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NAS BRUNSWICK ME
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8 July 2009

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State House, Station 17
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And

Mr. Michael Daly
Remedial Project Manager
U.S. Environmental Protection Agency, Region I
1 Congress Street, Suite 1100 (HBT)
Boston, Massachusetts 02214-2023

SUBJECT: Final Letter Summary Report
Performance Testing and Groundwater Sampling
Extraction Well EW-05B
Naval Air Station, Brunswick, Maine
Version: 0
Contract No. N62472-03-D-0802
Task Order 170, Task 7

Dear Ms. Sait and Mr. Daly:

This Final Letter Summary Report has been issued to document the performance testing and groundwater sampling of extraction well (EW)-05B, installed within the Eastern Plume at Naval Air Station (NAS) Brunswick, Maine. Attachments to this report include regulator comments on the Draft Letter Summary Report (Attachment A), performance test results (Attachment B), and soil boring logs and well completion diagrams (Attachment C).

The location of NAS Brunswick and the Eastern Plume is shown on Figure 1. The location of EW-05B within the Eastern Plume is shown on Figure 2. The location of EW-05B, associated piezometers, and a stream gauge gauged during the performance test are shown on Figure 3. NAS Brunswick is an active base owned and operated by the Federal government through the Department of Navy. In 1987, NAS Brunswick was placed on the National Priorities List (NPL) by the U.S. Environmental Protection Agency (US EPA) and is currently participating in the Navy's Installation Restoration Program. In December 2005, NAS Brunswick was recommended for closure by the Base Realignment and Closure (BRAC) commission; however, NAS Brunswick will continue to operate through 2011.

ECC has been tasked by the Navy with the installation, testing, and operation of extraction well EW-05B. EW-05B was installed along the eastern edge of the Eastern Plume at NAS Brunswick, Maine. Installation and development of EW-05B began on 10 July 2007 and was completed on 24 July 2007. EW-05B was

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installed to reduce concentrations of contaminants in the portions of the Eastern Plume with the highest levels and to limit migration of the Eastern Plume towards surface water.

GOALS OF PERFORMANCE TEST AND GROUNDWATER SAMPLING

The performance test and groundwater sampling are intended to provide the following information with regards to the Eastern Plume at this location; safe well yield for operation of the extraction well pump, localized hydraulic impacts to the plume, and steady state concentrations of volatile organic compounds (VOCs) and 1,4-dioxane during active pumping. The data collected is necessary in order to determine appropriate follow up design and response actions for ground water remedial activities in the future.

FIELD ACTIVITIES

Field activities associated with the performance test were conducted from 13 November to 20 November 2008, and were comprised of the following:

- Groundwater Elevation Gauging
- Performance Test
- Groundwater Sampling
- Temporary Storage of Groundwater
- Transport and Disposal of Groundwater

GROUNDWATER ELEVATION GAUGING

Prior to the start of the performance test, groundwater elevations were gauged over an eight day period to provide site groundwater elevation data prior to the start of the test. Groundwater elevations were gauged at piezometers (PZ) EW-05B-PZ-1, EW-05B-PZ-2, EW-05B-PZ-3, EW-05B-PZ-4, extraction well EW-05B, and monitoring well (MW) MW-209. Groundwater elevations were manually recorded using a Solinst® electronic water level indicator. Groundwater elevations were measured daily from 06 November 2008 to 13 November 2008, with the exception of 11 November 2008 when the Base was closed for Veterans Day. Groundwater elevations prior to the beginning of the pump tests remained generally constant with changes of less than 0.3 feet recorded over this time period.

PERFORMANCE TEST

The performance test at EW-05B consisted of two separate tests; a step-drawdown test (completed on 14 November 2008) followed by a 72 hour constant rate drawdown (pumping) test (conducted from 17 through 20 November 2008). Groundwater elevations were recorded at six monitoring wells/piezometers (EW-05B, EW-05B-PZ-1, EW-05B-PZ-2, EW-05B-PZ-3, EW-05B-PZ-4, and MW-209) during the step-drawdown test, and at seven monitoring wells/piezometers during the pumping test (the above plus P-106). In

addition, one stream gauge (GP-3B) located to the east of EW-05B was gauged during the two pump tests. Groundwater elevations at the wells/piezometers were logged using s In-Situ Level 700 Mini-Troll® submersible pressure transducers, with the exception of P-106 which was measured by hand using an electronic water level indicator. The wells/piezometers were gauged to assess drawdown within the area of influence of the pumping well, with the exception of MW-209, which was logged to assess water level fluctuations and trends unrelated to pumping EW-05B. In addition, stream stage levels were recorded from stream gauge GP-3B located on Picnic Pond/Merriconeag Stream. Figure 3 shows the location of the piezometers/wells and stream gauge. Two flowmeters (one analog and one digital) were connected to the discharge hose at the well head to record flow rates and groundwater discharge quantities. Both flowmeters were tested prior to the start of the performance test to ensure accuracy.

Table 1 provides the well specifics for each well/piezometer that was logged. Figure 4 provides two cross-sections transecting west-east and north-south through the area including the pumping well and piezometers. The lower sand is the semi-confined aquifer, and is the aquifer that was pumped during the pump test. All but one of the observation points are screened in this unit. The transition is the overlying aquitard. The unconfined aquifer is the Upper Sand and is the source bed for the semi-confined lower sand unit. The lower sand pinches out to the east, but is continuous from north to south.

Figure 5 shows stream stage, cumulative precipitation, and groundwater elevations at the background well, MW-209, which were recorded over the duration of the two pumping tests. The rise and fall of stream stage levels over the course of the two tests was interpreted to be due the precipitation events of 14 November and 15 – 16 November 2008. As shown on Figure 5, water levels at MW-209 fluctuated over the period of record as a result of precipitation, but there was no observable drawdown effect as a result of pumping. It was therefore concluded that MW-209 was outside the radius of influence of the pumping well. Since water level fluctuations at MW-209 were minor (approximately 0.2 ft), water level data collected from the remaining wells/piezometers within the radius of influence of the pumping well were not corrected to this data set. Any correction to the drawdown data of this small a magnitude would not change the results of analysis. It should be noted that the current Groundwater Extraction Treatment System (GWETS) was running continually during the two tests with the exception of minor interruptions (lasting only a few minutes each). It was assumed that drawdown in the aquifer due to the other extraction wells had essentially reached equilibrium conditions.

Step-Drawdown Test

The step-drawdown test was used to determine the specific capacity of EW-05B at various discharge rates. This information can be used select optimum discharge rates for the pumping test. Each step lasted 120 minutes with the exception of Step 5, which was stopped a few minutes into the step due to the fact that water levels inside EW-05B had reached the top of the screen. Table 2 provides the pumping rates and duration of each

step. Figure 6 provides a plot of the time-drawdown data for the step-drawdown test. Figure 7 provides a plot of drawdown vs. pumping rate.

Specific Capacity

The specific capacity of a well is its yield per unit of drawdown (gpm/ft), after a given time has elapsed. Specific capacities were calculated for each step in the step-drawdown test (see Table 2). Typically, specific capacity decreases as discharge increases; in this case there was a minor decrease (three percent) in specific capacity between Steps 1 and 4 (Figure 8). Since there is only a minor decrease in specific capacity as pumping rates are increased, pumping could be set at the maximum sustainable yield without major losses of specific capacity.

Determining Aquifer Properties

Several analytical solutions are available to calculate transmissivity (and hydraulic conductivity), and storativity. Theis (1935)[1] derived a solution for unsteady flow to a fully penetrating well in a confined aquifer. Hantush (1961a[2], b[3]) extended the Theis method to correct for partially penetrating wells. Cooper and Jacob (1946)[4] developed a method of analyzing pumping tests based on a straight-line approximation of the Theis (1935) equation for unsteady flow to a fully penetrating well in a confined aquifer. Late time drawdown levels during the constant rate test show a flattening of the drawdown curve indicating that the confined system (i.e., the lower sand unit) is leaky, i.e., bounded above by an aquitard and an unconfined aquifer. Extensive study of the Site confirms this is the case. For this reason, the Hantush-Jacob (1955)[5] method was considered to be the most appropriate analytical solution which, in addition to calculating aquifer properties, also calculates the vertical hydraulic conductivity of the overlying aquitard. The Hantush-Jacob solution assumes that water is discharged instantaneously from storage, the aquifer is homogeneous and isotropic, has constant thickness and a negligible slope, and is of infinite areal extent. In addition to the above, the Hantush-Jacob solution also assumes leakage through the confining bed is vertical and proportional to the drawdown, the head in the source bed supplying leakage is constant, and storage in the confining unit is negligible.

Drawdown data from the pumping well EW-05B and the five/six observation points were analyzed to determine aquifer and well performance properties. Figure 9 provides plots of the time-drawdown data for the constant rate test. Although its screen location is at the

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Theis, C.V., 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage, Am. Geophys. Union Trans., vol. 16, pp. 519-524.

[2]Hantush, M.S., 1961a. Drawdown around a partially penetrating well, Jour. of the Hyd. Div., Proc. of the Am. Soc. of Civil Eng., vol. 87, no. HY4, pp. 83-98

[3]Hantush, M.S., 1961b. Aquifer tests on partially penetrating wells, Jour. of the Hyd. Div., Proc. of the Am. Soc. of Civil Eng., vol. 87, no. HY5, pp. 171-194.

[4]Cooper, H.H. and C.E. Jacob, 1946. A generalized graphical method for evaluating formation constants and summarizing well field history, Am. Geophys. Union Trans., vol. 27, pp. 526-534.

[5]Hantush, M.S. and C.E. Jacob, 1955. Non-steady radial flow in an infinite leaky aquifer, Am. Geophys. Union Trans., vol. 36, pp. 95-100.

same elevation as EW-05B, an analytical solution could not be applied to water level data obtained from EW-05B-PZ-3 since its screen location is located within the clay as can be seen on the geologic cross section in Figure 4. The lower sand appears to pinch out somewhere between EW-05B and EW-05B-PZ-3. Also, the Cooper-Jacob analytical solution was used to derive aquifer property values for drawdown data obtained from EW-05B due to the possible interference of well casing storage effects. The following equation was used to calculate the time when casing storage becomes negligible (also see Figure10):

$$t_c = 0.6\,(d_c^2 - d_p^2) / (Q/s)$$ [6]

Where:

t_c = time when casing storage becomes negligible, in minutes
d_c = inside diameter of well casing, in inches
d_p = outside diameter of pump column, in inches
Q/s = specific capacity of the well, in gpm/ft of drawdown at time t_c

Using this equation,

$$t_c = 0.6\,(d_c^2 - d_p^2) / (Q/s)$$
$$= 0.6\,(36 - 1) / (12/45.85)$$
$$= 80 \text{ minutes}$$

Aquifer analysis was completed using Aqtesolv ®, version 4.50, an aquifer test software package. Attachment B provides the analytical solutions calculated for each well/piezometer using Aqtesolv. The vertical blue dashed line shown on the time-drawdown plots for EW-05B and P-106 indicates the time after which the Cooper-Jacob approximation is valid using a u value of 0.05[6]. The *u* value is defined as:

$$u = 1.87\, r^2 S/Tt,$$

Where:

r = distance from center of pumped well, in feet
S = coefficient of storage (dimensionless)
T = coefficient of transmissivity, in gpd/ft
t = time since pumping started, in days

Table 3 provides the aquifer properties calculated from the various analytical solutions that were used. Provided in the table are estimates of aquifer transmissivity, hydraulic conductivity, storativity, and specific storage for the lower sand. Also provided are estimates of the vertical hydraulic conductivity of the aquitard derived from the Hantush-Jacob solution. Overall, transmissivity values ranged from 48 to 194 ft^2/day.

[6] Driscoll, F.G., 1986. Groundwater and Wells, pp. 233.

Transmissivities calculated for EW-05B, EW-05B-PZ-1 and EW-05B-PZ-2 were 52, 48, and 48 ft^2/day respectively so are essentially equivalent. These transmissivity values are consistent with those values calculated during the April-May 2008 recovery-drawdown test[7]. The transmissivity value of 48 ft^2/day is probably the best estimate of transmissivity of the lower sand in the vicinity of EW-05B. Transmissivities for EW-05B-PZ-4 and P-106 which are to the north and more remote from EW-05B were more than twice as much as those calculated for EW-05B, EW-05B-PZ-1 and EW-05B-PZ-2. This could be due to a thickening of the lower sand unit towards the direction of these two peizometers as evidenced in the soil boring log for EW-05 which has a lower sand thickness of approximately 30 feet. Hydraulic conductivities ranged from 2.67 to 10.75 ft/day. Storativity values ranged from 0.0002 to 0.00105. Specific storage values ranged from 1.1E-05 to 5.8E-5/ft. The calculated vertical hydraulic conductivities of the aquitard ranged from 0.02 to 0.14 ft/day.

Determining Well Efficiency

Well efficiency is defined as the ratio of actual to theoretical drawdown at the pumping well for a given pumping rate. A commonly used method to determine well efficiency is to prepare a distance-drawdown plot using data from at least three observation wells. The theoretical drawdown is determined by fitting a straight line to the data and projecting the fitted line to a distance equal to the pumping well radius; the actual drawdown is measured in the pumping well.

Drawdown data was plotted on a distance-drawdown graph after one day of pumping (Figure 11). Drawdowns plotted vs. distance from the pumping well do not form a straight line but show considerable scatter owing to the anisotropy/heterogeneity of the aquifer. The extension of a straight line fitted to the drawdown data for the observation wells shows the theoretical drawdown at the pumping well (using a best fit line between EW-05B-PZ-1, -2, and -4) should be 42 feet. Since the observed drawdown is 52.2 feet, the well efficiency would be 42/52.2 x 100 = 80%. Excluding EW-05B-PZ-4 from the linear regression, the best fit line between EW-05B-PZ-1 and EW-05B-PZ-2 shows a theoretical drawdown of 23.2 ft yielding a well efficiency of 44 percent. This is probably the most accurate estimate of well efficiency since EW-05B-PZ-1 and EW-05B-PZ-2 are the two closest piezometers to the pumping well, and the variation in aquifer properties over such short distances is assumed to be minimal.

GROUNDWATER SAMPLING

A total of six groundwater samples were collected from EW-05B between 13 November and 20 November 2008. At the request of the Maine Department of Environmental Protection (MEDEP) and the US Environmental Protection Agency (US EPA), one baseline (BL) groundwater sample was collected on 13 November 2008 (prior to the start of the step-drawdown test). The sample was collected using low-flow sampling methods and was submitted under chain-of-custody protocol to Accutest Laboratories, of

[7] ECC, 2009. Final Groundwater Modeling Summary Report, Naval Air Station, Brunswick, Maine. April.

Marlborough, MA, for analysis for 1,2,3 tri-chloropropane (1,2,3-TCPA) by US EPA Method 8260B/SIM, VOCs by US EPA Method 8260B, and 1,4-dioxane by US EPA Method 8260B/SIM (as modified to meet the requirement of Method EIASOP VOADIOX3).

Five additional groundwater samples were collected at pre-determined stages during the pump test, which began on 17 November 2008. The first sample was collected approximately 8 minutes after the start of the pump test. This would allow for approximately one well volume to be purged (based on the initial flow rate of 12 gpm) before the first sample was collected. The four remaining samples were collected at 18 hour intervals up to 72 hours. All samples were collected from an adjustable flow sample port installed in the discharge hose at the well head. All samples were submitted under chain-of-custody protocol to Accutest Laboratories, of Marlborough, MA, for VOCs by US EPA Method 8260B, and 1,4-dioxane by US EPA Method 8260B/SIM (as modified to meet the requirement of Method EIASOP VOADIOX3). In addition, the third sample collected (36 hours after the start of the test) also included analysis for 1,2,3 tri-chloropropane (1,2,3-TCPA) by US EPA Method 8260B/SIM, as requested by the MEDEP.

GROUNDWATER SAMPLING RESULTS

A total of five groundwater samples were collected during conduct of the pumping test. The samples were collected approximately 18 hours apart to demonstrate contaminant concentration increase or decrease during prolonged pumping of EW-05B. As previously stated in this summary report, a baseline sample was collected prior to the start of the step-drawdown test. Results from this sample are included in this report.

The sample identification, time of collection, and sample analysis are as follows:

Sample ID	Collection Time[a]	Analysis
EW-05B-BL	-	VOCs, 1,4-dioxane, 1,2,3-TCPA
EW-05B-PT-1	8 Minutes[a]	VOCs, 1,4-dioxane
EW-05B-PT-2	18 Hours	VOCs, 1,4-dioxane
EW-05B-PT-3	36 Hours[b]	VOCs, 1,4-dioxane, 1,2,3-TCPA
EW-05B-PT-4	54 Hours	VOCs, 1,4-dioxane
EW-05B-PT-5	72 Hours	VOCs, 1,4-dioxane

a = Time is based on one well volume of approx. 90.52 gals and a flow rate of 12 gpm
Collection times are from the beginning of the pump test.
b = An additional sample was collected for 1,2,3-TCPA analysis at this time

Analytical results from all groundwater samples collected reported concentrations of four chlorinated VOCs (1,1-dichloroethene [1,1-DCE], tetrachloroethene [PCE], 1,1,1-trichloroethane [1,1,1-TCA], trichloroethene [TCE]), and 1,4-dioxane, in exceedance of applicable US EPA Maximum Contaminant Levels (MCLs) and/or Maine Center for Disease Control (CDC) Maximum Exposure Guidelines (MEGs). Contaminant concentrations remained relatively constant throughout the pump test, with three of the five concentrations (1,1-DCE, PCE, and 1,4-dioxane) increasing over time. Contaminant concentrations ranged from a low of 9.3 ug/L (PCE in the baseline sample and in sample PT-1), to a high of 668 ug/L (1,1,1-TCA in sample PT-2). All groundwater sampling analytical results are presented in Table 4.

TEMPORARY STORAGE, TRANSPORT AND DISPOSAL OF GROUNDWATER

Groundwater purged from EW-05B during the performance test (step-drawdown and pumping test) was temporarily stored on-site in three 20,000-gal portable storage tanks (i.e Frac tanks). Groundwater was pumped directly from the well into the tanks via a 1-inch diameter hose. Purged groundwater was then removed from the tanks via vaccum trucks and transported under straight bill of lading (BOL) to CleanHarbors Environmental Services facility located at 37 Rumery Road, South Portland, ME, for disposal as non-hazardous waste. Following removal of the purged groundwater, the tanks were removed from the site, transported to the CleanHarbors facility, and cleaned.

It has been ECC's pleasure to provide you with this Draft Letter Summary Report detailing the field activities conducted during the performance testing at EW-05B at Naval Air Station, Brunswick, Maine. Should you have any questions, or wish to discuss the proposed activities further, please do not hesitate to contact Todd Bober, NAS Brunswick Remedial Project Manager, at 215-897-4911.

Regards,
ECC

Al Easterday, P.G.
Senior Project Manager

Gina Calderone, P.G., C.P.G.
Project Manager/Hydrogeologist

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TtNUS (L. Klink, C. Race, J. Orient)
ECC (A. Easterday, G. Calderone, C. Guido)

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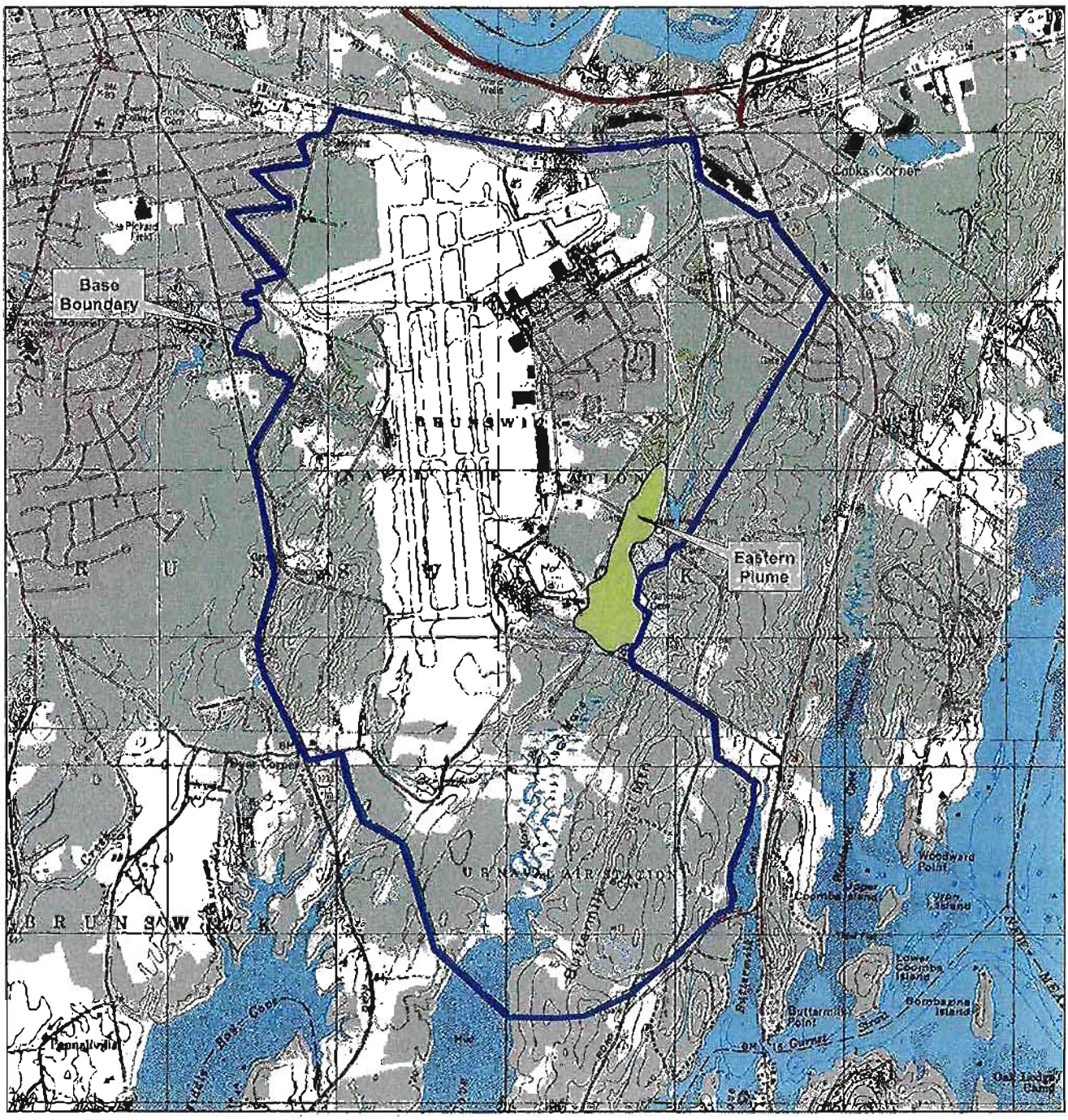
NASB Commanding Officer (CAPT Fitzgerald)
RAB Brunswick Representative (S. Johnson)

RAB Harpswell Representative (D. Chipman)
RAB Topsham Representative (S. Libby)
MRRA (V. Boundy)

FIGURES



Contract No.	N62472-02-D-0810
Description	NAS Brunswick, ME
Coordinate system	NAD 1983, UTM, Zone 19 N in meters
Sources	Naval Base Boundary provided by Navy.

Date	10 MAR 2009	Rev.	Date	App. By
DR	C. Davis			
CB	J. Donovan			
AB				

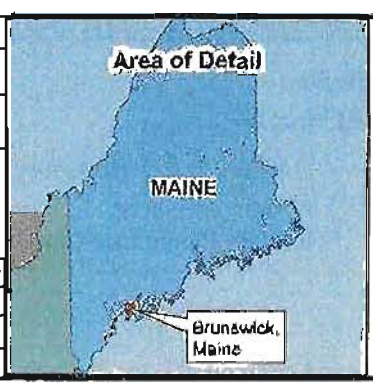
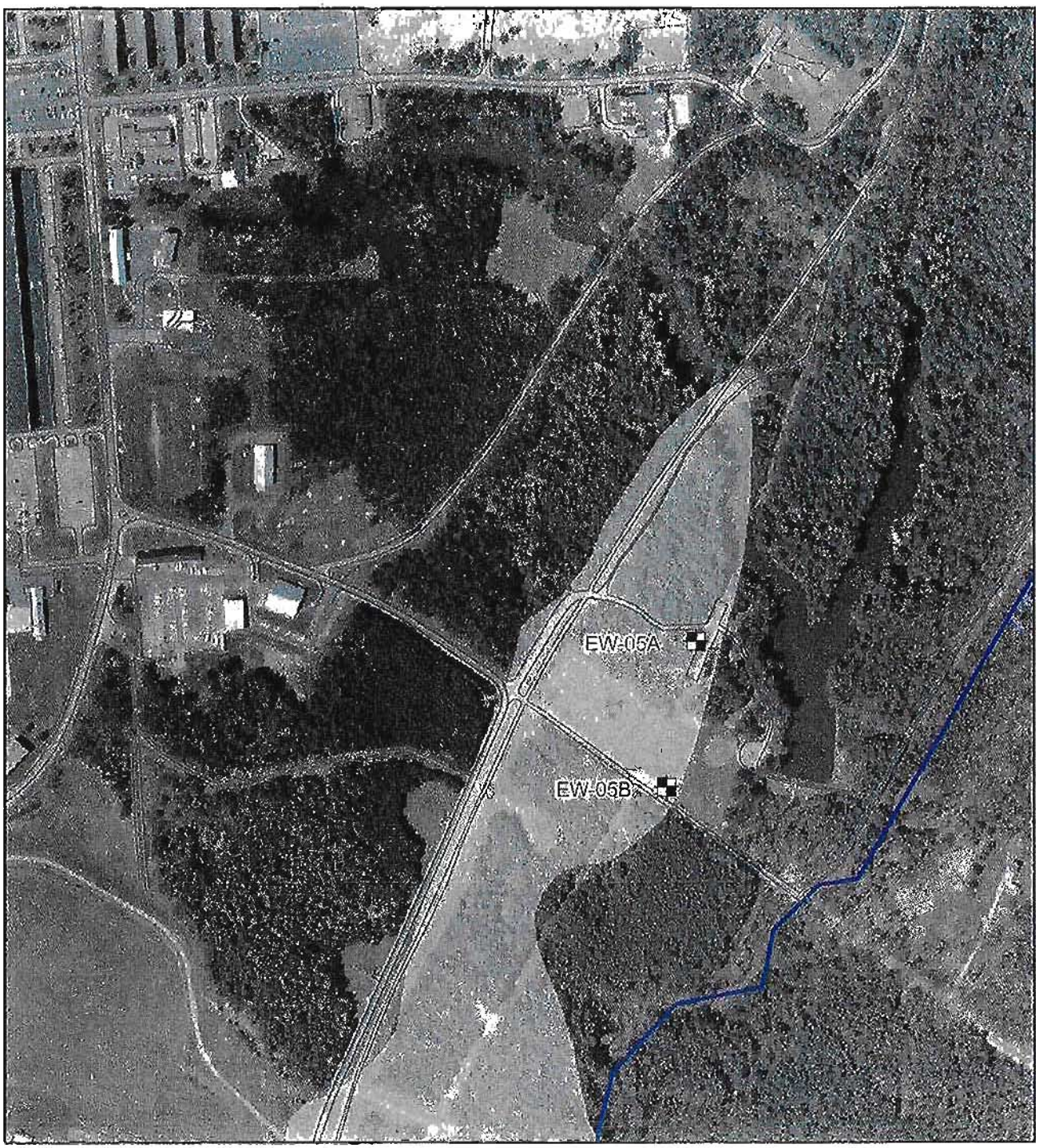


Figure 1

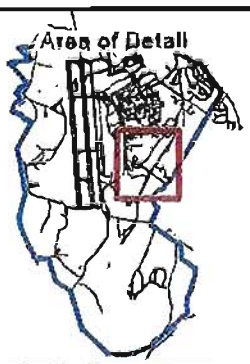
Naval Air Station/ Eastern Plume Site Location

Naval Air Station
Brunswick, Maine



Contract No.	N62472-02-D-0810
Description	NASB Brunswick, ME
Coordinate system	NAD 1983, UTM, Zone 19N
Sources	Naval Base Boundary provided by ME GIS.

Date	10-MAR-2008	Rev.	Date	App. By
DB	C. Guido			
CO	J. Donovan			
AB				



Legend

- Extraction Well
- NAS Brunswick Boundary
- Approx. Extent of Eastern Plume (Apr 08)

Figure 2

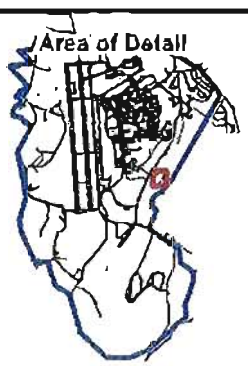
Location of Extraction Well EW-05B within Eastern Plume

Naval Air Station Brunswick, Maine

0 125 250 500 Feet

Contract No.	N62477-02-D-0810
Description	NASB Brunswick, ME
Coordinate system	NAD 1983, UTM, Zone 18N
Sources	Naval Base Boundary provided by ME GIS.

Date	23-JUN-2006	Rev.	Date	App. By
DB	C. Quick			
CB	J. Gilkey			
AB				



Legend

Cross-Section

- A-A'
- B-B'
- Extraction Well
- Piezometer
- Extraction Well Piezometer
- Stream Gauge
- Stream & Wetland

Figure 3

Location of Extraction Well/ Piezometers/ Stream Gauges Eastern Plume

Naval Air Station Brunswick, Maine

0 25 50 100 Feet

LEGEND

Monitoring Well

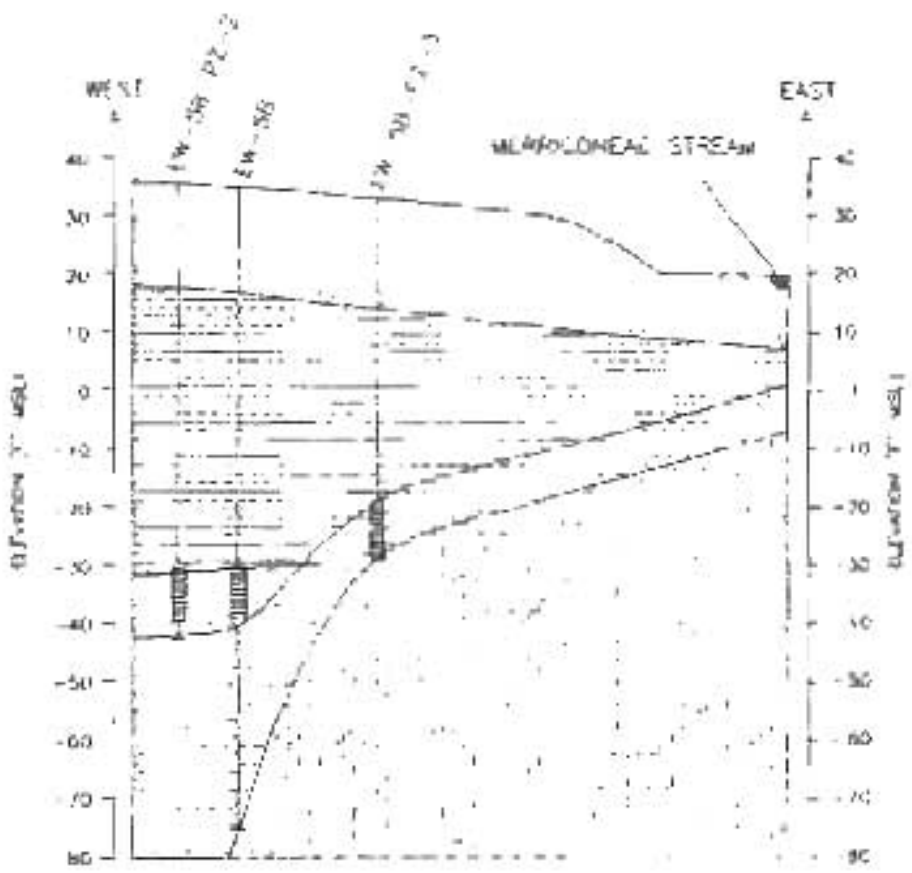
Ground surface

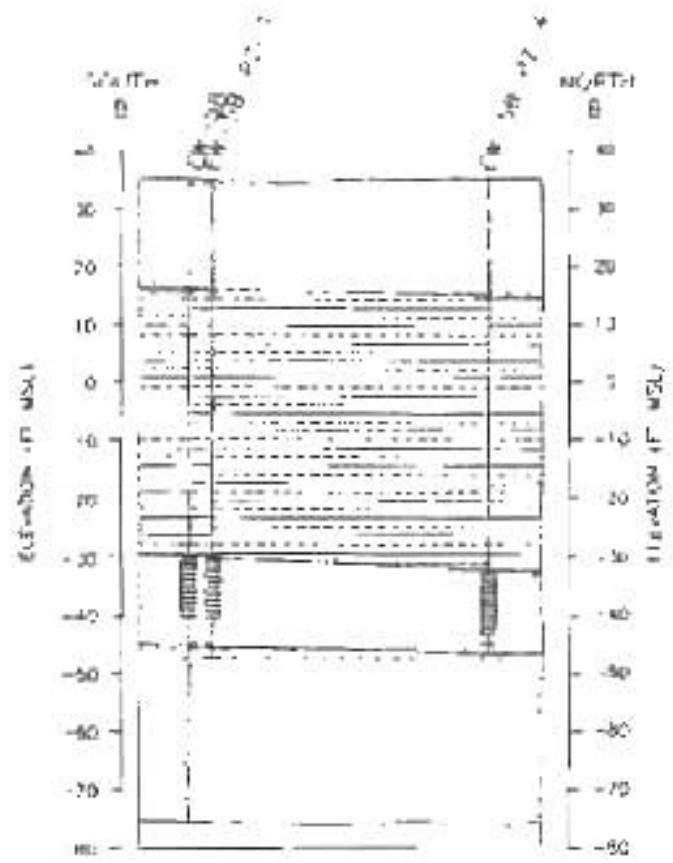
Well screen intervals

Bottom of boring

SOIL DESCRIPTION

UPPER SAND	Tan to light brown fine sand, trace to little medium sand and silt, poorly graded, loose to moderately dense, slightly stratified with depth
TRANSITION	Predominantly gray very fine to medium sand (coarser in isolated areas) in layers ranging from less than 0.5-ft up to 8-ft thick, interbedded with silt, silty sands, silt/clay, or clay in layers ranging from few laminae fractions of an inch thick up to 5.5-ft thick. Significant sand interbeds (confirmed in soil boring logs) greater than 2-ft thick are shown in the cross-section
LOWER SAND	Gray/brown very fine to coarse sand
PRESUMPSCOT CLAY	Gray silty clay to clayey silt (cross flow) medium to high plasticity, very soft
BEDROCK	Highly foliated mica (biotite) schist, regional metamorphic grade quartz, garnet and biotite also common, slightly to moderately weathered, not fractured





Contract No	N62472-02-D-1813
Description	Cross-sections in vicinity of NASB, ME
Coordinate system	NAD 1983 UTM Zone 19N in feet
Notes	1. Soil and bedrock contacts are inferred below and between locations. Dashed line indicates contacts are less precisely located. 2. The geologic unit depths shown are based on well boring records. 3. Ground elevations along cross section line from USGS Quad
Sources	1. Soil boring logs

Date	4-MAR-2008	Rev	Date	Apr	By
DB	J. Gothere				
CB	J. Donovan				
AB					

0 100 200 400

GRAPHIC SCALE IN FEET
VERTICAL EXAGGERATION = 5X

FIGURE 4

LW-5B, LW-7B, LW-8 - SECTIONS
EASTERN PLUME

NAVAL AIR STATION
BRUNSWICK, MAINE

Figure 5 - Pre-Test Well Gauging, Background Well (MW-209), Stream Gauge, and Precipitation Levels

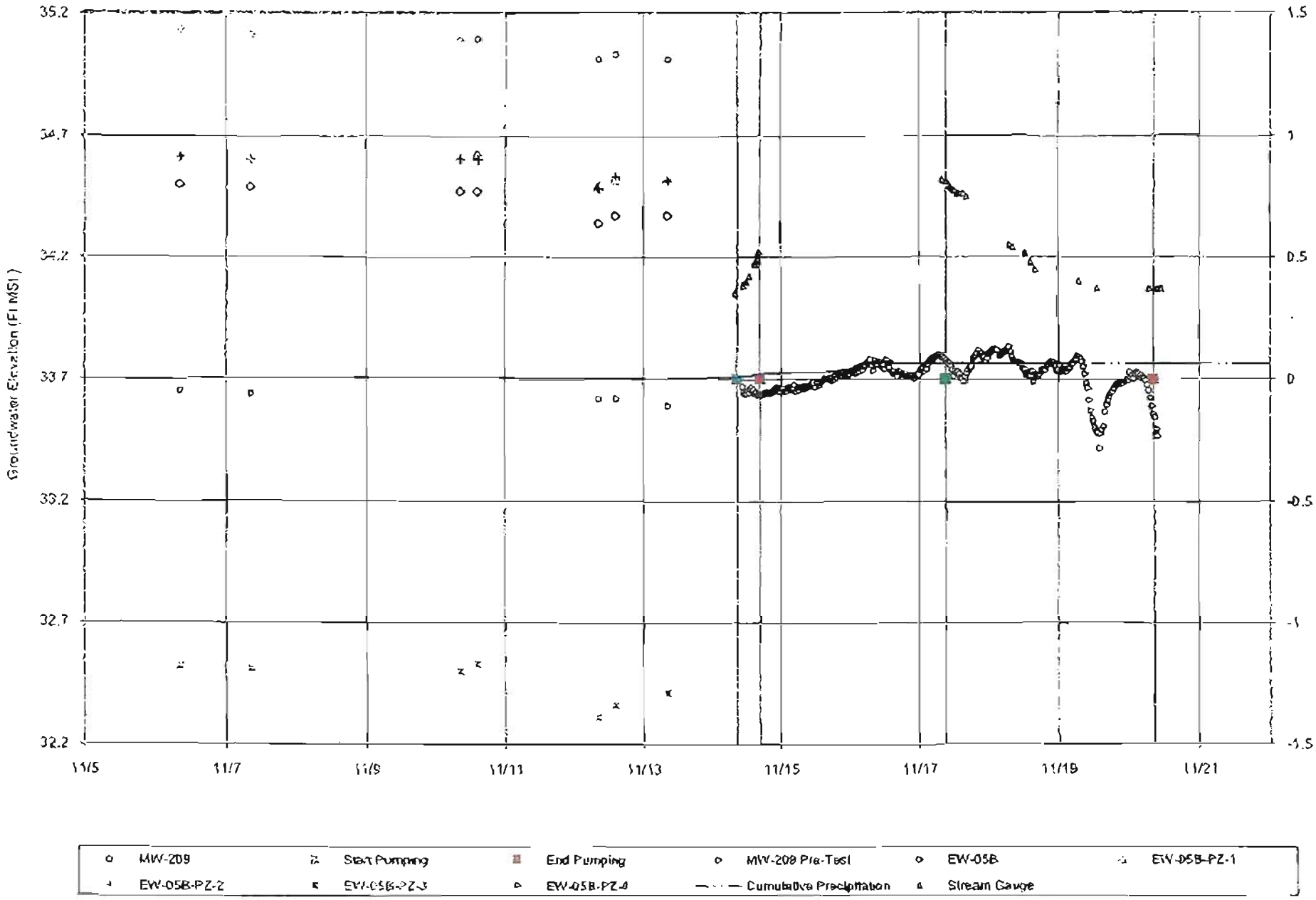


Figure 6 - Step-Drawdown Test Drawdown Data

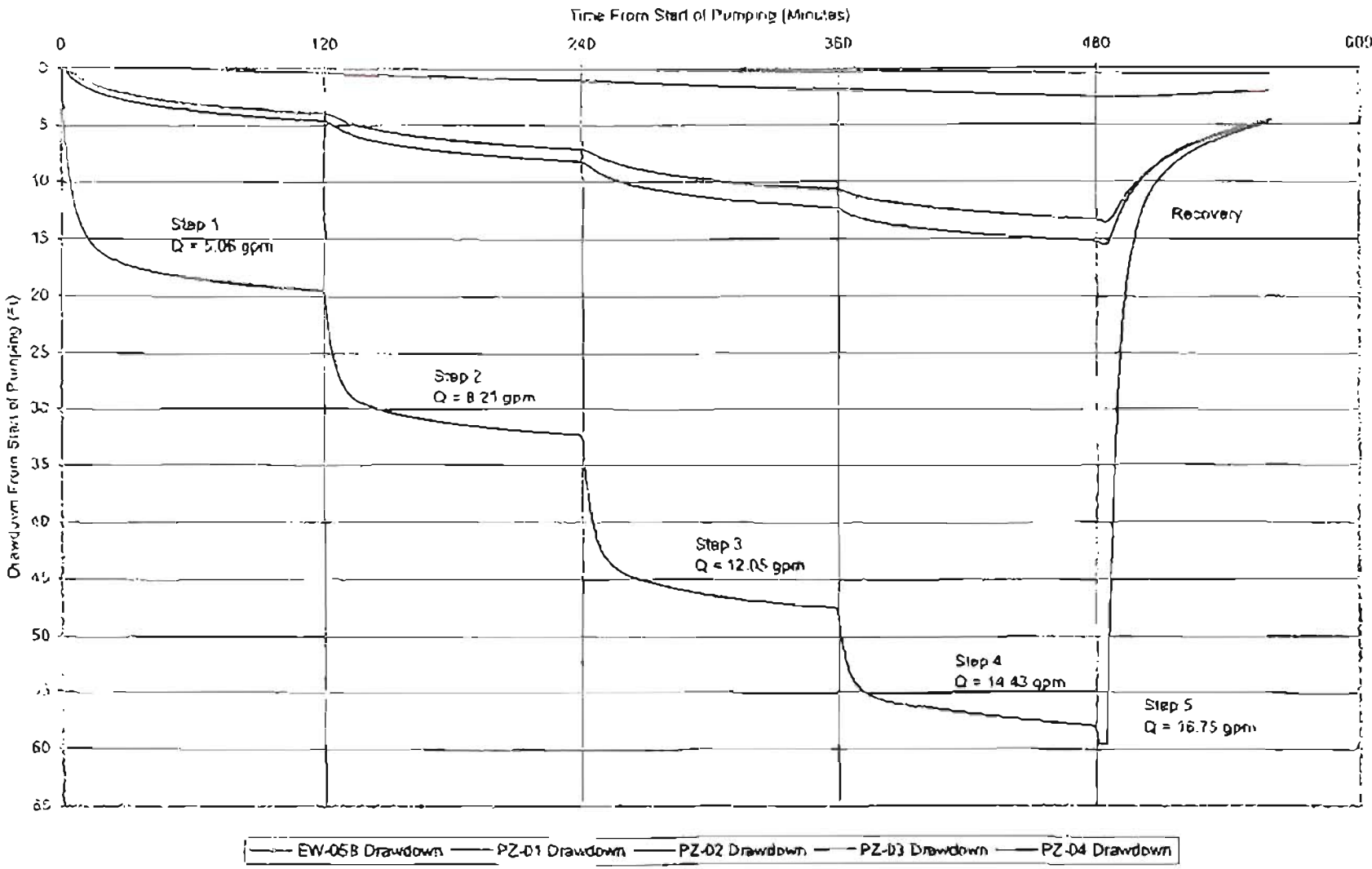


Figure 7 - Drawdown vs. Pumping Rate

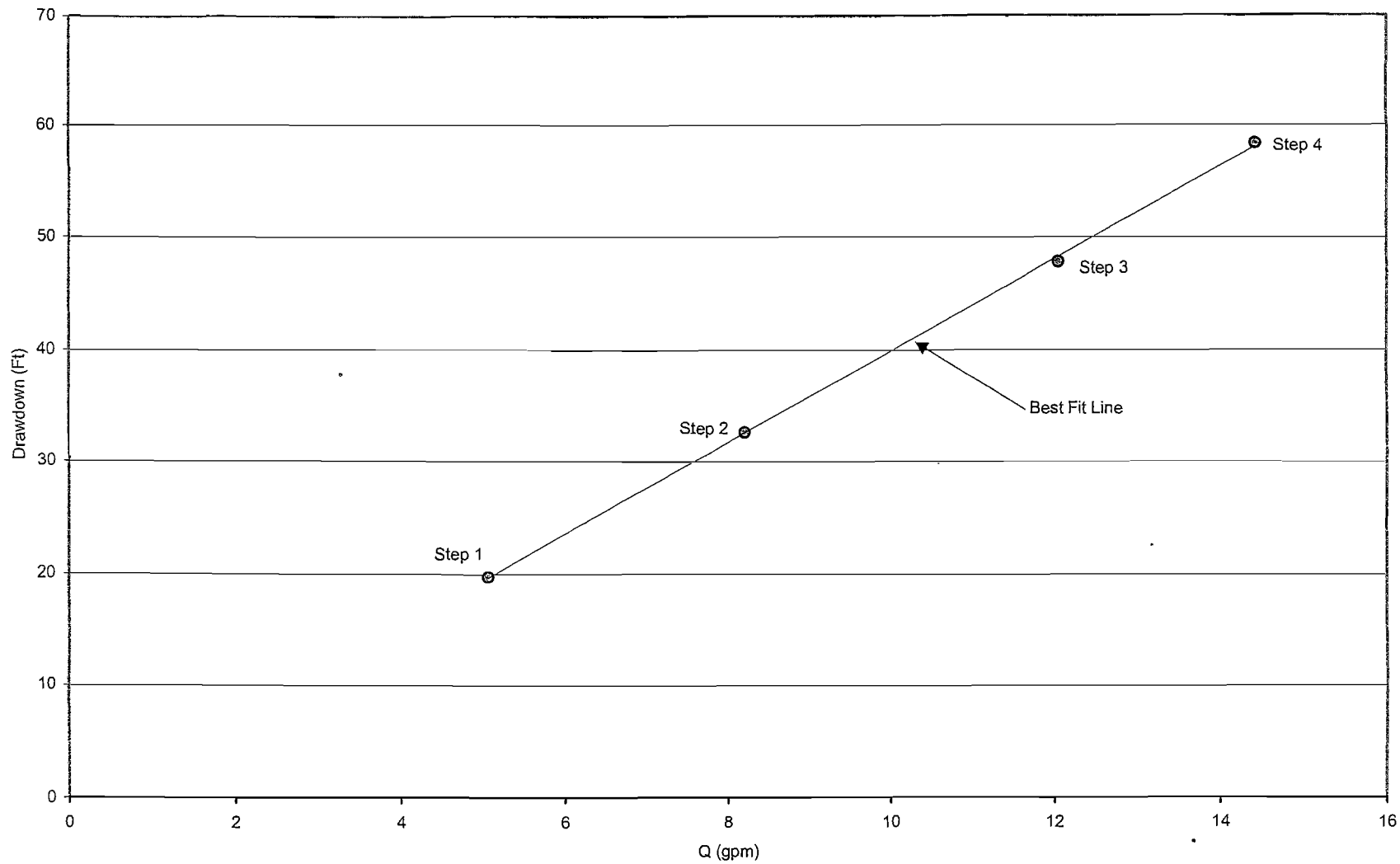


Figure 8 - Drawdown vs. Specific Cpacity

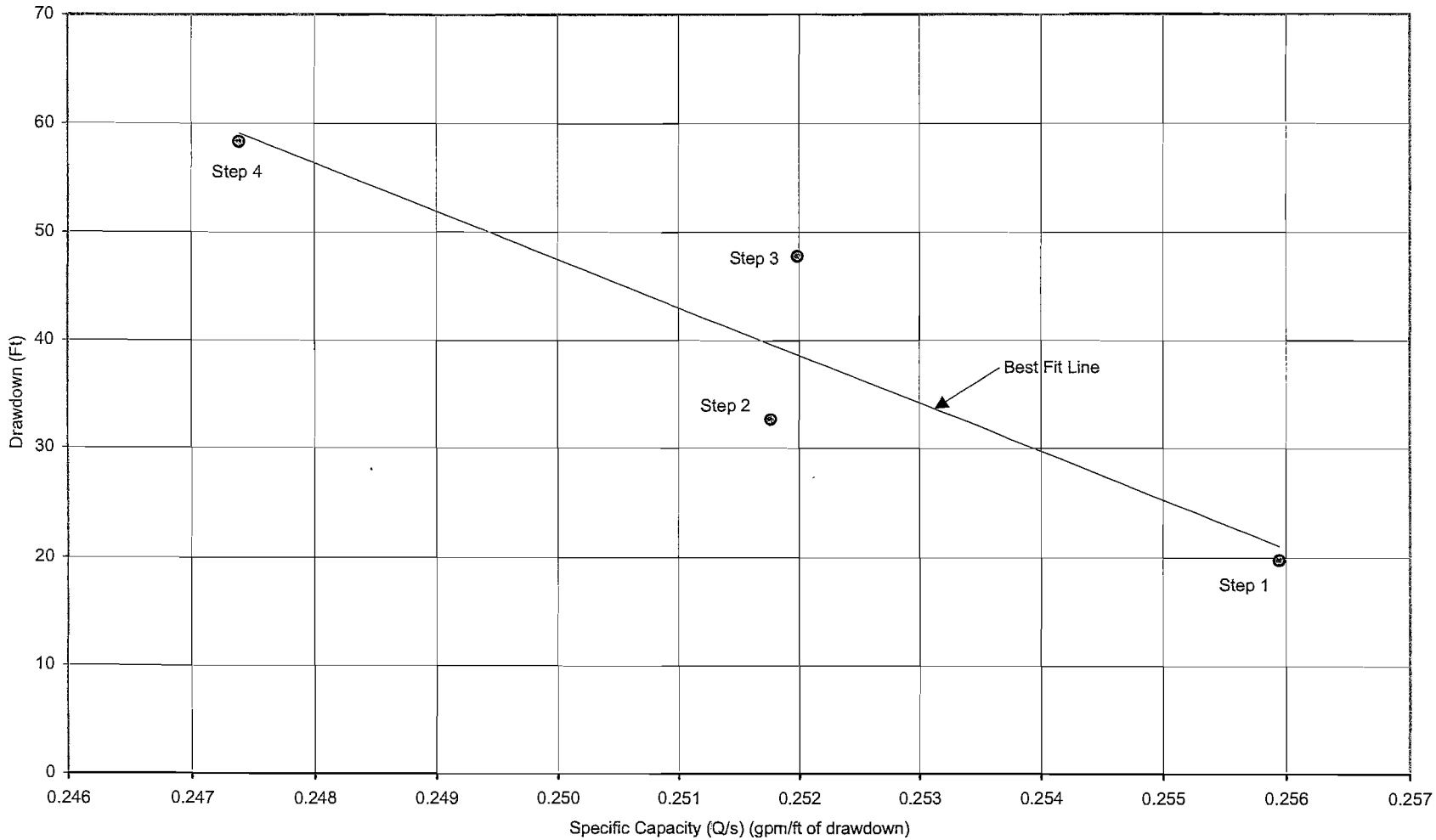


Figure 9 - Constant Rate Test Drawdown Data

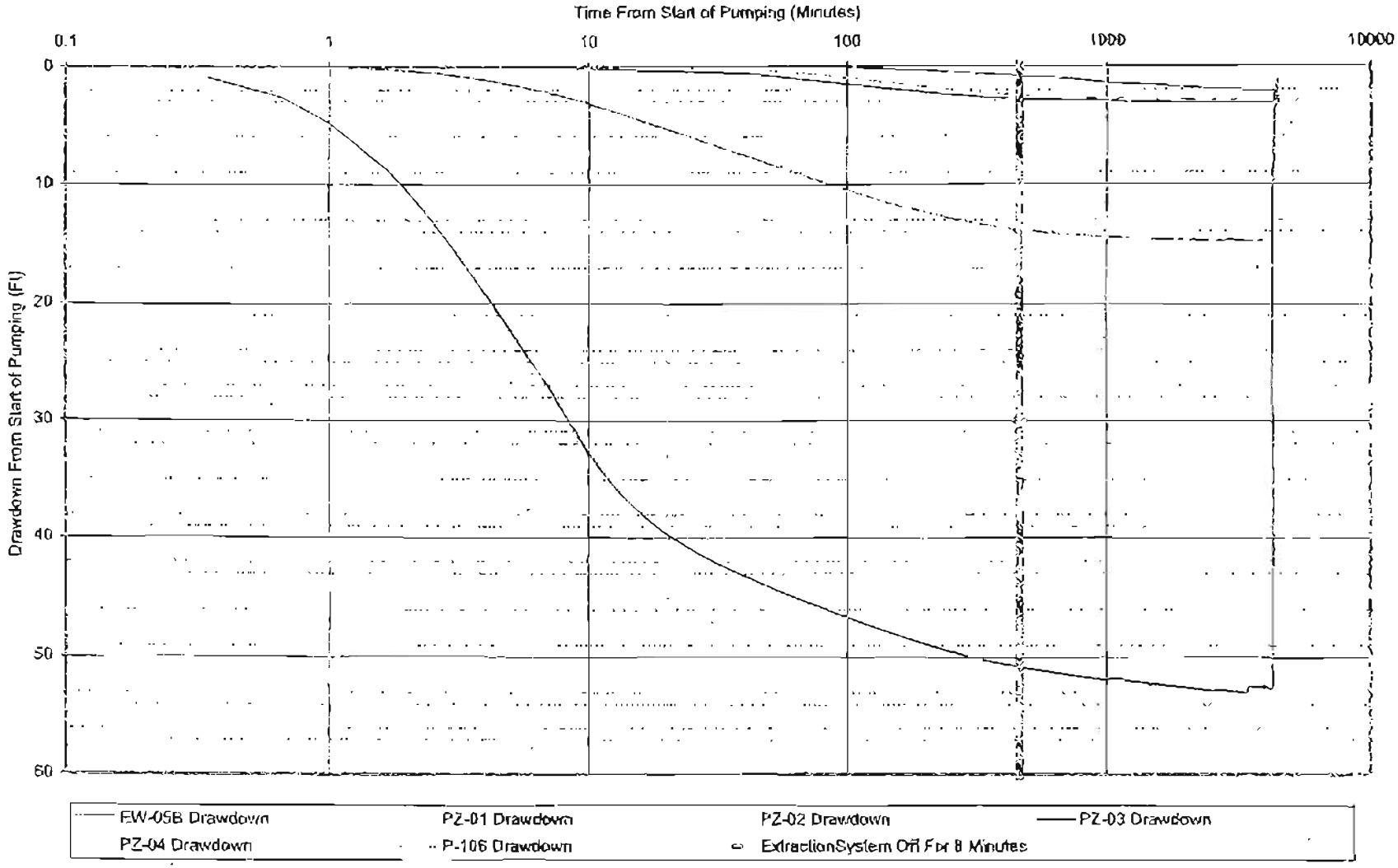


Figure 10 - EW-05B Drawdown During Constant Rate Test

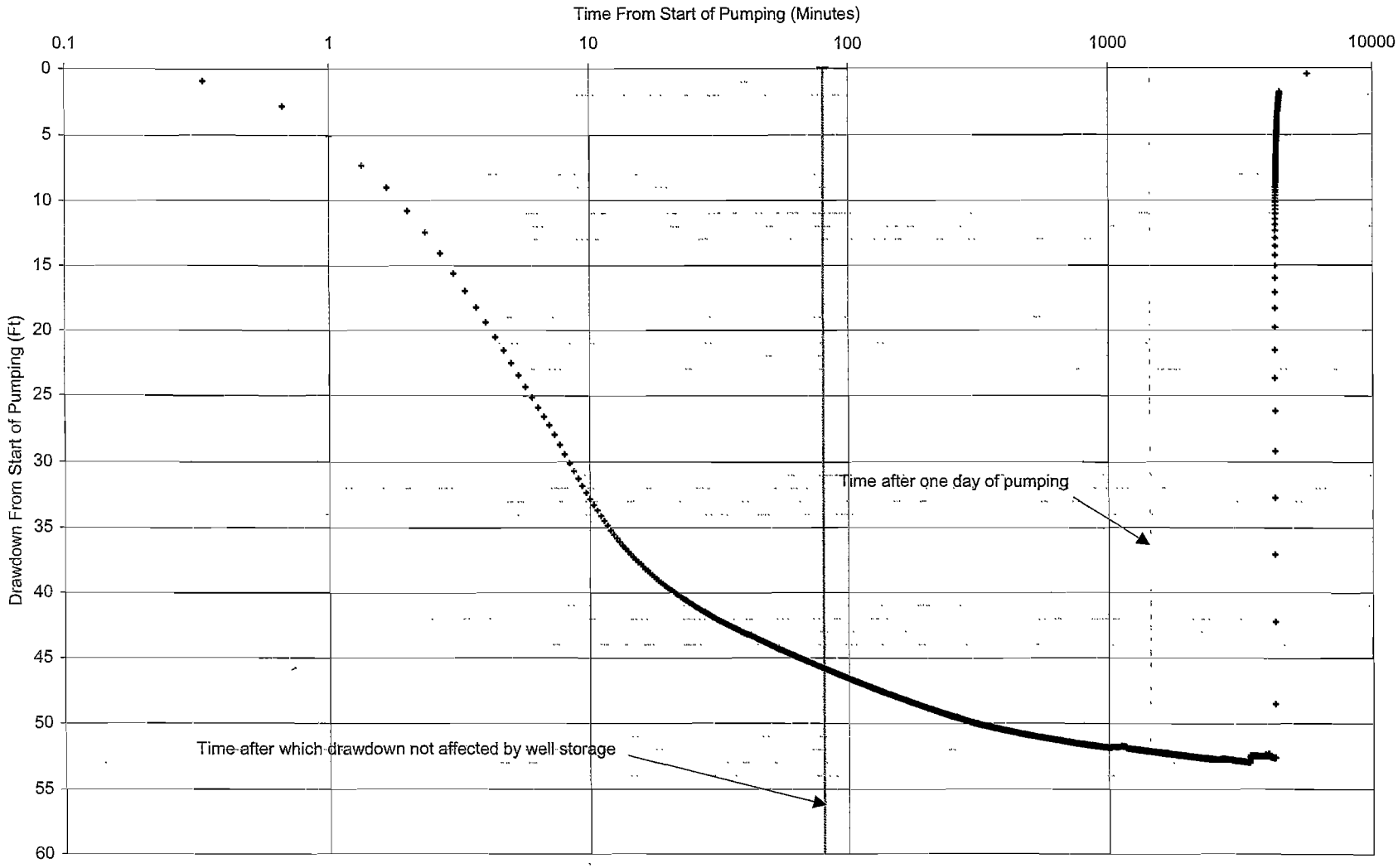
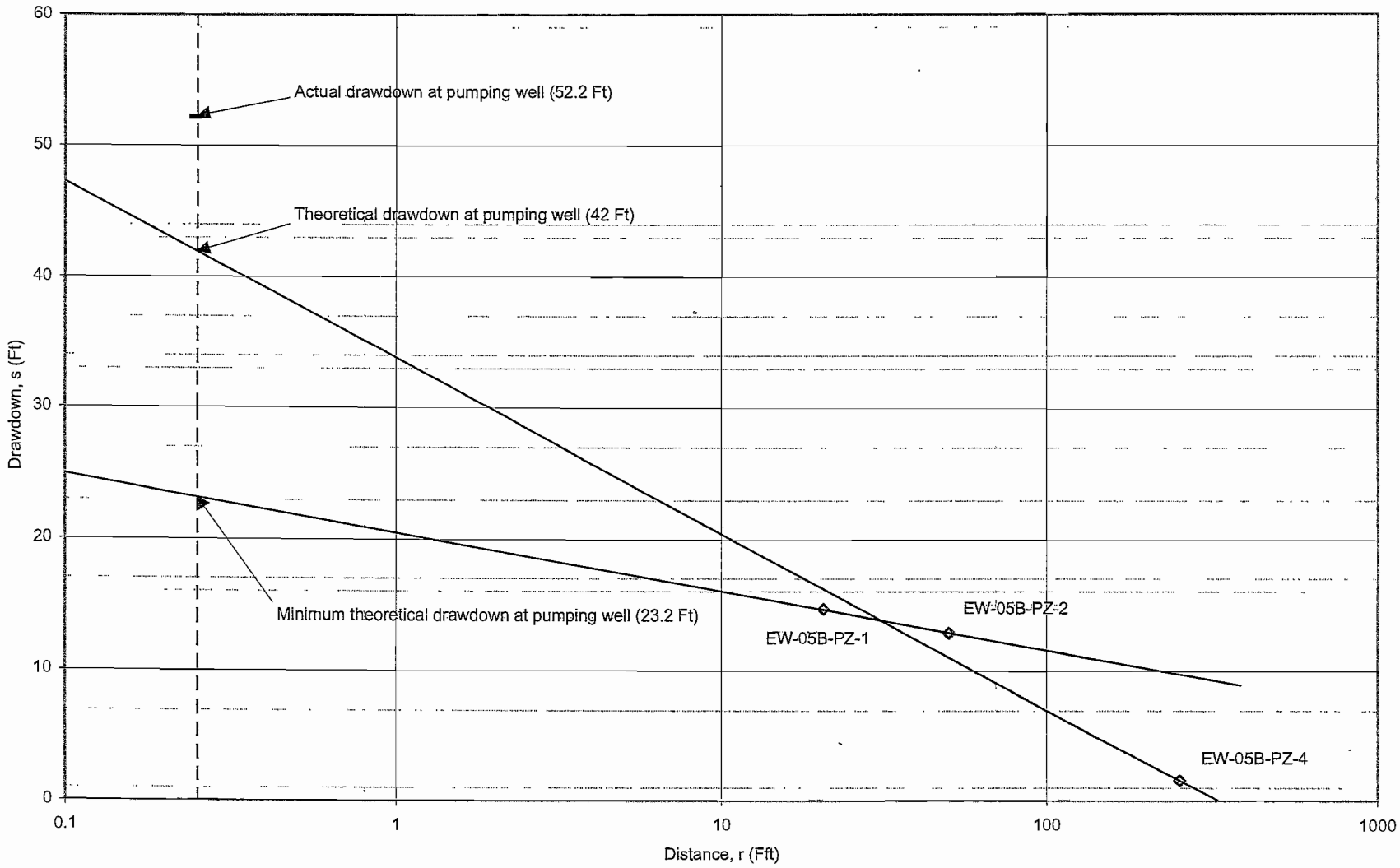


Figure 11 - Distance-Drawdown After One Day of Pumping



TABLES

ECC

Table 1

Well Specifications
Eastern Plume
Naval Air Station, Brunswick, Maine

Description	Northing (UTM 19N Mtrs)	Easting (UTM 19N Mtrs)	Ground Surface Elv. (NAVD83)	Depth to Top Screen (Ft bgs)	Depth to Bot Screen (Ft bgs)	Top Screen Elev (Ft MSL)	Bot Screen Elev (Ft MSL)	Distance From Pump (Ft)	Well Radius (In)	Constant Rate Test Pump Rate (gpm)
EW-05B	4859638.1	425910.0	34.81	65	75	-30.2	-40.2	0	3	12.1
EW-05B-PZ-1	4859643.2	425913.7	34.48	65	75	-30.5	-40.5	21	1	—
EW-05B-PZ-2	4859648.6	425898.9	35.45	65	75	-29.5	-39.5	50	1	—
EW-05B-PZ-3	4859617.3	425939.7	33.06	52	62	-18.9	-28.9	119	1	—
EW-05B-PZ-4	4859711.3	425934.6	34.94	68	78	-33.1	-43.1	253	1	—
P-106	4859737.9	425919.3	40.00	65.5	70.5	-25.5	-30.5	329	0.375	—

Table 2
Pumping Well Property Values Calculated from Step Test Data
14-Nov-08
EW-05B - Eastern Plume
Naval Air Station, Brunswick, Maine

Step	Duration (minutes)	Q (gpm)	Q (ft3/min)	Drawdown(s) (ft)	s/Q	Specific Capacity After 120 Minutes of Pumping (Q/s) (gpm/ft of drawdown)	Ratio of Laminar Head Loss to total head loss (Lp) (%)
1	120	5.06	0.676	19.77	3.907	0.2559	98.5
2	120	8.21	1.098	32.61	3.972	0.2518	97.6
3	120	12.05	1.61	47.82	3.968	0.2520	96.5
4	120	14.43	1.93	58.33	4.042	0.2474	95.8
5	5	16.75	1.93	---	---	---	---

Table 3

Aquifer Property Values Calculated from EW-05B Constant Rate Pump Test 17-20 November 2008 Eastern Plume Naval Air Station, Brunswick, Maine

Observation Point	Test	Aquifer Model	Analytical Solution	Transmissivity (T) (ft^2/day)	Hydraulic Conductivity (K (T/b)) (ft/day)	Storativity (dimensionless)	Specific Storage (Ss (S/b)) (1/ft)	Vertical Hydraulic Conductivity of Confining Unit (K') (ft/day)
EW-05B	Constant Rate	Confined	Cooper-Jacob (1946)	52.05	2.89	—	—	—
EW-05B-PZ-01	Constant Rate	Leaky	Hantush-Jacob (1955)	48.00	2.67	0.00105	5.83E-05	0.1397
EW-05B-PZ-02	Constant Rate	Leaky	Hantush-Jacob (1955)	48.00	2.67	0.00027	1.50E-05	0.03942
EW-05B-PZ-04	Constant Rate	Leaky	Hantush-Jacob (1955)	100.00	5.56	0.00020	1.11E-05	0.02216
P-106	Constant Rate	Confined	Cooper-Jacob (1946)	193.50	10.75	—	—	—

Notes:
1. Aquifer properties for EW-05B were calculated using Cooper-Jacob solution; Hantush-Jacob solution could not be used due to storage effects
2. Aquifer properties for PZ-03 not calculated due to screen location in clay
3. Aquifer properties for P-106 were calculated using Cooper-Jacob solution; insufficient data to calculate using Hantush-Jacob solution

Table 4

Summary of Groundwater Sampling Results Extraction Well EW-05B Eastern Plume Naval Air Station, Brunswick, Maine

Chemical	Units	MEG (ppb)	EPA MCL (ppb)	BN-EP-EW05B-BL 1120[1] 13-Nov.-08	BN-EP-EW05B-PT1 0918[1] 17-Nov.-08	BN-EP-EW05B-PT2 0300[1] 18-Nov.-08	BN-EP-EW05B-PT3 2300[1] 18-Nov.-08	BN-EP-EW05B-PT4 1500[1] 19-Nov.-08	BN-EP-EW05B-PT5 0800[1] 20-Nov.-08
Volatile Organic Compounds									
Benzene	ug/L	6	5	0.96	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
Bromodichloromethane	ug/L	6	NL	1 U	1 U	4.6	1 U	1 U	1 U
Chloroform	ug/l	6	5	0.3 U	1	1.1	1.2	1.2	1.4
1,1-Dichloroethane	ug/l	70	NL	40.8	60.1	58.5	58.7	58.3	59.8
1,2-Dichloroethane	ug/l	4	5	1 U	2.7	1 U	2.9	2.9	3
1,1-Dichloroethene	ug/l	0.6	7	**67.6**	**197**	**219**	**221**	**228**	**230**
1,2-Dichloroethene (total)[2]	ug/l	70	70	24.3	20	18.4	18.3	17.9	18.7
Methylene chloride	ug/l	47	5	0.45 J	2.5	3.2	3.4	3.8	4
Tetrachloroethene	ug/l	7	5	**9.3**	**9.5**	**10**	**10.1**	**10.2**	**10.4**
1,1,1-Trichloroethane	ug/l	200	200	**492**	**492**	**668**	**502**	**489**	**491**
1,1,2-Trichloroethane	ug/l	6	5	0.59 J	1 U	1 U	1U	1U	1U
1,2,3 Trichloropropane	ug/L	0.05	NL	<0.05 U	NS	NS	<0.05 U	NS	NS
Trichloroethene	ug/l	32	5	**171**	**307**	**400**	**313**	**304**	**308**
1,4-Dioxane	ug/L	32	NL	**75.9**	**121**	**128**	**138**	**139**	**144**

1 = Time of collection
2 = Equals the sum of cis and trans 1,2-DCE
BL = Baseline Sample
PT = Pump Test Sample
J = Estimated result
U = Not detected at or above method reporting limit
CDC = Maine Center for Disease Control
EPA = U.S. Environmental Protection Agency
MCL = Maximum Contaminant Level
MEG = Maine CDC Maximum Exposure Guideline
NL = Not listed
NS = Not sampled for
Only detections and 1,2,3-TCPA results shown.
Summary level data quality review performed for all sample results. All sample results representative of site conditions without bias.
Bold and shaded indicates exceedance of regulator standard.

ATTACHMENT A

REGULATOR COMMENTS ON DRAFT SUMMARY REPORT

RESPONSE TO COMMENTS FROM THE STATE OF MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION – BUREAU OF REMEDIATION AND WASTE MANAGEMENT ON THE DRAFT LETTER SUMMARY REPORT PERFORMANCE TESTING AND GROUNDWATER SAMPLING EXTRACTION WELL EW-05B NAVAL AIR STATION BRUNSWICK, MAINE

Commentor: Claudia Sait, MEDEP - Project Manager-Federal Facilities Bureau of Remediation & Waste Management	
Comment Issue Date: 13 May 2009	**Navy Response Date: 5 June 2009**

General Comments:

1. The performance test of EW-5B indicates it will support pumping rates similar to those seen at EW-2A, and will (at least initially) remove groundwater with at least order-of-magnitude higher concentrations of volatile organic compounds (VOCs) than the other extraction wells in the pump and treat system. The data suggest that there is a hydraulic connection from the clay depression where EW-5B was drilled to the north, at EW5B-PZ-04. This observation well appears to be located in a different clay depression than the extraction well, suggesting EW-5B will be able to reduce contaminant mass beyond the "clay bowl" where the well was placed. (No response required.)

   Response: Comment noted.

2. Review of the document was hampered somewhat by the lack of boring and well installation logs for the extraction well and the observation wells evaluated in the report. Please provide these as an appendix in the final copy; MEDEP utilized some draft copies obtained separately, but they are incomplete.

   Response: Boring logs and well installation completion diagrams will be included as an attachment to the letter report.

3. Also, the drawdown data need to be added to the final report as an appendix, either as hard copy tables or as a separate spreadsheet submittal.

   Response: The drawdown data will be submitted as a spreadsheet in electronic format.

4. Aquifer properties determined in this evaluation are reasonably close to those determined in the recovery test completed to support the groundwater model, another factor supporting the results. Navy should consider adding this comparison to the document.

   Response: A sentence will be added to the last paragraph of the section entitled **Determining Aquifer Properties** which will state, "These transmissivity values are consistent with those values calculated during the April-May 2008 recovery-drawdown test (Appendix C, ECC 2009)."

5. Was sufficient recovery data collected to evaluate for aquifer parameters as a check on the pump test information? Please note whether any recovery data analysis was attempted during the data evaluation.

   Response: Recovery data was not collected since analysis was not warranted for this study.

6. A certified Maine Geologist must sign and stamp the final copy.

   Response: Agreed, a certified Maine Geologist will sign and stamp the final copy.

Specific Comments:

7. Page 2, Groundwater Elevation Gauging: What were the results of the measurements? Were any unusual changes noted? Please provide a summary conclusion and a plot of the elevation data.

   Response: The pre- pump test water elevations will be added to Figure 5. No unusual changes were noted. A sentence will be added to the end of this paragraph which states, "Groundwater elevations prior to the beginning of the pump tests remained generally constant with changes of less than 0.3 feet recorded over this time period."

8. Page 2, Performance Test, second sentence: Please revise the text to state that eight rather than nine wells were gauged during the pump test.

   Response: The referenced sentence will be revised to read "...and at eight monitoring wells/piezometers during the pumping test (the above plus P-106). In addition, one stream gauge located to the east of EW-05B was gauged during the two pump tests."

9. Page 3, paragraph 3, Performance Test and Figure 5: Please address whether the declines in the stream gauge during the constant-rate test are interpreted to be related solely to decreases from a peak flow (not measured) due to precipitation between the step test and the constant rate test. Please note in the text or in the response.

   Response: Yes, the decline in stream stage during the constant rate test is interpreted to be related solely to decrease from peak flow as a result of the precipitation event from 14 – 16 November 2008. A sentence will be added to the text which will state, "The rise and fall of stream stage levels over the course of the two tests was interpreted to be due the precipitation events of 14 November and 15 – 16 November 2008."

10. Page 4, Determining Aquifer Properties, paragraph #2: "*Although its screen location is at the same elevation as EW-5B...*"

    As noted in the USEPA comments on the work plan for this pump test, the screening of the well in the lower sand unit is more important than the elevation of the screen. In the final summary report please refer to the boring log for EW5B-PZ-03, which notes only a 10 inch layer of sand on top of bedrock. Based on the data that sand unit is not hydraulically well connected to the sands screened by EW-05B.

    Response: The ten inches of sand above bedrock appears to be weathered bedrock and not part of the lower sand unit. The sentence referenced above is considered adequate to convey

the fact that the unit in which EW-05B-PZ-3 is screened is not the same as the unit that was being pumped.

11. Page 4 and 5, Determining Aquifer Properties, paragraph #2 and Attachment A (EW-5B data): "*Also, the Cooper-Jacob analytical solution was used to derive aquifer properties...*"

    The equation noted on page 5 for the time (t_c) when casing storage effects are negligible indicates that after 80 minutes the drawdown is primarily a reflection of the aquifer properties. The Cooper-Jacob solution provided appears to match a portion of the drawdown curve whose slope extends well into the earlier data influenced by the casing effects. The resulting aquifer parameters agree well with the values from the nearby observation wells, but if that timing was considered when the final solution was chosen please address it in the text otherwise address it in the response to comment.

    Response: Please also refer to the straight line fit matching EW-05B drawdown data presented in Attachment B. It is noted that that the Cooper-Jacob solution was used because the Hantush-Jacob method could not be matched to early time data because of the effects of casing storage. It is agreed that the straight line fit does appear to match drawdown data as early as ten minutes into pumping, but not before that. The calculated time (t_c) when casing storage effects are negligible is an estimation. To be conservative, the straight line was matched to drawdown data later than 80 minutes. We believe no change to the text is required.

12. Page 5, Determining Aquifer Properties, paragraph #2 and Attachment A (EW-5B and P-106 data): "*The vertical dashed line shown on the time-drawdown plots...*"

    Please define the "u" term in the text and explain the significance of the 0.05 value, or reference the source document for that value.

    Response: A sentence will be added which will state,

    "The *u* value is defined as:

    $u = 1.87\ r^2S/Tt$,

    Where:

    r = distance from center of pumped well, in feet
    S = coefficient of storage (dimensionless)
    T = coefficient of transmissivity, in gpd/ft
    t = time since pumping started, in days"

13. Page 5, Determining Aquifer Properties, paragraph #2 and Attachment A (P-106 data): Why was the Cooper-Jacob method chosen for P-106 rather than Hantush-Jacob? It also is likely to be a leaky confined well based on the closest boring logs, and the data indicate significant leakage or a boundary condition at about 400 minutes into the test. Were both methods considered? Please note in the text why one method was chosen over the other.

    Response: There was insufficient early time data for curve matching using the Hantush-Jacob solution; therefore, the Cooper-Jacob method was chosen.

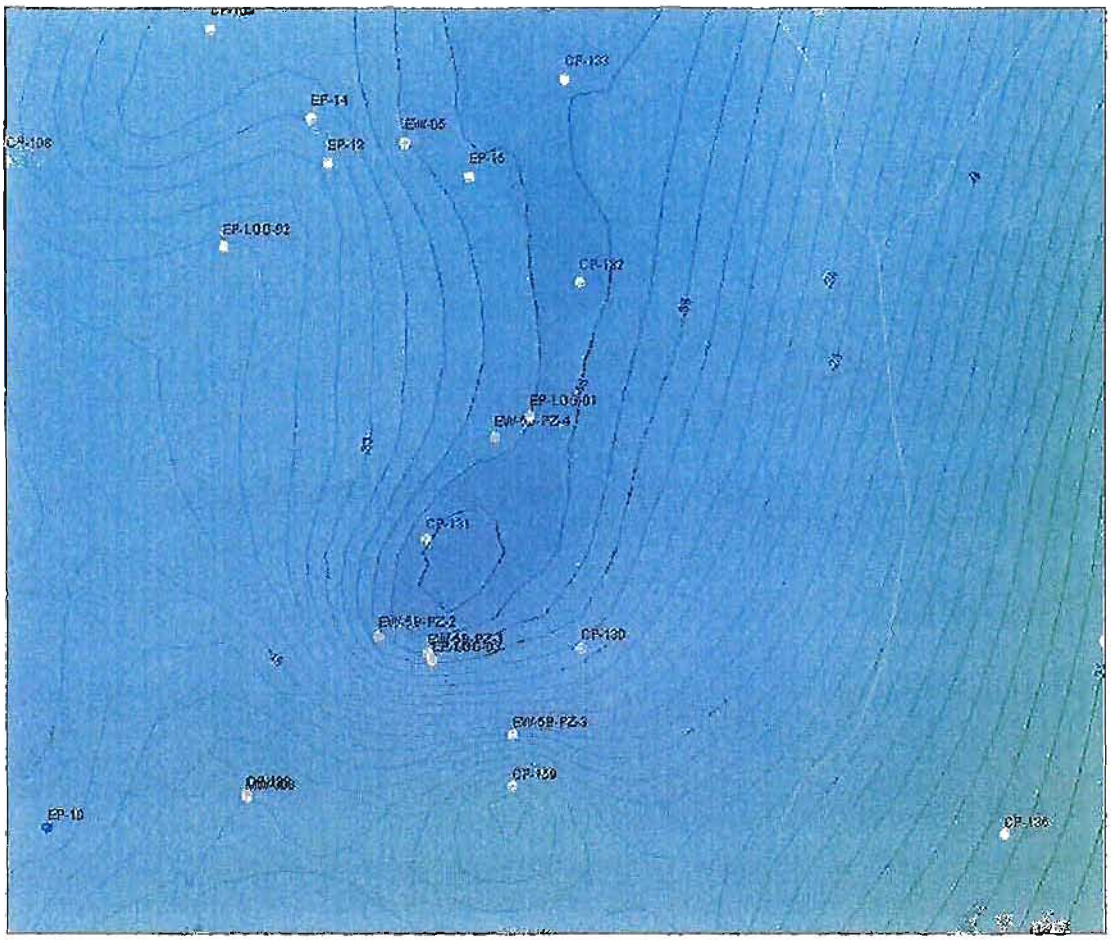
14. Page 5, Determining Aquifer Properties, paragraph #2, Table 3 and Figure 4: "*This could be due to a thickening of the lower sand unit towards the direction of these two peizometers...*"

    The text appears to be incomplete, or missing a comparison of the lower sand extent at EW5B-PZ-04 or EW-5 to EW5B-PZ-01 or EW-5B. Please revise the text as needed to support the statement, possibly by noting that P-106 is outside of the clay depressions mapped by Hager-Richter (and others including ECC in the groundwater modeling) and EW-5A (north of P-106) does appear to have approximately 30 feet of lower sand. The groundwater model recovery test values for P-106 were less than those calculated for this report, transmissivity values were 71 and 101 ft^2/day (versus 193 ft^2/day) and hydraulic conductivity was calculated at 2.3 and 3.3 ft/day (versus 10.75 ft/day). The recovery test values are in the same range as others from the pump test locations, and these values or a reference to the modeling report would be useful in this document.

    Response: The above referenced sentence was meant to state, "*This could be due to a thickening of the lower sand unit towards the direction of these two peizometers as evidenced in the soil boring log for EW-05* [not EW-05B as originally stated in the text] *which has a lower sand thickness of approximately 30 feet*". The text will be revised accordingly. Note that the calculated transmissivity for P-106 from the April-May 2008 recovery test was 100.6 ft^2/day. This value may be more appropriately compared to the calculated transmissivity for EW-05B-PZ-4 which was 100 ft^2/day. The distance between these two points is only about 100 feet. The transmissivity of 193.50 ft^2/day calculated for P-106 from the November 2008 pump test is considered less reliable because of a paucity of drawdown data at this point.

15. Figures 3 and 4: The Figure 4 cross-sections need a plan-view reference for their extent, either as an inset on this figure or on Figure 3. Based on an overlay of the Hager-Richter clay surface topography, EW5B-PZ-04 may lie within the clay depression to the north of the one where the extraction well is located. Conceptually this may help explain why the drawdown at that well is significantly less than at PZ-02. It may also be important if evaluation of EW-5B's capture zone is part of future Eastern Plume optimization. Navy should consider inclusion of a similar figure in the report.

    Response: The cross-section locations will be shown on Figure 3. EW-05B-PZ-4 is within the clay bowl as shown in the graphic below which shows the interpolated top of clay surface from the recently completed groundwater model. That the drawdown is less at PZ-4 than at PZ-2 is primarily due to increased distance from the pumping well, and the varying thickness and geometry of the lower sand.



16. Figure 9: Please revise the plot for PZ-02 to a darker color, the yellow is hard to see on the plot.

Response: Agreed, the plot for EW-05B-PZ-02 will be shown in a darker color.

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JOHN ELIAS BALDACCI
GOVERNOR

DAVID P. LITTELL
COMMISSIONER

June 25, 2009

Mr. Todd Bober
Department of Navy
Base Realignment and Closure
Program Management Office-Northeast
4911 South Broad Street
Philadelphia, PA 19112-1303

Re: Extraction Well 05-B, Performance Testing & Groundwater Sampling
Naval Air Station, Brunswick, Maine

Dear Mr. Bober:

Pursuant to Section VI of the Naval Air Station, Brunswick, Maine Federal Facility Agreement (Oct 1990), as amended, the Maine Department of Environmental Protection (MEDEP) has reviewed the Navy's responses dated June 5, 2009, and email dated June 19, 2009, to MEDEP's comments, dated May 13, 2009, for draft "Summary Report, Performance Testing and Groundwater Sampling, Extraction Well EW-05B", (March 25, 2009), prepared by ECC.

Based on that review, MEDEP has no further comments provided that the proposed revisions and additions are incorporated into the final report along with regulator comments, responses and this letter.

Please contact me at (207) 287-7713 or claudia.b.sait@maine.gov, if you have any questions or comments.

Respectfully,

Claudia Sait

Claudia Sait
Project Manager-Federal Facilities
Bureau of Remediation & Waste Management

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Al Easterday-ECC
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Gina Calderone-ECC
Suzanne Johnson-BASCE
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CONCURRENCE
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ON DRAFT SUMMARY REPORT

From: <Daly.Mike@epamail.epa.gov>
To: "Catherine Guido" <CGuido@ecc.net>
CC: "Al Easterday" <AEasterday@ecc.net>, "Claudia Sait" <Claudia.B.Sait@main...
Date: 5/11/2009 10:33 AM
Subject: Re: NASB Deliverables - Regulator Review Lists
Attachments: pic20083.jpg

Hi Catherine,

Just getting back to you on the deliverables list -

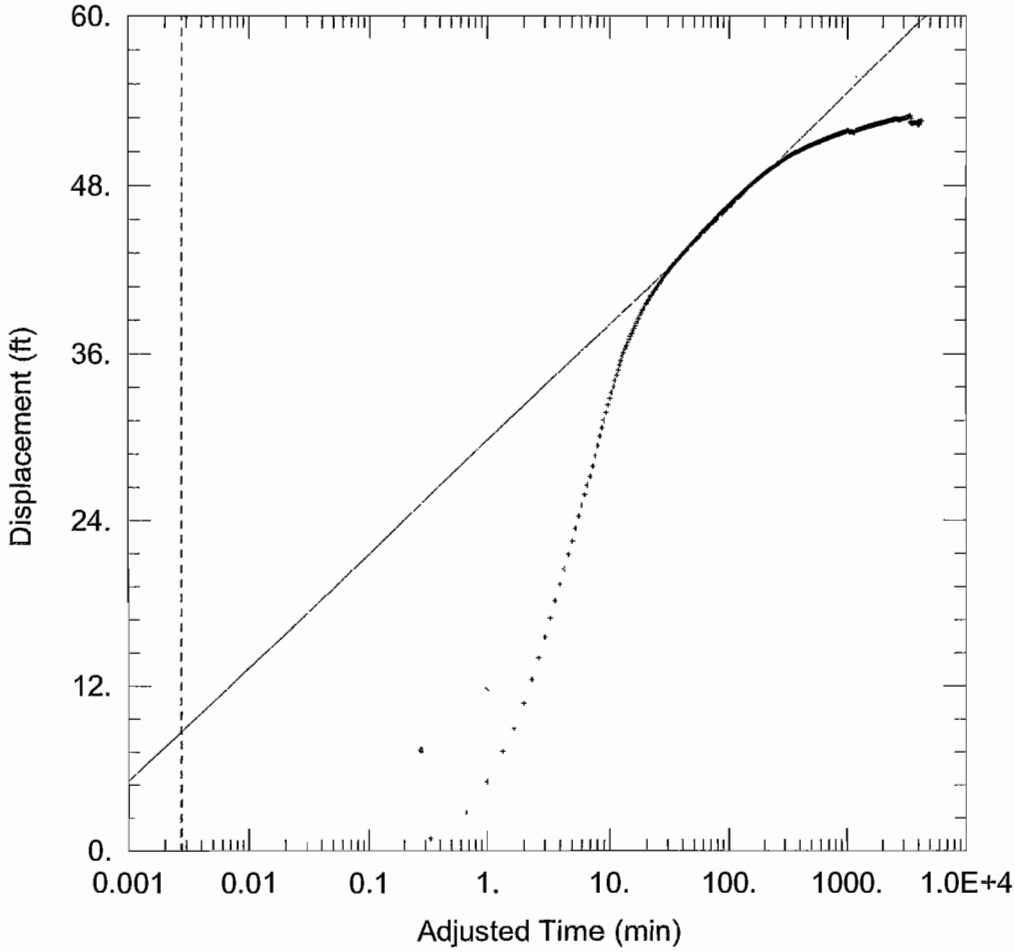
1) EPA has no comments on the pump test summary report
2) I will review the LTMP revisions and get back to you.

Thanks,

Mike

ATTACHMENT B

PERFORMANCE TEST RESULTS



WELL TEST ANALYSIS

Data Set: C:\...\EW-05B_ConstantRateTest.aqt
Date: 03/12/09 Time: 13:04:38

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-05B
Test Date: 17 - 20 Nov 2008

AQUIFER DATA

Saturated Thickness: 18. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-05B	1397339.89	15943662.62

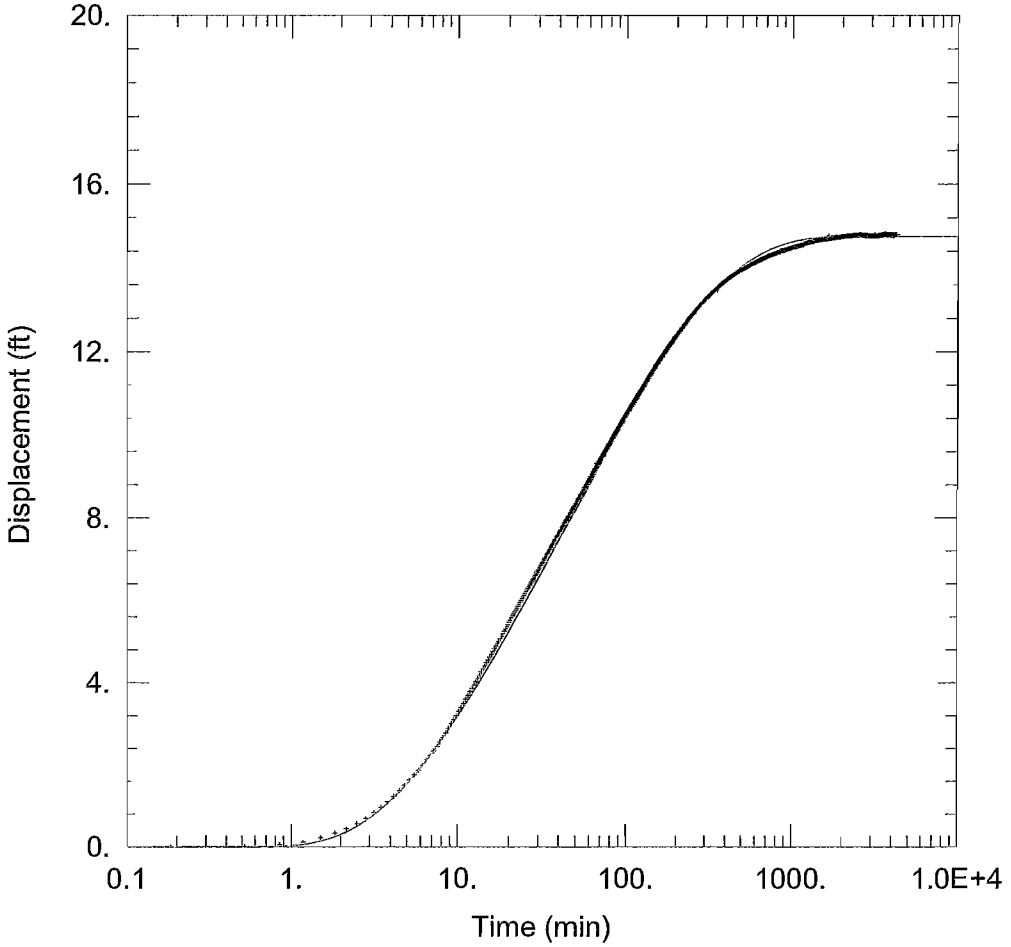
Observation Wells

Well Name	X (ft)	Y (ft)
EW-05B	1397339.89	15943662.62

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 52.05 ft^2/day S = 0.0003195



EW-05B

Data Set: C:\...\EW-05B-PZ-01_ConstantHantuschJacob.aqt
Date: 02/10/09 Time: 13:37:22

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-05B
Test Date: 17 - 20 Nov 2008

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-05B	1397339.89	15943662.62

Observation Wells

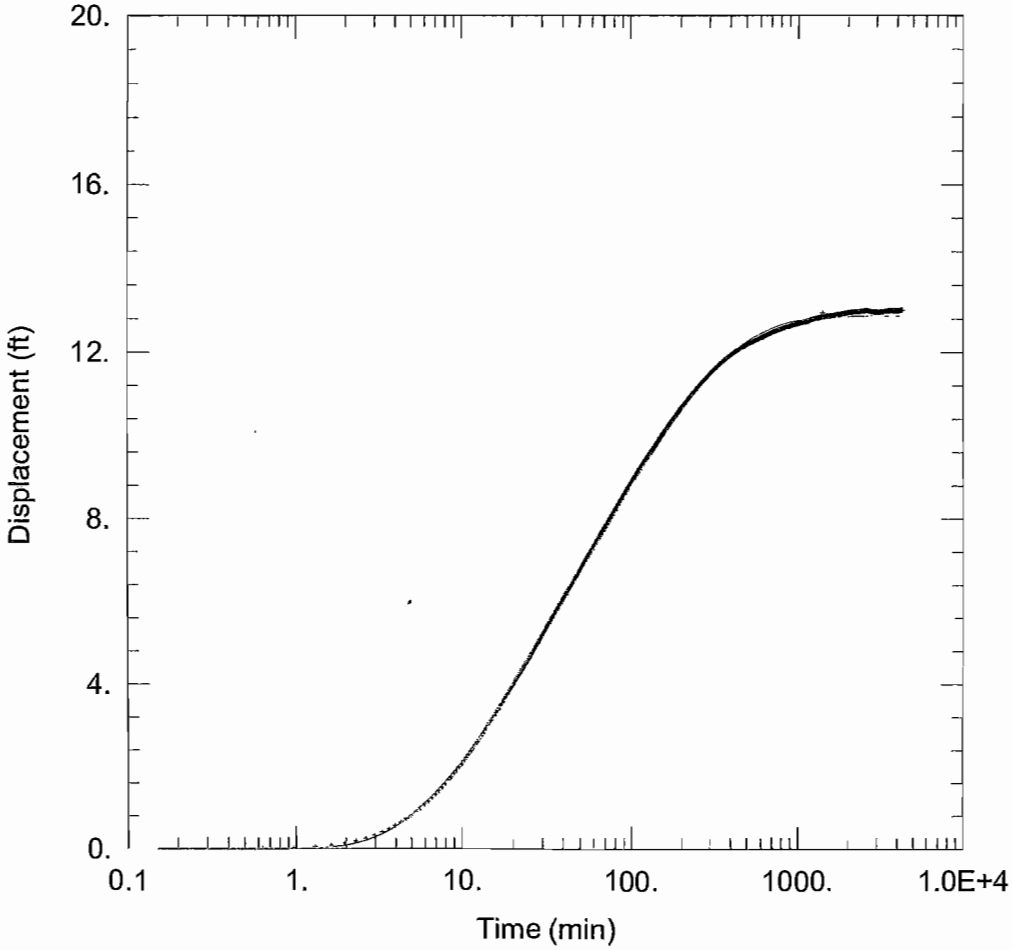
Well Name	X (ft)	Y (ft)
PZ-01	1397351.88	15943679.45

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

T = 48. ft^2/day
r/B = 0.172
b = 18. ft

S = 0.00105
Kz/Kr = 0.1



EW-05B

Data Set: C:\...\EW-05B-PZ-02_ConstantHantuschJacob.aqt
Date: 02/10/09 Time: 13:42:37

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-05B
Test Date: 17 - 20 Nov 2008

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-05B	1397339.89	15943662.62

Observation Wells

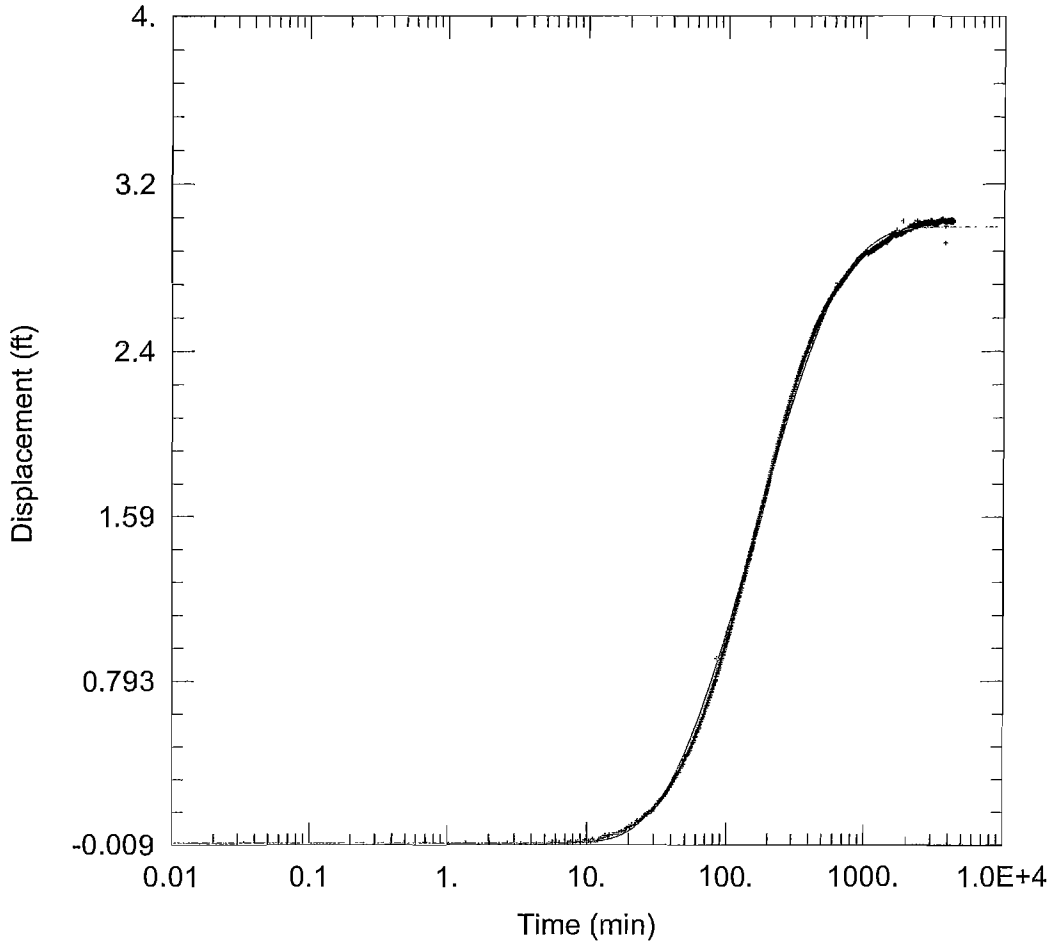
Well Name	X (ft)	Y (ft)
PZ-02	1397303.32	15943697.02

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

T = 48. ft^2/day
r/B = 0.222
b = 18. ft

S = 0.00027
Kz/Kr = 0.1



EW-05B

Data Set: C:\...\EW-05B-PZ-04_ConstantHantuschJacob.aqt
Date: 02/10/09 Time: 13:51:27

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-05B
Test Date: 17 - 20 Nov 2008

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-05B	1397339.89	15943662.62

Observation Wells

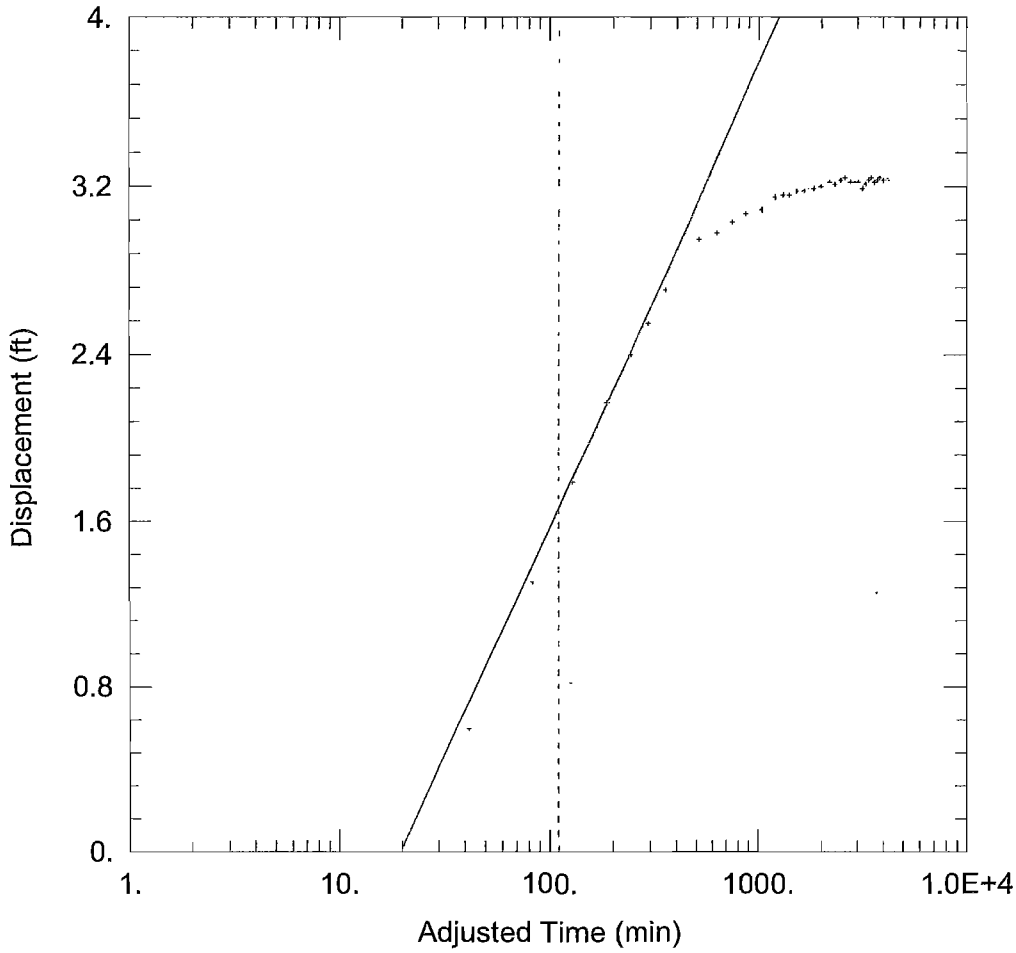
Well Name	X (ft)	Y (ft)
PZ-04	1397420.51	15943902.81

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush-Jacob

T = 100. ft^2/day
r/B = 0.582
b = 18. ft

S = 0.0002
Kz/Kr = 0.1



WELL TEST ANALYSIS

Data Set: C:\...\EW-05B-P-106_ConstantStraightLine.aqt
Date: 03/12/09 Time: 13:08:32

PROJECT INFORMATION

Company: ECC
Client: Navy
Project: 5700.017
Location: NAS Brunswick
Test Well: EW-05B
Test Date: 17 - 20 Nov 2008

AQUIFER DATA

Saturated Thickness: 18. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EW-05B	1397339.89	15943662.62

Observation Wells

Well Name	X (ft)	Y (ft)
P-106	1397370.2	15943990.1

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 193.5 ft^2/day S = 5.522E-5

ATTACHMENT C

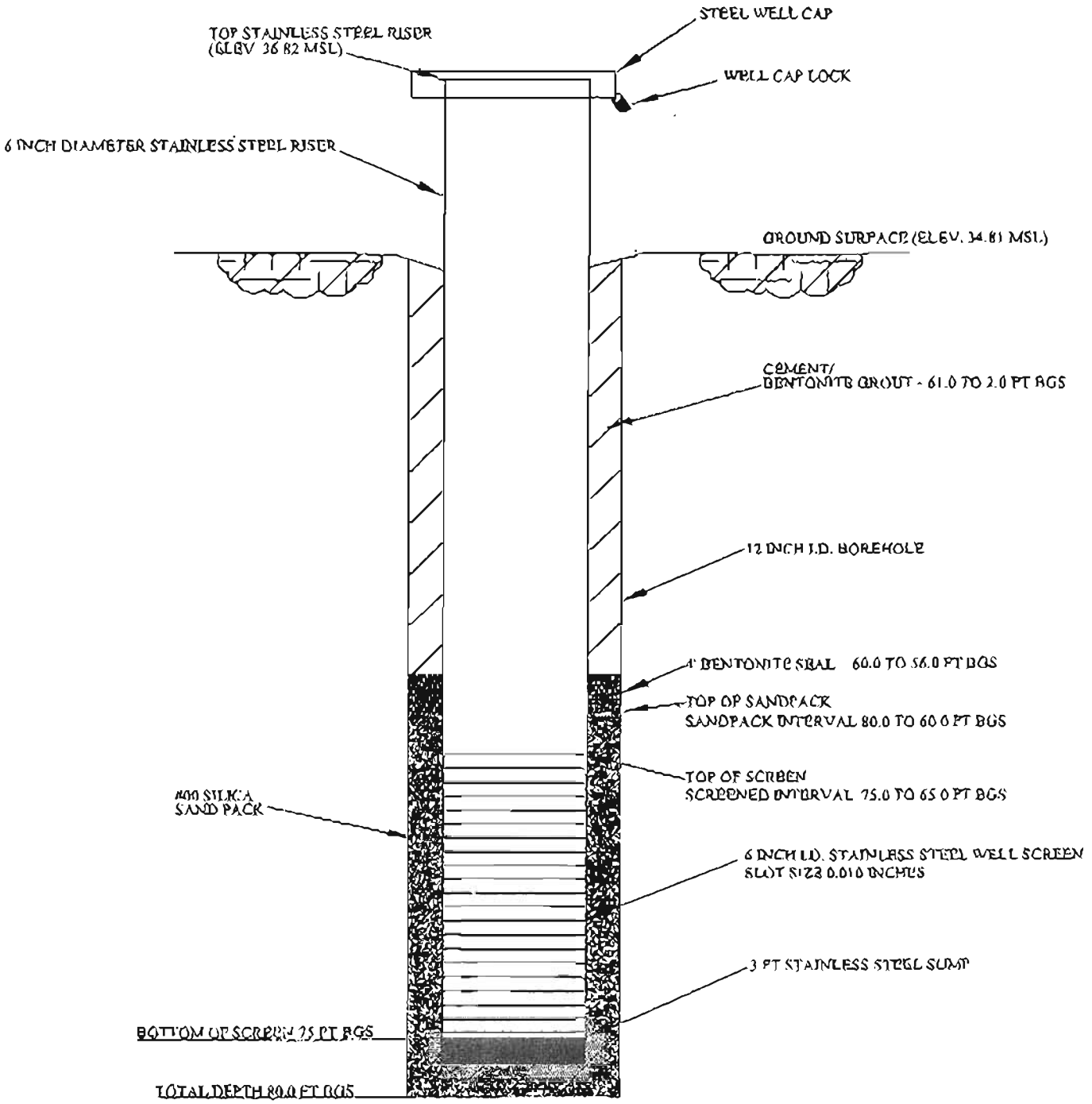
SOIL BORING LOGS AND WELL COMPLETION DIAGRAMS

05-195 Spatial Reference System : UTM/WGS 84/UTM zone 19N
Horizontal Units: METERS
Vertical Units: FEET (NAVD88 & NGVD29)
NOTE: ALL NEGATIVE ELEVATIONS ARE INVALID

BS PT#	Northing	Easting	Elv. NAVD88	Elv. NGVD29	Description
1610	4859617.3167	425939.8389	33.06	33.71	EW-5-B-PZ-3 G
1611	4859617.2864	425939.7928	35.56	36.21	EW-5-B-PZ-3 MTL
1612	4859617.3021	425939.7425	35.46	36.11	EW-5-B-PZ-3 PVC
1613	4859638.0861	425910.0499	36.82	37.47	EW-5-B MTL
1614	4859637.9626	425910.3177	34.81	35.46	EW-5-B G
1615	4859642.9584	425913.8733	34.48	35.13	EW-5-B-PZ-1 G
1616	4859643.1388	425913.6928	36.49	37.14	EW-5-B-PZ-1 MTL
1617	4859643.2143	425913.7036	36.30	36.95	EW-5-B-PZ-1 PVC
1618	4859648.5707	425898.9043	37.46	38.11	EW-5-B-PZ-2 PVC
1619	4859648.4975	425898.9304	37.58	38.23	EW-5-B-PZ-2 MTL
1620	4859648.4212	425899.0211	35.45	36.10	EW-5-B-PZ-2 G
1621	4859711.2986	425934.4978	34.94	35.58	EW-5-B-PZ-4 G
1622	4859711.3252	425934.6118	37.43	38.08	EW-5-B-PZ-4 MTL
1623	4859711.2958	425934.6235	37.26	37.91	EW-5-B-PZ-4 PVC

Survey done by Brian Smith Surveyors
Bowdinham, Maine
Sep-07

G= ground
PVC = top PVC riser
MTL = top metal protective casing



ECC 33 BOSTON POST ROAD WEST SUITE 340 MARLBOROUGH, MA 01752	DRAWN BY: JD APPROVED BY: JG DATE: 6/26/09 SIZE A	EW-05B CONSTRUCTION DIAGRAM EXTRACTION WELL INSTALLATION EASTERN PLUME NASB, BRUNSWICK, ME
		PROJECT CODE: 3700.000 — CONTRACT CODE: TO-07
		SCALE: NTS — FILENAME: EW.DWG — SHEET 1 OF 1 — REV: -

EA Engineering, Science and Technology, Inc.

LOG OF SOIL BORING

Coordinates
Surface Elevation
Well Base Elevation

Job No. 0177101_007	Client: ELI	Location: NASB Bronswick, ME
Drilling Method: Soil Borings Rotosonic Drilling Technique		Boring No. EP-LOG-03
Sampling Method: Soil Core Barrel, continuous from surface		Sheet 1 of 1
Drilling Water Level: Date NP, Time NA		Time: June 22 2005 0730 / Drilling Date/Time / Finish: June 24 2005 1500

Sample Type	Feet Drilled/ Recovered	Depth Boring (ft)	Sample # Depth (ft)	PID (ppm)	Ft bgs	Unit	Surface Conditions: SOIL DESCRIPTION
Rotosonic Core	6.0 / 2.0	1.5		1.5 / 1.0	0	Upper Sand	0.0-0.3 = Dry brn sp silt ORGANIC
				1.0 / 1.0	1		0.3-1.5 = Red fine F SAND
				1.0 / 1.0			1.5-2.0 = LT brn F SAND, trace silt
					2		Continuous 1.0 and 1.5 feet bgs
					3		
					4		
Rotosonic Core	10.0 / 10.0	15.0		1.0 / 1.0	5		5.0-6.0 = LT brn F SAND, trace silt
					6		
					7		
				1.0 / 1.0	8		8.0-10.0 = Red brn F SAND, trace silt
					9		
				1.0 / 1.0	10		10.0-11.0 = LT brn F SAND, trace silt
					11		
					12		
				1.0 / 1.0	13		
				1.5 / 1.0	14		14.0-15.0 = Gray SILT, trace sand; 15.0-16.0 = LT brn F SAND, trace silt
Rotosonic Core	10.0 / 10.0	20.0		1.0 / 0.0	15		15.0-16.0 = LT brn F SAND, trace silt
					16		
					17		
				0.0 / 0.0	18		17.0-18.0 = Gray SILT, trace sand; 18.0-19.0 = Red brn F SAND, trace silt
					19		19.0-20.0 = LT brn SAND, trace silt; 20.0-21.0 = Red brn F SAND, trace silt
				0.1 / 0.1	20		
					21		
					22		22.0-23.0 = LT brn to red to gray silt, 1 in 4 sand laminations
				0.1 / 0.1	23		23.0-24.0 = Gray brn F SAND, trace silt; 24.0-25.0 = LT brn to red to gray silt, 1 in 4 sand laminations
				0.2 / 0.2	24		24.0-25.0 = Gray SILT, trace sand, trace silt

Logged by: C. Springer
Drilling Contractor: UL Mallow, North Reading MA
Date: 23 June 2005
Driller: C. Mallow

EA Engineering, Science, and Technology, Inc

LOG OF SOIL BORING

Coordinates:
Surface Elevation:
Well Riser Elevation:

Job No	Client:	Location:
5177102 1002	FCC	NASB Brunswick, ME

Drilling Method:
Soil Borings
Rotosonic Drilling Technique
Sampling Method:
20' Core Barrel, continuous from surface

Boring No.
EP-LOG-03

Sheet 2 of 5

Drilling Water Level			
Date	NA		
Time	NA		

Start	Drilling Date/Time	Finish
June 23 2005		June 22 2005
0730		1100

Surface Conditions:

Sample Type	Feet Driven/R. Record	Depth Boring (ft)	Samp # / depth (ft)	PID / FID (ppm)	Ft bgs	GW Sample Interval	SOIL DESCRIPTION
Sonic Core	10.0 7.0	35.0			25	Transition	
					26		
					27		
					28		
					29		
					30		
					31		
					32		
					33		33.8-35.0 = Gray CLAY
					34		
Sonic Core	20.0 13.5	65.0		0.0 0.0	35		35.0-39.0 = Gray CLAY
					36		
					37		
					38		
					39		39.8-44.1 = Gray F SAND, some clay, fill silt (interbedded silt lenses 0.5" to 2.0" thick) (wet)
					40		
					41		GW-01 - 41.0 TO 45.0
					42		GW-41 SAMPLE RATIONALE: WATER BEARING SANDY INTERVAL IN THE LOWER TRANSITION.
					43		
					44		
					45		
					46		
					47		
					48		
					49		

Logged by: C. Springer
Drilling Contractor: DL Maher, North Reading MA
Date: 23 June 2005
Driller: C. Huther

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Coordinates:
Surface Elevation:
Well Riser Elevation:

Job No. 6177102.1002	Client: ECC	Location: NASB Brunswick, ME
Drilling Method: Soil Borings; Rotasonic Drilling Technique; Sampling Method: 20' Core Barrel, continuous from surface		Boring No. EP-LOG-03
Drilling Water Level: Date NA; Time NA		Sheet 3 of 5
Start: June 23 2005 0730	Drilling Date/Times	Finish: June 22 2005 1100

Sample Type	Feet Driven/Rec. Recvrd	Depth Boring (ft)	Sample Depth (ft)	PID / FID (ppm)	Ft bgs	GW Sample Interval	Surface Conditions: SOIL DESCRIPTION
					50	Transition	GW-01 - 50.0 TO 54.0
					51		GW-01 SAMPLE RATIONALE: WATER BEARING SANDY INTERVAL IN THE LOWER TRANSITION. THE FORMATION AT THIS INTERVAL IS INTERPRETED TO BE A LOW YIELD ZONE.
					52		
					53		
					54		
Sonic Core	13.0 6.0	70.0		0.0 0.0	55	Lower Sand	55.0-60.0 = LT brn F SAND, trace silt (wet)
					56		
					57		GW-01 - 55.0 TO 59.0 GW-01 SAMPLE RATIONALE: WATER BEARING INTERVAL IN UPPER PORTION OF LOWER SAND.
					58		
					59		
					60		
					61		
					62		
					63		GW-01 - 61.0 TO 66.0
					64		GW-01 SAMPLE RATIONALE: WATER BEARING INTERVAL IN LOWER PORTION OF LOWER SAND. THE FORMATION AT THIS INTERVAL IS INTERPRETED TO BE A LOW YIELD ZONE.
					65		
					66		
					67		
					68		
					69		
Sonic Core	20.0 12.0	90.0		1.0 3.0	70		70.0-71.0 = Gray F SAND, some clay
					71		GW-03 - 69.0 to 73.0 GW-03 SAMPLE RATIONALE: WATER BEARING INTERVAL AT BASE OF LOWER SAND
					72		
				0.0 0.0	73	Clay	73.0-82.0 = Gray CLAY
					74		

Logged by: C. Springer
Drilling Contractor: Dr. Meher, North Reading MA
Date: 23 June 2005
Driller: C. Huther

EA Engineering, Science, and Technology, Inc.

LOG OF SOIL BORING

Coordinates:
Surface Elevation:
Well Rotor Elevation:

Job. No. 8177100 1007	Client: CCC	Location: NASB Brunswick, ME
Drilling Method:		Boring No. EP-LOG-03
Soil Borings		
Relocatable Drilling Technique		
Sampling Method:		
20' Core Barrel continuous from surface		Sheet 4 of 5
Drilling Water Level		Start June 23 2005 0730 / Drilling Date/Time: / Finish June 22 2005 1100
Date MA		
Time MA		

Surface Conditions:

Sample Type	Feet Driven/ft Recovered	Depth Boring (ft)	Sample Depth (ft)	PID / FID (ppm)	Ft Bgs	GW Sample Interval	SOIL DESCRIPTION
					75	Clay	
					76		
					77		
					78		
					79		
					80		
					81		
					82		
					83		
					84		
					85		
					86		
					87		
					88		
					89		
Sonic Core	10.0 8.0	100.0			90		90.0-88.0 = Gray CLAY
					91		
					92		
					93		
					94		
					95		
					96		
					97		
					98		
					99		

Logged by: C. Sponger
Drilling Contractor: DL Maher, North Reading MA
Date: 23 June 2005
Driller: C. Huber

EA Engineering, Science, and Technology, Inc

LOG OF SOIL BORING

Coordinates:
Surface Elevation:
Well Riser Elevation:

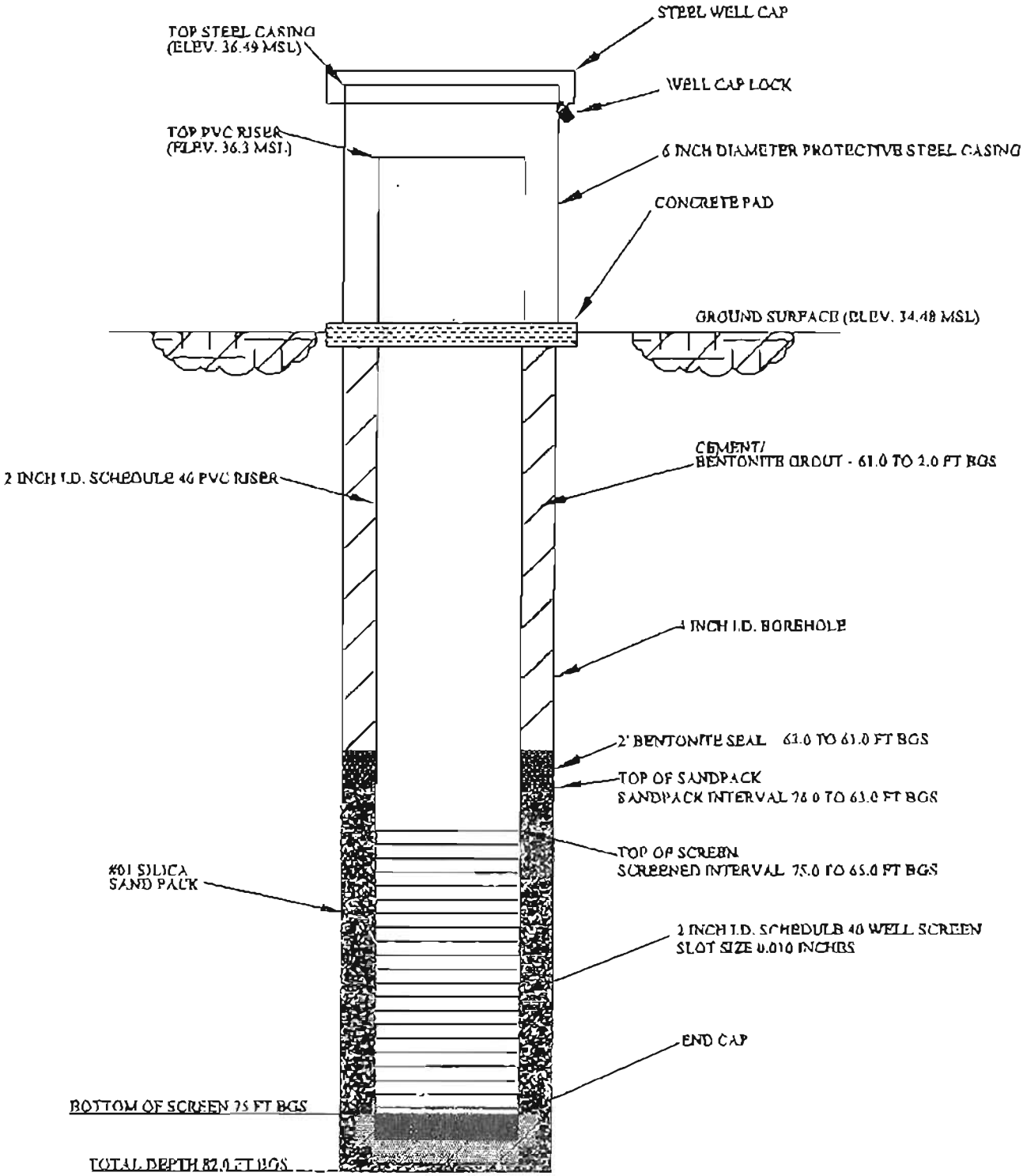
Job. No. 8127182 1002	Client: ECC	Location: NASB Brunswick, ME
Drilling Method: Soil Borings; Rotosonic Drilling Technique		Boring No. EP-LOG-03
Sampling Method: 20' Core Barrel, continuous from surface		Sheet 5 of 5
Drilling Water Level		
Date	NA	
Time	NA	

Start	Drilling Date/Times	Finish
June 23 2005		June 22 2005
0730		1100

Surface Conditions:

Sample Type	Feet Driven/Ft Recovered	Depth Boring (ft)	Sample / depth (ft)	PID / FID (ppm)	Ft bgs	GW Sample Interval	SOIL DESCRIPTION
Sonic Core	10.0 10.0	110.0			100	Clay	100.0-109.2 = Grey CLAY
					101		
					102		
					103		
					104		
					105		
					106		
					107		
					108		
					109		109.2-109.8 = Grey M SAND, ft S to M gravel
					110	Rock	109.8-110 = Weathered ROCK
					111		
					112		End of Boring at 110.0 feet
					113		
					114		
					115		
					116		
					117		
					118		
					119		
					120		
					121		
					122		
					123		
					124		

Logged by: C. Springer
Drilling Contractor: DL Maher, North Reading MA
Date: 23 June 2005
Driller: C. Huther



ECC 33 BOSTON POST ROAD WEST-SUITE 110 MARLBOROUGH, MA 01752	DRAWN BY: JD APPROVED BY: JD DATE: 6/26/09 SIZE: A	EW-05B-PZ-1 CONSTRUCTION DIAGRAM PIEZOMETER INSTALLATION EASTERN PLUME NASB, BRUNSWICK, MC
		PROJECT CODE: 3760.800 — CONTRACT CODE: TO-07
		SCALE: NTS — FILENAME: PZ.DWG — SHEET: 1 OF 1 — REV: -

Environmental Chemical Corporation

LOG OF SOIL BORING

Coordinates: X-485843.21, Y-425813.70
Surface Elevation: 34.48
Casing Below Surface:
Reference Elevation: 36.30
Reference Description: Top PVC Riser

Job. No 5700.007	Client NAVFAC	Location: EW-05B - NASB Eastern Plume	
Drilling Method: Drive and Wash - 4" Casing		Boring No. EW-05B PZ-1	
Sampling Method: 2 in. dia. 2 ft Split Spoon, 140 lb drop weight		Sheet 1 of 5	
		Drilling	
Water Lev.		Start	Finish
Time		1-Aug-07	2-Aug-07
Date			
Reference			

Surface Conditions: Grass

Digital Picture #	Sample Type	In. Drvn / In. Record	Depth. Deg.	Samp. # / Samp depth	PID (ppm)	Blows per 6 in.	Depth (feet)	USCS Log	
	SS	24/22	0		0	5	0		
						5			Top 10" brn SILT tr f-sand
						4	1		Bot 12" lt brn f-SAND, damp
						5			
	SS	24/18	0		0	4	2		
						5			Lt brn f-SAND, tr silt, damp
						6	3		
						8			
	SS	24/22	0		0	8	4		
						8			Lt brn f-SAND, tr silt, damp
						8	5		
						9			
	SS	24/20	0		0	9	6		
						8			Lt brn f-SAND, tr silt
						9	7		Bot 13" red laminations, damp
						10			
	SS	24/22	8		0	10	8		
						10			Lt brn f-SAND, top 11" moist
						10	9		Bot 11" wet - brn/gry f-SAND, red laminations, bits of mica
						10			
	SS	24/14	8		0	10	10		
						10			Brn/gry f-SAND, tr silt - wet
						12	11		Red mottling
						11			
	SS	24/11	12		0	8	12		
						12			Brn/gry f-SAND, tr silt - wet
						14	13		Bot 2" reddish f-SAND
						16			
	SS	24/14	14		0	9	14		
						9			Brn/gry f-SAND, tr silt
						13	15		2" layer reddish f-SAND at 16' 5" - wet
						14			
	SS	24/18	14		0	8	16		
						9			Brn/gry f-SAND, tr silt
						11	17		reddish f-SAND laminations at 17'
						13			
	SS	24/15	18		0	7	18		
						11			Top 3" brn/gry f-SAND, tr silt
						15	19		3" layer gry SILT, tr clay
						18			Bot 9" gry/brn SILT, tr f-sand - wet

Logged by: J. Donovan
Drilling Contractor: East Coast Explorations
Date: 1-Aug-07
Driller: C. Palmer
WOR = Weight of Rods
WOH = Weight of Hammer

WELL SPECIFICATIONS:

Diam. of casing:	4"	Screen Interval:	65-75 ft	Sandpack:	76-63 ft	Grout:	61-2 ft
BOH:	82 ft	Riser Interval:	65-0 ft	Bentonite:	63-61 ft	Cover:	Conc. Pad, Stick up

Environmental Chemical Corporation

LOG OF SOIL BORING

Coordinates:	X-4859643.21, Y-425913.70
Surface Elevation:	34.48
Casing Below Surface:	
Reference Elevation:	36.30
Reference Description:	Top PVC Riser

Job No. 5700.007	Client NAVFAC	Location EW-05B - NASB Eastern Plume
Drilling Method: Drive and Wash - 4" Casing		Boring No. EW-05B PZ-1
Sampling Method: 2 in. dia. 2 ft Split Spoon, 140 lb drop weight		Sheet 2 of 6
		Drilling

Water Lev.					Start	Finish
Time					1-Aug-07	2 Aug-07
Date						
Reference						

Surface Conditions: Grass

Digital Picture #	Sample Type	In. Drvn / In. Recvrd	Dpth Csg	Samp # / Samp. depth	PID (ppm)	Blows per 6 in.	Depth (feet)	USCS Log	
	SS	24/18	18		0	8	20		
						9			Gry/bry SILT, tr gry f-sand, tr clay
						21	21		Lt red mottling - wet
						18			Bott 4" red/brn f-SAND
	SS	24/18	18		0	7	22		
						8			Top 3" red/brn f-SAND, 2" layer gry silty clay
						9	23		Bott 10" gry/brn f-SAND, tr silt, mottled - wet
						12			
	SS	24/15	24		0	5	24		
						12			Top 6" gry SILT, tr clay, tr f-sand
						10	25		Bott 9" gry f-SAND, some mottling - wet
						10			
	SS	24/18	24		0	5	26		
						6			Top 10" gry f-SAND, tr silt
						7	27		Bott 6" gry silty CLAY, tr f-sand - wet
						9			
	SS	24/18	24		0	6	28		
						2			Top 5" brn silty CLAY, tr f-sand
						2	29		Bott 13" gry CLAY, tr silt - wet
						1			
	SS	24/18	24		0	4	30		
						1			Gry clayey SILT, tr gry f-sand, soft - wet
						1	31		
						1			
	SS	24/23	29		0	WOR	32		
						WOR			Gry CLAY, soft - wet
						WOR	33		
						WOR			
	SS	24/24	29		0	WOR	34		
						WOR			Gry CLAY, soft - wet
						WOH	35		Bott 3" tr gry f-sand
						WOH			
	SS	24/22	34		0	WOH	36		
						WOH			Gry silty CLAY, soft - wet
						WOH	37		
						WOH			
	SS	24/24	34		0	WOR	38		
						WOR			Gry silty CLAY, tr f-gry sand, soft - wet
						WOR	39		
						WOH			

Logged by: J. Donovan Date: 1-Aug-07

Drilling Contractor: East Coast Explorations Driller: C. Palmer

WELL SPECIFICATIONS:

Diam. of casing:	4"	Screen Interval:	65-75 ft	Sandpack:	76-63 ft	Grout:	61-2 ft
BOH:	82 ft	Riser Interval:	65-0 ft	Bentonite:	63-61 ft	Cover:	Conc. Pad, Stick up

Environmental Chemical Corporation

LOG OF SOIL BORING

Coordinates: X-1658843.21, Y-425913.70
Surface Elevation: 94.48
Casing Below Surface:
Reference Elevation: 96.30
Reference Description: Top PVC Riser

Job No 5700.007 | Client NAVFAC | Location: EW-05B - NASB Eastern Plume
Drilling Method: Drive and Wash - 4" Casing | Boring No. EW-05B PZ-1
Sampling Method: 2 in dia 2 ft Split Spoon, 140 lb drop weight | Sheet 3 of 5
Drilling

Water Lev.				
Time				
Date				
Reference				

Start	Finish
1-Aug-07	2-Aug-07

Surface Conditions: Grass

Digital Picture #	Sample Type	In Drvn / In Recvd	Drill. Csg.	Samp. # / Samp depth	PID (ppm)	Blows per 6 in	Depth (feet)	USCS Log	
	SS	24/24	39		0	WOH	40		
						WOH			Gry silty CLAY, tr f-gry sand, soft - wet
						WOH	41		
						WOH			
	SS	24/24	39		0	WOR	42		2-Aug-07
						WOR			Gry silty CLAY
						WOH	43		8" layer w/tr gry f-sand at 43' 2" - soft, wet
						WOH			
	SS	24/24	44		0	WOR	44		
						1			Gry silty CLAY, bott 8" tr gry f-sand, soft - wet
						2	45		
						2			
	SS	24/24	44		0	1	46		
						WOH			Gry silty CLAY,
						1	47		4" layer w/tr gry f-sand at 47', soft - wet
						1			
	SS	24/24	44		0	WOH	48		
						1			Gry silty CLAY
						4	49		Top 8" tr gry f-sand, soft - wet
						3			
	SS	24/22	49		0	WOR	50		
						WOH			Gry silty CLAY,
						WOH	51		Bott 4" tr gry f-sand, soft - wet
						3			
	SS	24/23	49		0	WOR	52		
						WOR			Gry silty CLAY, soft - wet
						WOH	53		
						WOH			
	SS	24/24	54		0	5	54		
						3			Gry f-SAND, tr silt
						2	55		Bott 3" gry SILT, some f-sand - wet
						1			
	SS	24/24	54		0	WOR	56		
						WOR			Top 11" gry f-SAND, tr silt
						2	57		12" layer gry SILT, some clay, soft
						10			Bott 2" gry f-SAND, tr silt - wet
	SS	24/24	54		0	6	58		
						1			Gry f-SAND, little med sand
						1	59		Bott 10" gry SILT, little clay, soft - wet
						7			

Logged by: J. Donovan | Date: 1-Aug-07
Drilling Contractor: East Coast Explorations | Driller: C Palmer

WELL SPECIFICATIONS:

Diam. of casing: 4" | Screen Interval: 65-75 ft | Sandpack: 76-63 ft | Grout: 61-2 ft
BOH: 82 ft | Riser Interval: 85-0 ft | Bentonite: 63-61 ft | Cover: Conc Pad, Stick up

Environmental Chemical Corporation

LOG OF SOIL BORING

Coordinates: X-4859843.21, Y-4259913.70
Surface Elevation: 34.38
Casing Below Surface:
Reference Elevation: 35.30
Reference Description: Top PVC Riser

Job. No. 5700.007 | Client: NAVFAC | Location: EW-058 - NASB Eastern Plume

Drilling Method: Drive and Wash - 4" Casing | Boring No. EW-058 PZ-1

Sampling Method: 2 in. dia. 2 ft Split Spoon, 140 lb drop weight | Sheet 4 of 5

Drilling

Water Lev.					Start	Finish
Time					1-Aug-07	2-Aug-07
Date						
Reference						

Surface Conditions: Grass

Digital Picture #	Sample Type	In Drvn / In Recvd	Depth Csg	Samp. # / Samp. depth	PID (ppm)	Blows per 6 in.	Depth (feet)	USCS Log	
	SS	24/22	59		0	WOR	60		
						2			Top 8" gry f-med SAND, 9" layer gry silt, some gry f-sand
						3	61		Bott 6" gry SILT, tr gry f-sand - wet
						2			
	SS	24/24	69		0	WOR	62		
						WOR			Gry silty CLAY, tr gry f-sand bott 4", soft - wet
						WOR	63		
						4			
	SS	24/20	64		0	2	64		
						7			Top 8" gry silty CLAY, little gry f-sand, 8" layer gry f-med SAND - wet
						6	65		Bott 3" gry silty CLAY, little gry f-sand
						7			
	SS	24/24	64		0	WOR	66		
						2			Top 6" gry f-med SAND, 4" layer gry silty CLAY, tr gry f-sand
						3	67		Bott 14" lt brn f-SAND, tr silt, some mottling - wet
						8			
	SS	24/14	64		0	WOR	68		
						8			Lt brn f-SAND, tr silt, some mottling - wet
						14	69		
						16			
	SS	24/21	69		0	2	70		
						7			Lt brn f-SAND, tr silt, some mottling - wet
						21	71		
						24			
	SS	24/15	69		0	7	72		
						12			Lt brn/gry f-SAND, little red mottling - wet
						16	73		Bott 4" gry CLAY, tr brn f-sand
						16			
	SS	24/11	74		0	WOR	74		
						WOR			Gry f-med SAND, tr clay - wet
						WOH	75		Bott 1" gry CLAY, tr gry f-sand
						2			
	SS	24/11	76		0	WOR	76		
						WOR			Gry f-SAND - wet
						1	77		
						2			
	SS	24/13	78		0	WOR	78		
						3			Gry f-SAND - wet
						5	79		
						7			

Logged by: J. Donovan | Date: 1-Aug-07
Drilling Contractor: East Coast Explorations | Driller: C. Palmer

WELL SPECIFICATIONS:

Diam. of casing: 4" | Screen Interval: 65-75 ft | Sandpack: 76-83 ft | Grout: 61-2 ft
BOH: 82 ft | Riser Interval: 65-0 ft | Bentonite: 63-61 ft | Cover: Conc. Pad, Stick up

Environmental Chemical Corporation

LOG OF SOIL BORING

Coordinates: X-1865843.21, Y-425913.70
Surface Elevation: 34.28
Casing Below Surface:
Reference Elevation: 36.20
Reference Description: Top PVC Riser

Job. No. 3700.007	Client NAVFAC
Location EW-05B - NASB Eastern Plume	
Drilling Method: Drive and Wash - 4" Casing	Boring No. EW-05B PZ-1
Sampling Method: 2 in. dia. 2 ft Split Spoon, 140 lb drop weight	Sheet 6 of 5
	Drilling

Water Lev.					Start	Finish
Time					1-Aug-07	2-Aug-07
Date						
Reference						

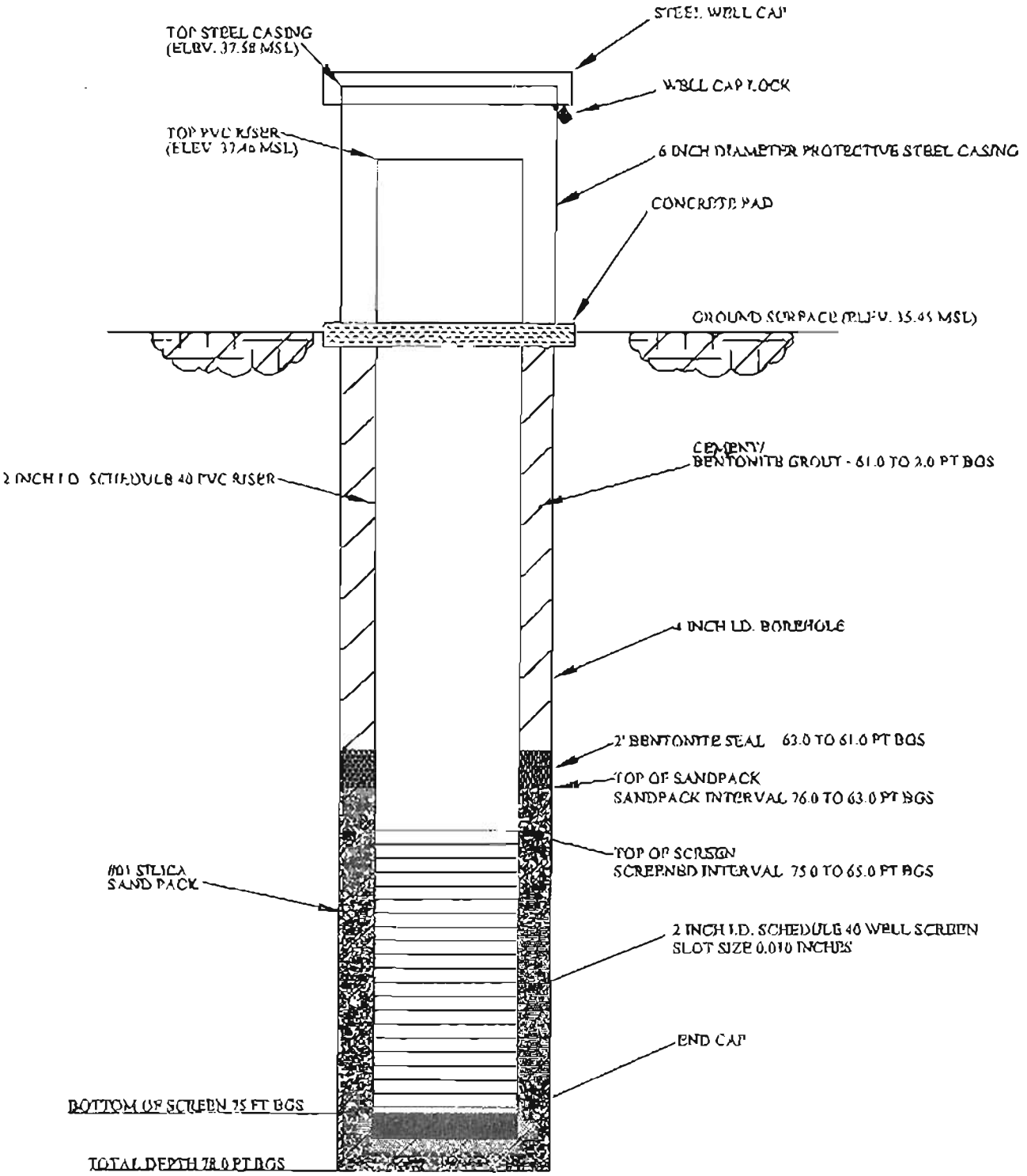
Surface Conditions: Grass

Digital Picture #	Sample Type	In Drive / In Recovery	Depth Csg	Samp # / Samp. Depth	PID (ppm)	Blows per 6 in.	Depth (feet)	USCS Log	
	SS	24/18	79		0	1	80		
						4			Gry CLAY - wet
						7	81		
						12			
							82		End of boring at 82 ft.
							83		
							84		
							85		
							86		
							87		
							88		
							89		
							90		
							91		
							92		
							93		
							94		
							95		
							96		
							97		
							98		
							99		

Logged by: J. Donovan
Date: 1-Aug-07
Drilling Contractor: East Coast Explorations
Driller: C. Palmer

WELL SPECIFICATIONS:

Diam. of casing: 4"
Screen Interval: 65-75 ft
Sandpack: 76-63 ft
Grout: 61-2 ft
BOH: 82 ft
Riser Interval: 65-0 ft
Bentonite: 63-61 ft
Cover: Conc. Pad, Stick up



ECC 33 BOSTON POST ROAD WEST-SUITE 340 MARLBOROUGH, MA 01752	DRAWN BY: JD APPROVED BY: JG DATE: 6/26/03 SIZE: A	EW-05D-P2-2 CONSTRUCTION DIAGRAM PIEZOMETER INSTALLATION EASTERN PLUME NASH, BRUNSWICK, ME
		PROJECT CODE: 1700.000 / CONTRACT CODE: TO-09
		SCALE: NTS / FILENAME: P2.DWG / SHEET: 1 OF 1 / REV: -

Environmental Chemical Corporation

LOG OF SOIL BORING

Coordinates:	X-4859048.57, Y-425898.90
Surface Elevation:	35.45
Casing Below Surface:	
Reference Elevation:	37.48
Reference Description:	Top PVC Riser

Job. No. 5700.007	Client NAVFAC	Location: EW-05B - NASB Eastern Plume
Drilling Method: Drive and Wash - 4" Casing		Boring No. EW-05B PZ-2
Sampling Method: 2 in. dia. 2 ft Split Spoon, 140 lb drop weight		Sheet 1 of 4
		Drilling

Water Lev					Start	Finish
Time					3-Aug-07	8-Aug-07
Date						
Reference						

Surface Conditions: Grass

Digital Picture #	Sample Type	In. Drvn / In. Recvrd	Depth Csg	Samp. # / Samp depth	PID (ppm)	Blows per 6 in	Depth (feet)	USCS Log	
	SS	24/19	0		0	3	0		
						4			Top 8" brn SILT little f-sand
						4	1		Bott 11" lt brn f-SAND, damp
						5			
	SS	24/17	0		0	4	2		
						6			Lt brn f-SAND, tr silt, damp
						5	3		Bott 4" red mottling
						8			
	SS	24/18	0		0	7	4		
						7			Lt brn f-SAND, damp
						7	5		
						8			
	SS	24/18	0		0	7	6		
						7			Lt brn f-SAND, damp
						9	7		
						16			
	SS	24/21	0		0	12	8		
						10			Lt brn f-SAND, damp
						10	9		
						9			
	SS	24/18	9		0	4	10		
						7			Brn f-med SAND, little red mottling - wet
						8	11		
						7			
	SS	24/13	9		0	5	12		
						5			Brn f-SAND, red laminations - wet
						8	13		
						12			
	SS	24/18	14		0	4	14		
						6			Top 11" brn f-SAND
						8	15		Bott 7" f-med brn SAND - wet
						7			
	SS	24/10	14		0	7	16		
						8			Brn f-SAND, red laminations to bott 2" - wet
						9	17		
						10			
	SS	24/15	14		0	7	18		
						14			Top 6" brn f-med SAND, 4" layer brn/red SILT, tr f-sand
						14	19		Bott 5" red f-med SAND, tr silt - wet
						17			

Logged by: J. Donovan
Date: 3-Aug-07
WOR = Weight of Rods
Drilling Contractor: East Coast Explorations
Driller: C. Palmer
WOH = Weight of Hammer

WELL SPECIFICATIONS

Diam. of casing:	4"	Screen Interval:	65-75 ft	Sandpack:	76-63 ft	Grout:	51-2 ft
BOH:	78 ft	Riser Interval:	65-0 ft	Bentonite:	63-61 ft	Cover:	Conc. Pad, Stick up

Environmental Chemical Corporation

LOG OF SOIL BORING

Coordinates: X-485968.57, Y-428898.90
Surface Elevation: 35.45
Casing Below Surface
Reference Elevation: 37.46
Reference Description: Top PVC Riser

Job No. 5700.007 | Client NAVFAC | Location: EVJ-05B - NASB Eastern Plume
Drilling Method: Drive and Wash, 4" Casing | Boring No. EVJ-05B PZ-2
Sampling Method: 2 in. dia., 2 ft Split Spoon, 140 lb drop weight | Sheet 2 of 4
Drilling
Water Lev. | Start 3 Aug-07 | Finish 8 Aug-07
Time
Date
Reference

Digital Picture #	Sample Type	In Drvn / In Recvd	Depth Csg	Samp. # / Samp depth	PID (ppm)	Blows per 6 in.	Depth (feet)	USCS Log	Surface Conditions: Grass
	SS	24/12	18		0	5	20		
						7			Top 3" brn f-SAND, tr silt
						11	21		Bott 9" brn SILT, tr f-sand, little red mottling - wet
						12			
	SS	24/18	19		0	3	22		
						11			Top 7" brn SILT, tr f-sand, mottled
						12	23		Bott 9" brn f-SAND, red laminations - wet
						13			
	SS	24/18	24		0	9	24		Top 8" brn f-SAND, mottled
						15			3" layer banded silt, tr f-sand
						26	25		Bott 6" brn f-SAND, mottled - wet
						25			
	SS	24/17	24		0	12	26		
						12			Top 9" brn f-SAND, red laminations, 5" layer banded SILT, tr f-SAND
						15	27		Bott 2" gry SILT, tr f-sand - wet
						18			
	SS	24/15	24		0	5	28		
						4			Top 7" gry f-SAND tr gry silt
						2	29		Bott 8" gry silty CLAY, soft - wet
						3			
	SS	24/17	29		0	WOR	30		
						4			Top 8" gry silty CLAY, soft. 6" layer gry SILT, tr clay, tr gry f-sand, soft - wet
						3	31		Bott 7" gry clayey SILT - wet
						1			
	SS	24/14	29		0	WOR	32		
						WOH			Top 10" gry clayey SILT
						WOH	33		Bott 4" gry silty CLAY, soft - wet
						1			
	SS	24/22	34		0	WOR	34		
						WOR			Gry silty CLAY, soft - wet
						WOR	35		
						WOR			
	SS	24/19	34		0	WOR	36		
						WOR			Gry silty CLAY, soft - wet
						WOH	37		Bott 5" gry clayey SILT - wet
						WOH			
	SS	24/13	34		0	WOR	38		
						WOR			Top 4" gry clayey SILT, soft
						WOH	39		Bott 8" gry silty CLAY, soft - wet
						WOH			

Logged by: J. Donovan | Date: 3-Aug-07
Drilling Contractor: East Coast Explorations | Driller: C. Palmer

WELL SPECIFICATIONS:

Diam. of casing: 4" | Screen Interval: 65-75 ft | Sandpack: 78-63 ft | Grout: 63-2 ft
BOH: 78 ft | Riser Interval: 65-0 ft | Bentonite: 63-61 ft | Cover: Conc. Pad, Stick up

Environmental Chemical Corporation

LOG OF SOIL BORING

Coordinates: X-1859848.57, Y-425898.80
Surface Elevation: 35.45
Casing Below Surface:
Reference Elevation: 37.48
Reference Description: Top PVC Riser

Job No. 5700.007 | Client NAVFAC | Location: EW-05B - NASB Eastern Plume

Drilling Method: Drive and Wash - 4" Casing | Boring No. EW-05B PZ-2

Sampling Method: 2 in. dia. 2 ft Split Spoon, 140 lb drop weight | Sheet 3 of 4

Drilling

Water Lev.					Start	Finish
Time					3-Aug-07	8-Aug-07
Date						
Reference						

Surface Conditions: Grass

Digital Picture #	Sample Type	In. Drvn / In. Record	Dpth. Csg	Samp. # - Samp. depth	PID (ppm)	Blows per 6 in.	Depth (feet)	USCS Log	Description
	SS	24/16	38		0	WOR	40		8-Aug-08
						WOR			Gry silty CLAY, soft - wet
						WOR	41		
						WOR			
	SS	24/24	39		0	WOR	42		
						WOR			Gry silty CLAY, soft - wet
						WOH	43		
						WOH			
	SS	24/22	44		0	WOR	44		
						WOR			Gry silty CLAY, soft - wet
						WOH	45		
						WOH			
	SS	24/24	44		0	WOH	46		
						3			Gry silty CLAY, soft - wet
						2	47		Bott 3" lr gry f-sand - wet
						1			
	SS	24/24	44		0	WOR	48		
						2			Top 7" gry f-SAND, lr silt
						3	49		9" layer gry silty CLAY, soft
						1			Bott 8" gry SILT, lr gry f-sand - wet
	SS	24/19	49		0	2	50		
						2			Gry SILT, lr f-SAND, lr clay, soft - wet
						2	51		
						1			
	SS	24/22	49		0	WOR	52		
						WOH			Gry silty CLAY, soft - wet, top 4" lr gry f-sand
						1	53		
						1			
	SS	24/23	54		0	WOR	54		
						1			Gry silty CLAY, soft - wet
						1	55		Bott 9" gry f-SAND, lr silt - wet
						2			
	SS	24/22	54		0	2	56		
						1			Top 4" gry f-SAND, lr silt - wet
						2	57		3" layer gry SILT, lr gry f-sand
						14			10" layer gry silty CLAY, bott 5" gry f-SAND
	SS	24/23	54		0	1	58		
						2			Top 12" gry f-SAND
						3	59		9" layer gry SILT, lr clay
						3			Bott 4" gry f-SAND, lr silt

Logged by: J. Donovan | Date: 6-Aug-07
Drilling Contractor: East Coast Explorations | Driller: C. Palmer

WELL SPECIFICATIONS:

Diam. of casing: 4" | Screen Interval: 65-75 ft | Sandpack: 76-63 ft | Grout: 61-2 ft
BOH: 78 ft | Riser Interval: 65-0 ft | Bentonite: 63-61 ft | Cover: Conc. Pad, Stick up

Environmental Chemical Corporation

LOG OF SOIL BORING

Coordinates: X-485848.57, Y-475858.93
Surface Elevation: 35.45
Casing Below Surface:
Reference Elevation: 37.48
Reference Description: Top PVC Riser

Job. No. 5700.007 | Client NAVFAC | Location EW-05B - NASB Eastern Plume

Drilling Method: Drive and Wash - 4" Casing | Boring No. EW-05B PZ-2

Sampling Method: 2 in. dia. 2 ft Split Spoon, 140 lb drop weight | Sheet 4 of 4

Drilling Start 3-Aug-07, Finish 6-Aug-07

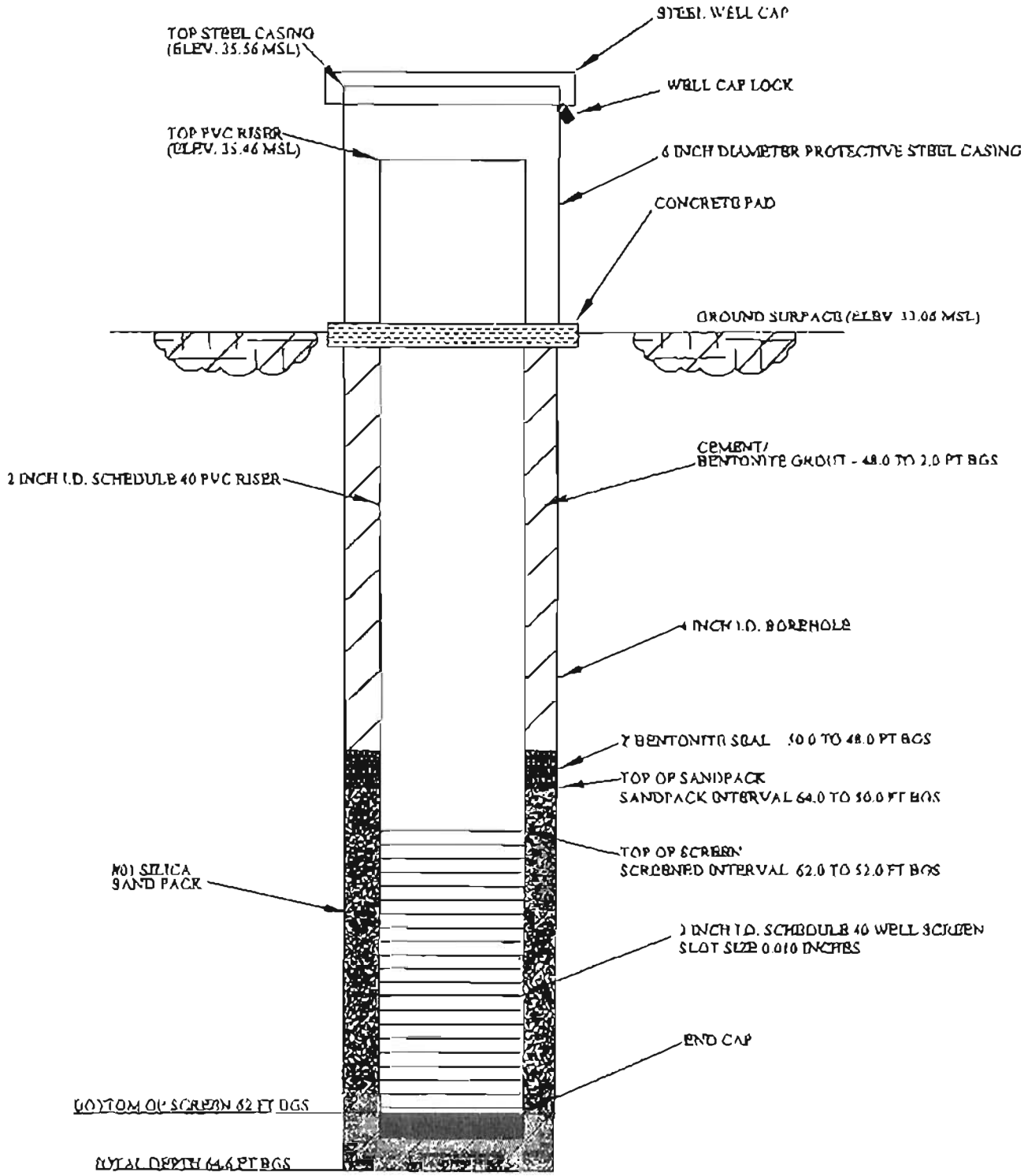
Water Lev				
Time				
Date				
Reference				

Digital Picture #	Sample Type	In. Drvn / In Recvd	Depth Csg.	Samp. # / Samp depth	PID (ppm)	Blows per 6 in.	Depth (feet)	USCS Log	Surface Conditions: Grass
	SS	24/24	59		0	1	80		
						1			Top 8" gry f-med SAND - 9" layer gry silt, some gry f-sand
						1	81		Bott 6" gry SILT, tr gry f-sand - wet
						1			
	SS	24/24	59		0	WOR	82		
						WOR			Gry silty CLAY, tr gry f-sand bott 4", soft - wet
						WOH	83		
						WOH			
	SS	24/24	64		0	3	84		
						3			Top 8" gry silty CLAY, little gry f-sand, 5" layer gry f-med SAND - wet
						7	85		Bott 3" gry silty CLAY, little gry f-sand
						13			
	SS	24/18	64		0	6	86		
						18			Top 6" gry f-med SAND, 4" layer gry silty CLAY, tr gry f-sand
						28	87		Bott 14" lt brn f-SAND, tr silt, some mottling - wet
						34			
	SS	24/24	64		0	8	88		
						13			Lt brn f-SAND, tr silt, some mottling - wet
						30	89		
						44			
	SS	24/13	69		0	2	70		
						11			Lt brn f-SAND, tr silt, some mottling - wet
						20	71		
						23			
	SS	24/24	69		0	8	72		
						13			Lt brn/gry f-SAND, little red mottling - wet
						18	73		Bott 4" gry CLAY, tr brn/red f-sand
						14			
	SS	24/19	74		0	6	74		
						10			Gry f-med SAND, tr clay - wet
						11	75		Bott 1" gry CLAY, tr gry f-sand
						11			
	SS	24/24	78		0	3	76		
						6			Gry f-SAND - wet
						3	77		
						5			
							78		
									Bottom of boring 78 ft
							79		

Logged by: J. Donovan | Date: 6-Aug-07
Drilling Contractor: East Coast Explorations | Driller: C. Palmer

WELL SPECIFICATIONS:

Diam. of casing: 4" | Screen Interval: 65-75 ft | Sandpack: 76-63 ft | Grout: 61-2 ft
BOH: 78 ft | Riser Interval: 65-0 ft | Bentonite: 63-61 ft | Cover: Conc. Pad, Stick up



ECC 33 BOSTON POST ROAD WEST SUITE 340 MARLBOROUGH, MA 01752	DRAWN BY: JD	RW-05U-PZ-1 CONSTRUCTION DIAGRAM
	APPROVED BY: JG	PIEZOMETER INSTALLATION EASTERN PLUME NASB, BRUNSWICK, ME
	DATE: 6/26/09	PROJECT CODE: 1100.000 — CONTRACT CODE: TO-07
	SIZE: A	SCALE: NTS — FILENAME: PZ.DWG — SHEET: 1 OF 1 — REV: -

Environmental Chemical Corporation

LOG OF SOIL BORING

Coordinates: X-4859617.20, Y-425939.74
Surface Elevation: 33.08
Casing Below Surface:
Reference Elevation: 35.46
Reference Description: Top PVC Riser

Job. No 5700.007 | Client NAVFAC | Location: EW-06B - NASB Eastern Plume

Drilling Method: Drive and Wash - 4" Casing | Boring No EW-06B P2-3

Sampling Method: 2 in dia 2 ft Split Spoon, 140 lb drop weight | Sheet 1 of 3

Drilling

Water Lev.					Start	Finish
Time					8-Aug-07	8-Aug-07
Date						
Reference						

Surface Conditions: Grass

Digital Picture #	Sample Type	In. Drvn / In. Recvrd	Depth Csg.	Samp. # / Samp. depth	PID (ppm)	Blows per 6 in.	Depth (feet)	USCS Log	
	SS	24/18	0			4	0		
						4			Top 6" brn SILT little f-sand
						4	1		Bott 10" lt brn f-SAND, damp
						6			
	SS	24/17	0			4	2		
						7			Lt brn f-SAND, tr silt, damp
						6	3		Bott 8" red mottling
						6			
	SS	24/15	0			6	4		
						8			Lt brn f-SAND, damp
						8	5		
						9			
	SS	24/20	0			6	6		
						8			Lt brn f-SAND, damp
						7	7		Bott 8" wet
						6			
	SS	24/22	0			5	8		
						4			Top 6" brn f-SAND - wet
						4	9		Bott 16" f-med brn SAND, little rust colored mottling - wet
						6			
	SS	24/10	9			4	10		
						8			Top 4" brn f-SAND bott 3" red laminations - wet
						8	11		4" layer lt brn f-sand, mottled - wet
						7			Bott 2" red/brn SILT, tr f-sand
	SS	24/10	9			4	12		
						6			Lt brn f-med SAND, bott 3" red laminations - wet
						8	13		
						8			
	SS	24/14	14			6	14		
						5			Lt brn f-SAND, red mottling - wet
						6	15		
						6			
	SS	24/12	14			6	16		
						5			Lt brn f-SAND, red laminations in bott 5" - wet
						7	17		
						7			
	SS	24/18	14			6	18		
						8			Top 4" lt brn f-SAND, 2" layer brn SILT
						9	19		2" layer brn/red f-sand
						8			Bott 8" brn SILT, tr f-sand, mottled - wet Trace gry CLAY in nose

Logged by: J. Donovan | Date: 8-Aug-07 | WOR = Weight of Rods

Drilling Contractor: East Coast Explorations | Driller: C. Palmer | WOH = Weight of Hammer

WELL SPECIFICATIONS | PID not working

Diam. of casing: 4" | Screen Interval: 62-52 ft | Sandpack: 64-50 ft | Grout: 48-2 ft

BOH: 64 ft 6 inches | Riser Interval: 52-0 ft | Bentonite: 50-48 ft | Cover: Conc. Pad, Stick up

Environmental Chemical Corporation

LOG OF SOIL BORING

Coordinates: X-485617.30, Y-425839.74
Surface Elevation: 33.06
Casing Below Surface:
Reference Elevation: 35.46
Reference Description: Top PVC Riser

Job. No. 5700.007	Client NAVFAC	Location: EW-05B - NASB Eastern Plume	
Drilling Method: Drive and Wash - 4" Casing		Boring No. EW-05B PZ-3	
Sampling Method: 2 in. dia. 2 ft Split Spoon, 140 lb drop weight		Sheet 2 of 4	
		Drilling	
Water Lev		Start	Finish
Time		8-Aug-07	8-Aug-07
Date			
Reference			

Surface Conditions: Grass

Digital Picture #	Sample Type	In. Drvn / In. Record	Dpth. Csg.	Samp. # / Samp. depth	PID (ppm)	Blows per 6 in.	Depth (feet)	USCS Log	Description
	SS	24/18	19			6	20		
						7			Top 8" brn SILT, tr clay, red mottling
						8	21		Bott 8" brn f-SAND - wet
						8			
	SS	24/12	19			3	22		
						11			Lt brn f-SAND tr silt - wet
						12	23		Bott 2" brn SILT, tr clay, mottled
						13			
	SS	24/10	24			9	24		Top 3" brn silty CLAY
						15			7" layer brn f-SAND, mottled - wet
						25	25		Bott 3" brn silty CLAY
						25			
	SS	24/20	24			12	26		
						12			Top 4" gry f-SAND
						15	27		Bott 16" gry silty CLAY, soft - wet
						18			
	SS	24/20	24			5	28		
						4			Top 8" gry silty CLAY, soft
						2	29		2" layer gry SILT, tr gry f-sand - wet
						2			Bott 10" gry silty CLAY, soft - wet
	SS	24/24	29			WOR	30		
						4			Gry silty CLAY, soft - wet
						3	31		
						1			
	SS	24/8	29			WOR	32		
						WOH			Gry silty CLAY, soft - wet
						WOH	33		
						1			
	SS	24/22	34			WOR	34		
						WOR			Gry silty CLAY, soft - wet
						WOR	35		
						WOR			
	SS	24/20	34			WOR	36		
						WOR			Top 8" gry silty CLAY
						WOH	37		4" layer gry CLAY
						WOH			Bott 10" gry silty CLAY, soft - wet
	SS	24/24	34			WOR	38		
						WOR			Gry silty CLAY, soft - wet
						WOH	39		
						WOH			

Logged by: J. Donovan
Date: 8-Aug-07
Drilling Contractor: East Coast Explorations
Driller: C. Palmer
PID not working

WELL SPECIFICATIONS.

Diam. of casing: 4"
Screen Interval: 52-62 ft
Sandpack: 62-50 ft
Grout: 48-2 ft
BOH: 64 ft 6 inches
Riser Interval: 52-0 ft
Bentonite: 50-49 ft
Cover: Conc. Pad, Stick up

Environmental Chemical Corporation

LOG OF SOIL BORING

Coordinates: X-1859817.30, Y-425939.74
Surface Elevation: 33.08
Casing Below Surface:
Reference Elevation: 35.48
Reference Description: Top PVC Riser

Job No 5700.007 | Client NAVFAC | Location: EW-05B - NASB Eastern Plume
Drilling Method: Drive and Wash - 4" Casing | Boring No. EW-05B P2-3
Sampling Method: 2 in. dia. 2 ft Split Spoon, 140 lb drop weight | Sheet 3 of 4
Drilling

Water Lev					Start	Finish
Time					8-Aug-07	8-Aug-07
Date						
Reference						

Surface Conditions: Grass

Digital Picture #	Sample Type	In. Drvn / In Recvd	Depth Cap	Samp. # / Samp. depth	FID (ppm)	Blows per 6 in.	Depth (feet)	USCS Log	
	SS	24/19	39		0	WOR	40		
						WOR			Gry silty CLAY, soft - wet
						WOR	41		
						WOR			
	SS	24/23	39		0	WOR	42		
						WOR			Gry silty CLAY, soft - wet
						WOH	43		Bott 2" f-sand
						WOH			
	SS	24/13	44		0	WOR	44		
						WOR			Gry silty CLAY, soft - wet
						WOH	45		
						WOH			
	SS	24/20	44		0	WOH	46		
						3			Gry silty CLAY, soft - wet
						2	47		Bott 4" f-y CLAY
						1			
	SS	24/24	44		0	WOR	48		
						2			Gry CLAY, intermittent silt lenses, soft - wet
						3	49		
						1			
	SS	24/24	49		0	2	50		
						2			Top 12" gry CLAY, silt lenses, soft
						2	51		3" layer gry f-SAND, silt layer at 51'
						1			Bott 6" gry silty CLAY, soft - wet
	SS	24/24	49		0	WOR	52		
						WOH			Gry CLAY, soft - wet
						1	53		
						1			
	SS	24/18	54		0	WOR	54		
						1			Gry CLAY, soft - wet
						1	55		Bott 8" gry f SAND, trace silt - wet
						2			
	SS	24/18	54		0	2	56		
						1			Gry CLAY, soft - wet
						2	57		
						14			
	SS	24/24	54		0	1	58		
						2			Gry CLAY, soft - wet
						3	59		2" layer gry CLAY, tr gry f-sand at 58' 3"
						3			

Logged by: J. Donovan | Date: 8-Aug-07
Drilling Contractor: East Coast Explorations | Driller: C. Palmer

WELL SPECIFICATIONS:

Diam. of casing: 4" | Screen Interval: 52-62 ft | Sandpack: 52-50 ft | Grout: 48-2 ft
BOH: 64 ft 6 inches | Riser Interval: 52-0 ft | Bentonite: 50-48 ft | Cover: Conc. Ped, Stick up

Environmental Chemical Corporation

LOG OF SOIL BORING

Coordinates: X-4839617.30, Y-425939.74
Surface Elevation: 33.08
Casing Below Surface:
Reference Elevation: 35.46
Reference Description: Top PVC Riser

Job. No. 5700.007 | Client: NAVFAC | Location: EW-05B - NASB Eastern Plume

Drilling Method: Drive and Wash - 4" Casing | Boring No. EW-05B PZ-3

Sampling Method: 2 in. dia. 2 ft Split Spoon, 140 lb drop weight | Sheet 1 of 1

Water Lev					Drilling	
Time					Start	Finish
Date					8-Aug-07	8-Aug-07
Reference						

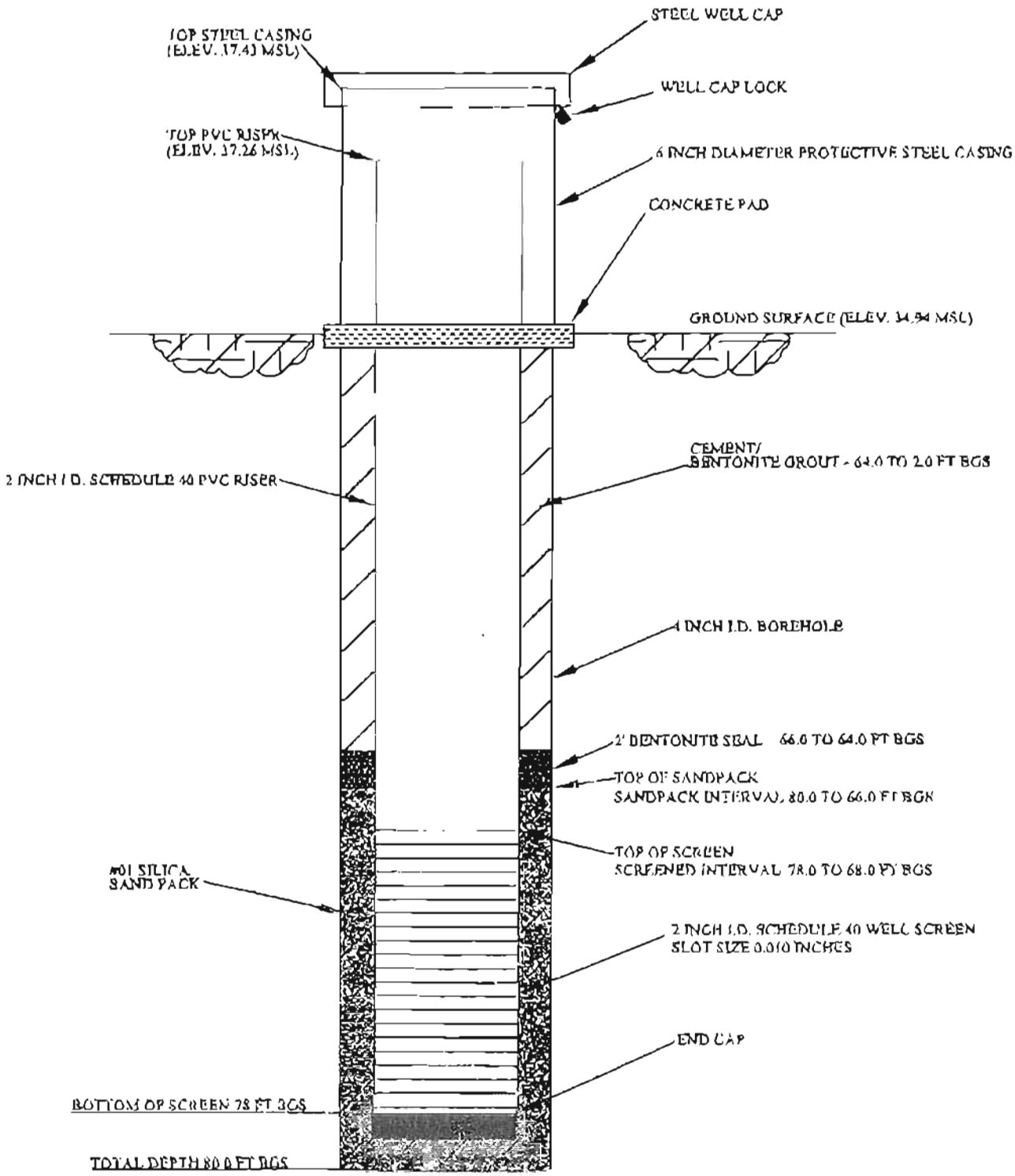
Surface Conditions: Grass

Digital Picture #	Sample Type	In. Drvn / In. Record	Dpth Csg	Samp. # / Samp. depth	PID (ppm)	Blows per 6 in	Depth (feet)	USCS Log	
	SS	24/22	59			5	60		
						17			Top 12" gry CLAY, soft - wet
						12	61		10" layer gry f-med SAND, blk of blk rock/quartz
						50/0			Refusal at 62 ft
	SS	NR	59				62		
									Roller bit to 64' 6"
							63		
	SS						64		
									End of boring at 64' 6"
							65		
	SS						66		
							67		
	SS						68		
							69		
	SS						70		
							71		
	SS						72		
							73		
	SS						74		
							75		
	SS						76		
							77		
							78		
							79		

Logged by: J. Donovan | Date: 8-Aug-07
Drilling Contractor: East Coast Explorations | Driller: C. Palmer | PID not working

WELL SPECIFICATIONS:

Diam. of casing: 1" | Screen Interval: 52-62 ft | Sandpack: 62-50 ft | Grout: 48-2 ft
BOH: 64 ft 6 inches | Riser Interval: 52-0 ft | Bentonite: 50-48 ft | Cover: Conc. Pad, Stick up



ECC 33 BOSTON POST ROAD WEST-SUITE 340 MARLBOROUGH MA 01752	DRAWN BY: JD APPROVED BY: JA DATE: 6/26/09 SIZE: A	GW-058-PZ-1A CONSTRUCTION DIAGRAM PIEZOMETER INSTALLATION EASTERN PLUME NASB, BRUNSWICK, ME
		PROJECT CODE: 3700.000 — CONTRACT CODE: TO-07
		SCALE: NTS — FILENAME: PZ.DWG — SHEET 1 OF 1 — REV: -

Environmental Chemical Corporation

LOG OF SOIL BORING

Coordinates: Not surveyed
Surface Elevation:
Casing Below Surface:
Reference Elevation:
Reference Description: Top PVC Riser

Job. No. 5700.007 | Client NAVFAC | Location: EW-05B - NASB Eastern Plume

Drilling Method: Drive and Wash - 4" Casing | Boring No. EW-05B PZ-4

Sampling Method: 2 in dia 2 ft Split Spoon, 140 lb drop weight | Sheet 1 of 3

Drilling

Water Lev.					Start	Finish
Time					5-Aug-07	8-Aug-07
Date						
Reference						

Surface Conditions: Grass

Digital Picture #	Sample Type	In. Drvn / In. Recvd	Dpth Csg.	Samp # / Samp. depth	PID (ppm)	Blows per 6 in.	Depth (feet)	USCS Log	
	SS	24/18	0			3	0		
						4			Top 5" drk brn SITL, tr f-sand
						4	1		Bott 11" red/brn f-SAND, tr silt
						8			
	SS	24/13	0			5	2		
						8			Lt brn f-SAND, tr silt, damp
						8	3		
						6			
	SS	24/23	0			8	4		
						7			Top 7" brn f-SAND, tr silt
						8	5		11" layer brn SILT, tr f-sand
						10			Bott 5" lt brn f-SAND
	SS	24/23	0			10	6		
						6			Lt brn f-SAND, damp
						8	7		Red mottling in nose
						5			
	SS	24/18	0			5	8		
						5			Brn f-SAND, tr med-sand, tr silt
						3	9		Bits of mica in sample
						4			Bott 7" wet
	SS	24/13	9			2	10		
						5			Lt brn f-SAND, little red mottling - wet
						8	11		
						8			
	SS	24/9	9			4	12		
						5			Brn f-SAND, bits of mica in sample - wet
						8	13		
						5			
	SS	24/14	14			7	14		
						7			Brn f-SAND, red laminations - wet
						8	15		
						11			
	SS	24/13	14			5	16		
						5			Brn f-SAND, bott 3" red mottling - wet
						8	17		
						9			
	SS	24/15	14			4	18		
						5			Top 9" brn f-SAND, mottled
						8	19		1" layer gy/brn silty CLAY
						3			Bott 5" brn f-SAND, mottled - wet

Logged by: J. Donovan | Date: 9-Aug-07 | WOR = Weight of Rods

Drilling Contractor: East Coast Explorations | Driller: C. Palmer | WOH = Weight of Hammer

WELL SPECIFICATIONS: Well not installed - no evidence of lower sand unit | PID not working

Diam. of casing: 4" | Screen Interval: | Sandpack: | Grout:

BOH: 53 ft 6 inches | Riser Interval: | Bentonite: | Cover:

Environmental Chemical Corporation

LOG OF SOIL BORING

Coordinates: Not surveyed
Surface Elevation:
Casing Below Surface:
Reference Elevation:
Reference Description: Top PVC Riser

Job No. 5700.007	Client NAVFAC	Location: EW-05B - NASB Eastern Panne
Drilling Method: Drive and Wash - 4" Casing		Boring No. EW-05B P2-4
Sampling Method: 2 in. dia. 2 ft Split Spoon, 140 lb drop weight		Sheet 2 of 3
		Drilling

Water Lev.					Start	Finish
Time					9-Aug-07	9-Aug-07
Date						
Reference						

Digital Picture #	Sample Type	In. Drvn / In. Recvrd	Dpth. Csg.	Samp. # / Samp depth	PID (ppm)	Blows per 6 in.	Depth (feet)	USCS Log	Surface Conditions, Grass
	SS	24/16	18			3	20		
						4			Top 2" gry/brn silty CLAY
						4	21		Bott 14" brn f-SAND, bits of mica in sample - wet
						5			
	SS	24/8	19			4	22		
						5			Brn f-SAND, little red mottling - wet
						6	23		
						7			
	SS	24/16	24			4	24		Top 2" gry/brn silty CLAY, 2" layer brn f-SAND, 3" layer gry/brn silty CLAY
						8			Bott 2" brn f-SAND, red laminations - wet
						8	25		
						6			
	SS	24/20	24			WOR	26		
						1			Top 2" f-SAND, red laminations
						5	27		11" layer gry silty CLAY
						3			Bott 7" gry SILT, tr f-sand - wet
	SS	24/22	24			WOH	28		
						WOH			Gry silty CLAY
						WOH	29		Bott 6" gry SILT, tr f-sand, tr clay - wet
						WOH			
	SS	24/14	29			WOR	30		
						WOR			Gry CLAY, silt lenses, med stiff - wet
						WOR	31		
						WOR			
	SS	24/19	29			WOR	32		
						WOR			Gry CLAY, 1' 5" silt/clay lens at 33' 3" - wet
						WOR	33		
						WOR			
	SS	24/18	34			WOH	34		
						WOH			Gry silty CLAY, med stiff - wet
						WOH	35		
						WOH			
	SS	24/16	34			WOR	36		
						WOR			Gry silty CLAY, med stiff - wet
						WOR	37		
						WOR			
	SS	24/24	34			WOR	38		
						WOR			Gry silty CLAY, med stiff - wet
						WOR	39		
						WOR			

Logged by: J. Donovan Date: 9-Aug-07
Drilling Contractor: East Coast Explorations Driller: C. Palmer PID not working
WELL SPECIFICATIONS Well not installed - no evidence of lower sand unit
Diam. of casing: 4" Screen interval: Sandpack: Grout:
BOH: 53 ft 6 inches Riser interval: Bentonite: Cover:

Environmental Chemical Corporation

LOG OF SOIL BORING

Coordinates: Not surveyed
Surface Elevation:
Casing Below Surface:
Reference Elevation:
Reference Description: Top PVC Riser

Job. No. 5700.007 | Client NAVFAC | Location: EW-038 - NAS8 Eastern Plume

Drilling Method: Drive and Wash - 4" Casing | Boring No. EW-038 P2-4

Sampling Method: 2 in. dia. 2 ft Split Spoon, 140 lb drop weight | Sheet 3 of 3

					Drilling	
Water Lev.					Start	Finish
Time					9-Aug-07	9-Aug-07
Date						
Reference						

Surface Conditions: Grass

Digital Picture #	Sample Type	In. Drvn / In. Recvrd	Depth. Cag.	Samp # / Samp. depth	PID (ppm)	Blows per 6 in.	Depth (feet)	USCS Log	Description
	SS	24/24	38		0	WOR	40		
						WOR			Gry silty CLAY, med stiff - wet
						WOH	41		
						WOH			
	SS	24/22	39		0	WOR	42		
						WOR			Gry silty CLAY, med stiff - wet
						WOR	43		
						WOR			
	SS	24/21	44		0	1	44		
						1			Gry silty CLAY, med stiff - wet
						1	45		
						1			
	SS	24/11	44		0	WOH	46		
						WOH			Gry silty CLAY, med stiff - wet
						WOH	47		
						WOH			
	SS	24/5	44		0	WOR	48		
						WOR			Gry silty CLAY, med stiff - wet
						WOR	49		
						WOR			
	SS	24/18	49		0	WOR	50		
						WOR			Gry silty CLAY, med stiff - wet
						WOR	51		
						WOR			
	SS	24/22	49		0	WOR	52		
						WOR			Gry CLAY, soft - wet
						5/3	53		1" lens gry f-SAND at 53'
						50/0			Bolt & gry CLAY, bits of rock in nose. Refusal at 53' 6"
	SS						54		
									End of boring at 53' 6"
							55		
	SS						56		
							57		
	SS						58		
							59		

Logged by: J. Donovan | Date: 9-Aug-07
Drilling Contractor: East Coast Explorations | Driller: C. Palmer
WELL SPECIFICATIONS: Well not installed - no evidence of lower sand unit
Diam. of casing: 4" | Screen Interval: | Sandpack: | Grout:
BOH: 53 ft 6 inches | Riser Interval: | Bentonite: | Cover:

Environmental Chemical Corporation

LOG OF SOIL BORING

Coordinates: X-485971.28, Y-425634.02
Surface Elevation: 35.94
Casing Below Surface:
Reference Elevation: 37.26
Reference Description: Top PVC Riser

Job No: 6700.007 | Client: NAVFAC | Location: EW-05B - NASB Eastern Plume
Drilling Method: Drive and Wash - 4" Casing | Boring No: EW-05B PZ-4A
Sampling Method: 2 in. dia. 2 ft. Split Spoon, 140 lb drop weight | Sheet 1 of 4
Drilling

Water Lev.					Start	Finish
Time					10-Aug-07	14-Aug-07
Date						
Reference						

Surface Conditions: Grass

Digital Picture #	Sample Type	In. Drvn / In. Recvd	Depth Csg	Samp. # / Samp depth	PID (ppm)	Blows per 6 in	Depth (feet)	USCS Log	Description
	SS	24/18	0		0	2	0		
						3			Top 3" drk brn SILT f-med sand
						4	1		Bott 15" brn f-SAND
						4			
	SS	24/17	0		0	4	2		
						4			Brn f-med SAND
						3	3		
						8			
	SS	24/19	0		0	8	4		
						6			Top 3" brn f-med SAND, 7" layer brn SILT, tr f-sand
						8	5		Bott 8" lt brn f-SAND
						7			
	SS	24/18	0		0	7	6		
						8			Top 4" brn f-SAND, red mottling
						7	7		8" layer lt brn f-SAND, mottled
						7			Bott 8" brn/red f-SAND, bott 2" wet
	SS	24/22	0		0	7	8		
						6			Top 6" brn/red f-SAND, mottled
						10	9		3" layer brn SILT, tr f-sand
						10			Bott 11" brn f-SAND, tr silt, mottled - wet
	SS	24/15	0		0	8	10		
						8			Brn f-SAND, red laminations - wet
						7	11		
						8			
	SS	24/16	0		0	7	12		
						7			Top 3" brn/red f-SAND, 8" layer brn SILT, mottled
						6	13		Bott 6" brn f-SAND, mottled - wet
						10			
	SS	24/18	14		0	9	14		13-Aug-09
						12			Brn f-SAND, tr silt, red mottling - wet
						15	15		
						11			
	SS	24/17	14		0	8	16		
						15			Brn f-SAND, tr silt, red mottling - wet
						14	17		
						13			
	SS	24/12	14		0	5	18		
						6			Brn f-SAND - wet
						5	19		
						7			

Logged by: J. Donovan | Date: 10-Aug-07 | WOR = Weight of Rods
Drilling Contractor: East Coast Explorations | Driller: C. Palmer | WOH = Weight of Hammer

WELL SPECIFICATIONS: PZ-4A boring advanced at diff. location than PZ-4

Diam. of casing: 4" | Screen Interval: 78-63 ft | Sandpack: 80-66 ft | Grout: 64-2 ft
BOH: 80 ft | Riser Interval: 68-0 ft | Bentonite: 66-64 ft | Cover: Conc. Pad, Stick up

Environmental Chemical Corporation

LOG OF SOIL BORING

Coordinates
Surface Elevation:
Casing Below Surface:
Reference Elevation:
Reference Description: Top PVC Riser

Job. No. 5700.007	Client NAVFAC	Location: EW-05B - NASB Eastern Plume
Drilling Method: Drive and Wash - 4" Casing		Boring No. EW-05B PZ-4A
Sampling Method: 2 in. dia 2 ft Split Spoon, 140 lb drop weight		Sheet 2 of 4
		Drilling

Water Lev					Start	Finish
Time					10-Aug-07	14-Aug-07
Date						
Reference						

Surface Conditions: Grass

Digital Picture #	Sample Type	In. Drvn / In. Recvd	Depth Csg.	Samp. # / Samp. depth	PID (ppm)	Blows per 6 in.	Depth (feet)	USCS Log	
	SS	24/8	18		0	2	20		13-Aug-07
						4			Brn f-SAND tr silt - wet
						5	21		
						5			
	SS	24/12	18		0	4	22		
						9			Top 2" brn f-SAND
						10	23		Bott 10" brn SILT, tr f-sand - wet
						11			
	SS	24/20	24		0	5	24		
						4			Top 4" brn SILT, tr gry f-sand, tr gry silt - wet
						5	25		Bott 16" gry SILT
						5			
	SS	24/16	24		0	4	26		
						2			Top 11" gry SILT, tr gry f-sand
						1	27		2" layer gry f-sand tr gry silt - wet
						1			Bott 3" gry SILT, tr f-sand
	SS	24/20	24		0	1	28		
						2			Top 7" gry SILT with sand lenses
						1	29		Bott 8" gry silty CLAY, soft
						2			
	SS	24/16	29		0	WOH	30		
						WOH			Top 5" gry silty CLAY
						WOH	31		Bott 11" gry CLAY, soft - wet
						WOH			
	SS	24/14	29		0	WOH	32		
						WOH			Gry CLAY, soft - wet
						WOH	33		
						WOH			
	SS	24/11	34		0	1	34		
						WOH			Top 4" gry CLAY, soft - wet
						WOH	35		Bott 7" gry silty CLAY
						WOR			
	SS	24/13	34		0	WOR	36		
						WOR			Top 6" gry CLAY, soft
						WOH	37		Bott 7" gry SILT, tr gry clay, tr gry f-sand - wet
						WOH			
	SS	24/22	34		0	WOR	38		
						WOR			Gry silty CLAY, soft - wet
						WOH	39		
						WOH			

Logged by: J. Donovan Date: 13-Aug-07
Drilling Contractor: East Coast Explorations Driller: C. Palmer

WELL SPECIFICATIONS PZ-4A boring advanced at diff. location than PZ-4

Diam. of casing: 4" Screen Interval: 78-68 ft Sandpack: 80-66 ft Grout: 64-2 ft
BOH: 80 ft Riser Interval: 68-0 ft Bentonite: 66-64 ft Cover: Conc. Pad, Stick up

Environmental Chemical Corporation

LOG OF SOIL BORING

Coordinates:
Surface Elevation:
Casing Below Surface:
Reference Elevation:
Reference Description: Top PVC Riser

Job. No 5700.007	Client NAVFAC
Location EW-05B - NASB Eastern Plume	
Drilling Method Drive and Wash - 4" Casing	Boring No. EW-03B 02 4A
Sampling Method: 2 in. dia. 2 ft Split Spoon, 140 lb drop weight	Sheet 3 of 4
Drilling	

Water Lev.					Start	Finish
Time					10-Aug-07	14-Aug-07
Date						
Reference						

Surface Conditions: Grass

Digital Picture #	Sample Type	In Drum / In. Record	Drill. Exp.	Sample # / Sample depth	PID (ppm)	Blows per 6 in	Depth (feet)	USCS Log	
	SS	24/24	39		0	WOR	40		
						WOR			Gry silty CLAY, soft - wet
						WOR	41		2" layer gry f-sand at 41' 3"
						WOR			Bott 9" fry CLAY
	SS	24/24	39		0	WOH	42		
						WOH			Gry silty CLAY, 3" layer gry sat at 43' 2"
						2	43		Bott 5" gry silty clay - wet
						2			
	SS	24/21	44		0	1	44		
						1			Top 4" gry silty CLAY, soft
						1	45		10" layer gry f-SAND - wet
						2			Bott 7" gry silty CLAY, soft
	SS	24/19	44		0	4	46		
						1			Gry silty CLAY, soft - wet
						2	47		Bott 7" gry f-SAND, wet
						4			
	SS	24/22	44		0	2	48		
						3			Top 5" gry f-SAND - wet
						3	49		12" layer gry silty CLAY
						5			Bott 5" gry f-SAND - wet
	SS	24/19	49		0	1	50		
						2			Top 7" gry f-SAND - wet
						1	51		8" layer gry silty CLAY
						2			2" layer gry f-SAND, bott 2" gry silty CLAY
	SS	24/20	49		0	1	52		
						1			Top 8" gry f-SAND, trace of mica in sample - wet
						2	53		Bott 14" gry silty CLAY, tr gry f-SAND, soft - wet
						5			
	SS	24/21	64		0	8	54		
						11			Gry f-SAND
						12	55		Bott 5" gry f-SAND, tr silt - wet
						14			
	SS	24/23	54		0	1	56		
						5			Top 15" gry f-SAND - wet
						4	57		4" layer gry silty CLAY
						12			Bott 2" gry silty CLAY tr gry f-sand
	SS	24/24	54		0	1	58		
						3			Top 12" gry f-SAND - wet
						2	59		8" layer gry silty CLAY, soft
						6			Bott 4" gry SILT, tr gry clay - wet

Logged by: J. Donovan
Date: 13-Aug-07
Drilling Contractor: East Coast Explorations
Driller: C. Palmer

WELL SPECIFICATIONS: PZ-4A boring advanced at diff. location than PZ-4

Diam. of casing: 4"
Screen Interval: 78-68 ft
Sandpack: 80-66 ft
Grout: 64-2 ft
BOH: 80 ft
Riser Interval: 68-0 ft
Bentonite: 66-64 ft
Cover: Conc. Pad, Stick up

Environmental Chemical Corporation

LOG OF SOIL BORING

Coordinates:
Surface Elevation:
Casing Below Surface:
Reference Elevation:
Reference Description: Top PVC Riser

Job No. 5700.007	Client NAVFAC	Location: EW-058 - NASB Eastern Plume
Drilling Method: Drive and Wash - 4" Casing		Boring No. EW-068 PZ-4A
Sampling Method: 2 in. dia. 2 ft Split Spoon, 140 lb drop weight		Sheet 4 of 4
		Drilling

Water Lev.					Start	Finish
Time					10-Aug-07	14-Aug-07
Date						
Reference						

Surface Conditions: Grass

Digital Picture #	Sample Type	In. Drvn / In. Recvrd	Depth Csg	Samp # / Samp. depth	PID (ppm)	Blows per 6 in.	Depth (feet)	USCS Log	
	SS	24/21	59		0	1	60		
						1			Top 8" gry f-SAND - wet
						1	61		Bott 15" gry CLAY, silt lenses, med stiff
						1			
	SS	24/24	59		0	WOR	62		
						WOR			Top 14" gry silty CLAY
						1	63		2" layer gry f-SAND, tr gry silt - wet
						1			Bott 6" gry silty CLAY, tr gry f-sand
	SS	24/24	64		0	3	64		
						3			Top 2" gry silty CLAY, 3" layer gry f-sand - wet
						7	65		2" layer gry silty CLAY, 2" layer gry f-SAND - wet
						14			
	SS	24/24	64		0	4	66		
						5			Red/brn f-SAND. Silt lenses throughout sample
						6	67		
						20			
	SS	24/16	64		0	3	68		
						14			Brn f-SAND, tr silt, tr clay, mottled - wet
						14	69		
						10			
	SS	24/21	69		0	6	70		
						5			Top 4" brn f-SAND, tr silt - wet
						8	71		11" layer brn silt, tr f-sand
						14			Bott 8" gry f-SAND, tr silt - wet
	SS	24/24	69		0	11	72		
						12			Top 7" brn/gry f-SAND
						8	73		Bott 17" gry f-SAND - wet
						8			
	SS	24/17	74		0	14	74		
						10			Gry f-SAND - wet
						14	75		
						10			
	SS	24/21	74		0	4	76		14-Aug-07
						6			Gry f-SAND - wet
						11	77		Bott 8" f-med sand - wet
						16			
	SS	24/24	74		0	8	78		
						10			Gry f-SAND - wet
						13	79		
						16			End of boring at 80 ft

Logged by: J. Donovan
Date: 14-Aug-07
Drilling Contractor: East Coast Explorations
Driller: C. Palmer

WELL SPECIFICATIONS: PZ-4A boring advanced at diff. location than PZ-4

Diam. of casing: 4"
Screen Interval: 78-68 ft
Sandpack: 80-66 ft
Grout: 64-2 ft
BOH: 80 ft
Riser Interval: 68-0 ft
Bentonite: 66-64 ft
Cover: Conc. Pad, Stick up

QUALITY REVIEW STATEMENT

Contract No. N62472-02-D-0810 ECC Project No.: 5700.017
Contract Task Order No. 017
Activity: Naval Air Station, Brunswick, Maine

Description/Deliverable: *Final Letter Summary Report Performance Testing and Groundwater Sampling Extraction Well EW-05B, Naval Air Station, Brunswick, Maine*

ECC CTO Senior Project Manager: Alexander C. Easterday, P.G.

As per State of Maine Department of Professional and Financial Regulations, Title 32 Chapter 73, Law, the sections of this document related to geology and geologic data interpretation have been reviewed for its technical content by the undersigned State of Maine Certified Geologist.

This document has been reviewed by the undersigned for their geological interpretive content. This statement is based upon the review of the undersigned conducted during the preparation of this report, as dated below.

State of Maine Geologist Reviewer:

STATE OF MAINE
GINA M. CALDERONE
No. GE442
CERTIFIED GEOLOGIST

Gina M. Calderone

7/8/09
Date

Gina M. Calderone, P.G., C.P.G.
State of Maine Certified Geologist (No. GE442)
ECC Project Manager/Hydrogeologist