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Annual Groundwater Monitoring Report
for
Defense Reutilization and Marketing Office (DRMO)

Naval Submarine Base - New London
Groton, Connecticut

Northern Division
Naval Facilities Engineering Command
Contract Number N62472-90-D-1298
Contract Task Order 0267

November 1999

TETRA TECH NUS, INC.

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ANNUAL GROUNDWATER MONITORING REPORT
FOR
DEFENSE REUTILIZATION AND MARKETING OFFICE (DRMO)

NAVAL SUBMARINE BASE - NEW LONDON
GROTON, CONNECTICUT

COMPREHENSIVE LONG-TERM
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1.0 INTRODUCTION

This annual groundwater monitoring report for the Defense Reutilization and Marketing Office (DRMO) at the Naval Submarine Base New London (NSB-NLON) in Groton, Connecticut, was prepared for the U.S. Department of the Navy (Navy) by Tetra Tech NUS, Inc. (TtNUS) under the Comprehensive Long-Term Environmental Action Navy (CLEAN), Contract Number N62472-90-D-1298, Contract Task Order (CTO) 0267. All field activities were performed in accordance with the approved work plan for the DRMO (B&R Environmental, 1998).

[Note: Brown & Root Environmental, Inc. (B&R Environmental), formerly Halliburton NUS, Inc. (HNUS), was purchased on January 1, 1998, and became Tetra Tech NUS, Inc. (TtNUS)].

1.1 PURPOSE

Due to elevated levels of lead, Polychlorinated Biphenyls (PCBs), and Polycyclic Aromatic Hydrocarbons (PAHs) in the soil at the DRMO, a time-critical removal action was performed by OHM Remediation Services Corporation during the course of the Phase II Remedial Investigation (B&R Environmental, March 1997). After removal of contaminated soil from the northern half of the site, an asphalt/GLC cap was installed to reduce precipitation infiltration and leaching of contaminants to the groundwater. This groundwater monitoring is part of the post-closure associated with the DRMO cap.

The purpose of this groundwater monitoring report is to present the results of four quarters of analytical data collected from monitoring wells located in the vicinity of the DRMO. The sampling was performed from April 1998 through April 1999.

The groundwater monitoring is designed to determine the effectiveness of the existing cap at the DRMO in preventing further migration of constituents to the groundwater and ultimately to the Thames River; the effectiveness of the remediation taken to eliminate health risks; whether the criteria used for evaluating the data have been met; and whether the groundwater plume interferes with any existing use of the groundwater. The ultimate goal of the monitoring program is to attain surface water protection requirements for those contaminants migrating from the site.

1.2 SCOPE AND OBJECTIVES

The objective of the groundwater monitoring is to provide the approach for long-term monitoring to evaluate the effectiveness of the cap and to confirm that contamination is not migrating through the soil, into the groundwater, and ultimately discharging to the Thames River.

To meet this objective, groundwater monitoring was conducted at ten monitoring wells. Seven existing Phase I and Phase II monitoring wells were installed during remedial investigations and three newly installed monitoring wells were installed under the monitoring program. Chemical analyses was determined based on an evaluation of site history and previous analytical results.

Five existing monitoring wells facility (6MW1S, 6MW2S, 6MW2D, 6MW3S, and 6MW3D) installed as part of the Phase I and Phase II investigations, and two newly installed monitoring wells (6MW10S and 6MW10D) were used to monitor the groundwater prior to discharge into the Thames River. Two existing wells (6MW6S and 6MW6D) and one newly installed monitoring well (6MW9S), immediately upgradient of the site, were used to establish the quality of groundwater flowing through the capped area of the DRMO site. These wells were screened to monitor shallow and deep groundwater in the overburden. The up-gradient wells were installed to establish groundwater concentrations upgradient of the DRMO cap. The downgradient wells were installed to monitor groundwater leaving the site. This groundwater monitoring was conducted to verify that significant contamination is not leaching to the groundwater from the capped area at concentrations above regulatory criteria and impacting the Thames River.

1.3 REPORT ORGANIZATION

This report consists of five sections. Section 1.0 provides a brief introduction and describes the purpose of the report. Section 1.0 also describes the scope and objectives of the report. Section 2.0 provides a site description of NSB-NLON including site characteristics. Additionally a discussion of previous investigation is included in Section 2.0. Section 3.0 provides the methodologies for performing the groundwater sampling. Section 4.0 presents the findings of the groundwater monitoring as well as a statistical analyses of the data. Finally, Section 5.0 provides conclusion and recommendations for the year one review.

2.0 BACKGROUND INFORMATION

The following sections describes the area of investigation identified as the Defense Reultilization and Marketing Office (DRMO) at the Naval Submarine Base New London (NSB-NLON).

2.1 SITE DESCRIPTION

The DRMO is located adjacent to the Thames River in the northwestern section of NSB-NLON. In the past, the southern half of the DRMO was covered with asphalt, most of which was deteriorated, while the northern portion was unpaved and had a gravel surface. The site was remediated in 1995 and an asphalt/GCL cap was constructed over a majority of the central and northern portions of the site (OHM, September 1995). Bituminous concrete pavement was then placed over the entire area of the composite cap. Currently, the DRMO is used as a storage and collection facility for items to be sold at auctions and sales held periodically throughout the year. Figure 2-1 displays the location of NSB-NLON. Figure 2-2 shows the site location within NSB-NLON, and Figure 2-3 shows the general site plan.

The DRMO was used as a major base landfill and burning ground from 1950 to 1969. The materials burned and landfilled included construction materials, combustible scrap, and other non-salvageable waste items. These materials were burned on the Thames River shoreline adjacent to the current location of the DRMO. The residue was pushed to the shoreline and partially covered.

2.2 SITE CHARACTERISTICS

2.2.1 Topography and Surface Features

The DRMO topography is illustrated in Figure 2-3. An exposed, bedrock highpoint, located to the east of the DRMO, slopes steeply to the west towards the site. The ground surface within the DRMO site boundaries gently slopes westward from an elevation of 8 feet mean sea level (msl) along the eastern boundary of the site to 4 feet msl at the Thames River. The land is relatively flat, low lying and prone to flooding by the Thames River.

A cap was installed during a Time-Critical Removal Action (see Section 2.3.4) and this area, as well as the remaining portion of the DRMO, was upgraded via placement of an asphalt layer. Buildings 479, 355 and 491 are located within the paved area.

2.2.2 Surface Water Features

All surface runoff from the site flows to the Thames River which is located along the western edge of the DRMO. Two storm sewer systems located along the southern boundary of the site transfer runoff from the eastern side of the Providence and Worcester Railroad to the Thames River (Atlantic, August 1992).

2.2.3 Soil Characteristics

The SCS Soils Map (SCS, 1983) classifies the soil at the DRMO as Udorthents-Urban land complex. This classification is defined as being excessively drained to moderately drained soil that has been disturbed by cutting and filling.

To the north of the site, the soil is classified as the Hinkley Loam. This soil is found on stream terraces and outwash plains and consists of a dark, gravely sand loam. Native materials at the DRMO were most likely of this type.

Northwest and upslope of the site, along the exposed bedrock highpoint, the soil is classified as Hollis-Charlton-Rock complex. This classification is defined as being stones and boulders intermingled with a dark, fine, sandy loam. Bedrock outcrops are prevalent.

2.2.4 Geology

Geologic conditions at the DRMO consist of a westward-thickening wedge of overburden materials (fill and natural deposits) overlying fractured metamorphic bedrock. The DRMO is underlain by an upper layer of 2 to 20 feet of fill material. The fill consists primarily of sand and gravel but also contains metal and wood. The fill is thickest along the Thames River and becomes thinner to the east of the site. There was no evidence of fill in areas located in southeast corner of site or the 6MW6 well cluster (offsite) (B&R Environmental, March 1997).

In most cases, the fill is underlain by clayey silt, which thickens from 2 feet along the eastern portion of the DRMO to a maximum observed thickness of 46 feet along the Thames River. The silt layer is underlain by sand and gravel, except at 6MW2D where the silt lies directly on bedrock. Upslope of the DRMO at the 6MW5 and 6MW6 well clusters, the clayey silt is missing and 20 feet of sand and gravel rest on bedrock. The coarse-grained natural overburden materials are generally mapped as terrace deposits along the Thames River (USGS, 1960). These terrace deposits are stratified drift of former glacial meltwater streams. At the DRMO, the coarse-grained terrace deposits are overlain by the clayey silt, which are finer-grained river bottom sediments (B&R Environmental, March 1997).

Bedrock in the northern portion of the DRMO has been mapped as the Granite Gneiss. Bedrock in the southern portion of the DRMO has been mapped as the Mamacoke Formation (USGS, 1967). These mapped formations were detected during drilling: the Granite Gneiss was encountered at 6MW5D and the Mamacoke Formation was encountered at 6MW6D. The Westerly Granite has been mapped along the eastern portion of the site, but it was not detected during drilling (Phase I RI). A bedrock high exists to the east of the DRMO and is an extension of the large bedrock high that borders the north part of NSB-NLON. The bedrock at the DRMO slopes westward toward the Thames River. The slope of the bedrock surface across the DRMO is approximately 25 percent (B&R Environmental, March 1997).

2.2.5 Hydrogeology

Groundwater is present within the overburden and bedrock underlying the DRMO. The water table is generally encountered within the fill materials at the site (between 2.5 and 10.5 feet below ground surface), with the underlying clayey silt and terrace deposits under saturated conditions. Based on the expected relative permeability of these three units (the coarse-grained fill and terrace deposits are expected to be significantly more permeable than the intervening clayey silt layer), the three deposits are considered to be separate hydrostratigraphic units. The clayey silt may function as an aquitard relative to the overlying and underlying coarser grained units.

Groundwater flow is generally from east to west, following topographic and bedrock surface slope to the Thames River. The Thames River is tidally influenced with a mean tidal range at NSB-NLON of 2.2 feet, which creates reversals in groundwater flow directions and causes water levels to fluctuate. Based on a tidal study conducted as part of an Action Memorandum for Building 31 at the Lower Base, monitoring well water levels at a distance of approximately 100 feet from the Thames River were noted to fluctuate by 1.19 feet. Due to the proximity of the site to the river, and the demonstrated influence of tides on groundwater levels near the river at the Lower Base, it is expected that tidal fluctuations of the river locally affect groundwater levels, at least in the western portion of the DRMO.

During low tide, the hydraulic gradient of the groundwater table at NSB-NLON is towards the Thames River and will result in the highest discharge rate of groundwater to the river. During high tide, the hydraulic gradient of the groundwater is reversed and flow occurs from the river to the site, temporarily halting the discharge of groundwater from the base to the river (B&R Environmental, March 1997).

Since the underlying clayey silt layer likely acts to minimize groundwater impacts from the DRMO to the deep river bottom and alluvial deposits, the groundwater flux from the DRMO to the river was calculated from the fill only. The average hydraulic conductivity of the fill materials was calculated by taking the geometric mean of DRMO-specific hydraulic conductivities (both Phase I RI and Phase II RI) for two wells completed within the fill materials. Hydraulic conductivities from Phase I RI well 6MW2S (70 ft/day) and

from Phase II RI well 6MW7S (1.9 ft/day), were used for this calculation. The average hydraulic conductivity calculated for the fill material is 11.5 feet/day. Using Darcy's equation, the associated hydraulic discharge rate was calculated to be 1,666 cubic feet/day The actual discharge rate is likely to be substantially lower than this calculated rate, as tidal effects were not considered. During periods of high tide, groundwater discharge to the river is expected to be halted as gradients reverse and the river recharges the groundwater.

The groundwater is classified as GB. This classification applies to groundwater within a historically highly urbanized area or an area of intense industrial activity and where public water supply service is available. Such groundwater may not be suitable for human consumption without treatment due to waste discharges, spills, or leaks of chemicals or land use impacts.

2.3 PREVIOUS INVESTIGATIONS

2.3.1 Phase I Remedial Investigation

The Phase I RI at this site included test borings and monitoring well installation, as well as, soil, surface water, and groundwater sampling. Twelve shallow subsurface (less than 2 feet deep) soil samples plus one field duplicate and 12 subsurface (greater than 2 feet deep) soil samples plus one field duplicate were collected from seven test borings and five monitoring well borings. Four surface soil samples (two composite and two grab samples) plus one field duplicate were collected and analyzed. Six groundwater samples plus one field duplicate were collected from five shallow wells and one deep well. Additionally, one surface water sample was collected from the Thames River at the north end of this site (B&R Environmental, March 1997). The soil samples were analyzed for Target Compound List (TCL) Volatile Organic Compounds (VOCs). Semivolatile Organic Compounds (SVOCs), pesticides and Polychlorinated Biphenyls (PCBs); Target Analyte List (TAL) metals; and Toxicity Characteristics Leaching Procedure (TCLP) metals. The groundwater and surface water samples were analyzed for TCL VOCs , SVOCs, pesticides and PCBs; TAL metals; and radiological analyses.

Concentrations of VOCs in the soil were generally low. However, the following VOCs were found in 6TB4 (6-8 feet): vinyl chloride detected at 1,300 µg/kg, trichloroethene detected at 20,000 µg/kg, and tetrachloroethene detected at 210 µg/kg. SVOCs were present in most soil samples collected in the former landfill area. They were predominately comprised of PAHs, many of which were detected at elevated levels (maximum of 931,000 µg/kg). A PCB, Aroclor 1260, was detected at almost all soil sample locations with concentrations ranging from 52 µg/kg to 12,000 µg/kg. Pesticides were detected in one soil sample at elevated concentrations. The total pesticide concentration was 57,800 µg/kg, consisting of 4,4' DDT, 4,4' DDD, and 4,4' DDE.

Out of the 24 soil samples analyzed for TCLP metals, 21 contained one or more metals exceeding "To Be Considered" values (TBCs). TBC values were exceeded for barium, cadmium, chromium, lead, mercury and silver. TCLP values for lead ranged from 6.2 to 52 milligrams per liter (mg/L) at three locations (Atlantic, August 1992), which exceeded the hazardous waste characteristic value of 5 mg/L.

Trichloroethene and 1,2-dichloroethene were present in three downgradient wells (6MW2S, 6MW3S, and 6MW4S). No SVOCs (including polcyclic aromatic hydrocarbons {PAHs}), pesticides, petroleum hydrocarbons, or PCBs were detected in any wells at the DRMO site. Low levels of phthalates and benzoic acid were detected in the upgradient well 6MW5D. The inorganic groundwater analysis results indicated that selenium exceeded the primary drinking water standards at wells 6MW2S, 6MW3S, and 6MW4S (Atlantic, August 1992).

No VOCs, SVOCs, pesticides, or PCBs were detected in the upgradient surface water sample. Comparison of the inorganic results for this sample with the downgradient water sample (Goss Cove) did not suggest any detectable impact on the Thames River from NSB-NLON based on this limited data set (Atlantic, August 1992).

2.3.2 Draft Focused Feasibility Study Field Investigation

A field investigation in support of the draft Focused Feasibility Study (FFS) was performed at the DRMO site in October 1993 to better define the extent of soil contamination. Split-spoon samples were collected from 17 borings. One or more samples were collected from each boring based on visual evidence of contamination, field-measured organic vapor readings, and field-measured lead contamination (using X-Ray Fluorescence). Twelve surface (less than 2 feet deep) soil samples and twelve subsurface (greater than 2 feet deep) soil samples were collected. One surface and two subsurface field duplicates were also collected. The samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs; TAL metals; dioxins; and TCLP VOCs SVOCs, pesticides, and metals. One of the borings was completed as a monitoring well (B&R Environmental, March 1997).

The highest concentrations of VOCs were present in soil samples 6TB17, 6TB19, and 6TB16 where values ranged from 9,600 to 4,840 µg/kg for total VOCs. The TBC value was exceeded for trichloroethene at two locations where values were reported at 3,900 and 40 µg/kg. The TBC value for 1,2-dichloroethane was exceeded at 6TB20 (79 µg/kg) and toluene at 6TB19 (2,900 µg/kg). SVOCs, predominately PAHs with concentrations ranging from non-detected to 931,000 µg/kg, were detected in soil across the site. PCBs (Aroclor 1254, Aroclor 1260, and Aroclor 1242) were detected at nearly all boring locations at low to high concentrations, ranging from 76 to 34,700 µg/kg. Pesticides (4,4' DDE, 4,4' DDD, 4,4' DDT) were detected at many locations across the site, primarily at low concentrations; however, several locations were found to have elevated levels. Inorganic compound levels were above

background at all locations. Of primary concern at the site, were the levels of lead, which ranged from 5.7 to 12,400 µg/kg.

Two soil samples were collected and analyzed for full TCLP parameters. There were no SVOCs, or pesticides values above the Connecticut Department of Environmental Protection (CTDEP) TBC values. Cadmium and 1,2-dichloroethane were detected in one sample above TCLP TBC values at concentrations of 0.028 and 10 micrograms per liter (µg/L), respectively. Both samples contained lead above the TCLP TBC value at concentrations of 904 and 525 µg/L (Atlantic, March 1995).

2.3.3 Phase II Remedial Investigation

Five new groundwater monitoring wells (two shallow and three deep) were installed and sampled during the Phase II RI. Additionally, four previously installed shallow wells were sampled. Two rounds of groundwater sampling were completed and ten samples (including one field duplicate sample) were collected during each sampling round. Three subsurface soil samples were collected during the installation of three of the new wells. The soil samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs and TAL metals. The groundwater samples were analyzed for TCL VOCs, SVOCs, and TAL metals (B&R Environmental, March 1997).

Relatively high concentrations of multiple organic and inorganic compounds were detected in the soil matrix at the DRMO. Organic chemicals detected at high concentrations include various halogenated aliphatic compounds, PAHs, phthalate esters, Aroclor-1254, and Aroclor-1260. The maximum observed concentration of the water insoluble organic compounds in groundwater was bis(2-ethylhexyl)phthalate at 20 µg/L (B&R Environmental, March 1997).

In spite of the fact that relatively high concentrations of some VOCs were detected in the subsurface soil, it does not appear that substantial impact on the groundwater has occurred to date. For example, although halogenated organic compounds such as 1,2-dichloroethene and trichloroethene were detected in soil samples at concentrations up to 16,000 µg/kg and 7,100 µg/kg, respectively, no evidence of substantial impact on groundwater quality has been noted. The maximum concentration of a halogenated organic compound in groundwater samples was 8 µg/L (1,2-dichloroethene and trichloroethene) (B&R Environmental, March 1997).

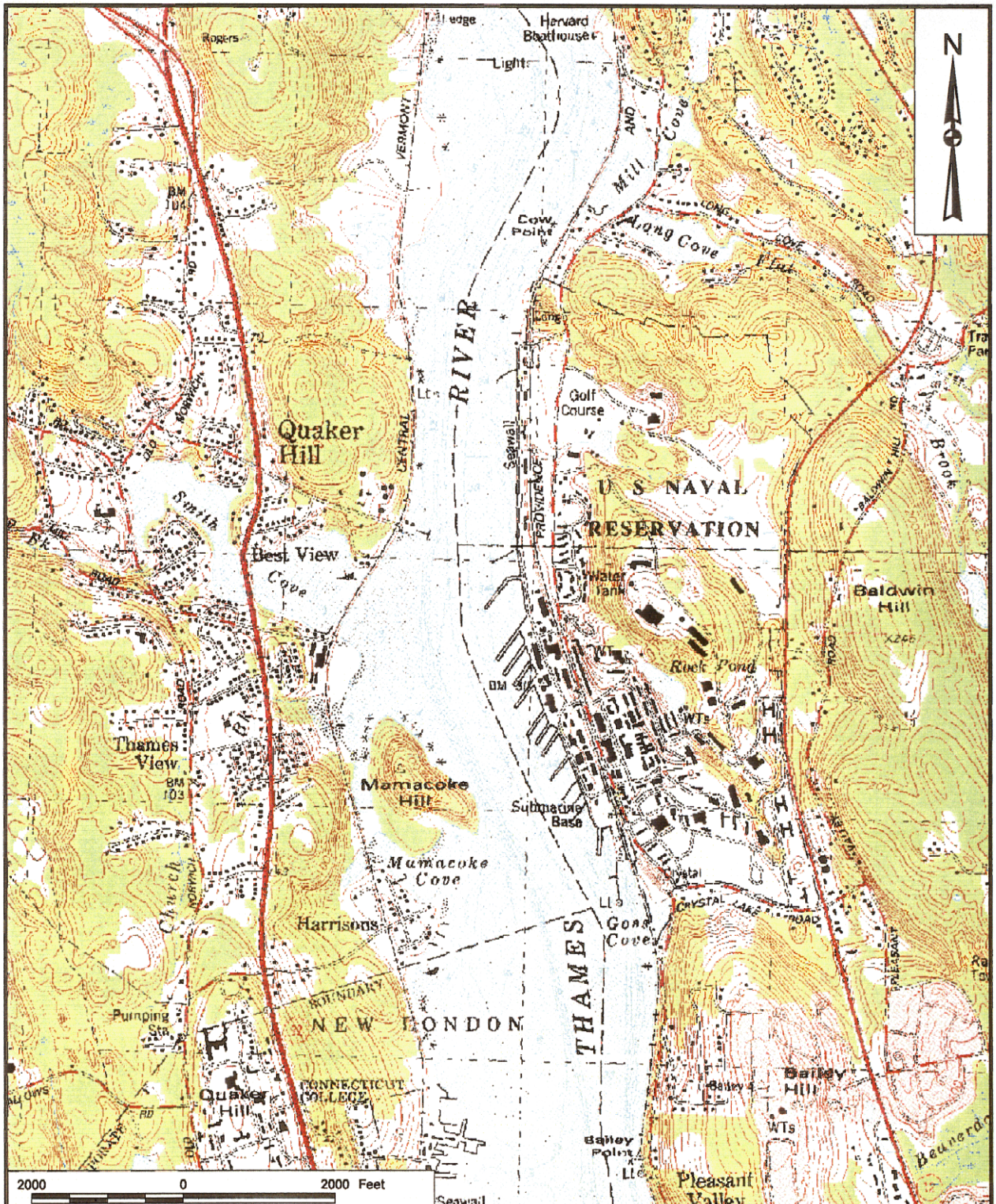
In addition to the various organic chemicals detected in soil at the DRMO, concentrations of lead still remained in soil after the Time-Critical Removal Action was conducted. Maximum concentrations of lead in surface and subsurface soil were 4,980 mg/kg and 2,140 mg/kg, respectively. In spite of the lead concentrations in soil, only limited evidence of lead migration to the water table is evidenced by the groundwater analytical results. Although lead was detected as high as 52.7 µg/L in one unfiltered

sample, lead concentrations in filtered groundwater samples ranged no higher than 2.4 µg/L. Furthermore, the cap will effectively minimize precipitation infiltration to the groundwater (B&R Environmental, March 1997).

2.3.4 Time-Critical Removal Action

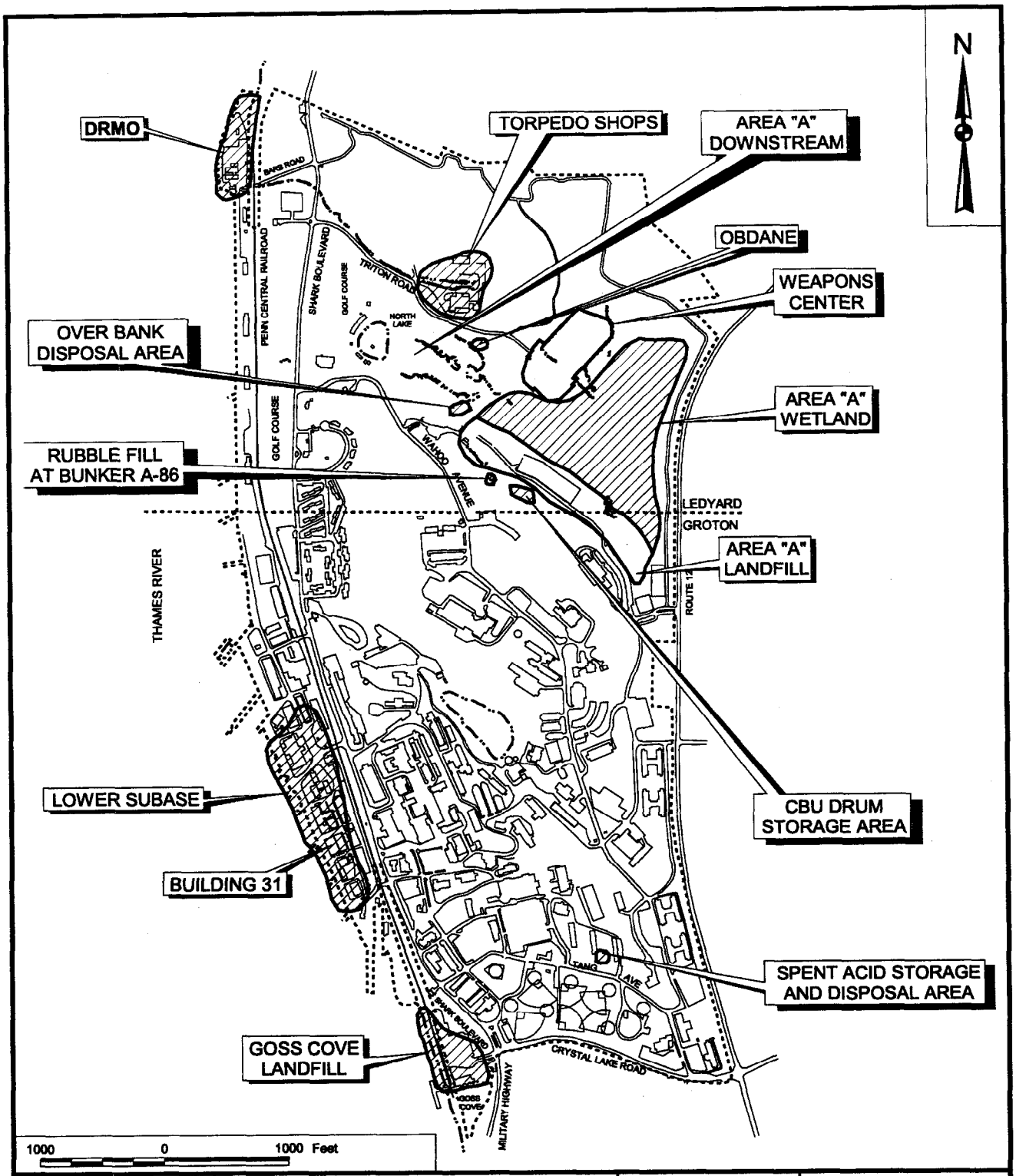
A Time-Critical Removal Action was performed at the DRMO by OHM Remediation Services Corporation during the course of the Phase II RI. Construction aspects of the removal action were completed in January 1995. The removal action focused on the removal of soil contaminated with lead, PAHs, and PCBs from the northern half of the DRMO. The excavation extended to a maximum depth of approximately 3 feet below the ground surface or to the water table. Approximately 4,700 tons of soils were excavated and transported to a RCRA landfill located in Grand View, Idaho. Additionally, a steel-walled spent-acid-storage tank was excavated, cut into manageable pieces, and disposed of offsite with the contaminated soil.

After the completion of removal activities, the excavated area was backfilled with clean borrow material from an offsite location. A cap consisting of a woven geotextile liner, a geosynthetic clay liner, and a nonwoven geotextile liner was installed. Approximately 12 inches of crushed stone and 3 inches of asphalt were placed over the clay/geotextile cover. The remaining (paved) portion of the DRMO was also upgraded via placement of an asphalt layer.



DRAWN BY	DATE	Tetra Tech NUS, Inc.	CONTRACT NUMBER	OWNER NO.
J. BELLONE	10/1/99		7363	
CHECKED BY	DATE	LOCATION MAP NSB - NLON GROTON, CONNECTICUT	APPROVED BY	DATE
MLM	10/20/99		Mark L. Mungel	10/20/99
COST/SCHEDULE-AREA			APPROVED BY	DATE
			—	—
SCALE			DRAWING NO.	REV
AS NOTED			FIGURE 2-1	0

P:\GIS\NLON\7363ANNUAL.APR 10/1/99 JCB LOCATION MAP LAYOUT



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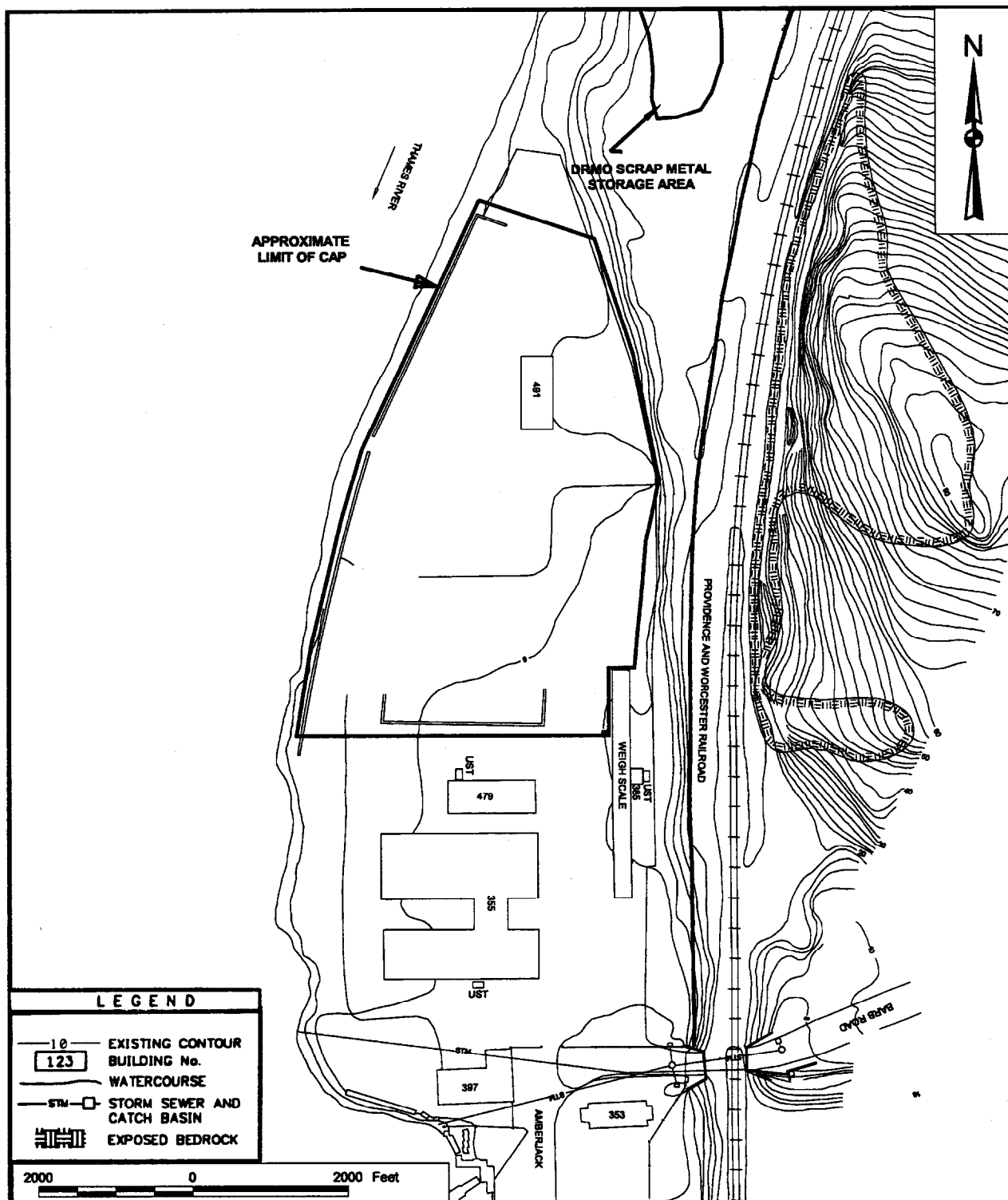
CHECKED BY MLM	DATE 10/20/99	SITE MAP NSB NLON GROTON, CONNECTICUT	APPROVED BY Mark L Mengel / DATE 10/20/99
COST/SCHEDULE-AREA			APPROVED BY — / DATE —
SCALE AS NOTED			DRAWING NO. FIGURE 2-2 / REV 0

P:\GIS\NLON\7363ANNUAL.APR 10/3/99 JCB SITE MAP LAYOUT



DRAWN BY	DATE	Tetra Tech NUS, Inc.	CONTRACT NUMBER	OWNER NO.
J. BELLONE	10/1/99		7363	
CHECKED BY	DATE	DRMO SITE PLAN NSB - NLON GROTON, CONNECTICUT	APPROVED BY	DATE
MLM	10/20/99		Mark K. Mengel	10/20/99
COST/SCHEDULE-AREA			APPROVED BY	DATE
			—	—
SCALE			DRAWING NO.	REV
AS NOTED			FIGURE 2-3	0

P:\GIS\NLON\7363ANNUAL.APR 10/1/99 JCB DRMO SITE PLAN LAYOUT

3.0 FIELD ACTIVITIES

This section provides a discussion of the sampling procedures used to conduct the groundwater monitoring, as well as a discussion and presentation of the physical data collected during the sampling.

3.1 SAMPLING LOCATIONS AND ANALYTICAL METHODS

Ten monitoring wells as described in the Groundwater Monitoring Plan for the DRMO (B&R Environmental, 1998) were designated to be sampled during the groundwater monitoring program. Monitoring wells were sampled during the initial year in April 1998, August 1998, January 1999, and April 1999. Monitoring well locations are shown on Figure 3-1. Three of the monitoring wells were damaged between the time of installation and the initial sampling round and were therefore not sampled until the second round. Well 6MW9S was repaired, while 6MW3S and 6MW3D were damaged beyond repair and replaced with 6MW11S and 6MW11D. Monitoring well construction details are shown on Table 3-1.

Each of the monitoring well samples were analyzed for Target Compound List (TCL) organics and Target Analyte List (TAL) inorganics. Monitoring focused on the following organic and inorganic Contaminants of Potential Concern (COPCs), as identified in the Groundwater Monitoring work plan (B&R Environmental, 1998):

- 1,1,2,2-Tetrachloroethane
- 1,2-Dichloroethane
- 1,2-Dichloroethene (total)
- Trichloroethene
- Vinyl Chloride
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Benzoic Acid
- Bis(2-ethylhexyl)phthalate
- Fluoranthene
- Fluorene
- Naphthalene
- Phenantrene
- Pyrene
- Heptachlor Epoxide
- Aroclors 1254 & 1260
- Hexachlorobiphenyl
- 4,4'-DDD
- Arsenic
- Barium
- Cadmium
- Chromium
- Copper
- Lead
- Silver
- Zinc

The contaminants were previously detected in soil either at concentrations that could result in exceedances of site specific Surface Water Protection Criteria (SWPCs) or at concentrations that exceed Connecticut's Pollutant Mobility Criteria for GB groundwater.

3.2 SAMPLE COLLECTION PROCEDURES

Ten monitoring wells were to be sampled during each of the four sampling rounds using low-flow purging and sampling techniques, in accordance with the Tetra Tech NUS SOP SA-1.1 (Groundwater Sample Acquisition) and the USEPA region I Low- Flow Purging and Sampling Procedure (GW-001). Low-flow purging and sampling was implemented because this method provides the least disturbance to the surrounding formation (less turbulence while purging and sampling and hence lower turbidity), allowing for a more representative sample to be obtained.

Prior to purging, during and before obtaining groundwater samples, water levels were measured using an electronic water-level indicator (M-Scope) capable of 0.01-foot accuracy. Water levels were monitored and recorded every 5 minutes during the purging. Each of the monitoring wells were purged prior to sampling using dedicated bladder pumps and dedicated teflon or teflon-lined polyethylene tubing with bottled nitrogen gas as the air source. Each pump was installed so that the pump intake was placed at the midpoint of the low tide saturated well screen and if possible, no less than 2 feet above the bottom of the well so as to not disturb any sediment located near the bottom of the well.

During the purging, water quality parameters (pH, specific conductivity, temperature, dissolved oxygen, salinity, and Eh) were measured every 5 minutes using a QED FC4000 Water Analyzer equipped with a flow-through cell. Water quality parameters were measured until all of the parameters had stabilized and the minimum purge volume was removed (stabilized purge volume plus the extraction tubing volume). Turbidity was also measured using a Lamotte 2020 Turbidimeter. Water quality parameters obtained at the time of sample collection for each of the sampling rounds are shown on sample logs sheets in Appendix A.

Stabilization of the above parameters is defined as follows:

- pH $\pm$ standard units
- Turbidity $\pm$ 10 percent for the value greater than 1 NTU
- Specific conductance $\pm$ 3 percent
- Temperature $\pm$ 3 percent
- EH $\pm$ 10 millivolts
- Dissolved oxygen $\pm$ 10 percent

Calibration and standards checks were conducted on the flow-through cell in accordance with the manufacturers' requirements. The cell was cleaned at each well prior to purging and during purging, as necessary (e.g., when fluctuating turbidity readings were observed and confirmed by collection of a

turbidity sample before the cell for comparison). A "tee" connector with a valve was inserted into the pump's discharge tubing prior to the cell for collection of a turbidity sample. If the cell required cleaning during purging activities, pumping continued and the cell was disconnected for cleaning. When completed, the cell was reconnected and monitoring activities continued. The cell was cleaned by thoroughly rinsing with deionized water.

Precautions were taken to prevent air entrapment and/or air leaks in the purging system so that potential problems with stabilizing dissolved oxygen were minimized. Precautions included: 1) taking care to fill the entire cell with water while minimizing air entrapment, prior to initiating purging and 2) maintaining a full cell of water by pinching the discharge line shut and elevating the discharge at the end of the tubing from the pump, above the cell. After purging was complete, the flow-through cell was disconnected and samples were collected directly from the pump discharge.

Purge water was containerized, labeled, and turned over to NSB-NLON for disposal.

All sample containers were filled by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence. Samples analyzed for volatile constituents were collected first and immediately sealed in a pre-preserved container so that no head space existed. For filtered inorganic samples, an in-line 0.45 micron filter was used. The filter was pre-rinsed with approximately 400 ml of deionized water and attached to the discharge end of the pump tubing.

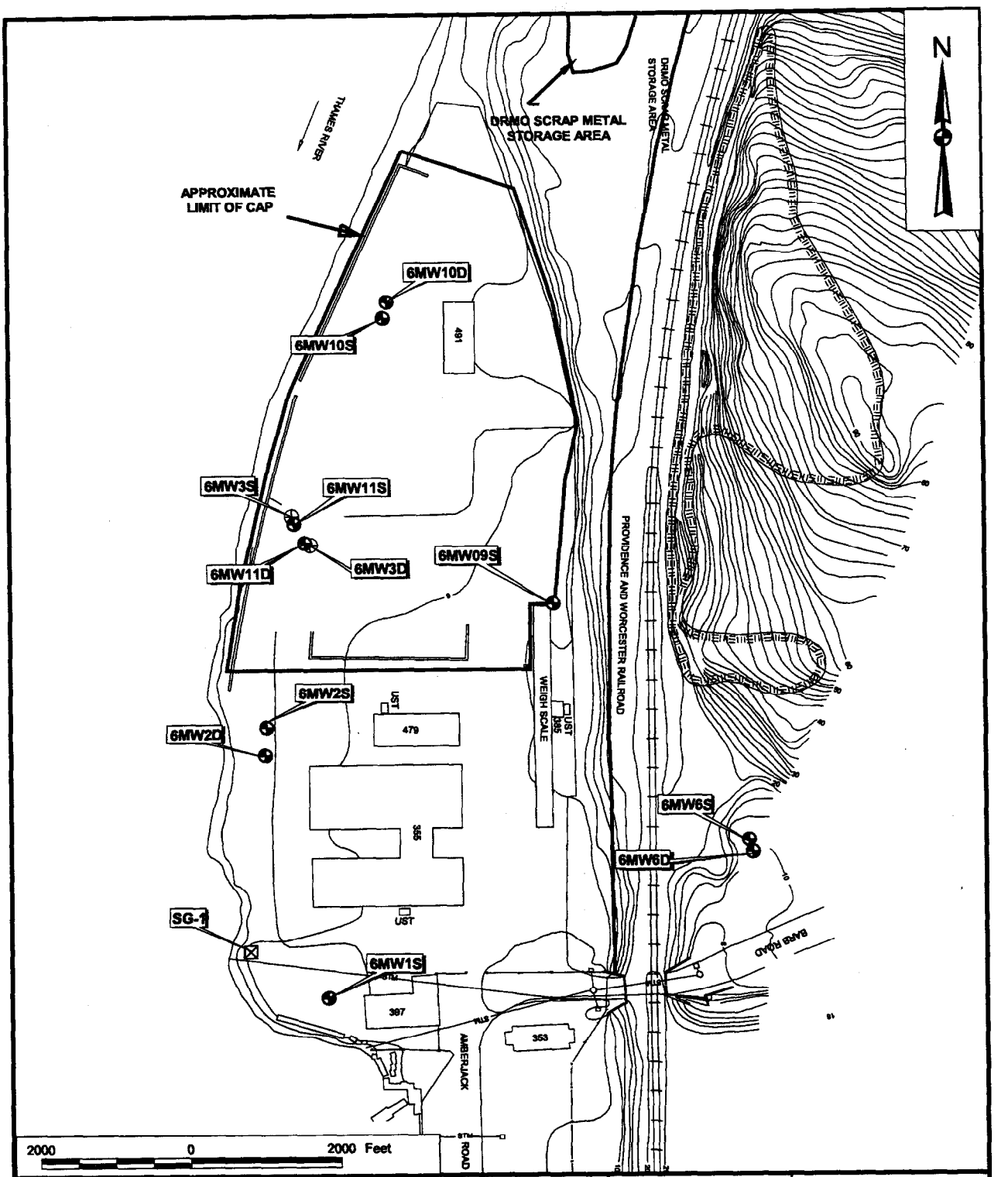
TABLE 3-1

MONITORING WELL CONSTRUCTION DETAILS
NSB-NLON, GROTON, CONNECTICUT

Well I.D.	Material of Construction	Top of Riser Elevation (ft)	Top/Bottom of Screen (ft. BGS)	Screened Formation[a]	Total Depth (ft BGS)	Depth to Bedrock (ft BGS)
6MW1S	PVC	8.63	4.0-14.0	Shallow OB	14.0	NA
6MW2S	PVC	7.30	3.0-13.0	Shallow OB	13.0	NA
6MW2D	PVC	7.85	77.0-87.0	Deep OB	88.5	88.5
6MW6S	PVC	12.16	6.0-16.0	Shallow OB	16.0	NA
6MW6D	PVC	12.50	28.0	Bedrock	42.0	22.0
6MW9S	PVC	7.52	4.0-12.0	Shallow OB	12.0	NA
6MW10S	PVC	5.19	4.0-14.0	Shallow OB	14.0	NA
6MW10D	PVC	5.01	43.4-53.4	Deep OB	53.4	59.0
6MW11S	PVC	4.92	3.5-13.5	Shallow OB	14.0	NA
6MW11D	PVC	5.31	75.0-85.0	Deep OB	85.0	85.0

a OB = Overburden

Notes:
Reference elevation is top of well casing (1982 Base Traverse System).
BGS means below ground surface.
NA means information is not available.



DRAWN BY J. BELLONE	DATE 10/1/99	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7363 / OWNER NO.
CHECKED BY MLM	DATE 10/20/99	DRMO MONITORING WELLS NSB - NLON GROTON, CONNECTICUT	APPROVED BY Mark L. Mengel DATE 10/20/99
COST/SCHEDULE-AREA			APPROVED BY — DATE —
SCALE AS NOTED			DRAWING NO. FIGURE 3-1 / REV 0

P:\GIS\NLON\7363ANNUAL.APR 10/1/99 JCB DRMO MONITORING WELLS LAYOUT

4.0 DATA EVALUATION

This section presents a discussion of the analytical data and hydrogeological data obtained during groundwater monitoring activities performed at the DRMO from April 1998 through April 1999. This section also presents a statistical analysis of the data as described within the groundwater monitoring work plan.

4.1 EXTENT OF CONTAMINATION

As described in the Groundwater Monitoring Plan (B&R Environmental, 1998), the Connecticut Remediation Standard Regulations (RSRs) require that all groundwater plumes be remediated to attain either a.) the Surface Water Protection Criteria (SWPCs) and the Volatilization Criteria, or b.) the background concentration for each substance in the plume (CTDEP, December 1995). Accordingly, the primary monitoring criteria used to evaluate the analytical data included the site-specific SWPCs developed for the DRMO (B&R Environmental, September 1997) as well as the standard SWPCs and Volatilization Criteria promulgated by the CTDEP. In addition, the groundwater analytical results were compared to secondary monitoring criteria consisting of the Federal Ambient Water Quality Criteria (AWQCs) and the Connecticut Water Quality Standards (WQSs) developed for chronic (long-term) exposure of aquatic receptors in saltwater. Finally, the results were compared to the Federal and State human health criteria for consumption of organisms since recreational fishing may occur in the Thames River. Since the Thames River is not a source of drinking water, no human health criteria for the ingestion of water was used.

Four rounds of groundwater samples were collected from each monitoring well as part of the initial evaluation. Monitoring wells 6MW9S, 6MW11S and 6MW11D were only sampled three times as these wells were damaged prior to the initial sampling round and had to be repaired or replaced. Additionally, four duplicate samples were collected as noted in the analytical summary tables. The data discussion will be limited to only those compounds designated as contaminants of potential concern as stated in Section 3.0.

A summary of analytical results is shown on Table 4-1. The primary screening criteria used for data evaluation was the site-specific SWPCs using a dilution factor of 100. No Volatile Organics Compounds (VOCs) were detected in any samples in excess of the primary screening criteria (SWPCs) during any of the sampling rounds. Additionally, VOCs were not detected in excess of any secondary screening criteria.

The results of Semivolatile Organic Compound (SVOC) analyses indicated no SVOCs were detected in any samples in excess of the primary screening criteria (SWPCs) during any of the sampling rounds. Bis(2-ethylhexyl)phthalate (BEHP) was detected in excess of secondary monitoring criteria in six of 41 samples at concentrations ranging from 7 to 130 µg/l. BEHP was detected two times each in monitoring wells 6MW1S (rounds 3 and 4) and 6MW2D (rounds 1 and 4) and once each in 6MW6D and 6MW11D during round 2. Polycylic aromatic hydrocarbons (PAHs), benzo(a)anthracene, benzo(a)pyrene, benzo(k)fluoranthene, and benzo(b)fluoranthene were detected in two of 41 samples (6MW10S in round 1 and 6MW2S in round 4). Benzo(b)fluoranthene was also detected in 6MW2D during round 2 in excess of the secondary monitoring criteria. No other SVOCs were detected in excess of any of the secondary monitoring criteria.

Arochlor 1260 was detected in the sample from well 6MW9S in round 3 at a concentration of 0.23 µg/l . This concentration exceeded the secondary monitoring criteria. No other positive results were reported for any pesticides/PCBs.

The results of metals analyses indicated positive results for arsenic, barium, chromium, copper, lead, silver and zinc in some of the total and dissolved metals samples. None of the positive results exceeded the primary screening criteria (SWPCs). Concentrations of arsenic (7 of 41 samples), copper (12 of 41 samples), silver (4 of 41 samples) and zinc (7 of 41 samples) were detected in excess of the secondary monitoring criteria. Arsenic was detected once in monitoring well 6MW2D (round 1), 6MW2S (round 3), 6MW9S (round 4), 6MW10S (round 1) and 6MW11S (round 4), and twice in well 6MW10D (round 1 and 3) at concentrations ranging from 2.4 µg/l to 15.9 µg/l. Copper was detected in rounds 1 and 4 in wells 6MW2D, 6MW2S, 6MW10S, and 6MW10D; and in round 4 in wells 6MW6D, 6MW9S and 6MW11S at concentrations ranging from 1.2 µg/l to 7.7 µg/l. Silver was detected in well 6MW1S in round 1 and in well 6MW2S, 6MW10D, and 6MW11D in round 4 at concentrations ranging from 2.0 µg/l to 5.5 µg/l. Zinc was detected in well 6MW2S, 6MW6D, and 6MW6S during round 1 and in 6MW10D during round 1, 3, and 4, at concentrations ranging from 53.3 µg/l to 513 µg/l. No other positive results exceeded any primary or secondary monitoring criteria. It should be noted that some of the positive results for metals were detected in the dissolved phase at slightly higher concentrations than in the total phase. This may be attributable to laboratory instrumentation fluctuation near the instrument detection limit. Figure 4-1 depicts the secondary monitoring criteria exceedances.

4.2 HYDROLOGIC EVALUATION

Static groundwater levels were measured during each of the four quarterly rounds of groundwater sampling. Groundwater levels were measured approximately one hour before the low tide based upon data aquired from the National Oceanic and Atmospheric Administration (NOAA) on April 20, 1998; July 28, 1998; January 25, 1999; and April 20, 1999. Groundwater levels were also measured at high tide

during the second (July 27, 1998) and fourth (April 19, 1999) quarterly sampling rounds. Potentiometric surface maps were prepared for each round of water level measurements and are depicted on Figures 4-2 through 4-7. The contours were drawn from the groundwater elevations of the shallow overburden monitoring wells (6MW1S, 6MW2S, 6MW3S, 6MW6S, 6MW9S, and 6MW10S).

Groundwater flow directions essentially mimic the ground surface contours. A comparison of these maps illustrate that groundwater flow patterns are similar throughout the year. Potentiometric surface maps prepared during times of low tide conditions were generally similar and indicate a westerly flow direction toward the Thames River. Potentiometric surface maps prepared during times of high tide illustrate similar flow patterns toward the Thames River. A slight reverse gradient is shown on Figure 4-6, likely because the tide rises faster than the opposing hydraulic gradient can respond. A comparison of groundwater elevations is summarized on Table 4-2.

4.3 STATISTICAL ANALYSIS

A statistical analysis was performed on the results from the groundwater monitoring effort to determine if contaminants associated with past activities at the DRMO are having an impact on groundwater at the site. This groundwater monitoring program employed three upgradient wells (6MW6S, 6MW6D, and 6MW9S) and seven downgradient wells (6MW1S, 6MW2S, 6MW2D, 6MW3S, 6MW3D, 6MW10S, and 6MW10D) sampled over four quarters.

The specific tests performed on data collected at the NSB New London DRMO site is identified and described in the next section.

The statistical methods proposed to evaluate the groundwater data are employed in order to:

- Develop summary statistics (e.g., range, mean, standard deviation) that describe environmental contaminant concentrations at the DRMO found in Appendix B.

- Allow comparisons of upgradient concentrations to those detected in site environmental samples (i.e., samples collected in areas potentially contaminated by waste disposal) at the DRMO.

4.3.1 Comparison of Downgradient Wells to Upgradient Wells

Figure 4-8 is a flow diagram taken from the Groundwater Monitoring Work Plan (B&R Environmental 1998) of the approach used to compare the downgradient data to the data collected from the upgradient wells. Downgradient data was compared to upgradient data using either parametric or non-parametric analysis. No correction for seasonal variability was required since all wells at the facility should be

effected similarly. The statistical methods described in the following paragraphs were used to determine if parameter concentrations detected in downgradient wells are significantly different, statistically speaking, from those detected in samples from the upgradient wells.

The Analysis of Variance, (ANOVA) technique was the basic approach used to compare data from upgradient and downgradient monitoring well locations. The ANOVA technique is used to test whether there is statistically significant evidence of contamination. There are two types of ANOVA tests: parametric and non-parametric. Parametric ANOVA tests, the method used here, assume that the data are normally (or lognormally) distributed. If the analysis of the data demonstrated that this assumption, critical to the parametric ANOVA test, was violated, a non-parametric ANOVA test was conducted using the ranks of the observations rather than the observations themselves (EPA, 1989). For this case, the Wilcoxon Rank-Sum test was the non-parametric ANOVA test used to compare the downgradient wells to the upgradient wells.

4.3.1.1 Limit of Detection

In the chemical analysis of environmental samples, some analytes may be present at concentrations that are below the sample quantitation limit (SQL) of the analytical procedure. The results are generally reported as not detected (rather than zero), and the appropriate limit of detection is given. The amount of data that are below the detection limit plays an important role in selecting the method of addressing the limit of detection problem. The non-detects found at the DRMO site were replaced with the SQL divided by two prior to statistical analysis. Clearly, if all the observations were non-detectable results, no statistical analysis was warranted. In addition, field duplicate results were averaged and counted as one sample for use in statistical analysis.

4.3.2 Parametric and Nonparametric Analysis of Variance (ANOVA)

ANOVA is widely used in the examination of environmental data sets. A one-way classification ANOVA is used to determine whether or not the difference between average concentrations of a parameter detected in downgradient wells and upgradient wells is statistically significant. Since only two means are compared, then an ANOVA test will give the same result as the t-test for independent samples. The data residuals are the values resulting from subtracting each measured value from the arithmetic mean. The assumptions that the residuals are drawn from an underlying normal (or lognormal) distribution must be examined prior to employing a parametric ANOVA.

4.3.2.1 The Shapiro and Wilk "W-test" of Normality (n ≤50)

As stated above, the data must be analyzed to determine whether they were drawn from an underlying normal or lognormal distribution. A number of statistical evaluations may be used to determine which, if either, of the distributions are exhibited by a given data set. As recommended by the EPA, the Shapiro and Wilk "W-test" (for sample sets ≤50) and the Shapiro-Francia "W-test" (for sample sets >50) will be used to determine whether the data are normally or lognormally distributed (EPA, 1992). If the test is inconclusive, lognormality is assumed.

The Shapiro and Wilk W-test (Gilbert, 1987) is an effective method for determining whether a data set has been drawn from an underlying normal (or lognormal) distribution. In addition, by conducting the Shapiro and Wilk W-test on the log-transformed data, the test may be used to determine whether the data have been drawn from an underlying lognormal distribution. The null hypothesis (H_0) that is tested is:

H_O - The population has a normal (or lognormal when the data is log-transformed) distribution.

The alternate hypothesis (H_A) is:

H_A. The population does not have a normal (or lognormal when the data is log-transformed) distribution.

If H_O is rejected, then H_A is accepted. If H_0 is not rejected, the data set is consistent with the H_0 distribution.

A "W" statistic (W_{calc}) is computed for a data set (or a log transformed data set) and compared to a test statistic (W_{test}). If $W_{calc} \geq W_{test}$, then the null hypothesis is not rejected (i.e. the data are assumed to be normally distributed [or lognormally distributed if log transformed data are tested]). If $W_{calc} < W_{test}$, then the null hypothesis is rejected and the alternative hypothesis is accepted (i.e., the data are not assumed to be normally distributed [or not lognormally distributed if log transformed data are tested]).

The following equations present a step-by-step procedure for conducting the W-test on the residuals.

- Step 1. Group all of the data from each of the individual wells.

- Step 2. Calculate the mean for each of the *k* wells $\overline{x_j}$ by the equation

$$\overline{x_j} = \frac{\sum_{i=1}^{n} x_i}{n}$$

where n is the total number of samples in each well.

- Step 3. Calculate the residuals for each ith well and j^{th} sampling round by

$$R_{ij} = x_{ij} - \overline{x_i}$$

The equation for conducting the W-Test is:

$$W_{calc} = \left[\frac{b}{S_R\sqrt{n-1}}\right]^2$$

where

$$b = \sum_{i=1}^{k} a_i \left(R_{[n-i+1]} - R_i\right) = \sum_{i=1}^{k} b_i$$

and n is the total number of sampling rounds.

- Step 4. Order the n residuals from smallest to largest:

$$x_1 \leq x_2 \leq x_3 \leq \ldots \leq x_n$$

- Step 5. Compute the standard deviation by:

$$S_R = \sqrt{\sum_{i=1}^{n} \frac{\left(R_{ij} - \overline{R}\right)^2}{(n-1)}}$$

- Step 6. Determine the coefficients $a_1, a_2, a_3, .., a_k$ for the sample size n using Table 1 where:

$$k = \frac{n}{2} \quad if\, n\ is\ even\text{; and}$$

$$k = \frac{n-1}{2} \quad if\, n\ is\ odd$$

- Step 7. Determine *b* by the formula:

$$b = \sum_{i=1}^{k} a_i \left(R_{[n-i+1]} - R_i\right) = \sum_{i=1}^{k} b_i$$

- Step 8. Calculate W_{calc} using b from above:

$$W_{calc} = \left[\frac{b}{S_R\sqrt{n-1}}\right]^2$$

- Step 9. Determine W_{test} at the 5% significance level from Table 2.

- Step 10. Reject H_O at the 5% significance level if W_{calc} is less than W_{test}.

To test the null hypothesis that the data set has been drawn from an underlying lognormal distribution, transform the data to $y_{1j}, y_{2j}, y_{3j}, \ldots, y_{km}$ where $y_{ij} = ln\ R_{ij}$. Repeat steps 1 through 10 as described in the preceding paragraphs.

4.3.2.2 Parametric ANOVA

Assume that a site has *k* wells and that n_i data points (analyte concentrations) are available for the ith well. The following equations present a step-by-step procedure for conducting the parametric ANOVA.

- Step 1. Compute the sums and means of each well (*i*) as follows:

$$X_i = \sum_{j=1}^{n_i} X_{ij}, \Sigma \text{ of all } n_i \text{ observations at well } i$$

$$\overline{X} = \frac{X}{N}, \text{ grand mean of all observations}$$

$$\overline{X_i} = \frac{X_i}{n_i}, \text{average of all } n_i \text{ observations at well } i$$

$$X = \sum_{i=1}^{k}\sum_{j=1}^{n_i} X_{ij}, \text{grand total of all } n_i \text{ observations}$$

$$N = \sum_{i=1}^{k} n_i, \text{total number of observations}$$

- Step 2. Compute the sum of squares of differences between the individual well means and the grand mean:

$$SS_{sample} = \sum_{i=1}^{k} n_i\left(\overline{X_i} - \overline{X}\right)^2 = \sum_{i=1}^{k}\left[\frac{X_i^2}{n_i}\right] - \frac{X^2}{N}$$

This sum of squares has (*k-1*) degrees of freedom associated with it and is a measure of the variability between wells.

- Step 3. Compute the corrected total sum of squares

$$SS_{total} = \sum_{i=1}^{k}\sum_{j=1}^{n_i}\left(X_{ij} - \overline{X}\right)^2 = \sum_{i=1}^{k}\sum_{j=1}^{n_i}\left[\left(X_{ij}\right)^2\right] - \frac{X^2}{N}$$

This sum of squares has (*N-1*) degrees of freedom associated with it and is a measure of variability in the whole data set.

- Step 4. Compute the sum of squares of differences of observations within wells from the well means. This value is the sum of squares due to error and is obtained by simple subtraction:

$$SS_{Error} = SS_{Total} - SS_{Sample}$$

The sum of squares due to error has associated with it (*N-k*) degrees of freedom and is a measure of the variability within wells.

- Step 5. Set up the ANOVA table. The sums of squares and their degree of freedom were obtained from Steps 2 through 4. The mean square quantities are simply obtained by dividing each sum of squares by its corresponding degrees of freedom.

ONE-WAY PARAMETRIC ANOVA TABLE

Source of Variation	Sums of Squares	Degrees of Freedom	Mean Squares	F
Between Locations	$S_{Ssample}$	MS_{Sample}=k-1	SS_{Sample}/(k-1)	F=$MS_{samples}$/MS_{Error}
Error (within Locations)	SS_{Error}	MS_{Error}=N-k	SS_{Error}/(N-k)	
Total	SS_{Total}	N-1		

- Step 6. To test the hypothesis of equal means for all *k* wells, compute $F = MS_{Sample}/MS_{Error}$ (last column in above table). Compare this statistic to the tabulated F statistic with (*k-1*) and (*N-k*) degrees of freedom (Table 3) at the 5% significance level. If the calculated *F* value exceeds the tabulated value, reject the hypothesis of equal well means. Otherwise, conclude that there is no significant difference between the concentrations of the *k* wells and thus no evidence of contamination.

4.3.2.3 Nonparametric ANOVA

The parametric ANOVA technique is the preferred approach for comparing environmental measurements from downgradient monitoring wells to upgradient well data. However, parametric ANOVA methods make a key assumption; the results are normally (or lognormally) distributed. If this assumption are violated, non-parametric tests (i.e. Kruskal-Wallis or Wilcoxon Rank-Sum tests) may be used to determine if constituent concentrations present in the downgradient areas significantly exceed those present in the upgradient well

Non-parametric tests are conducted using the ranks of the analytical results rather than the analytical results themselves. Therefore, the data sets are inspected for extremely high values that may have been underestimated as a result of the ranking process.

4.3.2.4 The Wilcoxon Rank-Sum Test

The Wilcoxon Rank-Sum test is described in the following paragraphs.

- Step 1. Combine the upgradient and downgradient data and rank the ordered values from 1 to *N*. Assume there are *n* downgradient samples and m upgradient samples so that $N = m + n$.

$$W = \sum_{i=1}^{n} E_i - \frac{1}{2}n(n+1)$$

- Step 2. Compute the Wilcoxon statistic *W*:

  where E_i are the ranks of the downgradient samples (Large values of the statistic *W* give evidence of contamination in downgradient wells).

- Step 3. Compute an approximate *Z-score*. To find the critical value of *W*, a normal approximation to its distribution is used. The expected value and standard deviation of *W* under the null hypothesis (i.e., no contamination exists) are given by the formulas

$$E(W) = \frac{1}{2}mn; \qquad SD(W) = \sqrt{\frac{1}{12}mn(N+1)}$$

  An approximate *Z-score* for the Wilcoxon Rank-Sum test may be calculated by the following equations:

$$Z = \frac{W - E(W) - \frac{1}{2}}{SD(W)}$$

  The factor of 1/2 in the numerator serves as a continuity correction since the discrete distribution of the statistic W is being approximated by the continuous normal distribution. If $n,m > 10$ and ties are present, an adjustment to the approximate *Z-score* must be made:

$$Z_{RS} = \frac{W - E(W) - \frac{1}{2}}{SD'(W)}$$

where: $$SD'(W) = \left(\frac{mn}{12} \left[N + 1 - \frac{\sum_{j=1}^{g} t_j(t_j^2 - 1)}{N(N-1)} \right] \right)^{\frac{1}{2}}$$

g = the number of tied groups and t_j is the number of tied data in the jth group.

- Step 4. For a one-tailed 0.05 significance level test for H_0 versus the H_A (i.e. the measurements from population 1 tend to exceed those from population 2), reject H_0 and accept H_A if $Z_{rs} > Z_{0.95} = 1.645$. For a one-tailed a significance level test for H_0 versus the H_A that the measurements from population 2 tend to exceed those from population 1, reject H_0 and accept H_A if $-Z_{rs} < -Z_{0.95} = -1.645$.

4.3.3 Statistical Findings

The following nineteen contaminants were considered potential COCs prior to statistical analysis as they were detected in the downgradient wells at least once during the four sampling rounds:

Volatile Organics

Trichloroethene	Vinyl Chloride

Semivolatile Organics

Benzo(a)anthracene	Benzo(a)pyrene
Benzo(b)fluoranthene	Benzo(k)fluoranthene
Bis(2-ethylhexyl)phthalate	Cis-1,2-dichloroethene
Fluoranthene	Fluorene
Phenanthrene	Pyrene

Metals

Arsenic	Barium
Chromium	Copper
Lead	Silver
Zinc	

The total and dissolved metals were compared to established background concentrations at the site as presented in the Groundwater Monitoring work plan (B&R Environmental, 1998). Copper and lead, as well as dissolved chromium, were determined to be at levels below background. All other metals were found in downgradient wells at levels above background.

Shapiro-Wilk W tests were performed to determine the underlying distribution of the upgradient and downgradient wells for each COC. If upgradient and downgradient results demonstrated the same underlying distribution, a parametric ANOVA was performed at a 95% level of confidence to compare data sets. If the underlying distributions could not be shown to be the same, a non-parametric ANOVA (Wilcoxon Rank-Sum) test was performed at a 95% level of confidence to compare data sets. COCs that produced p levels below 0.05 have downgradient results that are higher than upgradient results at a 95% level of significance.

The only COC that showed statistically significant differences between the downgradient and upgradient results was arsenic. The average arsenic concentration from each round of sampling was compared to the site specific and Connecticut Department of Environmental Protection Surface Water Protection Criteria (SWPC). The average arsenic concentration from the first round (4.49 µg/L) was greater than the CTDEP SWPC (4 µg/L).

The average concentration of arsenic was then plotted as a function of time as shown on Figure 4-9. The best-fit linear regression line showed a downward trend. At this point, no further statistical analyses were warranted.

TABLE 4-1

ROUNDS 1 THROUGH 4 ANALYTICAL RESULTS SUMMARY
ANNUAL GROUNDWATER MONITORING REPORT
DRMO, NSB-NLON, GROTON, CONNECTICUT

Chemical	Primary Monitoring Criterion [1]	Secondary Monitoring Criterion	6MW1S ROUND 1 4/21/98	6MW1S ROUND 2 8/3/98	6MW1S ROUND 3 1/28/99	6MW1S ROUND 4 4/23/99
VOCs (ug/L)						
1,1,2,2-TETRACHLOROETHANE	1,100	11 [4][5]	1 U	1 U	1 U	1 U
1,2-DICHLOROETHANE	29,700	99 [4][5]	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	NA	NA	1 U	1 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	NA	NA	1 U	1 U	1 U	1 U
TRICHLOROETHENE	23,400	81 [4][5]	0.6 J	1 U	1 U	1 U
VINYL CHLORIDE	157,500	525 [4][5]	1 U	1 U	1 U	1 U
SVOCs (ug/L)						
BENZO(A)ANTHRACENE	3.0	0.049 [4][5]	0.05 U	0.12 U	0.05 U	0.05 UJ
BENZO(A)PYRENE	3.0	0.049 [4][5]	0.05 U	0.12 U	0.05 UR	0.05 U
BENZO(B)FLUORANTHENE	3.0	0.049 [4][5]	0.1 U	0.047 U	0.1 UJ	0.1 U
BENZO(K)FLUORANTHENE	3.0	0.049 [4][5]	0.05 U	0.047 U	0.05 UJ	0.05 U
BENZOIC ACID	NA	NA	12 UR	19 UJ		10 UJ
BIS(2-ETHYLHEXYL)PHTHALATE	590	5.9 [4][5]	5 U	9 U	130	7
FLUORANTHENE	37,000	370 [4][5]	0.1 U	0.12 U	0.1 U	0.1 UJ
FLUORENE	1,400,000	14,000 [4][5]	0.1 U	0.23 U	0.1 UJ	0.1 U
NAPHTHALENE	NA	NA	0.1 U	1.2 U	0.1 U	0.5 U
PHENANTHRENE	0.77	NA	0.05 U	0.093 U	0.05 U	0.05 U
PYRENE	1,100,000	11,000 [4][5]	0.05 U	0.23 U	0.05 U	0.05 U
Pesticides/PCBs (ug/L)						
4,4'-DDD	NA	0.00084 [4][5]	0.01 U	0.019 U	0.02 U	0.02 U
AROCLOR-1254	5.0	0.00017 [4][5]	0.1 U	0.19 U	0.2 U	0.2 U
AROCLOR-1260	5.0	0.00017 [4][5]	0.1 U	0.19 U	0.2 U	0.2 U
HEPTACHLOR EPOXIDE	0.5	0.00011 [4][5]	0.005 U	0.010 U	0.01 U	0.01 U
HEXACHLOROBIPHENYL	NA	NA				0.02 U
Inorganics (total/dissolved) (ug/L)						
ARSENIC	40	0.14 [4][5]	1.8 U/1.8 U	3.7 UJ/3.7 UJ	1.9 U/1.9 U	2.1 U/2.1 U
BARIUM	NA	NA	4.0/81.1	8.3 U/8.3 U	5.2 U/5.1 U	9.9/11.2
CADMIUM	60	NA	0.19 U/0.19 U	2.3 U/2.3 U	2.3 UJ/2.6 U	1.9 U/1.9 U
CHROMIUM	1,100	50 [2]	0.79 U/0.74 U	3.4 U/8.8 U	3.4 U/3.4 U	4.3 U/4.3 U
COPPER	480	2.4 [2]	1.3/0.93 J	1.9 U/2.5 U	1.4 UJ/1.4 UJ	1.6 U/1.6 U
LEAD	130	8.1 [2]	0.91 U/0.91 U	2.6 UJ/2.6 UJ	1.3 U/1.3 U	1.1 U/1.1 U
SILVER	120	1.9 [2]	0.99 U/2.0	2.7 U/2.7 U	2.7 U/3.1 U	2.5 U/2.5 U
ZINC	1,230	81 [2]	13.0 U/66.9	11.2 U/11.1 U	10.0 U/15.2 U	9.6 U/10.3 U

NOTES:
Bold numbers denote exceedance of secondary monitoring criterion. There are no exceedances of primary monitoring criteria.
(1) Surface Water Protection Criteria for substances in groundwater, using a site-specific dilution factor of 100.
(2) Federal Ambient Water Quality Criteria for protection of aquatic life (chronic, saltwater).
(3) Connecticut Water Quality Criteria for protection of aquatic life (chronic, saltwater).
(4) Federal Ambient Water Quality Criteria for protection of human health from consumption of organisms.
(5) Connecticut Water Quality Criteria for protection of human health from consumption of organisms.
J Estimated Value
R Rejected Value
U Undetected
NA Not Available

TABLE 4-1

ROUNDS 1 THROUGH 4 ANALYTICAL RESULTS SUMMARY
ANNUAL GROUNDWATER MONITORING REPORT
DRMO, NSB-NLON, GROTON, CONNECTICUT

Chemical	Primary Monitoring Criterion [1]	Secondary Monitoring Criterion	6MW2D ROUND 1 4/21/98	6MW2D ROUND 2 7/31/98	6MW2D ROUND 3 1/25/99	6MW2D ROUND 4 4/21/99
VOCs (ug/L)						
1,1,2,2-TETRACHLOROETHANE	1,100	11 [4][5]	1 U	1 U	1 U	1 U
1,2-DICHLOROETHANE	29,700	99 [4][5]	1 U	1 U	1 UJ	1 U
CIS-1,2-DICHLOROETHENE	NA	NA	1 U	1 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	NA	NA	1 U	1 U	1 U	1 U
TRICHLOROETHENE	23,400	81 [4][5]	1 U	1 U	1 U	1 U
VINYL CHLORIDE	157,500	525 [4][5]	1 U	1 U	1 U	1 U
SVOCs (ug/L)						
BENZO(A)ANTHRACENE	3.0	0.049 [4][5]	0.05 U	0.12 U	0.05 U	0.05 UJ
BENZO(A)PYRENE	3.0	0.049 [4][5]	0.05 U	0.12 U	0.05 UR	0.05 U
BENZO(B)FLUORANTHENE	3.0	0.049 [4][5]	0.1 U	0.038 J	0.1 UJ	0.1 U
BENZO(K)FLUORANTHENE	3.0	0.049 [4][5]	0.05 U	0.047 U	0.05 UJ	0.05 U
BENZOIC ACID	NA	NA	12 U	19 UJ		10 UJ
BIS(2-ETHYLHEXYL)PHTHALATE	590	5.9 [4][5]	31	5 J	3 J	8
FLUORANTHENE	37,000	370 [4][5]	0.1 U	0.12 U	0.1 U	0.1 UJ
FLUORENE	1,400,000	14,000 [4][5]	0.1 U	0.24 U	0.1 U	0.1 U
NAPHTHALENE	NA	NA	0.1 U	1.2 U	0.1 U	0.5 U
PHENANTHRENE	0.77	NA	0.05 U	0.094 U	0.05 U	0.05 U
PYRENE	1,100,000	11,000 [4][5]	0.05 U	0.24 U	0.05 U	0.05 U
Pesticides/PCBs (ug/L)						
4,4'-DDD	NA	0.00084 [4][5]	0.01 U	0.019 U	0.02 U	0.02 U
AROCLOR-1254	5.0	0.00017 [4][5]	0.1 U	0.19 U	0.2 U	0.2 U
AROCLOR-1260	5.0	0.00017 [4][5]	0.1 U	0.19 U	0.2 U	0.2 U
HEPTACHLOR EPOXIDE	0.5	0.00011 [4][5]	0.005 U	0.009 U	0.01 U	0.01 U
HEXACHLOROBIPHENYL	NA	NA				0.02 U
Inorganics (total/dissolved) (ug/L)						
ARSENIC	40	0.14 [4][5]	3.1 J/1.8 U	3.4 U/7.1 U	1.9 U/1.9 U	10.4 U/10.4 U
BARIUM	NA	NA	191/563	178 J/172 J	182/156	168 J/164 J
CADMIUM	60	NA	0.24 U/0.19 U	0.25 U/0.25 U	2.3 UJ/2.3 UJ	1.3 U/1.3 U
CHROMIUM	1,100	50 [2]	7.7/2.7 U	6.6 U/4.3 U	3.4 U/3.4 U	4.8/3 U
COPPER	480	2.4 [2]	5.4/2.0	1.2 U/7.8 U	1.4 UJ/1.4 UJ	4.8 J/2.8 UJ
LEAD	130	8.1 [2]	3.4 J/0.91 U	1.3 UJ/2.7 U	1.3 U/1.3 U	5.5 U/5.5 U
SILVER	120	1.9 [2]	0.99 U/1.0 J	0.75 UJ/4.0 U	2.7 U/2.7 U	3.5 U/3.5 U
ZINC	1,230	81 [2]	1.2 U/12.0 U	4.8 U/12.0 U	25.9/14.2 U	14.6 U/43.6 U

NOTES:
Bold numbers denote exceedance of secondary monitoring criterion. There are no exceedances of primary monitoring criteria.
(1) Surface Water Protection Criteria for substances in groundwater, using a site-specific dilution factor of 100.
(2) Federal Ambient Water Quality Criteria for protection of aquatic life (chronic, saltwater).
(3) Connecticut Water Quality Criteria for protection of aquatic life (chronic, saltwater).
(4) Federal Ambient Water Quality Criteria for protection of human health from consumption of organisms.
(5) Connecticut Water Quality Criteria for protection of human health from consumption of organisms.
J Estimated Value
R Rejected Value
U Undetected
NA Not Available

TABLE 4-1

ROUNDS 1 THROUGH 4 ANALYTICAL RESULTS SUMMARY
ANNUAL GROUNDWATER MONITORING REPORT
DRMO, NSB-NLON, GROTON, CONNECTICUT

Chemical	Primary Monitoring Criterion (1)	Secondary Monitoring Criterion	6MW2S ROUND 1 4/21/98	6MW2S ROUND 2 7/31/98	6MW2S ROUND 3 1/28/99	6MW2S ROUND 4 4/21/99	6MW2S-D ROUND 4 4/21/99
VOCs (ug/L)							
1,1,2,2-TETRACHLOROETHANE	1,100	11 (4)(5)	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROETHANE	29,700	99 (4)(5)	1 U	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	NA	NA	0.8 J	1 U	0.5 J	1 U	1 U
TRANS-1,2-DICHLOROETHENE	NA	NA	1 U	1 U	1 U	1 U	1 U
TRICHLOROETHENE	23,400	81 (4)(5)	0.6 J	1 U	1 U	1 U	1 U
VINYL CHLORIDE	157,500	525 (4)(5)	1 U	1 U	1 U	1 U	1 U
SVOCs (ug/L)							
BENZO(A)ANTHRACENE	3.0	0.049 (4)(5)	0.05 U	0.12 U	0.05 U	0.11 J	0.05 UJ
BENZO(A)PYRENE	3.0	0.049 (4)(5)	0.05 U	0.12 U	0.05 UR	0.13 J	0.05 UJ
BENZO(B)FLUORANTHENE	3.0	0.049 (4)(5)	0.1 U	0.048 U	0.1 UJ	0.13	0.1 U
BENZO(K)FLUORANTHENE	3.0	0.049 (4)(5)	0.05 U	0.048 U	0.05 UJ	0.13 J	0.05 UJ
BENZOIC ACID	NA	NA	12 U	19 U		10 UJ	10 UJ
BIS(2-ETHYLHEXYL)PHTHALATE	590	5.9 (4)(5)	5 U	3 J	5 U	1 J	5 U
FLUORANTHENE	37,000	370 (4)(5)	0.1 U	0.12 U	0.1 U	0.088 J	0.1 U
FLUORENE	1,400,000	14,000 (4)(5)	0.1 U	0.24 U	0.1 UJ	0.1 U	0.1 U
NAPHTHALENE	NA	NA	0.1 U	1.2 U	0.1 U	0.5 U	0.5 U
PHENANTHRENE	0.77	NA	0.05 U	0.095 U	0.05 U	0.12 J	0.05 UJ
PYRENE	1,100,000	11,000 (4)(5)	0.05 U	0.24 U	0.05 U	0.12 J	0.05 UJ
Pesticides/PCBs (ug/L)							
4,4'-DDD	NA	0.00084 (4)(5)	0.01 U	0.019 U	0.02 U	0.02 U	0.02 U
AROCLOR-1254	5.0	0.00017 (4)(5)	0.1 U	0.19 U	0.2 U	0.2 U	0.2 U
AROCLOR-1260	5.0	0.00017 (4)(5)	0.1 U	0.19 U	0.2 U	0.2 U	0.2 U
HEPTACHLOR EPOXIDE	0.5	0.00011 (4)(5)	0.005 U	0.009 U	0.01 U	0.01 U	0.01 U
HEXACHLOROBIPHENYL	NA	NA				0.02 U	0.02 U
Inorganics (total/dissolved) (ug/L)							
ARSENIC	40	0.14 (4)(5)	1.8 U/1.8 U	3.4 U/1.9 UJ	1.9 U/2.5 J	10.4 U/10.4 U	10.4 U/10.4 U
BARIUM	NA	NA	16.2/359	27.2 U/26.0 U	42.2/41.2	21.9 J/20.5 J	23.3 J/20.3 J
CADMIUM	60	NA	0.19 U/0.19 U	0.25 U/0.25 U	2.3 UJ/2.3 U	1.3 U/1.3 U	1.3 U/1.3 U
CHROMIUM	1,100	50 (2)	1.0 U/0.60 U	9.8 U/8.0 U	3.4 U/3.4 U	3 U/3 U	4.8/3 U
COPPER	480	2.4 (2)	3.2/2.4	0.69 UJ/0.69 UJ	1.4 UJ/1.4 UJ	2.8 UJ/3.3 J	2.8 UJ/2.8 UJ
LEAD	130	8.1 (2)	1.5 J/0.91 U	1.7 U/1.9 U	1.9 U/1.3 U	5.5 U/5.5 U	5.5 U/5.5 U
SILVER	120	1.9 (2)	0.99 U/0.99 U	0.81 U/1.3 U	2.7 U/3.4 U	3.5 U/3.5 U	4.3/3.5 U
ZINC	1,230	81 (2)	18.5 U/108	7.4 U/4.9 U	22.0 J/8.3 UJ	22.9 U/27.9 U	22.5 U/21.2 U

NOTES:
Bold numbers denote exceedance of secondary monitoring criterion. There are no exceedances of primary monitoring criteria.
(1) Surface Water Protection Criteria for substances in groundwater, using a site-specific dilution factor of 100.
(2) Federal Ambient Water Quality Criteria for protection of aquatic life (chronic, saltwater).
(3) Connecticut Water Quality Criteria for protection of aquatic life (chronic, saltwater).
(4) Federal Ambient Water Quality Criteria for protection of human health from consumption of organisms.
(5) Connecticut Water Quality Criteria for protection of human health from consumption of organisms.
J Estimated Value
R Rejected Value
U Undetected
NA Not Available

TABLE 4-1

ROUNDS 1 THROUGH 4 ANALYTICAL RESULTS SUMMARY
ANNUAL GROUNDWATER MONITORING REPORT
DRMO, NSB-NLON, GROTON, CONNECTICUT

Chemical	Primary Monitoring Criterion [1]	Secondary Monitoring Criterion	6MW6D ROUND 1 4/22/98	6MW6D ROUND 2 7/29/98	6MW6D ROUND 3 1/25/99	6MW6D ROUND 4 4/19/99
VOCs (ug/L)						
1,1,2,2-TETRACHLOROETHANE	1,100	11 [4][5]	1 U	1 U	1 U	1 U
1,2-DICHLOROETHANE	29,700	99 [4][5]	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	NA	NA	7	6	14	6
TRANS-1,2-DICHLOROETHENE	NA	NA	1 U	1 U	1 U	1 U
TRICHLOROETHENE	23,400	81 [4][5]	7	8	7	7
VINYL CHLORIDE	157,500	525 [4][5]	1 U	1 U	1 U	1 U
SVOCs (ug/L)						
BENZO(A)ANTHRACENE	3.0	0.049 [4][5]	0.05 U	0.12 UJ	0.05 U	0.05 UJ
BENZO(A)PYRENE	3.0	0.049 [4][5]	0.05 U	0.12 UJ	0.05 UR	0.05 U
BENZO(B)FLUORANTHENE	3.0	0.049 [4][5]	0.1 U	0.047 UJ	0.1 UJ	0.1 U
BENZO(K)FLUORANTHENE	3.0	0.049 [4][5]	0.05 U	0.047 UJ	0.05 UJ	0.05 U
BENZOIC ACID	NA	NA	12 UR	19 UJ		10 UJ
BIS(2-ETHYLHEXYL)PHTHALATE	590	5.9 [4][5]	5 U	23	5 U	3 J
FLUORANTHENE	37,000	370 [4][5]	0.1 U	0.12 UJ	0.1 U	0.1 UJ
FLUORENE	1,400,000	14,000 [4][5]	0.1 U	0.23 UJ	0.1 U	0.1 U
NAPHTHALENE	NA	NA	0.1 U	1.2 UJ	0.1 U	0.5 U
PHENANTHRENE	0.77	NA	0.05 U	0.093 UJ	0.05 U	0.05 U
PYRENE	1,100,000	11,000 [4][5]	0.05 U	0.23 UJ	0.05 U	0.05 U
Pesticides/PCBs (ug/L)						
4,4'-DDD	NA	0.00084 [4][5]	0.01 U	0.019 UJ	0.02 U	0.02 U
AROCLOR-1254	5.0	0.00017 [4][5]	0.1 U	0.19 UJ	0.2 U	0.2 U
AROCLOR-1260	5.0	0.00017 [4][5]	0.1 U	0.19 UJ	0.2 U	0.2 U
HEPTACHLOR EPOXIDE	0.5	0.00011 [4][5]	0.005 U	0.009 UJ	0.01 U	0.01 U
HEXACHLOROBIPHENYL	NA	NA				0.02 U
Inorganics (total/dissolved) (ug/L)						
ARSENIC	40	0.14 [4][5]	1.8 U/1.8 U	1.9 U/2.1 U	1.9 U/1.9 U	2.1 U/2.1 U
BARIUM	NA	NA	76.0/267	44.2 U/44.5 U	41.2/40.3	47.1/44.2
CADMIUM	60	NA	0.66 U/0.26 U	0.93 U/0.58 U	2.3 UJ/2.3 UJ	2.4 U/1.9 U
CHROMIUM	1,100	50 [2]	1.9 U/0.99 U	1.3 U/11.8 U	3.4 U/3.4 U	4.3 U/4.3 U
COPPER	480	2.4 [2]	1.2 J/1.3	1.8 U/0.81 U	1.4 UJ/1.4 UJ	1.6 U/3.9
LEAD	130	8.1 [2]	1.1 J/0.91 U	2.3 U/1.3 UJ	1.5 U/1.3 U	1.1 U/1.1 U
SILVER	120	1.9 [2]	1.2 J/1.0 J	1.6 U/0.75 U	2.7 U/2.7 U	2.5 U/2.5 U
ZINC	1,230	81 [2]	53.3/91.3	26.0 U/19.4 U	111/16.4 U	13 U/13.7 U

NOTES:
Bold numbers denote exceedance of secondary monitoring criterion. There are no exceedances of primary monitoring criteria.
(1) Surface Water Protection Criteria for substances in groundwater, using a site-specific dilution factor of 100.
(2) Federal Ambient Water Quality Criteria for protection of aquatic life (chronic, saltwater).
(3) Connecticut Water Quality Criteria for protection of aquatic life (chronic, saltwater).
(4) Federal Ambient Water Quality Criteria for protection of human health from consumption of organisms.
(5) Connecticut Water Quality Criteria for protection of human health from consumption of organisms.
J Estimated Value
R Rejected Value
U Undetected
NA Not Available

TABLE 4-1

ROUNDS 1 THROUGH 4 ANALYTICAL RESULTS SUMMARY
ANNUAL GROUNDWATER MONITORING REPORT
DRMO, NSB-NLON, GROTON, CONNECTICUT

Chemical	Primary Monitoring Criterion [1]	Secondary Monitoring Criterion	6MW6S ROUND 1 4/21/98	6MW6S ROUND 2 7/29/98	6MW6S ROUND 3 1/25/99	6MW6S ROUND 4 4/19/99
VOCs (ug/L)						
1,1,2,2-TETRACHLOROETHANE	1,100	11 [4][5]	1 U	1 U	1 U	1 U
1,2-DICHLOROETHANE	29,700	99 [4][5]	1 U	1 U	1 UJ	1 U
CIS-1,2-DICHLOROETHENE	NA	NA	1 U	1 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	NA	NA	1 U	1 U	1 U	1 U
TRICHLOROETHENE	23,400	81 [4][5]	1 U	1 U	1 U	1 U
VINYL CHLORIDE	157,500	525 [4][5]	1 U	1 U	1 U	1 U
SVOCs (ug/L)						
BENZO(A)ANTHRACENE	3.0	0.049 [4][5]	0.05 U	0.12 UJ	0.05 U	0.05 UJ
BENZO(A)PYRENE	3.0	0.049 [4][5]	0.05 U	0.12 UJ	0.05 UR	0.05 U
BENZO(B)FLUORANTHENE	3.0	0.049 [4][5]	0.1 U	0.048 UJ	0.1 UJ	0.1 U
BENZO(K)FLUORANTHENE	3.0	0.049 [4][5]	0.05 U	0.048 UJ	0.05 UJ	0.05 U
BENZOIC ACID	NA	NA	12 UR	20 UJ		10 UJ
BIS(2-ETHYLHEXYL)PHTHALATE	590	5.9 [4][5]	4 J	10 U	5 U	5 U
FLUORANTHENE	37,000	370 [4][5]	0.1 U	0.12 UJ	0.1 U	0.1 UJ
FLUORENE	1,400,000	14,000 [4][5]	0.1 U	0.24 UJ	0.1 U	0.1 U
NAPHTHALENE	NA	NA	0.1 U	1.2 UJ	0.1 U	0.5 U
PHENANTHRENE	0.77	NA	0.05 U	0.095 UJ	0.05 U	0.05 U
PYRENE	1,100,000	11,000 [4][5]	0.05 U	0.24 UJ	0.05 U	0.05 U
Pesticides/PCBs (ug/L)						
4,4'-DDD	NA	0.00084 [4][5]	0.01 U	0.019 UJ	0.02 U	0.02 U
AROCLOR-1254	5.0	0.00017 [4][5]	0.1 U	0.19 UJ	0.2 U	0.2 U
AROCLOR-1260	5.0	0.00017 [4][5]	0.1 U	0.19 UJ	0.2 U	0.2 U
HEPTACHLOR EPOXIDE	0.5	0.00011 [4][5]	0.005 U	0.009 UJ	0.01 U	0.01 U
HEXACHLOROBIPHENYL	NA	NA				0.02 U
Inorganics (total/dissolved) (ug/L)						
ARSENIC	40	0.14 [4][5]	1.8 U/1.8 U	3.4 U/1.9 UJ	1.9 U/1.9 U	2.1 U/2.1 U
BARIUM	NA	NA	32.5/335	30.9 U/34.2 U	42.4/43.9	35.8/33.5
CADMIUM	60	NA	0.19 U/0.19 U	0.25 U/0.25 U	4.1 U/2.3 UJ	1.9 U/1.9 U
CHROMIUM	1,100	50 [2]	1.0 U/0.65 U	1.2 U/19.4 U	3.9 U/3.4 U	4.3 U/4.3 U
COPPER	480	2.4 [2]	2.1/0.64 U	0.70 U/2.3 U	1.4 UJ/1.4 UJ	1.6 U/1.6 U
LEAD	130	8.1 [2]	1.7 J/0.91 U	1.3 UJ/1.4 U	1.3 U/1.3 U	1.1 U/1.1 U
SILVER	120	1.9 [2]	0.99 U/0.99 U	0.75 U/0.75 U	4.5 U/2.7 U	2.5 U/2.5 U
ZINC	1,230	81 [2]	16.0 U/147	6.8 U/2.7 U	4.2 U/7.3 U	2.2 U/2.5 U

NOTES:
Bold numbers denote exceedance of secondary monitoring criterion. There are no exceedances of primary monitoring criteria.
(1) Surface Water Protection Criteria for substances in groundwater, using a site-specific dilution factor of 100.
(2) Federal Ambient Water Quality Criteria for protection of aquatic life (chronic, saltwater).
(3) Connecticut Water Quality Criteria for protection of aquatic life (chronic, saltwater).
(4) Federal Ambient Water Quality Criteria for protection of human health from consumption of organisms.
(5) Connecticut Water Quality Criteria for protection of human health from consumption of organisms.
J Estimated Value
R Rejected Value
U Undetected
NA Not Available

TABLE 4-1

ROUNDS 1 THROUGH 4 ANALYTICAL RESULTS SUMMARY
ANNUAL GROUNDWATER MONITORING REPORT
DRMO, NSB-NLON, GROTON, CONNECTICUT

Chemical	Primary Monitoring Criterion (1)	Secondary Monitoring Criterion	6MW9S ROUND 1	6MW9S ROUND 2 7/30/98	6MW9S ROUND 3 1/26/99	6MW9S ROUND 4 4/23/99
VOCs (ug/L)						
1,1,2,2-TETRACHLOROETHANE	1,100	11 (4)(5)		1 U	1 U	1 U
1,2-DICHLOROETHANE	29,700	99 (4)(5)		1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	NA	NA		1 U	1 U	1 U
TRANS-1,2-DICHLOROETHENE	NA	NA		1 U	1 U	1 U
TRICHLOROETHENE	23,400	81 (4)(5)		1 U	1 U	1 U
VINYL CHLORIDE	157,500	525 (4)(5)		1 U	1 U	1 U
SVOCs (ug/L)						
BENZO(A)ANTHRACENE	3.0	0.049 (4)(5)		0.12 U	0.05 U	0.05 UJ
BENZO(A)PYRENE	3.0	0.049 (4)(5)		0.12 U	0.05 UR	0.05 U
BENZO(B)FLUORANTHENE	3.0	0.049 (4)(5)		0.048 U	0.1 UJ	0.1 U
BENZO(K)FLUORANTHENE	3.0	0.049 (4)(5)		0.048 U	0.05 UJ	0.05 U
BENZOIC ACID	NA	NA		19 UJ		10 UJ
BIS(2-ETHYLHEXYL)PHTHALATE	590	5.9 (4)(5)		10 U	5 U	5 U
FLUORANTHENE	37,000	370 (4)(5)		0.12 U	0.1 U	0.1 UJ
FLUORENE	1,400,000	14,000 (4)(5)		0.24 U	0.1 U	0.1 U
NAPHTHALENE	NA	NA		1.2 U	0.1 U	0.5 U
PHENANTHRENE	0.77	NA		0.096 U	0.05 U	0.05 U
PYRENE	1,100,000	11,000 (4)(5)	-	0.24 U	0.05 U	0.05 U
Pesticides/PCBs (ug/L)						
4,4'-DDD	NA	0.00084 (4)(5)		0.019 U	0.02 U	0.02 U
AROCLOR-1254	5.0	0.00017 (4)(5)		0.19 U	0.2 U	0.2 U
AROCLOR-1260	5.0	0.00017 (4)(5)		0.19 U	0.23	0.2 U
HEPTACHLOR EPOXIDE	0.5	0.00011 (4)(5)		0.009 U	0.01 U	0.01 U
HEXACHLOROBIPHENYL	NA	NA				0.02 U
Inorganics (total/dissolved) (ug/L)						
ARSENIC	40	0.14 (4)(5)		2.8 U/3.6 U	1.9 U/1.9 U	2.1 U/3.2 J
BARIUM	NA	NA		27.2 U/19.1 U	17.4/17.0	15.9/14.5
CADMIUM	60	NA		0.52 U/0.35 U	2.3 UJ/2.3 UJ	1.9 U/1.9 U
CHROMIUM	1,100	50 (2)		3.7 U/7.6 U	3.4 U/3.4 U	4.3 U/4.3 U
COPPER	480	2.4 (2)		2.3 U/1.2 U	1.4 UJ/1.4 UJ	3/2.5
LEAD	130	8.1 (2)		1.4 U/2.7 U	2.0 U/1.3 U	1.1 U/1.1 U
SILVER	120	1.9 (2)		0.75 U/0.75 U	2.7 U/2.7 U	2.5 U/2.5 U
ZINC	1,230	81 (2)		70.3 U/68.0 U	80.0/80.7	126/122

NOTES:
Bold numbers denote exceedance of secondary monitoring criterion. There are no exceedances of primary monitoring criteria.
(1) Surface Water Protection Criteria for substances in groundwater, using a site-specific dilution factor of 100.
(2) Federal Ambient Water Quality Criteria for protection of aquatic life (chronic, saltwater).
(3) Connecticut Water Quality Criteria for protection of aquatic life (chronic, saltwater).
(4) Federal Ambient Water Quality Criteria for protection of human health from consumption of organisms.
(5) Connecticut Water Quality Criteria for protection of human health from consumption of organisms.
J Estimated Value
R Rejected Value
U Undetected
NA Not Available

TABLE 4-1

ROUNDS 1 THROUGH 4 ANALYTICAL RESULTS SUMMARY
ANNUAL GROUNDWATER MONITORING REPORT
DRMO, NSB-NLON, GROTON, CONNECTICUT

Chemical	Primary Monitoring Criterion [1]	Secondary Monitoring Criterion	6MW10D ROUND 1 4/20/98	6MW10D ROUND 2 8/3/98	6MW10D ROUND 3 1/26/99	6MW10D ROUND 4 4/20/99
VOCs (ug/L)						
1,1,2,2-TETRACHLOROETHANE	1,100	11 [4][5]	1 U	1 U	1 U	1 U
1,2-DICHLOROETHANE	29,700	99 [4][5]	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	NA	NA	13	13	0.9 J	14
TRANS-1,2-DICHLOROETHENE	NA	NA	1 U	1 U	1 U	1 U
TRICHLOROETHENE	23,400	81 [4][5]	7	6	1 U	6
VINYL CHLORIDE	157,500	525 [4][5]	1 U	1 U	1 U	1 U
SVOCs (ug/L)						
BENZO(A)ANTHRACENE	3.0	0.049 [4][5]	0.05 U	0.12 U	0.05 U	0.05 UJ
BENZO(A)PYRENE	3.0	0.049 [4][5]	0.05 U	0.12 U	0.05 UR	0.05 U
BENZO(B)FLUORANTHENE	3.0	0.049 [4][5]	0.1 U	0.047 U	0.1 UJ	0.1 U
BENZO(K)FLUORANTHENE	3.0	0.049 [4][5]	0.05 U	0.047 U	0.05 UJ	0.05 U
BENZOIC ACID	NA	NA	12 U	19 U		10 UJ
BIS(2-ETHYLHEXYL)PHTHALATE	590	5.9 [4][5]	5 U	10 U	1 J	2 J
FLUORANTHENE	37,000	370 [4][5]	0.1 U	0.12 U	0.1 U	0.047 J
FLUORENE	1,400,000	14,000 [4][5]	0.1 U	0.24 U	0.1 U	0.1 U
NAPHTHALENE	NA	NA	0.1 U	1.2 U	0.1 U	0.5 U
PHENANTHRENE	0.77	NA	0.18	0.066 J	0.05 U	0.039 J
PYRENE	1,100,000	11,000 [4][5]	0.035 J	0.24 U	0.05 U	0.05 U
Pesticides/PCBs (ug/L)						
4,4'-DDD	NA	0.00084 [4][5]	0.01 U	0.019 U	0.02 U	0.02 U
AROCLOR-1254	5.0	0.00017 [4][5]	0.1 U	0.19 U	0.2 U	0.2 U
AROCLOR-1260	5.0	0.00017 [4][5]	0.1 U	0.19 U	0.2 U	0.2 U
HEPTACHLOR EPOXIDE	0.5	0.00011 [4][5]	0.005 U	0.009 U	0.01 U	0.01 U
HEXACHLOROBIPHENYL	NA	NA				0.02 U
Inorganics (total/dissolved) (ug/L)						
ARSENIC	40	0.14 [4][5]	15.9/12.7	18.5 UJ/18.5 UJ	5.0/6.6	10.4 U/10.4 U
BARIUM	NA	NA	90.0/181	84.8 J/80.1 J	60.8/60.6	65 J/61.3 J
CADMIUM	60	NA	0.29 U/0.19 U	2.3 U/2.3 U	2.3 UJ/2.3 UJ	1.3 U/1.3 U
CHROMIUM	1,100	50 [2]	3.6 U/1.3 U	3.4 UJ/3.4 UJ	3.4 U/3.4 U	3 U/5.1
COPPER	480	2.4 [2]	7.7/1.1 J	3.0 U/1.4 UJ	1.4 UJ/1.4 UJ	2.8 UJ/3.2 J
LEAD	130	8.1 [2]	4.2 J/1.0 J	13.1 UJ/13.1 UJ	1.3 U/1.3 U	5.5 U/5.45 U
SILVER	120	1.9 [2]	0.99 U/0.99 U	2.7 UJ/2.7 UJ	2.7 U/2.7 U	3.5 U/5.5
ZINC	1,230	81 [2]	240/222	696 U/667 U	336/364	513/451

NOTES:
Bold numbers denote exceedance of secondary monitoring criterion. There are no exceedances of primary monitoring criteria.
(1) Surface Water Protection Criteria for substances in groundwater, using a site-specific dilution factor of 100.
(2) Federal Ambient Water Quality Criteria for protection of aquatic life (chronic, saltwater).
(3) Connecticut Water Quality Criteria for protection of aquatic life (chronic, saltwater).
(4) Federal Ambient Water Quality Criteria for protection of human health from consumption of organisms.
(5) Connecticut Water Quality Criteria for protection of human health from consumption of organisms.
J Estimated Value
R Rejected Value
U Undetected
NA Not Available

TABLE 4-1

ROUNDS 1 THROUGH 4 ANALYTICAL RESULTS SUMMARY
ANNUAL GROUNDWATER MONITORING REPORT
DRMO, NSB-NLON, GROTON, CONNECTICUT

Chemical	Primary Monitoring Criterion [1]	Secondary Monitoring Criterion	6MW10S ROUND 1 4/20/98	6MW10S-D ROUND 1 4/20/98	6MW10S ROUND 2 7/30/98	6MW10S ROUND 3 1/26/99	6MW10S-D ROUND 3 1/26/99	6MW10S ROUND 4 4/20/99
VOCs (ug/L)								
1,1,2,2-TETRACHLOROETHANE	1,100	11 [4][5]	1 U	1 U	1 U	1 U	1 U	1 U
1,2-DICHLOROETHANE	29,700	99 [4][5]	1 U	1 U	1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	NA	NA	1	0.9 J	2	1 U	1	1
TRANS-1,2-DICHLOROETHENE	NA	NA	1 U	1 U	1 U	1 U	1 U	1 U
TRICHLOROETHENE	23,400	81 [4][5]	1 U	1 U	1 U	1 U	1 U	1 U
VINYL CHLORIDE	157,500	525 [4][5]	1 U	1 U	1 U	1 U	1 U	1 U
SVOCs (ug/L)								
BENZO(A)ANTHRACENE	3.0	0.049 [4][5]	0.037 J	0.05 U	0.12 U	0.05 U	0.05 U	0.05 UJ
BENZO(A)PYRENE	3.0	0.049 [4][5]	0.082	0.05 U	0.12 U	0.05 UR	0.05 UR	0.05 U
BENZO(B)FLUORANTHENE	3.0	0.049 [4][5]	0.089 J	0.1 U	0.049 U	0.1 UJ	0.1 UJ	0.1 U
BENZO(K)FLUORANTHENE	3.0	0.049 [4][5]	0.042 J	0.05 U	0.049 U	0.05 UJ	0.05 UJ	0.05 U
BENZOIC ACID	NA	NA	12 U	12 UR	19 U			10 UJ
BIS(2-ETHYLHEXYL)PHTHALATE	590	5.9 [4][5]	1 J	5 U	10 U	5 U	5 U	2 J
FLUORANTHENE	37,000	370 [4][5]	0.15	0.1 U	0.26	0.068 J	0.083 J	0.1 UJ
FLUORENE	1,400,000	14,000 [4][5]	0.1 U	0.1 U	0.18 J	0.1 UJ	0.1 UJ	0.1 U
NAPHTHALENE	NA	NA	0.1 U	0.1 U	1.2 U	0.1 U	0.1 U	0.5 U
PHENANTHRENE	0.77	NA	0.3	0.11	0.32	0.05 U	0.05 U	0.05 U
PYRENE	1,100,000	11,000 [4][5]	0.24	0.055	0.28	0.11	0.14	0.069
Pesticides/PCBs (ug/L)								
4,4'-DDD	NA	0.00084 [4][5]	0.01 U	0.01 U	0.019 U	0.02 U	0.02 U	0.02 U
AROCLOR-1254	5.0	0.00017 [4][5]	0.1 U	0.1 U	0.19 U	0.2 U	0.2 U	0.2 U
AROCLOR-1260	5.0	0.00017 [4][5]	0.1 U	0.1 U	0.19 U	0.2 U	0.2 U	0.2 U
HEPTACHLOR EPOXIDE	0.5	0.00011 [4][5]	0.005 U	0.005 U	0.010 U	0.01 U	0.01 U	0.01 U
HEXACHLOROBIPHENYL	NA	NA						0.02 U
Inorganics (total/dissolved) (ug/L)								
ARSENIC	40	0.14 [4][5]	1.8 U/1.8 U	2.4 J/1.8 U	2.8 U/2.1 U	1.9 U/1.9 U	1.9 U/1.9 U	2.1 U/2.1 U
BARIUM	NA	NA	51.1/97.5	55.3/225	68.7 J/73.9 J	114/121	116/114	112/115
CADMIUM	60	NA	0.19 U/0.19 U	0.19 U/0.19 U	0.25 U/0.25 U	2.3 UJ/2.3 UJ	2.3 UJ/2.3 UJ	1.9 U/1.9 U
CHROMIUM	1,100	50 [2]	2.2 U/1.6 U	2.4 U/0.93 U	1.6 U/7.9 U	3.4 U/3.4 U	3.4 U/3.4 U	4.3 U/4.3 U
COPPER	480	2.4 [2]	5.5/1.2 J	5.9/0.64 U	2.6 U/0.69 U	1.4 UJ/1.4 UJ	1.4 UJ/1.4 UJ	6.9/1.6 U
LEAD	130	8.1 [2]	6.8 J/1.6 J	6.4 J/0.91 U	2.3 U/1.3 UJ	1.3 U/1.3 U	1.3 U/1.3 U	2 J/1.1 U
SILVER	120	1.9 [2]	0.99 U/0.99 U	0.99 U/0.99 U	0.75 U/0.75 U	2.7 U/2.7 U	2.7 U/2.7 U	2.5 U/2.5 U
ZINC	1,230	81 [2]	19.9 U/8.9 U	21.8/20.2 U	8.3 U/3.2 U	29.8/17.2 U	26.4 J/18.9	24.1 U/7.8 U

NOTES:
Bold numbers denote exceedance of secondary monitoring criterion. There are no exceedances of primary monitoring criteria.
(1) Surface Water Protection Criteria for substances in groundwater, using a site-specific dilution factor of 100.
(2) Federal Ambient Water Quality Criteria for protection of aquatic life (chronic, saltwater).
(3) Connecticut Water Quality Criteria for protection of aquatic life (chronic, saltwater).
(4) Federal Ambient Water Quality Criteria for protection of human health from consumption of organisms.
(5) Connecticut Water Quality Criteria for protection of human health from consumption of organisms.
J Estimated Value
R Rejected Value
U Undetected
NA Not Available

TABLE 4-1

ROUNDS 1 THROUGH 4 ANALYTICAL RESULTS SUMMARY
ANNUAL GROUNDWATER MONITORING REPORT
DRMO, NSB-NLON, GROTON, CONNECTICUT

Chemical	Primary Monitoring Criterion (1)	Secondary Monitoring Criterion	6MW11D ROUND 1	6MW11D ROUND 2 7/30/98	6MW11D-D ROUND 2 7/30/98	6MW11D ROUND 3 1/27/99	6MW11D ROUND 4 4/22/99
VOCs (ug/L)							
1,1,2,2-TETRACHLOROETHANE	1,100	11 (4)(5)		1 U	1 U	1 U	1 U
1,2-DICHLOROETHANE	29,700	99 (4)(5)		1 U	1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	NA	NA		3	3	5	3
TRANS-1,2-DICHLOROETHENE	NA	NA		1 U	1 U	1 U	1 U
TRICHLOROETHENE	23,400	81 (4)(5)		1 U	1 U	1 U	1 U
VINYL CHLORIDE	157,500	525 (4)(5)		1 U	1 U	0.6 J	0.7 J
SVOCs (ug/L)							
BENZO(A)ANTHRACENE	3.0	0.049 (4)(5)		0.12 U	0.12 U	0.05 U	0.05 UJ
BENZO(A)PYRENE	3.0	0.049 (4)(5)		0.12 U	0.12 U	0.05 UR	0.05 U
BENZO(B)FLUORANTHENE	3.0	0.049 (4)(5)		0.047 U	0.047 U	0.1 UJ	0.1 U
BENZO(K)FLUORANTHENE	3.0	0.049 (4)(5)		0.047 U	0.047 U	0.05 UJ	0.05 U
BENZOIC ACID	NA	NA		20 U	19 UJ		10 UJ
BIS(2-ETHYLHEXYL)PHTHALATE	590	5.9 (4)(5)		10 U	11	5 U	5 U
FLUORANTHENE	37,000	370 (4)(5)		0.12 U	0.12 U	0.1 U	0.1 UJ
FLUORENE	1,400,000	14,000 (4)(5)		0.24 U	0.24 U	0.1 UJ	0.1 U
NAPHTHALENE	NA	NA		1.2 U	1.2 U	0.1 U	0.5 U
PHENANTHRENE	0.77	NA		0.20	0.20	0.048 J	0.037 J
PYRENE	1,100,000	11,000 (4)(5)		0.24 U	0.24 U	0.05 U	0.05 U
Pesticides/PCBs (ug/L)							
4,4'-DDD	NA	0.00084 (4)(5)		0.019 UJ	0.019 U	0.02 U	0.02 U
AROCLOR-1254	5.0	0.00017 (4)(5)		0.19 UJ	0.19 U	0.2 U	0.2 U
AROCLOR-1260	5.0	0.00017 (4)(5)		0.19 UJ	0.19 U	0.2 U	0.2 U
HEPTACHLOR EPOXIDE	0.5	0.00011 (4)(5)		0.009 UJ	0.009 U	0.01 U	0.01 U
HEXACHLOROBIPHENYL	NA	NA					0.02 U
Inorganics (total/dissolved) (ug/L)							
ARSENIC	40	0.14 (4)(5)		9.5 U/9.4 U	8.3 U/8.6 U	1.9 U/1.9 U	10.4 U/10.4 U
BARIUM	NA	NA		261 J/289 J	250 J/279 J	280/289	269 J/265 J
CADMIUM	60	NA		0.25 U/0.25 U	0.25 U/0.25 U	2.3 UJ/2.3 UJ	1.3 U/1.3 U
CHROMIUM	1,100	50 (2)		8.2 U/11.4 U	7.8 U/13.3 U	3.4 U/3.4 U	23.2/3 U
COPPER	480	2.4 (2)		9.4 U/0.69 UJ	8.4 U/0.69 UJ	1.4 UJ/1.4 UJ	2.8 UJ/2.8 UJ
LEAD	130	8.1 (2)		13.1 UJ/1.3 UJ	14.6 U/1.4 U	1.3 U/1.3 U	5.5 U/5.5 U
SILVER	120	1.9 (2)		0.75 UJ/2.5 U	9.4 U/1.9 U	2.7 U/2.7 U	3.5 U/3.9
ZINC	1,230	81 (2)		81.1 U/40.1 U	71.8 U/38.6 U	20.8 J/6.2 U	8.9 U/4.6 U

NOTES:
Bold numbers denote exceedance of secondary monitoring criterion. There are no exceedances of primary monitoring criteria.
(1) Surface Water Protection Criteria for substances in groundwater, using a site-specific dilution factor of 100.
(2) Federal Ambient Water Quality Criteria for protection of aquatic life (chronic, saltwater).
(3) Connecticut Water Quality Criteria for protection of aquatic life (chronic, saltwater).
(4) Federal Ambient Water Quality Criteria for protection of human health from consumption of organisms.
(5) Connecticut Water Quality Criteria for protection of human health from consumption of organisms.
J Estimated Value
R Rejected Value
U Undetected
NA Not Available

TABLE 4-1

ROUNDS 1 THROUGH 4 ANALYTICAL RESULTS SUMMARY
ANNUAL GROUNDWATER MONITORING REPORT
DRMO, NSB-NLON, GROTON, CONNECTICUT

Chemical	Primary Monitoring Criterion [1]	Secondary Monitoring Criterion	6MW11S ROUND 1	6MW11S ROUND 2 7/30/98	6MW11S ROUND 3 1/27/99	6MW11S ROUND 4 4/22/99
VOCs (ug/L)						
1,1,2,2-TETRACHLOROETHANE	1,100	11 [4][5]		1 U	1 U	1 U
1,2-DICHLOROETHANE	29,700	99 [4][5]		1 U	1 U	1 U
CIS-1,2-DICHLOROETHENE	NA	NA		2	0.8 J	1
TRANS-1,2-DICHLOROETHENE	NA	NA		1 U	1 U	1 U
TRICHLOROETHENE	23,400	81 [4][5]		1 U	1 U	1 U
VINYL CHLORIDE	157,500	525 [4][5]		1 U	1 U	0.6 J
SVOCs (ug/L)						
BENZO(A)ANTHRACENE	3.0	0.049 [4][5]		0.12 U	0.05 U	0.05 UJ
BENZO(A)PYRENE	3.0	0.049 [4][5]		0.12 U	0.05 UR	0.05 U
BENZO(B)FLUORANTHENE	3.0	0.049 [4][5]		0.048 U	0.1 UJ	0.1 U
BENZO(K)FLUORANTHENE	3.0	0.049 [4][5]		0.048 U	0.05 UJ	0.05 U
BENZOIC ACID	NA	NA		19 U		10 UJ
BIS(2-ETHYLHEXYL)PHTHALATE	590	5.9 [4][5]		5 J	5 U	5 U
FLUORANTHENE	37,000	370 [4][5]		0.28	0.085 J	0.11 J
FLUORENE	1,400,000	14,000 [4][5]		0.42	0.25 J	0.07 J
NAPHTHALENE	NA	NA		1.2 U	0.1 U	0.5 U
PHENANTHRENE	0.77	NA		0.56	0.17	0.052
PYRENE	1,100,000	11,000 [4][5]		0.28	0.1	0.14 U
Pesticides/PCBs (ug/L)						
4,4'-DDD	NA	0.00084 [4][5]		0.019 U	0.02 U	0.02 U
AROCLOR-1254	5.0	0.00017 [4][5]		0.19 U	0.2 U	0.2 U
AROCLOR-1260	5.0	0.00017 [4][5]		0.19 U	0.2 U	0.2 U
HEPTACHLOR EPOXIDE	0.5	0.00011 [4][5]		0.008 R	0.01 U	0.01 U
HEXACHLOROBIPHENYL	NA	NA				0.02 U
Inorganics (total/dissolved) (ug/L)						
ARSENIC	40	0.14 [4][5]	-	2.0 U/3.4 U	1.9 U/1.9 U	2.7 J/2.1 U
BARIUM	NA	NA		105 J/110 J	81.2/80.5	83.2/76.1
CADMIUM	60	NA		0.25 U/0.25 U	2.3 UJ/2.3 UJ	1.9 U/1.9 U
CHROMIUM	1,100	50 [2]		1.1 U/10.0 U	3.4 U/3.4 U	4.3 U/4.3 U
COPPER	480	2.4 [2]		13.8 U/1.2 U	1.4 UJ/1.4 UJ	7.1/1.6 U
LEAD	130	8.1 [2]		6.6 UJ/1.4 U	4.1 U/1.3 U	1.7 J/1.1 U
SILVER	120	1.9 [2]		0.75 U/0.95 U	2.7 U/2.7 U	2.5 U/2.5 U
ZINC	1,230	81 [2]		16.8 U/8.6 U	41.8/6.7 U	45.3/5 U

NOTES:
Bold numbers denote exceedance of secondary monitoring criterion. There are no exceedances of primary monitoring criteria.
(1) Surface Water Protection Criteria for substances in groundwater, using a site-specific dilution factor of 100.
(2) Federal Ambient Water Quality Criteria for protection of aquatic life (chronic, saltwater).
(3) Connecticut Water Quality Criteria for protection of aquatic life (chronic, saltwater).
(4) Federal Ambient Water Quality Criteria for protection of human health from consumption of organisms.
(5) Connecticut Water Quality Criteria for protection of human health from consumption of organisms.
J Estimated Value
R Rejected Value
U Undetected
NA Not Available

TABLE 4-2

GROUNDWATER ELEVATIONS - ROUNDS 1 - 4
DRMO - NSB-NLON
GROTON, CONNECTICUT

WELL	Apr-98 HIGH TIDE / LOW TIDE	Jul-98 HIGH TIDE / LOW TIDE	Jan-99 HIGH TIDE / LOW TIDE	Apr-99 HIGH TIDE / LOW TIDE
6MW1S	(1) / 1.16	2.95 / 1.59	(1) / 0.37	3.20 / 0.35
6MW2S	(1) / 1.20	(3) / 1.46	(1) / 0.41	3.20 / 0.50
6MW2D	(1) / 2.55	2.99 / 3.74	(1) / 0.33	3.37 / 2.13
6MW6S	(1) / 4.05	3.50 / 3.18	(1) / 5.63	3.59 / 3.52
6MW6D	(1) / 4.17	3.62 / 3.36	(1) / 3.66	3.58 / 3.54
6MW9S	(2)	3.49 / 3.17	(1) / 3.66	3.71 / 3.20
6MW10S	(1) / 1.47	3.29 / 2.55	(1) / 0.70	3.18 / 0.80
6MW10D	(1) / 3.17	3.71 / 2.91	(1) / 2.92	4.18 / 2.39
6MW11S	(2)	4.32 / 1.47	(1) / 0.66	3.37 / 0.69
6MW11D	(2)	3.42 / 2.72	(1) / 2.73	3.85 / 2.50
SG-01	(1) / 0.81	2.91 / 1.45	(1) / 0.66	3.25 / 0.48

Notes:
1 High tide water levels were not measured during the sampling round.
2 Monitoring wells were damaged at time of sampling.
3 Water below pump. Measurement not taken.

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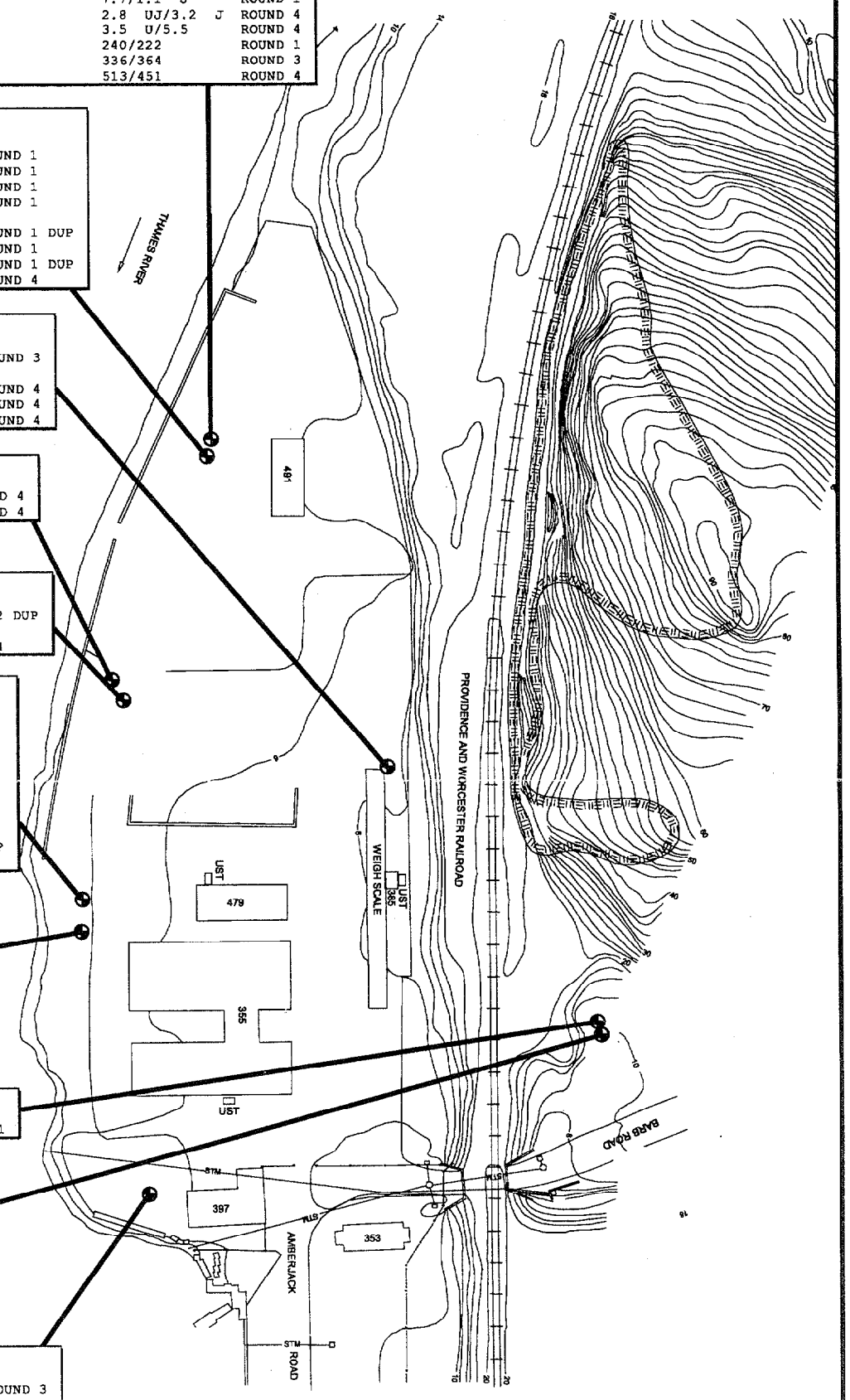


6MW10D
Inorganics (total/dissolved) (ug/L)

ARSENIC	15.9/12.7	ROUND 1
ARSENIC	5.0/6.6	ROUND 3
COPPER	7.7/1.1 J	ROUND 1
COPPER	2.8 UJ/3.2 J	ROUND 4
SILVER	3.5 U/5.5	ROUND 4
ZINC	240/222	ROUND 1
ZINC	336/364	ROUND 3
ZINC	513/451	ROUND 4

6MW10S
Semivolatile Organics (ug/L)

BENZO(A)ANTHRACENE	0.037 J	ROUND 1
BENZO(A)PYRENE	0.082	ROUND 1
BENZO(B)FLUORANTHENE	0.089 J	ROUND 1
BENZO(K)FLUORANTHENE	0.042 J	ROUND 1
Inorganics (total/dissolved) (ug/L)		
ARSENIC	2.4 J/1.8 U	ROUND 1 DUP
COPPER	5.5/1.2 J	ROUND 1
COPPER	5.9/0.64 U	ROUND 1 DUP
COPPER	6.9/1.6 U	ROUND 4

6MW9S
PCBS (ug/L)

AROCLOR-1260	0.23	ROUND 3
Inorganics (total/dissolved) (ug/L)		
ARSENIC	2.1 U/3.2 J	ROUND 4
COPPER	3/2.5	ROUND 4
ZINC	126/122	ROUND 4

6MW11S
Inorganics (total/dissolved) (ug/L)

ARSENIC	2.7 J/2.1 U	ROUND 4
COPPER	7.1/1.6 U	ROUND 4

6MW11D
Semivolatile Organics (ug/L)

BIS(2-ETHYLHEXYL)PHTHALATE	11	ROUND 2 DUP
Inorganics (total/dissolved) (ug/L)		
SILVER	3.5 U/3.9	ROUND 4

6MW2S
Semivolatile Organics (ug/L)

BENZO(A)ANTHRACENE	0.11 J	ROUND 4
BENZO(A)PYRENE	0.13 J	ROUND 4
BENZO(B)FLUORANTHENE	0.13	ROUND 4
BENZO(K)FLUORANTHENE	0.13 J	ROUND 4
Inorganics (total/dissolved) (ug/L)		
ARSENIC	1.9 U/2.5 J	ROUND 3
COPPER	3.2/2.4	ROUND 1
COPPER	2.8 UJ/3.3 J	ROUND 4
SILVER	4.3/3.5 U	ROUND 4 DUP
ZINC	18.5 U/108	ROUND 1

6MW2D
Semivolatile Organics (ug/L)

BENZO(B)FLUORANTHENE	0.038 J	ROUND 2
BIS(2-ETHYLHEXYL)PHTHALATE	31	ROUND 1
BIS(2-ETHYLHEXYL)PHTHALATE	8	ROUND 4
Inorganics (total/dissolved) (ug/L)		
ARSENIC	3.1 J/1.8 U	ROUND 1
COPPER	5.4/2.0	ROUND 1
COPPER	4.8 J/2.8 UJ	ROUND 4

6MW6S
Inorganics (total/dissolved) (ug/L)

ZINC	16.0 U/147	ROUND 1

6MW6D
Semivolatile Organics (ug/L)

BIS(2-ETHYLHEXYL)PHTHALATE	23	ROUND 2
Inorganics (total/dissolved) (ug/L)		
COPPER	1.6 U/3.9	ROUND 4
ZINC	53.3/91.3	ROUND 1

6MW1S
Semivolatile Organics (ug/L)

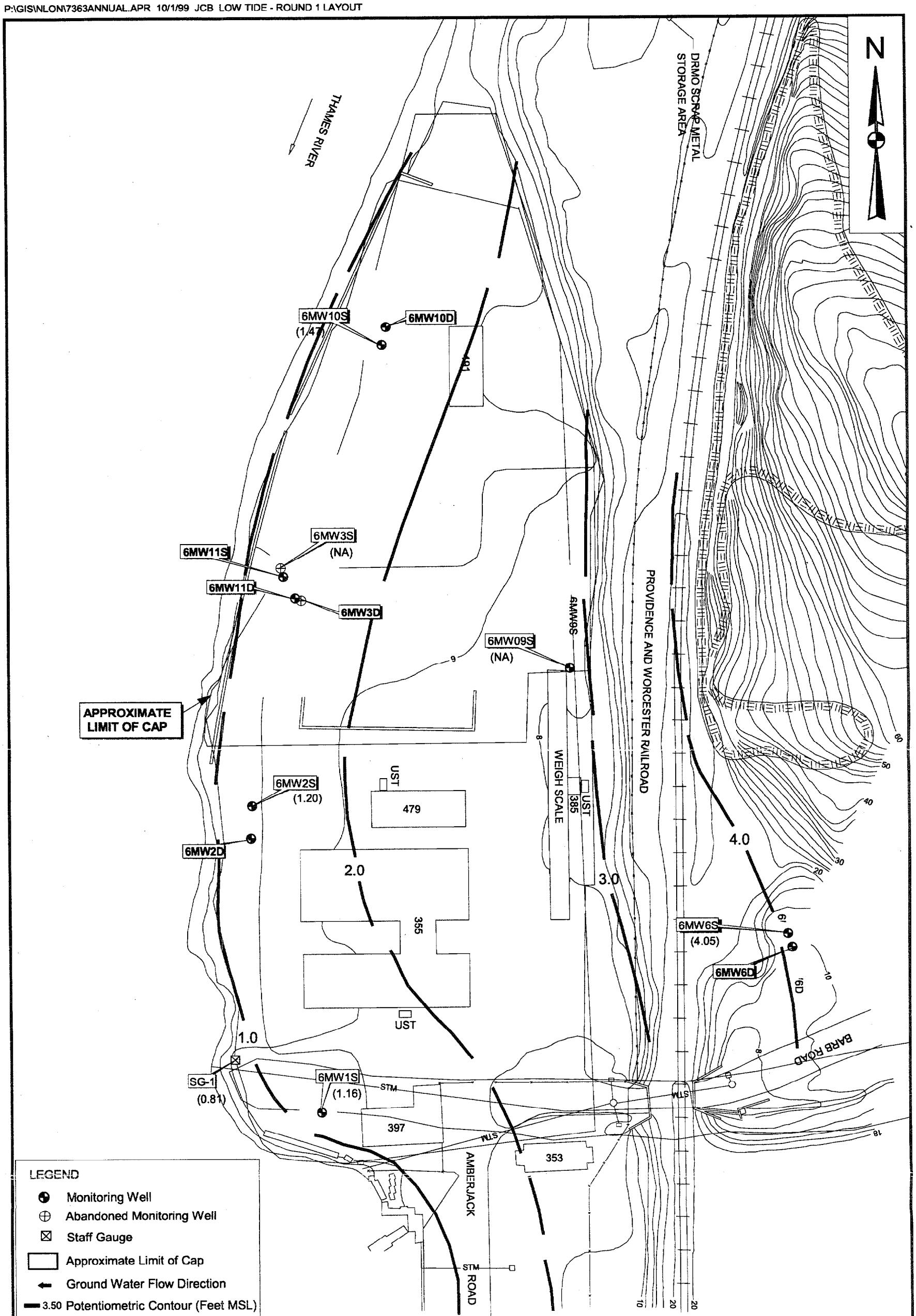
BIS(2-ETHYLHEXYL)PHTHALATE	130	ROUND 3
BIS(2-ETHYLHEXYL)PHTHALATE	7	ROUND 4
Inorganics (total/dissolved) (ug/L)		
SILVER	0.99 U/2.0	ROUND 1

100 0 100 Feet

DRAWN BY J. BELLONE	DATE 10/13/99	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7363 / OWNER NUMBER —
CHECKED BY MLM	DATE 10/20/99	EXCEEDANCES OF SECONDARY MONITORING CRITERIA IN GROUNDWATER ROUNDS 1 THROUGH 4 DRMO NSB-NLON, GROTON, CONNECTICUT	APPROVED BY Mark L. Mengel / DATE 10/20/99
COST/SCHEDULE-AREA			APPROVED BY — / DATE —
SCALE AS NOTED			DRAWING NO. FIGURE 4-1 / REV 0

1086AB02

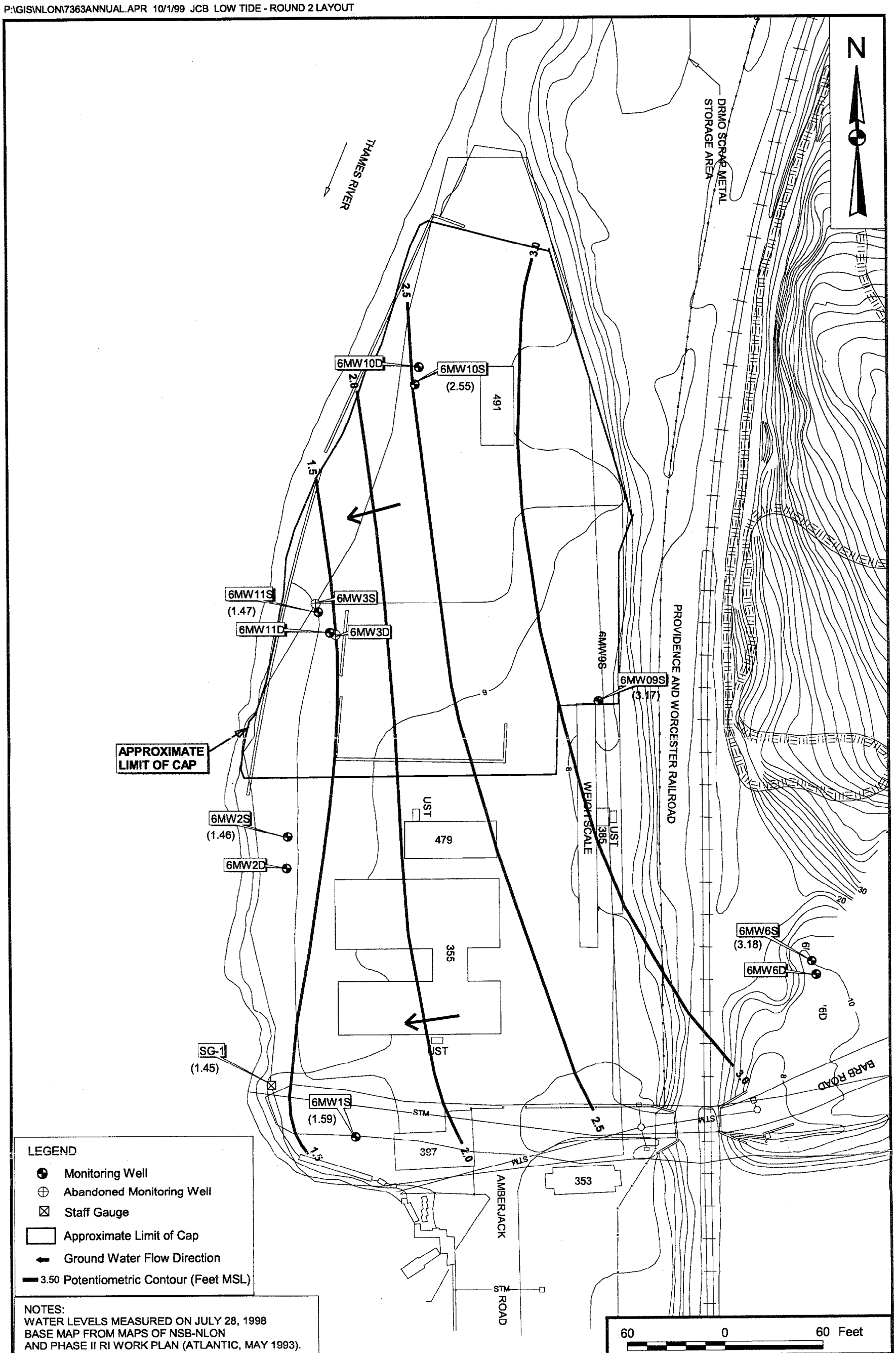
P:\GIS\NLON\7363ANNUAL.APR 10/1/99 JCB LOW TIDE - ROUND 1 LAYOUT



NOTES:
WATER LEVELS MEASURED ON APRIL 20, 1998
BASE MAP FROM MAPS OF NSB-NLON
AND PHASE II RI WORK PLAN (ATLANTIC, MAY 1993).

DRAWN BY J. BELLONE	DATE 10/1/99	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7363 / OWNER NUMBER —
CHECKED BY MLM	DATE 10/20/99	LOW TIDE POTENTIOMETRIC SURFACE CONTOURS ROUND 1 GROUNDWATER SAMPLING ANNUAL REPORT DRMO NSB-NLON, GROTON, CONNECTICUT	APPROVED BY Mark A. Mungal / DATE 10/20/99
COST/SCHEDULE-AREA			APPROVED BY — / DATE —
SCALE AS NOTED			DRAWING NO. FIGURE 4-2 / REV 0

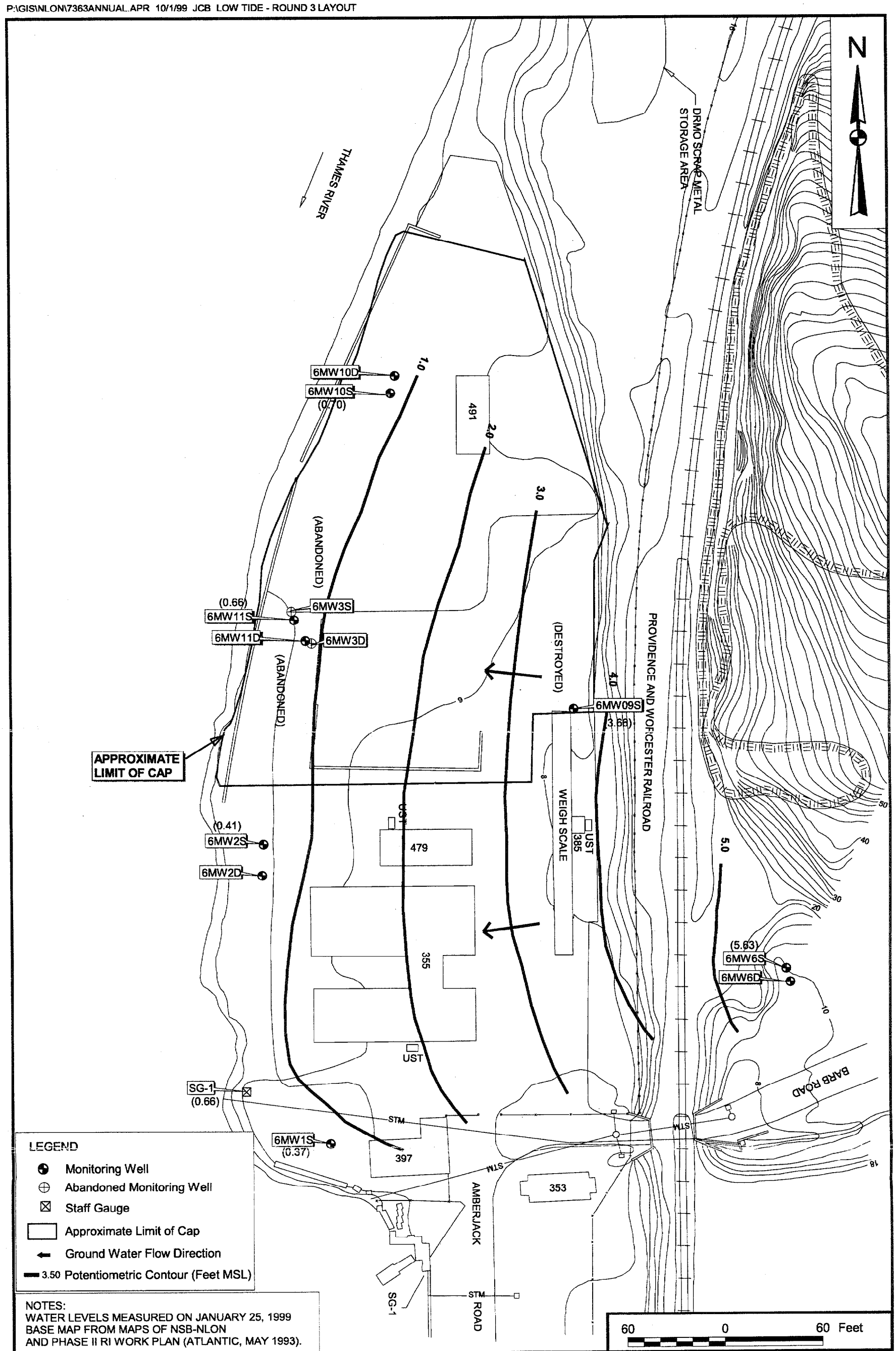
P:\GIS\NLON\7363ANNUAL.APR 10/1/99 JCB LOW TIDE - ROUND 2 LAYOUT



NOTES:
WATER LEVELS MEASURED ON JULY 28, 1998
BASE MAP FROM MAPS OF NSB-NLON
AND PHASE II RI WORK PLAN (ATLANTIC, MAY 1993).

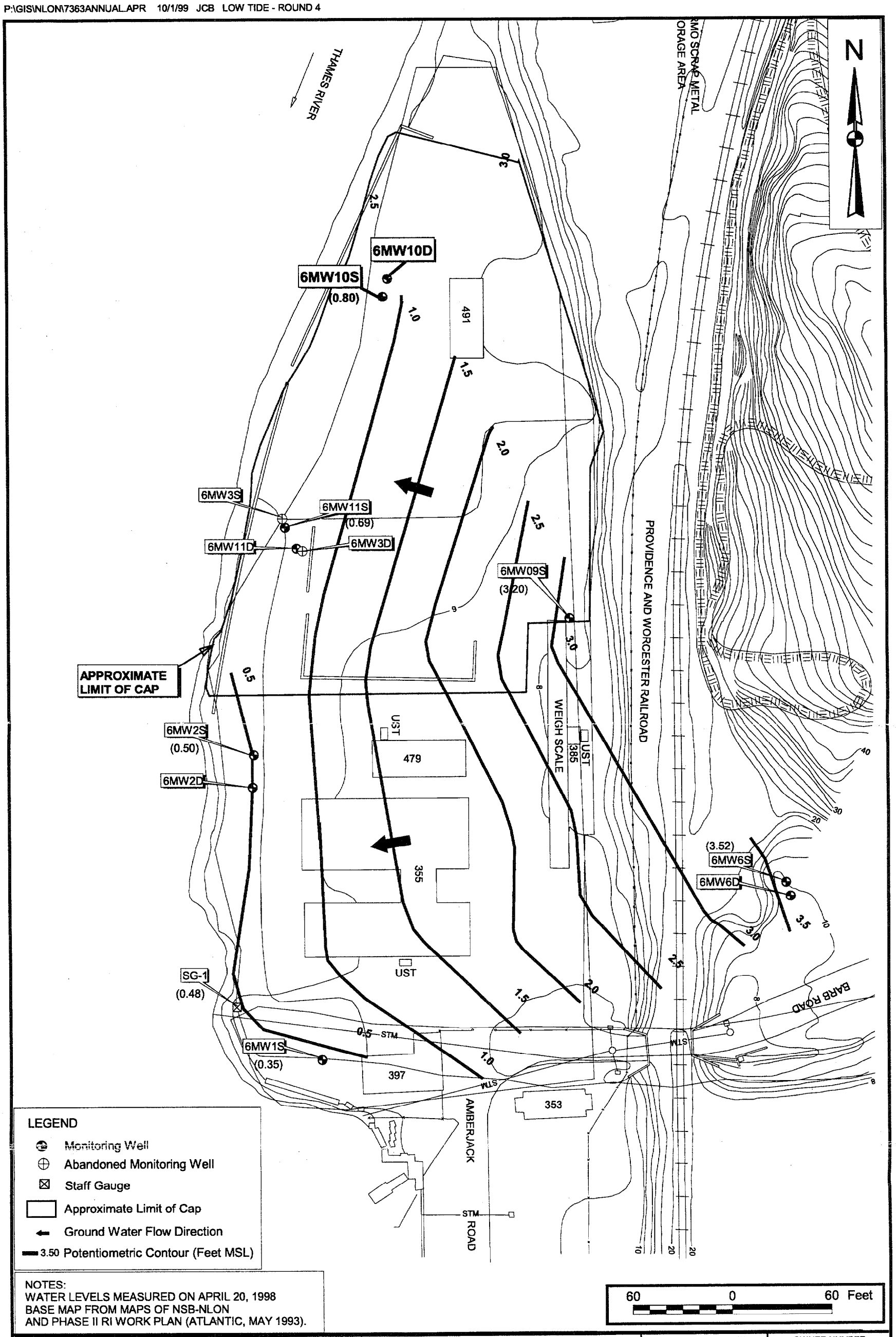
DRAWN BY J. BELLONE	DATE 10/1/99	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7363 / OWNER NUMBER —
CHECKED BY MLM	DATE 10/20/99	LOW TIDE POTENTIOMETRIC SURFACE CONTOURS ROUND 2 GROUNDWATER SAMPLING ANNUAL REPORT DRMO NSB-NLON, GROTON, CONNECTICUT	APPROVED BY Mark L. Mengel / DATE 10/20/99
COST/SCHEDULE-AREA			APPROVED BY — / DATE —
SCALE AS NOTED			DRAWING NO. FIGURE 4-3 / REV 0

P:\GIS\NLON\7363ANNUAL.APR 10/1/99 JCB LOW TIDE - ROUND 3 LAYOUT



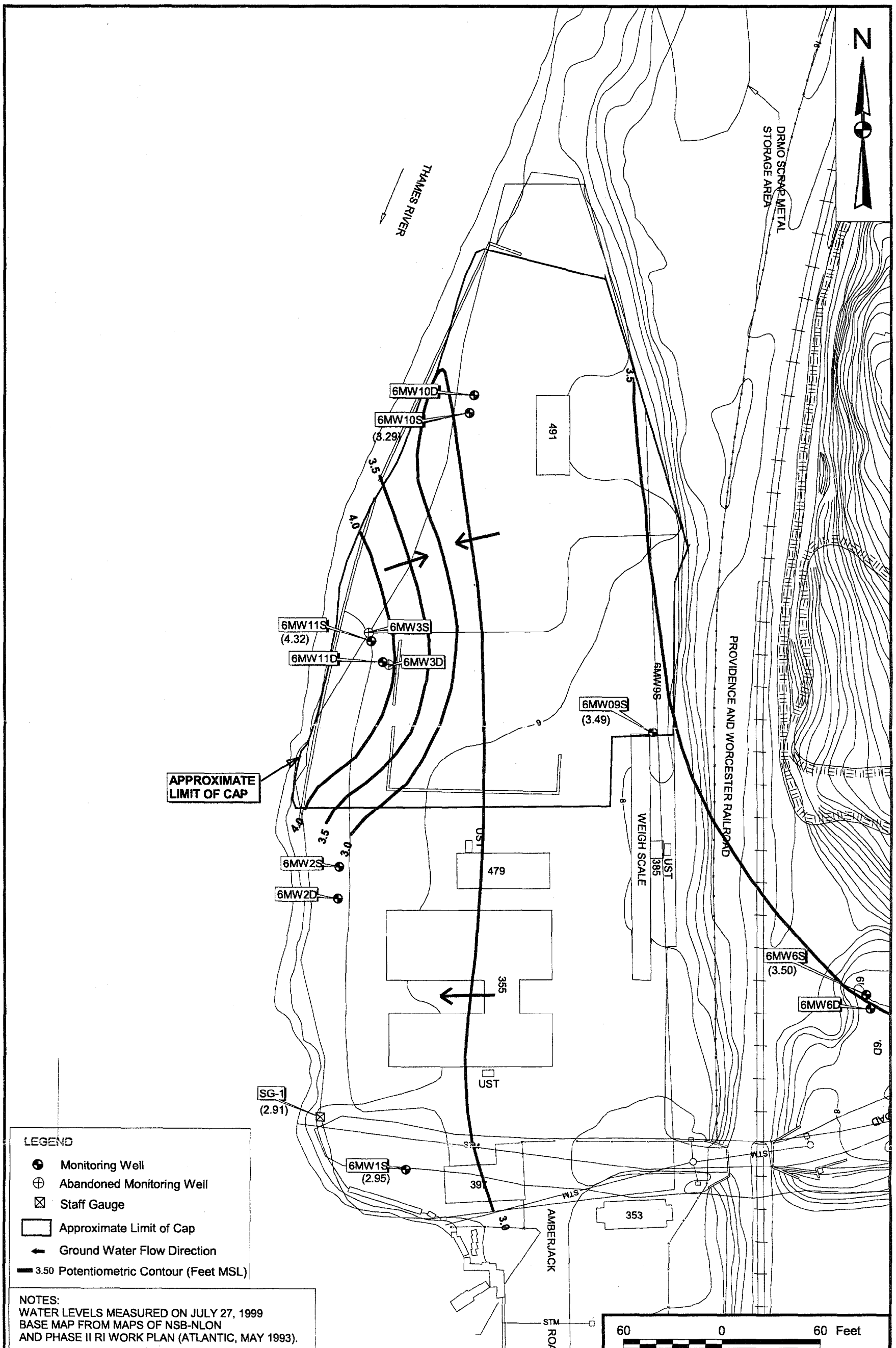
DRAWN BY J. BELLONE	DATE 10/1/99	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7363	OWNER NUMBER —
CHECKED BY MLM	DATE 10/20/99	LOW TIDE POTENTIOMETRIC SURFACE ROUND 3 GROUNDWATER SAMPLING ANNUAL REPORT DRMO NSB-NLON, GROTON, CONNECTICUT	APPROVED BY Mark K. Mungal	DATE 10/20/99
COST/SCHEDULE-AREA			APPROVED BY —	DATE —
SCALE AS NOTED			DRAWING NO. FIGURE 4-4	REV 0

P:\GIS\NLON\7363ANNUAL_APR 10/1/99 JCB LOW TIDE - ROUND 4



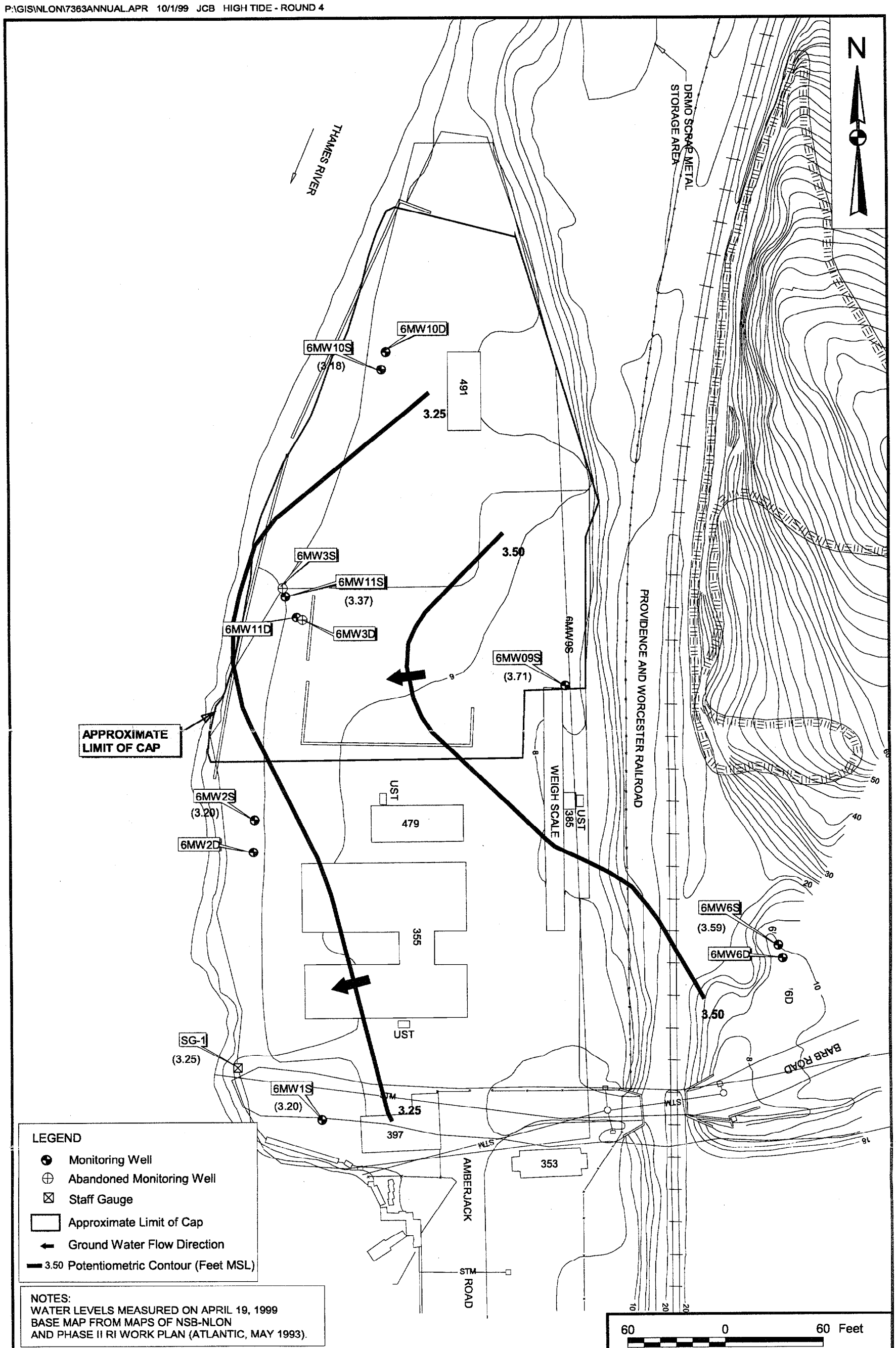
DRAWN BY J. BELLONE — DATE 10/1/99	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7363	OWNER NUMBER —
CHECKED BY MLM — DATE 10/20/99	LOW TIDE POTENTIOMETRIC SURFACE MAP ROUND 4 GROUNDWATER SAMPLING ANNUAL REPORT DRMO NSB-NLON, GROTON, CONNECTICUT	APPROVED BY Mark L. Mungel — DATE 10/20/99	
COST/SCHEDULE-AREA		APPROVED BY —	DATE —
SCALE AS NOTED		DRAWING NO. FIGURE 4-5	REV 0

P:\GIS\NLON\7363ANNUAL.APR 10/1/99 JCB HIGH TIDE - ROUND 2

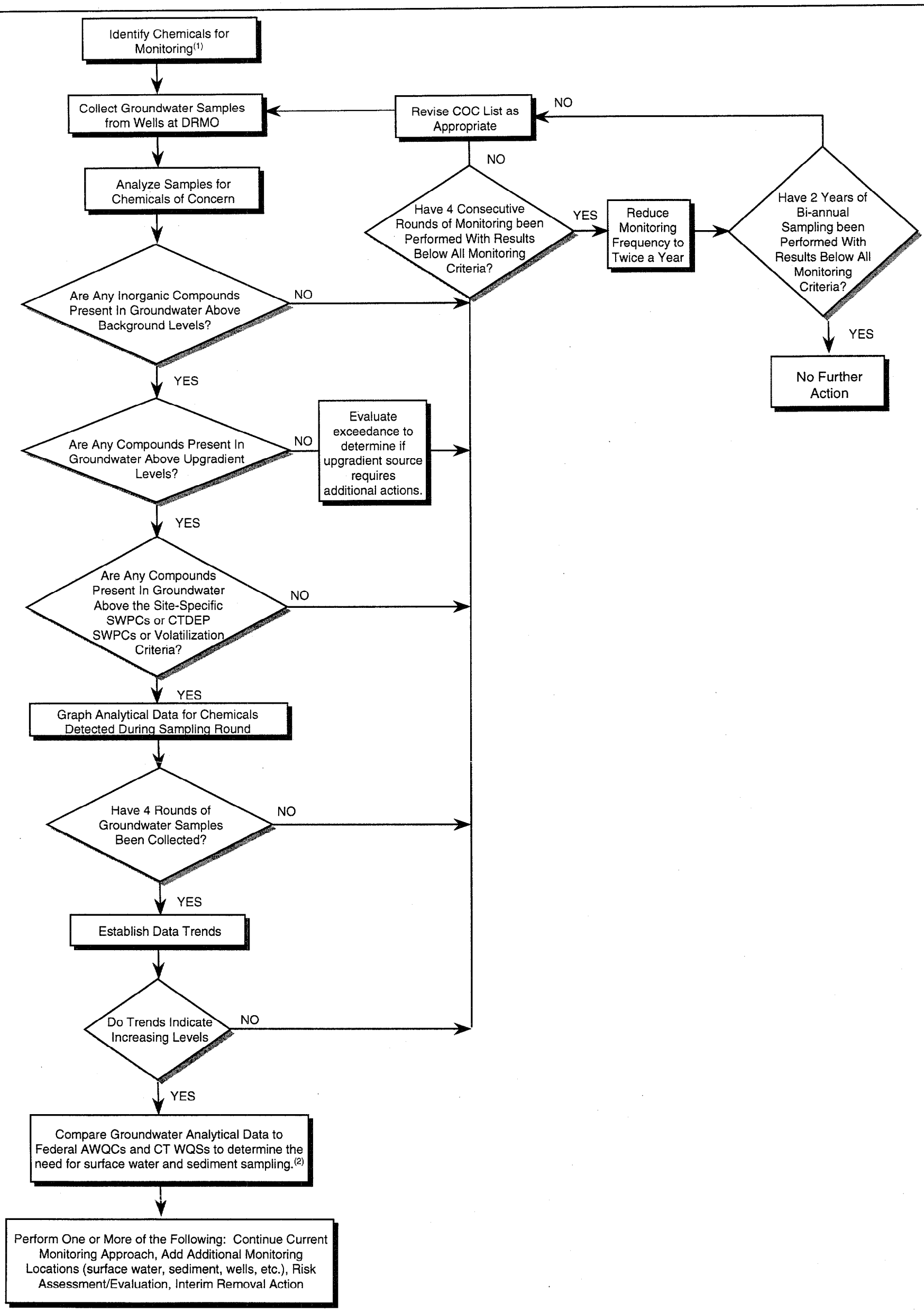


DRAWN BY J. BELLONE	DATE 10/1/99	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7363	OWNER NUMBER —
CHECKED BY MLM	DATE 10/20/99	HIGH TIDE POTENTIOMETRIC SURFACE CONTOURS ROUND 2 GROUNDWATER SAMPLING ANNUAL REPORT DRMO NSB-NLON, GROTON, CONNECTICUT	APPROVED BY Mark L. Mingel	DATE 10/20/99
COST/SCHEDULE-AREA			APPROVED BY —	DATE —
SCALE AS NOTED			DRAWING NO. FIGURE 4-6	REV 0

P:\GIS\NLON\7363ANNUAL.APR 10/1/99 JCB HIGH TIDE - ROUND 4



DRAWN BY J. BELLONE — DATE 10/1/99	Tetra Tech NUS, Inc.	CONTRACT NUMBER 7363	OWNER NUMBER —
CHECKED BY MLM — DATE 10/20/99	HIGH TIDE POTENTIOMETRIC SURFACE MAP ROUND 4 GROUNDWATER SAMPLING ANNUAL REPORT DRMO NSB-NLON, GROTON, CONNECTICUT	APPROVED BY Mark F. Mengel — DATE 10/20/99	
COST/SCHEDULE-AREA		APPROVED BY — DATE —	
SCALE AS NOTED		DRAWING NO. FIGURE 4-7	REV 0



(1) Initially evaluate soil contaminants which exceed the CTDEP Pollutant Mobility Criteria for GB classified groundwater. Evaluate chemicals in groundwater which exceed the site-specific Surface Water Protection Criteria (SWPCs) and Volatilization Criteria. Also include COCs identified in the Site 6 DRMO Feasibility Study and PCBs.

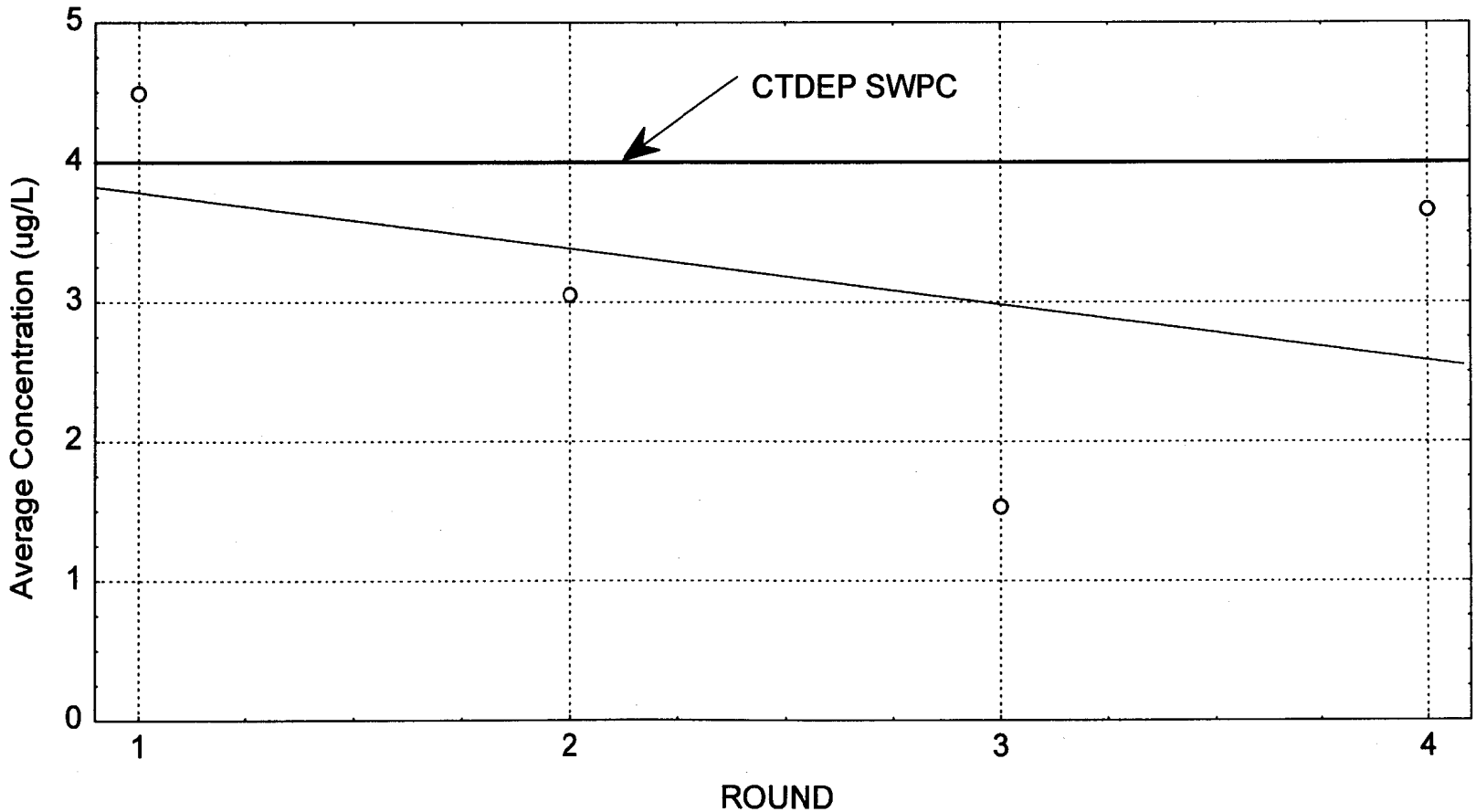
(2) Surface water samples will be compared to the Federal AWQCs and Connecticut WQSs; sediment samples will be compared to NOAA ERLs/ERMs.

FIGURE 4-8

GROUNDWATER MONITORING PLAN DECISION DIAGRAM
DRMO
NSB-NLON, GROTON, CONNECTICUT

TETRA TECH NUS, INC.

Figure 4 - 9
Average Concentration of Arsenic as a Function of Time
Rounds 1 Through 4
NSB - NLON, Groton, Connecticut



5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

This groundwater monitoring report summarizes the initial 4 rounds of groundwater analytical data collected from 10 monitoring wells installed at the DRMO to monitor groundwater quality beneath the asphalt cap installed as part of the post closure activities at the DRMO. As previously stated, the list of COCs evaluated consists of those contaminants identified in the Groundwater Monitoring Plan as shown on Table 4-1 of this report. To verify that contaminants are not migrating from the site at concentrations above criteria, the analytical results were compared to site-specific Surface Water Protection Criteria (SWPCs). The analytical results were also compared to Federal Ambient Water Quality Criteria (AWQCs) and the Connecticut Water Quality Standards (WQSs) as secondary monitoring criteria. The ultimate goal of the monitoring program is to attain surface water protection requirements for those contaminants.

The results obtained for the initial four rounds of groundwater monitoring for volatile and semivolatile organic compounds indicated no exceedances of any State of Connecticut Surface Water Protection Criteria (SWPCs). Bis(2-ethylhexyl)phthalate (BEHP) exceeded the secondary monitoring criteria in several samples, however the results were similar to positive detections noted in samples collected from upgradient monitoring wells. The low concentrations of BEHP that were detected may also be attributable to laboratory artifacts. Phthalate esters have been detected in laboratory QA/QC blanks and samples depending on plastics (gloves, sample tubing) used during sample collection, preparation, and analyses. Several polycyclic aromatic hydrocarbons (PAHs) detected in samples collected from monitoring wells 6MW2S and 6MW10S were noted to exceed secondary monitoring criteria. These PAHs may be artifacts related to the asphalt cap as PAHs are commonly associated with asphalt paving. An examination of the various exceedances of secondary monitoring criteria, do not indicate any increasing or decreasing trends.

As stated in Section 4.2, contaminant concentrations detected in upgradient monitoring wells (6MW9S, 6MW6S and 6MW6D) were compared to the remaining monitoring wells located downgradient. The statistical comparisons indicated that upgradient and downgradient concentrations of both organic and inorganic COCs were found to be similar except for arsenic. The average arsenic concentrations for each round were plotted as a function of time and compared to the Connecticut SWPCs. As shown on Figure 4-9 the average concentrations for arsenic show a decreasing trend.

A review of the inorganic results revealed that in several instances total metal concentrations were less than dissolved metal concentrations. Typically, dissolved metal concentrations are lower as the filtering process removes particulate matter to which the metals bond. For the instances where dissolved metal

concentrations exceed total metal concentrations, the concentration variance is primarily attributed to instrumentation fluctuation near the instrument detection limit. Instrumentation signal fluctuation therefore, can result in the reporting of concentrations that marginally exceed the instrument detection limit. Another condition suspected of contributing to the variance between total and dissolved metal concentrations is random laboratory contamination.

In summary, the current groundwater monitoring program compares groundwater data to State SWPCs to determine the effects of any potential release to a surface water body, i.e., the Thames River. Through the first year of monitoring (4 rounds), no exceedances of any of the SWPCs (primary monitoring criteria) were noted. The exceedances highlighted within Table 4-1 are exceedances of secondary monitoring criteria. These exceedances did not exhibit any notable increasing or decreasing trends. Statistically, there is no increase in contaminant concentrations detected in downgradient monitoring wells as compared to upgradient wells, except for arsenic, which overall exhibited a decreasing trend.

5.2 RECOMMENDATIONS

The analytical results at the end of the initial four rounds of groundwater monitoring sampling indicate no exceedances of the SWPCs, although several contaminants were detected in excess of the secondary monitoring criteria. Because of the various exceedances of secondary monitoring criteria, groundwater monitoring should be continued through year two to further evaluate these chemical concentrations.

The following considerations should be discussed between the Navy, EPA and CTDEP should contaminant concentrations remain similar to those exhibited to date.

- Round 5 sampling has recently been completed and Round 6 will be performed soon. At the completion of Rounds 7 & 8 (year 2) consideration should be given to reducing the number of parameters to be analyzed.

- Consideration should be given to reducing the sampling frequency at the completion of rounds 7 & 8.

- Maintain monitoring well integrity (well maintenance, well development) in case of extended monitoring.

- Discuss endpoint for groundwater monitoring if current trends continue.

REFERENCES

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Gilbert, Richard O., Statistical Methods for Environmental Pollution Monitoring. Van Nostrand Reinhold Company. New York, New York. 1987.

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(SCS, 1983): Soil Survey of New London County Connecticut. Soil Conversation Service.

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(USGS, 1967): Bedrock Geologic Map of the Uncasville Quadrangle, New London County, Connecticut. United States Geological Survey.

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APPENDIX A

GROUNDWATER SAMPLE LOGSHEETS AND LOW-FLOW PURGE DATA SHEETS

ROUND 1

GROUNDWATER SAMPLE LOG SHEET

Project / Site: NSB-NLON / DRMO
Project No.: 7363

Sample ID No.: DRMO-6MW15-GW-01
Sample Location: 6MW15
Sampled By: TE

[X] Monitoring Well
[ ] Domestic Well
[ ] Other Well Type:
[ ] QA Sample Type:

Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA

	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Date: 4/21/98								
Time: 1125								
Method: Low Flow	Clear	6.29	1.550	12.57	1.58	13.88	0.79	104.4

PURGE DATA

Date:	Volume	pH	S.C.	Temp (°C)	Turbidity	DO	Salinity	
Method:	Initial							
Monitor Reading (ppm):	1							
Well Casing Diameter:	2							
Well Casing Material:	3							
Total Well Depth (TD):								
Static Water Level (WL):								
One Casing Volume(gal/L):								
Start Purge (hrs):								
End Purge (hrs):								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

See Attached Low Flow Purge Data Sheet

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Collected	Laboratory
TCL VOC	HCl	3x 40 mL	✓	CEIMIC
TCL SVOC	None	2 x 1L	✓	CEIMIC
TCL PESTICIDES/PCBs	None	2 x 1L	✓	CEIMIC
TAL METALS (TOTAL)	HNO_3	1 x 500 mL	✓	KATAHDIN
TAL METALS (FILTERED)	HNO_3	1 x 500 mL	✓	KATAHDIN

OBSERVATIONS / NOTES

LABORATORY INFO

LAB: Katahdin Analytical Services
COC No.: I267-01
LAB: CEIMIC Corporation
COC No.: 0267-02

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s): Timothy S

GROUNDWATER SAMPLE LOG SHEET

Project / Site: NSB-NLON / DRMO
Project No.: 7363

Sample ID No.: DRMO-6MW25-GW-Ø
Sample Location: 6MW25
Sampled By: M Leger

[X] Monitoring Well
[ ] Domestic Well
[ ] Other Well Type:
[ ] QA Sample Type:

Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA

	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Date: 4/21/98 Time: 1235 Method: Low Flow	Clear	7.51	7.743	10.67	5.16	58.34	4.30	7.6

PURGE DATA

Date: 4/21/98	Volume	pH	S.C.	Temp (°C)	Turbidity	DO	Salinity
Method: Bladder	Initial						
Monitor Reading (ppm): —	1						
Well Casing Diameter: 2"	2						
Well Casing Material: PVC	3						
Total Well Depth (TD): 13.6							
Static Water Level (WL): 6.1							
One Casing Volume(gal/L): 4.6							
Start Purge (hrs): 1207							
End Purge (hrs): 1235							
Total Purge Time (min): 28							
Total Vol. Purged (gal/L): 5							

See Attached Low Flow Purge Data Sheet

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Collected	Laboratory
TCL VOC	HCl	3 x 40 mL	✓	CEIMIC
TCL SVOC	None	2 x 1L	✓	CEIMIC
TCL PESTICIDES/PCBs	None	2 x 1L	✓	CEIMIC
TAL METALS (TOTAL)	HNO_3	1 x 500 mL	✓	KATAHDIN
TAL METALS (FILTERED)	HNO_3	1 x 500 mL	✓	KATAHDIN

OBSERVATIONS / NOTES

LABORATORY INFO

LAB: Katahdin Analytical Services
COC No.: I267-Ø1
LAB: CEIMIC Corporation
COC No.: 0267-Ø2

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Project / Site: NSB-NLON / DRMO
Project No.: 7363

Sample ID No.: DRMO- 6MW2D-GW-01
Sample Location: 6MW2D
Sampled By: M Leger

[X] Monitoring Well
[ ] Domestic Well
[ ] Other Well Type:
[ ] QA Sample Type:

Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA

	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Date: 4/21/98								
Time: 1121								
Method: Low Flow	Clear	6.87	32.91	11.75	48.2	24.28	20.57	-164.1

PURGE DATA

	Volume	pH	S.C.	Temp (°C)	Turbidity	DO	Salinity	
Date: 4/21/98								
Method: Bladder	Initial							
Monitor Reading (ppm): –	1							
Well Casing Diameter: 2"	2							
Well Casing Material: PVC	3							
Total Well Depth (TD): 88.84								
Static Water Level (WL): 4.39								
One Casing Volume(gal/L): 52.1								
Start Purge (hrs): 1028								
End Purge (hrs): 1118								
Total Purge Time (min): 50								
Total Vol. Purged (gal/L): 8.9								

See Attached Low Flow Purge Data Sheet

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Collected	Laboratory
TCL VOC	HCl	3 x 40 mL	✓	CEIMIC
TCL SVOC	None	2 x 1L	✓	CEIMIC
TCL PESTICIDES/PCBs	None	2 x 1L	✓	CEIMIC
TAL METALS (TOTAL)	HNO_3	1 x 500 mL	✓	KATAHDIN
TAL METALS (FILTERED)	HNO_3	1 x 500 mL	✓	KATAHDIN

OBSERVATIONS / NOTES

LABORATORY INFO

LAB: Katahdin Analytical Services
COC No.: I267-01
LAB: CEIMIC Corporation
COC No.: 0267-02

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Project / Site: NSB-NLON / DRMO
Project No.: 7363

Sample ID No.: DRMO-6MW65-GW-01
Sample Location: 6MW65
Sampled By: M Leger

[X] Monitoring Well
[ ] Domestic Well
[ ] Other Well Type:
[ ] QA Sample Type:

Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA

Date: 4/21/98 Time: 2322	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Method: Low Flow	Clear	6.05	0.274	8.01	5.87	11.89	0.13	66.0

PURGE DATA

Date:	Volume	pH	S.C.	Temp (°C)	Turbidity	DO	Salinity	
Method: Bladder	Initial							
Monitor Reading (ppm): —	1							
Well Casing Diameter: 2"	2							
Well Casing Material: PVC	3							
Total Well Depth (TD): 18.58								
Static Water Level (WL): 8.09								
One Casing Volume(gal/L): 6.5								
Start Purge (hrs): 2255								
End Purge (hrs): 2320								
Total Purge Time (min): 25								
Total Vol. Purged (gal/L) 5.2								

See Low Flow Sheet for Purge Data

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Collected	Laboratory
TCL VOC	HCl	3 x 40 mL	✓	CEIMIC
TCL SVOC	None	2 x 1L	✓	CEIMIC
TCL PESTICIDES/PCBs	None	2 x 1L	✓	CEIMIC
TAL METALS (TOTAL)	HNO_3	1 x 500 mL	✓	KATAHDIN
TAL METALS (FILTERED)	HNO_3	1 x 500 mL	✓	KATAHDIN

OBSERVATIONS / NOTES

LABORATORY INFO

LAB: Katahdin Analytical Services
COC No.: I267-01
LAB: CEIMIC Corporation
COC No.: 0267-02

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Project / Site: NSB-NLON / DRMO
Project No.: 7363

Sample ID No.: DRMO-GMW6D-GW-01
Sample Location: GMW 6D
Sampled By: JEvans

[✓] Monitoring Well
[ ] Domestic Well
[ ] Other Well Type:
[ ] QA Sample Type:

Type of Sample:
[✓] Low Concentration
[ ] High Concentration

SAMPLING DATA

Date: 4/22/98	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Time: 0005								
Method: Low Flow	clear	6.59	4.612	8.85	35.6	2.49	2.47	-78.7

PURGE DATA

Date: 4/21/98	Volume	pH	S.C.	Temp (°C)	Turbidity	DO	Salinity	
Method: Bladder	Initial							
Monitor Reading (ppm): —	1							
Well Casing Diameter: 6"	2							
Well Casing Material: Open	3							
Total Well Depth (TD): 46.0								
Static Water Level (WL): 8.45								
One Casing Volume(gal/L): 209								
Start Purge (hrs): 4/21 2340								
End Purge (hrs): 4/22 0002								
Total Purge Time (min): 22								
Total Vol. Purged (gal/L): 5								

See Attached Low Flow Data Sheet for purge

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Collected	Laboratory
TCL VOC	HCl	3 x 40 mL	✓	CEIMIC
TCL SVOC	None	1 x 2 L	✓	CEIMIC
TCL PESTICIDES/PCBs	None	1 x 2 L	✓	CEIMIC
TAL METALS (TOTAL)	HNO_3	1 x 500 mL	✓	KATAHDIN
TAL METALS (FILTERED)	HNO_3	1 x 500 mL	✓	KATAHDIN

OBSERVATIONS / NOTES

LABORATORY INFO

LAB: Katahdin Analytical Services
COC No.: I267-01
LAB: CEIMIC Corporation
COC No.: 0267-02

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s): [signature]

GROUNDWATER SAMPLE LOG SHEET

Project / Site: NSB-NLON / DRMO
Project No.: 7363

[X] Monitoring Well
[ ] Domestic Well
[ ] Other Well Type:
[ ] QA Sample Type:

Sample ID No.: DRMO-GMW105-GW
Sample Location: ~~DRMO~~ GMW105
Sampled By: MLeger

Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA

	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/l	Salinity ppt	Eh mV
Date: 4/20/98 Time: 1035 Method: LOW FLOW	CLR	7.99	8.911	11.13	6.60	49.07	5.00	-134.5

PURGE DATA

	Volume	pH	S.C.	Temp (°C)	Turbidity	DO	Salinity
Date: 4/20/98							
Method: Bladder	Initial						
Monitor Reading (ppm): —	1						
Well Casing Diameter: 2"	2						
Well Casing Material: PVC	3						
Total Well Depth (TD): 13.31							
Static Water Level (WL): 3.45							
One Casing Volume(gal/L): 6.08							
Start Purge (hrs):							
End Purge (hrs):							
Total Purge Time (min):							
Total Vol. Purged (gal/L):							

See Attached Low Flow Purge Data Sheet

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Collected	Laboratory
TCL VOC	HCl	3x 40 ml	Yes	CEIMIC
TCL SVOC	NONE	2000 ml	Yes	CEIMIC
TCL PESTICIDES/PCBs	NONE	2000 ml	Yes	CEIMIC
TAL METALS (TOTAL)	HNO_3	500 ml	Yes	KATAHDIN
TAL METALS (FILTERED)	HNO_3	500 ml	Yes	KATAHDIN

OBSERVATIONS / NOTES

LABORATORY INFO

LAB: Katahdin Analytical Services
COC No.: I ~~0~~ 267-01
LAB: CEIMIC Corporation
COC No.: 0267-01

Circle if Applicable:

MS/MSD

Duplicate ID No.: GWFD-042098

Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Project / Site: NSB-NLON / DRMO
Project No.: 7363

Sample ID No.: DRMO-GMW10D-GW-
Sample Location: GMW10D
Sampled By: TE

[X] Monitoring Well
[ ] Domestic Well
[ ] Other Well Type:
[ ] QA Sample Type:

Type of Sample:
[X] Low Concentration
[ ] High Concentration

SAMPLING DATA

Date: 4-20-98 / Time: 1120	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Method: Low Flow	Clear	7.28	19.24	12.94	35.4	56.38	11.47	-235.0

PURGE DATA

Date:	Volume	pH	S.C.	Temp (°C)	Turbidity	DO	Salinity
Method:	Initial						
Monitor Reading (ppm):	1						
Well Casing Diameter:	2						
Well Casing Material:	3						
Total Well Depth (TD):							
Static Water Level (WL):							
One Casing Volume(gal/L):							
Start Purge (hrs):							
End Purge (hrs):							
Total Purge Time (min):							
Total Vol. Purged (gal/L):							

See attached Low Flow Purge Data Sheet

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Collected	Laboratory
TCL VOC	HCl	3 x 40 mL glass	✓	CEIMIC
TCL SVOC	None	2 x 1L Amber	✓	CEIMIC
TCL PESTICIDES/PCBs	None	2 x 1L Amber	✓	CEIMIC
TAL METALS (TOTAL)	HNO_3	1 x 500 mL	✓	KATAHDIN
TAL METALS (FILTERED)	HNO_3	1 x 500 mL	✓	KATAHDIN

OBSERVATIONS / NOTES

LABORATORY INFO

LAB: Katahdin Analytical Services
COC No.: I 0267-01 TE
LAB: CEIMIC Corporation
COC No.: 0267-01

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s): [illegible]

Low Flow Purge Data Sheet

Well No.: 6MW15

PROJECT:	NSB-NLON	**DATE:**	4-21-98
PROJECT NUMBER:	7363	**WEATHER:**	clear 55-60°F
SITE:	DRMO	**PERSONNEL:**	TE

Well Screen Depth: 5.7 / 15.7 ft. (TOC)
Initial Water Level: 7.27 @ 1055 hrs.

Pump Type/Material: Bladder / PVC
Pump Intake Depth: 12.0 ft TOC

Tide Cycle: [ ] High @ ____ [X] Low @ 1220 [ ] Not Affected

Total Purge Volume= 4.1 (gal / L) **Drawdown + Tubing Volume=** ____ (gal / L)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments	Press (psi)
1058	7.27	–	–	PD 5.0 VR 20.0	12.74	7.30	1.340	15.35	5.32	0.68	24.2	Start	~~20~~
1101	7.28	800	267	5.0 50.0	11.73	6.69	1.627	12.01	3.70	0.83	70.5	Clear	~~15~~
1102	7.27	800	800		11.93	6.47	1.633	10.88	2.50	0.83	86.6		
1107	7.34	900	180		12.12	6.40	1.629	10.89	2.79	0.83	94.0		
1112	7.28	800	160		12.47	6.41	1.595	13.91	1.23	0.81	95.9		~~10~~
1120	7.41	780	98	5.0 50.0	12.57	6.29	1.550	13.88	1.58	0.79	104.9		6 6
1125	Sample												
1155	End Sample												

Remarks: Water Quality Meter (S/N): QED Water Analyzer FC4020 (192079R)
Control Box Type (S/N) QED Well Wizard 400 (14862)

Notes:

Low Flow Purge Data Sheet

Well No.: 6MW 25

PROJECT:	NSB-NLON	**DATE:**	4/21/98
PROJECT NUMBER:	7363	**WEATHER:**	Sunny, warm 60's
SITE:	DRMO	**PERSONNEL:**	MLyn

Well Screen Depth: 3.6 / 13.6 ft.
Initial Water Level: 6.10 @ 1207 hrs.
Pump Type/Material: Bladder / PVC
Pump Intake Depth: 10.0'
Tide Cycle: [ ] High @ ____ [X] Low @ 1220 [ ] Not Affected
Total Purge Volume= 5 (gal / L)
Drawdown + Tubing Volume= ____ (gal / L)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1207	6.10			25 R 5 D								
1210		~~880~~			16.00	7.92	10.10	-21.15	19.2	5.68	-15.8	Full Cell
1215	6.19	880	176		11.29	7.84	7.536	6.28	10.03	4.17	3.6	
1220	6.21	1260	252	30 R 5 D	10.77	7.68	7.307	5.19	9.47	4.04	9.3	Flow ↓
1225	6.21	960	192		10.61	7.63	7.394	1.38	5.12	4.10	9.8	
1230	6.22	970	194		10.66	7.56	7.573	28.76	4.31	4.20	12.7	
1235	6.22	970	194		10.67	7.51	7.743	58.34	5.16	4.30	7.6	
1235								↑				Start Sampl
1256	6.19											End Sampl
								Erroneous DO values!				

Remarks: Water Quality Meter (S/N): 189054R
Control Box Type (S/N) 15663

Notes:

Low Flow Purge Data Sheet

Well No.: 6MW2D

PROJECT:	NSB-NLON	**DATE:**	4/21/98
PROJECT NUMBER:	7363	**WEATHER:**	SUNNY, WARM, 55 °F
SITE:	DRMO	**PERSONNEL:**	MLeg

Well Screen Depth: 78.84 / 88.84 ft.
Initial Water Level: 4.39 @ ~~0945~~/1028 hrs.

Pump Type/Material: Bladder / PVC
Pump Intake Depth: 83.0

Tide Cycle: [ ] High @ ____ ⋈ Low @ 1220 [ ] Not Affected

Total Purge Volume= 8.9 (gal (L))
Drawdown + Tubing Volume= ____ (gal / L)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
~~0945~~/1028	4.39	~~960~~		~~8~~ 25 R ↓ 5 D	11.90	6.90	33.49	68.91	200.	20.91	65.6	FULL CELL
1033	5.20	960	192	25 R 6 D	11.61	6.85	33.35	68.4	65.4	20.87	36.1	
1038	5.16	750	150	25 R 6 D	11.56	6.81	33.43	-0.35	188	20.92	-25.6	
1043	5.27	890	178	↓	11.53	6.81	33.16	-2.13	58.3	20.75	-45.1	
1048	5.31	900	180	↓	11.56	6.82	32.95	1.17	62.2	20.59	-65.8	
1053	5.35	900	180	↓	11.58	6.83	32.90	9.39	61.6	20.56	-98.7	
1058	↓	860	172		11.58	6.83	32.85	12.25	52.4	20.55	-108.9	
1103	↓	890	178		11.66	6.85	33.33	14.47	58.3	20.86	-131.4	
1108	↓	940	188		11.75	6.86	33.16	18.32	49.4	20.73	-150.3	
1113	↓	960	192		11.76	6.87	32.93	22.43	49.1	20.58	-162.6	
1118	↓	860	172		11.75	6.87	32.91	24.28	48.2	20.57	-164.1	
1121												Start Sample
1148	5.48											End Sample

Remarks:
Water Quality Meter (S/N): 189054 R
Control Box Type (S/N) Well Wizard 15663

Notes: ~~TE~~ needed W.L. meter during sampling.
Odor - rotten eggs / Petroleum.

Low Flow Purge Data Sheet

Well No.: 6MW6S

PROJECT:	NSB-NLON	**DATE:**	4/21/98
PROJECT NUMBER:	7363	**WEATHER:**	Clear, Cool 50°F
SITE:	DRMO	**PERSONNEL:**	M Lepp

Well Screen Depth: 8.6 / 18.6 ft.
Initial Water Level: 8.09 @ 2255 hrs.
Total Purge Volume= 5.2 (gal (L))

Pump Type/Material: Bladder / pvc
Pump Intake Depth: 14.0'
Drawdown + Tubing Volume= _____ (gal / L)

Tide Cycle: [ ] High @ _____ [x] Low @ 0044 (4/22) [ ] Not Affected

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
~~2255~~ ~~8.04~~	8.09			25R 5D	9.26	6.70	0.271	11.33	9.35	0.14	16.7	
~~2255~~	~~8.09~~											Cell Full
2300		1300	260	30R 4D	8.27	6.20	0.279	11.61	15.1	0.13	47.0	Flowing
2305	8.12	1000	200	35R 4D	8.14	6.12	0.278	11.90	8.47	0.13	53.9	Flowing
2310		950	190		8.09	6.08	0.276	11.83	6.22	0.13	59.7	
2315	8.12	950	190		8.03	6.06	0.275	11.93	5.94	0.13	63.0	
2320		950	190		8.01	6.05	0.274	11.89	5.87	0.13	66.0	
2322												Start Sample
2359	8.11											End Sample

Remarks: Water Quality Meter (S/N): QED Water Analyzer FC400 ~~Notes:~~ (192079R)
Control Box Type (S/N) QED Well Wizard (14862)

Low Flow Purge Data Sheet

Well No.: 6MW6D

PROJECT:	NSB-NLON	**DATE:**	4-21-98
PROJECT NUMBER:	7363	**WEATHER:**	clear 40-50°F
SITE:	DRMO	**PERSONNEL:**	JE

Well Screen Depth: 30.5 / 46.0 ft.
Initial Water Level: 8.45 @ 2236 hrs.

Pump Type/Material: Bladder / PVC
Pump Intake Depth: 38.0 TOC

Tide Cycle: [ ] High @ ____ [X] Low @ 0044 4/22 [ ] Not Affected

Total Purge Volume= 5 (gal / L) **Drawdown + Tubing Volume=** ____ (gal / L)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments	Prec psi
~~2235~~ 2340	8.45	—	—	D 57 R 25	9.08	7.04	2.630	52.45	49.0	2.38	-46.6	Start	18
2344	8.47	1000	250		8.94	6.66	4.480	50.07	40.7	2.40	-58.1		
2347	8.47	1000	333		9.02	6.65	4.599	16.55	37.1	2.47	-68.7		
2352	8.47	1000	200	5 25	8.96	6.64	4.616	3.84	35.6	2.47	-73.3		
2357	8.47	1000	200		8.84	6.62	4.614	1.28	36.7	2.47	-76.7		
0002	8.48	1020	204		8.85	6.59	4.612	2.49	35.6	2.47	-78.7		
4/22 0005	Sample												
0029	8.49	End Sample											

Remarks: Water Quality Meter (S/N): QED Water Analyzer EC4000 (1890 S/N) Notes: 6"
Control Box Type (S/N) QED Well Wizard 400 (151663)

Low Flow Purge Data Sheet

Well No.: 6MW10S

PROJECT:	NSB-NLON	**DATE:**	4/20/98
PROJECT NUMBER:	7363	**WEATHER:**	Cloudy, cool, 50°F
SITE:	DRMO	**PERSONNEL:**	MLeger

Well Screen Depth: 3.31 / 13.31 ft.
Initial Water Level: 3.45 @ 0919 hrs.
Total Purge Volume= 5.05 (gal / L)

Pump Type/Material: Bladder / PVC
Pump Intake Depth: 9.0 'TOC
Drawdown + Tubing Volume= _____ (gal / L)

Tide Cycle: [ ] High @ _____ [X] Low @ 1148 [ ] Not Affected

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/l	Turbidity NTU	Salinity ppt	Eh mV	Comments
0955	3.72			P 20 R A 05 D								
1000		1W π			11.74	7.69	5.832	48.53	11.20	3.18	60.4	Full cell
1005	3.81	540	108		11.19	7.89	8.341	49.05	7.10	4.67	-93.4	
1010	3.85	980	196	25 R 5 D	11.11	7.95	8.515	49.16	9.55	4.75	-114.1	
1015	3.89	940	188		11.16	7.97	8.602	49.07	9.64	4.83	-128.4	
1020	3.89	860	172		11.14	7.99	8.733	49.07	7.66	4.96	-133.4	
1025	3.91	870	174		11.12	7.99	8.852	49.10	6.38	4.96	-134.3	
1030	3.92	860	172		11.13	7.99	8.911	49.07	6.60	5.00	-134.8	
1035												START SAMPLING
1111	4.06											End sample

Remarks: Water Quality Meter (S/N): QED FC4000 192079R
Control Box Type (S/N) QED Well Wizard 14862

Notes: High DO values ?

Low Flow Purge Data Sheet

Well No.: 6MW10D

PROJECT:	NSB-NLON	**DATE:**	4-20-98
PROJECT NUMBER:	7363	**WEATHER:**	overcast 45-50°F
SITE:	DRMO	**PERSONNEL:**	T Evans

Well Screen Depth: 42.05 / 52.05 ft.
Initial Water Level: 2.07 @ 1028 hrs.
Pump Type/Material: Bladder / PVC
Pump Intake Depth:
Tide Cycle: [ ] High @ ____ [X] Low @ 1128 [ ] Not Affected
Total Purge Volume= 9.25 (gal / L)
Drawdown + Tubing Volume= ____ (gal / L)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1039	2.07	Initial	-	D 5.0 R 25.0	13.31	8.55	5.072	27.21	55.1	2.74	43.4	Start Pressure 50 psi
1043	-	900	225		12.88	7.46	19.65	10.46	-	11.80	-42.9	
1046	-	1000	250	D 4.56 R 30.0	12.91	7.31	19.29	10.61	103.2	11.50	-136.6	↓ Pressure 25 psi
1050	2.14	1000	250	D 8.0 R 30.0	13.00	7.29	19.11	~~5.04~~ 9.05	89.7	11.39	-176.4	cloudy
1055	2.11	940	188		12.98	7.28	19.26	30.90	93.5	11.48	-208.4	
1059	2.06	920	230		12.98	7.28	19.22	36.14	86.9	11.46	-208.8	
1103	2.07	880	220		12.97	7.28	19.23	42.71	61.3	11.47	-210.0	
1106	2.07	900	300		12.97	7.29	19.24	98.60	49.1	11.47	-226.0	
1110	2.07	880	220		12.99	7.29	19.23	34.58	45.5	11.47	-242.8	
1114	2.07	930	233		12.95	7.29	19.25	33.61	49.8	11.48	-239.0	
1118	2.09	900	225		12.94	7.28	19.24	56.38	35.4	11.47	-235.0	clear
								↑				
1120	Sample							Error	w/ DO	, high	values!	
1140	End Sample											

Remarks: Water Quality Meter (S/N): QED EC4000 (189054R)
Control Box Type (S/N): QED Well Wizard (15663)

Notes: D = Discharge time (sec)
R = Refill time (sec)

ROUND 2

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: DRMO-Groton
PROJECT NUMBER: 7363-0402

WELL I.D.: 6MW10D
DATE: 8/3/98

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. %	Turb. (NTU)	Comments ORP/D/B/PSI
1050	2.25								Static
JR 8/3/98 1100 ~~1020~~	2.25	120	18.50	7.17	2344	5.93	1.53	10.64	238/5/20/18 Initial
1105	2.28	120	18.00	7.17	16909	8.89	11.71	26.1	-132.5/5/20/18
1110	2.29	120	17.52	7.18	17364	7.92	12.13	21.1	-146.7/5/20/18
1115	2.29	120	17.38	7.18	17245	7.14	12.10	15.0	-151.1/5/20/18
1120	2.29	120	17.14	7.18	17101	6.67	12.07	11.6	-152.1/5/20/18
1125	2.30	120	16.96	7.17	16966	6.21	12.02	9.73	-151.8/5/20/18
1130	2.31	120	16.79	7.17	16860	5.92	11.98	8.53	-151.3/5/20/18
1135	2.35	120	16.67	7.16	16782	5.65	11.96	7.99	-150.9/5/20/18
1140	2.35	160	16.59	7.16	16727	5.41	11.95	7.90	-150.1/5/20/18
1145	2.39	160	16.39	7.16	16650	5.20	11.92	7.13	-149.3/5/20/18
1150	2.41	160	16.13	7.16	16481	4.83	11.87	6.68	-148.0/5/20/18
1155	2.40	160	16.11	7.16	16436	4.63	11.86	6.30	-147.2/5/20/18
1200	2.40	160	16.06	7.15	16423	4.67	11.85	6.41	-146.8/5/20/18
1205	Sample	Time							

WELL SCREEN -> 5.7' -> 15.7'
PUMP INTAKE -> 12.0 FT. TOC

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: NSB-NLON - DRMO
PROJECT NUMBER: 7363

WELL I.D.: 6MW15
DATE: 8-3-98

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. %	Turb. (NTU)	ORP	D	R	↓	Comments (AIR THROTTLE)
1113	6.90												
1126	START PUMP												
1129	7.10		18.92	7.20	5741.0	7.03	3.62		107.1	5	20	15	PURGE WATER IS COLORLESS & WITHOUT ODOR
1130	7.12	230	18.75	6.88	5955	5.74	3.72	1.99	109.7				
1135	7.14		18.94	6.53	5858	4.87	3.63	1.68	114.2				
1140	7.17		18.99	6.47	5764	4.83	3.57	1.10	116.0				
1145	7.19	280	18.76	6.44	5654	4.86	3.52	0.80	118.0				
1150	7.19		18.69	6.42	5578	4.89	3.48	0.50	119.3				
1155	7.20		18.57	6.41	5502	4.92	3.43	0.48	121.1				
1200			18.54	6.41	5455	4.92	3.41	0.45	122.9				
1210	SAMPLE TIME												

TOTAL WELL DEPTH = 11.75 'BTOC
SET WELL INTAKE AT 10' BTOC

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: DRMO- Groton
PROJECT NUMBER: 7363-0402

WELL I.D.: 6MW9S
DATE: 7/30/98

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. (%)	Turb. (NTU)	Comments ORP/D/R/PSIG/Comments
1330	4.08								Static
1335	4.08	350	19.05	7.50	69	11.60	0.04	29.1	200.6/4/20/7 Initial
1340	4.08	350	14.85	5.05	48	1.96	0.03	23.4	249.5/4/20/7
1345	4.08	350	14.69	4.86	48	1.33	0.03	8.43	267.9/4/20/7
1350	4.07	400	14.53	4.82	47	1.09	0.02	4.43	271.9/5/20/7
1355	4.07	400	14.53	4.80	47	1.01	0.03	2.87	277.0/5/20/7
1400	4.07	400	14.58	4.79	47	0.86	0.03	2.71	279.9/5/20/7
1405	4.07	400	14.56	4.78	47	0.83	0.03	1.58	282.5/5/20/7
1410	4.07	400	14.54	4.77	47	0.86	0.03	1.75	285.6/5/20/7
1415	4.07	400	14.61	4.77	47	0.83	0.03	0.76	286.6/5/20/7
1420	Sample time								

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: DRMO - Groton
PROJECT NUMBER: 7363-0402

WELL I.D.: GMW2S
DATE: 7/31/98

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. %	Turb. (NTU)	Comments ORP / P / R / PSIG / Comments
0753	5.16		~~21.5~~						Static
0815	5.16	300	21.57	7.27	11071	3.87	6.82	2.13	-10.2 / 5 / 25 / 2 / Initial
0820	5.30	300	20.92	6.90	16543	0.68	10.64	2.70	-97.2 / 5 / 25 / 2
0825	5.32	300	20.76	6.92	17102	0.47	11.06	2.63	-142.5 / 5 / 25 / 2
0830	5.37	300	20.80	6.91	17112	0.40	11.05	1.33	-162.9 / 5 / 25 / 2
0835	5.38	300	20.80	6.92	17497	0.42	11.36	1.76	-180.1 / 5 / 25 / 2
0840	5.39	300	20.67	6.95	19361	0.35	12.73	4.08	-193.2 / 5 / 25 / 2
0845	5.45	300	20.62	6.92	19734	0.32	12.96	3.98	-199.1 / 5 / 25 / 2
0850	5.46	300	20.60	6.97	19757	0.33	13.00	4.27	-199.5 / 5 / 25 / 2
0855	5.46	300	20.55	6.97	20062	0.30	13.22	4.30	-201.0 / 5 / 25 / 2
0900	Sample Time								

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: CT0267- DRMO GROTON
PROJECT NUMBER: 7363-0402

WELL I.D.: 6MW2D
DATE: 7-31-98

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. %	Turb. (NTU)	ORP	AIR THROTTLE Comments D 10	R 25	V 100	
1000	5.28												Static
1005	START PUMP		17.81	6.92									Initial
1010	5.34		~~20.50~~	~~7.15~~	27911	0.47	20.26	25.8	-161				PURGE WATER IS
1015	5.30	200	17.47	6.86	27432	0.42	20.02	23.0	-176				BLACK, WITH A
1020	5.50	200	17.29	6.85	26250	0.41	19.17	22.7	-194				LT. BLUE SHEEN.
1025	5.45	200	17.00	6.85	24553	0.40	17.94	22.5	-233				STRONG H_2S ODOR
1035	5.47		16.76	6.85	23248	0.40	16.85	24.7	-262				
1040	5.49	200	16.58	6.85	22337	0.40	16.30	24.0	-289				
1045	5.45	200	16.42	6.86	21093	0.39	15.31	23.8	-317				
1050	5.42	200	16.28	6.87	20680	0.41	15.17	24.3	-529				
1100	SAMPLE-TIME												

NOTE: DUE TO STRONG REACTION BETWEEN SAMPLE & HCl, VOA SAMPLES WERE RINSED W/ SAMPLE & COLLECTED UN-PRESERVED AS PER LAB.

WELL SCREEN FROM 75-85 BGS
PUMP INTAKE AT 82' BTOC

LOW FLOW PURGE DATA SHEET

DUPLICATE SAMPLE LOC.

PROJECT SITE NAME: CTO267
PROJECT NUMBER: 7363-0402

WELL I.D.: 6MW11D
DATE: 7-30-98

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. %	Turb. (NTU)	ORP	R	D	PUMP THROTTLE ↓	Comments
0855	2.70									15	8	100	
0915	START PUMP												
0920	2.71	300	16.15	6.95	30690	4.91	23.62	601	-139	15	8	100	BROWN, SILTY
0925	2.72	360	16.05	6.91	31390	4.20	24.06	387	-153	20	8	100	W/FINE ORGAN
0930	2.73	440	16.01	6.90	31356	4.00	24.01	216	-158.1	20	5	95	MATTER
0935	2.73	330	16.63	6.90	31785	3.96	24.09	139	-161.4	20	5	95	↓
0940	2.72		16.60	6.90	31767	3.92	24.05	110	-161.5	20	5	95	FLUSH OUT
0945	2.71		16.42	6.91	31692	4.24	24.09	91.3	-155.1	20	5	95	CELL.
0950	2.72	240	16.40	6.90	31613	3.65	24.07	68.4	-162	20	5	95	
0955	2.70	330	16.33	6.91	31568	3.49	24.07	65.8	-165.5	20	5	95	
1000	2.68	330	16.27	6.91	31536	3.43	24.07	56.7	-166.8	20	5	95	
1005	2.65	310	16.23	6.91	31512	3.34	24.07	53.6	-168.0	20	5	80	
1010	2.61		16.30	6.91	31579	3.27	24.07	45.0	-170	20	5	80	
1015	2.60		16.19	6.91	31490	3.20	24.07	41.2	-171.5	20	5	80	
1020	BEGIN SAMPLING												
1128	STOP SAMPLING												

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: DRMO-Groton
PROJECT NUMBER: 7363-0402

WELL I.D.: 6MW10S
DATE: 7/30/98

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. (%)	Turb. (NTU)	Comments ORP | D | R | PSIG | Comments
0957	3.68								Static
1006	3.68	360	24.63	7.64	6943	3.37	3.95	6.81	-130.0 | 4 | 25 | 3 Initial
1011	3.68	360	20.81	7.32	7061	0.67	4.25	5.41	-203.2 | 4 | 25 | 3
1016	3.67	360	20.58	7.33	6858	0.41	4.14	3.32	-233.0 | 4 | 25 | 3
1021	3.66	440	20.35	7.36	6659	0.34	4.04	1.54	-246.0 | 5 | 20 | 3
1026	3.67	440	20.47	7.39	6554	0.30	3.96	0.95	-260.0 | 5 | 20 | 3
1031	3.63	440	20.40	7.42	6436	0.25	3.89	0.43	-268.0 | 5 | 20 | 3
1036	3.63	440	20.41	7.42	6414	0.23	3.87	0.46	-272.1 | 5 | 20 | 3
1040	Sample Time								

WELL SCREEN FROM 3.5-13.5 'BGS. SET PUMP INTAKE AT 11 'BTOC

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: DRMD
PROJECT NUMBER: 7363·0402

WELL I.D.: 6MW115
DATE: 7/30/98

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. (%)	Turb. (NTU)	Comments ORP / D / R / ~~HOS~~ Feet H2O / Comment
0750	2.83	450	19.62	7.33	10400	1.60	6.49	26.4	JR Static -120.5 / 5 / 20 / 3 SR
0755	2.97	450	19.76	7.42	9025	0.72	5.67	8.28	-161.4 / 5 / 20 / 3 / ~~Initial~~ 7/30/98
0800	2.94	400	20.00	7.42	9095	0.41	5.68	4.05	-188.8 / 4 / 25 / 2
0805	3.02	290	20.06	7.41	9181	0.36	5.74	2.80	-199.2 / 4 / 25 / 2
0810	3.14	290	20.12	7.41	9265	0.29	5.79	2.62	-212.3 / 4 / 25 / 2
0815	3.15	160	20.27	7.41	9306	0.28	5.79	1.78	-215.8 / 3 / 25 / 2
0820	3.16	160	20.73	7.39	9536	0.27	5.89	1.84	-227.2 / 3 / 25 / 2
0825	3.19	160	20.82	7.39	9613	0.26	5.92	1.46	-236.0 / 3 / 25 / 2
0830		160	20.93	7.38	9654	0.26	5.93	1.37	-245.0 / 3 / 25 / 2
0835	Sample Time								

WELL SCREEN DEPTH = 30.5 → 46.0'
PUMP INTAKE DEPTH = 38' BTOC

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: CTO 209 - NSB - NLON - DRMO
PROJECT NUMBER: T363

WELL I.D.: 6MW6D
DATE: 7-29-98

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond. µS/L	DO (mg/L)	Sal. %	Turb. (NTU)	ORP	Comments: Pump Drive Throttle D	R	V
1440	8.95											30
1448	START PUMP									10	18	50
1452	9.05		11.83	6.05	3280.0	7.72	2.30	44.7	11.9	10	20	45
1457	8.97	540	11.66	5.74	3069	3.84	2.20	36.0	60.3	10	20	45
1500	8.98		11.63	5.81	3096	3.25	2.22	32.0	63.6	10	20	45
1505	9.00	520	11.55	5.74	3048	2.82	2.19	23.4				
~~1510~~	~~8.97~~		~~11.44~~	~~5.65~~	~~3009~~							
1515	8.97		11.52	5.64	3013	2.41	2.17	16.6	93.2	10	20	45
1520	8.96	525	11.47	5.64	3012	2.19	2.16	12.9	98.7	10	20	45
1525	8.98		11.37	5.64	3007	2.17	2.17	11.5	101.0	10	20	45
1530	8.98		11.37	5.63	2998	2.04	2.16	11.4	103.3	10	20	45
1535	8.98	520	11.46	5.62	3002	1.93	2.16	11.0	105.5	10	20	45
1540	8.97		11.37	5.61	2993	1.86	2.16	10.04				
1554	8.96	525	11.37	5.54	2969	1.72	2.14	9.96	118.5	↓	↓	↓
1600	8.96		11.35	5.51	2949	1.67	2.12	9.55	122			
1605	8.96		11.38	5.50	2931	1.64	2.11	9.81	122	↓	↓	↓
1615	SAMPLING BEGINS											
1704	COMPLETE SAMPLING											
1707	8.97		11.89	6.06	1405	4.39	0.96	5.80	43.4			

TD

Sampling Begins

LOW FLOW PURGE DATA SHEET

PROJECT SITE NAME: CTO267-NSB-NLON-DEMO
PROJECT NUMBER: 7363-0402

WELL I.D.: 6MW6S
DATE: 7-29-98

Time (Hrs.)	Water Level (Ft. below TOC)	Flow (mL/Min.)	Temp. (Celcius)	pH (S.U.)	Cond.	DO (mg/L)	Sal. %	Turb. (NTU)	Comments: ORP	D	R	AIR DRIVE THROTTLE ↓	COMMENTS
17:20	8.66								Static				
	START PUMP												
1732	8.66	280	14.29	6.40	240	9.42	0.15	3.59	124.2	5	30	8	Jammed
1737	8.69	280	11.99	5.93	210	8.93	0.13	16.1	210.5	5	30	9	
1742	8.68	280	11.77	5.90	207	8.85	0.13	15.0	218.6	5	30	9	
1747	8.68	280	11.60	5.88	207	8.77	0.13	10.76	225.0	5	30	9	
1752	8.68	300	11.56	5.87	206	8.69	0.13	10.18	240.5	5	30	8	
1757	8.69	300	11.55	5.87	206	8.68	0.13	5.66	243.2	5	30	8	
1802	8.69	300	11.57	5.87	206	8.68	0.13	6.83	246.8	5	30	8	
1807	8.69	300	11.49	5.87	205	8.69	0.13	4.36	252.0	5	30	9	
1812	8.69	300	11.46	5.87	205	8.66	0.13	4.25	255.0	5	30	9	
1815	Sample Time												

ROUND 3

Tetra Tech NUS, Inc. GROUNDWATER SAMPLE LOG SHEET

Project / Site:	NSB-NLON / DRMO	Sample ID No.:	DRMO-6MW15-GW-03
Project No.:	7363	Sample Location:	6MW15
		Sampler:	T. Evans

[X] Monitoring Well
[ ] Domestic Well
[ ] Other:

SAMPLING DATA

Date: 1/28/99	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Time: 1235								
Method: Ded. Bladder Pump	Clear	6.26	4.331	6.44	0.05	10.43	2.30	204.9

PURGE DATA

Date:	1/28/99
Method:	Ded. Bladder Pump
Monitor Reading (ppm):	00
Well Casing Diameter:	2"
Well Casing Material:	PVC
Total Well Depth (TD):	15.7
Static Water Level (WL):	7.01
One Casing Volume(gal/L):	5.4
Start Purge (hrs):	1134
End Purge (hrs):	1230
Total Purge Time (min):	56
Total Vol. Purged (gal/L):	9.28

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Laboratory	Collected
TCL VOLATILES (LOW-LEVEL)	HCl	3 x 40mL	Ceimic Corp.	✓
TCL SEMIVOLATILES	None	1 x 1L	Ceimic Corp.	✓
TCL PEST/PCBs	↓	1 x 1L	Ceimic Corp.	✓
TCL PAH	↓	1 x 1L	Ceimic Corp.	✓
TAL METALS (TOTAL)	HNO3	1 x 500mL	Katahdin Analytical	✓
TAL METALS (FILTERED)	HNO3	1 x 500mL	Katahdin Analytical	✓

OBSERVATIONS / NOTES

LAB INFO

LAB: CEIMIC CORP. NARRAGANSETT, RI
COC #: 3282
LAB: KATAHDIN ANALYTICAL WESTBROOK, ME
COC #: ~~K~~ K03Q1

Check if Collected:

[ ] ~~MS / MSD~~ [ ] ~~DUPLICATE~~ / ID No.:

Signature(s): [signature]

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: 6MW15

PROJECT:	NSB-NLON	**DATE:**	1-28-~~98~~ 99
PROJECT NUMBER:	7363	**WEATHER:**	overcast, cold 35°F,
SITE:	DRMO	**PERSONNEL:**	T. Evans damp

Well Screen Depth: 5.7 / 15.7 ft.
Initial Water Level: 7.01 @ 1130 hrs.
Pump Type/Material: PVC / Bladder
Pump Intake Depth: 12.0
Total Purge Volume= 9.28 (gal / L)
Total Purge Time= 56 (min)

Tide Cycle: ☐ High @ ☒ Low @ ~~1254~~ 1309 ☐ Not Affected

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1134		–		D 6.0 R 300 8 psi	6.20	6.91	5.560	12.04	2.5	3.00	182.6	Cell Full
1138	7.03	1020	204		6.46	6.63	4.908	10.54	1.6	2.63	189.7	clear
1145	7.15	1220	174		6.36	6.38	4.708	10.50	0.90	2.51	198.7	
1150	7.20	840	168		6.37	6.31	4.635	10.51	0.90	2.47	203.4	
1155	7.26	750	150		6.40	6.29	4.592	10.52	0.45	2.45	206.3	
1200	7.30	800	160		6.44	6.28	4.550	10.50	0.10	2.43	208.5	
1205	7.34	770	154		6.42	6.42	4.507	10.49	0.15	2.40	210.6	
1210	7.42	850	170		6.49	6.27	4.455	10.45	0.15	2.37	212.8	
1215	7.43	760	152		6.49	6.27	4.428	10.42	0.00	2.36	213.9	
1220	7.50	820	164		6.46	6.26	4.379	10.42	0.00	2.33	214.9	
1225	7.52	710	142		6.48	6.26	4.356	10.42	0.00	2.32	213.6	
1230	7.58	740	148		6.44	6.26	4.331	10.43	0.05	2.30	204.9	
1235	Sample											
~~1255~~ 1300	End Sample											

Water Quality Meter (S/N): YSI 610 DM (206470R) w/ 6820 (98D0778) AB
Control Box Type (S/N): RED Well Wizard (16789)
Turbidi[illegible]r (S/[illegible]): [illegible] 20[illegible] ([illegible])
Notes:

Tetra Tech NUS, Inc. GROUNDWATER SAMPLE LOG SHEET

Project / Site: NSB-NLON / DRMO
Project No.: 7363

Sample ID No.: DRMO GMW2S-GW03
Sample Location: DRMO

[X] Monitoring Well
[ ] Domestic Well
[ ] Other:

Sampler: K. SIMPSON

SAMPLING DATA

Date: 1.28.99 / Time: 1240	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Method: DED. BLADDER PUMP	CLEAR	6.92	16.12	7.5	2.0	4.56	9.43	-90.7

PURGE DATA

Date: 1.28.99	See Attached Low Flow Purge Data Sheet for Purge Data
Method: DED. BLADDER PUMP	
Monitor Reading (ppm):	
Well Casing Diameter: 2"	
Well Casing Material: PVC	
Total Well Depth (TD): 13.6	
Static Water Level (WL): 5.53	
One Casing Volume (gal):	
Start Purge (hrs): 1135	
End Purge (hrs): 1235	
Total Purge Time (min): 60	
Total Vol. Purged (gal): 4	

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Laboratory	Collected
TCL VOLATILES (LOW-LEVEL)	HCL 4°C	X	Ceimic Corp.	3
TCL SEMIVOLATILES	—	X	Ceimic Corp.	1
TCL PEST/PCBs	—	X	Ceimic Corp.	1
TCL PAH	—	X	Ceimic Corp.	1
TAL METALS (TOTAL)	HNO3	X	Katahdin Analytical	1
TAL METALS (FILTERED)	HNO3	X	Katahdin Analytical	1

OBSERVATIONS / NOTES

STICK-UP

LAB INFO

LAB: CEIMIC CORP.
NARRAGANSETT, RI
COC #: 3282

LAB: KATAHDIN ANALYTICAL
WESTBROOK, ME
COC #: K03061

Check if Collected: NO QA TAKEN

[ ] ~~MS / MSD~~ [ ] ~~DUPLICATE~~ / ID No.:

Signature(s): [illegible]

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: 6MW2S

PROJECT: NSB-NLON
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 1-28-98
WEATHER: LT RAIN 35°F
PERSONNEL: K. SIMPSON

Well Screen Depth: 3.6 / 13.6 ft.
Initial Water Level: 5.53 @ 1135 hrs.

Pump Type/Material:
Pump Intake Depth:

Tide Cycle: ☐ High @ ☒ Low @ ~~1259~~ 1309 ☐ Not Affected

Total Purge Volume= 4 (ga) L

Total Purge Time= (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1135	5.53		250	30D/60R	6.7	6.57	18.02	34.83	1.6	8.21	220.1	
1145	5.61		↓	10 PSI	6.7	6.89	13.21	7.41	2.2	7.70	19.6	
1155	5.70		↓	↓	7.1	6.92	14.85	6.04	2.1	8.60	-55.1	
1205	5.75		↓	↓	7.3	6.93	15.28	5.24	2.1	8.88	-69.4	
1215	5.76		↓	↓	7.5	6.94	15.56	4.53	2.0	9.08	-79.2	
1225	5.83		↓	↓	7.6	6.94	15.83	5.10	2.2	9.23	-84.8	
1230	5.85		↓	↓	7.6	6.93	16.01	4.78	2.1	9.99	-89.4	
1235	5.91		↓	↓	7.5	6.92	16.12	4.56	2.0	9.43	-90.7	
	START	SAMPLING @			1237							
	END	SAMPLING @			1301							

Water Quality Meter (S/N): YSI 610 DM 218089R
Control Box Type (S/N): QED 16788
Turbidimeter (S/N): LA MOTTE 0659 1298

Notes:

Tetra Tech NUS, Inc. GROUNDWATER SAMPLE LOG SHEET

Project / Site: NSB-NLON / DRMO
Project No.: 7363

Sample ID No.: DRMO-GMW 20-GW03
Sample Location: DRMO

[X] Monitoring Well
[ ] Domestic Well
[ ] Other:

Sampler: Keith Simpson
KEITH SIMPSON

SAMPLING DATA

Date: 1.25.99 / Time: 1015	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Method: DEDICATED BLADDER PUMP	LT. GRAY	6.71	30.9	10.7	7.90	2.70	19.5	-231.0

PURGE DATA

Date:	1.25.99
Method:	DED. BLADDER PUMP
Monitor Reading (ppm):	
Well Casing Diameter:	2"
Well Casing Material:	PVC
Total Well Depth (TD):	
Static Water Level (WL):	7.52
One Casing Volume (gal):	
Start Purge (hrs):	0940
End Purge (hrs):	1010
Total Purge Time (min):	30
Total Vol. Purged (gal):	3.5

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements		Laboratory	Collected
TCL VOLATILES (LOW-LEVEL)	HCL, 4°C	3	X	Ceimic Corp.	✓
TCL SEMIVOLATILES	—	2	X	Ceimic Corp.	1 2 ✓
TCL PEST/PCBs	—	2	X	Ceimic Corp.	1 2 ✓
TCL PAH	—	1	X	Ceimic Corp.	1 ✓
TAL METALS (TOTAL)	HNO3	1	X	Katahdin Analytical	1 ✓
TAL METALS (FILTERED)	HNO3 ↓	1	X	Katahdin Analytical	1 ✓

OBSERVATIONS / NOTES

SOME BLACK FINES IN PURGE & SAMPLE WATER
LT. SULPHUR ODOR

LABORATORY

LAB: CEIMIC CORP.
NARRAGANSETT, RI
COC #: 3281
LAB: KATAHDIN ANALYTICAL
WESTBROOK, ME
COC #: K0301

Check if Collected: NO QA COLLECTED

[ ] MS / MSD [ ] DUPLICATE / ID No.: —

Signature(s): Keith Simpson

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: DRMO - 6MW 2D GW03

PROJECT:	NSB-NLON	DATE:	1·25·99
PROJECT NUMBER:	7363	WEATHER:	OVERCAST 45°F
SITE:	DRMO	PERSONNEL:	R. SIMPSON, T. EVANS

Well Screen Depth: _____ / _____ ft.
Initial Water Level: 7.52 @ 0940 hrs.
Pump Type/Material: Bladder / PVC
Pump Intake Depth: _____
Tide Cycle: ☐ High @ _____ ☒ Low @ 1014 ☐ Not Affected
Total Purge Volume= 3.5 (gal / L)
Total Purge Time= 30 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
0943	7.52		1600	—	11.0	6.67	30.50	1.05	9.09	19.0	-77.6	BLACK FINES @ START
0945	6.45		1600	—	11.3	6.65	30.52	0.74	—	18.9	-128.0	
0955	5.75		250	300/60 R	10.7	6.70	30.9	2.31	8.91	19.2	-180.0	CLEAR TO
1000	5.76		250	60 PSI	10.6	6.70	31.0	2.60	8.73	19.2	-202.0	LT GRAY
1005	5.77		250	↓	10.6	6.71	31.0	2.51	8.86	19.2	-217.0	↓
1010	5.78		250	↓	10.7	6.71	30.9	2.70	7.90	19.5	-231.0	↓
	START SAMPLE 1015											
	END SAMPLING 1047											

Water Quality Meter (S/N): YSI 20647 OR (Model 6820)
Control Box Type (S/N): WELLWIZARD - QED 16789
Turbidimeter (S/N): [illegible] 0639 1200

Notes: NEED NEW DISCHARGE TUBING

Tetra Tech NUS, Inc. **GROUNDWATER SAMPLE LOG SHEET**

Project / Site:	NSB-NLON / DRMO	Sample ID No.:	DRMO GMW65 GW03
Project No.:	7363	Sample Location:	DRMO - GMW65
[X] Monitoring Well		Sampler:	K. SIMPSON
[ ] Domestic Well			
[ ] Other:			

SAMPLING DATA

	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Date: 1.25.99 / Time: 1507 / Method: DED. BLADDER PUMP	CLEAR	6.06	0.325	10.1	0.4	8.01	0.16	169.9

PURGE DATA

Date: 1.25.99	See Attached Low Flow Purge Data Sheet for Purge Data
Method: DED. BLADDER PUMP	
Monitor Reading (ppm): 0.1	
Well Casing Diameter: 2"	
Well Casing Material: PVC	
Total Well Depth (TD):	
Static Water Level (WL): 8.51	
One Casing Volume (gal/L):	
Start Purge (hrs): 1405	
End Purge (hrs): 1505	
Total Purge Time (min): 60	
Total Vol. Purged (gal/L): 3.5	

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements		Laboratory	Collected
TCL VOLATILES (LOW-LEVEL)	HCL, 4°C	3	X	Ceimic Corp.	9
TCL SEMIVOLATILES	—	1	X	Ceimic Corp.	3
TCL PEST/PCBs	—	1	X	Ceimic Corp.	3
TCL PAH	—	1	X	Ceimic Corp.	3
TAL METALS (TOTAL)	HNO3	1	X	Katahdin Analytical	3
TAL METALS (FILTERED)	HNO3	1	X	Katahdin Analytical	3
					(MS/MSD)

OBSERVATIONS / NOTES

LAB INFO

LAB: CEIMIC CORP. NARRAGANSETT, RI

COC #: 3281

LAB: KATAHDIN ANALYTICAL WESTBROOK, ME

COC #: K0301

Check if Collected:

[X] MS / MSD YES

[ ] ~~DUPLICATE / ID No.:~~

Signature(s): [signature]

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: DRMO GMW 6S GW03

PROJECT:	NSB-NLON	**DATE:**	1·25·99
PROJECT NUMBER:	7363	**WEATHER:**	CLOUDY, 45°F
SITE:	DRMO	**PERSONNEL:**	K. SIMPSON, T. EVANS

Well Screen Depth: 8.6 / 18.6 ft.
Initial Water Level: 8.51 @ 1400 hrs.
Pump Type/Material: Bladder / PVC
Pump Intake Depth: 17.0
Tide Cycle: ☐ High @ ☐ Low @ ☒ Not Affected
Total Purge Volume= 3.5 (gal / L)
Total Purge Time= 60 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1405	8.51		210	30D/60R	10.3	7.44	0.323	8.77	2.5	0.16	99.2	
1410			210	18 PSI	10.3	6.98	0.326	7.67	1.3	0.16	116.8	
1415			220		10.4	6.62	0.325	7.18	0.6	0.16	131.3	
1420					9.9	6.38	0.326	7.40	0.6	0.16	139.4	
1425					9.5	6.29	0.328	7.88	0.5	0.16	140.0	
1430					9.9	6.23	0.323	8.02	0.5	0.16	145.2	
1440					10.0	6.19	0.325	8.12	0.4	0.16	150.1	
1445					10.0	6.14	0.325	8.56	0.4	0.16	158.6	
1455					10.1	6.07	0.325	8.53	0.4	0.16	163.7	
1505					10.1	6.06	0.325	8.01	0.4	0.16	169.9	
	START SAMPLING @ 1507											
	END SAMPLING 1610											

Water Quality Meter (S/N): YSI 610DM 20647 OR
Control Box Type (S/N): QED WELL WIZARD 16789
Turbidimeter (S/N): LA MOTTE 0640 129 V
Notes:

Tetra Tech NUS, Inc. **GROUNDWATER SAMPLE LOG SHEET**

Project / Site: NSB-NLON / DRMO
Project No.: 7363

Sample ID No.: DRMO-6MW6D-GW-0
Sample Location: DRMO-6MW6

[X] Monitoring Well
[ ] Domestic Well
[ ] Other:

Sampler: T. Evans

SAMPLING DATA

Date: 1.25.99 / Time: 1547	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Method: DED. BLADDER PUMP	tan	5.88	3.412	9.83	50	1.95	1.80	109.6

PURGE DATA

Date: 1.25.99	See Attached Low Flow Purge Data Sheet for Purge Data
Method: DED. BLADDER PUMP	
Monitor Reading (ppm): 0.20	
Well Casing Diameter: 6"	
Well Casing Material: Steel	
Total Well Depth (TD): 46	
Static Water Level (WL): 8.84	
One Casing Volume (gal/L): 24.2	
Start Purge (hrs): 1405	
End Purge (hrs): 1544	
Total Purge Time (min): 99	
Total Vol. Purged (gal/L): 4.8	

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Laboratory	Collected
TCL VOLATILES (LOW-LEVEL)	HCl	3 X 40 ml	Ceimic Corp.	✓
TCL SEMIVOLATILES	None	1 X 1L	Ceimic Corp.	✓
TCL PEST/PCBs	↓	1 X 1L	Ceimic Corp.	✓
TCL PAH	↓	1 X 1L	Ceimic Corp.	✓
TAL METALS (TOTAL)	HNO3	1 X 500mL	Katahdin Analytical	✓
TAL METALS (FILTERED)	HNO3	1 X 500mL	Katahdin Analytical	✓

OBSERVATIONS / NOTES

LAB INFO:

LAB: CEIMIC CORP.
NARRAGANSETT, RI
COC #: 3281

LAB: KATAHDIN ANALYTICAL
WESTBROOK, ME
COC #: K03401

Check if Collected:

[ ] MS/MSD [ ] DUPLICATE / ID No.: —

Signature(s): T. Evans

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: DRMO-MW6D

PROJECT:	NSB-NLON	DATE:	1.25.99
PROJECT NUMBER:	7363	WEATHER:	CLOUDY, 45°F
SITE:	DRMO	PERSONNEL:	K. SIMPSON, T. EVANS

Well Screen Depth: open borehole TD = 46 ft.
Initial Water Level: 8.84 @ 1358 hrs.
Pump Type/Material: Bladder / PVC
Pump Intake Depth:
Tide Cycle: ☐ High @ ☐ Low @ ☒ Not Affected
Total Purge Volume= 18.2 (gal (L))
Total Purge Time= 99 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1405			—		10.01	6.26	3.406	1.77	95	1.80	90.6	Cell Full
1415	8.89	2000	200		9.89	6.02	3.430	1.53	90	1.81	98.4	turn discharge
1419	8.89	1200	300	30D 30R 25 psi	9.89	5.97	3.428	1.45	-	1.81	103.5	
1422	8.84	1000	333	10D 30R 20 psi	9.56	5.94	3.450	1.46	55	1.82	108.0	
1427	8.84	550	110	↓	8.99	5.91	3.446	1.41	55	1.82	110.6	
1432	8.84	720	144	10D 30R 24 psi	9.22	5.90	3.417	1.36	60	1.80	111.1	
1437	8.84	780	156		—	—	-	—	-	—	—	No Readings
1443	8.84	1020	170		9.37	5.89	3.418	1.26	65	1.80	109.5	
1450	8.84	1100	181		9.35	5.89	3.416	1.15	60	1.80	107.7	
1455	8.85	960	192		9.37	5.88	3.414	1.14	65	1.80	106.9	
1500	8.85	940	188		9.40	5.88	3.409	1.13	65	1.80	105.3	
1505	8.85	1000	200		9.47	5.89	3.411	1.05	65	1.80	102.4	
1510	8.85	940	188		9.50	5.88	3.410	1.01	70	1.80	101.3	
~~1510-1515~~ 1510-1515					8.77	5.99	3.374	4.41	65	1.78	106.3	Clean cell
1518	8.85								~~65~~			Cell Full
1524	8.85	890	148		9.48	5.89	3.394	3.35	65	1.79	111.6	
1528	8.85	1000	250		9.64	5.89	3.410	1.62	55	1.80	110.7	

Water Quality Meter (S/N): YSI 6820 (S/N 218089R)
Control Box Type (S/N): QED Well Wizard (S/N 16788)
Turbidimeter (S/N): LaMotte 2020 (S/N 0634-1298)
Notes: YSI + LaMotte - US Env. Rentals

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: DRMO-GW01

PROJECT:	NSB-NLON	DATE:	1/25/99
PROJECT NUMBER:	7363	WEATHER:	Cloudy 35-40°F
SITE:	DRMO	PERSONNEL:	T. Evans

Well Screen Depth: _____ / _____ ft.
Initial Water Level: _____ @ _____ hrs.
Pump Type/Material: _____
Pump Intake Depth: _____
Total Purge Volume= _____ (gal / L)
Total Purge Time= _____ (min)

Tide Cycle: ☐ High @ _____ ☐ Low @ _____ ☒ Not Affected

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1532	8.85	1000	200		9.69	5.88	3.417	2.74	55	1.80	110.8	
1537	↓	1000	200		9.67	5.88	3.414	2.30	55	1.80	109.8	
1541	↓	1100	275		9.70	5.88	3.413	1.62	55	1.80	109.6	
1544	↓	1000	333		9.83	5.88	3.412	1.95	50	1.80	109.6	
1547	Sample											
1600	End Sample											

Water Quality Meter (S/N): _____
Control Box Type (S/N): _____
Turbidimeter (S/N): _____

Notes: _____

Tetra Tech NUS, Inc. GROUNDWATER SAMPLE LOG SHEET

Project / Site:	NSB-NLON / DRMO	Sample ID No.:	DRMO-6MWGS-GW-1
Project No.:	7363	Sample Location:	6MWGS
[X] Monitoring Well		Sampler:	K. Simpson / T. Evan
[ ] Domestic Well			
[ ] Other:			

SAMPLING DATA

	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Date: 1/26/99 Time: 1418								
Method: Ded. Bladder Pump	Clear	5.52	0.055	7.0	0.1	9.34	0.03	250.1

PURGE DATA

Date:	1/26/99
Method:	Ded. Bladder Pump
Monitor Reading (ppm):	Ø
Well Casing Diameter:	2"
Well Casing Material:	PVC
Total Well Depth (TD):	11.75
Static Water Level (WL):	3.86
One Casing Volume(gal/L):	4.9
Start Purge (hrs):	1330
End Purge (hrs):	1415
Total Purge Time (min):	45
Total Vol. Purged (gal/L):	9.9

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Laboratory	Collected
TCL VOLATILES (LOW-LEVEL)	HCl	3 x 40mL	Ceimic Corp.	✓
TCL SEMIVOLATILES	None	1 x 1L	Ceimic Corp.	✓
TCL PEST/PCBs	↓	1 x 1L	Ceimic Corp.	✓
TCL PAH	↓	1 x 1L	Ceimic Corp.	✓
TAL METALS (TOTAL)	HNO3	1 x 500mL	Katahdin Analytical	✓
TAL METALS (FILTERED)	HNO3	1 x 500mL	Katahdin Analytical	✓

OBSERVATIONS / NOTES

LAB INFO

LAB: CEIMIC CORP.
NARRAGANSETT, RI
COC #: 3281

LAB: KATAHDIN ANALYTICAL
WESTBROOK, ME
COC #: K0301

Check if Collected:

[ ] ~~MS / MSD~~ [ ] ~~DUPLICATE~~ / ID No.:

Signature(s): [illegible]

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: GMW45 DRMO

PROJECT:	NSB-NLON	DATE:	1/26/99
PROJECT NUMBER:	7363	WEATHER:	Sunny 40°F
SITE:	DRMO	PERSONNEL:	T. Evans / K Simpson

Well Screen Depth: 7.75 / 17.75 ft.
Initial Water Level: 3.86 @ 1325 hrs.
Pump Type/Material: Bladder/PVC
Pump Intake Depth: 10.0
Tide Cycle: ☐ High @ ☐ Low @ ☒ Not Affected
Total Purge Volume= 9.9 (gal (L))
Total Purge Time= 45 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1330	3.86		220	30D/60P	7.1	7.85	0.067	10.43	7.3	0.03	131.0	
1340	3.80		↓	8 PSI	6.8	6.25	0.054	10.23	2.2	0.02	192.5	
1350	3.79		↓	↓	6.9	5.93	0.056	9.79	1.0	0.03	210.0	
1400	3.79		↓	↓	7.0	5.66	0.056	9.40	0.2	0.03	230.7	
1405	3.78		↓	↓	7.1	5.58	0.055	9.33	0.2	0.03	236.9	
1410	↓		↓	↓	7.0	5.54	0.055	9.32	0.1	0.03	241.3	
1415	↓		↓	↓	7.0	5.52	0.055	9.34	0.1	0.03	250.1	
	START	SAMPLING @		1418		SAMPLE TIME =			1420			
	END	SAMPLING @		1437								

Water Quality Meter (S/N): YSI 610 DM - 206470R
Control Box Type (S/N): QED 16780
Turbidimeter (S/N): LAMOTTE 0640 1298

Notes: Need 1/2" Socket - Flush mount

Tetra Tech NUS, Inc. GROUNDWATER SAMPLE LOG SHEET

Project / Site: NSB-NLON / DRMO
Project No.: 7363

Sample ID No.: DRMO-6MW105-GW
Sample Location: 6MW105

[X] Monitoring Well
[ ] Domestic Well
[ ] Other:

Sampler: T. Evans

SAMPLING DATA

Date: 1/26/99 Time: 1035	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Method: Ded. Bladder Pump	Clear	7.17	12.22	10.05	1.0	0.29	7.01	-149.0

PURGE DATA

Date:	1/26/99
Method:	Ded. Bladder Pump
Monitor Reading (ppm):	~~0~~
Well Casing Diameter:	2"
Well Casing Material:	PVC
Total Well Depth (TD):	13.3
Static Water Level (WL):	3.5
One Casing Volume(gal/L):	6.0
Start Purge (hrs): (TE)	~~1035~~ 0931
End Purge (hrs):	~~1119~~ 1030
Total Purge Time (min) (TE)	~~44~~ ~~Pg 5~~ ~~64~~ 59
Total Vol. Purged (gal/L)	11.7

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Laboratory	Collected
TCL VOLATILES (LOW-LEVEL)	HCl	3 x 40mL	Ceimic Corp.	✓
TCL SEMIVOLATILES	None	1 x 1L	Ceimic Corp.	✓
TCL PEST/PCBs	↓	1 x 1L	Ceimic Corp.	✓
TCL PAH	↓	1 x 1L	Ceimic Corp.	✓
TAL METALS (TOTAL)	HNO3	1 x 500mL	Katahdin Analytical	✓
TAL METALS (FILTERED)	HNO3	1 x 500mL	Katahdin Analytical	✓

OBSERVATIONS / NOTES

LABORATORY

LAB: CEIMIC CORP.
NARRAGANSETT, RI
COC #: 3281

LAB: KATAHDIN ANALYTICAL
WESTBROOK, ME
COC #: K0391

Check if Collected:

[ ] ~~MS / MSD~~
[✓] DUPLICATE ~~ID No.:~~ GWF-012699 ~~yet~~ (TE)

Signature(s): Thomas L

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: 6MW105

PROJECT:	NSB-NLON	DATE:	1/26/99
PROJECT NUMBER:	7363	WEATHER:	Sunny 35-40°F
SITE:	DRMO	PERSONNEL:	T. Evans

Well Screen Depth: 12.3 / 13.3 ft.
Initial Water Level: 3.52 @ 0927 hrs.
Pump Type/Material: Bladder / PVC
Pump Intake Depth: 9.0
Total Purge Volume= 11.7 (gal)
Total Purge Time= 4 (min)

Tide Cycle: ☐ High @ ☒ Low @ ~~1106~~ 1116 ☐ Not Affected

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
0931					9.60	6.82	9.661	1.50	1.5	5.44	30.5	Cell Full
0936	3.96	840		D4 R30 5 psi								Clear
0940	3.92	1000	250		9.75	7.08	11.46	0.71	1.3	6.55	-79.0	
0945		1250	250		9.79	7.11	11.57	0.44	1.0	6.61	92.4	
0950	4.05	~~900~~ 1150	230	D4 R30 4 psi	9.76	7.15	11.62	0.40	1.0	6.64	-105.2	
0955	4.01	930	186	D4 R30 4 psi	9.82	7.16	11.68	0.40	0.90	6.68	-112.5	
1000	4.05	930	186		9.84	7.17	11.69	0.37	0.85	6.68	-118.2	
1006	4.20	930			9.82	7.18	11.72	0.45	0.90	6.70	-124.4	
1010	4.11	940			9.90	7.17	11.80	0.34	1.0	6.75	-131.2	
1015	4.13	930			9.92	7.17	11.88	0.39	1.0	6.81	-136.1	
1020	4.11	880			9.92	7.17	11.98	0.32	0.65	6.87	-140.1	
1025	4.11	980			10.00	7.17	12.15	0.28	0.80	6.97	-145.1	
1030	4.13	~~930~~			10.05	7.17	12.22	0.29	1.0	7.01	-149.0	
1035	Sample + Duplicate GWFD-012699											
1114	End Sample											

Water Quality Meter (S/N): YSI 6820 (S/N 20467 ⇐ 10DM)
Control Box Type (S/N): QED Well Wizard (S/N 6788)
Turbidimeter (S/N): LaMotte 2020 (S/N 0640-1298)

Notes:

Tetra Tech NUS, Inc. GROUNDWATER SAMPLE LOG SHEET

Project / Site: NSB-NLON / DRMO
Project No.: 7363

Sample ID No.: [illegible]
Sample Location: DRMO

[X] Monitoring Well
[ ] Domestic Well
[ ] Other:

Sampler: K SIMPSON

SAMPLING DATA

Date: 1-26-99	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Time: 1033								
Method: DED. BLADDER PUMP	CLEAR	7.27	20.53	12.1	0.4	0.70	12.36	-80.0

PURGE DATA

Date: 1-26-99
Method: DED. BLADDER PUMP
Monitor Reading (ppm): 0
Well Casing Diameter: 2
Well Casing Material: PVC
Total Well Depth (TD):
Static Water Level (WL): 2.17
One Casing Volume (gal/L):
Start Purge (hrs): 0938
End Purge (hrs): 1030
Total Purge Time (min): 52
Total Vol. Purged (gal/L): 2.9

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Laboratory	Collected
TCL VOLATILES (LOW-LEVEL)	[illegible]	X	Ceimic Corp.	
TCL SEMIVOLATILES	—	X	Ceimic Corp.	
TCL PEST/PCBs	—	X	Ceimic Corp.	
TCL PAH	—	X	Ceimic Corp.	
TAL METALS (TOTAL)	HNO3	X	Katahdin Analytical	
TAL METALS (FILTERED)	HNO3 ✓	X	Katahdin Analytical	

OBSERVATIONS / NOTES

LAB INFO

LAB: CEIMIC CORP.
NARRAGANSETT, RI
COC #: 3281

LAB: KATAHDIN ANALYTICAL
WESTBROOK, ME
COC #: K03001

Check if Collected: NO QA

[ ] MS / MSD [ ] DUPLICATE / ID No.:

Signature(s):

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: GMW 10 ~~8~~ D KS

PROJECT:	NSB-NLON	DATE:	1-26-99
PROJECT NUMBER:	7363	WEATHER:	clear, 40°F
SITE:	DRMO	PERSONNEL:	T. Evans / K. Simpson

Well Screen Depth: 44.1 / 54.1 ft.
Initial Water Level: 2.17 @ _____ hrs.
Pump Type/Material: Bladder / PVC
Pump Intake Depth: 49.0
Tide Cycle: ☐ High @ _____ ☒ Low @ ~~1106~~ 1116 ☐ Not Affected
Total Purge Volume= 2.9 (gal)/(L)
Total Purge Time= 52 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
0938	2.17		215	300/60R	11.9	7.34	18.65	7.35	11	11.38	30.1	
0945	2.21		↓	32 PSI	12.3	7.23	21.03	0.94	6.3	12.62	-72.4	
0955	2.25			↓	12.4	7.23	20.57	0.68	4.2	12.31	-73.4	
1005	2.29		↓		12.3	7.24	20.48	0.66	3.8	12.26	-76.1	TURBIDITY DECREASING RATE
1010	2.30		200	400/60R	12.1	7.25	20.47	0.68	2.1	12.25	-79.2	
1020	2.30		↓	32 PSI	11.9	7.26	20.47	0.76	1.0	12.26	-77.4	
1030	2.30		↓	↓	12.1	7.27	20.53	0.70	0.40	12.36	-80.8	
	START	SAMPLING @		1033								
	END	SAMPLING @		1100								

Water Quality Meter (S/N): YSI 610 DM-218089R
Control Box Type (S/N): QED 16789
Turbidimeter (S/N): LAMOTTE 0639 1298

Notes: NEED 1/2" SOCKET TO OPEN FL. MT.

Tetra Tech NUS, Inc. GROUNDWATER SAMPLE LOG SHEET

Project / Site: NSB-NLON / DRMO
Project No.: 7363

Sample ID No.: DRMO-6MW11S-GW-0
Sample Location: 6MW11S

[X] Monitoring Well
[ ] Domestic Well
[ ] Other:

Sampler: T. Evans

SAMPLING DATA

Date: 1/27/99 Time: 1135 Method: Ded. Bladder Pump	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
	Clear	7.61	11.21	9.30	1.9	0.64	6.38	-244.8

PURGE DATA

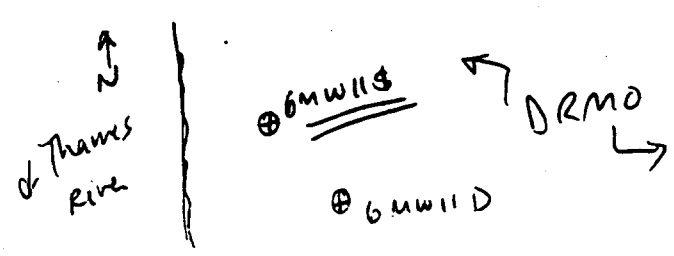
Date:	1/27/99
Method:	Ded. Bladder Pump
Monitor Reading (ppm):	Ø
Well Casing Diameter:	2"
Well Casing Material:	PVC
Total Well Depth (TD):	13.5
Static Water Level (WL):	3.37
One Casing Volume(gal/L):	6.2
Start Purge (hrs):	1031
End Purge (hrs):	1130
Total Purge Time (min):	59
Total Vol. Purged (gal/L):	9.8

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Laboratory	Collected
TCL VOLATILES (LOW-LEVEL)	HCl	3 x 40mL	Ceimic Corp.	
TCL SEMIVOLATILES	None	1 x 1L	Ceimic Corp.	✓
TCL PEST/PCBs	↓	1 x 1L	Ceimic Corp.	✓
TCL PAH	↓	1 x 1L	Ceimic Corp.	✓
TAL METALS (TOTAL)	HNO3	1 x 500 mL	Katahdin Analytical	✓
TAL METALS (FILTERED)	HNO3	1 x 500 mL	Katahdin Analytical	✓

OBSERVATIONS / NOTES



LAB INFO

LAB: CEIMIC CORP. NARRAGANSETT, RI
COC #: 3282
LAB: KATAHDIN ANALYTIC WESTBROOK, ME
COC #: K03001

Check if Collected:

[ ] MS/MSD [ ] DUPLICATE / ID No.:

Signature(s): [signature]

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: 6MW11S

PROJECT: NSB-NLON
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 1/27/99
WEATHER: Sunny 40°F
PERSONNEL: T. Evans

Well Screen Depth: 3.50 / 13.50 ft.
Initial Water Level: 3.37 @ 1027 hrs.

Pump Type/Material: PVC / Bladder
Pump Intake Depth:

Tide Cycle: ☐ High @ ☒ Low @ ~~2:06~~ 1214 ☐ Not Affected

Total Purge Volume= 9.8 (gal (L))
Total Purge Time= 59 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1031				DS.5 R300 10 psi	9.46	7.55	10.86	3.06	14	6.14	-115.1	Cell Full
1035	3.46	1030	258	DS.5 R300 6 psi	9.10	7.49	9.947	1.20	12	5.61	-139.1	Fine suspended black particles -
1039	3.50	660	165		9.13	7.50	10.07	1.00	7.7	5.69	-152.2	gray tint
1045	3.55	640	107		8.80	7.62	11.00	1.07	7.2	6.25	-178.8	clear
1050	3.59	700	140		9.08	7.56	11.34	0.88	7.5	6.46	-189.2	
1055	3.62	830	166		9.07	7.58	11.31	0.66	5.4	6.43	-201.7	
1100	3.65	770	154		8.87	7.59	11.20	0.65	4.2	6.37	-209.3	
1105	3.68	780	156		8.88	7.59	11.18	0.72	3.0	6.36	-214.6	
1110	3.75	900	180		8.92	7.60	11.12	0.79	2.8	6.32	-221.7	
1115	3.77	880	176		9.08	7.60	11.14	0.61	2.4	6.34	-227.4	
1120	3.79	890	178		9.22	7.66	11.25	0.64	2.1	6.40	-236.3	
1125	3.83	910	182		9.34	7.61	11.24	0.64	1.9	6.40	-239.4	
1130	3.91	850	170		9.30	7.61	11.21	0.64	1.9	6.38	-244.8	
1135	Sample											
~~1150~~ 1200	End Sample											

Water Quality Meter (S/N): YSI 610DM (S/N 28089R) w/ 6820
Control Box Type (S/N): QED Well Wizard (S/N 16789)
Turbidimeter (S/N): LaMotte 2020 (S/N 0640-1298)

Notes: ½" Socket for Flush Cover

Tetra Tech NUS, Inc. GROUNDWATER SAMPLE LOG SHEET

Project / Site: NSB-NLON / DRMO
Project No.: 7363

Sample ID No.: DRMO GMW11D GW03
Sample Location: DRMO

[X] Monitoring Well
[ ] Domestic Well
[ ] Other:

Sampler: K. SIMPSON

SAMPLING DATA

Date: 1.27.99 / Time: 1137	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Method: DED. BLADDER PUMP	CLEAR	6.90	36.08	12.3	8	0.28	22.76	-182.1

PURGE DATA

Date: 1.27.99
Method: DED. BLADDER PUMP
Monitor Reading (ppm): 0.2
Well Casing Diameter: 2"
Well Casing Material: PVC
Total Well Depth (TD): 85
Static Water Level (WL): 2.66
One Casing Volume (gal/L):
Start Purge (hrs): 1036
End Purge (hrs): 1136
Total Purge Time (min): 60
Total Vol. Purged (gal/L): 3.8

See Attached Low Flow Purge Data Sheet for Purge Data

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements	Laboratory	Collected
TCL VOLATILES (LOW-LEVEL)	HCl, 4°C	X	Ceimic Corp.	3
TCL SEMIVOLATILES	—	X	Ceimic Corp.	1
TCL PEST/PCBs	—	X	Ceimic Corp.	1
TCL PAH	—	X	Ceimic Corp.	1
TAL METALS (TOTAL)	HNO3	X	Katahdin Analytical	1
TAL METALS (FILTERED)	HNO3	X	Katahdin Analytical	1

OBSERVATIONS / NOTES

LAB INFO

LAB: CEIMIC CORP.
NARRAGANSETT, RI
COC #: 3282

LAB: KATAHDIN ANALYTICAL
WESTBROOK, ME
COC #: 40361

Check if Collected: NO QA COLLECTED

[ ] MS / MSD [ ] DUPLICATE / ID No.:

Signature(s): [signature]

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: 6MW11D DRMO

PROJECT:	NSB-NLON	DATE:	1.27.99
PROJECT NUMBER:	7363	WEATHER:	SUNNY 38°F
SITE:	DRMO	PERSONNEL:	K. SIMPSON

Well Screen Depth: 75 / 85 ft.
Initial Water Level: _____ @ _____ hrs.
Pump Type/Material: PVC / Bladder
Pump Intake Depth: 82
Tide Cycle: ☐ High @ ____ ☒ Low @ 1214 ☐ Not Affected
Total Purge Volume= 3.8 (gal / L)
Total Purge Time= 60 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1036	2.66		267	300/6R	12.4	7.05	37.81	0.87	23	23.97	-105.9	TR. FINES BLACK COLOR
1045	2.68		↓	50PSI	12.6	6.89	36.20	0.93	27	22.85	-125.6	
1055	2.75		240	35PSI	12.5	6.89	36.07	0.35	12	22.83	-146.3	
1105	2.79				12.3	6.90	36.13	0.31	5.0	22.78	-160.2	CLEARING
1110	2.82				12.3	6.90	36.13	0.29	4.0	22.77	-166.4	
1120	2.80				12.4	6.90	36.04	0.28	10.0	22.71	-174.3	
1130	2.82				12.3	6.90	36.09	0.28	9.0	22.77	-180.4	
1135	2.83		↓	↓	12.3	6.90	36.08	0.28	8.0	22.76	-182.1	
	START		SAMPLING	@	1137							
	END		SAMPLING	@	1155							

Water Quality Meter (S/N): YSI 6100M 20647 OR
Control Box Type (S/N): QED 16788
Turbidimeter (S/N): HANNA 96.39.1298
Notes:

ROUND 4

Tetra Tech NUS, Inc. **GROUNDWATER SAMPLE LOG SHEET**

Project / Site:	NSB-NLON / DRMO	Sample ID No.:	DRMO-6MW1S-GW-04
Project No.:	7363	Sample Location:	6MW1S
[X] Monitoring Well		Sampler:	T. Evans / K. Simpson
[ ] Domestic Well			
[ ] Other:			

SAMPLING DATA

Date: 4-23-99 / Time: 1035	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Method: Low Flow/Bladder Pump	CLEAR	6.16	7.736	11.0	0	7.74	4.30	133.5

PURGE DATA

Date: 4-23 99	See Attached Low Flow Purge Data Sheet for Purge Data
Method: Low Flow/Bladder Pump	
Monitor Reading (ppm): 0	
Well Casing Diameter: 2 in.	
Well Casing Material: PVC	
Total Well Depth (TD): 15.7 feet	
Static Water Level (WL): 6.87	
One Casing Volume (gal/L): 1.4	
Start Purge (hrs): 0927	
End Purge (hrs): 1035	
Total Purge Time (min): 68	
Total Vol. Purged (gal/L): 3.6	

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements			Laboratory	Collected
TCL VOLATILES (LOW-LEVEL)	HCl	3	X	40 mL Vial	Ceimic Corp.	✓
TCL SEMIVOLATILES	None	2	X	1L Amber	Ceimic Corp.	✓
TCL PEST/PCBs	None	2	X	1L Amber	Ceimic Corp.	✓
TCL PAH	None	2	X	1L Amber	Ceimic Corp.	✓
TAL METALS (TOTAL)	HNO3	1	X	500 mL HDPE	Katahdin Analytical	✓
TAL METALS (FILTERED)	HNO3	1	X	500 mL HDPE	Katahdin Analytical	✓

OBSERVATIONS / NOTES

POST SAMPLE WL 7.53' @ 1108

START SAMPLE 1035
END SAMPLE 1105

STICK-UP LOW TIDE @ 1127

LAB INFO

LAB: CEIMIC CORP.
NARRAGANSETT, RI
COC #: 0875

LAB: KATAHDIN ANALYTICAL
WESTBROOK, ME
COC #: K041999

Check if Collected:

☐ ~~MS / MSD~~ ☐ ~~DUPLICATE~~ / ID No.:

Signature(s): K. / T. Simpson

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: GMW15

PROJECT:	NSB-NLON	DATE:	4-23-99
PROJECT NUMBER:	7363	WEATHER:	LT RAIN ON/OFF 65°F
SITE:	DRMO	PERSONNEL:	R. SIMPSON

Well Screen Depth: 5.7 / 15.7 ft.
Initial Water Level: 6.87 @ 0925 hrs.
Pump Type/Material: Bladder/PVC
Pump Intake Depth: 12.0 ft TOC
Tide Cycle: ☐ High @ ☒ Low @ ~~1010~~ 1127 ☐ Not Affected
Total Purge Volume= 3.6 (gal) (L)
Total Purge Time= 68 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
0930	6.87	0	255	D 30/R45	11.1	5.90	6.534	8.01	6.8	5.00	145.6	CLEAR LIGHT ODOR
0935	6.95		200	15 PSI	11.0	5.98	8.932	7.47	4.2	4.99	142.3	
0940	6.97			D47/R47	11.0	5.97	8.817	7.14	3.7	4.94	142.1	
0945	7.01			15 PSI	11.0	6.05	8.571	7.69	2.0	4.80	139.7	
0950	7.07				11.0	6.07	8.426	7.60	1.7	4.71	138.5	
0955	7.11				11.0	6.11	8.192	7.71	1.1	4.57	137.0	
1000	7.13				11.1	6.12	8.139	8.00	0.40	4.52	136.4	
1005	7.18				11.0	6.13	8.029	8.02	0.37	4.47	135.6	
1010	7.23				11.0	6.13	7.910	7.47	0.35	4.40	134.8	
1015	7.26				11.1	6.15	7.837	7.84	0	4.36	134.0	
1020	7.30				11.0	6.16	7.806	7.95	0	4.34	133.7	
1025	7.34				11.0	6.14	7.755	7.68	0	4.30	133.9	
1030	7.39	13,600			11.0	6.16	7.736	7.74	0	4.30	133.5	

Water Quality Meter (S/N): 610-193455R, 96F50676 SNOF
Notes:
Control Box Type (S/N): QED
Turbidimeter (S/N): LAMOTTE 0916-4294

Tetra Tech NUS, Inc. **GROUNDWATER SAMPLE LOG SHEET**

Project / Site:	NSB-NLON / DRMO	Sample ID No.:	DRMO-6MW2D-GW-04
Project No.:	7363	Sample Location:	6MW2D
[X] Monitoring Well		Sampler:	T. Evans / K. Simpson
[ ] Domestic Well			
[ ] Other:			

SAMPLING DATA

Date: 4 21 99 / Time: 0855	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Method: Low Flow/Bladder Pump	LT GRAY	6.79	35.95	11.5	6.0	0.88	22.6	-200.5

PURGE DATA

Date: 4 21 99	LT/TR BLACK FINES IN PURGE/SAMPLE
Method: Low Flow/Bladder Pump	
Monitor Reading (ppm): 2.9	See Attached Low Flow Purge Data Sheet for Purge Data
Well Casing Diameter: 2 in.	
Well Casing Material: PVC	
Total Well Depth (TD): 88.8 feet	
Static Water Level (WL): 5.70	
One Casing Volume (gal/L): 13.6	
Start Purge (hrs): 0809	
End Purge (hrs): 0855	
Total Purge Time (min): 47	
Total Vol. Purged (gal/L): 2.9	

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements				Laboratory	Collected
TCL VOLATILES (LOW-LEVEL)	HCl	9	3	X	40 mL Vial	Ceimic Corp.	✓
TCL SEMIVOLATILES	None	6	2	X	1L Amber	Ceimic Corp.	✓
TCL PEST/PCBs	None	6	2	X	1L Amber	Ceimic Corp.	✓
TCL PAH	None	6	1	X	1L Amber	Ceimic Corp.	✓
TAL METALS (TOTAL)	HNO3	3	1	X	500 mL HDPE	Katahdin Analytical	✓
TAL METALS (FILTERED)	HNO3	3	1	X	500 mL HDPE	Katahdin Analytical	✓

OBSERVATIONS / NOTES

START SAMPLE 0855
END SAMPLE 1035 (MS/MSD)

SOME EFFERVESCING IN VOC VIALS (HCL)

SULFUR ODOR IN SAMPLE & PURGE WATER

LAB INFO

LAB: CEIMIC CORP.
NARRAGANSETT, RI
COC #: 0874

LAB: KATAHDIN ANALYTICAL
WESTBROOK, ME
COC #: K04~~01~~1999

Check if Collected:

[X] MS / MSD [ ] ~~DUPLICATE / ID No.~~:

Signature(s): K. S. Simpson

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: GMW 21D

PROJECT:	NSB-NLON	**DATE:**	4/21/97
PROJECT NUMBER:	7363	**WEATHER:**	NICE, SUNNY, 50-60°F
SITE:	DRMO	**PERSONNEL:**	K. SIMPSON

Well Screen Depth: 78.8 / 88.8 ft.
Initial Water Level: 5.70 @ 0805 hrs.
Pump Type/Material: Bladder / PVC
Pump Intake Depth: 83.0
Tide Cycle: ☐ High @ ☒ Low @ 0912 ☐ Not Affected
Total Purge Volume= 2.9 (gal/L)
Total Purge Time= 47 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
0810	5.70	0	~~400~~ KS 270	30D/60R	11.3	6.00	36.76	1.79	12	23.17	-163.1	
0815	5.92	↓	↓	50 PSI	11.4	6.72	35.99	1.08	10.7	22.60	-160.2	[illegible]
0820	5.80			↓	11.4	6.72	35.76	0.83	9.9	22.51	-113.0	
0825	5.89				11.5	6.73	35.76	0.76	6.7	22.47	-126.0	
0830	6.14			60D/60R	11.5	6.74	35.72	0.71	5.9	22.50	-148.2	REDUCED FLOW RATE
0835	5.90		200	50 PSI	11.5	6.75	35.79	0.66	6.0	22.54	-162.7	
0840	5.90				11.5	6.77	35.74	1.02	5.9	22.60	-181.9	
0845 KS	5.90				11.5	6.78	35.86	0.76	6.1	22.60	-190.7	
0850	5.90	11,139			11.5	6.79	35.85	0.88	6.0	22.60	-200.5	

Water Quality Meter (S/N): YSI 176477R, SONDE 97K1095
Control Box Type (S/N): QED 16626
Turbidimeter (S/N): HACH Model 2100P 17

Notes:

Tetra Tech NUS, Inc. **GROUNDWATER SAMPLE LOG SHEET**

Project / Site:	NSB-NLON / DRMO	Sample ID No.:	DRMO-6MW2S-GW-04
Project No.:	7363	Sample Location:	6MW2S
[X] Monitoring Well		Sampler:	T. Evans / K. Simpson
[ ] Domestic Well			
[ ] Other:			

SAMPLING DATA

Date: 4.21.99 / Time: 0855	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Method: Low Flow/Bladder Pump	Clear	6.84	22.00	9.48	0.54	3.27	13.22	142.1

PURGE DATA

Date: 4.21.99	See Attached Low Flow Purge Data Sheet for Purge Data
Method: Low Flow/Bladder Pump	
Monitor Reading (ppm): 0.0	
Well Casing Diameter: 2 in.	
Well Casing Material: PVC	
Total Well Depth (TD): 13.6 feet	
Static Water Level (WL): 6.14	
One Casing Volume(gal/L): 4.6	
Start Purge (hrs): 0811	
End Purge (hrs): 0850	
Total Purge Time (min): ~~0855~~ 39	
Total Vol. Purged (gal/L): 12.0	

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements			Laboratory	Collected
TCL VOLATILES (LOW-LEVEL)	HCl	3	X	40 mL Vial	Ceimic Corp.	✓
TCL SEMIVOLATILES	None	2	X	1L Amber	Ceimic Corp.	✓
TCL PEST/PCBs	None	2	X	1L Amber	Ceimic Corp.	✓
TCL PAH	None	2	X	1L Amber	Ceimic Corp.	✓
TAL METALS (TOTAL)	HNO3	1	X	500 mL HDPE	Katahdin Analytical	✓
TAL METALS (FILTERED)	HNO3	1	X	500 mL HDPE	Katahdin Analytical	✓

OBSERVATIONS / NOTES

LAB INFO

LAB: CEIMIC CORP.
NARRAGANSETT, RI
COC #: ~~0847~~ 0874

LAB: KATAHDIN ANALYTICAL
WESTBROOK, ME
COC #: K041999

Check If Collected:

☐ MS / MSD ☑ DUPLICATE / ID No.: GWFD-042199

Signature(s): [illegible]

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: 6MW25

PROJECT:	NSB-NLON	**DATE:**	4.21.99
PROJECT NUMBER:	7363	**WEATHER:**	Clear sunny 50-55°F
SITE:	DRMO	**PERSONNEL:**	T. Evans

Well Screen Depth: 36 / 136 ft.
Initial Water Level: 6.14 @ 0810 hrs.

Pump Type/Material: Bladder / PVC
Pump Intake Depth: 10.0 ft TOC

Tide Cycle: ☐ High @ ☒ Low @ 0912 ☐ Not Affected

Total Purge Volume= _____ (gal / L) **Total Purge Time=** _____ (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
0811					9.48	6.43	16.33	10.00	NM	9.57	163.0	Cell Full
0815	6.23	960	240	RED 10 23 PS	9.07	6.55	16.96	7.36	0.62	9.97	161.6	Clear
0820	6.20	1480	296		9.16	6.62	17.26	6.40	0.51	10.15	158.6	
~~0825~~ 0827	6.25	2750	392		9.20	6.68	17.87	5.54	0.59	10.63	154.4	
0830	6.27	720	240		9.22	6.68	18.54	4.82	0.49	10.98	153.2	
0835	6.31	1410	282		9.35	6.73	20.66	4.51	0.43	12.35	150.6	
0840	6.41	1790	358		9.38	6.77	21.44	4.29	0.45	12.85	148.0	
0845	6.42	1460	292		9.45	6.80	21.83	3.41	0.46	13.11	145.1	
0850	6.44	1450	290		9.48	6.84	22.00	~~5.43~~ ~~3.45~~ 3.27	0.54	13.22	142.1	
~~Start Sample~~												
0855	Start	Sample										
0942	End	Sample										
	0.57	Final	WL									

Water Quality Meter (S/N): YSI 610 DM w/ 6820 (193455R / 96F506K) **Notes:** Stick-up

Control Box Type (S/N): QED Well Wizard (16788)

Turbidimeter (S/N): Lamotte 2020 (E-16-290)

Tetra Tech NUS, Inc.

GROUNDWATER SAMPLE LOG SHEET

Project / Site:	NSB-NLON / DRMO	Sample ID No.:	DRMO-6MW6D-GW-04
Project No.:	7363	Sample Location:	6MW6D
[X] Monitoring Well		Sampler:	T. Evans / K. Simpson
[ ] Domestic Well			
[ ] Other:			

SAMPLING DATA

Date: 4.19.99 / Time: 1545	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Method: Low Flow/Bladder Pump	LT TAN	5.64	4.423	11.03	43.4	0.77	2.37	125.7

PURGE DATA

Date: 4-19-99	See Attached Low Flow Purge Data Sheet for Purge Data
Method: Low Flow/Bladder Pump	
Monitor Reading (ppm): 0.0	
Well Casing Diameter: 6 in.	
Well Casing Material: Open Bore	
Total Well Depth (TD): 46.0 feet	
Static Water Level (WL): 8.92	
One Casing Volume(gal/L): 206.7	
Start Purge (hrs): 1351	
End Purge (hrs): 1540	
Total Purge Time (min): 111	
Total Vol. Purged (gal/L): 4.7	

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements			Laboratory	Collected
TCL VOLATILES (LOW-LEVEL)	HCl	3	X	40 mL Vial	Ceimic Corp.	✓
TCL SEMIVOLATILES	None	2	X	1L Amber	Ceimic Corp.	✓
TCL PEST/PCBs	None	2	X	1L Amber	Ceimic Corp.	✓
TCL PAH	None	2	X	1L Amber	Ceimic Corp.	✓
TAL METALS (TOTAL)	HNO3	~~2~~ 1	X	500 mL HDPE	Katahdin Analytical	✓
TAL METALS (FILTERED)	HNO3	~~2~~ 1	X	500 mL HDPE	Katahdin Analytical	✓

OBSERVATIONS / NOTES

START SAMPLE 1543
END SAMPLE 1640

LAB INFO

LAB: CEIMIC CORP.
NARRAGANSETT, RI
COC #: 0874

LAB: KATAHDIN ANALYTICAL
WESTBROOK, ME
COC #: K041999

Check if Collected:

[ ] ~~MS / MSD~~ [ ] ~~DUPLICATE / ID No.:~~

Signature(s): T. Evans / K. Simpson

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: 6[illegible]

PROJECT:	NSB-NLON	DATE:	4-19-99
PROJECT NUMBER:	7363	WEATHER:	Clear Sunny 50 55°F
SITE:	DRMO	PERSONNEL:	T. Evans

Well Screen Depth: 30.5 / 46.0 ft.
Initial Water Level: 8.92 @ 1525 hrs.
Pump Type/Material: Bladder / PVC
Pump Intake Depth: 38.0 ft-TOC
Total Purge Volume= 4.7 (gal/L)
Total Purge Time= 111 (min)
Tide Cycle: ☐ High @ ☐ Low @ ☒ Not Affected

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1351				R30 D10 25psi	10.81	6.02	4.242	.277	—	2.23	191.7	F.11 F.11
1356	8.92	1010	202		11.75	5.66	4.371	1.00	83.5	2.34	15[illegible]	
1400	8.92	300	75		11.17	5.64	4.395	1.01	89.0	2.35	130.2	
1405	8.93	500	100		11.26	5.63	4.416	1.19	85.9	2.37	141.7	
1411	8.94	780	130		10.94	5.63	4.413	1.02	78.4	2.36	133.2	
1415	8.94	600	150		10.93	5.61	4.413	0.61	71.1	2.36	131.4	
1420	8.94	660	132		10.87	5.61	4.409	0.63	65.6	2.36	129.9	
1425	8.93	760	152		10.82	5.61	4.413	0.55	61.3	2.36	127.9	
1430	8.95	760	152		10.78	5.62	4.414	0.69	61.8	2.36	127.0	
1435	8.94	900	180		10.67	5.62	4.420	0.79	59.8	2.36	127.7	
1440	8.94	880	176		10.71	5.62	4.415	0.64	52.9	2.37	128.4	
1445	8.95	120+830	190		10.77	5.62	4.416	0.72	49.5	2.37	128.4	
1450	8.95	920	184		10.72	5.62	4.416	0.78	46.2	2.37	127.9	
1455	8.96	900	180		10.70	5.63	4.419	~~0.67~~	0.76 / 45.3	2.36	128.3	
1500	8.94	900	180		10.79	5.63	4.418	0.73	45.0	2.37	127.7	
1505	8.94	870	174		10.78	5.62	4.418	0.68	~~46.6~~ 45.7	2.37	127.2	

Water Quality Meter (S/N): 610DM w/ 6820 YSI 176477R
Control Box Type (S/N): QED Well Wizard 16676
Turbidimeter (S/N): LaMotte 2020 0916 4-18

Notes: Stickup

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: MW6D

PROJECT:	NSB-NLON	**DATE:**	4-19-99
PROJECT NUMBER:	7363	**WEATHER:**	Clear, Sunny, 50-55°F
SITE:	DRMO	**PERSONNEL:**	T. Evans

Well Screen Depth: SEE pg 2 / _____ ft.
Initial Water Level: _____ @ _____ hrs.
Pump Type/Material: _____
Pump Intake Depth: _____
Tide Cycle: ☐ High @ _____ ☐ Low @ _____ ☒ Not Affected
Total Purge Volume= 4.7 (gal / L)
Total Purge Time= 111 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1510	8.94	730	146	↓	10.81	5.64	4.423	1.01	45.0	2.37	126.4	
1515	8.95	870	174		10.82	5.63	4.424	0.83	45.6	2.37	126.1	
1520	8.95	650	130		10.95	5.63	4.418	0.68	45.9	2.37	125.5	
1525	8.95	650	130		11.03	5.64	4.421	0.82	44.7	2.37	125.2	
1530	8.95	650	130		11.04	5.64	4.419	0.81	42.8	2.37	125.5	
1535	8.95	~~65~~ 650	130		11.03	5.64	4.423	0.71	43.4	2.37	125.7	KB 10.77

Water Quality Meter (S/N): _____
Control Box Type (S/N): _____
Turbidimeter (S/N): _____
Notes: _____

Tetra Tech NUS, Inc. **GROUNDWATER SAMPLE LOG SHEET**

Project / Site:	NSB-NLON / DRMO	Sample ID No.:	DRMO-6MW6S-GW-04
Project No.:	7363	Sample Location:	6MW6S
[X] Monitoring Well		Sampler:	T. Evans / K. Simpson
[ ] Domestic Well			
[ ] Other:			

SAMPLING DATA

Date: 4.19.99 / Time: 1445	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Method: Low Flow/Bladder Pump	CLEAR	5.69	~~0.227~~ 0.320	9.8	0.30	9.57	0.15	148.6

PURGE DATA

Date: 4.19.99	See Attached Low Flow Purge Data Sheet for Purge Data
Method: Low Flow/Bladder Pump	
Monitor Reading (ppm): 0.6	
Well Casing Diameter: 2 in.	
Well Casing Material: PVC	
Total Well Depth (TD): 18.6 feet	
Static Water Level (WL): 8.57	
One Casing Volume (gal/L): 1.6	
Start Purge (hrs): 1354	
End Purge (hrs): 1438	
Total Purge Time (min): 44	
Total Vol. Purged (gal/L): 3.6	

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements			Laboratory	Collected
TCL VOLATILES (LOW-LEVEL)	HCl	3	X	40 mL Vial	Ceimic Corp.	✓
TCL SEMIVOLATILES	None	2	X	1L Amber	Ceimic Corp.	✓
TCL PEST/PCBs	None	2	X	1L Amber	Ceimic Corp.	✓
TCL PAH	None	2	X	1L Amber	Ceimic Corp.	✓
TAL METALS (TOTAL)	HNO3	1	X	500 mL HDPE	Katahdin Analytical	✓
TAL METALS (FILTERED)	HNO3	1	X	500 mL HDPE	Katahdin Analytical	✓

OBSERVATIONS / NOTES

NO ODOR

START SAMPLE 1440
END SAMPLE 1515

LAB INFO

LAB: CEIMIC CORP.
NARRAGANSETT, RI
COC #: 0874

LAB: KATAHDIN ANALYTICAL
WESTBROOK, ME
COC #: 1504199

Check if Collected:

[ ] ~~MS / MSD~~ [ ] ~~DUPLICATE~~ / ID No.:

Signature(s): K. / S. Simpson

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: 6MW65

PROJECT:	NSB-NLON	DATE:	4.19.99
PROJECT NUMBER:	7363	WEATHER:	SUNNY 64°F
SITE:	DRMO	PERSONNEL:	KEITH SIMPSON

Well Screen Depth: 8.6 / 18.6 ft.
Initial Water Level: 8.57 @ 1350 hrs.
Pump Type/Material: Bladder / PVC
Pump Intake Depth: 14.0 ft TOC
Tide Cycle: ☐ High @ ☐ Low @ ☒ Not Affected
Total Purge Volume= 3.6 (gal/L)
Total Purge Time= 44 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments Sp Cond (mS/cm)
1355	8.57	0	340	60 R / 30 D	10.2	5.66	0.237	10.27	1.43	0.16	142.6	0.330
1405	8.53	↓	↓	15 PSI	10.1	5.52	0.229	10.98	1.11	0.15	147.8	0.320
1415	8.53	↓	↓	↓	9.8	5.49	0.227	10.86	0.75	0.15	151.1	0.320
1420	↓	↓	↓	↓	9.9	5.51	0.227	10.47	0.71	0.15	152.5	0.319
1425	↓	↓	↓	↓	9.8	5.54	0.228	10.57	0.50	0.15	152.4	0.321
1430	↓	↓	↓	↓	9.7	5.60	0.227	10.25	0.36	0.15	151.2	0.321
1435	↓	136,000 mL	↓	↓	9.8	5.69	0.227	9.57	0.30	0.15	148.6	0.320

YSI Water Quality Meter (S/N): 193455R - SONDE 96F50676
Control Box Type (S/N): QED 16788
Turbidimeter (S/N): LA MOTTE 0361-4197

Notes: STICK-UP

Tetra Tech NUS, Inc. **GROUNDWATER SAMPLE LOG SHEET**

Project / Site:	NSB-NLON / DRMO	Sample ID No.:	DRMO-6MW9S-GW-04
Project No.:	7363	Sample Location:	6MW9S
[X] Monitoring Well		Sampler:	T. Evans / K. Simpson
[ ] Domestic Well			
[ ] Other:			

SAMPLING DATA

Date: 4-23-99 / Time: 1145	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Method: Low Flow/Bladder Pump	CLEAR	4.10	0.050	8.9	0.9	1.92	0.02	178.6

PURGE DATA

Date: 4-23-99	See Attached Low Flow Purge Data Sheet for Purge Data
Method: Low Flow/Bladder Pump	
Monitor Reading (ppm):	
Well Casing Diameter: 2 in.	
Well Casing Material: PVC	
Total Well Depth (TD): 11.8 feet	
Static Water Level (WL): 4.37	
One Casing Volume(gal/L): 1.2	
Start Purge (hrs): 1117	
End Purge (hrs): 1145	
Total Purge Time (min): 38	
Total Vol. Purged (gal/L): 2.7	

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements			Laboratory	Collected
TCL VOLATILES (LOW-LEVEL)	HCl	3	X	40 mL Vial	Ceimic Corp.	✓
TCL SEMIVOLATILES	None	2	X	1L Amber	Ceimic Corp.	✓
TCL PEST/PCBs	None	2	X	1L Amber	Ceimic Corp.	✓
TCL PAH	None	2	X	1L Amber	Ceimic Corp.	✓
TAL METALS (TOTAL)	HNO3	1	X	500 mL HDPE	Katahdin Analytical	✓
TAL METALS (FILTERED)	HNO3	1	X	500 mL HDPE	Katahdin Analytical	✓

OBSERVATIONS / NOTES

START SAMPLE 1145
END SAMPLE 1203

END WL 4.39' @ 1205

LAB INFO

LAB: CEIMIC CORP.
NARRAGANSETT, RI
COC #: 0875

LAB: KATAHDIN ANALYTICAL
WESTBROOK, ME
COC #: K041999

Check if Collected:

[ ] ~~MS / MSD~~ [ ] ~~DUPLICATE / ID No.~~:

Signature(s): T. Evans / K. Simpson

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: 6MW9S

PROJECT: NSB-NLON
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 4-23-99
WEATHER: LT. RAIN ON/OFF 67°F
PERSONNEL: R. SIMPSON

Well Screen Depth: 7.8 / 11.8 ft.
Initial Water Level: 4.37 @ 1113 hrs.

Pump Type/Material: Bladder / pvc
Pump Intake Depth: 10.0 ft TOC

Tide Cycle: ☐ High @ ☐ Low @ 1127 ☒ Not Affected

Total Purge Volume= ~~4.37~~ 2.7 (gal/LL) KS

Total Purge Time= ~~1113~~ 38 (min) KS

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
1120	4.37	0	270	30 PD/45S	9.1	5.06	0.055	4.28	9.0	0.02	163.6	CLEAR NO ODOR
1125	4.38	↓	↓	15 PSI	9.0	4.28	0.050	2.48	7.1	0.02	178.4	
1130	4.40			↓	8.9	4.08	0.050	2.11	5.6	0.02	183.9	
1135	4.40				8.9	4.08	0.050	2.07	1.6	0.02	180.5	
1140	4.40	10,260			8.9	4.10	0.050	1.92	0.9	0.02	178.6	

Water Quality Meter (S/N): 610-193455R 96F50676 DIXIE
Control Box Type (S/N): QED 16626
Turbidimeter (S/N): LAMOTTE 0916-4298

Notes:

Tetra Tech NUS, Inc. **GROUNDWATER SAMPLE LOG SHEET**

Project / Site:	NSB-NLON / DRMO	Sample ID No.:	DRMO-6MW10D-GW-04
Project No.:	7363	Sample Location:	6MW10D
[X] Monitoring Well		Sampler:	T. Evans / K. Simpson
[ ] Domestic Well			
[ ] Other:			

SAMPLING DATA

Date: 4.20.99 Time: 0815	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Method: Low Flow/Bladder Pump	CLEAR	7.14	~~16.33~~ 21.56	12.3	1.93	0.20	12.95	-73.3

PURGE DATA

Date: 4.20.99	NO ODOR
Method: Low Flow/Bladder Pump	
Monitor Reading (ppm): 1.70	See Attached Low Flow Purge Data Sheet for Purge Data
Well Casing Diameter: 2 in.	
Well Casing Material: PVC	
Total Well Depth (TD): 54.1 feet	
Static Water Level (WL): 2.61	
One Casing Volume (gal): 8.4	
Start Purge (hrs): 0728	
End Purge (hrs): 0815	
Total Purge Time (min): 47	
Total Vol. Purged (gal): 1.9	

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements			Laboratory	Collected
TCL VOLATILES (LOW-LEVEL)	HCl	3	X	40 mL Vial	Ceimic Corp.	✓
TCL SEMIVOLATILES	None	2	X	1L Amber	Ceimic Corp.	✓
TCL PEST/PCBs	None	2	X	1L Amber	Ceimic Corp.	✓
TCL PAH	None	2	X	1L Amber	Ceimic Corp.	✓
TAL METALS (TOTAL)	HNO3	1	X	500 mL HDPE	Katahdin Analytical	✓
TAL METALS (FILTERED)	HNO3	1	X	500 mL HDPE	Katahdin Analytical	✓

OBSERVATIONS / NOTES

START SAMPLE 0815
END SAMPLE 0837

END WL 2.62 @ 0835

LAB INFO:

LAB: CEIMIC CORP.
NARRAGANSETT, RI
COC #: 0874

LAB: KATAHDIN ANALYTICAL
WESTBROOK, ME
COC #: K041999

Check If Collected:

[ ] ~~MS / MSD~~ [ ] ~~DUPLICATE~~ / ID No.:

Signature(s): T. Evans

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: GMW101

PROJECT: NSB-NLON
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 4-20-99
WEATHER: SUNNY 55°F
PERSONNEL: R. SIMPSON

Well Screen Depth: 44.1 / 54.1 ft.
Initial Water Level: 2.61 @ 0725 hrs.

Pump Type/Material: Bladder / PVC
Pump Intake Depth: 49.0 ft TOC

Tide Cycle: ☐ High @ ☒ Low @ 0829 ☐ Not Affected

Total Purge Volume= 1.9 (gal) (L)
Total Purge Time= 47 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	~~Sp~~ Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments SpCond (mS/cm)
0730	2.61	0	~~2~~ 150	30R/30D	12.5	7.03	17.10	0.69	1.40	13.57	-54.7	22.46
0735	2.63			20 PSI	12.1	7.08	16.87	0.30	17.4	13.46	-68.8	22.39
0740	2.64				12.1	7.08	16.69	0.28	3.85	13.36	-67.4	22.15
0745	2.65				12.1	7.10	16.47	0.23	2.76	13.17	-68.5	21.85
0750	2.68				12.2	7.11	16.49	0.21	2.00	13.16	-69.7	21.82
0755	2.68				12.2	7.12	16.47	0.21	2.04	13.14	-71.5	21.80
0800	2.68				12.2	7.13	16.39	0.20	1.70	13.06	-72.8	21.69
0805	2.68				12.3	7.14	16.40	0.20	1.56	13.04	-73.4	21.65
0810	2.67	7050 mL			12.3	7.14	16.33	0.20	1.93	12.95	-73.3	21.56

Water Quality Meter (S/N): YSI 610DM 193455R & 96F50676 SONDE
Control Box Type (S/N): QED 16626
Turbidimeter (S/N): LA MOTTE 0916-4298

Notes:

Tetra Tech NUS, Inc. **GROUNDWATER SAMPLE LOG SHEET**

Project / Site:	NSB-NLON / DRMO	Sample ID No.:	DRMO-6MW10S-GW-04
Project No.:	7363	Sample Location:	6MW10S
[X] Monitoring Well		Sampler:	T. Evans / K. Simpson
[ ] Domestic Well			
[ ] Other:			

SAMPLING DATA

Date: 4-20-99	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Time: 0818								
Method: Low Flow/Bladder Pump	Clear	7.29	8.35	10.82	1.90	0.95	4.66	-112.9

PURGE DATA

Date: 4-20-99	See Attached Low Flow Purge Data Sheet for Purge Data
Method: Low Flow/Bladder Pump	
Monitor Reading (ppm): 1.4	
Well Casing Diameter: 2 in.	
Well Casing Material: PVC	
Total Well Depth (TD): 13.3 feet	
Static Water Level (WL): 4.02	
One Casing Volume(gal/L): 5.17	
Start Purge (hrs): 0735	
End Purge (hrs): 0817	
Total Purge Time (min): 42	
Total Vol. Purged (gal/L): 5.3	

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements			Laboratory	Collected
TCL VOLATILES (LOW-LEVEL)	HCl	3	X	40 mL Vial	Ceimic Corp.	✓
TCL SEMIVOLATILES	None	2	X	1L Amber	Ceimic Corp.	✓
TCL PEST/PCBs	None	2	X	1L Amber	Ceimic Corp.	✓
TCL PAH	None	2	X	1L Amber	Ceimic Corp.	✓
TAL METALS (TOTAL)	HNO3	1	X	500 mL HDPE	Katahdin Analytical	✓
TAL METALS (FILTERED)	HNO3	1	X	500 mL HDPE	Katahdin Analytical	✓

OBSERVATIONS / NOTES

TRACE BLACK FINES IN PURGE & SAMPLE

LAB INFO

LAB: CEIMIC CORP.
NARRAGANSETT, RI
COC #: 0874

LAB: KATAHDIN ANALYTICAL
WESTBROOK, ME
COC #: K041999

Check if Collected:

[ ] ~~MS / MSD~~ [ ] ~~DUPLICATE~~ / ID No.:

Signature(s): [illegible]

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: 6MW105

PROJECT:	NSB-NLON	DATE:	4-20-99
PROJECT NUMBER:	7363	WEATHER:	Clear, sunny, 45°F
SITE:	DRMO	PERSONNEL:	T. Evans

Well Screen Depth: 4.3 / 13.3 ft.
Initial Water Level: 4.02 @ 0722 hrs.
Pump Type/Material: Bladder / PVC
Pump Intake Depth: 9.0 ft TOC
Total Purge Volume= _____ (gal / L)
Total Purge Time= _____ (min)

Tide Cycle: ☐ High @ ☒ Low @ 0824 ☐ Not Affected

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
0735	4.20			D6.0/R30 7psi	11.13	6.90	9.239	3.05	1.83	5.12	-105	cell full
0740	4.25	1100	220	4psi	10.80	7.08	7.918	0.75	2.53	4.40	-86.6	*line high, pulled in stop
0745	4.23	840	168	4psi	10.96	7.15	7.918	0.78	2.00	4.40	-93.2	not clear
0750	4.25	380	76		10.97	7.19	7.913	0.62	2.20	4.40	-99.8	*H2S odor
0755	4.27	550	110	5psi	10.90	7.22	7.902	0.79	2.30	4.40	-102.8	
0806	4.33	1200	109		10.89	7.26	8.124	1.07	2.50	4.53	-106.7	
0810	4.34	560	140		10.81	7.27	8.24	0.96	2.10	4.59	-107.7	
0815	4.36	660	132		10.82	7.29	8.35	0.95	1.80	4.66	-112.0	
0817	End Purge											
0818	Sample											
0855	End Sample											

Water Quality Meter (S/N): YSI 60 w/ 6820 (176477R / 97K1095) Notes: Flush - no out
Control Box Type (S/N): QED Well Wizard (16788)
Turbidimeter (S/N): LaMotte 2020 (03601-4197)

Tetra Tech NUS, Inc. **GROUNDWATER SAMPLE LOG SHEET**

Project / Site:	NSB-NLON / DRMO	Sample ID No.:	DRMO-6MW11D-GW-04
Project No.:	7363	Sample Location:	6MW11D
[X] Monitoring Well		Sampler:	T. Evans / K. Simpson
[ ] Domestic Well			
[ ] Other:			

SAMPLING DATA

Date: 4.22.99	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Time: 1026								
Method: Low Flow/Bladder Pump	Clear	7.16	34.97	12.66	10	2.18	22.00	-99.0

PURGE DATA

Date: 4.22.99	See Attached Low Flow Purge Data Sheet for Purge Data
Method: Low Flow/Bladder Pump	
Monitor Reading (ppm): 0.60	
Well Casing Diameter: 2 in.	
Well Casing Material: PVC	
Total Well Depth (TD): 85.0 feet	
Static Water Level (WL): 2.85	
One Casing Volume(gal/L): 50.7	
Start Purge (hrs): 0925	
End Purge (hrs): 1025	
Total Purge Time (min): 60	
Total Vol. Purged (gal/L): 11.85	

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements			Laboratory	Collected
TCL VOLATILES (LOW-LEVEL)	HCl	3	X	40 mL Vial	Ceimic Corp.	
TCL SEMIVOLATILES	None	2	X	1L Amber	Ceimic Corp.	
TCL PEST/PCBs	None	2	X	1L Amber	Ceimic Corp.	
TCL PAH	None	2	X	1L Amber	Ceimic Corp.	
TAL METALS (TOTAL)	HNO3	1	X	500 mL HDPE	Katahdin Analytical	
TAL METALS (FILTERED)	HNO3	1	X	500 mL HDPE	Katahdin Analytical	

OBSERVATIONS / NOTES

LAB INFO

LAB: CEIMIC CORP.
NARRAGANSETT, RI
COC #: 0875

LAB: KATAHDIN ANALYTICAL
WESTBROOK, ME
COC #: K041999

Check if Collected:

[X] MS / MSD [X] DUPLICATE / ID No.:

Signature(s): [illegible]

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: 6MW11D

PROJECT:	NSB-NLON	DATE:	4 22 99
PROJECT NUMBER:	7363	WEATHER:	Overcast 45 - 50°F
SITE:	DRMO	PERSONNEL:	T. Evans

Well Screen Depth: 75.0 / 85.0 ft.
Initial Water Level: 2.85 @ 0920 hrs.
Pump Type/Material: Bladder/PVC
Pump Intake Depth: 82.0 ft TOC
Tide Cycle: ☐ High @ ☒ Low @ 1026 ☐ Not Affected
Total Purge Volume= 11.85 (gal (L))
Total Purge Time= 60 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
0925				R25 D10 50 psi	12.64	6.49	34.26	3.65	4.15	21.50	-17.2	Cell Full
0930	2.83	1100+780	376	R25 D9.0 45 psi	12.49	6.91	35.81	1.73	77.5	22.60	-65.3	~~clear~~, (2)
0935	2.87	1450	290	R25 D7.0 45 psi	12.49	7.02	35.81	2.15	103.9	22.59	-80.6	gray tint
0940	2.90	900	180	R25 D7.0 42 psi	12.44	7.06	35.87	2.51	64.6	22.62	-84.5	
0945	2.86	780	156		12.47	7.09	35.74	2.39	80.2	22.54	-86.1	
0950	2.93	780	156		12.56	7.10	35.67	1.85	30.	22.50	-85.6	
0955	2.93	780	156		12.65	7.11	35.56	2.23	24	22.42	-87.6	clear
1000	2.95	780	156		12.90	7.14	35.44	2.53	19	22.33	-90.0	
1005	3.03	900	180		12.93	7.13	35.31	2.20	19	22.25	-91.3	
1010	3.00	900	180		12.81	7.15	35.27	2.81	12	22.21	-93.2	
1015	3.02	900	180		12.71	7.15	35.12	2.40	(2) 11	22.12	-95.0	
1020	2.90	↓	↓		12.68	7.15	35.03	2.60	10	22.05	-96.7	
1025	2.90				12.66	7.16	34.97	2.18	10	22.00	-99.0	
1026	Sample											
1108	End Sample											
1108	2.68	Final WL										

Water Quality Meter (S/N): YSI 610DM w/6820 (193455R/
Control Box Type (S/N): QED Well Wizard (
Turbidimeter (S/N): LaMotte 2020 (

Notes:

Tetra Tech NUS, Inc. **GROUNDWATER SAMPLE LOG SHEET**

Project / Site:	NSB-NLON / DRMO	Sample ID No.:	DRMO-6MW11S-GW-04
Project No.:	7363	Sample Location:	6MW11S
[X] Monitoring Well		Sampler:	T. Evans / K. Simpson
[ ] Domestic Well			
[ ] Other:			

SAMPLING DATA

Date: 4-22-99 Time: 1008	Color	pH	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	Salinity ppt	Eh mV
Method: Low Flow/Bladder Pump	CLEAR	7.08	9.684	10.4	1.09	0.39	5.46	-187.7

PURGE DATA

Date: 4-22-99	See Attached Low Flow Purge Data Sheet for Purge Data
Method: Low Flow/Bladder Pump	
Monitor Reading (ppm): 0	
Well Casing Diameter: 2 in.	
Well Casing Material: PVC	
Total Well Depth (TD): 13.5 feet	
Static Water Level (WL): 3.53	
One Casing Volume (gal): 1.6	
Start Purge (hrs): 0920	
End Purge (hrs): 1008	
Total Purge Time (min): 48	
Total Vol. Purged (gal): 2.7	

SAMPLE COLLECTION INFORMATION

Analysis	Preservative	Container Requirements			Laboratory	Collected
TCL VOLATILES (LOW-LEVEL)	HCl	3	X	40 mL Vial	Ceimic Corp.	
TCL SEMIVOLATILES	None	2	X	1L Amber	Ceimic Corp.	
TCL PEST/PCBs	None	2	X	1L Amber	Ceimic Corp.	
TCL PAH	None	2	X	1L Amber	Ceimic Corp.	
TAL METALS (TOTAL)	HNO3	1	X	500 mL HDPE	Katahdin Analytical	
TAL METALS (FILTERED)	HNO3	1	X	500 mL HDPE	Katahdin Analytical	

OBSERVATIONS / NOTES

LT. SULFUR ODOR

START SAMPLE 1008
END SAMPLE 1049

END WL 3.86 @ 1049

LAB INFO

LAB: CEIMIC CORP.
NARRAGANSETT, RI
COC #: 0875

LAB: KATAHDIN ANALYTICAL
WESTBROOK, ME
COC #: K041999

Check if Collected:

~~☐ MS / MSD~~ ☐ ~~DUPLICATE / ID No.:~~

Signature(s): K. S. Simpson

Tetra Tech NUS, Inc.

LOW FLOW PURGE DATA SHEET

Well No.: 6MW11S

PROJECT: NSB-NLON
PROJECT NUMBER: 7363
SITE: DRMO

DATE: 4-22-99
WEATHER: LITE RAIN ON/OFF 63°F
PERSONNEL: R. SIMPSON

Well Screen Depth: 3.5 / 13.5 ft.
Initial Water Level: 3.53 @ 0920 hrs.

Pump Type/Material: Bladder/PVC
Pump Intake Depth: 11.0 ft TOC

Tide Cycle: ☐ High @ ☒ Low @ 1026 ☐ Not Affected

Total Purge Volume= 2.7 (gal)/(L)

Total Purge Time= 48 (min)

Time	Water Level feet below TOC	Volume mL	Flow Rate mL/min	Pump Settings	Temp °C	pH	Sp Cond mS/cm	DO mg/L	Turbidity NTU	Salinity ppt	Eh mV	Comments
0925	3.53	0	240	45R/45D	10.4	6.48	13.25	1.91	6.0	7.65	-89.6	cl GRAY
0930	3.55	↓	↓	20 PSI	10.3	6.83	9.786	0.64	5.6	5.52	-129.5	
0935	3.58			↓	10.3	6.92	9.671	0.81	2.8	5.45	-146.9	
0940	3.60		200	55R/55D	10.3	6.95	9.660	0.64	2.0	5.44	-153.7	
0945	3.64			20 PSI	10.3	7.00	9.644	0.87	1.55	5.44	-162.2	
0950	3.66				10.4	7.02	9.756	0.39	1.66	5.50	-168.8	
0955	3.71				10.3	7.05	9.748	0.68	1.97	5.50	-176.9	
1000	3.73				10.4	7.07	9.715	0.85	1.71	5.48	-182.4	
1005	3.79				10.4	7.07	9.686	0.41	1.56	5.46	-182.7	
1010	3.79	↓			10.4	7.09	9.726	0.46	1.12	5.49	-186.6	
1005	3.82	10,176	↓	↓	10.4	7.08	9.684	0.39	1.09	5.46	-187.7	

Water Quality Meter (S/N): 176477R-610, SONDE 97K1095
Control Box Type (S/N): QED 16626
Turbidimeter (S/N): LAMOTTE 0361 4197

Notes:

APPENDIX B

STATISTICS

NEW LONDON 267
DOWNGRADIENT GW RESULTS
95% UPPER CONFIDENCE LIMITS

PARAMETER	FREQUENCY OF DETECTION	AVERAGE	W NORMAL	W LOGNORMAL	W TEST	DISTRIBUTION	UCL - NORMAL	UCL - LOGNORMAL	DETECTS - MAX	95% UCL
Volatile Organics (µg/L)										
1,1-DICHLOROETHANE	6/26	0.5712	0.5722	0.5731	0.92	LOGNORMAL	0.6186	0.6145	1	0.6145
2-BUTANONE	1/1	2	---	---	---	LOGNORMAL	---	---	2	2
ACETONE	1/4	12.875	0.6297	0.6297	0.748	LOGNORMAL	37.2874	563538.9228	44	44
CHLOROFORM	1/26	0.5154	0.202	0.202	0.92	LOGNORMAL	0.5417	0.5356	0.9	0.5356
TRICHLOROETHENE	5/26	1.1808	0.393	0.4057	0.92	LOGNORMAL	1.8189	1.3879	7	1.3879
VINYL CHLORIDE	3/26	0.5154	0.3846	0.3885	0.92	LOGNORMAL	0.5309	0.5721	0.7	0.5721
Semivolatile Organics (µg/L)										
ANTHRACENE	7/26	0.0367	0.7517	0.7556	0.92	LOGNORMAL	0.0424	0.0429	0.082	0.0429
BENZO(A)ANTHRACENE	2/26	0.0363	0.6246	0.6224	0.92	LOGNORMAL	0.0419	0.0423	0.0675	0.0423
BENZO(A)PYRENE	2/19	0.0422	0.7307	0.7046	0.901	LOGNORMAL	0.0497	0.0526	0.0775	0.0526
BENZO(B)FLUORANTHENE	3/26	0.0458	0.7535	0.7379	0.92	LOGNORMAL	0.0509	0.0527	0.09	0.0527
BENZO(G,H,I)PERYLENE	1/26	0.0633	0.6095	0.6063	0.92	LOGNORMAL	0.0702	0.0703	0.075	0.0703
BENZO(K)FLUORANTHENE	2/26	0.027	0.2857	0.3443	0.92	LOGNORMAL	0.0305	0.0291	0.0775	0.0291
BIS(2-ETHYLHEXYL)PHTHALATE	14/26	9.4423	0.3158	0.7725	0.92	LOGNORMAL	17.8977	10.2543	130	10.2543
CHRYSENE	2/26	0.0368	0.6535	0.6442	0.92	LOGNORMAL	0.0426	0.0431	0.0725	0.0431
CIS-1,2-DICHLOROETHENE	16/26	2.5654	0.5473	0.7685	0.92	LOGNORMAL	3.9419	3.9499	14	3.9499
DIBENZO(A,H)ANTHRACENE	2/26	0.0941	0.699	0.8379	0.92	LOGNORMAL	0.1245	0.1683	0.0913	0.0913
FLUORANTHENE	8/26	0.076	0.4943	0.6415	0.92	LOGNORMAL	0.0959	0.088	0.28	0.088
FLUORENE	4/26	0.091	0.5644	0.6781	0.92	LOGNORMAL	0.1189	0.1112	0.42	0.1112
INDENO(1,2,3-CD)PYRENE	1/26	0.0352	0.596	0.5958	0.92	LOGNORMAL	0.0405	0.0407	0.045	0.0407
PENTACHLOROPHENOL	1/25	10.97	0.6535	0.6887	0.918	LOGNORMAL	13.8535	14.7209	6.5	6.5
PHENANTHRENE	12/26	0.091	0.6039	0.7994	0.92	LOGNORMAL	0.132	0.1307	0.56	0.1307
PYRENE	8/26	0.0798	0.7422	0.8047	0.92	LOGNORMAL	0.1042	0.1188	0.28	0.1188
Total Metals (µg/L)										
ALUMINUM	6/26	266.2058	0.4938	0.9301	0.92	LOGNORMAL	463.7672	756.3693	2780	756.3693
ANTIMONY	1/26	2.7212	0.6411	0.7347	0.92	LOGNORMAL	3.7139	3.7373	10.6	3.7373
ARSENIC	5/26	3.0808	0.671	0.8507	0.92	LOGNORMAL	4.2129	4.4152	15.9	4.4152
BARIUM	23/26	98.3712	0.8929	0.8909	0.92	LOGNORMAL	126.6281	305.649	280	280
CALCIUM	26/26	162253.8462	0.9216	0.9312	0.92	LOGNORMAL	195371.1584	241374.8315	333000	241374.8315
CHROMIUM	4/26	3.0575	0.4827	0.9155	0.92	LOGNORMAL	4.535	4.219	23.2	4.219
COBALT	3/26	1.367	0.8099	0.8601	0.92	LOGNORMAL	1.6628	1.8686	4.5	1.8686
COPPER	8/26	2.6171	0.7654	0.8708	0.92	LOGNORMAL	3.4606	4.3032	7.7	4.3032
IRON	18/26	2426.6827	0.7504	0.922	0.92	LOGNORMAL	3483.8462	33834.4541	11050	11050
LEAD	6/26	2.2454	0.8042	0.9234	0.92	LOGNORMAL	2.8973	3.3721	6.6	3.3721
MAGNESIUM	26/26	408661.5385	0.8679	0.9091	0.92	LOGNORMAL	502485.5096	683873.1828	827000	683873.1828
MANGANESE	22/26	508.9667	0.8779	0.7335	0.92	LOGNORMAL	657.5171	42446.7086	1915	1915
MERCURY	4/21	0.0687	0.2618	0.7383	0.908	LOGNORMAL	0.1623	0.0694	1.1525	0.0694
NICKEL	7/26	4.7458	0.8066	0.9386	0.92	LOGNORMAL	6.4524	10.9173	20.4	10.9173
POTASSIUM	26/26	141667.3077	0.8753	0.9201	0.92	LOGNORMAL	174433.8974	228488.938	303000	228488.938
SELENIUM	1/20	3.1725	0.3824	0.4176	0.905	LOGNORMAL	4.9448	3.94	17.1	3.94
SILVER	1/26	1.1814	0.8562	0.8479	0.92	LOGNORMAL	1.4075	1.5818	3.025	1.5818
SODIUM	26/26	3403846.154	0.8819	0.912	0.92	LOGNORMAL	4169386.972	5586216.849	6940000	5586216.849
VANADIUM	7/26	12.1837	0.5596	0.9309	0.92	LOGNORMAL	19.2572	25.0259	78.65	25.0259
ZINC	10/26	67.7135	0.5394	0.9359	0.92	LOGNORMAL	112.3587	195.9806	513	195.9806

Bold indicates parameter has been identifiied as a potential COC.
Data sets which fail the W test for normality
and lognormality are assumed to be lognormal.

NEW LONDON 267
DOWNGRADIENT GW RESULTS
95% UPPER CONFIDENCE LIMITS

PARAMETER	FREQUENCY OF DETECTION	AVERAGE	W NORMAL	W LOGNORMAL	W TEST	DISTRIBUTION	UCL - NORMAL	UCL - LOGNORMAL	DETECTS - MAX	95% UCL
Dissolved Metals (µg/L)										
ANTIMONY	1/26	2.8885	0.6784	0.7406	0.92	LOGNORMAL	3.9116	4.1692	6.2	4.1692
ARSENIC	3/26	2.9596	0.7244	0.8026	0.92	LOGNORMAL	3.9741	4.3841	12.7	4.3841
BARIUM	23/26	136.2635	0.8417	0.9056	0.92	LOGNORMAL	179.5138	407.008	563	407.008
CALCIUM	26/26	159332.6923	0.9317	0.9391	0.92	LOGNORMAL	192097.0849	236088.3128	346000	236088.3128
CHROMIUM	1/26	2.2549	0.8373	0.9029	0.92	LOGNORMAL	2.7701	3.2644	5.1	3.2644
COBALT	3/26	1.6656	0.8057	0.8921	0.92	LOGNORMAL	2.0658	2.3414	5.8	2.3414
COPPER	7/26	1.1663	0.7549	0.9095	0.92	LOGNORMAL	1.4664	1.5071	3.2	1.5071
IRON	16/26	2001.175	0.78	0.9106	0.92	LOGNORMAL	2856.3114	50320.0478	9430	9430
LEAD	2/26	1.2593	0.5999	0.8138	0.92	LOGNORMAL	1.7043	1.6088	1.0275	1.0275
MAGNESIUM	26/26	403938.4615	0.8893	0.9217	0.92	LOGNORMAL	497976.3036	677157.8237	875000	677157.8237
MANGANESE	23/26	502.9773	0.8433	0.7528	0.92	LOGNORMAL	655.7129	23552.9403	2080	2080
NICKEL	4/26	5.1771	0.7221	0.9605	0.92	LOGNORMAL	7.2271	10.9885	28.6	10.9885
POTASSIUM	26/26	137567.3077	0.8742	0.9173	0.92	LOGNORMAL	168822.4516	219561.2763	286000	219561.2763
SILVER	4/26	1.4783	0.7141	0.9129	0.92	LOGNORMAL	1.8405	1.9203	5.5	1.9203
SODIUM	26/26	3338653.846	0.8937	0.9161	0.92	LOGNORMAL	4075298.184	5374490.739	6865000	5374490.739
VANADIUM	8/26	10.0252	0.5654	0.9326	0.92	LOGNORMAL	15.8411	19.7056	66.9	19.7056
ZINC	6/26	64.8163	0.5546	0.8465	0.92	LOGNORMAL	107.4452	189.3156	451	189.3156

Bold indicates parameter has been identifiied as a potential COC.
Data sets which fail the W test for normality
and lognormality are assumed to be lognormal.

NEW LONDON 267
DOWNGRADIENT GW POTENTIAL COC METAL RESULTS
COMPARED TO BACKGROUND CONCENTRATIONS

PARAMETER	AVERAGE	95% UCL	DETECTS - MAX	BACKGROUND CONCENTRATION
Total Metals (µg/L)				
ARSENIC	3.0808	4.4152	15.9	3.6
BARIUM	98.3712	280	280	NA
CHROMIUM	3.0575	4.219	23.2	21.5
COPPER	2.6171	4.3032	7.7	25.6
LEAD	2.2454	3.3721	6.6	17.5
SILVER	1.1814	1.5818	3.025	NA
ZINC	67.7135	195.9806	513	31.3
Dissolved Metals (µg/L)				
ARSENIC	2.9596	4.3841	12.7	3.6
BARIUM	136.2635	407.008	563	NA
CHROMIUM	2.2549	3.2644	5.1	21.5
COPPER	1.1663	1.5071	3.2	25.6
LEAD	1.2593	1.0275	1.0275	17.5
SILVER	1.4783	1.9203	5.5	NA
ZINC	64.8163	189.3156	451	31.3

Bold indicates inorganic potential COC present in groundwater above background levels.

NEW LONDON 267
TYPE OF ANOVA TEST USED TO COMPARE POTENTIAL COC DOWNGRADIENT RESULTS WITH UPGRADIENT RESULTS BASED ON UNDERLYING DATA DISTRIBUTIONS

PARAMETER	DOWNGRADIENT DISTRIBUTION	UPGRADIENT DISTRIBUTION	TYPE OF ANOVA	P LEVEL	ANOVA RESULT
Volatile Organics					
TRICHLOROETHENE	LOGNORMAL	LOGNORMAL	PARAMETRIC	0.0734	PASSES
VINYL CHLORIDE	LOGNORMAL	---	NON-PARAMETRIC	0.2467	PASSES
Semivolatile Organics					
BENZO(A)ANTHRACENE	LOGNORMAL	---	NON-PARAMETRIC	0.6704	PASSES
BENZO(A)PYRENE	LOGNORMAL	---	NON-PARAMETRIC	0.6518	PASSES
BENZO(B)FLUORANTHENE	LOGNORMAL	---	NON-PARAMETRIC	0.7038	PASSES
BENZO(K)FLUORANTHENE	LOGNORMAL	---	NON-PARAMETRIC	0.7792	PASSES
BIS(2-ETHYLHEXYL)PHTHALATE	LOGNORMAL	LOGNORMAL	PARAMETRIC	0.8687	PASSES
CIS-1,2-DICHLOROETHENE	LOGNORMAL	LOGNORMAL	PARAMETRIC	0.7641	PASSES
FLUORANTHENE	LOGNORMAL	---	NON-PARAMETRIC	0.2154	PASSES
FLUORENE	LOGNORMAL	---	NON-PARAMETRIC	0.5612	PASSES
PHENANTHRENE	LOGNORMAL	---	NON-PARAMETRIC	0.0559	PASSES
PYRENE	LOGNORMAL	---	NON-PARAMETRIC	0.1734	PASSES
Total Metals					
ARSENIC	LOGNORMAL	---	NON-PARAMETRIC	**0.0275**	**FAILS**
BARIUM	LOGNORMAL	LOGNORMAL	PARAMETRIC	0.1261	PASSES
CHROMIUM	LOGNORMAL	---	NON-PARAMETRIC	0.3803	PASSES
SILVER	LOGNORMAL	NORMAL	NON-PARAMETRIC	0.3605	PASSES
ZINC	LOGNORMAL	LOGNORMAL	PARAMETRIC	0.9142	PASSES
Dissolved Metals					
ARSENIC	LOGNORMAL	LOGNORMAL	PARAMETRIC	**0.0489**	**FAILS**
BARIUM	LOGNORMAL	LOGNORMAL	PARAMETRIC	0.1940	PASSES
SILVER	LOGNORMAL	LOGNORMAL	PARAMETRIC	0.0914	PASSES
ZINC	LOGNORMAL	LOGNORMAL	PARAMETRIC	0.5401	PASSES

Downgradient results are in statistically significant exceedance of upgradient results when p level is less than 0.05.

NEW LONDON 267
WILCOXON RANK-SUM RESULTS COMPARING POTENTIAL COC
DOWNGRADIENT RESULTS WITH UPGRADIENT RESULTS

PARAMETER	Downgradient			Upgradient			Z		Adjusted	Adjusted	ANOVA
	Total of Ranks	Number of Samples	Avg Rank	Total of Ranks	Number of Samples	Avg Rank	Score	p-level	Z Score (1)	p-level (2)	RESULT
VINYL CHLORIDE	510.5	26	19.6	192.5	11	17.5	0.5483	0.5835	1.1583	0.2467	PASSES
BENZO(A)ANTHRACENE	504.5	26	19.4	198.5	11	18.0	0.3489	0.7272	0.4255	0.6704	PASSES
BENZO(A)PYRENE	273.5	19	14.4	104.5	8	13.1	0.3982	0.6905	0.4513	0.6518	PASSES
BENZO(B)FLUORANTHENE	503.5	26	19.4	199.5	11	18.1	0.3157	0.7523	0.3802	0.7038	PASSES
BENZO(K)FLUORANTHENE	501	26	19.3	202	11	18.4	0.2326	0.8161	0.2804	0.7792	PASSES
FLUORANTHENE	527.5	26	20.3	175.5	11	16.0	1.1132	0.2656	1.2388	0.2154	PASSES
FLUORENE	508.5	26	19.6	194.5	11	17.7	0.4818	0.6299	0.5811	0.5612	PASSES
PHENANTHRENE	547.5	26	21.1	155.5	11	14.1	1.7777	0.0755	1.9120	0.0559	PASSES
PYRENE	531.5	26	20.4	171.5	11	15.6	1.2461	0.2127	1.3612	0.1734	PASSES
ARSENIC	559.5	26	21.5	143.5	11	13.0	2.1765	0.0295	2.2040	**0.0275**	**FAIL**
CHROMIUM	520	26	20.0	183	11	16.6	0.8640	0.3876	0.8774	0.3803	PASSES
SILVER	521	26	20.0	182	11	16.5	0.8972	0.3696	0.9144	0.3605	PASSES

(1) Adjusted for tied rankings.
(2) Downgradient results are in statistically significant exceedance of upgradient results when p level is less than 0.05.

NEW LONDON 267
COMPARISON OF POTENTIAL COCS THAT ARE ABOVE BACKROUND AND UPGRADIENT CONCENTRATIONS TO SURFACE WATER PROTECTION CRITERIA

	Average				Cummulative	Site Specific	CTDEP
	Round 1	Round 2	Round 3	Round 4	Average	SWPC	SWPC
Downgradient Metals (ug/L)							
Arsenic	**4.49**	3.05	1.53	3.66	3.08	40	4
Arsenic, Filtered	3.26	3.26	1.98	3.42	2.96	40	4

	Maximum				Cummulative	Site Specific	CTDEP
	Round 1	Round 2	Round 3	Round 4	Maximum	SWPC	SWPC
Upgradient Metals (ug/L)							
Arsenic	1.80	3.40	1.90	2.10	3.40	40	4
Arsenic, Filtered	1.80	3.60	1.90	3.20	3.60	40	4

(1) Surface Water Protection Criteria for Substances in Groundwater, using a Site-Specific Dilution Factor of 100 (B&R Environmental, September 1997).
(2) Surface Water Protection Criteria for Substances in Groundwater, using a Site-Specific Dilution Factor of 10 (Connecticut Department of Environmental Protection, December 1995).
Bold indicated value exceeds criteria

Parametric ANOVA Results

TEST2

TRICHLOROETHENE
Var 19: LOGRES - (-9999)
No text values

Var 20: RISK_GRO - (-9999)

Text	Numeric	Long label
DOWN	100	DOWN
UP	101	UP

INDEPENDENT VARIABLES (between-groups factors):

RISK_GRO Number of Levels: 2 Codes: level 1: 100-DOWN
level 2: 101-UP

DESIGN: 1 - way ANOVA , fixed effects
DEPENDENT: 1 variable: LOGRES
BETWEEN: 1-RISK_GRO(2): DOWN UP
WITHIN: none

STAT. MAIN EFFECT: RISK_GRO (stat.sta)
GENERAL 1-RISK_GRO
MANOVA

Univar. Test	Sum of Squares	df	Mean Square	F	p-level	
Effect	3.41954	1	3.419543	3.407063	**.073390**	**PASSES**
Error	35.12820	35	1.003663			

STAT. Means (stat.sta)
GENERAL F(1,35)=3.41; p<.0734
MANOVA

RISK_GRO	LOGRES
DOWN	-.386474
UP	.278649

TEST2

BIS(2-ETHYLHEXYL) PHTHALATE

CASE SELECTION CONDITIONS:
Include if:
V3 = 'BIS(2-ET'

VARIABLES AND THEIR TEXT VALUES:

Var 19: LOGRES - (-9999)
No text values

Var 20: RISK_GRO - (-9999)

Text	Numeric	Long label
DOWN	100	DOWN
UP	101	UP

INDEPENDENT VARIABLES (between-groups factors):

RISK_GRO Number of Levels: 2 Codes: level 1: 100-DOWN
level 2: 101-UP

DESIGN: 1 - way ANOVA , fixed effects
DEPENDENT: 1 variable: LOGRES
BETWEEN: 1-RISK_GRO(2): DOWN UP
WITHIN: none

STAT. GENERAL MANOVA — MAIN EFFECT: RISK_GRO (stat.sta)
1-RISK_GRO

Univar. Test	Sum of Squares	df	Mean Square	F	p-level	
Effect	.02273	1	.022733	.027750	**.868657**	**PASSES**
Error	28.67276	35	.819222			

STAT. GENERAL MANOVA — Means (stat.sta)
F(1,35)=.03; p<.8687

RISK_GRO	LOGRES
DOWN	1.357597
UP	1.303366

TEST2

CIS-1,2-DICHLOROETHENE

CASE SELECTION CONDITIONS:
Include if:
V3 = 'CIS-1,2-'

VARIABLES AND THEIR TEXT VALUES:

Var 19: LOGRES - (-9999)
No text values

Var 20: RISK_GRO - (-9999)

Text	Numeric	Long label
DOWN	100	DOWN
UP	101	UP

INDEPENDENT VARIABLES (between-groups factors):

RISK_GRO Number of Levels: 2 Codes: level 1: 100-DOWN
level 2: 101-UP

DESIGN: 1 - way ANOVA , fixed effects
DEPENDENT: 1 variable: LOGRES
BETWEEN: 1-RISK_GRO(2): DOWN UP
WITHIN: none

STAT. GENERAL MANOVA — MAIN EFFECT: RISK_GRO (stat.sta)
1-RISK_GRO

Univar. Test	Sum of Squares	df	Mean Square	F	p-level	
Effect	.13158	1	.131579	.091477	**.764098**	**PASSES**
Error	50.34346	35	1.438385			

STAT. GENERAL MANOVA — Means (stat.sta)
F(1,35)=.09; p<.7641

RISK_GRO	LOGRES
DOWN	.171026
UP	.301496

data file: STAT.STA [6496 cases with 20 variables]

BARIUM

CASE SELECTION CONDITIONS:
Include if:
V3 = 'BARIUM'

VARIABLES AND THEIR TEXT VALUES:

Var 19: LOGRES - (-9999)
No text values

Var 20: RISK_GRO - (-9999)

Text	Numeric	Long label
DOWN	100	DOWN
UP	101	UP

INDEPENDENT VARIABLES (between-groups factors):

RISK_GRO Number of Levels: 2 Codes: level 1: 100-DOWN
level 2: 101-UP

DESIGN: 1 - way ANOVA , fixed effects
DEPENDENT: 1 variable: LOGRES
BETWEEN: 1-RISK_GRO(2): DOWN UP
WITHIN: none

STAT. MAIN EFFECT: RISK_GRO (fix2.sta)
GENERAL 1-RISK_GRO
MANOVA

Univar. Test	Sum of Squares	df	Mean Square	F	p-level	
Effect	3.41794	1	3.417940	2.456296	**.126052**	**PASSES**
Error	48.70255	35	1.391501			

STAT. Means (fix2.sta)
GENERAL F(1,35)=2.46; p<.1261
MANOVA

RISK_GRO	LOGRES
DOWN	4.008042
UP	3.343075

data file: STAT.STA [6496 cases with 20 variables]

ZINC
CASE SELECTION CONDITIONS:
Include if:
V3 = 'ZINC'

VARIABLES AND THEIR TEXT VALUES:

Var 19: LOGRES - (-9999)
No text values

TEST2

Var 20: RISK_GRO - (-9999)

Text	Numeric	Long label
DOWN	100	DOWN
UP	101	UP

INDEPENDENT VARIABLES (between-groups factors):

RISK_GRO Number of Levels: 2 Codes: level 1: 100-DOWN
level 2: 101-UP

DESIGN: 1 - way ANOVA , fixed effects
DEPENDENT: 1 variable: LOGRES
BETWEEN: 1-RISK_GRO(2): DOWN UP
WITHIN: none

STAT. GENERAL MANOVA — MAIN EFFECT: RISK_GRO (fix2.sta)
1-RISK_GRO

Univar. Test	Sum of Squares	df	Mean Square	F	p-level	
Effect	.03213	1	.032127	.011776	**.914204**	**PASSES**
Error	95.48378	35	2.728108			

STAT. GENERAL MANOVA — Means (fix2.sta)
F(1,35)=.01; p<.9142

RISK_GRO	LOGRES
DOWN	2.795434
UP	2.730965

data file: STAT.STA [6496 cases with 20 variables]

ARSENIC, FILTERED
CASE SELECTION CONDITIONS:
Include if:
V3 = 'ARSENIC,'

VARIABLES AND THEIR TEXT VALUES:

Var 19: LOGRES - (-9999)
No text values

TEST2

Var 20: RISK_GRO - (-9999)

Text	Numeric	Long label
DOWN	100	DOWN
UP	101	UP

INDEPENDENT VARIABLES (between-groups factors):

RISK_GRO Number of Levels: 2 Codes: level 1: 100-DOWN
level 2: 101-UP

DESIGN: 1 - way ANOVA , fixed effects
DEPENDENT: 1 variable: LOGRES
BETWEEN: 1-RISK_GRO(2): DOWN UP
WITHIN: none

STAT. GENERAL MANOVA — MAIN EFFECT: RISK_GRO (fix2.sta)
1-RISK_GRO

Univar. Test	Sum of Squares	df	Mean Square	F	p-level	
Effect	2.63805	1	2.638047	4.112488	**.048942**	**FAILS**
Error	26.94183	42	.641472			

STAT. GENERAL MANOVA — Means (fix2.sta)
F(1,42)=4.11; p<.0489

RISK_GRO	LOGRES
DOWN	.634425
UP	.097746

data file: STAT.STA [6496 cases with 20 variables]

BARIUM, FILTERED
CASE SELECTION CONDITIONS:
Include if:
V3 = 'BARIUM, '

VARIABLES AND THEIR TEXT VALUES:

Var 19: LOGRES - (-9999)
No text values

TEST2

Var 20: RISK_GRO - (-9999)

Text	Numeric	Long label
DOWN	100	DOWN
UP	101	UP

INDEPENDENT VARIABLES (between-groups factors):

RISK_GRO Number of Levels: 2 Codes: level 1: 100-DOWN
level 2: 101-UP

DESIGN: 1 - way ANOVA , fixed effects
DEPENDENT: 1 variable: LOGRES
BETWEEN: 1-RISK_GRO(2): DOWN UP
WITHIN: none

STAT. GENERAL MANOVA — MAIN EFFECT: RISK_GRO (fix2.sta)
1-RISK_GRO

Univar. Test	Sum of Squares	df	Mean Square	F	p-level	
Effect	2.94998	1	2.949984	1.742460	**.193977**	**PASSES**
Error	71.10600	42	1.693000			

STAT. GENERAL MANOVA — Means (fix2.sta)
F(1,42)=1.74; p<.1940

RISK_GRO	LOGRES
DOWN	4.512648
UP	3.945124

data file: STAT.STA [6496 cases with 20 variables]

SILVER, FILTERED
CASE SELECTION CONDITIONS:
Include if:
V3 = 'SILVER, '

VARIABLES AND THEIR TEXT VALUES:

Var 19: LOGRES - (-9999)
No text values

TEST2

Var 20: RISK_GRO - (-9999)

Text	Numeric	Long label
DOWN	100	DOWN
UP	101	UP

INDEPENDENT VARIABLES (between-groups factors):

RISK_GRO Number of Levels: 2 Codes: level 1: 100-DOWN
level 2: 101-UP

DESIGN: 1 - way ANOVA , fixed effects
DEPENDENT: 1 variable: LOGRES
BETWEEN: 1-RISK_GRO(2): DOWN UP
WITHIN: none

STAT. GENERAL MANOVA — MAIN EFFECT: RISK_GRO (fix2.sta)
1-RISK_GRO

Univar. Test	Sum of Squares	df	Mean Square	F	p-level	
Effect	1.18315	1	1.183155	2.985056	**.091384**	**PASSES**
Error	16.64709	42	.396359			

STAT. GENERAL MANOVA — Means (fix2.sta)
F(1,42)=2.99; p<.0914

RISK_GRO	LOGRES
DOWN	.124278
UP	-.235136

data file: STAT.STA [6496 cases with 20 variables]

ZINC, FILTERED
CASE SELECTION CONDITIONS:
Include if:
V3 = 'ZINC, FI'

VARIABLES AND THEIR TEXT VALUES:

Var 19: LOGRES - (-9999)
No text values

TEST2

Var 20: RISK_GRO - (-9999)

Text	Numeric	Long label
DOWN	100	DOWN
UP	101	UP

INDEPENDENT VARIABLES (between-groups factors):

RISK_GRO Number of Levels: 2 Codes: level 1: 100-DOWN
level 2: 101-UP

DESIGN: 1 - way ANOVA , fixed effects
DEPENDENT: 1 variable: LOGRES
BETWEEN: 1-RISK_GRO(2): DOWN UP
WITHIN: none

STAT. GENERAL MANOVA — MAIN EFFECT: RISK_GRO (fix2.sta)
1-RISK_GRO

Univar. Test	Sum of Squares	df	Mean Square	F	p-level	
Effect	1.1651	1	1.165061	.381581	**.540093**	**PASSES**
Error	128.2363	42	3.053246			

STAT. GENERAL MANOVA — Means (fix2.sta)
F(1,42)=.38; p<.5401

RISK_GRO	LOGRES
DOWN	2.708635
UP	3.065290

TETRA TECH NUS, INC. **CALCULATION WORKSHEET**

CLIENT NSB - NLON	JOB NUMBER 7363
SUBJECT SAMPLE CALCULATION OF STATISTICAL ANALYSES	
BASED ON GW DOWNGRADIENT ARSENIC	DRAWING NUMBER
BY BEL / CHECKED BY	APPROVED BY / DATE 10/13/99

ARSENIC RESULTS FROM THE DOWN GRADIENT WELLS:

LOCATION	ROUND	DUPLICATE	RESULT	QUAL		VALUE*
6MW1S	1		1.8	U		0.9
	2		3.7	UJ		1.85
	3		1.9	U		0.95
	4		2.1	U		1.05
6MW2D	1		3.1	U		3.1
	2		3.4	U		1.7
	3		1.9	U		0.95
	4		10.4	U		5.2
6MW2S	1		1.8	U		0.9
	2		3.4	U		1.7
	3		1.9	U		0.95
	4		10.4	U	AVG	5.2
	4	DUP	10.4	U		
6MW10D	1		15.9			15.9
	2		18.5	UJ		9.25
	3		5			5
	4		10.4	U		5.2
6MW10S	1		1.8	U	AVG	1.65
	1	DUP	2.4	J		
	2		2.8	U		1.4
	3		1.9	U	AVG	0.95
	3	DUP	1.9	U		
	4		2.1	U		1.05
6MW11D	2		9.5	U	AVG	4.45
	2	DUP	8.3	U		
	3		1.9	U		0.95
	4		10.4	U		5.2
6MW11S	2		2	U		1
	3		1.9	U		0.95
	4		2.7	J		2.7

$\sum_{i=1}^{26} x_i = 80.10$

*NON-DETECTS ARE REPLACED WITH HALF THE DETECTION LIMIT

CLIENT NSB-NLON		JOB NUMBER 7363	
SUBJECT SAMPLE CALCULATION OF STATISTICAL ANALYSES			
BASED ON GW DOWNGRADIENT ARSENIC		DRAWING NUMBER	
BY BEL	CHECKED BY	APPROVED BY	DATE 10/13/99

THE ARITHMETIC MEAN ($\bar{x}$) CAN BE CALCULATED BY:

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} = \frac{80.1}{26} = 3.081 \text{ ug/L}$$

COMPUTE THE SHAPIRO-WILK W STATISTIC (W_{CALC}):

$$W_{CALC} = \left[\frac{b}{S_x\sqrt{n-1}}\right]^2$$

where $b = \sum_{i=1}^{k} a_{(n-i+1)}\left(x_{(n-i+1)} - x_i\right) = \sum_{i=1}^{k} b_i$

MAKE A TABLE WITH 5 COLUMNS:

A. COLUMN 1 = DATA FROM SMALLEST TO LARGEST VALUE (x_i)
B. COLUMN 2 = DATA FROM LARGEST TO SMALLEST VALUE ($x_{(n-i+1)}$)
C. COLUMN 3 = COLUMN 2 - COLUMN 1 ($x_{(n-i+1)} - x_i$)
D. COLUMN 4 = SHAPIRO-WILK COEFFICENT ($a_{(n-i+1)}$) FROM TABLE 1
E. K = GREATEST INTEGER $\leq n/2$
F. COLUMN 5 = COLUMN 3 x COLUMN 4 ($b_i = a_{(n-i+1)}(x_{(n-i+1)} - x_i)$)

x_i	$x_{(n-i+1)}$	$x_{(n-i+1)} - x_i$	$a_{(n-i+1)}$	b_i	i
0.9	15.9	15	0.4407	6.6105	1
0.9	9.25	8.35	0.3043	2.5409	2
0.95	5.2	4.25	0.2533	1.0765	3
0.95	5.2	4.25	0.2151	0.9142	4
0.95	5.2	4.25	0.1836	0.7803	5
0.95	5.2	4.25	0.1563	0.6643	6
0.95	5	4.05	0.1316	0.5330	7
0.95	4.45	3.5	0.1089	0.3812	8
1	3.1	2.1	0.0876	0.1840	9
1.05	2.7	1.65	0.0672	0.1109	10
1.05	1.85	0.8	0.0476	0.0381	11
1.4	1.7	0.3	0.0284	0.0085	12
1.65	1.7	0.05	0.0094	0.0005	13=k
				b = 13.8427	

CLIENT NSB-NLON		JOB NUMBER 7363	
SUBJECT SAMPLE CALCULATION OF STATISTICAL ANALYSES			
BASED ON OW DOWNGRADIENT ARSENIC		DRAWING NUMBER	
BY JEL	CHECKED BY	APPROVED BY	DATE 10/13/99

COMPUTE THE STANDARD DEVIATION (S_x):

$$S_x = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}}$$

$$\sum_{i=1}^{26} (x_i - \bar{x})^2 = (15.9-3.081)^2 + (9.25-3.081)^2 + (5.2-3.081)^2 + (5.2-3.081)^2 + (5.2-3.081)^2 + (5.2-3.081)^2 + (5-3.081)^2 + (4.45-3.081)^2 + (3.1-3.081)^2 + (2.7-3.081)^2 + (1.85-3.081)^2 + (1.7-3.081)^2 + (1.7-3.081)^2 + (1.65-3.081)^2 + (1.4-3.081)^2 + (1.05-3.081)^2 + (1.05-3.081)^2 + (1-3.081)^2 + (0.95-3.081)^2 + (0.95-3.081)^2 + (0.95-3.081)^2 + (0.95-3.081)^2 + (0.95-3.081)^2 + (0.95-3.081)^2 + (0.9-3.081)^2 + (0.9-3.081)^2$$

$$= 164.3327 + 38.0594 + 4.4911 + 4.4911 + 4.4911 + 4.4911 + 3.6834 + 1.8748 + 0.0004 + 0.1450 + 1.5148 + 1.9065 + 1.9065 + 2.0471 + 2.8250 + 4.1240 + 4.1240 + 4.3296 + 4.5402 + 4.5402 + 4.5402 + 4.5402 + 4.5402 + 4.5402 + 4.7558 + 4.7558$$

$$= 285.5904$$

$$S_x = \sqrt{\frac{285.5904}{25}} = \sqrt{11.4236} = 3.3799$$

$$W_{CALC} = \left[\frac{b}{S_x\sqrt{n-1}}\right]^2 = \left[\frac{13.8427}{3.3799\sqrt{25}}\right]^2 = \left[\frac{13.8427}{16.8995}\right]^2 = [0.8191]^2$$

$$W_{CALC} = 0.6710$$

COMPARE W_{CALC} WITH W_{TEST} FROM TABLE 2:

$$W_{CALC} = 0.6710 < 0.9200 = W_{TEST}$$

SINCE $W_{CALC} < W_{TEST}$, WE REJECT THE NULL HYPOTHESIS (H_0) THAT THE DATA HAS A NORMAL DISTRIBUTION AND ACCEPT THE ALTERNATIVE HYPOTHESIS (H_A) THAT THE POPULATION DOES NOT HAVE A NORMAL DISTRIBUTION

TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE 4 OF 5

CLIENT NSB-NLON	JOB NUMBER 7363
SUBJECT SAMPLE CALCULATION OF STATISTICAL ANALYSES	
BASED ON GW DOWNGRADIENT ARSENIC	DRAWING NUMBER
BY BEL / CHECKED BY	APPROVED BY / DATE 10/13/99

PERFORM THE WILCOXON RANK-SUM NON-PARAMETRIC ANOVA:
RANK THE RESULTS FROM LOWEST TO HIGHEST

VALUE	GRADIENT	RANK	ADJUSTED RANK	VALUE	GRADIENT	RANK	ADJUSTED RANK
0.9	DOWN	1	2.5	1.05	UP	20	18
0.9	DOWN	2	2.5	1.4	DOWN	21	21.5
0.9	UP	3	2.5	1.4	UP	22	21.5
0.9	UP	4	2.5	1.65	DOWN	23	23
0.95	DOWN	5	9.5	1.7	DOWN	24	25
0.95	DOWN	6	9.5	1.7	DOWN	25	25
0.95	DOWN	7	9.5	1.7	UP	26	25
0.95	DOWN	8	9.5	1.85	DOWN	27	27
0.95	DOWN	9	9.5	2.7	DOWN	28	28
0.95	DOWN	10	9.5	3.1	DOWN	29	29
0.95	UP	11	9.5	4.45	DOWN	30	30
0.95	UP	12	9.5	5	DOWN	31	31
0.95	UP	13	9.5	5.2	DOWN	32	33.5
0.95	UP	14	9.5	5.2	DOWN	33	33.5
1	DOWN	15	15	5.2	DOWN	34	33.5
1.05	DOWN	16	18	5.2	DOWN	35	33.5
1.05	DOWN	17	18	9.25	DOWN	36	36
1.05	UP	18	18	15.9	DOWN	37	37
1.05	UP	19	18				

SUM THE RANKS:

$$N_{DS} = \sum \text{RANK}_{DOWN} = 2.5+2.5+9.5+9.5+9.5+9.5+9.5+9.5+15+18+18+21.5+23+25+25+27+28+29+30+31+33.5+33.5+33.5+33.5+36+37 = 559.5$$

$$\sum \text{RANK}_{UP} = 2.5+2.5+9.5+9.5+9.5+9.5+18+18+18+21.5+25 = 143.5$$

CLIENT NSB-NLON	JOB NUMBER 7363
SUBJECT SAMPLE CALCULATION OF STATISTICAL ANALYSES	
BASED ON GW DOWNGRADIENT ARSENIC	DRAWING NUMBER
BY BEL / CHECKED BY	APPROVED BY / DATE 10/13/99

CALCULATE THE Z SCORE (Z_{rs}):

$$Z_{rs} = \frac{W_{rs} - \frac{n_1(m+1)}{2}}{\sqrt{\frac{n_1 n_2 (m+1)}{12}}}$$

$$Z_{rs} = \frac{559.5 - \frac{(26)(38)}{2}}{\sqrt{\frac{(26)(11)(38)}{12}}} = \frac{65.5}{30.9} = 2.1768$$

FROM TABLE 3, A Z SCORE OF 2.1765 CORRESPONDS TO A P LEVEL OF 0.0295. SINCE,

$$0.0295 < 0.05$$

THE DOWNGRADIENT CONCENTRATIONS ARE STATISTICALLY HIGHER THAN THE UPGRADIENT ARSENIC CONCENTRATIONS AT A 95% LEVEL OF SIGNIFICANCE

TABLE 1
COEFFICIENTS A_i FOR W TEST OF NORMALITY FOR N=2 to 50

i/n	2	3	4	5	6	7	8	9	10
1	0.7071	0.7071	0.6872	0.6646	0.6431	0.6233	0.6052	0.5888	0.5739
2			0.1677	0.2413	0.2806	0.3031	0.3164	0.3244	0.3291
3					0.0875	0.1401	0.1743	0.1976	0.2141
4							0.0561	0.0947	0.1224
5									0.0399

i/n	11	12	13	14	15	16	17	18	19	20
1	0.5601	0.5475	0.5359	0.5251	0.5150	0.5056	0.4968	0.4886	0.4808	0.4734
2	0.3315	0.3325	0.3325	0.3318	0.3306	0.3290	0.3273	0.3253	0.3232	0.3211
3	0.2260	0.2347	0.2412	0.2460	0.2495	0.2521	0.2540	0.2553	0.2561	0.2565
4	0.1429	0.1586	0.1707	0.1802	0.1878	0.1939	0.1988	0.2027	0.2059	0.2085
5	0.0695	0.0922	0.1099	0.1240	0.1353	0.1447	0.1524	0.1587	0.1641	0.1686
6		0.0303	0.0539	0.0727	0.0880	0.1005	0.1109	0.1197	0.1271	0.1334
7				0.0240	0.0433	0.0593	0.0725	0.0837	0.0932	0.1013
8						0.0196	0.0359	0.0496	0.0612	0.0711
9								0.0163	0.0303	0.0422
10										0.0140

i/n	21	22	23	24	25	26	27	28	29	30
1	0.4643	0.4590	0.4542	0.4493	0.4450	0.4407	0.4366	0.4328	0.4291	0.4254
2	0.3185	0.3156	0.3126	0.3098	0.3069	0.3043	0.3018	0.2992	0.2968	0.2944
3	0.2578	0.2571	0.2563	0.2554	0.2543	0.2533	0.2522	0.2510	0.2499	0.2487
4	0.2119	0.2131	0.2139	0.2145	0.2148	0.2151	0.2152	0.2151	0.2150	0.2148
5	0.1736	0.1764	0.1787	0.1807	0.1822	0.1836	0.1848	0.1857	0.1864	0.1870
6	0.1399	0.1443	0.1480	0.1512	0.1539	0.1563	0.1584	0.1601	0.1616	0.1630
7	0.1092	0.1150	0.1201	0.1245	0.1283	0.1316	0.1346	0.1372	0.1395	0.1415
8	0.0804	0.0878	0.0941	0.0997	0.1046	0.1089	0.1128	0.1162	0.1192	0.1219
9	0.0530	0.0618	0.0696	0.0764	0.0823	0.0876	0.0923	0.0965	0.1002	0.1036
10	0.0263	0.0368	0.0459	0.0539	0.0610	0.0672	0.0728	0.0778	0.0822	0.0862
11		0.0122	0.0228	0.0321	0.0403	0.0476	0.0540	0.0598	0.0650	0.0697
12				0.0107	0.0200	0.0284	0.0358	0.0424	0.0483	0.0537
13						0.0094	0.0178	0.0253	0.0320	0.0381
14								0.0084	0.0159	0.0227
15										0.0076

i/n	31	32	33	34	35	36	37	38	39	40
1	0.4220	0.4188	0.4156	0.4127	0.4096	0.4068	0.4040	0.4015	0.9689	0.3964
2	0.2921	0.2898	0.2876	0.2854	0.2834	0.2813	0.2794	0.2774	0.2755	0.2737
3	0.2475	0.2463	0.2451	0.2439	0.2427	0.2415	0.2403	0.2391	0.2380	0.2368
4	0.2145	0.2141	0.2137	0.2132	0.2127	0.2121	0.2116	0.2110	0.2104	0.2098
5	0.1874	0.1878	0.1880	0.1882	0.1883	0.1883	0.1883	0.1881	0.1880	0.1878
6	0.1641	0.1651	0.1660	0.1667	0.1673	0.1678	0.1683	0.1686	0.1689	0.1691
7	0.1433	0.1449	0.1463	0.1475	0.1487	0.1496	0.1503	0.1513	0.1520	0.1526
8	0.1243	0.1265	0.1284	0.1301	0.1317	0.1331	0.1344	0.1356	0.1366	0.1376
9	0.1066	0.1093	0.1118	0.1140	0.1160	0.1179	0.1196	0.1211	0.1225	0.1237
10	0.0899	0.0931	0.0961	0.0988	0.1013	0.1036	0.1056	0.1075	0.1092	0.1108
11	0.0739	0.0777	0.0821	0.0844	0.0873	0.0900	0.0924	0.0947	0.0967	0.0986
12	0.0585	0.0629	0.0669	0.0706	0.0739	0.0770	0.0798	0.0824	0.0848	0.0870
13	0.0435	0.0485	0.0530	0.0572	0.0610	0.0645	0.0677	0.0706	0.0733	0.0759
14	0.0289	0.0344	0.0395	0.0441	0.0484	0.0523	0.0559	0.0592	0.0622	0.0651
15	0.0144	0.0206	0.0262	0.0314	0.0361	0.0404	0.0444	0.0481	0.0515	0.0546
16		0.0068	0.0131	0.0187	0.0239	0.0287	0.0331	0.0372	0.0409	0.0444
17				0.0062	0.0119	0.0172	0.0220	0.0264	0.0305	0.0343
18						0.0057	0.0110	0.0158	0.0203	0.0244
19								0.0053	0.0101	0.0146
20										0.0049

i/n	41	42	43	44	45	46	47	48	49	50
1	0.3940	0.3917	0.3894	0.3872	0.3850	0.3830	0.3808	0.3789	0.3770	0.3751
2	0.2719	0.2701	0.2684	0.2667	0.2651	0.2635	0.2620	0.2604	0.2589	0.2574
3	0.2357	0.2345	0.2334	0.2323	0.2313	0.2302	0.2291	0.2281	0.2271	0.2260
4	0.2091	0.2085	0.2078	0.2072	0.2065	0.2058	0.2052	0.2045	0.2038	0.2032
5	0.1876	0.1874	0.1871	0.1868	0.1865	0.1862	0.1859	0.1855	0.1851	0.1847
6	0.1693	0.1694	0.1695	0.1695	0.1695	0.1695	0.1695	0.1693	0.1692	0.1691
7	0.1531	0.1535	0.1539	0.1542	0.1545	0.1548	0.1550	0.1551	0.1553	0.1554
8	0.1384	0.1392	0.1398	0.1405	0.1410	0.1415	0.1420	0.1423	0.1427	0.1430
9	0.1249	0.1259	0.1269	0.1278	0.1286	0.1293	0.1300	0.1306	0.1312	0.1317
10	0.1123	0.1136	0.1149	0.1160	0.1170	0.1180	0.1189	0.1197	0.1205	0.1212
11	0.1004	0.1020	0.1035	0.1049	0.1062	0.1073	0.1085	0.1095	0.1105	0.1113
12	0.0891	0.0909	0.0927	0.0943	0.0959	0.0972	0.0986	0.0998	0.1010	0.1020
13	0.0782	0.0804	0.0824	0.0842	0.0860	0.0876	0.0892	0.0906	0.0919	0.0932
14	0.0677	0.0701	0.0724	0.0745	0.0775	0.0785	0.0801	0.0817	0.0832	0.0846
15	0.0575	0.0602	0.0628	0.0651	0.0673	0.0694	0.0713	0.0731	0.0748	0.0764
16	0.0476	0.0506	0.0534	0.0560	0.0584	0.0607	0.0628	0.0648	0.0667	0.0685
17	0.0379	0.0411	0.0442	0.0471	0.0497	0.0522	0.0546	0.0568	0.0588	0.0608
18	0.0283	0.0318	0.0352	0.0383	0.0412	0.0439	0.0465	0.0489	0.0511	0.0532
19	0.0188	0.0227	0.0263	0.0296	0.0328	0.0357	0.0385	0.0411	0.0436	0.0459
20	0.0094	0.0136	0.0175	0.0211	0.0245	0.0277	0.0307	0.0335	0.0361	0.0386
21		0.0045	0.0087	0.0126	0.0163	0.0197	0.0229	0.0259	0.0288	0.0314
22				0.0042	0.0081	0.0188	0.0153	0.0185	0.0215	0.0244
23						0.0039	0.0076	0.0111	0.0143	0.0174
24								0.0037	0.0071	0.0104
25										0.0350

TABLE 2
PERCENTAGE POINTS OF THE W TEST FOR N=3 to 50

n	0.01	0.05
3	0.753	0.767
4	0.687	0.748
5	0.686	0.762
6	0.713	0.788
7	0.730	0.803
8	0.749	0.818
9	0.764	0.829
10	0.781	0.842
11	0.792	0.850
12	0.805	0.859
13	0.814	0.866
14	0.825	0.874
15	0.835	0.881
16	0.844	0.887
17	0.851	0.892
18	0.858	0.897
19	0.863	0.901
20	0.868	0.905
21	0.873	0.908
22	0.878	0.911
23	0.881	0.914
24	0.884	0.916
25	0.888	0.918
26	0.891	0.920
27	0.894	0.923
28	0.896	0.924
29	0.898	0.926
30	0.900	0.927

n	0.01	0.05
31	0.902	0.929
32	0.904	0.930
33	0.906	0.931
34	0.908	0.933
35	0.910	0.934
36	0.912	0.935
37	0.914	0.936
38	0.916	0.938
39	0.917	0.939
40	0.919	0.940
41	0.920	0.941
42	0.922	0.942
43	0.923	0.943
44	0.924	0.944
45	0.926	0.945
46	0.927	0.945
47	0.928	0.946
48	0.929	0.947
49	0.929	0.947
50	0.930	0.947

Table 3
P levels Corresponding to Z Scores

Z	p level	Z	p level	Z	p level	Z	p level	Z	p level	Z	p level
0.01	0.9920	0.51	0.6101	1.01	0.3125	1.51	0.1310	2.01	0.0444	2.51	0.0121
0.02	0.9840	0.52	0.6031	1.02	0.3077	1.52	0.1285	2.02	0.0434	2.52	0.0117
0.03	0.9761	0.53	0.5961	1.03	0.3030	1.53	0.1260	2.03	0.0424	2.53	0.0114
0.04	0.9681	0.54	0.5892	1.04	0.2983	1.54	0.1236	2.04	0.0414	2.54	0.0111
0.05	0.9601	0.55	0.5823	1.05	0.2937	1.55	0.1211	2.05	0.0404	2.55	0.0108
0.06	0.9522	0.56	0.5755	1.06	0.2891	1.56	0.1188	2.06	0.0394	2.56	0.0105
0.07	0.9442	0.57	0.5687	1.07	0.2846	1.57	0.1164	2.07	0.0385	2.57	0.0102
0.08	0.9362	0.58	0.5619	1.08	0.2801	1.58	0.1141	2.08	0.0375	2.58	0.0099
0.09	0.9283	0.59	0.5552	1.09	0.2757	1.59	0.1118	2.09	0.0366	2.59	0.0096
0.10	0.9203	0.60	0.5485	1.10	0.2713	1.60	0.1096	2.10	0.0357	2.60	0.0093
0.11	0.9124	0.61	0.5419	1.11	0.2670	1.61	0.1074	2.11	0.0349	2.61	0.0091
0.12	0.9045	0.62	0.5353	1.12	0.2627	1.62	0.1052	2.12	0.0340	2.62	0.0088
0.13	0.8966	0.63	0.5287	1.13	0.2585	1.63	0.1031	2.13	0.0332	2.63	0.0085
0.14	0.8887	0.64	0.5222	1.14	0.2543	1.64	0.1010	2.14	0.0324	2.64	0.0083
0.15	0.8808	0.65	0.5157	1.15	0.2501	1.65	0.0989	2.15	0.0316	2.65	0.0080
0.16	0.8729	0.66	0.5093	1.16	0.2460	1.66	0.0969	2.16	0.0308	2.66	0.0078
0.17	0.8650	0.67	0.5029	1.17	0.2420	1.67	0.0949	2.17	0.0300	2.67	0.0076
0.18	0.8572	0.68	0.4965	1.18	0.2380	1.68	0.0930	2.18	0.0293	2.68	0.0074
0.19	0.8493	0.69	0.4902	1.19	0.2340	1.69	0.0910	2.19	0.0285	2.69	0.0071
0.20	0.8415	0.70	0.4839	1.20	0.2301	1.70	0.0891	2.20	0.0278	2.70	0.0069
0.21	0.8337	0.71	0.4777	1.21	0.2263	1.71	0.0873	2.21	0.0271	2.71	0.0067
0.22	0.8259	0.72	0.4715	1.22	0.2225	1.72	0.0854	2.22	0.0264	2.72	0.0065
0.23	0.8181	0.73	0.4654	1.23	0.2187	1.73	0.0836	2.23	0.0257	2.73	0.0063
0.24	0.8103	0.74	0.4593	1.24	0.2150	1.74	0.0819	2.24	0.0251	2.74	0.0061
0.25	0.8026	0.75	0.4533	1.25	0.2113	1.75	0.0801	2.25	0.0244	2.75	0.0060
0.26	0.7949	0.76	0.4473	1.26	0.2077	1.76	0.0784	2.26	0.0238	2.76	0.0058
0.27	0.7872	0.77	0.4413	1.27	0.2041	1.77	0.0767	2.27	0.0232	2.77	0.0056
0.28	0.7795	0.78	0.4354	1.28	0.2005	1.78	0.0751	2.28	0.0226	2.78	0.0054
0.29	0.7718	0.79	0.4295	1.29	0.1971	1.79	0.0735	2.29	0.0220	2.79	0.0053
0.30	0.7642	0.80	0.4237	1.30	0.1936	1.80	0.0719	2.30	0.0214	2.80	0.0051
0.31	0.7566	0.81	0.4179	1.31	0.1902	1.81	0.0703	2.31	0.0209	2.81	0.0050
0.32	0.7490	0.82	0.4122	1.32	0.1868	1.82	0.0688	2.32	0.0203	2.82	0.0048
0.33	0.7414	0.83	0.4065	1.33	0.1835	1.83	0.0672	2.33	0.0198	2.83	0.0047
0.34	0.7339	0.84	0.4009	1.34	0.1802	1.84	0.0658	2.34	0.0193	2.84	0.0045
0.35	0.7263	0.85	0.3953	1.35	0.1770	1.85	0.0643	2.35	0.0188	2.85	0.0044
0.36	0.7188	0.86	0.3898	1.36	0.1738	1.86	0.0629	2.36	0.0183	2.86	0.0042
0.37	0.7114	0.87	0.3843	1.37	0.1707	1.87	0.0615	2.37	0.0178	2.87	0.0041
0.38	0.7039	0.88	0.3789	1.38	0.1676	1.88	0.0601	2.38	0.0173	2.88	0.0040
0.39	0.6965	0.89	0.3735	1.39	0.1645	1.89	0.0588	2.39	0.0168	2.89	0.0039
0.40	0.6892	0.90	0.3681	1.40	0.1615	1.90	0.0574	2.40	0.0164	2.90	0.0037
0.41	0.6818	0.91	0.3628	1.41	0.1585	1.91	0.0561	2.41	0.0160	2.91	0.0036
0.42	0.6745	0.92	0.3576	1.42	0.1556	1.92	0.0549	2.42	0.0155	2.92	0.0035
0.43	0.6672	0.93	0.3524	1.43	0.1527	1.93	0.0536	2.43	0.0151	2.93	0.0034
0.44	0.6599	0.94	0.3472	1.44	0.1499	1.94	0.0524	2.44	0.0147	2.94	0.0033
0.45	0.6527	0.95	0.3421	1.45	0.1471	1.95	0.0512	2.45	0.0143	2.95	0.0032
0.46	0.6455	0.96	0.3371	1.46	0.1443	1.96	0.0500	2.46	0.0139	2.96	0.0031
0.47	0.6384	0.97	0.3320	1.47	0.1416	1.97	0.0488	2.47	0.0135	2.97	0.0030
0.48	0.6312	0.98	0.3271	1.48	0.1389	1.98	0.0477	2.48	0.0131	2.98	0.0029
0.49	0.6241	0.99	0.3222	1.49	0.1362	1.99	0.0466	2.49	0.0128	2.99	0.0028
0.50	0.6171	1.00	0.3173	1.50	0.1336	2.00	0.0455	2.50	0.0124	3.00	0.0027