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NAS BRUNSWICK
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FINAL ADDENDUM FOR FINAL EXTRACTION WELL INSTALLATION WORK PLAN FOR
EASTERN PLUME WITH TRANSMITTAL LETTER NAS BRUNSWICK ME
10/6/2008
BASE REALIGNMENT AND CLOSURE PROGRAM MANAGEMENT OFFICE NORTHEAST



DEPARTMENT OF THE NAVY
BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE, NORTHEAST
4911 SOUTH BROAD STREET
PHILADELPHIA, PA 19112-1303

5090
BPMO NE/TB
Ser 09-006
October 6, 2008

Mr. Michael J. Daly
Remedial Project Manager
Federal Facilities Superfund Section
U.S. Environmental Protection Agency (EPA)
1 Congress Street, Suite 1100 (HBT)
Boston, MA 02114-2023

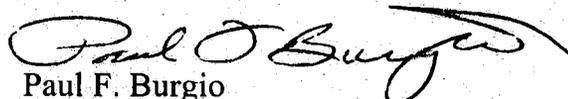
Ms. Claudia Sait
Remedial Project Manager
Maine Department of Environmental Protection (MEDEP)
Bureau of Remediation and Waste Management
17 State House Station
Augusta, ME 04333-0017

Dear Mr. Daly and Ms. Sait:

Enclosed you will find the Final Addendum to the Final Extraction Well Installation Work Plan, Naval Air Station (NAS) Brunswick, Maine. This report is provided for your use/reference.

If you have any questions or comments, please contact the Navy's Remedial Project Manager, Todd Bober at (215) 897-4911.

Sincerely,


Paul F. Burgio
BRAC Environmental Coordinator
By direction of BRAC PMO

Enclosure:
Final Addendum to the Final Extraction Well Installation Work Plan,
NAS Brunswick, Maine

Copy to:

MEDEP (C. Evans)

Gannet-Fleming (D. McTigue)

NASB (L. Joy, M. Fagan)

Lepage Environmental (C. Lepage)

NAVFAC MIDLANT (T. Bober)

NAVFAC ATLANTIC (J. Wright, B. Capito)

TINUS (L. Klink, C. Race)

ECC (A. Easterday, G. Calderone, C. Guido, R. Phinney, J. Donovan, J. Kiker)

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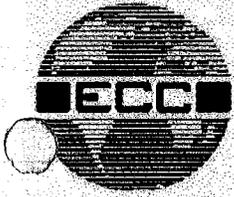
BACSE (E. Benedikt, C. Warren)

CO NASB (CAPT Fitzgerald)

RAB Brunswick Representative (S. Johnson)

RAB Harpswell Representative (D. Chipman)

MRRA (V. Boundy)



7 October, 2008

Ms. Claudia Sait
Project Manager
Maine Department of Environmental Protection
State House, Station 17
Augusta, Maine 04333-0017

And

Regional Office

33 Boston Post Rd West
Suite 340
Marlborough, MA 01752

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Fax: 508.229.7737

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

SUBJECT: Final Addendum to the Final
Extraction Well Installation Work Plan
Naval Air Station, Brunswick, Maine
Version: *Revised*
Contract No. N62472-03-D-0802
Task Order 170, Task 7

Dear Ms. Sait and Mr. Daly:

On behalf of the Department of the Navy, ECC is presenting this Final Addendum to the Final Extraction Well Installation Work Plan (ECC, April 2007). This addendum addresses groundwater sampling during the performance testing and the handling, storage, and disposal of groundwater generated during the performance testing. 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 Naval Air Station (NAS), Brunswick, Maine. Installation and development of EW-05B began on 10 July and was completed on 24 July 2007. EW-05B was 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. The location of NAS Brunswick is shown on Figure 1A and the location of EW-05B is shown on Figure 2A (See Attached.).

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This Addendum was developed as a result of technical discussions from a meeting held between the Navy and NAS Brunswick Stakeholders in February 2008. Based on that meeting, it was agreed that the Navy conduct sampling of groundwater during the performance testing of EW-05B. Based on this sampling data, remedial options will be determined for the treatment of 1,4-dioxane. This may necessitate the modification of the Final Extraction Well Installation Work Plan (ECC, April 2007) trenching and piping activities (installing a discharge pipe directly from EW-05B to the treatment plant instead of to EW-05A). Any changes to the Final Work Plan will be provided in a

supplemental document after the results of the pump test/groundwater sampling are evaluated.

It is anticipated that performance testing activities will commence in the fall of 2008. The draft version of this addendum was reviewed by the MEDEP and EPA. The comments have been addressed and incorporated into this revised Addendum. The regulator comments and subsequent concurrence correspondence are provided in Attachment A. The Navy will provide MEDEP and EPA with 14 days notice prior to the commencement of proposed field activities.

This addendum details the following field activities which will be performed in support of this performance testing:

- Groundwater Sampling
- Temporary Storage of Groundwater
- Transport and Disposal of Groundwater

Where applicable, the field activities for performance testing will be conducted in accordance with the Standard Operating Procedures provided herein (Attachment B and C), the approved Final Base-Wide Quality Assurance Project Plan, Naval Air Station, Brunswick, Maine (EA/ECC January 2006¹), the Site Safety and Health Plan, Naval Air Station, Brunswick, Maine (ECC September 2008²) and the Final Extraction Well Installation Work Plan (ECC April 2007³).

Goals of Groundwater Evaluation During Pump Test

The pump test is 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.

¹ EA/ECC. 2006. Base-Wide Quality Assurance Project Plan, Naval Air Station, Brunswick, Maine. January.

² ECC. 2008. Site Safety and Health Plan, Naval Air Station, Brunswick, Maine. September.

³ ECC. 2007. Final Extraction Well Installation Work Plan. April

The following sections detail the proposed field activities.

GROUNDWATER SAMPLING

In accordance with the Final Work Plan (ECC April 2007), ECC will conduct performance testing on EW-05B in two stages; a step drawdown test and a constant rate pumping test (pump test). The step drawdown test will directly precede the pump test and will follow the procedures outlined in the Final Work Plan (ECC April 2007). Prior to beginning the step drawdown test, MEDEP and ECC personnel will collect one baseline groundwater sample from extraction well EW-05B. MEDEP personnel will collect one sample for 1,2,3 tri-chloropropane (1,2,3- TCPA) analysis by US EPA Method 8260B/SIM, ECC personnel will collect one sample for analysis 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). These samples will be collected using low-flow groundwater sampling methods. Samples will be submitted to for laboratory analysis under chain-of-custody protocol. Standard turn around times will apply.

During the pump test, five (5) groundwater samples will be collected by ECC personnel. These samples will be collected in accordance with Attachment B of this addendum. The groundwater samples will be submitted to an off-site laboratory under chain-of-custody protocol for analysis 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, one sample will be collected for 1,2,3-TCPA, as requested by MEDEP, 36 hours after the beginning of the pump test, and submitted for laboratory analysis by US EPA Method 8260B/SIM. Standard turn around times will apply. The well will be tested at the design pumping rate of 15 gallons per minute for a duration of 72 hours. Groundwater samples will be collected during the pump test according to the following table:

Sample ID	Collection Time ^a	Analysis
EW-5B-PT-01	6 Minutes ^b	VOCs, 1-4 Dioxane
EW-5B-PT-02	18 Hours	VOCs, 1-4 Dioxane
EW-5B-PT-03	36 Hours ^c	VOCs, 1-4 Dioxane, 1,2,3 TCPA
EW-5B-PT-04	54 Hours	VOCs, 1-4 Dioxane
EW-5B-PT-05	72 Hours	VOCs, 1-4 Dioxane

a = After the start of the pump test

b = Time is based on one well volume of approx. 90.52 gals and a flow rate of 15 gpm

c = An additional sample will be collected (by ECC personnel) for 1,2,3-TCPA analysis at this time

The first groundwater sample will be collected 6 minutes from the start of the pump test. This will allow removal of approximately one well volume prior to sampling in order to provide a more representative site groundwater sample. The sample for 1,2,3-TCPA will be collected during the third sampling interval. The groundwater samples will be collected directly from the discharge hose and deposited into the appropriate sample containers. Samples will be immediately placed in a cooler with ice until delivery to the laboratory.

TEMPORARY STORAGE OF GROUNDWATER

Groundwater purged from EW-05B during the pump test will be temporarily stored on-site in 20,000-gal portable storage tanks (i.e. Frac tanks). Groundwater will be pumped directly from the well into the tanks via a 2-inch diameter hose. It is anticipated that a total of 3 Frac tanks will be used during the pump test.

TRANSPORT AND DISPOSAL OF GROUNDWATER

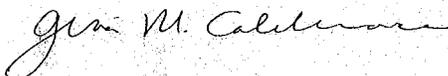
Following the completion of the pump test, the containerized water will be transported via vacuum trucks to a licensed facility for disposal. Following removal of all containerized water, the tanks will be cleaned and the rinsate disposed of at a licensed facility for disposal.

SUMMARY REPORT

Analytical results from the samples collected during the pump test will be presented in a brief letter summary report.

It has been ECC's pleasure to provide you with this Draft Addendum detailing groundwater sampling, and the handling, storage, and disposal of groundwater generated during the performance testing of 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 RPM at 215-897-4911.

Regards,
ECC

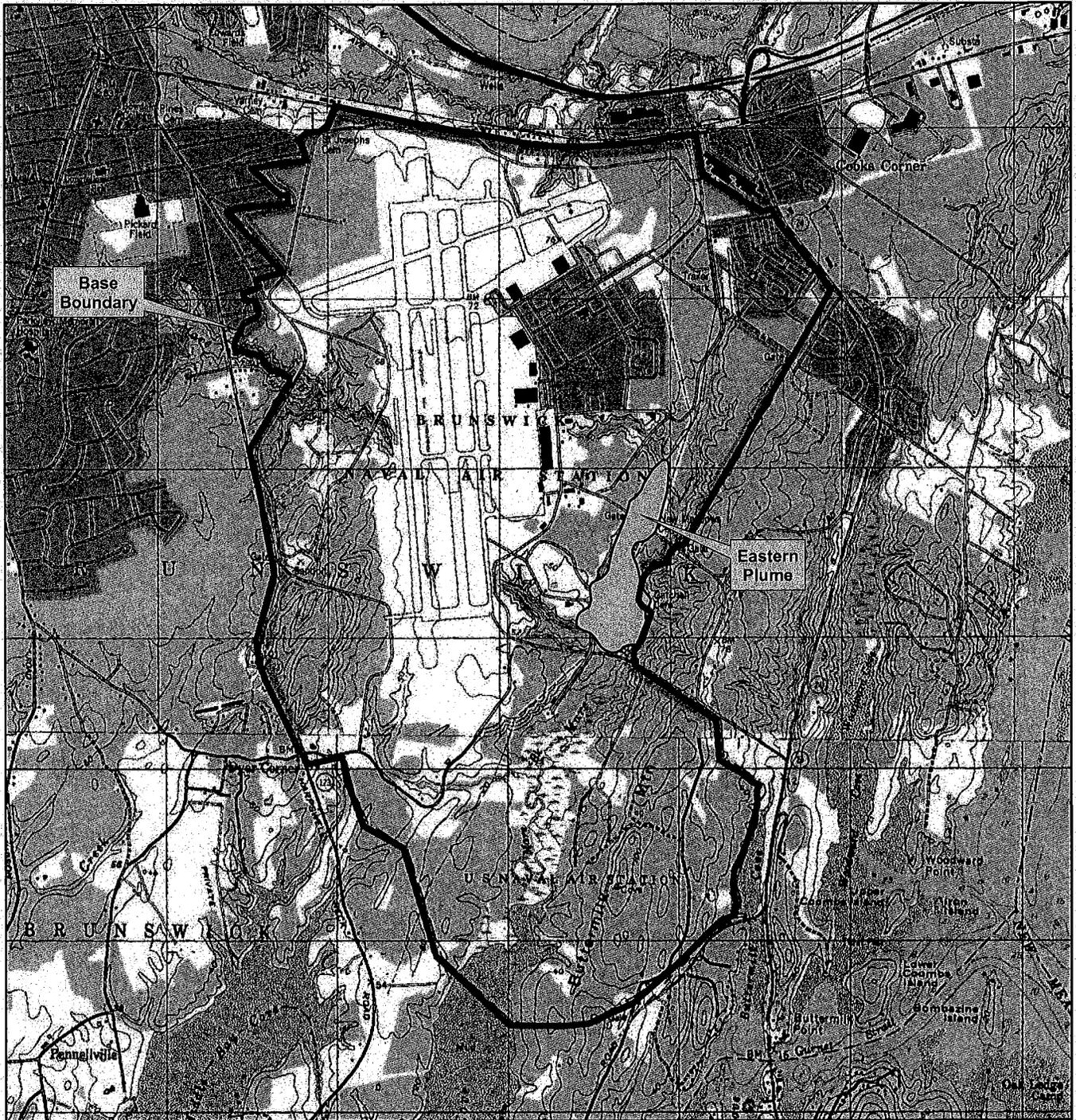


Gina Calderone, P.G., C.P.G.
Project Manager/Hydrogeologist

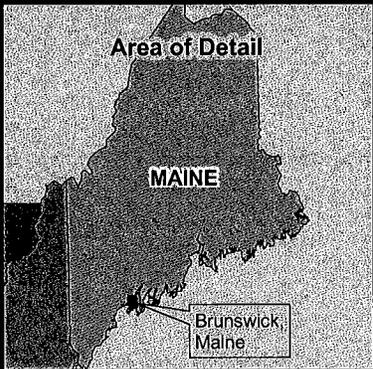
cc: MEDEP (C. Evans)
Gannet-Fleming (D. McTigue)
NASB (L. Joy, M. Fagan)
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TtNUS (L. Klink, C. Race)
ECC (A. Easterday, G. Calderone, C. Guido, R. Phinney)
Curtis Memorial Library (J. Fullerton)

cc w/o encl: BRAC PMO NE (P. Burgio)
NAVFAC ATLANTIC (D. Barclift)
BASCE (E. Benedikt, C. Warren)
NASB Commanding Officer (CAPT Fitzgerald)
RAB Brunswick Representative (S. Johnson)
RAB Harpswell Representative (D. Chipman)
MRRA (V. Boundy)

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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.		



- Legend**
- Naval Air Station Brunswick Boundary
 - Inferred Extent of Eastern Plume

Figure 1A

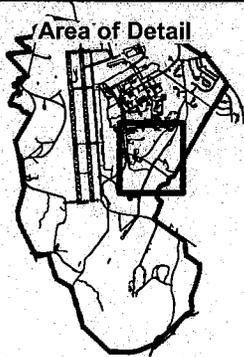
Eastern Plume Site Location

Naval Air Station Brunswick, Maine

Date	Rev.	Date	App. By
20-AUG-2008			
DB	C. Guldo		
CB	J. Donovan		
AB			



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.			



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

Figure 2A

**Location of
Extraction Well EW-05B
Eastern Plume**

Naval Air Station
Brunswick, Maine

Date	Rev.	Date	App. By
20-AUG-2008			
DB	C. Guldo		
CB	J. Donovan		
AB			

ATTACHMENT A

**RESPONSE TO REGULATOR COMMENTS
AND CONCURRENCE LETTERS**

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**RESPONSE TO COMMENTS FROM THE
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND – REGION 1
ON THE DRAFT ADDENDUM TO THE FINAL EXTRACTION WELL
INSTALLATION WORK PLAN
NAVAL AIR STATION BRUNSWICK, MAINE**

Commentor: Michael Daly, EPA - Remedial Project Manager Federal Facilities Superfund Section	
Comment Issue Date: 29 September 2008	Navy Response Date: 1 October 2008

The U.S. Environmental Protection Agency has reviewed the subject document and comments are below:

SPECIFIC COMMENTS:

Page 2, Groundwater Sampling: EPA requests that a baseline ground water sample be collected for VOCs, 1,4-Dioxane and 1,2,3-TCP (if TCP has not been sampled yet as part of the LTM program) prior to commencement of any pumping. Relying on sampling results from the last LTM round would not be considered a good baseline to compare with subsequent pumping samples.

Response: Concur. The extraction well will be sampled for VOCs, 1,4-Dioxane and 1,2,3 – TCP. The Groundwater Sampling Addendum will be modified to state this.

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**RESPONSE TO COMMENTS FROM THE
STATE OF MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION –
BUREAU OF REMEDIATION AND WASTE MANAGEMENT
ON THE DRAFT ADDENDUM TO THE EXTRACTION WELL INSTALLATION
WORKPLAN, NAVAL AIR STATION BRUNSWICK, MAINE**

Commentor: Claudia Sait, MEDEP - Project Manager-Federal Facilities Bureau of Remediation & Waste Management	
Comment Issue Date: 29 September 2008	Navy Response Date: 1 October 2008

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 draft "Addendum to the Extraction Well Installation Work Plan", dated September 9, 2008, prepared by ECC. Based on that review MEDEP has the following comments and issues.

SPECIFIC COMMENTS:

Page 2, Groundwater Sampling, and Attachment A, Section 1.3 - Pump Test paragraph 1:

There is additional detail provided for the constant rate test, but little description of the step test. Please indicate in the text if the step drawdown test will follow the procedure outlines in the final work plan and if it will directly precede the constant rate test. If the plan has changed please provide the rationale for the change and update the text on page 2 with any revisions.

Response: Correct. The plan has not changed. The step drawdown test will follow the procedure outlined in the Final Work Plan and it will directly precede the constant rate test.

Page 3, Groundwater Sampling, table: It is not clear from the text or this table if 1,2,3-Trichloropropane (TCP) will be analyzed for initially. Analyzing for 1,2,3-TCP after 36 hours will address if it is present after sustained pumping but it does not address if the compound is present under typical sampling procedures. MEDEP has offered to take a sample to have is analyzed for 1,2,3-TCP but it will need to be done prior to this test so that it taken under typical low flow sampling which is more static not after 6 minutes of pumping at 15 gallons per minute. If the Navy's plan is to have MEDEP take the initial sample please include that in the work plan.

Response: The Navy will sample the extraction well for VOCs, 1,4-Dioxane and 1,2,3-TCP after 36 hours of pumping, as suggested. Additionally, the Navy will help to coordinate with the MEDEP to collect an additional sample for 1,2,3-TCP prior to pumping. The collection of this additional sample by MEDEP will be included in the Final Work Plan.

Attachment A, Section 1.3 Pump Test paragraph 2: The pump/tubing assembly needs to include a foot valve to prevent back flow into the well when the recovery measurements are initiated.

Response: Concur. This will be added to Attachment A.

ECC

Attachment A, Section 1.4 Analysis of Drawdown Data: The drawdown data, plots and calculations need to be provided as appendices to the final report.

Response: Concur. This will be added to Attachment A.

Attachment B: The sampling procedure proposed for five intervals during the pump test is acceptable provided aeration of the samples is avoided to the greatest extent possible.

Response: Noted.

CONCURRENCE
U.S. ENVIRONMENTAL PROTECTION AGENCY
ON RESPONSE TO COMMENTS
DRAFT ADDENDUM TO THE FINAL EXTRACTION WELL INSTALLATION
WORK PLAN
NAVAL AIR STATION BRUNSWICK, MAINE

From: <Daly.Mike@epamail.epa.gov>
To: "Catherine Guido" <CGuido@ecc.net>
CC: "Al Easterday" <AEasterday@ecc.net>, "Bonnie P CIV NAVFAC Lant Capito" <...
Date: 10/1/2008 4:36 PM
Subject: Re: Extraction Well Installation WP Addendum RTCs - For Concurrence
Attachments: pic23377.jpg

Hi Catherine,

The comment response is fine....., thank you!

Take Care,

Mike

"Catherine Guido" <CGuido@ecc.net>
To
"Claudia Sait" <Claudia.B.Sait@maine.gov>, Mike Daly/R1/USEPA/US@EPA
10/01/2008 03:52 PM

cc "Al Easterday" <AEasterday@ecc.net>, "Bonnie P CIV NAVFAC Lant Capito" <bonnie.capito@navy.mil>, calepage@adelphia.net, "Charles Race" <Charles.Race@tetratech.com>, david.barclift@navy.mil, dmctigue@GFNET.com, "Gina Calderone" <GCalderone@ecc.net>, Gordon.C.Evans@maine.gov, "Jackson Kiker" <JKiker@ecc.net>, "Jeff Donovan" <JDonovan@ecc.net>, "Jennifer Wright" <jennifer.h.wright@navy.mil>, linda.klink@tnus.com, "Lisa Joy" <lisa.joy@navy.mil>, "Michael CIV NAS Brunswick Environmental Fagan" <michael.fagan1@navy.mil>, paul.burgio@navy.mil, todd.bober@navy.mil

Subject
Extraction Well Installation WP Addendum RTCs - For Concurrence

Hi Claudia and Mike:

Thank you for your comments on the Draft Pump Test Addendum. Attached are the Navy responses along with cover letter. We will collect a sample for 1,2,3 TCP as requested and all other comments will be incorporated into the Final Work Plan.

**Please send back an email indicating your concurrence with these RTCs, as soon as possible, so that we can finalize and move forward with the field work.

Thank you,
Gina/Catherine

Catherine Guido
GIS/Environmental Scientist
ECC
33 Boston Post Road West
Suite 340
Marlborough, MA 01752
Tel: (508) 229-2270 X121
Fax: (508) 229-7737
Cell: (508) 397-3439

(Embedded image moved to file: pic23377.jpg)ECC Green Team Your resource for greening the ECC community and beyond. Please consider the environment and, if possible, refrain from printing this email.[attachment "MEDEP EW Pump Test Addendum RTCs.pdf" deleted by Mike Daly/R1/USEPA/US] [attachment "09-002.PDF" deleted by Mike Daly/R1/USEPA/US] [attachment "EPA EW Pump Test Addendum RTCs.pdf" deleted by Mike Daly/R1/USEPA/US]

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October 3, 2008

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

Re: EW5B Pump Test Work Plan Addendum RTCs
Naval Air Station, Brunswick, Maine

Dear Mr. Bober:

The Maine Department of Environmental Protection (MEDEP) has reviewed the Navy's responses dated October 1, 2008, to MEDEP's comments, dated September 29, 2008, for draft "Addendum to the Extraction Well Installation Work Plan", issued September 9, 2008, prepared by ECC. Based on that review, MEDEP is satisfied with the responses and has no further comments provided Navy will be responsible for obtaining sample equipment needed to collect the pre-pump test samples requested by MEDEP and USEPA. MEDEP will coordinate the initial sampling of the extraction well with the Navy as soon as the pump test schedule is finalized.

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

Respectfully,

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

Cf: File
Mike Fagan-BNAS
Ed Benedikt
Al Easterday-ECC
Carol Warren-(email only)
Gina Calderone-ECC (email only)
Carol Warren -BASCE (email only)

Chris Evans-MEDEP
Mike Daly-EPA - EPA
Carolyn Lepage-Lepage Environmental
David W. Chipman (email only)
Catherine Guido-ECC (email only)
Suzanne Johnson BASCE (email only)
Vicki Boundy-MRRA (email only)

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ATTACHMENT B

**EXTRACTION WELL PUMP TEST
STANDARD OPERATING PROCEDURE**

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ATTACHMENT B
EXTRACTION WELL PUMP TEST
STANDARD OPERATING PROCEDURE

The following subsections describe the procedures to be used to collect the aquifer test data, the type of data that will be collected, and the methods of data reduction that will be employed to evaluate the aquifer testing data.

1.0 AQUIFER PERFORMANCE TEST

The following subsections describe the set-up and implementation of the constant rate aquifer performance test (i.e. pump test) to be performed at extraction well (EW)-5B, Naval Air Station, Brunswick, Maine.

1.1 Synoptic Groundwater Head Measurements

Prior to beginning the pump test, a water-level "snapshot" will be obtained by measuring head levels in EW-05B and at each of the following piezometers (PZ); EW-05B PZ-1, EW-05B PZ-2, EW-05B PZ-3, and EW-05B PZ-4. Water levels will be measured from a permanent mark at the top of the PVC riser to the nearest 0.01 of an inch using an electronic water level meter. The locations of EW-05B and piezometers EW-05B PZ-1 through EW-05B PZ-4 are shown on Figure 3A (See Attached.).

1.2 Antecedent Trend Monitoring

Following the initial synoptic groundwater head measurements, EW-05B and the selected piezometers will be outfitted with In-Situ Troll™ data loggers. The Troll™ data loggers are self-contained pressure transducers with programmable recording for capture of changes in water levels during the aquifer tests. The purpose of this data collection is to evaluate water level trends during the aquifer test. Data will be retrieved from the data loggers via laptop computer at the end of the aquifer testing. The data loggers will be placed in EW-05B and the piezometers a minimum of one hour prior to the beginning of the pump test.

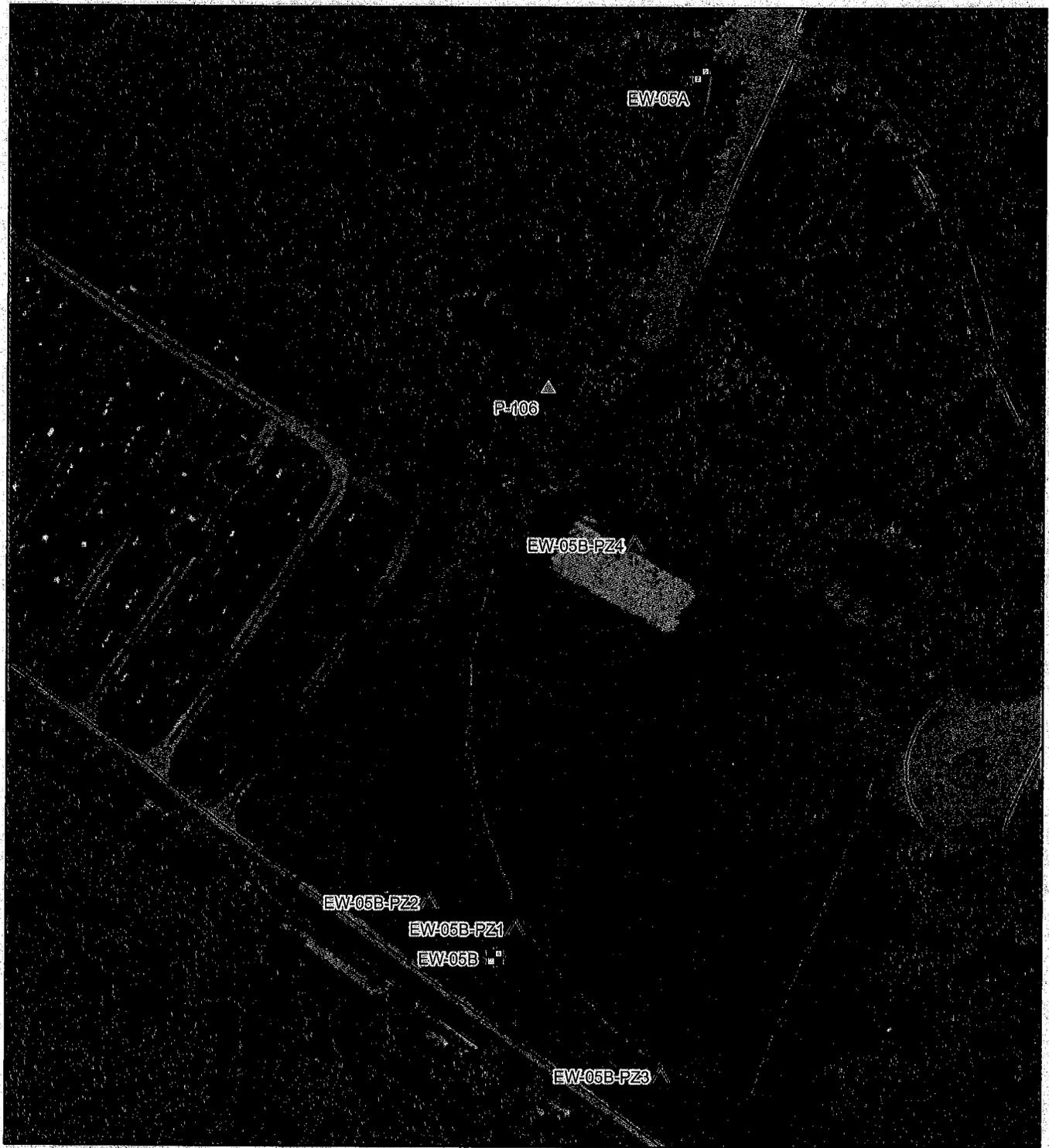
1.3 Pump Test

The constant rate performance test (i.e. pump test) will be conducted at the extraction well to calculate transmissivity, storage coefficients, aquifer parameters, and estimates of long-term extraction/pumping rates. The extraction rate for the test will be the maximum rate possible without causing dewatering the well during the anticipated 72-hour test duration. An initial design pumping rate of 15-gallons per minute is to be used at the beginning of the test. This rate may need to be adjusted to prevent dewatering of the well during the test.

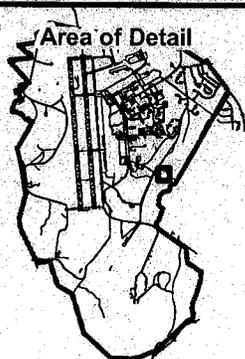
A maximum sustainable rate of groundwater extraction will be held constant for a period of up to 72 hours while drawdowns are recorded in surrounding observation wells. If drawdown stabilizes in observation wells/piezometers sooner than 72-hours, the test will be stopped and water level recovery data recorded. The frequency of water-level data collected by the Troll™ data loggers is approximately 10 readings per log cycle from 0.01 to 1,000 minutes, and will be programmed for each 30 minutes thereafter. The data loggers will be interrogated several times per day while the test is running, and data will be transferred to a laptop computer. The data will be reviewed by an ECC hydrogeologist to obtain a preliminary assessment of hydraulic response, and for adjusting shut-down date/time. Following shut-down, the water levels in each instrumented monitoring well/piezometer will be measured until the water table has recovered to 90 percent of the drawdown from the static water level. A foot valve will be placed in the pump hose assembly to prevent groundwater backflow into the extraction well during the water level measurement. Extraction rates will be monitored with a calibrated pail and stop watch.

1.4 Analysis of Drawdown Data

Due to the semi-confined nature of the aquifer, either the Cooper and Jacob straight line method or the Theis Type Curve Matching method will be used to analyze the performance test. The drawdown data, plots, and calculations will be included as appendices in any subsequent reporting documents.



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.			



Legend

- ☒ Extraction Well
- ▲ Extraction Well Piezometer
- △ Piezometer

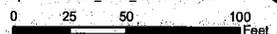
Date	15-AUG-2008	Rev.	Date	App. By
DB	C. Guido			
CB	J. Donovan			
AB				

Figure 3A

**Location of
Extraction Well/Piezometers
Eastern Plume**

Naval Air Station
Brunswick, Maine

ECC Marlborough, MA
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MapDocuments\EP_EW5b_AddendumA.mxd



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ATTACHMENT C

**GROUNDWATER SAMPLING DURING AN AQUIFER
PERFORMANCE TEST
STANDARD OPERATING PROCEDURE**

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ATTACHMENT C
GROUNDWATER SAMPLING DURING AN AQUIFER
PERFORMANCE TEST
STANDARD OPERATING PROCEDURE

1.0 SCOPE OF APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to establish the protocol for collecting groundwater samples during an aquifer performance test (i.e. pump test), or sampling from a discharge pipe. The procedure is designed to permit the collection of groundwater samples with minimum sample agitation, and is intended to be used in conjunction with the analyses for the most common types of groundwater contaminants (volatile organic compounds [VOCs], semi-volatile organic compounds [SVOCs], and inorganic compounds).

1.1 EQUIPMENT/MATERIALS

- Site Work Plan.
- Discharge hose.
- Teflon or Teflon-lined polyethylene tubing.
- Narrow gauge steel tie-down wire.
- Test paper for pH (as need by the analytical method).
- Flow measurement equipment (e.g., flow meter, graduated cylinder and stop watch).
- Tools (screwdrivers, wrench's, hose clamps [large and small], etc).
- Sample bottles and sample preservation supplies (as required by the analytical methods).
- Sample tags or labels.
- Field forms and logbook.
- Cooler with bagged ice.
- Photoionization or Flameionization Detector (depending on site contaminants).

1.2 PRELIMINARY SITE ACTIVITIES

The following site activities are required prior to performing groundwater sampling during a pump test. Field logbooks and sampling forms should be filled out as the procedure is being performed, as noted:

- Enter the following information in the field logbook and sampling form, as appropriate:

Site name, project number, field personnel, well identification, weather conditions, date and time, analysis to be performed, and equipment used.

- Measure VOCs at the wellhead and in the breathing zone with an ionization detector (flame or photo) instrument. Record the readings in the field logbook and the sampling form. If elevated readings are recorded, refer to Site Health and Safety Plan for proper response.

1.3 GROUNDWATER SAMPLING PROCEDURE

The following general procedure should be followed to obtain representative groundwater samples during a pump test. Field logbooks and sampling forms should be filled out as the procedure is being performed.

Prior to sampling and initiation of the pump test, use the following procedure to secure the sampling tube inside the discharge hose. Other methods of securing the sampling tube may be used as long as the pump test is not impacted and the representativeness of the groundwater is maintained.

- Take a large hose clamp and secure it behind the exit nozzle of the discharge hose. Take a small hose clamp and secure it around the sample tubing at point 2-feet from the end the tubing. Ensure that the hose clamps do not hinder flow of groundwater through the sampling tube or the discharge hose. Insert the sampling tube into the discharge hose only when there is no flow through the discharge hose. Insert the sampling tube about 1.5 to 2-feet inside the discharge hose exit nozzle. Take the narrow gauge steel wire and secure the sampling tube into the discharge hose by passing sufficient length of steel wire through both the hose clamps on the sampling tube and on the discharge hose. Secure the ends of the steel wire together.
- Ensure sufficient length of sampling tube is used so that the end can be placed into the groundwater holding tank when the sampling tube is not being used. This will ensure containment of all groundwater.
- Put a small hose clamp around the tubing near the end used end for filling sample containers. This hose clamp will serve as a flow regulator to allow for the filling of sample containers with minimum agitation, loss of preservatives, and spilling of

groundwater.

- Care should be taken not to cause entrapment of air in the tubing system.
- Care should be taken not to hinder the flow of water from the discharge hose.
- If the sampling tube is clamped shut prior to sampling, then the tube must be purged by opening the hose clamp and allowing it to flow for 5-minutes. This purge water must be directed into the groundwater holding tank.
- Begin filling sample containers by allowing the pump discharge to flow into the container with as little agitation or aeration as possible. Collect the samples in the order below, as applicable:
 - VOCs
 - SVOCs
 - Inorganics.
- VOC samples requiring pH adjustment will have their pH checked to assure that the proper pH has been obtained (see Section 1.5 of this SOP). This will require that a test sample be collected to determine the amount of preservative that needs to be added to the sample containers prior to sampling.
- Label each sample as collected. Those samples (VOCs, etc.) requiring cooling will be placed into an ice cooler for delivery to the laboratory. Inorganic samples, after preservation, do not need to be cooled.
- All purge water from the sampling tube and any water leaving the sampling tube not used for sample collection must be directed into the holding tank. Groundwater in the holding tank will be disposed of in accordance with applicable State and Federal regulations, or in accordance with the approved Site Work Plan.
- After all samples have been collected and the pump test has ended, remove the sampling tube and all clamp hoses.
- Where applicable, complete remaining portions of Field Record of Groundwater Level Measurement, Well Development, and Sampling forms (included in this SOP) after each well is sampled, including sample date and time, total quantity of water removed, well sampling sequence, types of sample bottles used, sample identification numbers, preservatives used, parameters requested for analysis, and field observations of sampling event.

1.5 SAMPLE PRESERVATION

The following preservation procedures are examples of typical preservation protocols specific to the indicated analyses. Pre-preserved bottles will be used if possible. Minimum sample preservation requirements for each parameter group are summarized below:

- **VOCs**—Aqueous VOC samples, including 1,4-dioxane and 1,2,3-trichloropropane samples must be collected as specified below. Each VOC sample is collected in two or more sample vials:

Uncap the sample bottle, taking care not to touch the Teflon-faced septum. If the septum is contaminated in any way, it should be replaced.

- Ensure HCl preservative levels are adequate ($\text{pH} < 2$) for VOC (8260B) and 1,2,3 trichloropropane (8260B/SIM) samples. *Note*: 1,4-dioxane samples do not require preservation prior to sampling and analysis. Samples collected for VOC analysis can not be directly pH tested, so expendable sample volume is collected for pH preservation testing. After sample containers are filled, fill an additional sample bottle (pre-preserved with HCl), and check the pH. Note this sample is only for testing acid levels, and it will not be submitted for analysis. Based upon the pH testing, adjust the volume of HCl in sample containers to ensure $\text{pH} < 2$ for the sample matrix and re-collect the samples if the $\text{pH} > 2$.
 - Place the Teflon-faced silicon rubber septum on the convex meniscus, Teflon side (shiny side) down and screw cap on.
 - Invert the bottle, tap lightly, and check for air bubbles.
 - If air bubbles are present, open the bottle, add sample to eliminate air bubbles, and reseal. Repeat this procedure until the bottle is filled and no air bubbles are detected.
 - Place samples on ice until shipment.
- **Inorganics**—Fill the sample bottle, preserve the sample to $\text{pH} < 2$ with nitric acid (HNO_3), seal container, and place sample on ice for shipment.

Disposable pipettes should be used to introduce preservatives into the samples if necessary. Chemicals used for preserving should be poured into a 150-ml beaker. They should not be drawn directly from the preservative bottles as the bottle may become contaminated. Measurements for pH and temperature should not be taken from the sample containers. When preserving samples to a required pH, pH paper should be used to check the resultant pH. The sample should be poured across the pH paper. Never place pH paper directly into sample.

NOTE: Shipping regulations for air couriers limit the amount of preservative that can be added. For a 1-L sample, this is generally 1.5 ml of acid preservative.

1.6 FIELD QUALITY CONTROL

Quality control samples are required to verify that the sample collection and handling process has not affected the quality of the groundwater samples. All field quality control samples must be prepared exactly as a normal sample with regard to sample volume, containers, and preservation. The following quality control samples will be collected at the frequency noted or in accordance with the project Work Plan:

- **Field Duplicate**—Required at a frequency of 1 per 10 samples.
- **Matrix Spike/Matrix Spike Duplicate**—Required at a frequency of 1 per 20 samples.
- **Equipment Rinsate Blank**—Required once prior to installation of dedicated pump systems.
- **Source Water Blank**—Required at a frequency of once per source per sampling event when equipment (rinsate) blank is required. For vendor or laboratory supplied water, the laboratory or vendor may provide certified values for the source water.
- **Trip Blank**— Required for VOC sample analysis at a frequency of 1 per sample shipment container/cooler.
- **Temperature Blank**—Required at a frequency of once per sample shipment container.

1.7 DECONTAMINATION

Non-dedicated sampling equipment and field monitoring equipment will be decontaminated prior to use and following sampling of each well. This equipment will be decontaminated by the procedure listed below. Alternative procedures must be approved by the Project Manager prior to the sampling event. Decontamination fluids will be collected in a 5-gal bucket and treated in accordance with the project Work Plan.

1.7.1 Procedure

The following decontamination procedure will be used:

- Flush the equipment with potable water
- Flush with non-phosphate detergent solution
- Flush with tap water to remove all of the detergent solution
- Flush with distilled/deionized water
- Flush with isopropyl alcohol or methanol

- Flush with distilled/deionized water.

It is recommended that isopropyl alcohol or methanol be used sparingly.