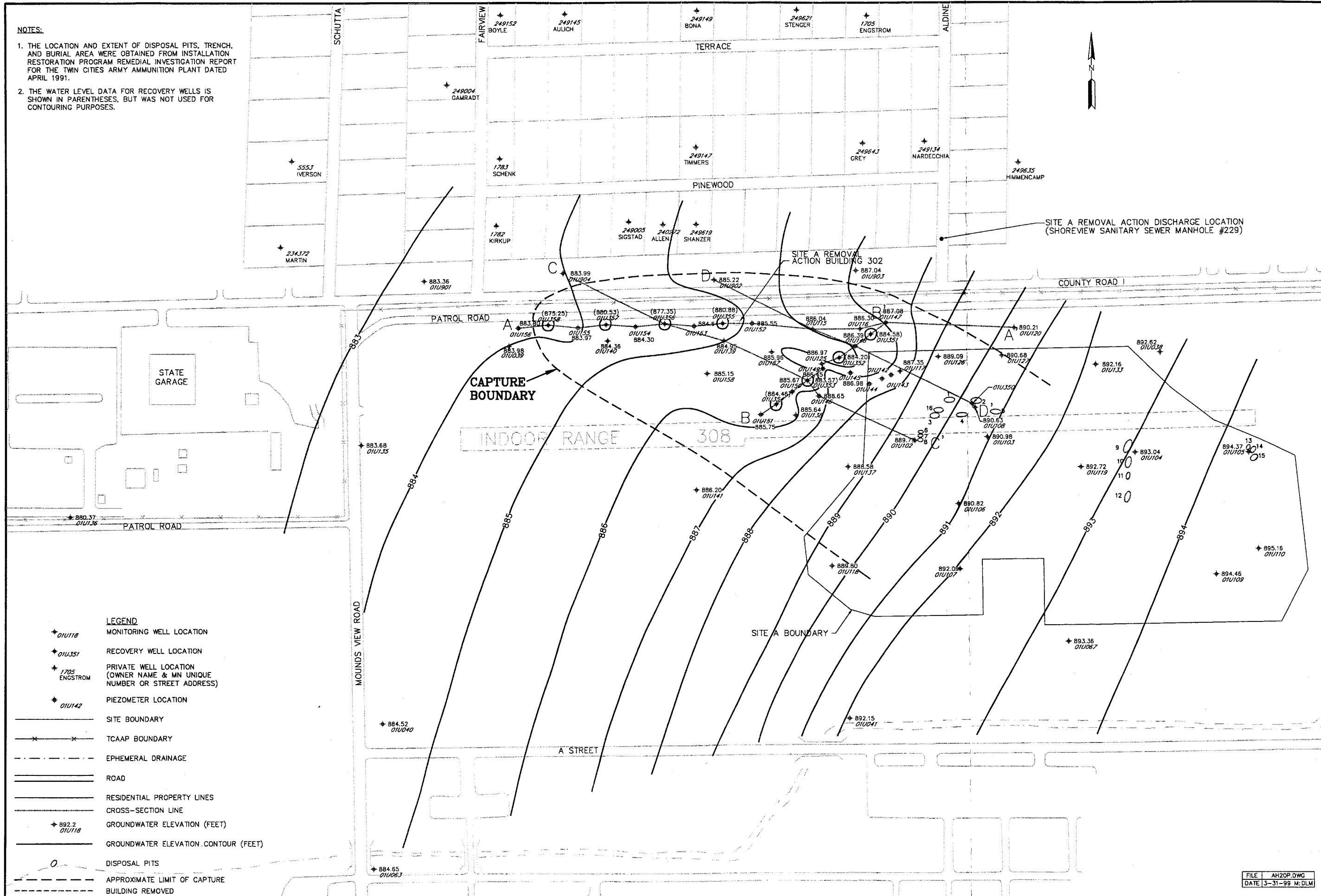
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Figure 3-2

NOTES:

1. THE LOCATION AND EXTENT OF DISPOSAL PITS, TRENCH, AND BURIAL AREA WERE OBTAINED FROM INSTALLATION RESTORATION PROGRAM REMEDIAL INVESTIGATION REPORT FOR THE TWIN CITIES ARMY AMMUNITION PLANT DATED APRIL 1991.
2. THE WATER LEVEL DATA FOR RECOVERY WELLS IS SHOWN IN PARENTHESES, BUT WAS NOT USED FOR CONTOURING PURPOSES.



LEGEND

| | |
|-----------------|---|
| ◆ 01U118 | MONITORING WELL LOCATION |
| ◆ 01U351 | RECOVERY WELL LOCATION |
| ◆ 1705 ENGSTROM | PRIVATE WELL LOCATION (OWNER NAME & MN UNIQUE NUMBER OR STREET ADDRESS) |
| ◆ 01U142 | PIEZOMETER LOCATION |
| — | SITE BOUNDARY |
| — x — x — | TCAAP BOUNDARY |
| - - - - - | EPHEMERAL DRAINAGE |
| == | ROAD |
| — | RESIDENTIAL PROPERTY LINES |
| — | CROSS-SECTION LINE |
| ◆ 892.2 01U118 | GROUNDWATER ELEVATION (FEET) |
| — | GROUNDWATER ELEVATION CONTOUR (FEET) |
| ○ | DISPOSAL PITS |
| - - - - - | APPROXIMATE LIMIT OF CAPTURE |
| - - - - - | BUILDING REMOVED |

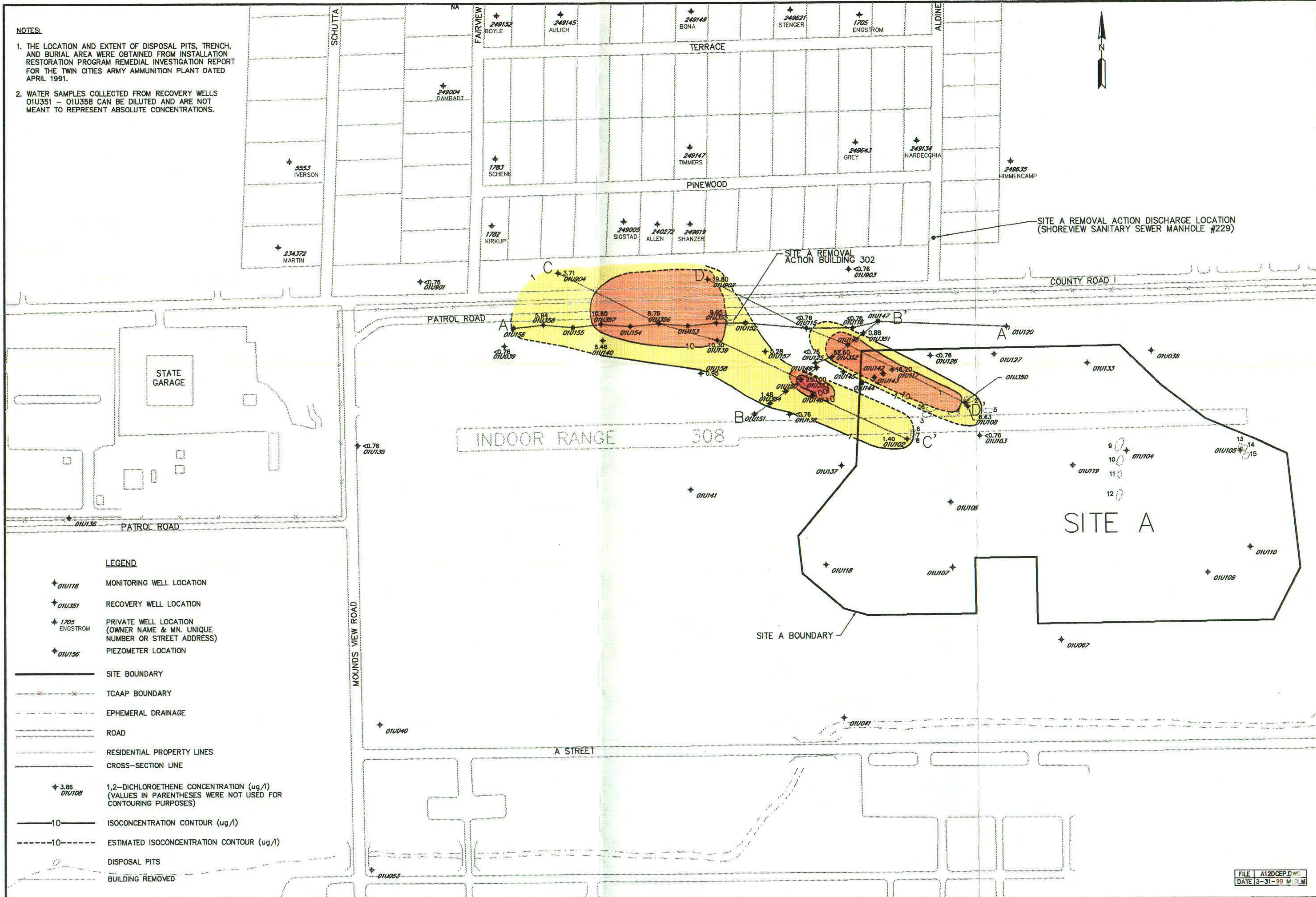
TWIN CITIES ARMY AMMUNITION PLANT
 Site A, Unit 1, Potentiometric Map – Summer 1998 (Q59)


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FILE: AH20P.DWG
 DATE: 3-31-99 M:DLM

NOTES:

1. THE LOCATION AND EXTENT OF DISPOSAL PITS, TRENCH, AND BURIAL AREA WERE OBTAINED FROM INSTALLATION RESTORATION PROGRAM REMEDIAL INVESTIGATION REPORT FOR THE TWIN CITIES ARMY AMMUNITION PLANT DATED APRIL 1991.
2. WATER SAMPLES COLLECTED FROM RECOVERY WELLS 01U351 - 01U358 CAN BE DILUTED AND ARE NOT MEANT TO REPRESENT ABSOLUTE CONCENTRATIONS.



- LEGEND**
- ★ 01U116 MONITORING WELL LOCATION
 - ★ 01U351 RECOVERY WELL LOCATION
 - ★ 1705 ENGSTROM PRIVATE WELL LOCATION (OWNER NAME & MN. UNIQUE NUMBER OR STREET ADDRESS)
 - ★ 01U156 PIEZOMETER LOCATION
 - SITE BOUNDARY
 - - - TCAAP BOUNDARY
 - - - EPHEMERAL DRAINAGE
 - == ROAD
 - RESIDENTIAL PROPERTY LINES
 - CROSS-SECTION LINE
 - ★ 3.86 01U108 1,2-DICHLOROETHENE CONCENTRATION (ug/l) (VALUES IN PARENTHESES WERE NOT USED FOR CONTOURING PURPOSES)
 - 10 — ISOCONCENTRATION CONTOUR (ug/l)
 - - - 10 - - - ESTIMATED ISOCONCENTRATION CONTOUR (ug/l)
 - DISPOSAL PITS
 - BUILDING REMOVED

TWIN CITIES ARMY AMMUNITION PLANT

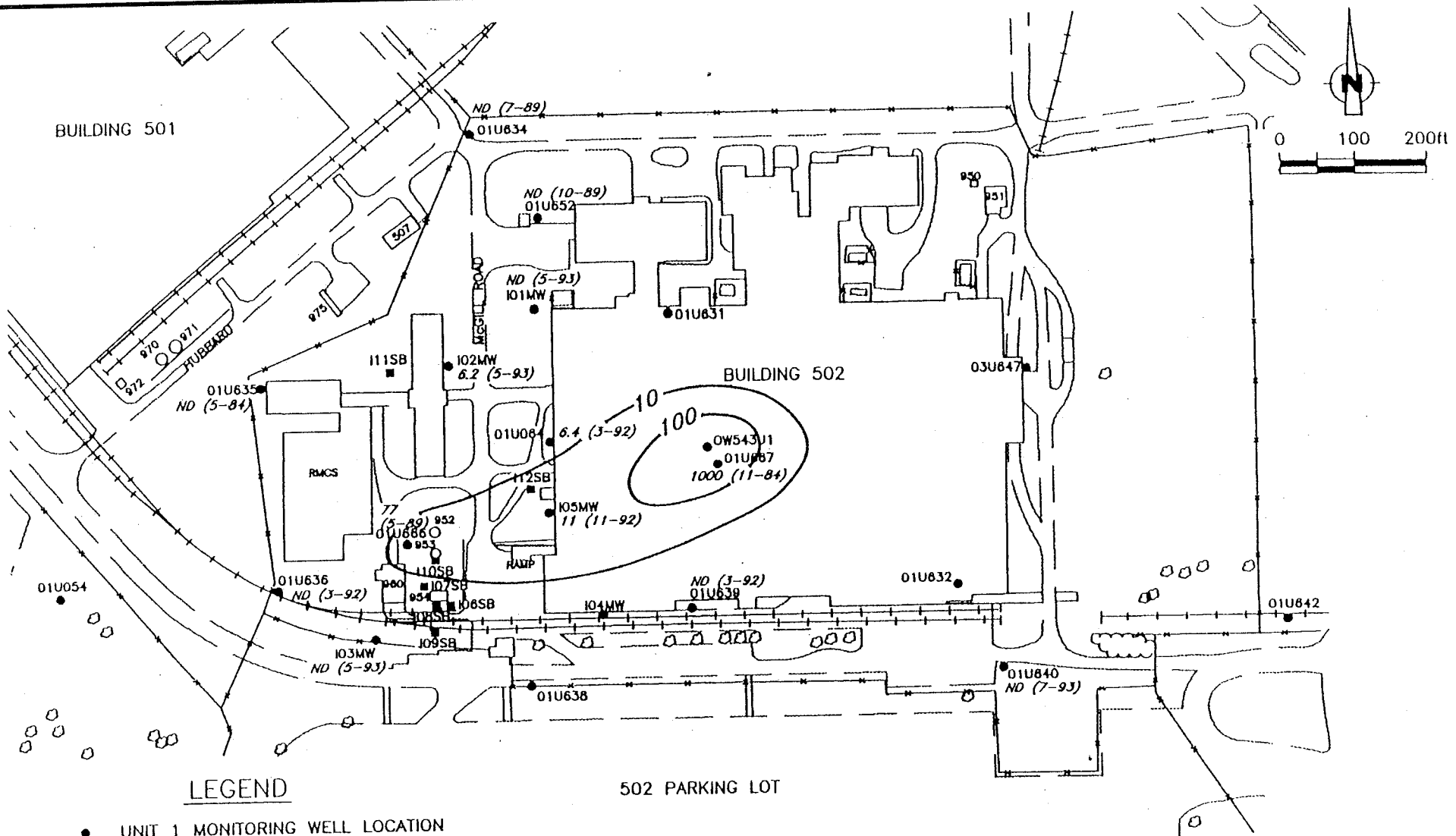
Site A, Unit 1 1,2-Dichloroethene Isoconcentration Map, Summer 1998 (Q59)

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 DATE: 3-31-99 M:DLM

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Figure 3-4



LEGEND

- UNIT 1 MONITORING WELL LOCATION
- SOIL SAMPLE LOCATION (SURFACE/BORING)

6.2 (5-93) TRICHLOROETHENE CONCENTRATION IN ug/L (LATEST SAMPLING DATE)

ND NOT DETECTED

CRA

Source: OU2 Record of Decision

TWIN CITIES ARMY AMMUNITION PLANT

Site I, Trichloroethene Isoconcentration Map

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Figure 3-5

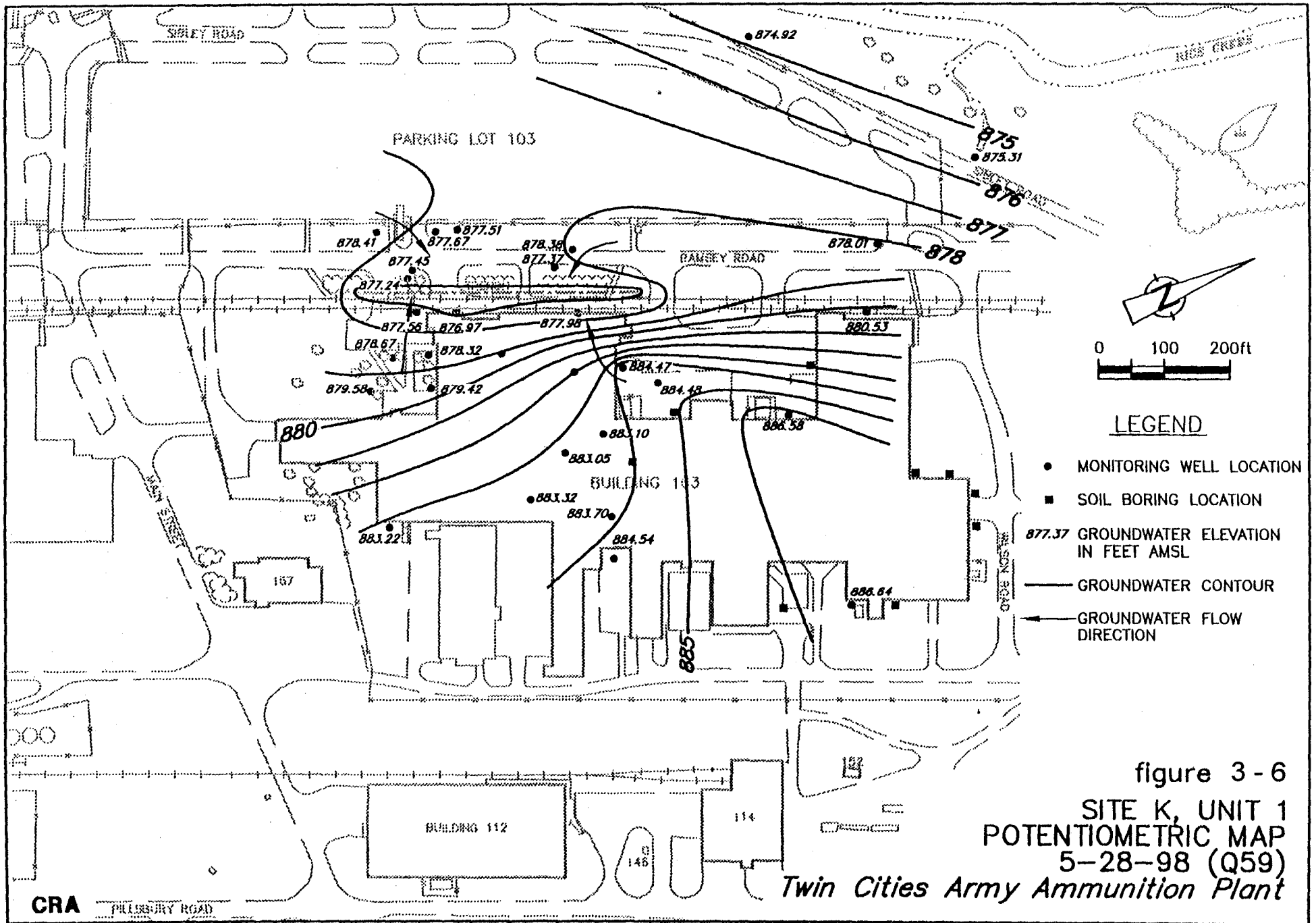
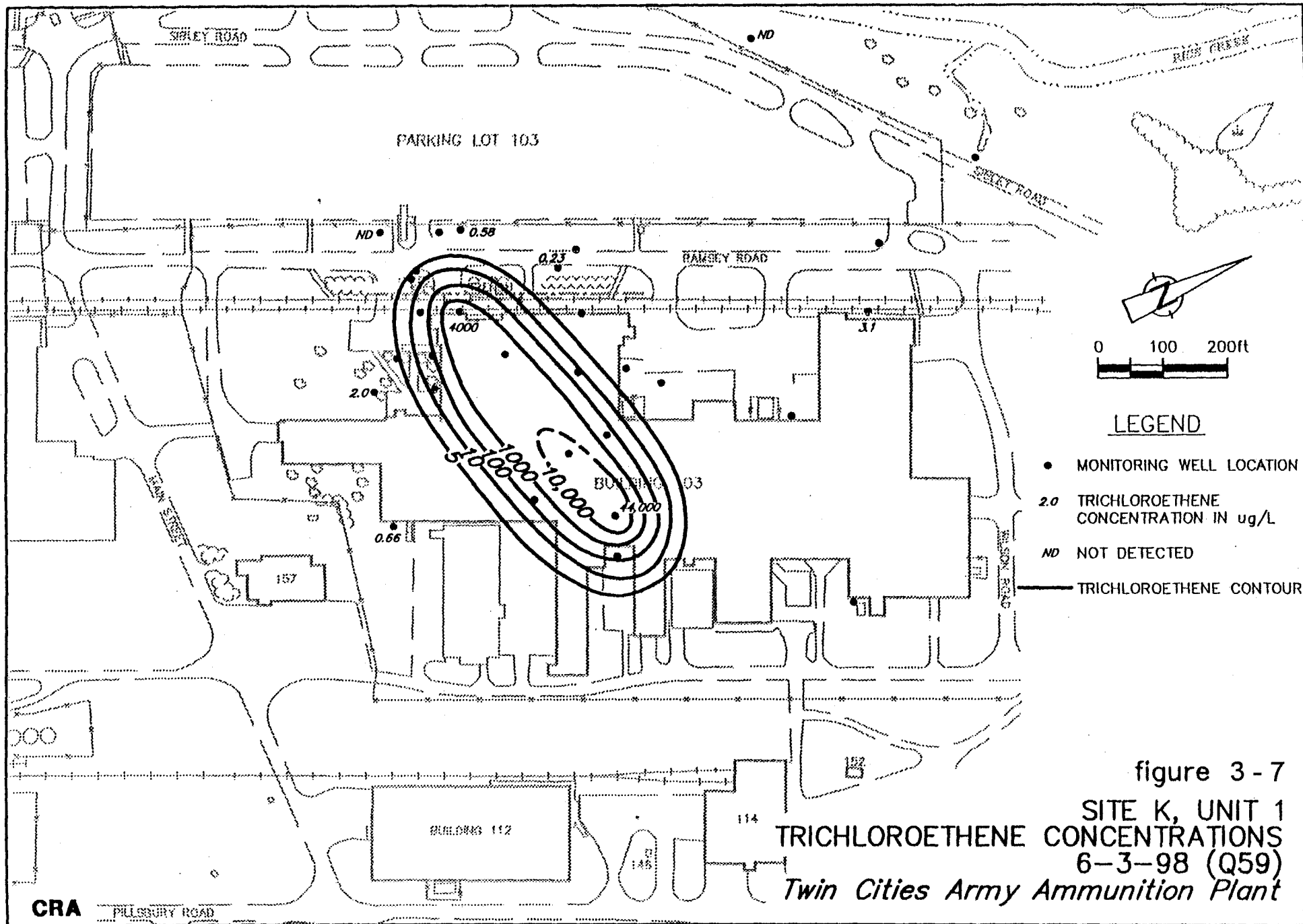
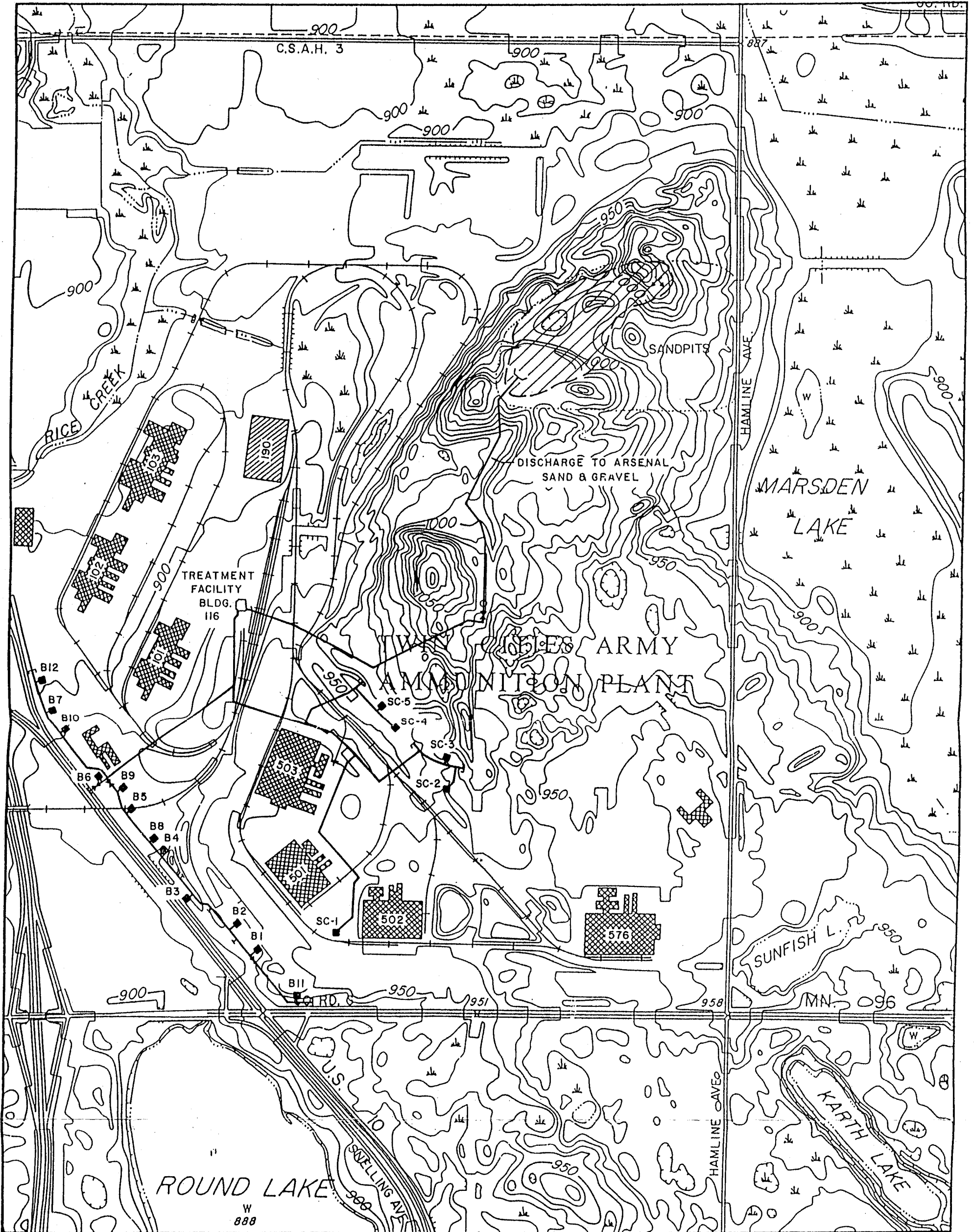


figure 3 - 6
 SITE K, UNIT 1
 POTENTIOMETRIC MAP
 5-28-98 (Q59)
 Twin Cities Army Ammunition Plant





LEGEND

- EXTRACTION WELL LOCATION
- ▨ ARSENAL SAND AND GRAVEL PIT

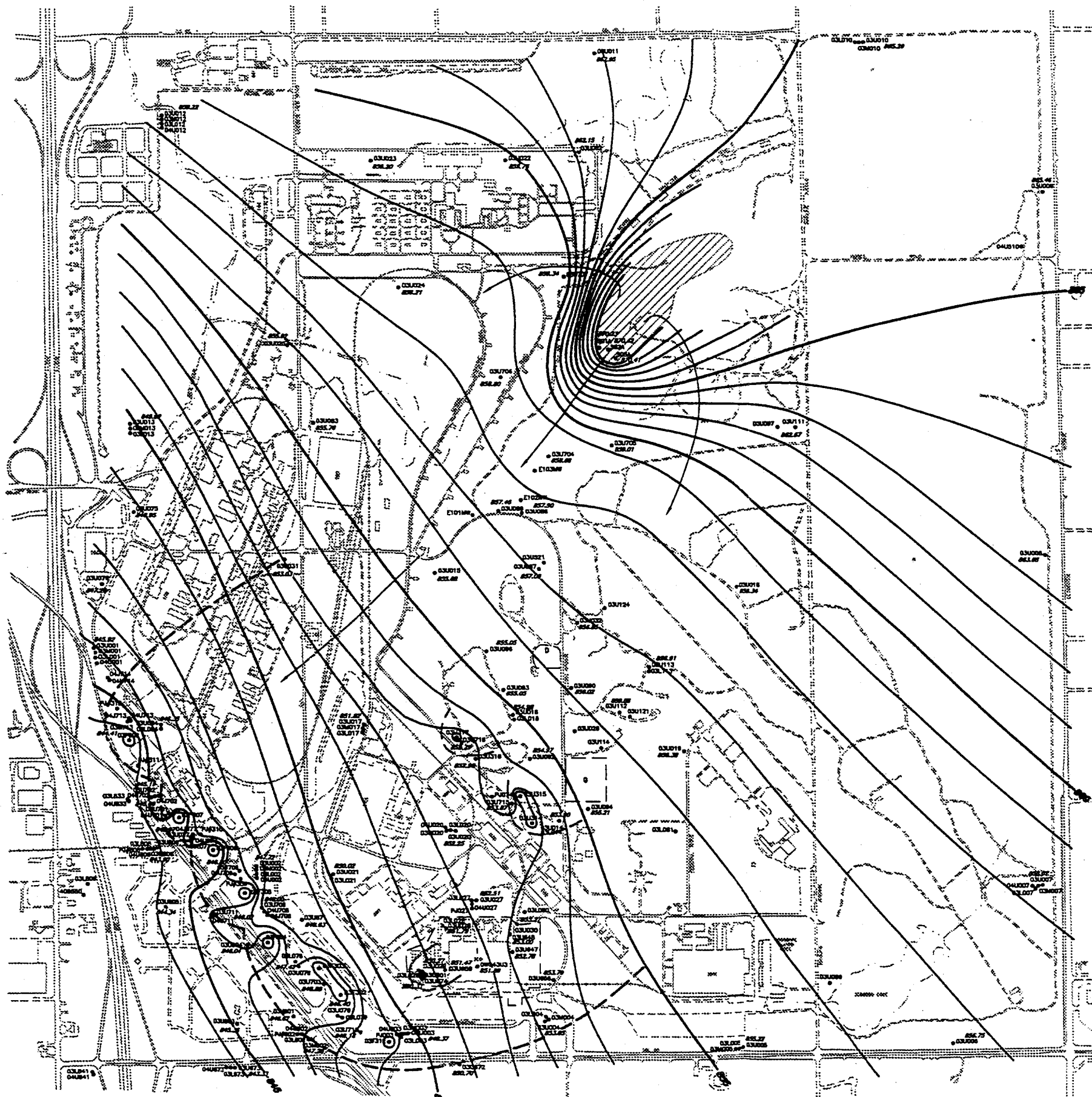


SCALE: 1" = 1000'

figure 3-8

OU2, TGRS LAYOUT
Twin Cities Army Ammunition Plant

CRA



LEGEND

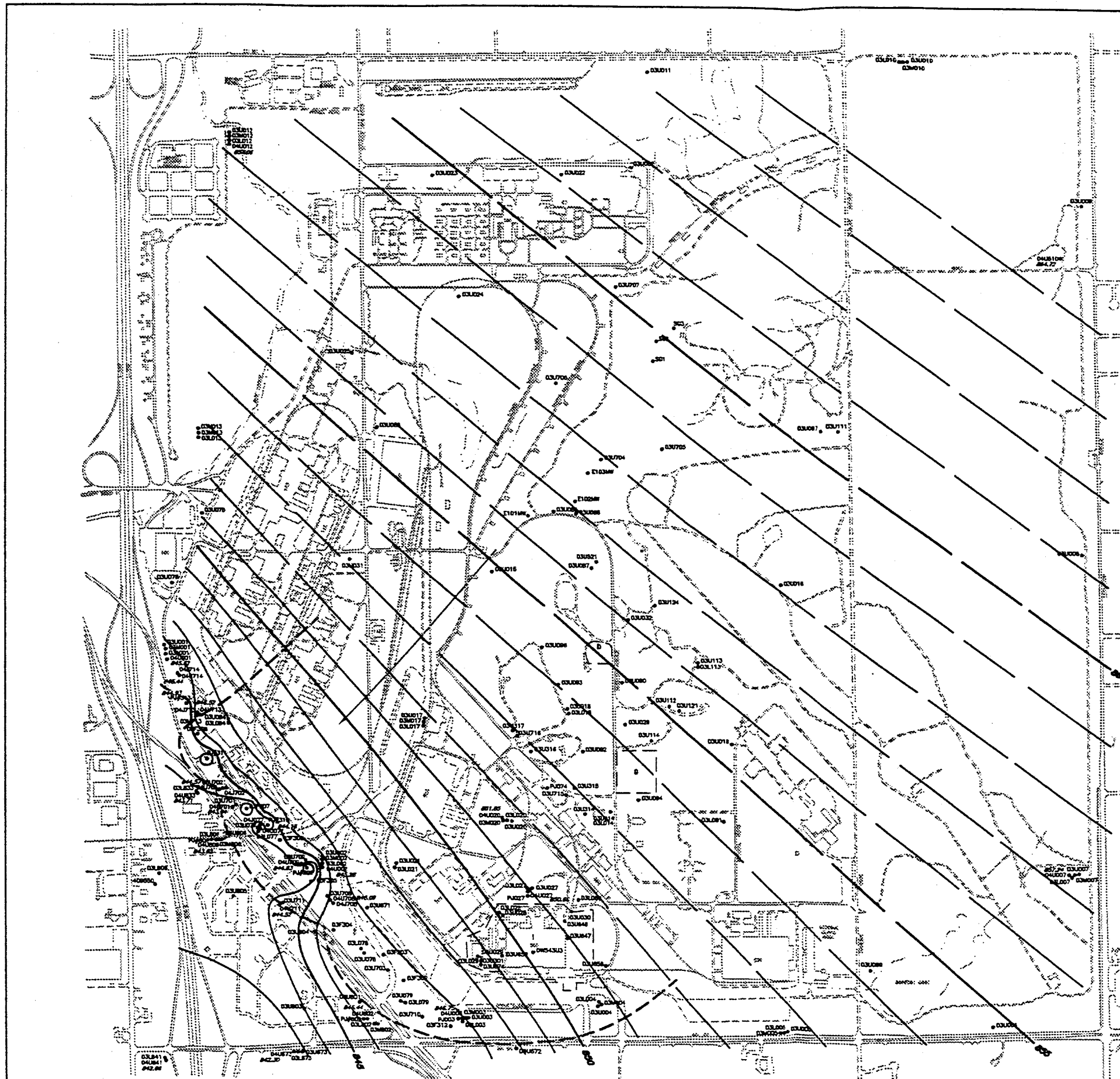
- PRIMARY ROAD
- SECONDARY ROAD
- RAILROAD
- DRAINAGE
- BUILDING
- BUILDING REMOVED
- SOURCE AREA
- WELL LOCATION
- 844.52 GROUNDWATER ELEVATION IN FEET AMSL
- GROUNDWATER CONTOUR
- DIRECTION OF GROUNDWATER FLOW
- LIMIT OF CAPTURE
- NOTE: GROUNDWATER CONTOURS ARE INTERPOLATED FROM THE DATA POINTS SHOWN.
- NA NOT AVAILABLE
- ARSENAL SAND AND GRAVEL PIT TREATED WATER DISCHARGE AREA. (APPROXIMATE BOUNDARIES)

EXTRACTION WELL NAME CROSS REFERENCE

| | |
|-----|--------|
| B1 | 03F302 |
| B2 | 03F303 |
| B3 | 03F304 |
| B4 | 03F305 |
| B5 | 03F306 |
| B6 | 03F307 |
| B7 | 03F308 |
| B8 | PJ#309 |
| B9 | PJ#310 |
| B10 | PJ#311 |
| B11 | 03F312 |
| B12 | PJ#313 |
| SC1 | 03U301 |
| SC2 | 03U314 |
| SC3 | 03U315 |
| SC4 | 03U316 |
| SC5 | 03U317 |

figure 3 - 9
 OU2, UPPER UNIT 3,
 POTENTIOMETRIC MAP,
 5-27-98 (Q59)
 Twin Cities Army Ammunition Plant

CRA



LEGEND

- PRIMARY ROAD
- - - SECONDARY ROAD
- RAILROAD
- - - DRAINAGE
- ▭ BUILDING
- ▭ BUILDING REMOVED
- [] SOURCE AREA
- WELL LOCATION
- 844.52 GROUNDWATER ELEVATION IN FEET AMSL
- GROUNDWATER CONTOUR
- ← DIRECTION OF GROUNDWATER FLOW
- - - LIMIT OF CAPTURE

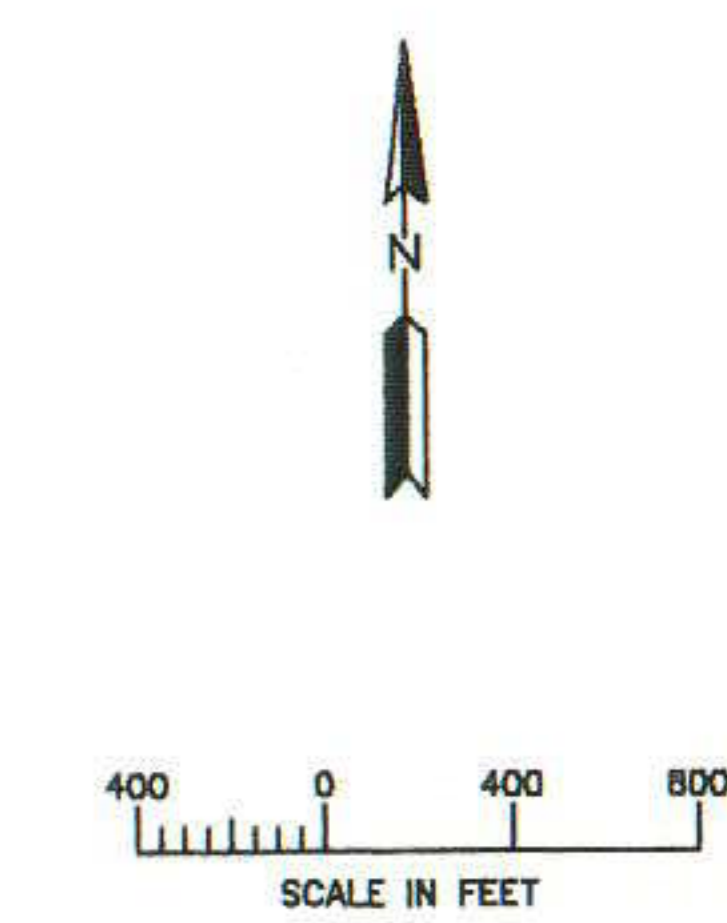
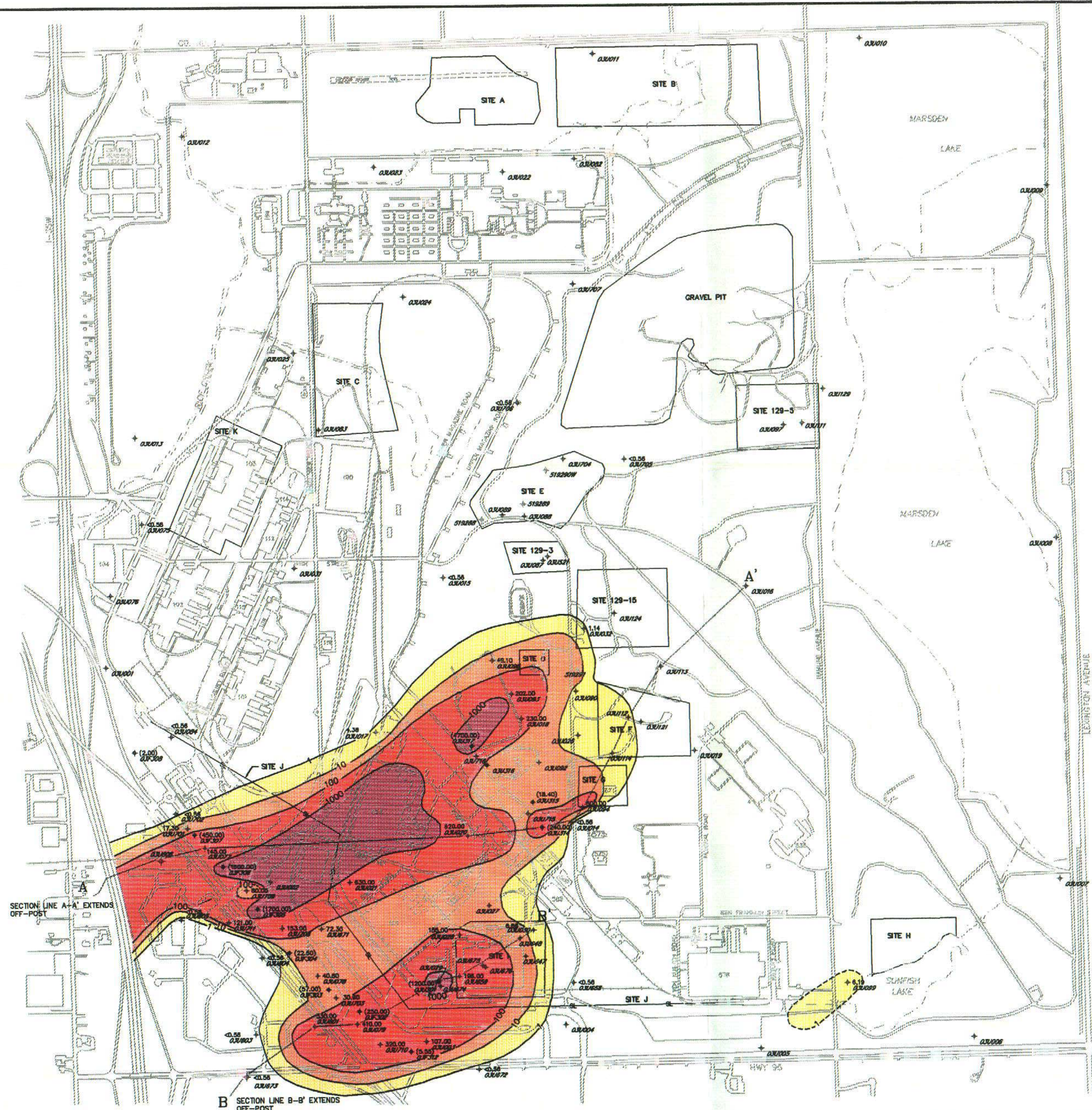
NOTE: GROUNDWATER CONTOURS ARE INTERPOLATED FROM THE DATA POINTS SHOWN.

NA NOT AVAILABLE

EXTRACTION WELL NAME CROSS REFERENCE

| | |
|-----|--------|
| B1 | 03F302 |
| B2 | 03F303 |
| B3 | 03F304 |
| B4 | 03F305 |
| B5 | 03F306 |
| B6 | 03F307 |
| B7 | 03F308 |
| B8 | PJ#309 |
| B9 | PJ#310 |
| B10 | PJ#311 |
| B11 | 03F312 |
| B12 | PJ#313 |
| SC1 | 03U301 |
| SC2 | 03U314 |
| SC3 | 03U315 |
| SC4 | 03U316 |
| SC5 | 03U317 |

figure 3 - 11
 OU2, UPPER UNIT 4,
 POTENTIOMETRIC MAP,
 5-28-98 (Q59)
 Twin Cities Army Ammunition Plant



- LEGEND**
- MONITORING WELL LOCATION
 - RECOVERY WELL LOCATION
 - SITE BOUNDARY
 - WATER SYMBOL
 - ROAD
 - TRICHLOROETHENE CONCENTRATION (ug/l)
(VALUES IN PARENTHESES WERE NOT USED FOR CONTOURING PURPOSES)
 - ISOCONCENTRATION CONTOUR (ug/l)
 - ESTIMATED ISOCONCENTRATION CONTOUR (ug/l)
 - CROSS SECTION LINE
 - BUILDING REMOVED

- NOTES:**
1. ALL UPPER UNIT 3 WELLS AT THE SITE ARE SHOWN.
 2. 03F AND 03U RECOVERY WELLS ARE SHOWN WITH DATA IN PARENTHESES, BUT CONCENTRATIONS WERE NOT USED FOR CONTOURING.
 3. RECOVERY WELL NAME CONVERSIONS:

| | |
|--------|------|
| 03F302 | B-1 |
| 03F303 | B-2 |
| 03F304 | B-3 |
| 03F305 | B-4 |
| 03F306 | B-5 |
| 03F307 | B-6 |
| 03F308 | B-7 |
| 03F312 | B-11 |
| 03U301 | SC-1 |
| 03U314 | SC-2 |
| 03U315 | SC-3 |
| 03U316 | SC-4 |
| 03U317 | SC-5 |

SECTION LINE A-A' EXTENDS OFF-POST

SECTION LINE B-B' EXTENDS OFF-POST

TWIN CITIES ARMY AMMUNITION PLANT

OU2, Upper Unit 3 Trichloroethene Isoconcentration Map, Summer 1998 (Q59)

FILE: CN3UTRCL.DWG
DATE: 2-3-99 M:DLM

Wenck
Wenck Associates, Inc.
Environmental Engineers
1800 Pioneer Creek Center
Maple Plain, MN 55359

SEPT. 1999
Figure 3-12

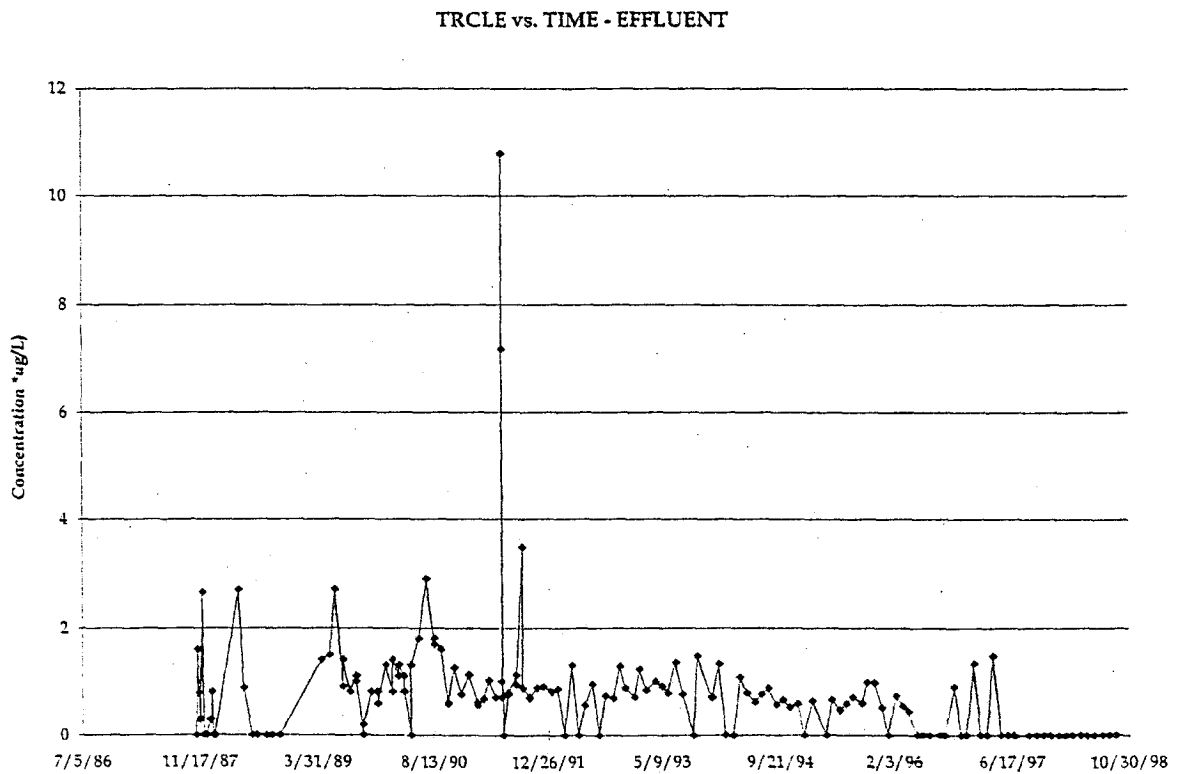
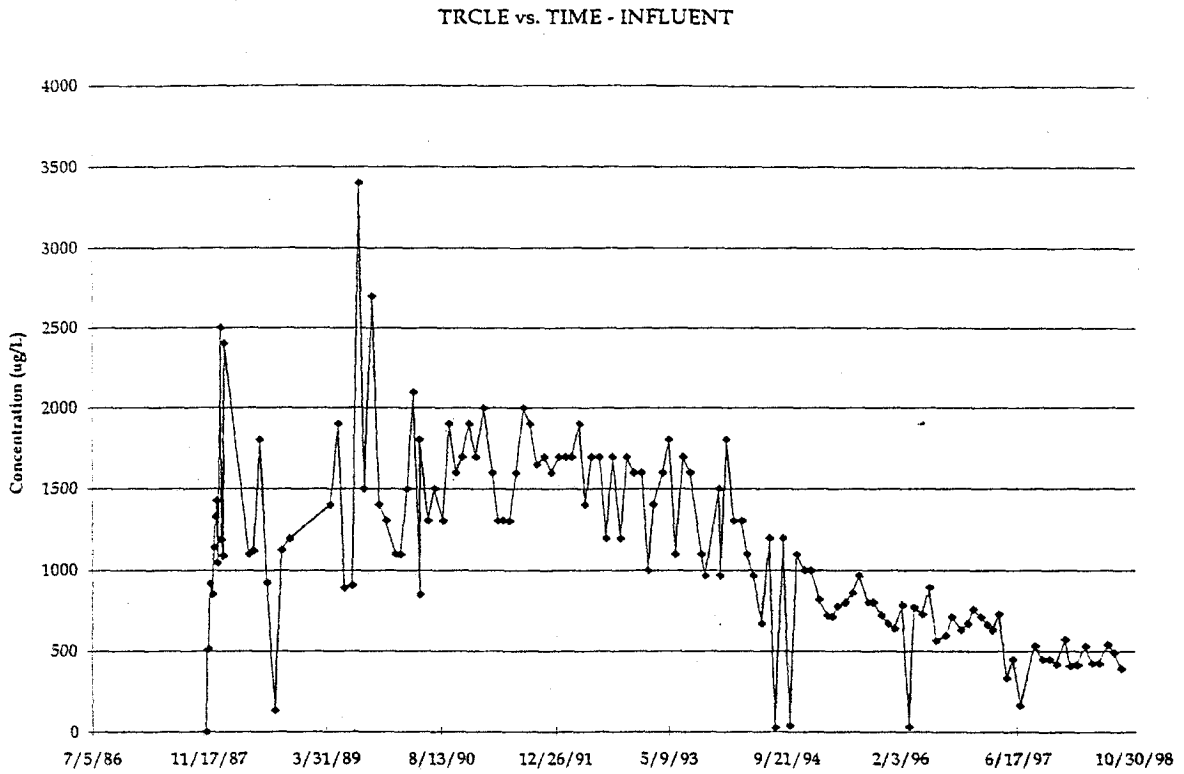


figure 3 - 13

OU2, TGRS TREATMENT SYSTEM PERFORMANCE
Twin Cities Army Ammunition Plant

CRA

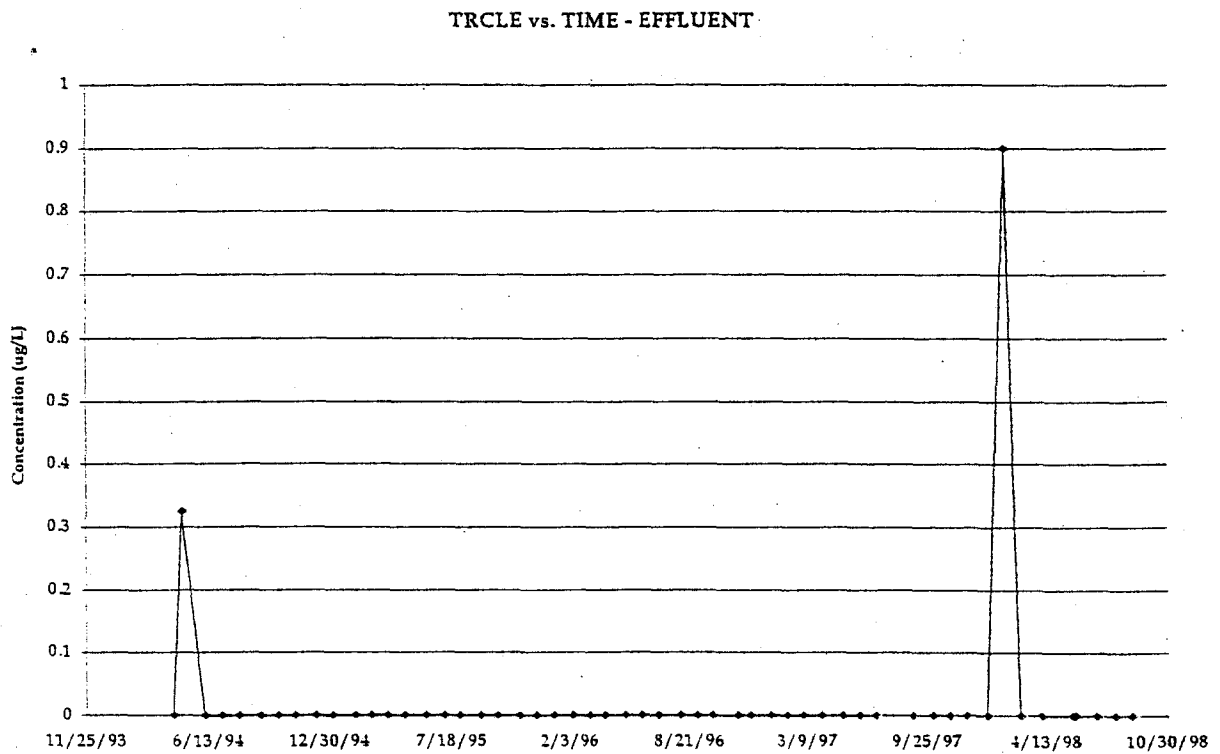
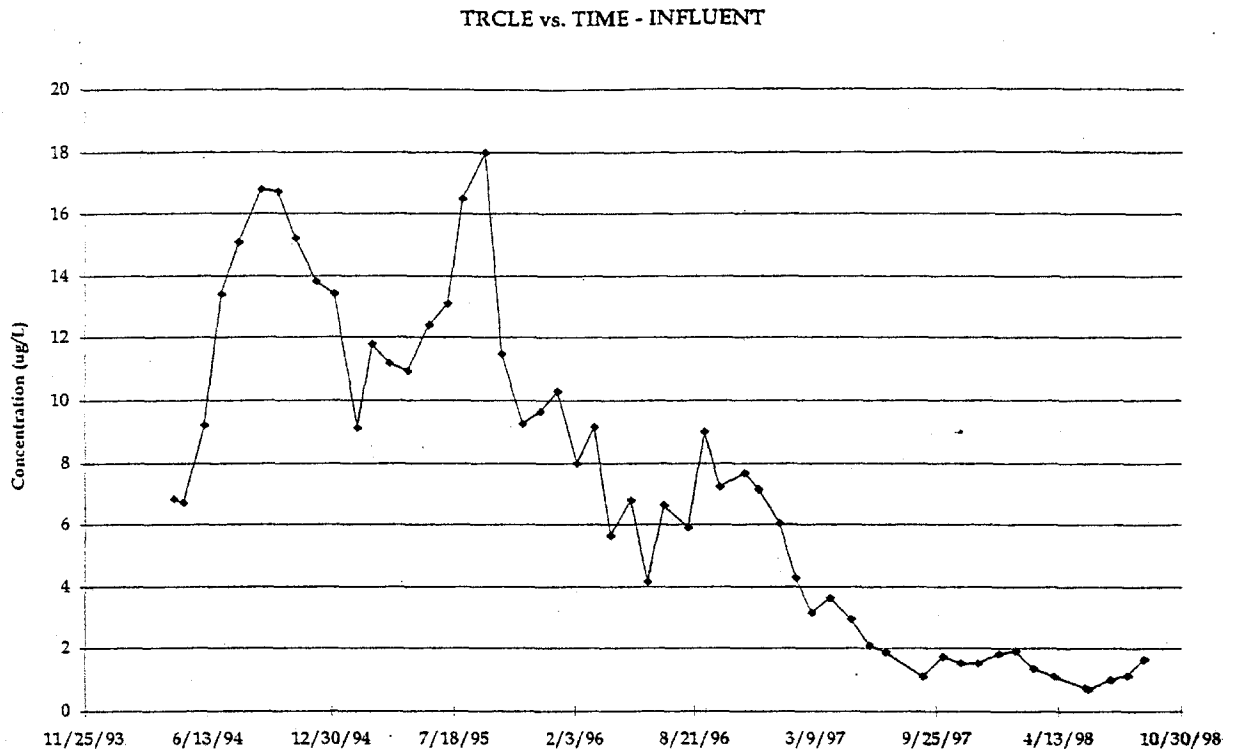


figure 4 - 1

OU3 (PGRS) TRCLE vs. TIME
Twin Cities Army Ammunition Plant

CRA

APPENDIX A

Appendix A

Site Inspection Checklists

A.1 List of Attendees for Site Inspection

A.2 OU1

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be filled in by hand and attached to the five-year review report as supporting documentation of site status.)

| I. SITE INFORMATION | |
|---|---|
| Site name: <i>Operable Unit 1 New Brighton/Arden Hills Superfund Site</i> | Date of inspection: <i>March 16, 1999</i> |
| Location and region: <i>Arden Hills, MN, Region 5</i> | USEPA ID: <i>MN 7213820908</i> |
| Agency, office or company leading the Five-Year Review: <i>U.S. Army</i> | Weather/temperature: |
| Remedy Includes (Check all that apply) <ul style="list-style-type: none"> <input type="checkbox"/> Landfill cover/containment <input checked="" type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input type="checkbox"/> Other _____ | |
| <input checked="" type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached | |
| II. INTERVIEWS (Check all that apply) | |
| 1. O&M site manager <i>Dave Olson, City of N.B.</i> <i>Public Works Superintendent</i> <i>N/A</i> <div style="display: flex; justify-content: space-between; font-size: small;"> Name Title Date </div> Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. <i>(651) 638-2113</i> Problems, suggestions; <input type="checkbox"/> Report attached _____ | |
| 2. O&M staff <i>Bob Hertenstein, City of N.B.</i> <i>Treatment Plant Operator</i> <i>3/16/99</i> <div style="display: flex; justify-content: space-between; font-size: small;"> Name Title Date </div> Interviewed <input checked="" type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. <i>(651) 638-2065</i> Problems, suggestions; <input type="checkbox"/> Report attached _____ | |

3. Local regulatory authorities and response agencies (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency N/A
Contact _____
Name Title Date Phone no.

Problems; suggestions; Report attached _____

Agency _____
Contact _____
Name Title Date Phone no.

Problems; suggestions; Report attached _____

Agency _____
Contact _____
Name Title Date Phone no.

Problems; suggestions; Report attached _____

Agency _____
Contact _____
Name Title Date Phone no.

Problems; suggestions; Report attached _____

4. Other interviews (optional) Report attached.

N/A

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. O&M Manual and As-Builts

O&M Manual Readily available Up to date N/A
 As-builts Readily available Up to date N/A
 Maintenance Logs Readily available Up to date N/A

Remarks _____

2. Site Specific Health and Safety Plan Readily available Up to date N/A

Contingency plan/emergency response plan Readily available Up to date N/A

Remarks _____

3. O&M and OSHA Training Records Readily available Up to date N/A

Remarks _____

4. Permits and Service Agreements

Air discharge permit Readily available Up to date N/A
 Effluent discharge Readily available Up to date N/A
 Waste disposal, POTW Readily available Up to date N/A
 Other permits (see remarks) _____ Readily available Up to date N/A

Remarks _____
1) A MDNR permit exists for groundwater appropriation.
2) A RCRA Hazardous Waste Generator permit exists for the spent granular activated carbon. Spent carbon is returned to the original, clean carbon supplier for regeneration.

5. Gas Generation Records Readily available Up to date N/A

Remarks _____

6. Settlement Monument Records Readily available Up to date N/A

Remarks _____

7. Groundwater Monitoring Records Readily available Up to date N/A

Remarks Groundwater monitoring results are documented in the TCAAP Fiscal Year 1998 Annual Performance Report.

8. Leachate Extraction Records Readily available Up to date N/A

Remarks _____

9. Discharge Compliance Records

Air Readily available Up to date N/A
 Water (effluent) Readily available Up to date N/A

Remarks _____

10. Daily Access/Security Logs

Readily available Up to date N/A

Remarks Daily Access is not logged but security alarms operable.

IV. O&M COSTS

1. O&M Organization

State in-house Contractor for State
 PRP in-house Contractor for PRP
 Other City of New Brighton

2. O&M Cost Records

Readily available Up to date
 Funding mechanism/agreement in place

Original O&M cost estimate \$705,000 (OUI ROD, 1993 dollars) Breakdown attached

Total annual cost by year for review period if available

| | | | |
|-----------------------|---------------------|-----------------------|--|
| From <u>Jan. 1994</u> | To <u>Dec. 1994</u> | <u>\$760,900.00</u> | <input checked="" type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |
| From <u>Jan. 1995</u> | To <u>Dec. 1995</u> | <u>\$897,923.00</u> | <input checked="" type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |
| From <u>Jan. 1996</u> | To <u>Dec. 1996</u> | <u>\$672,259.00</u> | <input checked="" type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |
| From <u>Jan. 1997</u> | To <u>Dec. 1997</u> | <u>\$1,076,812.00</u> | <input checked="" type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |
| From <u>Jan. 1998</u> | To <u>June 1998</u> | <u>\$141,247.00*</u> | <input checked="" type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |

* This cost is misleading. No carbon changeout cost has been incurred in the first half of 1998, which is a relatively large cost.

3. Unanticipated or Unusually High O&M Costs During Review Period

Describe costs and reasons:

O&M costs appear to be slightly higher than the original estimate; however, carbon changes are now occurring at 6 to 8 month intervals rather than the 12 month interval in the original estimate. Also, two carbon exchanges were paid for in 1997 and no carbon exchanges were paid for in 1996, resulting in the significant cost difference between these two years.

| V. GENERAL SITE CONDITIONS | |
|---|--|
| Whenever possible, actual site conditions should be documented with photographs. | |
| A. Fencing | |
| 1. Fencing damaged <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Gates secured <input type="checkbox"/> N/A | Remarks _____ |
| B. Site Access | |
| 1. Access restrictions, signs, other security measures <input type="checkbox"/> Location shown on map <input type="checkbox"/> N/A | Remarks <i>When not attended, treatment building is locked and also has security alarms.</i> |
| C. Perimeter Roads | |
| 1. Roads damaged <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Roads adequate <input type="checkbox"/> N/A | Remarks _____ |
| D. General | |
| 1. Vandalism/trespassing <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No vandalism evident | Remarks _____ |
| 2. Land use changes onsite <input checked="" type="checkbox"/> N/A | Remarks _____ |
| 3. Land use changes offsite <input checked="" type="checkbox"/> N/A | Remarks _____ |
| 4. Institutional controls (site conditions imply institutional controls not being enforced) <input type="checkbox"/> N/A | <i>Institutional controls are in place (see Section IX).</i> |
| Agency _____ | Contact _____ |
| Name | Title |
| Date | Phone no. |
| Problems; suggestions; <input type="checkbox"/> Report attached | _____ |
| VI. LANDFILL COVER <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> Not applicable | |
| VII. VERTICAL BARRIER WALLS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> Not applicable | |
| VIII. GROUNDWATER/SURFACE WATER REMEDIES <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> Not applicable | |
| A. Groundwater Extraction Wells, Pumps, and Pipelines | |
| <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> Not applicable | |
| 1. Pumps, Wellhead Plumbing, and Electrical | |
| <input checked="" type="checkbox"/> Good condition <input checked="" type="checkbox"/> All required wells located <input type="checkbox"/> Needs O&M <input type="checkbox"/> N/A | Remarks _____ |
| 2. Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances | |
| <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs O&M | Remarks _____ |

| | | |
|--|--|---|
| B. Surface Water Collection Structures, Pumps, and Pipelines | | |
| <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> Not applicable | | |
| 1. Collection Structures, Pumps, and Electrical | | |
| <input type="checkbox"/> Good condition <input type="checkbox"/> Needs O&M | | |
| Remarks _____ | | |
| 2. Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances | | |
| <input type="checkbox"/> Good condition <input type="checkbox"/> Needs O&M | | |
| Remarks _____ | | |
| C. Treatment System <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> Not applicable | | |
| 1. Treatment Train (Check components that apply) | | |
| <input type="checkbox"/> Metals removal | <input type="checkbox"/> Oil/water separation | <input type="checkbox"/> Bioremediation |
| <input type="checkbox"/> Air stripping | <input checked="" type="checkbox"/> Carbon adsorbers | |
| <input type="checkbox"/> Filters _____ | <input type="checkbox"/> Others _____ | |
| <input checked="" type="checkbox"/> Good condition | <input type="checkbox"/> Needs O&M | |
| <input checked="" type="checkbox"/> Sampling ports properly marked and functional | | |
| <input checked="" type="checkbox"/> Sampling/maintenance log displayed and-up to date (<i>not displayed</i>) | | |
| <input checked="" type="checkbox"/> Equipment properly identified | | |
| <input checked="" type="checkbox"/> Quantity of groundwater treated annually <u>Target Volume- 1.15 Billion gallons/year</u> | | |
| <input type="checkbox"/> Quantity of surface water treated annually <u>N/A</u> | | |
| Remarks <u>Treatment system is referred to as the Permanent Granular Activated Carbon System or "PGAC."</u> | | |
| <u>Sampling and maintenance information is maintained in a computer database that is accessible via the computers in the PGAC treatment system office.</u> | | |
| _____ | | |
| _____ | | |
| _____ | | |
| _____ | | |
| 2. Electrical Enclosures and Panels (properly rated and functional) <input type="checkbox"/> N/A | | |
| <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs O&M | | |
| Remarks _____ | | |
| 3. Tanks, Vaults, Storage Vessels <input type="checkbox"/> N/A | | |
| <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Proper secondary containment <input type="checkbox"/> Needs O&M | | |
| Remarks _____ | | |
| 4. Discharge Structure and Appurtenances <input type="checkbox"/> N/A | | |
| <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs O&M | | |
| Remarks _____ | | |
| 5. Treatment Building(s) <input type="checkbox"/> N/A | | |
| <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs repair | | |
| <input checked="" type="checkbox"/> Chemicals and equipment properly stored | | |
| Remarks _____ | | |

| |
|---|
| <p>6. Monitoring Wells (pump and treatment remedy) <input checked="" type="checkbox"/> Properly secured/locked</p> <p><input checked="" type="checkbox"/> Functioning <input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition <input checked="" type="checkbox"/> All required wells located</p> <p><input type="checkbox"/> Needs O&M <input type="checkbox"/> N/A</p> <p>Remarks _____</p> |
| D. Monitored Natural Attenuation |
| <p>1. Monitoring Wells (natural attenuation remedy) <input type="checkbox"/> Properly secured/locked</p> <p><input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled</p> <p><input type="checkbox"/> Good condition <input type="checkbox"/> All required wells located <input type="checkbox"/> Needs O&M <input checked="" type="checkbox"/> N/A</p> <p>Remarks _____</p> |
| IX. OTHER REMEDIES |
| <p>If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. <i>(See additional remedy components below.)</i></p> |
| A. Alternative Water Supply/Well Abandonment |
| <p>1. Well Inventory Records <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up-to-Date</p> <p>Remarks _____</p> |
| <p>2. O&M Organization</p> <p><input type="checkbox"/> State in-house <input type="checkbox"/> Contractor for State</p> <p><input type="checkbox"/> PRP in-house <input checked="" type="checkbox"/> Contractor for PRP</p> <p><input type="checkbox"/> Other _____</p> |
| <p>3. Program Status</p> <p>a. Number of well owners previously connected to an alternate water supply: <u> 1 </u></p> <p>b. Number of well owners currently scheduled to receive alternate water supply: <u> 2 </u></p> <p>c. Number of wells previously abandoned: <u> 8 </u></p> <p>d. Number of wells currently scheduled to be abandoned: <u> 2 </u></p> <p>e. Number of well owners yet to be contacted to be offered an alternate water supply/well abandonment: <u> 0 </u></p> |
| <p>4. Groundwater Monitoring Network</p> <p>a. Adequacy to detect plume size increase, if it occurred <input checked="" type="checkbox"/> Adequate <input type="checkbox"/> Not adequate</p> <p>Remarks _____</p> |
| B. Drilling Advisory |
| <p>1. MDH Special Well Construction Area (MDH SWCA)</p> <p>a. MDH SWCA currently in place <input checked="" type="checkbox"/> yes <input type="checkbox"/> no</p> <p>b. MDH SWCA encompasses entire plume <input checked="" type="checkbox"/> yes <input type="checkbox"/> no</p> <p>Remarks: <u> Revision of the MDH SWCA boundary to more closely match the area of concern are anticipated to be completed in 1999. </u></p> |

X. OVERALL OBSERVATIONS

A. Effectiveness of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The OUI groundwater recovery system (New Brighton Municipal Wells NBM#4, NBM#14 and NBM#15 was completed in August 1998. Performance monitoring is currently underway. System effectiveness will be evaluated when initial performance monitoring has been completed.

B. Adequacy and the Continued Need for O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

O&M procedures are adequate to ensure the short- and long-term protectiveness of the remedy. The PGAC system operation has provided reliable treatment of the water to drinking water standards.

C. Early Indicators of Potential Remedy Failure

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

None.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Optimization will be evaluated after initial performance monitoring is completed (see Item A above).

**ANNUAL FINANCIAL SUMMARIES
WATER TREATMENT PLANT #1, FUND 206
3001 5th Street N.W.**

I:\Shared\Army\1999\Plant1
July 29, 1998

| | 1994 | 1995 | 1996 | 1997 | 1997 | 1998 | Thru | 1999 | Percent | 2000 | |
|---------------------------------------|--------|------------------|------------------|------------------|--------------------|--------------------|--------------------|------------------|--------------------|---------------|--------------------|
| | Actual | Actual | Actual | Budget | Actual | Budget | June | Budget | Change | Budget | |
| | | | | | | | | | 98/99 | | |
| MATERIALS AND SUPPLIES | | | | | | | | | | | |
| General Materials | 2170 | \$26,200 | \$4,338 | \$6,285 | \$2,100 | \$2,805 | \$2,200 | \$736 | \$2,200 | 0.00% | \$2,300 |
| Chemicals | 2175 | | \$33,345 | \$15,214 | \$32,100 | \$26,526 | \$20,800 | \$9,145 | \$22,300 | 7.21% | \$23,000 |
| 1995 chem. correction. | | | | (\$5,751) | | | | | | | |
| Small Equipment | 2280 | \$200 | \$0 | \$0 | \$2,800 | \$0 | \$2,900 | \$0 | \$2,800 | -3.45% | \$2,900 |
| TOTAL | | \$26,400 | \$37,683 | \$15,748 | \$37,000 | \$29,331 | \$25,900 | \$9,881 | \$27,300 | 5.41% | \$28,200 |
| CONTRACTUAL SERVICES | | | | | | | | | | | |
| Professional Services | 3300 | | | | | | | | | | |
| Telephone | 3310 | \$1,100 | \$2,206 | \$6,510 | \$6,600 | \$7,077 | \$6,800 | \$3,527 | \$7,400 | 8.82% | \$7,600 |
| Utility Charges | 3320 | \$78,700 | \$102,981 | \$91,595 | \$159,500 | \$115,196 | \$118,000 | \$43,992 | \$123,600 | 4.75% | \$127,300 |
| Waste Removal | 3350 | \$700 | \$707 | \$609 | \$700 | \$556 | \$700 | \$228 | \$600 | -14.29% | \$600 |
| Subscriptions & Memberships | 3360 | | \$0 | \$0 | \$300 | \$0 | \$300 | \$0 | \$300 | 0.00% | \$300 |
| Training | 3370 | | \$0 | \$0 | \$300 | \$0 | \$300 | \$0 | \$300 | 0.00% | \$300 |
| Travel | 3380 | | \$44 | \$0 | \$0 | \$0 | \$100 | \$0 | \$100 | 0.00% | \$100 |
| Insurance | 3483 | \$8,900 | \$11,000 | \$12,990 | \$21,600 | \$6,862 | \$22,200 | \$4,876 | \$5,000 | 310.81% | \$5,200 |
| Maint. of Buildings & Grounds | 3510 | \$1,100 | \$1,536 | \$16,560 | \$2,300 | \$7,973 | \$2,400 | \$2,860 | \$68,400 | 2750.00% | \$70,500 |
| Maint. of Equipment | 3520 | \$10,900 | \$16,361 | \$18,030 | \$30,900 | \$55,076 | \$31,800 | \$9,503 | \$91,200 | 186.79% | \$93,900 |
| Other Services | 3590 | \$5,600 | \$8,811 | | | | | | | | |
| DNR App. Fee | | | | \$3,235 | \$6,700 | \$4,825 | \$5,400 | \$0 | \$5,600 | 3.70% | \$5,800 |
| MCES Ind. Chg. | | | \$796 | | \$100 | \$150 | \$100 | \$150 | \$900 | 800.00% | \$900 |
| SAC | | | | \$14,400 | \$100,000 | \$0 | \$0 | \$0 | \$10,450 | | \$0 |
| Sanitary Sewer | | | | \$22,541 | \$30,000 | \$10,269 | \$30,900 | \$2,402 | \$12,000 | -61.17% | \$12,400 |
| RC/MPCA Fee | | | | \$931 | \$1,500 | \$483 | \$1,500 | \$1,038 | \$1,500 | 0.00% | \$1,500 |
| Chemtrek, Misc. | | | | \$2,568 | \$1,500 | \$500 | \$1,500 | \$0 | \$1,500 | 0.00% | \$1,500 |
| Miscellaneous | | | | | | \$1,492 | | \$886 | \$2,000 | | |
| Carbon Contracts | 6751 | \$187,800 | \$191,581 | \$6,167 | \$390,000 | \$379,320 | \$401,700 | \$0 | \$375,000 | -6.65% | \$386,300 |
| City Services | 6752 | | | | | | | | | | |
| Administration | | \$89,900 | \$99,000 | \$102,700 | \$100,457 | \$103,104 | \$103,500 | \$0 | \$106,600 | 3.00% | \$109,800 |
| Operations | | \$107,500 | \$144,891 | \$152,226 | \$154,500 | \$152,018 | \$159,100 | \$0 | \$163,900 | 3.02% | \$168,800 |
| Engineering | 6752 | \$166,600 | \$175,999 | \$178,691 | \$240,000 | \$187,266 | \$247,200 | \$59,426 | \$200,000 | -19.09% | \$206,000 |
| Legal/Professional Services | 6755 | \$71,000 | \$101,026 | \$32,083 | \$67,000 | \$10,881 | \$69,000 | \$2,478 | \$12,000 | -82.61% | \$12,400 |
| Auditing Services | 6755 | \$4,700 | \$340 | \$400 | \$0 | \$0 | \$2,000 | \$0 | \$2,100 | 5.00% | \$2,200 |
| Capital Outlay -1/2 floor scrubber | 6200 | | \$2,961 | | | | | | | | |
| Corrections | | | | (\$5,725) | | \$4,433 | | | | | |
| TOTAL | | \$734,500 | \$860,240 | \$656,511 | \$1,313,957 | \$1,047,481 | \$1,204,500 | \$131,366 | \$1,190,450 | -1.17% | \$1,213,400 |
| TOTAL | | \$760,900 | \$897,923 | \$672,259 | \$1,350,957 | \$1,076,812 | \$1,230,400 | \$141,247 | \$1,217,750 | -1.03% | \$1,241,600 |
| Fridley Chemical Feed Project: | | | | | | | | | | | |
| Construction | 6751 | | | | \$21,002 | \$21,002 | | | | | |
| Engineering | 6752 | | | \$2,497 | | | | | | | |
| TOTAL | | | | \$2,497 | \$21,002 | \$21,002 | | | | | |
| GRAND TOTAL | | \$760,900 | \$897,923 | \$674,756 | \$1,371,959 | \$1,097,814 | \$1,230,400 | \$141,247 | \$1,217,750 | -1.03% | \$1,241,600 |

1997 Corrections

\$4,433.40 transfer from fund 207 to 206 to correct a 1996 miscoded legal charge

A.3 OU2 Shallow Soil Sites

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be filled in by hand and attached to the five-year review report as supporting documentation of site status.)

| I. SITE INFORMATION | |
|--|---|
| Site name: <i>Operable Unit 2, Shallow Soil Sites (A, C, E, H, 129-3, 129-5, Dump Sites B and 129-15) New Brighton/Arden Hills Superfund Site</i> | Date of inspection: <i>March 16, 1999</i> |
| Location and region: <i>Arden Hills, MN, Region 5</i> | USEPA ID: <i>MN 7213820908</i> |
| Agency, office or company leading the Five-Year Review: <i>U.S. Army</i> | Weather/temperature: |
| Remedy Includes (Check all that apply) <ul style="list-style-type: none"> <input type="checkbox"/> Landfill cover/containment <input type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input checked="" type="checkbox"/> Other <u><i>Soil excavation, treatment within TCAAP's CAMU, and off-site disposal. Soil vapor extraction (Site A only)</i></u> | |
| <input checked="" type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached | |
| II. INTERVIEWS (Check all that apply) | |
| 1. O&M site manager <u><i>John Chinnock, Stone & Webster</i></u> <u><i>Project Manager</i></u> <u><i>3/26/99</i></u> <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Title Date </div> Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input checked="" type="checkbox"/> by phone Phone no. <u><i>(303) 741-7024</i></u> Problems, suggestions; <input type="checkbox"/> Report attached _____ | |
| 2. O&M staff <u><i>Sid Lambiotte, Stone & Webster</i></u> <u><i>Remediation Manager</i></u> <u><i>N/A</i></u> <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Title Date </div> Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. <u><i>(303) 741-7700</i></u> Problems, suggestions; <input type="checkbox"/> Report attached _____ | |

3. Local regulatory authorities and response agencies (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency N/A

Contact _____

Name Title Date Phone no.

Problems; suggestions; Report attached _____

Agency _____

Contact _____

Name Title Date Phone no.

Problems; suggestions; Report attached _____

Agency _____

Contact _____

Name Title Date Phone no.

Problems; suggestions; Report attached _____

Agency _____

Contact _____

Name Title Date Phone no.

Problems; suggestions; Report attached _____

4. Other interviews (optional) Report attached.

N/A

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. O&M Manual and As-Builts

O&M Manual Readily available Up to date N/A

As-builts Readily available Up to date N/A

Maintenance Logs Readily available Up to date N/A

Remarks *Addendum 1 – CAMU Design documents CAMU operational procedures and construction drawings. The maintenance logs are the routine inspections of the Corrective Action Management Unit (CAMU). None of the above are currently applicable to the Site A SVE system as it has not yet been constructed.*

2. Site Specific Health and Safety Plan Readily available Up to date N/A

Contingency plan/emergency response plan Readily available Up to date N/A

Remarks _____

3. O&M and OSHA Training Records Readily available Up to date N/A

Remarks *The above item applies to the CAMU. It is not currently applicable to the Site A SVE system as it has not yet been constructed.*

4. Permits and Service Agreements

Air discharge permit Readily available Up to date N/A

Effluent discharge Readily available Up to date N/A

Waste disposal, POTW Readily available Up to date N/A (Note 2)

Other permits (Note 3) Readily available Up to date N/A

Remarks _____
1) The Site A SVE system, when operational, will not need an air discharge permit based on estimated mass removal rates.
2) Stormwater falling on the CAMU area is contained, tested, and then discharged to sanitary sewer, ultimately being treated at the Metropolitan Council Environmental Services (MCES) Treatment Plant located at 2400 Childs Road in St. Paul, Minnesota. Discharge is authorized under an MCES Special Discharge Approval.
3) Excavated soils that have been treated (stabilized) in the CAMU have been sent to a permitted landfill for disposal -- Laidlaw Environmental Services, (Rosemount, Minnesota) Inc.

5. Gas Generation Records Readily available Up to date N/A

Remarks _____

6. Settlement Monument Records Readily available Up to date N/A

Remarks _____

7. Groundwater Monitoring Records Readily available Up to date N/A

Remarks *Groundwater monitoring results are documented in the TCAAP Fiscal Year 1998 Annual Performance Report.*

8. Leachate Extraction Records Readily available Up to date N/A

Remarks: _____

9. Discharge Compliance Records

Air Readily available Up to date N/A

Water (effluent) Readily available Up to date N/A

Remarks *The above applies to discharges of stormwater from the CAMU (under the MCES Special Discharge Approval).*

10. Daily Access/Security Logs
 Readily available Up to date N/A
Remarks TCAAP is a secured facility with restricted access.

IV. O&M COSTS

1. O&M Organization
 State in-house Contractor for State
 PRP in-house Contractor for PRP
 Other _____

2. O&M Cost Records
 Readily available Up to date N/A (*Site A SVE system has not yet been constructed and review of CAMU costs was not deemed necessary*)
 Funding mechanism/agreement in place
Original O&M cost estimate _____ Breakdown attached

Total annual cost by year for review period if available

| | | | |
|------------|----------|------------|---|
| From _____ | To _____ | _____ | <input type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |
| From _____ | To _____ | _____ | <input type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |
| From _____ | To _____ | _____ | <input type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |
| From _____ | To _____ | _____ | <input type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |
| From _____ | To _____ | _____ | <input type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |

3. Unanticipated or Unusually High O&M Costs During Review Period
Describe costs and reasons: N/A

IX. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. (See additional remedy components below.)

A. Soil Remediation

What is the current status of soil remediation:

Site A 10,761 tons of soil have been excavated, transported to the TCAAP Corrective Action Management Unit (CAMU), treated (stabilized), and transported to a permitted off-site disposal facility. Work was suspended for the winter but will resume in spring 1999.

Site A SVE System The Engineering Evaluation/Cost Analysis (EE/CA) for a soil vapor extraction (SVE) system to be installed at this site was approved by the MPCA and the USEPA. The system is intended to remediate VOC-contaminated source-area soils and is scheduled to be installed in the latter part of 1999.

Site C A phytoremediation demonstration project is currently underway at this site and is scheduled to continue through FY 1999.

Site E Excavation has not yet been initiated.

Site H Excavation has not yet been initiated.

Site 129-3 A phytoremediation demonstration project is currently underway at this site and is scheduled to continue through FY 1999.

Site 129-5 Excavation has not yet been initiated.

What is the anticipated schedule for completion of soil remediation:

Site A 1999
Site A (SVE) 2003
Site C 2001
Site E 2000
Site H 2000
Site 129-3 2001
Site 129-5 2000

What is the present condition of the TCAAP Corrective Action Management Unit (CAMU):

Pad/berm condition good condition needs O&M
Run-on/run-off control good condition needs O&M
Materials storage good condition needs O&M

Describe any significant problems that have occurred during remediation activities, and whether they will require changes to the remedial design.

There have not been any significant problems that would require changes to the remedial design.

B. Groundwater Monitoring

Describe the status of the five-year period of groundwater monitoring that is intended to verify no adverse remediation impacts at Sites A, C, E, H, 129-3, and 129-5.

The five-year period is not scheduled to begin until soil excavation activities are complete.

C. Characterization of Dumps

Describe the status of dump characterization:

Site B: *Characterization work was conducted in early FY 1999 and a documentation report is currently under regulatory review.*

Site 129-15: *Characterization work was conducted in early FY 1999 and a documentation report is currently under regulatory review.*

If characterization is complete, describe the remedy that will be implemented and its status.

Site B: No further action Other _____
Status _____

Site 129-15: No further action Other _____
Status _____

X. OVERALL OBSERVATIONS

A. Effectiveness of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

For the shallow soil sites, exclusive of the dump sites, the remedy that has been selected is intended to remove soils that are contaminated above the cleanup goals specified in the OU2 ROD, restoring the site's availability for industrial use. The soil excavation, treatment, and off-site disposal remedy effectively accomplishes this objective. The remedy is in the early stages of implementation. Site A will have an additional removal action: an SVE system that will remove VOC-contamination from source area soils and thus speed the restoration of impacted groundwater. The SVE system is to be constructed in the latter part of 1999.

For the dump sites, the selected remedy is to first characterize the dumps and then determine if any further remedial actions are required. A post-ROD Amendment or an Explanation of Significant Difference (ESD) will be written if additional remedial action(s) are deemed necessary. At present, reports documenting the investigation results are under regulatory review.

B. Adequacy and the Continued Need for O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

O&M procedures are limited to the CAMU O&M procedures. Current procedures are deemed adequate. The CAMU is serving its intended purpose of providing an environmentally-protective working area for the staging and treatment of excavated soils prior to their being transported off-site to the permitted disposal facility.

C. Early Indicators of Potential Remedy Failure

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

None.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

None.

A.4 OU2 Deep Soil Sites (D and G)

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be filled in by hand and attached to the five-year review report as supporting documentation of site status.)

| I. SITE INFORMATION | |
|--|--|
| Site name: <i>Operable Unit 2, Deep Soil Sites (D and G) New Brighton/Arden Hills Superfund Site</i> | Date of inspection: <i>March 16, 1999</i> |
| Location and region: <i>Arden Hills, MN, Region 5</i> | USEPA ID: <i>MN 7213820908</i> |
| Agency, office or company leading the Five-Year Review: <i>U.S. Army</i> | Weather/temperature: |
| Remedy Includes (Check all that apply) | |
| <input checked="" type="checkbox"/> Landfill cover/containment <input type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input checked="" type="checkbox"/> Other <i>Soil vapor extraction</i> | |
| <input checked="" type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached | |
| II. INTERVIEWS (Check all that apply) | |
| 1. O&M site manager <i>Jim Persoon, Alliant Techsystems</i> <i>Program Director</i> <i>March 16, 1999</i> | |
| Name | Title Date |
| Interviewed <input checked="" type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone | Phone no. <i>(651) 633-2301, ext. 1631</i> |
| Problems, suggestions; <input type="checkbox"/> Report attached _____ | |
| 2. O&M staff <i>Jason Twaddle, CRA</i> <i>Project Engineer</i> <i>March 16, 1999</i> | |
| Name | Title Date |
| Interviewed <input checked="" type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone | Phone no. <i>(651) 639-0913</i> |
| Problems, suggestions; <input type="checkbox"/> Report attached _____ | |

3. Local regulatory authorities and response agencies (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency N/A
Contact _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

Agency _____
Contact _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

Agency _____
Contact _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

Agency _____
Contact _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

4. Other interviews (optional) Report attached.

| |
|-----|
| N/A |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. O&M Manual and As-Builts

O&M Manual Readily available Up to date N/A
 As-builts Readily available Up to date N/A
 Maintenance Logs Readily available Up to date N/A

Remarks _____

2. Site Specific Health and Safety Plan Readily available Up to date N/A

Contingency plan/emergency response plan Readily available Up to date N/A

Remarks _____

3. O&M and OSHA Training Records Readily available Up to date N/A

Remarks _____

4. Permits and Service Agreements

Air discharge permit Readily available Up to date N/A
 Effluent discharge Readily available Up to date N/A
 Waste disposal, POTW Readily available Up to date N/A
 Other permits _____ Readily available Up to date N/A

Remarks _____

5. Gas Generation Records Readily available Up to date N/A

Remarks *Air monitoring records and mass removal calculations.*

6. Settlement Monument Records Readily available Up to date N/A

Remarks _____

7. Groundwater Monitoring Records Readily available Up to date N/A

Remarks *Groundwater monitoring results are documented in the TCAAP Fiscal Year 1998 Annual Performance Report.*

8. Leachate Extraction Records Readily available Up to date N/A

Remarks _____

9. Discharge Compliance Records

Air Readily available Up to date N/A (*See Number 4 above*)
 Water (effluent) Readily available Up to date N/A

Remarks _____

10. Daily Access/Security Logs

Readily available Up to date N/A

Remarks TCAAP is a secured facility with restricted access

IV. O&M COSTS

1. O&M Organization

State in-house Contractor for State
 PRP in-house Contractor for PRP
 Other _____

2. O&M Cost Records

Readily available Up to date
 Funding mechanism/agreement in place

Original O&M cost estimate _____ Breakdown attached

Total annual cost by year for review period if available

| | | | |
|-----------------------|---------------------|-----------------|---|
| From _____ | To _____ | _____ | <input type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |
| From _____ | To _____ | _____ | <input type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |
| From _____ | To _____ | _____ | <input type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |
| From _____ | To _____ | _____ | <input type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |
| From <u>June 1997</u> | To <u>June 1998</u> | <u>\$51,000</u> | <input type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |

3. Unanticipated or Unusually High O&M Costs During Review Period

Describe costs and reasons: None.

| |
|--|
| <p>4. Holes <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Holes not evident Areal extent _____ Depth _____ Remarks _____</p> |
| <p>5. Vegetative Cover <input checked="" type="checkbox"/> Grass <input checked="" type="checkbox"/> Cover properly established <input checked="" type="checkbox"/> No signs of stress <input type="checkbox"/> Trees/Shrubs (indicate size and locations on a diagram) Remarks _____</p> |
| <p>6. Alternative Cover (armored rock, concrete, etc.) <input checked="" type="checkbox"/> N/A Remarks _____</p> |
| <p>7. Bulges <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Bulges not evident Areal extent _____ Height _____ Remarks _____</p> |
| <p>8. Wet Areas/Water Damage <input checked="" type="checkbox"/> Wet areas/water damage not evident <input type="checkbox"/> Wet areas <input type="checkbox"/> Location shown on site map Areal extent _____ <input type="checkbox"/> Ponding <input type="checkbox"/> Location shown on site map Areal extent _____ <input type="checkbox"/> Seeps <input type="checkbox"/> Location shown on site map Areal extent _____ <input type="checkbox"/> Soft subgrade <input type="checkbox"/> Location shown on site map Areal extent _____ Remarks _____</p> |
| <p>9. Slope Instability <input type="checkbox"/> Slides <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No evidence of slope instability Areal extent _____ Remarks _____</p> |
| <p>B. Benches <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> Not applicable (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)</p> |
| <p>C. Letdown Channels <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> Not applicable (Channel lined with erosion control mats, riprap, grout bags, or gabions that descends down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)</p> |

| | |
|--|--|
| D. Cover Penetrations <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> Not applicable | |
| 1. Gas Vents <input checked="" type="checkbox"/> Active <input type="checkbox"/> Passive <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs O&M <input type="checkbox"/> Evidence of leakage at penetration <input type="checkbox"/> N/A Remarks <u>SVE Vents currently not operating while testing results are being reviewed to determine if continued operation is necessary.</u> | |
| 2. Gas Monitoring Probes <input checked="" type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs O&M <input type="checkbox"/> Evidence of leakage at penetration <input type="checkbox"/> N/A Remarks <u>Site D pilot study vents.</u> | |
| 3. Monitoring Wells (within surface area of landfill) <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> Needs O&M <input type="checkbox"/> Evidence of leakage at penetration <input checked="" type="checkbox"/> N/A Remarks _____ | |
| 4. Leachate Extraction Wells <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> Needs O&M <input type="checkbox"/> Evidence of leakage at penetration <input checked="" type="checkbox"/> N/A Remarks _____ | |
| 5. Settlement Monuments <input type="checkbox"/> Located <input type="checkbox"/> Routinely surveyed <input checked="" type="checkbox"/> N/A Remarks _____ | |
| E. Gas Collection and Treatment (see SVE system discussion, Section IX) | |
| 1. Gas Treatment Facilities <input type="checkbox"/> Flaring <input type="checkbox"/> Thermal destruction <input type="checkbox"/> Collection for reuse <input type="checkbox"/> Good condition <input type="checkbox"/> Needs O&M Remarks _____ | |
| 2. Gas Collection Wells, Manifolds and Piping <input type="checkbox"/> Good condition <input type="checkbox"/> Needs O&M Remarks _____ | |

| | | | |
|--|--|--|--|
| F. Cover Drainage Layer | <input type="checkbox"/> Applicable | <input checked="" type="checkbox"/> Not applicable | |
| G. Detention/Sedimentation Ponds | <input type="checkbox"/> Applicable | <input checked="" type="checkbox"/> Not applicable | |
| H. Retaining Walls | <input type="checkbox"/> Applicable | <input checked="" type="checkbox"/> Not applicable | |
| I. Perimeter Ditches/Off-Site Discharge | <input type="checkbox"/> Applicable | <input checked="" type="checkbox"/> Not applicable | |
| VII. VERTICAL BARRIER WALLS | | | |
| | <input type="checkbox"/> Applicable | <input checked="" type="checkbox"/> Not applicable | |
| VIII. GROUNDWATER/SURFACE WATER REMEDIES | | | |
| | <input type="checkbox"/> Applicable | <input checked="" type="checkbox"/> Not applicable | |
| IX. OTHER REMEDIES | | | |
| If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. <i>(See additional remedy components below.)</i> | | | |
| A. SVE System | | | |
| 1. SVE Vents, Piping, Valves, and Other Appurtenances | | | |
| Site D | <input checked="" type="checkbox"/> Good condition | <input type="checkbox"/> Needs O&M | |
| Site G | <input checked="" type="checkbox"/> Good condition | <input type="checkbox"/> Needs O&M | |
| Remarks | _____ | | |
| 2. SVE Blowers | | | |
| Site D | <input checked="" type="checkbox"/> Good condition | <input type="checkbox"/> Needs O&M | |
| Site G | <input checked="" type="checkbox"/> Good condition | <input type="checkbox"/> Needs O&M | |
| Remarks | _____ | | |
| 3. Off-Gas Treatment System | | | |
| Site D | <input type="checkbox"/> GAC | <input type="checkbox"/> Thermal Oxidation | <input checked="" type="checkbox"/> Not Required |
| Site G | <input type="checkbox"/> GAC | <input type="checkbox"/> Thermal Oxidation | <input checked="" type="checkbox"/> Not Required |
| Remarks | _____ | | |

4. **Electrical Enclosures and Panels**

Site D Good condition Needs O&M

Site G Good condition Needs O&M

Remarks _____

5. **Treatment Building**

Site D Good condition Needs Repair Chemicals and Equipment Properly Stored

Site G Good condition Needs Repair Chemicals and Equipment Properly Stored

Remarks _____

6. **Operational Status**

System Airflow:

Site D approx. 6500 cfm

Site G approx. 7500 cfm

Remarks _____

Mode of Operation:

Site D Continuous Pulse

Site G Continuous Pulse

Remarks _____

Site D and G SVE systems were shut down on July 24, 1998, and August 6, 1998, respectively, in order to perform additional system investigation to show that the systems should remain off. A report recommending that the systems remain off is currently under review.

B. Characterize Site D Shallow Soils and Site G Dump

Describe the status of characterization:

Site D: Some characterization of shallow soils occurred coincident to deep soil investigation conducted in FY 1997. Additional characterization is still needed for non-VOC contaminants.

Site G: Some characterization of shallow soils occurred coincident to deep soil investigation conducted in FY 1997 and FY 1998. Additional characterization is still needed for non-VOC contaminants.

If characterization is complete, describe the remedy that will be implemented and its status.

Site D: No further action Other _____

Status _____

Site G: No further action Other _____

Status _____

X. OVERALL OBSERVATIONS

A. Effectiveness of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The shallow SVE systems at Sites D & G were installed to remove VOCs from soil in the unsaturated zone. The systems have been very effective, removing over 220,000 pounds of VOCs from startup in 1986 through FY 1998. A report recommending that the systems remain off is currently under review.

In FY 1998, a pilot study was conducted at site D to evaluate the potential effectiveness of installing a deep-vent SVE system to remove VOCs from deeper soils that are potentially present in soils between the water table and the lower reach of the existing shallow SVE systems. A pilot study report is currently being prepared.

B. Adequacy and the Continued Need for O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

N/A. The shallow SVE systems are anticipated to be left off.

Deep SVE systems are currently being evaluated.

C. Early Indicators of Potential Remedy Failure

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

None.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

None. (Shallow SVE systems are anticipated to be left off as described in Item A above.)

A.5 OU2 Site A Shallow Groundwater

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be filled in by hand and attached to the five-year review report as supporting documentation of site status.)

| I. SITE INFORMATION | |
|--|---|
| Site name: <i>OU2, Site A Shallow Groundwater New Brighton/Arden Hills Superfund Site</i> | Date of inspection: <i>March 16, 1999</i> |
| Location and region: <i>Arden Hills, MN, Region 5</i> | USEPA ID: <i>MN 7213820908</i> |
| Agency, office or company leading the Five-Year Review: <i>U.S. Army</i> | Weather/temperature: |
| Remedy Includes (Check all that apply) <ul style="list-style-type: none"> <input type="checkbox"/> Landfill cover/containment <input checked="" type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input type="checkbox"/> Other _____ | |
| <input checked="" type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached | |
| II. INTERVIEWS (Check all that apply) | |
| 1. O&M site manager <u><i>Jim Persoon, Alliant Techsystems</i></u> <u><i>Program Director</i></u> <u><i>March 16, 1999</i></u> <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Title Date </div> Interviewed <input checked="" type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. <u><i>(651) 633-2301 ext. 1631</i></u> Problems, suggestions; <input type="checkbox"/> Report attached _____ | |
| 2. O&M staff <u><i>Jason Twaddle, CRA</i></u> <u><i>Project Engineer</i></u> <u><i>March 16, 1999</i></u> <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Title Date </div> Interviewed <input checked="" type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. <u><i>(651) 639-0913</i></u> Problems, suggestions; <input type="checkbox"/> Report attached _____ | |

3. Local regulatory authorities and response agencies (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency N/A

Contact _____
Name Title Date Phone no.

Problems; suggestions; Report attached _____

Agency _____

Contact _____
Name Title Date Phone no.

Problems; suggestions; Report attached _____

Agency _____

Contact _____
Name Title Date Phone no.

Problems; suggestions; Report attached _____

Agency _____

Contact _____
Name Title Date Phone no.

Problems; suggestions; Report attached _____

4. Other interviews (optional) Report attached.

N/A

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. O&M Manual and As-Builts

O&M Manual Readily available Up to date N/A

As-builts Readily available Up to date N/A

Maintenance Logs Readily available Up to date N/A

Remarks _____

2. Site Specific Health and Safety Plan Readily available Up to date N/A

Contingency plan/emergency response plan Readily available Up to date N/A

Remarks _____

3. O&M and OSHA Training Records Readily available Up to date N/A

Remarks _____

4. Permits and Service Agreements

Air discharge permit Readily available Up to date N/A

Effluent discharge Readily available Up to date N/A

Waste disposal, POTW Readily available Up to date N/A

Other permits _____ Readily available Up to date N/A

Remarks ***Recovered groundwater is pumped into the sanitary sewer and is ultimately treated at the Metropolitan Council Environmental Services (MCES) Treatment Plant located at 2400 Childs Road in St. Paul, Minnesota. Discharge is authorized under Industrial Permit Number 2194 from the MCES.***

5. Gas Generation Records Readily available Up to date N/A

Remarks _____

6. Settlement Monument Records Readily available Up to date N/A

Remarks _____

7. Groundwater Monitoring Records Readily available Up to date N/A

Remarks ***Groundwater monitoring results are documented in the TCAAP Fiscal Year 1998 Annual Performance Report.***

8. Leachate Extraction Records Readily available Up to date N/A

Remarks _____

9. Discharge Compliance Records

Air Readily available Up to date N/A

Water (effluent) Readily available Up to date N/A

Remarks _____

10. Daily Access/Security Logs

Readily available Up to date N/A

Remarks TCAAP is a secured facility with restricted access.

IV. O&M COSTS

1. O&M Organization

State in-house Contractor for State
 PRP in-house Contractor for PRP
 Other _____

2. O&M Cost Records

Readily available Up to date
 Funding mechanism/agreement in place

Original O&M cost estimate \$192,200 (OU2 ROD, 1997 dollars) Breakdown attached

Total annual cost by year for review period if available

| | | | |
|---------------------|-------------------|------------------|---|
| From _____ | To _____ | _____ | <input type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |
| From _____ | To _____ | _____ | <input type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |
| From _____ | To _____ | _____ | <input type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |
| From _____ | To _____ | _____ | <input type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |
| From <u>10/1/97</u> | To <u>9/30/98</u> | <u>\$110,000</u> | <input type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |

3. Unanticipated or Unusually High O&M Costs During Review Period

Describe costs and reasons: None.

A high rate of pump failure has been observed at this site, apparently due to iron fouling. Pump replacement comprised the majority of repair costs for the system. If some of the recovery wells can be shut off, this cost would be reduced.

V. GENERAL SITE CONDITIONS

Whenever possible, actual site conditions should be documented with photographs.

A. Fencing

1. Fencing damaged Location shown on site map Gates secured N/A
 Remarks *TCAAP is a secured facility with restricted access. Fences and locked gates are in good condition.*

B. Site Access

1. Access restrictions, signs, other security measures Location shown on map N/A
 Remarks *(see above comments on fencing)*

C. Perimeter Roads

1. Roads damaged Location shown on site map Roads adequate N/A
 Remarks _____

D. General

1. Vandalism/trespassing Location shown on site map No vandalism evident
 Remarks _____

2. Land use changes onsite N/A
 Remarks _____

3. Land use changes offsite N/A
 Remarks _____

4. Institutional controls (site conditions imply institutional controls not being enforced) N/A
 Agency *Institutional controls are in place for the plume area that is off-site (see Section IX).*
 Contact _____

| | | | |
|------|-------|------|-----------|
| Name | Title | Date | Phone no. |
|------|-------|------|-----------|

 Problems; suggestions; Report attached _____

VI. LANDFILL COVER Applicable Not applicable

VII. VERTICAL BARRIER WALLS Applicable Not applicable

VIII. GROUNDWATER/SURFACE WATER REMEDIES Applicable Not applicable

A. Groundwater Extraction Wells, Pumps, and Pipelines

Applicable Not applicable

1. Pumps, Wellhead Plumbing, and Electrical

Good condition All required wells located Needs O&M N/A

Remarks _____

2. Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances

Good condition Needs O&M

Remarks _____

| |
|---|
| <p>6. Monitoring Wells (pump and treatment remedy) <input checked="" type="checkbox"/> Properly secured/locked</p> <p><input checked="" type="checkbox"/> Functioning <input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition <input checked="" type="checkbox"/> All required wells located</p> <p><input type="checkbox"/> Needs O&M <input type="checkbox"/> N/A</p> <p>Remarks _____</p> |
| <p>D. Monitored Natural Attenuation</p> |
| <p>1. Monitoring Wells (natural attenuation remedy) <input type="checkbox"/> Properly secured/locked</p> <p><input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled</p> <p><input type="checkbox"/> Good condition <input type="checkbox"/> All required wells located <input type="checkbox"/> Needs O&M <input checked="" type="checkbox"/> N/A</p> <p>Remarks _____</p> |
| <p style="text-align: center;">IX. OTHER REMEDIES</p> |
| <p>If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. <i>(See additional remedy components below.)</i></p> |
| <p>A. Alternative Water Supply/Well Abandonment</p> <p><i>The OU1 Alternative Water Supply and Well Abandonment Program was expanded to cover the area affected by the OU2 Site A shallow groundwater plume, both on-site and off-site. (See OU1 Site Inspection for discussion of this remedy component.) The off-site plume area is included within the Special Well Construction Area.</i></p> |
| <p>B. Source Characterization</p> <p>Describe the status of source characterization: <i>A source characterization investigation report was completed in FY 1998. Based upon review of results, some follow-up characterization work is currently planned.</i></p> <p>_____</p> <p>_____</p> <p>If characterization is complete, describe the remedy that will be implemented and its status: <input type="checkbox"/> No further action <input checked="" type="checkbox"/> Other <i>Soil excavation, treatment, and off-site disposal; SVE system</i></p> <p>Status <i>Excavation of metals-contaminated soils was initiated in FY 1998 but was suspended for the winter. Soils are being treated (stabilized) in the TCAAP Corrective Action Management Unit (CAMU) prior to transportation off-site to a permitted disposal facility. Soil excavation, treatment, and disposal will resume in spring 1999. Excavation of the A-5 dump is also planned. An SVE system is scheduled to be constructed in the latter part of 1999 to remediate VOC-contaminated soils.</i></p> |

X. OVERALL OBSERVATIONS

A. Effectiveness of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The recovery well system contains the VOC plume and is restoring the aquifer to the cleanup goals established in the OU2 ROD. The system is pumping at a rate which exceeds the design system flowrate of 25 gpm. VOC concentrations in the plume generally show stable or decreasing trends. The four downgradient recovery wells show no VOCs above cleanup goals. Water discharged to the sanitary sewer has met the discharge requirements.

B. Adequacy and the Continued Need for O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The O&M procedures are effective for providing short- and long-term protectiveness. The procedures have resulted in system operation that is providing adequate containment of the plume and restoration of the groundwater. The source removal work, particularly the planned SVE system, will shorten the time required to reach groundwater cleanup goals.

C. Early Indicators of Potential Remedy Failure

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

None

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.
Clean recovery wells should be shut off. Source removal should proceed as currently planned.

A.6 OU2 Site I Shallow Groundwater

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be filled in by hand and attached to the five-year review report as supporting documentation of site status.)

| I. SITE INFORMATION | |
|---|---|
| Site name: <i>OU2, Site I Shallow Groundwater New Brighton/Arden Hills Superfund Site</i> | Date of inspection: <i>March 16, 1999</i> |
| Location and region: <i>Arden Hills, MN, Region 5</i> | USEPA ID: <i>MN 7213820908</i> |
| Agency, office or company leading the Five-Year Review: <i>U. S. Army</i> | Weather/temperature: |
| Remedy Includes (Check all that apply) <ul style="list-style-type: none"> <input type="checkbox"/> Landfill cover/containment <input type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input checked="" type="checkbox"/> Other <u><i>Preliminary design/investigation, pilot testing, design and installation of a groundwater pump and treat system</i></u> | |
| <input checked="" type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached | |
| II. INTERVIEWS (Check all that apply) | |
| 1. O&M site manager <u><i>Dave Gosen, Alliant Techsystems Environmental Manager</i></u> <u><i>March 16, 1999</i></u> | |
| Name | Title |
| Date | |
| Interviewed <input checked="" type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. <u><i>(612) 931-6973</i></u> | |
| Problems, suggestions; <input type="checkbox"/> Report attached _____ | |
| 2. O&M staff <u><i>N/A</i></u> | |
| Name | Title |
| Date | |
| Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ | |
| Problems, suggestions; <input type="checkbox"/> Report attached _____ | |

3. Local regulatory authorities and response agencies (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency N/A

Contact _____
Name Title Date Phone no.

Problems; suggestions; Report attached _____

Agency _____

Contact _____
Name Title Date Phone no.

Problems; suggestions; Report attached _____

Agency _____

Contact _____
Name Title Date Phone no.

Problems; suggestions; Report attached _____

Agency _____

Contact _____
Name Title Date Phone no.

Problems; suggestions; Report attached _____

4. Other interviews (optional) Report attached.

N/A

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. O&M Manual and As-Built

- O&M Manual Readily available Up to date N/A
 As-builts Readily available Up to date N/A
 Maintenance Logs Readily available Up to date N/A

Remarks *The system is not designed or constructed.*

2. Site Specific Health and Safety Plan Readily available Up to date N/A

- Contingency plan/emergency response plan Readily available Up to date N/A

Remarks *The system is not designed or constructed.*

3. O&M and OSHA Training Records Readily available Up to date N/A

Remarks *The system is not designed or constructed.*

4. Permits and Service Agreements

- Air discharge permit Readily available Up to date N/A
 Effluent discharge Readily available Up to date N/A
 Waste disposal, POTW Readily available Up to date N/A
 Other permits _____ Readily available Up to date N/A

Remarks *The system is not designed or constructed.*

5. Gas Generation Records Readily available Up to date N/A

Remarks _____

6. Settlement Monument Records Readily available Up to date N/A

Remarks _____

7. Groundwater Monitoring Records Readily available Up to date N/A

Remarks *Groundwater monitoring results are documented in the TCAAP Fiscal Year 1998 Annual Performance Report.*

8. Leachate Extraction Records Readily available Up to date N/A

Remarks _____

9. Discharge Compliance Records

- Air Readily available Up to date N/A
 Water (effluent) Readily available Up to date N/A

Remarks *The system is not designed or constructed.*

| V. GENERAL SITE CONDITIONS | | | | | | | | |
|---|-------|------|-----------|--|------|-------|------|-----------|
| Whenever possible, actual site conditions should be documented with photographs. | | | | | | | | |
| A. Fencing | | | | | | | | |
| 1. Fencing damaged <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Gates secured <input type="checkbox"/> N/A Remarks <u>TCAAP is a secured facility with restricted access. Fences and locked gates are in good condition.</u> | | | | | | | | |
| B. Site Access | | | | | | | | |
| 1. Access restrictions, signs, other security measures <input type="checkbox"/> Location shown on map <input type="checkbox"/> N/A Remarks <u>(see above comments on fencing)</u> | | | | | | | | |
| C. Perimeter Roads | | | | | | | | |
| 1. Roads damaged <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Roads adequate <input type="checkbox"/> N/A Remarks _____ | | | | | | | | |
| D. General | | | | | | | | |
| 1. Vandalism/trespassing <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No vandalism evident Remarks _____ | | | | | | | | |
| 2. Land use changes onsite <input checked="" type="checkbox"/> N/A Remarks _____ | | | | | | | | |
| 3. Land use changes offsite <input checked="" type="checkbox"/> N/A Remarks _____ | | | | | | | | |
| 4. Institutional controls (site conditions imply institutional controls not being enforced) <input checked="" type="checkbox"/> N/A Agency _____ Contact _____ <table style="width: 100%; border: none;"> <tr> <td style="width: 25%; text-align: center;">Name</td> <td style="width: 25%; text-align: center;">Title</td> <td style="width: 25%; text-align: center;">Date</td> <td style="width: 25%; text-align: center;">Phone no.</td> </tr> </table> Problems; suggestions; <input type="checkbox"/> Report attached _____ | | | | | Name | Title | Date | Phone no. |
| Name | Title | Date | Phone no. | | | | | |
| VI. LANDFILL COVER <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> Not applicable | | | | | | | | |
| VII. VERTICAL BARRIER WALLS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> Not applicable | | | | | | | | |
| VIII. GROUNDWATER/SURFACE WATER REMEDIES <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> Not applicable <i>(The system is not designed or constructed.)</i> | | | | | | | | |
| A. Groundwater Extraction Wells, Pumps, and Pipelines <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> Not applicable | | | | | | | | |
| 1. Pumps, Wellhead Plumbing, and Electrical <input type="checkbox"/> Good condition <input type="checkbox"/> All required wells located <input type="checkbox"/> Needs O&M <input type="checkbox"/> N/A Remarks _____ _____ | | | | | | | | |

5. **Treatment Building(s)** N/A
 Good condition Needs repair
 Chemicals and equipment properly stored
Remarks _____

6. **Monitoring Wells** (pump and treatment remedy) Properly secured/locked
 Functioning Routinely sampled Good condition All required wells located
 Needs O&M N/A
Remarks _____

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy) Properly secured/locked
 Functioning Routinely sampled
 Good condition All required wells located Needs O&M N/A
Remarks _____

IX. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. *(See additional remedy components below.)*

A. Additional Investigation

Describe the status of additional investigation
Additional investigation work is complete.

If the additional investigation is complete, discuss whether the results have changed the remedy.
Results led to proposing a dual-phase extraction remedy (combining groundwater extraction and soil vapor extraction). The proposed remedy has been approved and is scheduled to begin pilot testing in FY 1999. A pilot study for dual-phase extraction will be conducted prior to system construction.

X. OVERALL OBSERVATIONS

A. Effectiveness of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The system is not designed or constructed. System is intended to contain the plume, remove VOCs from source area soils, and restore groundwater to the cleanup goals established in the OU2 ROD.

B. Adequacy and the Continued Need for O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The system is not designed or constructed.

C. Early Indicators of Potential Remedy Failure

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

The system is not designed or constructed.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.
The system is not designed or constructed.

A.7 OU2 Site K Shallow Groundwater

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be filled in by hand and attached to the five-year review report as supporting documentation of site status.)

| I. SITE INFORMATION | |
|--|---|
| Site name: <i>OU2, Site K Shallow Groundwater New Brighton/Arden Hills Superfund Site</i> | Date of inspection: <i>March 16, 1999</i> |
| Location and region: <i>Arden Hills, MN, Region 5</i> | EPA ID: <i>MN 7213820908</i> |
| Agency, office or company leading the Five-Year Review: <i>U. S. Army</i> | Weather/temperature: |
| Remedy Includes (Check all that apply) | |
| <input type="checkbox"/> Landfill cover/containment <input checked="" type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input type="checkbox"/> Other _____ | |
| <input checked="" type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached | |
| II. INTERVIEWS (Check all that apply) | |
| 1. O&M site manager <i>Dave Rastetter, Alliant Techsystems</i> <i>Environmental Engineer</i> <i>N/A</i> | |
| Name | Title |
| Date | Date |
| Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone | Phone no. <i>(651) 639-3031</i> |
| Problems, suggestions; <input type="checkbox"/> Report attached _____ | |
| 2. O&M staff <i>Charles Cooke, CRA</i> <i>Project Manager</i> <i>March 16, 1999</i> | |
| Name | Title |
| Date | Date |
| Interviewed <input checked="" type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone | Phone no. <i>(651) 639-0913</i> |
| Problems, suggestions; <input type="checkbox"/> Report attached _____ | |

3. Local regulatory authorities and response agencies (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency N/A
Contact _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

Agency _____
Contact _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

Agency _____
Contact _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

Agency _____
Contact _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

4. Other interviews (optional) Report attached.

N/A

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. O&M Manual and As-Builts

O&M Manual Readily available Up to date N/A
 As-builts Readily available Up to date N/A
 Maintenance Logs Readily available Up to date N/A

Remarks _____

2. Site Specific Health and Safety Plan Readily available Up to date N/A

Contingency plan/emergency response plan Readily available Up to date N/A

Remarks _____

3. O&M and OSHA Training Records Readily available Up to date N/A

Remarks _____

4. Permits and Service Agreements

Air discharge permit Readily available Up to date N/A (Note 1)
 Effluent discharge Readily available Up to date N/A
 Waste disposal, POTW Readily available Up to date N/A
 Other permits _____ Readily available Up to date N/A

Remarks _____

1) An air emissions permit is not required.

5. Gas Generation Records Readily available Up to date N/A

Remarks _____

6. Settlement Monument Records Readily available Up to date N/A

Remarks _____

7. Groundwater Monitoring Records Readily available Up to date N/A

Remarks Groundwater monitoring results are documented in the TCAAP Fiscal Year 1998 Annual Performance Report.

8. Leachate Extraction Records Readily available Up to date N/A

Remarks _____

9. Discharge Compliance Records

Air Readily available Up to date N/A
 Water (effluent) Readily available Up to date N/A

Remarks _____

10. Daily Access/Security Logs

Readily available Up to date N/A

Remarks TCAAP is a secured facility with restricted access.

IV. O&M COSTS

1. O&M Organization

State in-house Contractor for State
 PRP in-house Contractor for PRP
 Other _____

2. O&M Cost Records

Readily available Up to date (*costs are proprietary.*)

Funding mechanism/agreement in place

Original O&M cost estimate _____ Breakdown attached

Total annual cost by year for review period if available

| | | | |
|------------|----------|------------|---|
| From _____ | To _____ | _____ | <input type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |
| From _____ | To _____ | _____ | <input type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |
| From _____ | To _____ | _____ | <input type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |
| From _____ | To _____ | _____ | <input type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |
| From _____ | To _____ | _____ | <input type="checkbox"/> Breakdown attached |
| Dates | | Total cost | |

3. Unanticipated or Unusually High O&M Costs During Review Period

Describe costs and reasons: A new treatment system will be installed in FY 1999 to replace the existing system in order to lower the O&M costs. The existing air stripper is a packed-tower type that requires media replacement every 4 to 6 weeks due to iron fouling problems. The new air stripper is a fluidized bed type and is expected to minimize the fouling problems, thus reducing the O&M costs.

| V. GENERAL SITE CONDITIONS | | | | |
|--|--|--|------------------------------|-----------|
| Whenever possible, actual site conditions should be documented with photographs. | | | | |
| A. Fencing | | | | |
| 1. Fencing damaged | <input type="checkbox"/> Location shown on site map | <input checked="" type="checkbox"/> Gates secured | <input type="checkbox"/> N/A | |
| Remarks <i>TCAAP is a secured facility with restricted access. Fences and locked gates are in good condition.</i> | | | | |
| B. Site Access | | | | |
| 1. Access restrictions, signs, other security measures | <input type="checkbox"/> Location shown on map | <input type="checkbox"/> N/A | | |
| Remarks <i>(see above comments on fencing)</i> | | | | |
| C. Perimeter Roads | | | | |
| 1. Roads damaged | <input type="checkbox"/> Location shown on site map | <input checked="" type="checkbox"/> Roads adequate | <input type="checkbox"/> N/A | |
| Remarks _____ | | | | |
| D. General | | | | |
| 1. Vandalism/trespassing | <input type="checkbox"/> Location shown on site map | <input checked="" type="checkbox"/> No vandalism evident | | |
| Remarks _____ | | | | |
| 2. Land use changes onsite | <input checked="" type="checkbox"/> N/A | | | |
| Remarks _____ | | | | |
| 3. Land use changes offsite | <input checked="" type="checkbox"/> N/A | | | |
| Remarks _____ | | | | |
| 4. Institutional controls (site conditions imply institutional controls not being enforced) | <input checked="" type="checkbox"/> N/A | | | |
| Agency | _____ | | | |
| Contact | _____ | | | |
| | Name | Title | Date | Phone no. |
| Problems; suggestions; | <input type="checkbox"/> Report attached _____ | | | |
| VI. LANDFILL COVER <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> Not applicable | | | | |
| VII. VERTICAL BARRIER WALLS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> Not applicable | | | | |
| VIII. GROUNDWATER/SURFACE WATER REMEDIES <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> Not applicable | | | | |
| A. Groundwater Extraction Wells, Pumps, and Pipelines | | | | |
| <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> Not applicable | | | | |
| 1. Pumps, Wellhead Plumbing, and Electrical | | | | |
| <input checked="" type="checkbox"/> Good condition | <input checked="" type="checkbox"/> All required wells located | <input type="checkbox"/> Needs O&M | <input type="checkbox"/> N/A | |
| Remarks <i>Some items will be replaced when the new treatment system is installed.</i> | | | | |
| _____ | | | | |
| 2. Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances | | | | |
| <input checked="" type="checkbox"/> Good condition | <input type="checkbox"/> Needs O&M | | | |
| Remarks <i>Some items will be replaced when the new treatment system is installed</i> | | | | |
| _____ | | | | |

| | |
|--|---|
| B. Surface Water Collection Structures, Pumps, and Pipelines | |
| <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> Not applicable | |
| 1. Collection Structures, Pumps, and Electrical | |
| <input type="checkbox"/> Good condition <input type="checkbox"/> Needs O&M | |
| Remarks _____ | |
| 2. Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances | |
| <input type="checkbox"/> Good condition <input type="checkbox"/> Needs O&M | |
| Remarks _____ | |
| C. Treatment System <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> Not applicable | |
| 1. Treatment Train (Check components that apply) | |
| <input type="checkbox"/> Metals removal | <input type="checkbox"/> Oil/water separation <input type="checkbox"/> Bioremediation |
| <input checked="" type="checkbox"/> Air stripping | <input type="checkbox"/> Carbon adsorbers |
| <input type="checkbox"/> Filters _____ | <input type="checkbox"/> Others _____ |
| <input type="checkbox"/> Good condition | <input type="checkbox"/> Needs O&M |
| <input checked="" type="checkbox"/> Sampling ports properly marked and functional | |
| <input checked="" type="checkbox"/> Sampling/maintenance log displayed and up to date (<i>not displayed on-site</i>) | |
| <input type="checkbox"/> Equipment properly identified | |
| <input checked="" type="checkbox"/> Quantity of groundwater treated annually <u>Approx. 4 million gallons</u> | |
| <input type="checkbox"/> Quantity of surface water treated annually <u>N/A</u> | |
| Remarks _____ | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |
| 2. Electrical Enclosures and Panels (properly rated and functional) <input type="checkbox"/> N/A | |
| <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs O&M | |
| Remarks _____ | |
| 3. Tanks, Vaults, Storage Vessels <input checked="" type="checkbox"/> N/A | |
| <input type="checkbox"/> Good condition <input type="checkbox"/> Proper secondary containment <input type="checkbox"/> Needs O&M | |
| Remarks _____ | |
| 4. Discharge Structure and Appurtenances <input type="checkbox"/> N/A | |
| <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs O&M | |
| Remarks _____ | |
| 5. Treatment Building(s) <input type="checkbox"/> N/A | |
| <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs repair | |
| <input type="checkbox"/> Chemicals and equipment properly stored (<i>N/A</i>) | |
| Remarks _____ | |

| |
|--|
| <p>6. Monitoring Wells (pump and treatment remedy) <input checked="" type="checkbox"/> Properly secured/locked</p> <p><input checked="" type="checkbox"/> Functioning <input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition <input checked="" type="checkbox"/> All required wells located</p> <p><input type="checkbox"/> Needs O&M <input type="checkbox"/> N/A</p> <p>Remarks _____</p> |
| D. Monitored Natural Attenuation |
| <p>1. Monitoring Wells (natural attenuation remedy) <input type="checkbox"/> Properly secured/locked</p> <p><input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled</p> <p><input type="checkbox"/> Good condition <input type="checkbox"/> All required wells located <input type="checkbox"/> Needs O&M <input checked="" type="checkbox"/> N/A</p> <p>Remarks _____</p> |
| IX. OTHER REMEDIES |
| <p>If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. <i>(See additional remedy components below.)</i></p> |
| A. Additional Investigation |
| <p>Describe the status of additional investigation</p> <p><i>A work plan for additional investigation of the source area for VOC contamination has been approved. Additional investigation for non-VOC contaminants will be conducted after removal of the building.</i></p> <p>_____</p> <p>_____</p> <p>If the additional investigation is complete, discuss whether the results have changed the remedy.</p> <p>_____</p> <p>_____</p> <p>_____</p> |
| X. OVERALL OBSERVATIONS |
| A. Effectiveness of the Remedy |
| <p>Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).</p> <p><i>The remedy is intended to provide containment of the groundwater plume and to restore the groundwater to the cleanup levels specified in the OU2 ROD. The currently planned additional investigation is intended to further define the VOC source area and determine if any additional remedies are necessary. The groundwater recovery and treatment system is effective since it is containing the plume and since treated water is in compliance with the discharge requirements.</i></p> <p>_____</p> <p>_____</p> <p>_____</p> |

| |
|---|
| B. Adequacy and the Continued Need for O&M |
| Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. <i>O&M procedures are deemed adequate to ensure short- and long-term protectiveness of the remedy. Containment is being achieved and discharge requirements are consistently met.</i> |
| <hr/> <hr/> <hr/> <hr/> <hr/> |
| C. Early Indicators of Potential Remedy Failure |
| Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. <i>None.</i> |
| <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> |
| D. Opportunities for Optimization |
| Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. <i>None.</i> |
| <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> |

A.8 OU2 Deep Groundwater

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be filled in by hand and attached to the five-year review report as supporting documentation of site status.)

| I. SITE INFORMATION | |
|--|---|
| Site name: <i>OU2 Deep Groundwater New Brighton/Arden Hills Superfund Site</i> | Date of inspection: <i>March 16, 1999</i> |
| Location and region: <i>Arden Hills, MN, Region 5</i> | USEPA ID: <i>MN 7213820908</i> |
| Agency, office or company leading the Five-Year Review: <i>U. S. Army</i> | Weather/temperature: |
| Remedy Includes (Check all that apply) <input type="checkbox"/> Landfill cover/containment <input checked="" type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input type="checkbox"/> Other _____ | |
| <input checked="" type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached | |
| II. INTERVIEWS (Check all that apply) | |
| 1. O&M site manager <u><i>Jim Persoon, Alliant Techsystems</i></u> <u><i>Program Director</i></u> <u><i>March 16, 1999</i></u> <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Title Date </div> Interviewed <input checked="" type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. <u><i>(612) 931-6973</i></u> Problems, suggestions; <input type="checkbox"/> Report attached _____ | |
| 2. O&M staff <u><i>Charles Cooke, CRA</i></u> <u><i>Project Manager</i></u> <u><i>March 16, 1999</i></u> <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Title Date </div> Interviewed <input checked="" type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. <u><i>(651) 639-0913</i></u> Problems, suggestions; <input type="checkbox"/> Report attached _____ | |

3. Local regulatory authorities and response agencies (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency N/A
Contact _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

Agency _____
Contact _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

Agency _____
Contact _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

Agency _____
Contact _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

4. Other interviews (optional) Report attached.

N/A

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. O&M Manual and As-Builts

O&M Manual Readily available Up to date N/A
 As-builts Readily available Up to date N/A
 Maintenance Logs Readily available Up to date N/A

Remarks _____

2. Site Specific Health and Safety Plan Readily available Up to date N/A

Contingency plan/emergency response plan Readily available Up to date N/A

Remarks _____

3. O&M and OSHA Training Records Readily available Up to date N/A

Remarks _____

4. Permits and Service Agreements

Air discharge permit Readily available Up to date N/A
 Effluent discharge Readily available Up to date N/A
 Waste disposal, POTW Readily available Up to date N/A
 Other permits _____ Readily available Up to date N/A

Remarks _____

5. Gas Generation Records Readily available Up to date N/A

Remarks _____

6. Settlement Monument Records Readily available Up to date N/A

Remarks _____

7. Groundwater Monitoring Records Readily available Up to date N/A

Remarks Groundwater monitoring results are documented in the TCAAP Fiscal Year 1998 Annual Performance Report.

8. Leachate Extraction Records Readily available Up to date N/A

Remarks _____

9. Discharge Compliance Records

Air Readily available Up to date N/A (See Number 4 above)
 Water (effluent) Readily available Up to date N/A

Remarks _____

V. GENERAL SITE CONDITIONS

Whenever possible, actual site conditions should be documented with photographs.

A. Fencing

1. Fencing damaged Location shown on site map Gates secured N/A
Remarks *TCAAP is a secured facility with restricted access. Fences and locked gates are in good condition.*

B. Site Access

1. Access restrictions, signs, other security measures Location shown on map N/A
Remarks *(see above comments on fencing)*

C. Perimeter Roads

1. Roads damaged Location shown on site map Roads adequate N/A
Remarks _____

D. General

1. Vandalism/trespassing Location shown on site map No vandalism evident
Remarks _____

2. Land use changes onsite N/A
Remarks _____

3. Land use changes offsite N/A
Remarks _____

4. Institutional controls (site conditions imply institutional controls not being enforced) N/A
(see Section IX).
Agency _____
Contact _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

VI. LANDFILL COVER Applicable Not applicable

VII. VERTICAL BARRIER WALLS Applicable Not applicable

VIII. GROUNDWATER/SURFACE WATER REMEDIES Applicable Not applicable

A. Groundwater Extraction Wells, Pumps, and Pipelines

Applicable Not applicable

1. Pumps, Wellhead Plumbing, and Electrical
 Good condition All required wells located Needs O&M N/A
Remarks _____

2. Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances
 Good condition Needs O&M
Remarks _____

| | |
|---|---|
| B. Surface Water Collection Structures, Pumps, and Pipelines | |
| <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> Not applicable | |
| 1. Collection Structures, Pumps, and Electrical | |
| <input type="checkbox"/> Good condition <input type="checkbox"/> Needs O&M | |
| Remarks _____ | |
| 2. Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances | |
| <input type="checkbox"/> Good condition <input type="checkbox"/> Needs O&M | |
| Remarks _____ | |
| C. Treatment System <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> Not applicable | |
| 1. Treatment Train (Check components that apply) | |
| <input type="checkbox"/> Metals removal | <input type="checkbox"/> Oil/water separation <input type="checkbox"/> Bioremediation |
| <input checked="" type="checkbox"/> Air stripping | <input type="checkbox"/> Carbon adsorbers |
| <input type="checkbox"/> Filters _____ | <input type="checkbox"/> Others _____ |
| <input checked="" type="checkbox"/> Good condition | <input type="checkbox"/> Needs O&M |
| <input type="checkbox"/> Sampling ports properly marked and functional | |
| <input checked="" type="checkbox"/> Sampling/maintenance log displayed and up to date | |
| <input checked="" type="checkbox"/> Equipment properly identified | |
| <input checked="" type="checkbox"/> Quantity of groundwater treated annually <u>Approx. 1.2 Billion gallons</u> | |
| <input type="checkbox"/> Quantity of surface water treated annually <u>N/A</u> | |
| Remarks _____ | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |
| 2. Electrical Enclosures and Panels (properly rated and functional) <input type="checkbox"/> N/A | |
| <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs O&M | |
| Remarks _____ | |
| 3. Tanks, Vaults, Storage Vessels <input type="checkbox"/> N/A | |
| <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Proper secondary containment <input type="checkbox"/> Needs O&M | |
| Remarks <u>Maintenance painting is currently planned for the exterior of the air stripping towers.</u> | |
| 4. Discharge Structure and Appurtenances <input type="checkbox"/> N/A | |
| <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs O&M | |
| Remarks _____ | |
| 5. Treatment Building(s) <input type="checkbox"/> N/A | |
| <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs repair | |
| <input checked="" type="checkbox"/> Chemicals and equipment properly stored | |
| Remarks _____ | |

6. **Monitoring Wells** (pump and treatment remedy) Properly secured/locked
 Functioning Routinely sampled Good condition All required wells located
 Needs O&M N/A
Remarks _____

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy) Properly secured/locked
 Functioning Routinely sampled
 Good condition All required wells located Needs O&M N/A
Remarks _____

IX. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. *(See additional remedy components below.)*

A. Institutional Controls
The Special Well Construction Area does not include the TCAAP facility; however, the OUI Alternative Water Supply and Well Abandonment Program does include the TCAAP facility. (See OUI Site Inspection for discussion of this remedy component.)

B. Review of New Technologies
Are reviews conducted Yes No
Remarks *Natural attenuation is being reviewed. Also, APR includes review of new technologies, as applicable.*

X. OVERALL OBSERVATIONS

A. Effectiveness of the Remedy
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
The TCAAP Groundwater Recovery System (TGRS) provides containment of the VOC plume (above the cleanup goals) and provides contaminant removal from the highest groundwater contamination areas (source areas). The system is shrinking the size of the plume. The system has been effective at mass removal. Since system start-up in 1987, the TGRS has removed 167,289 pounds of VOCs. In FY 1998, the TGRS removed 6,132 pounds of VOCs. The annual mass removal has generally been declining since FY 1992, but continues to remove a relatively large mass of VOCs each year. The treatment component (air stripping) is effective because discharge requirements are consistently met.

B. Adequacy and the Continued Need for O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

O&M procedures are providing short- and long-term protectiveness of the remedy. The system has run without significant problems and in a manner that provides the desired containment and level of treatment prior to discharge.

C. Early Indicators of Potential Remedy Failure

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

None.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

The system could potentially be modified in two ways. First, extraction wells located on the "shrinking edge" of the plume could potentially be shut off as it is now pumping water that is below the cleanup goals specified in the OU2 ROD. Second, the pumping scheme could potentially be altered to better maximize mass removal (while still maintaining containment). System optimization is being studied now with a report expected in FY 1999.

A.9 OU3

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be filled in by hand and attached to the five-year review report as supporting documentation of site status.)

| I. SITE INFORMATION | |
|---|---|
| Site name: <i>Operable Unit 3 New Brighton/Arden Hills Superfund Site</i> | Date of inspection: <i>March 16, 1999</i> |
| Location and region: <i>Arden Hills, MN, Region 5</i> | USEPA ID: <i>MN 7213820908</i> |
| Agency, office or company leading the Five-Year Review: <i>U. S. Army</i> | Weather/temperature: |
| Remedy Includes (Check all that apply) <input type="checkbox"/> Landfill cover/containment <input checked="" type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input type="checkbox"/> Other _____ | |
| <input checked="" type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached | |
| II. INTERVIEWS (Check all that apply) | |
| 1. O&M site manager <u><i>Dave Olson, City of N.B.</i></u> <u><i>Public Works Superintendent</i></u> <u><i>N/A</i></u> <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Title Date </div> Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. <u><i>(651) 638-2113</i></u> Problems, suggestions; <input type="checkbox"/> Report attached _____ | |
| 2. O&M staff <u><i>Bob Hertenstein, City of N.B.</i></u> <u><i>Treatment Plant Operator</i></u> <u><i>3/16/99</i></u> <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Title Date </div> Interviewed <input checked="" type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. <u><i>(651) 638-2065</i></u> Problems, suggestions; <input type="checkbox"/> Report attached _____ | |

3. Local regulatory authorities and response agencies (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency N/A
Contact _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

Agency _____
Contact _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

Agency _____
Contact _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

Agency _____
Contact _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

4. Other interviews (optional) Report attached.

N/A

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. O&M Manual and As-Builts

O&M Manual Readily available Up to date N/A
 As-builts Readily available Up to date N/A
 Maintenance Logs Readily available Up to date N/A

Remarks Complete OU3 (PGRS) manuals are located at the PGAC (OU1 treatment plant).

2. Site Specific Health and Safety Plan Readily available Up to date N/A

Contingency plan/emergency response plan Readily available Up to date N/A

Remarks _____

3. O&M and OSHA Training Records Readily available Up to date N/A

Remarks _____

4. Permits and Service Agreements

Air discharge permit Readily available Up to date N/A
 Effluent discharge Readily available Up to date N/A
 Waste disposal, POTW Readily available Up to date N/A
 Other permits (see remarks) Readily available Up to date N/A

Remarks _____

1) A MDNR permit exists for groundwater appropriation.

2) A RCRA hazardous waste generator permit exists for the spent granular activated carbon. Spent carbon is returned to the original, clean carbon supplier for regeneration.

5. Gas Generation Records Readily available Up to date N/A

Remarks _____

6. Settlement Monument Records Readily available Up to date N/A

Remarks _____

7. Groundwater Monitoring Records Readily available Up to date N/A

Remarks Groundwater monitoring results are documented in the TCAAP Fiscal Year 1998 Annual Performance Report.

8. Leachate Extraction Records Readily available Up to date N/A

Remarks _____

9. Discharge Compliance Records

Air Readily available Up to date N/A
 Water (effluent) Readily available Up to date N/A

Remarks _____

| V. GENERAL SITE CONDITIONS | |
|---|--|
| Whenever possible, actual site conditions should be documented with photographs. | |
| A. Fencing | |
| 1. Fencing damaged <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Gates secured <input type="checkbox"/> N/A | Remarks _____ |
| B. Site Access | |
| 1. Access restrictions, signs, other security measures <input type="checkbox"/> Location shown on map <input type="checkbox"/> N/A | Remarks <u>When not attended, treatment building is locked and also has security alarms.</u> |
| C. Perimeter Roads | |
| 1. Roads damaged <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Roads adequate <input type="checkbox"/> N/A | Remarks _____ |
| D. General | |
| 1. Vandalism/trespassing <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No vandalism evident | Remarks _____ |
| 2. Land use changes onsite <input checked="" type="checkbox"/> N/A | Remarks _____ |
| 3. Land use changes offsite <input checked="" type="checkbox"/> N/A | Remarks _____ |
| 4. Institutional controls (site conditions imply institutional controls not being enforced) <input type="checkbox"/> N/A | Agency <u>Institutional controls are in place (see Section IX).</u> |
| Contact _____ | Name _____ Title _____ Date _____ Phone no. _____ |
| Problems; suggestions; <input type="checkbox"/> Report attached _____ | |
| VI. LANDFILL COVER <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> Not applicable | |
| VII. VERTICAL BARRIER WALLS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> Not applicable | |
| VIII. GROUNDWATER/SURFACE WATER REMEDIES <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> Not applicable | |
| A. Groundwater Extraction Wells, Pumps, and Pipelines | |
| <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> Not applicable | |
| 1. Pumps, Wellhead Plumbing, and Electrical | |
| <input checked="" type="checkbox"/> Good condition <input checked="" type="checkbox"/> All required wells located <input type="checkbox"/> Needs O&M <input type="checkbox"/> N/A | |
| Remarks _____ | |
| 2. Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances | |
| <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs O&M | |
| Remarks _____ | |

6. Monitoring Wells (pump and treatment remedy) Properly secured/locked
 Functioning Routinely sampled Good condition All required wells located
 Needs O&M N/A
Remarks _____

D. Monitored Natural Attenuation

1. Monitoring Wells (natural attenuation remedy) Properly secured/locked
 Functioning Routinely sampled
 Good condition All required wells located Needs O&M N/A
Remarks _____

IX. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. *(see additional remedy components below.)*

A. Institutional Controls

The OUI Alternative Water Supply and Well Abandonment Program was expanded to cover the OU3 groundwater plume. (See OUI Site Inspection for discussion of this remedy component.)

X. OVERALL OBSERVATIONS

A. Effectiveness of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
The OU3 groundwater recovery system (PGRS) is intended to provide containment of the plume (prevent any plume migration beyond the pumping well, NBM#13). The PGRS is providing the intended plume capture.

B. Adequacy and the Continued Need for O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.
O&M procedures are adequate to ensure the short- and long-term protectiveness of the remedy. The PGRS operation has provided reliable treatment of the water to drinking water standards and has provided the intended plume containment. The influent to the treatment system has been consistently below MCLs for trichloroethene and other VOCs since January 1997 (26 months). This suggests that the need for continued GAC treatment of the extracted groundwater should be re-evaluated.

C. Early Indicators of Potential Remedy Failure

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

None.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

The VOC plume in OU3 appears to be stable or shrinking with time. This, and the declining influent concentrations discussed above, suggest that the need for the current level of hydraulic containment within OU3 should be re-evaluated. Natural attenuation may be responsible for the plume stability and also warrants further evaluation.

**ANNUAL FINANCIAL SUMMARIES
WATER TREATMENT PLANT #2
680 5th Street NW**

F:\shared\Alliant\1999\plant 2b
31-Jul-98

| | 1994 | 1995 | 1996 | 1997 | 1997 | 1998 | Thru | 1999 | Percent | 2000 | 2001 |
|---------------------------------|-----------------|------------------|------------------|---------------------|------------------|------------------|-----------------|------------------|----------------|------------------|------------------|
| | Actual | Actual | Actual | Budget | Actual | Budget | June 98 | Budget | Change | Budget | Budget |
| | | | | | | | | | 98/99 | | |
| REVENUES | | | | | | | | | | | |
| U.S. Army | \$215,671 | (\$115,254) | | | \$4,433 | | | | | | |
| City (2) | \$5,050 | | | | | | | | | | |
| Alliant Tech Used | (\$129,356) | \$356,480 | \$232,689 | \$252,340 | \$181,089 | \$227,600 | \$53,443 | \$204,350 | -11.38% | \$200,200 | \$210,800 |
| Insurance Dividend | | \$879 | \$1,260 | | \$778 | | | | | | |
| City Contribution | \$2,000 | \$3,000 | \$3,000 | \$3,000 | | \$6,000 | \$6,000 | \$3,000 | -100.00% | \$3,100 | \$3,000 |
| Interest Earnings | \$3,935 | \$18,894 | \$14,179 | | \$19,182 | \$18,000 | \$12,650 | \$10,000 | | \$10,000 | \$10,000 |
| TOTAL | \$97,300 | \$263,999 | \$251,128 | \$255,340 | \$205,482 | \$251,600 | \$72,093 | \$217,350 | -15.76% | \$213,300 | \$223,800 |
| MATERIALS AND SUPPLIES | | | | | | | | | | | |
| General Materials 2170 | \$3,000 | \$978 | \$3,996 | \$1,000 | \$3,097 | \$1,000 | \$826 | \$1,000 | 0.00% | \$1,000 | \$1,000 |
| Chemicals 2175 | | \$16,779 | \$9,647 | \$10,200 | \$8,787 | \$8,500 | \$4,639 | \$8,500 | 0.00% | \$8,800 | \$9,100 |
| Small Equipment 2280 | | \$345 | \$210 | \$100 | \$0 | \$100 | \$0 | \$100 | 0.00% | \$100 | \$100 |
| TOTAL | \$3,000 | \$18,102 | \$13,853 | \$11,300 | \$11,884 | \$9,600 | \$5,465 | \$9,600 | 0.00% | \$9,900 | \$10,200 |
| CONTRACTUAL SERVICES | | | | | | | | | | | |
| Telephone 3310 | \$2,600 | \$2,130 | \$1,689 | \$1,600 | \$1,369 | \$1,600 | \$693 | \$1,600 | 0.00% | \$1,600 | \$1,600 |
| Utility Charges 3320 | \$27,200 | \$39,238 | \$37,900 | | \$41,941 | | \$17,373 | | | \$0 | \$0 |
| NSP Gas | | | | \$5,500 | | \$4,400 | | \$2,000 | -120.00% | \$2,100 | \$6,200 |
| NSP Electric | | | | \$39,000 | | \$39,500 | | \$38,600 | -2.33% | \$39,800 | \$41,000 |
| Insurance 3483 | | \$3,435 | \$3,181 | \$5,300 | \$1,699 | \$4,500 | \$776 | \$1,000 | -350.00% | \$1,000 | \$1,000 |
| Building Maintenance 3510 | | \$3,033 | \$4,008 | \$1,000 | \$1,377 | \$1,000 | \$577 | \$2,500 | 60.00% | \$2,600 | \$2,700 |
| Equipment Maintenance 3520 | | \$18,453 | \$18,950 | \$10,000 | \$23,891 | \$10,300 | \$20,222 | \$8,000 | -28.75% | \$8,200 | \$8,400 |
| Other Services 3590 | | | | | | | \$142 | | | | |
| Miscellaneous | | \$9,352 | \$1,194 | | \$1,520 | \$2,500 | | \$2,500 | 4.00% | \$2,600 | \$2,700 |
| DNR App. Fee | | | \$2,084 | \$2,400 | \$2,391 | \$2,400 | | \$2,400 | | \$2,500 | \$2,600 |
| MCWS Industrial Strength charge | | | | | | | | | | | |
| Other | | | | | | | | | | | |
| Sanitary Sewer | | \$21,702 | \$14,402 | \$13,000 | \$3,276 | \$5,000 | \$256 | \$5,000 | 0.00% | \$5,200 | \$5,400 |
| SAC | | | \$14,400 | | \$0 | \$0 | | \$10,450 | | | |
| City Services 6752 | | | | | | | | | | | |
| Administration | \$5,500 | \$14,900 | \$14,200 | \$15,200 | \$11,600 | \$15,700 | \$0 | \$16,200 | 3.09% | \$16,700 | \$17,200 |
| Administration | | \$10,000 | | | | | | | | | |
| Administration Correction | | | (\$10,600) | | | | | | | | |
| Operations | \$59,000 | \$77,473 | \$62,327 | \$78,000 | \$56,080 | \$80,300 | \$0 | \$60,000 | -33.83% | \$61,800 | \$63,700 |
| Engineering 6752 | | \$41,507 | \$64,355 | \$61,800 | \$47,485 | \$63,700 | \$25,885 | \$55,000 | -15.82% | \$56,700 | \$58,400 |
| Legal 6755 | | \$4,674 | \$8,936 | \$4,800 | \$969 | \$10,600 | \$704 | \$2,000 | -430.00% | \$2,100 | \$2,200 |
| Auditing Services 6755 | | | \$250 | \$0 | \$0 | \$500 | \$0 | \$500 | 0.00% | \$500 | \$500 |
| TOTAL | \$94,300 | \$245,897 | \$237,276 | \$237,600 | \$193,598 | \$242,000 | \$66,628 | \$207,750 | -16.49% | \$203,400 | \$213,600 |
| D.S.I. CHANGE ORDER 6A | | | | \$23,890 (see 3520) | | | | | | | |
| TOTAL | \$97,300 | \$263,999 | \$251,129 | \$272,790 | \$205,482 | \$251,600 | \$72,093 | \$217,350 | -15.76% | \$213,300 | \$223,800 |
| Alliant Tech Year-End Payment | \$146,703 | \$366,440 | \$271,700 | \$227,600 | \$252,340 | \$204,350 | | \$155,200 | | \$165,800 | \$165,800 |
| Unused Alliant Tech Balance | \$276,059 | \$286,019 | \$325,030 | \$300,290 | \$396,281 | \$373,031 | \$342,838 | \$323,881 | | \$289,481 | \$244,481 |

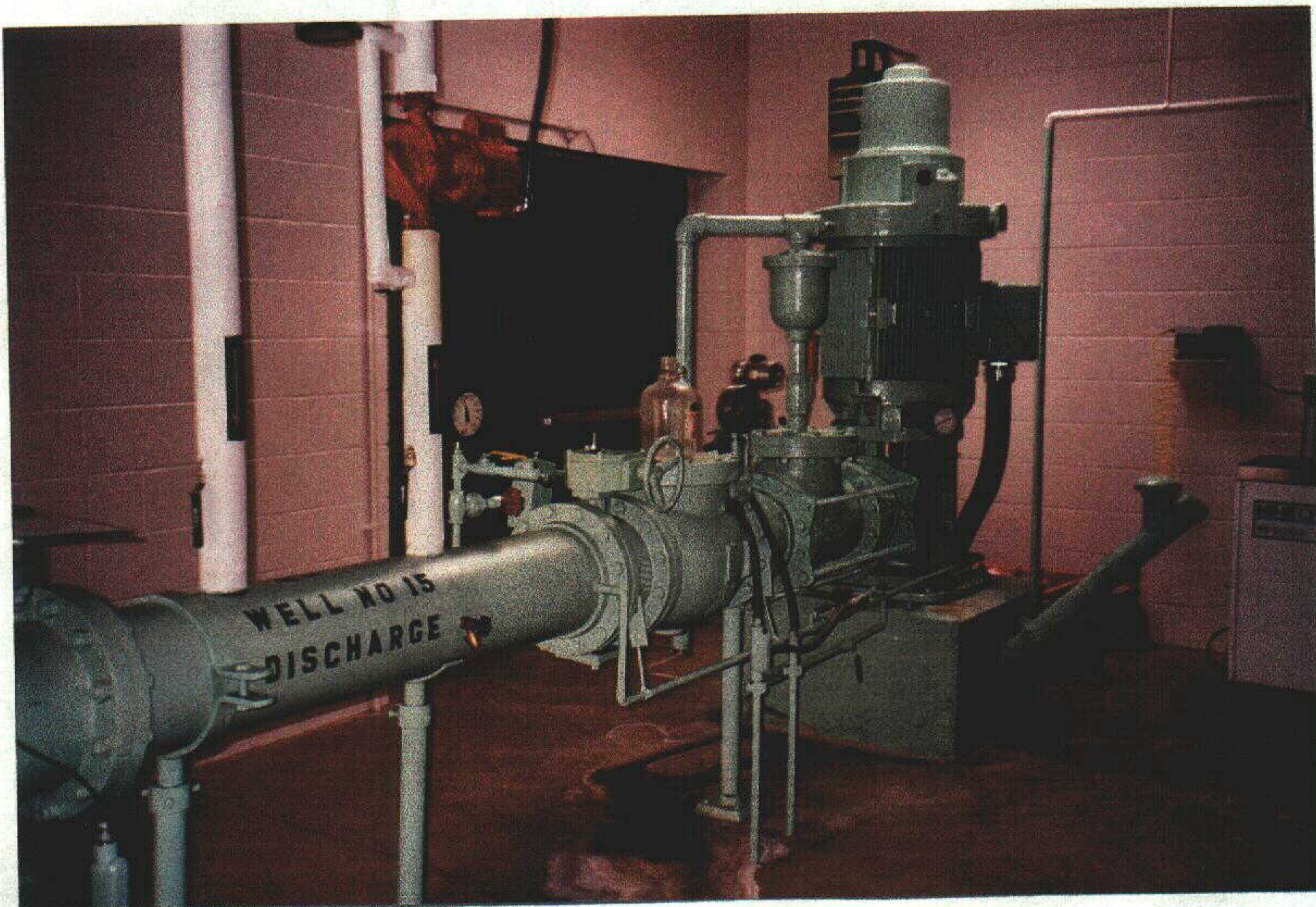
APPENDIX B

Appendix B

Photographs From Site Inspection



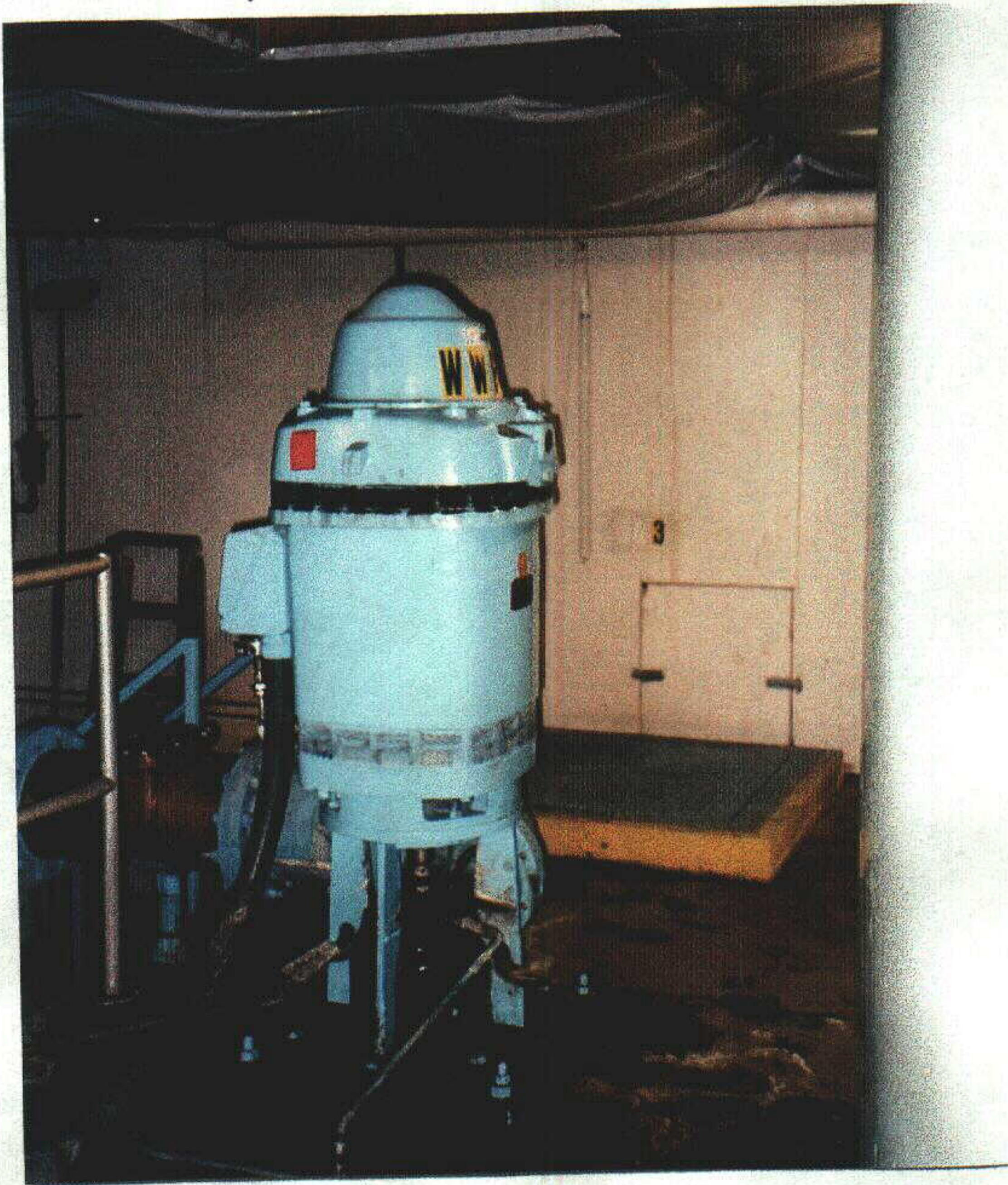
Photograph #1: PGAC Water Treatment Facility (OU1)



Photograph #2: Well NBM #15 Pumphouse (OU1)



Photograph #3: TGRS Water Treatment Plant (OU2)



Photograph #4: TGRS Wet Well Pump (OU2)



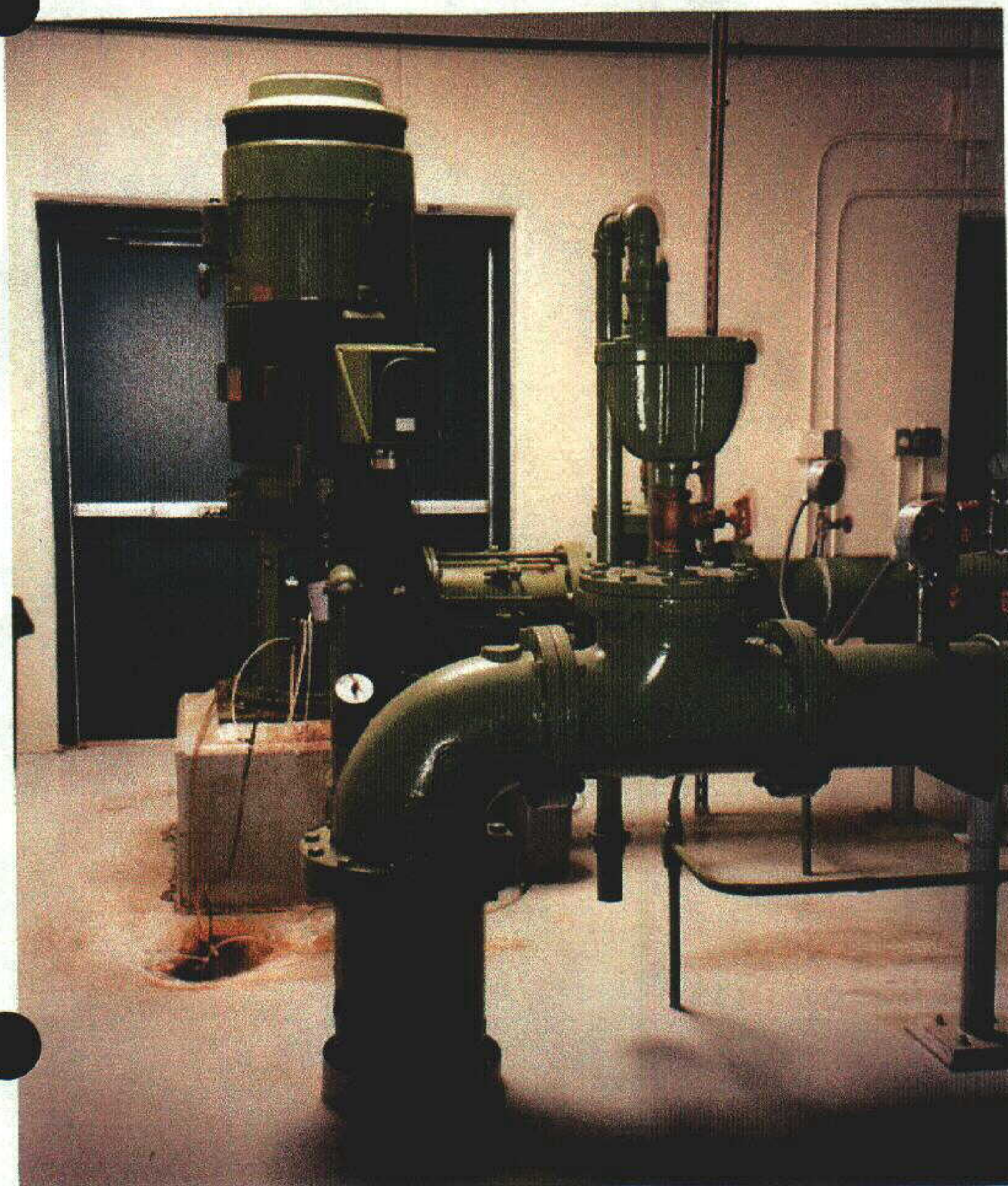
Photograph #5: Site D Shallow Soil SVE System (OU2)



Photograph #6: Site A Groundwater Treatment System (OU2)



Photograph #7: PGRS Water Treatment Facility (OU3)



Photograph #8: Well NBM #13 (OU3)
(located inside PGRS building)



Photograph #9: Site Inspection Team