

MEMORANDUM

TO: TRC Members

FROM: Barry Giroux, P.E., Project Manager
Paul Burgess, P.E., Principal

DATE: November 25, 1992

RE: BORON ANALYSES

As you are aware, the issue of boron concentrations in residential wells will be discussed at the December 2, 1992 TRC meeting.

Atlantic Environmental Services, Inc. (Atlantic), in conjunction with the Navy Northern Division, completed an assessment of the boron laboratory results for the residential wells. This assessment was conducted by Dr. Alan Cornell, Chemist of Atlantic. We have attached the results of this study for your review in advance of the TRC meeting. A representative of NET, Cambridge Division (Atlantic's laboratory subcontractor) will also be in attendance at the TRC meeting to discuss the boron analyses.

TECHNICAL MEMORANDUM

TO: Technical Review Committee Members

FROM: Alan Cornell, Ph.D, Principal Scientist

DATE: November 25, 1992

RE: **NAVAL SUBMARINE BASE - NEW LONDON, GROTON, CT
GROUND WATER ANALYSES FOR BORON**

Concern was raised over the level of boron in the ground water in the vicinity of the New London Naval Submarine Base by results of analyses made on samples from private residential wells. These results were from samples taken from December 1990 to July 1991 as sampling rounds 1 through 3. Results ranged from 0.85 to 2.0 ppm and the overall average was 1.35 ppm. The wells were sampled by Atlantic Environmental Services, Inc. (Atlantic) and analyzed by NET, Cambridge Division (NET).

To further evaluate the boron content in ground water, residential well water samples were collected by the Connecticut Department of Environmental Protection and analyzed by the Connecticut State Health Services Laboratory. An additional set of samples was taken by the Navy and submitted to Laboratory Resources, Inc. for analysis. These samples were taken in August and September of 1992, respectively. The results from both laboratories were quite similar to each other and differed from NET results by at least an order of magnitude, (values ranged from non-detect to 0.08 ppm).

These two laboratory results, in agreement with each other, indicated the need to re-examine the original test series that initially raised concern over contamination of the ground water with boron. Under the direction of the Northern Division, Naval Facilities Engineering Command, Atlantic devised a test to:

- check the accuracy of the laboratory boron analysis
- analyze a sample of well water under controlled conditions
- check NET's boron test results against an independent laboratory

The samples to be analyzed were boron spiked knowns at 5.0 and 0.5 ppm, a sample of residential well water from a single source submitted in triplicate, and a deionized water blank. Each laboratory received alternate samples from the six well water samples that comprised the two sets of triplicates. All samples, including blanks, were submitted as coded unknowns. The results of this test with sample identification and codes are presented in Table 1. Each laboratory reported the boron content to within at least 15 percent of the targeted spiked amount. Significantly, NET boron values for the well water samples were qualified due to suspected

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Ground Water Analyses for Boron
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interference. The other participating laboratory, Halliburton NUS, reported all three well samples at <0.05 ppm.

The Halliburton NUS results are in agreement with the boron levels reported by the Connecticut State Health Services Laboratory and Laboratory Resources, Inc. This test confirms that NET results of the three sampling rounds in 1990-1991 were indeed incorrectly high, most likely due to interference. The consistency of NET's results indicates an analysis bias rather than a random error. NET has stated that the interference is due to sulfur and is currently modifying its ICP (inductivity coupled argon plasma spectroscopy) unit to eliminate this problem.

The data as reported by NET and Halliburton NUS are presented in Appendix A.

**TABLE 1
SUMMARY OF BORON TEST RESULTS**

<i>Sample Identification</i>		<i>Laboratory</i>	
Code	Source	NET	Halliburton
GNV	Residential Well	* ≤ 1.7 ppm	---
BZS	Residential Well	---	< 0.05 ppm
HSC	Residential Well	* ≤ 1.7 ppm	---
HAJ	Residential Well	---	< 0.05 ppm
APP	Residential Well	* ≤ 1.7 ppm	---
GTJ	Residential Well	---	< 0.05 ppm
HND	Known, 0.5 ppm	0.57 ppm	---
BZV	Known, 0.5 ppm	---	0.46 ppm
CCJ	Known, 5.0 ppm	4.4 ppm	---
ERH	Known, 5.0 ppm	---	4.8 ppm
GBF	Blank	< 0.1 ppm	---
EUV	Blank	---	< 0.05 ppm

* Results to be qualified due to interference.

APPENDIX A

NET CAMBRIDGE DIVISION
AND
HALLIBURTON NUS DATA

NET Cambridge Division ANALYTICAL REPORT

Report Date: 11/02/1992

Report To: Atlantic Env. (NAVY)

NET Job No: 92.34395

Project: Resampling for Boron Only

Date Rec'd: 10/21/1992

Sample ID	NET ID	Result	Units	Analysis	
				Date	Analyst

Aqueous Digestion	EPA200 A9	EPA 200 mod			
QNH	68429	10/23/1992	date	10/23/1992	puh
HSC	68430	10/23/1992	date	10/23/1992	puh
APP	68431	10/23/1992	date	10/23/1992	puh
HND	68432	10/23/1992	date	10/23/1992	puh
CCJ	68433	10/23/1992	date	10/23/1992	puh
GBF	68434	10/23/1992	date	10/23/1992	puh
Boron (B)	200 ICP A9	EPA 200 ICP, 200.7			
QNH	68429	<=1.7"	mg/L	10/29/1992	ecw
HSC	68430	<=1.7"	mg/L	10/29/1992	ecw
APP	68431	<=1.7"	mg/L	10/29/1992	ecw
HND	68432	0.57	mg/L	10/29/1992	ecw
CCJ	68433	4.4	mg/L	10/29/1992	ecw
GBF	68434	<0.1	mg/L	10/29/1992	ecw

- * An exact value is not available at this time. Sulfur interferes with Boron in this test. In the absence of Sulfur an exact Boron value is available. Where both Sulfur and Boron are present, the exact Boron value is uncertain. NET is having the ICP instrument modified to analyze Boron without Sulfur interference. These samples will be reanalyzed after that is complete.



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Pittsburgh, PA 15205

900 Gemini Avenue
Houston, TX 77058

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LABORATORY ANALYSIS REPORT

CLIENT NAME: ATLANTIC ENVIRONMENTAL SERVICES
ADDRESS: 188 NORWICH AVENUE
COLCHESTER, CT 06415-
ATTENTION: MR. ALAN CORNELL

NUS CLIENT NO: 1824 0001
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: BZS-OSW-12
NUS SAMPLE NO: P0215259
P.O. NO.:

DATE SAMPLED: 19-OCT-92
DATE RECEIVED: 21-OCT-92
APPROVED BY: R Volk

LN	TEST CODE	DETERMINATION	RESULT	UNIT
1	ABW	Boron, Total (B)	< 0.05	mg/L

COMMENTS:

CLEVELAND
(216) 891-4700

HOUSTON
(713) 488-1810

PITTSBURGH
(412) 747-2580



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LABORATORY ANALYSIS REPORT

CLIENT NAME: ATLANTIC ENVIRONMENTAL SERVICES
ADDRESS: 188 NORWICH AVENUE
COLCHESTER, CT 06415-
ATTENTION: MR. ALAN CORNELL

NUS CLIENT NO: 1624 0001
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: HAJ-OSW-12
NUS SAMPLE NO: P0215280
P.O. NO.:

DATE SAMPLED: 19-OCT-92
DATE RECEIVED: 21-OCT-92
APPROVED BY: R Volk

<u>LN</u>	TEST CODE	DETERMINATION	RESULT	UNITS
1	ABW	Boron, Total (B)	< 0.05	µg/L

COMMENTS:

CLEVELAND
(216) 891-4700

HOUSTON
(713) 488-1810

PITTSBURGH
(412) 747-2580



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LABORATORY ANALYSIS REPORT

CLIENT NAME: ATLANTIC ENVIRONMENTAL SERVICES
ADDRESS: 188 NORWICH AVENUE
COLCHESTER, CT 06415-
ATTENTION: MR. ALAN CORNELL

NUS CLIENT NO: 1624 0001
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: GTJ-OSW-12
NUS SAMPLE NO: P0215261
P.O. NO.:

DATE SAMPLED: 19-OCT-92
DATE RECEIVED: 21-OCT-92
APPROVED BY: R Volk

<u>LN</u>	TEST CODE	DETERMINATION	RESULT	UNITS
1	ABW	Boron, Total (B)	< 0.05	mg/L

COMMENTS:



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LABORATORY ANALYSIS REPORT

CLIENT NAME: ATLANTIC ENVIRONMENTAL SERVICES
ADDRESS: 188 NORWICH AVENUE
COLCHESTER, CT 06415-
ATTENTION: MR. ALAN CORNELL

NUS CLIENT NO: 1624 0001
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: BZV-05W-12
NUS SAMPLE NO: P0215262
P.O. NO.:

DATE SAMPLED: 19-OCT-92
DATE RECEIVED: 21-OCT-92
APPROVED BY: R Volk

<u>LN</u>	TEST CODE	DETERMINATION	RESULT	UNITS
1	ABW	Boron, Total (B)	0.46	mg/L

COMMENTS:



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LABORATORY ANALYSIS REPORT

CLIENT NAME: ATLANTIC ENVIRONMENTAL SERVICES
ADDRESS: 188 NORWICH AVENUE
COLCHESTER, CT 06415-
ATTENTION: MR. ALAN CORNELL

NUS CLIENT NO: 1624 0001
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: ERH-OSW-12
NUS SAMPLE NO: P0215263
P.O. NO.:

DATE SAMPLED: 19-OCT-92
DATE RECEIVED: 21-OCT-92
APPROVED BY: R Volk

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ABW	Boron, Total (B)	4.8	mg/L

COMMENTS:



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LABORATORY ANALYSIS REPORT

CLIENT NAME: ATLANTIC ENVIRONMENTAL SERVICES
ADDRESS: 188 NORWICH AVENUE
COLCHESTER, CT 06415-
ATTENTION: MR. ALAN CORNELL

NUS CLIENT NO: 1624 0001
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: EUV-OSW-12
NUS SAMPLE NO: P0215264
P.O. NO.:

DATE SAMPLED: 19-OCT-92
DATE RECEIVED: 21-OCT-92
APPROVED BY: R Volk

<u>LN</u>	TEST CODE	DETERMINATION	RESULT	UNITS
1	ABW	Boron, Total (B)	< 0.05	mg/L

COMMENTS: