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LK5379 ^{Page 2}

Lockheed Environmental Systems & Technologies Co.
Lockheed Analytical Services
975 Kelly Johnson Drive Las Vegas, Nevada 89119-3705
Telephone 702-361-0220 800-582-7605 Facsimile 702-361-8146



October 27, 1995

Ms. Joan Kessner
Bechtel Hanford, Inc.
345 Hills
P.O. Box 969
Richland, WA 99352

RE: Log-in No.:	L5379
Quotation No.:	Q400000-B
SAF:	B95-093
Document File No.:	0916596
WHC Document File No.:	274
SDG No.:	LK5379

The attached data report contains the analytical results of samples that were submitted to Lockheed Analytical Services on 16 September 1995.

The temperature of the cooler upon receipt was 2°C. Sample containers received agree with the chain-of-custody documentation. Sample containers were received intact. Samples were received in time to meet the analytical holding time requirements with the exception of method 300.0 nitrate-nitrogen, nitrite-nitrogen, and orthophosphate.

The case narratives included in the following attachments provide a detailed description of all events that occurred during sample preparation, analysis, and data review specific to the samples and analytical methods requested.

A list of data qualifiers, chain-of-custody forms, sample receiving checklist, and log-in report are also enclosed representing the samples received within this group.

If you have any questions concerning the analysis or the data please call Kathleen Hall at (509) 375-4741.



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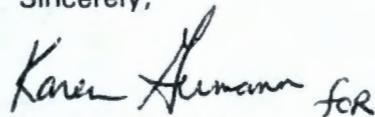
Lockheed Analytical Services

Log-in No.: L5379
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SDG No.: LK5379

Release of this data report has been authorized by the Laboratory Director or the Director's designee as evidenced by the following signature.

" I certify that this data package is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Manger or a designee, as verified by the following signature."

Sincerely,

Handwritten signature of Kathleen M. Hall in cursive, followed by the initials "for".

Kathleen M. Hall
Client Services Representative

cc: Client Services
Document Control

Lockheed Analytical Services

Log-in No.: L5379
 Quotation No.: Q400000-B
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**CASE NARRATIVE
 INORGANIC NON METALS ANALYSES
 WATER**

The routine calibration and quality control analyses performed for this batch include as applicable: initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), matrix spike sample(s), and duplicate sample(s).

Preparation and Analysis Requirements

- One water sample was received for LK5379 and analyzed in batches 916 bh and 916 bht for selected analytes as requested on the chain of custody. Quality control analysis was performed on the following sample:

Client ID	LAL #		Method
BOGJY4	L5379-9	DUP	120.1 Conductivity
	L5379-10	DUP	180.1 Turbidity
	L5379-3	MS, DUP	300.0 Chloride, Fluoride, Nitrate-Nitrogen, Nitrite-Nitrogen, Orthophosphate, Sulfate

Holding Time Requirements

- All samples were analyzed within the method-specific holding time with the exception of Method 180.1 Turbidity, Method 300.0 Nitrate-Nitrogen, Nitrite-Nitrogen and Orthophosphate which were received outside of holding time. The associated samples are flagged with an "H".

Method Blanks

- The concentration levels of all the requested analytes in the method blank were below the reporting detection limits.

Internal Quality Control

- All Internal Quality Control were within acceptance limits.

Kay McCann
 Prepared By

October 15, 1995
 Date

Lockheed Analytical Services

Log-in No.: L5379
 Quotation No.: Q400000-B
 SAF: B95-093
 Document File No.: 0916596
 WHC Document File No.:274
 SDG No.: LK5379

**CASE NARRATIVE
 INORGANIC NON-METALS ANALYSES
 FILTERED WATER**

The routine calibration and quality control analyses performed for this batch include as applicable: initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), matrix spike sample(s), and duplicate sample(s).

Preparation and Analysis Requirements

- One filtered water sample was received for LK5379 and analyzed in batch 916 bhd for selected analytes as requested on the chain of custody. Quality control analysis was performed on the following sample:

Client ID	LAL #		Method
BOGJY5	L5379-22	MS, DUP	300.0 Chloride, Fluoride, Nitrate-Nitrogen, Nitrite-Nitrogen, Orthophosphate, Sulfate

Holding Time Requirements

- All samples were analyzed within the method-specific holding time with the exception of Method 300.0 Nitrate-Nitrogen, Nitrite-Nitrogen and Orthophosphate which were received outside of holding time. The associated samples are flagged with an "H".

Method Blanks

- The concentration levels of all the requested analytes in the method blank were below the reporting detection limits.

Internal Quality Control

- All Internal Quality Control were within acceptance limits.

Kay McCann
 Prepared By

October 15, 1995
 Date

Lockheed Analytical Services

Log-in No.: L5379
Quotation No.: Q400000-B
SAF: B95-093
Document File No.: 0916596
WHC Document File No.: 274
SDG No.: LK5379

**CASE NARRATIVE
INORGANIC METALS ANALYSES
WATERS**

The routine calibration and quality control analyses performed for this batch include as applicable: instrument tune (ICP/MS only), initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), ICP interference check samples (ICP only), serial dilutions, analytical (post-digestion) spike samples, matrix spike (predigestion) sample(s), duplicate sample(s).

Preparation and Analysis Requirements

All samples were received on September 16, 1995. The samples were logged in as L5379 and were prepared and analyzed in batch 916 bhT.

Holding Time Requirements

- All samples were analyzed within the method-specific holding times.

Method Blanks

- The concentration levels of all the requested analytes in the method blank were below the reporting detection limits.

Internal Quality Control

- All Internal Quality Control were within acceptance limits.

Shellee McGrath
Prepared By

October 18, 1995
Date

Lockheed Analytical Services

Log-in No.: L5379
Quotation No.: Q400000-B
SAF: B95-093
Document File No.: 0916596
WHC Document File No.: 274
SDG No.: LK5379

**CASE NARRATIVE
INORGANIC METALS ANALYSES
FILTERED WATERS**

The routine calibration and quality control analyses performed for this batch include as applicable: instrument tune (ICP/MS only), initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), ICP interference check samples (ICP only), serial dilutions, analytical (post-digestion) spike samples, matrix spike (predigestion) sample(s), duplicate sample(s).

Preparation and Analysis Requirements

All samples were received on September 16, 1995. The samples were logged in as L5379 and were prepared and analyzed in batch 916 bhD.

Holding Time Requirements

- All samples were analyzed within the method-specific holding times.

Method Blanks

- The concentration levels of all the requested analytes in the method blank were below the reporting detection limits.

Internal Quality Control

- All Internal Quality Control were within acceptance limits.

Shellee McGrath
Prepared By

October 18, 1995
Date

Lockheed Analytical Services

Log-in No.: L5379
Quotation No.: Q400000-B
SAF: B95-093
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SDG No.: LK5379

**CASE NARRATIVE
ORGANIC ANALYSES**

Analytical Method 413.1

Analytical Batch 092895-413.1

NOTE: Sample BOGJY4 (L5379-4) was the native sample used for the Matrix Spike (27944MS) and the Matrix Spike Duplicate (27944MSD). The MS and MSD were analyzed using the duplicate samples BOGJY4 (L5379-5) and BOGJY4 (L5379-6).

The samples were extracted and analyzed within the required holding time on September 28, 1995. Target compound Total Oil and Grease was not detected in the Method Blank (MB). The recovery of Total Oil and Grease was within QC limits in the MS, MSD, and Laboratory Control Sample (LCS). The Relative Percent Difference (RPD) between the MS and MSD recoveries was within QC limits.

Analytical Method 418.1

Analytical Batch 092695-418.1

NOTE: Sample BOGFV2 (L5351-4) was the native sample used for the 27753MS/MSD. The MS and MSD were analyzed using the duplicate sample BOGFV2 (L5351-5).

The samples were extracted within the required holding time on September 25, 1995 and analyzed within the required holding time on September 26, 1995. All initial and continuing calibrations were within QC criteria. Total Recoverable Petroleum Hydrocarbon (TRPH) was not detected in the MB. A LCS and Laboratory Control Sample Duplicate (LCSDUP) were extracted and analyzed in addition to a MS and MSD. The recovery of TRPH was within QC limits in the MS, MSD, LCS and LCSDUP. The RPDs between the MS/MSD and LCS/LCSDUP recoveries were within QC limits.

Christine Davy
Prepared By

October 19, 1995
Date

Lockheed Analytical Services

Log-in No.: L5379
Quotation No.: Q400000-B
SAF: B95-093
Document File No.: 0916596
WHC Document File No.: 274
SDG No.: LK5379

CASE NARRATIVE RADIOCHEMICAL ANALYSES

The routine calibration and quality control (QC) analyses performed for this batch include as applicable: instrument calibration, initial and continuing calibration verification, quench monitoring standards, instrument background analysis, method blanks, yield tracer, laboratory control samples, matrix spike samples, duplicate samples.

NOTE: Chemical recoveries and minimum detectable activities (MDAs) can be found on the preparation sheets and calculation sheets on the attached raw data for each method.

Holding Time Requirements

All holding times were met.

Analytical Method Gamma Spectrometry

The gamma spectrometry analysis was performed using standard operating procedure (SOP), LAL-91-SOP-0063. The samples were analyzed in workgroup 27809. No problems were encountered during the analysis and all QC criteria were met. No re-analyses were performed.

Analytical Method Gross Alpha/Beta

The gross alpha/beta analysis was performed using SOP, LAL-91-SOP-0060. The samples were analyzed in workgroup 27812. No problems were encountered during the analysis and all QC criteria were met with the following exception: The MDA exceeded the reporting detection limit due to the residue weight limitations forcing a volume reduction, the associated samples were flagged with a "C" qualifier. No re-analyses were performed.

Analytical Method Strontium-90

The strontium-90 analysis was performed using SOP, LAL-91-SOP-0196. The samples were analyzed in workgroup 27451. No problems were encountered during the analysis and all QC criteria were met. No re-analyses were performed.

Lockheed Analytical Services

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Quotation No.: Q400000-B
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SDG No.: LK5379

Analytical Method Tritium

The tritium analysis was performed using SOP, LAL-91-SOP-0066. The samples were analyzed in workgroup 27851. No problems were encountered during analysis and all QC criteria were met. No re-analyses were performed.

Andrea Tippett
Prepared By

October 17, 1995
Date

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LOCKHEED ANALYTICAL SERVICES
 LOGIN CHAIN OF CUSTODY REPORT (ln01)
 Sep 18 1995, 08:49 pm

Login Number: L5379
 Account: 596 Bechtel Hanford, Inc. * Richland, WA
 Project: BECHTEL-HANFORD Bechtel Hanford Project

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	Due PR Date
L5379-1 temp 2; SAF# B95-093 Location: 157 Water 1 S SCREENING	BOGJY4	14-SEP-95	16-SEP-95	21-OCT-95
		Hold:12-MAR-96		
L5379-2 temp 2; SAF# B95-093 Location: 157 Water 1 S 6010 ICP METALS	BOGJY4	14-SEP-95	16-SEP-95	21-OCT-95
		Hold:12-MAR-96		
L5379-3 temp 2; SAF# B95-093 Location: 157 Water 1 S 300.0 CHLORIDE Water 1 S 300.0 FLUORIDE Water 1 S 300.0 NITRATE Water 1 S 300.0 NITRITE Water 1 S 300.0 PHOSPHATE Water 1 S 300.0 SULFATE	BOGJY4	14-SEP-95	16-SEP-95	21-OCT-95
		Hold:12-OCT-95		
		Hold:12-OCT-95		
		Hold:16-SEP-95		
		Hold:16-SEP-95		
		Hold:16-SEP-95		
		Hold:12-OCT-95		
L5379-4 temp 2; SAF# B95-093 Location: 157 Water 1 S 413.1 OIL AND GREASE	BOGJY4	14-SEP-95	16-SEP-95	21-OCT-95
		Hold:12-OCT-95		
L5379-5 temp 2; SAF# B95-093 Location: 157	BOGJY4	14-SEP-95	16-SEP-95	21-OCT-95
L5379-6 temp 2; SAF# B95-093 Location: 157	BOGJY4	14-SEP-95	16-SEP-95	21-OCT-95
L5379-7 temp 2; SAF# B95-093 Location: 157	BOGJY4	14-SEP-95	16-SEP-95	21-OCT-95
L5379-8 temp 2; SAF# B95-093 Location: 157 Water 1 S 418.1 TPH	BOGJY4	14-SEP-95	16-SEP-95	21-OCT-95
		Hold:12-OCT-95		

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LOCKHEED ANALYTICAL SERVICES
 LOGIN CHAIN OF CUSTODY REPORT (ln01)
 Sep 18 1995, 08:49 pm

Login Number: L5379
 Account: 596 Bechtel Hanford, Inc. * Richland, WA
 Project: BECHTEL-HANFORD Bechtel Hanford Project

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	Due PR Date
L5379-9 temp 2; SAF# B95-093 Location: 157 Water 1 S 120.1 CONDUCTIVITY	BOGJY4	14-SEP-95	16-SEP-95	21-OCT-95
				Hold:12-OCT-95
L5379-10 temp 2; SAF# B95-093 Location: 157 Water 1 S 180.1 TURBIDITY	BOGJY4	14-SEP-95	16-SEP-95	21-OCT-95
				Hold:16-SEP-95
L5379-11 temp 2; SAF# B95-093 Location: 157 Water 1 S 9040 PH	BOGJY4	14-SEP-95	16-SEP-95	21-OCT-95
				Hold:21-SEP-95
L5379-12 temp 2; SAF# B95-093 Location: 157 Water 1 S GAMMA SPEC LAL-0063 Water 1 S GR ALP/BETA LAL-0060 Water 1 S SR-90 LAL-0196	BOGJY4	14-SEP-95	16-SEP-95	21-OCT-95
				Hold:12-MAR-96
				Hold:12-MAR-96
				Hold:12-MAR-96
L5379-13 temp 2; SAF# B95-093 Location: 157	BOGJY4	14-SEP-95	16-SEP-95	21-OCT-95
L5379-14 temp 2; SAF# B95-093 Location: 157	BOGJY4	14-SEP-95	16-SEP-95	21-OCT-95
L5379-15 temp 2; SAF# B95-093 Location: 157	BOGJY4	14-SEP-95	16-SEP-95	21-OCT-95
L5379-16 temp 2; SAF# B95-093 Location: 157	BOGJY4	14-SEP-95	16-SEP-95	21-OCT-95
L5379-17 temp 2; SAF# B95-093 Location: 157	BOGJY4	14-SEP-95	16-SEP-95	21-OCT-95

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LOCKHEED ANALYTICAL SERVICES
 LOGIN CHAIN OF CUSTODY REPORT (ln01)
 Sep 18 1995, 08:49 pm

Login Number: L5379
 Account: 596 Bechtel Hanford, Inc. * Richland, WA
 Project: BECHTEL-HANFORD Bechtel Hanford Project

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	Due PR Date
L5379-18 temp 2; SAF# B95-093 Location: 157	BOGJY4	14-SEP-95	16-SEP-95	21-OCT-95
L5379-19 temp 2; SAF# B95-093 Location: 157	BOGJY4	14-SEP-95	16-SEP-95	21-OCT-95
L5379-20 temp 2; SAF# B95-093 Location: 157 Water 1 S TRITIUM(H3) LAL-0066 Hold:12-MAR-96	BOGJY4	14-SEP-95	16-SEP-95	21-OCT-95
L5379-21 temp 2; SAF# B95-093 Location: 157 Filt H20 15 S 6010 ICP METALS Hold:12-MAR-96	BOGJY5	14-SEP-95	16-SEP-95	21-OCT-95
L5379-22 temp 2; SAF# B95-093 Location: 157 Filt H20 15 S 300.0 CHLORIDE Hold:12-OCT-95 Filt H20 15 S 300.0 FLUORIDE Hold:12-OCT-95 Filt H20 15 S 300.0 NITRATE Hold:16-SEP-95 Filt H20 15 S 300.0 NITRITE Hold:16-SEP-95 Filt H20 15 S 300.0 PHOSPHATE Hold:16-SEP-95 Filt H20 15 S 300.0 SULFATE Hold:12-OCT-95	BOGJY5	14-SEP-95	16-SEP-95	21-OCT-95
L5379-23 SAF# B95-093 Location: Water 1 S EDD - DISK DEL.	REPORT TYPE	16-SEP-95	16-SEP-95	21-OCT-95

Page 3

Signature: *McMull*Date: 9-18-95

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Lockheed Analytical Laboratory
 SAMPLE SUMMARY REPORT (su02)
 Bechtel Hanford, Inc. * Richland, WA

Client Sample Number	LAL Sample Number	SDG Number	Matrix	Method
BOGJY4 -	L5379-1		Water	SCREENING -
	L5379-2		Water	6010 ICP METALS
	L5379-3		Water	300.0 CHLORIDE -
	L5379-3		Water	300.0 FLUORIDE
	L5379-3		Water	300.0 NITRATE -
	L5379-3		Water	300.0 NITRITE -
	L5379-3		Water	300.0 PHOSPHATE
	L5379-3		Water	300.0 SULFATE -
	L5379-4		Water	413.1 OIL AND G
	L5379-8		Water	418.1 TPH -
	L5379-9		Water	120.1 CONDUCTIV
	L5379-10		Water	180.1 TURBIDITY
	L5379-11		Water	9040 PH -
	L5379-12		Water	GAMMA SPEC LAL-
L5379-12		Water	GR ALP/BETA LAL	
L5379-12		Water	SR-90 LAL-0196	
L5379-20		Water	TRITIUM(H3) LAL	
BOGJY5 -	L5379-21		Filt H20	6010 ICP METALS
	L5379-22		Filt H20	300.0 CHLORIDE -
	L5379-22		Filt H20	300.0 FLUORIDE -
	L5379-22		Filt H20	300.0 NITRATE -
	L5379-22		Filt H20	300.0 NITRITE -
	L5379-22		Filt H20	300.0 PHOSPHATE
	L5379-22		Filt H20	300.0 SULFATE -
REPORT TYPE -	L5379-23		Water	EDD - DISK DEL.

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Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

L5379

Data Turnaround
 Priority
 Normal

Collector AL RIZZO / MONTY MELHORN	Company Contact J. V. Borghese	Telephone (509) 372-9584
Project Designation 100-NR-2 Groundwater Sampling - Round 8	Sampling Location 100 N	SAF No. B95-093
Ice Chest No. EL-15	Field Logbook No. EFL-1056	Method of Shipment Federal Express
Shipped To Lockhead	Offsite Property No. W95-0-0204-50	Bill of Lading/Air Bill No. 2904640785

Possible Sample Hazards/Remarks	Preservation	HNO ₃	Cool 4°C	Cool 4°C	H ₂ SO ₄	Cool 4°C	Cool 4°C	None	HNO ₃	None	None
	Type of Container	P/G	P/G	G	G	P/G	P/G	P	P/G	G	P/G
	No. of Container(s)	1	1	4	1	1	1	1	8	1	1
Special Handling and/or Storage Maintain samples between 2°C and 6°C.	Volume	500mL	500mL	1L	1L	250mL	250mL	250mL	1L	500mL	20mL

SAMPLE ANALYSIS	Matrix*	Date Sampled	Time Sampled	ICP Metals - TAL (Unfiltered)	Anions (IC) - F, Cl, SO ₄ , PO ₄ , NO ₂ , NO ₃ (Unfiltered)	Oil and Grease	TPH	Conductivity	Turbidity	pH	Gross Alpha, Gross Beta, Sr-90, Gamma Spec	Tritium	Activity Scan
					W	9/14/95	1355	X	X	X	X	X	X

0916596

CHAIN OF POSSESSION		Sign/Print Names		SPECIAL INSTRUCTIONS Sample analysis for phosphate, nitrate, and nitrite by EPA 300.0; pH by SW-846 9040; and turbidity by EPA 180.1 are being requested for information only. The ERC Contractor acknowledges that the holding times will not be met.								Matrix*	
Relinquished By <i>STEVEN GURLEY</i>	Date/Time 9/14/95 1515	Received By <i>ERIC</i>	Date/Time 1515									S - Soil SE - Sediment SO - Solid SL - Sludge W - Water O - Oil A - Air DS - Drum Solids DL - Drum Liquids T - Tissue WI - Wipe L - Liquid V - Vegetation X - Other	
Relinquished By <i>ERIC</i>	Date/Time 0800	Received By <i>KATHLEEN B. WATSON</i>	Date/Time 9-14-95										
Relinquished By <i>KATHLEEN B. WATSON</i>	Date/Time 9-15-95	Received By	Date/Time										
Relinquished By	Date/Time	Received By	Date/Time										

LABORATORY SECTION	Received By <i>MM</i>	Title Sample Custodian	Date/Time 9/16/95/0930
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

02

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Date Turnaround

Priority
 Normal

Collector AL RIZZO / MONTY MELIKSON

Company Contact
J. V. Borghese

Telephone
(509) 372-9584

Project Designation
100-NR-2 Groundwater Sampling - Round 8

Sampling Location
100 N

SAF No.
B95-093

Ice Chest No.
ER-15

Field Logbook No.
EFL-1056

Method of Shipment
Federal Express

Shipped To
Lockheed

Offsite Property No.
W95-0-0204-50

Bill of Lading/Air Bill No. 2904640785

Possible Sample Hazards/Remarks

Preservation	HNO ₃	Cool 4°C																		
Type of Container	P/G	P/G																		
No. of Container(s)	1	1																		
Special Handling and/or Storage Maintain samples between 2°C and 6°C.	Volume	500mL	500mL																	
SAMPLE ANALYSIS				ICP Metals - TAL (Filtered)	Anions (IC) - F, Cl, SO ₄ , PO ₄ , NO ₂ , NO ₃ (Filtered)															

Sample No.	Matrix*	Date Sampled	Time Sampled																	
<u>W95-015</u>	<u>W</u>	<u>9/14/95</u>	<u>1355</u>	<u>X</u>	<u>X</u>															

CHAIN OF POSSESSION	Sign/Print Names
Relinquished By <u>STEVEN GREEN</u> Date/Time <u>9/14/95 1515</u>	Received By <u>Eric [Signature]</u> Date/Time <u>1515</u>
Relinquished By <u>[Signature]</u> Date/Time <u>0800</u>	Received By <u>Vicki [Signature]</u> Date/Time <u>9-14-95</u>
Relinquished By <u>[Signature]</u> Date/Time <u>9-15-95</u>	Received By <u>[Signature]</u> Date/Time <u>[Signature]</u>
Relinquished By <u>[Signature]</u> Date/Time <u>[Signature]</u>	Received By <u>[Signature]</u> Date/Time <u>[Signature]</u>

SPECIAL INSTRUCTIONS
Sample analysis for phosphate, nitrate, and nitrite by EPA 300.0 are being requested for information only. The ERC Contractor acknowledges that the holding times will not be met.

Refer to Activity Scan on page 1 of 2.

Matrix*
S - Soil
SE - Sediment
SO - Solid
SL - Sludge
W - Water
O - Oil
A - Air
DS - Drum Solids
DL - Drum Liquids
T - Trasse
WI - Wipe
L - Liquid
V - Vegetation
X - Other

LABORATORY SECTION	Received By <u>[Signature]</u> Title <u>Sample Custodian</u> Date/Time <u>9-16-95/0930</u>
FINAL SAMPLE DISPOSITION	Disposal Method <u>[Signature]</u> Disposed By <u>[Signature]</u> Date/Time <u>[Signature]</u>

09165960

021

9613429-2611

Environmental
Restoration
Contractor

ERC Team
Interoffice Memorandum

Job No. 22192
Written Response Required: NO
CCN: N/A
OU: 100-NR-2
TSD: N/A
ERA: N/A
Subject Code: 5450

TO: W. S. Thompson N3-06 DATE: July 18, 1995
COPIES: R. L. Biggerstaff H4-91 FROM: S. K. De Mers
Radiological Controls
T7-05/373-1913

SUBJECT: 1995 sampling 100-NR-2

There is no need to perform total activities prior to offsite shipment to NRC licensed labs of samples taken from the list of wells in Attachment 1.

All of the wells listed in the first attachment were reviewed for radiological content based on the previous 4 years of sampling data. No well listed has a β activity in excess of 100,000 pCi/l (< .1 uCi/sample based on a 1 liter sample size) nor any α activity in excess of 10,000 pCi/l (< .01 uCi/l based on a 1 liter sample). All wells show activities < 2,000 pCi/gm (< 2 nCi/gm D.O.T. limit). The highest activity in recent samples is 3,260 pCi/l β and 5.2 pCi/l α .

The remaining wells are in locations that may have a credible path whereby they could become contaminated at the above listed levels and therefor will need to have total activities run on them prior to shipment. Radiological monitoring will be required for the wells and seeps listed in Attachment 2.

Radiological monitoring during sampling will only be required for the wells in Attachment 1, if the wells are located in radiological areas or if the wells themselves are labeled with radiological stickers. Monitoring requirements for down hole work such as pump removal will be determined based on the history of each well on a case by case basis.

skd

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022

ATTACHMENT 1

WELLS THAT DO NOT REQUIRE TOTAL ACTIVITIES

Wells

199-N-14
199-N-75
199-N-29
199-N-2
199-N-3
199-N-31
199-N-46
199-N-67
199-N-76
199-N-16
199-N-17
199-N-18
199-N-19
199-N-20
199-N-21
199-N-25
199-N-26
199-N-32
199-N-50
199-N-51
199-N-54
199-N-64
199-N-66
199-N-67
199-N-70
199-N-71
199-N-73
199-N-74
199-N-75
199-N-77
199-N-80

**Sample Login
Login Review Checklist**

Lot Number L5379

The login review should be conducted by that person logging in the samples as well as a peer. Please use this checklist to ensure that such reviews occur in a uniform basis. Please sign and date below to verify that a login review has occurred. This checklist should be affixed to each login package prior to distribution.

For effective login review, at a minimum, five reports from the login process are required. These are the COC (or equivalent), the login COC report, the sample summary report, the sample receiving checklist, and the login quotation. Before beginning review, ensure that these five components are available. Jobs with single component samples, the sample summary report may be omitted.

SAMPLE SUMMARY REPORT

	<u>YES</u>	<u>NO</u>	<u>N/A</u>	<u>Comment</u>
1. Are all sample ID's correct?	<u>X</u>	—	—	_____
2. Are all samples present?	<u>X</u>	—	—	_____
3. Are all matrices indicated correctly?	<u>X</u>	—	—	_____
4. Are all analyses on the COC logged in for the appropriate samples?	<u>X</u>	—	—	_____
5. Are all analyses logged in for the correct container?	<u>X</u>	—	—	_____
6. Are samples logged in according to L 3 batching procedures?	<u>X</u>	—	—	_____

LOGIN CHAIN OF CUSTODY

	<u>YES</u>	<u>NO</u>	<u>N/A</u>	<u>Comment</u>
1. Are the collect, receive, and due dates correct for every sample?	<u>X</u>	—	—	_____
2. Have all appropriate comments been indicated in the comment section?	—	—	<u>X</u>	_____

SAMPLE RECEIVING CHECKLIST

	<u>YES</u>	<u>NO</u>	<u>N/A</u>	<u>Comment</u>
1. Are all discrepancies between the COC and the login noted (if applicable)?	—	—	<u>X</u>	_____

[Signature]
primary review signature

9-18-95
date

[Signature]
secondary review signature

9-18-95
date

0916596

024

SAMPLE CHECK-IN LIST

Date/Time Received: 9-16-95/0930 SDG#: NLT

Work Order Number: NLT SAF #: B95-093

Shipping Container ID: EL-15 Chain of Custody #: NLT

- 1. Custody Seals on shipping container intact? Yes No
- 2. Custody Seals dated and signed? Yes No
- 3. Sample temperature 20C
- 4. Vermiculite/packing materials is Wet Dry
- 5. Each sample is in a plastic bag? Yes No
- 6. Sample holding times exceeded? Yes No

7. Samples have:
 tape hazard labels
 custody seals appropriate sample labels

8. Samples are:
 in good condition leaking
 broken have air bubbles

9. Is the information on the COC and Sample bottles in agreement?
 Yes No

Notes: _____

Sample Custodian/Laboratory: McM... Date: 9-18-95
 Telephoned To: Kathleen Hall On 9-18-95 By Anthony Miller

**Lockheed Analytical Services
Sample Receiving Checklist**

Client Name: *Bechtel-Hanford*

Job No. *L5379*

Cooler ID:

COOLER CONDITION UPON RECEIPT

Temperature of cooler upon receipt: *2°C*

temperature of temp. blank upon receipt:

	Yes	No	* Comments/Discrepancies
custody seals intact	<i>X</i>		
chain of custody present	<i>X</i>		
blue ice (or equiv.) present/frozen	<i>X</i>		
rad survey completed	<i>X</i>		

SAMPLE CONDITION UPON RECEIPT

	Yes	No	* Comments/Discrepancies
all bottles labeled	<i>X</i>		
samples intact	<i>X</i>		
proper container used for sample type	<i>X</i>		
sample volume sufficient for analysis	<i>X</i>		
proper pres indicated on the COC	<i>X</i>		
VOA's contain headspace			<i>N/A</i>
are samples bi-phasic (if so, indicate sample ID'S):			<i>N/A</i>

MISCELLANEOUS ITEMS

	Yes	No	* Comments/Discrepancies
samples with short holding times		<i>X</i>	
samples to subcontract		<i>X</i>	

ADDITIONAL COMMENTS/DISCREPANCIES

Completed by / date: *mtw* *9-18-95*

Sent to the client (date/initials): **** Client's signature upon receipt:**

Notes: * = contact the appropriate CSR of any discrepancies immediately upon receipt
** = please review this information and return via facsimile to the appropriate CSR (702) 361-8146

0916596

02E

9613429.2316

9613429.2317

LOCKHEED ANALYTICAL SERVICES

COMMON IONS AND ADDITIONAL ANALYTES

Sample Results

Client Sample ID: BOGJY4	Date Collected: 14-SEP-95
Matrix: Water	Date Received: 16-SEP-95

Constituent	Units	Method	Result	Reporting Det Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Specific Conductance	uS/cm	120.1	1100	1		26-SEP-95	27575	L5379-9
Turbidity	NTU	180.1	0.64	N/A	H	23-SEP-95	27708	L5379-10
Chloride	mg/L	300.0	20.	0.02		20-SEP-95	27576	L5379-3
Fluoride	mg/L	300.0	< 0.1	0.1		20-SEP-95	27578	L5379-3
Nitrate-N	mg/L	300.0	8.1	0.02	H	20-SEP-95	27580	L5379-3
Nitrite-N	mg/L	300.0	< 0.01	0.01	H	20-SEP-95	27582	L5379-3
Ortho Phosphate	mg/L	300.0	< 0.1	0.1	H	20-SEP-95	27584	L5379-3
Sulfate	mg/L	300.0	300	1	D(1:10)	20-SEP-95	27586	L5379-3
pH	pH Units	9040	7.8	0.1	H	22-SEP-95	27656	L5379-11

9613429.2318

LOCKHEED ANALYTICAL SERVICES

COMMON IONS AND ADDITIONAL ANALYTES

Sample Results

Client Sample ID: BOGJY5	Date Collected: 14-SEP-95
Matrix: Filt H2O	Date Received: 16-SEP-95

Constituent	Units	Method	Result	Reporting Det Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Chloride	mg/L	300.0	20.	0.02		20-SEP-95	27577	L5379-22
Fluoride	mg/L	300.0	< 0.1	0.1		20-SEP-95	27579	L5379-22
Nitrate-N	mg/L	300.0	8.3	0.02	H	20-SEP-95	27581	L5379-22
Nitrite-N	mg/L	300.0	< 0.01	0.01	H	20-SEP-95	27583	L5379-22
Ortho Phosphate	mg/L	300.0	< 0.1	0.1	H	20-SEP-95	27585	L5379-22
Sulfate	mg/L	300.0	300	1	D(1:10)	20-SEP-95	27587	L5379-22

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LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: BOGJY4	Date Collected: 14-SEP-95
Matrix: Water	Date Received: 16-SEP-95
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qual	Dilution	Date Analyzed	LAS Batch ID	LAS Sample ID
ALUMINUM, TOTAL	mg/L	6010	0.035	0.029	B	1	16-OCT-95	27912	L5379-2
ANTIMONY, TOTAL	mg/L	6010	< 0.058	0.058		1	16-OCT-95	27912	L5379-2
ARSENIC, TOTAL	mg/L	6010	< 0.098	0.098		1	16-OCT-95	27912	L5379-2
BARIUM, TOTAL	mg/L	6010	0.030	0.021	B	1	16-OCT-95	27912	L5379-2
BERYLLIUM, TOTAL	mg/L	6010	< 0.0010	0.0010		1	16-OCT-95	27912	L5379-2
CADMIUM, TOTAL	mg/L	6010	< 0.0050	0.0050		1	16-OCT-95	27912	L5379-2
CALCIUM, TOTAL	mg/L	6010	82.	0.032		1	16-OCT-95	27912	L5379-2
CHROMIUM, TOTAL	mg/L	6010	0.0043	0.0030	B	1	16-OCT-95	27912	L5379-2
COBALT, TOTAL	mg/L	6010	< 0.0060	0.0060		1	16-OCT-95	27912	L5379-2
COPPER, TOTAL	mg/L	6010	< 0.0030	0.0030		1	16-OCT-95	27912	L5379-2
IRON, TOTAL	mg/L	6010	0.15	0.012		1	16-OCT-95	27912	L5379-2
LEAD, TOTAL	mg/L	6010	< 0.056	0.056		1	16-OCT-95	27912	L5379-2
MAGNESIUM, TOTAL	mg/L	6010	17.	0.050		1	16-OCT-95	27912	L5379-2
MANGANESE, TOTAL	mg/L	6010	0.0042	0.0020	B	1	16-OCT-95	27912	L5379-2
NICKEL, TOTAL	mg/L	6010	< 0.015	0.015		1	16-OCT-95	27912	L5379-2
POTASSIUM, TOTAL	mg/L	6010	7.4	0.60		1	16-OCT-95	27912	L5379-2
SELENIUM, TOTAL	mg/L	6010	< 0.087	0.087		1	16-OCT-95	27912	L5379-2
SILVER, TOTAL	mg/L	6010	< 0.0040	0.0040		1	16-OCT-95	27912	L5379-2
SODIUM, TOTAL	mg/L	6010	150	0.070		1	16-OCT-95	27912	L5379-2
THALLIUM, TOTAL	mg/L	6010	0.075	0.050	B	1	16-OCT-95	27912	L5379-2
VANADIUM, TOTAL	mg/L	6010	0.0080	0.0040	B	1	16-OCT-95	27912	L5379-2
ZINC, TOTAL	mg/L	6010	0.019	0.0040	B	1	16-OCT-95	27912	L5379-2

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LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: BOGJY5	Date Collected: 14-SEP-95
Matrix: Filt H2O	Date Received: 16-SEP-95
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qual	Dilution	Date Analyzed	LAS Batch ID	LAS Sample ID
ALUMINUM, DISSOLVED	mg/L	6010	0.039	0.029	B	1	16-OCT-95	27913	L5379-21
ANTIMONY, DISSOLVED	mg/L	6010	< 0.058	0.058		1	16-OCT-95	27913	L5379-21
ARSENIC, DISSOLVED	mg/L	6010	< 0.098	0.098		1	16-OCT-95	27913	L5379-21
BARIUM, DISSOLVED	mg/L	6010	0.030	0.021	B	1	16-OCT-95	27913	L5379-21
BERYLLIUM, DISSOLVED	mg/L	6010	< 0.0010	0.0010		1	16-OCT-95	27913	L5379-21
CADMIUM, DISSOLVED	mg/L	6010	< 0.0050	0.0050		1	16-OCT-95	27913	L5379-21
CALCIUM, DISSOLVED	mg/L	6010	90.	0.032		1	16-OCT-95	27913	L5379-21
CHROMIUM, DISSOLVED	mg/L	6010	< 0.0030	0.0030		1	16-OCT-95	27913	L5379-21
COBALT, DISSOLVED	mg/L	6010	0.0076	0.0060	B	1	16-OCT-95	27913	L5379-21
COPPER, DISSOLVED	mg/L	6010	< 0.0030	0.0030		1	16-OCT-95	27913	L5379-21
IRON, DISSOLVED	mg/L	6010	< 0.012	0.012		1	16-OCT-95	27913	L5379-21
LEAD, DISSOLVED	mg/L	6010	< 0.056	0.056		1	16-OCT-95	27913	L5379-21
MAGNESIUM, DISSOLVED	mg/L	6010	18.	0.050		1	16-OCT-95	27913	L5379-21
MANGANESE, DISSOLVED	mg/L	6010	< 0.0020	0.0020		1	16-OCT-95	27913	L5379-21
NICKEL, DISSOLVED	mg/L	6010	< 0.015	0.015		1	16-OCT-95	27913	L5379-21
POTASSIUM, DISSOLVED	mg/L	6010	7.9	0.60		1	16-OCT-95	27913	L5379-21
SELENIUM, DISSOLVED	mg/L	6010	< 0.087	0.087		1	16-OCT-95	27913	L5379-21
SILVER, DISSOLVED	mg/L	6010	< 0.0040	0.0040		1	16-OCT-95	27913	L5379-21
SODIUM, DISSOLVED	mg/L	6010	150	0.070		1	16-OCT-95	27913	L5379-21
THALLIUM, DISSOLVED	mg/L	6010	0.089	0.050	B	1	16-OCT-95	27913	L5379-21
VANADIUM, DISSOLVED	mg/L	6010	0.0085	0.0040	B	1	16-OCT-95	27913	L5379-21
ZINC, DISSOLVED	mg/L	6010	0.011	0.0040	B	1	16-OCT-95	27913	L5379-21

LOCKHEED ANALYTICAL SERVICESTOTAL PETROLEUM HYDROCARBONS BY FTIR
418.1 TPH

Client Sample ID:	B0GJY4	LAL Sample ID:	L5379-8
Date Collected:	14-SEP-95	Date Received:	16-SEP-95
Date Analyzed:	26-SEP-95	Date Extracted:	25-SEP-95
Matrix:	Water	Analytical Batch ID:	092695-418.1
QC Group:	418.1 TPH_27753	Dilution Factor:	1

CONSTITUENT	RESULT mg/L	PRACTICAL QUANTITATION LIMIT mg/L	DATA QUALIFIER(*)
TRPH	<1.00	1.00	

LOCKHEED ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS BY FTIR
418.1 TPH

Client Sample ID:	BOGFV2	LAL Sample ID:	L5351-4
Date Collected:	12-SEP-95	Date Received:	14-SEP-95
Date Analyzed:	26-SEP-95	Date Extracted:	25-SEP-95
Matrix:	Water	Analytical Batch ID:	092695-418.1
QC Group:	418.1 TPH_27753	Dilution Factor:	1

CONSTITUENT	RESULT mg/L	PRACTICAL QUANTITATION LIMIT mg/L	DATA QUALIFIER(*)
TRPH	<1.00	1.00	

LOCKHEED ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS BY FTIR
418.1 TPH

Client Sample ID:	BOGFV2	LAL Sample ID:	27753MS
Date Collected:	12-SEP-95	Date Received:	14-SEP-95
Date Analyzed:	26-SEP-95	Date Extracted:	25-SEP-95
Matrix:	Water	Analytical Batch ID:	092695-418.1
QC Group:	418.1 TPH_27753	Dilution Factor:	1

CONSTITUENT	RESULT mg/L	PRACTICAL QUANTITATION LIMIT mg/L	DATA QUALIFIER(S)
TRPH	4.61	1.00	

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LOCKHEED ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS BY FTIR
418.1 TPH

Client Sample ID:	BOGFV2	LAL Sample ID:	27753MSD
Date Collected:	12-SEP-95	Date Received:	14-SEP-95
Date Analyzed:	26-SEP-95	Date Extracted:	25-SEP-95
Matrix:	Water	Analytical Batch ID:	092695-418.1
QC Group:	418.1 TPH_27753	Dilution Factor:	1

CONSTITUENT	RESULT mg/L	PRACTICAL QUANTITATION LIMIT mg/L	DATA QUALIFIER (#)
TRPH	4.55	1.00	

LOCKHEED ANALYTICAL SERVICES**OIL AND GREASE - GRAVIMETRIC METHOD
413.1 OIL AND GREASE**

Client Sample ID:	BOGJY4	LAL Sample ID:	L5379-4
Date Collected:	14-SEP-95	Date Received:	16-SEP-95
Date Analyzed:	28-SEP-95	Date Extracted:	28-SEP-95
Matrix:	Water	Analytical Batch ID:	092895-413.1
QC Group:	413.1 OIL AND GREASE_27944	Dilution Factor:	1

CONSTITUENT	RESULT mg/L	PRACTICAL QUANTITATION LIMIT mg/L	DATA QUALIFIER(=)
Total Oil and Grease	<5.00	5.00	

LOCKHEED ANALYTICAL SERVICES

OIL AND GREASE - GRAVIMETRIC METHOD
413.1 OIL AND GREASE

Client Sample ID:	BOGJY4	LAL Sample ID:	27944MS
Date Collected:	14-SEP-95	Date Received:	16-SEP-95
Date Analyzed:	28-SEP-95	Date Extracted:	28-SEP-95
Matrix:	Water	Analytical Batch ID:	092895-413.1
QC Group:	413.1 OIL AND GREASE_27944	Dilution Factor:	1

CONSTITUENT	RESULT mg/L	PRACTICAL QUANTITATION LIMIT mg/L	DATA QUALIFIER(±)
Total Oil and Grease	191	5.00	

LOCKHEED ANALYTICAL SERVICES**OIL AND GREASE - GRAVIMETRIC METHOD
413.1 OIL AND GREASE**

Client Sample ID:	BOGJY4	LAL Sample ID:	27944MSD
Date Collected:	14-SEP-95	Date Received:	16-SEP-95
Date Analyzed:	28-SEP-95	Date Extracted:	28-SEP-95
Matrix:	Water	Analytical Batch ID:	092895-413.1
QC Group:	413.1 OIL AND GREASE_27944	Dilution Factor:	1

CONSTITUENT	RESULT mg/L	PRACTICAL QUANTITATION LIMIT mg/L	DATA QUALIFIER(=)
Total Oil and Grease	184	5.00	

LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0GJY4

LAL Sample ID: L5379-12

Date Collected: 14-SEP-95

Date Received: 16-SEP-95

Matrix: Water

Login Number: L5379

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
Ac-228(Ra-228)	16-OCT-95	GAMMA SPEC LAL-0063_27809	5.	22.	40.		pCi/L
Co-58	16-OCT-95	GAMMA SPEC LAL-0063_27809	2.5	5.7	9.6		pCi/L
Co-60	16-OCT-95	GAMMA SPEC LAL-0063_27809	-0.5	1.5	12.		pCi/L
Cs-137	16-OCT-95	GAMMA SPEC LAL-0063_27809	4.1	7.3	9.4		pCi/L
Eu-152	16-OCT-95	GAMMA SPEC LAL-0063_27809	-4.0	8.1	36.		pCi/L
Eu-154	16-OCT-95	GAMMA SPEC LAL-0063_27809	-6.7	4.2	34.		pCi/L
Eu-155	16-OCT-95	GAMMA SPEC LAL-0063_27809	6.	13.	18.		pCi/L
Fe-59	16-OCT-95	GAMMA SPEC LAL-0063_27809	-1.3	9.0	27.		pCi/L
Pb-212	16-OCT-95	GAMMA SPEC LAL-0063_27809	4.7	9.4	13.		pCi/L
Pb-214(Ra-226)	16-OCT-95	GAMMA SPEC LAL-0063_27809	-3.5	8.4	17.		pCi/L
Ra-226(GAMMA)	16-OCT-95	GAMMA SPEC LAL-0063_27809	-110	100	160		pCi/L
Ru-106	16-OCT-95	GAMMA SPEC LAL-0063_27809	-20.	39.	74.		pCi/L
U-235(GAMMA)	16-OCT-95	GAMMA SPEC LAL-0063_27809	-5.	26.	41.		pCi/L
Gross Alpha	11-OCT-95	GR ALP/BETA LAL-0060_27812	1.8	3.2	5.8	C	pCi/L
Gross Beta	11-OCT-95	GR ALP/BETA LAL-0060_27812	7.9	3.4	5.1	C	pCi/L
Total radio-strontium	20-SEP-95	SR-90 LAL-0196_27451	0.67	0.61	1.0		pCi/L

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LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: 80GJY4

LAL Sample ID: L5379-20

Date Collected: 14-SEP-95

Date Received: 16-SEP-95

Matrix: Water

Login Number: L5379

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
H-3	02-OCT-95	TRITIUM(H3) LAL-0066_27851	1360	360	320		pCi/L

Geometry
A/B

LCS GAMMA STANDARDS --- RADIONUCLIDE CONCENTRATIONS

compiled AUG. 11, 1993 by J. Schmitt (h:\general\radnuc\LCSGAM.DOC)

updated 3/29/94 JSS

All activities in pCi on 4-2-91

GEOMETRY	Cs-137	Co-60	K-40	LCS Book - PREP INFO
1) Tuna Can 200ml AC1279 LAL-268-52 (E)	155 pCi	218	600	LAL-268-52 (p 52)
2) 1 Liter Marinelli AA4115 (A)	197	218	464	LAL-91-0218-37
3) 2 Liter Marinelli AC3410 LAL-353-80 (B)	298	327	n/a	LAL-92-353-20
4) 30ml in Polybottle AC2014 LAL-228-68	140	218	600	LAL-92-268-65
5) 10ml in Polybottle AA4013 LAL-353-79	197	218	n/a	LAL-92-353-79
6) 100ml in Polybottle AC3408 LAL-353-78	197	218	n/a	LAL-92-353-78
7) 2" Filter in Petri Dish AC3233 LAL-353-70-1	197	218	n/a	LAL-92-353-70-1 (p. 2)
8) 5ml in Scintillation Vial AC3409	197	218	n/a	
9) 30ml Aqueous in clear 400ml polybottle for ^{137}I = 100.8 pCi ^{137}I				LAL-93-0470-59
10) 30ml Aqueous in 125ml polybottle for ^{241}Am = 300 pCi				LAL-0475-12-1 (p12)
11) 500 ml Aqueous in 1L Marinelli A121W0 A121W0 LAL-0526-67	197 pCi (^{137}I)	218 pCi (^{60}Co)		

↓ J. Schmitt 3/29/94

MORE ON PAGE Continued on Page 6

Signed: J. Schmitt

Date: 3-31-94

Read and Understood By: J. Glomako

Date: 4/8/94

ISOTOPES DILUTION RECORD

Secondary/Working Level DilutionDate: 4/8/93 Preparer's Name: A. WongPipet Check / Balance Wt. Check Done ()Diluent used: 0.1 M HClI. Isotope #1: Cs-137Diluted Source ID (log#): 91-225-24-3A: Source activity: 940.831 pCi/ml decay corrected from 975-1348B: Amount of source transferred: 0.2 mlC: Total amount of dilution: 100 mlD: Isotope activity (A*B/C): 1.8817 pCi/mlII. Isotope #2: Co-60Diluted Source ID (log#): 91-225-80-1E: Source activity: 998.1087 pCi/ml decay corrected from 1091.1 pCi/F: Amount of source transferred: 0.2 mlG: Total amount of dilution: 100 mlH: Isotope activity (E*F/G): 1.9962 pCi/mlDilution Log Book ID: 92-353-78Reviewed by: [Signature] Date: 4/9/93

ISOTOPES DILUTION RECORD

Secondary/Working Level DilutionDate: 4/9/93 Preparer's Name: A. Wong

Pipet Check / Balance Wt. Check Done (✓)

Diluent used: 0.1 M HClI. Isotope #1: Cs-137Diluted Source ID (log#): 91-225-24-3A: Source activity: 940.831 pCi/ml decay corrected from 975.1348pB: Amount of source transferred: 2 mlC: Total amount of dilution: 10 mlD: Isotope activity (A*B/C): 188.1662 pCi/mlII. Isotope #2: Co-60Diluted Source ID (log#): 91-225-80-1E: Source activity: 998.1087 pCi/mlF: Amount of source transferred: 2 mlG: Total amount of dilution: 10 mlH: Isotope activity (E*F/G): 199.6217 pCi/ml★ Dilution Log Book ID: 92-353-79Reviewed by: [Signature] Date: 4/9/93

PROJECT Spec std Cs-137 & Co-60

Continued From Page _____

Agnes Wong
4-9-93

AC 3410

ISOTOPES DILUTION RECORD

Secondary/Working Level Dilution

Date: 4/9/93 Preparer's Name: A. Wong

Pipet Check / Balance Wt. Check Done (✓) Pipet # 37779

Diluent used: 0.1M HCl

I. Isotope #1: Cs-137 ⇒ 295.5 pCi 4-2-91

Diluted Source ID (log#): 91-225-24-3

A: Source activity: 940.83 pCi/ml decay corrected from 975.1348 pCi/ml

B: Amount of source transferred: 0.3 ml

C: Total amount of dilution: 1500 ml

= 295 pCi ¹³⁷Cs
4-2-91

D: Isotope activity (A*B/C): 0.1882 pCi/ml

II. Isotope #2: Co-60 ⇒ 327.3 pCi 4-2-91

Diluted Source ID (log#): 91-225-80-1

E: Source activity: 998.1087 pCi/ml decay corrected from 1091.1 pCi/ml

F: Amount of source transferred: 0.3 ml

G: Total amount of dilution: 1500 ml

= 327 pCi ⁶⁰Co
4-2-91

H: Isotope activity (E*F/G): 0.1996 pCi/ml

Dilution Log Book ID: 92-353-80

Reviewed by: A Date: 4/9/93

Continued on Page _____

Read and Understood By

Agnes Wong
Signed

4-9-93
Date

vys
Signed

4/4/93
Date

CERTIFICATE OF CALIBRATION GAMMA STANDARD SOLUTION

Radioisotope	Cs-137	Customer:	LOCKHEED ENGINEERING & SCIENCES Co.
Half Life:	30.0 ± 0.2 years	P.O.No.:	06LAB1036
Catalog No.:	7137	Reference Date:	September 1 1991 12:00 PST.
Source No.:	389-21-2	Contained Radioactivity:	1.002 μ Ci.
Description of Solution			
a. Mass of solution:	4.9523		grams.
b. Chemical form:	CsCl in 0.1N HCl		
c. Carrier content:	None added		
d. Density:	0.9996		gram/ml @ 20°C.
Radioimpurities			
	None detected		
Radioactive Daughters			
	None		
Radioisotope Concentration			
	0.202		μ Ci/gram.

Method of Calibration

Weighed aliquots of the solution were assayed using gamma spectrometry:

Energy peak(s) integrated under:	662	KeV.
Branching ratio(s) used:	0.8521	gamma rays per decay.

Uncertainty of Measurement

a. Systematic uncertainty in instrument calibration:	± 1.0%	
b. Random uncertainty in assay:	± 1.1%	
c. Random uncertainty in weighing(s):	± 0.4%	
d. Total uncertainty at the 99% confidence level:	± 2.5%	

NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

Notes

1. Nuclear data were taken from "Table of Isotopes", Seventh Edition, edited by Virginia S. Shirley.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials. (As in NRC Regulatory Guide 4.15)



ISOTOPE PRODUCTS LABORATORIES

1800 No. Keystone Street.,
Burbank, California 91504
(818) 843 - 7000

[Signature]
QUALITY CONTROL

Mass of solution 4.9149

inspired 1/4/92

U.S. Environmental Protection Agency
 Environmental Monitoring Systems Laboratory-Las Vegas
 Nuclear Radiation Assessment Division

ID # 91-0225-P=

Calibration Certificate

Description

Principal radionuclide Half-life

Nominal activity curies

Nominal volume ml in ampoule/bottle number

Measurement Activity of principal radionuclide

Activity per gram of this solution

curies of

at 0400 hours PST on

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

Per gram

of the daughter nuclide

Total mass of this solution

grams

Method of measurement

The activity of the primary solution was measured using an ionization chamber.

The activity of the dilution was measured using gamma spectroscopy.

Useful Life

This radionuclide has decayed through half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after

Purity

The manufacturer states that activities other than that of the principal nuclide and of its daughter nuclides, if any, were estimated, known to be

- (1) less than of the principal activity
- (2) less than of the principal activity
- (3) less than of the principal activity

The activity of impurity (1) is not (2) is not (3) is not included in the quoted figures of the principal activity

Random Errors

The precision of this standard was such that the certified value of the radioactive concentration of the principal activity had a standard error (sm) not greater than $\pm 0.42\%$ (The 99.7% confidence limits are given by $t(sm)$ where t is obtained from the student t factor for the degree of freedom $(n-1)$).

The maximum uncertainty due to the assessable systematic errors (dilution, counting, and known uncertainty of the standard) is obtained by the separate arithmetic summation of the positive and negative systematic error $(+\delta - \delta')$. These have been estimated not to exceed 2.1% or -2.1%

the overall uncertainty (often called accuracy) is an estimate of the possible divergence of the quoted result from the true value. It is a combination of random error $[t(sm)]$ at the 99.7% confidence limits and the worst case estimate of the systematic errors $(+\delta, -\delta')$. The overall uncertainty is therefore calculated on the basis of $+ [t(sm) + \delta], - [t(sm) + \delta']$ and is $+3.5\%$, -3.5% of the quoted radioactive concentration.

Decay Schemes

This standardization is based on the following assumptions of the principle nuclide, its daughter nuclides and impurities (no allowance for error in these assumptions or the assumption of quoted half-life have been included in the statement of accuracy above).

Cobalt-60 decays 100 percent by beta emission followed by prompt gamma transition.

Chemical Composition of Solution

Carrier content per gram of solution:
30 micrograms cobalt

Other components:
0.1 M HCl

Preservative:

Remarks

Date Certificate Prepared May 31, 1991

Approval Signature Paul B. Fahn 160

9613429-2337
 RADIATION RESULTS CHECK REPORT

Workgroup Number: GR ALP/BETA LAL-0060_27812

Sample	Parameter	Value	Error	MDA
27812DUP1	Gross Alpha	0.0146056	2.97087	6.16435
27812LCS1	Gross Alpha	41.0937	4.77935	1.57387
27812M881	Gross Alpha	0.700113	0.695432	1.08298
27812MS1	Gross Alpha	82.0275	13.0683	5.8528
L5379-12	Gross Alpha	1.7533	3.20938	5.75075
L5440-12	Gross Alpha	2.05197	1.57114	2.20882
27812DUP1	Gross Beta	10.352	3.48101	4.97015
27812LCS1	Gross Beta	41.9867	3.64313	2.12547
27812M881	Gross Beta	0.570641	1.19384	2.03893
27812MS1	Gross Beta	103.728	8.84446	5.14088
L5379-12	Gross Beta	7.94663	3.42358	5.1305
L5440-12	Gross Beta	6.47903	1.65388	2.18383

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information

Isotope: Am-241 and Sr-90

Parent Barcode Number: AA0030 AA0046

Vendor or Certificate I.D. # of Parent Standard: Am-241 IPL 388-100-1
Sr-90 NIST SRM 4219G

Diluted Source Logbook I.D. #: Am-241 91-0225-60-1
Sr-90 91-0225-30-2

Balance Verification?: Yes

Diluent Used: 0.1 N HNO₃

Dilution

*Diluent: 0.1 N HNO₃ + 42mg Sr(NO₃)₂/mL

*Density of diluent (g/ml): NA

a: Parent Specific Activity: Am-241 981 pCi/mL
Sr-90 600 pCi/mL m 8/1/90

b: Amount of Source Transferred: Am-241 0.5 mL
Sr-90 0.5 mL

c: Total amount of Dilution: 500 mL

d: Total Volume of Dilution: 500 mL

e: Activity of Dilution (a * b / c): NA

f: Activity of Dilution (a * b / d): Am-241 9.81 pCi/mL
Sr-90 12 pCi/mL m 8/1/90

Dilution Logbook I.D. #: 95-721-13-1

Prepared By: Joe Hutchinson Preparation Date: 8/23/95

Reviewed By: 97 Ar Mord Review Date: 8/24/95

*If the diluent remains unchanged from the diluent used for the dilution source, then a weight dilution of a volume unit source can be performed without a density conversion. If the diluent changes, a weighted proportion density conversion is necessary.

Read and Understood By

Signed _____ Date _____ Signed _____ Date _____

9615929.2339 91-0225-60-1 M44030

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide	Am-241	Customer:	LOCKHEED ENGINEERING & SCIENCES Co.	
Half Life:	432.7 ± 0.5 years	P.O.No.:	06LAB1245	
Catalog No.:	7241	Reference Date:	November 1 1991	12:00 PST.
Source No.:	388-100-1	Contained Radioactivity:	0.997	µCi.

Description of Solution

a. Mass of solution:	5.0007	grams.
b. Chemical form:	AmCl ₃ in 0.5N HCl	
c. Carrier content:	None added	
d. Density:	1.0077	gram/ml @ 20°C.

Radioimpurities

None detected

Radioactive Daughters

None detected

Radionuclide Concentration

0.1994 µCi/gram.

Method of Calibration

Weighed aliquots of the solution were assayed using a liquid scintillation counter.

Uncertainty of Measurement

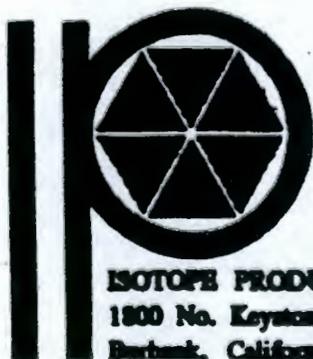
a. Systematic uncertainty in instrument calibration:	±2.0%
b. Random uncertainty in assay:	±0.7%
c. Random uncertainty in weighing(s):	±0.0%
d. Total uncertainty at the 99% confidence level:	±2.7%

NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

Notes

1. Nuclear data were taken from "Table of Isotopes", Seventh Edition, edited by Virginia S. Shirley.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials. (As in NRC Regulatory Guide 4.15)



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Ray A. Moore
QUALITY CONTROL



9613429.2340

THIS IS A PHOTOCOPY OF THE CERTIFICATE
WHICH IS BEING MAILED TO YOU UNDER
SEPARATE COVER.

National Institute of Standards & Technology

Certificate

Standard Reference Material 4919-G
Radioactivity Standard

Radionuclide	Strontium-90
Source identification	4919-G
Source description	Solution in NIST borosilicate-glass ampoule ⁽¹⁾ *
Solution composition	Strontium-90 plus yttrium-90 plus approximately 95 μg each of non-radioactive strontium and yttrium per gram of 1-molar hydrochloric acid ⁽²⁾
Mass	Approximately 5.0 grams
Radioactivity concentration	$4.514 \times 10^6 \text{ Bq g}^{-1}$
Reference time	1200 EST August 1, 1990
Overall uncertainty	1.05 percent ⁽³⁾
Photon-emitting impurities	None observed ⁽⁴⁾
Alpha-particle-emitting impurities	None observed ⁽⁵⁾
Half life	$28.5 \pm 0.2 \text{ years}$ ⁽⁶⁾
Measuring instrument	$4\pi\beta$ liquid-scintillation counter

This standard reference material was prepared in the Center for Radiation Research, Ionizing Radiation Division, Radioactivity Group, Dale D. Hoppes, Group Leader.

Gaithersburg, MD 20899
January, 1991

William P. Reed, Acting Chief
Office of Standard Reference Materials

*Notes on back

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOLUTION

Radionuclide:	Am-241	Customer:	LOCKHEED ENGINEERING & SCIENCES C
Half Life:	432.7 ± 0.5 years	P.O.No.:	06LAB1245
Catalog No.:	7241	Reference Date:	November 1 1991 12:00 PST.
Source No.:	388-100-1	Contained Radioactivity:	0.997 μ Cl

Description of Solution

a. Mass of solution:	5.0007	grams
b. Chemical form:	AmCl ₃ in 0.5N HCl	
c. Carrier content:	None added	
d. Density:	1.0077	gram/ml @ 20°C.

Radioimpurities None detected

Radioactive Daughters None detected

Radionuclide Concentration 0.1994 μ Cl/gram.

Method of Calibration

Weighed aliquots of the solution were assayed using a liquid scintillation counter.

Uncertainty of Measurement

- | | |
|--|-------|
| a. Systematic uncertainty in instrument calibration: | ±2.0% |
| b. Random uncertainty in assay: | ±0.7% |
| c. Random uncertainty in weighing(s): | ±0.0% |
| d. Total uncertainty at the 99% confidence level: | ±2.7% |

NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

Notes

1. Nuclear data were taken from "Table of Isotopes", Seventh Edition, edited by Virginia S. Shirley.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials. (As in NRC Regulatory Guide 4.15)



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Shirley A. Milmore
QUALITY CONTROL

U.S. Environmental Protection Agency
Environmental Monitoring Systems Laboratory-Las Vegas
Nuclear Radiation Assessment Division

Calibration Certificate

Description

Principal radionuclide **Strontium-90** Half-life **28.6 years**
 Nominal activity **27** **nano curies**
 Nominal volume **5** ml in ampoule/bottle number **94003-1**

Measurement Activity of principal radionuclide

Activity per gram of this solution

5.40 **nano curies** of **Strontium-90**
 at 0400 hours PST on **April 1, 1994**

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

5.40 **nano curies** Per gram
 of the daughter nuclide **Yttrium-90**

Total mass of this solution

Approximately 5.0 grams

Method of measurement

The activity of the primary solution was measured by liquid scintillation counting.

The activity of the dilution was measured by liquid scintillation counting.

Useful Life

This radionuclide has decayed through **0.0** half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after

August 1994

This dilution was prepared for the 1994 ASTM Collaborative Study of a test method for the determination of Sr-90 in water.

Purity

The manufacturer states that activities other than that of the principal nuclide and of its daughter nuclides, if any, were estimated/known to be:

(1)	less than equal to	<input type="text"/>	%	of the principal activity
(2)	less than equal to	<input type="text"/>	%	of the principal activity
(3)	less than equal to	<input type="text"/>	%	of the principal activity

The activity of impurity (1) is not (2) is not (3) is not included in the quoted figures of the principal activity.

Random Errors

The precision of this standard was such that the certified value of the radioactive concentration of the principal activity had a standard error (sm) not greater than \pm

(The 99.7% confidence limits are given by $t(sm)$ where t is obtained from the student t factor for the degree of freedom ($n-1$)).

The maximum uncertainty due to the assessable systematic errors (dilution, counting, and known uncertainty of the standard) is obtained by the separate arithmetic summation of the positive and negative systematic error ($+\delta - \delta'$). These have been estimated not to exceed

or

the overall uncertainty (often called accuracy) is an estimate of the possible divergence of the quoted result from the true value. It is a combination of random error [$t(sm)$] at the 99.7% confidence limits and the worst case estimate of the systematic errors ($+\delta, -\delta'$)

The overall uncertainty is therefore calculated on the basis of $+[t(sm) + \delta], -[t(sm) + \delta]$ and is , of the quoted radioactive concentration.

Decay Schemes

This standardization is based on the following assumptions of the principle nuclide, its daughter nuclides and impurities (no allowance for error in these assumptions or the assumption of quoted half-life have been included in the statement of accuracy above).

Strontium-90 decays 100 percent by beta emission to yttrium-90. Yttrium-90 also decays 100 percent by beta emission.

Chemical
Composition
of Solution

Carrier content per gram of solution:
30 micrograms strontium

Other components:
0.1 M HCl

Preservative:

Remarks

Date Certificate Prepared

April 26, 1994

Approval Signature

Paul B. Fahn 17

INITIAL STANDARD DILUTION RECORD

Standard Information:

Isotope:	<u>Sr-90</u>	Vendor:	<u>EPA</u>
Activity of Standard Received:	2.7×10^4 uCi	Vendor I.D. #	<u>94003-1</u>
Weight of Standard Received (g):	<u>5.0</u> g	LAL I.D. #:	<u>AC5281</u>
Standard Activity (pCi/g):	5.4×10^3 pCi/g	NIST Traceable ?	<u>yes</u>
Half-life in Years or Days:	<u>28.6</u> yrs	Certificate #:	<u>94003-1</u>
Reference Date:	<u>4-1-1994</u>	Receiver's Name:	<u>K. Free</u>
		Date Received:	<u>5-3-94</u>

Primary Dilution

Balance Verification?:	<u>yes</u>
Diluent Used:	<u>0.1 M HCl</u>
a: Decay Corrected Standard Activity (pCi/g):	5.4×10^3 pCi/g
b: Weight of the Source Transferred (g):	<u>4.9670</u> g
c: Total diluted weight (g):	<u>49.91</u> g
d: Total Diluted Volume (mL)	<u>50</u> mL
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:	<u>537.4</u> pCi/g
f: Calculated Density of Solution (g/mL) [c / d]:	<u>0.9982</u> g/mL
g: Activity of Dilution by Volume (pCi/mL) [e * f]:	<u>536.44</u> pCi/mL
h. Dilution Logbook I.D. #:	<u>93-474-81-1 93-474-82-1 CP 4/7/95</u>
Prepared By: <u>Agnes Wong</u>	Preparation Date: <u>6-15-94</u>
Reviewed By: <u>Joe Hutchinson</u>	Review Date: <u>6/30/94</u>
Purity/Cross Check Performed By: _____	Check Date: _____

9613429.2345

RADIATION RESULTS CHECK REPORT

Workgroup Number: SR-90 LAL-0196_27451

Sample	Parameter	Value	Error	MDA
27451DUP1	Total radio-strontium	7.27899	1.03161	1.13619
27451LCS1	Total radio-strontium	45.2713	2.827	0.94523
27451H881	Total radio-strontium	-0.334626	0.523796	0.953686
L5351-6	Total radio-strontium	7.41765	1.03967	1.12736
L5379-12	Total radio-strontium	0.665634	0.61304	1.01197

Strontium Carrier Standardization

Strontium Carrier (10 mg/mL):

Use commercially available 10,000 $\mu\text{g Sr/mL}$ ICP Standard or equivalent. Alternately, Dissolve 24.16 g of $\text{Sr}(\text{NO}_3)_2$ in water and dilute to 1 L in a volumetric flask with water.

Perform calibration check on a 0.5 mL pipet and then carefully pipet 3 - 0.5 mL portions of the strontium carrier solution into separate cleaned dried and tared planchets. Dry the planchet under a drying lamp. Cool the planchets in a desiccator and weigh.

Sr Carrier #91-208 - (100-) was recalibrated to give a new calibrated value. Prepped on 1-5-95

	Calib # 1	Calib # 2	Calib # 3
Carrier plus planchet wt.	6.60823	6.65050	6.818936 ^{AW}
Tare wt. of planchet	6.59582	6.63805	6.80698
Net wt. of carrier added (mg)	0.01241	0.01245	0.012068

AVERAGE $\text{Sr}(\text{NO}_3)_2 \pm \text{STD DEV.} = \underline{0.01231 \text{ g}}$

Expected mg of $\text{Sr}(\text{NO}_3)_2 = \text{cert. value} (=10 \text{ mg of Sr/mL}) * 0.5 \text{ mL} * 2.41$

Within 3% of expected (12.08 mg/0.5 mL) value (yes/no) yes

Initial and Date: AW 1-10-95

Read and Understood By

Alyson Wong
1-10-95

Signed _____

Date _____

Signed _____

Date **187**

D. Jones W. Wong
3-15-94

Strontium Carrier Standardization

Strontium Carrier (10 mg/mL):

Use commercially available 10,000 $\mu\text{g Sr/mL}$ ICP Standard or equivalent. Alternately, Dissolve 24.16 g of $\text{Sr}(\text{NO}_3)_2$ in water and dilute to 1 L in a volumetric flask with water.

Perform calibration check on a 0.5 mL pipet and then carefully pipet 3 - 0.5 mL portions of the strontium carrier solution into separate cleaned dried and tared planchets. Dry the planchet under a drying lamp. Cool the planchets in a desiccator and weigh.

	Calib # 1	Calib # 2	Calib # 3
Carrier plus planchet wt.	6.58185 g	6.49626 g	6.56816 g
Tare wt. of planchet	6.56968 g	6.48464 g	6.55620 g
Net wt. of carrier added (mg)	0.01217 g	0.01162	0.01196 g

AVERAGE $\text{Sr}(\text{NO}_3)_2 \pm \text{STD DEV.} = \underline{0.01192 \text{ g} \pm 0.000277}$

Expected mg of $\text{Sr}(\text{NO}_3)_2 = \text{cert. value} (=10 \text{ mg of Sr/mL}) * 0.5 \text{ mL} * 2.41$

Within 3% of expected (12.08 mg/0.5 mL) value (yes/no) yes

Initial and Date: DW 3-6-94

Continued on Page _____

D. Jones W. Wong
Signed

3-15-94
Date

Read and Understood By QA Review:
Yue-Mei-Lin
Signed

188

8/11/94
Date

U.S. Environmental Protection Agency
Environmental Monitoring Systems Laboratory-Las Vegas
Nuclear Radiation Assessment Division

Calibration Certificate

Description

Principal radionuclide Half-life
 Nominal activity Curies
 Nominal volume ml in ampoule/bottle number

Measurement Activity of principal radionuclide

Activity per gram of this solution

curies of
 at 0400 hours PST on

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

curies Per gram
 of the daughter nuclide

Total mass of this solution

grams

Method of measurement

The activity of the primary solution was measured by liquid scintillation counting.

The activity of the dilution was measured by liquid scintillation counting.

Useful Life

This radionuclide has decayed through half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after

This dilution was prepared for the 1994 ASTM Collaborative Study of a test method for the determination of Sr-90 in water.

Purity

The manufacturer states that activities other than that of the principal nuclide and of its daughter nuclides, if any, were estimated/known to be:

(1)	less than equal to		%	of the principal activity
(2)	less than equal to		%	of the principal activity
(3)	less than equal to		%	of the principal activity

The activity of impurity (1) is not (2) is not (3) is not included in the quoted figures of the principal activity.

Random Errors

The precision of this standard was such that the certified value of the radioactive concentration of the principal activity had a standard error (sm) not greater than $\pm 0.1\%$ (The 99.7% confidence limits are given by $t(sm)$ where t is obtained from the student t factor for the degree of freedom ($n-1$)).

The maximum uncertainty due to the assessable systematic errors (dilution, counting, and known uncertainty of the standard) is obtained by the separate arithmetic summation of the positive and negative systematic error ($+\delta - \delta'$). These have been estimated not to exceed

$+3.8\%$ or -3.8%

the overall uncertainty (often called accuracy) is an estimate of the possible divergence of the quoted result from the true value. It is a combination of random error [$t(sm)$] at the 99.7% confidence limits and the worst case estimate of the systematic errors ($+\delta, -\delta'$). The overall uncertainty is therefore calculated on the basis of $+[t(sm)+\delta], -[t(sm)+\delta]$ and is $+4.0\%$, -4.0% of the quoted radioactive concentration.

Decay Schemes

This standardization is based on the following assumptions of the principle nuclide, its daughter nuclides and impurities (no allowance for error in these assumptions or the assumption of quoted half-life have been included in the statement of accuracy above).

Strontium-90 decays 100 percent by beta emission to yttrium-90. Yttrium-90 also decays 100 percent by beta emission.

Chemical Composition of Solution

Carrier content per gram of solution:
30 micrograms strontium

Other components:
0.1 M HCl

Preservative:

Remarks

Date Certificate Prepared April 26, 1994

Approval Signature

Paul B. Hahn 190

INITIAL STANDARD DILUTION RECORD

Standard Information:

Isotope:	<u>Sr-90</u>	Vendor:	<u>EPA</u>
Activity of Standard Received:	<u>2.7×10^4 uCi</u>	Vendor I.D. #	<u>94003-1</u>
Weight of Standard Received (g):	<u>5.0 g</u>	LAL I.D. #:	<u>AC5281</u>
Standard Activity (pCi/g):	<u>5.4×10^3 pCi/g</u>	NIST Traceable ?	<u>yes</u>
Half-life in Years or Days:	<u>28.6 yrs</u>	Certificate #:	<u>94003-1</u>
Reference Date:	<u>4-1-1994</u>	Receiver's Name:	<u>K. Free</u>
		Date Received:	<u>5-3-94</u>

Primary Dilution

Balance Verification?:	<u>yes</u>
Diluent Used:	<u>0.1M HCl</u>
a: Decay Corrected Standard Activity (pCi/g):	<u>5.4×10^3 pCi/g</u>
b: Weight of the Source Transferred (g):	<u>4.9670 g</u>
c: Total diluted weight (g):	<u>49.91 g</u>
d: Total Diluted Volume (mL)	<u>50 mL</u>
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:	<u>537.4 pCi/g</u>
f: Calculated Density of Solution (g/ml) [c / d]:	<u>0.9982 g/mL</u>
g: Activity of Dilution by Volume (pCi/mL) [e * f]:	<u>536.44 pCi/mL</u>
h. Dilution Logbook I.D. #:	<u>93-494-81-1 ⁹³⁻⁴⁷⁴⁻⁸²⁻¹ 94/1/95</u>
Prepared By: <u>Agnes Wong</u>	Preparation Date: <u>6-15-94</u>
Reviewed By: <u>Joe Hutchinson</u>	Review Date: <u>6/30/94</u>
Purity/Cross Check Performed By: _____	Check Date: _____

Signed

Date

Signed

Date

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information	
Isotope:	<u>Sr-90</u>
Ref. <u>4-1-94</u> Parent Barcode Number	<u>AC5281</u>
Vendor or Certificate I.D. # of Parent Standard:	<u>EPA 94003-1</u>
Diluted Source Logbook I.D. #:	<u>93-474-82-1</u>
Balance Verification?:	<u>Yes</u>
Diluent Used:	<u>0.1 M HCl</u>

Dilution	
*Diluent:	<u>0.1 M HCl</u>
*Density of diluent (g/ml):	<u>N/A</u>
a: Parent Specific Activity:	<u>536.44 pCi/ml</u>
b: Amount of Source Transferred:	<u>5.0018 g</u>
c: Total amount of Dilution:	<u>100.20 g</u>
d: Total Volume of Dilution:	<u>N/A</u>
e: Activity of Dilution (a * b / c):	<u>N/A</u>
f: Activity of Dilution (a * b / d):	<u>26.78 pCi/ml</u>
Dilution Logbook I.D. #:	<u>94-677-44-1</u>
Prepared By: <u>Dynes Wong</u>	Preparation Date: <u>3-2-95</u>
Reviewed By: <u>Joe H. H.</u>	Review Date: <u>3/3/95</u>
*If the diluent remains unchanged from the diluent used for the dilution source, then a weight dilution of a volume unit source can be performed without a density conversion. If the diluent changes, a weighted proportion density conversion is necessary.	

Signed

Date

Signed

Date

Dynes Wong
3-3-95

9613429.2352
RADIATION RESULTS CHECK REPORT

Workgroup Number: TRITIUM(H3) LAL-0066_27851

Sample	Parameter	Value	Error	MDA
27851DUP1	H-3	909.653	321.456	313.281
27851LCS1	H-3	2113.43	410.145	311.155
27851HBB1	H-3	55.5773	237.925	303.134
27851MS1	H-3	4501.39	563.207	319.627
L5379-20	H-3	1359.07	359.374	317.161

Purity

The manufacturer states that activities other than that of the principal nuclide and of its daughter nuclides, if any, were estimated/known to be:

(1) none	less than equal to		%	of the principal activity
(2)	less than equal to		%	of the principal activity
(3)	less than equal to		%	of the principal activity

The activity of impurity (1) is not (2) is not (3) is not included in the quoted figures of the principal activity.

Random Errors

The precision of this standard was such that the certified value of the radioactive concentration of the principal activity had a standard error (sm) not greater than $\pm 0.4\%$ (The 99.7% confidence limits are given by $t(sm)$ where t is obtained from the student t factor for the degree of freedom ($n-1$)).

The maximum uncertainty due to the assessable systematic errors (dilution, counting, and known uncertainty of the standard) is obtained by the separate arithmetic summation of the positive and negative systematic error ($+\delta - \delta'$). These have been estimated not to exceed

$+2.9\%$ or -2.9%

the overall uncertainty (often called accuracy) is an estimate of the possible divergence of the quoted result from the true value. It is a combination of random error $[t(sm)]$ at the 99.7% confidence limits and the worst case estimate of the systematic errors ($+\delta, -\delta'$)

The overall uncertainty is therefore calculated on the basis of $+[t(sm) + \delta], -[t(sm) + \delta']$ and is $+4.3\%$, -4.3% of the quoted radioactive concentration.

Decay Schemes

This standardization is based on the following assumptions of the principle nuclide, its daughter nuclides and impurities (no allowance for error in these assumptions or the assumption of quoted half-life have been included in the statement of accuracy above).

Tritium decays 100 percent by beta emission. The maximum energy is 18.6 Kev, the average is 5.68 Kev.

Chemical Composition of Solution

Carrier content per gram of solution:

100 percent H_2O

Other components:

Barium less than 0.004 per cent
Lead less than 3×10^{-5} per cent

Preservative:

Remarks

Date Certificate Prepared

June 17, 1992

Approval Signature

George Tulbeck

201



U.S. DEPARTMENT OF COMMERCE
National Institute of Standards & Technology
Gaithersburg, MD 20899

REPORT OF TRACEABILITY

U.S. Environmental Protection Agency
Environmental Monitoring Systems Laboratory
Las Vegas, Nevada

Radionuclide	Hydrogen-3
Source identification	2606-1, prepared by EMSL
Source description	Liquid in 5-mL flame-sealed glass ampoule
Source mass	Approximately 5.0 grams
Source composition	Hydrogen-3 in water
Reference time	0700 EST June 3, 1992

	<u>NIST DATA</u>	<u>EMSL DATA</u>
Radioactivity concentration	810.5 Bq g ⁻¹	810.3 Bq g ⁻¹
Expanded uncertainty	0.64 percent ^{(1,2)*}	4.3 percent ⁽³⁾
Photon-emitting impurities	None observed ⁽⁴⁾	None observed
Measuring instrument	4 π β liquid-scintillation counters calibrated with SRM 4926D	Liquid-scintillation counting
Half life	12.43 \pm 0.05 years ⁽⁵⁾	
Difference from NIST		-0.05 percent ⁽⁶⁾

For the Director,

J.M. Robin Hutchinson, Acting Group Leader
Radioactivity Group
Physics Laboratory

Gaithersburg, MD 20899
January 1994

*Notes on next page

NOTES

- (1) The uncertainty analysis methodology and nomenclature used for the reported uncertainties are based on uniform NIST guidelines and are compatible with those adopted by the principal international metrology standardization bodies [cf., B.N. Taylor and C.E. Kuyatt, *NIST Technical Note 1129* (1993)].
- (2) The combined standard uncertainty, $u_c = 0.32$ percent, is the quadratic combination of the standard deviation (or standard deviation of the mean where appropriate), or approximations thereof, for the following component uncertainties:
- | | |
|---|--------------|
| a) 11 liquid-scintillation measurements on each of
4 vials | 0.11 percent |
| b) gravimetric | 0.05 percent |
| c) calibration of SRM 4926D | 0.29 percent |
| d) background | 0.00 percent |
| e) half life | 0.03 percent |
- The expanded uncertainty, $U = 0.64$ percent, is obtained by multiplying u_c by a coverage factor of $k = 2$ and is assumed to provide an uncertainty interval of at least 95% confidence.
- (3) Overall uncertainty reported by EMSL.
- (4) The limit of detection for photon-emitting impurities is:
- $0.08 \text{ } \gamma \text{ s}^{-1} \text{ g}^{-1}$ for energies between 90 and 2700 keV.
- (5) Unterwieser, M.P., Coursey, B.M., Schima, F.J., and Mann, W.B., *Int. J. Appl. Radiat. Isot.*, **31**, 611 (1980).
- (6) This result demonstrates the traceability of EMSL to NIST, for this measurement, to within five percent as specified in the appendix, *Traceability Studies*, of the EPA-NIST interagency agreement of April 1976, as amended.

For further information call Larry Lucas at 301-975-5546 or Jeffrey Cessna at 301-975-5539.

INITIAL STANDARD DILUTION RECORD

Standard Information:			
Isotope:	H-3	Vendor:	EPA
Activity of Standard Received:	.11 uCi	Vendor I.D. #	2/7/95
Weight of Standard Received (g):	5 g	LAL I.D. #:	AC5299
Standard Activity (pCi/g):	21.9 nCi/g pCi/g	NIST Traceable?	Yes
Half-life in Years or Days:	12.43 yrs	Certificate #:	2606-1
Reference Date:	CAO, 6/3/92	Receiver's Name:	Kevin Free
		Date Received:	1/25/95

Primary Dilution			
Balance Verification?:		Yes	
Diluent Used:	EPA	Distilled ASTM Type II Water (Deion Water)	
a: Decay Corrected Standard Activity (pCi/g):		21.9 nCi/g 4.939 pCi/g on 6/3/92	
b: Weight of the Source Transferred (g):		4.939 g	
c: Total diluted weight (g):		49.377 g	
d: Total Diluted Volume (mL)		50 ^{2/7/95} 49.5 mL	
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:		2190 pCi/g	
f: ^{Kevin} Calculated Density of Solution (g/mL) [c / d]:		0.99777 g/mL	
g: Activity of Dilution by Volume (pCi/mL) [e * f]:		2190 pCi/mL on 6/3/92	
h. Dilution Logbook I.D. #:	C. Pennewitz J. A. M. J.	LAL-95-0721-1	
Prepared By:	Joe Hutchinson / J. Morales	Preparation Date:	2/7/95
Reviewed By:	Joe Hutchinson	Review Date:	4/7/95
Purity/Cross Check Performed By:		Check Date:	

Signed

Date

CP5/8/95

Signed

Date

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information

Isotope: H-3 ~~LES~~^S MS

Parent Barcode Number: AC5299

Vendor or Certificate I.D. # of Parent Standard: _____

Diluted Source Logbook I.D. #: 95-0721-1

Balance Verification?: Yes

Diluent Used: Deion Water

Dilution

*Diluent: Low Bly Water

*Density of diluent (g/ml): 1 g/ml

a: Parent Specific Activity: 2190 pCi/g

b: Amount of Source Transferred: 10.0 g

c: Total amount of Dilution: 100 g

d: Total Volume of Dilution: 100 ml

e: Activity of Dilution (a * b / c): _____ pCi/g

f: Activity of Dilution (a * b / d): 219 pCi/ml on 6/13/95

Dilution Logbook I.D. #: 94-0677-70

Prepared By: Joe Hutchinson

Reviewed By: J. C. Mad

Preparation Date: 6/23/95

Review Date: 6/23/95

*If the diluent remains unchanged from the diluent used for the dilution source, then a weight dilution of a volume unit source can be performed without a density conversion. If the diluent changes, a weighted proportion density conversion is necessary.

read and understood by

U.S. Environmental Protection Agency
 Environmental Monitoring Systems Laboratory-Las Vegas
 Nuclear Radiation Assessment Division

Calibration Certificate

Description	Principal radionuclide	Tritium (H-3)		Half-life	12.43 years
	Nominal activity	110	nano curies		
	Nominal volume	5	ml in ampoule/bottle number	2606-1	

Measurement Activity of principal radionuclide

Activity per gram of this solution

nano curies of
 at 0400 hours PST on

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

curies Per gram
 of the daughter nuclide

Total mass of this solution

grams

Method of measurement

The activity of the primary solution and this dilution were measured by liquid scintillation counting.

Counting efficiencies for both standardizations were determined by counting solutions directly traceable to the National Institute of Standards & Technology (NIST).

Useful Life

This radionuclide has decayed through half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after



U.S. DEPARTMENT OF COMMERCE
National Institute of Standards & Technology
Gaithersburg, MD 20899

REPORT OF TRACEABILITY

U.S. Environmental Protection Agency
Environmental Monitoring Systems Laboratory
Las Vegas, Nevada

Radionuclide	Hydrogen-3
Source identification	2606-1, prepared by EMSL
Source description	Liquid in 5-mL flame-sealed glass ampoule
Source mass	Approximately 5.0 grams
Source composition	Hydrogen-3 in water
Reference time	0700 EST June 3, 1992

	<u>NIST DATA</u>	<u>EMSL DATA</u>
Radioactivity concentration	810.5 Bq g ⁻¹	810.3 Bq g ⁻¹
Expanded uncertainty	0.64 percent ^{(1,2)*}	4.3 percent ⁽³⁾
Photon-emitting impurities	None observed ⁽⁴⁾	None observed
Measuring instrument	4πβ liquid-scintillation counters calibrated with SRM 4926D	Liquid-scintillation counting
Half life	12.43 ± 0.05 years ⁽⁵⁾	
Difference from NIST		-0.05 percent ⁽⁶⁾

For the Director,

J.M. Robin Hutchinson, Acting Group Leader
Radioactivity Group
Physics Laboratory

Gaithersburg, MD 20899
January 1994

*Notes on next page

INITIAL STANDARD DILUTION RECORD

Standard Information:			
Isotope:	H-3	Vendor:	EPA
Activity of Standard Received:	.11 uCi	Vendor I.D. #	2/7/95
Weight of Standard Received (g):	5 g	LAL I.D. #:	AC5299
Standard Activity (pCi/g):	21.9 ^{nCi/g} pCi/g	NIST Traceable?	Yes
Half-life in Years or Days:	12.43 yrs	Certificate #:	2606-1
Reference Date:	0400, 6/3/92	Receiver's Name:	Kevin Free
		Date Received:	1/25/95

Primary Dilution			
Balance Verification?:		Yes	
Diluent Used:	EPA	Distilled ASTM Type II Water (Deaerated Water)	
a: Decay Corrected Standard Activity (pCi/g):		21.9 ^{nCi/g} 4.939 ^{pCi/g} on 6/3/92	
b: Weight of the Source Transferred (g):		4.939 g	
c: Total diluted weight (g):		49.377 g	
d: Total Diluted Volume (mL):		50 ^{2/7/95} 49.5 mL	
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:		2190 pCi/g	
f: Calculated Density of Solution (g/mL) [c / d]:		0.99777 g/mL	
g: Activity of Dilution by Volume (pCi/mL) [e * f]:		2190 pCi/mL on 6/3/92	
h. Dilution Logbook I.D. #:	C. Pennewitz A. J. O. M. P. L.	CAL-95-0721-1	
Prepared By:	Joe Hutchinson / J. Morales	Preparation Date:	2/7/95
Reviewed By:	Joe Hutchinson	Review Date:	2/7/95
Purity/Cross Check Performed By:		Check Date:	

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Am...

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information

Isotope: H-3 LCS

Parent Barcode Number: AC5299

Vendor or Certificate I.D. # of Parent Standard: 2606-1

Diluted Source Logbook I.D. #: LAL-95-721-1

Balance Verification?: Yes

Diluent Used: Deionized Water

Dilution

*Diluent: Deionized Water

*Density of diluent (g/ml): 0.99

a: Parent Specific Activity: 2190 pCi/ml

b: Amount of Source Transferred: 5.0 ml *8/24/95*

c: Total amount of Dilution: 4000 ml *8/24/95*

d: Total Volume of Dilution:

e: Activity of Dilution (a * b / c): 2.71 pCi/ml *8/24/95*

f: Activity of Dilution (a * b / d):

Dilution Logbook I.D. #: 95-721-14-1

9/27/95

Prepared By: [Signature]

Preparation Date: 8/24/95

Reviewed By: [Signature]

Review Date: 8/24/95

*If the diluent remains unchanged from the diluent used for the dilution source, then a weight dilution of a volume unit source can be performed without a density conversion. If the diluent changes, a weighted proportion density conversion is necessary.

Read and Understood By

209

Signed

Date

Signed

Date

9613429.2363

VALIDATION SUMMARY

9613429.2364

Kearney/Centaur Division
A.T. Kearney, Inc.
2952 George Washington Way
Richland, Washington 99352
509 375 5667
Facsimile 509 375 5151

Management
Consultants



ATKEARNEY

3 December 1995

Ms. Joan Kessner
Bechtel Hanford Incorporated
Post Office Box 969 MSIN H4-23
Richland, Washington 99352

Dear Ms. Kessner:

Enclosed are the Radiochemistry, Wet Chemistry, and Inorganic reports for SDGs No. W0699-QES and LK5379-LAS.

Sincerely,

A handwritten signature in cursive script, appearing to read "Bruce Christian".

R. Bruce Christian
Consultant

cc: J. Duncan - CH2
R. Stringer - ATK
J. Goode - ATK
C. Reyes - ATK

Date: December 1, 1995
 To: Bechtel Hanford Inc. (technical representative)
 From: A.T. Kearney, Inc.
 Project: 100-NR-2 Groundwater Sampling Round 8
 Subject: Inorganics - Data Package No. LK5379-LAS (SDG No. LK5379)

INTRODUCTION

This memo presents the results of data validation on Summary Data Package No. LK5379-LAS prepared by Lockheed Analytical Services (LAS). A list of samples validated along with the analyses reported and the method of analysis is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analysis
BOGJY4	09/14/95	Water	C	SW-846/ICP Metals
BOGJY5	09/14/95	Water	C	SW-846/ICP Metals

Data validation was conducted in accordance with the WHC statement of work (WHC 1994) and validation procedures (WHC 1993). Appendices 1 through 5 provide the following information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualifications
- Appendix 3. Qualified Data Summary and Annotated Laboratory Reports
- Appendix 4. Laboratory Narrative and Chain-of-Custody Documentation
- Appendix 5. Data Validation Supporting Documentation

DATA QUALITY OBJECTIVES

- **Holding Times**

Analytical holding times for ICP metals were assessed to ascertain whether the holding time requirements have been met by the laboratory. The holding time requirements for all metals is as follows: Samples must be analyzed within six months.

Holding time requirements were met for all analytes.

- **Blanks**

Calibration Blanks

A calibration blank must be analyzed immediately after every initial and continuing calibration verification. The blank must be analyzed at the beginning of the run and after the last analytical sample. In the case of positive blank results, samples with digestate concentrations (in ug/L) of less than five times ($<5x$) the highest amount found in any of the associated blanks have had their associated values qualified as non-detected and flagged "U". Samples with concentrations of greater than five times ($>5x$) the highest blank value do not require qualification.

In the case of negative calibration blank results, if the absolute value of any calibration blank exceeds the Instrument Detection Limit (IDL), all non-detects are qualified as estimates and flagged "UJ", and all positive results within two times ($2x$) the absolute value of the blank result are qualified as estimates and flagged "J". The qualification is applied only to results generated between the calibration blank IDL and the nearest acceptable blank.

Level C validation does not require the qualification of data based on calibration blanks.

Preparation Blanks

At least one preparation blank, consisting of deionized distilled water processed through each sample preparation and analysis procedure, must be prepared and analyzed with every sample delivery group. In the case of positive blank results, samples with digestate concentrations (in ug/L) of less than five times the preparation blank value have had their associated values qualified as non-detects and flagged "U". Samples with concentrations of greater than five times the highest blank concentration do not require qualification.

In the case of negative blank results, if the absolute value exceeds the Contract Required Detection Limit (CRDL), all non-detects are rejected and flagged "UR" and all detects that are less than ten times the absolute value of the associated preparation blank result are qualified as estimates and flagged "J". If the absolute value of the negative preparation blank is greater than the IDL and less than or equal to the CRDL, all non-detects are qualified as estimates and flagged "UJ" and all detects less than ten times the absolute value of the blank are qualified as estimates and flagged "J". If the sample results are greater than ten times the absolute value of the preparation blank, no qualification is necessary.

Due to the presence of a positive preparation blank result, the zinc result in sample number BOGJY4 has been flagged "U".

All other preparation blank results were acceptable.

- **Accuracy**

- Matrix Spike

Matrix spike analyses are used to assess the analytical accuracy of the reported data and the effect of the matrix on the ability to accurately quantify sample concentrations. Matrix spike recoveries must fall within the range of 75 to 125 percent. Samples with a spike recovery of less than 30% and a sample value below the IDL are rejected and flagged "UR". Samples with a spike recovery of 30% to 74% and a sample result less than the IDL are qualified "UJ". Samples with a spike recovery of greater than 125% or less than 75% and a sample result greater than the IDL are qualified "J". Finally, all samples with a spike recovery greater than 125% and a sample result less than the IDL, no qualification is required.

All matrix spike recovery results were acceptable.

- Laboratory Control Sample Recovery

The LCS monitors the overall performance of the analysis, including the sample preparation. An LCS should be digested or distilled and analyzed with every group of samples which have been prepared together. The performance criteria for solid LCS samples are established through interlaboratory studies coordinated by a certifying agency (e.g., EPA or an independent commercial supplier).

One liquid LCS is digested and analyzed for each sample batch in this report that contains water samples. The results were compared against the control limit of 80-120% as required by WHC data validation guidelines.

Level C validation does not require the qualification of data based on laboratory control samples.

- **Precision**

- Laboratory Duplicate Samples

The laboratory duplicate result measures the precision of the method by measuring a second aliquot of the sample that is treated the same way as the original. Samples whose precision fell outside the quality control requirements were qualified as estimates and flagged "J".

All laboratory duplicate recovery results were acceptable.

ICP Serial Dilution

The ICP serial dilution is used to determine whether significant physical or chemical interferences exist due to the sample matrix. If the sample concentration is less than or equal to fifty times the IDL for an analyte and the %D is outside the control limits (greater than 10%), the associated data must be qualified as estimated "J".

Level C validation does not require the qualification of data based on serial dilution results.

Field Split Samples

Two sets of field splits were associated with SDG No. LK5379, as shown below:

<u>Sample Number</u>	<u>Split Sample Number</u>	<u>Well Location</u>
B0GJS8	B0GJY4	199-N-21
B0GJS9	B0GJY5	199-N-21

Sample B0GJS8 and B0GJS9 were analyzed by Quanterra Environmental Services and reported with SDG W0699-QES. The split sample results were compared using the sample guidelines for determining the RPD between a sample and its duplicate. All results fell within the required control limits.

- **Completeness**

Data Package No. LK5379-LAS (SDG No. LK5379) was submitted for validation and verified for completeness. The completion rate was 100%.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES

Minor positive preparation blank contamination was encountered, resulting in the zinc result for sample B0GJY4 being flagged "U". All other validated results are considered accurate within the standard error associated with the methods.

REFERENCES

- EPA, 1987, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, Environmental Protection Agency, Washington, D.C.
- EPA, 1988c, *EPA Contract Laboratory Program Statement of Work for Inorganics Analyses, Multi-Media, Multi-Concentration*, U.S. Environmental Protection Agency, Washington, D.C.
- EPA, 1988d, *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses*, U.S. Environmental Protection Agency, Washington, D.C.
- EPA, 1990, *EPA Contract Laboratory Program Statement of Work for Inorganic Analyses, Multi-media, Multi-Concentration*, U.S. Environmental Protection Agency, Washington, D.C.
- WHC, 1992a, *Data Validation Procedures for Chemical Analyses*, WHC-SD-EN-SPP-002, Rev. 2, Westinghouse Hanford Company, October 1993.

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Appendix 1

Glossary of Data Reporting Qualifiers

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Qualifiers which may be applied by data validators in compliance with the procedures herein are as follows:

- U - Indicates the compound or analyte was analyzed for and not detected in the sample. The value reported is the sample quantitation limit corrected for sample dilution and moisture content by the laboratory.
- UJ - Indicates the compound or analyte was analyzed for and not detected in the sample. Due to a QC deficiency identified during the data validation, the associated quantitation limit is an estimate.
- J - Indicates the compound or analyte was analyzed for and detected. Due to a QC deficiency identified during the data validation, the associated concentration is an estimate, but the data are usable for decision-making purposes.
- BJ - Applied to inorganic analyses only. Indicates the analyte concentration was greater than the IDL but less than the CRDL and is considered an estimated value.
- R - Indicates the compound or analyte was analyzed for, detected, and due to an identified QC deficiency, the data are unusable.
- UR - Indicates the compound or analyte was analyzed for and not detected in the sample. Additionally, the data is unusable due to an identified QC deficiency.
- NJ - Indicates presumptive evidence of a compound at an estimated value. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).
- N - Indicates presumptive evidence of a compound. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).

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Appendix 2

Summary of Data Qualification

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DATA QUALIFICATION SUMMARY

SDG: LK5379	REVIEWER: RJS	DATE: 12/01/95	PAGE <u>1</u> OF <u>1</u>
COMMENTS:			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON
Zinc	U	BOGJY4	Positive preparation blank result

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Appendix 3

Qualified Data Summary and Annotated Laboratory Reports

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LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: BOGJY4	Date Collected: 14-SEP-95
Matrix: Water	Date Received: 16-SEP-95
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qual	Dilution	Date Analyzed	LAS Batch ID	LAS Sample ID
ALUMINUM, TOTAL	mg/L	6010	0.035	0.029	B	1	16-OCT-95	27912	L5379-2
ANTIMONY, TOTAL	mg/L	6010	< 0.058	0.058	u	1	16-OCT-95	27912	L5379-2
ARSENIC, TOTAL	mg/L	6010	< 0.098	0.098	u	1	16-OCT-95	27912	L5379-2
BARIUM, TOTAL	mg/L	6010	0.030	0.021	B	1	16-OCT-95	27912	L5379-2
BERYLLIUM, TOTAL	mg/L	6010	< 0.0010	0.0010	u	1	16-OCT-95	27912	L5379-2
CADMIUM, TOTAL	mg/L	6010	< 0.0050	0.0050	u	1	16-OCT-95	27912	L5379-2
CALCIUM, TOTAL	mg/L	6010	82.	0.032		1	16-OCT-95	27912	L5379-2
CHROMIUM, TOTAL	mg/L	6010	0.0043	0.0030	B	1	16-OCT-95	27912	L5379-2
COBALT, TOTAL	mg/L	6010	< 0.0060	0.0060	u	1	16-OCT-95	27912	L5379-2
COPPER, TOTAL	mg/L	6010	< 0.0030	0.0030	u	1	16-OCT-95	27912	L5379-2
IRON, TOTAL	mg/L	6010	0.15	0.012		1	16-OCT-95	27912	L5379-2
LEAD, TOTAL	mg/L	6010	< 0.056	0.056	u	1	16-OCT-95	27912	L5379-2
MAGNESIUM, TOTAL	mg/L	6010	17.	0.050		1	16-OCT-95	27912	L5379-2
MANGANESE, TOTAL	mg/L	6010	0.0042	0.0020	B	1	16-OCT-95	27912	L5379-2
NICKEL, TOTAL	mg/L	6010	< 0.015	0.015	u	1	16-OCT-95	27912	L5379-2
POTASSIUM, TOTAL	mg/L	6010	7.4	0.60		1	16-OCT-95	27912	L5379-2
SELENIUM, TOTAL	mg/L	6010	< 0.087	0.087	u	1	16-OCT-95	27912	L5379-2
SILVER, TOTAL	mg/L	6010	< 0.0040	0.0040	u	1	16-OCT-95	27912	L5379-2
SODIUM, TOTAL	mg/L	6010	150	0.070		1	16-OCT-95	27912	L5379-2
THALLIUM, TOTAL	mg/L	6010	0.075	0.050	B	1	16-OCT-95	27912	L5379-2
VANADIUM, TOTAL	mg/L	6010	0.0080	0.0040	B	1	16-OCT-95	27912	L5379-2
ZINC, TOTAL	mg/L	6010	0.019	0.0040	fu	1	16-OCT-95	27912	L5379-2

RJS 11/14/95

05-85

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LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: BOGJY5	Date Collected: 14-SEP-95
Matrix: Filt H2O	Date Received: 16-SEP-95
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qual	Dilution	Date Analyzed	LAS Batch ID	LAS Sample ID
ALUMINUM, DISSOLVED	mg/L	6010	0.039	0.029	B	1	16-OCT-95	27913	L5379-21
ANTIMONY, DISSOLVED	mg/L	6010	< 0.058	0.058	u	1	16-OCT-95	27913	L5379-21
ARSENIC, DISSOLVED	mg/L	6010	< 0.098	0.098	u	1	16-OCT-95	27913	L5379-21
BARIUM, DISSOLVED	mg/L	6010	0.030	0.021	B	1	16-OCT-95	27913	L5379-21
BERYLLIUM, DISSOLVED	mg/L	6010	< 0.0010	0.0010	u	1	16-OCT-95	27913	L5379-21
CADMIUM, DISSOLVED	mg/L	6010	< 0.0050	0.0050	u	1	16-OCT-95	27913	L5379-21
CALCIUM, DISSOLVED	mg/L	6010	90.	0.032		1	16-OCT-95	27913	L5379-21
CHROMIUM, DISSOLVED	mg/L	6010	< 0.0030	0.0030	u	1	16-OCT-95	27913	L5379-21
COBALT, DISSOLVED	mg/L	6010	0.0076	0.0060	B	1	16-OCT-95	27913	L5379-21
COPPER, DISSOLVED	mg/L	6010	< 0.0030	0.0030	u	1	16-OCT-95	27913	L5379-21
IRON, DISSOLVED	mg/L	6010	< 0.012	0.012	u	1	16-OCT-95	27913	L5379-21
LEAD, DISSOLVED	mg/L	6010	< 0.056	0.056	u	1	16-OCT-95	27913	L5379-21
MAGNESIUM, DISSOLVED	mg/L	6010	18.	0.050		1	16-OCT-95	27913	L5379-21
MANGANESE, DISSOLVED	mg/L	6010	< 0.0020	0.0020	u	1	16-OCT-95	27913	L5379-21
NICKEL, DISSOLVED	mg/L	6010	< 0.015	0.015	u	1	16-OCT-95	27913	L5379-21
POTASSIUM, DISSOLVED	mg/L	6010	7.9	0.60		1	16-OCT-95	27913	L5379-21
SELENIUM, DISSOLVED	mg/L	6010	< 0.087	0.087	u	1	16-OCT-95	27913	L5379-21
SILVER, DISSOLVED	mg/L	6010	< 0.0040	0.0040	u	1	16-OCT-95	27913	L5379-21
SODIUM, DISSOLVED	mg/L	6010	150	0.070		1	16-OCT-95	27913	L5379-21
THALLIUM, DISSOLVED	mg/L	6010	0.089	0.050	B	1	16-OCT-95	27913	L5379-21
VANADIUM, DISSOLVED	mg/L	6010	0.0085	0.0040	B	1	16-OCT-95	27913	L5379-21
ZINC, DISSOLVED	mg/L	6010	0.011	0.0040	B	1	16-OCT-95	27913	L5379-21

RJS 11/14/95

052-25

000013

9613429.2378

Lockheed Environmental Systems & Technologies Co.
Lockheed Analytical Services
975 Kelly Johnson Drive Las Vegas, Nevada 89119-3705
Telephone 702-361-0220 800-582-7605 Facsimile 702-361-8146



October 27, 1995

Ms. Joan Kessner
Bechtel Hanford, Inc.
345 Hills
P.O. Box 969
Richland, WA 99352

RE:	Log-in No.:	L5379
	Quotation No.:	Q400000-B
	SAF:	B95-093
	Document File No.:	0916596
	WHC Document File No.:	274
	SDG No.:	LK5379

The attached data report contains the analytical results of samples that were submitted to Lockheed Analytical Services on 16 September 1995.

The temperature of the cooler upon receipt was 2°C. Sample containers received agree with the chain-of-custody documentation. Sample containers were received intact. Samples were received in time to meet the analytical holding time requirements with the exception of method 300.0 nitrate-nitrogen, nitrite-nitrogen, and orthophosphate.

The case narratives included in the following attachments provide a detailed description of all events that occurred during sample preparation, analysis, and data review specific to the samples and analytical methods requested.

A list of data qualifiers, chain-of-custody forms, sample receiving checklist, and log-in report are also enclosed representing the samples received within this group.

If you have any questions concerning the analysis or the data please call Kathleen Hall at (509) 375-4741.

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003²⁵

9613429.2379

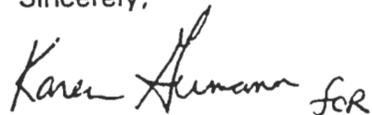
Lockheed Analytical Services

Log-in No.: L5379
Quotation No.: Q400000-B
SAF: B95-093
Document File No.: 0916596
WHC Document File No.:274
SDG No.: LK5379

Release of this data report has been authorized by the Laboratory Director or the Director's designee as evidenced by the following signature.

" I certify that this data package is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Manger or a designee, as verified by the following signature."

Sincerely,



Kathleen M. Hall
Client Services Representative

cc: Client Services
Document Control

000015

00-185

Lockheed Analytical Services

Log-in No.: L5379
Quotation No.: Q400000-B
SAF: B95-093
Document File No.: 0916596
WHC Document File No.: 274
SDG No.: LK5379

**CASE NARRATIVE
INORGANIC METALS ANALYSES
WATERS**

The routine calibration and quality control analyses performed for this batch include as applicable: instrument tune (ICP/MS only), initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), ICP interference check samples (ICP only), serial dilutions, analytical (post-digestion) spike samples, matrix spike (predigestion) sample(s), duplicate sample(s).

Preparation and Analysis Requirements

All samples were received on September 16, 1995. The samples were logged in as L5379 and were prepared and analyzed in batch 916 bhT.

Holding Time Requirements

- All samples were analyzed within the method-specific holding times.

Method Blanks

- The concentration levels of all the requested analytes in the method blank were below the reporting detection limits.

Internal Quality Control

- All Internal Quality Control were within acceptance limits.

Shellee McGrath
Prepared By

October 18, 1995
Date

Lockheed Analytical Services

Log-in No.: L5379
Quotation No.: Q400000-B
SAF: B95-093
Document File No.: 0916596
WHC Document File No.:274
SDG No.: LK5379

**CASE NARRATIVE
INORGANIC METALS ANALYSES
FILTERED WATERS**

The routine calibration and quality control analyses performed for this batch include as applicable: instrument tune (ICP/MS only), initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), ICP interference check samples (ICP only), serial dilutions, analytical (post-digestion) spike samples, matrix spike (predigestion) sample(s), duplicate sample(s).

Preparation and Analysis Requirements

All samples were received on September 16, 1995. The samples were logged in as L5379 and were prepared and analyzed in batch 916 bhD.

Holding Time Requirements

- All samples were analyzed within the method-specific holding times.

Method Blanks

- The concentration levels of all the requested analytes in the method blank were below the reporting detection limits.

Internal Quality Control

- All Internal Quality Control were within acceptance limits.

Shellee McGrath
Prepared By

October 18, 1995
Date

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

L5379

Data Turnaround
 Priority
 Normal

Collector AL RIZZO / MONTY MELHORN

Company Contact
J. V. Borghese

Telephone
(509) 372-9584

Project Designation
100-NR-2 Groundwater Sampling - Round 8

Sampling Location
100 N

SAF No.
B95-093

Ice Chest No.
EL-15

Field Logbook No.
EFL-1056

Method of Shipment
Federal Express

Shipped To
Lockheed

Offsite Property No.
W95-0-0204-50

Bill of Lading/Air Bill No.
2904640785

Possible Sample Hazards/Remarks

Preservation	HNO ₃	Cool 4°C	Cool 4°C	H ₂ SO ₄	Cool 4°C	Cool 4°C	None	HNO ₃	None	None	
Type of Container	P/G	P/G	G	G	P/G	P/G	P	P/G	G	P/G	
No. of Container(s)	1	1	4	1	1	1	1	8	1	1	
Special Handling and/or Storage	Volume	500mL	500mL	1L	1L	250mL	250mL	250mL	1L	500mL	20mL

Special Handling and/or Storage
Maintain samples between 2°C and 6°C.

SAMPLE ANALYSIS

000015 29416 59486

Matrix*	Date Sampled	Time Sampled	ICP Metals - TAL (Unfiltered)	Anions (IC) - F, Cl, SO ₄ , PO ₄ , NO ₃ , NO ₂ (Unfiltered)	Oil and Grease	TPH	Conductivity	Turbidity	pH	Gross Alpha, Gross Beta, Sr-90, Gamma Spec	Tritium	Activity Scan
W	9/14/95	1355	X	X	X	X	X	X	X	X	X	X

CHAIN OF POSSESSION

Sign/Print Names

Relinquished By <u>STEVEN GURD</u>	Date/Time <u>9/14/95 1515</u>	Received By <u>[Signature]</u>	Date/Time <u>1515</u>
Relinquished By <u>[Signature]</u>	Date/Time <u>0800</u>	Received By <u>[Signature]</u>	Date/Time <u>9-14-95</u>
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

SPECIAL INSTRUCTIONS

Sample analysis for phosphate, nitrate, and nitrite by EPA 300.0; pH by SW-846 9040; and turbidity by EPA 180.1 are being requested for information only. The ERC Contractor acknowledges that the holding times will not be met.

Matrix*

- S - Soil
- SE - Sediment
- SO - Solid
- SL - Sludge
- W - Water
- O - Oil
- A - Air
- DS - Drum Solids
- DL - Drum Liquids
- T - Tissue
- WI - Wipe
- L - Liquid
- V - Vegetation
- X - Other

LABORATORY SECTION

Received By [Signature]

Title Sample Custodian

Date/Time 9-16-95 1020

FINAL SAMPLE DISPOSITION

Disposal Method

Disposed By

Date/Time

11-14-1985 11:47AM
 P. 82
 509 372-2100
 LESAT-Richland WA 99355 UM puclhly-R-JASAT

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

L537A

Collector AL RIZZO / MONTY MELHORN	Company Contact J. V. Borghese	Telephone (509) 372-8684	Date Turnaround <input type="checkbox"/> Priority <input checked="" type="checkbox"/> Normal
Project Description 100-NR-2 Groundwater Sampling - Round 2	Sampling Location 100 N	SAF No. B98-093	
Ice Chest No. ER-15	Field Logbook No. EFL-1056	Method of Shipment Federal Express	
Shipped To Lockheed	Offsite Property No. W95-0-0204-50	Bill of Lading/Air Bill No. 2904640785	

Possible Sample Hazards/Remarks	Preservation	HNO ₃	Cool 4°C	Cool 4°C	H ₂ SO ₄	Cool 4°C	Cool 4°C	None	HNO ₃	None
	Type of Container	P/G	P/G	G	G	P/G	P/G	P	P/G	G
	No. of Container(s)	1	1	4	1	1	1	1	2	1
Special Handling and/or Storage Maintain samples between 2°C and 8°C.	Volume	500mL	500mL	1L	1L	250mL	250mL	250mL	1L	500mL
SAMPLE ANALYSIS	ICP Metals - TAL (Unfiltered)	Asbestos (EC) - P, CL, SO ₂ , PD, NO ₂ , NO _x (Unfiltered)	Oil and Greases	TPH	Conductivity	Turbidity	pH	Green Alpha, Green Beta, S-80, Gamma Spec	Tritium	At

Sample No.	Matrix*	Date Sampled	Time Sampled	ICP Metals	Asbestos	Oil and Greases	TPH	Conductivity	Turbidity	pH	Green Alpha	Green Beta	S-80	Gamma Spec	Tritium	At
806JV4	W	9/19/85	1335	X	X	X	X	X	X	X	X	X	X	X	X	X

CHAIN OF POSSESSION		Sign/Print Names	
Relinquished By <i>[Signature]</i>	Date/Time 9/19/85 1515	Received By <i>[Signature]</i>	Date/Time 9/19/85 1515
Relinquished By <i>[Signature]</i>	Date/Time 0900	Received By <i>[Signature]</i>	Date/Time 7:15 PM
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

SPECIAL INSTRUCTIONS
 Sample analysis for phosphate, nitrate, and nitrite by EPA 300.0; pH by SW-846 9040; and turbidity by EPA 180.1 are being requested for information only. The EAC Contractor acknowledges that the holding times will not be met.

- Matrix*
- B - Soil
 - BR - Bedrock
 - SO - Solid
 - SL - Sludge
 - W - Water
 - O - Oil
 - A - Air
 - OS - Drum 1
 - OL - Drum 2
 - T - Tissue
 - WI - Waste
 - L - Liquid
 - U - Urine
 - K - Other

LABORATORY SECTION	Received By <i>[Signature]</i>	Title <i>Single Custodian</i>	Date/Time 9/16/85 1030
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

000019

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Data Turnaround

- Priority
- Normal

Collector AL RIZZO / MONTY MELIKSON	Company Contact J. V. Borghese	Telephone (509) 372-9584
Project Designation 100-NR-2 Groundwater Sampling - Round 8	Sampling Location 100 N	SAF No. B95-093
Ice Chest No. ER-15	Field Logbook No. EFL-1056	Method of Shipment Federal Express
Shipped To Lockheed	Offsite Property No. W95-0-0204-50	Bill of Lading/Air Bill No. 2904640785

Possible Sample Hazards/Remarks	Preservation	HNO ₃	Cool 4°C						
	Type of Container	P/G	P/G						
	No. of Container(s)	1	1						
Special Handling and/or Storage Maintain samples between 2°C and 6°C.	Volume	500mL	500mL						

SAMPLE ANALYSIS

Sample No.	Matrix*	Date Sampled	Time Sampled	ICP Metals - TAL (Filtered)	Anions (IC) - F, Cl, SO ₄ , PO ₄ , NO ₃ , NO ₂ (Filtered)								
000020	W	9/14/95	1355	X	X								

CHAIN OF POSSESSION		Sign/Print Names	
Relinquished By <i>[Signature]</i>	Date/Time 9/14/95 1515	Received By <i>[Signature]</i>	Date/Time 9/14/95
Relinquished By <i>[Signature]</i>	Date/Time 9/15/95	Received By <i>[Signature]</i>	Date/Time 9/15/95
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

SPECIAL INSTRUCTIONS
 Sample analysis for phosphate, nitrate, and nitrite by EPA 300.0 are being requested for information only. The ERC Contractor acknowledges that the holding times will not be met.

Refer to Activity Scan on page 1 of 2.

- Matrix*
- S - Soil
 - SE - Sediment
 - SO - Solid
 - SL - Sludge
 - W - Water
 - O - Oil
 - A - Air
 - DS - Drum Solids
 - DL - Drum Liquids
 - T - Tissue
 - WI - Wipe
 - L - Liquid
 - V - Vegetation
 - X - Other

LABORATORY SECTION	Received By <i>[Signature]</i>	Title Sample Custodian	Date/Time 9-16-95/0920
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

9613429-2384

000020

9613429-2384

02 25

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Date Turnaround
 Priority
 Normal

Collector AL BIZZO / MORTY MELIKSON	Company Contact J. V. Borghese	Telephone (509) 372-8584
Project Designation 100-NR-2 Groundwater Sampling - Round 8	Sampling Location 100 N	SAF No. B95-033
Ice Chest No. ER-15	Field Logbook No. EEF-1056	Method of Shipment Federal Express
Shipped To Lockheed	Offsite Property No. W95-0-0204-50	Bill of Lading/Air Bill No. 2904640785

Possible Sample Hazards/Remarks	Preservation	HNO ₃	Cool 4°C								
	Type of Container	P/G	P/G								
	No. of Container(s)	1	1								
Special Handling and/or Storage Maintain samples between 2°C and 8°C.	Volume	500mL	500mL								
SAMPLE ANALYSIS		ICP Metals - TAL (Filtered)	Anions (IC - F, Cl, SO ₄ , PO ₄ , NO ₃ , NO ₂) (Filtered)								

Sample No.	Matrix*	Date Sampled	Time Sampled								
B0GJYS	W	9/14/95	1355	X	X						

CHAIN OF POSSESSION	Sign/Print Names	SPECIAL INSTRUCTIONS	Matrix*
Relinquished By: <i>STEVEN GREEN</i> Date/Time: <i>9/14/95 1515</i>	Received By: <i>ERIC B. BUSHAW</i> Date/Time: <i>9/14/95</i>	<p>Sample analysis for phosphate, nitrate, and nitrite by EPA 300.0 are being requested for information only. The ERC Contractor acknowledges that the holding times will not be met.</p> <p>Refer to Activity Scan on page 1 of 2.</p>	S - Soil
Relinquished By: <i>ERIC B. BUSHAW</i> Date/Time: <i>0900</i>	Received By: _____ Date/Time: _____		SE - Sediment
Relinquished By: _____ Date/Time: _____	Received By: _____ Date/Time: _____		SO - Solid
Relinquished By: _____ Date/Time: _____	Received By: _____ Date/Time: _____		SL - Sludge
			W - Water
			O - Oil
			A - Air
			DS - Drums
			DL - Drums L
			T - Tissues
			WM - Waste
			L - Liquid
			V - Vapors
			X - Other

LABORATORY SECTION	Received By: <i>Adrian</i>	Title: <i>Sample Custodian</i>	Date/Time: <i>9-16-95/0920</i>
FINAL SAMPLE DISPOSITION	Disposal Method: _____	Disposed By: _____	Date/Time: _____

120000LESAT-Richland WA 99352 5093754238

9/13/95 2:38P

9613429.2386

Appendix 5

Data Validation Supporting Documentation

000022

INORGANIC ANALYSIS DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	<u>C</u>	D	E
PROJECT: WHC/BHI			DATA PACKAGE: LK5379-LAS		
VALIDATOR: RJS		LAB: Lockheed		DATE: Nov. 14 1995	
CASE: 100-NR-2			SDG: LK5379		
ANALYSES PERFORMED					
<input type="checkbox"/> CLP/CP	<input type="checkbox"/> CLP/GFAA	<input type="checkbox"/> CLP/Hg	<input type="checkbox"/> CLP/Cyanide	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> SW-846/CP	<input type="checkbox"/> SW-846/GFAA	<input type="checkbox"/> SW-846/Hg	<input type="checkbox"/> SW-846 Cyanide	<input type="checkbox"/>	<input type="checkbox"/>
SAMPLES/MATRIX					
BOGJY4 , BOGJY5					
split samples (2 water samples)					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Is technical verification documentation present? Yes No N/A
 Is a case narrative present? Yes No N/A

Comments: _____

2. HOLDING TIMES

Are sample holding times acceptable? Yes No N/A

Comments: _____
 All metals < 6 months ✓

INORGANIC ANALYSIS DATA VALIDATION CHECKLIST

3. INSTRUMENT PERFORMANCE AND CALIBRATIONS

- Were initial calibrations performed on all instruments? Yes No N/A
- Are initial calibrations acceptable? Yes No N/A
- Are ICP interference checks acceptable? Yes No N/A
- Were ICV and CCV checks performed on all instruments? Yes No N/A
- Are ICV and CCV checks acceptable? Yes No N/A

Comments: _____

4. BLANKS

- Were ICB and CCB checks performed for all applicable analyses? Yes No N/A
- Are ICB and CCB results acceptable? Yes No N/A
- Were preparation blanks analyzed? Yes No N/A
- Are preparation blank results acceptable? Yes No N/A
- Were field/trip blanks analyzed? Yes No N/A
- Are field/trip blank results acceptable? Yes No N/A

Comments: _____
BOGJY4 Zn "u"

5. ACCURACY

- Were spike samples analyzed? Yes No N/A
- Are spike sample recoveries acceptable? Yes No N/A
- Were laboratory control samples (LCS) analyzed? Yes No N/A
- Are LCS recoveries acceptable? Yes No N/A

Comments: _____

~~A-2005~~

INORGANIC ANALYSIS DATA VALIDATION CHECKLIST

6. PRECISION

- Were laboratory duplicates analyzed? Yes No N/A
- Are laboratory duplicate samples RPD values acceptable? Yes No N/A
- Were ICP serial dilution samples analyzed? Yes No N/A
- Are ICP serial dilution %D values acceptable? Yes No N/A
- Are field duplicate RPD values acceptable? Yes No N/A
- Are field split RPD values acceptable? Yes No N/A

Comments: Split 1

BOGJY4/BOGJS8 ✓ BOGJY5/BOGJS9 ✓

7. FURNACE AA QUALITY CONTROL

- Were duplicate injections performed as required? Yes No N/A
- Are duplicate injection %RSD values acceptable? Yes No N/A
- Were analytical spikes performed as required? Yes No N/A
- Are analytical spike recoveries acceptable? Yes No N/A
- Was MSA performed as required? Yes No N/A
- Are MSA results acceptable? Yes No N/A

Comments: _____

8. REPORTED RESULTS AND DETECTION LIMITS

- Are results reported for all requested analyses? Yes No N/A
- Are all results supported in the raw data? Yes No N/A
- Are results calculated properly? Yes No N/A
- Do results meet the CRDLs? Yes No N/A

Comments: _____

A-2105

Date: December 1, 1995
 To: Bechtel Hanford Inc. (technical representative)
 From: A.T. Kearney, Inc.
 Project: 100-NR-2 Groundwater Sampling Round 8
 Subject: Wet Chemistry - Data Package No. LK5379-LAS (SDG No. LK5379)

INTRODUCTION

This memo presents the results of data validation on Summary Data Package No. LK5379-LAS prepared by Lockheed Analytical Services (LAS). A list of the samples validated along with the analyses reported and the method of analysis is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analysis
BOGJY4	09/14/95	Water	C	See Notes 1,2,3
BOGJY5	09/14/95	Water	C	See Note 1

Note 1. Requested Method: Cl, F, NO₃, NO₂, SO₄, PO₄

Note 2. Requested Method: Turbidity, pH, Conductivity

Note 3. Requested Method: TPH, Oil and Grease

Data validation was conducted in accordance with the WHC statement of work (WHC 1994) and validation procedures (WHC 1993). Appendices 1 through 5 provide the following information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualifications
- Appendix 3. Qualified Data Summary and Annotated Laboratory Reports
- Appendix 4. Laboratory Narrative and Chain-of-Custody Documentation
- Appendix 5. Data Validation Supporting Documentation

DATA QUALITY OBJECTIVES

- **Holding Times**

Analytical holding times are assessed to ascertain whether the holding time requirements are met by the laboratory. The holding time requirements are as follows: 28 days for fluoride, chloride, sulfate, specific conductivity and oil and grease; 14 days for total petroleum hydrocarbons; 48 hours for turbidity, nitrate, nitrite and phosphate, and immediately for pH.

If holding times are exceeded, but not by greater than two times the limit, all associated sample results are qualified as estimates and flagged "J" for detects and "UJ" for non-detects. If holding times are exceeded by greater than two times the limit, all associated detectable sample results are qualified as estimates and flagged "J" and all non-detects are rejected and flagged "UR".

The holding time for nitrate was exceeded by greater than twice the limit for sample numbers BOGJY4 and BOGJY5. Therefore, the associated results, both detects, were qualified as estimates and flagged "J".

The holding time for nitrite was exceeded by greater than twice the limit for sample numbers BOGJY4 and BOGJY5. Therefore, the associated results, both non-detects, were rejected and flagged "UR".

The holding time for phosphate was exceeded by greater than twice the limit for sample numbers BOGJY4 and BOGJY5. Therefore, the associated results, both non-detects, were rejected and flagged "UR".

The holding time for turbidity was exceeded by greater than twice the limit for sample number BOGJY4. Therefore, the associated detected result was qualified as an estimate and flagged "J".

The holding time for pH was exceeded by greater than twice the limit for sample number BOGJY4. Therefore, the associated result was qualified as an estimate and flagged "J".

The Oil and Grease method requires that water samples be preserved with 5 ml of HCl if analysis will not be performed within several hours of sampling. No preservatives were added to the aliquot of sample BOGJY4 which was used for Oil and Grease analysis, nor was the sample analyzed within several hours of sampling. Therefore, since the Oil and Grease result was non-detected, the result has been rejected and flagged "UR".

Holding times were met for all other analytes.

- **Instrument Calibration**

Instrument calibration is performed to establish that the instrument is capable of producing acceptable and reliable analytical data over a range of concentrations. The initial and continuing calibrations are performed according to the associated EPA Methods and all results must meet validation requirements set by Westinghouse Hanford Company (WHC 1992,b). At least one blank and three standards were used to establish the instrument calibrations prior to sample analysis and the correlation was greater than or equal to 0.995. Continuing

calibration checks are performed to verify that instrument performance is stable and reproducible on a day-to-day basis.

Instrument calibration is not evaluated under Level C validation.

- **Blanks**

Method blank analyses are performed to determine the extent of laboratory contamination introduced through sampling, sample preparation and analysis. At least one acceptable method blank analysis must be conducted for every 20 samples. No contaminants should be present in the method blank. All blank results must fall below the CRQL and if not, all associated data less than five times the amount found in the blank are qualified as non-detected "U".

All method blank results were acceptable.

- **Accuracy**

Matrix Spike

Matrix spike analyses are used to assess the analytical accuracy of the reported data and the effect of the matrix on the ability to accurately quantify sample concentrations. Matrix spike recoveries must fall within the range of 75 to 125 percent. Samples with a spike recovery of less than 30% and a sample value below the IDL were rejected and flagged "UR". Samples with a spike recovery of 30% to 74% and a sample result less than the IDL are qualified "UJ". Samples with a spike recovery of greater than 125% or less than 75% and a sample result greater than the IDL are qualified "J". Finally, all samples with a spike recovery greater than 125% and a sample result less than the IDL, no qualification is required.

All matrix spike recovery results were acceptable.

Laboratory Control Sample

The LCS monitors the overall performance of the analysis, including the sample preparation. An LCS should be prepared (e.g., digested or distilled) and analyzed with every group of samples which have been prepared together. The performance criteria for solid LCS samples are established through interlaboratory studies coordinated by a certifying agency (e.g., EPA or an independent commercial supplier). If the LCS recoveries are outside the control limit and the sample result is greater than the IDL, all sample results must be qualified as estimates and flagged "J". If the LCS recoveries are less than the control limit and the sample result is less than the IDL, all sample results must be

flagged "UJ". If the LCS recoveries are greater than the control limits and the sample result is less than the IDL, then no qualification is necessary. The performance criteria for aqueous LCS samples are percent recoveries between 80% and 120%. Samples with LCS recoveries of less than 50% are rejected and flagged "UR/R". Samples with LCS recoveries between 50% and 79% and a sample value below the IDL are qualified as estimates and flagged "UJ". If the LCS recovery is greater than 120% or between 50% and 79% and a sample value above the IDL, the result is qualified as an estimate and flagged "J". For LCS recoveries greater than 120% and a sample value below IDL, no qualification is necessary.

LCS results are not evaluated under Level C validation.

- Precision

Laboratory Duplicate Samples

Laboratory duplicate sample analyses are used to measure laboratory precision and sample homogeneity. Results must be within RPD limits of $\pm 35\%$. If RPD values are out of specification and the sample concentration is $> 5 \times \text{CRDL}$, all associated sample results are qualified as estimated "J" for detects, "UJ" for non-detects. If RPD values are plus or minus two times the CRDL ($\pm 2 \times \text{CRDL}$) and the sample concentration is less than five times the CRDL, all associated sample results are qualified as estimated and flagged "J" for detects and "UJ" for non-detects. The performance criteria for aqueous laboratory duplicates are an RPD less than 20% for positive sample results greater than five times the CRDL or plus or minus the CRDL ($\pm \text{CRDL}$) for positive sample results less than five times the CRDL. Sample results outside the criteria are qualified as estimates and flagged "J".

All laboratory duplicate results were acceptable.

Field Split Samples

Two sets of field splits were submitted to LAS as shown below:

<u>Sample Number</u>	<u>Split Sample Number</u>	<u>Well Location</u>
B0GJS8	B0GJY4	199-N-21
B0GJS9	B0GJY5	199-N-21

Sample B0GJS8 and B0GJS9 were analyzed by Quanterra Environmental Services and reported with SDG W0699-QES. The split sample results were compared using the sample guidelines for determining the RPD between a sample and its duplicate. All results fell within the required control limits.

- **Completeness**

Data Package No. LK5379-LAS (SDG No. LK5379) was submitted for validation and verified for completeness. Nitrite and phosphate results for both samples were rejected due to exceeded holding times, resulting in a completion rate of 69%.

MAJOR DEFICIENCIES

Due to exceeded holding times, nitrite and phosphate results for both samples were rejected and flagged "UR". Due to the lack of preservation, the Oil and Grease result in sample BOGJY4 was rejected and flagged "UR". Rejected results are not usable for any purposes and should not be reported.

MINOR DEFICIENCIES

Due to exceeded holding times, pH, nitrate and turbidity results have been qualified as estimates and flagged "J". Data flagged "J" indicate the associated concentration is an estimate, but the data are usable for decision making purposes. All other validated results are considered accurate within the standard error associated with the methods.

REFERENCES

EPA, 1987, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, Environmental Protection Agency, Washington, D.C.

EPA, 1991b, *EPA Contract Laboratory Program Statement of Work for Organics Analyses, Multi-Media, Multi-Concentration*, U.S. Environmental Protection Agency, Washington, D.C.

WHC, 1992a, *Data Validation Procedures for Chemical Analyses*, WHC-SD-EN-SPP-002, Rev. 2, Westinghouse Hanford Company, October 1993.

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Appendix 1

Glossary of Data Reporting Qualifiers

000006

Qualifiers which may be applied by data validators in compliance with the procedures herein are as follows:

- U - Indicates the compound or analyte was analyzed for and not detected in the sample. The value reported is the sample quantitation limit corrected for sample dilution and moisture content by the laboratory.
- UJ - Indicates the compound or analyte was analyzed for and not detected in the sample. Due to a QC deficiency identified during the data validation, the associated quantitation limit is an estimate.
- J - Indicates the compound or analyte was analyzed for and detected. The associated concentration is an estimate, but the data are usable for decision-making purposes.
- R - Indicates the compound or analyte was analyzed for, detected, and due to an identified QC deficiency, the data are unusable.
- UR - Indicates the compound or analyte was analyzed for and not detected in the sample. Additionally, the data is unusable due to an identified QC deficiency.
- NJ - Indicates presumptive evidence of a compound at an estimated value. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).
- N - Indicates presumptive evidence of a compound. The data may not be valid for some specific applications usable for decision-making purposes).

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Appendix 2
Summary of Data Qualification

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DATA QUALIFICATION SUMMARY

SDG: LK5379	REVIEWER: RJS	DATE: 12/01/95	PAGE <u>1</u> OF <u>1</u>
COMMENTS:			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON
pH	J	BOGJY4	Holding time exceeded
Turbidity	J	BOGJY4	Holding time exceeded
Nitrate	J	BOGJY4, BOGJY5	Holding time exceeded
Nitrite	UR	BOGJY4, BOGJY5	Holding time exceeded
Phosphates	UR	BOGJY4, BOGJY5	Holding time exceeded
Oil and Grease	UR	BOGJY4	No Preservation

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Appendix 3

Qualified Data Summary and Annotated Laboratory Reports

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LOCKHEED ANALYTICAL SERVICES

COMMON IONS AND ADDITIONAL ANALYTES

Sample Results

Client Sample ID: BOGJY4	Date Collected: 14-SEP-95
Matrix: Water	Date Received: 16-SEP-95

Constituent	Units	Method	Result	Reporting Det Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Specific Conductance	uS/cm	120.1	1100	1		26-SEP-95	27575	LS379-9
Turbidity	NTU	180.1	0.64	N/A	XJ	23-SEP-95	27708	LS379-10
Chloride	mg/L	300.0	20.	0.02		20-SEP-95	27576	LS379-3
Fluoride	mg/L	300.0	< 0.1	0.1	u	20-SEP-95	27578	LS379-3
Nitrate-N	mg/L	300.0	8.1	0.02	XJ	20-SEP-95	27580	LS379-3
Nitrite-N	mg/L	300.0	< 0.01	0.01	XUR	20-SEP-95	27582	LS379-3
Ortho Phosphate	mg/L	300.0	< 0.1	0.1	XUR	20-SEP-95	27584	LS379-3
Sulfate	mg/L	300.0	300	1	D(1:10)	20-SEP-95	27586	LS379-3
pH	pH Units	9040	7.8	0.1	XJ	22-SEP-95	27656	LS379-11

RJS
11/14/95

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LOCKHEED ANALYTICAL SERVICES

OIL AND GREASE - GRAVIMETRIC METHOD
413.1 OIL AND GREASE

Client Sample ID:	BOGJY4	LAL Sample ID:	L5379-4
Date Collected:	14-SEP-95	Date Received:	16-SEP-95
Date Analyzed:	28-SEP-95	Date Extracted:	28-SEP-95
Matrix:	Water	Analytical Batch ID:	092895-413.1
QC Group:	413.1 OIL AND GREASE_27944	Dilution Factor:	1

CONSTITUENT	RESULT mg/L	PRACTICAL QUANTITATION LIMIT mg/L	DATA QUALIFIER(ε)
Total Oil and Grease	<5.00 UR	5.00	

RJS 11/14/95

RBC 12/1/95

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LOCKHEED ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS BY FTIR
418.1 TPH

Client Sample ID:	BOGJY4	LAL Sample ID:	L5379-8
Date Collected:	14-SEP-95	Date Received:	16-SEP-95
Date Analyzed:	26-SEP-95	Date Extracted:	25-SEP-95
Matrix:	Water	Analytical Batch ID:	092695-418.1
QC Group:	418.1 TPH_27753	Dilution Factor:	1

CONSTITUENT	RESULT mg/L	PRACTICAL QUANTITATION LIMIT mg/L	DATA QUALIFIER(s)
TRPH	<1.00 u	1.00	

RJS 11/14/95

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LOCKHEED ANALYTICAL SERVICES

COMMON IONS AND ADDITIONAL ANALYTES

Sample Results

Client Sample ID: BOGJY5	Date Collected: 14-SEP-95
Matrix: Filt H2O	Date Received: 16-SEP-95

Constituent	Units	Method	Result	Reporting Det Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Chloride	mg/L	300.0	20.	0.02		20-SEP-95	27577	L5379-22
Fluoride	mg/L	300.0	< 0.1	0.1	u	20-SEP-95	27579	L5379-22
Nitrate-N	mg/L	300.0	8.3	0.02	XJ	20-SEP-95	27581	L5379-22
Nitrite-N	mg/L	300.0	< 0.01	0.01	XUR	20-SEP-95	27583	L5379-22
Ortho Phosphate	mg/L	300.0	< 0.1	0.1	XUR	20-SEP-95	27585	L5379-22
Sulfate	mg/L	300.0	300	1	D(1:10)	20-SEP-95	27587	L5379-22

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Appendix 4

Laboratory Narrative and Chain-of-Custody Documentation

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Appendix 5

Data Validation Supporting Documentation

Qualifiers which may be applied by data validators in compliance with the procedures herein are as follows:

- U - Indicates the compound or analyte was analyzed for and not detected in the sample. The value reported is the sample quantitation limit corrected for sample dilution and moisture content by the laboratory.
- UJ - Indicates the compound or analyte was analyzed for and not detected in the sample. Due to a QC deficiency identified during the data validation, the associated quantitation limit is an estimate.
- J - Indicates the compound or analyte was analyzed for and detected. The associated concentration is an estimate, but the data are usable for decision-making purposes.
- R - Indicates the compound or analyte was analyzed for, detected, and due to an identified QC deficiency, the data are unusable.
- UR - Indicates the compound or analyte was analyzed for and not detected in the sample. Additionally, the data is unusable due to an identified QC deficiency.
- NJ - Indicates presumptive evidence of a compound at an estimated value. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).
- N - Indicates presumptive evidence of a compound. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).

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Appendix 4

Laboratory Narrative and Chain-of-Custody Documentation

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Lockheed Environmental Systems & Technologies Co.
Lockheed Analytical Services
975 Kelly Johnson Drive Las Vegas, Nevada 89119-3705
Telephone 702-361-0220 800-582-7605 Facsimile 702-361-8146



October 27, 1995

Ms. Joan Kessner
Bechtel Hanford, Inc.
345 Hills
P.O. Box 969
Richland, WA 99352

RE:	Log-in No.:	L5379
	Quotation No.:	Q400000-B
	SAF:	B95-093
	Document File No.:	0916596
	WHC Document File No.:	274
	SDG No.:	LK5379

The attached data report contains the analytical results of samples that were submitted to Lockheed Analytical Services on 16 September 1995.

The temperature of the cooler upon receipt was 2°C. Sample containers received agree with the chain-of-custody documentation. Sample containers were received intact. Samples were received in time to meet the analytical holding time requirements with the exception of method 300.0 nitrate-nitrogen, nitrite-nitrogen, and orthophosphate.

The case narratives included in the following attachments provide a detailed description of all events that occurred during sample preparation, analysis, and data review specific to the samples and analytical methods requested.

A list of data qualifiers, chain-of-custody forms, sample receiving checklist, and log-in report are also enclosed representing the samples received within this group.

If you have any questions concerning the analysis or the data please call Kathleen Hall at (509) 375-4741.

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003^{RS}

Lockheed Analytical Services

Log-in No.: L5379
Quotation No.: Q400000-B
SAF: B95-093
Document File No.: 0916596
WHC Document File No.:274
SDG No.: LK5379

Release of this data report has been authorized by the Laboratory Director or the Director's designee as evidenced by the following signature.

" I certify that this data package is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Manger or a designee, as verified by the following signature."

Sincerely,



Kathleen M. Hall
Client Services Representative

cc: Client Services
Document Control

DD, MS

Lockheed Analytical Services

Log-in No.: L5379
 Quotation No.: Q400000-B
 SAF: B95-093
 Document File No.: 0916596
 WHC Document File No.:274
 SDG No.: LK5379

**CASE NARRATIVE
 INORGANIC NON METALS ANALYSES
 WATER**

The routine calibration and quality control analyses performed for this batch include as applicable: initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), matrix spike sample(s), and duplicate sample(s).

Preparation and Analysis Requirements

- One water sample was received for LK5379 and analyzed in batches 916 bh and 916 bht for selected analytes as requested on the chain of custody. Quality control analysis was performed on the following sample:

Client ID	LAL #		Method
BOGJY4	L5379-9	DUP	120.1 Conductivity
	L5379-10	DUP	180.1 Turbidity
	L5379-3	MS, DUP	300.0 Chloride, Fluoride, Nitrate-Nitrogen, Nitrite-Nitrogen, Orthophosphate, Sulfate

Holding Time Requirements

- All samples were analyzed within the method-specific holding time with the exception of Method 180.1 Turbidity, Method 300.0 Nitrate-Nitrogen, Nitrite-Nitrogen and Orthophosphate which were received outside of holding time. The associated samples are flagged with an "H".

Method Blanks

- The concentration levels of all the requested analytes in the method blank were below the reporting detection limits.

Internal Quality Control

- All Internal Quality Control were within acceptance limits.

Kay McCann
 Prepared By

October 15, 1995
 Date

00525

Lockheed Analytical Services

Log-in No.: L5379
 Quotation No.: Q400000-B
 SAF: B95-093
 Document File No.: 0916596
 WHC Document File No.: 274
 SDG No.: LK5379

**CASE NARRATIVE
 INORGANIC NON-METALS ANALYSES
 FILTERED WATER**

The routine calibration and quality control analyses performed for this batch include as applicable: initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), matrix spike sample(s), and duplicate sample(s).

Preparation and Analysis Requirements

- One filtered water sample was received for LK5379 and analyzed in batch 916 bhd for selected analytes as requested on the chain of custody. Quality control analysis was performed on the following sample:

Client ID	LAL #		Method
BOGJY5	L5379-22	MS, DUP	300.0 Chloride, Fluoride, Nitrate-Nitrogen, Nitrite-Nitrogen, Orthophosphate, Sulfate

Holding Time Requirements

- All samples were analyzed within the method-specific holding time with the exception of Method 300.0 Nitrate-Nitrogen, Nitrite-Nitrogen and Orthophosphate which were received outside of holding time. The associated samples are flagged with an "H".

Method Blanks

- The concentration levels of all the requested analytes in the method blank were below the reporting detection limits.

Internal Quality Control

- All Internal Quality Control were within acceptance limits.

Kay McCann
 Prepared By

October 15, 1995
 Date

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

L5379

Collector AL RIZZO / MONTY MELHORN	Company Contact J. V. Borghese	Telephone (509) 372-9584	Data Turnaround <input type="checkbox"/> Priority <input checked="" type="checkbox"/> Normal
Project Designation 100-NR-2 Groundwater Sampling - Round 8	Sampling Location 100 N	SAF No. B95-093	
Ice Chest No. EL-15	Field Logbook No. EFL-1056	Method of Shipment Federal Express	
Shipped To Lockheed	Offsite Property No. W95-0-0204-50	Bill of Lading/Air Bill No. 2904640785	

Possible Sample Hazards/Remarks	Preservation	HNO ₃	Cool 4°C	Cool 4°C	H ₂ SO ₄	Cool 4°C	Cool 4°C	None	HNO ₃	None	None
	Type of Container	P/G	P/G	G	G	P/G	P/G	P	P/G	G	P/G
	No. of Container(s)	1	1	4	1	1	1	1	8	1	1
Special Handling and/or Storage Maintain samples between 2°C and 6°C.	Volume	500mL	500mL	1L	1L	250mL	250mL	250mL	1L	500mL	20mL

SAMPLE ANALYSIS				ICP Metals - TAL (Unfiltered)	Anions (IC) - F, Cl, SO ₄ , PO ₄ , NO ₃ , NO ₂ (Unfiltered)	Oil and Grease	TPH	Conductivity	Turbidity	pH	Gross Alpha, Gross Beta, Sr-90, Gamma Spec	Tritium	Activity Scan
Date	Matrix	Date Sampled	Time Sampled										
	W	9/14/95	1355	X	X	X	X	X	X	X	X	X	X

CHAIN OF POSSESSION		Sign/Print Names		SPECIAL INSTRUCTIONS						Matrix*	
Relinquished By	Date/Time	Received By	Date/Time	Sample analysis for phosphate, nitrate, and nitrite by EPA 300.0; pH by SW-846 9040; and turbidity by EPA 180.1 are being requested for information only. The ERC Contractor acknowledges that the holding times will not be met.						<ul style="list-style-type: none"> S - Soil SE - Sediment SO - Solid SL - Sludge W - Water O - Oil A - Air OS - Drum Solids DL - Drum Liquids T - Tissue WH - Wipe L - Liquid V - Vegetation X - Other 	
Relinquished By	Date/Time	Received By	Date/Time								
Relinquished By	Date/Time	Received By	Date/Time								
Relinquished By	Date/Time	Received By	Date/Time								

LABORATORY SECTION	Received By	Title	Date/Time
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

10000224
941659016

9613020 2114

11-14-1995 11:47 AM
 P.02
 5893754238
 93012 375 503
 LESAT-Richland WA 99352

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

L537A

Collector AL RIZZO / MONTY MELHORN	Company Contact J. V. Borghese	Telephone (509) 372-9884	Date Turnaround <input type="checkbox"/> Priority <input checked="" type="checkbox"/> Normal
Project Description 100-NR-2 Groundwater Sampling - Round #	Sampling Location 100 N	SAF No. B98-093	
Ice Chest No. ER-15	Field Logbook No. EFL-1056	Method of Shipment Federal Express	
Shipped To Lockheed	Offsite Property No. W95-0-0204-50	Bill of Lading/Air Bill No. 2904640785	

Possible Sample Hazards/Remarks	Preservation	HNO ₃	Cool 4°C	Cool 4°C	H ₂ SO ₄	Cool 4°C	Cool 4°C	None	HNO ₃	None
		Type of Container	P/G	P/G	G	G	P/G	P/G	P	P/G
Special Handling and/or Storage Maintain samples between 2°C and 8°C.	Volume	500mL		1L	1L	250mL	250mL	250mL	1L	500mL
		SAMPLE ANALYSIS	JCP Metals - TAL (Unfiltered)	Arsons (AC) - F, CL, SO₂, PO₄, NO₃, NO₂ (Filtered)	OS and Greases	TPH	Conductivity	Turbidity	pH	Gross Alpha, Gross Beta, Sr-90, Gamma Spec

Sample No.	Matrix	Date Sampled	Time Sampled	JCP Metals - TAL	Arsons (AC)	OS and Greases	TPH	Conductivity	Turbidity	pH	Gross Alpha	Gross Beta	Sr-90	Gamma Spec	Tridem	Ac Sp
BOGJY4	W	9/14/95	1355	X	X	X	X	X	X	X	X	X	X	X	X	X

CHAIN OF POSSESSION	Sign/Print Names
Relinquished By <i>[Signature]</i>	Received By <i>[Signature]</i>
Date/Time 9/14/95 1515	Date/Time 9/14/95 1515
Relinquished By <i>[Signature]</i>	Received By <i>[Signature]</i>
Date/Time 0700	Date/Time 0700
Relinquished By <i>[Signature]</i>	Received By <i>[Signature]</i>
Date/Time 7:15 PM	Date/Time 7:15 PM
Relinquished By	Received By
Date/Time	Date/Time

SPECIAL INSTRUCTIONS
 Sample analysis for phosphate, nitrate, and nitrite by EPA 300.0; pH by SW-846 9040; and turbidity by EPA 180.1 are being requested for information only. The ERG Contractor acknowledges that the holding times will not be met.

- B - Soil
- SE - Sediment
- SO - Solid
- SL - Sludge
- W - Water
- O - Oil
- A - Air
- OS - Drum 1
- CL - Drum 1
- T - Tissue
- LI - Liquid
- V - Vegetative
- X - Other

LABORATORY SECTION	Received By <i>[Signature]</i>	Title Sample Custodian	Date/Time 9/16/95 1030
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

000025

P.02

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Date Turnaround

- Priority
- Normal

Collector AL RIZZO / MONTY MELIKIAN	Company Contact J. V. Borghese	Telephone (509) 372-9584
Project Designation 100-NR-2 Groundwater Sampling - Round 8	Sampling Location 100 N	SAF No. B95-093
Ice Chest No. ER-15	Field Logbook No. FFL-1056	Method of Shipment Federal Express
Shipped To Lockheed	Offsite Property No. W95-0-0204-50	Bill of Lading/Air Bill No. 2904640785

Possible Sample Hazards/Remarks	Preservation	HNO ₃	Cool 4°C							
	Type of Container	P/G	P/G							
	No. of Container(s)	1	1							
	Special Handling and/or Storage	Volume	500mL	500mL						
Maintain samples between 2°C and 6°C.										
SAMPLE ANALYSIS	ICP Metals - TAL (Filtered)	Anions (IC) - F, Cl, SO ₄ , PO ₄ , NO ₂ , NO ₃ (Filtered)								

Sample No.	Matrix	Date Sampled	Time Sampled							
B95-093	W	9/14/95	1355	X	X					

CHAIN OF POSSESSION	Sign/Print Names	SPECIAL INSTRUCTIONS	Matrix
Relinquished By: <i>STEVEN GRACE</i>	Received By: <i>ERIC</i>	Sample analysis for phosphate, nitrate, and nitrite by EPA 300.0 are being requested for information only. The ERC Contractor acknowledges that the holding times will not be met. Refer to Activity Scan on page 1 of 2.	S - Soil SE - Sediment SO - Solid SL - Sludge W - Water O - Oil A - Air DS - Drum Solids DL - Drum Liquids T - Tissue WI - Wipe L - Liquid V - Vegetation X - Other
Date/Time: 9/14/95 1515	Date/Time: 1515		
Relinquished By: <i>ERIC</i>	Received By: <i>Lisa White B. Whitton</i>		
Date/Time: 0800	Date/Time: 9/14/95		
Relinquished By: <i>Lisa White B. Whitton</i>	Received By: _____		
Date/Time: 9/15/95	Date/Time: _____		
Relinquished By: _____	Received By: _____		
Date/Time: _____	Date/Time: _____		

LABORATORY SECTION	Received By: <i>Melvin</i>	Title: <i>Sample Custodian</i>	Date/Time: 9-16-95/0920
FINAL SAMPLE DISPOSITION	Disposal Method: _____	Disposed By: _____	Date/Time: _____

11/11/02/25
09/15/95/0920/05
172/25

0613429-2416

Bchtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Date Turnaround

- Priority
- Normal

Collector AL RIZZO / MONTY MELIKSON	Company Contact J. V. Borghese	Telephone (509) 372-9584
Project Designation 100-NR-2 Groundwater Sampling - Round 8	Sampling Location 100 N	SAF No. B95-093
Ice Chest No. ER-15	Field Logbook No. EEL-1056	Method of Shipment Federal Express
Shipped To Lockheed	Offsite Property No. W95-0-0204-50	Bill of Lading/Air Bill No. 2904640785

Possible Sample Hazards/Remarks	Preservation	HNO ₃	Cool 4°C							
	Type of Container	P/G	P/G							
	No. of Container(s)	1	1							
	Special Handling and/or Storage Maintain samples between 2°C and 8°C.	Volume	500mL	500mL						

SAMPLE ANALYSIS

ICP Metals - TAL (Filtered)
Anions (IC) - F, Cl, SO₄, PO₄, NO₃, NO₂ (Filtered)

Sample No.	Matrix*	Date Sampled	Time Sampled										
B001Y5	W	9/14/95	1355	X	X								

CHAIN OF POSSESSION		Sign/Print Names	
Relinquished By <i>[Signature]</i>	Date/Time 9/14/95 1515	Received By <i>[Signature]</i>	Date/Time 9/14/95
Relinquished By <i>[Signature]</i>	Date/Time 9/15/95	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

SPECIAL INSTRUCTIONS
Sample analysis for phosphate, nitrate, and nitrite by EPA 300.0 are being requested for information only. The ERC Contractor acknowledges that the holding times will not be met.

Refer to Activity Scan on page 1 of 2.

- Matrix*
- S - Soil
 - SE - Sediment
 - SO - Solid
 - SL - Sludge
 - W - Water
 - O - Oil
 - A - Air
 - OS - Other S
 - OL - Other L
 - T - Tissue
 - VM - Vial
 - L - Liquid
 - V - Vapor
 - X - Other

LABORATORY SECTION	Received By <i>[Signature]</i>	Title Sample Custodian	Date/Time 9-16-95/0920
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

LESAT-Richland WA 99352 5093754238

20002

9/15/95 2:21/1127274196

9613429.2418

GENERAL CHEMISTRY DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	<u>C</u>	D	E
PROJECT: WHC / BHI			DATA PACKAGE: LK5379-LAS		
VALIDATOR: RJS		LAB: Lockheed		DATE: Nov. 14, 1995	
CASE: 100-NR-2			SDG: LK5379		
ANALYSES PERFORMED					
<input checked="" type="checkbox"/> Anions/IC	<input type="checkbox"/> TOC	<input type="checkbox"/> TOX	<input checked="" type="checkbox"/> TPH-418.1	<input checked="" type="checkbox"/> Oil and Grease	<input type="checkbox"/> Alkalinity
<input type="checkbox"/> Ammonia	<input type="checkbox"/> BOD/COD	<input checked="" type="checkbox"/> Chloride	<input type="checkbox"/> Chromium-VI	<input checked="" type="checkbox"/> pH	<input type="checkbox"/> NO ₂ /NO ₃
<input checked="" type="checkbox"/> Sulfate	<input type="checkbox"/> TDS	<input type="checkbox"/> TKN	<input checked="" type="checkbox"/> Phosphate	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> Fluoride	<input checked="" type="checkbox"/> Spec Cond.	<input checked="" type="checkbox"/> Turbidity	<input checked="" type="checkbox"/> Nitrate	<input checked="" type="checkbox"/> Nitrite	<input type="checkbox"/>
SAMPLES/MATRIX					
BOGJY4, BOGJY5 (water)					
BOGJV2 (TPH only) RJS 11/16/95 not included					
Y4, Y5 (split samples)					

1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Is technical verification documentation present? Yes No N/A
 Is a case narrative present? Yes No N/A

Comments: _____

2. HOLDING TIMES

Are sample holding times acceptable? Yes No N/A

Comments: _____
 F, Cl, SO₄ < 28 days ✓
 Spec Conductivity < 28 days ✓
 TPH < 14 days ✓
 Oil + Grease < 28 days ✓ No preservative 'UR' RIS
 Turbidity < 48 hours — > 2x holding time limit All samples "J"
 PO₄, NO₂, NO₃ < 48 hours → > 2x limit (NO₃ detected "J") (NO₂, PO₄ - nondetected) "UR"
 PH < ASAP → > 2x limit - All samples "J"
 A-2305

GENERAL CHEMISTRY DATA VALIDATION CHECKLIST

3. INSTRUMENT CALIBRATION

- Was initial calibration performed for all applicable analyses? Yes No N/A
- Are initial calibration results acceptable? Yes No N/A
- Was a calibration check performed for all applicable analyses? Yes No N/A
- Are calibration check results acceptable? Yes No N/A

Comments: _____

4. BLANKS

- Were laboratory blanks analyzed? Yes No N/A
- Are laboratory blank results acceptable? Yes No N/A
- Were field/trip blanks analyzed? Yes No N/A
- Are field/trip blank results acceptable? Yes No N/A

Comments: _____

5. ACCURACY

- Were spike samples analyzed at the required frequency? . . . Yes No N/A
- Are spike recoveries acceptable? Yes No N/A
- Were LCS analyses performed at the required frequency? . . . Yes No N/A
- Are LCS recoveries acceptable? Yes No N/A

Comments: _____

6. PRECISION

- Were laboratory duplicate samples analyzed at the required frequency? Yes No N/A
- Are laboratory duplicate sample RPD values acceptable? . . . Yes No N/A
- Are field duplicate RPD values acceptable? Yes No N/A
- Are field split RPD values acceptable? Yes No N/A

A-2425

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GENERAL CHEMISTRY DATA VALIDATION CHECKLIST

Comments: Field Splits

B06JY4 / B06JS8 ✓

B06JY5 / B06JS9 ✓

7. ANALYTE QUANTITATION

Was analyte quantitation performed properly? Yes No N/A

Comments: _____

8. REPORTED RESULTS AND DETECTION LIMITS

Are results reported for all requested analyses? Yes No N/A

Are results supported in the raw data? Yes No N/A

Are results calculated properly? Yes No N/A

Do results meet the CRDLs? Yes No N/A

Comments: _____

A-25-K5

00030

HOLDING TIME SUMMARY

SDG: LK5379 VALIDATOR: RJS DATE: 11/14/95 PAGE 1 OF 1

COMMENTS:

FIELD SAMPLE ID	ANALYSIS TYPE	DATE SAMPLED	DATE PREPARED	DATE ANALYZED	PREP. HOLDING TIME, DAYS	ANALYSIS HOLDING TIME, DAYS	QUALIFIER
B06JY4	pH	9/14/95	N/A	9/22/95	N/A	8	J
B06JY4	Turbidity	9/14/95	9/25/95 (N/A)	9/28/95	N/A	9	J
B06JY4	Nitrate	9/14/95	N/A	9/20/95	N/A	6	J
B06JYS	↓	↓	↓	9/20/95	↓	6	J
B06JY4	Nitrite	9/14/95	N/A	9/20/95	N/A	6	UR
B06JYS	↓	9/14/95	↓	9/20/95	↓	6	UR
B06JY4	Phosphate	9/14/95	N/A	9/20/95	N/A	6	UR
B06JYS	↓	9/14/95	↓	9/20/95	↓	6	UR

000031

9613429.2421

Date: December 1, 1995
 To: Bechtel Hanford, Inc. (technical representative)
 From: A.T. Kearney, Inc.
 Project: 100-NR-2 Groundwater Sampling Round 8
 Subject: Radiochemistry - Data Package No. LK5379-LAS (SDG No. LK5379)

INTRODUCTION

This memo presents the results of data validation on Summary Data Package No. LK5379-LAS prepared by Lockheed Analytical Services (LAS). A list of samples validated along with the analyses reported and the method of analysis is provided in the following table.

Sample ID	Sample Date	Media	Validation Level	Analysis
BOGJY4	09/14/95	Water	C	See Note 1

Note 1. Requested Method: Gross Alpha/Beta, Gamma Spectroscopy, and Tritium.

Data validation was conducted in accordance with the WHC statement of work (WHC 1994) and validation procedures (WHC 1993). Appendices 1 through 5 provide the following information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualification
- Appendix 3. Qualified Data Summary and Annotated Laboratory Reports
- Appendix 4. Laboratory Narrative and Chain-of-Custody Documentation
- Appendix 5. Data Validation Supporting Documentation

DATA QUALITY OBJECTIVES

- **Holding Times**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The maximum holding time for radiochemical analyses is six months.

All holding times were acceptable.

- **Instrument Calibration and Performance**

Instrument calibration is performed to establish that the counters used to determine radionuclide activities are capable of producing acceptable and reliable analytical data. Each counting system must be factory calibrated at installation and after any maintenance or repair. Calibration consists of an instrument efficiency determination for each applicable radionuclide. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible.

Initial and continuing calibration is not considered under level C validation.

- **Blanks**

Laboratory Blanks

Blank samples are analyzed to determine if positive results are due to laboratory reagent, sample container, or detector contamination. If blank analysis results indicate the presence of an analyte above the MDA, the following qualifiers were applied: All positive sample results less than five times the highest blank concentration were qualified as estimated; sample results below the MDA were elevated to the MDA and qualified as undetected; sample results above the MDA and greater than five times the highest blank concentration were not qualified.

All blank results were acceptable.

- **Accuracy**

Accuracy is evaluated by analyzing distilled water samples spiked with known quantities of radionuclides. The sample activity as determined by analysis is compared to the known activity to assess accuracy. The acceptable laboratory control sample recovery range is 70 to 130 percent, and 60 to 140 percent for matrix spike samples. Spike sample results outside the above ranges resulted in associated sample results being qualified as estimated, rejected, or not qualified, depending on the activity of the individual sample.

All accuracy results were acceptable.

- **Precision**

Duplicate Analysis

Analytical precision is expressed by the RPD between the recoveries of duplicate matrix spike analyses performed on a sample. When the laboratory has not

performed duplicate spike analyses, precision may also be assessed using unspiked duplicate sample analyses. If both sample and replicate activities are greater than five times the CRDL and the RPD is less than 35 percent for soil samples and 20 percent for water samples, the results are acceptable. If either activities are less than five times the CRDL, a control limit of less than or equal to two times the CRDL is used for soil samples and less than or equal to the CRDL for water samples. If either the original or replicate value is below the CRDL, the applicable control limits are less than or equal to the CRDL for water samples and less than or equal to two times the CRDL for soil samples. If the RPD is outside the applicable control limit, associated results are qualified as estimates.

All precision results were acceptable.

Field Split Samples

One split sample pair was submitted to LAS as shown below:

<u>Sample Number</u>	<u>Split Sample Number</u>	<u>Well Location</u>
BOGJS8	BOGJY4	199-N-21

Sample BOGJS8 was analyzed by Quanterra Environmental Services and reported with SDG W0699-QES. The split sample results were compared using the sample guidelines for determining the RPD between a sample and its duplicate. The RPD for gross beta was outside QC limits (31%). Lockheed analyzed for Ac-228, Pb-212, Pb-214, Ra-226, Ru-106 and U-235 while no such analysis was conducted by Quanterra. All other results fell within the required control limits. Under WHC guidelines, no qualification is required.

- **Completeness**

Data Package No. LK5379-LAS (SDG No. LK5379) was submitted for validation and verified for completeness. The completion rate was 100%. The MDA did not meet the CRDL for the following compounds: Ra-228, Eu-152, Eu-155, Fe-59, Ra-226, Ru-106, and U-234. Under WHC guidelines, no qualification is required.

MAJOR DEFICIENCIES

None found.

MINOR DEFICIENCIES.

None found.

REFERENCES

WHC, 1992a, *Data Validation Procedures for Chemical Analyses*, WHC-SD-EN-SPP-002, Rev. 2, Westinghouse Hanford Company, October 1993.

WHC, 1992b, *Data Validation Procedures for Radiochemical Analyses*, WHC-SD-EN-001, Rev. 1, Westinghouse Hanford Company, 1993.

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Appendix 1

Glossary of Data Reporting Qualifiers

000005

Qualifiers which may be applied by data validators in compliance with the procedures herein are as follows:

- U - Indicates the compound or analyte was analyzed for and not detected above the minimum detectable activity (MDA) in the sample. The value reported is the sample result corrected for sample dilution and moisture content by the laboratory. The data is usable for decision making purposes.
- UJ - Indicates the compound or analyte was analyzed for and not detected at concentrations above the minimum detectable activity (MDA) in the sample. Due to a QC deficiency identified during the data validation, the associated quantitation limit is an estimate, but is usable for decision making purposes.
- J - Indicates the compound or analyte was analyzed for and detected. Due to a QC deficiency identified during the data validation, the associated concentration is an estimate, but the data are usable for decision-making purposes.
- R - Indicates the compound or analyte was analyzed for, detected, and due to an identified QC deficiency, the data are unusable.
- UR - Indicates the compound or analyte was analyzed for and not detected in the sample. Additionally, the data is unusable due to an identified QC deficiency.

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Appendix 2

Summary of Data Qualification

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DATA QUALIFICATION SUMMARY

SDG: LK5379	REVIEWER: RBC	DATE: 12/01/95	PAGE <u>1</u> OF <u>1</u>
COMMENTS: No Qualifiers Assigned			
COMPOUND	QUALIFIER	SAMPLES AFFECTED	REASON

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Appendix 3

Qualified Data Summary and Annotated Laboratory Reports

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LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: BOGJY4

LAL Sample ID: L5379-12

Date Collected: 14-SEP-95

Date Received: 16-SEP-95

Matrix: Water

Login Number: L5379

Constituent	Analyzed	Batch	Activity	Error	MDA	Dataqual	Units
Ac-228(Ra-228)	16-OCT-95	GAMMA SPEC LAL-0063_27809	5.0	22.0	40.0		pCi/L
Co-58	16-OCT-95	GAMMA SPEC LAL-0063_27809	2.5	5.7	9.6		pCi/L
Co-60	16-OCT-95	GAMMA SPEC LAL-0063_27809	-0.5	1.5	12.0		pCi/L
Cs-137	16-OCT-95	GAMMA SPEC LAL-0063_27809	4.1	7.3	9.4		pCi/L
Eu-152	16-OCT-95	GAMMA SPEC LAL-0063_27809	-4.0	8.1	36.0		pCi/L
Eu-154	16-OCT-95	GAMMA SPEC LAL-0063_27809	-6.7	4.2	34.0		pCi/L
Eu-155	16-OCT-95	GAMMA SPEC LAL-0063_27809	6.0	13.0	18.0		pCi/L
Fe-59	16-OCT-95	GAMMA SPEC LAL-0063_27809	-1.3	9.0	27.0		pCi/L
Pb-212	16-OCT-95	GAMMA SPEC LAL-0063_27809	4.7	9.4	13.0		pCi/L
Pb-214(Ra-226)	16-OCT-95	GAMMA SPEC LAL-0063_27809	-3.5	8.4	17.0		pCi/L
Ra-226(GAMMA)	16-OCT-95	GAMMA SPEC LAL-0063_27809	-110	100	160		pCi/L
Ru-106	16-OCT-95	GAMMA SPEC LAL-0063_27809	-20.0	39.0	74.0		pCi/L
U-235(GAMMA)	16-OCT-95	GAMMA SPEC LAL-0063_27809	-5.0	26.0	41.0		pCi/L
Gross Alpha	11-OCT-95	GR ALP/BETA LAL-0060_27812	1.8	3.2	5.8	C	pCi/L
Gross Beta	11-OCT-95	GR ALP/BETA LAL-0060_27812	7.9	3.4	5.1	C	pCi/L
Total radio-strontium	20-SEP-95	SR-90 LAL-0196_27451	0.67	0.61	1.0		pCi/L

RBe
12/1/95

08/22

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LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: 80GJY4

LAL Sample ID: L5379-20

Date Collected: 14-SEP-95

Date Received: 16-SEP-95

Matrix: Water

Login Number: L5379

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
H-3	02-OCT-95	TRITIUM(H3) LAL-0066_27851	1360	360	320		pCi/L

RBC
12/11/95

Page ~~3~~

000012

09 ~~PK~~

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Appendix 4

Laboratory Narrative and Chain-of-Custody Documentation

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9618429.2435

Lockheed Environmental Systems & Technologies Co.
Lockheed Analytical Services
975 Kelly Johnson Drive Las Vegas, Nevada 89119-3705
Telephone 702-361-0220 800-582-7605 Facsimile 702-361-8146

LOCKHEED MARTIN



October 27, 1995

Ms. Joan Kessner
Bechtel Hanford, Inc.
345 Hills
P.O. Box 969
Richland, WA 99352

RE: Log-in No.: L5379
 Quotation No.: Q400000-B
 SAF: B95-093
 Document File No.: 0916596
 WHC Document File No.: 274
 SDG No.: LK5379

The attached data report contains the analytical results of samples that were submitted to Lockheed Analytical Services on 16 September 1995.

The temperature of the cooler upon receipt was 2°C. Sample containers received agree with the chain-of-custody documentation. Sample containers were received intact. Samples were received in time to meet the analytical holding time requirements with the exception of method 300.0 nitrate-nitrogen, nitrite-nitrogen, and orthophosphate.

The case narratives included in the following attachments provide a detailed description of all events that occurred during sample preparation, analysis, and data review specific to the samples and analytical methods requested.

A list of data qualifiers, chain-of-custody forms, sample receiving checklist, and log-in report are also enclosed representing the samples received within this group.

If you have any questions concerning the analysis or the data please call Kathleen Hall at (509) 375-4741.

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003/14

Lockheed Analytical Services

Log-in No.: L5379
Quotation No.: Q400000-B
SAF: B95-093
Document File No.: 0916596
WHC Document File No.:274
SDG No.: LK5379

Release of this data report has been authorized by the Laboratory Director or the Director's designee as evidenced by the following signature.

" I certify that this data package is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Manger or a designee, as verified by the following signature."

Sincerely,



Kathleen M. Hall
Client Services Representative

cc: Client Services
Document Control

Lockheed Analytical Services

Log-in No.: L5379
Quotation No.: Q400000-B
SAF: B95-093
Document File No.: 0916596
WHC Document File No.: 274
SDG No.: LK5379

CASE NARRATIVE RADIOCHEMICAL ANALYSES

The routine calibration and quality control (QC) analyses performed for this batch include as applicable: instrument calibration, initial and continuing calibration verification, quench monitoring standards, instrument background analysis, method blanks, yield tracer, laboratory control samples, matrix spike samples, duplicate samples.

NOTE: Chemical recoveries and minimum detectable activities (MDAs) can be found on the preparation sheets and calculation sheets on the attached raw data for each method.

Holding Time Requirements

All holding times were met.

Analytical Method Gamma Spectrometry

The gamma spectrometry analysis was performed using standard operating procedure (SOP), LAL-91-SOP-0063. The samples were analyzed in workgroup 27809. No problems were encountered during the analysis and all QC criteria were met. No re-analyses were performed.

Analytical Method Gross Alpha/Beta

The gross alpha/beta analysis was performed using SOP, LAL-91-SOP-0060. The samples were analyzed in workgroup 27812. No problems were encountered during the analysis and all QC criteria were met with the following exception: The MDA exceeded the reporting detection limit due to the residue weight limitations forcing a volume reduction, the associated samples were flagged with a "C" qualifier. No re-analyses were performed.

Analytical Method Strontium-90

The strontium-90 analysis was performed using SOP, LAL-91-SOP-0196. The samples were analyzed in workgroup 27451. No problems were encountered during the analysis and all QC criteria were met. No re-analyses were performed.

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010K

9613429.2438

Lockheed Analytical Services

Log-in No.: L5379
Quotation No.: Q400000-B
SAF: B95-093
Document File No.: 0916596
WHC Document File No.:274
SDG No.: LK5379

Analytical Method Tritium

The tritium analysis was performed using SOP, LAL-91-SOP-0066. The samples were analyzed in workgroup 27851. No problems were encountered during analysis and all QC criteria were met. No re-analyses were performed.

Andrea Tippett
Prepared By

October 17, 1995
Date

000017

01/16

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

L5379

Data Turnaround
Priority
Normal

Collector: AL RIZZO / MONTY MELHORN
Company Contact: J. V. Borghese
Telephone: (509) 372-9584
Project Designation: 100-NR-2 Groundwater Sampling - Round 8
Sampling Location: 100 N
SAF No.: B95-093
Ice Chest No.: EL-15
Field Logbook No.: EFL-1056
Method of Shipment: Federal Express
Shipped To: Lockheed
Offsite Property No.: W95-0-0204-50
Bill of Lading/Air Bill No.: 2904640785

Table with columns for Preservation (HNO3, Cool 4°C, H2SO4), Type of Container (P/G, G), No. of Container(s), and Volume (500mL, 1L, 250mL).

Special Handling and/or Storage: Maintain samples between 2°C and 6°C.
Sample Analysis parameters: ICP Metals - TAL, Anions (IC), Oil and Grease, TPH, Conductivity, Turbidity, pH, Gross Alpha, Tritium, Activity Scan.

000078

2944-5960

028

Table with columns: Matrix, Date Sampled, Time Sampled, and various analysis parameters (ICP, Anions, Oil, TPH, Conductivity, Turbidity, pH, Gross Alpha, Tritium, Activity Scan).

CHAIN OF POSSESSION: Relinquished/Received By, Date/Time.
SPECIAL INSTRUCTIONS: Sample analysis for phosphate, nitrate, and nitrite by EPA 300.0; pH by SW-846 9040; and turbidity by EPA 180.1 are being requested for information only.

LABORATORY SECTION: Received By, Title, Date/Time.
FINAL SAMPLE DISPOSITION: Disposal Method, Disposed By, Date/Time.

0613429-2139

- Matrix: S - Soil, SE - Sediment, SO - Solid, SL - Sludge, W - Water, O - Oil, A - Air, DS - Drum Solids, DL - Drum Liquids, T - Tissue, WI - Wipe, L - Liquid, V - Vegetation, X - Other

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

L537A

Date Turnaround
 Priority
 Normal

Collector AL RIZZO / MONTY MELHORN	Company Contact J. V. Borghese	Telephone (509) 372-8684
Project Description 100-NR-2 Groundwater Sampling - Round #	Sampling Location 100 N	SAF No. B98-093
Ice Chest No. ER-15	Field Logbook No. EFF-1056	Method of Shipment Federal Express
Shipped To Lockheed	Offsite Property No. W95-0-0204-50	Bill of Lading/Air Bill No. 2904640785

Possible Sample Hazards/Remarks	Preservation	HNO ₃	Cool 4°C	Cool 4°C	H ₂ SO ₄	Cool 4°C	Cool 4°C	None	HNO ₃	None
	Type of Container	P/G	P/G	G	G	P/G	P/G	P	P/G	G
	No. of Container(s)	1	1	4	1	1	1	1	3	1
Special Handling and/or Storage Maintain samples between 2°C and 8°C.	Volume	500ml	500ml	1L	1L	250ml	250ml	250ml	1L	500ml

SAMPLE ANALYSIS	ICP Metals - TAL (Unfiltered)	Arsenic (As) - F, Cl, SO ₄ , PO ₄ , NO ₃ , NO ₂ (Filtered)	Oil and Grease	TPH	Conductivity	Turbidity	pH	Green Alpha, Green Beta, Si-SD, Gamma Spec	Triben
-----------------	-------------------------------	--	----------------	-----	--------------	-----------	----	--	--------

Sample No.	Matrix*	Date Sampled	Time Sampled	ICP Metals	Arsenic	Oil and Grease	TPH	Conductivity	Turbidity	pH	Green Alpha	Green Beta	Si-SD	Gamma Spec	Triben
008JY4	W	7/14/95	1355	X	X	X	X	X	X	X	X	X	X	X	X

CHAIN OF POSSESSION		Sign/Print Names		SPECIAL INSTRUCTIONS		Notes* B - Soil BK - Borehole SD - Solid SL - Sludge W - Water O - Oil A - Air OS - Drums DL - Drums T - Tank W - Wipe L - Liquid V - Vapor X - Other
Relinquished By	Date/Time	Received By	Date/Time	Sample analysis for phosphates, nitrate, and nitrite by EPA 300.0; pH by SW-846 9040; and turbidity by EPA 180.1 are being requested for information only. The ERC Contractor acknowledges that the holding times will not be met.		
Relinquished By	Date/Time	Received By	Date/Time			
Relinquished By	Date/Time	Received By	Date/Time			
Relinquished By	Date/Time	Received By	Date/Time			

LABORATORY SECTION	Received By	Title	Date/Time
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

11-14-1995 11:47AM
 5893754238
 509-372-2106
 LESAT-Richland WA 99352
 000019

9613429.2441

Appendix 5

Data Validation Supporting Documentation

000020

RADIOCHEMICAL DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	<u>C</u>	D	E
PROJECT:	100-NR-2		DATA PACKAGE: LK5379-LAS		
VALIDATOR:	RBC	LAB: LAS	DATE: 11/16/95		
CASE:	SDG: LK 5379				
ANALYSES PERFORMED					
<input checked="" type="checkbox"/> Gross Alpha/Beta	<input checked="" type="checkbox"/> Strontium-90	<input type="checkbox"/> Technetium-99	<input type="checkbox"/> Alpha Spectroscopy	<input checked="" type="checkbox"/> Gamma Spectroscopy	
<input type="checkbox"/> Total Uranium	<input type="checkbox"/> Radium-22	<input checked="" type="checkbox"/> Tritium	<input type="checkbox"/>		
SAMPLES/MATRIX	BOGJY4 - water				

1. Completeness N/A
 Technical verification forms present? Yes No N/A

Comments: _____

2. Initial Calibration N/A
 Instruments/detectors calibrated within one year of sample analysis? Yes No N/A
 Initial calibration acceptable? Yes No N/A
 Standards NIST traceable? Yes No N/A
 Standards Expired? Yes No N/A

Comments: _____

- 3. Continuing Calibration N/A
- Calibration checked within one week of sample analysis? . . . Yes No N/A
- Calibration check acceptable? Yes No N/A
- Calibration check standards NIST traceable? Yes No N/A
- Calibration check standards expired? Yes No N/A

Comments: _____

- 4. Blanks N/A
- Method blank analyzed? Yes No N/A
- Method blank results acceptable? Yes No N/A
- Analytes detected in method blank? Yes No N/A
- Field blank(s) analyzed? Yes No N/A
- Field blank results acceptable? Yes No N/A
- Analytes detected in field blank(s)? Yes N/A N/A
- Transcription/Calculation Errors? Yes No N/A

Comments: _____

- 5. Matrix Spikes N/A
- Matrix spike analyzed? Yes No N/A
- Spike recoveries acceptable? Yes No N/A
- Spike source traceable? Yes No N/A
- Spike source expired? Yes No N/A
- Transcription/Calculation Errors? Yes No N/A

Comments: _____

A-2/2002

6. Laboratory Control Samples N/A

LCS analyzed? Yes No N/A

LCS recoveries acceptable? Yes No N/A

LCS traceable? Yes No N/A

Transcription/Calculation Errors? Yes No N/A

Comments: _____

7. Chemical Recovery N/A

Chemical carrier added? Yes No N/A

Chemical recovery acceptable? Yes No N/A

Chemical carrier traceable? Yes No N/A

Chemical carrier expired? Yes No N/A

Transcription/Calculation errors? Yes No N/A

Comments: SR-90

8. Duplicates N/A

Duplicates Analyzed? Yes No N/A

RPD Values Acceptable? Yes No N/A

Transcription/Calculation Errors? Yes No N/A

Comments: _____

A-3

9. Field QC Samples N/A

Field duplicate sample(s) analyzed? Yes No N/A

Field duplicate RPD values acceptable? Yes No N/A

Field split sample(s) analyzed? Yes No N/A

Field split RPD values acceptable? Yes No N/A

Performance audit sample(s) analyzed? Yes No N/A

Performance audit sample results acceptable? Yes No N/A

Comments: gross Beta RPD (31%)

Ac-228, Pb-212, Db-214, Ra-226, Ru106 + U-235 were
not analyzed by QES

10. Holding Times

Are sample holding times acceptable? Yes No N/A

Comments: _____

11. Results and Detection Limits (Levels D & E) N/A

Results reported for all required sample analyses? Yes No N/A

Results supported in raw data? Yes No N/A

Results Acceptable? Yes No N/A

Transcription/Calculation errors? Yes No N/A

MDA's meet required detection limits? Yes No N/A

Transcription/calculation errors? Yes No N/A

Comments: Ra-228, Eu-152, Eu-155, Fe-59, Ra-226

Ru-106, U234 MDA > CRDL

AC/HC

9613429.2446

Kearney/Centaur Division
A.T. Kearney, Inc.
2952 George Washington Way
Richland, Washington 99352
509 375 5667
Facsimile 509 375 5151

Management
Consultants

ATKEARNEY

19 December 1995

Ms. Joan Kessner
Bechtel Hanford Incorporated
Post Office Box 969 MSIN H4-23
Richland, Washington 99352



Dear Ms. Kessner:

Enclosed is the 100-NR-2 Groundwater Sampling Round 8
Summary Report.

Sincerely,

A handwritten signature in cursive script, appearing to read "Bruce Christian".

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Validation Reports 100-NR-2

**DATA VALIDATION SUMMARY REPORT
FOR THE
100-NR-2 OPERABLE UNIT
GROUNDWATER SAMPLING ROUND 8**

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DISCLAIMER

This report is designated as Revision 0. The report addresses the validation of the 100-NR-2 Operable Unit Groundwater Sampling Round 8 data. The report addresses only those samples that have been provided for data validation review.

All related quality assurance samples, including all field quality control samples, were reviewed and validated to verify that reported sample results were of sufficient quality to meet quality control objectives specified by Bechtel Hanford, Inc.

ACRONYMS

%D	Percent difference
AA	Atomic absorption
BFB	Bromofluorobenzene
BNA	Base/neutral and acid
CCB	Continuing calibration blank
CV	Coefficient of variation
CCV	Continuing calibration verification
CLP	Contract laboratory program
CRA	CRDL standard for AA
CRDL	Contract Required Detection Limit
CRI	CRDL standard for ICP
CRII	CRDL standard for ICP initial
CRIF	CRDL standard for ICP final
CRQL	Contract required quantitation limit
CVAA	Cold vapor atomic absorption
DBC	Dibutylchloroendate
DFTPP	Decafluorotriphenylphosphine
DQO	Data quality objectives
EPA	U.S. Environmental Protection Agency
GC/MS	Gas chromatography/mass spectrometry
GC	Gas chromatography
GFAA	Graphite furnace atomic absorption
GPC	Gel permeation chromatography
ICB	Initial calibration blank
ICP	Inductively coupled plasma emission spectrometry
ICS	ICP interference check sample
ICV	Initial calibration verification
IDL	Instrument detection limit
LCS	Laboratory control sample
LCSS	Laboratory control sample soil
LCSW	Laboratory control sample water
MDA	Minimum detectable activity
MSA	Method of standard addition
MS/MSD	Matrix spike/matrix spike duplicate
PBW	Preparation blank water
PCB	Polychlorinated biphenyl
PEM	Performance evaluation mixture
QA	Quality assurance
QC	Quality control
RDL	Required detection limit
RF	Response factor
RIC	Reconstructed ion chromatogram
RPD	Relative percent difference

RRF	Relative response factor
RRT	Relative retention time
RSD	Relative standard deviation
RT	Retention time
SDG	Sample delivery group
SOW	Statement of work
TAL	Target analyte list
TCL	Target compound list
TIC	Tentatively identified compounds
TOC	Total organic carbon
TOX	Total organic halogen
V	Validated
VOC	Volatile organic compounds

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1.0 INTRODUCTION

The information provided in this validation summary report includes data from the chemical analyses of samples from the 100-NR-2 Operable Unit Round 8 Groundwater Sampling Investigation. Data from this sampling event and their related quality assurance samples were reviewed and validated in accordance with WHC guidelines at the requested level.

Sample analyses included metals, general chemistry and radiochemistry. Forty-eight (48) metals samples were analyzed by Quanterra Environmental Services (QES) and Lockheed Analytical Services (LAS). The metals samples were validated using Westinghouse-Hanford protocols specified in *Data Validation Procedures for Chemical Analyses*, WHC-SD-EN-SPP-002, Rev. 2. All metals data were qualified based on this guidance. The container for sample number BOGJW7 in SDG No. W0721-QES was broken in transit and therefore no results were available for validation. The table below lists the metals SDGs that were validated for this sampling event.

SDG No.	Matrix	No. of Samples Analyzed	Level of Validation	Parameters
W0690	W	12	A	Metals
W0699	W	20	C	Metals
W0721	W	14	C	Metals
LK5379	W	2	C	Metals

Fifty (50) samples were analyzed for general chemistry parameters by QES and LAS laboratories. General chemistry sample analyses included the following parameters:

- Chloride
- Fluoride
- Nitrate
- Nitrite
- Orthophosphate
- Turbidity
- Specific Conductance
- pH
- Total Petroleum Hydrocarbons
- Oil and Grease

The general chemistry samples were validated using the Westinghouse Hanford protocols specified in *Data Validation Procedures for Chemical Analyses*, WHC-SD-EN-SPP-002, Rev. 2. All general chemistry data were qualified based on this guidance. The table below lists the general chemistry SDGs that were validated for this sampling event.

SDG No.	Matrix	No. of Samples Analyzed	Level of Validation	Parameters
W0690	W	13	A	General Chem
W0699	W	20	C	General Chem
W0721	W	15	C	General Chem
LK5379	W	2	C	General Chem

Twenty-nine (29) samples were analyzed for radiochemical parameters by QES and LAS laboratories. Radiochemistry sample analyses included the following parameters:

- Gross alpha and gross beta determination
- Strontium-90
- Gamma Spectroscopy
- Tritium

The radiochemical samples were validated using the Westinghouse-Hanford protocols specified in *Data Validation Procedures for Radiochemical Analyses*, WHC-SD-EN-SPP-001, Rev. 1. All radiochemical samples were qualified based on this guidance. The table below lists the radiochemistry SDGs that were validated for this sampling event.

SDG No.	Matrix	No. of Samples Analyzed	Level of Validation	Parameters
W0690	W	8	A	Radiochemistry
W0699	W	10	C	Radiochemistry
W0721	W	10	C	Radiochemistry
LK5379	W	1	C	Radiochemistry

Quality Control Samples

Included with the samples within this report are the following QC samples: Split samples, field duplicate samples, trip blanks and equipment blanks.

Split Samples

A field split sample is used to assess precision. A field split sample is a duplicate of a representative sample(s) from a sampling event that is sent to a third party (reference) laboratory for analysis. Two sets of split samples were submitted to the QES and LAS laboratories as shown below:

<u>Sample No.</u>	<u>Split Sample No.</u>	<u>Well Location</u>
BOGJS8(QES)	BOGJY4(LAS)	199-N-21
BOGJS9(QES)	BOGJY5(LAS)	199-N-21

The results for the split samples were compared using the validation guidelines for determining the RPD between a sample and its duplicate. All radiochemistry results fell within the required control limits with the exception of:

- Gross beta in SDG No. LK5379-LAS (sample pair BOGJS8/BOGJY4).

All general chemistry and metal results fell within the required control limits.

No qualifiers were assigned based on the split sample results, since under WHC validation guidelines, sample data are not qualified based on split samples results. All results for both well locations appear in the summary tables within this report.

Field Duplicates

A field duplicate sample is a sample that is split and submitted to a given laboratory as two discrete field samples without the laboratory knowing the duplicate identity. Three sets of field duplicate samples were submitted to the QES laboratory as shown below:

Set 1:

<u>Sample No.</u>	<u>Duplicate Sample No.</u>	<u>Well Location</u>
BOGJV0	BOGJX8	199-N-54
BOGJV1	BOGJX9	199-N-54

Set 2:

<u>Sample No.</u>	<u>Duplicate Sample No.</u>	<u>Well Location</u>
BOGJV6	BOGJY0	199-N-70
BOGJV7	BOFJY1	199-N-70

Set 3:

<u>Sample No.</u>	<u>Duplicate Sample No.</u>	<u>Well Location</u>
BOGJV8	BOGJY2	199-N-75
BOGJV9	BOGJY3	199-N-75

The field duplicate results were compared using the validation guidelines for determining the RPD between a sample and its duplicate. All metals, general chemistry, and radiochemistry results fell within the required control limits.

No qualifiers were assigned based on the duplicate sample results, since under WHC guidelines, sample data are not qualified based on field duplicate results. All results for both well locations appear in the summary tables within this report.

Equipment Blanks

Equipment blanks are water samples used to determine whether or not decontamination procedures were adequate or that contamination was not inherent in the equipment used. Four equipment blanks were submitted to the QES laboratory as follows:

- Samples BOGJW6, BOGJW7 (sample container destroyed), BOGJW8 and BOGJX0.

The following metal analytes were detected in the equipment blanks:

- Barium, calcium, iron, magnesium, manganese, sodium and zinc in sample BOGJW6.
- Barium, beryllium, calcium, copper, iron, magnesium, manganese, sodium, vanadium and zinc in sample BOGJW8.
- Barium, calcium, iron, magnesium, manganese, sodium, vanadium, and zinc in sample BOGJX0.

The following general chemistry analytes were detected in the equipment blanks:

- Turbidity in samples BOGJW6, BOGJW8, and BOGJX0.
- Oil and Grease in samples BOGJW8 and BOGJX0.

The following radiochemical analytes were detected in the equipment blanks:

- Gross beta in sample BOGJW6.

No qualifiers were assigned since under WHC validation guidelines, sample data are not qualified based on field blank results.

Trip Blanks

Trip blanks are deionized water samples used to measure contamination during sample transport. Trip blanks travel with sample containers to the sampling site and return unopened to the laboratory with the samples to be analyzed. Five trip blanks were submitted to QES as follows:

Samples BOGJX2, BOGJX3, BOGJX4, BOGJX5, and BOGJX6.

The following metal analytes were detected in the trip blanks:

- Barium, calcium, chromium, iron, magnesium, manganese, sodium, vanadium and zinc in sample BOGJX2.
- Barium, calcium, iron, magnesium, manganese, sodium and zinc in sample BOGJX3.
- Barium, beryllium, calcium, copper, iron, magnesium, manganese, potassium, silver, sodium, vanadium and zinc in sample BOGJX4.
- Barium, beryllium, calcium, copper, iron, magnesium, manganese, potassium, sodium, vanadium and zinc in sample BOGJX5.
- Barium, beryllium, calcium, copper, iron, magnesium, manganese, sodium, vanadium, and zinc in sample BOGJX6.

The following wet chemistry analytes were detected in the trip blanks:

- Nitrate, oil and grease, and turbidity in sample BOGJX4.
- Nitrate in sample BOGJX5.

- Turbidity and oil and grease in sample BOGJX6.

No detects were reported for trip blanks analyzed for radiochemical parameters.

No qualifiers were assigned since under WHC validation guidelines, sample data are not qualified based on field blank results.

The following report is broken down into sections for metals, general chemistry and radiochemical analyses. Each metals section includes:

- A general validation summary which addresses precision, accuracy, representativeness, completeness, and comparability;
- Holding times;
- Calibrations;
- Blanks, including calibration, and preparation blanks;
- Analytical accuracy including matrix spike samples, laboratory control samples, GFAA analytical spikes and MSA results;
- Analytical precision including laboratory duplicates, ICP serial dilutions, field duplicates, field splits, and GFAA duplicate injections;
- Sample result quantitation, verification and reported detection limits; and
- System performance and overall assessment.

Each general chemistry section includes:

- A general validation summary which addresses precision, accuracy, representativeness, completeness, and comparability;
- Holding times;
- Calibrations;
- Blanks, including calibration and preparation blanks;
- Analytical accuracy including matrix spike samples and laboratory control samples;
- Analytical precision including laboratory duplicates, field duplicates and field splits;
- Sample result quantitation, verification and reported detection limits; and
- System performance and overall assessment.

Each radiochemistry section includes:

- A general validation summary which addresses precision, accuracy, representativeness, completeness, and comparability;
- Holding times;
- Calibrations;
- Blanks, including laboratory and method blanks;

- Analytical accuracy including chemical recoveries, matrix spike samples and laboratory control samples;
- Analytical precision including laboratory duplicates, field duplicates and field splits;
- Sample result quantitation, verification and reported detection limits; and
- System performance and overall assessment.

In addition, the appendices include the data summary tables as well as the validated laboratory report forms for metals, general chemistry and radiochemistry analyses.

Data validation personnel added qualifiers to the reported data based on specified data quality objectives. Qualifiers which may be applied by data validators in compliance with WHC guidelines are as follows:

- U - Indicates the compound or analyte was analyzed for and not detected in the sample. The value reported is the sample quantitation limit corrected for sample dilution and moisture content by the laboratory.
- UJ - Indicates the compound or analyte was analyzed for and not detected in the sample. Due to a QC deficiency identified during the data validation, the associated quantitation limit is an estimate.
- J - Indicates the compound or analyte was analyzed for and detected. Due to a QC deficiency identified during the data validation, the associated concentration is an estimate, but the data are usable for decision-making purposes.
- BJ - Applied to inorganic analyses only. Indicates the analyte concentration was greater than the IDL but less than the CRDL and is considered an estimated value.
- R - Indicates the compound or analyte was analyzed for, detected, and due to an identified QC deficiency, the data are unusable.
- UR - Indicates the compound or analyte was analyzed for and not detected in the sample. Additionally, the data is unusable due to an identified QC deficiency.

- NJ - Indicates presumptive evidence of a compound at an estimated value. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).
- N - Indicates presumptive evidence of a compound. The data may not be valid for some specific applications (i.e., usable for decision-making purposes).

1.1 OBJECTIVES AND SCOPE

Data validation is performed in order to determine the usability of analytical results to support programmatic decisions regarding the selection of cleanup remedies and investigative approach. Data validation is the process of reviewing a body of analytical data to determine if it meets the criteria defined in the WHC validation guidelines, and to assure that the data are acceptable for their intended use. The validation process consists of:

- Verifying the data packages for completeness using validation Level A;
- Verifying compliance with quality assurance (QA) requirements;
- Checking quality control (QC) values against the defined limits; and
- Applying qualifiers to analytical results for the purpose of defining the limitations of the reviewed data;

The result of data validation is the completion of narrative reports, checklists, and summary forms. The validation will be used to determine whether the analytical data are acceptable for their intended use.

The objectives of this data validation project is to provide Bechtel Hanford Inc. with reliable environmental data regarding the 100-NR-2 Operable Unit Round 8 Groundwater Sampling Investigation.

1.2 SAMPLES AND ANALYSES

SAMPLES AND ANALYSES						
Data Package No.	Sample Number	Sample Location	Sample Date	Sample Type ²	Level of Validation	Analysis ¹
W0690-QES	BOGHX9	199-N-73	08/28/95	GW	A	1,2,3
W0690-QES	BOGHX8	199-N-71	08/28/95	GW	A	1,2,3
W0690-QES	BOGHY0	199-N-74	08/28/95	GW	A	1,2,3
W0690-QES	BOGJS1	199-N-16	09/06/95	GW	A	1,2,3
W0690-QES	BOGJS2	199-N-16	09/06/95	GW	A	1,2

SAMPLES AND ANALYSES						
Data Package No.	Sample Number	Sample Location	Sample Date	Sample Type ²	Level of Validation	Analysis ¹
W0690-QES	B0GJS6	199-N-19	09/06/95	GW	A	2
W0690-QES	B0GHX6	199-N-67	09/07/95	GW	A	1,2,3
W0690-QES	B0GJT4	199-N-32	09/07/95	GW	A	1,2,3
W0690-QES	B0GJT6	199-N-50	09/07/95	GW	A	1,2,3
W0690-QES	B0GJT8	199-N-51	09/07/95	GW	A	1,2,3
W0690-QES	B0GJT9	199-N-51	09/07/95	GW	A	1,2
W0690-QES	B0GJT7	199-N-50	09/07/95	GW	A	1,2
W0690-QES	B0GJT5	199-N-32	09/07/95	GW	A	1,2
W0699-QES	B0GJS8	199-N-21	09/14/95	GW	C	1,2,3
W0699-QES	B0GJS9	199-N-21	09/14/95	GW	C	1,2
W0699-QES	B0GJT0	199-N-25	09/05/95	GW	C	1,2,3
W0699-QES	B0GJT1	199-N-25	09/05/95	GW	C	1,2
W0699-QES	B0GJT2	199-N-26	09/05/95	GW	C	1,2,3
W0699-QES	B0GJT3	199-N-26	09/05/95	GW	C	1,2
W0699-QES	B0GJV0	199-N-54	09/13/95	GW	C	1,2,3
W0699-QES	B0GJV1	199-N-54	09/13/95	GW	C	1,2
W0699-QES	B0GJV8	199-N-75	09/12/95	GW	C	1,2,3
W0699-QES	B0GJV9	199-N-75	09/12/95	GW	C	1,2
W0699-QES	B0GJW0	199-N-76	09/05/95	GW	C	1,2,3
W0699-QES	B0GJW1	199-N-76	09/05/95	GW	C	1,2
W0699-QES	B0GJW4	199-N-80	09/11/95	GW	C	1,2,3
W0699-QES	B0GJW5	199-N-80	09/11/95	GW	C	1,2

SAMPLES AND ANALYSES						
Data Package No.	Sample Number	Sample Location	Sample Date	Sample Type ²	Level of Validation	Analysis ¹
W0699-QES	B0GJX4	199-N-54	09/13/95	GW,TB	C	1,2,3
W0699-QES	B0GJX5	199-N-54	09/13/95	GW,TB	C	1,2
W0699-QES	B0GJX8	199-N-54	09/13/95	GW,DUP	C	1,2,3
W0699-QES	B0GJX9	199-N-54	09/13/95	GW,DUP	C	1,2
W0699-QES	B0GJY2	199-N-75	09/12/95	GW,DUP	C	1,2,3
W0699-QES	B0GJY3	199-N-75	09/12/95	GW,DUP	C	1,2
W0721-QES	B0GJS7	199-N-20	09/20/95	GW	C	2
W0721-QES	B0GHX7	199-N-3	09/15/95	GW	C	1,2,3
W0721-QES	B0GJV2	199-N-64	09/20/95	GW	C	1,2,3
W0721-QES	B0GJV6	199-N-70	09/18/95	GW	C	1,2,3
W0721-QES	B0GJV7	199-N-70	09/18/95	GW	C	1,2
W0721-QES	B0FJW2	199-N-77	09/15/95	GW	C	1,2,3
W0721-QES	B0GJW3	199-N-77	09/15/95	GW,	C	1,2
W0721-QES	B0GJW6		09/15/95	GW,EB	C	1,2,3
W0721-QES	B0GJW8	199-N-64	09/20/95	GW,EB	C	1,2,3
W0721-QES	B0GJX0	199-N-20	09/20/95	GW,EB	C	1,2,3
W0721-QES	B0GJX2		09/15/95	GW,TB	C	1,2,3
W0721-QES	B0GJX3		09/15/95	GW,TB	C	1,2
W0721-QES	B0GJX6	199-N-64	09/20/95	GW,TB	C	1,2,3
W0721-QES	B0GJY0	199-N-70	09/18/95	GW,DUP	C	1,2,3
W0721-QES	B0GJY1	199-N-70	09/18/95	GW,DUP	C	1,2

SAMPLES AND ANALYSES						
Data Package No.	Sample Number	Sample Location	Sample Date	Sample Type ²	Level of Validation	Analysis ¹
LK5379-LAS	B0GJY4	199-N-21	09/14/95	GW, SPLIT	C	1,2,3
LK5379-LAS	B0GJY5	199-N-21	09/14/95	GW, SPLIT	C	1,2

¹ 1 = Inorganics, 2 = General Chemistry, 3 = Radiochemistry

² GW = Ground Water EB = Equipment Blank DUP = Duplicate TB = Trip Blank SPLIT = Split Sample

2.0 METALS DATA VALIDATION SUMMARY

2.1 SUMMARY

Positive preparation blank contamination was detected in numerous samples. Two samples were not preserved as required by the analytical method. All associated results for the two samples were flagged accordingly.

With the exceptions noted above, the project-specific data quality objectives in terms of precision, accuracy, completeness, representativeness, and comparability have been met.

2.2 HOLDING TIMES

Analytical holding times for ICP metals analyses were assessed to ascertain whether the holding time requirements were met by the laboratory. The holding time requirements are as follows: Samples must be analyzed within six months for all metals.

Sample number B0GJX8 in SDG No. W0699-QES and sample number B0GJX2 in SDG No. W0721-QES were not preserved as required in WHC protocols and the analytical method. Therefore, based on professional judgement and the requirements in the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, all results for these sample have been qualified as estimates and flagged "J/UJ".

Holding times were met for all samples.

2.3 CALIBRATIONS

Performance of specific instrument quality assurance and quality control procedures, including deficiencies noted during the quality assurance review, are outlined below.

The calibrations are each immediately verified with an ICV standard and a calibration blank. The ICV is prepared from a source independent of the calibration standards, at a mid-calibration range concentration. The ICV percent recovery must fall within the control limits of 90% to 110% for metals analyzed by ICP. Calibration linearity near the detection limit is verified with a standard prepared at a concentration near the CRDL.

The calibrations are subsequently verified at regular intervals using a CCV standard. The control windows for percent recovery of CCV standards are the same as the ICV windows described above.

Calibrations are not reviewed under Level C validation.

2.3.1 ICP Calibration

An ICS is analyzed at the beginning and end of each ICP sample run to verify the laboratory interelement and background correction factors. Results for the ICS solution must fall within the control limit of $\pm 20\%$ of the true value.

ICP calibration is not reviewed under Level C validation.

2.3.2 Atomic Absorption Calibrations

Duplicate injections are required for all GFAA analyses. The duplicate injections establish the precision of the individual analytical determinations. For sample concentrations greater than the CRDL, duplicate injections must agree within plus or minus 20% RSD or CV.

Duplicate injections are not reviewed under Level C validation.

2.4 BLANKS

2.4.1 Calibration Blanks

A calibration blank must be analyzed at each wavelength used for analysis immediately after every initial and continuing calibration verification, at a frequency of 10% or every two hours during the run. The blank must be analyzed at the beginning of the run and after the last analytical sample. A CCB must be run after the last CCV following the last analytical sample of the run. In the case of positive blank results, samples with results (in ug/L) of less than five times the highest amount found in any of the associated blanks have had their associated values qualified as non-detected and flagged "U". Samples with concentrations greater than five times the highest blank value do not require qualification.

If the absolute value of any negative calibration blank exceeds the IDL, all non-detects are qualified as estimates and flagged "UJ". All associated positive results within two times the absolute blank value are qualified as estimates and flagged "J". The qualification applies only to results generated between the associated calibration blank and the nearest acceptable calibration blank.

Calibration results are not reviewed under Level C validation.

2.4.2 Preparation Blanks

At least one preparation blank, consisting of deionized distilled water must be prepared and analyzed with every sample delivery group. In the case of positive blank results, samples with results (in ug/L) of less than 5 times the preparation blank value have their associated values qualified as non-detected and flagged "U". Samples with concentrations of greater than five times the highest blank concentration do not require qualification.

If the absolute value of the negative preparation blank exceeds the CRDL, all associated undetected results are rejected and flagged "UR". All associated detects that are less than ten times the absolute value of the preparation blank result are qualified as estimates and flagged "J". If the sample results are greater than ten times the absolute value of the preparation blank, no qualification is necessary. If the absolute value of the negative preparation blank is greater than the IDL and less than or equal to the CRDL, all associated non-detected sample results are qualified as estimates and flagged "UJ". All associated detects less than ten times the absolute value of the preparation blank are qualified as estimates and flagged "J".

Due to the presence of a positive preparation blank result, aluminum results in SDG No. W0699-QES sample numbers B0GJS9, B0GJT2 and B0GJX8 have been flagged "U".

Due to the presence of a positive preparation blank result, beryllium results in SDG No. W0699-QES sample numbers B0GJS8, B0GJS9, B0GJT0, B0GJT1, B0GJT2, B0GJV0, B0GJV1, B0GJV8, B0GJV9, B0GJW1, B0GJW4, B0GJW5, B0GJX8, B0GJX9, B0GJY2 and B0GJY3 have been flagged "U".

Due to the presence of a positive preparation blank result, copper results in SDG No. W0699-QES sample numbers B0GJS8, B0GJS9, B0GJT0, B0GJT2, B0GJV0, B0GJV1, B0GJV8, B0GJV9, B0GJW0, B0GJW1, B0GJW4, B0GJW5, B0GJX8, B0GJX9, B0GJY2 and B0GJY3 have been flagged "U".

Due to the presence of a positive preparation blank result, iron results in SDG No. W0699-QES sample numbers B0GJS8, B0GJS9, B0GJT0, B0GJT1, B0GJT3, B0GJV0, B0GJV1, B0GJV8, B0GJV9, B0GJW0, B0GJW1, B0GJW4, B0GJW5, B0GJX8, B0GJX9, B0GJY2 and B0GJY3 have been flagged "U".

Due to the presence of a positive preparation blank result, manganese results in SDG No. W0699-QES sample numbers B0GJS9, B0GJV0, B0GJV8, B0GJV9, B0GJW0, B0GJW1, B0GJW4, B0GJW5, B0GJY2 and B0GJY3 have been flagged "U".

Due to the presence of a positive preparation blank result, all vanadium results in SDG No. W0699-QES in all samples except B0GJX4 and B0GJX5 have been flagged "U".

Due to the presence of a positive preparation blank result, all zinc results in all samples in SDG No. W0699-QES except B0GJX4 and B0GJX5 have been flagged "U".

Due to the presence of a positive preparation blank result, the aluminum result for SDG No. W0721-QES sample number B0GHX7 has been flagged "U".

Due to the presence of a positive preparation blank result, the beryllium results for SDG No. W0721-QES sample numbers B0GHX7, B0GJV2, and B0GJW2 have been flagged "U".

Due to the presence of a positive preparation blank result, the iron results for SDG No. W0721-QES, sample numbers B0GJV6, B0GJV7, B0GJW2, B0GJW3, B0GJY0 and B0GJY1, have been flagged "U".

Due to the presence of a positive preparation blank result, the zinc results for SDG No. W0721-QES sample numbers B0GJV7, B0GJW2, B0GJY0 and B0GJY1 have been flagged "U".

To avoid masking potential sources of contamination, professional judgement was used to determine that for SDG Nos. W0699-QES and W0721-QES, the trip blank and equipment blank results would not be qualified based on method blank results.

Due to the presence of a positive preparation blank result, the zinc result in SDG No. LK5379-LAS sample number B0GJY4 has been flagged "U".

All other preparation blank results were acceptable.

2.5 ACCURACY

2.5.1 Matrix Spike Samples

Matrix spike analyses are used to assess the analytical accuracy of the reported data and the effect of the matrix on the ability to accurately quantify sample concentrations. Matrix spike recoveries must fall within the range of 75% to 125%. Samples with a spike recovery of less than 30% and a sample value below the IDL are rejected and flagged "UR". Samples with a spike recovery of 30% to 74% and a sample result less than the IDL are qualified "UJ". Samples with a spike recovery of greater than 125% or less than 75% and a sample result

greater than the IDL are qualified "J". All samples with a spike recovery greater than 125% and a sample result less than the IDL require no qualification.

All matrix spike recovery results were acceptable.

2.5.2 Laboratory Control Samples

The LCS monitors the overall performance of the analysis, including the sample preparation. An LCS should be digested or distilled and analyzed with every group of samples which have been prepared together. Non-detected sample results with a LCS recovery between 50% and 79% are qualified as estimates and flagged "UJ". Detected sample results with a LCS recovery between 50% to 79% or greater than 120% are qualified as estimates and flagged "J". Associated sample results with a LCS recovery less than 50% are rejected and flagged "R".

LCS results are not considered under Level C validation.

2.5.3 GFAA Analytical Spikes

The post-digestion analytical spike is analyzed to determine the extent of interference in the sample matrix. The analytical spike recoveries establish the accuracy of the individual GFAA determinations.

Positive sample results whose analytical spike results are outside the 85% to 115% control limit, but whose absorbances are less than 50% of the analytical spike absorbance, are qualified as estimates and flagged "J". In cases where the analytical spike recovery was less than 10 percent, all non-detects are rejected and flagged "UR".

GFAA analytical spike results are not reviewed under Level C validation

2.5.4 Method of Standard Addition (MSA) Results

For all samples whose analytical spike results are outside the 85% to 115% control limit and whose absorbances are greater than 50% of the analytical spike absorbance, an MSA is required. In cases where the MSA correlation coefficient was less than 0.995, the MSA analysis is repeated once. If the correlation coefficient was still less than 0.995, samples are qualified as estimates and flagged "J". If a sample required MSA analysis but was not analyzed, all associated data must be qualified as estimates and flagged "J".

MSA results are not reviewed under Level C validation.

2.6 ANALYTICAL PRECISION

2.6.1 Laboratory Duplicate Samples

The laboratory duplicate results are used to assess the precision of the method by measuring a second aliquot of the sample that is treated the same way as the original. If the RPD of the original sample and its duplicate is greater than 35% and the positive sample result is greater than five times the CRDL, the associated sample result is qualified as an estimate and flagged "J". Also, if the difference between the duplicate samples is greater than plus or minus the CRDL and the positive sample result is less than five times the CRDL, the associated sample result is qualified as an estimate and flagged "J".

All laboratory duplicate results were acceptable.

2.6.2 ICP Serial Dilution

The ICP serial dilution is used to determine whether significant physical or chemical interferences exist due to sample matrix. If a sample concentration is less than or equal to fifty times the IDL for an analyte and the %D is outside the plus or minus 10% control limits the associated data are qualified as estimates and flagged "J".

Serial dilution results are not reviewed under Level C validation.

2.6.3 Field Duplicates

Field duplicate results are compared using the same guidelines for determining the RPD between a sample and its duplicate. According to WHC validation guidelines, no qualifiers are assigned based on field duplicate results. Field duplicate results are discussed in section 1.0 of this report.

2.6.4 Field Split Samples

A field split sample is a representative sample from a sampling event that is sent to a third party laboratory. The field split sample results are evaluated by comparing the corresponding sample results to the reference laboratory sample results. According to WHC validation guidelines, no qualifiers are assigned based on field split results. Field duplicate results are discussed in section 1.0 of this report.

2.6.5 GFAA Duplicate Injections

Each GFAA analysis requires a minimum of two injections (burns), except for full MSAs. The RSD for the duplicate injections must be within the control limits of plus or minus 20% for samples with concentrations greater than the CRQL. If these requirements are not met, the analytical sample must be rerun once (i.e., two additional burns). If the readings are then still outside the QC limits, the result is qualified as an estimate and flagged "J".

GFAA duplicate injections are not reviewed under Level C validation.

2.7 SAMPLE DETECTION LIMITS

The objective of reviewing detection limits is to verify that reported detection limits are less than or equal to the CRDL. All sample results and reported detection limits were acceptable.

2.8 SYSTEM PERFORMANCE AND OVERALL ASSESSMENT

Positive preparation blank contamination was detected in numerous samples. Associated sample results were flagged accordingly. Two samples were not preserved as required by the analytical method and WHC guidelines and were qualified as estimates and flagged "J/UJ". Data flagged "J" indicates that the associated concentration is an estimate, but per WHC guidelines, the data are usable for decision making purposes. All other validated results are considered accurate within the standard error associated with the methods.

All metals data packages submitted for validation were found to be 100% complete.

3.0 GENERAL CHEMISTRY DATA VALIDATION SUMMARY

3.1 SUMMARY

Holding times were exceeded for pH, turbidity, nitrate, nitrite, and phosphate in all samples in all SDGs. All associated positive sample results were qualified as estimates and flagged "J" and all non-detects rejected and flagged "UR". Samples submitted for TPH analysis in SDG Nos. W0690-QES, W0699-QES and W0721-QES and oil and grease analysis in SDG No. LK5379-LAS were not preserved as called for in the analytical method and WHC guidelines and were, therefore, rejected and flagged "R/UR".

With the above noted exceptions, the project-specific data quality objectives in terms of precision, accuracy, completeness, representativeness, and comparability have been met.

3.2 HOLDING TIMES

Analytical holding times were assessed to ascertain whether the holding time requirements were met by the laboratory. The holding time requirements are as follows: 28 days for fluoride, chloride, sulfate, specific conductivity and oil and grease; 14 days for total petroleum hydrocarbons; 48 hours for turbidity, nitrate, nitrite and phosphate and immediately for pH.

If holding times are exceeded, but not by greater than two times the limit, all associated sample results are qualified as estimates and flagged "J" for detects and "UJ" for non-detects. If holding times are exceeded by greater than two times the limit, all associated detected sample results are qualified as estimates and flagged "J" and all non-detects are rejected and flagged "UR".

The holding time for nitrate was exceeded by less than two times the limit for SDG No. W0690-QES samples BOGHX8, BOGHX9 and BOGHY0 and by greater than twice the limit for sample numbers BOGHX6, BOGJS1, BOGJS2, BOGJT4, BOGJT5, BOGJT6, BOGJT7, BOGJT8, and BOGJT9. All associated results were detects and were, therefore, qualified as estimates and flagged "J".

The holding time for nitrite was exceeded by less than two times the limit for SDG No. W0690-QES samples BOGHX8, BOGHX9 and BOGHY0. All associated results were non-detects, and were therefore flagged "UJ". The holding time for nitrite was exceeded by greater than twice the limit for sample numbers BOGHX6, BOGJS1, BOGJS2, BOGJT4, BOGJT5, BOGJT6, BOGJT7, BOGJT8, and BOGJT9. All associated results were non-detects and were, therefore, rejected and flagged "UR".

The holding time for orthophosphate was exceeded by less than two times the limit for SDG No. W0690-QES samples B0GHX8, B0GHX9 and B0GHY0. All associated results were non-detects and, therefore, flagged "UJ". The holding time for orthophosphate was exceeded by greater than twice the limit for sample numbers B0GJS1, B0GJS2, B0GHX6, B0GJT4, B0GJT5, B0GJT6, B0GJT7, B0GJT8, and B0GJT9. All associated results were non-detects and were, therefore, rejected and flagged "UR".

The holding time for pH was exceeded by less than two times the limit for SDG No. W0690-QES samples B0GJS1, B0GJT4, B0GJT6 and B0GJT8. All associated results were detects and were, therefore, flagged "J".

The holding time for turbidity was exceeded by greater than two times the limit for SDG No. W0690-QES samples B0GHX6, B0GHX8, B0GHX9, B0GJS1, B0GJT4, B0GJT6, B0GJT8 and B0GHY0. All associated results were detects and were, therefore, flagged "J".

The holding time for nitrate was exceeded by less than two times the limit for SDG No. W0699-QES samples B0GJW4 and B0GJW5 and by greater than twice the limit for sample numbers B0GJS8, B0GJS9, B0GJT0, B0GJT1, B0GJT2, B0GJT3, B0GJV0, B0GJV1, B0GJV8, B0GJV9, B0GJW0, B0GJW1, B0GJX4, B0GJX5, B0GJX8, B0GJX9, B0GJY2 and B0GJY3. All associated results were detects and were, therefore, qualified as estimates and flagged "J".

The holding time for nitrite was exceeded by greater than twice the limit for SDG No. W0699-QES sample numbers B0GJS8, B0GJS9, B0GJT0, B0GJT1, B0GJT2, B0GJT3, B0GJV0, B0GJV1, B0GJV8, B0GJV9, B0GJW0, B0GJW1, B0GJX4, B0GJX5, B0GJX8, B0GJX9, B0GJY2 and B0GJY3. All associated results were non-detected and were, therefore, rejected and flagged "UR".

The holding time for nitrite was exceeded, but not by greater than twice the limit, for SDG No. W0699-QES sample numbers B0GJW4 and B0GJW5. Therefore, the associated results, both non-detects, were qualified as estimates and flagged "UJ".

The holding time for orthophosphate was exceeded by greater than twice the limit for SDG No. W0699-QES sample numbers B0GJS8, B0GJS9, B0GJT0, B0GJT1, B0GJT2, B0GJT3, B0GJV0, B0GJV1, B0GJV8, B0GJV9, B0GJW0, B0GJW1, B0GJX4, B0GJX5, B0GJX8, B0GJX9, B0GJY2 and B0GJY3. All associated results were non-detected, and therefore rejected and flagged "UR".

The holding time for orthophosphate was exceeded, but not by greater than twice the limit for SDG No. W0699-QES sample numbers B0GJW4 and B0GJW5. Therefore, the associated results, both non-detects, were qualified as estimates and flagged "UJ".

The holding time for turbidity was exceeded by greater than twice the limit for SDG No. W0699-QES sample numbers B0GJS8, B0GJT0, B0GJT2, B0GJV0, B0GJV8, B0GJW0, B0GJW4, B0GJX4, B0GJX8 and B0GJY2. All associated results were detects and were therefore qualified as estimates and flagged "J".

The holding time for pH was grossly exceeded for SDG No. W0699-QES sample numbers B0GJS8, B0GJT0, B0GJT2, B0GJV0, B0GJV8, B0GJW0, B0GJW4, B0GJX4, B0GJX8 and B0GJY2. Therefore, the associated results were qualified as estimates and flagged "J".

The TPH method requires that water samples be preserved with 5 ml of HCl if analysis will not be performed within several hours of sampling. No preservatives were added to any of the sample aliquots in SDG Nos. W0690-QES, W0699-QES and W0721-QES used for TPH analysis, nor were they analyzed within several hours of sampling. Therefore, since all TPH results were non-detects, all TPH results have been rejected and flagged "UR".

The holding time for nitrate was exceeded by greater than twice the limit in all SDG No. W0721-QES samples analyzed for anions. The associated detected results in samples B0GHX7, B0GJV2, B0GJV6, B0GJV7, B0GJW2, B0GJW3, B0GJY0 and B0GJY1 were qualified as estimates and flagged "J". The associated non-detected results in samples B0GJW6, B0GJW8, B0GJX0, B0GJX2, B0GJX3 and B0GJX6 were rejected and flagged "UR".

The holding time for nitrite was exceeded by greater than twice the limit for SDG No. W0721-QES sample numbers B0GHX7, B0GJV2, B0GJV6, B0GJV7, B0GJW2, B0GJW3, B0GJW6, B0GJW8, B0GJX0, B0GJX2, B0GJX3, B0GJX6, B0GJY0 and B0GJY1. All associated results were non-detects and were therefore rejected and flagged "UR".

The holding time for orthophosphate was exceeded by greater than twice the limit for SDG No. W0721-QES sample numbers B0GHX7, B0GJV2, B0GJV6, B0GJV7, B0GJW2, B0GJW3, B0GJW6, B0GJW8, B0GJX0, B0GJX2, B0GJX3, B0GJX6, B0GJY0 and B0GJY1. All associated results were non-detects and were therefore rejected and flagged "UR".

The holding time for pH was grossly exceeded for SDG No. W0721-QES sample numbers B0GJV2, B0GJV6, B0GJW2, B0GJW6, B0GJW8, B0GJX0, B0GJX2, B0GJX6 and B0GJY0. Therefore, the associated results were qualified as estimates and flagged "J".

The holding time for turbidity was exceeded by greater than twice the limit for SDG No. W0721-QES sample numbers B0GHX7, B0GJV2, B0GJV6, B0GJW2, B0GJW6, B0GJW8, B0GJX0, B0GJX2, B0GJX6 and B0GJY0. The associated results were all positive and therefore were qualified as estimates and flagged "J".

The holding time for nitrate was exceeded by greater than twice the limit for SDG No. LK5379-LAS sample numbers B0GJY4 and B0GJY5. Therefore, the associated results, both detects, were qualified as estimates and flagged "J".

The holding time for nitrite was exceeded by greater than twice the limit for SDG No. LK5379-LAS sample numbers B0GJY4 and B0GJY5. Therefore, the associated results, both non-detects, were rejected and flagged "UR".

The holding time for orthophosphate was exceeded by greater than twice the limit for SDG No. LK5379-LAS sample numbers B0GJY4 and B0GJY5. Therefore, the associated results, both non-detects, were rejected and flagged "UR".

The holding time for turbidity was exceeded by greater than twice the limit for SDG No. LK5379-LAS sample number B0GJY4. Therefore, the associated detected result was qualified as an estimate and flagged "J".

The holding time for pH was grossly exceeded for SDG No. LK5379-LAS sample number B0GJY4. Therefore, the associated result was qualified as an estimate and flagged "J".

The Oil and Grease method requires that water samples be preserved with 5 ml of HCl if analysis will not be performed within several hours of sampling. No preservatives were added to the aliquot of SDG No. LK5379-LAS sample B0GJY4 which was used for Oil and Grease analysis, nor was the sample analyzed within several hours of sampling. Therefore, since the Oil and Grease result was non-detected, the result was rejected and flagged "UR".

Holding times for all other analytes met QC requirements.

3.3 CALIBRATIONS

3.3.1 Initial Calibration

The following calibration procedures must be conducted:

- At least one blank and three standards are used to establish the ion chromatography, ion selective electrode, and spectrophotometer calibrations prior to sample analysis with a correlation greater than or equal to 0.995.
- At least two reference buffers or standards at a high and low concentration were used to calibrate the pH and conductivity meters.

If any of these initial calibration requirements are not met, all associated data are qualified "J" for detects and "UJ" for non-detects.

Initial calibration results are not reviewed under Level C validation.

3.3.2 Continuing Calibration Verification

All CCV standards must be analyzed within the required frequency or every 20 samples. The percent recoveries must fall within the 90%-110% acceptance windows. If the recoveries fall outside this window, then all associated detects are qualified as estimates and flagged "J" and all non-detects are flagged "UJ".

Continuing calibration results are not considered under Level C validation.

3.4 BLANKS

3.4.1 Laboratory Blanks

At least one laboratory preparation blank must be analyzed with each sample batch. At least one initial calibration blank must be analyzed for every 20 samples. As per WHC guidelines, no qualification of data based on blank contamination is required.

All laboratory blank results were acceptable.

3.5 ACCURACY

3.5.1 Matrix Spike Recovery

Matrix spike analyses are used to assess the analytical accuracy of the reported data and the effect of the matrix on the ability to accurately quantify sample concentrations. Matrix spike recoveries must fall within the range of 75% to 125%. Samples with a spike recovery less than 30% and a sample value below the IDL are rejected and flagged "UR". Samples with a spike recovery between 30% and 74% and a sample value below the IDL are qualified as estimates and flagged "UJ". Samples with a spike recovery of less than 75% or greater than 125% and a sample value greater than the IDL are qualified as "J". Finally, samples with a spike recovery of greater than 125% and a sample value less than the IDL are acceptable and do not require qualification.

All matrix spike recovery results were acceptable.

3.5.2 Laboratory Control Sample Recovery

The LCS monitors the overall performance of all steps in the analysis, including the sample preparation. An LCS should be prepared (e.g., digested or distilled) and analyzed with every group of samples which have been prepared together. The performance criteria for aqueous LCS percent recovery is 80% to 120%. The performance criteria for solid LCS samples are established by the manufacturer or the laboratory.

LCS results are not reviewed under Level C validation.

3.6 PRECISION

3.6.1 Laboratory Duplicates

The laboratory duplicate sample analyses are used to measure laboratory precision and sample homogeneity. Laboratory duplicate RPDs must fall below 20% for waters and 35% for soils. If an RPD for an aqueous sample is greater than 20% and the sample result is less than five times the CRDL, all associated detects are qualified as estimates and flagged "J". If the range between duplicate aqueous samples is greater than plus or minus the CRDL and the sample result is less than five times the CRDL, all associated detects are qualified as estimates and flagged "J". If an RPD for soil samples is greater than 35% and the sample result is greater than five times the CRDL, all associated detects are flagged "J". If the range between duplicate soil samples is greater than plus or minus two times the CRDL and the sample result is less than five times the CRDL, then all detects are flagged "J".

All laboratory duplicate results were acceptable.

3.6.2 Field Duplicates

Field duplicate sample analyses are used to measure both the lab and field sampling procedure precision. Field duplicate results are compared using the same guidelines for determining the precision between a sample and its duplicate. Under WHC validation guidelines, data are not qualified based on field duplicate results. Results of the field duplicate samples are discussed in section 1.0 of this report.

3.6.3 Field Split Samples

A field split sample is a representative sample from a sampling event that is sent to a third party laboratory. Field split sample results are evaluated by comparing the corresponding sample results to the reference laboratory sample

results. Under WHC validation guidelines, data qualification is not required based on field split results. Results of the field split samples are discussed in section 1.0.

3.7 SAMPLE DETECTION LIMITS

The sample detection limits were evaluated to ensure that all analytes were analyzed for at or below the CRDL. All sample detection limits were acceptable.

3.8 OVERALL ASSESSMENT AND SUMMARY

Holding times for pH, turbidity, nitrate, nitrite, and phosphate were exceeded for all samples in all SDGs. All results were qualified as estimates and flagged "J/UJ" or rejected and flagged "UR". TPH results in SDG Nos. W0690-QES, W0699-QES and W0721-QES were rejected and flagged "UR" due to the lack of a preservative. Oil and grease results in SDG No. LK 5379-LAS were rejected and flagged "UR" due to the lack of a preservative. Data flagged "J" indicates that the associated concentration is an estimate, but under WHC guidelines, the data are considered usable for decision making purposes. Rejected data is not useable and should not be reported. All other validated results are considered accurate within the standard error associated with the methods.

All packages submitted for validation contained data that was rejected and flagged "R/UR", resulting in an overall completeness of 73%.

4.0 RADIOCHEMISTRY DATA VALIDATION SUMMARY

4.1 SUMMARY

Due to a high LCS percent recovery, sample B0GJV2 in SDG No. W0721-QES was qualified as estimated and flagged "J". Due to the lack of a matrix spike analysis, all tritium results in SDG Nos. W0699-QES and W0721-QES were qualified as estimates and flagged "J/UJ".

With the exceptions noted above, the project-specific data quality objectives in terms of precision, accuracy, completeness, representativeness, and comparability have been met.

4.2 HOLDING TIMES AND SAMPLE PREPARATION

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The maximum holding time for radiochemical analyses is six months. Tritium sample preparation requires distillation. Tritium samples must be analyzed within seven days of distillation.

All holding times and sample preparation measures were acceptable.

4.3 CALIBRATIONS

Instrument calibration is performed to establish that the counters used to determine radionuclide activities are capable of producing acceptable and reliable analytical data. Each counting system must be factory calibrated at installation and after any maintenance or repair. Calibration consists of an instrument efficiency determination for each applicable radionuclide. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible.

Calibration results, including efficiency checks and background counts, are not reviewed Level C validation.

4.4 LABORATORY BLANKS

Laboratory blank samples are analyzed to determine if positive results are due to laboratory reagent, sample container, or detector contamination. If blank analysis results indicate the presence of an analyte above the MDA, the following qualifiers were applied: All positive sample results less than five times the highest blank concentration are qualified as estimates; sample results below the MDA are

elevated to the MDA and qualified as undetected; sample results above the MDA and greater than five times the highest blank concentration are not qualified.

All laboratory blank results were acceptable.

4.5 ACCURACY

4.5.1 Laboratory Control and Matrix Spike Samples

Accuracy was evaluated by analyzing soil or distilled water samples spiked with known amounts of radionuclides. The sample activity as determined by analysis is compared to the known activity to assess accuracy. The acceptable laboratory control sample recovery range is 70% to 130%, while that for a matrix spike is 60% to 140%. Spike sample results outside the above ranges resulted in associated sample results being qualified as estimates, rejected, or not qualified, depending on the activity of the individual sample.

Due to an LCS recovery of 481 percent, all gross alpha results in SDG No. W0721-QES were qualified as estimates and flagged "J/UJ".

Due to the lack of a matrix spike analysis, all tritium results in SDG Nos. W0699-QES and W0721-QES were qualified as estimates and flagged "J/UJ".

All other laboratory control and matrix spike sample results were acceptable.

4.6 PRECISION

4.6.1 Laboratory Duplicates

Analytical precision is expressed by the RPD between the recoveries of duplicate matrix spike analyses performed on a sample. Precision is also be assessed using unspiked duplicate sample analyses. If both sample and replicate activities are greater than five times the CRDL and the RPD is less than 35% for soil samples and less than 20% for water samples, the results are acceptable. If either activities are less than five times the CRDL, a control limit of less than or equal to two times the CRDL is used for soil samples and less than or equal to the CRDL for water samples. If the RPD is outside the applicable control limit, associated results are qualified as estimates and flagged "J/UJ".

All laboratory duplicate results were acceptable.

4.6.2 Field Duplicates

Field duplicate results are compared using the same guidelines for determining the RPD between a sample and its duplicate. Under WHC validation guidelines, data qualification is not required based on field duplicate results. Results of the field duplicate samples are discussed in section 1.0.

4.6.3 Field Split Samples

A field split sample is a representative sample from a sampling event that is sent to a third party laboratory. The field split sample results are evaluated by comparing the corresponding sample results to the reference laboratory sample results. Under WHC validation guidelines, data qualification is not required based on field split results. Results of the field split samples are discussed in section 1.0.

4.7 SAMPLE RESULTS QUANTITATION, VERIFICATION AND REPORTED DETECTION LIMITS

The MDA for each analyte was assessed to ensure that it met the CRDL. The reviewer verified that the reported detection limits were at or below the CRDL.

4.8 SYSTEM PERFORMANCE AND OVERALL ASSESSMENT

Due to a 481 percent LCS recovery, all gross alpha results in SDG No. W0721 were qualified as estimates and flagged "J/UJ". Due to the lack of a matrix spike analysis with SDG Nos. W0699-QES and W0721-QES, all tritium results were qualified as estimates and flagged "J/UJ". Data flagged "J" indicate the associated concentration is an estimate, but under WHC guidelines, the data are considered usable for decision making purposes. All other validated results are considered accurate within the standard error associated with the methods.

All data packages were found to be 100% complete.

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APPENDICES

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APPENDIX A
METALS DATA SUMMARY TABLES

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Project: BECHTEL-HANFORD																					
Laboratory: Quanterra																					
Case		SDG: W0699																			
Sample Number	BOGJS8		BOGJS9		BOGJT0		BOGJT1		BOGJT2		BOGJT3		BOGJV0		BOGJV1		BOGJV8		BOGJV9		
Location	199-N-21		199-N-21		199-N-25		199-N-25		199-N-26		199-N-26		199-N-54		199-N-54		199-N-75		199-N-75		
Remarks																					
Sample Date	09/14/95		09/14/95		09/05/95		09/05/95		09/05/95		09/05/95		09/13/95		09/13/95		09/12/95		09/12/95		
Inorganic Analytes	CRDL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Aluminum	200	24.6	U	26.3	U	24.6	U	24.6	U	25.0	U	24.6	U								
Antimony	60	45.9	U	45.9	U	45.9	U	45.9	U	45.9	U	45.9	U	45.9	U	45.9	U	45.9	U	45.9	U
Arsenic	10	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Barium	200	30.4		30.5		43.4		42.6		51.6		51.0		67.4		72.4		26.8		28.0	
Beryllium	5	0.91	U	1.4	U	0.61	U	0.61	U	0.62	U	0.50	U	0.92	U	1.3	U	0.69	U	0.92	U
Cadmium	5	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U
Calcium	5000	73100		75400		29000		28900		43400		42700		124000		135000		30200		30000	
Chromium	10	3.3		2.8	U	13.1		4.8		26.4		3.2		8.4		2.8	U	2.8	U	2.8	U
Cobalt	50	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U
Copper	25	29.2	U	37.0	U	14.2	U	3.6	U	17.0	U	3.6	U	30.1	U	35.5	U	9.0	U	23.0	U
Iron	100	228	U	55.6	U	211	U	175	U	582		101	U	82.2	U	92.8	U	36.7	U	40.6	U
Lead	3	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Magnesium	5000	15600		15900		7990		7870		9400		9320		21200		22800		5280		5300	
Manganese	15	13.2		8.0	U	30.1		33.8		49.5		34.7		7.8	U	10.5		4.6	U	5.3	U
Mercury	0.2	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Nickel	40	14.2	U	14.2	U	14.2	U	14.2	U	16.8		14.2	U	14.2	U	15.9		14.2	U	14.2	U
Potassium	5000	8560		9100		4810		4740		6050		5290		6120		4890		2310		2300	
Selenium	5	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Silver	10	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U	2.2	U	9.3		2.2	U	2.2	U
Sodium	5000	131000		131000		133000		128000		109000		113000		45900		49200		3070		3020	
Thallium	10	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Vanadium	50	32.9	U	43.7	U	13.7	U	20.1	U	24.6	U	19.4	U	28.2	U	34.4	U	14.9	U	27.2	U
Zinc	20	21.8	U	21.1	U	28.9	U	24.2	U	12.8	U	14.7	U	15.1	U	15.7	U	36.6	U	12.2	U

000038

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QKC
12/1/95

NA = Not Analyzed

Project: BECHTEL-HANFORD															
Laboratory: Quanterra															
Case		SDG: W0699													
Sample Number		B0GJW0	B0GJW1	B0GJW4	B0GJW5	B0GJX4	B0GJX5	B0GJX8	B0GJX9	B0GJY2	B0GJY3				
Location		199-N-76	199-N-76	199-N-80	199-N-80	199-N-54	199-N-54	199-N-54	199-N-54	199-N-75	199-N-75				
Remarks						Trip blank	Trip blank	Duplicate	Duplicate	Duplicate	Duplicate				
Sample Date		09/05/95	09/05/95	09/11/95	09/11/95	09/13/95	09/13/95	09/13/95	09/13/95	09/12/95	09/12/95				
Inorganic Analytes	CRDL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Aluminum	200	24.6	U	24.6	U	24.6	U	24.6	U	37.1	UJ	24.6	U	24.6	U
Antimony	60	45.9	U	45.9	U	45.9	U	45.9	U	45.9	UJ	45.9	U	45.9	U
Arsenic	10	NA		NA		NA		NA		NA		NA		NA	
Barium	200	17.9		18.6		31.2		31.5		5.0		4.2		72.1	J
Beryllium	5	0.50	U	0.69	U	0.84	U	0.92	U	0.92		1.5	UJ	1.5	U
Cadmium	5	3.1	U	3.1	U	3.1	U	3.1	U	3.1	UJ	3.1	U	3.1	U
Calcium	5000	28300		28500		34100		33600		1850		1740		135000	J
Chromium	10	3.1		2.8	U	199		179		2.8	U	2.8	U	6.3	J
Cobalt	50	4.3	U	4.3	U	4.3	U	4.3	U	4.3	UJ	4.3	U	4.3	U
Copper	25	13.6	U	5.2	U	19.7	U	18.2	U	21.1		9.0		21.6	UJ
Iron	100	41.0	U	56.2	U	94.5	U	41.7	U	37.5		32.7		103	UJ
Lead	3	NA		NA		NA		NA		NA		NA		NA	
Magnesium	5000	4890		5000		16300		15900		649		640		22900	J
Manganese	15	3.3	U	4.5	U	7.7	U	7.4	U	4.5		4.2		10.3	J
Mercury	0.2	NA		NA		NA		NA		NA		NA		NA	
Nickel	40	14.2	U	14.2	U	14.2	U	14.2	U	14.2	UJ	14.2	U	14.2	U
Potassium	5000	2290		2540		4900		5220		1130		1450		5830	J
Selenium	5	NA		NA		NA		NA		NA		NA		NA	
Silver	10	2.2	U	2.2	U	2.2	U	2.2	U	4.1		2.2	U	3.5	J
Sodium	5000	2990		3000		24100		23300		464		449		49300	J
Thallium	10	NA		NA		NA		NA		NA		NA		NA	
Vanadium	50	7.2	U	16.3	U	31.1	U	36.6	U	21.0		19.6		37.4	UJ
Zinc	20	10.4	U	16.1	U	14.5	U	36.3	U	14.2		13.6		32.8	UJ

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RISC
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NA = Not Analyzed

Project: BECHTEL-HANFORD																					
Laboratory: Quanterra																					
Case		SDG: W0721																			
Sample Number		B0GHX7		B0GJV2		B0GJV6		B0GJV7		B0GJW2		B0GJW3		B0GJW6		B0GJW8		B0GJX0		B0GJX2	
Location		199-N-3		199-N-64		199-N-70		199-N-70		199-N-77		199-N-77				199-N-64		199-N-20			
Remarks		EB																			
Sample Date		09/15/95		09/20/95		09/18/95		09/18/95		09/15/95		09/15/95		09/15/95		09/20/95		09/20/95		09/15/95	
Inorganic Analytes	CRDL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Aluminum	200	44.2	U	632		24.6	U	24.6	UJ												
Antimony	60	45.9	U	45.9	U	45.9	U	45.9	U	45.9	U	45.9	U	45.9	U	45.9	U	45.9	U	45.9	UJ
Barium	200	158		122		35.4		34.8		37.9		37.9		5.2		5.2		5.2		3.1	J
Beryllium	5	0.84	U	1.1	U	0.51	U	0.50	U	0.66	U	0.50	U	0.50	U	0.67		0.50	U	0.50	UJ
Cadmium	5	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U	3.1	U	3.1	UJ
Calcium	5000	172000		115000		36400		36400		30500		31200		1700		1780		1820		1670	J
Chromium	20	9.8		89.8		11.5		10.8		11.2		3.2	U	2.8	U	2.8	U	2.8	U	2.8	J
Cobalt	50	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U	4.3	U	4.3	UJ
Copper	25	21.8		30.3		4.7	U	5.4		4.7	U	4.7	UJ								
Iron	100	267		1550		56.4	U	34.6	U	63.5	U	32.2	U	28.1		29.4		29.1		24.2	J
Magnesium	5000	30500		24200		10300		10400		7900		8040		237		439		393		340	J
Manganese	15	14.8		46.1		4.1		3.6		4.1		3.3		1.8		3.4		3.5		3.5	J
Nickel	40	14.2	U	52.9		14.2	U	14.2	UJ												
Potassium	5000	4330		5290		3070		3200		3890		3820		1060	U	1060	U	1060	U	1060	UJ
Silver	10	4.6	U	2.2	U	2.7	U	2.2	U	4.3	U	2.2	UJ								
Sodium	5000	17600		15700		6640		6990		171000		172000		240		291		279		253	J
Vanadium	50	23.1		31.3		22.3		21.8		26.8		23.2		3.8	U	8.2		6.4		4.9	J
Zinc	20	40.7		65.9		46.8		19.4	U	27.9	U	44.4		33.5		19.4		30.7		41.2	J

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12/8/95
 [Signature]

EB = Equipment Blank

Project: BECHTEL-HANFORD																				
Laboratory: Quanterra																				
Case	SDG: W0721																			
Sample Number	B0GJX3		B0GJX6		B0GJY0		B0GJY1													
Location			199-N-64		199-N-70		199-N-70													
Remarks	Trip Blank		Trip Blank		Duplicate		Duplicate													
Sample Date	09/15/95		09/20/95		09/18/95		09/18/95													
Inorganic Analytes	CRDL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	
Aluminum	200	24.6	U	24.6	U	24.6	U	24.6	U											
Antimony	80	45.9	U	45.9	U	45.9	U	45.9	U											
Barium	200	5.2		7.0		35.1		35.8												
Beryllium	5	0.50	U	0.67		0.51	U	0.59	U											
Cadmium	5	3.1	U	3.1	U	3.1	U	3.1	U											
Calcium	5000	1830		1790		36400		37100												
Chromium	20	2.8	U	2.8	U	14.7		11.1												
Cobalt	50	4.3	U	4.3	U	4.3	U	4.3	U											
Copper	25	4.7	U	18.4		4.7	U	4.7	U											
Iron	100	31.8		33.5		58.5	U	37.8	U											
Magnesium	5000	375		484		10400		10600												
Manganese	15	2.0		3.6		3.9		4.1												
Nickel	40	14.2	U	14.2	U	14.2	U	14.2	U											
Potassium	5000	1060	U	1060	U	3240		4330												
Silver	10	2.4	U	2.2	U	2.2	U	2.2	U											
Sodium	5000	1110		341		6780		7140												
Vanadium	50	3.8	U	13.2		24.6		23.0												
Zinc	20	20.7		19.5		28.5	U	28.3	U											

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R/S

EB = Equipment Blank

Project: BECHTEL-HANFORD																			
Laboratory: Lockheed																			
Case		SDG: LK5379																	
Sample Number		B0GJY4		B0GJY5															
Location		199-N-21		199-N-21															
Remarks		Split		Split															
Sample Date		09/14/95		09/14/95															
Inorganic Analytes	CRDL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Aluminum	0.2	0.035		0.039															
Antimony	0.06	0.058	U	0.058	U														
Arsenic	0.01	0.098	U	0.098	U														
Barium	0.2	0.030		0.030															
Beryllium	0.005	0.0010	U	0.0010	U														
Cadmium	0.005	0.0050	U	0.0050	U														
Calcium	5	82		90															
Chromium	0.01	0.0043		0.0030	U														
Cobalt	0.05	0.0060	U	0.0076															
Copper	0.025	0.0030	U	0.0030	U														
Iron	0.1	0.15		0.012	U														
Lead	0.003	0.056	U	0.056	U														
Magnesium	5	17		18															
Manganese	0.015	0.0042		0.0020	U														
Mercury	0.0002	NA		NA															
Nickel	0.04	0.015	U	0.015	U														
Potassium	5	7.4		7.9															
Selenium	0.005	0.087	U	0.087	U														
Silver	0.01	0.0040	U	0.0040	U														
Sodium	5	150		150															
Thallium	0.01	0.075		0.089															
Vanadium	0.05	0.0080		0.0085															
Zinc	0.02	0.019	U	0.011															

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12/1/95 pcr

NA = Not Analyzed

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APPENDIX B
METALS VALIDATED LABORATORY REPORT FORMS

000043

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LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: BOGJY4	Date Collected: 14-SEP-95
Matrix: Water	Date Received: 16-SEP-95
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qual	Dilution	Date Analyzed	LAS Batch ID	LAS Sample ID
ALUMINIUM, TOTAL	mg/L	6010	0.035	0.029	B	1	16-OCT-95	27912	L5379-2
ANTIMONY, TOTAL	mg/L	6010	< 0.058	0.058	u	1	16-OCT-95	27912	L5379-2
ARSENIC, TOTAL	mg/L	6010	< 0.098	0.098	u	1	16-OCT-95	27912	L5379-2
BARIUM, TOTAL	mg/L	6010	0.030	0.021	B	1	16-OCT-95	27912	L5379-2
BERYLLIUM, TOTAL	mg/L	6010	< 0.0010	0.0010	u	1	16-OCT-95	27912	L5379-2
CADMIUM, TOTAL	mg/L	6010	< 0.0050	0.0050	u	1	16-OCT-95	27912	L5379-2
CALCIUM, TOTAL	mg/L	6010	82.	0.032		1	16-OCT-95	27912	L5379-2
CHROMIUM, TOTAL	mg/L	6010	0.0043	0.0030	B	1	16-OCT-95	27912	L5379-2
COBALT, TOTAL	mg/L	6010	< 0.0060	0.0060	u	1	16-OCT-95	27912	L5379-2
COPPER, TOTAL	mg/L	6010	< 0.0030	0.0030	u	1	16-OCT-95	27912	L5379-2
IRON, TOTAL	mg/L	6010	0.15	0.012		1	16-OCT-95	27912	L5379-2
LEAD, TOTAL	mg/L	6010	< 0.056	0.056	u	1	16-OCT-95	27912	L5379-2
MAGNESIUM, TOTAL	mg/L	6010	17.	0.050		1	16-OCT-95	27912	L5379-2
MANGANESE, TOTAL	mg/L	6010	0.0042	0.0020	B	1	16-OCT-95	27912	L5379-2
NICKEL, TOTAL	mg/L	6010	< 0.015	0.015	u	1	16-OCT-95	27912	L5379-2
POTASSIUM, TOTAL	mg/L	6010	7.4	0.60		1	16-OCT-95	27912	L5379-2
SELENIUM, TOTAL	mg/L	6010	< 0.087	0.087	u	1	16-OCT-95	27912	L5379-2
SILVER, TOTAL	mg/L	6010	< 0.0040	0.0040	u	1	16-OCT-95	27912	L5379-2
SODIUM, TOTAL	mg/L	6010	150	0.070		1	16-OCT-95	27912	L5379-2
THALLIUM, TOTAL	mg/L	6010	0.075	0.050	B	1	16-OCT-95	27912	L5379-2
VANADIUM, TOTAL	mg/L	6010	0.0080	0.0040	B	1	16-OCT-95	27912	L5379-2
ZINC, TOTAL	mg/L	6010	0.019	0.0040	u	1	16-OCT-95	27912	L5379-2

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LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: BOGJY5	Date Collected: 14-SEP-95
Matrix: Filt H2O	Date Received: 16-SEP-95
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qual	Dilution	Date Analyzed	LAS Batch ID	LAS Sample ID
ALUMINUM, DISSOLVED	mg/L	6010	0.039	0.029	B	1	16-OCT-95	27913	L5379-21
ANTIMONY, DISSOLVED	mg/L	6010	< 0.058	0.058	u	1	16-OCT-95	27913	L5379-21
ARSENIC, DISSOLVED	mg/L	6010	< 0.098	0.098	u	1	16-OCT-95	27913	L5379-21
BARIUM, DISSOLVED	mg/L	6010	0.030	0.021	B	1	16-OCT-95	27913	L5379-21
BERYLLIUM, DISSOLVED	mg/L	6010	< 0.0010	0.0010	u	1	16-OCT-95	27913	L5379-21
CADMIUM, DISSOLVED	mg/L	6010	< 0.0050	0.0050	u	1	16-OCT-95	27913	L5379-21
CALCIUM, DISSOLVED	mg/L	6010	90.	0.032		1	16-OCT-95	27913	L5379-21
CHROMIUM, DISSOLVED	mg/L	6010	< 0.0030	0.0030	u	1	16-OCT-95	27913	L5379-21
COBALT, DISSOLVED	mg/L	6010	0.0076	0.0060	B	1	16-OCT-95	27913	L5379-21
COPPER, DISSOLVED	mg/L	6010	< 0.0030	0.0030	u	1	16-OCT-95	27913	L5379-21
IRON, DISSOLVED	mg/L	6010	< 0.012	0.012	u	1	16-OCT-95	27913	L5379-21
LEAD, DISSOLVED	mg/L	6010	< 0.056	0.056	u	1	16-OCT-95	27913	L5379-21
MAGNESIUM, DISSOLVED	mg/L	6010	18.	0.050		1	16-OCT-95	27913	L5379-21
MANGANESE, DISSOLVED	mg/L	6010	< 0.0020	0.0020	u	1	16-OCT-95	27913	L5379-21
NICKEL, DISSOLVED	mg/L	6010	< 0.015	0.015	u	1	16-OCT-95	27913	L5379-21
POTASSIUM, DISSOLVED	mg/L	6010	7.9	0.60		1	16-OCT-95	27913	L5379-21
SELENIUM, DISSOLVED	mg/L	6010	< 0.087	0.087	u	1	16-OCT-95	27913	L5379-21
SILVER, DISSOLVED	mg/L	6010	< 0.0040	0.0040	u	1	16-OCT-95	27913	L5379-21
SODIUM, DISSOLVED	mg/L	6010	150	0.070		1	16-OCT-95	27913	L5379-21
THALLIUM, DISSOLVED	mg/L	6010	0.089	0.050	B	1	16-OCT-95	27913	L5379-21
VANADIUM, DISSOLVED	mg/L	6010	0.0085	0.0040	B	1	16-OCT-95	27913	L5379-21
ZINC, DISSOLVED	mg/L	6010	0.011	0.0040	B	1	16-OCT-95	27913	L5379-21

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Rev. 00

APPENDIX C
GENERAL CHEMISTRY DATA SUMMARY TABLES

000036

Project: BECHTEL-HANFORD																					
Laboratory: Quanterra																					
Case		SDG: W0699																			
Sample Number	B0GJS8	B0GJS9	B0GJT0	B0GJT1	B0GJT2	B0GJT3	B0GJV0	B0GJV1	B0GJV8	B0GJV9											
Location	199-N-21	199-N-21	199-N-25	199-N-25	199-N-26	199-N-26	199-N-54	199-N-54	199-N-75	199-N-75											
Remarks																					
Sample Date	09/14/95	09/14/95	09/05/95	09/05/95	09/05/95	09/05/95	09/13/95	09/13/95	09/12/95	09/12/95											
General Chemistry	CRDL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q				
Chloride	0.2	21.1		21.4		11.3		11.5		17.4		18.1		23.1		23.5		1.32		1.35	
Fluoride	0.1	0.45		0.47		0.30		0.31		0.75		0.73		0.20	U	0.20	U	0.14		0.16	
Nitrate-N	0.2	8.59	J	8.39	J	2.10	J	2.17	J	13.8	J	14.9	J	4.93	J	4.96	J	1.60	J	1.60	J
Nitrite-N	0.2	0.020	UR	0.020	UR	0.020	UR	0.020	UR	0.020	UR	0.020	UR	0.020	UR	0.020	UR	0.020	UR	0.020	UR
Ortho-Phosphate	0.5	0.50	UR	0.50	UR	0.50	UR	0.50	UR	0.50	UR	0.50	UR	0.50	UR	0.50	UR	0.50	UR	0.50	UR
Sulfate	0.5	326		325		224		225		149		148		260		254		16.4		16.2	
Spec. Conductivity	N/A	1090		NA		777		NA		772		NA		962		NA		187		NA	
Turbidity	1	1.06	J	NA		0.45	J	NA		3.85	J	NA		0.45	J	NA		0.16	J	NA	
pH	+/-0.05	7.78	J	NA		8.26	J	NA		7.92	J	NA		7.34	J	NA		8.15	J	NA	
Oil and Grease		0.98	U	NA		0.95	U	NA		10.6		NA		0.95	U	NA		NA		NA	
TPH		0.48	UR	NA		0.49	UR	NA		0.49	UR	NA		0.48	UR	NA		NA		NA	

RBC 12/1/95

NA = Not Analyzed, Turbidity (NTU), Specific Conductivity (umhos/cm), pH (pH units)

000081

9615429.2528

Project: BECHTEL-HANFORD																						
Laboratory: Quanterra																						
Case		SDG: W0721																				
Sample Number		B0GJX2			B0GJX3			B0GJX6			B0GJY0			B0GJY1								
Location								199-N-64			199-N-70			199-N-70								
Remarks		Trip Blank			Trip Blank			Trip Blank			Duplicate			Duplicate								
Sample Date		09/15/95			09/15/95			09/20/95			09/18/95			09/18/95								
General Chemistry	CRDL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	
Chloride	0.2	0.20	U	0.20	U	0.20	U	4.58		4.80												
Fluoride	0.1	0.10	U	0.10	U	0.10	U	0.18		0.19												
Nitrate-N	0.2	0.020	UR	0.020	UR	0.020	UR	4.26	J	4.23	J											
Nitrite-N	0.2	0.020	UR	0.020	UR	0.020	UR	0.020	UR	0.020	UR											
Ortho-Phosphate	0.5	0.50	UR	0.50	UR	0.50	UR	0.50	UR	0.50	UR											
Sulfate	0.5	0.50	U	0.50	U	0.50	U	57.6		58.7												
Spec. Conductivity	N/A	314		NA		100	U	100	U	NA												
Turbidity	1	0.29	J	NA		0.75	J	0.29	J	NA												
pH	+/-0.05	5.46	J	NA		5.16	J	8.10	J	NA												
Oil and Grease		0.95	U	NA		2.63		NA		NA												
TPH		0.48	UR	NA		0.48	UR	NA		NA												

000081

9613429.2531

JBC 12/1/95

NA = Not Analyzed, EB = Equipment Blank, Turbidity (NTU), Specific Conductivity (umhos/cm), pH (pH units)

Project: BECHTEL - HANFORD																			
Laboratory: Lockheed																			
Case		SDG: LK5379																	
Sample Number		B0GJY4				B0GJY5													
Location		199-N-21				199-N-21													
Remarks		Split				Split													
Sample Date		09/14/95				09/14/95													
General Chemistry	CRDL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Chloride	0.2	20		20															
Fluoride	0.1	0.1	U	0.1	U														
Nitrate-N	0.2	8.1	J	8.3	J														
Nitrite-N	0.2	0.01	UR	0.01	UR														
Ortho-Phosphate	0.5	0.1	UR	0.1	UR														
Sulfate	0.5	300		300															
Spec. Conductance	N/A	1100		NA															
Turbidity	1	0.64	J	NA															
pH	+/-0.05	7.8	J	NA															
Oil and Grease		5.00	UR	NA															
TPH		1.00	U	NA															

000085

9613429.2532

RBC 12/1/95

NA = Not Analyzed, Turbidity (NTU), Specific Conductivity (umhos/cm), pH (pH units)

9613429.2533

BHI-00555
Rev. 00

APPENDIX D
GENERAL CHEMISTRY VALIDATED LABORATORY REPORT FORMS

000086

9613429.2534

Quanterra-Richland
P.O. Box 1970
Richland, WA 99352

Project: 550.99

Category: Chloride
Method: EPA 300.0
Matrix: LIQUID

Sample Date : 09/05/95
Receipt Date : 09/06/95
Report Date : 10/19/95

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
BOGJT0	9273-001	Chloride	16887-00-6	QCBLK77766-1	09/11/95	09/11/95	11.3	MG/L		1.00	5
BOGJT0	9273-001DUP	Chloride	16887-00-6	QCBLK77766-1	09/11/95	09/11/95	11.7	MG/L		1.00	5
BOGJT0	9273-001MS	Chloride	16887-00-6	QCBLK77766-1	09/11/95	09/11/95	95	XREC			10
BOGJT2	9273-002	Chloride	16887-00-6	QCBLK77766-1	09/11/95	09/11/95	17.4	MG/L		1.00	5
BOGJW0	9273-003	Chloride	16887-00-6	QCBLK77766-1	09/11/95	09/11/95	1.23	MG/L		0.20	1
BOGJW1	9273-004	Chloride	16887-00-6	QCBLK77766-1	09/11/95	09/11/95	1.20	MG/L		0.20	1
BOGJT1	9273-005	Chloride	16887-00-6	QCBLK77766-1	09/11/95	09/11/95	11.5	MG/L		1.00	5
BOGJT3	9273-006	Chloride	16887-00-6	QCBLK77766-1	09/11/95	09/11/95	18.1	MG/L		1.00	5
BOGJU4	9319-001	Chloride	16887-00-6	QCBLK78341-1	09/15/95	09/15/95	2.24	MG/L		0.20	1
BOGJU5	9319-002	Chloride	16887-00-6	QCBLK78341-1	09/15/95	09/15/95	2.33	MG/L		0.20	1
BOGJY2	9336-001	Chloride	16887-00-6	QCBLK78546-1	09/19/95	09/19/95	1.27	MG/L		0.20	1
BOGJV8	9336-002	Chloride	16887-00-6	QCBLK78546-1	09/19/95	09/19/95	1.32	MG/L		0.20	1
BOGJY3	9336-003	Chloride	16887-00-6	QCBLK78546-1	09/19/95	09/19/95	1.33	MG/L		0.20	1
BOGJV9	9336-004	Chloride	16887-00-6	QCBLK78546-1	09/19/95	09/19/95	1.35	MG/L		0.20	1
BOGJX8	9347-001	Chloride	16887-00-6	QCBLK79282-1	09/27/95	09/27/95	22.5	MG/L		1.00	5
BOGJX4	9347-002	Chloride	16887-00-6	QCBLK79282-1	09/27/95	09/27/95	0.20	MG/L	U	0.20	1
BOGJV0	9347-003	Chloride	16887-00-6	QCBLK79282-1	09/27/95	09/27/95	23.1	MG/L		1.00	5
BOGJX5	9347-004	Chloride	16887-00-6	QCBLK79282-1	09/27/95	09/27/95	0.20	MG/L	U	0.20	1
BOGJX9	9347-005	Chloride	16887-00-6	QCBLK79282-1	09/27/95	09/27/95	23.0	MG/L		1.00	5
BOGJV1	9347-006	Chloride	16887-00-6	QCBLK79282-1	09/27/95	09/27/95	23.5	MG/L		1.00	5
BOGJS8	9364-001	Chloride	16887-00-6	QCBLK78809-2	09/22/95	09/22/95	21.1	MG/L		1.00	5
BOGJS9	9364-002	Chloride	16887-00-6	QCBLK78809-2	09/22/95	09/22/95	21.4	MG/L		1.00	5
NA	QCBLK77766-1	Chloride	16887-00-6	QCBLK77766-1	09/11/95	09/11/95	0.20	MG/L	U	0.20	1
NA	QCBLK78341-1	Chloride	16887-00-6	QCBLK78341-1	09/15/95	09/15/95	0.20	MG/L	U	0.20	1
NA	QCBLK78546-1	Chloride	16887-00-6	QCBLK78546-1	09/19/95	09/19/95	0.20	MG/L	U	0.20	1
NA	QCBLK78809-2	Chloride	16887-00-6	QCBLK78809-2	09/22/95	09/22/95	0.20	MG/L	U	0.20	1
NA	QCBLK79282-1	Chloride	16887-00-6	QCBLK79282-1	09/27/95	09/27/95	0.20	MG/L	U	0.20	1
NA	QCLCS77766-1	Chloride	16887-00-6	QCBLK77766-1	09/11/95	09/11/95	93	XREC			1
NA	QCLCS78341-1	Chloride	16887-00-6	QCBLK78341-1	09/15/95	09/15/95	93	XREC			1
NA	QCLCS78546-1	Chloride	16887-00-6	QCBLK78546-1	09/19/95	09/19/95	91	XREC			1
NA	QCLCS78809-3	Chloride	16887-00-6	QCBLK78809-2	09/22/95	09/22/95	95	XREC			1
NA	QCLCS79282-1	Chloride	16887-00-6	QCBLK79282-1	09/27/95	09/27/95	92	XREC			1

RSC
12/1/95
~~9000119~~ RSC

000087

9613429.2535

Quanterra-Richland
P.O. Box 1970
Richland, WA 99352

Project: 550.99

Category: Fluoride
Method: EPA 300.0
Matrix: LIQUID

Sample Date : 09/05/95
Receipt Date : 09/06/95
Report Date : 10/19/95

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
BOGJTO	9273-001	Fluoride	16984-48-8	QCBLK77766-1	09/11/95	09/11/95	0.30	MG/L		0.10	1
BOGJTO	9273-001DUP	Fluoride	16984-48-8	QCBLK77766-1	09/11/95	09/11/95	0.30	MG/L		0.10	1
BOGJTO	9273-001MS	Fluoride	16984-48-8	QCBLK77766-1	09/11/95	09/11/95	95	%REC			1
BOGJT2	9273-002	Fluoride	16984-48-8	QCBLK77766-1	09/11/95	09/11/95	0.75	MG/L		0.10	1
BOGJW0	9273-003	Fluoride	16984-48-8	QCBLK77766-1	09/11/95	09/11/95	0.10	MG/L	U	0.10	1
BOGJW1	9273-004	Fluoride	16984-48-8	QCBLK77766-1	09/11/95	09/11/95	0.11	MG/L		0.10	1
BOGJT1	9273-005	Fluoride	16984-48-8	QCBLK77766-1	09/11/95	09/11/95	0.31	MG/L		0.10	1
BOGJT3	9273-006	Fluoride	16984-48-8	QCBLK77766-1	09/11/95	09/11/95	0.73	MG/L		0.10	1
BOGJW4	9319-001	Fluoride	16984-48-8	QCBLK78341-1	09/15/95	09/15/95	0.32	MG/L		0.10	1
BOGJW5	9319-002	Fluoride	16984-48-8	QCBLK78341-1	09/15/95	09/15/95	0.33	MG/L		0.10	1
BOGJY2	9336-001	Fluoride	16984-48-8	QCBLK78546-1	09/19/95	09/19/95	0.15	MG/L		0.10	1
BOGJV8	9336-002	Fluoride	16984-48-8	QCBLK78546-1	09/19/95	09/19/95	0.14	MG/L		0.10	1
BOGJY3	9336-003	Fluoride	16984-48-8	QCBLK78546-1	09/19/95	09/19/95	0.16	MG/L		0.10	1
BOGJV9	9336-004	Fluoride	16984-48-8	QCBLK78546-1	09/19/95	09/19/95	0.16	MG/L		0.10	1
BOGJX8	9347-001	Fluoride	16984-48-8	QCBLK79282-1	09/27/95	09/27/95	0.20	MG/L	U	0.20	2
BOGJX4	9347-002	Fluoride	16984-48-8	QCBLK79282-1	09/27/95	09/27/95	0.10	MG/L	U	0.10	1
BOGJV0	9347-003	Fluoride	16984-48-8	QCBLK79282-1	09/27/95	09/27/95	0.20	MG/L	U	0.20	2
BOGJX5	9347-004	Fluoride	16984-48-8	QCBLK79282-1	09/27/95	09/27/95	0.10	MG/L	U	0.10	1
BOGJX9	9347-005	Fluoride	16984-48-8	QCBLK79282-1	09/27/95	09/27/95	0.20	MG/L	U	0.20	2
BOGJV1	9347-006	Fluoride	16984-48-8	QCBLK79282-1	09/27/95	09/27/95	0.20	MG/L	U	0.20	2
BOGJS8	9364-001	Fluoride	16984-48-8	QCBLK78809-2	09/22/95	09/22/95	0.45	MG/L		0.20	2
BOGJS9	9364-002	Fluoride	16984-48-8	QCBLK78809-2	09/22/95	09/22/95	0.47	MG/L		0.20	2
NA	QCBLK77766-1	Fluoride	16984-48-8	QCBLK77766-1	09/11/95	09/11/95	0.10	MG/L	U	0.10	1
NA	QCBLK78341-1	Fluoride	16984-48-8	QCBLK78341-1	09/15/95	09/15/95	0.10	MG/L	U	0.10	1
NA	QCBLK78546-1	Fluoride	16984-48-8	QCBLK78546-1	09/19/95	09/19/95	0.10	MG/L	U	0.10	1
NA	QCBLK78809-2	Fluoride	16984-48-8	QCBLK78809-2	09/22/95	09/22/95	0.10	MG/L	U	0.10	1
NA	QCBLK79282-1	Fluoride	16984-48-8	QCBLK79282-1	09/27/95	09/27/95	0.10	MG/L	U	0.10	1
NA	QCCLCS77766-1	Fluoride	16984-48-8	QCBLK77766-1	09/11/95	09/11/95	88	%REC			1
NA	QCCLCS78341-1	Fluoride	16984-48-8	QCBLK78341-1	09/15/95	09/15/95	99	%REC			1
NA	QCCLCS78546-1	Fluoride	16984-48-8	QCBLK78546-1	09/19/95	09/19/95	96	%REC			1
NA	QCCLCS78809-3	Fluoride	16984-48-8	QCBLK78809-2	09/22/95	09/22/95	94	%REC			1
NA	QCCLCS79282-1	Fluoride	16984-48-8	QCBLK79282-1	09/27/95	09/27/95	95	%REC			1

OK
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~~0000120~~*OK*

000080

9613429.2536

Quanterra-Richland
P.O. Box 1970
Richland, WA 99352

Project: 550.99

Category: Nitrate
Method: EPA 300.0
Matrix: LIQUID

Sample Date : 09/05/95
Receipt Date : 09/06/95
Report Date : 10/19/95

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
BOGJTO	9273-001	Nitrate-N	14797-55-8	QCBLK77766-1	09/11/95	09/11/95	2.10	MG/L	J	0.10	5
BOGJTO	9273-001DUP	Nitrate-N	14797-55-8	QCBLK77766-1	09/11/95	09/11/95	2.13	MG/L		0.10	5
BOGJTO	9273-001MS	Nitrate-N	14797-55-8	QCBLK77766-1	09/11/95	09/11/95	104	XREC			5
BOGJT2	9273-002	Nitrate-N	14797-55-8	QCBLK77766-1	09/11/95	09/11/95	13.8	MG/L	J	0.40	20
BOGJW0	9273-003	Nitrate-N	14797-55-8	QCBLK77766-1	09/11/95	09/11/95	1.95	MG/L		0.10	5
BOGJW1	9273-004	Nitrate-N	14797-55-8	QCBLK77766-1	09/11/95	09/11/95	1.93	MG/L		0.10	5
BOGJT1	9273-005	Nitrate-N	14797-55-8	QCBLK77766-1	09/11/95	09/11/95	2.17	MG/L		0.10	5
BOGJT3	9273-006	Nitrate-N	14797-55-8	QCBLK77766-1	09/11/95	09/11/95	14.9	MG/L		0.40	20
BOGJW4	9319-001	Nitrate-N	14797-55-8	QCBLK78341-1	09/15/95	09/15/95	1.96	MG/L		0.10	5
BOGJW5	9319-002	Nitrate-N	14797-55-8	QCBLK78341-1	09/15/95	09/15/95	1.94	MG/L		0.10	5
BOGJY2	9336-001	Nitrate-N	14797-55-8	QCBLK78546-1	09/19/95	09/19/95	1.59	MG/L		0.040	2
BOGJV8	9336-002	Nitrate-N	14797-55-8	QCBLK78546-1	09/19/95	09/19/95	1.60	MG/L		0.040	2
BOGJY3	9336-003	Nitrate-N	14797-55-8	QCBLK78546-1	09/19/95	09/19/95	1.56	MG/L		0.040	2
BOGJV9	9336-004	Nitrate-N	14797-55-8	QCBLK78546-1	09/19/95	09/19/95	1.60	MG/L		0.040	2
BOGJX8	9347-001	Nitrate-N	14797-55-8	QCBLK79282-1	09/27/95	09/27/95	4.91	MG/L		0.10	5
BOGJX4	9347-002	Nitrate-N	14797-55-8	QCBLK79282-1	09/27/95	09/27/95	0.28	MG/L		0.020	1
BOGJV0	9347-003	Nitrate-N	14797-55-8	QCBLK79282-1	09/27/95	09/27/95	4.93	MG/L		0.10	5
BOGJX5	9347-004	Nitrate-N	14797-55-8	QCBLK79282-1	09/27/95	09/27/95	0.047	MG/L		0.020	1
BOGJX9	9347-005	Nitrate-N	14797-55-8	QCBLK79282-1	09/27/95	09/27/95	5.00	MG/L		0.10	5
BOGJV1	9347-006	Nitrate-N	14797-55-8	QCBLK79282-1	09/27/95	09/27/95	4.96	MG/L		0.10	5
BOGJS8	9364-001	Nitrate-N	14797-55-8	QCBLK78809-2	09/22/95	09/22/95	8.59	MG/L		0.40	20
BOGJS9	9364-002	Nitrate-N	14797-55-8	QCBLK78809-2	09/22/95	09/22/95	8.39	MG/L		0.40	20
NA	QCBLK77766-1	Nitrate-N	14797-55-8	QCBLK77766-1	09/11/95	09/11/95	0.020	MG/L	U	0.020	1
NA	QCBLK78341-1	Nitrate-N	14797-55-8	QCBLK78341-1	09/15/95	09/15/95	0.020	MG/L	U	0.020	1
NA	QCBLK78546-1	Nitrate-N	14797-55-8	QCBLK78546-1	09/19/95	09/19/95	0.020	MG/L	U	0.020	1
NA	QCBLK78809-2	Nitrate-N	14797-55-8	QCBLK78809-2	09/22/95	09/22/95	0.020	MG/L	U	0.020	1
NA	QCBLK79282-1	Nitrate-N	14797-55-8	QCBLK79282-1	09/27/95	09/27/95	0.020	MG/L	U	0.020	1
NA	QCLCS77766-1	Nitrate-N	14797-55-8	QCBLK77766-1	09/11/95	09/11/95	100	XREC			1
NA	QCLCS78341-1	Nitrate-N	14797-55-8	QCBLK78341-1	09/15/95	09/15/95	96	XREC			1
NA	QCLCS78546-1	Nitrate-N	14797-55-8	QCBLK78546-1	09/19/95	09/19/95	96	XREC			1
NA	QCLCS78809-3	Nitrate-N	14797-55-8	QCBLK78809-2	09/22/95	09/22/95	98	XREC			1
NA	QCLCS79282-1	Nitrate-N	14797-55-8	QCBLK79282-1	09/27/95	09/27/95	100	XREC			1

RSC
12/1/95
00001212K

9613429.2537

Quanterra-Richland
P.O. Box 1970
Richland, WA 99352

Project: 550.99

Category: Nitrite
Method: EPA 300.0
Matrix: LIQUID

Sample Date : 09/05/95
Receipt Date : 09/06/95
Report Date : 10/19/95

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
BOGJT0	9273-001	Nitrite-N	14797-65-0	QCBLK77766-1	09/11/95	09/11/95	0.020	MG/L	UR	0.020	1
BOGJT0	9273-001DUP	Nitrite-N	14797-65-0	QCBLK77766-1	09/11/95	09/11/95	0.020	MG/L	U	0.020	1
BOGJT0	9273-001MS	Nitrite-N	14797-65-0	QCBLK77766-1	09/11/95	09/11/95	91	XREC			5
BOGJT2	9273-002	Nitrite-N	14797-65-0	QCBLK77766-1	09/11/95	09/11/95	0.020	MG/L	UR	0.020	1
BOGJW0	9273-003	Nitrite-N	14797-65-0	QCBLK77766-1	09/11/95	09/11/95	0.020	MG/L	UR	0.020	1
BOGJW1	9273-004	Nitrite-N	14797-65-0	QCBLK77766-1	09/11/95	09/11/95	0.020	MG/L	UR	0.020	1
BOGJT1	9273-005	Nitrite-N	14797-65-0	QCBLK77766-1	09/11/95	09/11/95	0.020	MG/L	UR	0.020	1
BOGJT3	9273-006	Nitrite-N	14797-65-0	QCBLK77766-1	09/11/95	09/11/95	0.020	MG/L	UR	0.020	1
BOGJW4	9319-001	Nitrite-N	14797-65-0	QCBLK78341-1	09/15/95	09/15/95	0.020	MG/L	UJ	0.020	1
BOGJW5	9319-002	Nitrite-N	14797-65-0	QCBLK78341-1	09/15/95	09/15/95	0.020	MG/L	UJ	0.020	1
BOGJY2	9336-001	Nitrite-N	14797-65-0	QCBLK78546-1	09/19/95	09/19/95	0.020	MG/L	UR	0.020	1
BOGJV8	9336-002	Nitrite-N	14797-65-0	QCBLK78546-1	09/19/95	09/19/95	0.020	MG/L	UR	0.020	1
BOGJY3	9336-003	Nitrite-N	14797-65-0	QCBLK78546-1	09/19/95	09/19/95	0.020	MG/L	UR	0.020	1
BOGJV9	9336-004	Nitrite-N	14797-65-0	QCBLK78546-1	09/19/95	09/19/95	0.020	MG/L	UR	0.020	1
BOGJX8	9347-001	Nitrite-N	14797-65-0	QCBLK79282-1	09/27/95	09/27/95	0.020	MG/L	UR	0.020	1
BOGJX4	9347-002	Nitrite-N	14797-65-0	QCBLK79282-1	09/27/95	09/27/95	0.020	MG/L	UR	0.020	1
BOGJV0	9347-003	Nitrite-N	14797-65-0	QCBLK79282-1	09/27/95	09/27/95	0.020	MG/L	UR	0.020	1
BOGJX5	9347-004	Nitrite-N	14797-65-0	QCBLK79282-1	09/27/95	09/27/95	0.020	MG/L	UR	0.020	1
BOGJX9	9347-005	Nitrite-N	14797-65-0	QCBLK79295-1	09/28/95	09/28/95	0.020	MG/L	UR	0.020	1
BOGJV1	9347-006	Nitrite-N	14797-65-0	QCBLK79295-1	09/28/95	09/28/95	0.020	MG/L	UR	0.020	1
BOGJS8	9364-001	Nitrite-N	14797-65-0	QCBLK78809-2	09/22/95	09/22/95	0.020	MG/L	UR	0.020	1
BOGJS9	9364-002	Nitrite-N	14797-65-0	QCBLK78809-2	09/22/95	09/22/95	0.020	MG/L	UR	0.020	1
NA	QCBLK77766-1	Nitrite-N	14797-65-0	QCBLK77766-1	09/11/95	09/11/95	0.020	MG/L	U	0.020	1
NA	QCBLK78341-1	Nitrite-N	14797-65-0	QCBLK78341-1	09/15/95	09/15/95	0.020	MG/L	U	0.020	1
NA	QCBLK78546-1	Nitrite-N	14797-65-0	QCBLK78546-1	09/19/95	09/19/95	0.020	MG/L	U	0.020	1
NA	QCBLK78809-2	Nitrite-N	14797-65-0	QCBLK78809-2	09/22/95	09/22/95	0.020	MG/L	U	0.020	1
NA	QCBLK79282-1	Nitrite-N	14797-65-0	QCBLK79282-1	09/27/95	09/27/95	0.020	MG/L	U	0.020	1
NA	QCBLK79295-1	Nitrite-N	14797-65-0	QCBLK79295-1	09/28/95	09/28/95	0.020	MG/L	U	0.020	1
NA	QCCLCS77766-1	Nitrite-N	14797-65-0	QCBLK77766-1	09/11/95	09/11/95	101	XREC			1
NA	QCCLCS78341-1	Nitrite-N	14797-65-0	QCBLK78341-1	09/15/95	09/15/95	95	XREC			1
NA	QCCLCS78546-1	Nitrite-N	14797-65-0	QCBLK78546-1	09/19/95	09/19/95	92	XREC			1
NA	QCCLCS78809-3	Nitrite-N	14797-65-0	QCBLK78809-2	09/22/95	09/22/95	94	XREC			1

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Quanterra-Richland
P.O. Box 1970
Richland, WA 99352

Project: 550.99

Category: Nitrite
Method: EPA 300.0
Matrix: LIQUID

Sample Date : NA
Receipt Date : NA
Report Date : 10/19/95

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
NA	QCLCS79282-1	Nitrite-N	14797-65-0	QCBLK79282-1	09/27/95	09/27/95	94	XREC			1
NA	QCLCS79295-1	Nitrite-N	14797-65-0	QCBLK79295-1	09/28/95	09/28/95	89	XREC			1

RJS
11/4/95

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Quanterra-Richland
P.O. Box 1970
Richland, WA 99352

Project: 550.99

Category: Orthophosphate
Method: EPA-300.0
Matrix: LIQUID

Sample Date : 09/05/95
Receipt Date : 09/06/95
Report Date : 10/19/95

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
BOGJTO	9273-001	Ortho-Phosphate	14265-44-2	QCBLK78341-1	09/15/95	09/15/95	0.50	MG/L	✓UR	0.50	1
BOGJTO	9273-001DUP	Ortho-Phosphate	14265-44-2	QCBLK78341-1	09/15/95	09/15/95	0.50	MG/L	U	0.50	1
BOGJTO	9273-001MS	Ortho-Phosphate	14265-44-2	QCBLK78341-1	09/15/95	09/15/95	100	XREC			1
BOGJT2	9273-002	Ortho-Phosphate	14265-44-2	QCBLK78341-1	09/15/95	09/15/95	0.50	MG/L	✓UR	0.50	1
BOGJW0	9273-003	Ortho-Phosphate	14265-44-2	QCBLK78341-1	09/15/95	09/15/95	0.50	MG/L	✓UR	0.50	1
BOGJW1	9273-004	Ortho-Phosphate	14265-44-2	QCBLK78341-1	09/15/95	09/15/95	0.50	MG/L	✓UR	0.50	1
BOGJT1	9273-005	Ortho-Phosphate	14265-44-2	QCBLK78341-1	09/15/95	09/15/95	0.50	MG/L	✓UR	0.50	1
BOGJT3	9273-006	Ortho-Phosphate	14265-44-2	QCBLK78341-1	09/15/95	09/15/95	0.50	MG/L	✓UR	0.50	1
BOGJW4	9319-001	Ortho-Phosphate	14265-44-2	QCBLK78341-1	09/15/95	09/15/95	0.50	MG/L	✓UT	0.50	1
BOGJW5	9319-002	Ortho-Phosphate	14265-44-2	QCBLK78341-1	09/15/95	09/15/95	0.50	MG/L	✓UT	0.50	1
BOGJY2	9336-001	Ortho-Phosphate	14265-44-2	QCBLK78546-1	09/19/95	09/19/95	0.50	MG/L	✓UR	0.50	1
BOGJV8	9336-002	Ortho-Phosphate	14265-44-2	QCBLK78546-1	09/19/95	09/19/95	0.50	MG/L	✓UR	0.50	1
BOGJY3	9336-003	Ortho-Phosphate	14265-44-2	QCBLK78546-1	09/19/95	09/19/95	0.50	MG/L	✓UR	0.50	1
BOGJV9	9336-004	Ortho-Phosphate	14265-44-2	QCBLK78546-1	09/19/95	09/19/95	0.50	MG/L	✓UR	0.50	1
BOGJX8	9347-001	Ortho-Phosphate	14265-44-2	QCBLK79282-1	09/27/95	09/27/95	0.50	MG/L	✓UR	0.50	1
BOGJX4	9347-002	Ortho-Phosphate	14265-44-2	QCBLK79282-1	09/27/95	09/27/95	0.50	MG/L	✓UR	0.50	1
BOGJV0	9347-003	Ortho-Phosphate	14265-44-2	QCBLK79282-1	09/27/95	09/27/95	0.50	MG/L	✓UR	0.50	1
BOGJX5	9347-004	Ortho-Phosphate	14265-44-2	QCBLK79282-1	09/27/95	09/27/95	0.50	MG/L	✓UR	0.50	1
BOGJX9	9347-005	Ortho-Phosphate	14265-44-2	QCBLK79282-1	09/27/95	09/27/95	0.50	MG/L	✓UR	0.50	1
BOGJV1	9347-006	Ortho-Phosphate	14265-44-2	QCBLK79282-1	09/27/95	09/27/95	0.50	MG/L	✓UR	0.50	1
BOGJS8	9364-001	Ortho-Phosphate	14265-44-2	QCBLK78809-2	09/22/95	09/22/95	0.50	MG/L	✓UR	0.50	1
BOGJS9	9364-002	Ortho-Phosphate	14265-44-2	QCBLK78809-2	09/22/95	09/22/95	0.50	MG/L	✓UR	0.50	1
NA	QCBLK78341-1	Ortho-Phosphate	14265-44-2	QCBLK78341-1	09/15/95	09/15/95	0.50	MG/L	U	0.50	1
NA	QCBLK78546-1	Ortho-Phosphate	14265-44-2	QCBLK78546-1	09/19/95	09/19/95	0.50	MG/L	U	0.50	1
NA	QCBLK78809-2	Ortho-Phosphate	14265-44-2	QCBLK78809-2	09/22/95	09/22/95	0.50	MG/L	U	0.50	1
NA	QCBLK79282-1	Ortho-Phosphate	14265-44-2	QCBLK79282-1	09/27/95	09/27/95	0.50	MG/L	U	0.50	1
NA	QCCLCS78341-1	Ortho-Phosphate	14265-44-2	QCBLK78341-1	09/15/95	09/15/95	112	XREC			1
NA	QCCLCS78546-1	Ortho-Phosphate	14265-44-2	QCBLK78546-1	09/19/95	09/19/95	103	XREC			1
NA	QCCLCS78809-3	Ortho-Phosphate	14265-44-2	QCBLK78809-2	09/22/95	09/22/95	96	XREC			1
NA	QCCLCS79282-1	Ortho-Phosphate	14265-44-2	QCBLK79282-1	09/27/95	09/27/95	102	XREC			1

RJS
11/19/95

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Quanterra-Richland
P.O. Box 1970
Richland, WA 99352

Project: 550.99

Category: Sulfate
Method: EPA 300.0
Matrix: LIQUID

Sample Date : 09/05/95
Receipt Date : 09/06/95
Report Date : 10/19/95

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
BOGJTO	9273-001	Sulfate	14808-79-8	QCBLK77766-1	09/11/95	09/11/95	224	MG/L		10.0	20
BOGJTO	9273-001DUP	Sulfate	14808-79-8	QCBLK77766-1	09/11/95	09/11/95	223	MG/L		10.0	20
BOGJTO	9273-001MS	Sulfate	14808-79-8	QCBLK77766-1	09/11/95	09/11/95	60	%REC			20
BOGJT2	9273-002	Sulfate	14808-79-8	QCBLK77766-1	09/11/95	09/11/95	149	MG/L		10.0	20
BOGJW0	9273-003	Sulfate	14808-79-8	QCBLK77766-1	09/11/95	09/11/95	12.2	MG/L		0.50	1
BOGJW1	9273-004	Sulfate	14808-79-8	QCBLK77766-1	09/11/95	09/11/95	12.5	MG/L		0.50	1
BOGJT1	9273-005	Sulfate	14808-79-8	QCBLK77766-1	09/11/95	09/11/95	225	MG/L		10.0	20
BOGJT3	9273-006	Sulfate	14808-79-8	QCBLK77766-1	09/11/95	09/11/95	148	MG/L		10.0	20
BOGJW4	9319-001	Sulfate	14808-79-8	QCBLK78341-1	09/15/95	09/15/95	48.6	MG/L		2.50	5
BOGJW5	9319-002	Sulfate	14808-79-8	QCBLK78341-1	09/15/95	09/15/95	48.7	MG/L		2.50	5
BOGJY2	9336-001	Sulfate	14808-79-8	QCBLK78546-1	09/19/95	09/19/95	16.4	MG/L		0.50	1
BOGJV8	9336-002	Sulfate	14808-79-8	QCBLK78546-1	09/19/95	09/19/95	16.4	MG/L		0.50	1
BOGJY3	9336-003	Sulfate	14808-79-8	QCBLK78546-1	09/19/95	09/19/95	16.2	MG/L		0.50	1
BOGJV9	9336-004	Sulfate	14808-79-8	QCBLK78546-1	09/19/95	09/19/95	16.2	MG/L		0.50	1
BOGJX8	9347-001	Sulfate	14808-79-8	QCBLK79282-1	09/27/95	09/27/95	255	MG/L		10.0	20
BOGJX4	9347-002	Sulfate	14808-79-8	QCBLK79282-1	09/27/95	09/27/95	0.50	MG/L	U	0.50	1
BOGJV0	9347-003	Sulfate	14808-79-8	QCBLK79282-1	09/27/95	09/27/95	260	MG/L		10.0	20
BOGJX5	9347-004	Sulfate	14808-79-8	QCBLK79282-1	09/27/95	09/27/95	0.50	MG/L	U	0.50	1
BOGJX9	9347-005	Sulfate	14808-79-8	QCBLK79282-1	09/27/95	09/27/95	258	MG/L		10.0	20
BOGJV1	9347-006	Sulfate	14808-79-8	QCBLK79282-1	09/27/95	09/27/95	254	MG/L		10.0	20
BOGJS8	9364-001	Sulfate	14808-79-8	QCBLK78809-2	09/22/95	09/22/95	326	MG/L		10.0	20
BOGJS9	9364-002	sulfate	14808-79-8	QCBLK78809-2	09/22/95	09/22/95	325	MG/L		10.0	20
NA	QCBLK77766-1	Sulfate	14808-79-8	QCBLK77766-1	09/11/95	09/11/95	0.50	MG/L	U	0.50	1
NA	QCBLK78341-1	Sulfate	14808-79-8	QCBLK78341-1	09/15/95	09/15/95	0.50	MG/L	U	0.50	1
NA	QCBLK78546-1	Sulfate	14808-79-8	QCBLK78546-1	09/19/95	09/19/95	0.50	MG/L	U	0.50	1
NA	QCBLK78809-2	Sulfate	14808-79-8	QCBLK78809-2	09/22/95	09/22/95	0.50	MG/L	U	0.50	1
NA	QCBLK79282-1	Sulfate	14808-79-8	QCBLK79282-1	09/27/95	09/27/95	0.50	MG/L	U	0.50	1
NA	QCCLCS77766-1	Sulfate	14808-79-8	QCBLK77766-1	09/11/95	09/11/95	92	%REC			1
NA	QCCLCS78341-1	Sulfate	14808-79-8	QCBLK78341-1	09/15/95	09/15/95	94	%REC			1
NA	QCCLCS78546-1	Sulfate	14808-79-8	QCBLK78546-1	09/19/95	09/19/95	92	%REC			1
NA	QCCLCS78809-3	Sulfate	14808-79-8	QCBLK78809-2	09/22/95	09/22/95	92	%REC			1
NA	QCCLCS79282-1	Sulfate	14808-79-8	QCBLK79282-1	09/27/95	09/27/95	93	%REC			1

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00001257pkc

9613429.2541

Quanterra-Richland
 P.O. Box 1970
 Richland, WA 99352

Project: 550.99

Category: Conductivity EPA 120.1
 Method: EPA 120.1
 Matrix: LIQUID

Sample Date : 09/05/95
 Receipt Date : 09/06/95
 Report Date : 10/19/95

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
80GJT0	9273-001	Specific Conduc	C-011	QCBLK77923-1	09/13/95	09/13/95	777	UMHOS/CM		100	1
80GJT0	9273-001DUP	Specific Conduc	C-011	QCBLK77923-1	09/13/95	09/13/95	778	UMHOS/CM		100	1
80GJT2	9273-002	Specific Conduc	C-011	QCBLK77923-1	09/13/95	09/13/95	772	UMHOS/CM		100	1
80GJW0	9273-003	Specific Conduc	C-011	QCBLK77923-1	09/13/95	09/13/95	177	UMHOS/CM		100	1
80GJW4	9319-001	Specific Conduc	C-011	QCBLK78781-1	09/25/95	09/25/95	372	UMHOS/CM		100	1
80GJY2	9336-001	Specific Conduc	C-011	QCBLK78781-1	09/25/95	09/25/95	186	UMHOS/CM		100	1
80GJV8	9336-002	Specific Conduc	C-011	QCBLK78781-1	09/25/95	09/25/95	187	UMHOS/CM		100	1
80GJX8	9347-001	Specific Conduc	C-011	QCBLK78781-1	09/25/95	09/25/95	969	UMHOS/CM		100	1
80GJX4	9347-002	Specific Conduc	C-011	QCBLK78781-1	09/25/95	09/25/95	100	UMHOS/CM U		100	1
80GJV0	9347-003	Specific Conduc	C-011	QCBLK78781-1	09/25/95	09/25/95	962	UMHOS/CM		100	1
80GJS8	9364-001	Specific Conduc	C-011	QCBLK78781-1	09/25/95	09/25/95	1090	UMHOS/CM		100	1
NA	QCBLK77923-1	Specific Conduc	C-011	QCBLK77923-1	09/13/95	09/13/95	100	UMHOS/CM U		100	1
NA	QCBLK78781-1	Specific Conduc	C-011	QCBLK78781-1	09/25/95	09/25/95	100	UMHOS/CM U		100	1

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9613429.2542

Quanterra-Richland
P.O. Box 1970
Richland, WA 99352

Project: 550.99

Category: Oil & Grease EPA 413.1
Method: EPA 413.1
Matrix: LIQUID

Sample Date : 09/05/95
Receipt Date : 09/06/95
Report Date : 10/19/95

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
BOGJT0	9273-001	Oil & Grease	C-007	QCBLK77768-1	09/12/95	09/12/95	0.95	MG/L	U	0.95	1
BOGJT0	9273-001DUP	Oil & Grease	C-007	QCBLK77768-1	09/12/95	09/12/95	0.98	MG/L	U	0.98	1
BOGJT2	9273-002	Oil & Grease	C-007	QCBLK77768-1	09/12/95	09/12/95	10.6	MG/L		0.94	1
BOGJX8	9347-001	Oil & Grease	C-007	QCBLK78647-1	09/21/95	09/21/95	0.98	MG/L	U	0.98	1
BOGJX4	9347-002	Oil & Grease	C-007	QCBLK78647-1	09/21/95	09/21/95	2.23	MG/L		0.93	1
BOGJVO	9347-003	Oil & Grease	C-007	QCBLK78647-1	09/21/95	09/21/95	0.95	MG/L	U	0.95	1
BOGJS8	9364-001	Oil & Grease	C-007	QCBLK78647-1	09/21/95	09/21/95	0.98	MG/L	U	0.98	1
NA	QCBLK77768-1	Oil & Grease	C-007	QCBLK77768-1	09/12/95	09/12/95	1.00	MG/L	U	1.00	1
NA	QCBLK78647-1	Oil & Grease	C-007	QCBLK78647-1	09/21/95	09/21/95	1.00	MG/L	U	1.00	1
NA	QCCLCS77768-1	Oil & Grease	C-007	QCBLK77768-1	09/12/95	09/12/95	113	%REC			1
NA	QCCLCS78647-1	Oil & Grease	C-007	QCBLK78647-1	09/21/95	09/21/95	94	%REC			1

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Quanterra-Richland
P.O. Box 1970
Richland, WA 99352

Project: 550.99

Category: pH EPA 9040
Method: EPA 9040
Matrix: LIQUID

Sample Date : 09/05/95
Receipt Date : 09/06/95
Report Date : 10/19/95

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
BOGJT0	9273-001	pH	C-006	QCBLK77585-1	09/08/95	09/08/95	8.26	PH	J		1
BOGJT0	9273-001DUP	pH	C-006	QCBLK77585-1	09/08/95	09/08/95	8.27	PH			1
BOGJT2	9273-002	pH	C-006	QCBLK77585-1	09/08/95	09/08/95	7.92	PH	J		1
BOGJW0	9273-003	pH	C-006	QCBLK77585-1	09/08/95	09/08/95	8.23	PH	J		1
BOGJW4	9319-001	pH	C-006	QCBLK78098-1	09/15/95	09/15/95	7.95	PH	J		1
BOGJY2	9336-001	pH	C-006	QCBLK78098-1	09/15/95	09/15/95	8.15	PH	J		1
BOGJV8	9336-002	pH	C-006	QCBLK78098-1	09/15/95	09/15/95	8.15	PH	J		1
BOGJX8	9347-001	pH	C-006	QCBLK78368-1	09/19/95	09/19/95	7.35	PH	J		1
BOGJX4	9347-002	pH	C-006	QCBLK78368-1	09/19/95	09/19/95	5.74	PH	J		1
BOGJV0	9347-003	pH	C-006	QCBLK78368-1	09/19/95	09/19/95	7.34	PH	J		1
BOGJS8	9364-001	pH	C-006	QCBLK78368-1	09/19/95	09/19/95	7.78	PH	J		1
NA	QCBLK77585-1	pH	C-006	QCBLK77585-1	09/08/95	09/08/95	5.65	PH			
NA	QCBLK78098-1	pH	C-006	QCBLK78098-1	09/15/95	09/15/95	5.54	PH			
NA	QCBLK78368-1	pH	C-006	QCBLK78368-1	09/19/95	09/19/95	5.16	PH			

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Quanterra-Richland
P.O. Box 1970
Richland, WA 99352

Project: 550.99

Category: TPH EPA 418.1
Method: EPA 418.1
Matrix: LIQUID

Sample Date : 09/05/95
Receipt Date : 09/06/95
Report Date : 10/19/95

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
BOGJT0	9273-001	TPH	10-90-2	QCBLK77946-1	09/13/95	09/14/95	0.49	MG/L	U R	0.49	1
BOGJT0	9273-001MS	TPH	10-90-2	QCBLK77946-1	09/13/95	09/14/95	81	%REC			1
BOGJT0	9273-001MSD	TPH	10-90-2	QCBLK77946-1	09/13/95	09/14/95	80	%REC			1
BOGJT2	9273-002	TPH	10-90-2	QCBLK77946-1	09/13/95	09/14/95	0.49	MG/L	U R	0.49	1
BOGJX8	9347-001	TPH	10-90-2	QCBLK78908-1	09/26/95	09/27/95	0.48	MG/L	U R	0.48	1
BOGJX4	9347-002	TPH	10-90-2	QCBLK78908-1	09/26/95	09/27/95	0.48	MG/L	U R	0.48	1
BOGJV0	9347-003	TPH	10-90-2	QCBLK78908-1	09/26/95	09/27/95	0.48	MG/L	U R	0.48	1
BOGJS8	9364-001	TPH	10-90-2	QCBLK78908-1	09/26/95	09/27/95	0.48	MG/L	U R	0.48	1
NA	QCBLK77946-1	TPH	10-90-2	QCBLK77946-1	09/13/95	09/14/95	0.50	MG/L	U	0.50	1
NA	QCBLK78908-1	TPH	10-90-2	QCBLK78908-1	09/26/95	09/27/95	0.50	MG/L	U	0.50	1
NA	QCCLCS77946-1	TPH	10-90-2	QCBLK77946-1	09/13/95	09/14/95	93	%REC			1
NA	QCCLCS78908-1	TPH	10-90-2	QCBLK78908-1	09/26/95	09/27/95	89	%REC			1

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12/1/95

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Quanterra-Richland
 P.O. Box 1970
 Richland, WA 99352

Project: 550.99

Sample Date : 09/05/95
 Receipt Date : 09/06/95
 Report Date : 10/19/95

Category: Turbidity EPA 180.1
 Method: EPA 180.1
 Matrix: LIQUID

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
BOGJT0	9273-001	Turbidity	G-019	QCBLK77698-1	09/11/95	09/11/95	0.45	NTU	J	0.01	1
BOGJT0	9273-001DUP	Turbidity	G-019	QCBLK77698-1	09/11/95	09/11/95	0.44	NTU		0.01	1
BOGJT2	9273-002	Turbidity	G-019	QCBLK77698-1	09/11/95	09/11/95	3.85	NTU	J	0.01	1
BOGJW0	9273-003	Turbidity	G-019	QCBLK77698-1	09/11/95	09/11/95	0.82	NTU	J	0.01	1
BOGJW4	9319-001	Turbidity	G-019	QCBLK78789-1	09/25/95	09/25/95	0.41	NTU	J	0.01	1
BOGJY2	9336-001	Turbidity	G-019	QCBLK78789-1	09/25/95	09/25/95	0.10	NTU	UJ	0.01	1
BOGJV8	9336-002	Turbidity	G-019	QCBLK78789-1	09/25/95	09/25/95	0.16	NTU	J	0.01	1
BOGJX8	9347-001	Turbidity	G-019	QCBLK78789-1	09/25/95	09/25/95	0.38	NTU	J	0.01	1
BOGJX4	9347-002	Turbidity	G-019	QCBLK78789-1	09/25/95	09/25/95	0.95	NTU	J	0.01	1
BOGJV0	9347-003	Turbidity	G-019	QCBLK78789-1	09/25/95	09/25/95	0.45	NTU	J	0.01	1
BOGJS8	9364-001	Turbidity	G-019	QCBLK78789-1	09/25/95	09/25/95	1.06	NTU	J	0.01	1
NA	QCBLK77698-1	Turbidity	G-019	QCBLK77698-1	09/11/95	09/11/95	0.01	NTU		0.01	1
NA	QCBLK78789-1	Turbidity	G-019	QCBLK78789-1	09/25/95	09/25/95	0.03	NTU		0.01	1

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 12/1/95

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9613429.2546

Quanterra-Richland
P.O. Box 1970
Richland, WA 99352

Project: 550.99

Category: Chloride
Method: EPA 300.0
Matrix: LIQUID

Sample Date : 09/15/95
Receipt Date : 09/18/95
Report Date : 10/26/95

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
80GJW6	9375-001	Chloride	16887-00-6	QCBLK78923-1	09/25/95	09/25/95	0.20	MG/L	U	0.20	1
80GJW6	9375-001DUP	Chloride	16887-00-6	QCBLK78923-1	09/25/95	09/25/95	0.20	MG/L	U	0.20	1
80GJW6	9375-001HS	Chloride	16887-00-6	QCBLK78923-1	09/25/95	09/25/95	99	%REC			5
80GJX2	9375-002	Chloride	16887-00-6	QCBLK78923-1	09/25/95	09/25/95	0.20	MG/L	U	0.20	1
80GHX7	9375-003	Chloride	16887-00-6	QCBLK78923-1	09/25/95	09/25/95	30.6	MG/L		5.00	25
80GJW2	9375-004	Chloride	16887-00-6	QCBLK78923-1	09/25/95	09/25/95	5.85	MG/L		0.40	2
80GJW3	9375-005	Chloride	16887-00-6	QCBLK78923-1	09/25/95	09/25/95	6.14	MG/L		0.40	2
80GJX3	9375-007	Chloride	16887-00-6	QCBLK78923-2	09/25/95	09/25/95	0.20	MG/L	U	0.20	1
80GJV6	9380-001	Chloride	16887-00-6	QCBLK78923-1	09/25/95	09/25/95	4.86	MG/L		1.00	5
80GJY0	9380-002	Chloride	16887-00-6	QCBLK78923-1	09/25/95	09/25/95	4.58	MG/L		1.00	5
80GJV7	9380-003	Chloride	16887-00-6	QCBLK78923-1	09/25/95	09/25/95	4.68	MG/L		1.00	5
80GJY1	9380-004	Chloride	16887-00-6	QCBLK78923-1	09/25/95	09/25/95	4.80	MG/L		1.00	5
80GJV8	9404-001	Chloride	16887-00-6	QCBLK79282-1	09/27/95	09/27/95	0.20	MG/L	U	0.20	1
80GJX6	9404-002	Chloride	16887-00-6	QCBLK79282-1	09/27/95	09/27/95	0.20	MG/L	U	0.20	1
80GJX0	9404-003	Chloride	16887-00-6	QCBLK79282-1	09/27/95	09/27/95	0.20	MG/L	U	0.20	1
80GJV2	9404-004	Chloride	16887-00-6	QCBLK79282-1	09/27/95	09/27/95	50.3	MG/L		5.00	25
NA	QCBLK78923-1	Chloride	16887-00-6	QCBLK78923-1	09/25/95	09/25/95	0.20	MG/L	U	0.20	1
NA	QCBLK78923-2	Chloride	16887-00-6	QCBLK78923-2	09/25/95	09/25/95	0.20	MG/L	U	0.20	1
NA	QCBLK79282-1	Chloride	16887-00-6	QCBLK79282-1	09/27/95	09/27/95	0.20	MG/L	U	0.20	1
NA	QCCLCS78923-1	Chloride	16887-00-6	QCBLK78923-1	09/25/95	09/25/95	93	%REC			1
NA	QCCLCS78923-2	Chloride	16887-00-6	QCBLK78923-2	09/25/95	09/25/95	93	%REC			1
NA	QCCLCS79282-1	Chloride	16887-00-6	QCBLK79282-1	09/27/95	09/27/95	92	%REC			1

RJS 12/4/95

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9613429.2547

Quanterra-Richland
P.O. Box 1970
Richland, WA 99352

Project: 550.99

Category: Fluoride
Method: EPA 300.0
Matrix: LIQUID

Sample Date : 09/15/95
Receipt Date : 09/18/95
Report Date : 10/26/95

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
BOGJW6	9375-001	Fluoride	16984-48-8	QCBLK78923-1	09/25/95	09/25/95	0.10	MG/L	U	0.10	1
BOGJW6	9375-001DUP	Fluoride	16984-48-8	QCBLK78923-1	09/25/95	09/25/95	0.10	MG/L	U	0.10	1
BOGJW6	9375-001MS	Fluoride	16984-48-8	QCBLK78923-1	09/25/95	09/25/95	92	UREC			1
BOGJX2	9375-002	Fluoride	16984-48-8	QCBLK78923-1	09/25/95	09/25/95	0.10	MG/L	U	0.10	1
BOGHX7	9375-003	Fluoride	16984-48-8	QCBLK78923-1	09/25/95	09/25/95	0.20	MG/L	U	0.20	2
BOGJW2	9375-004	Fluoride	16984-48-8	QCBLK78923-1	09/25/95	09/25/95	0.67	MG/L		0.20	2
BOGJV3	9375-005	Fluoride	16984-48-8	QCBLK78923-1	09/25/95	09/25/95	0.66	MG/L		0.20	2
BOGJX3	9375-007	Fluoride	16984-48-8	QCBLK78923-2	09/25/95	09/25/95	0.10	MG/L	U	0.10	1
BOGJV6	9380-001	Fluoride	16984-48-8	QCBLK78923-1	09/25/95	09/25/95	0.17	MG/L		0.10	1
BOGJY0	9380-002	Fluoride	16984-48-8	QCBLK78923-1	09/25/95	09/25/95	0.18	MG/L		0.10	1
BOGJV7	9380-003	Fluoride	16984-48-8	QCBLK78923-1	09/25/95	09/25/95	0.18	MG/L		0.10	1
BOGJY1	9380-004	Fluoride	16984-48-8	QCBLK78923-1	09/25/95	09/25/95	0.19	MG/L		0.10	1
BOGJW8	9404-001	Fluoride	16984-48-8	QCBLK79282-1	09/27/95	09/27/95	0.10	MG/L	U	0.10	1
BOGJX6	9404-002	Fluoride	16984-48-8	QCBLK79282-1	09/27/95	09/27/95	0.10	MG/L	U	0.10	1
BOGJX0	9404-003	Fluoride	16984-48-8	QCBLK79282-1	09/27/95	09/27/95	0.10	MG/L	U	0.10	1
BOGJV2	9404-004	Fluoride	16984-48-8	QCBLK79282-1	09/27/95	09/27/95	0.23	MG/L		0.10	1
NA	QCBLK78923-1	Fluoride	16984-48-8	QCBLK78923-1	09/25/95	09/25/95	0.10	MG/L	U	0.10	1
NA	QCBLK78923-2	Fluoride	16984-48-8	QCBLK78923-2	09/25/95	09/25/95	0.10	MG/L	U	0.10	1
NA	QCBLK79282-1	Fluoride	16984-48-8	QCBLK79282-1	09/27/95	09/27/95	0.10	MG/L	U	0.10	1
NA	QCCLS78923-1	Fluoride	16984-48-8	QCBLK78923-1	09/25/95	09/25/95	96	UREC			1
NA	QCCLS78923-2	Fluoride	16984-48-8	QCBLK78923-2	09/25/95	09/25/95	93	UREC			1
NA	QCCLS79282-1	Fluoride	16984-48-8	QCBLK79282-1	09/27/95	09/27/95	95	UREC			1

RJS 11/4/95

9613429.2548

Quanterra-Richland
P.O. Box 1970
Richland, WA 99352

Project: 550.99

Category: Nitrate
Method: EPA 300.0
Matrix: LIQUID

Sample Date : 09/15/95
Receipt Date : 09/18/95
Report Date : 10/26/95

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
BOGJW6	9375-001	Nitrate-N	14797-55-8	QCBLK78923-1	09/25/95	09/25/95	0.020	MG/L	✓UR	0.020	1
BOGJW6	9375-001DUP	Nitrate-N	14797-55-8	QCBLK78923-1	09/25/95	09/25/95	0.020	MG/L	U	0.020	1
BOGJW6	9375-001MS	Nitrate-N	14797-55-8	QCBLK78923-1	09/25/95	09/25/95	100	%REC			5
BOGJX2	9375-002	Nitrate-N	14797-55-8	QCBLK78923-1	09/25/95	09/25/95	0.020	MG/L	✓UR	0.020	1
BOGHX7	9375-003	Nitrate-N	14797-55-8	QCBLK78923-1	09/25/95	09/25/95	16.4	MG/L	J	0.50	25
BOGJW2	9375-004	Nitrate-N	14797-55-8	QCBLK78923-1	09/25/95	09/25/95	0.79	MG/L	J	0.020	1
BOGJW3	9375-005	Nitrate-N	14797-55-8	QCBLK78923-1	09/25/95	09/25/95	0.81	MG/L	J	0.020	1
BOGJX3	9375-007	Nitrate-N	14797-55-8	QCBLK78923-2	09/25/95	09/25/95	0.020	MG/L	✓UR	0.020	1
BOGJV6	9380-001	Nitrate-N	14797-55-8	QCBLK78923-1	09/25/95	09/25/95	4.30	MG/L	J	0.10	5
BOGJY0	9380-002	Nitrate-N	14797-55-8	QCBLK78923-1	09/25/95	09/25/95	4.26	MG/L	J	0.10	5
BOGJV7	9380-003	Nitrate-N	14797-55-8	QCBLK78923-1	09/25/95	09/25/95	4.30	MG/L	J	0.10	5
BOGJY1	9380-004	Nitrate-N	14797-55-8	QCBLK78923-1	09/25/95	09/25/95	4.23	MG/L	J	0.10	5
BOGJW8	9404-001	Nitrate-N	14797-55-8	QCBLK79282-1	09/27/95	09/27/95	0.020	MG/L	✓UR	0.020	1
BOGJX6	9404-002	Nitrate-N	14797-55-8	QCBLK79282-1	09/27/95	09/27/95	0.020	MG/L	✓UR	0.020	1
BOGJX0	9404-003	Nitrate-N	14797-55-8	QCBLK79282-1	09/27/95	09/27/95	0.020	MG/L	✓UR	0.020	1
BOGJV2	9404-004	Nitrate-N	14797-55-8	QCBLK79282-1	09/27/95	09/27/95	14.4	MG/L	J	0.50	25
NA	QCBLK78923-1	Nitrate-N	14797-55-8	QCBLK78923-1	09/25/95	09/25/95	0.020	MG/L	U	0.020	1
NA	QCBLK78923-2	Nitrate-N	14797-55-8	QCBLK78923-2	09/25/95	09/25/95	0.020	MG/L	U	0.020	1
NA	QCBLK79282-1	Nitrate-N	14797-55-8	QCBLK79282-1	09/27/95	09/27/95	0.020	MG/L	U	0.020	1
NA	QCCLCS78923-1	Nitrate-N	14797-55-8	QCBLK78923-1	09/25/95	09/25/95	101	%REC			1
NA	QCCLCS78923-2	Nitrate-N	14797-55-8	QCBLK78923-2	09/25/95	09/25/95	103	%REC			1
NA	QCCLCS79282-1	Nitrate-N	14797-55-8	QCBLK79282-1	09/27/95	09/27/95	100	%REC			1

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Quanterra-Richland
 P.O. Box 1970
 Richland, WA 99352

Project: 550.99

Category: Nitrite
 Method: EPA 300.0
 Matrix: LIQUID

Sample Date : 09/15/95
 Receipt Date : 09/18/95
 Report Date : 10/26/95

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
BOGJW6	9375-001	Nitrite-N	14797-65-0	QCBLK78923-1	09/25/95	09/25/95	0.020	MG/L	✓ UR	0.020	1
BOGJW6	9375-001DUP	Nitrite-N	14797-65-0	QCBLK78923-1	09/25/95	09/25/95	0.020	MG/L	U	0.020	1
BOGJW6	9375-001MS	Nitrite-N	14797-65-0	QCBLK78923-1	09/25/95	09/25/95	92	XREC			5
BOGJX2	9375-002	Nitrite-N	14797-65-0	QCBLK78923-1	09/25/95	09/25/95	0.020	MG/L	✓ UR	0.020	1
BOGHX7	9375-003	Nitrite-N	14797-65-0	QCBLK78923-1	09/25/95	09/25/95	0.020	MG/L	✓ UR	0.020	1
BOGJW2	9375-004	Nitrite-N	14797-65-0	QCBLK78923-1	09/25/95	09/25/95	0.020	MG/L	✓ UR	0.020	1
BOGJW3	9375-005	Nitrite-N	14797-65-0	QCBLK78923-1	09/25/95	09/25/95	0.020	MG/L	✓ UR	0.020	1
BOGJX3	9375-007	Nitrite-N	14797-65-0	QCBLK78923-2	09/25/95	09/25/95	0.020	MG/L	✓ UR	0.020	1
BOGJV6	9380-001	Nitrite-N	14797-65-0	QCBLK78923-1	09/25/95	09/25/95	0.020	MG/L	✓ UR	0.020	1
BOGJY0	9380-002	Nitrite-N	14797-65-0	QCBLK78923-1	09/25/95	09/25/95	0.020	MG/L	✓ UR	0.020	1
BOGJV7	9380-003	Nitrite-N	14797-65-0	QCBLK78923-1	09/25/95	09/25/95	0.020	MG/L	✓ UR	0.020	1
BOGJY1	9380-004	Nitrite-N	14797-65-0	QCBLK78923-1	09/25/95	09/25/95	0.020	MG/L	✓ UR	0.020	1
BOGJW8	9404-001	Nitrite-N	14797-65-0	QCBLK79282-1	09/27/95	09/27/95	0.020	MG/L	✓ UR	0.020	1
BOGJX6	9404-002	Nitrite-N	14797-65-0	QCBLK79282-1	09/27/95	09/27/95	0.020	MG/L	✓ UR	0.020	1
BOGJX0	9404-003	Nitrite-N	14797-65-0	QCBLK79282-1	09/27/95	09/27/95	0.020	MG/L	✓ UR	0.020	1
BOGJV2	9404-004	Nitrite-N	14797-65-0	QCBLK79282-1	09/27/95	09/27/95	0.020	MG/L	✓ UR	0.020	1
NA	QCBLK78923-1	Nitrite-N	14797-65-0	QCBLK78923-1	09/25/95	09/25/95	0.020	MG/L	U	0.020	1
NA	QCBLK78923-2	Nitrite-N	14797-65-0	QCBLK78923-2	09/25/95	09/25/95	0.020	MG/L	U	0.020	1
NA	QCBLK79282-1	Nitrite-N	14797-65-0	QCBLK79282-1	09/27/95	09/27/95	0.020	MG/L	U	0.020	1
NA	QCCLCS78923-1	Nitrite-N	14797-65-0	QCBLK78923-1	09/25/95	09/25/95	92	XREC			1
NA	QCCLCS78923-2	Nitrite-N	14797-65-0	QCBLK78923-2	09/25/95	09/25/95	95	XREC			1
NA	QCCLCS79282-1	Nitrite-N	14797-65-0	QCBLK79282-1	09/27/95	09/27/95	94	XREC			1

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 12/14/95

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9613429.2550

Quanterra-Richland
P.O. Box 1970
Richland, WA 99352

Project: 550.99

Category: Orthophosphate
Method: EPA 300.0
Matrix: LIQUID

Sample Date : 09/15/95
Receipt Date : 09/18/95
Report Date : 10/26/95

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
80GJW6	9375-001	Ortho-Phosphate	14265-44-2	QCBLK78923-1	09/25/95	09/25/95	0.50	MG/L	✓ UR	0.50	1
80GJW6	9375-001DUP	Ortho-Phosphate	14265-44-2	QCBLK78923-1	09/25/95	09/25/95	0.50	MG/L	U	0.50	1
80GJW6	9375-001MS	Ortho-Phosphate	14265-44-2	QCBLK78923-1	09/25/95	09/25/95	104	ΣREC			1
80GJX2	9375-002	Ortho-Phosphate	14265-44-2	QCBLK78923-1	09/25/95	09/25/95	0.50	MG/L	✓ UR	0.50	1
80GHX7	9375-003	Ortho-Phosphate	14265-44-2	QCBLK78923-1	09/25/95	09/25/95	0.50	MG/L	✓ UR	0.50	1
80GJV2	9375-004	Ortho-Phosphate	14265-44-2	QCBLK78923-1	09/25/95	09/25/95	0.50	MG/L	✓ UR	0.50	1
80GJV3	9375-005	Ortho-Phosphate	14265-44-2	QCBLK78923-1	09/25/95	09/25/95	0.50	MG/L	✓ UR	0.50	1
80GJX3	9375-007	Ortho-Phosphate	14265-44-2	QCBLK78923-2	09/25/95	09/25/95	0.50	MG/L	✓ UR	0.50	1
80GJV6	9380-001	Ortho-Phosphate	14265-44-2	QCBLK78923-1	09/25/95	09/25/95	0.50	MG/L	✓ UR	0.50	1
80GJY0	9380-002	Ortho-Phosphate	14265-44-2	QCBLK78923-1	09/25/95	09/25/95	0.50	MG/L	✓ UR	0.50	1
80GJV7	9380-003	Ortho-Phosphate	14265-44-2	QCBLK78923-1	09/25/95	09/25/95	0.50	MG/L	✓ UR	0.50	1
80GJY1	9380-004	Ortho-Phosphate	14265-44-2	QCBLK78923-1	09/25/95	09/25/95	0.50	MG/L	✓ UR	0.50	1
80GJV8	9404-001	Ortho-Phosphate	14265-44-2	QCBLK79282-1	09/27/95	09/27/95	0.50	MG/L	✓ UR	0.50	1
80GJV6	9404-002	Ortho-Phosphate	14265-44-2	QCBLK79282-1	09/27/95	09/27/95	0.50	MG/L	✓ UR	0.50	1
80GJV0	9404-003	Ortho-Phosphate	14265-44-2	QCBLK79282-1	09/27/95	09/27/95	0.50	MG/L	✓ UR	0.50	1
80GJV2	9404-004	Ortho-Phosphate	14265-44-2	QCBLK79282-1	09/27/95	09/27/95	0.50	MG/L	✓ UR	0.50	1
NA	QCBLK78923-1	Ortho-Phosphate	14265-44-2	QCBLK78923-1	09/25/95	09/25/95	0.50	MG/L	U	0.50	1
NA	QCBLK78923-2	Ortho-Phosphate	14265-44-2	QCBLK78923-2	09/25/95	09/25/95	0.50	MG/L	U	0.50	1
NA	QCBLK79282-1	Ortho-Phosphate	14265-44-2	QCBLK79282-1	09/27/95	09/27/95	0.50	MG/L	U	0.50	1
NA	QCCLCS78923-1	Ortho-Phosphate	14265-44-2	QCBLK78923-1	09/25/95	09/25/95	104	ΣREC			1
NA	QCCLCS78923-2	Ortho-Phosphate	14265-44-2	QCBLK78923-2	09/25/95	09/25/95	96	ΣREC			1
NA	QCCLCS79282-1	Ortho-Phosphate	14265-44-2	QCBLK79282-1	09/27/95	09/27/95	102	ΣREC			1

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Quanterra-Richland
P.O. Box 1970
Richland, WA 99352

Project: 550.99

Category: Sulfate
Method: EPA 300.0
Matrix: LIQUID

Sample Date : 09/15/95
Receipt Date : 09/18/95
Report Date : 10/26/95

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
BOGJW6	9375-001	Sulfate	14808-79-8	QCBLK78923-1	09/25/95	09/25/95	0.50	MG/L	U	0.50	1
BOGJW6	9375-001DUP	Sulfate	14808-79-8	QCBLK78923-1	09/25/95	09/25/95	0.50	MG/L	U	0.50	1
BOGJW6	9375-001MS	Sulfate	14808-79-8	QCBLK78923-1	09/25/95	09/25/95	98	%REC			5
BOGJX2	9375-002	Sulfate	14808-79-8	QCBLK78923-1	09/25/95	09/25/95	0.50	MG/L	U	0.50	1
BOGHX7	9375-003	Sulfate	14808-79-8	QCBLK78923-1	09/25/95	09/25/95	143	MG/L		12.5	25
BOGJW2	9375-004	Sulfate	14808-79-8	QCBLK78923-1	09/25/95	09/25/95	340	MG/L		25.0	50
BOGJW3	9375-005	Sulfate	14808-79-8	QCBLK78923-1	09/25/95	09/25/95	350	MG/L		25.0	50
BOGJX3	9375-007	Sulfate	14808-79-8	QCBLK78923-2	09/25/95	09/25/95	0.50	MG/L	U	0.50	1
BOGJV6	9380-001	Sulfate	14808-79-8	QCBLK78923-1	09/25/95	09/25/95	59.4	MG/L		2.50	5
BOGJY0	9380-002	Sulfate	14808-79-8	QCBLK78923-1	09/25/95	09/25/95	57.6	MG/L		2.50	5
BOGJV7	9380-003	Sulfate	14808-79-8	QCBLK78923-1	09/25/95	09/25/95	57.8	MG/L		2.50	5
BOGJY1	9380-004	Sulfate	14808-79-8	QCBLK78923-1	09/25/95	09/25/95	58.7	MG/L		2.50	5
BOGJW8	9404-001	Sulfate	14808-79-8	QCBLK79282-1	09/27/95	09/27/95	0.50	MG/L	U	0.50	1
BOGJX6	9404-002	Sulfate	14808-79-8	QCBLK79282-1	09/27/95	09/27/95	0.50	MG/L	U	0.50	1
BOGJX0	9404-003	Sulfate	14808-79-8	QCBLK79282-1	09/27/95	09/27/95	0.50	MG/L	U	0.50	1
BOGJV2	9404-004	Sulfate	14808-79-8	QCBLK79282-1	09/27/95	09/27/95	214	MG/L		12.5	25
NA	QCBLK78923-1	Sulfate	14808-79-8	QCBLK78923-1	09/25/95	09/25/95	0.50	MG/L	U	0.50	1
NA	QCBLK78923-2	Sulfate	14808-79-8	QCBLK78923-2	09/25/95	09/25/95	0.50	MG/L	U	0.50	1
NA	QCBLK79282-1	Sulfate	14808-79-8	QCBLK79282-1	09/27/95	09/27/95	0.50	MG/L	U	0.50	1
NA	QCCLCS78923-1	Sulfate	14808-79-8	QCBLK78923-1	09/25/95	09/25/95	95	%REC			1
NA	QCCLCS78923-2	Sulfate	14808-79-8	QCBLK78923-2	09/25/95	09/25/95	91	%REC			1
NA	QCCLCS79282-1	Sulfate	14808-79-8	QCBLK79282-1	09/27/95	09/27/95	93	%REC			1

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Quanterra-Richland
P.O. Box 1970
Richland, WA 99352

Project: 550.99

Category: Conductivity EPA 120.1
Method: EPA 120.1
Matrix: LIQUID

Sample Date : 09/15/95
Receipt Date : 09/18/95
Report Date : 10/27/95

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
BOGJW6	9375-001	Specific Conduc	C-011	QCBLK78781-1	09/25/95	09/25/95	100	UMHOS/CM	U	100	1
BOGJW6	9375-0010UP	Specific Conduc	C-011	QCBLK78781-1	09/25/95	09/25/95	100	UMHOS/CM	U	100	1
BOGJX2	9375-002	Specific Conduc	C-011	QCBLK78781-1	09/25/95	09/25/95	314	UMHOS/CM		100	1
BOGHX7	9375-003	Specific Conduc	C-011	QCBLK78781-1	09/25/95	09/25/95	1090	UMHOS/CM		100	1
BOGJW2	9375-004	Specific Conduc	C-011	QCBLK78781-1	09/25/95	09/25/95	1040	UMHOS/CM		100	1
BOGJV6	9380-001	Specific Conduc	C-011	QCBLK78781-1	09/25/95	09/25/95	314	UMHOS/CM		100	1
BOGJY0	9380-002	Specific Conduc	C-011	QCBLK78781-1	09/25/95	09/25/95	100	UMHOS/CM	U	100	1
BOGJW8	9404-001	Specific Conduc	C-011	QCBLK80386-1	10/13/95	10/13/95	100	UMHOS/CM	U	100	1
BOGJX6	9404-002	Specific Conduc	C-011	QCBLK80386-1	10/13/95	10/13/95	100	UMHOS/CM	U	100	1
BOGJX0	9404-003	Specific Conduc	C-011	QCBLK80386-1	10/13/95	10/13/95	100	UMHOS/CM	U	100	1
BOGJV2	9404-004	Specific Conduc	C-011	QCBLK80386-1	10/13/95	10/13/95	824	UMHOS/CM		100	1
NA	QCBLK78781-1	Specific Conduc	C-011	QCBLK78781-1	09/25/95	09/25/95	100	UMHOS/CM	U	100	1
NA	QCBLK80386-1	Specific Conduc	C-011	QCBLK80386-1	10/13/95	10/13/95	100	UMHOS/CM	U	100	1

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Quanterra-Richland
P.O. Box 1970
Richland, WA 99352

Category: Oil & Grease EPA 413.1
Method: EPA 413.1
Matrix: LIQUID

Project: 550.99

Sample Date : 09/15/95
Receipt Date : 09/18/95
Report Date : 10/27/95

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
BOGJW6	9375-001	Oil & Grease	C-007	QCBLK79628-1	10/04/95	10/04/95	0.99	MG/L	U	0.99	1
BOGJW6	9375-001DUP	Oil & Grease	C-007	QCBLK79628-1	10/04/95	10/04/95	0.97	MG/L	U	0.97	1
BOGJX2	9375-002	Oil & Grease	C-007	QCBLK79628-1	10/04/95	10/04/95	0.95	MG/L	U	0.95	1
BOGHX7	9375-003	Oil & Grease	C-007	QCBLK79628-1	10/04/95	10/04/95	0.94	MG/L	U	0.94	1
BOGJW8	9404-001	Oil & Grease	C-007	QCBLK80549-1	10/16/95	10/16/95	2.21	MG/L		1.00	1
BOGJX6	9404-002	Oil & Grease	C-007	QCBLK80549-1	10/16/95	10/16/95	2.63	MG/L		0.94	1
BOGJX0	9404-003	Oil & Grease	C-007	QCBLK80549-1	10/16/95	10/16/95	2.13	MG/L		1.02	1
BOGJS7	9404-005	Oil & Grease	C-007	QCBLK80549-1	10/16/95	10/16/95	2.94	MG/L		1.18	1
NA	QCBLK79628-1	Oil & Grease	C-007	QCBLK79628-1	10/04/95	10/04/95	1.00	MG/L	U	1.00	1
NA	QCBLK80549-1	Oil & Grease	C-007	QCBLK80549-1	10/16/95	10/16/95	1.00	MG/L	U	1.00	1
NA	QCCLCS79628-1	Oil & Grease	C-007	QCBLK79628-1	10/04/95	10/04/95	87	XREC			1
NA	QCCLCS80549-1	Oil & Grease	C-007	QCBLK80549-1	10/16/95	10/16/95	93	XREC			1

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Quanterra-Richland
P.O. Box 1970
Richland, WA 99352

Project: 550.99

Category: pH EPA 9040
Method: EPA 9040
Matrix: LIQUID

Sample Date : 09/15/95
Receipt Date : 09/18/95
Report Date : 10/26/95

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
BOGJW6	9375-001	pH	C-006	QCBLK78766-1	09/25/95	09/25/95	5.13	PH	J		1
BOGJW6	9375-001DUP	pH	C-006	QCBLK78766-1	09/25/95	09/25/95	5.18	PH			1
BOGJX2	9375-002	pH	C-006	QCBLK78766-1	09/25/95	09/25/95	5.46	PH	J		1
BOGJW2	9375-004	pH	C-006	QCBLK78766-1	09/25/95	09/25/95	8.13	PH	J		1
BOGJV6	9380-001	pH	C-006	QCBLK78766-1	09/25/95	09/25/95	8.08	PH	J		1
BOGJY0	9380-002	pH	C-006	QCBLK78766-1	09/25/95	09/25/95	8.10	PH	J		1
BOGJW8	9404-001	pH	C-006	QCBLK78861-1	09/26/95	09/26/95	5.33	PH	J		1
BOGJX6	9404-002	pH	C-006	QCBLK78861-1	09/26/95	09/26/95	5.16	PH	J		1
BOGJX0	9404-003	pH	C-006	QCBLK78861-1	09/26/95	09/26/95	5.07	PH	J		1
BOGJV2	9404-004	pH	C-006	QCBLK78861-1	09/26/95	09/26/95	8.17	PH	J		1
NA	QCBLK78766-1	pH	C-006	QCBLK78766-1	09/25/95	09/25/95	5.30	PH			1
NA	QCBLK78861-1	pH	C-006	QCBLK78861-1	09/26/95	09/26/95	5.21	PH			1

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Quanterra-Richland
 P.O. Box 1970
 Richland, WA 99352

Project: 550.99

Category: TPH EPA 418.1
 Method: EPA 418.1
 Matrix: LIQUID

Sample Date : 09/15/95
 Receipt Date : 09/18/95
 Report Date : 10/26/95

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
80GJV6	9375-001	TPH	10-90-2	QCBLK78908-1	09/26/95	09/27/95	0.48	MG/L	UR	0.48	1
80GJV6	9375-001HS	TPH	10-90-2	QCBLK78908-1	09/26/95	09/27/95	82	%REC			1
80GJV6	9375-001MSD	TPH	10-90-2	QCBLK78908-1	09/26/95	09/27/95	82	%REC			1
80GJX2	9375-002	TPH	10-90-2	QCBLK78908-1	09/26/95	09/27/95	0.48	MG/L	UR	0.48	1
80GHX7	9375-003	TPH	10-90-2	QCBLK78908-1	09/26/95	09/27/95	0.48	MG/L	UR	0.48	1
80GJV8	9404-001	TPH	10-90-2	QCBLK78908-1	09/26/95	09/27/95	0.50	MG/L	UR	0.50	1
80GJX6	9404-002	TPH	10-90-2	QCBLK78908-1	09/26/95	09/27/95	0.48	MG/L	UR	0.48	1
80GJX0	9404-003	TPH	10-90-2	QCBLK78908-1	09/26/95	09/27/95	0.50	MG/L	UR	0.50	1
80GJS7	9404-005	TPH	10-90-2	QCBLK78908-1	09/26/95	09/27/95	0.56	MG/L	UR	0.56	1
NA	QCBLK78908-1	TPH	10-90-2	QCBLK78908-1	09/26/95	09/27/95	0.50	MG/L	U	0.50	1
NA	QCCLS78908-1	TPH	10-90-2	QCBLK78908-1	09/26/95	09/27/95	89	%REC			1

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Quanterra-Richland
P.O. Box 1970
Richland, WA 99352

Project: 550.99

Category: Turbidity EPA 180.1
Method: EPA 180.1
Matrix: LIQUID

Sample Date : 09/15/95
Receipt Date : 09/18/95
Report Date : 10/26/95

Client ID	Quanterra ID	Analyte	CAS Number	Blank Sample Name	Prep. Date	Analyses Date	Result	Unit	Qual.	Detection Limit	Dil.
80GJW6	9375-001	Turbidity	G-019	QCBLK78789-1	09/25/95	09/25/95	0.95	NTU	J	0.01	1
80GJW6	9375-001DUP	Turbidity	G-019	QCBLK78789-1	09/25/95	09/25/95	0.93	NTU		0.01	1
80GJX2	9375-002	Turbidity	G-019	QCBLK78789-1	09/25/95	09/25/95	0.29	NTU	J	0.01	1
80GHX7	9375-003	Turbidity	G-019	QCBLK78789-1	09/25/95	09/25/95	1.75	NTU	J	0.01	1
80GJW2	9375-004	Turbidity	G-019	QCBLK78789-1	09/25/95	09/25/95	0.93	NTU	J	0.01	1
80GJV6	9380-001	Turbidity	G-019	QCBLK78789-1	09/25/95	09/25/95	0.59	NTU	J	0.01	1
80GJY0	9380-002	Turbidity	G-019	QCBLK78789-1	09/25/95	09/25/95	0.29	NTU	J	0.01	1
80GJW8	9404-001	Turbidity	G-019	QCBLK81228-1	10/23/95	10/23/95	0.50	NTU	J	0.01	1
80GJX6	9404-002	Turbidity	G-019	QCBLK81228-1	10/23/95	10/23/95	0.75	NTU	J	0.01	1
80GJX0	9404-003	Turbidity	G-019	QCBLK81228-1	10/23/95	10/23/95	0.51	NTU	J	0.01	1
80GJV2	9404-004	Turbidity	G-019	QCBLK81228-1	10/23/95	10/23/95	4.32	NTU	J	0.01	1
NA	QCBLK78789-1	Turbidity	G-019	QCBLK78789-1	09/25/95	09/25/95	0.03	NTU		0.01	1
NA	QCBLK81228-1	Turbidity	G-019	QCBLK81228-1	10/23/95	10/23/95	0.07	NTU		0.01	1

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LOCKHEED ANALYTICAL SERVICES

COMMON IONS AND ADDITIONAL ANALYTES

Sample Results

Client Sample ID: B0GJY4	Date Collected: 14-SEP-95
Matrix: Water	Date Received: 16-SEP-95

Constituent	Units	Method	Result	Reporting Det Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Specific Conductance	uS/cm	120.1	1100	1		26-SEP-95	27575	L5379-9
Turbidity	NTU	180.1	0.64	N/A	X J	23-SEP-95	27708	L5379-10
Chloride	mg/L	300.0	20.	0.02		20-SEP-95	27576	L5379-3
Fluoride	mg/L	300.0	< 0.1	0.1	U	20-SEP-95	27578	L5379-3
Nitrate-N	mg/L	300.0	8.1	0.02	X J	20-SEP-95	27580	L5379-3
Nitrite-N	mg/L	300.0	< 0.01	0.01	X UR	20-SEP-95	27582	L5379-3
Ortho Phosphate	mg/L	300.0	< 0.1	0.1	X UR	20-SEP-95	27584	L5379-3
Sulfate	mg/L	300.0	300	1	D(1:10)	20-SEP-95	27586	L5379-3
pH	pH Units	9040	7.8	0.1	X J	22-SEP-95	27656	L5379-11

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LOCKHEED ANALYTICAL SERVICES

OIL AND GREASE - GRAVIMETRIC METHOD
413.1 OIL AND GREASE

Client Sample ID:	BOGJY4	LAL Sample ID:	L5379-4
Date Collected:	14-SEP-95	Date Received:	16-SEP-95
Date Analyzed:	28-SEP-95	Date Extracted:	28-SEP-95
Matrix:	Water	Analytical Batch ID:	092895-413.1
QC Group:	413.1 OIL AND GREASE_27944	Dilution Factor:	1

CONSTITUENT	RESULT mg/L	PRACTICAL QUANTIFICATION LIMIT mg/L	DATA QUALIFIER (#)
Total Oil and Grease	<5.00 UR	5.00	

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LOCKHEED ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS BY FTIR
418.1 TPH

Client Sample ID:	B0GJY4	LAL Sample ID:	L5379-8
Date Collected:	14-SEP-95	Date Received:	16-SEP-95
Date Analyzed:	26-SEP-95	Date Extracted:	25-SEP-95
Matrix:	Water	Analytical Batch ID:	092695-418.1
QC Group:	418.1 TPH_27753	Dilution Factor:	1

CONSTITUENT	RESULT mg/L	PRACTICAL QUANTITATION LIMIT mg/L	DATA QUALIFIER(S)
TRPH	<1.00 u	1.00	

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LOCKHEED ANALYTICAL SERVICES

COMMON IONS AND ADDITIONAL ANALYTES

Sample Results

Client Sample ID: BOGJY5	Date Collected: 14-SEP-95
Matrix: Filt H2O	Date Received: 16-SEP-95

Constituent	Units	Method	Result	Reporting Det/Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Chloride	mg/L	300.0	20.	0.02		20-SEP-95	27577	L5379-22
Fluoride	mg/L	300.0	< 0.1	0.1	u	20-SEP-95	27579	L5379-22
Nitrate-N	mg/L	300.0	8.3	0.02	XJ	20-SEP-95	27581	L5379-22
Nitrite-N	mg/L	300.0	< 0.01	0.01	XUR	20-SEP-95	27583	L5379-22
Ortho Phosphate	mg/L	300.0	< 0.1	0.1	AUR	20-SEP-95	27585	L5379-22
Sulfate	mg/L	300.0	300	1	D(1:10)	20-SEP-95	27587	L5379-22

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APPENDIX E
RADIOCHEMISTRY DATA SUMMARY TABLES

000114

Project: BECHTEL - HANFORD																					
Laboratory: QES																					
Case		SDG: W0699																			
Sample Number		B0GJT0		B0GJT2		B0GJW0		B0GJW4		B0GJY2		B0GJV8		B0GJX8		B0GJX4		B0GJV0		B0GJS8	
Location		199-N-25		199-N-26		199-N-76		199-N-80		199-N-75		199-N-75		199-N-54		199-N-54		199-N-54		199-N-21	
Remarks										Duplicate				Duplicate		Trip Blank					
Sample Date		09/05/95		09/05/95		09/05/95		09/11/95		09/12/95		09/12/95		09/13/95		09/13/95		09/13/95		09/14/95	
Radiochemistry Analysis	CRDL	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
Gross Alpha	4	4.24		2.01		0.00	U	3.57		0.652	U	0.298	U	1.44	U	-0.050	U	1.63	U	3.30	
Gross Beta	8	4.20		5.59		185		6.86		1380		1390		825		1.72	U	813		10.9	
Strontium	5	-0.048	U	0.0147	U	85.3		0.293	U	682		678		399		0.114	U	394		0.787	U
Tritium	500	1030	J	381	J	67800	J	42200	J	61800	J	61900	J	6170	J	8.18	UJ	6550	J	1230	J
Co-58	20	-0.0009	U	-0.0038	U	6.38	U	-4.38	U	0.00	U	-2.74	U	6.76	U	-0.0748	U	-3.66	U	-3.17	U
Co-60	20	-0.0033	U	-0.0028	U	-0.509	U	2.58	U	1.88	U	7.76	U	2.72	U	2.50	U	3.34	U	0.736	U
Cs-137	20	0.00175	U	-6.27E-05	U	3.17	U	-3.03	U	-2.57	U	-0.314	U	1.31	U	3.93	U	2.41	U	-0.399	U
Eu-152	20	0.00528	U	-0.0003	U	1.39	U	2.57	U	-3.46	U	6.79	U	-2.70	U	0.694	U	6.82	U	-8.68	U
Eu-154	20	0.00554	U	-0.0011	U	-3.67	U	-1.50	U	11.2	U	-1.59	U	0.00	U	14.9	U	-16.7	U	3.49	U
Eu-155	20	0.00542	U	-0.0003	U	-2.48	U	0.956	U	-4.44	U	1.63	U	4.15	U	-4.49	U	4.05	U	-3.82	U
Fe-59	20	-0.0094	U	0.0104	U	-6.43	U	11.7	U	-12.7	U	3.88	U	3.01	U	0.00	U	1.28	U	-3.54	U

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Rev. 00

APPENDIX F
RADIOCHEMISTRY VALIDATED LABORATORY REPORT FORMS

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SAMPLE RESULTS

LAB NAME: ITAS-RICHLAND SDG: W0699
 LAB SAMPLE ID: 50906101 MATRIX: WATER
 CLIENT ID: B0GJTO DATE RECEIVED: 9/6/95 9:15:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58	-8.90E-04 U	4.9E-03	4.9E-03	8.68E-03	pCi/L	N/A	RD3219
CO-60	-3.33E-03 U	4.6E-03	4.6E-03	7.44E-03	pCi/L	N/A	RD3219
CS-137DA	1.75E-03 U	5.3E-03	5.3E-03	9.77E-03	pCi/L	N/A	RD3219
EU-152	5.28E-03 U	1.2E-02	1.2E-02	2.24E-02	pCi/L	N/A	RD3219
EU-154	5.54E-03 U	1.3E-02	1.3E-02	2.65E-02	pCi/L	N/A	RD3219
EU-155	5.42E-03 U	1.0E-02	1.0E-02	1.82E-02	pCi/L	N/A	RD3219
FE-59	-9.42E-03 U	1.2E-02	1.2E-02	1.97E-02	pCi/L	N/A	RD3219
ALPHA	4.24E+00	2.2E+00	2.2E+00	2.68E+00	pCi/L	100.00%	RD3214
BETA	4.20E+00	1.7E+00	1.7E+00	3.06E+00	pCi/L	100.00%	RD3214
STRONTIUM	-4.76E-02 U	1.7E-01	1.7E-01	7.54E-01	pCi/L	98.00%	RD3204
TRITIUM	1.03E+03 J	1.8E+02	2.6E+02	2.93E+02	pCi/L	88.10%	RD3205

Number of Results: 11

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SAMPLE RESULTS

LAB NAME: ITAS-RICHLAND SDG: W0699
 LAB SAMPLE ID: 50906102 MATRIX: WATER
 CLIENT ID: B0GJT2 DATE RECEIVED: 9/6/95 9:15:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58	-3.78E-03 U	5.2E-03	5.2E-03	8.57E-03	pCi/L	N/A	RD3219
CO-60	-2.75E-03 U	3.9E-03	3.9E-03	6.35E-03	pCi/L	N/A	RD3219
CS-137DA	-6.27E-05 U	5.0E-03	5.0E-03	8.91E-03	pCi/L	N/A	RD3219
EU-152	-3.40E-04 U	1.1E-02	1.1E-02	1.92E-02	pCi/L	N/A	RD3219
EU-154	-1.06E-03 U	1.2E-02	1.2E-02	2.39E-02	pCi/L	N/A	RD3219
EU-155	-2.72E-04 U	1.1E-02	1.1E-02	1.87E-02	pCi/L	N/A	RD3219
FE-59	1.04E-02 U	9.6E-03	9.7E-03	2.30E-02	pCi/L	N/A	RD3219
ALPHA	2.01E+00	1.4E+00	1.4E+00	1.87E+00	pCi/L	100.00%	RD3214
BETA	5.59E+00	1.8E+00	1.9E+00	3.09E+00	pCi/L	100.00%	RD3214
STRONTIUM	1.47E-02 U	1.7E-01	1.7E-01	7.33E-01	pCi/L	97.10%	RD3204
TRITIUM	3.81E+02 J	1.4E+02	2.1E+02	2.93E+02	pCi/L	88.10%	RD3205

Number of Results: 11

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SAMPLE RESULTS

LAB NAME: ITAS-RICHLAND SDG: W0699
 LAB SAMPLE ID: 50906103 MATRIX: WATER
 CLIENT ID: B0GJW0 DATE RECEIVED: 9/6/95 9:15:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58	6.38E+00 U	5.1E+00	5.1E+00	1.11E+01	pCi/L	N/A	RD3219
CO-60	-5.09E-01 U	6.0E+00	6.0E+00	1.07E+01	pCi/L	N/A	RD3219
CS-137DA	3.17E+00 U	3.1E+00	3.1E+00	6.83E+00	pCi/L	N/A	RD3219
EU-152	1.39E+00 U	1.1E+01	1.1E+01	1.92E+01	pCi/L	N/A	RD3219
EU-154	-3.67E+00 U	1.5E+01	1.5E+01	2.77E+01	pCi/L	N/A	RD3219
EU-155	-2.48E+00 U	9.4E+00	9.4E+00	1.58E+01	pCi/L	N/A	RD3219
FE-59	-6.43E+00 U	1.4E+01	1.4E+01	2.42E+01	pCi/L	N/A	RD3219
ALPHA	0.00E+00 U	2.8E-01	2.8E-01	7.92E-01	pCi/L	100.00%	RD3214
BETA	1.85E+02	6.6E+00	1.5E+01	2.81E+00	pCi/L	100.00%	RD3214
STRONTIUM	8.53E+01	2.0E+00	2.2E+01	7.35E-01	pCi/L	96.90%	RD3204
TRITIUM	6.78E+04 J	1.1E+03	5.1E+03	2.93E+02	pCi/L	88.10%	RD3205

Number of Results: 11

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SAMPLE RESULTS

LAB NAME: ITAS-RICHLAND SDG: W0699
 LAB SAMPLE ID: 50915401 MATRIX: WATER
 CLIENT ID: B0GJW4 DATE RECEIVED: 9/12/95 10:15:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58	-4.38E+00 U	5.6E+00	5.6E+00	8.89E+00	pCi/L	N/A	RD3219
CO-60	2.58E+00 U	4.0E+00	4.0E+00	9.09E+00	pCi/L	N/A	RD3219
CS-137DA	-3.03E+00 U	4.3E+00	4.3E+00	6.69E+00	pCi/L	N/A	RD3219
EU-152	2.57E+00 U	1.2E+01	1.2E+01	2.05E+01	pCi/L	N/A	RD3219
EU-154	-1.50E+00 U	1.5E+01	1.5E+01	2.78E+01	pCi/L	N/A	RD3219
EU-155	9.56E-01 U	1.1E+01	1.1E+01	1.82E+01	pCi/L	N/A	RD3219
FE-59	1.17E+01 U	1.3E+01	1.3E+01	2.64E+01	pCi/L	N/A	RD3219
ALPHA	3.57E+00	1.2E+00	1.3E+00	9.76E-01	pCi/L	100.00%	RD3214
BETA	6.86E+00	1.8E+00	1.8E+00	2.81E+00	pCi/L	100.00%	RD3214
STRONTIUM	2.93E-01 U	2.1E-01	2.3E-01	7.64E-01	pCi/L	100.00%	RD3204
TRITIUM	4.22E+04 J	8.6E+02	3.2E+03	2.93E+02	pCi/L	88.10%	RD3205

Number of Results: 11

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SAMPLE RESULTS

LAB NAME: ITAS-RICHLAND SDG: W0699
 LAB SAMPLE ID: 50917301 MATRIX: WATER
 CLIENT ID: B0GJY2 DATE RECEIVED: 9/13/95 11:00:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58	0.00E+00 U	4.2E+00	4.2E+00	8.00E+00	pCi/L	N/A	RD3219
CO-60	1.88E+00 U	5.9E+00	5.9E+00	1.19E+01	pCi/L	N/A	RD3219
CS-137DA	-2.57E+00 U	4.5E+00	4.5E+00	7.38E+00	pCi/L	N/A	RD3219
EU-152	-3.46E+00 U	1.2E+01	1.2E+01	2.09E+01	pCi/L	N/A	RD3219
EU-154	1.12E+01 U	8.5E+00	8.6E+00	2.41E+01	pCi/L	N/A	RD3219
EU-155	-4.44E+00 U	1.3E+01	1.3E+01	2.11E+01	pCi/L	N/A	RD3219
FE-59	-1.27E+01 U	1.1E+01	1.1E+01	1.58E+01	pCi/L	N/A	RD3219
ALPHA	6.52E-01 U	5.0E-01	5.1E-01	7.12E-01	pCi/L	100.00%	RD3214
BETA	1.38E+03	1.8E+01	9.9E+01	2.93E+00	pCi/L	100.00%	RD3214
STRONTIUM	6.82E+02	5.6E+00	1.8E+02	7.81E-01	pCi/L	97.80%	RD3204
TRITIUM	6.18E+04 J	1.0E+03	4.7E+03	2.93E+02	pCi/L	88.10%	RD3205

Number of Results: 11

RBC
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SAMPLE RESULTS

LAB NAME: ITAS-RICHLAND SDG: W0699
 LAB SAMPLE ID: 50917302 MATRIX: WATER
 CLIENT ID: B0GJV8 DATE RECEIVED: 9/13/95 11:00:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58	-2.74E+00 U	5.5E+00	5.5E+00	9.48E+00	pCi/L	N/A	RD3219
CO-60	7.76E+00 U	5.4E+00	5.4E+00	1.29E+01	pCi/L	N/A	RD3219
CS-137DA	-3.14E-01 U	4.7E+00	4.7E+00	8.50E+00	pCi/L	N/A	RD3219
EU-152	6.79E+00 U	9.6E+00	9.6E+00	1.89E+01	pCi/L	N/A	RD3219
EU-154	-1.59E+00 U	1.1E+01	1.1E+01	2.25E+01	pCi/L	N/A	RD3219
EU-155	1.63E+00 U	1.0E+01	1.0E+01	1.76E+01	pCi/L	N/A	RD3219
FE-59	3.88E+00 U	1.1E+01	1.1E+01	2.23E+01	pCi/L	N/A	RD3219
ALPHA	2.98E-01 U	4.4E-01	4.4E-01	8.96E-01	pCi/L	100.00%	RD3214
BETA	1.39E+03	1.8E+01	1.0E+02	2.85E+00	pCi/L	100.00%	RD3214
STRONTIUM	6.78E+02	5.7E+00	1.8E+02	7.50E-01	pCi/L	97.10%	RD3204
TRITIUM	6.19E+04 J	1.0E+03	4.7E+03	2.93E+02	pCi/L	88.10%	RD3205

Number of Results: 11

RBC
 11/17/95

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SAMPLE RESULTS

LAB NAME: ITAS-RICHLAND SDG: W0699
 LAB SAMPLE ID: 50920701 MATRIX: WATER
 CLIENT ID: B0GJX8 DATE RECEIVED: 9/14/95 10:00:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58	6.76E+00 U	3.9E+00	3.9E+00	9.22E+00	pCi/L	N/A	RD3219
CO-60	2.72E+00 U	4.7E+00	4.8E+00	1.02E+01	pCi/L	N/A	RD3219
CS-137DA	1.31E+00 U	3.9E+00	3.9E+00	7.66E+00	pCi/L	N/A	RD3219
EU-152	-2.70E+00 U	1.0E+01	1.0E+01	1.75E+01	pCi/L	N/A	RD3219
EU-154	0.00E+00 U	1.1E+01	1.1E+01	2.19E+01	pCi/L	N/A	RD3219
EU-155	4.15E+00 U	8.0E+00	8.0E+00	1.43E+01	pCi/L	N/A	RD3219
FE-59	3.01E+00 U	8.3E+00	8.3E+00	1.71E+01	pCi/L	N/A	RD3219
ALPHA	1.44E+00 U	1.4E+00	1.4E+00	2.23E+00	pCi/L	100.00%	RD3214
BETA	8.25E+02	1.4E+01	5.9E+01	3.17E+00	pCi/L	100.00%	RD3214
STRONTIUM	3.99E+02	5.0E+00	9.4E+01	1.04E+00	pCi/L	68.90%	RD3204
TRITIUM	6.17E+03 J	3.5E+02	6.2E+02	2.93E+02	pCi/L	88.10%	RD3205

Number of Results: 11

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SAMPLE RESULTS

LAB NAME: ITAS-RICHLAND SDG: W0699
 LAB SAMPLE ID: 50920702 MATRIX: WATER
 CLIENT ID: B0GJX4 DATE RECEIVED: 9/14/95 10:00:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58	-7.48E-02 U	6.0E+00	6.0E+00	1.09E+01	pCi/L	N/A	RD3219
CO-60	2.50E+00 U	4.1E+00	4.1E+00	9.28E+00	pCi/L	N/A	RD3219
CS-137DA	3.93E+00 U	4.1E+00	4.1E+00	8.18E+00	pCi/L	N/A	RD3219
EU-152	6.94E-01 U	1.2E+01	1.2E+01	2.12E+01	pCi/L	N/A	RD3219
EU-154	1.49E+01 U	1.3E+01	1.3E+01	3.17E+01	pCi/L	N/A	RD3219
EU-155	-4.49E+00 U	8.3E+00	8.3E+00	1.39E+01	pCi/L	N/A	RD3219
FE-59	0.00E+00 U	8.4E+00	8.4E+00	1.68E+01	pCi/L	N/A	RD3219
ALPHA	-5.01E-02 U	1.6E-01	1.6E-01	5.39E-01	pCi/L	100.00%	RD3214
BETA	1.72E+00 U	1.3E+00	1.4E+00	2.69E+00	pCi/L	100.00%	RD3214
STRONTIUM	1.14E-01 U	1.9E-01	2.0E-01	7.68E-01	pCi/L	90.40%	RD3204
TRITIUM	8.18E+00 U	1.2E+02	1.9E+02	2.93E+02	pCi/L	88.10%	RD3205

Number of Results: 11

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SAMPLE RESULTS

LAB NAME: ITAS-RICHLAND SDG: W0699
 LAB SAMPLE ID: 50920703 MATRIX: WATER
 CLIENT ID: B0GJV0 DATE RECEIVED: 9/14/95 10:00:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58	-3.66E+00 U	5.9E+00	6.0E+00	9.61E+00	pCi/L	N/A	RD3219
CO-60	3.34E+00 U	4.1E+00	4.1E+00	9.33E+00	pCi/L	N/A	RD3219
CS-137DA	2.41E+00 U	4.8E+00	4.8E+00	9.11E+00	pCi/L	N/A	RD3219
EU-152	6.82E+00 U	1.1E+01	1.1E+01	2.16E+01	pCi/L	N/A	RD3219
EU-154	-1.67E+01 U	1.7E+01	1.7E+01	2.72E+01	pCi/L	N/A	RD3219
EU-155	4.05E+00 U	9.2E+00	9.2E+00	1.65E+01	pCi/L	N/A	RD3219
FE-59	1.28E+00 U	1.1E+01	1.1E+01	2.05E+01	pCi/L	N/A	RD3219
ALPHA	1.63E+00 U	1.6E+00	1.6E+00	2.65E+00	pCi/L	100.00%	RD3214
BETA	8.13E+02	1.4E+01	5.9E+01	2.95E+00	pCi/L	100.00%	RD3214
STRONTIUM	3.94E+02	4.7E+00	9.6E+01	8.57E-01	pCi/L	80.00%	RD3204
TRITIUM	6.55E+03 J	3.6E+02	6.5E+02	2.93E+02	pCi/L	88.10%	RD3205

Number of Results: 11

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SAMPLE RESULTS

LAB NAME: ITAS-RICHLAND SDG: W0699
 LAB SAMPLE ID: 50924001 MATRIX: WATER
 CLIENT ID: B0GJS8 DATE RECEIVED: 9/15/95 10:00:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58	-3.17E+00 U	5.1E+00	5.1E+00	8.51E+00	pCi/L	N/A	RD3219
CO-60	7.36E-01 U	4.8E+00	4.8E+00	9.61E+00	pCi/L	N/A	RD3219
CS-137DA	-3.99E-01 U	5.4E+00	5.4E+00	8.89E+00	pCi/L	N/A	RD3219
EU-152	-8.68E+00 U	1.3E+01	1.3E+01	1.92E+01	pCi/L	N/A	RD3219
EU-154	3.49E+00 U	1.3E+01	1.3E+01	2.71E+01	pCi/L	N/A	RD3219
EU-155	-3.82E+00 U	1.1E+01	1.1E+01	1.69E+01	pCi/L	N/A	RD3219
FE-59	-3.54E+00 U	1.2E+01	1.2E+01	2.08E+01	pCi/L	N/A	RD3219
ALPHA	3.30E+00	2.2E+00	2.2E+00	2.96E+00	pCi/L	100.00%	RD3214
BETA	1.09E+01	2.1E+00	2.3E+00	2.99E+00	pCi/L	100.00%	RD3214
STRONTIUM	7.87E-01 U	3.1E-01	3.6E-01	9.55E-01	pCi/L	71.20%	RD3204
TRITIUM	1.23E+03 J	1.9E+02	2.7E+02	2.93E+02	pCi/L	88.10%	RD3205

Number of Results: 11

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SAMPLE RESULTS

LAB NAME: ITAS-RICHLAND SDG: W0721
 LAB SAMPLE ID: 50925901 MATRIX: WATER
 CLIENT ID: B0GJW6 DATE RECEIVED: 9/18/95 11:20:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58.	8.23E-02U	5.6E+00	5.6E+00	1.04E+01	pCi/L	N/A	RD3219
CO-60.	-3.08E+00U	4.4E+00	4.4E+00	7.12E+00	pCi/L	N/A	RD3219
CS-137DA.	2.26E+00U	3.4E+00	3.4E+00	7.21E+00	pCi/L	N/A	RD3219
EU-152.	6.14E-01U	1.0E+01	1.0E+01	1.84E+01	pCi/L	N/A	RD3219
EU-154.	7.54E-01U	1.4E+01	1.4E+01	2.69E+01	pCi/L	N/A	RD3219
EU-155.	-2.31E+00U	7.7E+00	7.7E+00	1.26E+01	pCi/L	N/A	RD3219
FE-59.	4.13E+00U	1.1E+01	1.1E+01	2.40E+01	pCi/L	N/A	RD3219
ALPHA	4.20E-01U	3.4E-01	3.5E-01	5.11E-01	pCi/L	100.00%	RD3214
BETA	2.79E+00	1.4E+00	1.5E+00	2.72E+00	pCi/L	100.00%	RD3214
STRONTIUM	9.87E-02 U	1.7E-01	1.7E-01	8.16E-01	pCi/L	94.20%	RD3204
TRITIUM	6.58E+01UT	1.3E+02	2.0E+02	2.99E+02	pCi/L	88.10%	RD3205

Number of Results: 11

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SAMPLE RESULTS

LAB NAME: ITAS-RICHLAND SDG: W0721
 LAB SAMPLE ID: 50925902 MATRIX: WATER
 CLIENT ID: B0GJX2 DATE RECEIVED: 9/18/95 11:20:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58.	-4.77E+00 ^U	6.2E+00	6.2E+00	1.02E+01	pCi/L	N/A	RD3219
CO-60.	4.13E+00 ^U	5.4E+00	5.4E+00	1.18E+01	pCi/L	N/A	RD3219
CS-137DA.	2.32E+00 ^U	3.6E+00	3.6E+00	7.61E+00	pCi/L	N/A	RD3219
EU-152.	4.38E+00 ^U	1.3E+01	1.3E+01	2.29E+01	pCi/L	N/A	RD3219
EU-154.	7.96E+00 ^U	7.1E+00	7.2E+00	2.09E+01	pCi/L	N/A	RD3219
EU-155.	9.88E+00 ^U	6.7E+00	6.8E+00	1.34E+01	pCi/L	N/A	RD3219
FE-59.	5.85E+00 ^U	1.2E+01	1.2E+01	2.56E+01	pCi/L	N/A	RD3219
ALPHA	4.76E-01 ^U	3.6E-01	3.7E-01	5.17E-01	pCi/L	100.00%	RD3214
BETA	1.68E+00 ^U	1.3E+00	1.3E+00	2.69E+00	pCi/L	100.00%	RD3214
STRONTIUM	-1.25E-03 ^U	1.9E-01	1.9E-01	9.51E-01	pCi/L	80.30%	RD3204
TRITIUM	4.62E+01 ^{UJ}	1.3E+02	2.0E+02	2.99E+02	pCi/L	88.10%	RD3205

Number of Results: 11

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SAMPLE RESULTS

LAB NAME: ITAS-RICHLAND SDG: W0721
 LAB SAMPLE ID: 50925903 MATRIX: WATER
 CLIENT ID: B0GHX7 DATE RECEIVED: 9/18/95 11:20:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER-
CO-58.	7.74E-01U	4.7E+00	4.7E+00	9.08E+00	pCi/L	N/A	RD3219
CO-60.	-2.05E+00U	6.6E+00	6.6E+00	1.15E+01	pCi/L	N/A	RD3219
CS-137DA.	5.48E+00U	4.2E+00	4.2E+00	9.18E+00	pCi/L	N/A	RD3219
EU-152.	-9.76E+00U	1.2E+01	1.2E+01	1.78E+01	pCi/L	N/A	RD3219
EU-154.	3.94E+00U	9.7E+00	9.7E+00	2.22E+01	pCi/L	N/A	RD3219
EU-155.	3.53E+00U	9.6E+00	9.6E+00	1.69E+01	pCi/L	N/A	RD3219
FE-59.	-9.43E+00U	1.5E+01	1.6E+01	2.63E+01	pCi/L	N/A	RD3219
STRONTIUM	9.52E+02	6.8E+00	2.7E+02	9.06E-01	pCi/L	77.70%	RD3204
TRITIUM	2.09E+04 J	6.1E+02	1.7E+03	2.99E+02	pCi/L	88.10%	RD3205

Number of Results: 19

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SAMPLE RESULTS

LAB NAME: ITAS-RICHLAND SDG: W0721
 LAB SAMPLE ID: 50925904 MATRIX: WATER
 CLIENT ID: BOGJW2 DATE RECEIVED: 9/18/95 11:20:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58.	7.19E-01 U	6.0E+00	6.0E+00	1.14E+01	pCi/L	N/A	RD3219
CO-60.	3.62E+00 U	3.0E+00	3.0E+00	8.51E+00	pCi/L	N/A	RD3219
CS-137DA.	-3.10E-01 U	3.7E+00	3.7E+00	6.81E+00	pCi/L	N/A	RD3219
EU-152.	1.76E+00 U	9.1E+00	9.1E+00	1.62E+01	pCi/L	N/A	RD3219
EU-154.	4.62E+00 U	8.7E+00	8.7E+00	2.14E+01	pCi/L	N/A	RD3219
EU-155.	4.02E+00 U	1.1E+01	1.1E+01	2.00E+01	pCi/L	N/A	RD3219
FE-59.	5.02E+00 U	1.4E+01	1.4E+01	2.78E+01	pCi/L	N/A	RD3219
ALPHA	2.14E+00 U	2.0E+00	2.0E+00	3.29E+00	pCi/L	100.00%	RD3214
BETA	6.63E+00	1.9E+00	1.9E+00	3.07E+00	pCi/L	100.00%	RD3214
STRONTIUM	1.09E-01 U	1.7E-01	1.7E-01	7.97E-01	pCi/L	97.10%	RD3204
TRITIUM	6.28E+02 J	1.6E+02	2.4E+02	2.99E+02	pCi/L	88.10%	RD3205

Number of Results: 11

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SAMPLE RESULTS

LAB NAME: ITAS-RICHLAND SDG: W0721
 LAB SAMPLE ID: 50926701 MATRIX: WATER
 CLIENT ID: B0GJV6 DATE RECEIVED: 9/19/95 11:40:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58.	-9.67E-01U	5.1E+00	5.2E+00	9.35E+00	pCi/L	N/A	RD3219
CO-60.	-2.02E+00U	6.8E+00	6.8E+00	1.17E+01	pCi/L	N/A	RD3219
CS-137DA.	-2.56E+00U	4.8E+00	4.8E+00	8.05E+00	pCi/L	N/A	RD3219
EU-152.	6.37E+00U	1.1E+01	1.1E+01	2.03E+01	pCi/L	N/A	RD3219
EU-154.	2.74E+00U	1.1E+01	1.1E+01	2.22E+01	pCi/L	N/A	RD3219
EU-155.	4.45E+00U	1.1E+01	1.1E+01	1.93E+01	pCi/L	N/A	RD3219
FE-59.	1.93E+00U	1.3E+01	1.3E+01	2.46E+01	pCi/L	N/A	RD3219
ALPHA	6.02E-01U	5.4E-01	5.5E-01	8.50E-01	pCi/L	100.00%	RD3214
BETA	6.08E+00	1.7E+00	1.8E+00	2.85E+00	pCi/L	100.00%	RD3214
STRONTIUM	7.31E-02U	1.6E-01	1.6E-01	7.82E-01	pCi/L	99.60%	RD3204
TRITIUM	3.22E+04J	7.5E+02	2.5E+03	2.99E+02	pCi/L	88.10%	RD3205

Number of Results: 11

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SAMPLE RESULTS

LAB NAME: ITAS-RICHLAND SDG: W0721
 LAB SAMPLE ID: 50926702 MATRIX: WATER
 CLIENT ID: B0GJY0 DATE RECEIVED: 9/19/95 11:40:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58.	2.27E+00U	4.9E+00	4.9E+00	1.01E+01	pCi/L	N/A	RD3219
CO-60.	9.39E+00U	4.7E+00	4.8E+00	1.25E+01	pCi/L	N/A	RD3219
CS-137DA.	-3.44E+00U	5.2E+00	5.2E+00	8.45E+00	pCi/L	N/A	RD3219
EU-152.	1.64E+01U	1.0E+01	1.0E+01	2.05E+01	pCi/L	N/A	RD3219
EU-154.	1.03E+01U	1.2E+01	1.2E+01	2.74E+01	pCi/L	N/A	RD3219
EU-155.	6.23E+00U	8.1E+00	8.1E+00	1.48E+01	pCi/L	N/A	RD3219
FE-59.	1.39E+00U	1.1E+01	1.1E+01	2.17E+01	pCi/L	N/A	RD3219
ALPHA	7.82E-01U	6.6E-01	6.7E-01	1.09E+00	pCi/L	100.00%	RD3214
BETA	6.84E+00	1.8E+00	1.9E+00	2.88E+00	pCi/L	100.00%	RD3214
STRONTIUM	6.96E-02U	1.7E-01	1.7E-01	8.27E-01	pCi/L	93.20%	RD3204
TRITIUM	3.30E+04J	7.6E+02	2.6E+03	2.99E+02	pCi/L	88.10%	RD3205

Number of Results: 11

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SAMPLE RESULTS

LAB NAME: ITAS-RICHLAND SDG: W0721
 LAB SAMPLE ID: 50931901 MATRIX: WATER
 CLIENT ID: B0GJW8 DATE RECEIVED: 9/21/95 9:35:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58.	-3.55E+00U	5.2E+00	5.3E+00	8.64E+00	pCi/L	N/A	RD3219
CO-60.	-2.85E-01U	4.0E+00	4.0E+00	8.16E+00	pCi/L	N/A	RD3219
CS-137DA.	2.52E+00U	5.2E+00	5.2E+00	9.76E+00	pCi/L	N/A	RD3219
EU-152.	-4.30E+00U	1.3E+01	1.3E+01	2.10E+01	pCi/L	N/A	RD3219
EU-154.	-7.96E+00U	1.5E+01	1.5E+01	2.62E+01	pCi/L	N/A	RD3219
EU-155.	-5.37E-01U	1.2E+01	1.2E+01	1.89E+01	pCi/L	N/A	RD3219
FE-59.	2.64E+00U	1.4E+01	1.4E+01	2.57E+01	pCi/L	N/A	RD3219
ALPHA	1.71E-01U	2.6E-01	2.6E-01	5.13E-01	pCi/L	100.00%	RD3214
BETA	-5.47E-02U	1.2E+00	1.2E+00	2.72E+00	pCi/L	100.00%	RD3214
STRONTIUM	1.07E-01U	2.0E-01	2.0E-01	9.28E-01	pCi/L	86.80%	RD3204
TRITIUM	1.05E+02UJ	1.3E+02	2.0E+02	2.99E+02	pCi/L	88.10%	RD3205

Number of Results: 11

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SAMPLE RESULTS

LAB NAME: ITAS-RICHLAND SDG: W0721
 LAB SAMPLE ID: 50931902 MATRIX: WATER
 CLIENT ID: B0GJX6 DATE RECEIVED: 9/21/95 9:35:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58.	-4.32E+00U	5.0E+00	5.0E+00	8.22E+00	pCi/L	N/A	RD3219
CO-60.	4.95E-01U	2.7E+00	2.7E+00	6.69E+00	pCi/L	N/A	RD3219
CS-137DA.	2.32E+00U	4.4E+00	4.4E+00	8.67E+00	pCi/L	N/A	RD3219
EU-152.	8.65E+00U	9.3E+00	9.4E+00	1.89E+01	pCi/L	N/A	RD3219
EU-154.	1.07E+00U	9.8E+00	9.8E+00	2.11E+01	pCi/L	N/A	RD3219
EU-155.	1.72E+00U	1.1E+01	1.1E+01	1.83E+01	pCi/L	N/A	RD3219
FE-59.	-9.90E+00U	1.3E+01	1.3E+01	2.06E+01	pCi/L	N/A	RD3219
ALPHA	-3.02E-02U	2.2E-01	2.2E-01	6.38E-01	pCi/L	100.00%	RD3214
BETA	1.58E+00U	1.3E+00	1.4E+00	2.73E+00	pCi/L	100.00%	RD3214
STRONTIUM	-4.27E-02U	1.7E-01	1.7E-01	9.02E-01	pCi/L	81.80%	RD3204
TRITIUM	6.78E+01UJ	1.3E+02	2.0E+02	2.99E+02	pCi/L	88.10%	RD3205

Number of Results: 11

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SAMPLE RESULTS

LAB NAME: ITAS-RICHLAND SDG: W0721
 LAB SAMPLE ID: 50931903 MATRIX: WATER
 CLIENT ID: B0GJX0 DATE RECEIVED: 9/21/95 9:35:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58.	2.84E+00U	4.3E+00	4.3E+00	9.19E+00	pCi/L	N/A	RD3219
CO-60.	4.17E+00U	3.2E+00	3.2E+00	8.94E+00	pCi/L	N/A	RD3219
CS-137DA.	-5.77E+00U	5.6E+00	5.6E+00	7.91E+00	pCi/L	N/A	RD3219
EU-152.	-1.55E+00U	1.2E+01	1.2E+01	2.16E+01	pCi/L	N/A	RD3219
EU-154.	9.65E+00U	7.9E+00	7.9E+00	2.27E+01	pCi/L	N/A	RD3219
EU-155.	3.97E+00U	7.3E+00	7.3E+00	1.36E+01	pCi/L	N/A	RD3219
FE-59.	1.37E+01U	8.7E+00	8.8E+00	2.39E+01	pCi/L	N/A	RD3219
ALPHA	1.21E-01U	2.4E-01	2.4E-01	5.13E-01	pCi/L	100.00%	RD3214
BETA	1.95E+00U	1.4E+00	1.4E+00	2.69E+00	pCi/L	100.00%	RD3214
STRONTIUM	9.00E-02 U	1.9E-01	1.9E-01	9.15E-01	pCi/L	86.10%	RD3204
TRITIUM	4.77E+01 UJ	1.3E+02	2.0E+02	2.99E+02	pCi/L	88.10%	RD3205

Number of Results: [11]

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SAMPLE RESULTS

LAB NAME: ITAS-RICHLAND SDG: W0721
 LAB SAMPLE ID: 50931904 MATRIX: WATER
 CLIENT ID: B0GJV2 DATE RECEIVED: 9/21/95 9:35:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
CO-58.	1.31E+00U	6.1E+00	6.1E+00	1.13E+01	pCi/L	N/A	RD3219
CO-60.	5.48E+00U	5.5E+00	5.5E+00	1.22E+01	pCi/L	N/A	RD3219
CS-137DA.	-2.79E+00U	5.6E+00	5.6E+00	8.59E+00	pCi/L	N/A	RD3219
EU-152.	-5.35E+00U	1.3E+01	1.3E+01	2.04E+01	pCi/L	N/A	RD3219
EU-154.	-8.31E+00U	1.7E+01	1.7E+01	2.92E+01	pCi/L	N/A	RD3219
EU-155.	-2.45E+00U	1.1E+01	1.1E+01	1.75E+01	pCi/L	N/A	RD3219
FE-59.	-4.68E+00U	1.6E+01	1.6E+01	2.76E+01	pCi/L	N/A	RD3219
ALPHA	5.64E+00J	2.4E+00	2.4E+00	2.34E+00	pCi/L	100.00%	RD3214
BETA	1.09E+01	2.1E+00	2.3E+00	3.06E+00	pCi/L	100.00%	RD3214
STRONTIUM	7.95E-02U	2.0E-01	2.0E-01	9.76E-01	pCi/L	78.40%	RD3204
TRITIUM	1.27E+04J	4.8E+02	1.1E+03	2.99E+02	pCi/L	88.10%	RD3205

Number of Results: 11

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LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: 80GJY4

LAL Sample ID: L5379-12

Date Collected: 14-SEP-95

Date Received: 16-SEP-95

Matrix: Water

Login Number: L5379

Constituent	Analyzed	Batch	ACTIVITY	Eff	MDA	Detected	Units
Ac-228(Ra-228)	16-OCT-95	GAMMA SPEC LAL-0063_27809	5.0	U	22.	40.	pCi/L
Co-58	16-OCT-95	GAMMA SPEC LAL-0063_27809	2.5		5.7	9.6	pCi/L
Co-60	16-OCT-95	GAMMA SPEC LAL-0063_27809	-0.5		1.5	12.	pCi/L
Cs-137	16-OCT-95	GAMMA SPEC LAL-0063_27809	4.1		7.3	9.4	pCi/L
Eu-152	16-OCT-95	GAMMA SPEC LAL-0063_27809	-4.0		8.1	36.	pCi/L
Eu-154	16-OCT-95	GAMMA SPEC LAL-0063_27809	-6.7		4.2	34.	pCi/L
Eu-155	16-OCT-95	GAMMA SPEC LAL-0063_27809	6.		13.	18.	pCi/L
Fe-59	16-OCT-95	GAMMA SPEC LAL-0063_27809	-1.3		9.0	27.	pCi/L
Pb-212	16-OCT-95	GAMMA SPEC LAL-0063_27809	4.7		9.4	13.	pCi/L
Pb-214(Ra-226)	16-OCT-95	GAMMA SPEC LAL-0063_27809	-3.5		8.4	17.	pCi/L
Ra-226(GAMMA)	16-OCT-95	GAMMA SPEC LAL-0063_27809	-110		100	160	pCi/L
Ru-106	16-OCT-95	GAMMA SPEC LAL-0063_27809	-20.		39.	74.	pCi/L
U-235(GAMMA)	16-OCT-95	GAMMA SPEC LAL-0063_27809	-5.		26.	41.	pCi/L
Gross Alpha	11-OCT-95	GR ALP/BETA LAL-0060_27812	1.8	↓	3.2	5.8	pCi/L
Gross Beta	11-OCT-95	GR ALP/BETA LAL-0060_27812	7.9		3.4	5.1	pCi/L
Total radio-strontium	20-SEP-95	SR-90 LAL-0196_27451	0.67	U	0.61	1.0	pCi/L

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LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: 80GJY4

LAL Sample ID: L5379-20

Date Collected: 14-SEP-95

Date Received: 16-SEP-95

Matrix: Water

Login Number: L5379

Constituent	Analyzed	Batch	Activity	Error	NDA	Radial	Units
H-3	02-OCT-95	TRITIUM(H3)	LAL-0066_27851	1360	360	320	pci/L

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