ESH-18 WQ&H 01-378 G/M/01

Los Alamos
NATIONAL LABORATORY

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

ENTERED

Date: November 7, 2001
In Reply Refer To: ESH-18/WQ&H:01-378
Mail Stop: K497
Telephone: (505) 667-7969

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Mr. Timothy A. Glasco
Deputy Utilities Manager
Department of Public Utilities
County of Los Alamos
P.O. Drawer 1030
Los Alamos, New Mexico 87544

SUBJECT: MONITORING RESULTS, SPECIAL DRINKING WATER MONITORING PROGRAM, LOS ALAMOS WATER SUPPLY WELLS

Dear Mr. Glasco:

As you are aware, under the Laboratory's Special Drinking Water Monitoring Program, the Los Alamos water supply wells are routinely sampled for tritium (^3H), perchlorate (ClO_4), high explosives (HE), and strontium-90 (Sr-90). This report provides analytical results for the following sampling events:

(1) August sampling of O-1 and G-5A for tritium,
(2) September sampling of PM-3, PM-5, O-1, and G-5A for perchlorate,
(3) September sampling PM-1, PM-2, PM-3, PM-4, PM-5, and O-1 for nitrate/nitrite and fluoride,
(4) 3rd Quarter 2001 sampling of PM-2, PM-4, PM-5, and G-5A for high explosives (HE), and
(5) September sampling of PM-3, PM-5, O-1, and G-5A for the Perchlorate Method Detection Limit (MDL) Study.

August Tritium Results

On August 8, 2001, the Laboratory sampled water supply wells O-1 and G-5A for low-level tritium analysis by the University of Miami's Tritium Laboratory. A copy of the analytical report has been enclosed in Attachment 1.0. In addition, Table 1.0 summarizes all of the CY2001 tritium results that have been received to-date.

Tritium was detected in the August sample from O-1 at 31.29 pCi/L (+/- 0.96 pCi/L). This result is consistent with previous tritium results obtained from O-1 during 2000 and 2001. The current EPA Maximum Contaminant Level (MCL) for tritium is 20,000 pCi/L. No tritium was detected in the August samples from G-5A.

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September Perchlorate Results

GEL Samples. On September 5, 2001, the Laboratory collected two samples (initial sample and duplicate sample) from water supply wells PM-3, PM-5, O-1, and G-5A for perchlorate analysis by General Engineering Laboratories (GEL), Charleston, SC. At the Laboratory's request, GEL performed four replicate analyses on the initial sample. As a result, the Laboratory obtained six perchlorate values from GEL from the two samples collected at each well.

Babcock Samples. On September 5, 2001, the Laboratory collected one sample (initial sample) from water supply wells PM-3, PM-5, O-1, and G-5A for perchlorate analysis by E.S. Babcock & Sons, Inc., Riverside, CA. At the Laboratory's request, Babcock performed three replicate analyses on the initial sample. As a result, the Laboratory obtained four perchlorate values from Babcock from the single sample collected at each well.

These replicate analyses were conducted as part of the Laboratory's Perchlorate Method Detection Limit (MDL) Study. Additional information on the study has been provided later in this letter.

Copies of the analytical reports have been enclosed in Attachment 2.0. In addition, Table 2.0 summarizes all of the CY2001 perchlorate results. A discussion of the results follows.

- **PM-3 Results.** GEL detected perchlorate in three of the six analyses from PM-3 at the following concentrations: 1.47J ppb, 1.62J ppb, and 2.56J ppb. All three detections were qualified as estimated detections (J flag) because the sample results were less than the Reporting Limit (RL) of 4 ppb, but greater than the MDL of 0.958 ppb.

  Babcock did not detect perchlorate in any of the four analyses from PM-3 at concentrations greater than their MDL of 2 ppb.

- **PM-5 Results.** GEL detected perchlorate in three of the six analyses from PM-5 at the following concentrations: 2.05J ppb, 1.49J ppb, and 1.66J ppb. All three detections were qualified as estimated detections (J flag) because the sample results were less than the RL of 4 ppb, but greater than the MDL of 0.958 ppb.

  Babcock did not detect perchlorate in any of the four analyses from PM-5 at concentrations greater than their MDL of 2 ppb.

- **O-1 Results.** GEL detected perchlorate in all six of the analyses from O-1 at the following concentrations: 3.86J ppb, 3.24J ppb, 2.55J ppb, 3.07J ppb, 2.92J ppb, and 3.53J ppb. All six detections were qualified as estimated detections (J flag) because the sample results were less than the RL of 4 ppb, but greater than the MDL of 0.958 ppb.

  Babcock did not detect perchlorate in any of the four analyses from O-1 at concentrations greater than their MDL of 2 ppb.

- **G-5A (GR-1) Results.** GEL detected perchlorate in three of the six analyses from G-5A at the following concentrations: 1.47J ppb, 1.29J ppb, and 2.61J ppb. All three detections were qualified as estimated detections (J flag) because the sample results were less than the RL of 4 ppb, but greater than the MDL of 0.958 ppb.

  Babcock did not detect perchlorate in any of the four analyses from G-5A at concentrations greater than their MDL of 2 ppb.

September Nitrate/Nitrite Results

On September 5, 2001, the Laboratory sampled water supply wells PM-1, PM-2, PM-3, PM-4, PM-5, and O-1 for nitrite/nitrite. Copies of the analytical reports have been enclosed in Attachment 2.0. In addition, Table 3.0 summarizes the results. The nitrate/nitrite (as nitrogen) concentrations for wells PM-1, PM-2, PM-3, PM-4, and PM-5 are consistent with previous results obtained from these wells and the regional aquifer. The nitrate/nitrite (as nitrogen) concentrations from O-1 of 1.10 mg/L and 1.11 mg/L are elevated above regional aquifer concentrations, but consistent with previous results obtained from this well. The Laboratory will continue to monitor these six wells for nitrate/nitrite quarterly.

September Fluoride Results

On September 5, 2001, the Laboratory sampled water supply wells PM-1, PM-2, PM-3, PM-4, PM-5, and O-1 for fluoride. Copies of the analytical reports have been enclosed in Attachment 2.0. In addition, Table 4.0 summarizes the results. The fluoride concentrations for wells PM-1, PM-2, PM-3, PM-4, PM-5, and O-1 are consistent with previous results obtained from these wells and the regional aquifer.

3rd Quarter 2001 HE Results

On September 5, 2001, the Laboratory sampled water supply wells PM-2, PM-4, PM-5, and G-5A for high explosives (HE). These 3rd quarter 2001 HE samples were initially collected on August 8, 2001, but due to shipping delays by the Laboratory's contract carrier the samples became too warm to analyze. As a result, the samples were recollected on September 5, 2001. Copies of the analytical reports have been enclosed in Attachment 3.0. In addition, Table 5.0 summarizes all of the HE results for CY2001. No HE was detected in any of the samples at concentrations greater than GEL's MDL.

September VOA and SVOA Results.

On September 5, 2001, the Laboratory collected two samples (initial sample and duplicate sample) from water supply well O-1 for volatile (VOA) and semivolatile (SVOA) organic compounds. Copies of the analytical reports have been enclosed in Attachment 4.0. No VOA compounds were positively identified in either sample. One VOA compound, 1,4-Dichlorobenzene, was reported in both samples at estimated (J flag) concentrations of 0.27 ppb and 0.16 ppb. GEL's Reporting Limit for 1,4-Dichlorobenzene is 1.0 ppb. The Laboratory will collect a confirmation sample from O-1 for VOA compounds in November 2001 to confirm the presence of 1,4-Dichlorobenzene.

No SVOA compounds are detected in either of the samples from O-1.

Perchlorate MDL Study

Overview. Over the past 18 months the Laboratory has been conducting routine monitoring of the Los Alamos Water Supply Wells for perchlorate. Perchlorate was first detected in a water supply well in June 2000 at Otowi-1. Since then, 40 perchlorate samples (not including replicate analyses) were collected from O-1. The results can be summarized as follows:

- 30 detections for perchlorate from 40 samples (30/40, 75%),
- 28 qualified detections ('J flagged' detections ranging from 1.1 ppb to 3.9 ppb),
- 2 unqualified detections (5 ppb, 5.9 ppb),
- 10 of the 30 detections were from13 samples run by GEL (10/13, 77%),
- 20 of the 30 detections were from 27 samples run by Babcock (20/27, 74%).
- 10 non-detects.

Both GEL and Babcock have consistently reported low-level detections of perchlorate from O-1. The data show good agreement between GEL and Babcock results; 77% of GEL results are detects while 74% of Babcock results are detects. The quantities reported by both GEL and Babcock, however, vary widely from 1.1 ppb to 5.9 ppb. The data suggest that at concentrations below 4 ppb analysis by Ion Chromatography (IC) may be effective at determining the presence or absence of perchlorate, but is not effective at accurately measuring the quantity of perchlorate in the sample. In conclusion, the 75% detection frequency at O-1 strongly indicates that perchlorate is present in the well water at a concentration between 1 ppb and 4 ppb.

Since April 2001, perchlorate detections have also been reported at PM-1, PM-3, PM-5, O-4, and G-5A. During CY2001, the percent of GEL detections (including replicate analyses) for PM-1, PM-3, PM-5, O-4, and G-5A are as follows:

- PM-1: 50% of results are detections (1 detection in 2 samples),
- PM-2: 0% detects (0/2),
- PM-3: 43% detects (7/16),
- PM-4: 0% detects (0/2),
- PM-5: 33% detects (5/15),
- O-4: 50% detects (1/2),
- G-1A: 0% detects (0/2),
- G-2A: 0% detects (0/2),
- G-3A: 0% detects (0/2),
- G-4A: 0% detects (0/2),
- G-5A: 57% detects (4/7), and
- *Overall: 33% detects (18/54).*

Detections at PM-1, PM-3, PM-5, O-4, and G-5A have a distinctively different profile than those at water supply well O-1. First, the frequency of detections at these five wells ranges from 33% to 57%, far lower than the frequencies seen at O-1. And second, all detections at these five wells have been reported by GEL alone; Babcock has never reported a perchlorate detection in a water supply well with the exception of Otowi-1. The randomness of the GEL data suggests that their MDL of 0.958 ppb may be too low to prevent the reporting of false positives. The CY2001 data do not substantiate the presence of perchlorate in PM-1, PM-3, PM-5, O-4, and G-5A. Further, the

CY2001 data prompted the Laboratory to conduct a study to determine what the actual or effective MDL is for perchlorate.

MDL Determination. Analytical laboratories determine their MDL for perchlorate using deionized water. Ground water, in contrast, contains a wide variety of naturally occurring ions. During analysis these ions can create interference resulting in a less precise measurement. The precision obtained in deionized water cannot be duplicated in natural water. The inconsistencies in the perchlorate data collected from the Los Alamos Water Supply Wells suggest that interference occurs and that the actual detection limit is higher than the calculated MDLs reported by GEL and Babcock.

Following the recommendation of Mr. Mark Minteer, Analytical Quality Associates, Inc., in September 2001 the Laboratory initiated a Perchlorate MDL Study. Samples from water supply wells PM-3, PM-5, O-1, and G-5A were spiked as follows: (1) GEL samples at 1 ppb, 2 ppb, 4 ppb, and 6 ppb; and (2) Babcock samples at 2 ppb, 4 ppb, and 6 ppb. Table 6.0 presents a summary of the study's results. A discussion of the results follows.

The perchlorate results reported by GEL for the unspiked samples from PM-3, PM-5, and G-5A are highly uncertain. Fifty percent (50%) of the unspiked analyses from PM-3, PM-5, and G-5A were detections. This detection frequency is consistent with GEL's CY2001 data reported earlier in this letter (33% detection frequency for all wells except O-1). These data suggest further that GEL's MDL of 0.958 ppb may be too low to provide consistent results and prevent the reporting of false positives.

The perchlorate results reported by GEL for PM-3, PM-5, and G-5A suggest that the measurements have a high bias in the 1 ppb, 2 ppb, and 4 ppb spiked samples. The table below presents the average of all detections for each sample type. For the 1 ppb spiked samples, the average for the 12 detections reported at these three wells is 2.5 ppb with a high bias of approximately 1.5 ppb. At 2 ppb, results from PM-3, PM-5, and G-5A become more consistent, but continue to show a uniformly high bias of approximately 1.3 ppb. The bias diminishes to 0.7 ppb for the 4 ppb spiked samples and to 0 ppb for the 6 ppb spiked samples. The data show a good correlation between instrument accuracy and the concentration of perchlorate in the sample.

Sample Type	Average of All Detections PM-3, PM-5, G-5A	Bias
1 ppb spike	2.5	+1.5
2 ppb spike	3.3	+1.3
4 ppb spike	4.7	+0.7
6 ppb spike	6.0	0

The GEL results for water supply well O-1 are markedly different than the results from PM-3, PM-5, and G-5A. All (100%) of the unspiked analyses from O-1 were detections. While the 1 ppb and 2 ppb spiked results are less random and more consistent than those same samples from PM-3, PM-5, and G-5A, they do not accurately display the additive progression that is expected (ie, unspiked results+1 ppb+2 ppb, etc.). This suggests further that the instrument's capability to quantify below 4 ppb is limited.

The enclosed (Attachment 5.0) report from Mr. Minteer details his findings from the Perchlorate MDL Study data. In summary, Mr. Minteer recommends that LANL adopt a MDL for perchlorate that is no lower than 4 ppb. Mr. Minteer believes that the sensitivity of the IC is not adequate to produce reliable results at GEL's calculated MDL of 1 ppb.

Before implementing Mr. Minteer's recommendation the Laboratory is collecting additional data for the Perchlorate MDL Study using a new analytical laboratory, Acculabs. Acculabs has the capability of analyzing for perchlorate using a more specific method, Liquid Chromatography/Mass Spec/Mass Spec (LC/MS/MS). On October 24, 2001, the Laboratory collected samples from PM-3, PM-5, and G-1A. Samples were spiked a 1 ppb, 2 ppb, 3 ppb, 4 ppb, and 5 ppb and submitted to GEL, Babcock, and Acculabs. Results will be reported to Los Alamos County as soon as they become available.

Please contact me at (505) 667-7969 should you have any questions regarding these results.

Sincerely,

Bob Beers
Water Quality and Hydrology Group

BB/tml

Attachments: a/s

Cy: B. Bartels, NMED/DWB, Santa Fe, New Mexico, w/att.
C. Ortega, Los Alamos County, New Mexico, w/att.
J. Vozella, DOE/LAAO, w/att., MS A316
K. Agogino, DOE/AL, Albuquerque, New Mexico, w/att.
S. Yanicek, DOE/NMED/OB, w/att., MS J993
J. Holt, ADO, w/att., MS A104
L. McAtee, ESH-DO, w/att., MS K491
D. Stavert, ESH-DO, w/att., MS K491
P. Thullen, ESH-DO, w/att., MS K491
S. Rae, ESH-18, w/att., MS K497
C. Nylander, ESH-18, w/att., MS K497
K. Mullen, ESH-18, w/att., MS K497
D. Rogers, ESH-18, w/att., MS K497
WQ&H File, w/att., MS K497
IM-5, w/att., MS A150

Table 1.0. CY2001 Special Drinking Water Monitoring Results for Tritium (pCi/L)

Sample Date	PM-1		PM-2		PM-3		PM-4		PM-5		O-1	
	Result	Uncertainty	Result	Uncertainty	Result	Uncertainty	Result	Uncertainty	Result	Uncertainty	Result	Uncertainty
1/9/01											29.06	0.96
1/9/01											30.33	0.96
2/14/01	1.34	0.29	-0.13	0.29	OS	OS	0.00	0.29	0.00	0.29	38.00	1.28
2/14/01											36.40	1.28
3/13/01											32.57	0.96
3/13/01											33.53	0.96
4/11/01											28.10	0.96
5/9/01					-0.19	0.29					35.44	1.28
6/13/01											33.85	1.28
7/11/01											33.53	0.96
8/8/01											31.29	0.96

Sample Date	O-4		G-1A		G-2A (GR-2)		G-3A (GR-3)		G-4A (GR-4)		G-5A (GR-1)	
	Result	Uncertainty	Result	Uncertainty	Result	Uncertainty	Result	Uncertainty	Result	Uncertainty	Result	Uncertainty
1/9/01											OS	
2/14/01	-0.10	0.29	0.26	0.29	OS	OS	0.10	0.29	0.00	0.29	OS	
3/13/01											OS	
4/11/01											OS	
5/9/01					0.06	0.35					OS	
8/8/01											-0.10	0.29
8/8/01											0.16	0.29

Notes:

"Uncertainty" means the analytical uncertainty (+/-). Uncertainties are expressed as one standard deviation (1 sigma).

"OS" means that the well was out-of-service on that date.

The federal Maximum Contaminant Level (MCL) for tritium in drinking water is 20,000 pCi/L.

All units are pCi/L.

Analytical Laboratory

University of Miami Tritium Laboratory

Table 2.0. CY 2001 Special Drinking Water Monitoring Results for Perchlorate (ppb)

Sample Date	Analytical Lab	PM-1	PM-2	PM-3	PM-4	PM-5	O-1	O-4	G-1A	G-2A (GR-2)	G-3A (GR-3)	G-4A (GR-4)	G-5A (GR-1)
1/9/01	Babcock						1.5J						
1/9/01	Babcock						1.5J						
2/14/01	GEL	ND	ND	OS	ND	1.06J	ND	ND	ND	OS	ND	ND	OS
2/14/01	GEL						ND						
2/14/01	Babcock	ND	ND	OS	ND	ND	2.31	ND	ND	OS	ND	ND	OS
2/14/01	Babcock						1.61						
3/13/01	Babcock						ND						
4/11/01	GEL			2.29J		ND	2.24J						
4/11/01	GEL			ND		ND	1.16J						
4/11/01	GEL			ND		ND	ND						
4/11/01	GEL			1.01J		ND	1.18J						
4/11/01	Babcock			ND		ND	1.5J						
4/11/01	Babcock			ND		ND	2.01						
4/11/01	Babcock			ND		ND	1.61						
4/11/01	Babcock			ND		ND	ND						
5/9/01	Babcock			ND		ND	1.9J			ND			
5/9/01	GEL			1.35J		ND				ND			
6/13/01	Babcock			ND		ND	2.7J						OS
6/13/01	GEL			ND		ND	1.12J						
7/11/01	GEL			ND		2.42J	5.85						
7/11/01	GEL			3.96J			3.74J						
7/11/01	Babcock			ND		ND	ND						
8/8/01	GEL	2.12J	ND	ND	ND	ND	3.48J	1.65J	ND	ND	ND	ND	1.75J
8/8/01	GEL						3.32J						
9/5/01	GEL initial sample			ND		2.05J	3.86J						ND
9/5/01	GEL initial replicate			ND		ND	3.24J						ND
9/5/01	GEL initial replicate			1.47J		1.49J	2.55J						1.47J
9/5/01	GEL initial replicate			ND		1.66J	3.07J						1.29J
9/5/01	GEL initial replicate			1.62J		ND	2.92J						ND
9/5/01	GEL duplicate sample			2.56J		ND	3.53J						2.61J
9/5/01	Babcock initial sample			ND		ND	ND						ND
9/5/01	Babcock initial replicate			ND		ND	ND						ND
9/5/01	Babcock initial replicate			ND		ND	ND						ND
9/5/01	Babcock initial replicate			ND		ND	ND						ND

Notes:

"OS" means that the well was out-of-service on that date.
"J" means that the sample result is estimated because it is below the analytical laboratory's RL of 4 ppb, but above the laboratory's MDL.
"ND" means that none of the analyte was detected above the analytical laboraory's Minimum Detection Limit (MDL).
Babcock means the *E.S. Babcock & Sons* that has a Reporting Limit (RL) of 4 ppb and a Minimum Detection Limit (MDL) of 2 ppb.
GEL means the *General Engrineering Laboratories* that has a Reporting Limit (RL) of 4 ppb and a Minimum Detection Limit (MDL) of 1 ppb.

Table 3.0. CY 2001 Special Drinking Water Monitoring Results for Nitrate/nitrite (as N).

Sample Date	Analytical Lab	PM-1 (mg/L)	PM-2 (mg/L)	PM-3 (mg/L)	PM-4 (mg/L)	PM-5 (mg/L)	O-1 (mg/L)
9/5/01	GEL	0.460	0.330	0.460	0.300	0.310	1.10
9/5/01	GEL duplicate sample						1.11

Notes:
GEL means the *General Engrineering Laboratories*

Table 4.0. CY 2001 Special Drinking Water Monitoring Results for Fluoride.

Sample Date	Analytical Lab	PM-1 (mg/L)	PM-2 (mg/L)	PM-3 (mg/L)	PM-4 (mg/L)	PM-5 (mg/L)	O-1 (mg/L)
9/5/01	GEL	0.237	0.246	0.292	0.266	0.252	0.364
9/5/01	GEL duplicate sample						0.366

Notes:
GEL means the *General Engrineering Laboratories*

Table 5.0. Special Drinking Water Monitoring Results for High-Explosives (ppb)

Sample Date	PM-1	PM-2	PM-3	PM-4	PM-5	O-1	O-4	G-1A	G-2A	G-3A	G-4A	G-5A
2/14/01	ND	ND	OS	ND	ND	ND	ND	ND	OS	ND	ND	OS
2/14/01						ND						
5/9/01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	OS
5/9/01						ND						
9/5/01		ND		ND	ND							ND
9/5/01					ND							

Notes:
"ND" means that the target analyte was not detected above the analytical laboratory's detection limit.
"OS" means that the well was out-of-service on that date.

Table 6.0. Summary of Perchlorate Study Analytical Results. Sample Date: 9/5/2001. All units are ug/L (ppb).

	O-1		PM-3		PM-5		G-5A	
Sample Type	**Babcock**	**GEL**	**Babcock**	**GEL**	**Babcock**	**GEL**	**Babcock**	**GEL**
Initial Sample	<2	3.86	<2	<0.958	<2	2.05	<2	<0.958
Initial Sample Rerun #1	<2	3.24	<2	<0.958	<2	<0.958	<2	<0.958
Initial Sample Rerun #2	<2	2.55	<2	1.47	<2	1.493	<2	1.474
Initial Sample Rerun #3	NA	3.07	NA	<0.958	NA	1.663	NA	1.287
Initial Sample Rerun #4	NA	2.92	NA	1.62	NA	<0.958	NA	<0.958
Dupe Sample	<2	3.53	<2	2.56	<2	<0.958	<2	2.61
1 ppb Spike	NA	3.87	NA	3.49	NA	1.3	NA	<0.958
1 ppb Spike Rerun #1	NA	3.53	NA	1.86	NA	3.267	NA	1.88
1 ppb Spike Rerun #2	NA	3.88	NA	<0.958	NA	2.58	NA	3.026
1 ppb Spike Rerun #3	NA	3.77	NA	2.67	NA	1.505	NA	<0.958
1 ppb Spike Rerun #4	NA	3.87	NA	3.49	NA	1.295	NA	3.058
2 ppb Spike	2.7	4.22	<2	3.90	<2	2.3	3.1	3.24
2 ppb Spike Rerun #1	<2	4.52	<2	3.21	<2	3.525	<2	3.56
2 ppb Spike Rerun #2	<2	4.91	<2	3.57	<2	3.2	<2	3.269
2 ppb Spike Rerun #3	NA	4.56	NA	3.60	NA	3.37	NA	3.455
2 ppb Spike Rerun #4	NA	4.69	NA	3.00	NA	3.594	NA	3.015
4 ppb spike	6	6.59	4	4.16	4	3.72	5	6.19
6 ppb spike	7	7.56	6	5.72	7	6.88	7	5.42

ATTACHMENT 1.0

ANALYTICAL REPORTS

TRITIUM RESULTS

UNIVERSITY OF MIAMI TRITIUM LABORATORY

OTOWI-1
G-5A

SAMPLE DATE: AUGUST 8, 2001

Client: LOS ALAMOS NATIONAL LAB - BEERS
Recvd : 01/08/13
Job# : 1525
Final : 01/09/19

Pur. Order: 13004 7C18/W5R5 1802
Contact: Bob Beers, 505/667-7969
ESH-18, MS K497 (F) 665-9344
Los Alamos, NM 87545

Cust	LABEL INFO	JOB.SX	REFDATE	QUANT	ELYS	TU	eTU
1	LANL-BEERS- UU01081G10W	1525.01	010808	1000	275	9.8	0.3
2	LANL-BEERS- UU01081G1RG	1525.02	010808	1000	238	-0.03*	0.09
3	LANL-BEERS- UU01082G1RG	1525.03	010808	1000	275	0.05	0.09
	LANL-BEERS- UU0108BUCK1	1525.04	010816	1000	276	0.00	0.09
	LANL-BEERS- UU01081BUCK1-FLD	1525.05	010816	1000	275	0.35*	0.09
	LANL-BEERS- UU01081BUCK7	1525.06	010816	1000	275	0.07*r	0.09
	LANL-BEERS- UU01081BUCK2	1525.07	010816	1000	275	-0.06	0.09

* Average of duplicate runs
r RERUN in progress

1 OTOW1-1, AUGUST 8, 2001

2 G-5A, AUGUST 8, 2001

3 G-5A duplicate sample, AUGUST 8, 2001

NOTE: 1 TU = 3.193 pCi/L

ATTACHMENT 2.0

ANALYTICAL REPORTS

SEPTEMBER PERCHLORATE RESULTS

GENERAL ENGINEERING LABORATORIES
E.S. BABCOCK & SONS INC.

PM-3, PM-5, O-1, G-5A

QUARTERLY NITRATE & FLUORIDE RESULTS

GENERAL ENGINEERING LABORATORIES

PM-1, PM-2, PM-3, PM-4, PM-5, O-1

SAMPLE DATE: APRIL 11, 2001

PM-1

Certificate of Analysis

Company : Los Alamos National Labs
Address : MS K497 ESH-18
Water Quality & Hydrology
Los Alamos, New Mexico 87545
Contact: Billy Turney
Project: Groundwater

Report Date: October 4, 2001

Client Sample ID: GU01091G1MP
Sample ID: 48671020
Matrix: Ground Water
Collect Date: 05-SEP-01
Receive Date: 07-SEP-01
Collector: Client

Project: LANL00701
Client ID: LANL003

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
TRAACS Nutrient Analysis Fed											
EPA 353.1 Nitrogen, (NO3/NO2											
Nitrogen, Nitrate/Nitrite		0.460	0.0069	0.050	mg/L	1	THL	09/11/01	1635	108760	1
Wet Chemistry General Federal											
EPA 340.2 Fluoride Federal											
Fluoride		0.237	0.006	0.100	mg/L	1	AL1	10/02/01	1220	112718	2

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	EPA 353.1	
2	EPA 340.2	

Notes:
The Qualifiers in this report are defined as follows :

** Indicates the analyte is a surrogate compound.
< Actual result is less than amount reported
> Actual result is greater than amount reported
E Concentration exceeds instrument calibration range
J Indicates an estimated value. The result was greater than the detection limit, but less than the reporting limit.
U Indicates the compound was analyzed for but not detected above the detection limit
X Lab-specific qualifier - must be fully described in case narrative and data summary package

The above sample is reported on an "as received" basis.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories, Inc. standard operating procedures. Please direct any questions to your Project Manager, Edie Kent.

Reviewed by

PM-2

Certificate of Analysis

Company : Los Alamos National Labs
Address : MS K497 ESH-18
Water Quality & Hydrology
Los Alamos, New Mexico 87545
Contact: Billy Turney
Project: Groundwater

Report Date: October 4, 2001

Client Sample ID: GU01091G2MP
Sample ID: 48671002
Matrix: Ground Water
Collect Date: 05-SEP-01
Receive Date: 07-SEP-01
Collector: Client

Project: LANL00701
Client ID: LANL003

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
TRAACS Nutrient Analysis Fed											
EPA 353.1 Nitrogen, (NO3/NO2											
Nitrogen, Nitrate/Nitrite		0.330	0.0069	0.050	mg/L	1	THL	09/11/01	1635	108760	1
Wet Chemistry General Federal											
EPA 340.2 Fluoride Federal											
Fluoride		0.246	0.006	0.100	mg/L	1	AL1	10/02/01	1220	112718	2

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
SW846 8330 PREP	8330 EXPLOSIVES BY HPLC Prep in liquid	GMS	09/12/01	1000	109006

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	EPA 353.1	
2	EPA 340.2	

Notes:
The Qualifiers in this report are defined as follows :

** Indicates the analyte is a surrogate compound.
< Actual result is less than amount reported
> Actual result is greater than amount reported
E Concentration exceeds instrument calibration range
J Indicates an estimated value. The result was greater than the detection limit, but less than the reporting limit.
U Indicates the compound was analyzed for but not detected above the detection limit
X Lab-specific qualifier - must be fully described in case narrative and data summary package

The above sample is reported on an "as received" basis.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories, Inc. standard operating procedures. Please direct any questions to your Project Manager, Edie Kent.

Reviewed by

PM-3

Certificate of Analysis

Company : Los Alamos National Labs
Address : MS K497 ESH-18
Water Quality & Hydrology
Los Alamos, New Mexico 87545
Contact: Billy Turney
Project: Groundwater

Report Date: October 4, 2001

Client Sample ID: GU01091G3MP
Sample ID: 48671030
Matrix: Ground Water
Collect Date: 05-SEP-01
Receive Date: 07-SEP-01
Collector: Client

Project: LANL00701
Client ID: LANL003

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Ion Chromatography Federal											
EPA 314.0 Perchlorate by IC											
Perchlorate	U	ND	0.958	4.00	ug/L	1	RWS	09/14/01	1858	109638	1
TRAACS Nutrient Analysis Fed											
EPA 353.1 Nitrogen, (NO3/NO2											
Nitrogen, Nitrate/Nitrite		0.460	0.0069	0.050	mg/L	1	THL	09/11/01	1635	108760	2
Wet Chemistry General Federal											
EPA 340.2 Fluoride Federal											
Fluoride		0.292	0.006	0.100	mg/L	1	ALI	10/02/01	1220	112718	3

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	EPA 314.0	
2	EPA 353.1	
3	EPA 340.2	

Notes:
The Qualifiers in this report are defined as follows :

** Indicates the analyte is a surrogate compound.
< Actual result is less than amount reported
> Actual result is greater than amount reported
E Concentration exceeds instrument calibration range
J Indicates an estimated value. The result was greater than the detection limit, but less than the reporting limit.
U Indicates the compound was analyzed for but not detected above the detection limit
X Lab-specific qualifier - must be fully described in case narrative and data summary package

The above sample is reported on an "as received" basis.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories, Inc. standard operating procedures. Please direct any questions to your Project Manager, Edie Kent.

Reviewed by

PM-3
duplicate sample

Certificate of Analysis

Company : Los Alamos National Labs
Address : MS K497 ESH-18
Water Quality & Hydrology
Los Alamos, New Mexico 87545
Contact: Billy Turney
Project: Groundwater

Report Date: October 4, 2001

Client Sample ID: GU01092G3MP
Sample ID: 48671013
Matrix: Ground Water
Collect Date: 05-SEP-01
Receive Date: 07-SEP-01
Collector: Client

Project: LANL00701
Client ID: LANL003

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Ion Chromatography Federal											
EPA 314.0 Perchlorate by IC											
Perchlorate	J	2.56	0.958	4.00	ug/L	1	RWS	09/14/01	1709	109638	1

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	EPA 314.0	

Notes:
The Qualifiers in this report are defined as follows :

** Indicates the analyte is a surrogate compound.
< Actual result is less than amount reported
> Actual result is greater than amount reported
E Concentration exceeds instrument calibration range
J Indicates an estimated value. The result was greater than the detection limit, but less than the reporting limit.
U Indicates the compound was analyzed for but not detected above the detection limit
X Lab-specific qualifier - must be fully described in case narrative and data summary package

The above sample is reported on an "as received" basis.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories, Inc. standard operating procedures. Please direct any questions to your Project Manager, Edie Kent.

Reviewed by

PM-4

Certificate of Analysis

Company : Los Alamos National Labs
Address : MS K497 ESH-18
Water Quality & Hydrology
Los Alamos, New Mexico 87545
Contact: Billy Turney
Project: Groundwater

Report Date: October 4, 2001

Client Sample ID:	GU01091G4MP	Project:	LANL00701
Sample ID:	48671001	Client ID:	LANL003
Matrix:	Ground Water		
Collect Date:	05-SEP-01		
Receive Date:	07-SEP-01		
Collector:	Client		

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
TRAACS Nutrient Analysis Fed											
EPA 353.1 Nitrogen, (NO3/NO2											
Nitrogen, Nitrate/Nitrite		0.300	0.0069	0.050	mg/L	1	THL	09/11/01	1635	108760	1
Wet Chemistry General Federal											
EPA 340.2 Fluoride Federal											
Fluoride		0.266	0.006	0.100	mg/L	1	AL1	10/02/01	1220	112718	2

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
SW846 8330 PREP	8330 EXPLOSIVES BY HPLC Prep in liquid	GMS	09/12/01	1000	109006

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	EPA 353.1	
2	EPA 340.2	

Notes:
The Qualifiers in this report are defined as follows :

** Indicates the analyte is a surrogate compound.
< Actual result is less than amount reported
> Actual result is greater than amount reported
E Concentration exceeds instrument calibration range
J Indicates an estimated value. The result was greater than the detection limit, but less than the reporting limit.
U Indicates the compound was analyzed for but not detected above the detection limit
X Lab-specific qualifier - must be fully described in case narrative and data summary package

The above sample is reported on an "as received" basis.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories, Inc. standard operating procedures. Please direct any questions to your Project Manager, Edie Kent.

Reviewed by

PM-5

Certificate of Analysis

Company : Los Alamos National Labs
Address : MS K497 ESH-18
Water Quality & Hydrology
Los Alamos, New Mexico 87545
Contact: Billy Turney
Project: Groundwater

Report Date: October 4, 2001

Client Sample ID: GU01091G5MP
Sample ID: 48671005
Matrix: Ground Water
Collect Date: 05-SEP-01
Receive Date: 07-SEP-01
Collector: Client

Project: LANL00701
Client ID: LANL003

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Ion Chromatography Federal											
EPA 314.0 Perchlorate by IC											
Perchlorate	J	2.05	0.958	4.00	ug/L	1	RWS	09/13/01	1207	109268	1
TRAACS Nutrient Analysis Fed											
EPA 353.1 Nitrogen, (NO3/NO2											
Nitrogen, Nitrate/Nitrite		0.310	0.0069	0.050	mg/L	1	THL	09/11/01	1635	108760	2
Wet Chemistry General Federal											
EPA 340.2 Fluoride Federal											
Fluoride		0.252	0.006	0.100	mg/L	1	AL1	10/02/01	1220	112718	3

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
SW846 8330 PREP	8330 EXPLOSIVES BY HPLC Prep in liquid	GMS	09/12/01	1000	109006

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	EPA 314.0	
2	EPA 353.1	
3	EPA 340.2	

Notes:
The Qualifiers in this report are defined as follows :

** Indicates the analyte is a surrogate compound.
< Actual result is less than amount reported
> Actual result is greater than amount reported
E Concentration exceeds instrument calibration range
J Indicates an estimated value. The result was greater than the detection limit, but less than the reporting limit.
U Indicates the compound was analyzed for but not detected above the detection limit
X Lab-specific qualifier - must be fully described in case narrative and data summary package

The above sample is reported on an "as received" basis.

PM-5
duplicate sample

Certificate of Analysis

Company : Los Alamos National Labs
Address : MS K497 ESH-18
Water Quality & Hydrology
Los Alamos, New Mexico 87545
Contact: Billy Turney
Project: Groundwater

Report Date: October 4, 2001

Client Sample ID: GU01092G5MP
Sample ID: 48671003
Matrix: Ground Water
Collect Date: 05-SEP-01
Receive Date: 07-SEP-01
Collector: Client

Project: LANL00701
Client ID: LANL003

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Ion Chromatography Federal											
EPA 314.0 Perchlorate by IC											
Perchlorate	U	ND	0.958	4.00	ug/L	1	RWS	09/13/01	1127	109268	1

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
SW846 8330 PREP	8330 EXPLOSIVES BY HPLC Prep in liquid	GMS	09/12/01	1000	109006

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	EPA 314.0	

Notes:
The Qualifiers in this report are defined as follows :

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> Actual result is greater than amount reported
E Concentration exceeds instrument calibration range
J Indicates an estimated value. The result was greater than the detection limit, but less than the reporting limit.
U Indicates the compound was analyzed for but not detected above the detection limit
X Lab-specific qualifier - must be fully described in case narrative and data summary package

The above sample is reported on an "as received" basis.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories, Inc. standard operating procedures. Please direct any questions to your Project Manager, Edie Kent.

Reviewed by

otowi-1

Certificate of Analysis

Company : Los Alamos National Labs
Address : MS K497 ESH-18
Water Quality & Hydrology
Los Alamos, New Mexico 87545
Contact: Billy Turney
Project: Groundwater

Report Date: October 4, 2001

Client Sample ID: GU01091G10W
Sample ID: 48671024
Matrix: Ground Water
Collect Date: 05-SEP-01
Receive Date: 07-SEP-01
Collector: Client

Project: LANL00701
Client ID: LANL003

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Ion Chromatography Federal											
EPA 314.0 Perchlorate by IC											
Perchlorate	J	3.86	0.958	4.00	ug/L	1	RWS	09/14/01	1848	109638	1
TRAACS Nutrient Analysis Fed											
EPA 353.1 Nitrogen, (NO3/NO2											
Nitrogen, Nitrate/Nitrite		1.11	0.0069	0.050	mg/L	1	THL	09/11/01	1635	108760	2
Wet Chemistry General Federal											
EPA 340.2 Fluoride Federal											
Fluoride		0.366	0.006	0.100	mg/L	1	AL1	10/02/01	1220	112718	3

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3510C	3510C-608 PCB Prep Liquid Federal	JPB	09/11/01	1644	108901

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	EPA 314.0	
2	EPA 353.1	
3	EPA 340.2	

Notes:
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> Actual result is greater than amount reported
E Concentration exceeds instrument calibration range
J Indicates an estimated value. The result was greater than the detection limit, but less than the reporting limit.
U Indicates the compound was analyzed for but not detected above the detection limit
X Lab-specific qualifier - must be fully described in case narrative and data summary package

The above sample is reported on an "as received" basis.

OTOWi-1
duplicate sample

Certificate of Analysis

Company : Los Alamos National Labs
Address : MS K497 ESH-18
Water Quality & Hydrology
Los Alamos, New Mexico 87545
Contact: Billy Turney
Project: Groundwater

Report Date: October 4, 2001

Client Sample ID: GU01092G10W
Sample ID: 48671023
Matrix: Ground Water
Collect Date: 05-SEP-01
Receive Date: 07-SEP-01
Collector: Client

Project: LANL00701
Client ID: LANL003

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Ion Chromatography Federal											
EPA 314.0 Perchlorate by IC											
Perchlorate	J	3.53	0.958	4.00	ug/L	1	RWS	09/14/01	1838	109638	1
TRAACS Nutrient Analysis Fed											
EPA 353.1 Nitrogen, (NO3/NO2											
Nitrogen, Nitrate/Nitrite		1.10	0.0069	0.050	mg/L	1	THL	09/11/01	1635	108760	2
Wet Chemistry General Federal											
EPA 340.2 Fluoride Federal											
Fluoride		0.364	0.006	0.100	mg/L	1	AL1	10/02/01	1220	112718	3

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3510C	3510C-608 PCB Prep Liquid Federal	JPB	09/11/01	1644	108901

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	EPA 314.0	
2	EPA 353.1	
3	EPA 340.2	

Notes:
The Qualifiers in this report are defined as follows :

** Indicates the analyte is a surrogate compound.
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> Actual result is greater than amount reported
E Concentration exceeds instrument calibration range
J Indicates an estimated value. The result was greater than the detection limit, but less than the reporting limit.
U Indicates the compound was analyzed for but not detected above the detection limit
X Lab-specific qualifier - must be fully described in case narrative and data summary package

The above sample is reported on an "as received" basis.

G-5A

Certificate of Analysis

Company : Los Alamos National Labs
Address : MS K497 ESH-18
Water Quality & Hydrology
Los Alamos, New Mexico 87545
Contact: Billy Turney
Project: Groundwater

Report Date: October 4, 2001

Client Sample ID:	GU01091G1RG	Project:	LANL00701
Sample ID:	48671004	Client ID:	LANL003
Matrix:	Ground Water		
Collect Date:	05-SEP-01		
Receive Date:	07-SEP-01		
Collector:	Client		

Parameter	Qualifier	Result	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
Ion Chromatography Federal										
EPA 314.0 Perchlorate by IC										
Perchlorate	U	ND	0.958	4.00	ug/L	1	RWS 09/13/01	1157	109268	1

The following Prep Methods were performed

Method	Description	Analyst	Date	Time	Prep Batch
SW846 8330 PREP	8330 EXPLOSIVES BY HPLC Prep in liquid	GMS	09/12/01	1000	109006

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	EPA 314.0	

Notes:
The Qualifiers in this report are defined as follows :

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> Actual result is greater than amount reported
E Concentration exceeds instrument calibration range
J Indicates an estimated value. The result was greater than the detection limit, but less than the reporting limit.
U Indicates the compound was analyzed for but not detected above the detection limit
X Lab-specific qualifier - must be fully described in case narrative and data summary package

The above sample is reported on an "as received" basis.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories, Inc. standard operating procedures. Please direct any questions to your Project Manager, Edie Kent.

Reviewed by

G-5A
duplicate sample

Certificate of Analysis

Company : Los Alamos National Labs
Address : MS K497 ESH-18
Water Quality & Hydrology
Los Alamos, New Mexico 87545
Contact: Billy Turney
Project: Groundwater

Report Date: October 4, 2001

Client Sample ID: GU01092G1RG
Sample ID: 48671012
Matrix: Ground Water
Collect Date: 05-SEP-01
Receive Date: 07-SEP-01
Collector: Client

Project: LANL00701
Client ID: LANL003

Parameter	Qualifier	Result	DL	RL	Units	DF	AnalystDate	Time	Batch	Method
Ion Chromatography Federal										
EPA 314.0 Perchlorate by IC										
Perchlorate	J	2.61	0.958	4.00	ug/L	1	RWS 09/14/01	1659	109638	1

The following Analytical Methods were performed

Method	Description	Analyst Comments
1	EPA 314.0	

Notes:
The Qualifiers in this report are defined as follows :

** Indicates the analyte is a surrogate compound.
< Actual result is less than amount reported
> Actual result is greater than amount reported
E Concentration exceeds instrument calibration range
J Indicates an estimated value. The result was greater than the detection limit, but less than the reporting limit.
U Indicates the compound was analyzed for but not detected above the detection limit
X Lab-specific qualifier - must be fully described in case narrative and data summary package

The above sample is reported on an "as received" basis.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories, Inc. standard operating procedures. Please direct any questions to your Project Manager, Edie Kent.

Reviewed by

E.S. BABCOCK & SONS, INC.
ESTABLISHED 1906

Environmental Laboratory Certification #1156
6100 Quail Valley Court Riverside, CA 92507-0704
P.O. Box 432 Riverside, CA 92502-0432
PH (909) 653-3351 FAX (909) 653-1662
e-mail: esbsales@aol.com
www.babcocklabs.com

Pm-3

Laboratory Results

2951-PERC
Client:
Los Alamos National Laboratory
Bob Beers
P.O. Box 1663
M.S. K497
Los Alamos,NM 87545

Client I.D.: BU01091G3MP
Site:
Description:

Matrix: water

Page: 1 of
Lab No.: L89451-006

Date Reported: 09/18/2001

Collected By:
Date: 09/05/2001
Time: 0625
Submitted By: Fed.Exp.
Date: 09/07/2001
Time: 0920

Constituent	Result		Method	RL	MDL	Date / Analyst
Perchlorate	ND	ug/L	EPA 314.0	4.	2.	010912/KO

ND = None detected at MDL (Method Detection Limit). RL & MDL units same as result.

Evidence tape intact. J=Trace (Less than RL, above MDL), value estimated

cc:

ESB Project Reviewer

E.S. BABCOCK & SONS, INC.
ESTABLISHED 1906

Environmental Laboratory Certification #1156
6100 Quail Valley Court Riverside, CA 92507-0704
P.O. Box 432 Riverside, CA 92502-0432
PH (909) 653-3351 FAX (909) 653-1662
e-mail: esbsales@aol.com
www.babcocklabs.com

PM-3
duplicate sample

Laboratory Results

2951-PERC
Client:
Los Alamos National Laboratory
Bob Beers
P.O. Box 1663
M.S. K497
Los Alamos,NM 87545

Client I.D.: BU01092G3MP
Site:
Description:

Matrix: water

Page: 1 of
Lab No.: L89451-010

Date Reported: 09/18/2001

Collected By:
Date: 09/05/2001
Time: 0630
Submitted By: Fed.Exp.
Date: 09/07/2001
Time: 0920

Constituent	Result		Method	RL	MDL	Date / Analyst
Perchlorate	ND	ug/L	EPA 314.0	4.	2.	010912/KO

ND = None detected at MDL (Method Detection Limit). RL & MDL units same as result.

Evidence tape intact. J=Trace (Less than RL, above MDL), value estimated

cc:

ESB Project Reviewer

E.S. BABCOCK & SONS, INC.
ESTABLISHED 1906

Environmental Laboratory Certification #1156
6100 Quail Valley Court Riverside, CA 92507-0704
P.O. Box 432 Riverside, CA 92502-0432
PH (909) 653-3351 FAX (909) 653-1662
e-mail: esbsales@aol.com
www.babcocklabs.com

PM-5

Laboratory Results

2951-PERC
Client:
Los Alamos National Laboratory
Bob Beers
P.O. Box 1663
M.S. K497
Los Alamos,NM 87545

Client I.D.: BU01091G5MP
Site:
Description:

Matrix: water

Page: 1 of
Lab No.: L89451-011

Date Reported: 09/18/2001

Collected By:
Date: 09/05/2001
Time: 0715
Submitted By: Fed.Exp.
Date: 09/07/2001
Time: 0920

Constituent	Result		Method	RL	MDL	Date / Analyst
Perchlorate	ND	ug/L	EPA 314.0	4.	2.	010912/KO

ND = None detected at MDL (Method Detection Limit). RL & MDL units same as result.

Evidence tape intact. J=Trace (Less than RL, above MDL), value estimated

cc:

ESB Project Reviewer

E.S. BABCOCK & SONS, INC.
ESTABLISHED 1906

Environmental Laboratory Certification #1156
6100 Quail Valley Court Riverside, CA 92507-0704
P.O. Box 432 Riverside, CA 92502-0432
PH (909) 653-3351 FAX (909) 653-1662
e-mail: esbsales@aol.com
www.babcocklabs.com

PM-5
duplicate sample

Laboratory Results

2951-PERC
Client:
Los Alamos National Laboratory
Bob Beers
P.O. Box 1663
M.S. K497
Los Alamos,NM 87545

Client I.D.: BU01092G5MP
Site:
Description:

Matrix: water

Page: 1 of
Lab No.: L89451-015

Date Reported: 09/18/2001

Collected By:
Date: 09/05/2001
Time: 0720
Submitted By: Fed.Exp.
Date: 09/07/2001
Time: 0920

Constituent	Result		Method	RL	MDL	Date / Analyst
Perchlorate	ND	ug/L	EPA 314.0	4.	2.	010913/KO

ND = None detected at MDL (Method Detection Limit). RL & MDL units same as result.

Evidence tape intact. J=Trace (Less than RL, above MDL), value estimated

cc:

ESB Project Reviewer

E.S. BABCOCK & SONS, INC.
ESTABLISHED 1906

Environmental Laboratory Certification #1156
6100 Quail Valley Court Riverside, CA 92507-0704
P.O. Box 432 Riverside, CA 92502-0432
PH (909) 653-3351 FAX (909) 653-1662
e-mail: esbsales@aol.com
www.babcocklabs.com

OTOWI-1

Laboratory Results

2951-PERC
Client:
Los Alamos National Laboratory
Bob Beers
P.O. Box 1663
M.S. K497
Los Alamos,NM 87545

Client I.D.: BU01091G10W
Site:
Description:

Matrix: water

Page: 1 of
Lab No.: L89451-001

Date Reported: 09/18/2001

Collected By:
Date: 09/05/2001
Time: 0530
Submitted By: Fed.Exp.
Date: 09/07/2001
Time: 0920

Constituent	Result		Method	RL	MDL	Date / Analyst
Perchlorate	ND	ug/L	EPA 314.0	4.	2.	010912/KO

ND = None detected at MDL (Method Detection Limit). RL & MDL units same as result.

Evidence tape intact. J=Trace (Less than RL, above MDL), value estimated

cc:

ESB Project Reviewer

E.S. BABCOCK & SONS, INC.
ESTABLISHED 1906

Environmental Laboratory Certification #1156
6100 Quail Valley Court Riverside, CA 92507-0704
P.O. Box 432 Riverside, CA 92502-0432
PH (909) 653-3351 FAX (909) 653-1662
e-mail: esbsales@aol.com
www.babcocklabs.com

OTOWI-1
duplicate sample

Laboratory Results

2951-PERC
Client:
Los Alamos National Laboratory
Bob Beers
P.O. Box 1663
M.S. K497
Los Alamos,NM 87545

Client I.D.: BU01092G10W
Site:
Description:

Matrix: water

Page: 1 of
Lab No.: L89451-005

Date Reported: 09/18/2001

Collected By:
Date: 09/05/2001
Time: 0540
Submitted By: Fed.Exp.
Date: 09/07/2001
Time: 0920

Constituent	Result		Method	RL	MDL	Date / Analyst
Perchlorate	ND	ug/L	EPA 314.0	4.	2.	010912/KO

ND = None detected at MDL (Method Detection Limit). RL & MDL units same as result.

Evidence tape intact. J=Trace (Less than RL, above MDL), value estimated

cc:

ESB Project Reviewer

E.S. BABCOCK & SONS, INC.
ESTABLISHED 1906

Environmental Laboratory Certification #1156
6100 Quail Valley Court Riverside, CA 92507-0704
P.O. Box 432 Riverside, CA 92502-0432
PH (909) 653-3351 FAX (909) 653-1662
e-mail: esbsales@aol.com
www.babcocklabs.com

G-5A

Laboratory Results

2951-PERC
Client:
Los Alamos National Laboratory
Bob Beers
P.O. Box 1663
M.S. K497
Los Alamos,NM 87545

Client I.D.: BU01091G1RG
Site:
Description:

Matrix: water

Page: 1 of
Lab No.: L89451-016

Date Reported: 09/18/2001

Collected By:
Date: 09/05/2001
Time: 1420
Submitted By: Fed.Exp.
Date: 09/07/2001
Time: 0920

Constituent	Result		Method	RL	MDL	Date / Analyst
Perchlorate	ND	ug/L	EPA 314.0	4.	2.	010913/KO

ND = None detected at MDL (Method Detection Limit). RL & MDL units same as result.

Evidence tape intact. J=Trace (Less than RL, above MDL), value estimated

cc:

ESB Project Reviewer

E.S. BABCOCK & SONS, INC.
ESTABLISHED 1906

Environmental Laboratory Certification #1156
6100 Quail Valley Court Riverside, CA 92507-0704
P.O. Box 432 Riverside, CA 92502-0432
PH (909) 653-3351 FAX (909) 653-1662
e-mail: esbsales@aol.com
www.babcocklabs.com

G-5A
duplicate sample

Laboratory Results

2951-PERC
Client:
Los Alamos National Laboratory
Bob Beers
P.O. Box 1663
M.S. K497
Los Alamos,NM 87545

Client I.D.: BU01092G1RG
Site:
Description:

Matrix: water

Page: 1 of
Lab No.: L89451-020

Date Reported: 09/18/2001

Collected By:
Date: 09/05/2001
Time: 1420
Submitted By: Fed.Exp.
Date: 09/07/2001
Time: 0920

Constituent	Result		Method	RL	MDL	Date / Analyst
Perchlorate	ND	ug/L	EPA 314.0	4.	2.	010913/KO

ND = None detected at MDL (Method Detection Limit). RL & MDL units same as result.

Evidence tape intact. J=Trace (Less than RL, above MDL), value estimated

cc:

ESB Project Reviewer

ATTACHMENT 4.0

ANALYTICAL REPORTS

VOLATILE ORGANICS ANALYSIS RESULTS

SEMIVOLATILE ORGANICS ANALYSIS RESULTS

GENERAL ENGINEERING LABORATORIES

OTOWI-1

SAMPLE DATE: SEPTEMBER 5, 2001

OTOWi-1

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GU01091G10W

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 48671

Matrix: (soil/water) WATER Lab Sample ID: 48671022

Sample wt/vol: 5.000 (g/ml) ML Lab File ID: 2B312

Level: (low/med) LOW Date Received: 09/07/01

% Moisture: not dec. _____ Date Analyzed: 09/19/01

GC Column: DB-624 ID: 0.25 (mm) Dilution Factor: 1.0

Soil Extract Volume:_____(uL) Soil Aliquot Volume: _____(uL

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-71-8	Dichlorodifluoromethane	1.0	U
74-87-3	Chloromethane	1.0	U
75-01-4	Vinyl chloride	1.0	U
74-83-9	Bromomethane	1.0	U
75-00-3	Chloroethane	1.0	U
75-69-4	Trichlorofluoromethane	1.0	U
107-02-8	Acrolein	10.0	U
75-35-4	1,1-Dichloroethylene	1.0	U
67-64-1	Acetone	5.6	B
76-13-1	Trichlorotrifluoroethane	5.0	U
74-88-4	Iodomethane	5.0	U
75-15-0	Carbon disulfide	5.0	U
75-09-2	Methylene chloride	5.0	U
107-13-1	Acrylonitrile	10.0	U
156-60-5	trans-1,2-Dichloroethylene	1.0	U
75-34-3	1,1-Dichloroethane	1.0	U
78-93-3	2-Butanone	5.0	U
594-20-7	2,2-Dichloropropane	1.0	U
74-97-5	Bromochloromethane	1.0	U
67-66-3	Chloroform	1.0	U
71-55-6	1,1,1-Trichloroethane	1.0	U
563-58-6	1,1-Dichloropropene	1.0	U
56-23-5	Carbon tetrachloride	1.0	U
107-06-2	1,2-Dichloroethane	1.0	U
71-43-2	Benzene	1.0	U
79-01-6	Trichloroethylene	1.0	U
78-87-5	1,2-Dichloropropane	1.0	U
74-95-3	Dibromomethane	1.0	U
75-27-4	Bromodichloromethane	1.0	U
110-75-8	2-Chloroethylvinyl ether	5.0	U
10061-01-5	cis-1,3-Dichloropropylene	1.0	U
108-10-1	4-Methyl-2-pentanone	5.0	U
108-88-3	Toluene	1.0	U

0-1

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GU01091G10W

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 48671

Matrix: (soil/water) WATER Lab Sample ID: 48671022

Sample wt/vol: 5.000 (g/ml) ML Lab File ID: 2B312

Level: (low/med) LOW Date Received: 09/07/01

% Moisture: not dec. _____ Date Analyzed: 09/19/01

GC Column: DB-624 ID: 0.25 (mm) Dilution Factor: 1.0

Soil Extract Volume:_____(uL) Soil Aliquot Volume: _____(uL

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
10061-02-6	trans-1,3-Dichloropropylene	1.0	U
79-00-5	1,1,2-Trichloroethane	1.0	U
142-28-9	1,3-Dichloropropane	1.0	U
591-78-6	2-Hexanone	5.0	U
127-18-4	Tetrachloroethylene	1.0	U
124-48-1	Dibromochloromethane	1.0	U
106-93-4	1,2-Dibromoethane	1.0	U
108-90-7	Chlorobenzene	1.0	U
630-20-6	1,1,1,2-Tetrachloroethane	1.0	U
100-41-4	Ethylbenzene	1.0	U
----------	m,p-Xylenes	2.0	U
95-47-6	o-Xylene	1.0	U
100-42-5	Styrene	1.0	U
75-25-2	Bromoform	1.0	U
98-82-8	Isopropylbenzene	1.0	U
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U
96-18-4	1,2,3-Trichloropropane	1.0	U
108-86-1	Bromobenzene	1.0	U
103-65-1	n-Propylbenzene	1.0	U
95-49-8	2-Chlorotoluene	1.0	U
108-67-8	1,3,5-Trimethylbenzene	1.0	U
95-63-6	1,2,4-Trimethylbenzene	1.0	U
106-43-4	4-Chlorotoluene	1.0	U
98-06-6	tert-Butylbenzene	1.0	U
135-98-8	sec-Butylbenzene	1.0	U
99-87-6	4-Isopropyltoluene	1.0	U
541-73-1	1,3-Dichlorobenzene	1.0	U
106-46-7	1,4-Dichlorobenzene	0.27	J
104-51-8	n-Butylbenzene	1.0	U
95-50-1	1,2-Dichlorobenzene	1.0	U
96-12-8	1,2-Dibromo-3-chloropropane	1.0	U
87-68-3	Hexachlorobutadiene	1.0	U
91-20-3	Naphthalene	1.0	U

0-1

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GU01092G10W

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 48671

Matrix: (soil/water) WATER Lab Sample ID: 48671021

Sample wt/vol: 5.000 (g/ml) ML Lab File ID: 2B311

Level: (low/med) LOW Date Received: 09/07/01

% Moisture: not dec. _____ Date Analyzed: 09/19/01

GC Column: DB-624 ID: 0.25 (mm) Dilution Factor: 1.0

Soil Extract Volume:_____(uL) Soil Aliquot Volume: _____(uL

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-71-8	Dichlorodifluoromethane	1.0	U
74-87-3	Chloromethane	1.0	U
75-01-4	Vinyl chloride	1.0	U
74-83-9	Bromomethane	1.0	U
75-00-3	Chloroethane	1.0	U
75-69-4	Trichlorofluoromethane	1.0	U
107-02-8	Acrolein	10.0	U
75-35-4	1,1-Dichloroethylene	1.0	U
67-64-1	Acetone	5.4	B
76-13-1	Trichlorotrifluoroethane	5.0	U
74-88-4	Iodomethane	5.0	U
75-15-0	Carbon disulfide	5.0	U
75-09-2	Methylene chloride	5.0	U
107-13-1	Acrylonitrile	10.0	U
156-60-5	trans-1,2-Dichloroethylene	1.0	U
75-34-3	1,1-Dichloroethane	1.0	U
78-93-3	2-Butanone	5.0	U
594-20-7	2,2-Dichloropropane	1.0	U
74-97-5	Bromochloromethane	1.0	U
67-66-3	Chloroform	1.0	U
71-55-6	1,1,1-Trichloroethane	1.0	U
563-58-6	1,1-Dichloropropene	1.0	U
56-23-5	Carbon tetrachloride	1.0	U
107-06-2	1,2-Dichloroethane	1.0	U
71-43-2	Benzene	1.0	U
79-01-6	Trichloroethylene	1.0	U
78-87-5	1,2-Dichloropropane	1.0	U
74-95-3	Dibromomethane	1.0	U
75-27-4	Bromodichloromethane	1.0	U
110-75-8	2-Chloroethylvinyl ether	5.0	U
10061-01-5	cis-1,3-Dichloropropylene	1.0	U
108-10-1	4-Methyl-2-pentanone	5.0	U
108-88-3	Toluene	1.0	U

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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GU01092G10W

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 48671

Matrix: (soil/water) WATER Lab Sample ID: 48671021

Sample wt/vol: 5.000 (g/ml) ML Lab File ID: 2B311

Level: (low/med) LOW Date Received: 09/07/01

% Moisture: not dec. _____ Date Analyzed: 09/19/01

GC Column: DB-624 ID: 0.25 (mm) Dilution Factor: 1.0

Soil Extract Volume:_____(uL) Soil Aliquot Volume: _____(uL

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
10061-02-6	trans-1,3-Dichloropropylene	1.0	U
79-00-5	1,1,2-Trichloroethane	1.0	U
142-28-9	1,3-Dichloropropane	1.0	U
591-78-6	2-Hexanone	5.0	U
127-18-4	Tetrachloroethylene	1.0	U
124-48-1	Dibromochloromethane	1.0	U
106-93-4	1,2-Dibromoethane	1.0	U
108-90-7	Chlorobenzene	1.0	U
630-20-6	1,1,1,2-Tetrachloroethane	1.0	U
100-41-4	Ethylbenzene	1.0	U
	m,p-Xylenes	2.0	U
95-47-6	o-Xylene	1.0	U
100-42-5	Styrene	1.0	U
75-25-2	Bromoform	1.0	U
98-82-8	Isopropylbenzene	1.0	U
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U
96-18-4	1,2,3-Trichloropropane	1.0	U
108-86-1	Bromobenzene	1.0	U
103-65-1	n-Propylbenzene	1.0	U
95-49-8	2-Chlorotoluene	1.0	U
108-67-8	1,3,5-Trimethylbenzene	1.0	U
95-63-6	1,2,4-Trimethylbenzene	1.0	U
106-43-4	4-Chlorotoluene	1.0	U
98-06-6	tert-Butylbenzene	1.0	U
135-98-8	sec-Butylbenzene	1.0	U
99-87-6	4-Isopropyltoluene	1.0	U
541-73-1	1,3-Dichlorobenzene	1.0	U
106-46-7	1,4-Dichlorobenzene	0.16	J
104-51-8	n-Butylbenzene	1.0	U
95-50-1	1,2-Dichlorobenzene	1.0	U
96-12-8	1,2-Dibromo-3-chloropropane	1.0	U
87-68-3	Hexachlorobutadiene	1.0	U
91-20-3	Naphthalene	1.0	U

0-1

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GU01091G10W

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 48671

Matrix: (soil/water) WATER Lab Sample ID: 48671022

Sample wt/vol: 1015 (g/mL) ML Lab File ID: 8N220

Level: (low/med) LOW Date Received: 09/07/01

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 09/12/01

Concentrated Extract Volume: 1.00(mL) Date Analyzed: 09/25/01

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
62-75-9	N-Methyl-N-nitrosomethylamin	9.8	U
110-86-1	Pyridine	9.8	U
62-53-3	Aniline	9.8	U
108-95-2	Phenol	9.8	U
111-44-4	bis(2-Chloroethyl) ether	9.8	U
95-57-8	2-Chlorophenol	9.8	U
541-73-1	1,3-Dichlorobenzene	9.8	U
106-46-7	1,4-Dichlorobenzene	9.8	U
100-51-6	Benzyl alcohol	9.8	U
95-50-1	1,2-Dichlorobenzene	9.8	U
108-60-1	bis(2-Chloroisopropyl)ether	9.8	U
95-48-7	o-Cresol	9.8	U
621-64-7	N-Nitrosodipropylamine	9.8	U
106-44-5	m,p-Cresols	9.8	U
67-72-1	Hexachloroethane	9.8	U
98-95-3	Nitrobenzene	9.8	U
78-59-1	Isophorone	9.8	U
88-75-5	2-Nitrophenol	9.8	U
105-67-9	2,4-Dimethylphenol	9.8	U
111-91-1	bis(2-Chloroethoxy)methane	9.8	U
120-83-2	2,4-Dichlorophenol	9.8	U
65-85-0	Benzoic acid	19.7	U
120-82-1	1,2,4-Trichlorobenzene	9.8	U
91-20-3	Naphthalene	0.98	U
106-47-8	4-Chloroaniline	9.8	U
87-68-3	Hexachlorobutadiene	9.8	U
59-50-7	4-Chloro-3-methylphenol	9.8	U
91-57-6	2-Methylnaphthalene	0.98	U
77-47-4	Hexachlorocyclopentadiene	9.8	U
88-06-2	2,4,6-Trichlorophenol	9.8	U
95-95-4	2,4,5-Trichlorophenol	9.8	U
91-58-7	2-Chloronaphthalene	0.98	U
88-74-4	o-Nitroaniline	9.8	U

0-1

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GU01091G10W

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 48671

Matrix: (soil/water) WATER Lab Sample ID: 48671022

Sample wt/vol: 1015 (g/mL) ML Lab File ID: 8N220

Level: (low/med) LOW Date Received: 09/07/01

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 09/12/01

Concentrated Extract Volume: 1.00(mL) Date Analyzed: 09/25/01

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
99-09-2	m-Nitroaniline	9.8	U
131-11-3	Dimethylphthalate	9.8	U
606-20-2	2,6-Dinitrotoluene	9.8	U
208-96-8	Acenaphthylene	0.98	U
83-32-9	Acenaphthene	0.98	U
51-28-5	2,4-Dinitrophenol	19.7	U
132-64-9	Dibenzofuran	9.8	U
121-14-2	2,4-Dinitrotoluene	9.8	U
84-66-2	Diethylphthalate	9.8	U
100-02-7	4-Nitrophenol	9.8	U
86-73-7	Fluorene	0.98	U
7005-72-3	4-Chlorophenylphenylether	9.8	U
534-52-1	2-Methyl-4,6-dinitrophenol	9.8	U
100-01-6	p-Nitroaniline	9.8	U
122-39-4	Diphenylamine	9.8	U
122-66-7	1,2-Diphenylhydrazine	9.8	U
101-55-3	4-Bromophenylphenylether	9.8	U
118-74-1	Hexachlorobenzene	9.8	U
87-86-5	Pentachlorophenol	9.8	U
85-01-8	Phenanthrene	0.98	U
120-12-7	Anthracene	0.98	U
84-74-2	Di-n-butylphthalate	9.8	U
206-44-0	Fluoranthene	0.98	U
92-87-5	Benzidine	49.3	U
129-00-0	Pyrene	0.98	U
85-68-7	Butylbenzylphthalate	9.8	U
56-55-3	Benzo(a)anthracene	0.98	U
91-94-1	3,3'-Dichlorobenzidine	9.8	U
218-01-9	Chrysene	0.98	U
117-81-7	bis(2-Ethylhexyl)phthalate	9.8	U
117-84-0	Di-n-octylphthalate	9.8	U
205-99-2	Benzo(b)fluoranthene	0.98	U
207-08-9	Benzo(k)fluoranthene	0.98	U

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1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GU01091G10W

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 48671

Matrix: (soil/water) WATER Lab Sample ID: 48671022

Sample wt/vol: 1015 (g/mL) ML Lab File ID: 8N220

Level: (low/med) LOW Date Received: 09/07/01

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 09/12/01

Concentrated Extract Volume: 1.00(mL) Date Analyzed: 09/25/01

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
50-32-8	Benzo(a)pyrene	0.98	U
193-39-5	Indeno(1,2,3-cd)pyrene	0.98	U
53-70-3	Dibenzo(a,h)anthracene	0.98	U
191-24-2	Benzo(ghi)perylene	0.98	U
109-06-8	2-Picoline	9.8	U

0-1

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GU01092G10W

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 48671

Matrix: (soil/water) WATER Lab Sample ID: 48671021

Sample wt/vol: 1000 (g/mL) ML Lab File ID: 8N219

Level: (low/med) LOW Date Received: 09/07/01

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 09/12/01

Concentrated Extract Volume: 1.00(mL) Date Analyzed: 09/25/01

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
62-75-9	N-Methyl-N-nitrosomethylamin	10.0	U
110-86-1	Pyridine	10.0	U
62-53-3	Aniline	10.0	U
108-95-2	Phenol	10.0	U
111-44-4	bis(2-Chloroethyl) ether	10.0	U
95-57-8	2-Chlorophenol	10.0	U
541-73-1	1,3-Dichlorobenzene	10.0	U
106-46-7	1,4-Dichlorobenzene	10.0	U
100-51-6	Benzyl alcohol	10.0	U
95-50-1	1,2-Dichlorobenzene	10.0	U
108-60-1	bis(2-Chloroisopropyl)ether	10.0	U
95-48-7	o-Cresol	10.0	U
621-64-7	N-Nitrosodipropylamine	10.0	U
106-44-5	m,p-Cresols	10.0	U
67-72-1	Hexachloroethane	10.0	U
98-95-3	Nitrobenzene	10.0	U
78-59-1	Isophorone	10.0	U
88-75-5	2-Nitrophenol	10.0	U
105-67-9	2,4-Dimethylphenol	10.0	U
111-91-1	bis(2-Chloroethoxy)methane	10.0	U
120-83-2	2,4-Dichlorophenol	10.0	U
65-85-0	Benzoic acid	20.0	U
120-82-1	1,2,4-Trichlorobenzene	10.0	U
91-20-3	Naphthalene	1.0	U
106-47-8	4-Chloroaniline	10.0	U
87-68-3	Hexachlorobutadiene	10.0	U
59-50-7	4-Chloro-3-methylphenol	10.0	U
91-57-6	2-Methylnaphthalene	1.0	U
77-47-4	Hexachlorocyclopentadiene	10.0	U
88-06-2	2,4,6-Trichlorophenol	10.0	U
95-95-4	2,4,5-Trichlorophenol	10.0	U
91-58-7	2-Chloronaphthalene	1.0	U
88-74-4	o-Nitroaniline	10.0	U

0-1

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GU01092G10W

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 48671

Matrix: (soil/water) WATER Lab Sample ID: 48671021

Sample wt/vol: 1000 (g/mL) ML Lab File ID: 8N219

Level: (low/med) LOW Date Received: 09/07/01

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 09/12/01

Concentrated Extract Volume: 1.00(mL) Date Analyzed: 09/25/01

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
99-09-2	m-Nitroaniline	10.0	U
131-11-3	Dimethylphthalate	10.0	U
606-20-2	2,6-Dinitrotoluene	10.0	U
208-96-8	Acenaphthylene	1.0	U
83-32-9	Acenaphthene	1.0	U
51-28-5	2,4-Dinitrophenol	20.0	U
132-64-9	Dibenzofuran	10.0	U
121-14-2	2,4-Dinitrotoluene	10.0	U
84-66-2	Diethylphthalate	10.0	U
100-02-7	4-Nitrophenol	10.0	U
86-73-7	Fluorene	1.0	U
7005-72-3	4-Chlorophenylphenylether	10.0	U
534-52-1	2-Methyl-4,6-dinitrophenol	10.0	U
100-01-6	p-Nitroaniline	10.0	U
122-39-4	Diphenylamine	10.0	U
122-66-7	1,2-Diphenylhydrazine	10.0	U
101-55-3	4-Bromophenylphenylether	10.0	U
118-74-1	Hexachlorobenzene	10.0	U
87-86-5	Pentachlorophenol	10.0	U
85-01-8	Phenanthrene	1.0	U
120-12-7	Anthracene	1.0	U
84-74-2	Di-n-butylphthalate	10.0	U
206-44-0	Fluoranthene	1.0	U
92-87-5	Benzidine	50.0	U
129-00-0	Pyrene	1.0	U
85-68-7	Butylbenzylphthalate	10.0	U
56-55-3	Benzo(a)anthracene	1.0	U
91-94-1	3,3'-Dichlorobenzidine	10.0	U
218-01-9	Chrysene	1.0	U
117-81-7	bis(2-Ethylhexyl)phthalate	10.0	U
117-84-0	Di-n-octylphthalate	10.0	U
205-99-2	Benzo(b)fluoranthene	1.0	U
207-08-9	Benzo(k)fluoranthene	1.0	U

0-1

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GU01092G10W

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 48671

Matrix: (soil/water) WATER Lab Sample ID: 48671021

Sample wt/vol: 1000 (g/mL) ML Lab File ID: 8N219

Level: (low/med) LOW Date Received: 09/07/01

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 09/12/01

Concentrated Extract Volume: 1.00(mL) Date Analyzed: 09/25/01

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
50-32-8	Benzo(a)pyrene	1.0	U
193-39-5	Indeno(1,2,3-cd)pyrene	1.0	U
53-70-3	Dibenzo(a,h)anthracene	1.0	U
191-24-2	Benzo(ghi)perylene	1.0	U
109-06-8	2-Picoline	10.0	U

0-1

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GU01092G10W

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 48671

Matrix: (soil/water) WATER Lab Sample ID: 48671025

Sample wt/vol: 1000 (g/mL) mL Lab File ID: 013B1301

% Moisture: _____ decanted: (Y/N)___ Date Received: 09/07/01

Extraction: (SepF/Cont/Sonc) SEPF Date Extracted: 09/12/01

Concentrated Extract Volume: 5.00(mL) Date Analyzed: 09/24/01

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
319-84-6	alpha-BHC	0.020	U
319-85-7	beta-BHC	0.020	U
319-86-8	delta-BHC	0.020	U
58-89-9	gamma-BHC (Lindane)	0.020	U
76-44-8	Heptachlor	0.020	U
309-00-2	Aldrin	0.020	U
1024-57-3	Heptachlor epoxide	0.020	U
959-98-8	Endosulfan I	0.020	U
60-57-1	Dieldrin	0.040	U
72-55-9	4,4'-DDE	0.040	U
72-20-8	Endrin	0.040	U
33213-65-9	Endosulfan II	0.040	U
72-54-8	4,4'-DDD	0.040	U
1031-07-8	Endosulfan sulfate	0.040	U
50-29-3	4,4'-DDT	0.040	U
72-43-5	Methoxychlor	0.20	U
7421-93-4	Endrin aldehyde	0.040	U
8001-35-2	Toxaphene	1.0	U
57-74-9	Chlordane (tech.)	0.25	U

0-1

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GU01091G10W

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 48671

Matrix: (soil/water) WATER Lab Sample ID: 48671026

Sample wt/vol: 1000 (g/mL) mL Lab File ID: 014B1401

% Moisture: _____ decanted: (Y/N)___ Date Received: 09/07/01

Extraction: (SepF/Cont/Sonc) SEPF Date Extracted: 09/12/01

Concentrated Extract Volume: 5.00(mL) Date Analyzed: 09/24/01

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
319-84-6	alpha-BHC	0.020	U
319-85-7	beta-BHC	0.020	U
319-86-8	delta-BHC	0.020	U
58-89-9	gamma-BHC (Lindane)	0.020	U
76-44-8	Heptachlor	0.020	U
309-00-2	Aldrin	0.020	U
1024-57-3	Heptachlor epoxide	0.020	U
959-98-8	Endosulfan I	0.020	U
60-57-1	Dieldrin	0.040	U
72-55-9	4,4'-DDE	0.040	U
72-20-8	Endrin	0.040	U
33213-65-9	Endosulfan II	0.040	U
72-54-8	4,4'-DDD	0.040	U
1031-07-8	Endosulfan sulfate	0.040	U
50-29-3	4,4'-DDT	0.040	U
72-43-5	Methoxychlor	0.20	U
7421-93-4	Endrin aldehyde	0.040	U
8001-35-2	Toxaphene	1.0	U
57-74-9	Chlordane (tech.)	0.25	U

0-1

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GU01091G10W

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 48671

Matrix: (soil/water) GROUND WATER Lab Sample ID: 48671024

Sample wt/vol: 950.0 (g/mL) mL Lab File ID: 075B7501

% Moisture: _____ decanted: (Y/N)___ Date Received: 09/07/01

Extraction: (SepF/Cont/Sonc) SEPF Date Extracted: 09/11/01

Concentrated Extract Volume: 1.00(uL) Date Analyzed: 09/15/01

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
12674-11-2	Aroclor-1016	0.10	U
11104-28-2	Aroclor-1221	0.10	U
11141-16-5	Aroclor-1232	0.10	U
53469-21-9	Aroclor-1242	0.10	U
12672-29-6	Aroclor-1248	0.10	U
11097-69-1	Aroclor-1254	0.10	U
11096-82-5	Aroclor-1260	0.10	U
37324-23-5	Aroclor-1262	0.10	U

0-1

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GU01092G10W

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 48671

Matrix: (soil/water) GROUND WATER Lab Sample ID: 48671023

Sample wt/vol: 970.0 (g/mL) mL Lab File ID: 074B7401

% Moisture: _____ decanted: (Y/N)___ Date Received: 09/07/01

Extraction: (SepF/Cont/Sonc) SEPF Date Extracted: 09/11/01

Concentrated Extract Volume: 1.00(uL) Date Analyzed: 09/15/01

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
12674-11-2	Aroclor-1016	0.10	U
11104-28-2	Aroclor-1221	0.10	U
11141-16-5	Aroclor-1232	0.10	U
53469-21-9	Aroclor-1242	0.10	U
12672-29-6	Aroclor-1248	0.10	U
11097-69-1	Aroclor-1254	0.10	U
11096-82-5	Aroclor-1260	0.10	U
37324-23-5	Aroclor-1262	0.10	U

0-1

FORM 1 Los Alamos National 07-SEP-2001 00

HERBICIDE ORGANICS ANALYSIS DATA SHEET

GU01091G10W

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 48671

Matrix: (soil/water) GROUND WATER Lab Sample ID: 48671028

Sample wt/vol: 1000 (g/mL) mL Lab File ID: 034B3401

% Moisture: _____ decanted: (Y/N)___ Date Received: 09/07/01

Extraction: (SepF/Cont/Sonc) SEPF Date Extracted: 09/11/01

Concentrated Extract Volume: 1.00(mL) Date Analyzed: 09/17/01

Injection Volume: 1.0(uL) Dilution Factor: 20.0

GPC Cleanup: (Y/N) N Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
94-75-7	2,4-D	0.48	U
93-72-1	2,4,5-TP	0.48	U

FORM I HERBICIDE

0-1

FORM 1 Los Alamos National 07-SEP-2001 00

HERBICIDE ORGANICS ANALYSIS DATA SHEET

GU01092G10W

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 48671

Matrix: (soil/water) GROUND WATER Lab Sample ID: 48671027

Sample wt/vol: 1000 (g/mL) mL Lab File ID: 033B3301

% Moisture: _____ decanted: (Y/N)___ Date Received: 09/07/01

Extraction: (SepF/Cont/Sonc) SEPF Date Extracted:09/11/01

Concentrated Extract Volume: 1.00(mL) Date Analyzed: 09/17/01

Injection Volume: 1.0(uL) Dilution Factor: 20.0

GPC Cleanup: (Y/N) N Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
94-75-7	2,4-D	0.48	U
93-72-1	2,4,5-TP	0.48	U

FORM I HERBICIDE

ATTACHMENT 5.0

REPORT ON PERCHLORATE MDL STUDY RESULTS

ANALYTICAL QUALITY ASSOCIATES, INC.
616 MAXINE NE
ALBUQUERQUE, NM 87123

NOVEMBER 2, 2001

Analytical Quality Associates, Inc.
616 Maxine NE
Albuquerque, NM 87123
Phone: 505-299-5201
Fax: 505-299-6744
Email: minteer@aol.com

To: Bob Beers, William Turney, and Ken Mullen (LANL ESH)
From: Mark Minteer (AQA/DOE-AL Analytical Management Program) MCM
Date: 11/2/01
Re: ClO_4 detection limit study results

Background and Summary:

The method detection limit for perchlorate (ClO_4) by ion chromatography (IC), as calculated by GEL according to the specifications of 40 CFR 136, is 1 ppb. We have shown empirically that for ClO_4 by IC, as with previous results for some GC and HPLC techniques, the high precision attainable for low-level standards in clean (DI) water leads to calculated detection limits that are demonstrably lower than the limit of sensitivity of the instrument.

Pantex, LANL ESH, and LANL ER have all seen unexpected, random low-level hits for ClO_4 by IC. Matrix-specific MDL verification studies run for Pantex in late 2000 and early 2001 showed that ClO_4 can not be detected at the calculated 1 ppb MDL for IC when run in a real Ogallala aquifer groundwater matrix. Pantex adopted a 4 ppb MDL for ClO_4 after reviewing those data (see Attachment One). Additional data were recently acquired using groundwater from Los Alamos, with similar results. The data for groundwater matrices from both DOE-AL facilities show significant random variations in background (noise) that lead to frequent false positives. Based upon the data acquired in the new MDL verification studies, the GEL IC chemist (Bob Sosa) and DOE-AL Analytical Management Program staff recommend that LANL ESH also adopt an MDL level for ClO_4 run by IC that is <u>no lower than 4 ppb</u>.

Discussion of LANL groundwater results:

LANL ESH personnel sent a number of groundwater samples to GEL during October 2001 to support the investigation. Those samples included unspiked water from four wells, as well as the same water spiked with 1, 2, 4, and 6 ppb of ClO_4. The unspiked samples, together with the 1 and 2 ppb spikes, were run in quadruplicate. The 4 and 6 ppb spikes were run once each. The data obtained were summarized in tabular form by Deidre (Dee) Reilly of GEL and are presented in Attachment Two.

Three out of four of the unspiked samples show results that vary randomly between zero and the mid-1 ppb range. Results obtained by the method of standard additions (MSA) for those three samples, while run on very low concentration standards, are all below the calculated 1 ppb MDL (see Attachment Three for MSA results). Taken together, these data suggest that either there is no perchlorate in the samples or the analyte is well below the instrument's ability to detect. To provide typical examples of the mid-1 ppb results, we obtained chromatograms for the G5MP unspiked sample run that gave the 1.493 ppb result. These chromatograms show the retention time of interest using both the standard y-axis scale and a 10X expanded scale (see Attachment Four). The ClO_4 result changed slightly when the chromatogram was reprocessed on the 10X

scale, but the conclusion is the same. It is clear that the 1 ppb level is well inside the instrument noise in this matrix, and is hence unreliable as a detection limit.

If we look at the data obtained on the 1 ppb spikes of the three samples that showed no reliable ClO_4 hits, we see once again that the data appear to vary randomly with a slightly higher bias. We still obtain 2 zero results among the 12 runs, but the high result is now 3.494 ppb.

Sample G5MP was run 10 times with a 4 ppb spike added. In that data set (see Attachment Five), two of the results were less than 4 ppb. That is, 20% of the results would have been non-detects at a 4 ppb MDL. One of the results was greater than 50% high, one was 38% high, and the data set average was 4.47 ppb. That is, there is also a significant probability of obtaining false positives at a 4 ppb MDL. Using the 40 CFR 136 calculation approach, this data set supports using a significantly higher MDL of 2.57 ppb. However, the 4 ppb standard concentration used here would be at the extreme low end of the concentration range specified in 40 CFR 136 for MDL determination standards. Using standards at such low concentrations in MDL studies typically yields unreasonably low MDLs. The remaining statistics for that data set are given below.

$\bar{X}$	=	4.47 ppb
σ_{N-1}	=	0.913 ppb
High	=	6.30 ppb
Low	=	3.11 ppb
Range	=	3.19 ppb

For this data set, we would have about 20% false negatives, and at least 20% false positives. The standard deviation of this data set is approximately 25% of the spike added, and the mean shows a general high bias. From this data set it is clear that the accuracy and precision attainable by IC make a 4 ppb MDL something of a stretch. Using an MDL that is lower than 4 ppb would make it very likely that the reported results would be significantly erroneous.

In summary, we have shown that that the sensitivity of IC is not adequate to produce reliable results at the (40 CFR 136) calculated 1 ppb MDL. The empirical data we have acquired additionally suggest that using any detection limit below 4 ppb in real LANL groundwater matrix will result in unacceptably high percentages of false positives and false negatives. We recommend 4 ppb as the lowest possible MDL that should be reported when analyzing ClO_4 by IC. Additional data are being acquired at present, and we will complete our evaluation when those data become available.

cc: Dave Bourne (DOE)
Keith Greene (LANL ER)
Bill Wyatt (Pantex)
Pam Puissant (Sandia)
Gary Dechant (AQA)

Attachment One

Mason & Hanger Corporation
A Subsidiary of
Day & Zimmermann, Inc.

Date: November 28, 2000

From: W.R. Wy[illegible] **Location:** S&A, 18-1

To: S&A File **Location:**

Subject: Detection Limits for Perchlorates

On November18, 2000 General Engineering Laboratories (GEL) was requested to verify the method detection limit (MDL) of 1.0 μg/L for perchlorate established using deionized laboratory reagent water. The verification was performed on two samples of local groundwater (Ogallala). The lab could not reliably detect perchlorate at either 1.0 and 1.7 μg/L. Perchlorate was detected in one of the samples at 4.0 μg/L. GEL was requested to elevate their MDL to 4.0 μg/L for natural waters which would be expected to contain interfering anions.

All detections for perchlorate below 4.0 μg/L should be treated as not detected. Sample results in the IEDb should be evaluated against this criteria and changed accordingly. The report from GEL and email communication is attached for reference.

cc: file

Attachments as stated

Table 2
Pantex Matrix Spike

Spike Conc. (ug/L)	Sample	Found	% Recovery
4.0	Not Detected	3.8	95%
1.7	Not Detected	Not Detected	N/A
1.0	Not Detected	Not Detected	N/A

The DI spike study shows that the laboratory has very good accuracy and precision when concentrations fall near the PQL. The study also shows that concentrations below that level, while detected, do not reflect good precision.

The sample spike study shows that the sample matrix, as expected, had considerable baseline rise. While the 4.0 ug/L spike exhibited good recovery, the other concentrations were not even detected. As Ms. Reilly had explained, the instrument software has a difficult time assigning peaks when the instrument response is this low, especially considering the background matrix of the samples in question. This may be causing the lack of detection at these spiking concentrations.

To summarize the study, we believe that sample concentrations below the PQL for Pantex samples show high variability due to the sample matrix. Concentrations found below the PQL are considered questionable and may not truly indicate true concentration or detection. If you have additional questions on this study, or would like to review the raw data files please call me at (843) 556-8171.

Your very truly,

Robert L. Pullano
Quality Systems Manger

Fc: PNTX

Cc: Bill Wyatt (Pantex)
Gary Dechant (AQA)
Scott Hall (GEL)
Carey Bocklet (GEL)
Deidre Reilly (GEL)

GENERAL ENGINEERING LABORATORIES
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GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

November 18, 2000

Mr. Mark Minteer
Analytical Quality Associates, Inc.
616 Maxine NE
Albuquerque, NM 87123

Re: Follow-up to Perchlorate Quantitation Limit Verification

Dear Mr. Minteer,

General Engineering Laboratories, Inc. (GEL) has completed the verification study as described in Ms. Reilly's November 3rd letter. As explained by Ms. Reilly, GEL has analyzed groundwater samples for perchlorate for several clients. Samples from the Pantex site consistently show more matrix interference than those from other sites. This often results in a baseline that is not nearly as level as other samples or laboratory process controls that are made in deionized water (DI).

A study was performed to verify the instrument detection capabilities, accuracy, and precision for deionized spiked standards and Pantex matrix spikes. It was our initial conclusion that the estimated results reported on the Pantex samples were caused by interferences from the sample matrix and that the data should be considered estimated.

The laboratory analyzed seven standards prepared at the Practical Quantitation Limit (PQL) of 4.0ug/L, seven standards prepared at 1.7 ug/L, and seven standards prepared at 1.0 ug/L (which is the current Method Detection Limit). Results of the study are summarized in Table 1. The laboratory also spiked one Pantex sample at the same concentrations. Results from this study are summarized in Table 2.

Table 1
De-Ionized Water Spike

Known Conc. (ug/L)	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Average (ug/L)	Stdev	Avg. Recovery
4.0	4.1	3.8	3.1	3.1	4.9	3.8	3.8	3.8	0.62	95%
1.7	0.5	0.5	1.7	2.5	1.7	3.3	1.7	1.7	1.01	100%
1.0	1.4	0.2	1.4	1.8	0.6	0.5	1.5	1.1	0.61	110%

P O Box 30712 •Charleston, SC 29417 •2040 Savage Road •29407
(843) 556-8171 •Fax (843) 766-1178

Printed on recycled paper.

From: <Minteer%aol.com@internet.pantex.com>
To: <rlp%gel.com@internet.pantex.com>
Date: 11/27/00 4:25PM
Subject: ClO4 reporting limit

Bob:

Based upon the data you have sent to Bill Wyatt and me, it is clear that you cannot detect ClO4 in Pantex samples at your 1 ppb reporting limit. Your data suggest to us that we should artificially elevate the detection limit, consistent with the spirit of Model SOW section 3.3.1 (a) (iv), to 4 ppb. Please ensure that future reported detection limits conform to this guideline. In addition, we suggest that it might be beneficial to try similar experiments with other natural waters. You might find that your ClO4 reporting limits should be elevated in a more broadly general sense and not just for Pantex.

Regards,
Mark Minteer
AQA/DOE-AL Analytical Management Program

CC: <GLDechant%aol.com@internet.pantex.com>, <dbourne%doeal.gov@internet.pantex.com>, <cjb%gel.com@internet.pantex.com>, <kmullen%lanl.gov@internet.pantex.com>, <shagelbe%lanl.gov@internet.pantex.com>, <wwyatt@pantex.com>, <CMOKE@pantex.com>, <tvincent@pantex.com>, <tlawler@pantex.com>, <drsalmi%sandia.gov@internet.pantex.com>, <pmpuiss%sandia.gov@internet.pantex.com>

Attachment Two

LANL Perchlorate MDL Verification

GEL ID	Client ID	Result (ug/L)	Date	Time	Analyst
48671005	GU01091G5MP	0.000	10/3/01	20:25	RWS
		1.493	10/3/01	20:35	RWS
		1.663	10/3/01	20:44	RWS
		0.000	10/3/01	20:54	RWS
49768003	GU01091G5MP1	3.267	10/3/01	12:32	RWS
		2.580	10/3/01	12:41	RWS
		1.505	10/3/01	12:51	RWS
		1.295	10/3/01	13:01	RWS
48671006	GU01091G5MP2	3.525	10/3/01	21:04	RWS
		3.200	10/3/01	21:14	RWS
		3.370	10/3/01	21:24	RWS
		3.594	10/3/01	21:34	RWS
48761007	GU1091G5MP4	3.72	9/13/01	12:47	RWS
48761008	GU1091G5MP6	6.88	9/13/01	17:16	RWS
48671004	GU01091G1RG	0.000	10/3/01	19:45	RWS
		1.474	10/3/01	19:55	RWS
		1.287	10/3/01	20:05	RWS
		0.000	10/3/01	20:15	RWS
49768001	GU01091G1RG1	1.880	10/3/01	10:43	RWS
		3.026	10/3/01	10:53	RWS
		0.000	10/3/01	11:03	RWS
		3.058	10/3/01	11:13	RWS
48671009	GU01091G1RG2	3.560	10/3/01	21:44	RWS
		3.269	10/3/01	21:54	RWS
		3.455	10/3/01	22:03	RWS
		3.015	10/3/01	22:13	RWS
48761010	GU1091G1RG4	6.19	9/14/01	16:20	RWS
48761011	GU1091G1RG6	5.42	9/17/01	18:23	RWS

LANL Perchlorate MDL Verification

GEL ID	Client ID	Result (ug/L)	Date	Time	Analyst
48671024	GU01091G1OW	3.236	10/3/01	23:42	RWS
		2.545	10/3/01	23:52	RWS
		3.066	10/4/01	00:02	RWS
		2.918	10/4/01	00:12	RWS
49768004	GU01091G1OW1	3.531	10/3/01	13:11	RWS
		3.876	10/3/01	13:21	RWS
		3.771	10/3/01	13:31	RWS
		3.871	10/3/01	13:41	RWS
48671014	GU01091G1OW2	4.516	10/3/01	22:23	RWS
		4.906	10/3/01	22:33	RWS
		4.558	10/3/01	22:43	RWS
		4.693	10/3/01	22:53	RWS
48761015	GU1091G1OW4	6.59	9/17/01	18:44	RWS
48761016	GU1091G1OW6	7.56	9/17/01	18:54	RWS
48671030	GU01091G3MP	0.000	10/4/01	00:22	RWS
		1.468	10/4/01	00:31	RWS
		0.000	10/4/01	00:41	RWS
		1.616	10/4/01	00:51	RWS
49768002	GU01091G3MP1	1.856	10/3/01	11:32	RWS
		0.000	10/3/01	11:42	RWS
		2.665	10/3/01	12:12	RWS
		3.494	10/3/01	12:22	RWS
48671017	GU01091G3MP2	3.214	10/3/01	23:03	RWS
		3.567	10/3/01	23:13	RWS
		3.596	10/3/01	23:22	RWS
		2.996	10/3/01	23:32	RWS
48761018	GU1091G3MP4	4.16	9/17/01	19:04	RWS
48761019	GU1091G3MP6	5.72	9/17/01	19:14	RWS

Attachment Three

Deidre Reilly

dar@mail.gel.com

LANL Perchlorate MSA Study

GEL ID	Client ID	Result (ug/L)	Date	Time	Analyst	
49641001	GU01081G1MP	2.120	8/28/01	13:20	RWS	
	GU01081G1MP	0.000	10/3/01	14:29	RWS	corr. coef. = 0.995
	+ 1 ug/L spike	1.862	10/3/01	14:39	RWS	MSA result = 0.118875
	+ 2 ug/L spike	3.048	10/3/01	14:49	RWS	
	+ 3 ug/L spike	4.394	10/3/01	14:58	RWS	
49641002	GU01081G1OW	3.480	8/30/01	12:59	RWS	
	GU01081G1OW	2.469	10/3/01	15:08	RWS	corr. coef. = 0.985
	+ 2 ug/L spike	4.854	10/3/01	15:18	RWS	MSA result = 3.386246
	+ 4 ug/L spike	6.397	10/3/01	15:28	RWS	
	+ 6 ug/L spike	7.490	10/3/01	15:38	RWS	
49641003	GU01081G4OW	1.650	8/30/01	13:19	RWS	
	GU01081G4OW	0.000	10/3/01	15:48	RWS	corr. coef. = 0.886
	+ 1 ug/L spike	2.498	10/3/01	15:58	RWS	MSA result = 0.576778
	+ 2 ug/L spike	3.730	10/3/01	16:27	RWS	
	+ 3 ug/L spike	3.488	10/3/01	18:26	RWS	
49641004	GU01081G1RG	1.750	8/30/01	23:19	RWS	
	GU01081G1RG	0.000	10/3/01	18:36	RWS	corr. coef. = 0.823
	+ 1 ug/L spike	4.092	10/3/01	16:57	RWS	MSA result = 0.797272
	+ 2 ug/L spike	3.536	10/3/01	17:07	RWS	
	+ 3 ug/L spike	4.633	10/3/01	17:17	RWS	
49641005	GU01081BUCK7	0.999	9/6/01	16:09	RWS	
	GU01081BUCK7	0.000	10/3/01	17:27	RWS	corr. coef. = 0.881
	+ 0.5 ug/L spike	0.000	10/3/01	17:36	RWS	MSA result = -0.115752
	+ 1 ug/L spike	2.594	10/3/01	17:46	RWS	
	+ 1.5 ug/L spike	2.447	10/3/01	17:56	RWS	

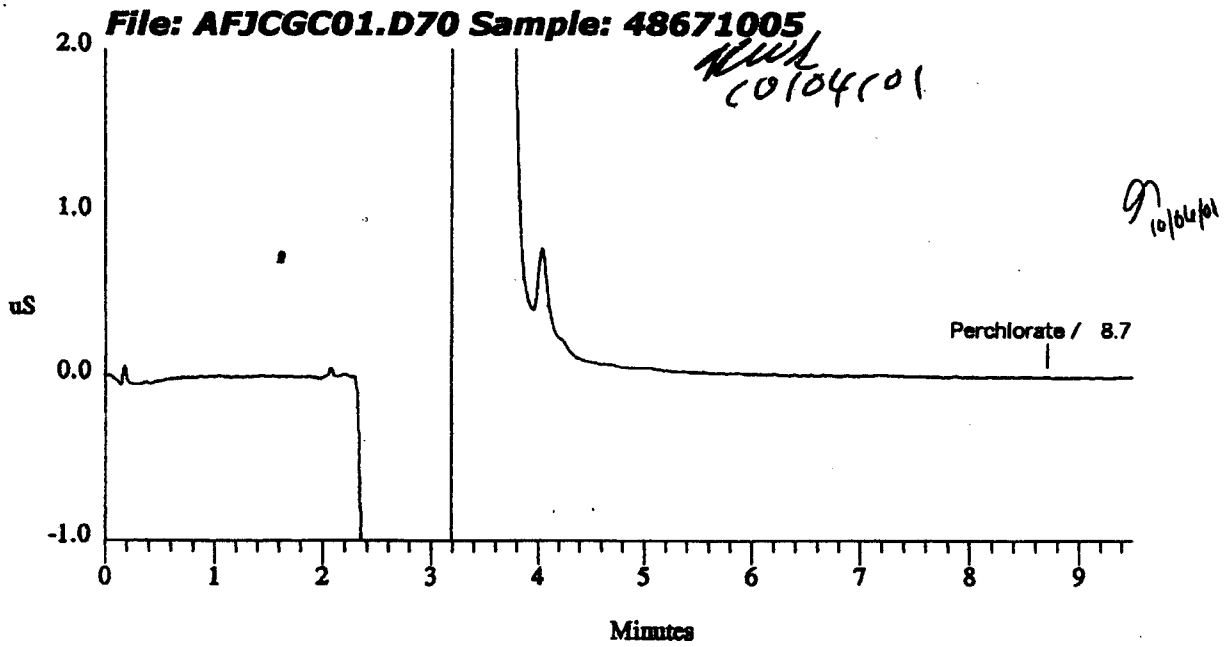
Attachment Four

Sample Name: 48671005	Date: 10/03/2001 20:35:03
Data File : C:\TMP\HORIZON\AFJCGC01.D70	
Method : C:\DX\METHOD\AFAS16.MET	
ACI Address: 1 System: 1 Inject#: 70	Detector:CDM-2
Analyst : RWS	Column: AS16 #1916;SOP: GL-GC-E-086;314

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area Reject
External	1	1	2850	5Hz	0.00	9.50	0

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration ug/l	Height	Area	Bl. Code	%Delta
1	8.71	Perchlorate	1.493	6310	45944	1	0.00
		Totals	1.493	6310	45944		



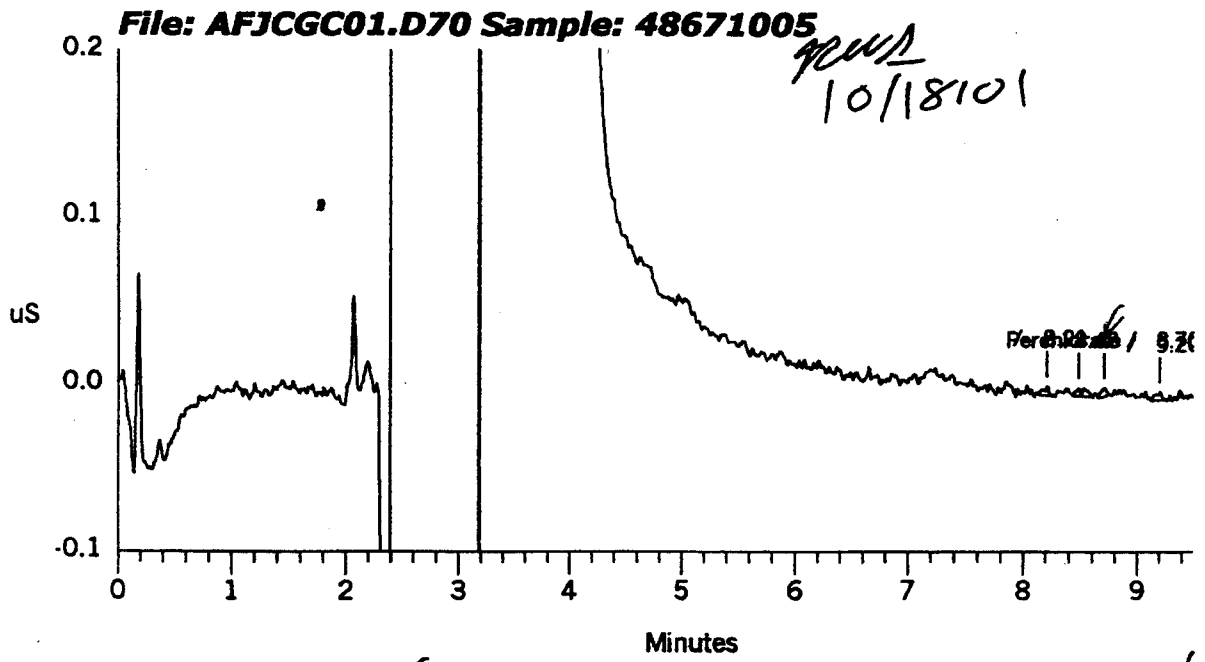
Data Reprocessed On 10/18/2001 08:26:00

Sample Name: 48671005	Date: 10/03/2001 20:35:03
Data File : F:\AFJCGC01.D70	
Method : C:\DX\METHOD\AFAS16.MET	
ACI Address: 1 System: 1 Inject#: 70	Detector:CDM-2
Analyst : RWS	Column: AS16 #1916;SOP: GL-GC-E-086;314

Calibration	Volume	Dilution	Points	Rate	Start	Stop	Area	Reject
External	1	1	2850	5Hz	0.00	9.50		0

********** Component Report: All Components **********

Pk. Num	Ret Time	Component Name	Concentration ug/l	Height	Area	Bl. Code	%Delta
3	8.70	Perchlorate	1.304	5304	19752	1	0.00
		Totals	1.304	5304	19752		



This chromatogram was reprocessed so the perchlorate could be more easily seen.

Attachment Five

LANL Perchlorate MDL Verification

GEL ID	Client ID	Result (ug/L)	Date	Time	Analyst
48671005	GU01091G5MP	0.000	10/3/01	20:25	RWS
		1.493	10/3/01	20:35	RWS
		1.663	10/3/01	20:44	RWS
		0.000	10/3/01	20:54	RWS
48671005	GU01091G5MP	4.232	10/18/01	11:21	RWS
	+ 4 ug/L spike	5.508	10/18/01	11:32	RWS
		3.113	10/18/01	11:42	RWS
		4.526	10/18/01	11:52	RWS
		6.305	10/18/01	12:03	RWS
		4.290	10/18/01	12:13	RWS
		4.094	10/18/01	12:23	RWS
		3.901	10/18/01	12:34	RWS
		4.944	10/18/01	12:44	RWS
		3.816	10/18/01	12:54	RWS

$\bar{X} = 4.47$

$\sigma_{n-1} = 0.913$

high = 6.30

Low = 3.11

range = 3.19

ATTACHMENT 3.0

ANALYTICAL REPORTS

QUARTERLY HIGH EXPLOSIVES RESULTS

GENERAL ENGINEERING LABORATORIES

PM-2, PM-4, PM-5, G-5A

SAMPLE DATE: SEPTEMBER 5, 2001

PM-2

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GU01091G2MP

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 48671

Matrix: (soil/water) WATER Lab Sample ID: 48671002

Sample wt/vol: 770.0 (g/ml) ML Lab File ID: EX3I1310

Level: (low/med) LOW Date Received: 09/07/01

% Moisture: _____ decanted: (Y/N)___ Date Extracted:09/12/01

Concentrated Extract Volume: 1.60(ml) Date Analyzed: 09/13/01

Injection Volume: 0.100(mL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
2691-41-0	HMX	0.10	U
121-82-4	RDX	0.10	U
99-35-4	1,3,5-Trinitrobenzene	0.10	U
99-65-0	1,3-Dinitrobenzene	0.10	U
98-95-3	Nitrobenzene	0.10	U
479-45-8	Tetryl	0.10	U
118-96-7	2,4,6-Trinitrotoluene	0.10	U
35572-78-2	2-Amino-4,6-dinitrotoluene	0.10	U
19406-51-0	4-Amino-2,6-dinitrotoluene	0.10	U
121-14-2	2,4-Dinitrotoluene	0.10	U
606-20-2	2,6-Dinitrotoluene	0.10	U
88-72-2	2-Nitrotoluene	0.10	U
99-99-0	4-Nitrotoluene	0.10	U
99-08-1	3-Nitrotoluene	0.10	U

FORM I SV-1

PM-4

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GU01091G4MP

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 48671

Matrix: (soil/water) WATER Lab Sample ID: 48671001

Sample wt/vol: 770.0 (g/ml) ML Lab File ID: EX3I1309

Level: (low/med) LOW Date Received: 09/07/01

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 09/12/01

Concentrated Extract Volume: 1.60(ml) Date Analyzed: 09/13/01

Injection Volume: 0.100(mL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
2691-41-0	HMX	0.10	U
121-82-4	RDX	0.10	U
99-35-4	1,3,5-Trinitrobenzene	0.10	U
99-65-0	1,3-Dinitrobenzene	0.10	U
98-95-3	Nitrobenzene	0.10	U
479-45-8	Tetryl	0.10	U
118-96-7	2,4,6-Trinitrotoluene	0.10	U
35572-78-2	2-Amino-4,6-dinitrotoluene	0.10	U
19406-51-0	4-Amino-2,6-dinitrotoluene	0.10	U
121-14-2	2,4-Dinitrotoluene	0.10	U
606-20-2	2,6-Dinitrotoluene	0.10	U
88-72-2	2-Nitrotoluene	0.10	U
99-99-0	4-Nitrotoluene	0.10	U
99-08-1	3-Nitrotoluene	0.10	U

FORM I SV-1

PM-5

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GU01091G5MP

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 48671

Matrix: (soil/water) WATER Lab Sample ID: 48671005

Sample wt/vol: 770.0 (g/ml) ML Lab File ID: EX3I1313

Level: (low/med) LOW Date Received: 09/07/01

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 09/12/01

Concentrated Extract Volume: 1.60(ml) Date Analyzed: 09/13/01

Injection Volume: 0.100(mL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
2691-41-0	HMX	0.10	U
121-82-4	RDX	0.10	U
99-35-4	1,3,5-Trinitrobenzene	0.10	U
99-65-0	1,3-Dinitrobenzene	0.10	U
98-95-3	Nitrobenzene	0.10	U
479-45-8	Tetryl	0.10	U
118-96-7	2,4,6-Trinitrotoluene	0.10	U
35572-78-2	2-Amino-4,6-dinitrotoluene	0.10	U
19406-51-0	4-Amino-2,6-dinitrotoluene	0.10	U
121-14-2	2,4-Dinitrotoluene	0.10	U
606-20-2	2,6-Dinitrotoluene	0.10	U
88-72-2	2-Nitrotoluene	0.10	U
99-99-0	4-Nitrotoluene	0.10	U
99-08-1	3-Nitrotoluene	0.10	U

FORM I SV-1

PM-5
duplicate sample

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GU01092G5MP

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 48671

Matrix: (soil/water) WATER Lab Sample ID: 48671003

Sample wt/vol: 770.0 (g/ml) ML Lab File ID: EX3I1311

Level: (low/med) LOW Date Received: 09/07/01

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 09/12/01

Concentrated Extract Volume: 1.60(ml) Date Analyzed: 09/13/01

Injection Volume: 0.100(mL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
2691-41-0	HMX	0.10	U
121-82-4	RDX	0.10	U
99-35-4	1,3,5-Trinitrobenzene	0.10	U
99-65-0	1,3-Dinitrobenzene	0.10	U
98-95-3	Nitrobenzene	0.10	U
479-45-8	Tetryl	0.10	U
118-96-7	2,4,6-Trinitrotoluene	0.10	U
35572-78-2	2-Amino-4,6-dinitrotoluene	0.10	U
19406-51-0	4-Amino-2,6-dinitrotoluene	0.10	U
121-14-2	2,4-Dinitrotoluene	0.10	U
606-20-2	2,6-Dinitrotoluene	0.10	U
88-72-2	2-Nitrotoluene	0.10	U
99-99-0	4-Nitrotoluene	0.10	U
99-08-1	3-Nitrotoluene	0.10	U

FORM I SV-1

G-5A

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GU01091G1RG

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: 48671

Matrix: (soil/water) WATER Lab Sample ID: 48671004

Sample wt/vol: 770.0 (g/ml) ML Lab File ID: EX3I1312

Level: (low/med) LOW Date Received: 09/07/01

% Moisture: _____ decanted: (Y/N)___ Date Extracted: 09/12/01

Concentrated Extract Volume: 1.60(ml) Date Analyzed: 09/13/01

Injection Volume: 0.100(mL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
2691-41-0	HMX	0.10	U
121-82-4	RDX	0.10	U
99-35-4	1,3,5-Trinitrobenzene	0.10	U
99-65-0	1,3-Dinitrobenzene	0.10	U
98-95-3	Nitrobenzene	0.10	U
479-45-8	Tetryl	0.10	U
118-96-7	2,4,6-Trinitrotoluene	0.10	U
35572-78-2	2-Amino-4,6-dinitrotoluene	0.10	U
19406-51-0	4-Amino-2,6-dinitrotoluene	0.10	U
121-14-2	2,4-Dinitrotoluene	0.10	U
606-20-2	2,6-Dinitrotoluene	0.10	U
88-72-2	2-Nitrotoluene	0.10	U
99-99-0	4-Nitrotoluene	0.10	U
99-08-1	3-Nitrotoluene	0.10	U