PICATINNY ARSENAL
TASK ORDER 27
RCRA SUBPART X
PERMIT MONITORING
ROUND E

GROUNDWATER
ASSESSMENT
REPORT

Prepared by:

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APRIL 2003

U.S. Army Corps of Engineers
Baltimore District

Total Environmental Restoration Contract
(TERC) Number DACA31-95-D-0083

DRAFT

DEPARTMENT OF THE ARMY
UNITED STATES ARMY TANK - AUTOMOTIVE AND ARMAMENTS COMMAND
ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER
PICATINNY ARSENAL, NEW JERSEY 07806-5000

April 09, 2003

Environmental Affairs Division

SUBJECT: Submittal of **RCRA Subpart X Permit Monitoring, Round E** for Supart X Permit Application, U.S. Army Research Development and Engineering Center, Picatinny Arsenal, NJ

Mr. John Scott
Chief, Bureau of Hazardous Waste
And Transfer Facilities
Division of Solid and Hazardous Waste
401 East State Street
P.O. Box 414
Trenton, New Jersey 08625-0414

Dear Mr. Scott:

Enclosed for your information is report entitled "RCRA Subpart X Permit Monitoring, Round E." The sampling was performed on September 18 & 19 of 2002 and represent the first semi-annual event after the one year of quarterly sampling as was presented in the letter of December 12th, 2002.

We realize that the NJDEP is considering our responses to comments in your January 2nd letter invalidating the previous groundwater results. Therefore, the report will only get reviewed if the issues of your letter are positively resolved. However, a table was prepared as part of the report that indicates the certification status of each lab per analyte. Only a few analytes were tested at labs not certified but these are not considered CoCs per the statistical report provided last year.

We have received your letter of April 02 and have suspended groundwater sampling for the Open Detonation Area until two (2) weeks after the issues are resolved.

If you should need additional information on this matter, please contact Mr. Ted Gabel at (973) 724-6748.

Sincerely yours,

for Tom Solecki Chief,
Environmental Affairs

Copies of Letter Furnished:

Greg Zalaskus, NJDEP

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Date: April 09, 2003,

Mr. Tom Solecki,
Chief of Environmental Affairs
Picatinny Arsenal

TECHNICAL REVIEW RECORD		
PROJECT NAME: RCRA Monitoring for the Open Detonation Area	PROJECT NO.: 66727 003 01	CLIENT: Picatinny Arsenal
DOCUMENT NAME/DATE: Picatinny Arsenal, RCRA Subpart X Permit Monitoring Round E– Groundwater Assessment Report - September 2002		
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GEOLOGY OK:		
CHEMISTRY OK:		
HEALTH & SAFETY OK:		
OTHER REVIEWER:		

boundary of the installation, and Interstate 80, which is located 1 mile to the southeast of the main gate.

The OD study area, about 4 acres in extent, is located along Gorge Road in Area N of PTA, approximately 1.5 miles west of Lake Denmark. This area is located in the northern most area of the arsenal and is very remote from other facilities. The site consists of a large pile of sand along the eastern side and a sand-filled bunker at its northern end. The site is situated in an alluvial valley bordered by Green Pond Mountain to the west and Copperas Mountain to the east, that separates this area from the Lake Denmark basin (Figure 1-2).

1.3 Site History

The Gorge is used to test large and small caliber weapons, ammunition, and various explosive devices as well as the OD of waste ordnance and explosives. The OD operations are conducted in the large sandpit along the eastern side of the Gorge (Figure 1-3).

A RCRA Part B permit application was submitted by Picatinny Arsenal to USEPA, Region 2 in November 1985 for the operation and monitoring of the OD area. The permit application was updated, revised and resubmitted in November 1988. Picatinny received a Notice of Deficiency (NOD) from USEPA and the permit application was revised in July 1993 and September 1994 and resubmitted to USEPA.

Operating at the Open Detonation (OD) Area under Interim status, Picatinny installed six monitoring wells and conducted quarterly groundwater sampling from February 1999 to October 1999. Chemical analysis of the groundwater samples was for eight metals and six explosive compounds. Two additional sampling events were conducted in March and April 2000 to verify elevated levels of lead in two downgradient monitoring wells. Analytical data from these six sampling events are presented in the *Summary of Groundwater Sampling Results from February 1999 to October 2000* (IT, 2001a).

During this time, New Jersey took primacy over RCRA enforcement within the state from USEPA. The New Jersey Department of Environmental Protection (NJDEP) issued a NOD on the revised 1994 permit application. The permit application was revised and updated and submitted to NJDEP in November 2000. Based on comments and discussions with NJDEP, the revised permit application contained an expanded analytical list for groundwater sampling (Appendix A). It should be noted that white phosphorous and red phosphorous could not be analyzed for because there is currently no approved or certified analytical method. In order to develop analytical methods, standards for these two compounds would be required. Standards were not readily available for either compound. The permit application is currently still under review by NJDEP.

In March 2001, Picatinny received a letter from NJDEP requesting that quarterly sampling be resumed for two years at the OD Area (ODA). The letter also requested that in addition to the expanded analyte list contained in the revised permit application (Nov. 2000), groundwater samples also be analyzed for VOCs with additional compounds, SVOCs with additional compounds, and pesticides/PCBs with additional compounds. A copy of this letter is included in Appendix A. Picatinny agreed to conduct quarterly groundwater sampling for the expanded analyte list contained in the revised permit application for one year (four consecutive quarters). Picatinny also agreed to analyze for the additional compounds requested by NJDEP (i.e., VOCs with additional compounds, SVOCs with additional compounds, and pesticides/PCBs with additional compounds) for two consecutive quarters. In June 2001, NJDEP notified Picatinny that the reduced sampling duration was acceptable (See Appendix A for a copy of this correspondence).

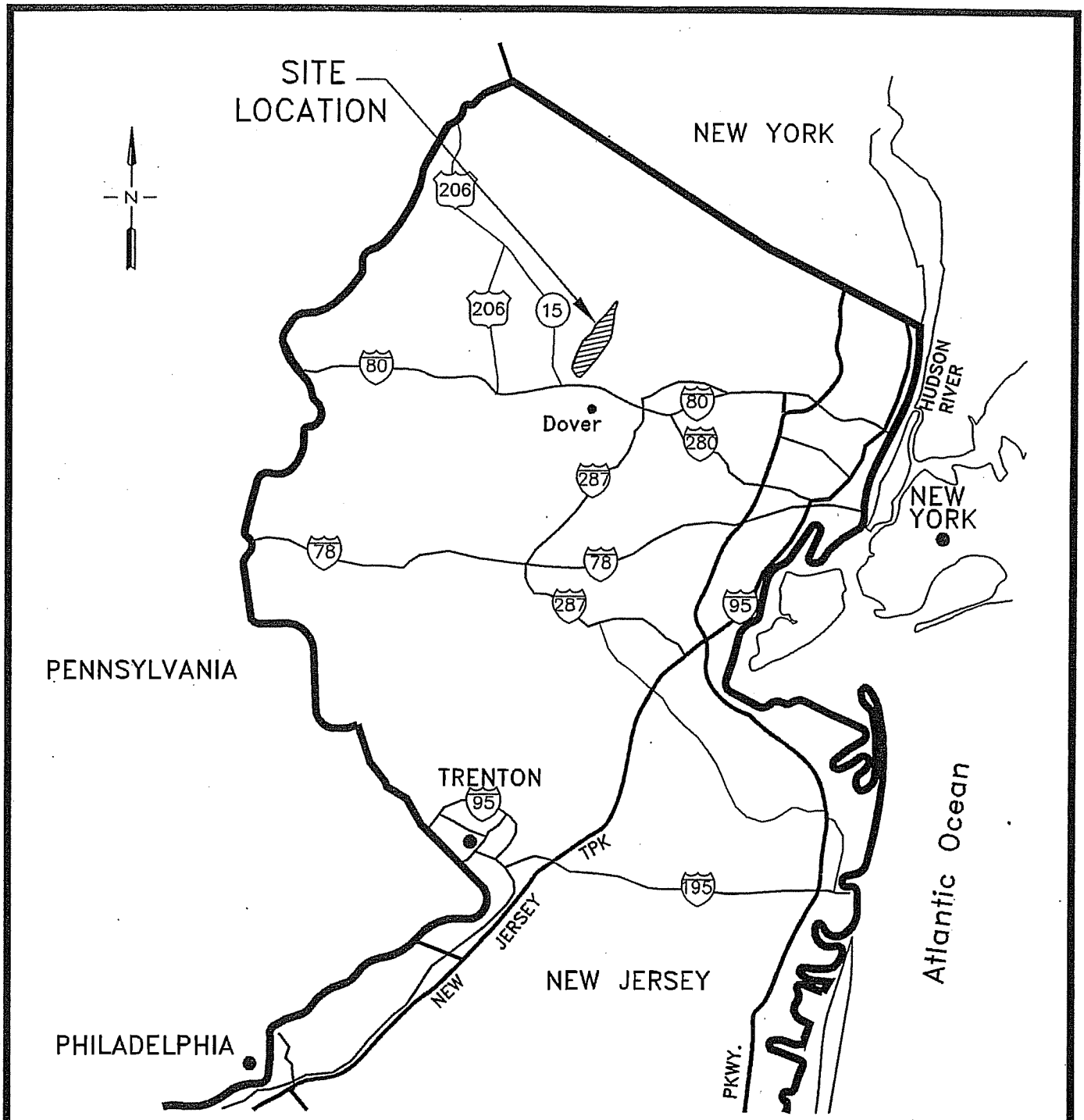
The first round of quarterly groundwater sampling with the expanded analyte list (Round A) was conducted from June 20 to June 25, 2001. Analytical results from that sampling are presented in the *Round A Groundwater Assessment Report, October 2001* (IT, 2001b). The second quarter of groundwater sampling was performed from September 25 to September 27, 2001. Analytical results are presented in the *Round B Groundwater Assessment Report, January 2002* (IT,

2002a). The third round (Round C) of groundwater sampling was conducted from January 15 to 17, 2002. Analytical results are presented in the *Round C Groundwater Assessment Report, April 2002* (IT, 2002b). The fourth quarter (Round D) of groundwater sampling was conducted at Site 8 on April 16 and 17, 2002. Analytical results are presented in the *Round D Groundwater Assessment Report, August 2002* (IT, 2002c).

For the Round C and Round D sampling events, the analytical suite was reduced as discussed at the regulatory meeting conducted on November 20, 2001(see Appendix C for a copy of the meeting minutes). The following compounds, which were only required to be sampled for a minimum of two consecutive quarters, were eliminated from the analytical program, because none of these compounds were detected at concentrations above their respective LOCs: VOCs with additional alcohol compounds, SVOCs with additional compounds, and pesticides/PCBs with additional compounds. One exception was ethylene oxide. Future sampling rounds will include ethylene oxide in the analytical program unless the statistical evaluation of the data indicates that the single ethylene oxide exceedance is not statistically significant. As a result of recent sampling at the ODA, which identified depleted uranium (DU) in the surface and subsurface soil, DU was added to the Round C and Round D groundwater analytical suite.

In accordance with the permit application and NJDEP correspondence, a statistical evaluation of the quarterly groundwater data was conducted after one year to develop a reduced analytical program on a semi-annual basis. The statistical evaluation performed on the groundwater data, the results of the evaluation, and the revised analytical program for the RCRA unit were documented in the *Evaluation of Quarterly Groundwater Data* (IT 2002d), which was submitted to NJDEP on December 12, 2002.

As a result of the data screening and statistical evaluation process, the sampling program for the OD area within the Gorge region of PTA has been revised for subsequent sampling events. Table 1-1 presents the compounds eliminated from the RCRA permit groundwater monitoring program along with an explanation for its removal. Table 1-2 presents the compounds retained for future sampling events along with an explanation for its continued analysis.



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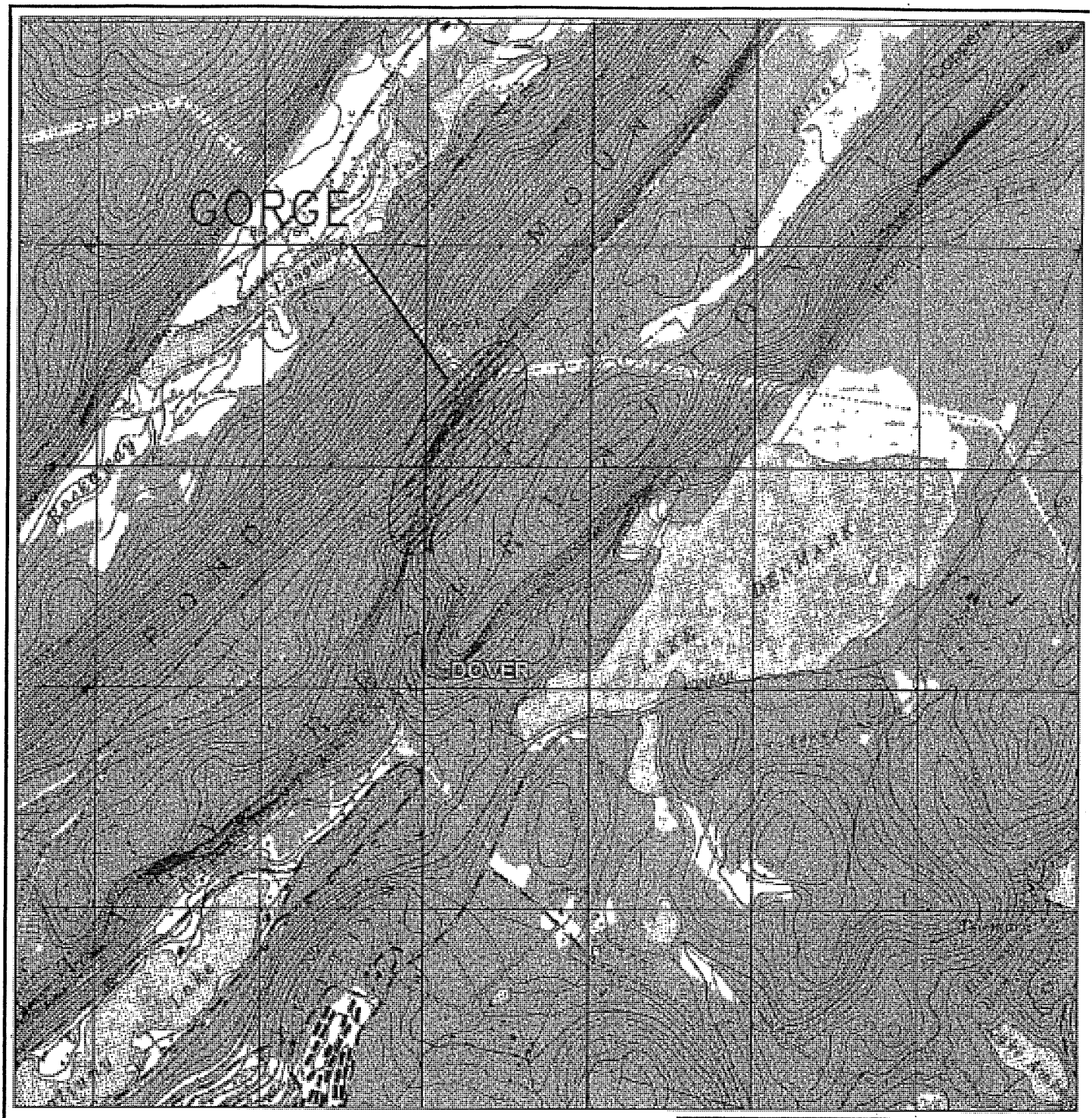
U.S. Army Corps of Engineers

REVISION NO.:	DATE:	ACAD FILE:
1	10/12/01	SITEMAP.dwg

PICATINNY ARSENAL
SITE LOCATION MAP
DOVER, NJ

DET'D:	CLIENT:	PROJECT NO.:
RG	PICATINNY ARSENAL	866717-72204
CHK'D:	LOCATION:	FIGURE NO.:
GC	DOVER, NEW JERSEY	1

PLOT DATE: 03/17/03



N

1500 500 0 1000 2000

SCALE IN FEET

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REVISION NO.:	DATE:	ACAD FILE:
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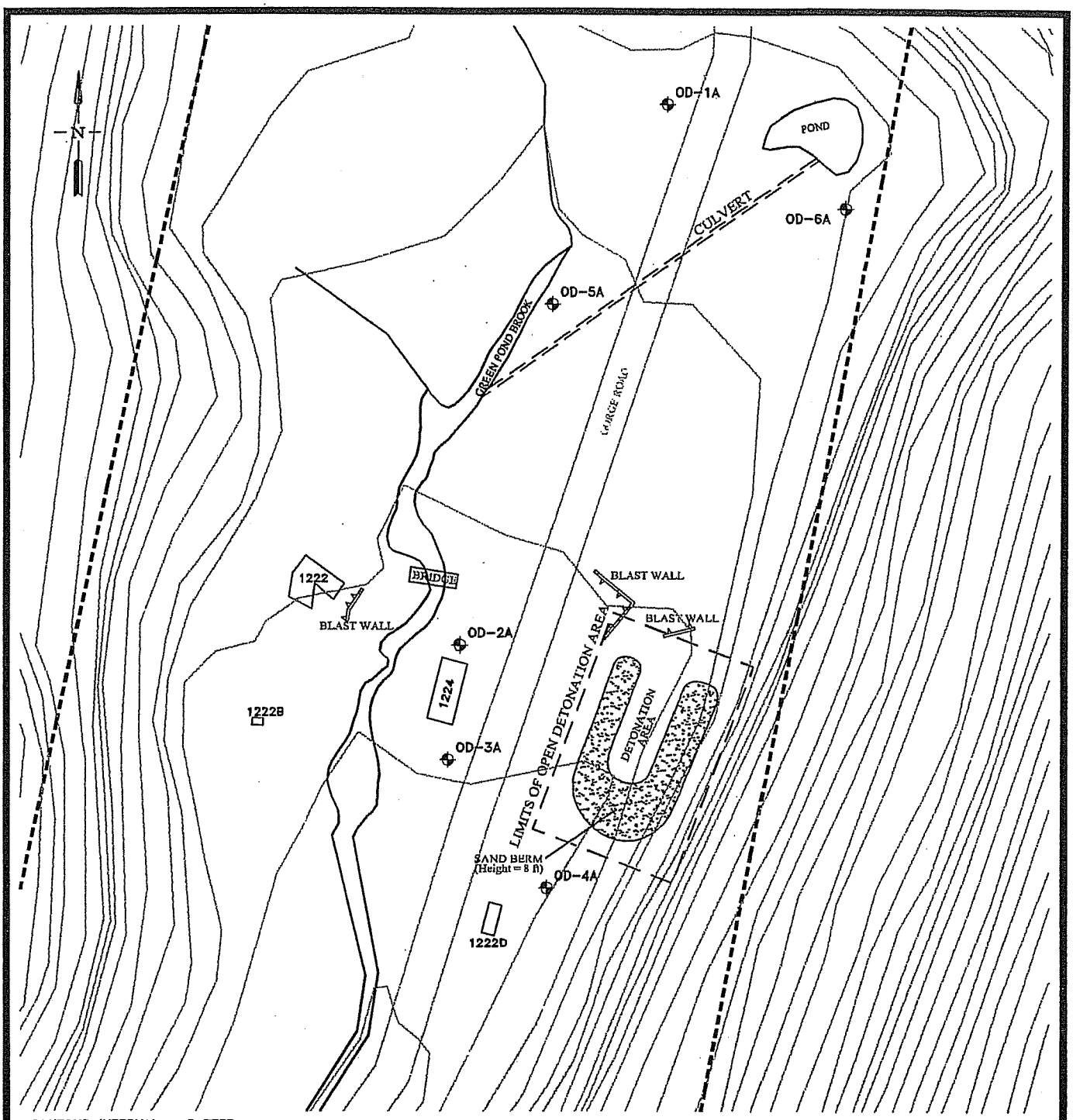
SITE 8 GORGE AREA AND SURROUNDING AREAS USGS SURVEY

DET'D:	CLIENT:	PROJECT NO.:
CDT	PICATINNY ARSENAL	66727-003-03
CHK'D:	LOCATION:	FIGURE NO.:
GM	DOVER, NEW JERSEY	1-2



CONTOUR INTERVAL = 5 FEET

SAND BERM
BLDG. NO. BUILDING
BLAST WALL
STORM SEWER
ROAD
WATER
SITE BOUNDARY

80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80
SCALE IN FEET

EXISTING SAMPLING LOCATIONS
MONITORING WELL

NOTES: Site features have not been surveyed to verify coordinate accuracy, but relative locations of site features have been verified by field measurements. Water levels are based on measurements taken on 06/20/01.

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U.S. Army Corps of Engineers

REVISION NO.:	DATE:	ACAD FILE:
1	10/24/01	N8MWg102401.dwg

OPEN DETONATION AND MONITORING WELL LOCATION MAP

DET'D:	CLIENT:	PROJECT NO.:
CDT	PICATINNY ARSENAL	66727-003-03
CHK'D:	LOCATION:	FIGURE NO.:
GM	DOVER, NEW JERSEY	1-3

PLOT DATE: 03/17/03

Table 1-1
Compounds Eliminated from the RCRA GW Monitoring Program
at the Open Detonation Area, Picatinny Arsenal, New Jersey

Compounds	Quarters Analyzed	Rationale for Elimination
TCL Volatile Organic Compounds with Additional Alcohol Compounds	2	No concentrations detected above LOCs. [1]
TCL Semivolatile Organic Compounds	2	No concentrations detected above LOCs.
Diphenylamine, aniline, carbazole	2	No concentrations detected above EQLs.
TCL PCBs/Pesticides and Mirex	2	No concentrations detected above EQLs.
Organophosphorous Pesticides (malathion and diazinon)	4	No concentrations detected above EQLs.
Exotic Explosives (DEGDN, TEGDN, TMEDN, DATB, HNS)	4	No concentrations detected above EQLs.
Nitroesters - nitrocellulose, nitroguanidine, nitroglycerine	4	No concentrations detected above EQLs.
TAL Metals	4	LOC exceedances are below background threshold values.
Additional Metals (boron, titanium, silicon, molybedenum, tin, tungsten, strontium, zirconium)	4	No concentrations detected above LOCs.
Cyanides	4	No concentrations detected above EQLs.
Anions	4	No concentrations detected above LOCs.

Notes -
LOC = Level of Concern.
EQL = Estimated Quantitation Limit.
[1] - Ethylene Oxide, which was detected above the LOC in Round 2, was analyzed for four quarters. An ANOVA for ethylene oxide indicated the exceedance was not statistically significant and could be eliminated from further analyses.

Table 1-2
RCRA Groundwater Monitoring Program
at the Open Detonation Area, Picatinny Arsenal, New Jersey

Compounds	Rationale for Retention
Baseline Explosives	RDX detected above LOC in each round.
Perchlorates	Perchlorates detected in OD Area each round and detected above LOC during a previous sampling event using the bailer method.
Lead	Lead detected above LOCs during previous sampling events using the bailer method.

2.0 PHYSICAL CHARACTERISTICS

2.1 Topography/Surface Water Hydrology

The OD area lies in a low lying valley, relative to the surrounding topography, bordered by steeply sloping ridges of Green Pond Mountain to the west and undifferentiated metamorphic/igneous rock to the east (Copperas Mountain). These ridges reach an average elevation of 1,000 to 1,100 feet mean sea level (MSL) within 500 feet of the valley axis. The elevation of the Site 8 area varies from 840 to 870 feet MSL and averages 200 to 500 feet in width in the study area. The surface water from this region flows down the steep valley walls via a number of small, unnamed, streams, ditches, and culverts to the valley axis where it contributes to the base flow of Green Pond Brook. Green Pond Brook in this area averages 5 to 10 feet in width and approximately 2 to 3 feet in depth. Green Pond Brook flows to the south along the valley axis at a steep (approx. 9:1 ft) gradient to the confluence with Burnt Meadow Brook in the main valley of PTA where it eventually discharges to the southwest into Picatinny Lake.

2.2 Geology

The geology of the OD area was determined by reviewing lithologic boring logs recorded during the advancement of the six Gorge wells installed for the RCRA Subpart X permit monitoring program. Bedrock compositions in this area were interpreted through outcrop observations and confirmed with the use of geologic maps published on the regional geology. The lithologic boring logs indicate that the site overburden is composed of a poorly sorted heterogeneous mixture of boulders and gravel in a silty sand matrix, with trace amounts of clay. This variable sedimentary sequence is a function of the complex geomorphic conditions in the Gorge resulting from the redistribution of glacial, talus, and stream related sediments that occur in the valley. The low occurrence of clay in the interval investigated (0-20 feet below ground surface) and relatively high hydraulic conductivity observed in the aquifer (Section 2.3) suggest that fluvial processes were the primary mechanism in the redistribution and deposition of sediments in the Gorge. The boring logs reveal that a maximum of 3 to 10 feet of artificial fill composed of varying amounts of sand, gravel, cobbles, boulders, and rubble covers the entire site. Bedrock was not encountered during the advancement of borings in the OD area; therefore, accurate depth to bedrock and overburden thickness estimations could not be determined. As a result, identification and placement of the fault transecting the valley was indeterminable from the limited subsurface investigation. Bedrock composition west of the fault is described from outcrops as oxidized quartz pebble conglomerate of the Green Pond Syncline. Undifferentiated granitic gneiss composed of varying degrees of hornblende, quartz, plagioclase feldspar, potassium feldspar, and mica is identified in outcrops east of the fault.

2.3 Hydrogeology

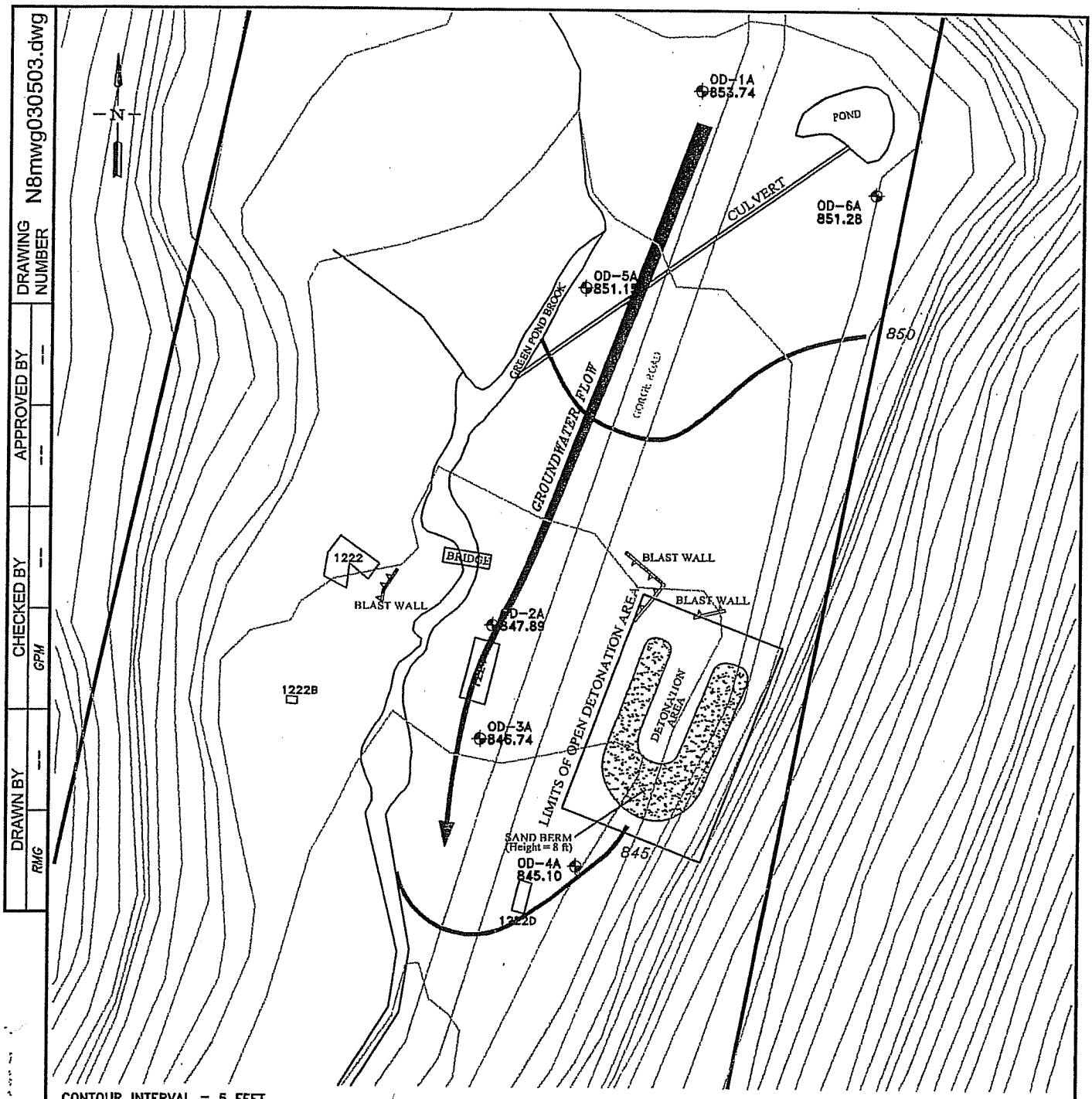
Two aquifers are presumed to exist in the Gorge area: an overburden aquifer and a bedrock aquifer. The hydrogeology of the OD area was determined through the evaluation of well development data from the six Gorge area wells installed into the unconfined overburden aquifer. Potentiometric surface gradients and groundwater flow directions were determined using static water level measurements collected from the wells (Figure 2-1). The horizontal hydraulic gradient along the flow axis between monitoring well OD-1A and OD-3A was measured at 0.0184. No wells were installed into the fractured bedrock aquifer underlying the OD area, therefore, accurate estimations of fractured bedrock aquifer characteristics were indeterminable.

Overburden aquifer characteristics were estimated using measurements obtained during well development of the Site 8 wells. Flow rate (Q) and drawdown ($h_0 - h$) data, from the wells which exhibited equilibrium of these variables during purging, were applied to the Razack and Huntley (1991) partially penetrating well equation to determine a transmissivity (T) value for the Gorge area aquifer.

$$T = 33.6\left(\frac{Q}{h_0 - h}\right)^{0.67}$$

This formula utilizes a correlation coefficient of 0.67 for the empirical relationship between transmissivity and specific capacity, which is derived from the flow rate and drawdown data of the wells. Gorge area well data applied to this formula yielded transmissivity values ranging from 246.1 ft^2/day from OD-5A, to 618.3 ft^2/day from OD-2A. Hydraulic conductivity values, based on these transmissivity results and a theoretical aquifer thickness of 30 feet, ranged from 8.20 ft/day at OD-5A, to 20.61 ft/day at OD-2A. Monitoring wells OD-3A and OD-4A did not exhibit any drawdown during development, at purge rates equal to those used on the other Gorge wells applied to the formula. Therefore, transmissivity and hydraulic conductivity values are presumably higher since purge rates of equal magnitude failed to drawdown the standing water column in the well. Although accurate calculations could not be performed for these wells, transmissivity and hydraulic conductivity values are not likely to exceed 1,000 ft^2/day and 33.33 ft/day respectfully, based on the subsurface lithology at these locations.

In summation, the OD area overburden aquifer characteristics are approximated at 8.20 ft/day to 33.33 ft/day for hydraulic conductivity, and 246.1 ft^2/day to 1,000 ft^2/day for aquifer transmissivity. These values are typical for the types of sediments identified during borehole advancement of the monitoring wells located in the area, and are representative of values that are anticipated for wells with yields such as those observed at Site 8.



CONTOUR INTERVAL = 5 FEET

SAND BERM
BLDG. NO. BUILDING
BLAST WALL
STORM SEWER
ROAD
WATER
SITE BOUNDARY

845.34 GROUNDWATER ELEVATION (ft msl)
GROUNDWATER CONTOUR (ft msl)
GROUNDWATER FLOW DIRECTION

80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80
SCALE IN FEET

EXISTING SAMPLING LOCATIONS
MONITORING WELL

NOTES: Water levels are based on measurements taken on 09/18/2002.

Picatinny Arsenal Installation Restoration Program

U.S. Army Corps of Engineers

Shaw Environmental & Infrastructure, Inc.

FIGURE 2-1

OD AREA GROUNDWATER ELEVATION CONTOURS 09/18/02 SAMPLING, ROUND E

PICATINNY ARSENAL, DOVER, NJ

3.0 FIELD ACTIVITIES

3.1 Groundwater Sampling Field Measurements

Prior to sampling, the Site 8 wells were opened and the headspaces were immediately screened using an 11.7eV lamp Photoionization Detector (PID) to identify the presence of Volatile Organic Compounds (VOCs) in the wells. None of the monitoring wells registered VOC levels in excess of background. At no time during the sampling event were VOCs detected in breathable air space.

Physical measurements of groundwater level, well depth, and PVC well casing height were collected using a decontaminated electronic water level indicator. This information was recorded onto pre-sample purge forms. A potentiometric surface map was generated from these measurements in order to evaluate groundwater flow direction and gradient (Figure 2-1).

3.2 Groundwater Purging and Sampling

Adjustable rate, stainless steel submersible pumps, attached to dedicated Teflon-lined polyethylene tubing, were utilized to remove the required groundwater volume from the wells prior to sampling. In order to minimize drawdown and prevent turbulent groundwater flow into the well casing during purging, purge rates were maintained at an average of 500 ml/min. Monitoring wells were purged by removing water from the center of the water column or screened interval, allowing groundwater indigenous to the aquifer to enter the well. The efficiency of stagnant casing water removal from the well was monitored approximately every five minutes throughout the purge by evaluating the stability of groundwater quality parameters obtained using a YSI water quality analyzer. The parameters collected before and during groundwater evacuation included pH, temperature, specific conductance, dissolved oxygen (DO), oxidation/reduction potential (ORP), and turbidity. A summary of the groundwater quality measurements for each location is provided in Table 3-1. Evacuation of the well continued until the water quality parameters stabilized for three successive readings as follows: 10% for DO, ORP and turbidity; 3% for specific conductance; 5% for pH (Puls et al, 1992), and 1% for temperature, indicating water representative of the aquifer was being obtained.

Groundwater samples were collected directly from the Teflon-lined tubing at a flow rate of 100 to 250 ml/min. Pre-preserved, laboratory-supplied sample bottles were filled and immediately chilled at 4^0C in laboratory-supplied sample coolers for shipment. Severn Trent Laboratories (STL), an NJDEP-certified laboratory, performed all the analyses. All analyses for the Round E sampling event were performed under NJDEP certification except for the radioisotopes of bismuth, lead and americium, which are not a requirement of the RCRA Subpart X permit, and thallium. A table listing the Round E analytes and the STL certification is presented in Appendix D. All samples were shipped overnight delivery to STL in Canton, Ohio (ethylene oxide, metals, anions and radiological analyses); Knoxville, Tennessee (explosives analyses); and Sacramento, California (thallium and perchlorate analyses). Post-sampling water quality parameters are provided in Table 3-1. Groundwater purging and sample collection were conducted in accordance with the procedures and guidelines detailed in the approved *Picatinny Arsenal Facility-Wide Field Sampling Plan*, (ICF KE, 1998).

TABLE 3-1
Summary of Monitoring Well Field Measurements for the
OD Area - Round E RCRA Permit Monitoring
September 18 and 19, 2002

Well ID NJ Permit No.	OD-1A 22-33305	OD-2A 22-33306	OD-3A 22-33307	OD-4A 22-33308	OD-5A 22-37389	OD-6A 22-37390
Depth To Water (ft. bgs)	7.06	2.98	0.39	2.06	3.98	10.44
Well Depth (ft. bgs)	13.71	12.51	11.45	11.60	19.54	21.16
Purge Rate (ml/min)	500	500	500	500	500	500
Volume Purged (liters)	25.0	17.5	17.5	20.0	45.0	20.0
Sample Depth (ft. bgs)	10.00	8.00	6.00	6.00	14.00	17.00
INITIAL PARAMETERS						
pH	5.36	5.70	6.00	5.76	5.88	5.18
Temperature (°C)	15.50	20.12	12.85	14.34	17.29	15.77
Conductivity (µS/cm)	91	149	74	87	91	63
Dissolved Oxygen (mg/L)	6.96	4.27	13.57	--	9.84	--
Redox (mV)	184	128	224	259	55.2	171
Turbidity (NTU)	3.0	0.8	0.0	569	100	128
FINAL PARAMETERS						
Ph	5.53	5.74	5.98	5.91	5.92	5.84
Temperature (°C)	15.98	20.15	13.12	15.15	16.46	16.75
Conductivity (µS/cm)	93	149	75	68	92	74
Dissolved Oxygen (mg/L)	--	2.34	11.19	--	3.32	--
Redox (mV)	216	113	222	242	34	127
Turbidity (NTU)	0.0	0.0	0.0	9.0	7.3	9.1

-- Dissolved oxygen readings from the water quality analyzer were inaccurate.

3.3 Quality Control Samples

Quality Control (QC) samples were collected during the field investigation, to check for cross-contamination during the handling of sampling materials, as well as monitor the performance of analytical contracting services. The following QC samples were collected during Round "E" of the Picatinny Arsenal, Subpart X RCRA Permit Monitoring program:

- Rinsate Blank sample GW091802R1 was collected for the groundwater samples by pumping analyte-free water through Teflon-lined tubing, using a decontaminated two-inch adjustable rate Grundfos pump, into the applicable sample containers. This sample was collected on September 18, 2002.

- Trip Blank samples GW091802T1 and GW091902T1 were prepared using analyte-free distilled water.

All groundwater samples were submitted for data validation by an independent subcontractor, as required by NJDEP. The analytical data were validated based upon laboratory QC criteria and pertinent USEPA Region 2 data validation functional guidelines. Data validation reports for the groundwater data packages are presented, under separate cover as Appendix E. Analytical data packages will also be provided under separate cover in Full NJDEP Regulatory Deliverables Format.

4.0 CHEMICAL ANALYTICAL RESULTS

4.1 Introduction

Round E groundwater analytical results, collected and analyzed in accordance with the groundwater monitoring program, were evaluated by comparing groundwater constituent concentrations with several sources of established groundwater quality standards. This was conducted to contrast upgradient and downgradient constituent concentrations with administrated maximum contaminant limits. No inorganic concentrations exceeded their respective RCRA Maximum Concentration Standards in the six OD area wells. Several metals including cadmium, cobalt, potassium, and vanadium and the anion, sulfide were detected in the groundwater rinsate blank sample collected in conjunction with the sampling event (Table 4-1). Ethylene oxide, which was the only VOC analyzed for in the groundwater samples, was not detected in the two trip blanks.

Summary tables listing all the compounds analyzed for during this sampling event are provided as Appendix B. For compounds, which were not detected in the sample, the RL/SQL is listed with any applicable data qualifiers. Full Electronic Data Deliverables packages for this sampling round will be provided at a later date. Data validation reports for all groundwater parameters are also provided, under separate cover, as Appendix D. A summary of the groundwater analytical results for Round E along with reference groundwater quality standards and RCRA Maximum Concentration Limit Standards is provided in Table 4-2.

4.2 Summary of Chemical Constituents Detected in Groundwater

Ethylene oxide was the only VOC analyzed for in the Round E samples. Ethylene oxide was not detected in any wells (Table 4-2) including OD-2A, which contained ethylene oxide during Round B.

With the exception of upgradient wells OD-5A and OD-6A, HMX and RDX were detected in each well. Concentrations of HMX ranged from an estimated concentration of 0.45 µg/L at OD-3A to 8.00 µg/L at OD-1A. The LOC for HMX is 400 µg/L. RDX concentrations ranged from an estimated level of 0.19 µg/L at OD-3A to 7.60 µg/L at OD-2A. The maximum RDX concentration was identified at OD-2A, located approximately 80 feet downgradient of the Open Detonation Area. The RDX concentrations detected at OD-1A (3.5 µg/L), OD-2A (7.6 µg/L), and OD-4A (3.0 µg/L) exceed the RDX LOC of 0.61 µg/L. No other explosives were detected in the samples.

Monitoring wells OD-2A and OD-4A, which are located closest to the RCRA unit have historically contained RDX at concentrations in excess of the LOC. Figure 4-1 is a graph of RDX concentrations detected at these wells since 1999. It should be noted that the groundwater samples from the four sampling events in 1999 were collected with bailers. All subsequent samples for explosives analysis were collected by the low-flow pumping method. The graph indicates that the RDX concentrations reported at OD-4A have maintained relatively constant ranging from 3.5 µg/L to 5.5 µg/L. The RDX levels detected in OD-2A have varied and exhibited an increase with the switch to the low-flow sampling methodology.

Aluminum, iron and manganese, which are common naturally occurring elements, were detected at elevated concentrations above LOCs in nearly every well with the exception of OD-3A. These metals are commonly identified at high concentrations throughout the facility and are believed to be the result of weathering of the local bedrock rather than a site-related source. As part of the data screening process for the *Evaluation of Quarterly Groundwater Data* (IT, 2002d), background threshold values were determined for aluminum, iron and manganese. The background threshold values were calculated as the mean concentration from the three upgradient wells (OD-1A, OD-5A, and OD-6A) plus three standard deviations as recommended by USEPA Region 2. Concentrations of aluminum, iron, and manganese in the downgradient

wells (OD-2A, OD-3A, and OD-4A) were compared to the background threshold values. Concentrations of these compounds in the downgradient wells did not exceed the background threshold values. Lead and arsenic were the only other metals detected in excess of LOCs. Lead was identified in OD-4A at 26 µg/L and in OD-6A at 19 µg/L, which exceed the LOC of 10 µg/L. The arsenic concentration reported in OD-6A was 22 µg/L, which is above the LOC of 8 µg/L. However, the arsenic and lead concentrations are below the RCRA Maximum Contaminant Standard for lead and arsenic, 50 µg/L.

Eight anions including perchlorates were detected in the six monitoring wells. The perchlorate concentration identified in OD-1A was 48 µg/L, which exceeds the LOC of 18 µg/L. All other anion concentrations were below LOCs.

Radiological analyses for gamma spectroscopy, uranium isotopes, and radium-226 and its daughters were also conducted at the request of PTA's Radiation Protection Office to determine the impact of the recent identification of radiological parameters in the soil at the OD area to the groundwater. Six radiological compounds were detected in the samples including bismuth-214, lead-214, radium-226, and the three isotopes of uranium. Since there are no LOCs for these compounds in groundwater (with the exception of radium-226) and no background levels have been established for groundwater, the analytical results were compared to the background surface water levels.

Radium-226, which has a groundwater LOC of 5 pCi/L, was detected in three wells. The maximum concentration of radium-226 was 0.33 pCi/L reported in OD-4A. The three uranium isotopes were only detected in OD-6A. The concentrations of uranium-234 (2.62 pCi/L), uranium-235 (0.17 pCi/L), and uranium-238 (3.22 pCi/L) detected in OD-6A exceed the surface water background levels established during the *Picatinny Arsenal Facility-Wide Background Investigation* (IT, 2002f). The two remaining radiological compounds, bismuth-214 and lead-214, were not analyzed as part of the background investigation. In order to evaluate the concentrations of these two compounds, the concentrations detected in the upgradient wells were compared with the concentrations in the downgradient wells. The highest concentrations of bismuth-214 and lead-214 were identified in upgradient well OD-6A. The next highest concentrations were reported in OD-4A, the well closest to the RCRA unit. The pattern of radiological concentrations does not indicate significant impact to groundwater from radiological contamination in the soil at the OD area.

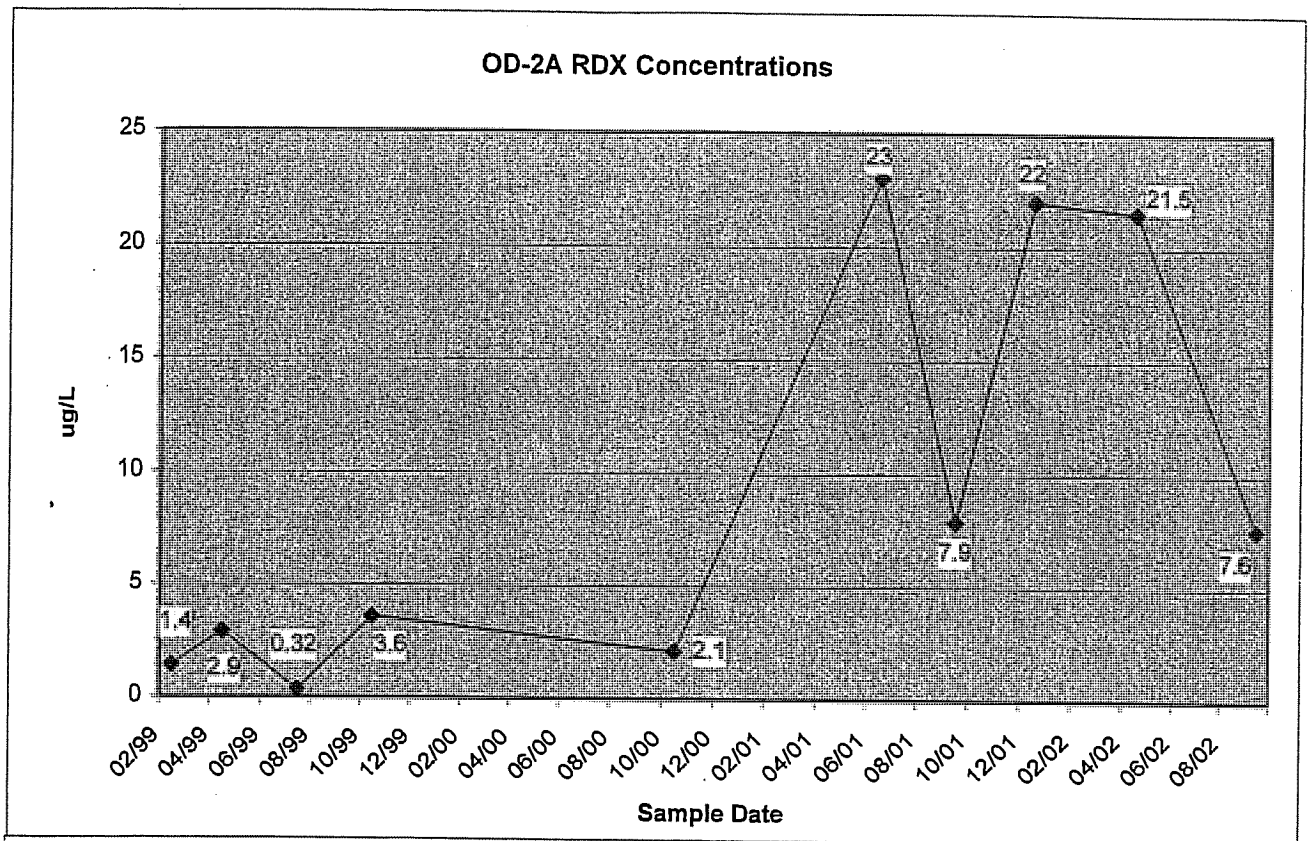
It should be noted that all of the additional compounds recommended for elimination in the *Evaluation of Quarterly Groundwater Data* (IT, 2002d) [Table 1-1] were either not detected (ethylene oxide) or detected at concentrations below LOCs (all anions with the exception of perchlorates and most TAL metals). Perchlorates and lead, which were detected above LOCs in Round E, will be retained for analysis during future sampling events, as recommended in the *Evaluation of Quarterly Groundwater Data* (IT, 2002d). Arsenic, which was also detected above the LOC in one well during Round E will also continue to be analyzed for in the subsequent sampling rounds. It should also be noted that no inorganic compounds were detected in the groundwater samples above RCRA concentration limits described in 40 CFR Part 264 Subpart F 264.94.

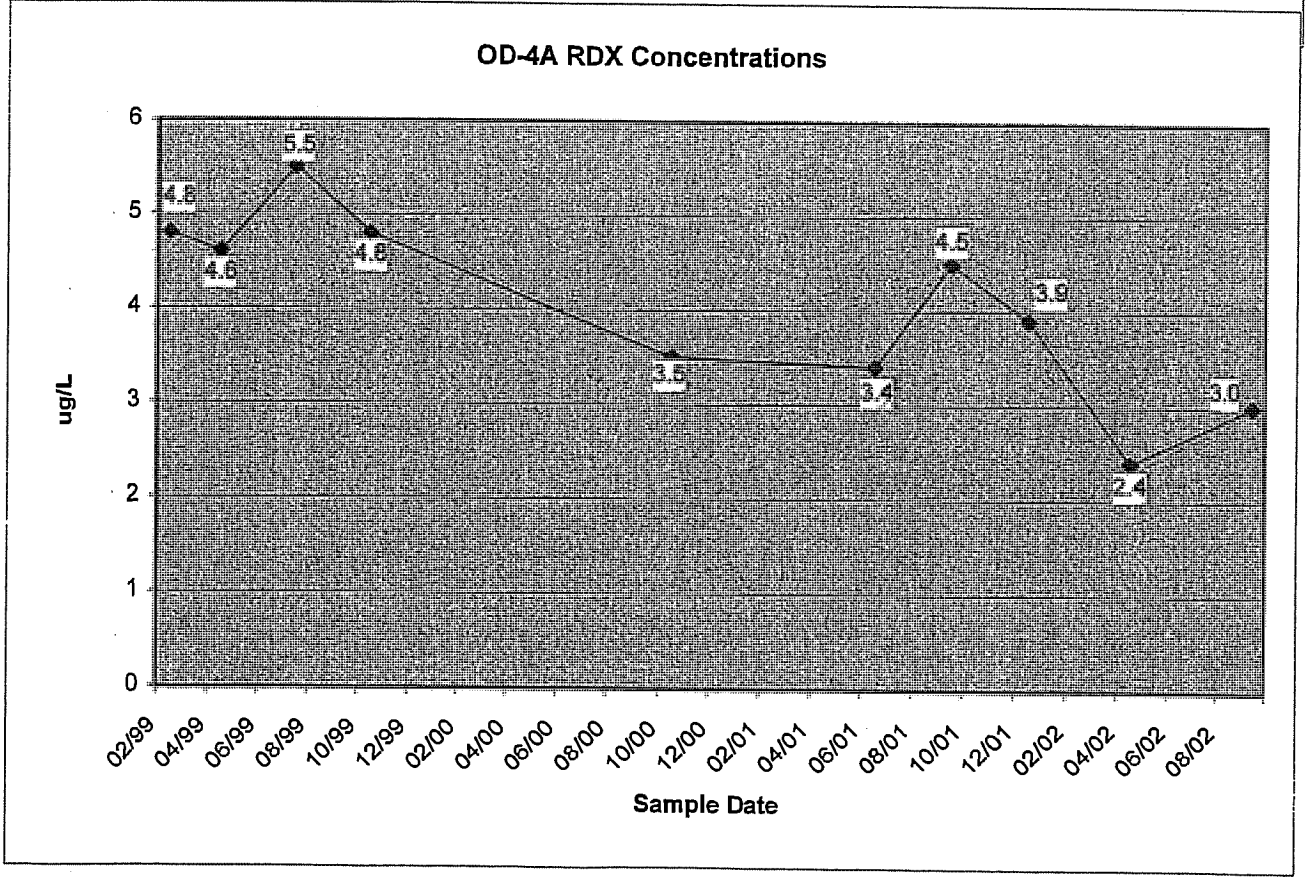
TABLE 4-1
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS DETECTED IN RINSE BLANK (µg/L; Rads - pCi/L)
PICATINNY ARSENAL

Sample ID: / Date Sampled: / Depth Sampled (ft): / Chemical	Analytical Results: GW091802R1, 09/18/02, —				
	Result	Q	RL/EQL	SQL	Lab
Volatiles					
Explosives					
Inorganics					
Cadmium	0.300	J	2.00	0.280	QT
Cobalt	1.10	J	50.0	0.740	QT
Potassium	170	J	5,000	23.0	QT
Vanadium	0.780	J	50.0	0.670	QT
Anions					
Sulfide	1,000		1,000	250	QT
Radiologicals					

Q = Flags/Qualifiers (QA/QC):
J = Detect, value is an estimate of the concentration.
U = Non-detect, value is the detection limit.
QT = Quanterra Laboratories, Inc.
RL/EQL = Reporting Limit / Estimated Quantitation Limit
SQL = Sample Quantitation Limit

FIGURE 4-1
RDX Concentrations over Time in
0D-2A and 0D-4A





5.0 ADDITIONAL INVESTIGATIONS

As approved in correspondence from NJDEP to PTA dated June 21, 2001 (Appendix A) and discussed at the November 20, 2001 meeting at PTA (Appendix C), the groundwater sampling program for the OD Area has been reduced from quarterly sampling events to semi-annual events. The resultant data from the four quarterly sampling events (Rounds A to D) have been statistically evaluated in accordance with 40 CFR Part 264. Based on the results of the statistical evaluation, a semi-annual monitoring program was developed and submitted to NJDEP for approval in December 2002 (IT, 2002d). The next semi-annual groundwater sampling event for the OD area (Round F) was scheduled for March 2003. However, due to the recent issues with laboratory certification and rejection of the analytical data, the groundwater sampling has been postponed until these issues can be resolved with NJDEP. The Army notified NJDEP of their intention to discontinue the groundwater sampling in correspondence submitted to NJDEP at the March 18, 2003 technical meeting in Trenton. The Army requests NJDEP concurrence on the reduced analytical program presented in the *Evaluation of Quarterly Groundwater Data* (IT, 2002d) prior to the next sampling event. The groundwater sampling will be resumed two weeks after resolution of the issues outlined in NJDEP correspondence to Picatinny Arsenal dated January 2, 2003.

6.0 REFERENCES

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TABLE 4-2
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L; Rads - pCi/L)
PICATINNY ARSENAL

Chemical	LOC (a):	Source	RCRA Maximum Concentration Limit (b):	Analytical Results																											
Sample ID:				OD-1A					OD-2A					OD-3A					OD-4A					OD-5A					OD-6A				
Date Sampled:				09/19/02					09/18/02					09/18/02					09/18/02					09/19/02					09/19/02				
Depth Sampled (ft):				5.0 - 10.0					10.0 - 15.0					10.0 - 15.0					10.0 - 15.0					10.0 - 15.0					10.0 - 20.0				
				Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab
Volatiles																																
Explosives																																
HMX	400	HA	NA	8.00		0.500	0.100	QT	3.60		0.500	0.100	QT	0.450	J	0.500	0.100	QT	1.80	J	0.500	0.100	QT	0.500	U	0.500	0.100	QT	0.500	U	0.500	0.100	QT
RDX	0.61	RBC	NA	3.50	J	0.500	0.130	QT	7.60	J	0.500	0.130	QT	0.190	J	0.500	0.130	QT	3.00	J	0.500	0.130	QT	0.500	U	0.500	0.130	QT	0.500	U	0.500	0.130	QT
Inorganics																																
Aluminum	200	Quality Criteria, NJPQL	NA	410		92.0	57.0	QT	180		92.0	57.0	QT	92.0	U	92.0	57.0	QT	2,400		92.0	57.0	QT	310		92.0	57.0	QT	2,300		92.0	57.0	QT
Arsenic	8	NJPQL	50.0	2.70	J	4.00	2.10	QT	2.30	J	4.00	2.10	QT	2.60	J	4.00	2.10	QT	4.00	U	4.00	2.10	QT	3.20	J	4.00	2.10	QT	22.0	J	4.00	2.10	QT
Barium	2,000	MCL, Quality Criteria, MCLG	1,000	52.0	J	200	0.940	QT	130	J	200	0.940	QT	7.00	J	200	0.940	QT	27.0	J	200	0.940	QT	50.0	J	200	0.940	QT	64.0	J	200	0.940	QT
Beryllium	4	MCL, MCLG	NA	2.00	U	2.00	0.600	QT	2.00	U	2.00	0.600	QT	2.00	U	2.00	0.600	QT	2.00	U	2.00	0.600	QT	2.00	U	2.00	0.600	QT	3.10		2.00	0.600	QT
Cadmium	4	Quality Criteria	100	0.590	J	2.00	0.280	QT	0.600	J	2.00	0.280	QT	2.00	U	2.00	0.280	QT	0.920	J	2.00	0.280	QT	2.00	U	2.00	0.280	QT	0.540	J	2.00	0.280	QT
Calcium	400,000	ADI	NA	7,800	J	5,000	59.0	QT	10,600	J	5,000	59.0	QT	7,900	J	5,000	59.0	QT	6,700	J	5,000	59.0	QT	3,900	J	5,000	59.0	QT	6,400	J	5,000	59.0	QT
Chromium	100	MCL, Quality Criteria, MCLG	50	5.50	J	10.0	1.50	QT	10.0	U	10.0	1.50	QT	2.90	J	10.0	1.50	QT	3.70	J	10.0	1.50	QT	4.70	J	10.0	1.50	QT	2.10	J	10.0	1.50	QT
Cobalt	730	RBC	NA	50.0	U	50.0	0.740	QT	2.90	J	50.0	0.740	QT	1.00	J	50.0	0.740	QT	4.30	J	50.0	0.740	QT	3.30	J	50.0	0.740	QT	3.90	J	50.0	0.740	QT
Copper	1,000	Quality Criteria, NJPQL	NA	4.00	J	9.00	1.70	QT	15.0	J	9.00	1.70	QT	2.10	J	9.00	1.70	QT	45.0		9.00	1.70	QT	5.40	J	9.00	1.70	QT	43.0	J	9.00	1.70	QT
Iron	300	Quality Criteria	NA	670	J	100	42.0	QT	2,600	J	100	42.0	QT	42.0	J	100	42.0	QT	3,700	J	100	42.0	QT	3,600	J	100	42.0	QT	79,000	J	100	42.0	QT
Lead	10	NJPQL	50	3.00	U	3.00	1.60	QT	3.00	U	3.00	1.60	QT	3.00	U	3.00	1.60	QT	26.0		3.00	1.60	QT	3.00	U	3.00	1.60	QT	19.0		3.00	1.60	QT
Magnesium	80,500	ADI	NA	2,400	J	5,000	35.0	QT	3,600	J	5,000	35.0	QT	1,700	J	5,000	35.0	QT	1,900	J	5,000	35.0	QT	1,400	J	5,000	35.0	QT	2,100	J	5,000	35.0	QT
Manganese	50	Quality Criteria	NA	590	J	15.0	0.680	QT	1,400	J	15.0	0.680	QT	1.20	J	15.0	0.680	QT	220	J	15.0	0.680	QT	1,100	J	15.0	0.680	QT	1,000	J	15.0	0.680	QT
Mercury	2	MCL, Quality Criteria, MCLG	2.0	0.0920	U	0.0920	0.0870	QT	0.0920	U	0.0920	0.0870	QT	0.0920	U	0.0920	0.0870	QT	0.170		0.0920	0.0870	QT	0.0920	U	0.0920	0.0870	QT	0.120		0.0920	0.0870	QT
Nickel	100	Quality Criteria	NA	6.90	J	40.0	2.90	QT	3.40	J	40.0	2.90	QT	3.10	J	40.0	2.90	QT	4.80	J	40.0	2.90	QT	6.80	J	40.0	2.90	QT	7.50	J	40.0	2.90	QT
Potassium	100,000	ADI	NA	480	J	5,000	23.0	QT	890	J	5,000	23.0	QT	600	J	5,000	23.0	QT	1,100	J	5,000	23.0	QT	660	J	5,000	23.0	QT	600	J	5,000	23.0	QT
Silver	2	NJPQL	50	4.00	U	4.00	0.980	QT	4.00	U	4.00	0.980	QT	4.00	U	4.00	0.980	QT	4.00	U	4.00	0.980	QT	4.00	U	4.00	0.980	QT	1.70	J	4.00	0.980	QT
Sodium	50,000	Quality Criteria	NA	3,300	J	5,000	360	QT	4,900	J	5,000	360	QT	2,900	J	5,000	360	QT	1,700	J	5,000	360	QT	5,000		5,000	360	QT	1,800	J	5,000	360	QT
Vanadium	260	RBC	NA	2.40	J	50.0	0.670	QT	0.850	J	50.0	0.670	QT	50.0	U	50.0	0.670	QT	4.40	J	50.0	0.670	QT	1.20	J	50.0	0.670	QT	1.90	J	50.0	0.670	QT
Zinc	5,000	Quality Criteria	NA	30.0		20.0	14.0	QT	57.0		20.0	14.0	QT	20.0	U	20.0	14.0	QT	43.0		20.0	14.0	QT	42.0		20.0	14.0	QT	84.0		20.0	14.0	QT
Anions																																
Ammonia	500	Quality Criteria	NA	88.0	J	200	34.0	QT	82.0	J	200	34.0	QT	110	J	200	34.0	QT	94.0	J	200	34.0	QT	170	J	200	34.0	QT	150	J	200	34.0	QT
Chloride	250,000	Quality Criteria	NA	3,860		1,000	94.0	QT	4,810		1,000	94.0	QT	2,520		1,000	94.0	QT	1,250		1,000	94.0	QT	4,010		1,000	94.0	QT	1,320		1,000	94.0	QT
Fluoride	2,000	Quality Criteria	NA	180	J	1,000	3.90	QT	80.0	J	1,000	3.90	QT	50.0	J	1,000	3.90	QT	50.0	J	1,000	3.90	QT	40.0	J	1,000	3.90	QT	100	J	1,000	3.90	QT
Nitrate	10,000	MCL, Quality Criteria, MCLG	NA	500	U	500	7.60	QT	150	J	500	7.60	QT	40.0	J	500	7.60	QT	140	J	500	7.60	QT	500	U	500	7.60	QT	110	J	500	7.60	QT
Perchlorate	18	AL	NA	48.4		4.00	2.00	QT	11.2		4.00	2.00	QT	4.00	U	4.00	2.00	QT	6.70		4.00	2.00	QT	4.00	U	4.00	2.00	QT	4.00	U	4.00	2.00	QT
Phosphorus	—	NA	NA	100	U	100	15.0	QT	39.0	J	100	15.0	QT	31.0	J	100	15.0	QT	2,900	D	500	75.0	QT	59.0	J	100	15.0	QT	16,000	D	2,000	300	QT
Sulfate	250,000	Quality Criteria	NA	12,700		1,000	110	QT	9,440		1,000	110	QT	9,440		1,000	110	QT	10,600		1,000	110	QT	12,000		1,000	110	QT	8,550		1,000	110	QT
Radiologicals																																
Bismuth-214	—	NA	NA	36.0	UJ	53.0	53.0	QT	59.0	J	51.0	51.0	QT	162	J	78.0	78.0	QT	270	J	93.0	93.0	QT	41.0	UJ	48.0	48.0	QT	378	J	31.0	31.0	QT
Lead-214	—	NA	NA	54.0	J	47.0	47.0	QT	36.0	UJ	48.0	48.0	QT	166	J	21.0	21.0	QT	196	J	28.0	28.0	QT	65.0	J	26.0	26.0	QT	359	J	32.0	32.0	QT
Radium-226	5	MCL	NA	0.250	U	0.300	0.300	QT	0.330	J	0.220	0.220	QT	0.140	U	0.220	0.220	QT	0.230	J	0.220	0.220	QT	-0.0400	U	0.240	0.240	QT	0.250	J	0.230	0.230	QT
Uranium-234	—	NA	NA	0.110	U	0.140	0.140	QT	0.0500	U	0.130	0.130	QT	0.0650	U	0.140	0.140	QT	0.0900	U	0.150	0.150	QT	0.0750	U	0.120	0.120	QT	2.62		0.160	0.160	QT
Uranium-235	—	NA	NA	-0.0120	U	0.170	0.170	QT	-0.00500	U	0.120	0.120	QT	0.0100	U	0.160	0.160	QT	-0.00800	U	0.190	0.190	QT	0.0560	U	0.180	0.180	QT	0.170	J	0.170	0.170	QT
Uranium-238	—	NA	NA	0.0190	U	0.120	0.120	QT	0.0660	U	0.140	0.140	QT	0.0480	U	0.130	0.130	QT	0.190	U	0.250	0.250	QT	0.0370	U	0.0990	0.0990	QT	3.22		0.180	0.180	QT

(a) See the "ARARs and Other Guidance to be Considered for Picatinny Arsenal Groundwater" table for a complete list of LOC values. Groundwater samples were compared to the lower of the Federal MCLs, the New Jersey State MCLs, the New Jersey

TABLE 4-2
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L; Rads - pCi/L)
PICATINNY ARSENAL

Chemical	Sample ID: / Date Sampled: / Depth Sampled (ft):	LOC (a):	Source	RCRA Maximum Concentration Limit (b):	Analytical Results																											
					OD-1A 09/19/02 5.0 - 10.0					OD-2A 09/18/02 10.0 - 15.0					OD-3A 09/18/02 10.0 - 15.0					OD-4A 09/18/02 10.0 - 15.0					OD-5A 09/19/02 10.0 - 15.0					OD-6A 09/19/02 10.0 - 20.0				
					Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab

Groundwater Quality Criteria or PQLs (whichever is higher), or any non-zero Federal MCLG. If the above are not available, groundwater comparison criteria are based on the lower of the following TBC: Federal Drinking Water Health Advisories or USEPA Region III Tap Water (noncarcinogenic or carcinogenic 10^{-6}) RBCs.

(b) Maximum concentration criteria established in 40 CFR Part 264 Subpart 264.94.

Bolded and shaded values indicate the detected result is above the Level of Concern (LOC).

ADI = Allowable Daily Intake
AL = Action Level
HA = Federal Drinking Water Standards and Health Advisories
MCL = Federal Maximum Contaminant Level
MCLG = Federal Maximum Contaminant Level Goal
NA = No value available.
NJPQL = New Jersey State Practical Quantitation Limit
Q = Flags/Qualifiers (QA/QC):
D = Result was obtained from the analysis of a dilution.
J = Detect, value is an estimate of the concentration.
R = Rejected result, value should not be used for any purpose.
U = Non-detect, value is the detection limit.
QC = New Jersey Groundwater Quality Criteria
QT = Quanterra Laboratories, Inc.
RBC = USEPA Region III Tap Water Risk Based Concentration
RL/EQL = Reporting Limit/Estimated Quantitation Limit
SQL = Sample Quantitation Limit

John S

DONALD T. DiFRANCESCO
Acting Governor

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Commissioner

MAR 07 2001

Thomas J. Solecki
Chief, Environmental
Affairs Division
Department of the Army
U.S. Army Armament Research,
Development and Engineering Center
Picatinny Arsenal, New Jersey 07806-5000

Re: Interim Status Groundwater Monitoring for the Open Detonation of Waste Explosives, Department of the Army, U.S. Army Armament Research, Development and Engineering Center, Picatinny Arsenal, Federal Enclave Located in Morris County, USEPA ID No. NJ3 210 020 704

Dear Mr. Solecki:

The New Jersey Department of Environmental Protection (Department), Division of Solid and Hazardous Waste, Bureau of Hazardous Waste and Transfer Facilities (Bureau) is in receipt of your September 8, 2000, letter. The letter states that Picatinny Arsenal will perform groundwater sampling at the open detonation range for the constituents listed in your September 8, 2000, letter in accordance with the procedures of the PICATINNY ARSENAL FACILITY-WIDE FIELD SAMPLING PLAN dated September 1998. Low flow sampling will be used for all of the constituents and New Jersey approved bailer methods will be employed for a separate analysis of metals only. The letter also requests concurrence with your interpretation that the interim status open burning or detonation of waste explosives is subject to 40 C.F.R. 265.382 and not 40 C.F.R. Part 265, Subparts M or N and, therefore, does not require groundwater monitoring provided it does not threaten human health or the environment.

The Bureau concurs with your statement that the interim status open burning and detonation of waste explosives is subject to the requirements of 40 C.F.R. 265.382 and not 40 C.F.R. Part 265, Subparts M or N. However, 40 C.F.R. 265.382, in part, states that owners or operators choosing to open burn or detonate must do so in a manner that does not threaten human health or the environment.

The Bureau has determined that, the operation of the open detonation range is a potential threat to human health and the environment because the open detonation of waste explosives takes place directly on the ground without the use of any engineering controls that would prevent the migration of hazardous waste or hazardous waste constituents to the soils or groundwater. Furthermore, in order for the Bureau to determine if the unit is being operated in a manner that does not threaten human health or the environment, as required by 40 C.F.R. 265.382, groundwater monitoring must be conducted.

In addition, the Bureau in conjunction with its support group, the Bureau of Groundwater Pollution Abatement, has made the following determinations regarding its review of four rounds of groundwater monitoring data collected at the open detonation range designated as Rounds A through D for the first quarter through the fourth quarter, respectively, of 1999:

A) Round A:

Class IIA groundwater quality criteria have been exceeded for lead in downgradient compliance monitoring well OD-3A. This criteria exceedence is also significantly greater than the background monitoring well sample concentrations (See Attachment); and

Federal Lifetime Drinking Water Health Advisory criteria for RDX have been exceeded in background monitoring well OD-6A and the downgradient compliance well OD-4A. The RDX concentration in the downgradient compliance monitoring well OD-4A is greater than the concentration in background monitoring well OD-6A.

B) Round B:

Class IIA groundwater quality criteria have been exceeded for lead in downgradient compliance monitoring well OD-2A. This criteria exceedence is also significantly greater than the background monitoring well sample concentrations (See Attachment);

Class IIA groundwater quality criteria have been exceeded for arsenic and lead in downgradient compliance monitoring well OD-4A. These criteria exceedences are also significantly greater than the background monitoring well sample concentrations (See Attachment); and

Federal Lifetime Drinking Water Health Advisory criteria for RDX have been exceeded in downgradient compliance monitoring wells OD-2A and OD-4A. The criteria exceedences are also significantly greater than background monitoring well sample concentrations (See Attachment).

C) Round C:

Class IIA groundwater quality criteria have been exceeded for cadmium, lead and arsenic in downgradient compliance monitoring well OD-2A. These criteria exceedences are also significantly greater than the background monitoring well sample concentrations (See Attachment);

Class IIA groundwater quality criteria have been exceeded for cadmium and lead in downgradient compliance monitoring well OD-4A. These criteria exceedences are also

significantly greater than the background monitoring well sample concentrations (See Attachment); and

Federal Lifetime Drinking Water Health Advisory criteria for RDX have been exceeded in downgradient compliance monitoring well OD-4A. This criteria exceedence is also significantly greater than background monitoring well sample concentrations (See Attachment).

D) Round D:

Class IIA groundwater quality criteria have been exceeded for lead in downgradient compliance monitoring well OD-2A. This criteria exceedence is also significantly greater than the background monitoring well sample concentrations (See Attachment);

Class IIA groundwater quality criteria have been exceeded for cadmium, lead and arsenic in downgradient compliance monitoring well OD-4A. These criteria exceedences are also significantly greater than the background monitoring well sample concentrations (See Attachment); and

Federal Lifetime Drinking Water Health Advisory criteria for RDX have been exceeded in downgradient compliance monitoring wells OD-2A, OD-4A and OD-5A. These criteria exceedences are also significantly greater than background monitoring well sample concentrations (See Attachment).

In addition, during a February 10, 2000, meeting Picatinny Arsenal presented data to the Department indicating that the concentration of lead in the surface water adjacent to the open detonation unit is above surface water quality criteria.

The data referenced in A through D above indicates that a release of hazardous waste or hazardous waste constituents has occurred from the open detonation range. Furthermore, the release has entered the groundwater and has migrated to the subsurface environment and the surface water and may have an adverse effect on human health or the environment.

Please be advised that the Bureau has transferred the information listed in items A through D above to the Bureau of Site Assessment for integration into the Department's "Case Management Strategy" for assignment to the appropriate Bureau for any possible future Departmental action regarding this matter. Please note that this Bureau will not be the lead for oversight of any possible future Departmental remediation of this release.

Regarding your statement that the groundwater will be sampled for the constituents listed in your September 8, 2000, letter in accordance with the procedures of the PICATINNY ARSENAL FACILITY-WIDE FIELD SAMPLING PLAN dated September 1998 using low flow sampling for all of the constituents and New Jersey approved bailer methods for a separate analysis of metals only, the Bureau concurs that the above referenced procedures of the PICATINNY ARSENAL FACILITY-WIDE FIELD SAMPLING PLAN dated September 1998 should be used. However, the Bureau does not agree with the proposed list of constituents. Instead, the Bureau has determined that the groundwater must be sampled and analyzed for the following constituents listed in the PICATINNY

ARSENAL FACILITY-WIDE FIELD SAMPLING PLAN dated September 1998 and other constituents deemed appropriate by the Bureau:

Table 4-5 TCL Volatile Organic Compounds with Additional Compounds;

Table 4-6 Semivolatile Organic Compounds with Additional Compounds and n-nitrosodimethylamine (NDMA);

Table 4-7 TAL Metals with Additional Elements;

Table 4-8 Cyanides;

Table 4-10 Anions;

Table 4-12 Explosives with Additional Compounds and diphenylamine, diecthyleneglycol dinitrate (DEGDN), triethyleneglycol dinitrate (TEGDN), trimethyleneglycol dinitrate (TMETN), 1,3-diamino-2, 4,6-trinitrobenzene (DATB), HNS, perchlorates, white and red phosphorus, ammonium pirate and nitrate and nitrite (As nitrogen);

Table 4-13 TCL Pesticides/PCBs with Additional Compounds; and

Conventional Parameters: pH, temperature (°C), specific conductance (µS), dissolved oxygen (mg/l) and turbidity (NTU).

The Department offers certifications for the following SW846 Methods: 8330, 8331, 8332 and 7580. Therefore, if your facility chooses a commercial laboratory for these analyses, the laboratory must be New Jersey certified for these methods. However, if your facility chooses a Federal Department of Defense laboratory for these analyses, New Jersey certification of that laboratory is not required. In addition, please note that white phosphorus can be measured directly by using SW846 Method 7580. Ammonium picrate can be analyzed in water by High Pressure Liquid Chromatography (HPLC). This test can be used instead of analyzing for ammonia and picric acid individually. However, if ammonia and picric acid are analyzed, the facility must be able to demonstrate the relationship of the concentration of both compounds to the actual molar ratio of ammonium picrate in the groundwater.

Based on the above determinations, Picatinny Arsenal must begin quarterly groundwater monitoring during interim status at the open detonation range for the constituents listed above within three (3) months from the date of this letter. After eight (8) quarters of groundwater monitoring data have been collected and reviewed by the Department, the Bureau will reevaluate the constituents for which sampling and analysis must be performed. All groundwater samples must be collected and analyzed in accordance with the procedures specified in the PICATINNY ARSENAL FACILITY-WIDE FIELD SAMPLING PLAN dated September 1998. In addition, the Bureau requests that all future groundwater monitoring and validation data for the open detonation range be sent to this Bureau within three (3) months from the date of sampling.

Should you have any questions regarding this matter, please E-mail John P. Scott of my staff at jscott@dep.state.nj.us or call him at (609) 292-9880.

Very truly yours,

Anthony Fontana, Chief
Bureau of Hazardous Waste
and Transfer Facilities

EP58/JPS
Document: PASUBX12
Attachment
C: Tracy Grabiak, BGWPA, with attachment
Joseph Marchesani, BGWPA, with attachment
James Kealy, BEERA, with attachment
Greg Zalaskus, BCM, with attachment
Kathleen Grimes, BEMQA, with attachment
Jeff Sterling, BHWCE-Northern, with attachment
Barry Tornick, USEPA, Region II, with attachment
Stephen Shukailo, Mayor, Town of Dover, with attachment
Russel Felter, Mayor, Jefferson Township, with attachment
Harry R. Shupe, Mayor, Wharton Borough, with attachment
Joeseph Lebar, Mayor, Rockaway Borough, with attachment
John P. Inglesino, Mayor, Rockaway Township, with attachment
Sandy Urgo, Mayor, Roxbury Township, with attachment
Paul Minenna, Councilman, Rockaway Township, with attachment

DONALD T. DIFRANCESCO
Acting Governor

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Commissioner

JUN 21 2001

Thomas J. Solecki
Chief, Environmental
Affairs Division
Department of the Army
U.S. Army Armament Research,
Development and Engineering Center
Picatinny Arsenal, New Jersey 07806-5000

Re: Interim Status Groundwater Monitoring for the Open Detonation of Waste Explosives, Department of the Army, U.S. Army Armament Research, Development and Engineering Center, Picatinny Arsenal, Federal Enclave Located in Morris County, USEPA ID No. NJ3 210 020 704

Dear Mr. Solecki:

The New Jersey Department of Environmental Protection (Department), Division of Solid and Hazardous Waste, Bureau of Hazardous Waste and Transfer Facilities (Bureau) is in receipt of your May 3, 2001, letter. The letter contains comments on the Bureau's March 7, 2001, letter regarding the interim status groundwater monitoring requirements for the open detonation of waste explosives. The Bureau has reviewed the comments submitted and has made the following determinations:

Comment # 1

A quarterly monitoring program will be committed to for all existing open detonation wells for one year for all constituents listed in the revised Subpart X permit application. The resultant data will be used to develop a semi-annual monitoring program in compliance with 40 C.F.R. Part 264. The four quarters of monitoring data is also consistent with the State equivalent of 40 C.F.R. Part 270.

Response

The Department does not agree that the Federal requirement is equivalent to the State requirement. N.J.A.C. 7:26E-6.1(e) requires eight quarters of monitoring and, therefore, is more stringent than the Federal requirement. However, the Department agrees to grant a variance to reduce the frequency of monitoring from eight to four quarters provided the four quarters of monitoring are consecutive.

Regarding your statement that the resultant data will be used to develop a semi-annual monitoring program in compliance with 40 C.F.R. Part 264. Proposals to sample the monitoring wells at a decreased frequency will only be considered by the Department after four consecutive quarters of monitoring data have been collected and reviewed.

Comments # 2 and 3

Picatinny Arsenal will analyze the additional parameters requested in your letter, which are not listed in the Subpart X permit application for the first two quarters of the monitoring program. The following parameters are not included in the Subpart X permit application:

a) TCL Volatiles and additional compounds.
b) Semi-volatile organic compounds with additional compounds and NDMA.
c) TCL pesticides/PCBs with additional compounds.

Analysis of these compounds will continue if the resultant data indicates levels above the detection limit for that compound.

The Bureau's letter did not provide any justification for the inclusion of the above listed compounds in the groundwater-monitoring program. The Subpart X permit application provides justification for the inclusion or elimination of compounds based on historical records. The record indicates that these compounds were never tested or disposed of at the open detonation range. Therefore, two rounds of sampling are sufficient for monitoring purposes.

Response

The Department agrees that two rounds of sampling are adequate for monitoring of the above referenced compounds. In addition, the use of detection limits for determining if analysis will continue is acceptable provided the detection limits have been approved by the Department. However, detection limits were not included in your submittal. Therefore, please submit this information, for the Department's review and approval, within thirty (30) days from the date of this letter.

Comment # 4

New Jersey certified laboratories will be used for methods requiring State certification.

Response

The Department concurs with the comment.

Comment # 5

Groundwater sampling will be performed using low-flow methodology that was approved in the Field Sampling Plan (FSP) for all parameters including the inorganics. The USEPAs directives and guidance clearly maintains the superiority of low-flow methodology for providing a representative sample with

regard to evaluating metal concentrations in groundwater. Decisions will not be based on the results of unfiltered groundwater samples based on samples with traditional bailer methods.

Response

Low flow sampling is acceptable as long as conventional bailer sampling is also conducted. Any sampling that does not include conventional bailer sampling will be at your own risk.

Comment # 6

All data, monitoring results and validation reports will be submitted within one hundred days after the last day of the quarterly sampling event. This conforms with Picatinny Arsenal's Facility Wide Sampling Plan (FSP) that was submitted as part of the Subpart X permit application. Any subsequent comments on the adequacy or completeness of the FSP by the Department as part of the Subpart X permit application process will not invalidate the data from the sampling.

Response

The Department agrees that all data, monitoring results and validation reports may be submitted within one hundred days after the last day of the quarterly sampling event. However, the Department does not agree that any subsequent comments on the adequacy or completeness of the FSP by the Department as part of the Subpart X permit application process will not invalidate the data from the sampling. Any written correspondence from the Department that is issued prior to any sampling event must be adhered to.

Picatinny Arsenal shall conduct the first round of quarterly groundwater sampling within thirty (30) days from the date of this letter. The groundwater sampling and analysis shall adhere to the requirements of this letter in conjunction with the Bureau's letter of March 7, 2001.

Should you have any questions regarding this matter, please E-mail John P. Scott at jscott@dep.state.nj.us or call him at 609-292-9880.

Very truly yours,

Anthony Fontana, Chief
Bureau of Hazardous Waste
and Transfer Facilities

EP58/JPS
C: Barry Tornick, USEPA, Region II
Jeffrey Sterling, BHWCE, Northern Region
Tracy Grabiak, GWPA
Document: PASUBX22

TABLE 1
GROUNDWATER MONITORING CONSTITUENTS FOR THE DETECTION MONITORING SYSTEM AT THE OPEN DETONATION AREA

Parameter	Compounds	Criterion
Explosives	2,4-Dinitrotoluene	1.0 µg/L
	1,3-Dinitrobenzene	TBD
	1,3,5-Trinitrobenzene	TBD
	2,4,6-Trinitrotoluene	44.0 µg/L
	2,6-Dinitrotoluene	1.0 µg/L
	Cyclotetramethylene tetranitramine (HMX)	35.0 µg/L
	Cyclotrimethylene trinitramine (RDX)	35.0 µg/L
	N-Methyl-N-2,4,6-tetranitroaniline (Tetryl)	TBD
	4-Amino-2,6-dinitrotoluene	TBD
	2-Amino-4,6-dinitrotoluene	TBD
	Nitrobenzene	TBD
	2-Nitrotoluene	TBD
	3-Nitrotoluene	TBD
	4-Nitrotoluene	TBD
	Nitroguanidine	TBD
	Pentaerythritol tetranitrate (PETN)	TBD
	Nitrocellulose	TBD
	Picric acid	0.5 mg/L
	Ammonium Picrate	TBD
	Tetrazene	TBD
	Nitroglycerin (NG)	TBD
	Diethyleneglycol Dinitrate DEGDN	TBD
	Triethyleneglycol Dinitrate TEGDN	TBD
	Trimethyleneglycol Dinitrate TMETN	TBD
	1,3-Diamino-2,4,6-trinitrobenzene DATB	TBD
	2,2',4,4',6,6'-Hexanitrostilbene HNS	TBD
Metals	Aluminum	TBD
	Antimony	TBD
	Arsenic	0.05 mg/L
	Barium	1.00 mg/L
	Beryllium	TBD
	Cadmium	0.01 mg/L
	Calcium	TBD
	Chromium	0.05 mg/L
	Cobalt	TBD
	Copper	TBD
	Iron	TBD
	Lead	0.05 mg/L
	Magnesium	TBD
	Manganese	TBD
	Mercury	0.002 mg/L
	Nickel	TBD
	Potassium	TBD
	Selenium	0.01 mg/L
	Silver	0.05 mg/L
	Sodium	TBD
	Thallium	TBD

TABLE 1 (CONTINUED)
GROUNDWATER MONITORING CONSTITUENTS FOR THE DETECTION MONITORING SYSTEM AT THE OPEN DETONATION AREA

Parameter	Compounds	Criterion
Metals	Vanadium	TBD
	Zinc	TBD
	Boron	TBD
	Titanium	TBD
	Strontium	TBD
	Zirconium	TBD
	Silicon	TBD
	Tin	TBD
	Tungsten	TBD
	Molybdenum	TBD
Semivolatile	Diphenylamine	TBD
Anions	Perchlorate	TBD
	No 2.- No 3 (as N)	10.0 mg/L
	Ammonia	TBD
White Phosphorous	White Phosphorous	TBD
Red Phosphorous	Red Phosphorous	TBD

Legend:

µg/L micrograms per liter
mg/L milligrams per liter
TBD To Be Determined

TABLE B-1
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS ANALYZED IN GROUNDWATER (µg/L; Rads - pCi/L)
PICATINNY ARSENAL

Chemical	Sample ID: / Date Sampled: / Depth Sampled (ft):	LOC (a):	Source	RCRA Maximum Concentration Limit (b):	Analytical Results																											
					OD-1A 09/19/02 5.0 - 10.0					OD-2A 09/18/02 10.0 - 15.0					OD-3A 09/18/02 10.0 - 15.0					OD-4A 09/18/02 10.0 - 15.0					OD-5A 09/19/02 10.0 - 15.0					OD-6A 09/19/02 10.0 - 20.0				
					Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab
Anions																																
Ammonia	500	Quality Criteria	NA	88.0	J	200	34.0	QT	82.0	J	200	34.0	QT	110	J	200	34.0	QT	94.0	J	200	34.0	QT	170	J	200	34.0	QT	150	J	200	34.0	QT
Chloride	250,000	Quality Criteria	NA	3,860		1,000	94.0	QT	4,810		1,000	94.0	QT	2,520		1,000	94.0	QT	1,250		1,000	94.0	QT	4,010		1,000	94.0	QT	1,320		1,000	94.0	QT
Fluoride	2,000	Quality Criteria	NA	180	J	1,000	3.90	QT	80.0	J	1,000	3.90	QT	50.0	J	1,000	3.90	QT	50.0	J	1,000	3.90	QT	40.0	J	1,000	3.90	QT	100	J	1,000	3.90	QT
Nitrate	10,000	MCL, Quality Criteria, MCLG	NA	500	U	500	7.60	QT	150	J	500	7.60	QT	40.0	J	500	7.60	QT	140	J	500	7.60	QT	500	U	500	7.60	QT	110	J	500	7.60	QT
Nitrite	1,000	MCL, Quality Criteria, MCLG	NA	500	U	500	20.0	QT	500	U	500	20.0	QT	500	U	500	20.0	QT	500	U	500	20.0	QT	500	U	500	20.0	QT	500	U	500	20.0	QT
Perchlorate	18	AL	NA	484		4.00	2.00	QT	11.2		4.00	2.00	QT	4.00	U	4.00	2.00	QT	6.70		4.00	2.00	QT	4.00	U	4.00	2.00	QT	4.00	U	4.00	2.00	QT
Phosphorus	—	NA	NA	100	U	100	15.0	QT	39.0	J	100	15.0	QT	31.0	J	100	15.0	QT	2,900	D	500	75.0	QT	59.0	J	100	15.0	QT	16,000	D	2,000	300	QT
Sulfate	250,000	Quality Criteria	NA	12,700		1,000	110	QT	9,440		1,000	110	QT	9,440		1,000	110	QT	10,600		1,000	110	QT	12,000		1,000	110	QT	8,550		1,000	110	QT
Sulfide	—	NA	NA	3,700	R	1,000	250	QT	530	R	1,000	250	QT	530	R	1,000	250	QT	530	R	1,000	250	QT	2,800	R	1,000	250	QT	1,000	R	1,000	250	QT
Radiologicals																																
Americium-241	—	NA	NA	-6.00	U	57.0	57.0	QT	-7.00	U	55.0	55.0	QT	-2.00	U	65.0	65.0	QT	7.00	U	27.0	27.0	QT	-10.0	U	54.0	54.0	QT	-21.0	U	30.0	30.0	QT
Bismuth-212	—	NA	NA	-66.0	U	120	120	QT	44.0	U	180	180	QT	10.0	U	210	210	QT	-40.0	U	250	250	QT	99.0	U	220	220	QT	-40.0	U	200	200	QT
Bismuth-214	—	NA	NA	36.0	UJ	53.0	53.0	QT	59.0	J	51.0	51.0	QT	162	J	78.0	78.0	QT	270	J	93.0	93.0	QT	41.0	UJ	48.0	48.0	QT	378	J	31.0	31.0	QT
Cesium-137	—	NA	NA	0.200	U	14.0	14.0	QT	-1.10	U	14.0	14.0	QT	2.20	U	18.0	18.0	QT	-0.400	U	19.0	19.0	QT	-1.90	U	12.0	12.0	QT	-12.0	U	23.0	23.0	QT
Cobalt-60	—	NA	NA	1.10	U	16.0	16.0	QT	-7.10	U	11.0	11.0	QT	-8.30	U	14.0	14.0	QT	-0.500	U	21.0	21.0	QT	5.70	U	16.0	16.0	QT	-2.00	U	22.0	22.0	QT
Lead-212	—	NA	NA	-26.0	U	22.0	22.0	QT	-17.0	U	23.0	23.0	QT	-30.0	U	27.0	27.0	QT	-21.0	U	24.0	24.0	QT	-15.0	U	25.0	25.0	QT	-5.00	U	29.0	29.0	QT
Lead-214	—	NA	NA	54.0	J	47.0	47.0	QT	36.0	UJ	48.0	48.0	QT	166	J	21.0	21.0	QT	196	J	28.0	28.0	QT	65.0	J	26.0	26.0	QT	359	J	32.0	32.0	QT
Radium-226	5	MCL	NA	0.250	U	0.300	0.300	QT	0.330	J	0.220	0.220	QT	0.140	U	0.220	0.220	QT	0.230	J	0.220	0.220	QT	-0.0400	U	0.240	0.240	QT	0.250	J	0.230	0.230	QT
Radium-228	—	NA	NA	0.440	U	0.870	0.870	QT	0.530	U	0.640	0.640	QT	0.0600	U	0.620	0.620	QT	0.310	U	0.640	0.640	QT	0.370	U	0.760	0.760	QT	0.120	U	0.920	0.920	QT
Uranium-234	—	NA	NA	0.110	U	0.140	0.140	QT	0.0500	U	0.130	0.130	QT	0.0650	U	0.140	0.140	QT	0.0900	U	0.150	0.150	QT	0.0750	U	0.120	0.120	QT	2.62		0.160	0.160	QT
Uranium-235	—	NA	NA	-0.0120	U	0.170	0.170	QT	-0.00500	U	0.120	0.120	QT	0.0100	U	0.160	0.160	QT	-0.00800	U	0.190	0.190	QT	0.0560	U	0.180	0.180	QT	0.170	J	0.170	0.170	QT
Uranium-238	—	NA	NA	0.0190	U	0.120	0.120	QT	0.0660	U	0.140	0.140	QT	0.0480	U	0.130	0.130	QT	0.190	U	0.250	0.250	QT	0.0370	U	0.0990	0.0990	QT	3.22		0.180	0.180	QT

(a) See the "ARARs and Other Guidance to be Considered for Picatinny Arsenal Groundwater" table for a complete list of LOC values. Groundwater samples were compared to the lower of the Federal MCLs, the New Jersey State MCLs, the New Jersey Groundwater Quality Criteria or PQLs (whichever is higher), or any non-zero Federal MCLG. If the above are not available, groundwater comparison criteria are based on the lower of the following TBC: Federal Drinking Water Health Advisories or USEPA Region III Tap Water (noncarcinogenic or carcinogenic 10^{-6}) RBCs.

(b) Maximum concentration criteria established in 40 CFR Part 264 Subpart 264.94.

Bolded and shaded values indicate the detected result is above the Level of Concern (LOC).

ADI = Allowable Daily Intake
AL = Action Level
HA = Federal Drinking Water Standards and Health Advisories
MCL = Federal Maximum Contaminant Level
MCLG = Federal Maximum Contaminant Level Goal
NA = No value available.
NJPQL = New Jersey State Practical Quantitation Limit
Q = Flags/Qualifiers (QA/QC):
D = Result was obtained from the analysis of a dilution.
J = Detect, value is an estimate of the concentration.
R = Rejected result, value should not be used for any purpose.
U = Non-detect, value is the detection limit.
QC = New Jersey Groundwater Quality Criteria
QT = Quanterra Laboratories, Inc.
RBC = USEPA Region III Tap Water Risk Based Concentration
RL/EQL = Reporting Limit/Estimated Quantitation Limit
SQL = Sample Quantitation Limit

TABLE B-1
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS ANALYZED IN GROUNDWATER (µg/L; Rads - pCi/L)
PICATINNY ARSENAL

Chemical	LOC (a):	Source	RCRA Maximum Concentration Limit (b):	Sample ID: / Date Sampled: / Depth Sampled (ft):	Analytical Results																											
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					Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab
Volatiles																																
Ethylene Oxide	0.023	RBC	NA		1,000	UJ	1,000	530	QT	1,000	UJ	1,000	530	QT	1,000	UJ	1,000	530	QT	1,000	UJ	1,000	530	QT	1,000	UJ	1,000	530	QT	1,000	UJ	1,000	530	QT
Explosives																																
1,3-Dinitrobenzene	1	HA	NA		0.200	U	0.200	0.0800	QT	0.200	U	0.200	0.0800	QT	0.200	U	0.200	0.0800	QT	0.200	U	0.200	0.0800	QT	0.200	U	0.200	0.0800	QT	0.200	U	0.200	0.0800	QT
2,4-Dinitrotoluene	10	NJPQL	NA		0.200	U	0.200	0.0700	QT	0.200	U	0.200	0.0700	QT	0.200	U	0.200	0.0700	QT	0.200	U	0.200	0.0700	QT	0.200	U	0.200	0.0700	QT	0.200	U	0.200	0.0700	QT
2,6-Dinitrotoluene	10	NJPQL	NA		0.200	U	0.200	0.110	QT	0.200	U	0.200	0.110	QT	0.200	U	0.200	0.110	QT	0.200	U	0.200	0.110	QT	0.200	U	0.200	0.110	QT	0.200	U	0.200	0.110	QT
2-amino-4,6-Dinitrotoluene	2.2	RBC	NA		0.200	U	0.200	0.0900	QT	0.200	U	0.200	0.0900	QT	0.200	U	0.200	0.0900	QT	0.200	U	0.200	0.0900	QT	0.200	U	0.200	0.0900	QT	0.200	U	0.200	0.0900	QT
4-amino-2,6-Dinitrotoluene	2.2	RBC	NA		0.200	U	0.200	0.110	QT	0.200	U	0.200	0.110	QT	0.200	U	0.200	0.110	QT	0.200	U	0.200	0.110	QT	0.200	U	0.200	0.110	QT	0.200	U	0.200	0.110	QT
HMX	400	HA	NA		8.00		0.500	0.100	QT	3.60		0.500	0.100	QT	0.450	J	0.500	0.100	QT	1.80	J	0.500	0.100	QT	0.500	U	0.500	0.100	QT	0.500	U	0.500	0.100	QT
Nitrobenzene	10	NJPQL	NA		0.200	U	0.200	0.0700	QT	0.200	U	0.200	0.0700	QT	0.200	U	0.200	0.0700	QT	0.200	U	0.200	0.0700	QT	0.200	U	0.200	0.0700	QT	0.200	U	0.200	0.0700	QT
2-Nitrotoluene	61	RBC	NA		0.200	U	0.200	0.140	QT	0.200	U	0.200	0.140	QT	0.200	U	0.200	0.140	QT	0.200	U	0.200	0.140	QT	0.200	U	0.200	0.140	QT	0.200	U	0.200	0.140	QT
3-Nitrotoluene	120	RBC	NA		0.200	U	0.200	0.130	QT	0.200	U	0.200	0.130	QT	0.200	U	0.200	0.130	QT	0.200	U	0.200	0.130	QT	0.200	U	0.200	0.130	QT	0.200	U	0.200	0.130	QT
4-Nitrotoluene	61	RBC	NA		0.200	U	0.200	0.170	QT	0.200	U	0.200	0.170	QT	0.200	U	0.200	0.170	QT	0.200	U	0.200	0.170	QT	0.200	U	0.200	0.170	QT	0.200	U	0.200	0.170	QT
RDX	0.61	RBC	NA		3.50	J	0.500	0.130	QT	7.60	J	0.500	0.130	QT	0.190	J	0.500	0.130	QT	3.00	J	0.500	0.130	QT	0.500	U	0.500	0.130	QT	0.500	U	0.500	0.130	QT
Tetryl	370	RBC	NA		0.200	U	0.200	0.170	QT	0.200	U	0.200	0.170	QT	0.200	U	0.200	0.170	QT	0.200	U	0.200	0.170	QT	0.200	U	0.200	0.170	QT	0.200	U	0.200	0.170	QT
1,3,5-Trinitrobenzene	1,100	RBC	NA		0.200	U	0.200	0.110	QT	0.200	U	0.200	0.110	QT	0.200	U	0.200	0.110	QT	0.200	U	0.200	0.110	QT	0.200	U	0.200	0.110	QT	0.200	U	0.200	0.110	QT
2,4,6-Trinitrotoluene	2	HA	NA		0.200	U	0.200	0.0800	QT	0.200	U	0.200	0.0800	QT	0.200	U	0.200	0.0800	QT	0.200	U	0.200	0.0800	QT	0.200	U	0.200	0.0800	QT	0.200	U	0.200	0.0800	QT
Inorganics																																
Aluminum	200	Quality Criteria, NJPQL	NA		410		92.0	57.0	QT	180		92.0	57.0	QT	92.0	U	92.0	57.0	QT	2,400		92.0	57.0	QT	310		92.0	57.0	QT	2,300		92.0	57.0	QT
Antimony	6	MCL, MCLG	NA		10.0	U	10.0	3.40	QT	10.0	U	10.0	3.40	QT	10.0	U	10.0	3.40	QT	10.0	U	10.0	3.40	QT	10.0	U	10.0	3.40	QT	10.0	U	10.0	3.40	QT
Arsenic	8	NJPQL	50.0		2.70	J	4.00	2.10	QT	2.30	J	4.00	2.10	QT	2.60	J	4.00	2.10	QT	4.00	U	4.00	2.10	QT	3.20	J	4.00	2.10	QT	22.0	J	4.00	2.10	QT
Barium	2,000	MCL, Quality Criteria, MCLG	1,000		52.0	J	200	0.940	QT	130	J	200	0.940	QT	7.00	J	200	0.940	QT	27.0	J	200	0.940	QT	50.0	J	200	0.940	QT	64.0	J	200	0.940	QT
Beryllium	4	MCL, MCLG	NA		2.00	U	2.00	0.600	QT	2.00	U	2.00	0.600	QT	2.00	U	2.00	0.600	QT	2.00	U	2.00	0.600	QT	2.00	U	2.00	0.600	QT	3.10		2.00	0.600	QT
Cadmium	4	Quality Criteria	100		0.590	J	2.00	0.280	QT	0.600	J	2.00	0.280	QT	2.00	U	2.00	0.280	QT	0.920	J	2.00	0.280	QT	2.00	U	2.00	0.280	QT	0.540	J	2.00	0.280	QT
Calcium	400,000	ADI	NA		7,800	J	5,000	59.0	QT	10,600	J	5,000	59.0	QT	7,900	J	5,000	59.0	QT	6,700	J	5,000	59.0	QT	3,900	J	5,000	59.0	QT	6,400	J	5,000	59.0	QT
Chromium	100	MCL, Quality Criteria, MCLG	50		5.50	J	10.0	1.50	QT	10.0	U	10.0	1.50	QT	2.90	J	10.0	1.50	QT	3.70	J	10.0	1.50	QT	4.70	J	10.0	1.50	QT	2.10	J	10.0	1.50	QT
Cobalt	730	RBC	NA		50.0	U	50.0	0.740	QT	2.90	J	50.0	0.740	QT	1.00	J	50.0	0.740	QT	4.30	J	50.0	0.740	QT	3.30	J	50.0	0.740	QT	3.90	J	50.0	0.740	QT
Copper	1,000	Quality Criteria, NJPQL	NA		4.00	J	9.00	1.70	QT	15.0	J	9.00	1.70	QT	2.10	J	9.00	1.70	QT	45.0		9.00	1.70	QT	5.40	J	9.00	1.70	QT	43.0	J	9.00	1.70	QT
Iron	300	Quality Criteria	NA		670	J	100	42.0	QT	2,600	J	100	42.0	QT	42.0	J	100	42.0	QT	3,700	J	100	42.0	QT	3,600	J	100	42.0	QT	79,000	J	100	42.0	QT
Lead	10	NJPQL	50		3.00	U	3.00	1.60	QT	3.00	U	3.00	1.60	QT	3.00	U	3.00	1.60	QT	26.0		3.00	1.60	QT	3.00	U	3.00	1.60	QT	19.0		3.00	1.60	QT
Magnesium	80,500	ADI	NA		2,400	J	5,000	35.0	QT	3,600	J	5,000	35.0	QT	1,700	J	5,000	35.0	QT	1,900	J	5,000	35.0	QT	1,400	J	5,000	35.0	QT	2,100	J	5,000	35.0	QT
Manganese	50	Quality Criteria	NA		59.0	J	15.0	0.680	QT	1,400	J	15.0	0.680	QT	1.20	J	15.0	0.680	QT	220	J	15.0	0.680	QT	1,100	J	15.0	0.680	QT	1,000	J	15.0	0.680	QT
Mercury	2	MCL, Quality Criteria, MCLG	2.0		0.0920	U	0.0920	0.0870	QT	0.0920	U	0.0920	0.0870	QT	0.0920	U	0.0920	0.0870	QT	0.170		0.0920	0.0870	QT	0.0920	U	0.0920	0.0870	QT	0.120		0.0920	0.0870	QT
Nickel	100	Quality Criteria	NA		6.90	J	40.0	2.90	QT	3.40	J	40.0	2.90	QT	3.10	J	40.0	2.90	QT	4.80	J	40.0	2.90	QT	6.80	J	40.0	2.90	QT	7.50	J	40.0	2.90	QT
Potassium	100,000	ADI	NA		480	J	5,000	23.0	QT	890	J	5,000	23.0	QT	600	J	5,000	23.0	QT	1,100	J	5,000	23.0	QT	660	J	5,000	23.0	QT	600	J	5,000	23.0	QT
Selenium	50	MCL, Quality Criteria, MCLG	10		5.00	U	5.00	4.70	QT	5.00	U	5.00	4.70	QT	5.00	U	5.00	4.70	QT	5.00	U	5.00	4.70	QT	5.00	U	5.00	4.70	QT	5.00	U	5.00	4.70	QT
Silver	2	NJPQL	50		4.00	U	4.00	0.980	QT	4.00	U	4.00	0.980	QT	4.00	U	4.00	0.980	QT	4.00	U	4.00	0.980	QT	4.00	U	4.00	0.980	QT	1.70	J	4.00	0.980	QT
Sodium	50,000	Quality Criteria	NA		3,300	J	5,000	360	QT	4,900	J	5,000	360	QT	2,900	J	5,000	360	QT	1,700	J	5,000	360	QT	5,000		5,000	360	QT	1,800	J	5,000	360	QT
Thallium	0.5	Quality Criteria, MCLG	NA		1.00	U	1.00	0.340	QT	1.00	U	1.00	0.340	QT	1.00	U	1.00	0.340	QT	1.00	U	1.00	0.340	QT	1.00	U	1.00	0.340	QT	1.00	U	1.00	0.340	QT
Vanadium	260	RBC	NA		2.40	J	50.0	0.670	QT	0.850	J	50.0	0.670	QT	50.0	U	50.0	0.670	QT	4.40	J	50.0	0.670	QT	1.20	J	50.0	0.670	QT	1.90	J	50.0	0.670	QT
Zinc	5,000	Quality Criteria	NA		30.0		20.0	14.0	QT	57.0		20.0	14.0	QT	20.0	U	20.0	14.0	QT	43.0		20.0	14.0	QT	42.0		20.0	14.0	QT	84.0		20.0	14.0	QT

TABLE B-2
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS ANALYZED IN RINSE BLANK (µg/L; Rads - pCi/L)
PICATINNY ARSENAL

Sample ID: / Date Sampled: / Depth Sampled (ft): / Chemical	Analytical Results: GW091802R1, 09/18/02, —				
	Result	Q	RL/EQL	SQL	Lab
Volatiles					
Ethylene Oxide	1,000	UJ	1,000	530	QT
Explosives					
1,3-Dinitrobenzene	0.200	U	0.200	0.0800	QT
2,4-Dinitrotoluene	0.200	U	0.200	0.0700	QT
2,6-Dinitrotoluene	0.200	U	0.200	0.110	QT
2-amino-4,6-Dinitrotoluene	0.200	U	0.200	0.0900	QT
4-amino-2,6-Dinitrotoluene	0.200	U	0.200	0.110	QT
HMX	0.500	U	0.500	0.100	QT
Nitrobenzene	0.200	U	0.200	0.0700	QT
2-Nitrotoluene	0.200	U	0.200	0.140	QT
3-Nitrotoluene	0.200	U	0.200	0.130	QT
4-Nitrotoluene	0.200	U	0.200	0.170	QT
RDX	0.500	U	0.500	0.130	QT
Tetryl	0.200	U	0.200	0.170	QT
1,3,5-Trinitrobenzene	0.200	U	0.200	0.110	QT
2,4,6-Trinitrotoluene	0.200	U	0.200	0.0800	QT
Inorganics					
Aluminum	92.0	U	92.0	57.0	QT
Antimony	10.0	U	10.0	3.40	QT
Arsenic	4.00	U	4.00	2.10	QT
Barium	200	U	200	0.940	QT
Beryllium	2.00	U	2.00	0.600	QT
Cadmium	0.300	J	2.00	0.280	QT
Calcium	5,000	U	5,000	59.0	QT
Chromium	10.0	U	10.0	1.50	QT
Cobalt	1.10	J	50.0	0.740	QT
Copper	9.00	U	9.00	1.70	QT
Iron	100	U	100	42.0	QT
Lead	3.00	U	3.00	1.60	QT
Magnesium	5,000	U	5,000	35.0	QT
Manganese	15.0	U	15.0	0.680	QT
Mercury	0.0920	U	0.0920	0.0870	QT
Nickel	40.0	U	40.0	2.90	QT
Potassium	170	J	5,000	23.0	QT
Selenium	5.00	U	5.00	4.70	QT
Silver	4.00	U	4.00	0.980	QT
Sodium	5,000	U	5,000	360	QT
Thallium	1.00	U	1.00	0.340	QT
Vanadium	0.780	J	50.0	0.670	QT
Zinc	20.0	U	20.0	14.0	QT

TABLE B-2
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS ANALYZED IN RINSE BLANK (µg/L; Rads - pCi/L)
PICATINNY ARSENAL

Sample ID: / Date Sampled: / Depth Sampled (ft): / Chemical	Analytical Results: GW091802R1, 09/18/02, —				
	Result	Q	RL/EQL	SQL	Lab
Anions					
Ammonia	200	U	200	34.0	QT
Chloride	1,000	U	1,000	94.0	QT
Fluoride	1,000	U	1,000	3.90	QT
Nitrate	500	U	500	7.60	QT
Nitrite	500	U	500	20.0	QT
Perchlorate	4.00	U	4.00	2.00	QT
Phosphorus	100	U	100	15.0	QT
Sulfate	1,000	U	1,000	110	QT
Sulfide	1,000		1,000	250	QT
Radiologicals					
Americium-241	-18.0	U	29.0	29.0	QT
Bismuth-212	60.0	U	230	230	QT
Bismuth-214	3.00	U	40.0	40.0	QT
Cesium-137	-14.5	U	16.0	16.0	QT
Cobalt-60	-7.65	U	21.0	21.0	QT
Lead-212	-5.00	U	28.0	28.0	QT
Lead-214	-4.00	U	34.0	34.0	QT
Radium-226	0.0700	U	0.220	0.220	QT
Radium-228	0.0300	U	0.700	0.700	QT
Uranium-234	0.0680	U	0.110	0.110	QT
Uranium-235	-0.00900	U	0.130	0.130	QT
Uranium-238	-0.00380	U	0.0900	0.0900	QT

Q = Flags/Qualifiers (QA/QC):
J = Detect, value is an estimate of the concentration.
U = Non-detect, value is the detection limit.
QT = Quanterra Laboratories, Inc.
RL/EQL = Reporting Limit / Estimated Quantitation Limit
SQL = Sample Quantitation Limit

TABLE B-3
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS ANALYZED IN TRIP BLANK (µg/L)
PICATINNY ARSENAL

Sample ID:	Analytical Results									
	GW091802T1					GW091902T1				
Date Sampled:	09/18/02					09/19/02				
Depth Sampled (ft):	---					---				
Chemical	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab
Volatiles										
Ethylene Oxide	1,000	UJ	1,000	530	QT	1,000	UJ	1,000	530	QT

Q = Flags/Qualifiers (QA/QC):

J = Detect, value is an estimate of the concentration.

U = Non-detect, value is the detection limit.

QT = Quanterra Laboratories, Inc.

RL/EQL = Reporting Limit / Estimated Quantitation Limit

SQL = Sample Quantitation Limit

DEPARTMENT OF THE ARMY
UNITED STATES ARMY TANK - AUTOMOTIVE AND ARMAMENTS COMMAND
ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER
PICATINNY ARSENAL, NEW JERSEY 07806-5000

December 17, 2001

Environmental Affairs Division

SUBJECT: Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)/Interagency Agreement (IAG) Administrative Docket No. II-CERCLA-FFA-001-04: Submittal of Meeting Minutes of November 20th meeting and **enclosures**: Review is ER-A eligible.

Mr. Gregory Zalaskus
New Jersey Department of Environmental Protection
Division of Responsible Party Site Remediation
Bureau of Case Management,
401 East State Street, Floor 5
P.O. Box 028
Trenton, New Jersey 08625-0028

Mr. William Roach
U.S. Environmental Protection Agency
Region II
290 Broadway, 18th Floor
New York, New York 10007-1866

Dear Sirs:

Enclosed for your records are copies of the final minutes of the November 20th, 2001 meeting held at Picatinny. We received no response to my email of December 6th requesting comments to a draft version of these minutes.

I am also enclosing *for your records* the following packages including the revised maps discussed at the meeting, letter to the Nuclear Regulatory Commission, sampling maps at the Open Detonation Area and the agenda.

I ask that you call me at (973) 724-6748 with any concerns regarding this matter.

Sincerely,

Ted Gabel
Project Manager for
Environmental Restoration

Meeting Minutes for November 20, 2001 Meeting between PTA, NJDEP, USEPA, USACE, and the IT Corporation

Meeting Attendees: Mr. Ted Gabel, PTA EAO
Mr. Paul Reibel, PTA EAO
Mr. Joe Fabiano, PTA EAO
Mr. Paul Reed, PTA EAO
Ms. Nancy Flaherty, USACE
Mr. Jim Kealy, NJDEP
Mr. Joe Marchesani, NJDEP
Mr. John Scott, NJDEP
Mr. Bill Roach, USEPA
Mr. Jerry Maresca, IT Corporation
Mr. Doug Schicho, IT Corporation
Ms. Eileen Heider, PTA Range Safe Program
Mr. Doug Bell and others from BEM
Mr. Gary Kosteck, PTA

The meeting was held at the Picatinny Arsenal Environmental Affairs Office.

The meeting followed an agenda prepared by the Environmental Affairs Office. However, the discussions which took place at the meeting did not follow the agenda order. The discussion below appears in the order discussed.

1. **Next Meeting, RAB Meeting Next Week, 5-Year Review and USEPA Response to Letter from Picatinny, NJDEP DSMOA issues, General Overview of Schedule and Other Related Items, and the update on 20/24 and 13 Sites RODs or the IC Issue and what to do.**

   -Next meeting – no firm date for the next meeting was established
   -RAB Next Week – The RAB scheduled for November 29th was discussed. Area C is going to be a major issue. Other topics include the USEPA 5-year review. Ted Gabel asked if a public notice for the 5-year review was going to be made. Bill Roach said he thought it would.

-USEPA 5-Year Review - Ted Gabel asked if a public notice for the 5-year review was going to be made. Bill Roach said he thought it would.
-NJDEP DSMOA Issues – They were not discussed because Greg Zalaskus was not present.
-General Overview of Schedule and Other Issues – The main item discussed was the Area D Groundwater Feasibility Study. The USEPA discussed the position currently being drafted with regard to the interim action at the Building 24 groundwater plume. The discussion went on to cover the issues surrounding the Area D Groundwater FS. EPA does not believe the current pumping system is an effective hydraulic barrier. Mr. Marchesani delivered comments to the FS recalibration on 9/25. Responses to these comments were made on 10/8/01 and discussed at the 10/10/01 meeting. At the 10/10/01 meeting, some Area D issues were diverted until a later time. Joe Marchesani discussed his concerns with the currently proposed remedy (PRB). He indicated that the selected remedy for the Building 24 plume must include a well head protection plan. This plan must be submitted at the same time as the FS. The remedy must demonstrate that the drinking water production well is protected from plume impact. The well head protection must include a program for monitoring the drinking water wells and modeling the potential for continued impact. The remedy for the entire plume must include a simulation with the well pumping so that the remedy compensates for its effect. Wellhead treatment can be part of the remedy. The Army took this matter under advisement and did not agree to the additional documentation requested at the meeting and would wait until it received written documentation that the plan is required before the ROD.

The addition of a sixth well and potentially a seventh extraction well was then discussed. The USEPA indicated that it may require a seventh extraction well. At the meeting the Army directed IT to begin modeling simulations for a sixth and seventh extraction well and begin preparations for the installation of two additional extraction wells. ***Note that after the meeting the Army decided that potentially installing a seventh well would not be done unless the USEPA requested it

in writing. IT was then directed to model a sixth and seventh well but only plan on installing a sixth well for the time being.

The USEPA indicated that finalization of the FS must include an exit strategy for turning off the interim action pump and treat after the wall is installed (this had been agreed to at the last April IAP meeting.)

2. Green Pond Brook Additional Sampling

Doug Schicho distributed a sampling map depicting the locations of proposed surface water samples in Green Pond Brook. The samples were proposed to be collected from each location sampled by USGS in 1997. The regulators agreed with all of the proposed locations but requested that one additional location be added adjacent to the location of minipiezometer MP-2.3. Picatinny agreed to comply with this request. The sampling was scheduled for the week of November 26.

3. Group I Report and Investigation: General Overview

a. **USEPA Comments** – The USEPA had recently provided comments to the document both the report and the investigation. The Army had highlighted comments concerning the investigative report to discuss at the meeting. The remainder of the comments would be resolved with a written response or clarification. The following is a summary of the discussions that took place on selected USEPA comments.

GENERAL COMMENTS

3. The Army clarified that 25% validation was required under the facility-wide QAPP. The regulators agreed.

17. After hearing the Army's clarification of the rationale for selecting the well location, the USEPA accepted the proposed location in the work plan. Joe Marchesani requested that an additional bedrock well be installed. No consensus was reached on the request for an additional well.

SPECIFIC COMMENTS

34. The Army has to ensure that metals are kept as COCs and sampled as part of the post-remediation sampling.

37. Sampling for PCBs was already proposed in the work plan section of the document. The USEPA withdrew the comment based on that clarification.

41. After clarification the USEPA withdrew the comment. Therefore, sampling for Methylene Chloride is not required at 40MW-4.

44. The USEPA is not going to require the additional deep hydropunch samples.

73. The Army indicated that it has good knowledge of the site-specific geology and does not believe there are any groundwater seeps or distinct surface water drainage pathways in that area. Based on this clarification, the USEPA is not going to require additional surface water samples at Site 40.

74. The Army explained why a composite sample was being collected. The USEPA concurred and will not require changing this sample.

75. The Army withdrew its request for approval for subsequent sampling locations.

77. The Army explained why additional delineation for RDX near 93MW-1 was unnecessary. Based on this explanation, USEPA rescinded the recommendation.

78. The Army agreed to collect a sediment sample in Picatinny Lake downgradient of former sample 93SP-2 and analyze the sample for metals and explosives, as requested. EPA also noted that there should be a consideration of the removal and disposal of Flare Island.

79. The Army agreed to add SVOCs to the sample as requested.

80. No piezometers are required at Site 156.

82. Explosives will be added to the groundwater analyses for 93MW-1.

BTAG COMMENTS

2. The Army agreed to collect two sediment samples in the lake from the locations where the two stormwater drainage pipes discharge.

Action Item: IT is to provide written responses to the USEPA comments on the report. Following EPA approval of the RTC

document, the Group 1 Report will be finalized. .The Workplan will be modified based upon the approval of these minutes.

b. NJDEP Comments – No formal NJDEP comments had been received. Joe Marchesani indicated that he had reviewed the document and made comments. The comments had not been formally released by the NJDEP yet. However, he said that his primary comment was that he wanted one additional bedrock well. The well was discussed but no consensus was reached regarding the addition of this well.

c. The report and Work Plan Resubmittals – IT will prepare written responses to the USEPA comments on the Report. Following EPA approval of the RTC document, the Group 1 Report will be finalized.

d. Potential Study Area – It was noted that Envirogen and WES both received copies of the Report in order to assess the viability of a treatability study.

4. Open Detonation Area Subpart X Permit

Recent RCRA Groundwater Data and Next Sampling Round – Jerry Maresca summarized the new data. Most of the new data is similar to previous rounds. There was one new detection of ethylene oxide, which exceeded the LOC. Perchlorate, which had been detected above the LOC is now below the LOC.The Army had previously stated that certain parameters that had not been detected in the initial rounds of sampling would be dropped from subsequent rounds. Some parameters would be dropped after 2 rounds and others will be dropped after 4 rounds. The NJDEP acknowledged that they were aware of this and it is acceptable to them.

a. Depleted Uranium results – Ted Gabel provided a letter from Picatinny to the Nuclear Regulatory Commission (Attachment 1) that indicated that soil sampling found depleted uranium (DU) in the surface and subsurface soils. NRC sampling protocols were followed during this sample collection and analysis. The NJDEP and EPA had been told of this in a September 6th letter summarizing the plan action of radioactive investigations. The NJDEP had provided Picatinny with clean-up levels for depleted uranium. These levels must be used for data comparison for all additional sampling rounds.

Action Item: Based on these results, IT is to add DU to the next round of groundwater sampling. Samples for DU analysis will be

collected by a bailer as well as the low-flow method. The analysis should be carried out by alpha spectrometry at an NRC-approved and NJDEP approved laboratory by the sampling and analysis methodology specified by the PTA Radiation Protection Office.

b. Montclair State University Results – Joe Marchesani distributed data (Attachment 2) recently derived from groundwater analysis for colloidal metals at two wells in this area. One concern that he voiced was that the subsurface at the OD area may be favorable for the transport of fine particles. These fine particles may be the cause of the elevated readings of lead found in the two OD area wells. While it appears that these particles are traveling to the downgradient wells, they will not be able to travel a long distance. It is likely that the subsurface geology of gravel and boulders found at the OD area does not exist as you approach the valley floor from the Gorge. After the geology changes to a less conductive substrate, the fine particles will not transported. However, there is a concern that the stream may be impacted.

Action item: Collect surface water and sediment samples in the Gorge area for metals and DU analysis. It was agreed that 1 sample will be collected upgradient of the OD area, 2 samples will be collected near the wells adjacent to the OD area, and 1 sample will be collected near the gate entrance to the OD area. The proposed sampling locations are shown on Figure 8-1, which has been included as **Attachment 3**.

c. Status of the Subpart X – The NJDEP indicated that the review of the Subpart X was ongoing. Joe Marchesani indicated that approval could be problematic due to the lead contamination. EPA is advising the NJDEP that a permit cannot be issued for a RCRA unit that is contributing to groundwater contamination. Particularly, the lead contamination of groundwater. NJDEP could deny the permit based on this issue. Two options exist if the permit is denied. The first is Alternate Technology and the second is Delay of Closure. Delay of Closure would result in the OD area only being used for "emergencies".

Action Item: John Scott indicated that he would provide the Army with an example of a draft delay of closure submittal.

d. What's Next and Recap – The next step is the ongoing NJDEP review of the Subpart X submission and the Army sampling at the OD Area.

5. **ARS Study** – ARS presented the results, which were also provided in their report. ARS will complete one last round of groundwater sampling in November.

a. Area B FS and the Next Step – The Army did state that we will be developing a proposed plan based on the approval status of the FS.

b. Schedule and General Approach – The pilot scale HRC study will be scoped and scheduled.

6. **Bench Scale Studies on Area E** – BEM asked for input into the work plan dated October 2001. Doug Schicho indicated that IT had reviewed the chemical oxidation portion of the work plan and found that it would provide the data needed for the FS. The matrix demand data to be provided by BEM will allow the cost estimate for chemical oxidation to be fine tuned. **The representatives of the Army, NJDEP and EPA who were all provided copies of this Workplan offered no comments. Ellen Heidner stated that this signified an approval of the Workplan and BEM would initiate the proposal.**

7. **Phase II Additional Sampling** – Site maps with proposed sample locations were provided for the meeting. The sampling proposals were reviewed for each site. The agreements are summarized below:

Site 33 – Agreed to add one surface soil sample for arsenic analysis.

Site 40 – The proposed sampling is acceptable.

Site 65 – Agreed to add one surface soil sample for arsenic analysis.

Site 71 – The proposed sampling is acceptable.

Site 79 - The proposed sampling is acceptable.

Site 82 - The proposed sampling is acceptable.

Site 90 - The proposed sampling is acceptable.

Site 93 – Agreed to add copper to the proposed sample analysis.

Site 97 - The proposed sampling is acceptable.

Site 102 – Agreed to collect additional hydropunch groundwater samples for the delineation of lead. The hydropunch samples will be filtered to reduce the turbidity.

Site 105 - The proposed sampling is acceptable.

Site 108 – Agreed to collect one surface water sample off of Flare Island for SVOCs and metals analyses. Agreed to collect a deep soil sample on Flare Island for SVOCs and metals analyses.
Site 137 - The proposed sampling is acceptable.
Site 148 - The proposed sampling is acceptable.
Site 149 - The proposed sampling is acceptable.
Site 150 – Agreed to add one surface soil sample for lead analysis.
Site 158 – Agreed to collect additional sediment samples at two locations further into Picatinny Lake. Samples will be collected from 0-1 ft bgs and 2-3 ft bgs at each location and analyzed for metals.
Site 178 - The proposed sampling is acceptable.
Site 2 (Building 3517) - The proposed sampling is acceptable.
Site 48 - The proposed sampling is acceptable.

No comments were received on the following sites for which no further sampling was proposed – Sites 46, 47, 50, 70, 83, 109, 113, 156, 159, 203, 175, 3, 189, Building 3250, and Bear Swamp Brook.

The additional sampling locations for Sites 33, 65, 93, 102, 108, 150 and 158 are shown on the figures included as **Attachment 4**.

Picatinny Arsenal
NJDEP Certification Statement
Gorge Quarterly Sampling
Sampling Date: September 2003
Report Date: March 2003

Analyte	Analytical Method	NJDEP Certification Lab ID
Volatiles		
Ethylene Oxide	8015B	Aqueous: North Canton OH001
Prep Methods for Volatiles	5030B, 5035, 5035 Methanol	Aqueous: North Canton OH001
Metals		
Aluminum	6010B	Aqueous: North Canton OH001
Antimony	6010B	Aqueous: North Canton OH001
Arsenic	6010B	Aqueous: North Canton OH001
Barium	6010B	Aqueous: North Canton OH001
Beryllium	6010B	Aqueous: North Canton OH001
Cadmium	6010B	Aqueous: North Canton OH001
Calcium	6010B	Aqueous: North Canton OH001
Chromium	6010B	Aqueous: North Canton OH001
Cobalt	6010B	Aqueous: North Canton OH001
Copper	6010B	Aqueous: North Canton OH001
Iron	6010B	Aqueous: North Canton OH001
Lead	6010B	Aqueous: North Canton OH001
Magnesium	6010B	Aqueous: North Canton OH001
Manganese	6010B	Aqueous: North Canton OH001
Mercury	7470A	Aqueous: North Canton OH001
Nickel	6010B	Aqueous: North Canton OH001
Potassium	6010B	Aqueous: North Canton OH001
Selenium	6010B	Aqueous: North Canton OH001
Silver	6010B	Aqueous: North Canton OH001

Picatinny Arsenal
NJDEP Certification Statement (continued)
Gorge Quarterly Sampling
Sampling Date: September 2003
Report Date: March 2003

Analyte	Analytical Method	NJDEP Certification Lab ID
Sodium	6010B	Aqueous: North Canton OH001
Thallium (ICP/MS)	Not Certified: Certification Pending	
Vanadium	6010B	Aqueous: North Canton OH001
Zinc	6010B	Aqueous: North Canton OH001
Prep Methods for Metals	3005A, 3010A, 3015, 3050B, 3051, 3052, 3060A	Aqueous: North Canton OH001
Anions		
Ammonium (Ammonia as Nitrogen)	350.2, 350.3	Aqueous: North Canton OH001
Chloride	300.0A	Aqueous: North Canton OH001
Fluoride	300.0A	Aqueous: North Canton OH001
Nitrate (NO_3)	300.0A	Aqueous: North Canton OH001
Nitrite (NO_2)	300.0A	Aqueous: North Canton OH001
Sulfate	300.0A	Aqueous: North Canton OH001
Sulfide	367.1	Aqueous: North Canton OH001
Total Phosphorous	365.2	Aqueous: North Canton OH001
Perchlorate	314.1	Aqueous: Sacramento CA005
Explosives		
2,4-Dinitrotoluene	8330	Aqueous: Knoxville TN001
1,3-Dinitrobenzene	8330	Aqueous: Knoxville TN001
1,3,5-Trinitrobenzene	8330	Aqueous: Knoxville TN001
2,4,6-Trinitrotoluene	8330	Aqueous: Knoxville TN001
2,6-Dinitrotoluene	8330	Aqueous: Knoxville TN001
Cyclotetramethylene tetranitramine (HMX)	8330	Aqueous: Knoxville TN001

Picatinny Arsenal
NJDEP Certification Statement (continued)
Gorge Quarterly Sampling
Sampling Date: September 2003
Report Date: March 2003

Analyte	Analytical Method	NJDEP Certification Lab ID
Cyclotrimethylene trinitramine (RDX)	8330	Aqueous: Knoxville TN001
N-Methyl-N,2,4,6-tetranitroaniline (Tetryl)	8330	Aqueous: Knoxville TN001
Nitrobenzene	8330	Aqueous: Knoxville TN001
4-Amino-2,6-dinitrotoluene	8330	Aqueous: Knoxville TN001
2-Amino-4,6-dinitrotoluene	8330	Aqueous: Knoxville TN001
2-Nitrotoluene	8330	Aqueous: Knoxville TN001
4-Nitrotoluene	8330	Aqueous: Knoxville TN001
3-Nitrotoluene	8330	Aqueous: Knoxville TN001
Radiologicals		
Bismuth-212	Not Certified	
Bismuth-214	Not Certified	
Uranium-234	USEPA 908.0	Aqueous: St Louis MO002
Uranium -238	USEPA 908.0	Aqueous: St Louis MO002
Uranium -235	USEPA 908.0	Aqueous: St Louis MO002
Cesium - 137	USEPA Method 901.1	Aqueous: St Louis MO002
Americium - 241	Not Certified	
Lead-212	Not Certified	
Lead-214	Not Certified	
Radium - 226	USEPA Method 903.0	Aqueous: St Louis MO002
Radium-228	USEPA 904.0	Aqueous: St Louis MO002
Cobalt - 60	USEPA Method 901.1	Aqueous: St Louis MO002

ATTACHMENT T
PROTECTION OF GROUNDWATER

T.0 Introduction

A groundwater protection plan is presented that will allow for detection of potential contamination releases from the Open Detonation (OD) Area at Picatinny Arsenal. The plan is a revision and restructuring of the document originally prepared by Foster Wheeler for the Subpart X permit application submitted to USEPA on November 4, 1988 by ARDEC at Picatinny Arsenal, New Jersey. This plan was revised in 1994, 2000 and 2005 in response to Notices of Deficiency (NOD) received by ARDEC from USEPA on July 31, 1992 and March 9, 1993 and from NJDEP on September 21, 1999 and July 20, 2005.

The groundwater protection program is discussed in detail below and in two appendices. Appendix T-1 (Hydrogeological Investigation Report) presents regional geology and topographic information, site-specific geology and hydrogeology for the OD Area, a description of the site, location and description of the installed monitoring well network with installation and construction details, identification of the uppermost aquifer, and existing groundwater monitoring chemical data.

Appendix T-2 (Groundwater Sampling and Analysis Plan) discusses chemical sampling parameters, analytical methods, quality assurance /quality control measures, sampling frequency, and sampling procedures.

The information in this section is being provided according to 40 CFR 264.95, 264.97, 264.98 and 270.14(c).

T.1 Regional Geology

The regional geology at Picatinny Arsenal is discussed in detail in Appendix T-1, Hydrogeologic Investigation Report.

T.2 Topographic Information

The OD area occupies approximately one-third acre in the four acre Gorge area. The Gorge is located approximately 0.4 miles west of Lake Denmark along Gorge Rd. (Figure T-1). Green Pond Brook, which runs through the site, follows the steeply sloped north-south trending valley that encloses the OD area. Topographic relief at the OD area is fairly rugged with elevations varying from about 850 feet MSL at the OD area to over 1200 feet MSL in the surrounding ridges. The location of the open detonation pits is presented in Figure T-2.

Topographic information required by 40 CFR 270.14(c) is described below. This requirement includes delineating the point of compliance and presenting the location of groundwater monitoring wells to be included in the detection monitoring system.

T.2.1 Point of Compliance

Figure T-3 identifies the point of compliance for the OD area. Although the actual OD operational area is defined by the extent of the mine sand (with a 30 foot buffer), the point of compliance has been extended because of the potential risk of damage to monitoring wells from detonations at the site and the testing of conventional weapons in the same area. Placing the point of compliance at a different location beyond the operating area is in accordance with the Draft Permit Writers Guidance Document for 40 CFR 264, Subpart X.

T.2.2 Location of Groundwater Monitoring Wells

The location of the groundwater detection monitoring system is presented in Figure T-3. The first four wells (OD-1A through OD-4A) were installed in November 1993. The last two wells of the network (OD-5A and OD-6A) were installed in December 1998.

T.2.3 Seismic Standard

Because New Jersey is not listed in Appendix VI of 40 CFR 264, the seismic considerations for location standards do not apply. This conclusion is in accordance with 40 CFR 264.18 (a) and 270.14 (b) (11)(i-ii).

T.2.4 Regional Hydrogeology

Regional hydrogeology of the Arsenal area is discussed in detail in Appendix T-1, Hydrogeologic Investigation Report.

T.2.5 Site Specific Hydrogeology

Site Specific hydrogeology is discussed in detail in Appendix T-1, Hydrogeologic Investigation Report.

T.2.6 Identification of the Uppermost Aquifer

The identification of the uppermost aquifer was completed by the installation of the monitoring well network at the OD area. The uppermost aquifer is an unconfined (water table) aquifer in the unconsolidated glacial sediments overlying the basement rocks of the Gorge.

T.2.6.1 Groundwater Occurrence

Water level data has been collected from all six OD area wells during all eight rounds of groundwater sampling from 1999 to 2002. Depth to groundwater ranges from 0.0 to 11.65 feet bgs. While water levels changed from round to round, changes were minimal and consistent across the site so that there was little change in the groundwater gradient and flow direction between the sampling rounds.

T.2.6.2 Groundwater Flow Rate and Direction

The direction of groundwater flow is towards Green Pond Brook with a strong down-valley component. Groundwater flow contour maps and detailed discussion of flow rates and aquifer characteristics are discussed in detail in Appendix T-1, Hydrogeologic Investigation Report.

T.2.7 Existing Groundwater Contamination

As stated previously, four rounds of groundwater samples were collected in 1999 and analyzed for compounds identified in the 1994 permit application. The results of the four rounds of sampling are discussed in detail in Appendix T-1, Hydrogeologic Report. Chemical results indicated that there were concentrations of RDX and HMX in both upgradient and downgradient wells ranging from 0.22 to 4.8 µg/L.

Two metals exceeded RCRA Maximum Concentration Limits (MCL). Mercury was detected only once at a concentration of 3.8 µg/L, exceeding the MCL of 2.0 µg/L. Lead was detected in down gradient wells in all four rounds of sampling at concentrations ranging from 57.2 to 390 µg/L, exceeding the MCL of 50 µg/L.

Following receipt of NJDEP's letters on March 7, 2001 and June 21, 2001, the Army conducted another four rounds of groundwater sampling for an extensive list of analytes outlined in the NJDEP correspondence. Only six compounds were detected above Levels of Concern (LOCs). Volatile organic compound ethylene oxide and explosive compound 2,4,6-trinitrotoluene (TNT) were detected above their respective LOCs of 0.023 µg/L and 2.0 µg/L in one well (OD-2A) during one round of sampling.

RDX was detected in excess of the LOC of 0.61 µg/L in downgradient wells OD-2A and OD-4A in all four rounds. RDX concentrations in these two wells ranged from 2.4 µg/L to 23.0 µg/L. RDX was also detected in upgradient well OD-1A at concentrations above the LOC during two sampling events with a maximum concentration of 3.50 µg/L.

Aluminum, iron and manganese were also identified in excess of their LOCs. LOC exceedances for these three metals were reported in all wells with the exception of OD-3A. These three inorganic compounds are common naturally occurring metals that are detected throughout Picatinny Arsenal at elevated levels in the soil and groundwater. The levels are believed to be related to the weathering of the local bedrock and are not likely site-related.

No RCRA metals were detected above the RCRA MCLs. Sampling for lead using the low-flow method indicated that dissolved lead concentrations were below the MCL of 50 µg/L Explosive compounds – diethyleneglycol dinitrate (DEGDN); triethyleneglycol dinitrate (TEGDN); trimethethyleneglycol dinitrate (TMEDN); 1,3-diamino-2,4,6-trinitrobenzene (DATB); and 2,2,'4,4,'6,6'-hexanitrostilbene (HNS) were not detected in any round. Chemical results are discussed in detail in Appendix T-1, Hydrogeologic Investigation Report.

Soil contamination data for the OD area that has been previously collected is discussed in Section II.B.3

T.2.8 Detection Monitoring System

A groundwater detection monitoring system consisting of six overburden monitoring wells has been installed at the OD area. Construction details, well placement, boring logs and other details of the detection system are discussed in detail in Appendix T-1, Hydrogeologic Investigation Report.

T.2.8.1 Compliance Monitoring

Compliance monitoring will be performed on a quarterly basis at the OD Area in accordance with the Bureau of Hazardous Waste and Transfer Facilities' March 7, 2001 letter and subsequent revisions. All correspondence between NJDEP and Picatinny Arsenal regarding the groundwater compliance monitoring program is included in (Attachment T-3). The determination of the presence and concentration of hazardous constituents in the groundwater will be made from statistical evaluations of the results from four (4) consecutive quarterly groundwater monitoring events. Background concentrations will be established from the upgradient monitoring wells. The resultant data will be used to develop a semi-annual monitoring program in compliance with 40 CFR Part 264. All subsequent sampling events will be conducted on a semi-annual basis for a reduced analytical program derived from the statistical evaluation of the groundwater data. All laboratories will use certified methods for each analysis, and the laboratories will also be certified in accordance with NJAC 7:26 – 7.18.

T.2.9 Groundwater Sampling and Analysis Plan

A groundwater sampling and analysis plan for the Open Detonation Area is presented in Appendix T-2 in accordance with 40 CFR 264.97 (d) - (i). The plan includes a description of sample collection procedures, preservation and shipment methods, chain of custody control methods, quality assurance/quality control measures, and analytical procedures.

All data will be reported and used to evaluate potential contaminate sources, distribution, and migration.

T.2.9.1 Constituents to be Monitored

The constituents that will be monitored in the groundwater detection system are listed in Table T-1. The list was determined based on the nature of the waste handled at the OD Area as described in section I.C.1, soil contamination identified in the OD Area, on the persistence, mobility and toxicity of the constituents, and negotiations with NJDEP. The sample containers and preservation methods to be used for sampling these constituents are listed in Table T-2

The following constituents will be analyzed for a minimum of four (4) consecutive quarters:

- Explosives
- Organophosphorous pesticides (malathion and diazinon)
- Nitroesters (nitrocellulose, nitroguanidine, nitroglycerine)
- TAL Metals
- Additional metals (boron, molybdenum, silicon, strontium, tin, titanium, tungsten, zirconium)
- Cyanides
- Anions including perchlorates
- Depleted Uranium including individual uranium isotopes
- Radioanalytes (Gamma Emitters)

The remaining analytes will be analyzed for a minimum of two consecutive quarters:

- TCL VOCs with additional alcohol compounds
- TCL SVOCs with additional compounds and n-nitrosodiphenylamine
- Diphenylamine, aniline, carbazole
- TCL PCBs, pesticides and mirex

Analysis of these compounds will continue if the resultant data indicate levels above the LOC for that compound. Levels of concern for groundwater are listed in Table T-3.

Groundwater levels will be measured during every sampling event. Levels will be measured to the nearest 0.01 foot. Static water level and well depth measurements will be obtained using an electric water level sounding device. The tape will be rinsed with distilled water, cloth-wiped, and allowed to air dry between consecutive water level measurements. All measurements of the depth to groundwater and well depth will be referenced to a permanently marked reference point on the monitoring wells (highest point on the top rim of the PVC casing). Personnel will also note any physical changes to the well or the concrete pad.

The goal of low-flow sampling is to collect more representative samples by matching the intake velocity of the sampling device with the natural groundwater flow velocity, thereby reducing sample disturbances. The primary advantage of this procedure is the collection of low turbidity samples (i.e., samples with low concentrations of suspended

particles) and the reduction of sample aeration, resulting in samples which are more representative of true aquifer conditions. Low flow sampling also, in most cases, reduces the volume of groundwater purged from the well.

This sampling procedure involves removing groundwater from a monitoring well using a variable speed stainless-steel electric-powered submersible pump placed at the screened interval. The pump intake will be kept at least two feet above the bottom of the monitoring well to prevent mobilization of any sediment present in the bottom of the well. The depth to which the pump is lowered and the sample collected will be recorded so that the pump can be placed in the same location during future sampling events.

Before pumping begins, the water level in the monitoring well will be measured. The water level will be measured at a minimum of every three to five minutes during pumping. Pumping rates will be less than 500 mL per minute. Ideally, a pumping rate will be maintained that results in a stabilized water level (less than 0.3 ft drawdown) in the monitoring well. Water quality parameters (i.e., pH, temperature, conductivity, DO, turbidity, and ORP) will be measured on three to five minute intervals for stabilization. Stabilization will be defined by the following variances between three successive readings: turbidity, DO and ORP within 10%; conductivity within 3%; pH within 5%; and temperature within 1° C. If the water quality parameters do not stabilize, pre-sample purging will continue until one well volume has been removed or a purge time of two hours has been exceeded.

If drawdown in the monitoring well is greater than 0.3 feet, the pumping rate will be reduced to match the recharge rate of the well, taking care to maintain pump suction and avoid air entrainment in the tubing. If drawdown continues despite reducing the pumping rate, then the following alternative method will be used:

If the groundwater level in the monitoring well stabilizes at some level above the top of the screened interval, pumping will continue until the water quality parameters stabilize. At a minimum, three times the volume of the groundwater drawdown in the monitoring well will be removed prior to groundwater sampling.

Teflon® tubing, connected to the pump with stainless-steel clamps, will be used in collecting low-flow groundwater samples. The tubing will be dedicated to each individual well. Sample bottles will be filled in order of decreasing analyte volatility and preserved according to the aqueous preservation procedures provided in Table T-2 Entrainment of air in the tubing must not occur. The sampling sequences associated with each event will be documented in the field logbook. VOC samples will be collected first and directly into pre-preserved sample containers. The amount of HCL required for preservation will be determined using an acid blank with well purge water prior to sampling each well. All containers will be filled by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence.

Two-inch diameter, variable speed stainless steel submersible pumps will be used for pre-sample purging as well as monitoring well sampling. The submersible pumps will be decontaminated after each use according to the following procedure:

a. Wash and flush approximately 10 gallons with presampled and approved water through the pump
b. Wash and flush approximately 10 gallons of alconox (low phosphate detergent) through the pump
c. Wash and flush approximately 10 gallons of presampled and approved water through the pump
d. Wash and flush approximately 10 gallons demonstrated analyte-free water through the pump
g. Air dry
h. Wrap with aluminum foil (shiny side out)

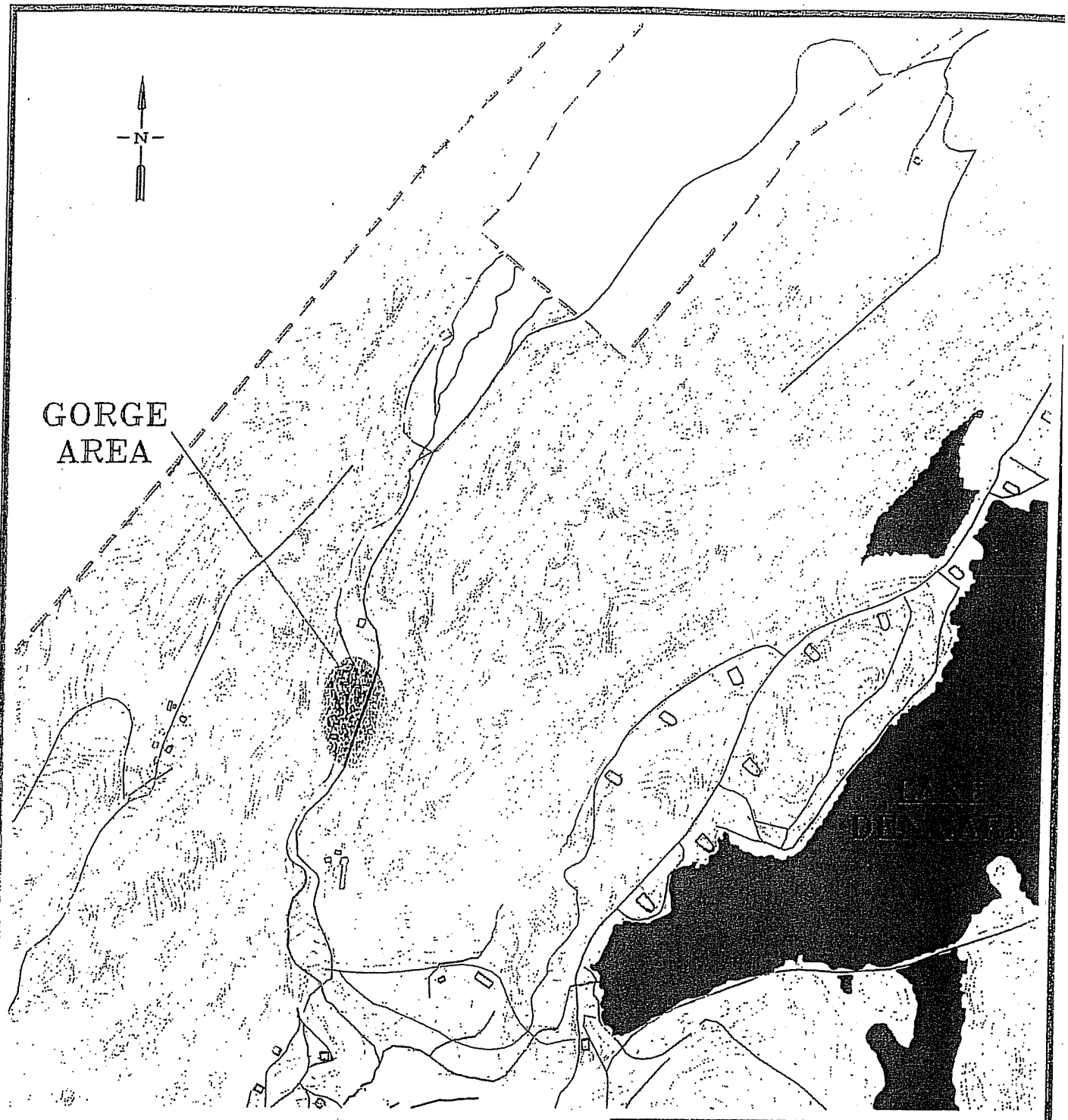
The decontamination procedure is consistent with the "Decontamination of Pumps" described in the NJDEP *Field Sampling Procedures Manual* (NJDEP, 1992). Dedicated Teflon-lined tubing will only be decontaminated prior to its first use.

T.2.9.2 Sampling Frequency

Groundwater samples will be collected from the monitoring wells quarterly for the first year. Some constituents, which were never tested or disposed of at the OD Area, will only be analyzed for two events (Section T.2.9.1). After the first year, the resultant data will be statistically evaluated and used to develop a semi-annual monitoring program.

Groundwater levels will be measured during every sampling event. Groundwater contour maps will be prepared to show the horizontal direction of groundwater flow and to determine the flow rate.

FIGURES



600 400 200 0 200 400 600 800
SCALE IN FEET

- INSTALLATION BOUNDARY
- ROAD
- TOPOGRAPHIC CONTOUR (5 ft interval)
- BUILDING
- SURFACE WATER BODY
- SURFACE WATER (LINEAR)

IT CORPORATION

Picatinny Arsenal Installation Restoration Program

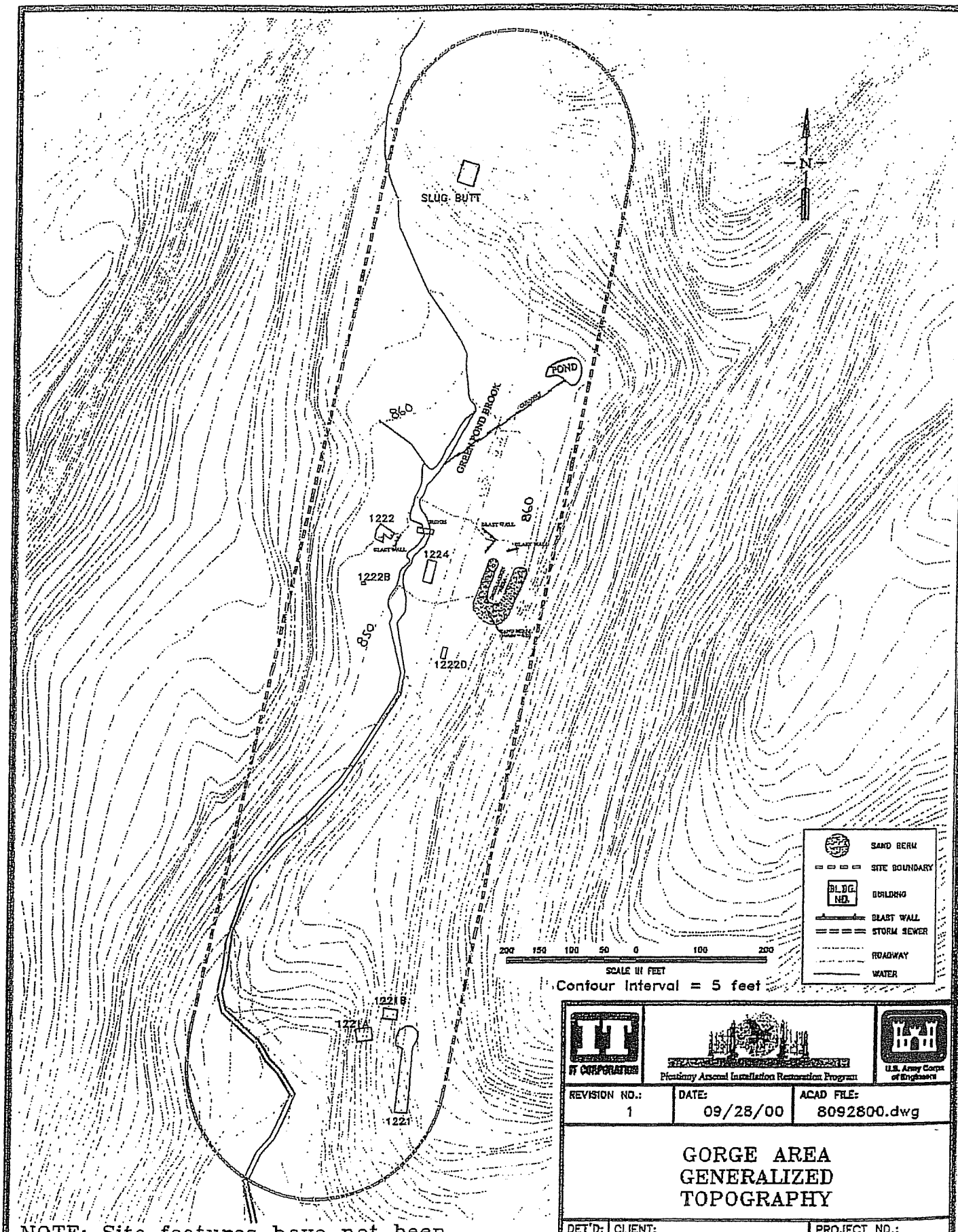
U.S. Army Corps of Engineers

REVISION NO.:	DATE:	ACAD FILE:
0	09/28/00	GORGE092800.dwg

GORGE AREA

DET'D:	CLIENT:	PROJECT NO.:
AS	PICATINNY ARSENAL	66727-005-00
CHK'D:	LOCATION:	FIGURE NO.:
JP	DOVER, NEW JERSEY	T-1

PLOT DATE: 09/28/00



NOTE: Site features have not been surveyed to verify coordinate accuracy, but relative locations of site features have been verified by field measurements.

IT CORPORATION

Picatinny Arsenal Installation Restoration Program

U.S. Army Corps of Engineers

REVISION NO.:	DATE:	ACAD FILE:
1	09/28/00	8092800.dwg

GORGE AREA GENERALIZED TOPOGRAPHY

DET'D:	CLIENT:	PROJECT NO.:
AS	PICATINNY ARSENAL	66727-005-00
CHK'D:	LOCATION:	FIGURE NO.:
JP	DOVER, NEW JERSEY	T-2

PLOT DATE: 09/28/00

TABLES

Table T-1
Picatinny Detonation Area
Subpart X Permit
Groundwater Analytical Parameters, Methods, Laboratories and Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Volatiles							
1,1-Dichloroethene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04220	STL North Canton OH001	Yes	
Methylene Chloride	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04260	STL North Canton OH001	Yes	
trans-1,2-Dichloroethene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04230	STL North Canton OH001	Yes	
1,1-Dichloroethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04200	STL North Canton OH001	Yes	
Chloroform	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04150	STL North Canton OH001	Yes	
1,1,1-Trichloroethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04290	STL North Canton OH001	Yes	
Trichloroethene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04310	STL North Canton OH001	Yes	
Tetrachloroethene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04280	STL North Canton OH001	Yes	
1,2-Dibromoethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04185	STL North Canton none	Yes	

NPW: Non-Potable Water

Table T-1 (continued)
Picatinny Open Detonation Area
Subpart X Permit
Groundwater Monitoring Analytical Parameters, Methods, Laboratories, Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Benzene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04010	STL North Canton OH001	Yes	
Toluene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04070	STL North Canton OH001	Yes	
1,1-Dichloroethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04200	STL North Canton OH001	Yes	
1,1-Dichloroethylene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04220	STL North Canton OH001	Yes	
1,1,1-Trichloroethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04290	STL North Canton OH001	Yes	
1,1,2-Trichloroethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04300	STL North Canton OH001	Yes	
1,1,2,2-Tetrachloroethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04270	STL North Canton OH001	Yes	
1,2-Dichloroethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04210	STL North Canton OH001	Yes	
1,2-Dichloropropane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04240	STL North Canton OH001	Yes	
2-Butanone	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04360	STL North Canton OH001	Yes	
2-Hexanone	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04370	STL North Canton OH001	Yes	

NPW: Non-Potable Water

Table T-1 (continued)
Picatinny Open Detonation Area
Subpart X Permit
Groundwater Monitoring Analytical Parameters, Methods, Laboratories, Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
4-Methyl-2-pentanone (Methyl Isobutyl Ketone)	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04380	STL North Canton OH001	Yes	
Acetone	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04340	STL North Canton OH001	Yes	
Bromodichloromethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04090	STL North Canton OH001	Yes	
Bromoform	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04100	STL North Canton OH001	Yes	
Bromomethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04110	STL North Canton OH001	Yes	
Carbon Disulfide	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04350	STL North Canton OH001	Yes	
Vinyl Acetate	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04327	STL North Canton OH001	Yes	
Carbon Tetrachloride	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04120	STL North Canton OH001	Yes	
Chlorobenzene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04020	STL North Canton OH001	Yes	
Chloroethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04130	STL North Canton OH001	Yes	
Chloroform	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04150	STL North Canton OH001	Yes	

NPW: Non-Potable Water

Table T-1 (continued)
Picatinny Open Detonation Area
Subpart X Permit
Groundwater Monitoring Analytical Parameters, Methods, Laboratories, Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Chloromethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04160	STL North Canton OH001	Yes	
cis-1,2-Dichloroethene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04235	STL North Canton OH001	Yes	
cis-1,3-Dichloropropene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04250	STL North Canton OH001	Yes	
Dibromochloromethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04180	STL North Canton OH001	Yes	
Dichlorodifluoromethane (Freon 12)	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04190	STL North Canton OH001	Yes	
Ethylbenzene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04060	STL North Canton OH001	Yes	
Styrene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04550	STL North Canton OH001	Yes	
Tetrachloroethylene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04280	STL North Canton OH001	Yes	
Toluene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04070	STL North Canton OH001	Yes	
Trans-1,2-Dichloroethene[a]	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04230	STL North Canton OH001	Yes	
Trans-1,3-Dichloropropene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04170	STL North Canton OH001	Yes	

NPW: Non-Potable Water

Table T-1 (continued)
Picatinny Open Detonation Area
Subpart X Permit
Groundwater Monitoring Analytical Parameters, Methods, Laboratories, Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix Analyte Code	Lab ID		
Trichlorofluoromethane (Freon 11)	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04320	STL North Canton OH001	Yes	
Trichloroethylene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04310	STL North Canton OH001	Yes	
Vinyl Chloride	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04330	STL North Canton OH001	Yes	
Total Xylene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04080	STL North Canton OH001	Yes	
Acetonitrile	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04398	STL North Canton OH001	Yes	
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04322	STL North Canton OH001	Yes	
Iodomethane (Methyl Iodide)	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04375	STL North Canton OH001	Yes	
1,1,1,2-Tetrachloroethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04560	STL North Canton OH001	Yes	
2-Chloroethyl Vinyl Ether	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04140	STL North Canton OH001	Yes	
1,2-Dibromo-3-chloropropene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04187	STL North Canton OH001	Yes	
trans-1,4-Dichloro-2-butene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04255	STL North Canton OH001	Yes	

NPW: Non-Potable Water

Table T-1 (continued)
Picatinny Open Detonation Area
Subpart X Permit
Groundwater Monitoring Analytical Parameters, Methods, Laboratories, Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
1,2,3-Trichloropropane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04325	STL North Canton OH001	Yes	
Additional Alcohols							
Ethanol	SW-846 8260B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04259	Environmental Science Corporation TN002	Yes	
Isopropanol	SW-846 8260B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04377	Environmental Science Corporation TN002	Yes	
tert-Butyl alcohol	SW-846 8260B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04395	Environmental Science Corporation TN002	Yes	
Semivolatiles							
1,2-Dichlorobenzene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05691	STL North Canton OH001	Yes	
1,2,4-Trichlorobenzene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05120	STL North Canton OH001	Yes	
1,3-Dichlorobenzene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05692	STL North Canton OH001	Yes	

NPW: Non-Potable Water

Table T-1 (continued)
Picatinny Open Detonation Area
Subpart X Permit
Groundwater Monitoring Analytical Parameters, Methods, Laboratories, Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
1,4-Dichlorobenzene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05700	STL North Canton OH001	Yes	
2-Chloronaphthalene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05070	STL North Canton OH001	Yes	
2-Chlorophenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05450	STL North Canton OH001	Yes	
2-Methylnaphthalene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05400	STL North Canton OH001	Yes	
2-Methylphenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05500	STL North Canton OH001	Yes	
2-Nitroaniline	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05060	STL North Canton OH001	Yes	
2-Nitrophenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05520	STL North Canton OH001	Yes	
2,4-Dichlorophenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05460	STL North Canton OH001	Yes	
2,4-Dimethylphenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05470	STL North Canton OH001	Yes	
2,4-Dinitrophenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05480	STL North Canton OH001	Yes	
2,4-Dinitrotoluene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05170	STL North Canton OH001	Yes	

NPW: Non-Potable Water

Table T-1 (continued)
Picatinny Open Detonation Area
Subpart X Permit
Groundwater Monitoring Analytical Parameters, Methods, Laboratories, Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
2,4,5-Trichlorophenol	SW-846.3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05560	STL North Canton OH001	Yes	
2,4,6-Trichlorophenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05570	STL North Canton OH001	Yes	
2,6-Dinitrotoluene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05180	STL North Canton OH001	Yes	
3-Nitroaniline	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05062	STL North Canton OH001	Yes	
3,3'-Dichlorobenzidine	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05040	STL North Canton OH001	Yes	
4-Bromophenyl-phenylether	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05160	STL North Canton OH001	Yes	
4-Chloro-3-methylphenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05440	STL North Canton OH001	Yes	
4-Chloroaniline	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05050	STL North Canton OH001	Yes	
4-Chlorophenyl-phenylether	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05150	STL North Canton OH001	Yes	
4-Methylphenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05510	STL North Canton OH001	Yes	

NPW: Non-Potable Water

Table T-1 (continued)
Picatinny Open Detonation Area
Subpart X Permit
Groundwater Monitoring Analytical Parameters, Methods, Laboratories, Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
4-Nitroaniline	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05063	STL North Canton OH001	Yes	
4-Nitrophenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05530	STL North Canton OH001	Yes	
4,6-Dinitro-2-methylphenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05490	STL North Canton OH001	Yes	
Acenaphthene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05270	STL North Canton OH001	Yes	
Acenaphthylene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05290	STL North Canton OH001	Yes	
Anthracene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05280	STL North Canton OH001	Yes	
Benzo[a]anthracene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05300	STL North Canton OH001	Yes	
Benzo[a]pyrene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05310	STL North Canton OH001	Yes	
Benzo[b]fluoranthene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05320	STL North Canton OH001	Yes	
Benzo[g,h,i]perylene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05330	STL North Canton OH001	Yes	

NPW: Non-Potable Water

Table T-1 (continued)
Picatinny Open Detonation Area
Subpart X Permit
Groundwater Monitoring Analytical Parameters, Methods, Laboratories, Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix, Analyte Code	Lab ID		
Benzo[k]fluoranthene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05340	STL North Canton OH001	Yes	
Bis(2-chloroethoxy)methane	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05130	STL North Canton OH001	Yes	
Bis(2-chloroethyl)ether	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05132	STL North Canton OH001	Yes	
Butylbenzylphthalate	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05210	STL North Canton OH001	Yes	
Bis(2-chloroisopropyl)ether	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05140	STL North Canton OH001	Yes	
Carbazole	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05030	STL North Canton OH001	Yes	
Aniline	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07:05048	STL North Canton OH001	Yes	
Dibenzofuran	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05600	STL North Canton OH001	Yes	
Dimethylphthalate	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05240	STL North Canton OH001	Yes	
Diethylphthalate	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05230	STL North Canton OH001	Yes	

NPW: Non-Potable Water

Table T-1 (continued)
Picatinny Open Detonation Area
Subpart X Permit
Groundwater Monitoring Analytical Parameters, Methods, Laboratories, Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Bis(2-ethylhexyl)phthalate	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05220	STL North Canton OH001	Yes	
Fluoranthene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05370	STL North Canton OH001	Yes	
Fluorene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05380	STL North Canton OH001	Yes	
Diphenylamine (HPLC/UV)	SW-846 8330, Rev. 0, 9/94 (modified)	N/A	SW-846 8330, Rev. 0, 9/94 (modified)	Not Certified in NJDEP Database	None	No	User Defined Method for Picatinny Arsenal; No Labs listed in NJDEP Database using HPLC as of 8/26/05
Hexachlorobenzene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05080	STL North Canton OH001	Yes	
Hexachlorobutadiene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05090	STL North Canton OH001	Yes	
Hexachlorocyclopentadiene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05100	STL North Canton OH001	Yes	
Hexachloroethane	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05110	STL North Canton OH001	Yes	
Indeno(1,2,3-c,d)pyrene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05390	STL North Canton OH001	Yes	
Isophorone	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05190	STL North Canton OH001	Yes	

NPW: Non-Potable Water

Table T-1 (continued)
Picatinny Open Detonation Area
Subpart X Permit
Groundwater Monitoring Analytical Parameters, Methods, Laboratories, Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Nitrobenzene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05200	STL North Canton OH001	Yes	
Naphthalene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05410	STL North Canton OH001	Yes	
N-nitroso-di-n-propylamine	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05006	STL North Canton OH001	Yes	
N-nitroso-di-phenylamine[1]	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05004	STL North Canton OH001	Yes	
Di-n-octylphthalate	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05260	STL North Canton OH001	Yes	
Pentachlorophenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05540	STL North Canton OH001	Yes	
Phenanthrene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05420	STL North Canton OH001	Yes	
Phenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05550	STL North Canton OH001	Yes	
Pyrene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05430	STL North Canton OH001	Yes	

[1] Cannot be distinguished from Diphenylamine

NPW: Non-Potable Water

Table T-1 (continued)
Picatinny Open Detonation Area
Subpart X Permit
Groundwater Monitoring Analytical Parameters, Methods, Laboratories, Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Chrysene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05350	STL North Canton OH001	Yes	
Di-n-butylphthalate	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05250	STL North Canton OH001	Yes	
Dibenz[a,h]anthracene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05360	STL North Canton OH001	Yes	
Explosives							
2,4-Dinitrotoluene	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28100	STL Knoxville TN001	Yes	
1,3-Dinitrobenzene	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28040	Knoxville TN001	Yes	
1,3,5-Trinitrobenzene	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28030	Knoxville TN001	Yes	
2,4,6-Trinitrotoluene	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28070	Knoxville TN001	Yes	
2,6-Dinitrotoluene	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28110	Knoxville TN001	Yes	
Cyclotetramethylene tetranitramine (HMX)	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28010	Knoxville TN001	Yes	
Cyclotrimethylene trinitramine (RDX)	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28020	Knoxville TN001	Yes	

NPW: Non-Potable Water

Table T-1 (continued)
Picatinny Open Detonation Area
Subpart X Permit
Groundwater Monitoring Analytical Parameters, Methods, Laboratories, Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
N-Methyl-N,2,4,6-tetranitroanliline (Tetryl)	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28050	Knoxville TN001	Yes	
Nitrobenzene	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28060	Knoxville TN001	Yes	
Nitrocellulose	USEPA 353.2 (modified)	N/A	USEPA 353.2 (modified)	Not Certified in NJDEP Database	None	No	User Defined Method for Picatinny Arsenal; No Labs listed in NJDEP Database as of 8/26/05
Nitroglycerin	SW-846 8332 Rev. 0, 12/96	N/A	SW-846 8332 Rev. 0, 12/96	NPW: SHW06.29100	Knoxville TN001	Yes	
Nitroguanidine	SW-846 8330, Rev. 0, 9/94 (modified)	N/A	SW-846 8330, Rev. 0, 9/94 (modified)	Not Certified in NJDEP Database	None	No	User Defined Method for Picatinny Arsenal; No Labs listed in NJDEP Database as of 8/26/05
Pentaerythritol tetranitrate (PETN)	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28045	Knoxville TN001	Yes	
4-Amino-2,6-dinitrotoluene	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28080	Knoxville TN001	Yes	
2-Amino-4,6-dinitrotoluene	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28090	Knoxville TN001	Yes	
2-Nitrotoluene	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28120	Knoxville TN001	Yes	
4-Nitrotoluene	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28140	Knoxville TN001	Yes	

NPW: Non-Potable Water

Table T-1 (continued)
Picatinny Open Detonation Area
Subpart X Permit
Groundwater Monitoring Analytical Parameters, Methods, Laboratories, Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Date	Comment
	Extraction	Clean-up	Analysis	Matrix Analyte Code	Lab ID		
3-Nitrotoluene	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28130	Knoxville TN001	Yes	
Metals							
Aluminum (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.05000	North Canton OH001	Yes	
Antimony (ICP/MS)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6020, Rev. 0, 9/94	NPW: SHW04.07000	North Canton OH001	Yes	
Arsenic (ICP/MS)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6020, Rev. 0, 9/94	NPW: SHW04.09500	North Canton OH001	Yes	
Barium (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.11500	North Canton OH001	Yes	
Beryllium (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.13500	North Canton OH001	Yes	
Cadmium (ICP/MS)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6020, Rev. 0, 9/94	NPW: SHW04.16000	North Canton OH001	Yes	
Calcium (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.17500	North Canton OH001	Yes	
Chromium (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.18500	North Canton OH001	Yes	
Cobalt (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.22500	North Canton OH001	Yes	

NPW: Non-Potable Water

Table T-1 (continued)
Picatinny Open Detonation Area
Subpart X Permit
Groundwater Monitoring Analytical Parameters, Methods, Laboratories, Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix-Analyte Code	Lab ID		
Copper (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.24500	North Canton OH001	Yes	
Iron (ICP/MS)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6020, Rev. 0, 9/94	NPW: SHW04.26005	North Canton OH001	Yes	
Lead (ICP/MS)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6020, Rev. 0, 9/94	NPW: SHW04.28000	North Canton OH001	Yes	
Magnesium (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.30500	North Canton OH001	Yes	
Manganese (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.31500	North Canton OH001	Yes	
Mercury	EPA 245.1	N/A	SW-846 7470A, Rev. 1, 9/94	NPW:WPP04.33000	North Canton OH001	Yes	
Nickel (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.35500	North Canton OH001	Yes	
Potassium (ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.38000	North Canton OH001	Yes	
Selenium (ICP/MS)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6020, Rev. 0, 9/94	NPW: SHW04.40600	North Canton OH001	Yes	
Silver (ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.41000	North Canton OH001	Yes	

NPW: Non-Potable Water

Table T-1 (continued)
Picatinny Open Detonation Area
Subpart X Permit
Groundwater Monitoring Analytical Parameters, Methods, Laboratories, Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Sodium (ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.43000	North Canton OH001	Yes	
Thallium (ICP/MS)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6020, Rev. 0, 9/94	NPW: SHW04.45500	North Canton OH001	Yes	
Vanadium (ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.47500	North Canton OH001	Yes	
Zinc (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.49000	North Canton OH001	Yes	
Boron (ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.15100	North Canton OH001	Yes	
Tin (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.47100	North Canton OH001	Yes	
Titanium (ICP)	EPA 200.7	N/A	EPA 200.7	NPW: WPP04.52050	North Canton OH001	Yes	
Tungsten (ICP/MS)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6020, Rev. 0, 9/94	NPW: SHW04.47170	North Canton OH001	Yes	
Strontium (ICP/MS)	SW-846 3005, Rev. 1 7/92 (modified)	N/A	SW-846 6020, Rev. 0, 9/94 (modified)	NPW: SHW04.44001	STL Pittsburgh PA005	Yes	User Defined Method for Picatinny Arsenal
Zirconium (ICP/MS)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6020, Rev. 0, 9/94	Other Picatinny Arsenal Project	North Canton OH001	Yes	

NPW: Non-Potable Water

Table T-1 (continued)
Picatinny Open Detonation Area
Subpart X Permit
Groundwater Monitoring Analytical Parameters, Methods, Laboratories, Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Silicon (ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	Not Certified in NJDEP Database	None	No	User Defined Method for Picatinny Arsenal; No Labs listed in NJDEP Database as of 8/26/05; Request analysis of Silica (SiO_2) in lieu of Silicon (Si)
Molybdenum (ICP/MS)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6020, Rev. 0, 9/94	NPW: SHW04.34005	North Canton OH001	Yes	
Cyanide							
Total Cyanide	SW-846 Method 9012A, Rev. 3, 12/96	N/A	SW-846 Method 9012A, Rev. 3, 12/96	NPW: SHW09.05000	North Canton OH001	Yes	
Pesticides/PCBs							
Aldrin	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12010	North Canton OH001	Yes	
Aroclor-1016	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8082, Rev. 0, 12/96	NPW: SHW06.13110	North Canton OH001	Yes	
Aroclor-1221	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8082, Rev. 0, 12/96	NPW: SHW06.13120	North Canton OH001	Yes	
Aroclor-1232	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8082, Rev. 0, 12/96	NPW: SHW06.13130	North Canton OH001	Yes	
Aroclor-1242	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8082, Rev. 0, 12/96	NPW: SHW06.13140	North Canton OH001	Yes	
Aroclor-1248	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8082, Rev. 0, 12/96	NPW: SHW06.13150	North Canton OH001	Yes	

NPW: Non-Potable Water

Table T-1 (continued)
Picatinny Open Detonation Area
Subpart X Permit
Groundwater Monitoring Analytical Parameters, Methods, Laboratories, Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Aroclor-1254	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8082, Rev. 0, 12/96	NPW: SHW06.13160	North Canton OH001	Yes	
Aroclor-1260	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8082, Rev. 0, 12/96	NPW: SHW06.13170	North Canton OH001	Yes	
alpha-BHC	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12020	North Canton OH001	Yes	
beta-BHC	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12030	North Canton OH001	Yes	
delta-BHC	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12040	North Canton OH001	Yes	
gamma-BHC (lindane)	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12050	North Canton OH001	Yes	
Chlordane (technical)	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12060	North Canton OH001	Yes	
P,P'-DDD	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12090	North Canton OH001	Yes	
P,P'-DDE	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12100	North Canton OH001	Yes	
P,P'-DDT	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12110	North Canton OH001	Yes	
Dieldrin	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12120	North Canton OH001	Yes	
Endosulfan A	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12130	North Canton OH001	Yes	
Endosulfan B	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12140	North Canton OH001	Yes	

NPW: Non-Potable Water

Table T-1 (continued)
Picatinny Open Detonation Area
Subpart X Permit
Groundwater Monitoring Analytical Parameters, Methods, Laboratories, Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Endosulfan sulfate	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12150	North Canton OH001	Yes	
Endrin	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12160	North Canton OH001	Yes	
Endrin aldehyde	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12170	North Canton OH001	Yes	
Endrin ketone	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12180	North Canton OH001	Yes	
Heptachlor	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12190	North Canton OH001	Yes	
Heptachlor epoxide	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12200	North Canton OH001	Yes	
Methoxychlor	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12210	North Canton OH001	Yes	
Toxaphene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12220	North Canton OH001	Yes	
Mirex	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12212	North Canton OH001	Yes	
Organophosphorous Pesticides							
Malathion	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8141A, Rev. 1, 9/94	NPW: SHW06.21060	North Canton OH001	Yes	
Diazinon	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8141A, Rev. 1, 9/94	NPW: SHW06.21040	North Canton OH001	Yes	
Anions							

NPW: Non-Potable Water

Table T-1 (continued)
Picatinny Open Detonation Area
Subpart X Permit
Groundwater Monitoring Analytical Parameters, Methods, Laboratories, Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Ammonium (Ammonia as Nitrogen)	EPA 350.2 Distillation	N/A	EPA 350.3 Electrode	NPW: WPP02.03500	North Canton OH001	Yes	
Chloride	SW-846 9056, Rev. 0, 12/96	N/A	SW-846 9056, Rev. 0, 12/96	NPW: SHW09.33100	North Canton OH001	Yes	
Fluoride	SW-846 9056, Rev. 0, 12/96	N/A	SW-846 9056, Rev. 0, 12/96	NPW: SHW09.34150	North Canton OH001	Yes	
Nitrate (NO_3)	SW-846 9056, Rev. 0, 12/96	N/A	SW-846 9056, Rev. 0, 12/96	NPW: SHW09.30150	North Canton OH001	Yes	
Nitrite (NO_2)	SW-846 9056, Rev. 0, 12/96	N/A	SW-846 9056, Rev. 0, 12/96	NPW: SHW09.29150	North Canton OH001	Yes	
Sulfate	SW-846 9056, Rev. 0, 12/96	N/A	SW-846 9056, Rev. 0, 12/96	NPW: SHW09.13050	North Canton OH001	Yes	
Sulfide	EPA 376.1	N/A	EPA 376.1	NPW: WPP02.47500	North Canton OH001	Yes	
Total Phosphorous	EPA 365.2	N/A	EPA 365.2	NPW: WPP02.34000	North Canton OH001	Yes	
Perchlorate	EPA 314.0	N/A	EPA 314.0	SDW:SDW02.31120	Knoxville TN001	Yes	As per NJDEP, Method 314 is acceptable for the analysis of Groundwater
Depleted Uranium							
Total Uranium (mass)	EPA 200.8	N/A	EPA 200.8	WPP04.52500	STL St. Louis MO002	Yes	

NPW: Non-Potable Water

Table T-1 (continued)
Picatinny Open Detonation Area
Subpart X Permit
Groundwater Monitoring Analytical Parameters, Methods, Laboratories, Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Uranium -238 (radiological)	DOE U-02	N/A	DOE U-02	NPW:SHW09.60310	USACE FUSRAP Lab 02022	Yes	USACE FUSRAP Maywood Laboratory 100 West Hunter Ave. Maywood, NJ 07607 201-226-6680
Uranium -234 (radiological)	DOE U-02	N/A	DOE U-02	NPW:SHW09.60310	USACE FUSRAP Lab 02022	Yes	USACE FUSRAP Maywood Laboratory 100 West Hunter Ave. Maywood, NJ 07607 201-226-6680
Uranium -235 (radiological)	DOE U-02	N/A	DOE U-02	NPW:SHW09.60310	USACE FUSRAP Lab 02022	Yes	USACE FUSRAP Maywood Laboratory 100 West Hunter Ave. Maywood, NJ 07607 201-226-6680
Cesium - 134/137	DOE 4.5.2.3	N/A	DOE 4.5.2.3	NPW: SHW09.60120	USACE FUSRAP Lab 02022	Yes	USACE FUSRAP Maywood Laboratory 100 West Hunter Ave. Maywood, NJ 07607 201-226-6680
Radium - 226	DOE Ra-04	N/A	EPA 903.1	NPW: SHW09.60105	SC&A Lab AL001	Yes	SC&A SOUTHEASTERN ENVIRONMENTAL LABORATORY 1000 Monticello Ct Montgomery, Al 36117 334-272-2234
Radium-228	SW-846 9320, Rev. 0, 9/86	N/A	SW-846 9320, Rev. 0, 9/86	NPW: SHW09.60110	USACE FUSRAP Lab 02022	Yes	USACE FUSRAP Maywood Laboratory 100 West Hunter Ave. Maywood, NJ 07607 201-226-6680

NPW: Non-Potable Water

Table T-1 (continued)
Picatinny Open Detonation Area
Subpart X Permit
Groundwater Monitoring Analytical Parameters, Methods, Laboratories, Certifications

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Cobalt – 60	DOE 4.5.2.3	N/A	DOE 4.5.2.3	NPW: SHW09.60130	USACE FUSRAP Lab 02022	Yes	USACE FUSRAP Maywood Laboratory 100 West Hunter Ave. Maywood, NJ 07607 201-226-6680

NPW: Non-Potable Water

Table T-2
Groundwater Sampling and Testing Requirements
Open Detonation Area
Picatinny Arsenal, New Jersey

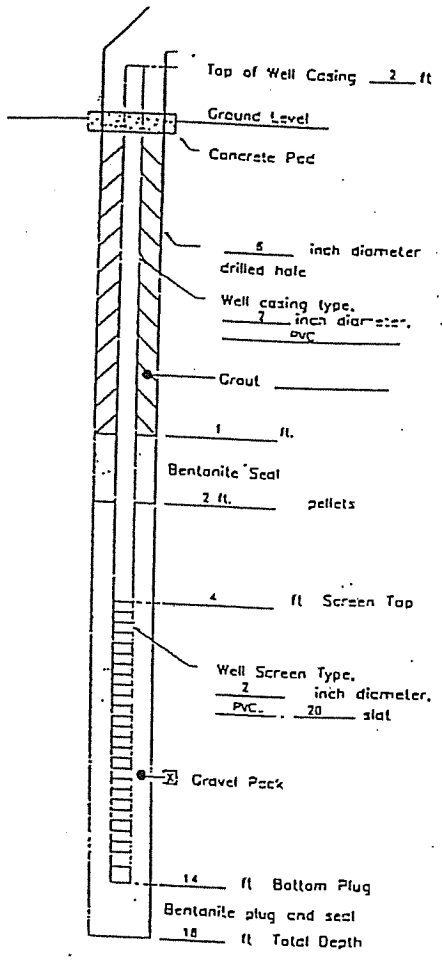
Analyte	Sample Container	Preservative	Holding Time
TCL Volatile Organic Compounds + Additional Alcohol Compounds	40 ml glass vial with teflon-lined septum	HCl to pH < 2 Cool to 4°C	7 days
TCL Semivolatile Organic Compounds + Mirex, Diphenylamine, carbazole, anilne	2 liter amber glass with Teflon lined cap	Cool to 4°C	7 days to extraction 40 days after extraction
TCL Pesticides/PCBs	2 liter amber glass with Teflon lined cap	Cool to 4°C	7 days to extraction 40 days after extraction
Organophosphorous Pesticides	2 liter amber glass with Teflon lined cap	Cool to 4°C	7 days to extraction 40 days after extraction
Explosives including nitroesters	4 liter amber glass with Teflon lined cap	Cool to 4°C	7 days
TAL Metals + Boron, Titanium, Strontium, Tin, Silicon, Molybdenum, Tungsten, Zirconium	1 Liter polyethylene	HNO_3 to pH < 2 Cool to 4° C	6 months (except Mercury, 28 days)
Cyanide	1 Liter polyethylene	Na OH to pH > 12 Cool to 4° C	14 days
Ammonia	500 ml polyethylene	H_2SO_4 to pH < 2 Cool to 4°C	28 days
Chloride	500 ml polyethylene	Cool to 4°C	28 days
Flouride	500 ml polyethylene	Cool to 4°C	28 days
Nitrite	500 ml polyethylene	Cool to 4°C	48 hours
Nitrate	500 ml polyethylene	Cool to 4°C	48 hours
Total Phosphorous	1 Liter polyethylene	H_2SO_4 to pH < 2 Cool to 4°C	28 days
Sulfide	1 Liter polyethylene	Na OH to pH > 12 Cool to 4° C	7 days
Perchlorate	500 ml polyethylene	Cool to 4°C	48 days
Depleted Uranium	2 liter amber glass with Teflon lined cap	HNO3 to pH < 2 Cool to 4° C	6 months
Gamma Spectroscopy	2 liter amber glass with Teflon lined cap	HNO3 to pH < 2 Cool to 4° C	6 months

APPENDIX T-1.A

BORING LOGS

WELL CONSTRUCTION LOG

Well OD-1A



measuring point is ground level

Project: Open Detonation Area - Task 8 Well: OD-1A

Town/City: Picatinny Arsenal (PTA)

County Morris State NJ

Permit No. NJ 2233305

Land Surface Elevation and Datum 862.5 feet Estimated: X Surveyed:

Installation Date(s): 11/19/93

Drilling Method: Air hammer

Drilling Contractor: Diamond Drilling

Drilling Fluid: none

Development Technique(s) and Date(s):

11/23/93, suction pump

Fluid Loss During Drilling: N/A gallons

Water Removed During Development: 525 gallons

Static Depth to Water: 6.63 feet below M.P.

Pumping Depth to Water: 9.45 feet below M.P.

Pumping Duration: 2.50 hours. M.P top of casing

Yield: 3.5 gpm Date: 11/23/94

Specific Capacity: 1.2 gpm/ft

Well Purpose: monitoring

Remarks: No problems at this location with caving of boulders.

11/23/93 Specific Conductivity = 60 µs/cm, temp = 10.0°C

On 12/16/93 @ 1500 hrs depth to water was 6.42 ft below top of PVC casing

Prepared by: Joe Lysonski

Anderson-Mulholland & Associates, Inc.

SAMPLE/CORE LOG

Boring/Well 1A Project/No. _____ Page _____ of _____

Site Location PTA - OU Area Drilling Started 11/17/93 Drilling Completed 11/19/93

Total Depth Drilled 18 feet Hole Diameter _____ inches Type of Sample/ Coring Device _____

Length and Diameter of Coring Device _____ Sampling Interval _____ feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum _____

Drilling Fluid Used _____ Drilling Method _____

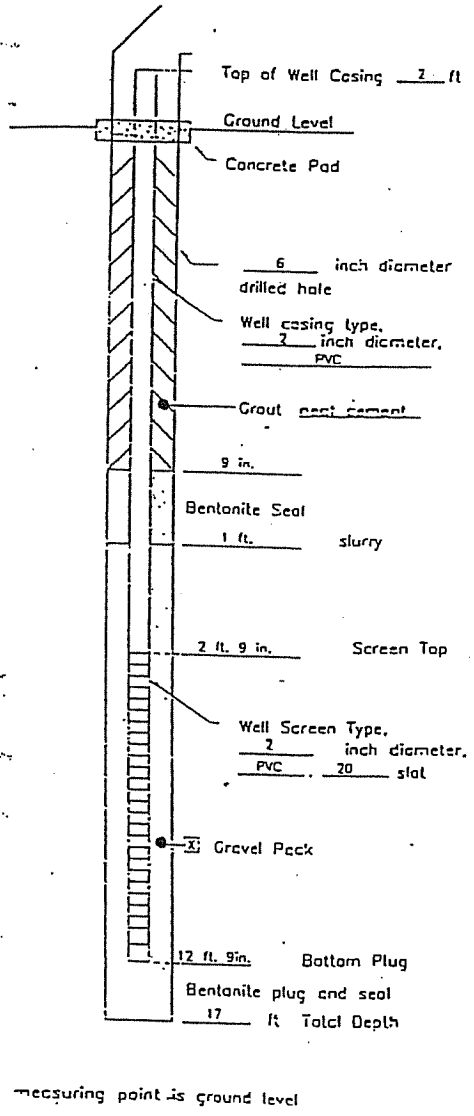
Drilling Contractor Diamond Drilling Driller _____ Helper _____

Prepared By JC Lysonski Hammer Weight _____ Hammer Drop _____ inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	3 ft			surface fill, silt, some sand, dark brown
3	18 ft			sand, gravel, boulders, clayey, lgt brown
				No obvious show of water until 18'
				12 ft bgl. More clayey at this location
				that at other well locations.
				Hole remained open without any
				caving problems.

WELL CONSTRUCTION LOG

Well OD-2A



measuring point is ground level

Project: Open Detonation Area - Task 8 Well: OD-2A

Town/City: Picatinny Arsenal (PTA), OD Area

County: Morris State NJ

Permit No. NJ 2233306

Land Surface Elevation

and Datum 850.5 feet Estimated: X Surveyed: ____

Installation Date(s): 11/19/93

Drilling Method: Air hammer

Drilling Contractor: Diamond Drilling

Drilling Fluid: none

Development Technique(s) and Date(s):

11/22/1993, suction pump

Fluid Loss During Drilling: N/A gallons

Water Removed During Development: est. 60 gallons

Static Depth to Water: 5.62 on 11/23/93 feet below M.P.

Pumping Depth to Water: not measured feet below M.P.

Pumping Duration: 1 hours M.P top of casing

Yield: low gpm Date: ____

Specific Capacity: ____

Well Purpose: monitoring

Remarks: Difficult to set casing and screen because of caving of boulders. Had to set temporary surface casing to keep hole open. Low yielding well.

On 12/16/93 @ 1542 hrs depth to water was 5.27 ft below top of PVC casing.

Prepared by: Joe Lysonski

Anderson-Mulholland & Associates, Inc.

SAMPLE/CORE LOG

Boring/Well OD-2A Project/No. Pueblo Assmt, Task 8 Page ____ of ____

Site Location Open Detonation Area Drilling Started 11/19/93 Drilling Completed ____

Total Depth Drilled 17 feet Hole Diameter 6 inches Type of Sample/ Coring Device ____

Length and Diameter of Coring Device ____ Sampling Interval ____ feet

Land-Surface Elev. ____ feet ☐ Surveyed ☐ Estimated Datum ____

Drilling Fluid Used ____ Drilling Method ____

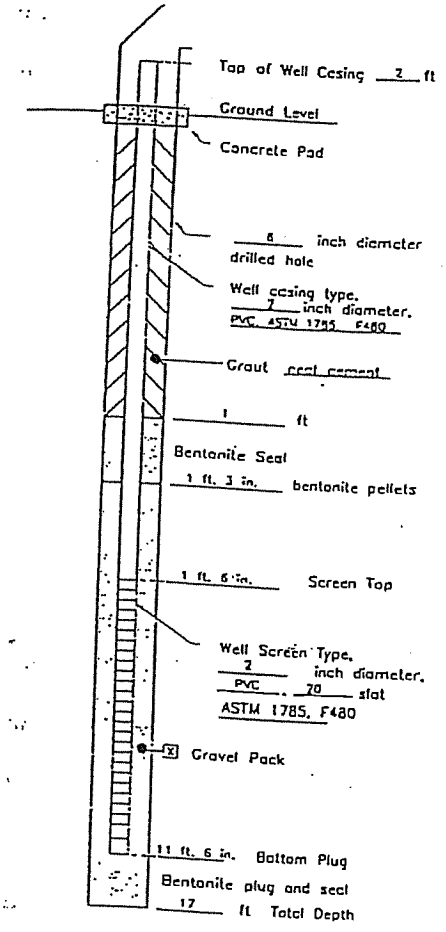
Drilling Contractor Diamond Drilling Co. Driller Brink Helper ____

Prepared By JC LYSOWSKI Hammer Weight ____ Hammer Drop ____ inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	3			Sand + gravel, silty dark brown
				water at 40" below ground level
3	17			boulders, sand, gravel, silty + clay
				air bubbles from air hammer coming to
				surface at within a 15' radius of well.
				No evidence of air bubbles in nearby
				Fresno Pond Brook.
				JC Lysowski

WELL CONSTRUCTION LOG

Well OD-3A



measuring point is ground level

Project: Open Detonation Area - Task 8 Well: OD-3A

Town/City: Picatinny Arsenal (PTA)

County Morris State NJ

Permit No. NJ 2233307

Land Surface Elevation

and Datum 846.0 feet Estimated: X Surveyed:

Installation Date(s): 11/17/93-11/18/93

Drilling Method: Air hammer

Drilling Contractor: Diamond Drilling

Drilling Fluid: none

Development Technique(s) and Date(s):

11/19/93, suction pump

Fluid Loss During Drilling: N/A gallons

Water Removed During Development: 300 gallons

Static Depth to Water: 4.13 feet below M.P.

Pumping Depth to Water: 4.68 feet below M.P.

Pumping Duration: 0.5 hours M.P top of casing

Yield: 10 gpm Date: 11/19/93

Specific Capacity: 18 gpm/ft

Well Purpose: monitoring

Remarks: Difficult drilling because of caving of boulders.

On 12/16/93 @ 1543 hrs depth to water was 3.21 ft below top of PVC casing.

Prepared by: Joe Lysonski

Anderson-Mulholland & Associates, Inc.

SAMPLE/CORE LOG

Boring/Well 3R Project/No. _____ Page _____ of _____

Site Location OD AREA Drilling Started 11/17/93 Drilling Completed 11/18/93

Total Depth Drilled 17 feet Hole Diameter 6 inches Type of Sample/ Coring Device _____

Length and Diameter of Coring Device _____ Sampling Interval _____ feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum _____

Drilling Fluid Used _____ Drilling Method _____

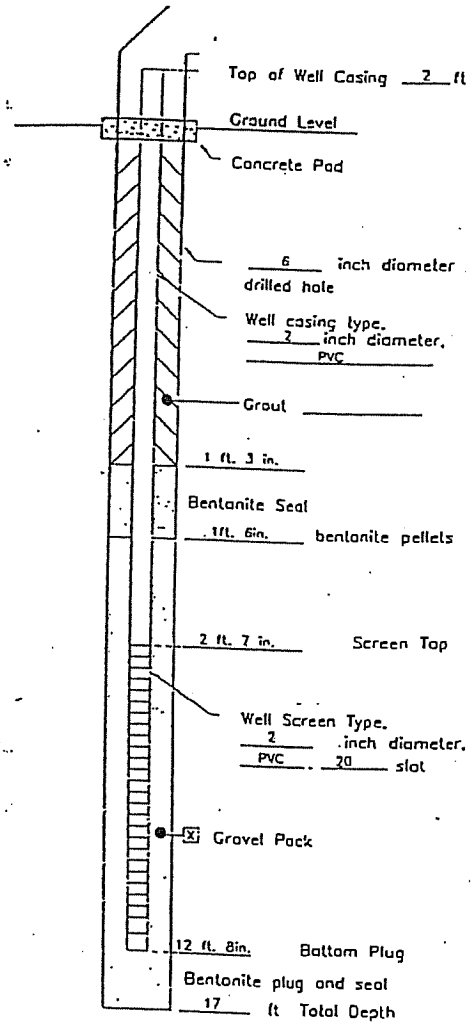
Drilling Contractor Dennett Drilling Driller _____ Helper _____

Prepared By J.C. LYSONSKI Hammer Weight _____ Hammer Drop _____ inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	3			surface sediment
3	17'			silt, ~~clay~~ dark brown, boulders (stream pond conglomerate)
				Water at elt 3 ft
				D/O 3.0 ft bgl measured 45 min after pause in
				drilling for lunch
				Drill to 10' silt, clay, boulders
				~~cc~~ caving at around 8 ft
				Drill to 17' silt, clay, boulders

WELL CONSTRUCTION LOG

Well OD-4A



measuring point is ground level

Project: Open Detonation Area - Task 8 Well: OD-4A

Town/City: Picatinny Arsenal (PTA)

County Morris State NJ

Permit No. NJ 2233308

Land Surface Elevation

and Datum 847.0 feet Estimated: X Surveyed:

Installation Date(s): 11/18/93

Drilling Method: Air hammer

Drilling Contractor: Diamond Drilling

Drilling Fluid: none

Development Technique(s) and Date(s):

11/19/93, suction pump

Fluid Loss During Drilling: N/A gallons

Water Removed During Development: 60 gallons

Static Depth to Water: 4.56 feet below M.P.

Pumping Depth to Water: 5.85 feet below M.P.

Pumping Duration: 0.33 hours M.P top of casing

Yield: 3 gpm Date: 11/19/93

Specific Capacity: 2.3 gpm/ft

Well Purpose: monitoring

Remarks: Difficult drilling because of caving of boulders. Had to set temporary surface casing to prevent caving.

On 12/16/93 @ 1545 hrs depth to water was 4.19 ft below top of PVC casing.

Prepared by: Joe Lysonski

Anderson-Mulholland & Associates, Inc.

SAMPLE/CORE LOG

Boring/Well OD-4A Project/No. _____ Page _____ of _____

Site Location PTA-OD Drilling Started 11/15/93 Drilling Completed _____

Total Depth Drilled _____ feet Hole Diameter 6 inches Type of Sample/Coring Device _____

Length and Diameter of Coring Device _____ Sampling Interval _____ feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum _____

Drilling Fluid Used _____ Drilling Method air hammer

Drilling Contractor Diamond Drilling Driller _____ Helper _____

Prepared By J.C. LYSOOSKI Hammer Weight _____ Hammer Drop _____ inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 1 Inches	Sample/Core Description
0	3			sand, gravel, silty dark brown
3	17			boulders, sand, gravel, clay
				boulders mostly composed of Brown Pond
				conglomerate

(973)770-5300
FAX: (973)770-5315

MONITORING WELL CONSTRUCTION DIAGRAM

Facility/Project Name:	PTA / D.O.27 – Gorge
Well Name:	OD-5A State Well Tag No:
Well Installed by: (Name & Firm)	T. Lynch – CT&E
Date Well Installed:	10 Dec 98
UTM Coordinates of Well:	N: E:

All measurements are referenced below ground surface.

A. Protective Cover Interval: 2.5 FT TO 2.5 FT

B. Well Casing Stickup: 9.5 FT TO 2.0 FT

C. Mortar Collar Interval: 0 FT TO 0.5 FT

D. Bentonite Grout Interval: 4.0 FT TO 0 FT

E. Primary Seal Interval: 9.5 FT TO 4.0 FT

F. Screened Interval: 19.5 FT TO 9.5 FT

G. Screen-Bottom Plug: / FT TO / FT

H. Filter Pack Interval: 20.0 FT TO 5.0 FT

I. Backfill Interval: / FT TO / FT

USCS Classification of soil near screen

GP ☐ GM ☐ GC ☒ GW ☐
SW ☐ SP ☐ SM ☐ SC ☐
ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

Drilling method used:

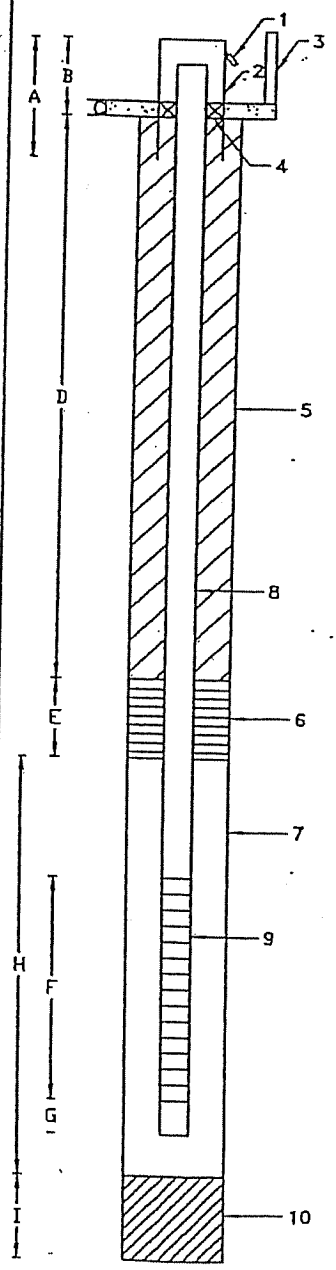
☒ Hollow Stemmed Auger
→ ☒ Air Rotary
☐ Other

Size and type of bit: 6" Hammer

Drilling fluid used:

Water ☐ Air ☒ Mud ☐
None ☐ Lost: 0 GAL

Comments:



2. Protective Cover:
   ☒ Above Ground
   ☐ Flush Cover
   A. Inside Diameter: 6
   B. Length: 5
   C. Material:
      ☒ Steel
      ☐ Other
   D. Drainage Port Size: .25

3. Surface Protection:
   A. Type: steel pickets
   B. Location: corners

4. Internal Mortar Collar
   A. Composition: Neat Cement
   B. Quantity: 5 gallons

5. Grout Seal:
   A. Composition: Portland Type I
      Cement Quantity: 25.2
      Bentonite Quantity: 20
      Water Quantity: 30
   B. Total Grout: 40
   C. Installation method:
      ☐ Tremie Pumped ☐ Gravity

6. Primary Seal:
   A. Composition:
      ☐ Bentonite Pellets:
      ☒ Bentonite Slurry:
      ☐ Sand:
   B. Quantity: 20 gallons
   C. Installation method:
      ☐ Tremie Pumped ☒ Gravity

7. Filter Pack:
   A. Manufacturer: Filter Sil
   B. Mesh Size: #1
   C. Volume Added: 350 lbs

8. Well Casing:
   A. Diameter: ☒ 2 IN ☐ 4 IN ☐ 6 IN
   B. Composition:
      ☒ Flush Tread PVC, Schedule 40
      ☐ Other:

9. Well Screen:
   A. Manufacturer: Bedrock
   B. Composition: PVC
   C. Slot Size: 0.010"
   Length: 10.0'

10. Backfill:
    A. Composition:
       ☒ None:
       ☐ Other:

(973)770-5300
FAX: (973)770-5315

MONITORING WELL CONSTRUCTION DIAGRAM

Facility/Project Name:	PTA / D.O. 27 George
Well Name:	OD-6A State Well Tag No:
Well Installed by: (Name & Firm)	T. Lynch - CT&E
Date Well Installed:	9 Dec 98
UTM Coordinates of Well:	N: E:

All measurements are referenced below ground surface.

A. Protective Cover Interval: 2.5 FT TO -2.5 FT

B. Well Casing Stickup: 11.0 2.5 FT TO -1.0 FT

C. Mortar Collar Interval: 0.0 FT TO -0.5 FT

D. Bentonite Grout Interval: 3.0 FT TO 0.0 FT

E. Primary Seal Interval: 6.0 FT TO 3.0 FT

F. Screened Interval: 21.0 FT TO 11.0 FT

G. Screen-Bottom Plug: — FT TO — FT

H. Filter Pack Interval: 21.0 FT TO 6.0 FT

I. Backfill Interval: — FT TO — FT

USCS Classification of soil near screen

GP ☐ GM ☐ GC ☒ GW ☐
SW ☐ SP ☐ SM ☐ SC ☐
ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

Drilling method used:

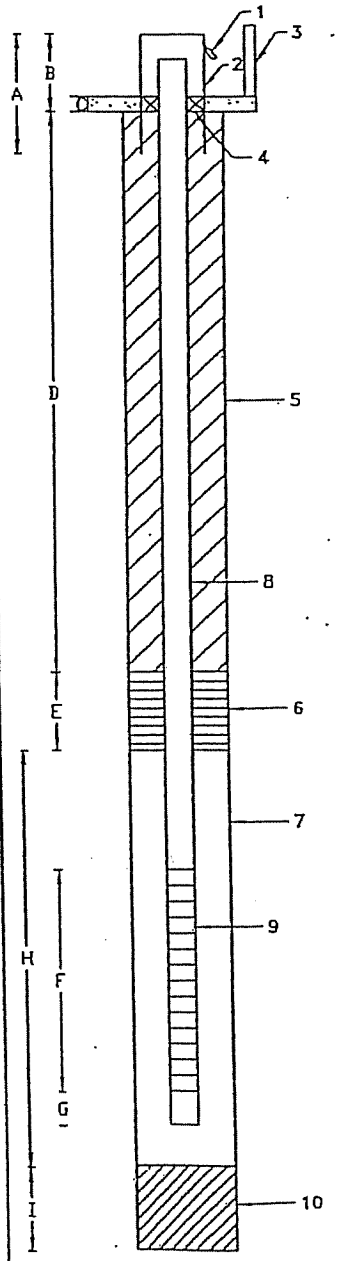
☐ Hollow Stemmed Auger
☒ Air Rotary
☐ Other

Size and type of bit: 6" Hammer

Drilling fluid used:

Water ☐ Air ☒ Mud ☐
None ☐ Lost: GAL

Comments:



2. Protective Cover:

☒ Above Ground
☐ Flush Cover

A. Inside Diameter: 6
B. Length: 5
C. Material:
☒ Steel
☐ Other
D. Drainage Port Size: .25 IN

3. Surface Protection:

A. Type: Steel Pickets
B. Location: Corner of Pad

4. Internal Mortar Collar

A. Composition: Neat Cement
B. Quantity: 5 gallons

5. Grout Seal:

A. Composition: Portland Type I
Cement Quantity: 285 LB
Bentonite Quantity: 30 LB
Water Quantity: 30 GA
B. Total Grout: 40 GA
C. Installation method:
☒ Tremie Pumped ☐ Gravity

6. Primary Seal:

A. Composition:
☐ Bentonite Pellets:
☒ Bentonite Slurry:
☐ Sand:
B. Quantity: 20 gallons
C. Installation method:
☒ Tremie Pumped ☐ Gravity

7. Filter Pack:

A. Manufacturer: Filter Sil
B. Mesh Size: #1
C. Volume Added: 300 lbs

8. Well Casing:

A. Diameter: ☒ 2 IN ☐ 4 IN ☐ 6 IN
B. Composition:
☒ Flush Tread PVC, Schedule 40
☐ Other:

9. Well Screen:

A. Manufacturer: Bedrock
B. Composition: PVC
C. Slot Size: 0.010"
Length: 10.0'

10. Backfill:

A. Composition:
☒ None:
☐ Other:

APPENDIX T-2

GROUNDWATER SAMPLING AND ANALYSIS PLAN

APPENDIX T-2
OD AREA GROUNDWATER SAMPLING AND ANALYSIS PLAN

1.0 Introduction

This document presents the groundwater sampling and analysis plan (SAP) for the RCRA detection monitoring system at the Open Detonation Area (ODA) at Picatinny Arsenal, New Jersey. The SAP is being provided in accordance with 40 CFR 264.97. The plan presents a description of the groundwater detection monitoring system, a discussion of field sampling activities and the analytical parameters to be sampled for at the six wells in the ODA. All sampling activities will be conducted in accordance with this SAP.

The list of constituents that will be analyzed in groundwater at he ODA is discussed in Section 4.0. The list includes all constituents previously detected in soil and groundwater samples plus additional parameters requested by NJDEP. Sample parameters and analytical methods are listed in **Table T-1** of Attachment T, Protection of Groundwater. All parameters will be analyzed using certified methods and laboratories, when available.

2.0 Groundwater Detection Monitoring System

The system of detection monitoring wells at the ODA is shown in **Figure 3-1** of Appendix T-1. The network consists of six overburden wells to monitor constituents in the groundwater at the ODA. Details of well construction and installation are presented in Appendix T-1, Hydrogeologic Investigation Report. **Figure 3-1** also presents groundwater elevation contours and groundwater flow direction. Groundwater flow in the shallow aquifer is influenced by topography and Green Pond Brook. Groundwater flow is towards Green Pond Brook with a strong down valley component. Wells OD-2A, OD-3A and OD-4A are down or side gradient to the ODA and constitute the point of compliance for the ODA.

3.0 Groundwater Sampling

Procedures and protocols for collecting groundwater samples, sample preservation and shipment, and chain of custody control are discussed in the following sections.

3.1 Groundwater Sample Collection

All groundwater samples to be collected from monitoring wells will be collected using low-flow purging and sampling techniques to minimize disturbance to the water column in the well. Water levels will be measured in each well before purging and prior to sample collection.

The goal of low-flow sampling is to collect more representative samples by matching the intake velocity of the sampling device with the natural groundwater flow velocity, thereby reducing sample disturbances. The primary advantage of this procedure is the collection of low turbidity samples (i.e., samples with low concentrations of suspended particles) and the reduction of sample aeration, resulting in samples which are more representative of true aquifer conditions. Low flow sampling also, in most cases, reduces the volume of groundwater purged from the well.

This sampling procedure involves removing groundwater from a monitoring well using a variable speed stainless-steel electric-powered submersible pump placed at the screened interval. The pump intake will be kept at least two feet above the bottom of the monitoring well to prevent mobilization of any sediment present in the bottom of the well. The depth to which the pump is lowered and the sample collected will be recorded so that the pump can be placed in the same location during future sampling events.

Before pumping begins, the water level in the monitoring well will be measured. The water level will be measured at a minimum of every three to five minutes during pumping. Pumping rates will be less than 500 mL per minute. Ideally, a pumping rate will be maintained that results in a stabilized water level (less than 0.3 ft drawdown) in the monitoring well. Water quality parameters (i.e., pH, temperature, conductivity, DO, turbidity, and ORP) will be measured on three to five minute intervals for stabilization. Stabilization will be defined by the following variances between three successive readings: turbidity, DO and ORP within 10%; conductivity within 3%; pH within 5%; and temperature within 1° C. If the water quality parameters do not stabilize, pre-sample purging will continue until one well volume has been removed or a purge time of two hours has been exceeded.

If drawdown in the monitoring well is greater than 0.3 feet, the pumping rate will be reduced to match the recharge rate of the well, taking care to maintain pump suction and avoid air entrainment in the tubing. If drawdown continues despite reducing the pumping rate, then the following alternative method will be used:

If the groundwater level in the monitoring well stabilizes at some level above the top of the screened interval, pumping will continue until the water quality parameters stabilize. At a minimum, three times the volume of the groundwater drawdown in the monitoring well will be removed prior to groundwater sampling.

Teflon® tubing, connected to the pump with stainless-steel clamps, will be used in collecting low-flow groundwater samples. The tubing will be dedicated to each individual well. Sample bottles will be filled in order of decreasing analyte volatility and preserved according to the aqueous preservation procedures provided in **Table T-2** of Attachment T, Protection of Groundwater. Entrainment of air in the tubing must not occur. The sampling sequences associated with each event will be documented in the field logbook. VOC samples will be collected first and directly into pre-preserved sample containers. The amount of HCL required for preservation will be determined using an acid blank with well purge water prior to sampling each well. All containers will be filled by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence.

Two-inch diameter, variable speed stainless steel submersible pumps will be used for pre-sample purging as well as monitoring well sampling. The submersible pumps will be decontaminated after each use according to the following procedure:

a. Wash and flush approximately 10 gallons with presampled and approved water through the pump
b. Wash and flush approximately 10 gallons of alconox (low phosphate detergent) through the pump
c. Wash and flush approximately 10 gallons of presampled and approved water through the pump
d. Wash and flush approximately 10 gallons demonstrated analyte-free water through the pump
g. Air dry
h. Wrap with aluminum foil (shiny side out)

The decontamination procedure is consistent with the "Decontamination of Pumps" described in the NJDEP *Field Sampling Procedures Manual* (NJDEP, 1992). Dedicated Teflon-lined tubing will only be decontaminated prior to its first use.

3.2 Quality Control

The following types of field quality control samples will be collected during each round: equipment rinse blanks and field duplicate samples. The methods and frequency for collection of these QC samples are described briefly below.

Laboratory QA/QC will be reported in the analytical laboratory deliverables and will include method (laboratory) blanks, laboratory control (check) samples, laboratory duplicates, surrogate percent recovery, matrix spike/matrix spike duplicates, holding times, method detection limits, and a report narrative. The QA/QC will not be used to correct data.

3.2.1 Field/Rinse Blank Samples

The purpose of a field/rinse blank is to place a mechanism of control on sample equipment handling, preparation, storage, and shipment. The field/rinse blank travels and is stored with the sample bottles, and is also representative of bottle shipment effects on sample quality. The field/rinse blank is primarily used to indicate potential contamination from ambient air as well as from sampling instruments used to collect and transfer samples from point of collection into sample containers.

At the field location, in an area suspected to be contaminated, reagent-grade water prepared at the laboratory is poured into or over properly decontaminated sampling equipment and collected in the appropriate sample bottles. Field/rinse blanks will be submitted for the complete suite of analyses performed per matrix. Field/rinse blank samples will be collected at a frequency of one per type of equipment per decontamination event.

3.2.2 Field Duplicate Samples

Field duplicate samples are a second sample collected at the same location as the original sample. Duplicate samples will be collected simultaneously or in immediate succession, using identical sampling techniques, and treated in an identical manner during storage, transportation, and analysis to provide information on sampling precision as well as analytical precision. Duplicate samples will be collected at a frequency of 1 in 20 samples

3.3 Sample Management

The procedures described in this section ensure that once representative environmental samples are obtained, they are properly containerized, preserved, shipped and handled in a manner that maintains their chemical integrity. The use of these techniques will endure the representativeness of a sample and significantly reduce the possibility of sample contamination from external sources.

3.3.1 Sample Containers

All sample containers for laboratory analysis will be pre-cleaned and provided by the analytical laboratory(ies).

3.3.2 Sample Preservation and Holding Times

Chemical preservatives are required for select aqueous samples to retard degradation during shipment and storage prior to laboratory analysis. Preservatives will be added to appropriate samples at the time of collection. In addition to chemical preservatives, samples for chemical analysis will be transported to the laboratory in temperature-controlled coolers. The types of preservation required for aqueous samples collected during the field sampling activities at the ODA as well as holding times, are contained in **Table T-2** of Attachment T, Protection of Groundwater. Ice will be used to maintain the internal cooler temperature at 4°C.

3.3.4 Sample Documentation

Accountability for a sample begins when the ample is collected from its natural environment. A bound field logbook will be maintained to record the acquisition of each sample. Chain-of-

custody records for all environmental samples and field QC samples, laboratory results and any other data generated as a result of sampling activities at the ODA will be maintained on file. Sampling locations will be noted on site figures, which will become part of the permanent project records.

3.3.5 Data Management

Hard copies of the data will be provided in a report to NJDEP following validation of the data. The analytical data results will be validated in accordance with the USEPA Region II Standard Operating Procedure HP-6 Revision 11 (March 2001).

4.0 Sampling Frequency and Chemical Analysis

The constituents that will be monitored in the groundwater detection system are listed in **Table T-1** of Attachment T, Protection of Groundwater. The list was determined based on the nature of the waste handled at the OD Area as described in section I.C.1, soil and groundwater contamination identified in the OD Area, on the persistence, mobility and toxicity of the constituents, and negotiations with NJDEP. The sample containers and preservation methods to be used for sampling these constituents are listed in **Table T-2** of Attachment T, Protection of Groundwater.

The following constituents will be analyzed for a minimum of four (4) consecutive quarters:

- Explosives
- Organophosphorous pesticides (malathion and diazinon)
- Nitroesters (nitrocellulose, nitroguanidine, nitroglycerine)
- TAL Metals
- Additional metals (boron, molybdenum, silicon, strontium, tin, titanium, tungsten, zirconium)
- Cyanides
- Anions including perchlorates
- Depleted Uranium including individual uranium isotopes
- Radioanalytes (Gamma Emitters)

The remaining analytes will be analyzed for a minimum of two consecutive quarters:

- TCL VOCs with additional alcohol compounds
- TCL SVOCs with additional compounds and n-nitrosodiphenylamine
- Diphenylamine, aniline, carbazole
- TCL PCBs, pesticides and mirex

Analysis of these compounds will continue if the resultant data indicate levels above the LOC for that compound. Levels of concern for groundwater are listed in **Table T-3** of Attachment T, Protection of Groundwater.

Groundwater levels will be measured during every sampling event. Levels will be measured to the nearest 0.01 foot. Static water level and well depth measurements will be obtained using an electric water level sounding device. The tape will be rinsed with distilled water, cloth-wiped, and allowed to air dry between consecutive water level measurements. All measurements of the depth to groundwater and well depth will be referenced to a permanently marked reference point on the monitoring wells (highest point on the top rim of the PVC casing). Personnel will also note any physical changes to the well or the concrete pad.

After the first year, the resultant data will be statistically evaluated and used to develop a semi-annual monitoring program. A groundwater assessment report will be submitted to NJDEP within

90 days of each sampling event. Groundwater contour maps will be prepared to show the horizontal direction of groundwater flow and to determine the flow rate. Laboratory data packages and data validation packages will also be submitted to NJDEP for each sampling event.

4.1 Statistical Procedures

Background concentration values from upgradient wells for constituents being monitored will be determined by computing the arithmetic mean from at least four sampling events. If any of the results are below detection limits, then half the detection limit will be used in the computation of the mean. An appropriate statistical method will be selected according to 40 CFR 264.97(h),

When sufficient groundwater monitoring data is acquired at the ODA, Picatinny will select an appropriate statistical method that will demonstrate compliance with the performance standards set forth below:

- The test should be conducted separately for each constituent detected in the well;
- The method should be appropriate for the noted distribution of chemical parameters or constituents, and more than one method may be required;
- Any practical quantitation limit (PQL) used in the method should be the lowest concentration level within levels of precision/accuracy for routine lab operations; and
- The selected method(s) should include procedures to control or correct for seasonal and spatial variability and temporal correlation in data.

The choice of statistical test will depend on the nature of the data and its distribution. If the proportion of the detected values is 50% or more, an analysis of variance (ANOVA) procedure will be preferred, although tolerance limits, prediction intervals or control charts may be used.

If an ANOVA procedure is used and the proportion of non-detects is less than 15%, then a non-parametric one-way ANOVA method will be used. If the proportion of non-detects is greater than 15%, a one-way parametric ANOVA procedure will be used. If the data is log-normally distributed, it will be transferred to a normal distribution before the statistical analysis.

If sampling data does not conform to any uniform distribution, the data will be ranked and a non-parametric statistical test will be proposed.

4.2 Record Keeping and Reporting

Records of groundwater chemical analysis and statistical evaluations for the ODA will be kept in ARDEC Environmental Affairs Division files at Picatinny Arsenal. Records will be kept in a manner to facilitate evaluation of potential statistically significant increases in contamination. Additionally, files containing all notifications to the Director of the Division of Solid and Hazardous Waste of NJDEP will be maintained. The records and files will be kept for 30 years beyond the active life of the facility and throughout the post-closure care period.

Computer records of the groundwater sampling results will also be maintained in the PTA Geographical Information System (GIS).

The following procedures will be implemented if there is statistically significant evidence that a release of contamination for any constituent or parameter is apparent at any compliance point monitoring well.

- Notify the Director of this finding in writing within seven days;

- Submit a compliance monitoring plan meeting the requirements of 40CFR 264.99 within 90 days;

- Submit an engineering feasibility plan within 180 days for a corrective action program unless all constituents identified are listed in Table 1 of 40 CFR 264.94, and their concentrations do not exceed their respective maximum values presented in Table 1 of 40 CFR 264.94, unless alternative cleanup levels (ACLs) have been approved.

- If appropriate, submit a demonstration that a source other than the regulated unit caused the contamination.

APPENDIX T-3

NJDEP CORRESPONDENCE REGARDING GROUNDWATER SAMPLING AND ANALYSIS AT THE OD AREA

John S

DONALD T. DIFRANCESCO
Acting Governor

State of New Jersey
Department of Environmental Protection
Division of Solid and Hazardous Waste
401 East State Street
P.O. Box 414
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Robert C. Shinn, Jr.
Commissioner

MAR 0 7 2001

Thomas J. Solecki
Chief, Environmental
Affairs Division
Department of the Army
U.S. Army Armament Research,
Development and Engineering Center
Picatinny Arsenal, New Jersey 07806-5000

Re: Interim Status Groundwater Monitoring for the Open Detonation of Waste Explosives, Department of the Army, U.S. Army Armament Research, Development and Engineering Center, Picatinny Arsenal, Federal Enclave Located in Morris County, USEPA ID No. NJ3 210 020 704

Dear Mr. Solecki:

The New Jersey Department of Environmental Protection (Department), Division of Solid and Hazardous Waste, Bureau of Hazardous Waste and Transfer Facilities (Bureau) is in receipt of your September 8, 2000, letter. The letter states that Picatinny Arsenal will perform groundwater sampling at the open detonation range for the constituents listed in your September 8, 2000, letter in accordance with the procedures of the PICATINNY ARSENAL FACILITY-WIDE FIELD SAMPLING PLAN dated September 1998. Low flow sampling will be used for all of the constituents and New Jersey approved bailer methods will be employed for a separate analysis of metals only. The letter also requests concurrence with your interpretation that the interim status open burning or detonation of waste explosives is subject to 40 C.F.R. 265.382 and not 40 C.F.R. Part 265, Subparts M or N and, therefore, does not require groundwater monitoring provided it does not threaten human health or the environment.

The Bureau concurs with your statement that the interim status open burning and detonation of waste explosives is subject to the requirements of 40 C.F.R. 265.382 and not 40 C.F.R. Part 265, Subparts M or N. However, 40 C.F.R. 265.382, in part, states that owners or operators choosing to open burn or detonate must do so in a manner that does not threaten human health or the environment.

The Bureau has determined that, the operation of the open detonation range is a potential threat to human health and the environment because the open detonation of waste explosives takes place directly on the ground without the use of any engineering controls that would prevent the migration of hazardous waste or hazardous waste constituents to the soils or groundwater. Furthermore, in order for the Bureau to determine if the unit is being operated in a manner that does not threaten human health or the environment, as required by 40 C.F.R. 265.382, groundwater monitoring must be conducted.

In addition, the Bureau in conjunction with its support group, the Bureau of Groundwater Pollution Abatement, has made the following determinations regarding its review of four rounds of groundwater monitoring data collected at the open detonation range designated as Rounds A through D for the first quarter through the fourth quarter, respectively, of 1999:

A) Round A:

Class IIA groundwater quality criteria have been exceeded for lead in downgradient compliance monitoring well OD-3A. This criteria exceedence is also significantly greater than the background monitoring well sample concentrations (See Attachment); and

Federal Lifetime Drinking Water Health Advisory criteria for RDX have been exceeded in background monitoring well OD-6A and the downgradient compliance well OD-4A. The RDX concentration in the downgradient compliance monitoring well OD-4A is greater than the concentration in background monitoring well OD-6A.

B) Round B:

Class IIA groundwater quality criteria have been exceeded for lead in downgradient compliance monitoring well OD-2A. This criteria exceedence is also significantly greater than the background monitoring well sample concentrations (See Attachment);

Class IIA groundwater quality criteria have been exceeded for arsenic and lead in downgradient compliance monitoring well OD-4A. These criteria exceedences are also significantly greater than the background monitoring well sample concentrations (See Attachment); and

Federal Lifetime Drinking Water Health Advisory criteria for RDX have been exceeded in downgradient compliance monitoring wells OD-2A and OD-4A. The criteria exceedences are also significantly greater than background monitoring well sample concentrations (See Attachment).

C) Round C:

Class IIA groundwater quality criteria have been exceeded for cadmium, lead and arsenic in downgradient compliance monitoring well OD-2A. These criteria exceedences are also significantly greater than the background monitoring well sample concentrations (See Attachment);

Class IIA groundwater quality criteria have been exceeded for cadmium and lead in downgradient compliance monitoring well OD-4A. These criteria exceedences are also

significantly greater than the background monitoring well sample concentrations (See Attachment); and

Federal Lifetime Drinking Water Health Advisory criteria for RDX have been exceeded in downgradient compliance monitoring well OD-4A. This criteria exceedence is also significantly greater than background monitoring well sample concentrations (See Attachment).

D) Round D:

Class IIA groundwater quality criteria have been exceeded for lead in downgradient compliance monitoring well OD-2A. This criteria exceedence is also significantly greater than the background monitoring well sample concentrations (See Attachment);

Class IIA groundwater quality criteria have been exceeded for cadmium, lead and arsenic in downgradient compliance monitoring well OD-4A. These criteria exceedences are also significantly greater than the background monitoring well sample concentrations (See Attachment); and

Federal Lifetime Drinking Water Health Advisory criteria for RDX have been exceeded in downgradient compliance monitoring wells OD-2A, OD-4A and OD-5A. These criteria exceedences are also significantly greater than background monitoring well sample concentrations (See Attachment).

In addition, during a February 10, 2000, meeting Picatinny Arsenal presented data to the Department indicating that the concentration of lead in the surface water adjacent to the open detonation unit is above surface water quality criteria.

The data referenced in A through D above indicates that a release of hazardous waste or hazardous waste constituents has occurred from the open detonation range. Furthermore, the release has entered the groundwater and has migrated to the subsurface environment and the surface water and may have an adverse effect on human health or the environment.

Please be advised that the Bureau has transferred the information listed in items A through D above to the Bureau of Site Assessment for integration into the Department's "Case Management Strategy" for assignment to the appropriate Bureau for any possible future Departmental action regarding this matter. Please note that this Bureau will not be the lead for oversight of any possible future Departmental remediation of this release.

Regarding your statement that the groundwater will be sampled for the constituents listed in your September 8, 2000, letter in accordance with the procedures of the PICATINNY ARSENAL FACILITY-WIDE FIELD SAMPLING PLAN dated September 1998 using low flow sampling for all of the constituents and New Jersey approved bailer methods for a separate analysis of metals only, the Bureau concurs that the above referenced procedures of the PICATINNY ARSENAL FACILITY-WIDE FIELD SAMPLING PLAN dated September 1998 should be used. However, the Bureau does not agree with the proposed list of constituents. Instead, the Bureau has determined that the groundwater must be sampled and analyzed for the following constituents listed in the PICATINNY

ARSENAL FACILITY-WIDE FIELD SAMPLING PLAN dated September 1998 and other constituents deemed appropriate by the Bureau:

Table 4-5 TCL Volatile Organic Compounds with Additional Compounds;

Table 4-6 Semivolatile Organic Compounds with Additional Compounds and n-nitrosodimethylamine (NDMA);

Table 4-7 TAL Metals with Additional Elements;

Table 4-8 Cyanides;

Table 4-10 Anions;

Table 4-12 Explosives with Additional Compounds and diphenylamine, diecthyleneglycol dinitrate (DEGDN), triethyleneglycol dinitrate (TEGDN), trimethyleneglycol dinitrate (TMETN), 1,3-diamino-2, 4,6-trinitrobenzene (DATB), HNS, perchlorates, white and red phosphorus, ammonium pirate and nitrate and nitrite (As nitrogen);

Table 4-13 TCL Pesticides/PCBs with Additional Compounds; and

Conventional Parameters: pH, temperature (°C), specific conductance (µS), dissolved oxygen (mg/l) and turbidity (NTU).

The Department offers certifications for the following SW846 Methods: 8330, 8331, 8332 and 7580. Therefore, if your facility chooses a commercial laboratory for these analyses, the laboratory must be New Jersey certified for these methods. However, if your facility chooses a Federal Department of Defense laboratory for these analyses, New Jersey certification of that laboratory is not required. In addition, please note that white phosphorus can be measured directly by using SW846 Method 7580. Ammonium picrate can be analyzed in water by High Pressure Liquid Chromatography (HPLC). This test can be used instead of analyzing for ammonia and picric acid individually. However, if ammonia and picric acid are analyzed, the facility must be able to demonstrate the relationship of the concentration of both compounds to the actual molar ratio of ammonium picrate in the groundwater.

Based on the above determinations, Picatinny Arsenal must begin quarterly groundwater monitoring during interim status at the open detonation range for the constituents listed above within three (3) months from the date of this letter. After eight (8) quarters of groundwater monitoring data have been collected and reviewed by the Department, the Bureau will reevaluate the constituents for which sampling and analysis must be performed. All groundwater samples must be collected and analyzed in accordance with the procedures specified in the PICATINNY ARSENAL FACILITY-WIDE FIELD SAMPLING PLAN dated September 1998. In addition, the Bureau requests that all future groundwater monitoring and validation data for the open detonation range be sent to this Bureau within three (3) months from the date of sampling.

Should you have any questions regarding this matter, please E-mail John P. Scott of my staff at jscott@dep.state.nj.us or call him at (609) 292-9880.

Very truly yours,

Anthony Fontana, Chief
Bureau of Hazardous Waste
and Transfer Facilities

EP58/JPS
Document: PASUBX12
Attachment
C: Tracy Grabiak, BGWPA, with attachment
Joseph Marchesani, BGWPA, with attachment
James Kealy, BEERA, with attachment
Greg Zalaskus, BCM, with attachment
Kathleen Grimes, BEMQA, with attachment
Jeff Sterling, BHWCE-Northern, with attachment
Barry Tornick, USEPA, Region II, with attachment
Stephen Shukailo, Mayor, Town of Dover, with attachment
Russel Felter, Mayor, Jefferson Township, with attachment
Harry R. Shupe, Mayor, Wharton Borough, with attachment
Joeseph Lebar, Mayor, Rockaway Borough, with attachment
John P. Inglesino, Mayor, Rockaway Township, with attachment
Sandy Urgo, Mayor, Roxbury Township, with attachment
Paul Minenna, Councilman, Rockaway Township, with attachment

DONALD T. DIFRANCESCO
Acting Governor

State of New Jersey
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JUN 21 2001

Thomas J. Solecki
Chief, Environmental
Affairs Division
Department of the Army
U.S. Army Armament Research,
Development and Engineering Center
Picatinny Arsenal, New Jersey 07806-5000

Re: Interim Status Groundwater Monitoring for the Open Detonation of Waste Explosives, Department of the Army, U.S. Army Armament Research, Development and Engineering Center, Picatinny Arsenal, Federal Enclave Located in Morris County, USEPA ID No. NJ3 210 020 704

Dear Mr. Solecki:

The New Jersey Department of Environmental Protection (Department), Division of Solid and Hazardous Waste, Bureau of Hazardous Waste and Transfer Facilities (Bureau) is in receipt of your May 3, 2001, letter. The letter contains comments on the Bureau's March 7, 2001, letter regarding the interim status groundwater monitoring requirements for the open detonation of waste explosives. The Bureau has reviewed the comments submitted and has made the following determinations:

Comment # 1

A quarterly monitoring program will be committed to for all existing open detonation wells for one year for all constituents listed in the revised Subpart X permit application. The resultant data will be used to develop a semi-annual monitoring program in compliance with 40 C.F.R. Part 264. The four quarters of monitoring data is also consistent with the State equivalent of 40 C.F.R. Part 270.

Response

The Department does not agree that the Federal requirement is equivalent to the State requirement. N.J.A.C. 7:26E-6.1(e) requires eight quarters of monitoring and, therefore, is more stringent than the Federal requirement. However, the Department agrees to grant a variance to reduce the frequency of monitoring from eight to four quarters provided the four quarters of monitoring are consecutive.

Regarding your statement that the resultant data will be used to develop a semi-annual monitoring program in compliance with 40 C.F.R. Part 264. Proposals to sample the monitoring wells at a decreased frequency will only be considered by the Department after four consecutive quarters of monitoring data have been collected and reviewed.

Comments # 2 and 3

Picatinny Arsenal will analyze the additional parameters requested in your letter, which are not listed in the Subpart X permit application for the first two quarters of the monitoring program. The following parameters are not included in the Subpart X permit application:

a) TCL Volatiles and additional compounds.
b) Semi-volatile organic compounds with additional compounds and NDMA.
c) TCL pesticides/PCBs with additional compounds.

Analysis of these compounds will continue if the resultant data indicates levels above the detection limit for that compound.

The Bureau's letter did not provide any justification for the inclusion of the above listed compounds in the groundwater-monitoring program. The Subpart X permit application provides justification for the inclusion or elimination of compounds based on historical records. The record indicates that these compounds were never tested or disposed of at the open detonation range. Therefore, two rounds of sampling are sufficient for monitoring purposes.

Response

The Department agrees that two rounds of sampling are adequate for monitoring of the above referenced compounds. In addition, the use of detection limits for determining if analysis will continue is acceptable provided the detection limits have been approved by the Department. However, detection limits were not included in your submittal. Therefore, please submit this information, for the Department's review and approval, within thirty (30) days from the date of this letter.

Comment # 4

New Jersey certified laboratories will be used for methods requiring State certification.

Response

The Department concurs with the comment.

Comment # 5

Groundwater sampling will be performed using low-flow methodology that was approved in the Field Sampling Plan (FSP) for all parameters including the inorganics. The USEPAs directives and guidance clearly maintains the superiority of low-flow methodology for providing a representative sample with

regard to evaluating metal concentrations in groundwater. Decisions will not be based on the results of unfiltered groundwater samples based on samples with traditional bailer methods.

Response

Low flow sampling is acceptable as long as conventional bailer sampling is also conducted. Any sampling that does not include conventional bailer sampling will be at your own risk.

Comment # 6

All data, monitoring results and validation reports will be submitted within one hundred days after the last day of the quarterly sampling event. This conforms with Picatinny Arsenal's Facility Wide Sampling Plan (FSP) that was submitted as part of the Subpart X permit application. Any subsequent comments on the adequacy or completeness of the FSP by the Department as part of the Subpart X permit application process will not invalidate the data from the sampling.

Response

The Department agrees that all data, monitoring results and validation reports may be submitted within one hundred days after the last day of the quarterly sampling event. However, the Department does not agree that any subsequent comments on the adequacy or completeness of the FSP by the Department as part of the Subpart X permit application process will not invalidate the data from the sampling. Any written correspondence from the Department that is issued prior to any sampling event must be adhered to.

Picatinny Arsenal shall conduct the first round of quarterly groundwater sampling within thirty (30) days from the date of this letter. The groundwater sampling and analysis shall adhere to the requirements of this letter in conjunction with the Bureau's letter of March 7, 2001.

Should you have any questions regarding this matter, please E-mail John P. Scott at jscott@dep.state.nj.us or call him at 609-292-9880.

Very truly yours,

Anthony Fontana, Chief
Bureau of Hazardous Waste
and Transfer Facilities

EP58/JPS
C: Barry Tornick, USEPA, Region II
Jeffrey Sterling, BHWCE, Northern Region
Tracy Grabiak, GWPA
Document: PASUBX22

DEPARTMENT OF THE ARMY
UNITED STATES ARMY INSTALLATION MANAGEMENT AGENCY
NORTHEAST REGIONAL OFFICE GARRISON
PICATINNY ARSENAL, NEW JERSEY 07806-5000

REPLY TO
ATTENTION OF

August 31, 2005

ORIGINAL CONTROLLED DOCUMENT

Environmental Affairs Directorate

SUBJECT: Request for a Forty Five (45) day Extension for Submittal of a Response to Technical Notice of Deficiency, November 2000 Subpart X Permit Application for Open Detonation, U.S. Army Armament Research Development and Engineering Center, Picatinny Arsenal, Morris County, EPA ID No. NJ3 210 020 704

Mr. Anthony Fontana, Chief
Bureau of Hazardous Waste and Transfer Facilities
New Jersey Department of Environmental Protection
Division of Solid and Hazardous Waste
401 East State Street
P.O. Box 414
Trenton, New Jersey 08625-0414

Dear Mr. Fontana:

Picatinny requests a Forty Five (45) day extension from the September 4, 2005 deadline given in your July 6, 2005, letter. The extension is needed to give contractor personnel adequate time to prepare responses to NJDEP comments and for ARDEC to review responses.

You also request in regard to groundwater (part 4 of the attachment) that we "resume sampling ninety (90) days of the date of the letter" and for Picatinny to comply with your March 7th and June 21, 2001 letters. For Picatinny to ensure the data resultant from this sampling is acceptable to NJDEP and to clear up statements at our June 9th meeting in Trenton that a new groundwater sampling work plan be developed for approval before implementation of the quarterly groundwater monitoring, we request the following concurrence or guidance on four points.

1) Request NJDEP agreement to proposed analytes included in the attached table for the quarterly groundwater monitoring program:

Picatinny will include the analysis for most of the parameters in accordance with the Bureau's March 7, 2001 and subsequently revised June 21, 2001 letters. However, based on Ms. Grimes' statements at the June 9, 2005 meeting and consistent with your December 31st 2003 letter, the results from analyses which were performed by Crane Naval Warfare Center are acceptable to NJDEP and those compounds will not have to be re-sampled. The 4 quarters of results were all non-detects.

Hence, the program does not include the explosives:

1. diethyleneglycol dinitrate (DEGDN),
2. triethyleneglycol dinitrate (TEGDN),
3. trimethyleneglycol dinitrate (TMEDN),

4. 1,3-diamino-2, 4,6-trinitrobenzene (DATB); and
5. 2'4,4,'6,6'-hexanitrostilbene (HNS).

2) Verify that the information in the attached table regarding laboratory certification is up-to-date. Our contractor's, Shaw Environmental's, chemist is permitted to speak directly to your laboratory certification and data quality personnel.

3) Request for guidance regarding the few cases of analytes in which there is no certified methods and/or no certified laboratory for the analyte (e.g., diphenylamine, zirconium, and uranium isotopes). In this case we request that Shaw Environmental's chemist be permitted to speak directly to your laboratory certification and data quality personnel.

4) Request for use of certified drinking water analytical methods to analyze the non-potable well water from the ODA in cases where a certified method does not exist for non-potable water (e.g., perchlorate, cobalt-60).

Once we have resolved these issues and have reached agreement that the result data will be acceptable to NJDEP, we will resume the groundwater sampling at the Open Detonation Area within 10 days of receipt of your concurrence on the four points noted above. We appreciate any efforts you can do to expedite this matter.

If you have any questions please feel free to contact Freddy Sanchez at 973-724-5948 or myself at 973-724-5818.

Sincerely,

Thomas J. Solecki
Director, Environmental Affairs
Directorate

Table I.C-3 Groundwater
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Volatiles							
1,1-Dichloroethene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04220	STL North Canton OH001	Yes	
Methylene Chloride	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04260	STL North Canton OH001	Yes	
trans-1,2-Dichloroethene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04230	STL North Canton OH001	Yes	
1,1-Dichloroethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04200	STL North Canton OH001	Yes	
Chloroform	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04150	STL North Canton OH001	Yes	
1,1,1-Trichloroethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04290	STL North Canton OH001	Yes	
Trichloroethene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04310	STL North Canton OH001	Yes	
Tetrachloroethene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04280	STL North Canton OH001	Yes	
1,2-Dibromoethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04185	STL North Canton none	Yes	

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix-Analyte Code	Lab ID		
Benzene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04010	STL North Canton OH001	Yes	
Toluene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04070	STL North Canton OH001	Yes	
1,1-Dichloroethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04200	STL North Canton OH001	Yes	
1,1-Dichloroethylene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04220	STL North Canton OH001	Yes	
1,1,1-Trichloroethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04290	STL North Canton OH001	Yes	
1,1,2-Trichloroethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04300	STL North Canton OH001	Yes	
1,1,2,2-Tetrachloroethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04270	STL North Canton OH001	Yes	
1,2-Dichloroethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04210	STL North Canton OH001	Yes	
1,2-Dichloropropane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04240	STL North Canton OH001	Yes	
2-Butanone	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04360	STL North Canton OH001	Yes	

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
2-Hexanone	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04370	STL North Canton OH001	Yes	
4-Methyl-2-pentanone (Methyl Isobutyl Ketone)	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04380	STL North Canton OH001	Yes	
Acetone	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04340	STL North Canton OH001	Yes	
Bromodichloromethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04090	STL North Canton OH001	Yes	
Bromoform	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04100	STL North Canton OH001	Yes	
Bromomethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04110	STL North Canton OH001	Yes	
Carbon Disulfide	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04350	STL North Canton OH001	Yes	
Vinyl Acetate	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04327	STL North Canton OH001	Yes	
Carbon Tetrachloride	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04120	STL North Canton OH001	Yes	
Chlorobenzene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04020	STL North Canton OH001	Yes	

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Chloroethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04130	STL North Canton OH001	Yes	
Chloroform	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04150	STL North Canton OH001	Yes	
Chloromethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04160	STL North Canton OH001	Yes	
cis-1,2-Dichloroethene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04235	STL North Canton OH001	Yes	
cis-1,3-Dichloropropene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04250	STL North Canton OH001	Yes	
Dibromochloromethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04180	STL North Canton OH001	Yes	
Dichlorodifluoromethane (Freon 12)	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04190	STL North Canton OH001	Yes	
Ethylbenzene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04060	STL North Canton OH001	Yes	
Styrene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04550	STL North Canton OH001	Yes	
Tetrachloroethylene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04280	STL North Canton OH001	Yes	

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Toluene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04070	STL North Canton OH001	Yes	
Trans-1,2-Dichloroethene[a]	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04230	STL North Canton OH001	Yes	
Trans-1,3-Dichloropropene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04170	STL North Canton OH001	Yes	
Trichlorofluoromethane (Freon 11)	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04320	STL North Canton OH001	Yes	
Trichloroethylene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04310	STL North Canton OH001	Yes	
Vinyl Chloride	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04330	STL North Canton OH001	Yes	
Total Xylene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04080	STL North Canton OH001	Yes	
Acetonitrile	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04398	STL North Canton OH001	Yes	
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04322	STL North Canton OH001	Yes	
Iodomethane (Methyl Iodide)	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04375	STL North Canton OH001	Yes	

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
1,1,1,2-Tetrachloroethane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04560	STL North Canton OH001	Yes	
2-Chloroethyl Vinyl Ether	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04140	STL North Canton OH001	Yes	
1,2-Dibromo-3-chloropropene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04187	STL North Canton OH001	Yes	
trans-1,4-Dichloro-2-butene	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04255	STL North Canton OH001	Yes	
1,2,3-Trichloropropane	SW-846 5030B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04325	STL North Canton OH001	Yes	
Additional Alcohols							
Ethanol	SW-846 8260B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04259	Environmental Science Corporation TN002	Yes	
Isopropanol	SW-846 8260B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04377	Environmental Science Corporation TN002	Yes	
tert-Butyl alcohol	SW-846 8260B, Rev. 2, 12/96	N/A	SW-846 8260B, Rev. 2, 12/96	NPW: SHW07.04395	Environmental Science Corporation TN002	Yes	

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Semivolatiles							
1,2-Dichlorobenzene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05691	STL North Canton OH001	Yes	
1,2,4-Trichlorobenzene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05120	STL North Canton OH001	Yes	
1,3-Dichlorobenzene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05692	STL North Canton OH001	Yes	
1,4-Dichlorobenzene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05700	STL North Canton OH001	Yes	
2-Chloronaphthalene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05070	STL North Canton OH001	Yes	
2-Chlorophenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05450	STL North Canton OH001	Yes	
2-Methylnaphthalene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05400	STL North Canton OH001	Yes	
2-Methylphenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05500	STL North Canton OH001	Yes	
2-Nitroaniline	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05060	STL North Canton OH001	Yes	
2-Nitrophenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05520	STL North Canton OH001	Yes	

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
2,4-Dichlorophenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05460	STL North Canton OH001	Yes	
2,4-Dimethylphenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05470	STL North Canton OH001	Yes	
2,4-Dinitrophenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05480	STL North Canton OH001	Yes	
2,4-Dinitrotoluene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05170	STL North Canton OH001	Yes	
2,4,5-Trichlorophenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05560	STL North Canton OH001	Yes	
2,4,6-Trichlorophenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05570	STL North Canton OH001	Yes	
2,6-Dinitrotoluene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05180	STL North Canton OH001	Yes	
3-Nitroaniline	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05062	STL North Canton OH001	Yes	
3,3'-Dichlorobenzidine	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05040	STL North Canton OH001	Yes	
4-Bromophenyl-phenylether	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05160	STL North Canton OH001	Yes	

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
4-Chloro-3-methylphenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05440	STL North Canton OH001	Yes	
4-Chloroaniline	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05050	STL North Canton OH001	Yes	
4-Chlorophenyl-phenylether	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05150	STL North Canton OH001	Yes	
4-Methylphenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05510	STL North Canton OH001	Yes	
4-Nitroaniline	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05063	STL North Canton OH001	Yes	
4-Nitrophenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05530	STL North Canton OH001	Yes	
4,6-Dinitro-2-methylphenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05490	STL North Canton OH001	Yes	
Acenaphthene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05270	STL North Canton OH001	Yes	
Acenaphthylene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05290	STL North Canton OH001	Yes	
Anthracene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05280	STL North Canton OH001	Yes	

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Benzo[a]anthracene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05300	STL North Canton OH001	Yes	
Benzo[a]pyrene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05310	STL North Canton OH001	Yes	
Benzo[b]fluoranthene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05320	STL North Canton OH001	Yes	
Benzo[g,h,i]perylene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05330	STL North Canton OH001	Yes	
Benzo[k]fluoranthene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05340	STL North Canton OH001	Yes	
Bis(2-chloroethoxy)methane	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05130	STL North Canton OH001	Yes	
Bis(2-chloroethyl)ether	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05132	STL North Canton OH001	Yes	
Butylbenzylphthalate	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05210	STL North Canton OH001	Yes	
Bis(2-chloroisopropyl)ether	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05140	STL North Canton OH001	Yes	
Carbazole	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05030	STL North Canton OH001	Yes	

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Aniline	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05048	STL North Canton OH001	Yes	
Dibenzofuran	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05600	STL North Canton OH001	Yes	
Dimethylphthalate	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05240	STL North Canton OH001	Yes	
Diethylphthalate	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05230	STL North Canton OH001	Yes	
Bis(2-ethylhexyl)phthalate	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05220	STL North Canton OH001	Yes	
Fluoranthene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05370	STL North Canton OH001	Yes	
Fluorene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05380	STL North Canton OH001	Yes	
Diphenylamine (HPLC/UV)	SW-846 8330, Rev. 0, 9/94 (modified)	N/A	SW-846 8330, Rev. 0, 9/94 (modified)	Not Certified in NJDEP Database	None	No	User Defined Method for Picatinny Arsenal; No Labs listed in NJDEP Database using HPLC as of 8/26/05
Hexachlorobenzene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05080	STL North Canton OH001	Yes	

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Hexachlorobutadiene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05090	STL North Canton OH001	Yes	
Hexachlorocyclopentadiene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05100	STL North Canton OH001	Yes	
Hexachloroethane	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05110	STL North Canton OH001	Yes	
Indeno(1,2,3-c,d)pyrene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05390	STL North Canton OH001	Yes	
Isophorone	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05190	STL North Canton OH001	Yes	
Nitrobenzene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05200	STL North Canton OH001	Yes	
Naphthalene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05410	STL North Canton OH001	Yes	
N-nitroso-di-n-propylamine	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05006	STL North Canton OH001	Yes	
N-nitroso-di-phenylamine[1]	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05004	STL North Canton OH001	Yes	

[1] Cannot be distinguished from Diphenylamine

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix Analyte Code	Lab ID		
Di-n-octylphthalate	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05260	STL North Canton OH001	Yes	
Pentachlorophenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05540	STL North Canton OH001	Yes	
Phenanthrene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05420	STL North Canton OH001	Yes	
Phenol	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05550	STL North Canton OH001	Yes	
Pyrene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05430	STL North Canton OH001	Yes	
Chrysene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05350	STL North Canton OH001	Yes	
Di-n-butylphthalate	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05250	STL North Canton OH001	Yes	
Dibenz[a,h]anthracene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8270C, Rev. 3, 12/96	NPW: SHW07.05360	STL North Canton OH001	Yes	
Explosives							
2,4-Dinitrotoluene	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28100	STL Knoxville TN001	Yes	

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
1,3-Dinitrobenzene	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28040	Knoxville TN001	Yes	
1,3,5-Trinitrobenzene	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28030	Knoxville TN001	Yes	
2,4,6-Trinitrotoluene	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28070	Knoxville TN001	Yes	
2,6-Dinitrotoluene	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28110	Knoxville TN001	Yes	
Cyclotetramethylene tetranitramine (HMX)	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28010	Knoxville TN001	Yes	
Cyclotrimethylene trinitramine (RDX)	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28020	Knoxville TN001	Yes	
N-Methyl-N,2,4,6-tetranitroaniline (Tetryl)	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28050	Knoxville TN001	Yes	
Nitrobenzene	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28060	Knoxville TN001	Yes	
Nitrocellulose	USEPA 353.2 (modified)	N/A	USEPA 353.2 (modified)	Not Certified in NJDEP Database	None	No	User Defined Method for Picatinny Arsenal; No Labs listed in NJDEP Database as of 8/26/05
Nitroglycerin	SW-846 8332 Rev. 0, 12/96	N/A	SW-846 8332 Rev. 0, 12/96	NPW: SHW06.29100	Knoxville TN001	Yes	

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix-Analyte Code	Lab ID		
Nitroguanidine	SW-846 8330, Rev. 0, 9/94 (modified)	N/A	SW-846 8330, Rev. 0, 9/94 (modified)	Not Certified in NJDEP Database	None	No	User Defined Method for Picatinny Arsenal; No Labs listed in NJDEP Database as of 8/26/05
Pentaerythritol tetranitrate (PETN)	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28045	Knoxville TN001	Yes	
4-Amino-2,6-dinitrotoluene	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28080	Knoxville TN001	Yes	
2-Amino-4,6-dinitrotoluene	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28090	Knoxville TN001	Yes	
2-Nitrotoluene	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28120	Knoxville TN001	Yes	
4-Nitrotoluene	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28140	Knoxville TN001	Yes	
3-Nitrotoluene	SW-846 8330, Rev. 0, 9/94	N/A	SW-846 8330, Rev. 0, 9/94	NPW: SHW06.28130	Knoxville TN001	Yes	
Metals							
Aluminum (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.05000	North Canton OH001	Yes	
Antimony (ICP/MS)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6020, Rev. 0, 9/94	NPW: SHW04.07000	North Canton OH001	Yes	

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Arsenic (ICP/MS)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6020, Rev. 0, 9/94	NPW: SHW04.09500	North Canton OH001	Yes	
Barium (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.11500	North Canton OH001	Yes	
Beryllium (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.13500	North Canton OH001	Yes	
Cadmium (ICP/MS)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6020, Rev. 0, 9/94	NPW: SHW04.16000	North Canton OH001	Yes	
Calcium (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.17500	North Canton OH001	Yes	
Chromium (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.18500	North Canton OH001	Yes	
Cobalt (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.22500	North Canton OH001	Yes	
Copper (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.24500	North Canton OH001	Yes	
Iron (ICP/MS)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6020, Rev. 0, 9/94	NPW: SHW04.26005	North Canton OH001	Yes	
Lead (ICP/MS)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6020, Rev. 0, 9/94	NPW: SHW04.28000	North Canton OH001	Yes	

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Magnesium (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.30500	North Canton OH001	Yes	
Manganese (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.31500	North Canton OH001	Yes	
Mercury	EPA 245.1	N/A	SW-846 7470A, Rev. 1, 9/94	NPW:WPP04.33000	North Canton OH001	Yes	
Nickel (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.35500	North Canton OH001	Yes	
Potassium (ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.38000	North Canton OH001	Yes	
Selenium (ICP/MS)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6020, Rev. 0, 9/94	NPW: SHW04.40600	North Canton OH001	Yes	
Silver (ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.41000	North Canton OH001	Yes	
Sodium (ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.43000	North Canton OH001	Yes	
Thallium (ICP/MS)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6020, Rev. 0, 9/94	NPW: SHW04.45500	North Canton OH001	Yes	
Vanadium (ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.47500	North Canton OH001	Yes	

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Zinc (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.49000	North Canton OH001	Yes	
Boron (ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.15100	North Canton OH001	Yes	
Tin (Trace ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	NPW: SHW04.47100	North Canton OH001	Yes	
Titanium (ICP)	EPA 200.7	N/A	EPA 200.7	NPW: WPP04.52050	North Canton OH001	Yes	
Tungsten (ICP/MS)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6020, Rev. 0, 9/94	NPW: SHW04.47170	North Canton OH001	Yes	
Strontium (ICP/MS)	SW-846 3005, Rev. 1 7/92 (modified)	N/A	SW-846 6020, Rev. 0, 9/94 (modified)	NPW: SHW04.44001	STL Pittsburgh PA005	Yes	User Defined Method for Picatinny Arsenal
Zirconium (ICP/MS)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6020, Rev. 0, 9/94	Not Certified in NJDEP Database	None	No	User Defined Method for Picatinny Arsenal; No Labs listed in NJDEP Database as of 8/26/05
Silicon (ICP)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6010B, Rev. 2, 12/96	Not Certified in NJDEP Database	None	No	User Defined Method for Picatinny Arsenal; No Labs listed in NJDEP Database as of 8/26/05; Request analysis of Silica (SiO_2) in lieu of Silicon (Si)
Molybdenum (ICP/MS)	SW-846 3005, Rev. 1 7/92	N/A	SW-846 6020, Rev. 0, 9/94	NPW: SHW04.34005	North Canton OH001	Yes	

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Cyanide							
Total Cyanide	SW-846 Method 9012A, Rev. 3, 12/96	N/A	SW-846 Method 9012A, Rev. 3, 12/96	NPW: SHW09.05000	North Canton OH001	Yes	
Pesticides/PCBs							
Aldrin	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12010	North Canton OH001	Yes	
Aroclor-1016	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8082, Rev. 0, 12/96	NPW: SHW06.13110	North Canton OH001	Yes	
Aroclor-1221	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8082, Rev. 0, 12/96	NPW: SHW06.13120	North Canton OH001	Yes	
Aroclor-1232	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8082, Rev. 0, 12/96	NPW: SHW06.13130	North Canton OH001	Yes	
Aroclor-1242	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8082, Rev. 0, 12/96	NPW: SHW06.13140	North Canton OH001	Yes	
Aroclor-1248	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8082, Rev. 0, 12/96	NPW: SHW06.13150	North Canton OH001	Yes	
Aroclor-1254	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8082, Rev. 0, 12/96	NPW: SHW06.13160	North Canton OH001	Yes	
Aroclor-1260	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8082, Rev. 0, 12/96	NPW: SHW06.13170	North Canton OH001	Yes	
alpha-BHC	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12020	North Canton OH001	Yes	

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
beta-BHC	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12030	North Canton OH001	Yes	
delta-BHC	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12040	North Canton OH001	Yes	
gamma-BHC (lindane)	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12050	North Canton OH001	Yes	
Chlordane (technical)	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12060	North Canton OH001	Yes	
P,P'-DDD	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12090	North Canton OH001	Yes	
P,P'-DDE	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12100	North Canton OH001	Yes	
P,P'-DDT	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12110	North Canton OH001	Yes	
Dieldrin	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12120	North Canton OH001	Yes	
Endosulfan A	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12130	North Canton OH001	Yes	
Endosulfan B	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12140	North Canton OH001	Yes	
Endosulfan sulfate	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12150	North Canton OH001	Yes	
Endrin	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12160	North Canton OH001	Yes	

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Endrin aldehyde	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12170	North Canton OH001	Yes	
Endrin ketone	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12180	North Canton OH001	Yes	
Heptachlor	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12190	North Canton OH001	Yes	
Heptachlor epoxide	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12200	North Canton OH001	Yes	
Methoxychlor	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12210	North Canton OH001	Yes	
Toxaphene	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12220	North Canton OH001	Yes	
Mirex	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8081A, Rev. 1, 12/96	NPW: SHW06.12212	North Canton OH001	Yes	
Organophosphorous Pesticides							
Malathion	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8141A, Rev. 1, 9/94	NPW: SHW06.21060	North Canton OH001	Yes	
Diazinon	SW-846 3520C, Rev. 3, 12/96	N/A	SW-846 8141A, Rev. 1, 9/94	NPW: SHW06.21040	North Canton OH001	Yes	
Anions							
Ammonium (Ammonia as Nitrogen)	EPA 350.2 Distillation	N/A	EPA 350.3 Electrode	NPW: WPP02.03500	North Canton OH001	Yes	

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Chloride	SW-846 9056, Rev. 0, 12/96	N/A	SW-846 9056, Rev. 0, 12/96	NPW: SHW09.33100	North Canton OH001	Yes	
Fluoride	SW-846 9056, Rev. 0, 12/96	N/A	SW-846 9056, Rev. 0, 12/96	NPW: SHW09.34150	North Canton OH001	Yes	
Nitrate (NO_3)	SW-846 9056, Rev. 0, 12/96	N/A	SW-846 9056, Rev. 0, 12/96	NPW: SHW09.30150	North Canton OH001	Yes	
Nitrite (NO_2)	SW-846 9056, Rev. 0, 12/96	N/A	SW-846 9056, Rev. 0, 12/96	NPW: SHW09.29150	North Canton OH001	Yes	
Sulfate	SW-846 9056, Rev. 0, 12/96	N/A	SW-846 9056, Rev. 0, 12/96	NPW: SHW09.13050	North Canton OH001	Yes	
Sulfide	EPA 376.1	N/A	EPA 376.1	NPW: WPP02.47500	North Canton OH001	Yes	
Total Phosphorous	EPA 365.2	N/A	EPA 365.2	NPW: WPP02.34000	North Canton OH001	Yes	
Perchlorate	EPA 314.0	N/A	EPA 314.0	SDW:SDW02.31120	Knoxville TN001	No – Request to NJDEP for using SDW code for NPW	Need to request to NJDEP the application of the SDW Matrix to NPW Matrix
Depleted Uranium							
Total Uranium (mass)	EPA 200.8		EPA 200.8	WPP04.52500	STL St. Louis MO002	Yes	

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Uranium -238 (radiological)				Not Certified in NJDEP Database	None	No	No Labs listed in NJDEP Database as of 8/26/05
Uranium -235 (radiological)				Not Certified in NJDEP Database	None	No	No Labs listed in NJDEP Database as of 8/26/05
Cesium - 137	EPA 901.1	N/A	EPA 901.1	WPP09.03100	Paragon Analytics CO003	Yes	Alternate Laboratory
Radium - 226	EPA 903.1	N/A	EPA 903.1	WPP09.0600	Paragon Analytics CO003	Yes	Alternate Laboratory
Radium-228	EPA 904	N/A	EPA 904	WPP09.06020	Paragon Analytics CO003	Yes	Alternate Laboratory
Cobalt – 60	EPA 901.1	N/A	EPA 901.1	SDW07.03120	STL St. Louis MO002	No – Request to NJDEP for using SDW code for NPW	Need to request to NJDEP the application of the SDW Matrix to NPW Matrix

NPW: Non-Potable Water

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION

N S. CORZINE
Governor

LISA P. JACKSON
Commissioner

Division of Remediation Management and Response
Hazardous Site Science Element
Office of Data Quality
P.O. Box 413
Trenton, New Jersey 08625-0413

MEMORANDUM

TO: Zahar Billah, Section Chief
Bureau of Solid & Hazardous Waste North
Division of Solid and Hazardous Waste

THRU: Greg Toffoli, Section Chief 4/10/2006
Office of Data Quality
Division of Remediation Management and Response

FROM: Kathleen M. Grimes, Research Scientist I 4/10/06
Office of Data Quality
Division of Remediation Management and Response

SUBJECT: Review of the August 31, 2005 Letter In Response to July 6, 2005, Technical NOD, Subpart X Permit Application. ***U.S. Army Armanent Research Development and Engineering Center, Picatinny Arsenal, Morris County,*** USEPA ID No. NJ3 210 020 704.

The Office of Data Quality, Division Remediation Management and Response has reviewed the August 31, 2005 letter from the facility and is submitting the following comments. The Bureau of Radiation Protection and the Office of Quality Assurance also provided assistance with this response.

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For the exotic explosive compounds that were analyzed by Crane Naval Warfare Center, the facility stated in the meeting of June 9, 2005 that the data had been submitted properly. The re- review of the document submittals (various dates) submitted by the facility and all of the reviews conducted by this Office clearly indicated that only summary data was submitted. No analytical data packages were ever submitted for validation. Requests were made by this Office in every memorandum that full regulatory deliverable packages must be submitted for validation. As the required analytical data packages were never submitted, the statements made by the facility cannot be verified. The option exists for the facility to submit this data to the Department in the proper full regulatory format and have the data validated. The issue regarding whether or not the data meet the regulatory requirements will then be determined by the permit writer after the data is validated.

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The facility states that there are a few analytes in which there are no certified methods and/or certified laboratory for the analyte. (e.g., diphenylamine, zirconium and uranium isotopes). In this case we request

that a Shaw Environmental chemist be permitted to speak directly to your laboratory certification and data quality personnel.

Diphenylamine

The Office of Quality Assurance has been offering certification for diphenylamine since 1997 under USEPA SW846 Method 8270C certification code SHW07.05020. Currently there are at least 42 laboratories certified for this compound. STL North Canton has been certified for this compound since July 1, 2003.

Based on the attached chart submitted by the facility, the facility wants to use a modification of USEPA SW846 Method 8330 (HPLC technique) for the analysis of diphenylamine. The laboratory chosen by the facility would have to request certification for this compound by this method from the Office of Quality Assurance. The laboratory needs to contact their Office of Quality Assurance Certification Officer to find out the required documentation and fees that must accompany their request for certification. Once certification is granted by the Office of Quality Assurance, the method can be used for the analysis of this compound.

Zirconium

The Office of Quality Assurance has been offering certification for zirconium since July 2003 as an "Other Picatinny Arsenal Project" specific compound by USEPA SW846 Method 6020. Effective July 2005 zirconium has been offered as a routine parameter. STL-North Canton, Ohio, which is identified by the facility for this analysis, has been certified for this method since July 2003 as an "Other Picatinny Arsenal Project". This office agrees with the facility that if a search is conducted for this analyte using the NJDEP OQA website, it returns the search as no laboratory found. However, since the facility had used this laboratory for the previous sampling events at the site, they could have asked the laboratory directly if they were certified.

Uranium Isotopes

The Plan states that they could not locate labs certified for Uranium-235 and URANIUM-238. The certification offered by OQA lists the uranium isotopes and Total Uranium instead of listing the isotopes individually. Where the technique is indicated as alpha spectrometry, it denotes isotopic speciation, in this case Uranium-234, -U235 and Uranium-238.

The facility requests the use of certified drinking water analytical methods to analyze non potable well water from the ODA in cases where a certified method does not exist for non-potable water (e.g. perchlorate, cobalt-60).

Cobalt-60

The Office of Quality Assurance has been offering certification for cobalt-60 under the Water Pollution certification since 2003 under certification code WPP09.03200. The currently listed required method is USEPA Method 901.1 using the gamma spectrometry. There are two additional methods which are considered equivalent to USEPA 901.1 which are currently acceptable to NJDEP that are not listed in Part III of the application. The methods are ASTM D3649 and Standard Method 7120. There are currently two laboratories certified for the Method 901.1 under this certification code. The use of a laboratory certified for this parameter under Drinking Water or Solid or Hazardous Waste is not acceptable. If the facility has a designated laboratory that it wants to use that is currently certified under the drinking water category, that laboratory must obtain certification for cobalt-60 under the Water Pollution category. The laboratory must contact their Certification Officer for the procedures to obtain certification.

Also if the facility wants to propose another method for the analysis of cobalt-60, their designated laboratory needs to contact their Certification Officer to find out the required documentation and fees that must accompany their request for certification. Once certification is granted by the Office of Quality Assurance, this method can be used for the analysis of this compound.

Perchlorate

The facility was informed in the meeting of June 9, 2005, that the use of USEPA Method 314.0 for perchlorate will be acceptable for analysis of monitoring well water and a modified method for the soil matrix will be acceptable for soils. The Office of Quality Assurance has already developed a certification code for perchlorate in soils. To use this method in soils, their laboratory must request certification approval from the Office of Quality Assurance for the use of this method in the Water Pollution category. Additionally, the Department is currently in the regulatory process of proposing a Drinking Water Criteria for Perchlorate. This will lead to a Ground Water Criteria for Perchlorate. The facility's laboratory must provide a current Method Detection Limit study that includes their Reporting Limit, so it can be compared to the current standards.

Tentatively Identified Compound Reporting

Tentatively Identified Compounds reporting are required for both the Volatile Organics by USEPA SW846 Method 8260B and USEPA SW846 Method 8270C. Up to thirty (30) non-target compounds are to be reported for each fraction.

Table I.C.3. Ground Water

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Trans-1,2-dichloroethene
There is a note on trans-1,2-dichloroethene that is not defined.

Xylenes
The total xylenes must be reported separately as m& p- xylenes and o-xylene. The laboratory may report a total xylene concentration as well as the other two concentrations. STL-North Canton is certified for the individual xylenes under a "Picatinny Arsenal Project User Defined" since July 1, 2004. The Office of Quality Assurance has certified for individual xylene isomers since July 1, 2004.

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Tert-butyl Alcohol
STL-North Canton is certified for tert-butyl alcohol by the Office of Quality Assurance as a under a "Picatinny Arsenal Project User Defined" since July 1, 2004. The Office of Quality Assurance has certified for tert-butyl alcohol under USEPA Method SW846 8260B since July 1, 2004.

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Diphenylamine - See the comment above.

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Nitrocellulose

The facility states that a modified of USEPA Method 353.2 will be used for this analysis. The laboratory designated by the facility for this analysis must obtain certification from the Office of Quality Assurance for this modification. Their designated laboratory needs to contact their Certification Officer to find out the required documentation and fees that must accompany their request for certification. Once certification is granted by the Office of Quality Assurance, this method can be used for the analysis of this parameter.

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Nitroguanidine

The facility states that a modified of USEPA SW846 Method 8330 will be used for this analysis. The laboratory designated by the facility for this analysis must obtain certification from the Office of Quality Assurance for this modification. Once a laboratory is designated for this analysis, the laboratory needs to contact their Certification Officer to find out the required documentation and fees that must accompany their request for certification. Once certification is granted by the Office of Quality Assurance, this method can be used for the analysis of this parameter.

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Strontium

The facility states that modification of USEPA SW846 methods 3005 and Method 6020 are required for this analyte to be certified. STL North Canton has held certification for this analyte since July 1, 2003 as a under a "Picatinny Arsenal Project User Defined". In July 2005, the Office of Quality offered certification for this parameter as a "Picatinny Arsenal Project User Defined" for USEPA SW846 Method 6020 and regular certification for USEPA SW846 Method 6010. As of July 2005, the Office of Quality Assurance offers regular certification for this parameter under Method 6020 and certification by two other methods. Please note that Strontium-89/90 analysis will be required under the Radiological parameters.

Zirconium- See comment above.

Silicon

The table indicates in the first column that Silicon analysis is being required and the second column specifies USEPA SW846 Method 3005 for the digestion followed by USEPA SW846 Method 6010B for the preparation. The last column of this row then states that a "User Defined Method For Picatinny Arsenal No labs listed in NJDEP data base as of 8/20/05. Request analysis of Silica (SiO2) Instead of Silicon (Si)."

The Office of Quality Assurance was contacted regarding these issues and the following was determined.

- The proposal of the facility to use USEPA SW846 Method 3005 (Acid Digestion of Waters for Total Recoverable or Dissolved Metals for Analysis by FLAA or ICP Spectroscopy) is not rigorous enough to break apart the silica matrix to make all of the Silicon available for measurement.

Currently OQA offers Certification under the Drinking Water category for silica and under the Water Pollution category Silica Dissolved. OQA can offer certification for USEPA SW846 Method 6010 if there is a request from a laboratory. The laboratory would have to apply for certification for this compound and submit all the supporting documentation. Additionally, since the actual measurement obtained will be silica, the laboratory will have to determine by stiochiometry, the concentration of Silicon in the sample. This calculation will have to be submitted as part of the laboratory's Standard Operating Procedure.

Silica (undissolved) is not a certification currently offered under the Water Pollution Category. If the laboratory wishes to pursue certification for silica using Method 200.7, the laboratory must apply for certification for this compound and submit all of the supporting documentation. In addition, the concentration of Silicon would have to be determined by stiochiometry.

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Pesticide Compounds

Report alpha and gamma chlordane in addition to Technical Chlordane. STL-North Canton is certified for both alpha and gamma chlordane.

Endosulfan A must be reported as Endosulfan I

Endosulfan B must be reported as Endosulfan II.

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Ammonia

The method citations are incorrect. The use of USEPA Method 350.3 as a stand-alone method for this determination is not acceptable.

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Perchlorate - See comment above.

Uranium -See comments on Radiological Analysis below.

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Uranium - See comments on Radiological Analysis below.

Cobalt-60 - See comment above.

Analyze Immediately Parameters

The table does not address the "analyze immediately" parameters that are required for the sampling of the monitoring wells. The following parameters if they are being determined must be addressed: dissolved oxygen, temperature, pH, and specific conductance.

Radiological Analysis

The Office of Quality Assurance (OQA) offers certification for various approved radiological methods in the Drinking Water, Water Pollution and Solid and Hazardous Waste Categories. OQA is aware that there are other methods than what NJDEP have listed that may be appropriate for the determination of radiological parameters. In recognition of this fact, if the facility's laboratory wants to use another method and it involves an analytical technique for which it currently certified, the laboratory must request certification from the Office of Quality Assurance for the other method. The laboratory requesting certification must contact the Office of Quality Assurance certification officer responsible for the radiological laboratories for complete requirements. At a minimum, the laboratory must conduct and submit to the Office of Quality Assurance an Initial Demonstration of Capability (IDOC) Study in the matrix requested. A current Standard Operating Procedure must be submitted and address the matrix being analyzed. An IDOC study must be conducted for each project.

Additionally, OQA has determined that since different methods using the same analytical technique are certified in the three-certification categories, the laboratories may propose using a method approved in one category for another matrix, such as proposing the use of a drinking water method for non-potable ground water. However, certain requirements must be met for this to be allowed. The laboratory requesting certification must contact the Office of Quality Assurance certification officer responsible for the radiological laboratories for complete requirements. At a minimum, the laboratory must conduct and submit to the Office of Quality Assurance a current Minimum Demonstration of Capability (DOC) Study in the matrix requested. A current Standard Operating Procedure must be submitted and address the matrix being analyzed. The Office of Quality Assurance makes the final determination as to method acceptability. The DOC study must be conducted for each project.

A laboratory that is not currently certified for a method in a category and is not certified for it in another category must request certification in the required category. The laboratory requesting certification must contact the Office of Quality Assurance certification officer responsible for the radiological laboratories for complete requirements. At a minimum, the laboratory must conduct and submit to the Office of Quality Assurance a current Minimum Demonstration of Capability (DOC) Study in the matrix requested. A current Standard Operating Procedure must be submitted and address the matrix being analyzed. The MDC study must be conducted for each project.

Laboratories that are currently certified by OQA in an approved method and are currently designated for this project, must submit DOC data for the required matrices for review and approval in the next submittal.

Radiological Project Requirements

The Bureau of Environmental Radiation has established various Minimum Detectable Concentrations (MDC) that must be met for this project for both groundwater and soils analyses. Soils are being addressed in this memorandum. As the facility is proposing groundwater analysis for various radiological compounds, the future soil analyses will be critical in determining a potential contamination source. The future soil sampling analyses are the same radiochemical/radiological compounds that are required in the groundwater sampling plan. Based on those requirements, the analytical methods and/or techniques that are currently certified are listed. Options are provided where the facility's laboratory can propose other methods. Please be advised that laboratory certification must be obtained prior to the analysis of environmental samples. These methods should be able to meet the MDC requirements, however the laboratory is required to determine each MDC for the appropriate matrix.

The table indicates that total uranium as well as the isotopes Uranium-235 and Uranium-238 are being analyzed for in this project. Total uranium can be determined by USEPA Method 200.8 as stated in the plan. The Plan states that they could not locate labs certified for Uranium-235 and Uranium-238. The certification offered by OQA lists the uranium isotopes as Uranium instead of listing the isotopes individually. The alpha spectrometry technique listed in the certification database

is for speciation of isotopic uranium. The fluorometry technique is for the determination of total uranium.

Ground Water Analysis

Gross Alpha & Beta

The gross alpha MDC must not exceed 3 pCi/L.

The gross beta MDC must not exceed 4 pCi/L.

The certified methods in the water pollution category and the drinking water category are the same except for the required 48 Hour Rapid Gross Alpha Test. The 48 Hour Rapid Gross Alpha Test (N.J.A.C 7:18-6) is required for the determination of gross alpha in the ground water. A laboratory certified in category SDW07.01001 is required.

The laboratory can chose a method from either category for the gross beta determination.

Total Uranium

The MDC for total Uranium must be below 3 ug/L.

Uranium-235 and Uranium-238

Since the facility is proposing to analyze for these isotopes in groundwater, an alpha spectrometry technique should be proposed.

Cesium 134/137

The Cesium 134 MDC must not exceed 5 pCi/L.
The Cesium 137 MDC must not exceed 10 pCi/L.

Both isotopes of cesium must be determined and the results reported separately. The required technique is gamma spectrometry. OQA offers certification as Cesium 134/137.

Radium

Radium-226
The Radium –226 MDC must not exceed 1.0 pCi/L. The method cited in the table USEPA Method 903.1 (radiochemical method) is acceptable.

Radium-228
The Radium –228 MDC must not exceed 1.0 pCi/L. The method cited in the table USEPA Method 904 (radiochemical method) is acceptable.

Cobalt- 60

The Cobalt-60 MDC must not exceed 10 pCi/L.

OQA offers certification by gamma spectrometry for cobalt-60 in both the drinking water category and the water pollution category by USEPA Method 901.1, which is also a gamma spectrometry method. The laboratory must be certified in either category.

Strontium 89/90

The plan states that Strontium is being analyzed for using USEPA Method 200.8. USEPA Method 200.8 is not acceptable for the determination of Strontium for the determination of radiological components. In addition, strontium-89 and strontium-90 is required since the standards are based on the isotopes.

The strontium-89 MDC must not exceed 10 pCi/L.

The strontium-90 MDC must not exceed 2 pCi/L.

OQA offers certification for various methods for these two compounds in both the Drinking Water and Water Pollution Categories. The laboratory must be certified in either category.

Soils Analysis

Uranium

The MDC for Uranium-234 must be below 1 pCi/g for gamma spectrometry and 0.5 pCi/g if alpha spectrometry is used.

The MDC for Uranium-235 must be below 1 pCi/g for gamma spectrometry.

The MDC for Uranium-238 must be below 1 pCi/g for gamma spectrometry and 0.5 pCi/g if alpha spectrometry is used.

Please note that currently OQA only offers certification for alpha spectrometry (DOE Method U-02) under the Solid and Hazardous Waste Categories. If the facility's laboratory wants to use gamma spectrometry for the reporting of these compounds a certification request is required.

Cesium 134/137

The Cesium 134 MDC must not exceed 0.5 pCi/g.

The Cesium 137 MDC must not exceed 0.5 pCi/g.

OQA offers certification as Cesium 134/137. Both isotopes of cesium must be determined and the results reported separately. The required technique is gamma spectrometry by DOE Method 4.5.2.3 in the Solid and Hazardous Waste Category. If the facility's laboratory wants to use USEPA Method 901.1, which is also a gamma spectrometry method, a certification request must be made to OQA.

Radium

Radium-226

The Radium-226 MDC must not exceed 1.0 pCi/g.

The certified methods in the Solid and Hazardous Waste Category are Radon Emanation or precipitation technique. If the facility's laboratory wants to use another method, a certification request is required. If the facility's laboratory wants to use gamma spectrometry for the soils analysis, the samples must be dried and sealed for 21 days before counting. The Bi-214 and Pb-214 gamma energies are used for determining the radium-226.

Radium-228

The Radium-228 MDC must not exceed 0.5 pCi/g.

The certified methods in the Solid and Hazardous Waste Category is a precipitation technique. If the facility's laboratory wants to use another method, a certification request is required. If the facility's laboratory wants to use gamma spectrometry for the soils analysis, the samples must be dried and sealed for 21 days before counting. The Ac-228 gamma energy is used for determining the radium-228.

Cobalt-60

The cobalt- 60 MDC must not exceed 0.5 pCi/g.

OQA offers certification in the Solid and Hazardous Waste Category by gamma spectrometry for cobalt-60 by DOE Method 4.5.2.3. If the facility's laboratory wants to use USEPA Method 901.1, which is also a gamma spectrometry method, a certification request is required.

Strontium 89/90

The strontium-89 MDC must not exceed 0.5 pCi/g.

The strontium-90 MDC must not exceed 0.5 pCi/g.

OQA offers certification by precipitation/beta counting for these two compounds in the Solid and Hazardous Waste Category. If the facility's laboratory wants to use another method, a certification request is required

If you have any questions, please do not hesitate to contact this office at 633-0752 or via email at kathleen.grimes@dep.state.nj.us

c: Jenny Goodman, BRP
Sreenivas Komanduri, OQA
Stu Nagnoumey, OQA
Robert Royce, OQA
Joseph Marchanesi, BGWPA

DEPARTMENT OF THE ARMY
UNITED STATES ARMY INSTALLATION MANAGEMENT AGENCY
NORTHEAST REGIONAL OFFICE GARRISON
PICATINNY ARSENAL, NEW JERSEY 07806-5000

REPLY TO
ATTENTION OF

July 28, 2006

SUBJECT: Response to Comments on August 31st submittal regarding groundwater monitoring at the Open Detonation Area, U.S. Army Armament Research Development and Engineering Center, Picatinny Arsenal, Morris County, EPA ID No. NJ3 210 020 704

Mr. Anthony Fontana, Chief
Bureau of Solid and Hazardous Waste Permitting North
New Jersey Department of Environmental Protection
Solid and Hazardous Waste Program
401 East State Street
P.O. Box 414
Trenton, New Jersey 08625-0414

Dear Mr. Fontana:

Enclosed please find responses to your comments relating to our August 31, 2005 submittal that addressed the groundwater monitoring aspects related to the Open Detonation Subpart X application.

We are asking for a written concurrence as soon as possible to implement the quarterly groundwater monitoring program minus the four parameters noted in the table attached and the exotic explosives formerly analyzed for by Crane Naval Warfare Center. The program would use labs that were certified for over 95% of the required parameters and clearly all the critical ones. The wells have not been sampled as you know for a number of years. The certification process may take many months to resolve; thus logic and stewardship suggests that NJDEP concur that the groundwater sampling program for the certified parameters should begin.

There are no laboratories that are presently certified for the analysis of silicon, nitrocellulose, nitroguanidine, and diphenylamine by the proposed methods. These parameters were all analyzed in previous four quarters of groundwater sampling; they were never detected although a certified laboratory for those parameters was not used. These four parameters, however, should not be considered critical to the program.

Once the laboratories are certified for these methods for these parameters, we will add them to the list of parameters in the quarterly program at that point. Our contractor will work

directly with your Office of Data Quality to get selected labs certified ensure that the Analyze Immediately Parameters are performed by a certified program before sampling occurs as discussed in the responses.

As your office of Data Quality has requested, we have also enclosed the data packages from Crane Naval Warfare Center from the previous four quarters of results in order to data validate. The results were all non-detects for the following five parameters: diethyleneglycol dinitrate (DEGDN), triethyleneglycol dinitrate (TEGDN), trimethyleneglycol dinitrate (TMEDN), 1,3-diamino-2, 4,6-trinitrobenzene (DATB); and 2'4,4,'6,6'-hexanitrostilbene (HNS.) We *trust* that NJDEP's validation of the data packages from Crane Naval Warfare Center finds the data acceptable.

We also ask that the NJDEP project managers consider the five Crane parameters not critical to the program and the previous four quarters of results adequate - independent of the results of the validation.

If you have any questions please feel free to contact me at 973-724-5818 or Fred Sanchez at 973-724-5948.

Sincerely,

For Thomas J. Solecki
Director, Environmental Affairs
Directorate

Enclosures:

Copy Furnished:

Barry Tornick, EPA, Chief, NJS, RPB, DEPP

Response to NJDEP Comments on the Groundwater Analytical Program for the Open Detonation Area at Picatinny Arsenal Dated May 31, 2006

Comments from the Office of Data Quality

Comment 1: Page 1 of 23
For the exotic explosive compounds that were analyzed by Crane Naval Warfare Center, the facility stated in the meeting of June 9, 2005 that the data had been submitted properly. The re-review of the document submittals (various dates) submitted by the facility and all of the reviews conducted by this Office clearly indicated that only summary data was submitted. No analytical data packages were ever submitted for validation. Requests were made by this Office in every memorandum that full regulatory deliverable packages must be submitted for validation. As the required analytical data packages were never submitted, the statements made by the facility cannot be verified. The option exists for the facility to submit this data to the Department in the proper full regulatory format and have the data validated. The issue regarding whether or not the data meet the regulatory requirements will then be determined by the permit writer after the data is validated.

Response 1:
The analytical data packages provided to Picatinny Arsenal by Crane Naval Warfare Center (CNWC) for the exotic explosive analyses performed quarterly from June 2001 to April 2002 is being submitted to NJDEP for validation as part of this response. The full data packages from CNWC are provided in a separate binder.

Comment 2a: Page 2 of 23
The facility states that there are a few analytes in which there are no certified methods and/or certified laboratory for the analyte (e.g., diphenylamine, zirconium and uranium isotopes). In this case we request that a Shaw Environmental chemist be permitted to speak directly to your laboratory certification and data quality personnel.

Diphenlylamine

The Office of Quality Assurance has been offering certification for diphenylamine since 1997 under USEPA SW846 Method 8270C certification code SHW07.05020. Currently there are at least 42 laboratories certified f6r this compound. STL North Canton has been certified for this compound since July 1, 2003.

Based on the attached chart submitted by the facility, the facility wants to use a modification of USEPA SW846 Method 8330 (HPLC technique) for the analysis of diphenylamine. The laboratory chosen by the facility would have to request certification for this compound by this method from the Office of Quality Assurance. The laboratory needs to contact their Office of Quality Assurance Certification Officer to find out the required documentation and fees that must accompany their request for certification. Once certification is granted by the Office of Quality Assurance, the method can be used for the analysis of this compound.

Response 2a: Picatinny Arsenal originally intended to perform diphenylamine (DPA) analysis under Method 8270C. However, NJDEP stated in the NOD dated July 6, 2005 that DPA must be analyzed by HPLC to "obtain the accurate concentration of the compound." Using 8270C, DPA cannot be distinguished from N-Nitroso-diphenylamine. If analysis of DPA by Method 8270C is acceptable to NJDEP, as suggested by the comment, Picatinny would utilize the 8270C certified method. If analysis of

DPA by Method 8270C is unacceptable to NJDEP, the selected laboratory will submit the required documentation and fees along with their request for certification.

Comment 2b: *Zirconium*

The Office of Quality Assurance has been offering certification for zirconium since July 2003 as an "Other Picatinny Arsenal Project" specific compound by USEPA SW846 Method 6020. Effective July 2005 zirconium has been offered as a routine parameter. STL-North Canton, Ohio, which is identified by the facility for this analysis, has been certified for this method since July 2003 as an "Other Picatinny Arsenal Project". This office agrees with the facility that if a search is conducted for this analyte using the NJDEP OQA website, it returns the search as a no laboratory found. However, since the facility had used this laboratory for the previous sampling events at the site, they could have asked the laboratory directly if they were certified.

Response 2b: Picatinny Arsenal will use Severn Trent Laboratories or another certified laboratory listed on the NJDEP OQA website and crosschecked against the current Fiscal Year laboratory-specific NJDEP Certification Statement for the analysis of zirconium.

Comment 2c: *Uranium Isotopes*

The Plan states that they could not locate labs certified for Uranium-235 and Uranium-238. The certification offered by OQA lists the uranium isotopes and Total Uranium, instead of listing the Isotopes individually. Where the technique is indicated as alpha spectrometry, it denotes isotopic speciation, in this case Uranium-234, -U235 and Uranium-238.

Response 2c: Picatinny Arsenal will use a certified laboratory listed on the NJDEP OQA website and crosschecked against the current Fiscal Year laboratory-specific NJDEP Certification Statement for the analysis of the uranium isotopes.

Comment 3a:
The facility requests the use of certified drinking water analytical methods to analyze non potable well water from the ODA in cases where a certified method does not exist for non-potable water (e.g. perchlorate, cobalt-60).

Cobalt-60

The Office of Quality Assurance has been offering certification for cobalt-60 under the Water Pollution certification since 2003 under certification code WPP09.03200. The currently listed required method is USEPA Method 901.1 using the gamma spectrometry. There are two additional methods which are considered equivalent to USEPA 901.1 which are currently acceptable to NJDEP that are not listed in Part III of the application. The methods are ASTM D3649 and Standard Method 7120. There are currently two laboratories certified for the Method 901.1 under this certification code. The use of a laboratory certified for this parameter under Drinking Water or Solid or Hazardous Waste is not acceptable. If the facility has a designated laboratory that it wants to use that is currently certified under the drinking water category, that laboratory must obtain certification for cobalt-60 under the Water Pollution category. The laboratory must contact their Certification Officer for the procedures to obtain certification.

Also if the facility wants to propose another method for the analysis of cobalt-60, their designated laboratory needs to contact their Certification Officer to find out the required documentation and fees

that must accompany their request for certification. Once certification is granted by the Office of Quality Assurance, this method can be used for the analysis of this compound.

Response 3a: Picatinny Arsenal will use a certified laboratory listed on the NJDEP OQA website under the Water Pollution certification and crosschecked against the current Fiscal Year laboratory-specific NJDEP Certification Statement for the analysis of cobalt-60.

Comment 3b: *Perchlorate*

The facility was informed in the meeting of June 9, 2005, that 'the use of USEPA Method 314.0 for perchlorate will be acceptable for analysis of monitoring well water and a modified method for the soil matrix will be acceptable for soils. The Office of Quality Assurance has already developed a certification code for perchlorate in soils. To use this method in soils, their laboratory must request certification approval from the Office of Quality Assurance for the use of this method in the Water Pollution category. Additionally, the Department is currently in the regulatory process of proposing a Drinking Water Criteria for Perchlorate. This will lead to a Ground Water Criteria for Perchlorate. The facility's laboratory must provide a current Method Detection Limit study that includes their Reporting Limit, so it can be compared to the current standards.

Response 3b: Picatinny Arsenal will use a certified laboratory listed on the NJDEP OQA website and crosschecked against the current Fiscal Year laboratory-specific NJDEP Certification Statement for the analysis of perchlorate.

As stated by NJDEP, Picatinny Arsenal will use USEPA Method 314 under the certification: Knoxville TN001, SDW02.31120 for the analysis of non-potable monitoring well water. In addition, current Method Detection Limit study data and the associated Reporting Limit will be submitted to NJDEP in order to verify compliance with the proposed drinking water criterion.

For soil analysis, as necessary, the retained laboratory will obtain certification for soils under SHW10.30025 which is inclusive of obtaining certification under the Water Pollution Category (WPP).

Comment 4: Tentatively Identified Compound Reporting

Tentatively Identified Compounds reporting are required for both the Volatile Organics by USEPA SW846 Method 8260B and USEPA SW846 Method 8270C. Up to thirty (30) non-target compounds are to be reported for each fraction.

Response 4: Tentatively identified compounds will be reported for the proposed volatile organics analyses.

Table I.C.3, Ground Water

Page 5 of 23

Comment 5a: *Trans-1,2-dichloroethene*
There is a note on trans-1,2-dichloroethene that is not defined.

Response 5a: The note on trans-1,2-dichloroethene will be removed from the table.

Comment 5b: *Xylenes*
The total xylenes must be reported separately as m& p- xylenes and o-xylene. The laboratory may report a total xylene concentration as well as the other two concentrations. STL-North Canton is certified for the individual xylenes under a "Picatinny Arsenal Project User Defined" since July 1, 2004. The Office of Quality Assurance has certified for individual xylene isomers since July 1, 2004.

Response 5b: Xylenes will be reported as total xylenes as well as separately as m&p-xylenes and o-xylene. STL-North Canton will be used to perform the xylenes analysis.

Page 6 of 23

Comment 6: *Tert-butyl Alcohol*
STL-North Canton is certified for tert-butyl alcohol by the Office of Quality Assurance as a under a "Picatinny Arsenal Project User Defined" since July 1, 2004. The Office of Quality Assurance has certified for tert-butyl alcohol under USEPA Method SW846 8260B since July 1, 2004.

Response 6: Picatinny Arsenal will use STL-North Canton for the analysis of tert-butyl alcohol under certified USEPA Method SW846 8260B.

Page 11 of 23

Comment 7: *Diphenylamine* - See the comment above.

Response 7: See response to Comment 2a above.

Page 14 of 23

Comment 8: *Nitrocellulose*

The facility states that a modified of USEPA Method 353.2 will be used for this analysis. The laboratory designated by the facility for this analysis must obtain certification from the Office of Quality Assurance for this modification. Their designated laboratory needs to contact their Certification Officer to find out the required documentation and fees that must accompany their request for certification. Once certification is granted by the Office of Quality Assurance, this method can be used for the analysis of this parameter.

Response 8: If no certified method or certified laboratory exists for the analysis of nitrocellulose, the intended laboratory, STL-Knoxville, will obtain certification for nitrocellulose under the approved methodology using a modification of USEPA Method 353.2.

Page 15 of 23

Comment 9: *Nitroguanidine*

The facility states that a modified of USEPA SW846 Method 8330 will be used for this analysis. The laboratory designated by the facility for this analysis must obtain certification from the Office of Quality Assurance for this modification. Once a laboratory is designated for this analysis, the laboratory needs to contact their Certification Officer to find out the required documentation and fees that must accompany their request for certification. Once certification is granted by the Office of Quality Assurance, this method can be used for the analysis of this parameter.

Response 9: If no certified method or certified laboratory exists for the analysis of nitroguanidine, the intended laboratory, STL-Knoxville, will obtain certification for a modification of USEPA SW846 Method 8330 for the analysis.

Page 18 of 23

Comment 10: *Strontium*

The facility states that modification of USEPA SW846 methods 3005 and Method 6020 are required for this analyte to be certified. STL North Canton has held certification for this analyte since July 1, 2003 as a under a "Picatinny Arsenal Project User Defined". In July 2005, the Office of Quality offered certification for this parameter as a "Picatinny Arsenal Project User Defined" for USEPA SW846 Method 6020 and regular certification for USEPA SW846 Method 6010. As of July 2005, the Office of Quality Assurance offers regular certification for this parameter under Method 6020 and certification by two other methods. Please note that Strontium-89/90 analysis will be required under the Radiological parameters.

Response 10: Picatinny Arsenal will use Severn Trent Laboratories or another certified laboratory listed on the NJDEP OQA website and crosschecked against the current Fiscal Year laboratory-specific NJDEP Certification Statement for the analysis of strontium.

See response to Comment 9 (Page 11) from the Office of Data Quality and the Bureau of Radiation Protection regarding the radioanalysis of Strontium-89/90.

Comment 11: *Zirconium* - See comment above.

Response 11: See response to Comment 2b above.

Comment 12: *Silicon*

The table indicates in the first column that Silicon analysis is being required and the second column specifics USEPA SW846 Method 3005 for the digestion followed by USEPA SW846 Method 6010B for the preparation. The last column of this row then states that a "User Defined Method For Picatinny Arsenal No labs listed in NJDEP data base as of 8/20/05. Request analysis of Silica (SiO2) Instead of Silicon (SI)."

The Office of Quality Assurance was contacted regarding these issues and the following was determined.

> The proposal of the facility to use USEPA SW846 Method 3005 (Acid Digestion of Waters for Total Recoverable or Dissolved Metals for Analysis by FLAA or ICP Spectroscopy) is not rigorous enough to break apart the silica matrix to make all of the Silicon available for measurement.
>
> Currently OQA offers Certification under the Drinking Water category for silica and under the Water Pollution category Silica Dissolved. OQA can offer certification for USEPA SW846 Method 6010 if there is a request from a laboratory. The laboratory would have to apply for certification for this compound and submit all the supporting documentation. Additionally, since the actual measurement obtained will be silica, the laboratory will have to determine by

stiochlometry, the concentration of Silicon in the sample. This calculation will have to be submitted as part of the laboratory's Standard Operating Procedure.

Silica (undissolved) is not a certification currently offered under the Water Pollution Category. If the laboratory wishes to pursue certification for silica using Method 200.7, the laboratory must apply for certification for this compound and submit all of the supporting documentation. In addition, the concentration of Silicon would have to be determined by stiochlometry.

Response 12: Picatinny Arsenal will use a certified method for the analysis of Silica Dissolved under the Water Pollution category followed by the use of stiochlometry to determine the concentration of silicon in the samples.

Page 20 of 23

Comment 13: *Pesticide Compounds*

Report alpha and gamma chlordane in addition to Technical Chlordane. STL-North Canton is certified for both alpha and gamma chlordane.

Endosulfan A must be reported as Endosulfan I
Endosulfan B must be reported as Endosulfan II

Response 13: Alpha and gamma chlordane will be reported in addition to technical chlordane. STL North Canton will be utilized for the analysis. Endosulfan A and Endosulfan B will be reported as Endosulfan I and Endosulfan II, respectively.

Page 21 of 23

Comment 14: *Ammonia*

The method citations are incorrect. The use of USEPA Method 350.3 as a stand-alone method for this determination is not acceptable.

Response 14: STL North Canton will utilize the appropriate SOP as certified under NPW: WPP02.03500. The certified method would be inclusive of both USEPA 350.2, distillation, and USEPA 350.3, electrode. These methods were referenced in the table.

Page 22 of 23

Comment 15: *Perchlorate* - see comment above.

Response 15: See response to Comment 3b above.

Comment 16*: Uranium* - See comments on Radiological Analysis below.

Response 16: See response to Comments 4 and 10 from the Office of Data Quality and the Bureau of Radiation Protection.

Page 23 of 23

Comment 17: *Uranium* - See comments on Radiological Analysis below.

Response 17: See response to Comments 4 and 10 from the Office of Data Quality and the Bureau of Radiation Protection.

Comment 18: *Cobalt-60* - See comment above.
Response 18: See response to Comment 3a above.

Comment 19: **Analyze Immediately Parameters**

The table does not address the "analyze immediately" parameters that are required for the sampling of the monitoring wells. The following parameters if they are being determined must be addressed: dissolved oxygen, temperature, pH, and specific conductance.

Response 19: Picatinny's contractor, Shaw Environmental (SHAW) intends to utilize their certified laboratory in Lawrenceville, NJ as the base for the "analyze immediately" certification. The required documentation and associated deliverables will be provided by SHAW and Picatinny through the Lawrenceville laboratory.

Response to NJDEP Comments on the Groundwater Analytical Program for the Open Detonation Area at Picatinny Arsenal Dated May 31, 2006

Comments from the Office of Quality Assurance and the Bureau of Radiation Protection

Comment 1: Radiological Analysis

The Office of Quality Assurance (OW) offers certification for various approved radiological methods in the Drinking Water, Water Pollution and Solid and Hazardous Waste Categories. OQA is aware that there are other methods than what NJDEP have listed that may be appropriate for the determination of radiological parameters. In recognition of this fact, if the facility's laboratory wants to use another method and it involves an analytical technique for which it currently certified, the laboratory must request certification from the Office of Quality Assurance for the other method. The laboratory requesting certification must contact the Office of Quality Assurance certification officer responsible for the radiological laboratories for complete requirements. At a minimum, the laboratory must conduct and submit to the Office of Quality Assurance an Initial Demonstration of Capability (IDOC) Study in the matrix requested. A current Standard Operating Procedure must be submitted and address the matrix being analyzed. An IDOC study must be conducted for each project.

Additionally, OQA haS determined that since different methods using the same analytical technique are certified in the three-certification categories, the laboratories may propose using a method approved in one category for another matrix, such as proposing the use of a drinking water method for non-potable ground water. However, certain requirements must be met for this to be allowed. The laboratory requesting certification must contact the Office' of Quality Assurance certification officer responsible for the radiological laboratories for complete requirements. At a minimum, the laboratory must conduct and submit to the Office of Quality Assurance a wrrent Minimum Demonstration of Capability (DOC) Study in the matrix requested. A current Standard Operating Procedure must be submitted and address the matrix being analyzed. The Office of Quality Assurance makes the final determination as to method acceptability. The DOC study must be conducted for each project.

A laboratory that is not currently certified for a method in a category and is not certified for it in another category must request certification in the required category. The laboratory requesting certification must contact the Office of Quality Assurance certification officer responsible for the radiological laboratories for complete requirements. At a minimum, the laboratory must conduct and submit to the Office of Quality Assurance a current Minimum Demonstration of Capability (DOC) Study in the matrix requested. A current Standard Operating Procedure must be submitted and address the matrix being analyzed. The MDC study must be conducted for each project.

Laboratories that are currently certified by OQA in an approved method and are currently designated for this project, must submit DOC data for the required matrices for review and approval in the next submittal.

Response 2: Picatinny is requesting clarification of the Initial Demonstration of Capability (IDOC) and Minimum Demonstration of Capability (DOC) study requirements for certified laboratories and the different matrices. Picatinny's contractor Shaw Environmental (SHAW) intends to use approved NJDEP-certified radiological methods as verified by the NJDEP Database and the laboratory-specific certifications; therefore, do we have to complete the IDOC and DOC requirements?

Comment 2: Radiological Project Requirements

The Bureau of Environmental Radiation has established various Minimum Detectable Concentrations (MDC) that must be met for this project for both groundwater and soils analyses. Soils are being addressed in this memorandum. As the facility is proposing groundwater analysis for various radiological compounds, the future soil analyses will be critical in determining a potential contamination source. The future soil sampling analyses are the same radiochemical/radiological compounds that are required in the groundwater sampling plan. Based on those requirements, the analytical methods and/or techniques that are currently certified ate listed. Options are provided where the facility's laboratory can propose other methods. Please be advised that laboratory certification must be obtained prior to the analysis of environmental samples. These methods should be able to meet the MDC requirements, however the laboratory is required to determine each MDC for the appropriate matrix.

The table indicates that total uranium as well as the Isotopes Uranium-235 and Uranium-238 are, being analyzed for in this project. Total uranium can be determined by USEPA Method 200.8 as stated in the plan. The Plan states that they could not locate labs certified for Uranium-235 and Uranium-238. The certification offered by OQA lists the uranium isotopes as Uranium *instead of* listing the isotopes individually. The alpha spectrometry technique listed in the certification database is for speciation of isotopic uranium. The fluorometry technique is for the determination of total uranium.

Response 2: What is the laboratory's requirement to document compliance with the MDC for each analyte for each matrix? If the method is certified, associated documentation for the MDCs should have been provided and approved.

Picatinny did not propose to analyze for all the same parameters in the soil as in the groundwater investigation, because a previous characterization survey conducted at the site only identified the decay products of the uranium-238 series and the decay products of the radium-226 series to be present at the site. It does not seem prudent to investigate the soil for a potential source, before it is determined whether there is any groundwater contamination from radioanalytes.

Picatinny will utilize a certified alpha spectroscopy method for the analysis of the specific uranium isotopes.

Ground Water Analysis

Comment 3: *Gross Alpha & Beta*

The gross alpha MDC must not exceed 3 pCi/L.

The gross beta MDC must not exceed 4 pCi/L.

The certified methods in the water pollution category and the drinking water category are the same except for the required 48 Hour Rapid Gross Alpha Test. The 48 Hour Rapid Gross Alpha Test (N.J.A.C 7:18-6) is required for the determination of gross alpha in the ground water. A laboratory certified in category SDW07.01001 is required.

The laboratory can chose a method from either category for the gross beta determination.

Response 3: Picatinny is requesting clarification of the radiological analyses being requested by NJDEP and the rationale for the radioanalytes such as gross alpha and gross beta. There has been neither historical data nor any indication from the "waste stream" to the ODA for the presence of beta emitters. In addition, all the soil samples are proposed for alpha spectroscopy.

Comment 4: *Total Uranium*

The MDC for total Uranium must be below 3 ug/L.

Response 4: Picatinny will retain a laboratory which is certified and can attain the required MDC (i.e., less than 3 µg/L for total uranium).

For uranium the MDC value is given in ug/L versus pCi/L. Please clarify.

Comment 5: *Uranium-235 and Uranium-238*

Since the facility is proposing to analyze for these isotopes in groundwater, an alpha spectrometry technique should be proposed.

Response 5: Picatinny will utilize a certified alpha spectroscopy method for the analysis of the specific uranium isotopes.

Comment 6: *Cesium 134/137*

The Cesium 134 MDC must not exceed 5 pCi/L .
The Cesium 137 MDC must not exceed 10 pCi/L.

Both isotopes of cesium must be determined and the results reported separately. The required technique is gamma spectrometry. OQA offers certification as Cesium 134/137.

Response 6: Picatinny will retain a laboratory which is certified and has the required MDCs for cesium 134 and cesium 137. The results of each isotope will be reported separately.

Comment 7: *Radium*

<u>Radium-226</u>
The Radium -226 MDC must not exceed 1.0 pCi/L. The method cited in the table USEPA Method 903.1 (radiochemical method) is acceptable.

<u>Radium-228</u>
The Radium -228 MDC must not exceed 1.0 pCi/L. The method cited in the table USEPA Method 904 (radiochemical method) is acceptable.

Response 7: Picatinny will retain a laboratory which is certified and has the required MDCs for radium-226 and radium-228.

Comment 8: *Cobalt-60*

The Cobalt-60 MDC must not exceed 10 pCi/L.

OQA offers certification by gamma spectrometry for cobalt-60 in both the drinking water category and the water pollution category by USEPA Method 901.1, which is also a gamma spectrometry method. The laboratory must be certified in either category.

Response 8: Picatinny will retain a laboratory which is certified under the water pollution category and has the required MDC (i.e., less than 10 pCi/L for cobalt-60).

Comment 9: *Strontium 89/90*

The plan states that Strontium is being analyzed for using USEPA Method 200.8. USEPA Method 200.8 is not acceptable for the determination of Strontium for the determination of radiological components. In addition, strontium-89 and strontium-90 is required since the standards are based on the isotopes.

The strontium-89 MDC must not exceed 10 pCi/L.

The strontium-90 MDC must not exceed 2 pCi/L.

OQA offers certification for various methods for these two compounds in both the Drinking Water and Water Pollution Categories. The laboratory must be certified in either category.

Comment 9: Picatinny is requesting clarification of the radiological analyses being requested by NJDEP and the rationale for the radioanalytes such as Strontium-89/90. There has been neither historical data nor any indication from the "waste stream" to the ODA for the presence of Strontium-89/90. If necessary, Picatinny will retain a laboratory which is certified under the water pollution category and has the required MDCs for strontium-89 and strontium-90.

Soils Analysis

Comment 10: *Uranium*

The MDC for Uranium-234 must be below 1 pCi/g for gamma spectrometry and 0.5 pCi/g if alpha spectrometry is used.

The MDC for Uraniuin-235 must be below 1 pCi/g for gamma spectrometry.

The MDC for Uranium-238 must be below 1 pCi/g for gamma spectrometry and 0.5 pCi/g if alpha spectrometry is used.

Please note that currently OQA only offers certification for alpha spectrometry (DOE Method U-02) under the Solid and Hazardous Waste Categories. If the facility's laboratory wants to use gamma spectrometry for the reporting of these compounds a certification request is required.

Response 10: Picatinny will retain a laboratory which is certified for alpha spectroscopy and can meet the required MDCs for uranium-234, uranium-235 and uranium-238.

Comment 11: *Cesium 134/137*

The Cesium 134 MDC must not exceed 0.5 pCi/g.

The Cesium 137 MDC must not exceed 0.5 pCi/g.

OQA offers certification as Cesium 134/137. Both isotopes of cesium must be determined and the results reported separately. The required technique is gamma spectrometry by DOE Method 4.5.2.3 in the Solid and Hazardous Waste Category. If the facility's laboratory wants to use USEPA Method 901.1, which is also a gamma spectrometry method, a certification request must be made to OQA.

Response 11: Picatinny will retain a laboratory which is certified and can meet the required MDCs for cesium 134 and cesium 137. The results of each isotope will be reported separately.

Comment 12: *Radium*

Radium-226

The Radium-226 MDC must not exceed 1.0 pCi/g.

The certified methods in the Solid and Hazardous Waste Category are Radon Emanation or precipitation technique. If the facility's laboratory wants to use another method, a certification request is required. If the facility's laboratory wants to use gamma spectrometry for the soils analysis, the samples must be dried and sealed for 21 days before counting. The Bi-214 and Pb-214 gamma energies are used for determining the radium-226.

Radium-228

The Radium-228 MDC must not exceed 0.5 pCi/g.

The certified methods in the Solid and Hazardous Waste Category is a precipitation technique. If the facility's laboratory wants to use another method, a certification request is required. If the facility's laboratory wants to use gamma spectrometry for the soils analysis, the samples must be dried and sealed for 21 days before counting. The Ac-228 gamma energy is used for determining the radium-228.

Response 12: Picatinny will retain a laboratory which is certified and can meet the required MDCs for radium-226 and radium-228. The soil samples will be dried and sealed for 21 days before counting.

Comment 13: *Cobalt-60*

The cobalt-60 MDC must not exceed 0.5 pCi/g.

OQA offers certification in the Solid and Hazardous Waste Category by gamma spectrometry for cobalt-60 by DOE Method 4.5.2.3. If the facility's laboratory wants to use USEPA Method 901.1, which is also a gamma spectrometry method, a certification request is required.

Response 13: Picatinny will retain a laboratory which is certified in the Solid and Hazardous Waste category for gamma spectroscopy by DOE Method 4.5.2.3 and has the required MDC (i.e., less than 0.5 pCi/g for cobalt-60).

Comment 14: *Strontium 89/90*

The strontium-89 MDC must not exceed 0.5 pCi/g.

The strontium-90 MDC must not exceed 0.5 pCi/g.

OQA offers certification by precipitation/beta counting for these two compounds in the Solid and Hazardous Waste Category. If the facility's laboratory wants to use another method, a certification request is required.

Response 14: See response to Comment 9 above.

Table I.C-3 Groundwater
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix Analyte Code	Lab ID		
Analyze Immediately Parameters							
Dissolved Oxygen	N/A	N/A	EPA 360.1: Electrode	Not Certified	None	No	Certification required prior to sampling
Temperature	N/A	N/A	EPA 170.1: Thermometric	Not Certified	None	No	Certification required prior to sampling
pH	N/A	N/A	EPA 150.1: Electrometric	Not Certified	None	No	Certification required prior to sampling
Specific Conductance	N/A	N/A	EPA 120.1: Wheatstone Bridge	Not Certified	None	No	Certification required prior to sampling
TCL Volatiles: NJDEP Certified per 6/30/06 Certification Statement and NJDEP Online Database Certification Check							
Additional Alcohols: NJDEP Certified per 6/30/06 Certification Statement and NJDEP Online Database Certification Check - Contracting to multiple STL Laboratories							
TCL Semivolatiles: with the exception of the referenced analyte below, NJDEP Certified per 6/30/06 Certification Statement and NJDEP Online Database Certification Check							
Diphenylamine (LC/MS)	SW-846 8321A, Rev. 1, 12/96 (modified)	N/A	SW-846 8321A, Rev. 0, 9/94 (modified)	Not Certified	None	No	
Explosives List with the exception of the referenced analyte below, NJDEP Certified per 6/30/06 Certification Statement and NJDEP Online Database Certification Check							
Nitrocellulose	USEPA 353.2 (modified)	N/A	USEPA 353.2 (modified)	Not Certified	None	No	
Nitroguanidine	SW-846 8330, Rev. 0, 9/94 (modified)	N/A	SW-846 8330, Rev. 0, 9/94 (modified)	Not Certified	None	No	
TAL Metals with the exception of the referenced analyte below, NJDEP Certified per 6/30/06 Certification Statement and NJDEP Online Database Certification Check							

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Silicon (ICP)	To be Determined	N/A	To be Determined	Not Certified	None	No	
Cyanide: NJDEP Certified per 6/30/06 Certification Statement and NJDEP Online Database Certification Check							
TCL Pesticides/PCBs: NJDEP Certified per 6/30/06 Certification Statement and NJDEP Online Database Certification Check							
Organophosphorous Pesticides: NJDEP Certified per 6/30/06 Certification Statement and NJDEP Online Database Certification Check							
Anions List: NJDEP Certified per 6/30/06 Certification Statement and NJDEP Online Database Certification Check including Perchlorate							
Perchlorate	EPA 314.0	N/A	EPA 314.0	SDW:SDW02.31120	STL Knoxville TN001	Yes	As per NJDEP, Method 314 is acceptable for the analysis of Groundwater
Depleted Uranium: NJDEP Certified per 6/30/06 Certification Statement and NJDEP Online Database Certification Check, multiple laboratories contracted as referenced							
Total Uranium (mass)	EPA 200.8	N/A	EPA 200.8	NPW: WPP04.52500	STL St. Louis MO002	Yes	
Uranium -238 (radiological)	DOE U-02	N/A	DOE U-02	NPW:SHW09.60310	USACE FUSRAP Lab 02022	Yes	USACE FUSRAP Maywood Laboratory 100 West Hunter Ave. Maywood, NJ 07607 201-226-6680
Uranium -234 (radiological)	DOE U-02	N/A	DOE U-02	NPW:SHW09.60310	USACE FUSRAP Lab 02022	Yes	USACE FUSRAP Maywood Laboratory 100 West Hunter Ave. Maywood, NJ 07607 201-226-6680

NPW: Non-Potable Water

Table I.C.3 Groundwater (continued)
Picatinny Burning Ground
Subpart X Permit
Groundwater Monitoring NPW Certification
Analytical Parameters

Analyte	Analytical Method			NJDEP Certification		Eligible to Report NJ Data	Comment
	Extraction	Clean-up	Analysis	Matrix: Analyte Code	Lab ID		
Uranium -235 (radiological)	DOE U-02	N/A	DOE U-02	NPW: SHW09.60310	USACE FUSRAP Lab 02022	Yes	USACE FUSRAP Maywood Laboratory 100 West Hunter Ave. Maywood, NJ 07607 201-226-6680
Radiological Analysis: NJDEP Certified per NJDEP Online Database Certification Check multiple laboratories contracted as referenced							
Cesium - 134/137	DOE 4.5.2.3	N/A	DOE 4.5.2.3	NPW: SHW09.60120	USACE FUSRAP Lab 02022	Yes	USACE FUSRAP Maywood Laboratory 100 West Hunter Ave. Maywood, NJ 07607 201-226-6680
Radium - 226	DOE Ra-04	N/A	EPA 903.1	NPW: SHW09.60105	SC&A Lab AL001	Yes	SC&A SOUTHEASTERN ENVIRONMENTAL LABORATORY 1000 Monticello Ct Montgomery, Al 36117 334-272-2234
Radium-228	SW-846 9320, Rev. 0, 9/86	N/A	SW-846 9320, Rev. 0, 9/86	NPW: SHW09.60110	USACE FUSRAP Lab 02022	Yes	USACE FUSRAP Maywood Laboratory 100 West Hunter Ave. Maywood, NJ 07607 201-226-6680
Cobalt – 60	DOE 4.5.2.3	N/A	DOE 4.5.2.3	NPW: SHW09.60130	USACE FUSRAP Lab 02022	Yes	USACE FUSRAP Maywood Laboratory 100 West Hunter Ave. Maywood, NJ 07607 201-226-6680

NPW: Non-Potable Water

APPENDIX T-1

HYDROGEOLOGIC INVESTIGATION REPORT
OPEN DETONATION AREA – PICATINNY ARSENAL

APPENDIX T-1

HYDROGEOLOGIC INVESTIGATION REPORT
OPEN DETONATION AREA – PICATINNY ARSENAL

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LIST OF ACRONYMS AND ABBREVIATIONS

µg/L ..... micrograms per liter
ASTM..... American Society for Testing and Materials
FID ..... Flame Ionization Detector
ft bgs..... feet below ground surface
ft msl..... feet mean sea level
ft/day..... feet per day
ft^2/day ..... square feet per day
gpm..... gallons per minute
ICFKE ..... ICF Kaiser Engineers
MS/MSD ..... Matrix Spike/Matrix Spike Duplicate
NJDEP..... New Jersey Department of Environmental Protection
NOAA ..... National Oceanic and Atmospheric Administration
OD ..... Open Detonation
PID ..... Photoionization Detector
PTA ..... Picatinny Arsenal
PVC..... polyvinyl chloride
QA/QC ..... quality assurance/quality control
QC ..... quality control
RCRA..... Resource Conservation and Recovery Act
USATHAMA U.S. Army Toxic and Hazardous Materials Agency
USEPA ..... U.S. Environmental Protection Agency
USGS..... United States Geological Survey
UXO ..... unexploded ordnance
VOC ..... Volatile Organic Compound

1.0 INTRODUCTION

This Hydrogeologic Investigation Report was developed in support of the Subpart X permit application for the Open Detonation (OD) in the Gorge area. Information presented in this report was compiled from groundwater investigations at nearby sites, well boring logs, published regional geologic data, and analysis of data from groundwater sampling at the OD area.

Four monitoring wells (OD-1A through OD-4A) were installed in the OD area on November 17-19, 1993. Two additional wells were installed on December 9-10, 1998 to complete the monitoring well network designed to monitor groundwater conditions at the OD area. The wells have been sampled eight times since the installation of the complete monitoring network. Groundwater sampling was conducted in January, April, July, and October of 1999. Another four quarters of sampling were completed in June and September of 2001 and January and April of 2002.

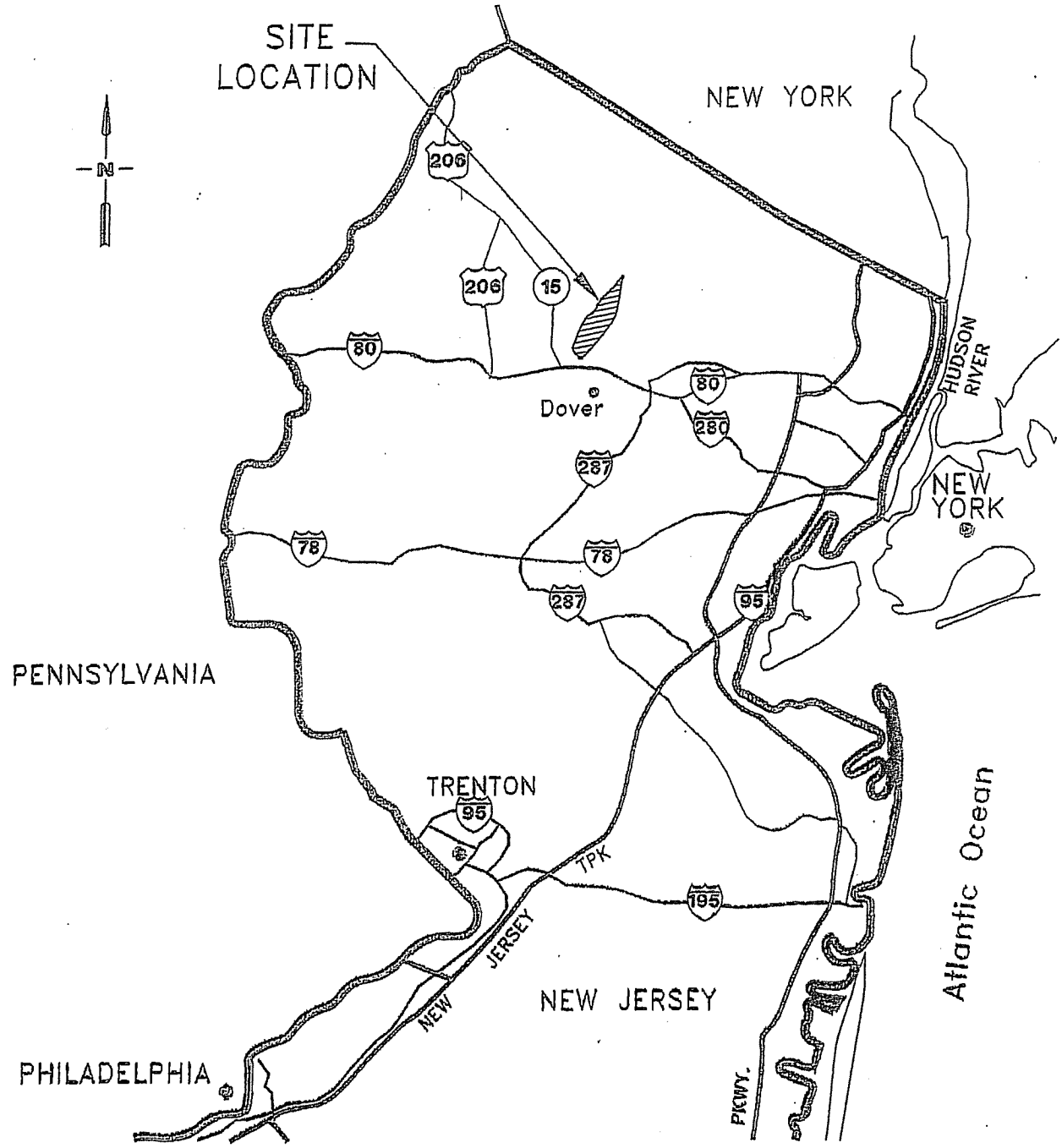
1.1 SITE LOCATION

Picatinny Arsenal (PTA) is located in the New Jersey Highlands physiographic province in north central New Jersey, approximately four miles north of the city of Dover in Rockaway Township, Morris County (**Figure 1-1**). Major roadways adjacent to the Installation include State Route 15, which skirts the southern boundary of the installation, and Interstate 80, which is located 1 mile to the southeast of the main gate.

The OD area, is located along Gorge Road approximately 1.5 miles west of Lake Denmark. The site is situated in an alluvial valley bordered by Green Pond Mountain to the west and Copperas Mountain to the east (**Figure 1-2**). This area is located in the northern most area of the arsenal and is very remote from other facilities (**Figure 1-3**). The OD area is an approximately 1/3 acre area surrounded by a sand berm in the four acre Gorge area.

1.2 SITE DESCRIPTION AND HISTORY

The Gorge area is approximately four acres in size and is used to test large caliber weapons, ammunition and various explosive devices as well as to open detonate waste ordnance and explosives. The OD activities are conducted in a large sand pit along the eastern side of the Gorge area. The sand pit is surrounded by an eight foot high sand berm. The entire OD area is approximately 100 feet by 150 feet, including a 30 foot buffer zone for metal debris. (**Figure 1-4**).



IT CORPORATION

Picatinny Arsenal Installation Restoration Program

U.S. Army Corps of Engineers

REVISION NO.:	DATE:	ACAD FILE:
0	09/03/99	SITEMAP.dwg

PICATINNY ARSENAL
SITE LOCATION MAP
DOVER, NJ

DET'D:	CLIENT:	PROJECT NO.:
AS	PICATINNY ARSENAL	66727-005-00
CHK'D:	LOCATION:	FIGURE NO.:
JP	DOVER, NEW JERSEY	1-1

PLOT DATE: 09/26/00

TABLE 5-2
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L)
FIRST AND SECOND CONFIRMATORY LEAD SAMPLING - OD AREA RCRA PERMIT MONITORING

Well ID Sample ID Sample Date	Federal Drinking Water Standards (a) MCL	New Jersey Groundwater Standards (b) Quality Criteria	 PQL	RCRA Maximum Concentration Limit (c)	OD-2A GWOD-2A 3/20/2000	OD-2A GWOD-2A1 4/20/2000	OD-2A GWOD-2A2 4/20/2000	OD-2A GWOD-2A3 4/20/2000	OD-4A GWOD-4A 3/20/2000	OD-4A GWOD-4ADUP 3/20/2000	OD-4A GWOD-4A1 4/20/2000	OD-4A GWOD-4A2 4/20/2000	OD-4A GWOD-4A3 4/20/2000
Metals													
Lead	15	5	10	50	2.6 B	1.9 B	ND	ND	66.1	12.6	3.4	6.0	3.4

ND = Not Detected.
MCL = Maximum Contaminant Level.
PQL = Practical Quantitation Limit.
(a) = USEPA (1996a).
(b) = NJDEP (1992, 1993).
(c) = Maximum concentration criteria established in 40 CFR Part 264 Subpart F 264.94.
B = Value is estimated.

TABLE 5-1 (CONTINUED)
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L)
ROUND D - OD AREA RCRA PERMIT MONITORING

Well ID Sample ID Sample Date	Federal Drinking Water Standards (a) MCL	New Jersey Groundwater Standards (b) Quality Criteria	 PQL	RCRA Maximum Concentration Limit (c)	OD-1A G08D01A 10/6/1999	OD-2A G08D02A 10/6/1999	OD-3A ** G08D03A 10/6/1999	OD-4A G08D04A 10/6/1999	OD-4A * G08D04AD 10/6/1999	OD-5A G08D05A 10/6/1999	OD-6A G08D06A 10/6/1999	RINSATE GW012199R1 1/21/1999
Metals												
Arsenic	50	0.02	8	50.0	ND	3.2 B	ND	10.2	ND	ND	ND	ND
Barium	2,000	2,000	200	1,000	57.1 B	197 B	6.4 B	76.2 B	62.7 B	76.8 B	41.2 B	16.0
Cadmium	5	4	2	100	ND	1.9 B	ND	4.1	4	ND	0.70 B	ND
Chromium	100	100	10	50	3.1 B	ND	ND	4.5 B	1.4 B	ND	ND	ND
Lead	15	5	10	50	3.6	28.9	ND	112	112	ND	ND	ND
Mercury	2	2	0.5	2.0	ND	0.40	ND	ND	ND	ND	ND	ND
Selenium	50	50	10	10	ND	ND	ND	ND	ND	ND	ND	ND
Silver	NA	NA	2	50	ND	1.0 B	ND	ND	ND	ND	ND	ND
Explosives												
HMX	NA	NA	NA	NA	0.37 J	4.5	0.8	2.6	2.7	4	0.24 J	ND
RDX	NA	NA	NA	NA	0.14 J	3.6	0.28 J	4.8	4.8	2.3	0.22 J	ND
2, 4, 6-TNT	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND
2, 4-DNT	NA	0.05	10	NA	ND	ND	ND	ND	ND	ND	ND	ND
2, 6-DNT	NA	0.05	10	NA	ND	ND	ND	ND	ND	ND	ND	ND
Picric Acid	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND
Nitrate + Nitrite												
(as Nitrogen)	10,000	10,000	NA	NA	20 B	60 B	ND	100	100	30 B	60 B	ND

NA = Not Available.

ND = Not Detected.

MCL = Maximum Contaminant Level.

PQL = Practical Quantitation Limit.

(a) = USEPA (1996a).

(b) = NJDEP (1992, 1993).

(c) = Maximum concentration criteria established in 40 CFR Part 264 Subpart F 264.94.

= Indicates exceedance of maximum concentration criteria established in 40 CFR Part 264 Subpart F 264.94.

* = Duplicate.

** = MS/MSD analysis performed at this location.

B = Value is estimated.

J = Value is estimated.

TABLE 5-1 (CONTINUED)
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L)
ROUND C - OD AREA RCRA PERMIT MONITORING

Well ID Sample ID Sample Date	Federal Drinking Water Standards (a) MCL	New Jersey Groundwater Standards (b) Quality Criteria	 PQL	RCRA Maximum Concentration Limit (c)	OD-2A ** G08C02A 7/14/1999	OD-3A G08C03A 7/14/1999	OD-4A G08C04A 7/14/1999	OD-5A G08C05A 7/14/1999	OD-6A G08C06A 7/14/1999	OD-6A * G08C06A dup 7/14/1999	RINSATE GW012199R1 1/21/1999
Metals											
Arsenic	50	0.02	8	50.0	25.7	ND	3.1 B	4.3 B	6.9 B	7.2 B	ND
Barium	2,000	2,000	200	1,000	440	4.3 B	107 B	81.3 B	75.7 B	76.4 B	16.0
Cadmium	5	4	2	100	7.3	ND	7.6	ND	ND	ND	ND
Chromium	100	100	10	50	27.5	ND	6.6	4.5 B	8.0	8.3	ND
Lead	15	5	10	50	139	ND	137	4.1	11.6	11.6	ND
Mercury	2	2	0.5	2.0	1.00	ND	0.19 B	ND	ND	ND	ND
Selenium	50	50	10	10	ND	ND	ND	ND	ND	ND	ND
Silver	NA	NA	2	50	2.7 B	ND	1.1 B	ND	ND	ND	ND
Explosives											
HMX	NA	NA	NA	NA	2.3	0.72	2.4	0.49 J	0.84 J	0.26 J	ND
RDX	NA	NA	NA	NA	0.32 J	0.40 J	5.5	1.3	1.8	0.32 J	ND
Nitrobenzene	NA	3	10	NA	ND	ND	ND	ND	ND	0.069 J	ND
2, 4, 6-TNT	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND
2, 4-DNT	NA	0.05	10	NA	ND	ND	ND	ND	ND	ND	ND
2, 6-DNT	NA	0.05	10	NA	ND	0.067 J	ND	ND	ND	ND	ND
Tetryl	NA	NA	NA	NA	ND	ND	ND	ND	0.044 J	0.091 J	ND
2-Nitrotoluene	NA	NA	NA	NA	0.11 J	ND	0.071 J	ND	ND	ND	ND
4-Nitrotoluene	NA	NA	NA	NA	ND	ND	0.18 J	ND	ND	0.15 J	ND
4-Amino-2,6-DNT	NA	NA	NA	NA	ND	ND	ND	ND	0.13 J	0.37	ND
Picric Acid	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND
Nitrate + Nitrite											
(as Nitrogen)	10,000	10,000	NA	NA	ND	ND	80 B	ND	ND	60 B	ND

NA = Not Available.
ND = Not Detected.
MCL = Maximum Contaminant Level.
PQL = Practical Quantitation Limit.
(a) = USEPA (1996a).
(b) = NJDEP (1992, 1993).
(c) = Maximum concentration criteria established in 40 CFR Part 264 Subpart F 264.94.
= Indicates exceedance of maximum concentration criteria established in 40 CFR Part 264 Subpart F 264.94.
* = Duplicate.
** = MS/MSD analysis performed at this location.
B = Value is estimated. J = Value is estimated.

TABLE 5-1 (CONTINUED)
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L)
ROUND B - OD AREA RCRA PERMIT MONITORING

Well ID Sample ID Sample Date	Federal Drinking Water Standards (a) MCL	New Jersey Groundwater Standards (b) Quality Criteria	 PQL	RCRA Maximum Concentration Limit (c)	OD-1A G08B01A 4/15/1999	OD-2A ** G08B02A 4/15/1999	OD-3A G08B03A 4/15/1999	OD-4A G08B04A 4/15/1999	OD-4A * G08A04AD 4/15/1999	OD-5A G08B05A 4/15/1999	OD-6A G08B06A 4/15/1999	RINSATE GW012199R1 1/21/1999
Metals												
Arsenic	50	0.02	8	50.0	ND	7.9 B	ND	9.0 B	8.8 B	ND	ND	ND
Barium	2,000	2,000	200	1,000	22.8 B	158 B	6.9 B	147 B	148 B	77.9 B	44.0 B	16.0
Cadmium	5	4	2	100	ND	0.81 B	ND	3.5	4.7	ND	ND	ND
Chromium	100	100	10	50	ND	16.2	ND	18.4	16.1	6.0	ND	ND
Lead	15	5	10	50	ND	57.2	ND	128	159	5.3	ND	ND
Mercury	2	2	0.5	2.0	ND	0.40	ND	1.0	0.99	ND	ND	ND
Selenium	50	50	10	10	ND	ND	ND	ND	ND	ND	ND	ND
Silver	NA	NA	2	50	ND	1.0 B	ND	2.9 B	2.9 B	ND	ND	ND
Explosives												
HMX	NA	NA	NA	NA	ND	3.3	0.93 J	2.3	2.3	0.84 J	0.26 J	ND
RDX	NA	NA	NA	NA	ND	2.9	0.46 J	4.7	4.4	1.8	0.32 J	ND
2, 4, 6-TNT	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND
2, 4-DNT	NA	0.05	10	NA	ND	ND	ND	ND	ND	ND	ND	ND
2, 6-DNT	NA	0.05	10	NA	ND	ND	ND	ND	ND	ND	ND	ND
Picric Acid	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND
Nitrate - Nitrite												
(as Nitrogen)	10,000	10,000	NA	NA	20 B	30 B	80 B	100	100	30 B	50 B	ND

NA = Not Available.
ND = Not Detected.
MCL = Maximum Contaminant Level.
PQL = Practical Quantitation Limit.
(a) = USEPA (1996a).
(b) = NJDEP (1992, 1993).
(c) = Maximum concentration criteria established in 40 CFR Part 264 Subpart F 264.94.
= Indicates exceedance of maximum concentration criteria established in 40 CFR Part 264 Subpart F.264.94.
* = Duplicate.
** = MS/MSD analysis performed at this location.
B = Value is estimated.
J = Value is estimated.

TABLE 5-1
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L)
ROUND A - OD AREA RCRA PERMIT MONITORING

Well ID Sample ID Sample Date	Federal Drinking Water Standards (a) MCL	New Jersey Groundwater Standards (b) Quality Criteria	 PQL	RCRA Maximum Concentration Limit (c)	OD-1A G08A01A 2/21/1999	OD-1A* G08A01AD 2/21/1999	OD-2A G08A02A 2/21/1999	OD-3A** G08A03A 2/21/1999	OD-4A G08A04A 2/21/1999	OD-5A G08A05A 2/21/1999	OD-6A G08A06A 2/21/1999	RINSATE GW012199R1 2/21/1999
Metals												
Arsenic	50	0.02	8	50.0	ND	ND	ND	2.4	22.0	ND	ND	ND
Barium	2,000	2,000	200	1,000	17.0	ND	64.0	34.0	330.0	28.0	62.0	16.0
Cadmium	5	4	2	100	ND	ND	ND	1.5	15.0	ND	ND	ND
Chromium	100	100	10	50	1.7	ND	2.4	3.1	46.0	ND	7.8	ND
Lead	15	5	10	50	ND	ND	5.9	14.0	390.0	ND	6.3	ND
Mercury	2	2	0.5	2.0	ND	ND	ND	ND	3.8	ND	ND	ND
Selenium	50	50	10	10	ND	ND	ND	ND	2.2	ND	ND	ND
Silver	NA	NA	2	50	ND	ND	ND	ND	9.4	ND	ND	ND
Explosives												
HMX	NA	NA	NA	NA	0.92	1.0	1.9	0.90	2.0	1.6	1.0	ND
RDX	NA	NA	NA	NA	1.0	1.0	1.4	0.56	4.8	1.5	3.2	ND
2, 4, 6-TNT	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND
2, 4-DNT	NA	0.05	10	NA	ND	ND	ND	ND	ND	ND	ND	ND
2, 6-DNT	NA	0.05	10	NA	ND	ND	ND	ND	ND	ND	ND	ND
Picric Acid	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND
Nitrate + Nitrite												
(as Nitrogen)	10,000	10,000	NA	NA	ND	160.0	ND	67.0	72.0	ND	370.0	ND

NA = Not Available.

ND = Not Detected.

MCL = Maximum Contaminant Level.

PQL = Practical Quantitation Limit.

(a) = USEPA (1996a).

(b) = NJDEP (1992, 1993).

(c) = Maximum concentration criteria established in 40 CFR Part 264 Subpart F 264.94.

= Indicates exceedance of maximum concentration criteria established in 40 CFR Part 264 Subpart F 264.94.

* = Duplicate.

** = MS/MSD analysis performed at this location.

66.1 µg/L in the original sample and a concentration of 12.6 µg/l in the duplicate sample for an average concentration of 39.5 µg/L

The two wells were then re-sampled in April 2000 with a representative of NJDEP present. Each well was sampled at three different screen intervals, as requested by the NJDEP representative. The results for well OD-2A indicated lead concentrations of 1.9 µg/L, ND, and ND at the three different screen intervals. The results for well OD-4A indicated lead concentrations of 3.4 µg/L, 6.0 µg/L and 3.4 µg/L. All concentrations of lead in the two re-sampling events were below the RCRA maximum concentration limit of 50 g/L **(Table 5-2).**

During the four subsequent sampling events, low-flow sampling produced similar metals results. No samples contained metals concentrations in excess of the RCRA MCLs. The maximum lead concentration detected in the six wells was 8.3 µg/L in downgradient well OD-4A. Aluminum, iron and manganese were identified in excess of their LOCs. LOC exceedances for these three metals were reported in all wells with the exception of OD-3A. These three inorganic compounds are common naturally occurring metals that are detected throughout Picatinny Arsenal at elevated levels in the soil and groundwater. The levels are believed to be related to the weathering of the local bedrock and are not likely site-related.

5.4 OTHER ANALYTICAL RESULTS

During the 2001 and 2002 sampling events, numerous other analytes were added to the monitoring program including VOCs, SVOCs, pesticides, PCBs and perchlorates. Volatile organic compound ethylene oxide was the only compound of these additional analytes detected above a LOC. Ethylene oxide was identified at 780 µg/L in one well (OD-2A) during a single sampling event (LOC = 0.023 µg/L). Perchlorate was detected in three of the six wells at concentrations ranging from 4.8 µg/l to 11.6 µg/L.

For the following compounds no concentrations were detected above the estimated quantitation limits: diphenylamine, aniline, carbazole, PCBs, TCL pesticides, mirex, organophosphorous pesticides, and cyanides. For TCL VOCs, SVOCs and anions, no concentrations were reported in excess of LOCs.

5.5 SUMMARY

In the initial four rounds of sampling (1999), lead and mercury were detected exceeding the RCRA maximum concentration limits. For these groundwater samples collected by bailers with associated high turbidity, all four rounds had lead exceedances in the downgradient wells. Mercury was detected slightly exceeding the RCRA limit. Sampling with low-flow techniques, which reduce turbidity, resulted in lead and mercury concentrations below their RCRA limits. These results would indicate that the lead detected in the groundwater samples is not dissolved lead but more likely colloidal or particulate lead entrained with fine sediments.

There were detections of HMX and RDX in both upgradient and downgradient wells with a maximum concentration of HMX of 9.0 µg/L and RDX of 23 µg/L. All concentrations of RDX and HMX were below the proposed permit criterion of 35.0 µg/L. There were also trace detections of other explosive compounds such as DNT and TNT. These results would indicate that the only compounds that warrant continued compliance monitoring are explosives and perchlorates.

5.0 CHEMICAL ANALYTICAL RESULTS

5.1 INTRODUCTION

The eight rounds of chemical analytical results, collected and analyzed in accordance with the groundwater monitoring program, were evaluated by comparing groundwater constituent concentrations with several sources of established groundwater quality standards. This was conducted to contrast upgradient and downgradient location constituent concentrations with administrated maximum contaminant concentration limits. In addition, several compounds, for which no groundwater constituent level of concern exists, were detected at low concentrations in the overburden aquifer. **Table 5-1** presents a summary of the chemical analytical results from the four rounds of groundwater sampling conducted between February 21, and October 6, 1999. **Table 5-3** presents a summary of the chemical analytical results for the four rounds of groundwater sampling conducted between June 2001 and April 2002.

5.2 EXPLOSIVES ANALYTICAL RESULTS

HMX and RDX were the two explosive compounds most commonly detected during groundwater sampling. As presented in **Tables 5-1 and 5-3,** low concentrations of HMX and RDX have been detected in various wells, both upgradient and downgradient of the OD area during all eight rounds of groundwater sampling.

In upgradient wells OD-1A, OD-5A and OD-6A, concentrations of HMX ranged from non-detect (0.5 µg/L – detection limit) to 8.0 µg/L. RDX was detected in concentrations from non-detect (0.5 µg/L – detection limit) to 3.5 µg/L in the same wells. In downgradient wells OD-2A, OD-3A and OD-4A, similar concentrations of HMX were identified ranging from 0.45 µg/L to 9.0 µg/L. RDX concentrations in downgradient wells ranged from 0.19 to 23 µg/L.

All other explosive compounds were non-detects except for an estimated concentration of 2,6-DNT at 0.067 µg/L in well OD-3A detected during a single event and a concentration of 2,4,6-TNT at 2.0 µg/L in well OD-2A during a single sampling event.

Nitroesters – nitrocellulose, nitroguanidine and nitroglycerin were not detected in the 2001 and 202 sampling events.

5.3 METALS ANALYTICAL RESULTS

During the initial four sampling events conducted in 1999, the bailer sampling method produced elevated metals concentrations. However, only two metals, lead and mercury, were detected at concentrations above applicable comparison criteria in the four rounds of groundwater sampling.

Mercury was reported once in well OD-4A, during the first round of sampling, at a concentration of 3.8 µg/L. Lead was detected in downgradient wells at concentrations above applicable comparison criteria during all four rounds of sampling. Lead was detected in all four rounds of sampling in well OD-4A ranging on concentrations from 112 to 390 µg/L. Lead was identified in well OD-2A during the second and third rounds at concentrations of 57.2 and 139 µg/L, respectively.

The elevated concentrations of lead detected in the two downgradient wells may be attributable to exceptionally high turbidity levels observed during sampling activities. Although turbidity levels markedly decreased at the end of purging, the samples from these wells contained a visibly higher percentage of suspended load particles when compared with the other OD area wells.

As a check, wells OD-2A and OD-4A were re-sampled for lead analysis using the low-flow sampling technique. This method of groundwater sampling has been accepted by both the U.S. Environmental Protection Agency and the NJDEP for use at PTA. The two wells were re-sampled in March 2000. The concentration of lead in well OD-4A was 2.6 µg/L. Well OD-4A had a concentration of

- A Matrix Spike/Matrix Spike Duplicate (MS/MSD) sample was submitted for laboratory quality assurance/quality control (QA/QC).

to sampling during the four sampling events conducted in 1999. In order to minimize drawdown and prevent turbulent groundwater flow into the well casing during purging, purge rates were maintained at an average 0.5 to 0.75 gpm range. Monitoring wells were purged by removing water from the top of the water column, allowing groundwater indigenous to the aquifer to enter the well casing. The efficiency of stagnant casing water removal from the well was monitored throughout the purge by evaluating the stability of groundwater quality parameters obtained using a Hydrolab water quality analyzer. The parameters collected before and during groundwater evacuation included pH, temperature, specific conductance, oxidation/reduction potential, dissolved oxygen, and turbidity. Evacuation of the well continued until a minimum of 3 volumes of standing well water were removed, and groundwater quality parameters were stabilized, indicating water representative of the aquifer was being obtained.

Groundwater samples were collected using dedicated Teflon bailers equipped with Teflon-coated stainless steel leaders. The samples were obtained by lowering the bailer until it was completely submerged and then immediately retrieving it with minimal aeration and disturbance. Pre-preserved, laboratory-supplied sample bottles were filled and immediately chilled at 4^0C in laboratory-supplied sample coolers for shipment.

4.4 GROUNDWATER PURGING AND SAMPLING – 2001 and 2002

Adjustable rate, stainless steel submersible pumps, attached to dedicated Teflon-lined polyethylene tubing, were utilized to remove the required groundwater volume from the wells prior to sampling during the four sampling events conducted in 2001 and 2002. In order to minimize drawdown and prevent turbulent groundwater flow into the well casing during purging, purge rates were maintained at an average of 500 ml/min. Monitoring wells were purged by removing water from the center of the water column or screened interval, allowing groundwater indigenous to the aquifer to enter the well. The efficiency of stagnant casing water removal from the well was monitored approximately every five minutes throughout the purge by evaluating the stability of groundwater quality parameters obtained using a YSI water quality analyzer. The parameters collected before and during groundwater evacuation included pH, temperature, specific conductance, dissolved oxygen (DO), oxidation/reduction potential (ORP), and turbidity. A summary of the groundwater quality measurements for each location is provided in **Table 3-1**. Evacuation of the well continued until the water quality parameters stabilized for three successive readings as follows: 10% for DO, ORP and turbidity; 3% for specific conductance; 5% for pH (Puls et al, 1992), and 1% for temperature, indicating water representative of the aquifer was being obtained.

Groundwater samples were collected directly from the Teflon-lined tubing at a flow rate of 100 to 250 ml/min. Pre-preserved, laboratory-supplied sample bottles were filled and immediately chilled at 4^0C in laboratory-supplied sample coolers for shipment. Severn Trent Laboratories (STL), an NJDEP-certified laboratory, performed all the analyses with the exception of the exotic explosives. Crane Naval Surface Warfare Center (NSWC) in Crane Indiana, a Department of Defense Laboratory, was the only laboratory identified to be proficient in the analysis of the exotic explosive compounds. All samples were shipped overnight delivery to Crane NSWC and STL in Canton, Ohio (VOCs, SVOCs, pesticides, metals, and anions); Knoxville, Tennessee (explosives analyses); Earth City, Missouri (radiological analyses) and Sacramento, California (thallium and perchlorate analyses).

4.5 QUALITY CONTROL SAMPLES

Quality Control (QC) samples were collected during each round of sampling to check for cross-contamination during the handling of sampling materials, as well as monitor the performance of analytical contracting services. The following QC samples were collected during each round of sampling.

- A rinsate blank sample was collected by pouring analyte-free water through a Teflon bailer, into the applicable sample containers.
- A replicate sample was collected for duplicate analysis.

4.0 WELL INSTALLATION AND GROUNDWATER INVESTIGATION

4.1 MONITORING WELL INSTALLATION

4.1.1 UXO Avoidance Survey

UXO avoidance techniques were performed for monitoring well installation in accordance with the procedures and guidelines detailed in the approved Picatinny Arsenal Facility-Wide Field Sampling Plan, (ICF KE, 1997). Qualified UXO technicians, subcontracted by ICFKE, were responsible for UXO clearance and avoidance during monitoring well installation in the OD area. Hand augers and shovels were utilized by UXO personnel to clear monitoring well locations to a minimum depth of six feet below ground surface (bgs) in preparation of drill rig boring activities. UXO clearance was performed during borehole advancement through the subsurface fill material every two feet, to a minimum depth of ten feet (bgs). UXO did not impede the field investigation or require relocation of the monitoring wells from their designated positions per the approved workplan.

4.1.2 Monitoring Well Installation and Development

Borehole advancement for monitoring well installation was performed utilizing air rotary drilling with temporary casing advancement (ODEX) technology. This drilling method simultaneously advances six-inch carbon steel casing along with specially designed drill bits, preventing cave-in of subsurface soils, cobbles, and boulders. Boreholes were advanced with this method to twenty feet bgs at each location for the placement of the two wells. Monitoring wells were comprised of 2-inch by 10.0 foot, schedule 40, 0.010-inch slot, PVC well screens, and 2-inch PVC riser pipe. Both monitoring wells were completed above ground surface and protected with concrete-filled steel posts. Well development was performed within 48 hours of well installation with the use of centrifugal pumps and dedicated black polyethylene ASTM drinking water grade tubing equipped with foot valves. Well development was also performed on the four pre-existing wells located in the Gorge per the approved workplan. Groundwater quality parameters were monitored for stability and five volumes of standing well water were removed from each well during development activities. Monitoring well construction diagrams are provided in **Appendix T-1.A.** Locations of the six monitoring wells are presented in **Figure 3-1.**

4.2 GROUNDWATER SAMPLING FIELD MEASUREMENTS

Prior to each round of sampling, the six wells were opened and the headspaces were immediately screened using an 11.7eV lamp Photoionization Detector (PID) and MicroFID Flame Ionization Detector (FID) to identify the presence of Volatile Organic Compounds (VOCs) in the wells. A sustained VOC reading above background from the well head into breathable air space would constitute an upgrade in personal respiratory protective equipment. At no time during the eight sampling events were VOCs detected in breathable air space.

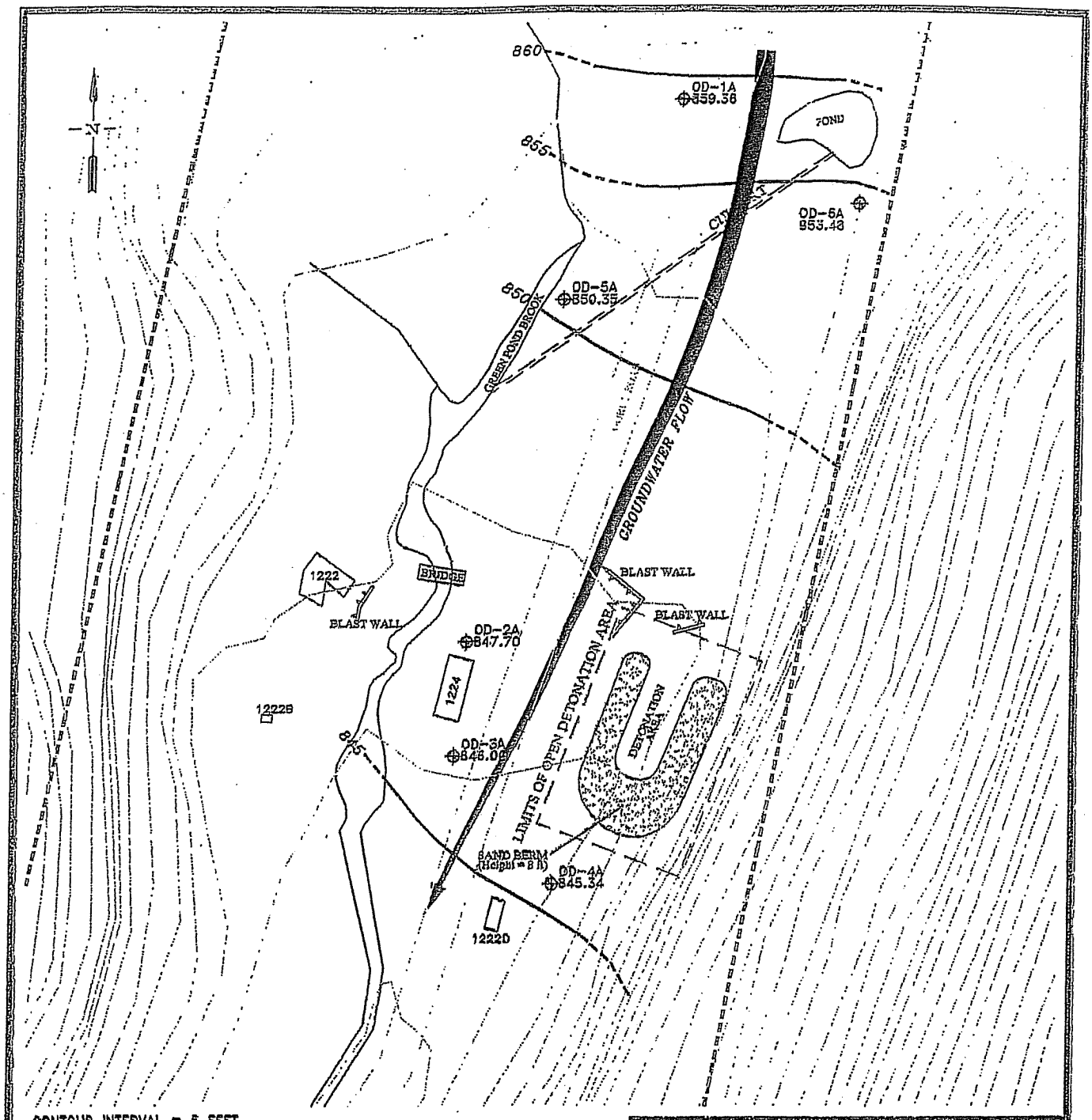
Physical measurements of groundwater level, well depth, and PVC well casing height were collected using a decontaminated electronic water level indicator. This information was recorded onto pre-sample purge forms, used in calculating the volume of standing water present in the casing and granular filter pack. These measurements were used to determine the minimum required volume of groundwater to remove from the well prior to sample collection. Potentiometric surface maps were generated from these measurements in order to evaluate groundwater flow direction and gradient (**Figure 3-1**).

4.3 GROUNDWATER PURGING AND SAMPLING – 1999

Centrifugal pumps, attached to dedicated black polyethylene ASTM drinking water grade tubing equipped with foot valves, were utilized to remove the required groundwater volume from the wells prior

This formula utilizes a correlation coefficient of 0.67 for the empirical relationship between transmissivity and specific capacity, which is derived from the flow rate and drawdown data of the wells. Gorge area well data applied to this formula yielded transmissivity values ranging from 246.1 square feet per day (ft^2/day) from OD-5A, to 618.3 ft^2/day from OD-2A. Hydraulic conductivity values, based on these transmissivity results and a theoretical aquifer thickness of 30 feet, ranged from 8.20 feet per day (ft/day) at OD-5A, to 20.61 ft/day at OD-2A. Monitoring wells OD-3A and OD-4A did not exhibit any drawdown during development, at purge rates equal to those used on the other Gorge wells applied to the formula. Therefore, transmissivity and hydraulic conductivity values are presumably higher since purge rates of equal magnitude failed to drawdown the standing water column in the well. Although accurate calculations could not be performed for these wells, transmissivity and hydraulic conductivity values are not likely to exceed 1,000 ft^2/day and 33.33 ft/day respectively, based on the subsurface lithology at these locations.

In summation, the OD area overburden aquifer characteristics are approximated at 8.20 ft/day to 33.33 ft/day for hydraulic conductivity, and 246.1 ft^2/day to 1,000 ft^2/day for aquifer transmissivity. These values are typical for the types of sediments identified during borehole advancement of the monitoring wells located in the area, and are representative of values that are anticipated for wells with yields such as those observed at the site.



NOTES: Site features have not been surveyed to verify coordinate accuracy, but relative locations of site features have been verified by field measurements. Water levels are based on measurements taken on 02/21/2000.

PLOT DATE: 09/28/00

IT CORPORATION	Picatinny Arsenal Installation Restoration Program	U.S. Army Corps of Engineers
REVISION NO.: 0	DATE: 09/26/00	ACAD FILE: SMWg092600.dwg

OPEN DETONATION AREA POTENTIOMETRIC SURFACE MAP

DET'D:	CLIENT:	PROJECT NO.:
AS	PICATINNY ARSENAL	66727-005-00
CHK'D:	LOCATION:	FIGURE NO.:
JP	DOVER, NEW JERSEY	3-1

3.1 TOPOGRAPHY/SURFACE WATER HYDROLOGY

The OD area lies in a flat bottomed gorge, bordered by steeply sloping ridges of Green Pond Mountain to the west and undifferentiated metamorphic/igneous rock to the east (Copperas Mountain). These ridges reach an average elevation of 1,000 to 1,100 ft msl within 500 feet of the valley axis. The elevation of the Gorge area varies from 840 to 870 ft msl and averages 200 to 500 feet in width. The surface water from this region flows down the steep valley walls via a number of small, unnamed, streams, ditches, and culverts to the valley axis where it contributes to the base flow of Green Pond Brook. Green Pond Brook in this area averages 5 to 10 feet in width and approximately 2 to 3 feet in depth. Green Pond Brook flows to the south along the valley axis at a steep (approx. 9:1 feet) gradient to the confluence with Burnt Meadow Brook in the main valley of PTA where it eventually discharges to the southwest into Picatinny Lake.

3.2 GEOLOGY

The geology of the OD area was determined by reviewing lithologic boring logs recorded during the advancement of the six wells installed for the Resource Conservation and Recovery Act (RCRA) Subpart X permit monitoring program. Bedrock compositions in this area were interpreted through outcrop observations and confirmed with the use of geologic maps published on the regional geology. The lithologic boring logs indicate that the overburden is composed of a poorly sorted heterogeneous mixture of boulders and gravel in a silty sand matrix, with varying trace amounts of clay. This variable sedimentary sequence is a function of the complex geomorphic conditions in the Gorge resulting from the redistribution of glacial, talus, and stream related sediments that occur in the valley. The low occurrence of clay in the interval investigated (0-20 feet below ground surface [ft bgs]) and relatively high hydraulic conductivity observed in the aquifer (Section 3.3) suggest that fluvial processes were the primary mechanism in the redistribution and deposition of sediments in the Gorge. The boring logs reveal that a maximum of 3 to 10 feet of artificial fill composed of varying amounts of sand, gravel, cobbles, boulders, and rubble covers the entire Site. Bedrock was not encountered during the advancement of borings in the OD area; therefore, accurate depth to bedrock and overburden thickness estimations could not be determined. As a result, identification and placement of the fault transecting the valley was indeterminable from the limited subsurface investigation. Bedrock composition west of the fault is described from outcrops as oxidized quartz pebble conglomerate of the Greenpond Syncline. Undifferentiated granitic gneiss composed of varying degrees of hornblende, quartz, plagioclase feldspar, potassium feldspar, and mica is identified in outcrops east of the fault.

3.3 HYDROGEOLOGY

Two aquifers are presumed to exist in the Gorge area: an overburden aquifer and a bedrock aquifer. The hydrogeology of the OD area was determined through the evaluation of well development data from the six Gorge area wells installed into the unconfined overburden aquifer. Potentiometric surface gradients and groundwater flow directions were determined using static water level measurements collected from the wells (**Figure 3-1**). The horizontal hydraulic gradient along the flow axis between monitoring well OD-1A and OD-3A was measured at 0.037. No wells were installed into the fractured bedrock aquifer underlying the OD area, therefore, accurate estimations of fractured bedrock aquifer characteristics were indeterminable.

Overburden aquifer characteristics were estimated using measurements obtained during well development of the wells. Flow rate (Q) and drawdown ($h_0 - h$) data, from the wells which exhibited equilibrium of these variables during purging, were applied to the Razack and Huntley (1991) partially penetrating well equation to determine a transmissivity value for the Gorge area aquifer.

$$T = 33.6\left(\frac{Q}{h_0 - h}\right)^{0.67}$$

The nature and thickness of the glacial deposits vary substantially at PTA. Relatively impermeable till is found both in the moraines and in patches against the sides and bottom of the valley. Stratified drift, deposited by the retreating glaciers behind the moraines, fills the valley underlying PTA. The drift is thickest above the axis of the valley, and thins rapidly off axis, pinching out against the valley slopes. Seismic studies indicate that the maximum drift thickness (along the valley axis) varies from about 50 feet near Picatinny Lake to over 300 feet near the southwestern boundary of PTA (Lacombe et al., 1986).

Classification of the glacial deposits into separate and homogeneous units is complex at PTA. The United States Geological Survey (USGS, 1993) reported the glacial deposits as five permeable layers represented as aquifers and three low permeability layers represented as confining units in the southern portion of the Arsenal, south of Picatinny Lake. In contrast, Dames and Moore (1995) reported three permeable layers in the same area. In the middle portion of the Arsenal, ICF Kaiser Engineers (ICFKE) separated the glacial deposits into two aquifer units.

2.6 HYDROGEOLOGY

The principal source of groundwater in the Green Pond Valley is local precipitation. The low-permeability and the steep slopes of Green Pond Mountain and Copperas Mountain restrict the infiltration of precipitation into these mountains. Most of the precipitation that falls on the mountains flows overland to their bases and into the highly permeable glacial sediments. The small amount of precipitation that enters Green Pond and Copperas Mountains flows down through shallow fractures to the glacial sediments in the valley. Effectively, all discharge from the groundwater system flows to surface water bodies, primarily the Rockaway River and Green Pond Brook (USGS, 1991a).

Groundwater occurs in both the valley glacial materials and in the bedrock at PTA. South of Picatinny Lake, where the hydrogeology has been studied in detail, the bedrock and glacial sediments at PTA were divided into a sequence of six permeable layers and five intervening, low-permeability layers on the basis of the general hydraulic properties of the sediments (USGS, 1991a). Sand units exceeding 10 feet in thickness can act as pathways for contaminants and, therefore, were designated as permeable layers. Confining units, such as thick clay units, do not appear to be present at PTA; however, units containing clay and/or silt that impede the flow of groundwater are present. The designation of a layer as a low-permeability or permeable layer was made solely on the basis of the layer's ability to transmit water, and thus may not correspond to time- or rock-stratigraphic designations.

The thickness of the weathered zone of the bedrock was determined from drilling logs. The thickness of the weathered zone ranges from 24 feet at well 27-84 near Picatinny Lake to 136 feet at well 27-250 near the southern boundary of the arsenal. The bedrock beneath the glacial sediments at PTA weathers to a clay, which fills the fractures in the bedrock and impedes the flow of water. Therefore, the weathered zone of the bedrock was designated as a low-permeability layer.

TABLE 2-1
GENERALIZED STRATIGRAPHIC SEQUENCE AT PTA

Stratigraphic System	Geologic Unit	Max. Thickness (ft)	Lithology	Hydrogeology
Cenozoic Era				
Holocene	Alluvium	10	Ranges from silty loam in the valley to stoney gravel on the hillsides	Too thin to be tapped
	Swamp Deposits	30	Dark organic material	High permeability among layers
Pleistocene	Stratified Drift	200+	Present as glaciofluvial and glaciolacustrine deposits; mostly sand- to clay-sized sediments; exhibits stratifactions and some rhythmic lamination	Yields vary widely: well-sorted coarse-grained deposits are good aquifiers and can yield up to 2,200 gal/min; silt and clay deposits are unsuitable as auifers
	Unstratified Drift	100+	Present as ground, terminal, and recessional moraine; deposits are generally tight-packed and poorly sorted: grain sizes range from boulders to clay	Yields depend on sorting and packing; generally low yields
Paleozoic Era				
Silurian	Green Pond Conglomerate	1400	Unconformity. Coarse quartz conglomerate interbedded with and grading upward into quartzite and sandstone; mostly massive and red with some white and green beds	Generally yields small amounts of water from fractures and joints
Cambrian	Leithsville Formation	500-700	Uncomformity . Present mostly as gray, microcrystalline, locally stylolithic rock to fissile, silicious to dolomitic micrite rock; often weathered to yellow silty clay	Contains water-bearing fractures and cavities that generally have moderate yields of up to 380 gal/min.
	Hardyston Quartzite	100	Gradational contact. Orthoquartzite is conglomerate; generally well indurated	Generally few fractures; yields small amounts of water
Precambrian Era				
	Alaskite	Basement	Granitiod gneiss composed principally of microperthite, quartz, and oligoclase (<5% mafic minerals); locally contains microantiperthite granite and granite pegmatite	Groundwater occurs in fractures and joints; yields are generally low, ranging from 26-75 gal/min.
	Homblende granite		Granitoid gneiss composed principally of microperthite, quartz, olioclase, and homblende; locally contains biotite granite, homblende granite gneiss, granodiorite, and granite pegmatite	
	Biotite gneiss		Varying composition of gneiss; predominant facies is composed of biotite, quartz, and oligoclase; minor facies are characterized by abundant garnet and micropertite, with local silimanite and grapite	

Sources: (ANL, 1991), (Sims, 1958), (Gill and Vecchioli, 1985), (Vowinkel et al., 1985), and (Drake, 1969)

southwest to east-southeast across PTA south of Lake Picatinny. The Mount Hope Fault dips about 60 degrees to the southwest, with a net slip of 300 feet (Sims, 1958).

Four bedrock formations underlie PTA: Precambrian Basement and three lower Paleozoic sedimentary formations – the Hardyston Quartzite, the Leithsville Formation, and the Green Pond Conglomerate. The overlying valley fill is composed of Pleistocene glacial deposits and minor amounts of recent alluvium. The stratigraphic units recognized at PTA and their hydrologic properties are summarized in **Table 2-1**.Several uncertainties exist regarding the state of geologic knowledge at PTA. The vast majority of the geologic characterization at PTA has been performed in the southwestern half of the facility. The geologic descriptions provided here rely primarily on this work and on regional studies. Hence, the variability/uncertainty of the geology increases to the northeast. Second, the environmental investigations at PTA to date have focused on hydrogeologic studies of the stratified drift. Much less work has been done characterizing the bedrock formations and their weathered zones. Most deep borings and wells have been terminated at refusal, or at best, advanced only a few tens of a foot into bedrock (Harte et al., 1986). Because boulder beds have been encountered in the lower portions of the drift, bedrock elevations and overburden thicknesses determined by drilling refusal may be locally uncertain (Vowinkel et al., 1985). Finally, the apparent thickness of the bedrock formations is both erosionally and fault controlled, and varies widely both at PTA and regionally. The Precambrian section is composed of highly metamorphosed meta-sedimentary and intrusive igneous rocks variously referred to as the Byram intrusive suite (Sims, 1958) or Losee Formation. The oldest basement unit is a meta-sedimentary sequence of biotite-quartz-plagioclase gneiss and amphibolite, which crops out in a band extending northeast from Lake Denmark (Sims, 1958). The majority (75%) of the basement complex consists of gneissic hornblende granite and alaskite known as the Byram intrusive suite. The granites are primarily composed of microperthite, quartz, hornblende, and plagioclase and contain abundant xenoliths and pegmatites. The alaskite facies (granite lacking mafic minerals) is closely associated with large magnetite ore deposits (Sims, 1958). These metamorphosed intrusive rocks show a strong gneissic structure and have been mapped in the past as gneiss (Sims, 1958).

The Early Cambrian age Hardyston Quartzite unconformably overlies the Precambrian basement bedrock. It is composed of well-cemented thin- to medium-bedded feldspathic quartzite with interbeds of arkose, quartz-pebble conglomerate, and silty shale, becoming more calcareous in the upward direction. The Hardyston Formation has a maximum thickness of 100 feet and underlies a narrow ridge on the eastern flank of the valley, south of Picatinny Lake (Lytle and Epstein, 1987).

The Leithsville Formation is an Early to Middle Cambrian age dolomite that underlies the western part of Picatinny Lake and much of the valley fill sediments to the southwest. It gradationally overlies the Hardyston Quartzite (Harte et al., 1986). The Leithsville Formation has also been referred to as the Kittatinny Dolomite (Barnett, 1976). The Leithsville Formation has three members: the (basal) Califon member, which consists of about 100 feet of dolomite; the Hamburg member, which consists of 35-100 feet of interbedded sandstone, siltstone, shale, and dolomite; and the (upper) Wallkill member, which consists of 350-500 feet of dark gray, patchy dolomite (Markewicz and Dalton, 1980).

Green Pond Conglomerate is a Silurian age conglomerate that makes up most of Green Pond and Copperas Mountains. It is composed of well-cemented coarse red and grey sandstone with white quartz pebbles and accessory grey, green, yellow, and red chert, red shale, and red sandstone pebbles and cobbles (Barnett, 1976). At PTA, the lower contact of the Green Pond Conglomerate has been cut out by the Green Pond Fault, which places the Green Pond Conglomerate over the Leithsville Formation south of Picatinny Lake, and over the Precambrian basement north of Picatinny Lake. The thickness of the Green Pond Conglomerate at PTA is fault controlled, ranging from about 1,000 to 1,400 feet (Lytle and Epstein, 1987).

Unconsolidated glacial deposits overlie the Precambrian and lower Paleozoic age bedrock at PTA. The glacial materials consist mostly of till and stratified drift deposited during the Wisconsin glacial event. The terminal moraine of the Wisconsin glaciation, a 25-40 foot high mound of tightly packed till consisting of unsorted particles ranging in size from clay to boulders, roughly coincides with the southwest boundary of PTA (Harte et al., 1986). A smaller recessional moraine is located just south of Picatinny Lake. Stratified drift, consisting of interbedded layers of sand, silt, and clay, were deposited behind these moraines as the glaciers retreated.

Three gauging stations are located on Green Pond Brook: just north of Picatinny Lake, at the Picatinny Lake outfall, and approximately 100 feet upstream of the southwestern border of PTA. Base flow discharge data indicate that Green Pond Brook is a gaining stream (Vowinkel et al., 1985).

Bear Swamp Brook, with a width of 3 to 7 feet and a maximum depth of 2 feet, is a tributary to Green Pond Brook. Bear Swamp Brook starts as a spring on Green Pond Mountain on the western side of the installation. This brook drains the area southwest of Picatinny Lake and south of Green Pond Mountain before entering Green Pond Brook approximately 1 mile south of Picatinny Lake. The flat valley bottom near the southern portion of PTA is drained by a network of man-made drainage ditches that discharge into Green Pond Brook.

Ames Brook drains several small streams and man-made reservoirs which are located along the eastern portion of an unnamed ridge located on the southeast side of the site. The top of the unnamed ridge is a water divide with all drainage to the east flowing southeast, rather than west to the installation valley. Ames Brook exits the installation and drains into the valley to the southeast. Robinson Run and several unnamed tributaries drain the southeastern central portion of PTA. Robinson Run and its tributaries discharge into Green Pond Brook to the northwest. Numerous other small ponds and reservoirs which serve as collection basins, also influence local drainage patterns at PTA.

2.4 SOILS

The soils at PTA can be categorized into two major types: 1.) Soils highly disturbed by human influence; and 2.) Soils exhibiting characteristics of past glacial activity. The Soil Survey of Morris County, New Jersey identifies 27 different soil types at PTA. Four of the soils identified on the Arsenal (Ma, Ps, Ua, UrD) are classified as disturbed areas as a result of human activities. The majority of these soils are mapped in the central and southwestern portion of the Arsenal where extensive filling activities have occurred in areas which were previously somewhat poorly to very poorly drained.

The remainder of the soils mapped at PTA are closely related to the underlying geologic formations and past glacial influences. The Hibernia, Netcong, Ridgebury, Rockaway, and Whitman soils were formed from glacial till deposits and contain a high amount of stone and/or gravel content. The remaining glaciated soils mapped at PTA derived either from organic and mineral deposition of proglacial lakes and kettles or glacial outwash.

The hydric soils mapped at PTA include the Adrian muck, Carlisle muck, Preakness, Ridgebury, and Whitman soils. The hydric soils present at PTA are derived either from organic or mineral deposition. The organic hydric soils (Ad, Cm) commonly occupy the position of former depressions where the deposition of organic and mineral sediment have completely or partially filled in lakes and ponds. The hydric mineral soils (PvA, Pw, RgA, RlB, Wm) commonly occur in various landscape positions including outwash plains, kettles, and undrained depressions. The Hibernia and Pompton soils are considered non-hydric with hydric inclusions, indicating that small areas of hydric soils are included in the mapping units.

2.5 GEOLOGY

The Green Pond syncline is a narrow northeast-trending fault-breached syncline. The syncline is covered by lower Paleozoic sedimentary rocks, which unconformably overlie the Precambrian basement on the eastern limb of the syncline, and are faulted out to the east by the Green Pond Fault, which places the Green Pond Conglomerate over the basement (Lytle and Epstein, 1987). The Green Pond Fault trends northeast up the valley on the west side of Lake Picatinny and Lake Denmark, and is sub-vertical to steeply west-dipping. The Green Pond Fault is downthrown to the east, with an estimated vertical displacement of 800 feet and a poorly constrained strike-slip displacement (Barnett, 1976). A tight, asymmetrical syncline, presumably a fault-drag fold, parallels the Green Pond Fault to the east between the fault and Lake Denmark (Barnett, 1976). A larger anticline parallels the Green Pond Fault to the west, with dips increasing westward to a maximum of 55 degrees to the northwest near the PTA boundary (Sims, 1958). The Mount Hope Fault is a high-angle fault, downthrown to the south, which trends west-

2.0 REGIONAL PHYSICAL CHARACTERISTICS

2.1 CLIMATOLOGY

Northern New Jersey has a continental temperate climate, which is controlled by weather patterns from the continental interior. The prevailing winds blow from the northwest from October to April and from the southwest from May to September (Gill and Vecchioli, 1985). The average monthly temperature ranges from a high of approximately 72°F in July to approximately 27°F in January/February (National Oceanic and Atmospheric Administration [NOAA], 1982). The average date of the last freeze of spring and the first freeze of fall are May 2 and October 8, respectively (Eby, 1976). Located approximately 8 miles southeast of PTA, the average annual precipitation at the Boonton monitoring station from 1980 to 1990 was 47.19 inches. The least amount of precipitation occurs during February (2.79 inches) while the greatest amount of precipitation occurs during June (5.41 inches) (NOAA, 1982).

2.2 PHYSIOGRAPHY AND TOPOGRAPHY

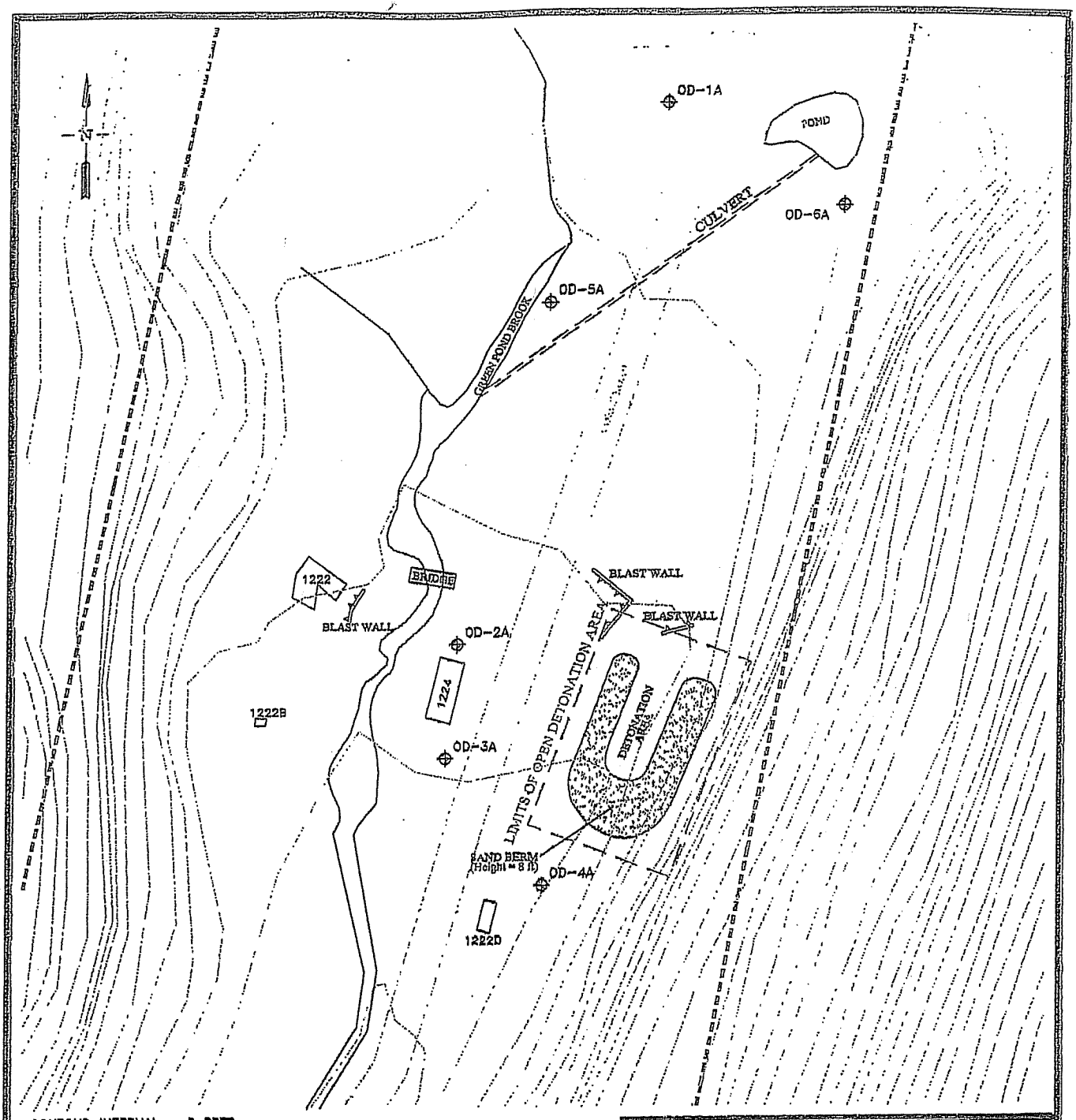
PTA is located in the New Jersey Highlands physiographic province, which ranges from 12 - 18 miles wide and is located between the Appalachian Piedmont physiographic province to the southeast and the Valley and Ridge province to the northwest. The New Jersey Highlands is the southernmost extension of the New England sub-province (Reading Prong) of the Appalachian Highland physiographic province (Gill and Vecchioli, 1985). The area is characterized by broad, rounded, or flat-topped northeast-southwest trending ridges, and deep and generally narrow valleys that are controlled by the northeast-trending folds and faults of the underlying bedrock.

The valley in which PTA resides has a broad and relatively flat floor, which slopes gently to the southwest. The valley varies from 1,000 to 4,000 feet in width. Elevations within the valley floor range from approximately 800 feet mean sea level (ft msl) at the northeastern boundary to approximately 700 ft msl at the southwestern boundary. The main valley of PTA is bounded to the northwest by Green Pond and Copperas Mountains and to the southeast by an unnamed ridge. Green Pond and Copperas Mountains are rugged and steeply sloped with a maximum elevation of about 1,250 ft msl. The southeastern ridge is less steep with a maximum elevation of about 1,150 ft msl and contains small elevated plateaus. Marshy areas at the southern end of PTA and north of Lake Denmark are very flat with minor relief.

2.3 SURFACE WATER HYDROLOGY

PTA is located in the upper part of the Passaic River drainage basin. Green Pond Brook, which is the primary drainage feature of PTA, joins the Rockaway River approximately one mile south of PTA. From this confluence, the Rockaway River flows east through the Boonton Reservoir, an 8.5-billion gallon water source for Jersey City. The Rockaway River then flows southeast, merging with the Passaic River, which discharges into Newark Bay at Elizabeth, New Jersey.

At PTA, surface water generally flows down to the valley axis via a number of small, unnamed streams and ditches, and then to the southwest via Burnt Meadow Brook and Green Pond Brook. The northeast portion of PTA is drained by Burnt Meadow Brook, which has an average width of 3 to 4 feet and a maximum depth of 1 foot. Burnt Meadow Brook discharges into Lake Denmark in the northeastern portion of the installation (U.S. Army Toxic and Hazardous Materials Agency [USATHAMA], 1976). Lake Denmark discharges by a continuation of Burnt Meadow Brook into Green Pond Brook, the principal drainage feature for PTA. Green Pond Brook then flows southwestward into Picatinny Lake. Located in the geographic center of PTA, Picatinny Lake is approximately 5,300 feet long, an average of 1,000 feet wide (108 acres), with a maximum depth of 20 feet (165 million gallons) (USATHAMA, 1976). Green Pond Brook, with a width of 10 to 30 feet and a maximum depth of 5 feet, continues southwestward from Picatinny Lake through the center of the valley, and discharges into the Rockaway River about one mile southeast of PTA.



IT CORPORATION

Picatinny Arsenal Installation Restoration Program

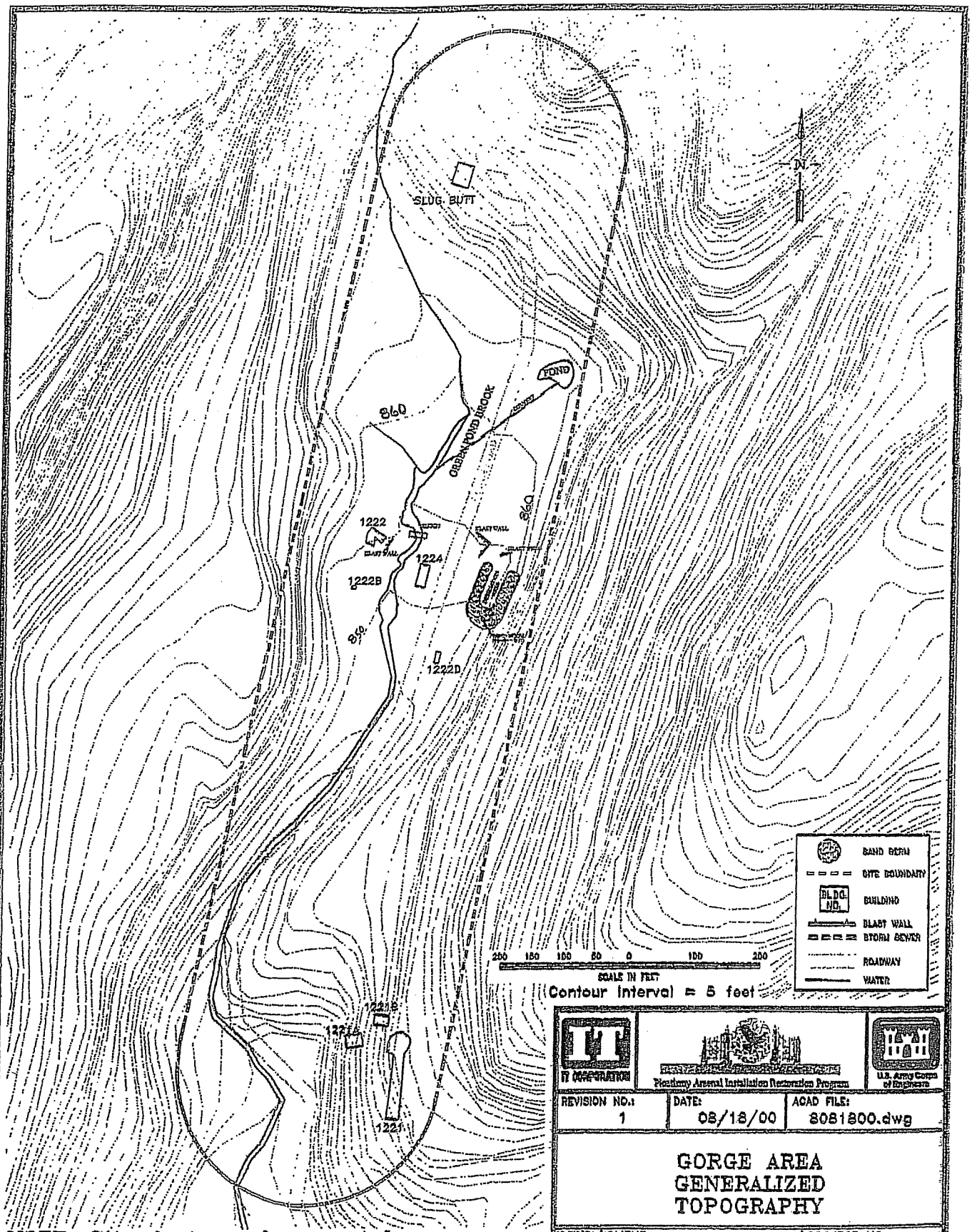
U.S. Army Corps of Engineers

REVISION NO.:	DATE:	ACAD FILE:
0	09/26/00	SMWL092600.dwg

GORGE AREA - MONITORING WELLS & OPEN DETONATION AREA

DET'D:	CLIENT:	PROJECT NO.:
AS	PICATINNY ARSENAL	66727-005-00
CHK'D:	LOCATION:	FIGURE NO.:
JP	DOVER, NEW JERSEY	1-4

PLOT DATE: 09/26/00



NOTE: Site features have not been surveyed to verify coordinate accuracy, but relative locations of site features have been verified by field measurements.

IT CORPORATION

Picatinny Arsenal Installation Restoration Program

U.S. Army Corps of Engineers

REVISION NO.:	DATE:	ACAD FILE:
1	08/18/00	8081800.dwg

GORGE AREA GENERALIZED TOPOGRAPHY

DET'D:	CLIENT:	PROJECT NO.:
AS	PICATINNY ARSENAL	66727-005-00
CHK'D:	LOCATION:	FIGURE NO.:
JP	DOVER, NEW JERSEY	1-3

PLOT DATE: 09/26/00

Table T-3
ARARs and Other Guidance to be Considered for Picatinny Arsenal Groundwater (a)
(µg/L)

Chemical	ARARs					TBCs					Level of Concern	
	Federal Drinking Water Standards (b)		New Jersey Drinking Water	New Jersey Groundwater (c)		Federal Drinking Water Health Advisories (b)	USEPA Region III Tap Water RBCs (d)				Site Characterization/ Prioritization	
	MCL	MCLG	NJMCL	Quality Criteria	NJPQL	HA	Non-carcinogen	Carcinogen $1x10^{-6}$	Carcinogen $1x10^{-4}$	C/N	LOC (e)	LOC Chosen
Volatiles												
Acetone	---	---	---	6,000	10	---	5,500	---	---	N	6,000	Quality Criteria
Acetonitrile	---	---	---	---	---	---	120	---	---	N	120	TWRBC
Acrolein	---	---	---	4	5	---	0.042	---	---	N	5	NJPQL
Acrylonitrile	---	---	---	0.06	2	---	---	0.037	3.7	C	2	NJPQL
Benzene	5	0	1	0.2	1	---	---	0.34	34	C	1	NJMCL, NJPQL
Bromodichloromethane (f)	80	0	---	0.6	1	---	---	0.17	17	C	1	NJPQL
Bromoform (f)	80	0	---	4	0.8	---	---	8.5	850	C	4	Quality Criteria
Bromomethane	---	---	---	10	1	10	8.5	---	---	N	10	Quality Criteria
2-Butanone	---	---	---	300	2	4,000	7,000	---	---	N	300	Quality Criteria
tert-Butylalcohol	---	---	---	100	2	---	---	---	---	-	100	Quality Criteria
Butyl benzene	---	---	---	---	---	---	---	---	---	-	---	---
tert-Butylbenzene	---	---	---	---	---	---	---	---	---	-	---	---
sec-Butylbenzene	---	---	---	---	---	---	---	---	---	-	---	---
Carbon disulfide	---	---	---	700	1	---	1,000	---	---	N	700	Quality Criteria
Carbon tetrachloride	5	0	2	0.4	1	---	---	0.16	16	C	1	NJPQL
Chlorobenzene	100	100	50	50	1	100	110	---	---	N	50	NJMCL, Quality Criteria
Chlorobromomethane	---	---	---	---	---	90	---	---	---	-	90	HA
Chloroethane	---	---	---	---	---	---	---	3.6	360	C	3.6	TWRBC
2-Chloroethyl vinyl ether	---	---	---	---	---	---	---	---	---	-	---	---
Chloroform (f)	80	70	---	70	1	70	---	0.15	15	C	70	Quality Criteria, MCLG
Chloromethane	---	---	---	---	---	30	190	---	---	N	30	HA
2-Chlorotoluene	---	---	---	---	---	100	120	---	---	N	100	HA
4-Chlorotoluene (g)	---	---	---	---	---	100	120	---	---	N	100	HA
Cymene	---	---	---	---	---	---	---	---	---	-	---	---
Dibromochloromethane (f)	80	60	---	0.4	1	60	---	0.13	13	C	1	NJPQL
1,2-Dibromoethane	0.05	0	---	0.0004	0.03	---	---	0.0053	0.53	C	0.03	NJPQL
Dichlorodifluoromethane	---	---	---	1,000	2	1,000	350	---	---	N	1,000	Quality Criteria
1,1-Dichloroethane	---	---	50	50	1	---	900	---	---	N	50	NJMCL, Quality Criteria
1,2-Dichloroethane	5	0	2	0.3	2	---	---	0.12	12	C	2	NJMCL, NJPQL
1,1-Dichloroethene	7	7	2	1	1	---	350	---	---	N	1	Quality Criteria, NJPQL
1,2-Dichloroethene (total) (h)	---	---	---	70	---	70	55	---	---	N	70	Quality Criteria
cis-1,2-Dichloroethene (i)	70	70	---	70	1	70	55	---	---	N	70	MCL, Quality Criteria, MCLG
trans-1,2-Dichloroethene	100	100	---	100	1	100	110	---	---	N	100	MCL, Quality Criteria, MCLG
1,2-Dichloropropane	5	0	---	0.5	1	---	---	0.16	16	C	1	NJPQL
1,3-Dichloropropane (j)	---	---	---	0.5	---	---	---	0.16	16	C	0.5	Quality Criteria
2,2-Dichloropropane (j)	---	---	---	0.5	---	---	---	0.16	16	C	0.5	Quality Criteria
1,1-Dichloropropene (k)	---	---	---	0.4	---	---	---	0.44	44	C	0.4	Quality Criteria
1,3-Dichloropropene	---	---	---	0.4	1	---	---	0.44	44	C	1	NJPQL
cis-1,3-Dichloropropene (l)	---	---	---	0.4	1	---	---	0.44	44	C	1	NJPQL
trans-1,3-Dichloropropene (l)	---	---	---	0.4	1	---	---	0.44	44	C	1	NJPQL

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ARARs and Other Guidance to be Considered for Picatinny Arsenal Groundwater (a)
(µg/L)

	ARARs					TBCs					Level of Concern	
	Federal Drinking Water Standards (b)		New Jersey Drinking Water	New Jersey Groundwater (c)		Federal Drinking Water Health Advisories (b)	USEPA Region III Tap Water RBCs (d)				Site Characterization/ Prioritization	
Chemical	MCL	MCLG	NJMCL	Quality Criteria	NJPQL	HA	Non-carcinogen	Carcinogen $1x10^{-6}$	Carcinogen $1x10^{-4}$	C/N	LOC (e)	LOC Chosen
Ethane	---	---	---	---	---	---	---	---	---	-	---	---
Ethanol	---	---	---	---	---	---	---	---	---	-	---	---
Ethene	---	---	---	---	---	---	---	---	---	-	---	---
Ethyl benzene	700	700	---	700	2	700	1,300	---	---	N	700	MCL, Quality Criteria, MCLG
Ethylene oxide	---	---	---	---	---	---	---	0.023	2.3	C	0.023	TWRBC
2-Hexanone	---[1]	---	---	---	---	---	---	---	---	-	---	---
Isobutanol	---	---	---	---	---	---	1,800	---	---	N	1,800	TWRBC
Isopropanol	---	---	---	---	---	---	---	---	---	-	---	---
Isopropylbenzene	---	---	---	700	1	---	660	---	---	N	700	Quality Criteria
Methane	---	---	---	---	---	---	---	---	---	-	---	---
Methanol	---	---	---	4,000	70	---	18,000	---	---	N	4,000	Quality Criteria
4-Methyl-2-pentanone (MIBK)	---	---	---	---	---	---	6,300	---	---	N	6,300	TWRBC
Methylene bromide	---	---	---	---	---	---	61	---	---	N	61	TWRBC
Methylene chloride	5	0	3	3	1	---	---	4.1	410	C	3	NJMCL, Quality Criteria
Methyl tert-Butyl ether	---	---	70	70	1	---	---	2.6	260	C	70	NJMCL, Quality Criteria
Monobromobenzene	---	---	---	---	---	---	---	---	---	-	---	---
n-Propylbenzene	---	---	---	---	---	---	---	---	---	-	---	---
Styrene	100	100	---	100	2	100	1,600	---	---	N	100	MCL, Quality Criteria, MCLG
1,1,1,2-Tetrachloroethane (m)	---	---	1	1	1	70	---	0.41	41	C	1	NJMCL, Quality Criteria, NJPQL
1,1,2,2-Tetrachloroethane	---	---	1	1	1	0.3	---	0.053	5.3	C	1	NJMCL, Quality Criteria, NJPQL
Tetrachloroethene	5	0	1	0.4	1	10	---	0.10	10	C	1	NJMCL, NJPQL
Tetrahydrofuran	---	---	---	10	10	---	---	8.8	880	C	10	Quality Criteria, NJPQL
Toluene	1,000	1,000	---	1,000	1	1,000	2,300	---	---	N	1,000	MCL, Quality Criteria, MCLG
1,1,1-Trichloroethane	200	200	30	30	1	200	1,700	---	---	N	30	NJMCL, Quality Criteria
1,1,2-Trichloroethane	5	3	3	3	2	3	---	0.19	19	C	3	NJMCL, Quality Criteria, MCLG
Trichloroethene	5	0	1	1	1	---	---	0.026	2.6	C	1	NJMCL, Quality Criteria, NJPQL
Trichlorofluoromethane	---	---	---	2,000	1	2,000	1,300	---	---	N	2,000	Quality Criteria
1,2,3-Trichloropropane	---	---	---	0.005	0.03	40	---	0.0053	0.53	C	0.03	NJPQL
1,1,2-Trichloro-1,2,2-trifluoroethane	---	---	---	---	---	---	59,000	---	---	N	59,000	TWRBC
1,2,4-Trimethylbenzene	---	---	---	---	---	---	---	---	---	-	---	---
1,3,5-Trimethylbenzene	---	---	---	---	---	---	---	---	---	-	---	---
Vinyl acetate	---[1]	---	---	7,000	5	---	410	---	---	N	7,000	Quality Criteria
Vinyl chloride	2	0	---	0.08	1	---	---	0.015	1.5	C	1	NJPQL
o-Xylene (n)	---[1]	---	1,000	1,000	---	---	210	---	---	N	1,000	NJMCL, Quality Criteria
m-Xylene (n)	---	---	1,000	1,000	---	---	210	---	---	N	1,000	NJMCL, Quality Criteria
m+p-Xylenes (n)	---	---	1,000	1,000	---	---	210	---	---	N	1,000	NJMCL, Quality Criteria
Xylenes	10,000	10,000	1,000	1,000	2	---	210	---	---	N	1,000	NJMCL, Quality Criteria
Semivolatiles												
Acenaphthene	---	---	---	400	10	---	370	---	---	N	400	Quality Criteria
Acenaphthylene (o)	---	---	---	200	0.1	---	180	---	---	N	200	Quality Criteria
Aniline	---	---	---	6	2	---	---	12	1,200	C	6	Quality Criteria

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	Federal Drinking Water Standards (b)		New Jersey Drinking Water	New Jersey Groundwater (c)		Federal Drinking Water Health Advisories (b)	USEPA Region III Tap Water RBCs (d)				Site Characterization/ Prioritization	
Chemical	MCL	MCLG	NJMCL	Quality Criteria	NJPQL	HA	Non-carcinogen	Carcinogen $1x10^{-6}$	Carcinogen $1x10^{-4}$	C/N	LOC (e)	LOC Chosen
Anthracene	---	---	---	2,000	10	---	1,800	---	---	N	2,000	Quality Criteria
Atrazine	3	3	---	3	0.1	---	---	0.30	30	C	3	MCL, Quality Criteria, MCLG
Benz(a)anthracene	---	---	---	0.05	0.1	---	---	0.092	9.2	C	0.1	NJPQL
Benzidine	---	---	---	0.0002	20	---	---	0.00029	0.029	C	20	NJPQL
Benzo(a)pyrene	0.2	0	---	0.005	0.1	---	---	0.0092	0.92	C	0.1	NJPQL
Benzo(b)fluoranthene	---	---	---	0.05	0.2	---	---	0.092	9.2	C	0.2	NJPQL
Benzo(g,h,i)perylene (o)	---	---	---	200	0.1	---	180	---	---	N	200	Quality Criteria
Benzo(k)fluoranthene	---	---	---	0.5	0.3	---	---	0.92	92	C	0.5	Quality Criteria
Benzoic Acid	---	---	---	30,000	50	---	150,000	---	---	N	30,000	Quality Criteria
Benzyl alcohol	---	---	---	2,000	20	---	11,000	---	---	N	2,000	Quality Criteria
Bromacil	---	---	---	---	---	90	---	---	---	-	90	HA
4-Bromophenyl phenyl ether	---	---	---	---	---	---	---	---	---	-	---	---
di-n-Butylphthalate	---	---	---	700	1	---	3,700	---	---	N	700	Quality Criteria
Butylbenzyl phthalate	---	---	---	100	1	---	---	35	3,500	C	100	Quality Criteria
Carbazole	---	---	---	---	---	---	---	3.3	330	C	3.3	TWRBC
4-Chloroaniline	---	---	---	30	10	---	150	---	---	N	30	Quality Criteria
bis(2-Chloroethoxy)methane	---	---	---	---	---	---	---	---	---	-	---	---
bis(2-Chloroethyl)ether	---	---	---	0.03	7	---	---	0.0096	0.96	C	7	NJPQL
bis(2-Chloroisopropyl)ether	---	---	---	300	10	300	---	0.26	26	C	300	Quality Criteria
4-Chloro-3-methylphenol	---	---	---	---	---	---	---	---	---	-	---	---
2-Chloronaphthalene	---	---	---	600	10	---	490	---	---	N	600	Quality Criteria
2-Chlorophenol	---	---	---	40	20	40	30	---	---	N	40	Quality Criteria
p-Chlorophenylmethyl sulfide	---	---	---	---	---	---	---	---	---	-	---	---
p-Chlorophenylmethyl sulfone	---	---	---	---	---	---	---	---	---	-	---	---
p-Chlorophenylmethyl sulfoxide	---	---	---	---	---	---	---	---	---	-	---	---
4-Chlorophenyl phenyl ether	---	---	---	---	---	---	---	---	---	-	---	---
Chrysene	---	---	---	5	0.2	---	---	9.2	920	C	5	Quality Criteria
Dibenz(a,h)anthracene	---	---	---	0.005	0.3	---	---	0.0092	0.92	C	0.3	NJPQL
Dibenzofuran	---	---	---	---	---	---	---	---	---	-	---	---
Dibromochloropropane	0.2	0	---	0.02	0.02	---	---	0.047	4.7	C	0.02	Quality Criteria, NJPQL
Dichlorobenzenes (p)	---	---	---	75	---	75	---	0.47	47	C	75	Quality Criteria
1,2-Dichlorobenzene	600	600	---	600	5	600	270	---	---	N	600	MCL, Quality Criteria, MCLG
1,3-Dichlorobenzene	---	---	600	600	5	600	18	---	---	N	600	NJMCL, Quality Criteria
1,4-Dichlorobenzene	75	75	---	75	5	75	---	0.47	47	C	75	MCL, Quality Criteria, MCLG
3,3'-Dichlorobenzidine	---	---	---	0.08	30	---	---	0.15	15	C	30	NJPQL
2,4-Dichlorophenol	---	---	---	20	10	20	110	---	---	N	20	Quality Criteria
Diethylphthalate	---	---	---	6,000	1	---	29,000	---	---	N	6,000	Quality Criteria
Diisopropyl methylphosphonate	---	---	---	---	---	600	2,900	---	---	N	600	HA
Dimethylmethylphosphonate	---	---	---	---	---	100	---	---	---	-	100	HA
2,4-Dimethylphenol	---	---	---	100	20	---	730	---	---	N	100	Quality Criteria
Dimethylphthalate	---	---	---	---	---	---	---	---	---	-	---	---

Table T-3
ARARs and Other Guidance to be Considered for Picatinny Arsenal Groundwater (a)
(µg/L)

	ARARs					TBCs					Level of Concern	
	Federal Drinking Water Standards (b)		New Jersey Drinking Water	New Jersey Groundwater (c)		Federal Drinking Water Health Advisories (b)	USEPA Region III Tap Water RBCs (d)				Site Characterization/ Prioritization	
Chemical	MCL	MCLG	NJMCL	Quality Criteria	NJPQL	HA	Non-carcinogen	Carcinogen $1x10^{-6}$	Carcinogen $1x10^{-4}$	C/N	LOC (e)	LOC Chosen
2,6-Dinitroaniline	---	---	---	---	---	---	---	---	---	-	---	---
3,5-Dinitroaniline	---	---	---	---	---	---	---	---	---	-	---	---
2,4-Dinitrophenol	---	---	---	10	40	---	73	---	---	N	40	NJPQL
Diphenylamine	---	---	---	200	20	---	910	---	---	N	200	Quality Criteria
1,2-Diphenylhydrazine	---	---	---	0.04	20	---	---	0.084	8.4	C	20	NJPQL
Dithiane (q)	---	---	---	---	---	80	370	---	---	N	80	HA
bis(2-Ethylhexyl)phthalate	6	0	---	2	3	---	---	4.8	480	C	3	NJPQL
Fluoranthene	---	---	---	300	10	---	1,500	---	---	N	300	Quality Criteria
Fluorene	---	---	---	300	1	---	240	---	---	N	300	Quality Criteria
Hexachlorobenzene	1	0	---	0.02	0.02	---	---	0.042	4.2	C	0.02	Quality Criteria, NJPQL
Hexachlorobutadiene	---	---	---	0.4	1	1	---	0.86	86	C	1	NJPQL
Hexachlorocyclopentadiene	50	50	---	40	0.5	---	220	---	---	N	40	Quality Criteria
Hexachloroethane	---	---	---	2	7	1	---	4.8	480	C	7	NJPQL
Indeno(1,2,3-c,d)pyrene	---	---	---	0.05	0.2	---	---	0.092	9.2	C	0.2	NJPQL
Isophorone	---	---	---	40	10	100	---	70	7,000	C	40	Quality Criteria
2-Methylnaphthalene	---	---	---	---	---	---	24	---	---	N	24	TWRBC
2-Methylphenol	---	---	---	---	---	---	1,800	---	---	N	1,800	TWRBC
4-Methylphenol	---	---	---	---	---	---	180	---	---	N	180	TWRBC
4,6-dinitro-2-Methylphenol	---	---	---	---	---	---	3.7	---	---	N	3.7	TWRBC
Naphthalene	---	---	300	300	2	100	6.5	---	---	N	300	NJMCL, Quality Criteria
2-Nitroaniline (r)	---	---	---	---	---	---	---	3.3	330	C	3.3	TWRBC
3-Nitroaniline	---	---	---	---	---	---	---	3.3	330	C	3.3	TWRBC
4-Nitroaniline	---	---	---	---	---	---	---	3.3	330	C	3.3	TWRBC
2-Nitrophenol	---	---	---	---	---	---	---	---	---	-	---	---
4-Nitrophenol	---	---	---	---	---	60	---	---	---	-	60	HA
n-Nitrosodimethylamine	---	---	---	0.0007	0.8	---	---	0.0013	0.13	C	0.8	NJPQL
n-Nitroso-di-n-propylamine	---	---	---	0.005	10	---	---	0.0096	0.96	C	10	NJPQL
n-Nitrosodiphenylamine	---	---	---	7	10	---	---	14	1,400	C	10	NJPQL
di-n-Octylphthalate	---	---	---	100	10	---	---	---	---	-	100	Quality Criteria
1,4-Oxathiane	---	---	---	---	---	---	---	---	---	-	---	---
Parathion	---	---	---	4	0.08	---	220	---	---	N	4	Quality Criteria
Pentachlorophenol	1	0	---	0.3	0.1	---	---	0.56	56	C	0.3	Quality Criteria
Phenanthrene (o)	---	---	---	200	0.1	---	180	---	---	N	200	Quality Criteria
Phenol	---	---	---	2,000	10	2,000	11,000	---	---	N	2,000	Quality Criteria
Pyrene	---	---	---	200	0.1	---	180	---	---	N	200	Quality Criteria
Supona	---	---	---	---	---	---	---	---	---	-	---	---
1,2,3-Trichlorobenzene (s)	---	---	9	---	---	40	7.2	---	---	N	9	NJMCL
1,2,4-Trichlorobenzene	70	70	9	9	1	70	7.2	---	---	N	9	NJMCL, Quality Criteria
2,3,6-Trichlorophenol (t)	---	---	---	1	---	---	---	6.1	610	C	1	Quality Criteria
2,4,5-Trichlorophenol	---	---	---	700	10	---	3,700	---	---	N	700	Quality Criteria
2,4,6-Trichlorophenol	---	---	---	1	20	---	---	6.1	610	C	20	NJPQL

Table T-3
ARARs and Other Guidance to be Considered for Picatinny Arsenal Groundwater (a)
(µg/L)

	ARARs					TBCs					Level of Concern	
	Federal Drinking Water Standards (b)		New Jersey Drinking Water	New Jersey Groundwater (c)		Federal Drinking Water Health Advisories (b)	USEPA Region III Tap Water RBCs (d)				Site Characterization/ Prioritization	
Chemical	MCL	MCLG	NJMCL	Quality Criteria	NJPQL	HA	Non-carcinogen	Carcinogen $1x10^{-6}$	Carcinogen $1x10^{-4}$	C/N	LOC (e)	LOC Chosen
Pesticides												
Aldrin	---	---	---	0.002	0.04	---	---	0.0039	0.39	C	0.04	NJPQL
alpha-BHC (u)	---	---	---	0.006	0.02	0.2	---	0.011	1.1	C	0.02	NJPQL
beta-BHC (u)	---	---	---	0.02	0.04	0.2	---	0.037	3.7	C	0.04	NJPQL
delta-BHC (u,v)	---	---	---	0.006	---	0.2	---	0.011	1.1	C	0.006	Quality Criteria
gamma-BHC (Lindane)	0.2	0.2	---	0.03	0.02	0.2	---	0.052	5.2	C	0.03	Quality Criteria
Chlordane	2	0	0.5	0.01	0.5	---	---	0.19	19	C	0.5	NJMCL, NJPQL
alpha-Chlordane (w)	---	---	0.5	0.01	---	---	---	0.19	19	C	0.01	Quality Criteria
gamma-Chlordane (w)	---	---	0.5	0.01	---	---	---	0.19	19	C	0.01	Quality Criteria
4,4'-DDD	---	---	---	0.1	0.02	---	---	0.28	28	C	0.1	Quality Criteria
4,4'-DDE	---	---	---	0.1	0.01	---	---	0.20	20	C	0.1	Quality Criteria
4,4'-DDT	---	---	---	0.1	0.1	---	---	0.20	20	C	0.1	Quality Criteria, NJPQL
Diazinon	---	---	---	---	---	0.6	33	---	---	N	0.6	HA
Dieldrin	---	---	---	0.002	0.03	---	---	0.0042	0.42	C	0.03	NJPQL
Endosulfan I (x)	---	---	---	40	0.02	---	220	---	---	N	40	Quality Criteria
Endosulfan II (x)	---	---	---	40	0.04	---	220	---	---	N	40	Quality Criteria
Endosulfan sulfate (x)	---	---	---	40	0.02	---	220	---	---	N	40	Quality Criteria
Endrin	2	2	---	2	0.03	2	11	---	---	N	2	MCL, Quality Criteria, MCLG
Endrin aldehyde (y)	---	---	---	2	---	2	11	---	---	N	2	Quality Criteria
Endrin ketone (y)	---	---	---	2	---	2	11	---	---	N	2	Quality Criteria
Heptachlor	0.4	0	---	0.008	0.05	---	---	0.015	1.5	C	0.05	NJPQL
Heptachlor epoxide	0.2	0	---	0.004	0.2	---	---	0.0074	0.74	C	0.2	MCL, NJPQL
Isodrin	---	---	---	---	---	---	---	---	---	-	---	---
Malathion	---	---	---	100	0.6	100	730	---	---	N	100	Quality Criteria
Methoxychlor	40	40	---	40	0.1	40	180	---	---	N	40	MCL, Quality Criteria, MCLG
Mirex	---	---	---	0.1	0.08	---	7.3	---	---	N	0.1	Quality Criteria
Toxaphene	3	0	---	0.03	2	---	---	0.061	6.1	C	2	NJPQL
Vapona	---	---	---	---	---	---	---	0.23	23	C	0.23	TWRBC
PCBs (z)												
Aroclor 1016	0.5	0	---	0.02	0.5	---	---	0.96	96	C	0.5	MCL, NJPQL
Aroclor 1221	0.5	0	---	0.02	0.5	---	---	0.033	3.3	C	0.5	MCL, NJPQL
Aroclor 1232	0.5	0	---	0.02	0.5	---	---	0.033	3.3	C	0.5	MCL, NJPQL
Aroclor 1242	0.5	0	---	0.02	0.5	---	---	0.033	3.3	C	0.5	MCL, NJPQL
Aroclor 1248	0.5	0	---	0.02	0.5	---	---	0.033	3.3	C	0.5	MCL, NJPQL
Aroclor 1254	0.5	0	---	0.02	0.5	---	---	0.033	3.3	C	0.5	MCL, NJPQL
Aroclor 1260	0.5	0	---	0.02	0.5	---	---	0.033	3.3	C	0.5	MCL, NJPQL
Explosives												
1,3-Diamino-2,4,6-trinitrobenzene	---	---	---	---	---	---	---	---	---	-	---	---
Diethyleneglycol dinitrate	---	---	---	---	---	---	---	---	---	-	---	---
1,3-Dinitrobenzene	---	---	---	---	---	1	3.7	---	---	N	1	HA
2,4-Dinitrotoluene (aa)	---	---	---	0.05	10	---	73	---	---	N	10	NJPQL

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(µg/L)

	ARARs					TBCs					Level of Concern	
	Federal Drinking Water Standards (b)		New Jersey Drinking Water	New Jersey Groundwater (c)		Federal Drinking Water Health Advisories (b)	USEPA Region III Tap Water RBCs (d)				Site Characterization/ Prioritization	
Chemical	MCL	MCLG	NJMCL	Quality Criteria	NJPQL	HA	Non-carcinogen	Carcinogen $1x10^{-6}$	Carcinogen $1x10^{-4}$	C/N	LOC (e)	LOC Chosen
2,6-Dinitrotoluene (aa)	---	---	---	0.05	10	---	37	---	---	N	10	NJPQL
2-amino-4,6-Dinitrotoluene	---	---	---	---	---	---	---	---	---	-	---	---
4-amino-2,6-Dinitrotoluene	---	---	---	---	---	---	---	---	---	-	---	---
Amino DNT's	---	---	---	---	---	---	---	---	---	-	---	---
DNX	---	---	---	---	---	---	---	---	---	-	---	---
2,2',4,4',6,6'-Hexanitrostilbene	---	---	---	---	---	---	---	---	---	-	---	---
HMX	---	---	---	---	---	400	1,800	---	---	N	400	HA
MNX	---	---	---	---	---	---	---	---	---	-	---	---
Nitrobenzene	---	---	---	4	6	---	3.5	---	---	N	6	NJPQL
Nitrocellulose	---	---	---	---	---	---	---	---	---	-	---	---
Nitroglycerin	---	---	---	---	---	---	---	---	---	-	---	---
Nitroguanidine	---	---	---	---	---	700	3,700	---	---	N	700	HA
2-Nitrotoluene	---	---	---	---	---	---	61	---	---	N	61	TWRBC
2- and 4-Nitrotoluene (ab)	---	---	---	---	---	---	61	---	---	N	61	TWRBC
3-Nitrotoluene (ab)	---	---	---	---	---	---	61	---	---	N	61	TWRBC
4-Nitrotoluene (ab)	---	---	---	---	---	---	61	---	---	N	61	TWRBC
PETN	---	---	---	---	---	---	---	---	---	-	---	---
Picric acid	---	---	---	---	---	---	---	---	---	-	---	---
RDX	---	---	---	---	---	2	---	0.61	61	C	0.61	TWRBC
Tetrazene	---	---	---	---	---	---	---	---	---	-	---	---
Tetryl	---	---	---	---	---	---	150	---	---	N	150	TWRBC
Thiodiglycol	---	---	---	---	---	---	---	---	---	-	---	---
TNX	---	---	---	---	---	---	---	---	---	-	---	---
Triethyleneglycol dinitrate	---	---	---	---	---	---	---	---	---	-	---	---
Trimethylol ethylmethane trinitrate	---	---	---	---	---	---	---	---	---	-	---	---
1,3,5-Trinitrobenzene	---	---	---	---	---	---	1,100	---	---	N	1,100	TWRBC
2,4,6-Trinitrotoluene	---	---	---	---	---	2	---	2.2	220	C	2	HA
Herbicides												
2,4'-D	70	70	---	70	2	70	370	---	---	N	70	MCL, Quality Criteria, MCLG
Dalapon	200	200	---	200	0.1	200	1,100	---	---	N	200	MCL, Quality Criteria, MCLG
2,4'-DB	---	---	---	---	---	---	290	---	---	N	290	TWRBC
Dicamba	---	---	---	---	---	200	1,100	---	---	N	200	HA
Dichloroprop	---	---	---	---	---	---	---	---	---	-	---	---
Dinoseb	7	7	---	7	2	7	37	---	---	N	7	MCL, Quality Criteria, MCLG
2,4,5-T	---	---	---	---	---	70	370	---	---	N	70	HA
2,4,5-TP (Silvex)	50	50	---	60	0.6	50	290	---	---	N	50	MCL, MCLG
Dioxins/Furans (ac)												
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	---	---	---	---	---	---	---	0.000045	0.0045	C	0.000045	TWRBC
Total heptachlorodibenzo-p-dioxins	---	---	---	---	---	---	---	---	---	-	---	---
1,2,3,4,6,7,8-Heptachlorodibenzofuran	---	---	---	---	---	---	---	0.000045	0.0045	C	0.000045	TWRBC
1,2,3,4,7,8,9-Heptachlorodibenzofuran	---	---	---	---	---	---	---	0.000045	0.0045	C	0.000045	TWRBC

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ARARs and Other Guidance to be Considered for Picatinny Arsenal Groundwater (a)
(µg/L)

	ARARs					TBCs					Level of Concern	
	Federal Drinking Water Standards (b)		New Jersey Drinking Water	New Jersey Groundwater (c)		Federal Drinking Water Health Advisories (b)	USEPA Region III Tap Water RBCs (d)				Site Characterization/ Prioritization	
Chemical	MCL	MCLG	NJMCL	Quality Criteria	NJPQL	HA	Non-carcinogen	Carcinogen $1x10^{-6}$	Carcinogen $1x10^{-4}$	C/N	LOC (e)	LOC Chosen
Total heptachlorodibenzofurans	---	---	---	---	---	---	---	---	---	-	---	---
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	---	---	---	---	---	---	---	0.0000045	0.00045	C	0.0000045	TWRBC
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	---	---	---	---	---	---	---	0.0000045	0.00045	C	0.0000045	TWRBC
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	---	---	---	---	---	---	---	0.0000045	0.00045	C	0.0000045	TWRBC
Total hexachlorodibenzo-p-dioxins	---	---	---	---	---	---	---	---	---	-	---	---
1,2,3,4,7,8-Hexachlorodibenzofuran	---	---	---	---	---	---	---	0.0000045	0.00045	C	0.0000045	TWRBC
1,2,3,6,7,8-Hexachlorodibenzofuran	---	---	---	---	---	---	---	0.0000045	0.00045	C	0.0000045	TWRBC
1,2,3,7,8,9-Hexachlorodibenzofuran	---	---	---	---	---	---	---	0.0000045	0.00045	C	0.0000045	TWRBC
2,3,4,6,7,8-Hexachlorodibenzofuran	---	---	---	---	---	---	---	0.0000045	0.00045	C	0.0000045	TWRBC
Total hexachlorodibenzofurans	---	---	---	---	---	---	---	---	---	-	---	---
Octachlorodibenzodioxin	---	---	---	---	---	---	---	0.0045	0.45	C	0.0045	TWRBC
Octachlorodibenzofuran	---	---	---	---	---	---	---	0.0045	0.45	C	0.0045	TWRBC
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	---	---	---	---	---	---	---	0.00000045	0.000045	C	0.00000045	TWRBC
Total pentachlorodibenzo-p-dioxins	---	---	---	---	---	---	---	---	---	-	---	---
1,2,3,7,8-Pentachlorodibenzofuran	---	---	---	---	---	---	---	0.0000090	0.00090	C	0.0000090	TWRBC
2,3,4,7,8-Pentachlorodibenzofuran	---	---	---	---	---	---	---	0.00000090	0.000090	C	0.00000090	TWRBC
Total pentachlorodibenzofurans	---	---	---	---	---	---	---	---	---	-	---	---
2,3,7,8-Tetrachlorodibenzo-p-dioxin	0.00003	0	---	0.0000002	0.00001	---	---	0.00000045	0.000045	C	0.00001	NJPQL
Total tetrachlorodibenzo-p-dioxins	---	---	---	---	---	---	---	---	---	-	---	---
2,3,7,8-Tetrachlorodibenzofuran	---	---	---	---	---	---	---	0.0000045	0.00045	C	0.0000045	TWRBC
Total tetrachlorodibenzofurans	---	---	---	---	---	---	---	---	---	-	---	---
Glycols												
Ethylene glycol	---	---	---	300	200	14,000	73,000	---	---	N	300	Quality Criteria
Hydrogen												
Hydrogen	---	---	---	---	---	---	---	---	---	-	---	---
Hydrazines												
Hydrazine	---	---	---	---	---	---	---	0.022	2.2	C	0.022	TWRBC
Monomethyl hydrazine	---	---	---	---	---	---	---	---	---	-	---	---
Unsymmetrical dimethyl hydrazine	---	---	---	---	---	---	---	---	---	-	---	---
Volatile Fatty Acids												
Acetic acid	---	---	---	---	---	---	---	---	---	-	---	---
Propionic acid	---	---	---	---	---	---	---	---	---	-	---	---
Inorganics												
Aluminum	---	---	---	200	30	---	---	---	---	-	200	Quality Criteria
Antimony	6	6	---	6	3	6	15	---	---	N	6	MCL, Quality Criteria, MCLG
Arsenic	10	0	5	0.02	3	---	---	0.045	4.5	C	3	NJPQL
Barium	2,000	2,000	---	2,000	200	2,000	7,300	---	---	N	2,000	MCL, Quality Criteria, MCLG
Beryllium	4	4	---	1	1	---	73	---	---	N	1	Quality Criteria, NJPQL
Boron	---	---	---	---	---	600	7,300	---	---	N	600	HA
Cadmium	5	5	---	4	0.5	5	18	---	---	N	4	Quality Criteria
Calcium (ad)	---	---	---	---	---	---	500,000	---	---	-	500,000	ADI

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(µg/L)

Chemical	ARARs					TBCs					Level of Concern	
	Federal Drinking Water Standards (b)		New Jersey Drinking Water	New Jersey Groundwater (c)		Federal Drinking Water Health Advisories (b)	USEPA Region III Tap Water RBCs (d)				Site Characterization/ Prioritization	
	MCL	MCLG	NJMCL	Quality Criteria	NJPQL	HA	Non-carcinogen	Carcinogen $1x10^{-6}$	Carcinogen $1x10^{-4}$	C/N	LOC (e)	LOC Chosen
Chromium (ae)	100	100	---	70	1	---	110	---	---	N	70	Quality Criteria
Cobalt	---	---	---	---	---	---	---	---	---	-	---	---
Copper (af)	1,300	1,300	---	1,300	4	---	1,500	---	---	N	1,300	MCL, Quality Criteria, MCLG
Cyanide	200	200	---	100	6	200	730	---	---	N	100	Quality Criteria
Ferrous Iron	---	---	---	---	---	---	---	---	---	-	---	---
Iron	---	---	---	300	20	---	11,000	---	---	N	300	Quality Criteria
Lead (af)	15	0	---	5	5	---	15	15	15	-	5	Quality Criteria, NJPQL
Magnesium (ad)	---	---	---	---	---	---	175,000	---	---	-	175,000	ADI
Manganese (ag)	---	---	---	50	0.4	300	730	---	---	N	50	Quality Criteria
Mercury (ah)	2	2	---	2	0.05	2	3.7	---	---	N	2	MCL, Quality Criteria, MCLG
Molybdenum	---	---	---	40	2	40	180	---	---	N	40	Quality Criteria
Nickel (ai)	---	---	---	100	4	100	730	---	---	N	100	Quality Criteria
Potassium (ad)	---	---	---	---	---	---	1,000,000	---	---	-	1,000,000	ADI
Selenium (aj)	50	50	---	40	4	50	180	---	---	N	40	Quality Criteria
Silica	---	---	---	---	---	---	---	---	---	-	---	---
Silicon	---	---	---	---	---	---	---	---	---	-	---	---
Silver	---	---	---	40	1	100	180	---	---	N	40	Quality Criteria
Sodium (ad)	---	---	---	50,000	400	---	20,000	---	---	-	50,000	Quality Criteria
Strontium	---	---	---	---	---	4,000	22,000	---	---	N	4,000	HA
Tellurium	---	---	---	---	---	---	---	---	---	-	---	---
Thallium	2	0.5	---	0.5	2	0.5	2.6	---	---	N	0.5	MCLG
Tin	---	---	---	---	---	---	22,000	---	---	N	22,000	TWRBC
Titanium	---	---	---	---	---	---	---	---	---	-	---	---
Tungsten	---	---	---	---	---	---	---	---	---	-	---	---
Vanadium	---	---	---	---	---	---	37	---	---	N	37	TWRBC
Zinc	---	---	---	2,000	10	2,000	11,000	---	---	N	2,000	Quality Criteria
Zirconium	---	---	---	---	---	---	---	---	---	-	---	---
Anions												
Ammonia	---	---	---	3,000	200	30,000	210	---	---	N	3,000	Quality Criteria
Chloride	---	---	---	250,000	2,000	---	---	---	---	-	250,000	Quality Criteria
Fluoride (ak)	4,000	4,000	---	2,000	500	---	2,200	---	---	N	2,000	Quality Criteria
Nitrate	10,000	10,000	---	10,000	100	---	58,000	---	---	N	10,000	MCL, Quality Criteria, MCLG
Nitrate/Nitrite - nonspecific (al)	10,000	10,000	---	10,000	10	---	3,700	---	---	N	10,000	MCL, Quality Criteria, MCLG
Nitrite	1,000	1,000	---	1,000	10	---	3,700	---	---	N	1,000	MCL, Quality Criteria, MCLG
Perchlorate (am)	---	---	---	---	---	---	18	18	18	-	18	AL
Phosphate	---	---	---	---	---	---	---	---	---	-	---	---
Phosphorus (ad)	---	---	---	---	---	---	600,000	---	---	-	600,000	ADI
Sulfate	500,000	500,000	---	250,000	5,000	---	---	---	---	-	250,000	Quality Criteria
Sulfide	---	---	---	---	---	---	---	---	---	-	---	---
Field Parameters												
Alkalinity	---	---	---	---	---	---	---	---	---	-	---	---

Table T-3
ARARs and Other Guidance to be Considered for Picatinny Arsenal Groundwater (a)
(µg/L)

	ARARs					TBCs					Level of Concern	
	Federal Drinking Water Standards (b)		New Jersey Drinking Water	New Jersey Groundwater (c)		Federal Drinking Water Health Advisories (b)	USEPA Region III Tap Water RBCs (d)				Site Characterization/ Prioritization	
Chemical	MCL	MCLG	NJMCL	Quality Criteria	NJPQL	HA	Non-carcinogen	Carcinogen $1x10^{-6}$	Carcinogen $1x10^{-4}$	C/N	LOC (e)	LOC Chosen
Carbon	---	---	---	---	---	---	---	---	---	-	---	---
Dissolved Oxygen	---	---	---	---	---	---	---	---	---	-	---	---
Dissolved organic carbon	---	---	---	---	---	---	---	---	---	-	---	---
Hardness	---	---	---	250,000	10,000	---	---	---	---	-	250,000	Quality Criteria
Total Dissolved Solids	---	---	---	500,000	10,000	---	---	---	---	-	500,000	Quality Criteria
Total organic carbon	---	---	---	---	---	---	---	---	---	-	---	---
Total Suspended Solids	---	---	---	---	---	---	---	---	---	-	---	---
Fuel Related Contaminants												
Diesel Range Organics	---	---	---	---	---	---	---	---	---	-	---	---
GRO	---	---	---	---	---	---	---	---	---	-	---	---
Total Volatile Petroleum Hydrocarbons	---	---	---	---	---	---	---	---	---	-	---	---
Total Extractable Petroleum	---	---	---	---	---	---	---	---	---	-	---	---
Total Recoverable Petroleum	---	---	---	---	---	---	---	---	---	-	---	---
TPH	---	---	---	---	---	---	---	---	---	-	---	---
TPH, aviation gas fraction	---	---	---	---	---	---	---	---	---	-	---	---
Radiological Parameters (an)												
Americium-241	---	---	---	---	---	---	---	---	---	-	---	---
Bismuth-212	---	---	---	---	---	---	---	---	---	-	---	---
Bismuth-214	---	---	---	---	---	---	---	---	---	-	---	---
Cerium-143	---	---	---	---	---	---	---	---	---	-	---	---
Cesium-134	---	---	---	---	---	---	---	---	---	-	---	---
Cesium-137	---	---	---	---	---	---	---	---	---	-	---	---
Cobalt-60	---	---	---	---	---	---	---	---	---	-	---	---
Gross alpha	15	0	---	---	---	---	---	---	---	-	15	MCL
Gross beta	---	---	---	---	---	---	---	---	---	-	---	---
Krypton-85	---	---	---	---	---	---	---	---	---	-	---	---
Lead-212	---	---	---	---	---	---	---	---	---	-	---	---
Lead-214	---	---	---	---	---	---	---	---	---	-	---	---
Molybdenum-99	---	---	---	---	---	---	---	---	---	-	---	---
Potassium-40	---	---	---	---	---	---	---	---	---	-	---	---
Radium-224	---	---	---	---	---	---	---	---	---	-	---	---
Radium-226 (ao)	5	0	---	---	---	---	---	---	---	-	5	MCL
Radium-228 (ao)	5	0	---	---	---	---	---	---	---	-	5	MCL
Uranium (ap)	30	0	---	---	---	---	7.3	---	---	N	30	MCL
Uranium-234	---	---	---	---	---	---	---	---	---	-	---	---
Uranium-235	---	---	---	---	---	---	---	---	---	-	---	---
Uranium-238	---	---	---	---	---	---	---	---	---	-	---	---
Zinc-65	---	---	---	---	---	---	---	---	---	-	---	---
Asbestos (aq)												
Actinolite	7,000,000	7,000,000	---	7,000,000	100,000	---	---	---	---	-	7,000,000	MCL, Quality Criteria, MCLG
Amosite	7,000,000	7,000,000	---	7,000,000	100,000	---	---	---	---	-	7,000,000	MCL, Quality Criteria, MCLG

Table T-3
ARARs and Other Guidance to be Considered for Picatinny Arsenal Groundwater (a)
(µg/L)

	ARARs					TBCs					Level of Concern	
	Federal Drinking Water Standards (b)		New Jersey Drinking Water	New Jersey Groundwater (c)		Federal Drinking Water Health Advisories (b)	USEPA Region III Tap Water RBCs (d)				Site Characterization/ Prioritization	
Chemical	MCL	MCLG	NJMCL	Quality Criteria	NJPQL	HA	Non-carcinogen	Carcinogen $1x10^{-6}$	Carcinogen $1x10^{-4}$	C/N	LOC (e)	LOC Chosen
Anthopyllite	7,000,000	7,000,000	---	7,000,000	100,000	---	---	---	---	-	7,000,000	MCL, Quality Criteria, MCLG
Asbestos	7,000,000	7,000,000	---	7,000,000	100,000	---	---	---	---	-	7,000,000	MCL, Quality Criteria, MCLG
Chrysotile	7,000,000	7,000,000	---	7,000,000	100,000	---	---	---	---	-	7,000,000	MCL, Quality Criteria, MCLG
Crocidolite	7,000,000	7,000,000	---	7,000,000	100,000	---	---	---	---	-	7,000,000	MCL, Quality Criteria, MCLG
Tremolite	7,000,000	7,000,000	---	7,000,000	100,000	---	---	---	---	-	7,000,000	MCL, Quality Criteria, MCLG
Tremolite/Actinolite	7,000,000	7,000,000	---	7,000,000	100,000	---	---	---	---	-	7,000,000	MCL, Quality Criteria, MCLG

ADI = Allowable Daily Intake
AL = Action Level
ARAR = Applicable or Relevant and Appropriate Requirement
C/N = Carcinogenic or noncarcinogenic according to USEPA (2005).
HA = Health Advisory
LOC = Level of Concern
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
NJMCL = New Jersey Maximum Contaminant Level (2005)
PQL = Practical Quantitation Limit
TBC = To Be Considered
TWRBC = Tap Water Risk Based Concentration
--- = No value available.

(a) Note that chemicals without guidance values are presented in this table.
(b) USEPA Drinking Water Standards and Health Advisories (Winter 2004) Publication #EPA 822-R-04-005.
(c) NJDEP (2005).
(d) USEPA (2005). Residential exposure based on ingestion of tap water and inhalation while showering for 350 days. A hazard index of 1 was used for noncarcinogenic RBCs.
(e) LOC for PTA groundwater are based on the lower of the following values: (1) Federal MCLs, (2) New Jersey State MCLs, (3) New Jersey Groundwater Quality Criteria (QC) or PQLs (whichever is higher), and (4) any non-zero Federal MCLGs. If none of the above criteria are available, the groundwater LOC will be based on the lower of the following: Federal Drinking Water Health Advisories or USEPA Region III Tap Water RBCs.
(f) MCL value is based on trihalomethanes.
(g) The RBC value for 2-chlorotoluene was used.
(h) The QC value for cis-1,2-dichloroethene was used.
(i) The RBC value for 1,2-dichloroethene (total) was used.
(j) Values for 1,2-dichloropropane were used.
(k) Values for 1,3-dichloropropene were used.
(l) The RBC value for 1,3-dichloropropene was used.
(m) The NJMCL value for 1,1,2,2-tetrachloroethane was used.
(n) The values for xylenes (total) were used.
(o) The values for pyrene were used for noncarcinogenic polycyclic aromatic hydrocarbons (PAHs) lacking RBCs and NJ criteria.
(p) Values for 1,4-dichlorobenzene were used.
(q) The values for 1,4-dithiane was used.
(r) The value for 3-nitroaniline was used.
(s) The NJMCL and RBC values for 1,2,4-trichlorobenzene and the HA value for 1,3,5-trichlorobenzene were used.
(t) The values for 2,4,6-trichlorophenol were used.
(u) The HA value for gamma-BHC (lindane) was used.
(v) The QC and RBC values for alpha-BHC were used.
(w) The values for chlordane were used.
(x) The RBC value for endosulfan was used.
(y) The values for endrin were used.
(z) The Federal MCLs and NJ values for PCBs were used.
(aa) The value for 2,4-dinitrotoluene and 2,6-dinitrotoluene mixture was used for the QC and the PQL values.
(ab) The RBC value for 2-nitrotoluene was used.
(ac) USEPA Region III RBC values for PCDD/PCDF congeners were derived using toxicity criterion for 2,3,7,8-TCDD modified by toxic equivalency factors (TEFs) (USEPA 2000).

Table T-3
ARARs and Other Guidance to be Considered for Picatinny Arsenal Groundwater (a)
(µg/L)

	ARARs					TBCs					Level of Concern	
	Federal Drinking Water Standards (b)		New Jersey Drinking Water	New Jersey Groundwater (c)		Federal Drinking Water Health Advisories (b)	USEPA Region III Tap Water RBCs (d)				Site Characterization/ Prioritization	
Chemical	MCL	MCLG	NJMCL	Quality Criteria	NJPQL	HA	Non-carcinogen	Carcinogen $1x10^{-6}$	Carcinogen $1x10^{-4}$	C/N	LOC (e)	LOC Chosen

(ad) The value presented in the RBC column is an allowable daily intake (ADI) level for essential human nutrients.
(ae) The value for total chromium was used for Federal and NJ criteria and the value for Chromium VI was used for the RBC.
(af) Federal and State MCLs are based on action levels for these chemicals. Lead does not have an RBC, however the 15 µg/L action level (USEPA 1996a) is presented in the RBC column.
(ag) The non-food RBC value for manganese was used.
(ah) The value for inorganic mercury was used for the federal criteria, the value for total mercury was used for the NJ criteria and the RBC value was based on methyl mercury.
(ai) The value for soluble salts was used for the NJ criteria and the PQL.
(aj) The NJ value for total selenium was used.
(ak) The RBC value for fluorine was used.
(al) The RBC value for nitrite was used.
(am) Perchlorate does not have an RBC, however the 18 µg/L action level (USEPA 1998) is presented in the RBC column.
(an) The values for radiological parameters are in units of pCi/L, except where noted below.
(ao) The value for combined radium-226 and radium-228 was used.
(ap) Uranium is in units of µg/L. The RBC for the most conservative soluble salts was used.
(aq) The values for asbestos are based on units of fibers/L>10µm.

TABLE 5-3
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L)
PICATINNY ARSENAL

Chemical	LOC (a):	Sample ID: / Date Sampled: / Depth Sampled (ft):	Source	RCRA Maximum Concentration Limit (b):	Analytical Results																					
					OD-1A 06/25/01 2.85 - 12.85					OD-2A 06/21/01 2.45 - 12.45					OD-3A 06/20/01 1.24 - 11.24					OD-4A 06/21/01 2.30 - 12.30					OD-5A 06/20/01 9.55 - 19.55				
					Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab
Volatiles																												
Acetone	700	QC	NA		1.30	J	10.0	0.510	QT	10.0	UJ	10.0	0.510	QT	10.0	UJ	10.0	0.510	QT	8.10	JD	100	5.10	QT	10.0	UJ	10.0	0.510	QT
Carbon disulfide	1,000	RBC	NA		3.50		1.00	0.200	QT	1.00	U	1.00	0.200	QT	1.00	U	1.00	0.200	QT	10.0	UD	10.0	2.00	QT	1.00	U	1.00	0.200	QT
Toluene	1,000	MCL, QC, MCLG	NA		1.00	U	1.00	0.180	QT	0.250	J	1.00	0.180	QT	1.00	U	1.00	0.180	QT	10.0	UD	10.0	1.80	QT	1.00	U	1.00	0.180	QT
1,1,2-Trichloro-1,2,2-trifluoroethane	59,000	RBC	NA		1.00	U	1.00	0.320	QT	6.50		1.00	0.320	QT	7.90		1.00	0.320	QT	190	D	10.0	3.20	QT	1.00	U	1.00	0.320	QT
Semivolatiles																												
bis(2-Ethylhexyl)phthalate	6	MCL	NA		10.0	U	10.0	2.70	QT	10.0	U	10.0	2.70	QT	4.20	J	10.0	2.70	QT	2.80	J	10.0	2.70	QT	10.0	U	10.0	2.70	QT
Pesticides																												
PCBs																												
Explosives																												
HMX	400	HA	NA		0.500	U	0.500	0.100	QT	9.00	D	1.50	0.300	QT	0.600		0.500	0.100	QT	2.10		0.500	0.100	QT	0.130	J	0.500	0.100	QT
RDX	0.61	RBC	NA		0.500	U	0.500	0.130	QT	23.0	D	1.50	0.390	QT	0.210	J	0.500	0.130	QT	3.40		0.500	0.130	QT	0.500	U	0.500	0.130	QT
Inorganics																												
Aluminum	200	QC, NJPQL	NA		1,100	J	92.0	28.0	QT	83.0	J	92.0	28.0	QT	100	J	92.0	28.0	QT	1,100	J	92.0	28.0	QT	680	J	92.0	28.0	QT
Barium	2,000	MCL, QC, MCLG	1,000		37.0	J	200	3.00	QT	30.0	J	200	3.00	QT	4.80	J	200	3.00	QT	10.0	J	200	3.00	QT	38.0	J	200	3.00	QT
Beryllium	4	MCL, MCLG	NA		2.00	U	2.00	0.540	QT	2.00	U	2.00	0.540	QT	2.00	U	2.00	0.540	QT	2.00	U	2.00	0.540	QT	2.00	U	2.00	0.540	QT
Boron	600	HA	NA		31.0	J	200	21.0	QT	68.0	J	200	21.0	QT	71.0	J	200	21.0	QT	46.0	J	200	21.0	QT	75.0	J	200	21.0	QT
Cadmium	4	QC	100		2.00	U	2.00	0.280	QT	2.00	U	2.00	0.280	QT	2.00	U	2.00	0.280	QT	2.00	U	2.00	0.280	QT	2.00	U	2.00	0.280	QT
Calcium	400,000	ADI	NA		3,800	J	5,000	250	QT	8,000	J	5,000	250	QT	7,100	J	5,000	250	QT	6,400	J	5,000	250	QT	4,000	J	5,000	250	QT
Chromium	100	MCL, QC, MCLG	50		1.80	J	10.0	1.40	QT	10.0	U	10.0	1.40	QT	10.0	U	10.0	1.40	QT	10.0	J	10.0	1.40	QT	10.0	U	10.0	1.40	QT
Cobalt	2,200	RBC	NA		1.40	J	50.0	1.30	QT	50.0	U	50.0	1.30	QT	50.0	U	50.0	1.30	QT	50.0	U	50.0	1.30	QT	50.0	U	50.0	1.30	QT
Copper	1,000	QC, NJPQL	NA		9.00	U	9.00	4.20	QT	5.00	J	9.00	4.20	QT	9.00	U	9.00	4.20	QT	9.10	J	9.00	4.20	QT	11.0	J	9.00	4.20	QT
Iron	300	QC	NA		920	J	100	88.0	QT	100	U	100	88.0	QT	100	U	100	88.0	QT	1,500	J	100	88.0	QT	2,900	J	100	88.0	QT
Lead	10	NJPQL	50		3.00	U	3.00	2.50	QT	3.00	U	3.00	2.50	QT	3.00	U	3.00	2.50	QT	5.00	J	3.00	2.50	QT	4.50	J	3.00	2.50	QT
Magnesium	80,500	ADI	NA		1,100	J	5,000	30.0	QT	2,400	J	5,000	30.0	QT	1,500	J	5,000	30.0	QT	1,600	J	5,000	30.0	QT	1,100	J	5,000	30.0	QT
Manganese	50	QC	NA		99.0	J	15.0	0.900	QT	210	J	15.0	0.900	QT	1.50	J	15.0	0.900	QT	54.0	J	15.0	0.900	QT	530	J	15.0	0.900	QT
Mercury	2	MCL, QC, MCLG	2.0		0.0920	U	0.0920	0.0690	QT	0.0920	U	0.0920	0.0690	QT	0.0920	U	0.0920	0.0690	QT	0.0860	J	0.0920	0.0690	QT	0.0920	U	0.0920	0.0690	QT
Molybdenum	40	HA	NA		1.00	U	1.00	0.600	QT	1.00	U	1.00	0.600	QT	1.00	U	1.00	0.600	QT	1.00	U	1.00	0.600	QT	1.00	U	1.00	0.600	QT
Nickel	100	QC	NA		6.40	J	40.0	2.20	QT	40.0	U	40.0	2.20	QT	40.0	U	40.0	2.20	QT	6.60	J	40.0	2.20	QT	40.0	U	40.0	2.20	QT
Potassium	100,000	ADI	NA		550	J	5,000	41.0	QT	670	J	5,000	41.0	QT	540	J	5,000	41.0	QT	730	J	5,000	41.0	QT	660	J	5,000	41.0	QT
Silicon	NA	---	NA		3,850	J	500	38.0	QT	3,870	J	500	38.0	QT	4,900	J	500	38.0	QT	5,800	J	500	38.0	QT	3,330	J	500	38.0	QT
Sodium	50,000	QC	NA		1,200	J	5,000	630	QT	3,900	J	5,000	630	QT	2,700	J	5,000	630	QT	2,200	J	5,000	630	QT	5,300	J	5,000	630	QT
Strontium	4,000	HA	NA		17.0	J	5.00	0.280	QT	29.0	J	5.00	0.280	QT	17.0	J	5.00	0.280	QT	15.0	J	5.00	0.280	QT	22.0	J	5.00	0.280	QT
Tin	22,000	RBC	NA		10.0	U	10.0	1.40	QT	10.0	U	10.0	1.40	QT	10.0	U	10.0	1.40	QT	10.0	U	10.0	1.40	QT	10.0	U	10.0	1.40	QT
Titanium	150,000	RBC	NA		16.0	J	50.0	6.30	QT	50.0	U	50.0	6.30	QT	50.0	U	50.0	6.30	QT	22.0	J	50.0	6.30	QT	50.0	U	50.0	6.30	QT
Tungsten	NA	---	NA		5.00	U	5.00	1.00	QT	1.50	J	5.00	1.00	QT	1.70	J	5.00	1.00	QT	5.00	U	5.00	1.00	QT	5.30	J	5.00	1.00	QT
Vanadium	260	RBC	NA		1.30	J	50.0	0.820	QT	50.0	U	50.0	0.820	QT	50.0	U	50.0	0.820	QT	1.10	J	50.0	0.820	QT	0.940	J	50.0	0.820	QT
Zinc	5,000	QC	NA		60.0	J	20.0	12.0	QT	60.0	J	20.0	12.0	QT	20.0	U	20.0	12.0	QT	15.0	J	20.0	12.0	QT	73.0	J	20.0	12.0	QT
Zirconium	NA	---	NA		5.00	U	5.00	1.00	QT	5.00	U	5.00	1.00	QT	5.00	U	5.00	1.00	QT	5.00	U	5.00	1.00	QT	1.90	J	5.00	1.00	QT

TABLE 5-3 (CONTINUED)
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L)
PICATINNY ARSENAL

Chemical	LOC (a):	Sample ID: / Date Sampled: / Depth Sampled (ft): Source	RCRA Maximum Concentration Limit (b):	Analytical Results: OD-5ADUP 06/20/01 9.55 - 19.55					Analytical Results: OD-6A 06/25/01 10.22 - 20.22				
				Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab
Volatiles													
Acetone	700	QC	NA	10.0	UJ	10.0	0.510	QT	10.0	U	10.0	0.510	QT
Carbon disulfide	1,000	RBC	NA	1.00	U	1.00	0.200	QT	1.00	U	1.00	0.200	QT
Toluene	1,000	MCL, QC, MCLG	NA	1.00	U	1.00	0.180	QT	1.00	U	1.00	0.180	QT
1,1,2-Trichloro-1,2,2-trifluoroethane	59,000	RBC	NA	1.00	U	1.00	0.320	QT	1.00	U	1.00	0.320	QT
Semivolatiles													
bis(2-Ethylhexyl)phthalate	6	MCL	NA	3.30	J	10.0	2.70	QT	10.0	U	10.0	2.70	QT
Pesticides													
PCBs													
Explosives													
HMX	400	HA	NA	NT					0.290	J	0.500	0.100	QT
RDX	0.61	RBC	NA	NT					0.190	J	0.500	0.130	QT
Inorganics													
Aluminum	200	QC, NJPQL	NA	2,100	J	92.0	28.0	QT	470	J	92.0	28.0	QT
Barium	2,000	MCL, QC, MCLG	1,000	49.0	J	200	3.00	QT	44.0	J	200	3.00	QT
Beryllium	4	MCL, MCLG	NA	2.00	U	2.00	0.540	QT	1.10	J	2.00	0.540	QT
Boron	600	HA	NA	69.0	J	200	21.0	QT	28.0	J	200	21.0	QT
Cadmium	4	QC	100	2.00	U	2.00	0.280	QT	0.620	J	2.00	0.280	QT
Calcium	400,000	ADI	NA	4,600	J	5,000	250	QT	1,900	J	5,000	250	QT
Chromium	100	MCL, QC, MCLG	50	2.60	J	10.0	1.40	QT	10.0	U	10.0	1.40	QT
Cobalt	2,200	RBC	NA	2.20	J	50.0	1.30	QT	24.0	J	50.0	1.30	QT
Copper	1,000	QC, NJPQL	NA	14.0	J	9.00	4.20	QT	14.0	J	9.00	4.20	QT
Iron	300	QC	NA	4,600	J	100	88.0	QT	1,000	J	100	88.0	QT
Lead	10	NJPQL	50	3.00	U	3.00	2.50	QT	2.90	J	3.00	2.50	QT
Magnesium	80,500	ADI	NA	1,400	J	5,000	30.0	QT	600	J	5,000	30.0	QT
Manganese	50	QC	NA	620	J	15.0	0.900	QT	850	J	15.0	0.900	QT
Mercury	2	MCL, QC, MCLG	2.0	0.0860	J	0.0920	0.0690	QT	0.0920	U	0.0920	0.0690	QT
Molybdenum	40	HA	NA	1.00	U	1.00	0.600	QT	0.800	J	1.00	0.600	QT
Nickel	100	QC	NA	4.00	J	40.0	2.20	QT	5.70	J	40.0	2.20	QT
Potassium	100,000	ADI	NA	970	J	5,000	41.0	QT	360	J	5,000	41.0	QT
Silicon	NA	---	NA	3,140	J	500	38.0	QT	2,820	J	500	38.0	QT
Sodium	50,000	QC	NA	7,400	J	5,000	630	QT	1,100	J	5,000	630	QT
Strontium	4,000	HA	NA	21.0	J	5.00	0.280	QT	12.0	J	5.00	0.280	QT
Tin	22,000	RBC	NA	3.90	J	10.0	1.40	QT	10.0	U	10.0	1.40	QT
Titanium	150,000	RBC	NA	19.0	J	50.0	6.30	QT	50.0	U	50.0	6.30	QT
Tungsten	NA	---	NA	3.10	J	5.00	1.00	QT	5.00	U	5.00	1.00	QT
Vanadium	260	RBC	NA	3.10	J	50.0	0.820	QT	50.0	U	50.0	0.820	QT
Zinc	5,000	QC	NA	93.0	J	20.0	12.0	QT	84.0	J	20.0	12.0	QT
Zirconium	NA	---	NA	5.00	U	5.00	1.00	QT	5.00	U	5.00	1.00	QT

TABLE 5-3
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L)
PICATINNY ARSENAL

Chemical	LOC (a):	Sample ID: Date Sampled: Depth Sampled (ft): Source	RCRA Maximum Concentration Limit (b):	Analytical Results																										
				OD-1A 06/25/01 2.85 - 12.85					OD-2A 06/21/01 2.45 - 12.45					OD-3A 06/20/01 1.24 - 11.24					OD-4A 06/21/01 2.30 - 12.30					OD-5A 06/20/01 9.55 - 19.55				
				Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab
Anions																														
Ammonia	500	QC	NA	200	U	200	19.0	QT	46.0	J	200	19.0	QT	200	R	200	19.0	QT	59.0	J	200	19.0	QT	200	R	200	19.0	QT
Chloride	250,000	QC	NA	829	J	1,000	130	QT	2,080		1,000	130	QT	2,380		1,000	130	QT	1,300		1,000	130	QT	4,480		1,000	130	QT
Fluoride	2,000	QC	NA	110	J	1,000	17.0	QT	70.0	J	1,000	17.0	QT	50.0	J	1,000	17.0	QT	50.0	J	1,000	17.0	QT	50.0	J	1,000	17.0	QT
Nitrate	10,000	MCL, QC, MCLG	NA	500	U	500	15.0	QT	30.0	J	500	15.0	QT	500	U	500	15.0	QT	40.0	J	500	15.0	QT	500	U	500	15.0	QT
Perchlorate	18	AL	NA	5.00	U	5.00	2.00	QT	5.00	U	5.00	2.00	QT	5.00	U	5.00	2.00	QT	11.6		5.00	2.00	QT	5.00	U	5.00	2.00	QT
Phosphorus	NA	---	NA	100	U	100	16.0	QT	100	U	100	16.0	QT	100	U	100	16.0	QT	140		100	16.0	QT	110		100	16.0	QT
Sulfate	250,000	QC	NA	9,120		1,000	150	QT	9,400		1,000	150	QT	10,900		1,000	150	QT	11,900		1,000	150	QT	6,370		1,000	150	QT
Sulfide	NA	---	NA	1,000	U	1,000	920	QT	1,000	U	1,000	920	QT	1,100		1,000	920	QT	1,000	U	1,000	920	QT	1,000	U	1,000	920	QT

TABLE 5-3 (CONTINUED)
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L)
PICATINNY ARSENAL

Chemical	LOC (a):	Sample ID: Date Sampled: Depth Sampled (ft): Source	RCRA Maximum Concentration Limit (b):	Analytical Results									
				OD-5ADUP 06/20/01 9.55 - 19.55					OD-6A 06/25/01 10.22 - 20.22				
				Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab
Anions													
Ammonia	500	QC	NA	250		200	19.0	QT	200	U	200	19.0	QT
Chloride	250,000	QC	NA	4,300		1,000	130	QT	873	J	1,000	130	QT
Fluoride	2,000	QC	NA	50.0	J	1,000	17.0	QT	140	J	1,000	17.0	QT
Nitrate	10,000	MCL, QC, MCLG	NA	500	U	500	15.0	QT	500	U	500	15.0	QT
Perchlorate	18	AL	NA	5.00	U	5.00	2.00	QT	5.00	U	5.00	2.00	QT
Phosphorus	NA	---	NA	79.0	J	100	16.0	QT	100	U	100	16.0	QT
Sulfate	250,000	QC	NA	6,240		1,000	150	QT	10,400		1,000	150	QT
Sulfide	NA	---	NA	1,000	U	1,000	920	QT	1,000	U	1,000	920	QT

(a) See the "ARARs and Other Guidance to be Considered for Picatinny Arsenal Groundwater" table for a complete list of LOC values. Groundwater samples were compared to the lower of the Federal MCLs, the New Jersey State MCLs, the New Jersey Groundwater Quality Criteria or PQLs (whichever is higher), or any non-zero Federal MCLG. If the above are not available, groundwater comparison criteria are based on the lower of the following TBC: Federal Drinking Water Health Advisories or USEPA Region III Tap Water (noncarcinogenic or carcinogenic 10^{-6}) RBCs.

(b) Maximum concentration criteria established in 40 CFR Part 264 Subpart 264.94.

Bolded and shaded values indicate the detected result is above the Level of Concern (LOC).
ADI = Allowable Daily Intake
AL = Action Level
CNSWC = Crane Naval Surface Warfare Center
HA = Federal Drinking Water Standards and Health Advisories
MCL = Federal Maximum Contaminant Level
MCLG = Federal Maximum Contaminant Level Goal
NA = No value available.
NJMCL = New Jersey State Maximum Contaminant Level
NJPQL = New Jersey State Practical Quantitation Limit
NT = Not tested.
Q = Flags/Qualifiers (QA/QC):
D = Result was obtained from the analysis of a dilution.
J = Detect, value is an estimate of the concentration.
R = Rejected result, value should not be used for any purpose.
U = Non-detect, value is the detection limit.
(U) = Non-detect, chemical was detected in blank.
QC = New Jersey Groundwater Quality Criteria
QT = Quanterra Laboratories, Inc.
RBC = USEPA Region III Tap Water Risk Based Concentration
RL/EQL = Reporting Limit / Estimated Quantitation Limit
SQL = Sample Quantitation Limit

TABLE 5-3 (CONTINUED)
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L)
PICATINNY ARSENAL

Chemical	LOC (a):	Sample ID: / Date Sampled: / Depth Sampled (ft): / Source	RCRA Maximum Concentration Limit (b):	Analytical Results																						
				OD-1A 09/27/01 5.0 - 10.0					OD-2A 09/25/01 10.0 - 15.0					OD-3A 09/26/01 10.0 - 15.0					OD-4A 09/25/01 10.0 - 15.0					OD-5A 09/26/01 10.0 - 15.0				
				Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab
Volatiles																												
Acetone	700	QC	NA	10.0	(U)	10.0	0.510	QT	17.0	(U)JD	17.0	0.850	QT	10.0	(U)	10.0	0.510	QT	120	(U)D	120	6.40	QT	10.0	(U)	10.0	0.510	QT
Ethylene Oxide	0.023	RBC	NA	1,000	UJ	1,000	0.250	QT	780	J	1,000	0.250	QT	1,000	UJ	1,000	0.250	QT	1,000	UJ	1,000	0.250	QT	1,000	UJ	1,000	0.250	QT
1,1,2-Trichloro-1,2,2-trifluoroethane	59,000	RBC	NA	1.00	U	1.00	0.320	QT	40.0	D	1.70	0.530	QT	13.0		1.00	0.320	QT	300	D	12.0	4.00	QT	1.00	U	1.00	0.320	QT
Semivolatiles																												
2,4-Dimethylphenol	100	QC	NA	10.0	U	10.0	0.850	QT	10.0	U	10.0	0.850	QT	10.0	U	10.0	0.850	QT	10.0	U	10.0	0.850	QT	10.0	U	10.0	0.850	QT
bis(2-Ethylhexyl)phthalate	6	MCL	NA	10.0	U	10.0	2.70	QT	10.0	U	10.0	2.70	QT	5.30	J	10.0	2.70	QT	10.0	U	10.0	2.70	QT	10.0	U	10.0	2.70	QT
Pesticides																												
PCBs																												
Explosives																												
HMX	400	HA	NA	7.60		0.500	0.100	QT	3.70		0.500	0.100	QT	0.880		0.500	0.100	QT	2.90		0.500	0.100	QT	0.500	U	0.500	0.100	QT
RDX	0.61	RBC	NA	3.50		0.500	0.130	QT	7.90		0.500	0.130	QT	0.250	J	0.500	0.130	QT	4.60		0.500	0.130	QT	0.500	U	0.500	0.130	QT
Inorganics																												
Aluminum	200	QC, NJPQL	NA	190	J	92.0	28.0	QT	92.0	U	92.0	28.0	QT	92.0	U	92.0	28.0	QT	260	J	92.0	28.0	QT	260	J	92.0	28.0	QT
Barium	2,000	MCL, QC, MCLG	1,000	57.0	J	200	3.00	QT	140	J	200	3.00	QT	5.90	J	200	3.00	QT	6.90	J	200	3.00	QT	40.0	J	200	3.00	QT
Boron	600	HA	NA	140	J	200	21.0	QT	81.0	J	200	21.0	QT	69.0	J	200	21.0	QT	80.0	J	200	21.0	QT	73.0	J	200	21.0	QT
Cadmium	4	QC	100	0.340	J	2.00	0.280	QT	0.640	J	2.00	0.280	QT	2.00	U	2.00	0.280	QT	2.00	U	2.00	0.280	QT	2.00	U	2.00	0.280	QT
Calcium	400,000	ADI	NA	6,300		5,000	250	QT	9,600		5,000	250	QT	7,200		5,000	250	QT	5,900		5,000	250	QT	3,100	J	5,000	250	QT
Cobalt	2,200	RBC	NA	50.0	U	50.0	1.30	QT	3.10	J	50.0	1.30	QT	50.0	U	50.0	1.30	QT	50.0	U	50.0	1.30	QT	2.90	J	50.0	1.30	QT
Copper	1,000	QC, NJPQL	NA	9.00	U	9.00	4.20	QT	4.50	J	9.00	4.20	QT	9.00	U	9.00	4.20	QT	5.20	J	9.00	4.20	QT	6.80	J	9.00	4.20	QT
Iron	300	QC	NA	160		100	88.0	QT	1,300	J	100	88.0	QT	100	U	100	88.0	QT	390	J	100	88.0	QT	3,300	J	100	88.0	QT
Magnesium	80,500	ADI	NA	2,100	J	5,000	30.0	QT	3,700	J	5,000	30.0	QT	1,600	J	5,000	30.0	QT	1,500	J	5,000	30.0	QT	1,200	J	5,000	30.0	QT
Manganese	50	QC	NA	70.0	J	15.0	0.900	QT	1,900	J	15.0	0.900	QT	15.0	J	15.0	0.900	QT	22.0	J	15.0	0.900	QT	920	J	15.0	0.900	QT
Nickel	100	QC	NA	7.30	J	40.0	2.20	QT	40.0	U	40.0	2.20	QT	40.0	U	40.0	2.20	QT	40.0	U	40.0	2.20	QT	2.20	J	40.0	2.20	QT
Potassium	100,000	ADI	NA	470	J	5,000	41.0	QT	990	J	5,000	41.0	QT	600	J	5,000	41.0	QT	630	J	5,000	41.0	QT	650	J	5,000	41.0	QT
Silicon	NA	---	NA	4,230		500	38.0	QT	4,510		500	38.0	QT	5,130		500	38.0	QT	5,990		500	38.0	QT	3,420		500	38.0	QT
Sodium	50,000	QC	NA	2,600	J	5,000	630	QT	4,300	J	5,000	630	QT	2,100	J	5,000	630	QT	1,600	J	5,000	630	QT	4,000	J	5,000	630	QT
Strontium	4,000	HA	NA	28.0		5.00	0.280	QT	36.0		5.00	0.280	QT	15.0		5.00	0.280	QT	14.0		5.00	0.280	QT	17.0		5.00	0.280	QT
Titanium	150,000	RBC	NA	50.0	U	50.0	6.30	QT	50.0	U	50.0	6.30	QT	50.0	U	50.0	6.30	QT	7.50	J	50.0	6.30	QT	50.0	U	50.0	6.30	QT
Zinc	5,000	QC	NA	48.0		20.0	12.0	QT	55.0		20.0	12.0	QT	20.0	U	20.0	12.0	QT	14.0	J	20.0	12.0	QT	26.0		20.0	12.0	QT

TABLE 5-3 (CONTINUED)
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L)
PICATINNY ARSENAL

Chemical	LOC (a):	Sample ID: / Date Sampled: / Depth Sampled (ft): Source	RCRA Maximum Concentration Limit (b):	Analytical Results: OD-5ADUP 09/26/01 10.0 - 15.0					OD-6A 09/27/01 10.0 - 20.0				
				Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab
Volatiles													
Acetone	700	QC	NA	NT					10.0	(U)	10.0	0.510	QT
Ethylene Oxide	0.023	RBC	NA	NT					1,000	UJ	1,000	0.250	QT
1,1,2-Trichloro-1,2,2-trifluoroethane	59,000	RBC	NA	NT					1.00	U	1.00	0.320	QT
Semivolatiles													
2,4-Dimethylphenol	100	QC	NA	NT					10.0	(U)	10.0	0.850	QT
bis(2-Ethylhexyl)phthalate	6	MCL	NA	NT					10.0	UJ	10.0	2.70	QT
Pesticides													
PCBs													
Explosives													
HMX	400	HA	NA	0.500	U	0.500	0.100	QT	0.500	U	0.500	0.100	QT
RDX	0.61	RBC	NA	0.500	U	0.500	0.130	QT	0.500	U	0.500	0.130	QT
Inorganics													
Aluminum	200	QC, NJPQL	NA	NT					80.0	J	92.0	28.0	QT
Barium	2,000	MCL, QC, MCLG	1,000	NT					34.0	J	200	3.00	QT
Boron	600	HA	NA	NT					120	J	200	21.0	QT
Cadmium	4	QC	100	NT					2.00	U	2.00	0.280	QT
Calcium	400,000	ADI	NA	NT					5,700		5,000	250	QT
Cobalt	2,200	RBC	NA	NT					6.00	J	50.0	1.30	QT
Copper	1,000	QC, NJPQL	NA	NT					9.00	U	9.00	4.20	QT
Iron	300	QC	NA	NT					3,800	J	100	88.0	QT
Magnesium	80,500	ADI	NA	NT					2,300	J	5,000	30.0	QT
Manganese	50	QC	NA	NT					1,000	J	15.0	0.900	QT
Nickel	100	QC	NA	NT					7.30	J	40.0	2.20	QT
Potassium	100,000	ADI	NA	NT					650	J	5,000	41.0	QT
Silicon	NA	---	NA	NT					6,490		500	38.0	QT
Sodium	50,000	QC	NA	NT					2,200	J	5,000	630	QT
Strontium	4,000	HA	NA	NT					24.0		5.00	0.280	QT
Titanium	150,000	RBC	NA	NT					50.0	U	50.0	6.30	QT
Zinc	5,000	QC	NA	NT					27.0		20.0	12.0	QT

TABLE 5-3 (CONTINUED)
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L)
PICATINNY ARSENAL

		Sample ID:		Analytical Results																						
		Date Sampled:		OD-1A 09/27/01 5.0 - 10.0					OD-2A 09/25/01 10.0 - 15.0					OD-3A 09/26/01 10.0 - 15.0					OD-4A 09/25/01 10.0 - 15.0					OD-5A 09/26/01 10.0 - 15.0				
	LOC (a):	Depth Sampled (ft):	RCRA Maximum Concentration Limit (b):																							
Chemical		Source		Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab
Anions																												
Ammonia	500	QC	NA	200	R	200	19.0	QT	200	R	200	19.0	QT	200	R	200	19.0	QT	200	R	200	19.0	QT	250	R	200	19.0	QT
Chloride	250,000	QC	NA	3,120		1,000	170	QT	4,370		1,000	170	QT	2,470		1,000	170	QT	1,220		1,000	170	QT	3,720		1,000	170	QT
Fluoride	2,000	QC	NA	130	J	1,000	15.0	QT	60.0	J	1,000	15.0	QT	50.0	J	1,000	15.0	QT	50.0	J	1,000	15.0	QT	50.0	J	1,000	15.0	QT
Nitrate	10,000	MCL, QC, MCLG	NA	500	U	500	20.0	QT	50.0	J	500	20.0	QT	500	U	500	20.0	QT	30.0	J	500	20.0	QT	500	U	500	20.0	QT
Perchlorate	18	AL	NA	10.2		5.00	2.00	QT	5.00	U	5.00	2.00	QT	5.00	U	5.00	2.00	QT	9.00		5.00	2.00	QT	5.00	U	5.00	2.00	QT
Phosphorus	NA	---	NA	100	U	100	11.0	QT	100	U	100	11.0	QT	35.0	J	100	11.0	QT	100	U	100	11.0	QT	63	J	100	11.0	QT
Sulfate	250,000	QC	NA	14,800		1,000	380	QT	6,690		1,000	380	QT	9,590		1,000	380	QT	11,000		1,000	380	QT	7,680		1,000	380	QT
Sulfide	NA	---	NA	1,000	U	1,000	920	QT	1,000	U	1,000	920	QT	2,500		1,000	920	QT	1,000	U	1,000	920	QT	2,700		1,000	920	QT

TABLE 5-3 (CONTINUED)
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L)
PICATINNY ARSENAL

Chemical	LOC (a):	Sample ID: / Date Sampled: / Depth Sampled (ft): / Source	RCRA Maximum Concentration Limit (b):	Analytical Results									
				OD-5ADUP 09/26/01 10.0 - 15.0					OD-6A 09/27/01 10.0 - 20.0				
				Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab
Anions													
Ammonia	500	QC	NA	NT					200	R	200	19.0	QT
Chloride	250,000	QC	NA	NT					1,180		1,000	170	QT
Fluoride	2,000	QC	NA	NT					65.0	J	1,000	15.0	QT
Nitrate	10,000	MCL, QC, MCLG	NA	NT					500	U	500	20.0	QT
Perchlorate	18	AL	NA	NT					5.00	U	5.00	2.00	QT
Phosphorus	NA	---	NA	NT					130		100	11.0	QT
Sulfate	250,000	QC	NA	NT					7,050		1,000	380	QT
Sulfide	NA	---	NA	NT					1,000	U	1,000	920	QT

(a) See the "ARARs and Other Guidance to be Considered for Picatinny Arsenal Groundwater" table for a complete list of LOC values. Groundwater samples were compared to the lower of the Federal MCLs, the New Jersey State MCLs, the New Jersey Groundwater Quality Criteria or PQLs (whichever is higher), or any non-zero Federal MCLG. If the above are not available, groundwater comparison criteria are based on the lower of the following TBC: Federal Drinking Water Health Advisories or USEPA Region III Tap Water (noncarcinogenic or carcinogenic 10^{-6}) RBCs.

(b) Maximum concentration criteria established in 40 CFR Part 264 Subpart 264.94.

Bolded and shaded values indicate the detected result is above the Level of Concern (LOC).

ADI = Allowable Daily Intake
AL = Action Level
CNSWC = Crane Naval Surface Warfare Center
HA = Federal Drinking Water Standards and Health Advisories
MCL = Federal Maximum Contaminant Level
MCLG = Federal Maximum Contaminant Level Goal
NA = No value available.
NJMCL = New Jersey State Maximum Contaminant Level
NJPQL = New Jersey State Practical Quantitation Limit
NT = Not tested.

Q = Flags/Qualifiers (QA/QC):
D = Result was obtained from the analysis of a dilution.
J = Detect, value is an estimate of the concentration.
R = Rejected result, value should not be used for any purpose.
U = Non-detect, value is the detection limit.
(U) = Non-detect, chemical was detected in blank.
QC = New Jersey Groundwater Quality Criteria
QT = Quanterra Laboratories, Inc.
RBC = USEPA Region III Tap Water Risk Based Concentration
RL/EQL = Reporting Limit/Estimated Quantitation Limit
SQL = Sample Quantitation Limit

TABLE 5-3 (CONTINUED)
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L; Rads - pCi/L)
PICATINNY ARSENAL

Chemical	LOC (a):	Source	RCRA Maximum Concentration Limit (b):	Analytical Results																				
				Sample ID: OD-1A Date Sampled: 01/16/02 Depth Sampled (ft): 7.36 - 15.8					Sample ID: OD-2A Date Sampled: 01/16/02 Depth Sampled (ft): 4.90 - 14.5					Sample ID: OD-3A Date Sampled: 01/15/02 Depth Sampled (ft): 2.09 - 13.5					Sample ID: OD-4A Date Sampled: 01/15/02 Depth Sampled (ft): 3.98 - 13.95				
				Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab
Volatiles																								
Pesticides																								
Explosives																								
HMX	400	HA	NA	0.460	J	0.500	0.100	QT	4.90	D	2.50	0.100	QT	0.680		0.500	0.100	QT	2.70		0.500	0.100	QT
RDX	0.61	RBC	NA	0.500	U	0.500	0.130	QT	22.0	D	2.50	0.130	QT	0.250	J	0.500	0.130	QT	3.90		0.500	0.130	QT
Inorganics																								
Aluminum	200	Quality Criteria, NJPQL	NA	170		92.0	28.0	QT	110		92.0	28.0	QT	40.0	J	92.0	28.0	QT	1,300		92.0	28.0	QT
Arsenic	5	MCL	50.0	3.90	U	3.90	3.90	QT	3.90	U	3.90	3.90	QT	3.90	U	3.90	3.90	QT	3.90	U	3.90	3.90	QT
Barium	2,000	MCL, Quality Criteria, MCLG	1,000	23.0	J	200	3.00	QT	60.0	J	200	3.00	QT	6.00	J	200	3.00	QT	14.0	J	200	3.00	QT
Beryllium	4	MCL, MCLG	NA	2.00	U	2.00	0.540	QT	2.00	U	2.00	0.540	QT	2.00	U	2.00	0.540	QT	2.00	U	2.00	0.540	QT
Boron	600	HA	NA	43.0	J	200	21.0	QT	48.0	J	200	21.0	QT	76.0	J	200	21.0	QT	83.0	J	200	21.0	QT
Cadmium	4	Quality Criteria	100	2.00	U	2.00	0.280	QT	0.320	J	2.00	0.280	QT	2.00	U	2.00	0.280	QT	0.450	J	2.00	0.280	QT
Calcium	400,000	ADI	NA	3,400	J	5,000	250	QT	6,600		5,000	250	QT	7,400		5,000	250	QT	6,700		5,000	250	QT
Chromium	100	MCL, Quality Criteria, MCLG	50	1.40	J	10.0	1.40	QT	10.0	U	10.0	1.40	QT	10.0	U	10.0	1.40	QT	15.0		10.0	1.40	QT
Cobalt	2,200	NCARC_RBC	NA	1.30	J	50.0	1.30	QT	50.0	U	50.0	1.30	QT	50.0	U	50.0	1.30	QT	2.80	J	50.0	1.30	QT
Copper	1,000	Quality Criteria, NJPQL	NA	9.00	U	9.00	4.20	QT	4.80	J	9.00	4.20	QT	9.00	U	9.00	4.20	QT	17.0		9.00	4.20	QT
Iron	300	Quality Criteria	NA	100	U	100	88.0	QT	620		100	88.0	QT	100	U	100	88.0	QT	1,900		100	88.0	QT
Lead	10	NJPQL	50	3.00	U	3.00	2.50	QT	3.00	U	3.00	2.50	QT	3.00	U	3.00	2.50	QT	8.30		3.00	2.50	QT
Magnesium	80,500	ADI	NA	1,000	J	5,000	30.0	QT	2,400	J	5,000	30.0	QT	1,600	J	5,000	30.0	QT	1,900	J	5,000	30.0	QT
Manganese	50	Quality Criteria	NA	8.10	J	15.0	0.900	QT	270		15.0	0.900	QT	15.0	U	15.0	0.900	QT	96.0		15.0	0.900	QT
Molybdenum	40	HA	NA	1.00	U	1.00	0.600	QT	1.00	U	1.00	0.600	QT	1.00	U	1.00	0.600	QT	1.30		1.00	0.600	QT
Nickel	100	Quality Criteria	NA	5.30	J	40.0	2.20	QT	40.0	U	40.0	2.20	QT	40.0	U	40.0	2.20	QT	11.0	J	40.0	2.20	QT
Potassium	100,000	ADI	NA	380	J	5,000	41.0	QT	540	J	5,000	41.0	QT	550	J	5,000	41.0	QT	870	J	5,000	41.0	QT
Selenium	50	MCL, Quality Criteria, MCLG	10	4.60	J	5.00	4.50	QT	5.00	U	5.00	4.50	QT	5.00	U	5.00	4.50	QT	5.00	U	5.00	4.50	QT
Silicon	---	NA	NA	2,710		500	42.3	QT	2,990		500	42.3	QT	5,420		500	42.3	QT	6,820		500	42.3	QT
Sodium	50,000	Quality Criteria	NA	1,000	J	5,000	630	QT	2,900	J	5,000	630	QT	2,700	J	5,000	630	QT	2,300	J	5,000	630	QT
Strontium	4,000	HA	NA	15.0		5.00	0.280	QT	25.0		5.00	0.280	QT	17.0		5.00	0.280	QT	16.0		5.00	0.280	QT
Tin	22,000	NCARC_RBC	NA	1.90	J	10.0	1.40	QT	10.0	U	10.0	1.40	QT	10.0	U	10.0	1.40	QT	10.0	U	10.0	1.40	QT
Titanium	150,000	NCARC_RBC	NA	50.0	U	50.0	6.30	QT	50.0	U	50.0	6.30	QT	50.0	U	50.0	6.30	QT	39.0	J	50.0	6.30	QT
Tungsten	---	NA	NA	4.50	J	5.00	1.00	QT	5.00	U	5.00	1.00	QT	5.00	U	5.00	1.00	QT	15.0		5.00	1.00	QT
Vanadium	260	NCARC_RBC	NA	50.0	U	50.0	0.820	QT	50.0	U	50.0	0.820	QT	50.0	U	50.0	0.820	QT	2.00	J	50.0	0.820	QT

TABLE 5-3 (CONTINUED)
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L; Rads - pCi/L)
PICATINNY ARSENAL

Chemical	LOC (a):	Source	RCRA Maximum Concentration Limit (b):	Analytical Results: OD-5A 01/16/02 6.20 - 21.95					Analytical Results: OD-6A 01/17/02 11.0 - 23.81				
				Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab
Volatiles													
Pesticides													
Explosives													
HMX	400	HA	NA	0.500	U	0.500	0.100	QT	0.500	U	0.500	0.100	QT
RDX	0.61	RBC	NA	0.500	U	0.500	0.130	QT	0.500	U	0.500	0.130	QT
Inorganics													
Aluminum	200	Quality Criteria, NJPQL	NA	4,300		92.0	28.0	QT	360		92.0	28.0	QT
Arsenic	5	MCL	50.0	4.50		3.90	3.90	QT	3.90	U	3.90	3.90	QT
Barium	2,000	MCL, Quality Criteria, MCLG	1,000	60.0	J	200	3.00	QT	27.0	J	200	3.00	QT
Beryllium	4	MCL, MCLG	NA	2.00	U	2.00	0.540	QT	0.750	J	2.00	0.540	QT
Boron	600	HA	NA	47.0	J	200	21.0	QT	70.0	J	200	21.0	QT
Cadmium	4	Quality Criteria	100	0.370	J	2.00	0.280	QT	0.280	J	2.00	0.280	QT
Calcium	400,000	ADI	NA	3,800	J	5,000	250	QT	2,500	J	5,000	250	QT
Chromium	100	MCL, Quality Criteria, MCLG	50	5.80	J	10.0	1.40	QT	10.0	U	10.0	1.40	QT
Cobalt	2,200	NCARC_RBC	NA	6.00	J	50.0	1.30	QT	6.90	J	50.0	1.30	QT
Copper	1,000	Quality Criteria, NJPQL	NA	19.0		9.00	4.20	QT	5.50	J	9.00	4.20	QT
Iron	300	Quality Criteria	NA	6,000		100	88.0	QT	6,500		100	88.0	QT
Lead	10	NJPQL	50	3.80		3.00	2.50	QT	3.00	U	3.00	2.50	QT
Magnesium	80,500	ADI	NA	2,100	J	5,000	30.0	QT	900	J	5,000	30.0	QT
Manganese	50	Quality Criteria	NA	970		15.0	0.900	QT	83.0		15.0	0.900	QT
Molybdenum	40	HA	NA	1.00	U	1.00	0.600	QT	1.00	U	1.00	0.600	QT
Nickel	100	Quality Criteria	NA	9.10	J	40.0	2.20	QT	4.40	J	40.0	2.20	QT
Potassium	100,000	ADI	NA	1,400	J	5,000	41.0	QT	400	J	5,000	41.0	QT
Selenium	50	MCL, Quality Criteria, MCLG	10	4.80	J	5.00	4.50	QT	5.00	U	5.00	4.50	QT
Silicon	---	NA	NA	6,010		500	42.3	QT	3,110		500	42.3	QT
Sodium	50,000	Quality Criteria	NA	7,400		5,000	630	QT	1,200	J	5,000	630	QT
Strontium	4,000	HA	NA	18.0		5.00	0.280	QT	12.0		5.00	0.280	QT
Tin	22,000	NCARC_RBC	NA	2.10	J	10.0	1.40	QT	10.0	U	10.0	1.40	QT
Titanium	150,000	NCARC_RBC	NA	45.0	J	50.0	6.30	QT	50.0	U	50.0	6.30	QT
Tungsten	---	NA	NA	7.20		5.00	1.00	QT	5.40		5.00	1.00	QT
Vanadium	260	NCARC_RBC	NA	7.00	J	50.0	0.820	QT	50.0	U	50.0	0.820	QT

TABLE 5-3 (CONTINUED)
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L; Rads - pCi/L)
PICATINNY ARSENAL

Chemical	Sample ID: / Date Sampled: / Depth Sampled (ft):			Analytical Results																	
				OD-1A 01/16/02 7.36 - 15.8					OD-2A 01/16/02 4.90 - 14.5					OD-3A 01/15/02 2.09 - 13.5					OD-4A 01/15/02 3.98 - 13.95				
	LOC (a):	**Source**	**RCRA Maximum Concentration Limit (b):**	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab
Anions																							
Chloride	250,000	Quality Criteria	NA	1,000		1,000	170	QT	2,850		1,000	170	QT	2,470		1,000	170	QT	1,080		1,000	170	QT
Fluoride	2,000	Quality Criteria	NA	100	J	1,000	15.0	QT	50.0	J	1,000	15.0	QT	60.0	J	1,000	15.0	QT	40.0	J	1,000	15.0	QT
Nitrate	10,000	MCL, Quality Criteria, MCLG	NA	80.0	J	500	20.0	QT	210	J	500	20.0	QT	500	U	500	20.0	QT	500	U	500	20.0	QT
Perchlorate	18	AL	NA	5.00	U	5.00	2.00	QT	5.90		5.00	2.00	QT	5.00	U	5.00	2.00	QT	5.00		5.00	2.00	QT
Phosphorus	---	NA	NA	100	U	100	11.0	QT	100	U	100	11.0	QT	100	U	100	11.0	QT	100	U	100	11.0	QT
Sulfate	250,000	Quality Criteria	NA	8,440		1,000	380	QT	9,530		1,000	380	QT	9,510		1,000	380	QT	10,900		1,000	380	QT
Sulfide	---	NA	NA	1,000	U	1,000	920	QT	1,000	U	1,000	920	QT	1,100		1,000	920	QT	1,000	U	1,000	920	QT
Radiologicals																							

TABLE 5-3 (CONTINUED)
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L; Rads - pCi/L)
PICATINNY ARSENAL

Chemical	Sample ID: / Date Sampled: / Depth Sampled (ft):			Analytical Results									
				OD-5A 01/16/02 6.20 - 21.95					OD-6A 01/17/02 11.0 - 23.81				
	LOC (a):	Source	RCRA Maximum Concentration Limit (b):	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab
Anions													
Chloride	250,000	Quality Criteria	NA	5,230		1,000	170	QT	950	J	1,000	170	QT
Fluoride	2,000	Quality Criteria	NA	40.0	J	1,000	15.0	QT	30.0	J	1,000	15.0	QT
Nitrate	10,000	MCL, Quality Criteria, MCLG	NA	500	U	500	20.0	QT	150	J	500	20.0	QT
Perchlorate	18	AL	NA	5.00	U	5.00	2.00	QT	5.00	U	5.00	2.00	QT
Phosphorus	---	NA	NA	140		100	11.0	QT	200		100	11.0	QT
Sulfate	250,000	Quality Criteria	NA	9,170		1,000	380	QT	8,610		1,000	380	QT
Sulfide	---	NA	NA	1,000	U	1,000	920	QT	1,000	U	1,000	920	QT
Radiologicals													

(a) See the "ARARs and Other Guidance to be Considered for Picatinny Arsenal Groundwater" table for a complete list of LOC values. Groundwater samples were compared to the lower of the Federal MCLs, the New Jersey State MCLs, the New Jersey Groundwater Quality Criteria or PQLs (whichever is higher), or any non-zero Federal MCLG. If the above are not available, groundwater comparison criteria are based on the lower of the following TBC: Federal Drinking Water Health Advisories or USEPA Region III Tap Water (noncarcinogenic or carcinogenic 10^{-6}) RBCs.

(b) Maximum concentration criteria established in 40 CFR Part 264 Subpart 264.94.

Bolded and shaded values indicate the detected result is above the Level of Concern (LOC).

ADI = Allowable Daily Intake
AL = Action Level
CNSWC = Crane Naval Surface Warfare Center
HA = Federal Drinking Water Standards and Health Advisories
MCL = Federal Maximum Contaminant Level
MCLG = Federal Maximum Contaminant Level Goal
NA = No value available.
NJMCL = New Jersey State Maximum Contaminant Level
NJPQL = New Jersey State Practical Quantitation Limit

Q = Flags/Qualifiers (QA/QC):
D = Result was obtained from the analysis of a dilution.
J = Detect, value is an estimate of the concentration.
R = Rejected result, value should not be used for any purpose.
U = Non-detect, value is the detection limit.
QC = New Jersey Groundwater Quality Criteria
QT = Quanterra Laboratories, Inc.
RBC = USEPA Region III Tap Water Risk Based Concentration
RL/EQL = Reporting Limit/Estimated Quantitation Limit
SQL = Sample Quantitation Limit

TABLE 5-3 (CONTINUED)
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L; Rads - pCi/L)
PICATINNY ARSENAL

				Analytical Results																						
Sample ID:				OD-1A					OD-2A					OD-2ADUP					OD-3A					OD-4A				
Date Sampled:				04/17/02					04/16/02					04/16/02					04/16/02					04/16/02				
Depth Sampled (ft):				5.0 - 10.0					10.0 - 15.0					10.0 - 15.0					10.0 - 15.0					10.0 - 15.0				
Chemical	LOC (a):	Source	RCRA Maximum Concentration Limit (b):	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab
Volatiles																												
Pesticides																												
Explosives																												
2,2',4,4';6,6'-Hexanitrostilbene	---	NA	NA	5,400	UJ	5,400	400	CNSWC	5,400	UJ	5,400	400	CNSWC	5,400		5,400	400	CNSWC	5,400	UJ	5,400	400	CNSWC	5,400	UJ	5,400	400	CNSWC
HMX	400	HA	NA	1.10		0.500	0.100	QT	5.90	D	1.50	0.300	QT	5.30	D	1.50	0.300	QT	0.540		0.500	0.100	QT	1.90		0.500	0.100	QT
RDX	0.61	RBC	NA	2.20		0.500	0.130	QT	22.0	D	1.50	0.390	QT	21.0	D	1.50	0.390	QT	0.210	J	0.500	0.130	QT	2.40		0.500	0.130	QT
2,4,6-Trinitrotoluene	2	HA	NA	0.200	U	0.200	0.0800	QT	3.40	D	0.600	0.240	QT	0.560	JD	0.600	0.240	QT	0.200	U	0.200	0.0800	QT	0.200	U	0.200	0.0800	QT
Inorganics																												
Aluminum	200	QC, NJPQL	NA	300	J	92.0	28.0	QT	970	J	92.0	28.0	QT	250		92.0	28.0	QT	92.0	U	92.0	28.0	QT	720		92.0	28.0	QT
Barium	2,000	MCL, QC, MCLG	1,000	23.0	J	200	3.00	QT	43.0	J	200	3.00	QT	40.0	J	200	3.00	QT	6.20	J	200	3.00	QT	13.0	J	200	3.00	QT
Beryllium	4	MCL, MCLG	NA	2.00	U	2.00	0.540	QT	2.00	U	2.00	0.540	QT	2.00	U	2.00	0.540	QT	2.00	U	2.00	0.540	QT	0.560	J	2.00	0.540	QT
Boron	600	HA	NA	24.0	J	200	21.0	QT	33.0	J	200	21.0	QT	35.0	J	200	21.0	QT	34.0	J	200	21.0	QT	32.0	J	200	21.0	QT
Cadmium	4	QC	100	0.390	J	2.00	0.280	QT	0.490	J	2.00	0.280	QT	2.00	U	2.00	0.280	QT	2.00	U	2.00	0.280	QT	0.390	J	2.00	0.280	QT
Calcium	400,000	ADI	NA	3,400	J	5,000	250	QT	7,400	J	5,000	250	QT	7,100	J	5,000	250	QT	7,800	J	5,000	250	QT	6,800	J	5,000	250	QT
Chromium	100	MCL, QC, MCLG	50	10.0	UJ	10.0	1.40	QT	2.10	J	10.0	1.40	QT	10.0	UJ	10.0	1.40	QT	10.0	UJ	10.0	1.40	QT	21.0	J	10.0	1.40	QT
Cobalt	2,200	RBC	NA	50.0	UJ	50.0	1.30	QT	50.0	UJ	50.0	1.30	QT	50.0	UJ	50.0	1.30	QT	50.0	UJ	50.0	1.30	QT	1.70	J	50.0	1.30	QT
Copper	1,000	QC, NJPQL	NA	9.00	U	9.00	4.20	QT	28.0	J	9.00	4.20	QT	11.0	J	9.00	4.20	QT	9.00	U	9.00	4.20	QT	13.0		9.00	4.20	QT
Iron	300	QC	NA	140		100	88.0	QT	4,400	J	100	88.0	QT	1,400	J	100	88.0	QT	100	U	100	88.0	QT	1,500		100	88.0	QT
Lead	10	NJPQL	50	3.00	U	3.00	2.50	QT	5.10		3.00	2.50	QT	3.00	U	3.00	2.50	QT	3.00	U	3.00	2.50	QT	5.70		3.00	2.50	QT
Magnesium	80,500	ADI	NA	930	J	5,000	30.0	QT	2,400	J	5,000	30.0	QT	2,300	J	5,000	30.0	QT	1,600	J	5,000	30.0	QT	1,800	J	5,000	30.0	QT
Manganese	50	QC	NA	5.80	J	15.0	0.900	QT	110	J	15.0	0.900	QT	64.0	J	15.0	0.900	QT	1.00	J	15.0	0.900	QT	100	J	15.0	0.900	QT
Mercury	2	MCL, QC, MCLG	2.0	0.0920	U	0.0920	0.0690	QT	0.0920	U	0.0920	0.0690	QT	0.0920	U	0.0920	0.0690	QT	0.230	J	0.0920	0.0690	QT	0.370	J	0.0920	0.0690	QT
Nickel	100	QC	NA	2.50	J	40.0	2.20	QT	40.0	U	40.0	2.20	QT	40.0	U	40.0	2.20	QT	40.0	U	40.0	2.20	QT	16.0	J	40.0	2.20	QT
Potassium	100,000	ADI	NA	970	J	5,000	41.0	QT	830	J	5,000	41.0	QT	650	J	5,000	41.0	QT	550	J	5,000	41.0	QT	750	J	5,000	41.0	QT
Silicon	---	NA	NA	3,510		500	42.3	QT	4,700		500	42.0	QT	3,900		500	42.0	QT	5,100		500	42.0	QT	5,700		500	42.0	QT
Sodium	50,000	QC	NA	1,400	J	5,000	630	QT	2,100	J	5,000	630	QT	2,000	J	5,000	630	QT	2,600	J	5,000	630	QT	1,800	J	5,000	630	QT
Strontium	4,000	HA	NA	16.0		5.00	0.280	QT	21.0		5.00	0.280	QT	22.0		5.00	0.280	QT	17.0		5.00	0.280	QT	19.0		5.00	0.280	QT
Titanium	150,000	RBC	NA	50.0	U	50.0	6.30	QT	38.0	J	50.0	6.30	QT	12.0	J	50.0	6.30	QT	50.0	U	50.0	6.30	QT	40.0	J	50.0	6.30	QT
Tungsten	---	NA	NA	1.00	J	5.00	1.00	QT	5.00	U	5.00	1.00	QT	5.00	U	5.00	1.00	QT	5.00	U	5.00	1.00	QT	5.60		5.00	1.00	QT
Vanadium	260	RBC	NA	50.0	U	50.0	0.820	QT	3.20	J	50.0	0.820	QT	1.50	J	50.0	0.820	QT	1.50	J	50.0	0.820	QT	3.50	J	50.0	0.820	QT
Zinc	5,000	QC	NA	25.0	J	20.0	12.0	QT	110		20.0	12.0	QT	82.0		20.0	12.0	QT	20.0	U	20.0	12.0	QT	16.0	J	20.0	12.0	QT
Zirconium	---	NA	NA	5.00	U	5.00	1.00	QT	5.00	U	5.00	1.00	QT	5.00	U	5.00	1.00	QT	5.00	U	5.00	1.00	QT	5.00	U	5.00	1.00	QT

TABLE 5-3 (CONTINUED)
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L; Rads - pCi/L)
PICATINNY ARSENAL

Chemical	Sample ID: / Date Sampled: / Depth Sampled (ft):			Analytical Results									
				OD-5A 04/17/02 10.0 - 15.0					OD-6A 04/17/02 10.0 - 20.0				
	LOC (a):	Source	RCRA Maximum Concentration Limit (b):	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab
Volatiles													
Pesticides													
Explosives													
2,2',4,4',6,6'-Hexanitrostilbene	---	NA	NA	5,400	UJ	5,400	400	CNSWC	5,400	UJ	5,400	400	CNSWC
HMX	400	HA	NA	0.500	U	0.500	0.100	QT	0.270	J	0.500	0.100	QT
RDX	0.61	RBC	NA	0.500	U	0.500	0.130	QT	0.330	J	0.500	0.130	QT
2,4,6-Trinitrotoluene	2	HA	NA	0.200	U	0.200	0.0800	QT	0.200	U	0.200	0.0800	QT
Inorganics													
Aluminum	200	QC, NJPQL	NA	7,300	J	92.0	28.0	QT	340	J	92.0	28.0	QT
Barium	2,000	MCL, QC, MCLG	1,000	68.0	J	200	3.00	QT	40.0	J	200	3.00	QT
Beryllium	4	MCL, MCLG	NA	0.640	J	2.00	0.540	QT	0.740	J	2.00	0.540	QT
Boron	600	HA	NA	26.0	J	200	21.0	QT	25.0	J	200	21.0	QT
Cadmium	4	QC	100	0.280	J	2.00	0.280	QT	0.550	J	2.00	0.280	QT
Calcium	400,000	ADI	NA	3,200	J	5,000	250	QT	2,500	J	5,000	250	QT
Chromium	100	MCL, QC, MCLG	50	10.0	J	10.0	1.40	QT	6.00	J	10.0	1.40	QT
Cobalt	2,200	RBC	NA	7.30	J	50.0	1.30	QT	3.80	J	50.0	1.30	QT
Copper	1,000	QC, NJPQL	NA	19.0		9.00	4.20	QT	6.40	J	9.00	4.20	QT
Iron	300	QC	NA	12,700		100	88.0	QT	540		100	88.0	QT
Lead	10	NJPQL	50	5.00		3.00	2.50	QT	3.00	U	3.00	2.50	QT
Magnesium	80,500	ADI	NA	2,800	J	5,000	30.0	QT	760	J	5,000	30.0	QT
Manganese	50	QC	NA	910	J	15.0	0.900	QT	38.0	J	15.0	0.900	QT
Mercury	2	MCL, QC, MCLG	2.0	0.0920	U	0.0920	0.0690	QT	0.0920	U	0.0920	0.0690	QT
Nickel	100	QC	NA	14.0	J	40.0	2.20	QT	9.00	J	40.0	2.20	QT
Potassium	100,000	ADI	NA	2,000	J	5,000	41.0	QT	530	J	5,000	41.0	QT
Silicon	---	NA	NA	7,350		500	42.3	QT	2,850		500	42.3	QT
Sodium	50,000	QC	NA	4,100	J	5,000	630	QT	1,000	J	5,000	630	QT
Strontium	4,000	HA	NA	21.0		5.00	0.280	QT	14.0		5.00	0.280	QT
Titanium	150,000	RBC	NA	69.0		50.0	6.30	QT	50.0	U	50.0	6.30	QT
Tungsten	---	NA	NA	1.90	J	5.00	1.00	QT	1.20	J	5.00	1.00	QT
Vanadium	260	RBC	NA	11.0	J	50.0	0.820	QT	50.0	U	50.0	0.820	QT
Zinc	5,000	QC	NA	60.0	J	20.0	12.0	QT	75.0	J	20.0	12.0	QT
Zirconium	---	NA	NA	2.70	J	5.00	1.00	QT	5.00	U	5.00	1.00	QT

TABLE 5-3 (CONTINUED)
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L; Rads - pCi/L)
PICATINNY ARSENAL

Chemical	Sample ID: / Date Sampled: / Depth Sampled (ft):			Analytical Results																						
				OD-1A 04/17/02 5.0 - 10.0					OD-2A 04/16/02 10.0 - 15.0					OD-2ADUP 04/16/02 10.0 - 15.0					OD-3A 04/16/02 10.0 - 15.0					OD-4A 04/16/02 10.0 - 15.0				
	LOC (a):	Source	RCRA Maximum Concentration Limit (b):	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab
Anions																												
Chloride	250,000	QC	NA	1,000		1,000	170	QT	1,730		1,000	170	QT	1,730		1,000	170	QT	2,410		1,000	170	QT	1,180		1,000	170	QT
Fluoride	2,000	QC	NA	107	J	1,000	15.0	QT	63.2	J	1,000	15.0	QT	63.2	J	1,000	15.0	QT	65.1	J	1,000	15.0	QT	45.5	J	1,000	15.0	QT
Nitrate	10,000	MCL, QC, MCLG	NA	67.0	J	500	20.0	QT	160	J	500	20.0	QT	140	J	500	20.0	QT	71.5	J	500	20.0	QT	80.6	J	500	20.0	QT
Perchlorate	18	AL	NA	5.00	U	5.00	2.00	QT	5.20		5.00	2.00	QT	4.40	J	5.00	2.00	QT	5.00	U	5.00	2.00	QT	5.00	U	5.00	2.00	QT
Phosphorus	---	NA	NA	100	U	100	11.0	QT	120	R	100	11.0	QT	38.0	R	100	11.0	QT	19.0	R	100	11.0	QT	230	J	100	11.0	QT
Sulfate	250,000	QC	NA	8,040		1,000	380	QT	10,400		1,000	380	QT	10,300		1,000	380	QT	9,730		1,000	380	QT	10,300		1,000	380	QT
Radiologicals																												
Uranium-234	---	NA	NA	0.111	J	0.0920	0.0920	QT	0.160	J	0.150	0.150	QT	0.0170	U	0.100	0.100	QT	0.0500	U	0.130	0.130	QT	0.620	J	0.140	0.140	QT
Uranium-238	---	NA	NA	0.0650	U	0.120	0.120	QT	0.0610	U	0.170	0.170	QT	0.0930	U	0.130	0.130	QT	0.110	U	0.130	0.130	QT	1.21		0.0800	0.0800	QT

TABLE 5-3 (CONTINUED)
GORGE QUARTERLY SAMPLING
SUMMARY OF CHEMICALS DETECTED IN GROUNDWATER (µg/L; Rads - pCi/L)
PICATINNY ARSENAL

Chemical	Sample ID: / Date Sampled: / Depth Sampled (ft):			Analytical Results									
				OD-5A 04/17/02 10.0 - 15.0					OD-6A 04/17/02 10.0 - 20.0				
	LOC (a):	Source	RCRA Maximum Concentration Limit (b):	Result	Q	RL/EQL	SQL	Lab	Result	Q	RL/EQL	SQL	Lab
Anions													
Chloride	250,000	QC	NA	2,480		1,000	170	QT	1,080		1,000	170	QT
Fluoride	2,000	QC	NA	51.5	J	1,000	15.0	QT	67.6	J	1,000	15.0	QT
Nitrate	10,000	MCL, QC, MCLG	NA	500	U	500	20.0	QT	21.3	J	500	20.0	QT
Perchlorate	18	AL	NA	5.00	U	5.00	2.00	QT	5.00	U	5.00	2.00	QT
Phosphorus	---	NA	NA	180		100	11.0	QT	22.0	J	100	11.0	QT
Sulfate	250,000	QC	NA	9,270		1,000	380	QT	8,120		1,000	380	QT
Radiologicals													
Uranium-234	---	NA	NA	0.0650	J	0.0590	0.0590	QT	0.300	J	0.250	0.250	QT
Uranium-238	---	NA	NA	0.0430	U	0.0580	0.0580	QT	0.0800	U	0.200	0.200	QT

(a) See the "ARARs and Other Guidance to be Considered for Picatinny Arsenal Groundwater" table for a complete list of LOC values. Groundwater samples were compared to the lower of the Federal MCLs, the New Jersey State MCLs, the New Jersey Groundwater Quality Criteria or PQLs (whichever is higher), or any non-zero Federal MCLG. If the above are not available, groundwater comparison criteria are based on the lower of the following TBC: Federal Drinking Water Health Advisories or USEPA Region III Tap Water (noncarcinogenic or carcinogenic 10^{-6}) RBCs.

(b) Maximum concentration criteria established in 40 CFR Part 264 Subpart 264.94.

Bolded and shaded values indicate the detected result is above the Level of Concern (LOC).

ADI = Allowable Daily Intake
AL = Action Level.
CNSWC = Crane Naval Surface Warfare Center
HA = Federal Drinking Water Standards and Health Advisories
MCL = Federal Maximum Contaminant Level
MCLG = Federal Maximum Contaminant Level Goal
NA = No value available.
NJPQL = New Jersey State Practical Quantitation Limit
Q = Flags/Qualifiers (QA/QC):
D = Result was obtained from the analysis of a dilution.
J = Detect, value is an estimate of the concentration.
R = Rejected result, value should not be used for any purpose.
U = Non-detect, value is the detection limit.
QC = New Jersey Groundwater Quality Criteria
QT = Quanterra Laboratories, Inc.
RBC = USEPA Region III Tap Water Risk Based Concentration
RL/EQL = Reporting Limit/Estimated Quantitation Limit
SQL = Sample Quantitation Limit