START 9713516.0750

LK6649-LAS

0046198

LOCKHEED MARTIN

Lockheed Analytical Services

Ms. Joan Kessner
Bechtel Hanford, Inc.
P. O. Box 969
1022 Lee Blvd.
Richland, WA 99352

MAY 1996
RECEIVED
Data
Log In

ANALYTICAL DATA REPORT

FOR

METALS, CHLORIDE, FLUORIDE, NITRATE, NITRITE, PHOSPHATE, SULFATE, CONDUCTIVITY, TOTAL PETROLEUM HYDROCARBON AND OIL AND GREASE ORGANICS, GAMMA SPECTROMETRY, GROSS ALPHA/BETA, STRONTIUM-90, AND TRITIUM

JAN 1997
RECEIVED
EDMC

LOG-IN NUMBER:	L6649/L6661
QUOTATION NUMBER:	Q400000-B
SAF:	B96-089
DOCUMENT FILE NUMBER:	0320596/0322596
BHI DOCUMENT FILE NO.:	339
SDG NUMBER:	LK6649

9713516.0751

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

April 26, 1996

Ms. Joan Kessner
Bechtel Hanford, Inc.
3350 George Washington Way
MS B1-35
Richland, WA 99352

MAY 1996
RECEIVED
Data
Log In

RE:	Log-in No.:	L6649/L6661
	Quotation No.:	Q400000-B
	SAF:	B96-089
	Document File No.:	0320596/0322596
	WHC Document Control No.:	339
	SDG No.:	LK6649

The attached data report contains the analytical results of samples that were submitted to Lockheed Analytical Services on March 20 and 22, 1996. The temperature of the coolers upon receipt were 3°C and 4°C. Sample containers received agree with the chain-of-custody documentation. Sample containers were received intact. Samples for nitrate/nitrite analysis were not received in time to meet the analytical holding time requirements.

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 M. Hall at (509) 375-4741.

"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 Manager or a designee, as verified by the following signature."

Sincerely,

Karen Hermann for

Kathleen M. Hall
Client Services Representative

cc: Client Services
Document Control

Lockheed Analytical Services

Log-in No.: L6649/L6661
Quotation No.: Q400000-B
SAF: B96-089
Document File No.: 0320596/0322596
WHC Document File No.: 339
SDG No.: LK6649
Page No.: 1

CASE NARRATIVE
INORGANIC NON METALS ANALYSES

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), duplicate sample(s).

Preparation and Analysis Requirements

- One water and one filtered water sample were received for LK6649 and analyzed in batches 320 bh, 320 bh1 and 320 bh2 for selected analytes as requested on the chain of custody. Quality control analysis was performed on the following samples:

Client ID	LAL #		Method
BOH8G2	L6649-3	MS, DUP	300.0 Chloride, Fluoride, Nitrate as Nitrogen, Nitrite as Nitrogen, Orthophosphate and Sulfate
BOH8G3	L6649-23	MS, DUP	300.0 Chloride, Fluoride, Nitrate as Nitrogen, Nitrite as Nitrogen, Orthophosphate and Sulfate
BOH8G3	L6649-12	DUP	9050 Conductivity

Holding Time Requirements

- All samples were received within method-specified holding times with the following exceptions which are flagged with an "H": Method 300.0 Nitrate as Nitrogen, Nitrite as Nitrogen and Orthophosphate.

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

April 19, 1996
Date

Lockheed Analytical Services

Log-in No.: L6649/L6661
Quotation No.: Q400000-B
SAF: B96-089
Document File No.: 0320596/0322596
WHC Document File No.: 339
SDG No.: LK6649
Page No.: 2

CASE NARRATIVE
INORGANIC NON METALS ANALYSES

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), duplicate sample(s).

Preparation and Analysis Requirements

- One water and one filtered water sample were received for LK6649 and analyzed in batches 320 bh, 322 bh1 and 322 bh2 for selected analytes as requested on the chain of custody. Quality control analysis was performed on the following samples:

Client ID	LAL #		Method
BOH8F0	L6661-3	MS, DUP	300.0 Chloride, Fluoride, Nitrate as Nitrogen, Nitrite as Nitrogen, Orthophosphate and Sulfate
BOH8F1	L6661-24	MS, DUP	300.0 Chloride, Fluoride, Nitrate as Nitrogen, Nitrite as Nitrogen, Orthophosphate and Sulfate
BOH8F0	L6661-12	DUP	9050 Conductivity

Holding Time Requirements

- All samples were received within method-specified holding times with the following exceptions which are flagged with an "H": Method 300.0 Nitrate as Nitrogen, Nitrite as Nitrogen and Orthophosphate.

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

April 19, 1996
Date

Lockheed Analytical Services

Log-in No.: L6649/L6661
Quotation No.: Q400000-B
SAF: B96-089
Document File No.: 0320596/0322596
WHC Document File No.: 339
SDG No.: LK6649
Page No.: 3

CASE NARRATIVE
INORGANIC METALS ANALYSES

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 March 20, and 22, 1996. The samples were logged in as L6649 and L6661 and were prepared and analyzed in batches 320 btT for total metals and 320 btD for dissolved metals.

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

April 26, 1996
Date

CASE NARRATIVE
ORGANIC ANALYSES

Analytical Method 418.1

Analytical Batch 032496PM-418.1

NOTE: Client sample B0H8G2 (L6649-8) was the native sample used for the Matrix Spike (MS) and Matrix Spike Duplicate (MSD).

The samples were extracted and analyzed within the required holding time on March 24, 1996. All initial and continuing calibrations met criteria. Total Recoverable Petroleum Hydrocarbon (TRPH) was not detected in the Method Blank (MB). The compound recovery of TRPH 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 413.1

Analytical Batch 032596AM-413.1

NOTE: Client sample B0H8G2 (L6649-4) was the native sample used for the MS and MSD.

The samples were extracted and analyzed within the required holding time on March 25, 1996. Oil and Grease was not detected in the MB. The compound recovery of Oil and Grease was within QC limits in the MS, MSD and LCS. The RPD between the MS and MSD recoveries was within QC limits.

Prepared By
Patricia Lonergan

April 26, 1996

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, and duplicate samples.

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

Holding Time Requirements

All holding time requirements were met.

Gamma Spectrometry

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 35166. The instrument calibration verification met criteria. The method blank was within QC criteria. The laboratory control sample (LCS) recoveries were within QC criteria. The duplicate (DUP) recoveries were within QC criteria. No re-analyses were performed.

Gas Proportional Counter

Analytical Method Gross Alpha/Beta

The gross alpha/beta analysis was performed using SOP, LAL-91-SOP-0060. The samples were analyzed in workgroup 35168. The instrument calibration verification met criteria. The method blank was within QC criteria. The beta LCS recovery was within QC criteria, however, the alpha LCS recovery was out of QC criteria. Since all other QC criteria were met data quality is not believed to be adversely affected. The matrix spike (MS) recovery was within QC criteria. The DUP recoveries were within QC criteria. 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-0065. The samples were analyzed in workgroup 35403. The instrument calibration verification met criteria. The method blank was within QC criteria. The LCS recovery was within QC criteria. The DUP recoveries were within QC criteria. No re-analyses were performed.

Liquid Scintillation Counter

Analytical Method Tritium

The tritium analysis was performed using SOP, LAL-91-SOP-0066. The samples were analyzed in workgroup 35178. The instrument calibration verification met criteria. The method blank was within QC criteria. The LCS and MS recoveries were within QC criteria. The DUP recoveries were within QC criteria. The quench value was within curve limitations. No re-analyses were performed.

Andrea Tippett
Prepared By

April 16, 1996
Date

9713516.0758

LOCKHEED ANALYTICAL SERVICES
LOGIN CHAIN OF CUSTODY REPORT (ln01)
Mar 21 1996, 04:02 pm

Revision METALS

Login Number: L6649
Account: 596 Bechtel Hanford, Inc. * Richland, WA
Project: BECHTEL-HANFORD Bechtel Hanford Project

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	PR	Due Date
L6649-1	B0H8G2	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 156TMP-1					
Water 1 S SCREENING		Hold:14-SEP-96			
L6649-2	B0H8G2	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 156TMP-1					
Water 1 S 6010 ICP METALS		Hold:14-SEP-96			
Water 1 S 6010 ICP TRACE		Hold:14-SEP-96			
L6649-3	B0H8G2	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 153					
Water 1 S 300.0 CHLORIDE		Hold:15-APR-96			
Water 1 S 300.0 FLUORIDE		Hold:15-APR-96			
Water 1 S 300.0 NITRATE		Hold:20-MAR-96			
Water 1 S 300.0 NITRITE		Hold:20-MAR-96			
Water 1 S 300.0 PHOSPHATE		Hold:20-MAR-96			
Water 1 S 300.0 SULFATE		Hold:15-APR-96			
L6649-4	B0H8G2	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 156RAD1-03					
Water 1 S 413.1 OIL AND GREASE		Hold:15-APR-96			
L6649-5	B0H8G2	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 156RAD1-03					
L6649-6	B0H8G2	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 156RAD1-03					
L6649-7	B0H8G2	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 156RAD1-03					
L6649-8	B0H8G2	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 156RAD1-03					
Water 1 S 418.1 TPH		Hold:15-APR-96			

Revised

0015
0320596

9713516.0759

LOCKHEED ANALYTICAL SERVICES
LOGIN CHAIN OF CUSTODY REPORT (ln01)
Mar 21 1996, 04:02 pm

Login Number: L6649
Account: 596 Bechtel Hanford, Inc. * Richland, WA
Project: BECHTEL-HANFORD Bechtel Hanford Project

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	PR	Due Date
L6649-9	B0H8G2	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 156RAD1-03					
L6649-10	B0H8G2	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 156RAD1-03					
L6649-11	B0H8G2	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 156RAD1-03					
L6649-12	B0H8G2	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 156RAD1-03					
Water 1 S 9050	CONDUCTIVITY	Hold:	15-APR-96		
L6649-13	B0H8G2	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 156TMP-1					
Water 1 S	GAMMA SPEC LAL-0063	Hold:	14-SEP-96		
Water 1 S	GR ALP/BETA LAL-0060	Hold:	14-SEP-96		
Water 1 S	SR-89/90 LAL-0065	Hold:	14-SEP-96		
L6649-14	B0H8G2	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 156TMP-1					
L6649-15	B0H8G2	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 156TMP-1					
L6649-16	B0H8G2	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 156TMP-1					
L6649-17	B0H8G2	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 156TMP-1					
L6649-18	B0H8G2	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 156TMP-1					

0016

03205-96

9713516.0760

LOCKHEED ANALYTICAL SERVICES
LOGIN CHAIN OF CUSTODY REPORT (ln01)
Mar 21 1996, 04:02 pm

Login Number: L6649
Account: 596 Bechtel Hanford, Inc. * Richland, WA
Project: BECHTEL-HANFORD Bechtel Hanford Project

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	PR	Due Date
L6649-19	B0H8G2	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 156TMP-1					
L6649-20	B0H8G2	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 156TMP-1					
L6649-21	B0H8G2	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 156TMP-1					
L6649-22	B0H8G2	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 156TMP-1					
Water 1 S TRITIUM(H3) LAL-0066 Hold:14-SEP-96					
L6649-23	B0H8G3	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 153					
Filt H20 15 S 300.0 CHLORIDE Hold:15-APR-96					
Filt H20 15 S 300.0 FLUORIDE Hold:15-APR-96					
Filt H20 15 S 300.0 NITRATE Hold:20-MAR-96					
Filt H20 15 S 300.0 NITRITE Hold:20-MAR-96					
Filt H20 15 S 300.0 PHOSPHATE Hold:20-MAR-96					
Filt H20 15 S 300.0 SULFATE Hold:15-APR-96					
L6649-24	B0H8G3	18-MAR-96	20-MAR-96		24-APR-96
temp 3					
Location: 156TMP-1					
Filt H20 15 S 6010 ICP METALS Hold:14-SEP-96					
Filt H20 15 S 6010 ICP TRACE Hold:14-SEP-96					
L6649-25	REPORT TYPE	20-MAR-96	20-MAR-96		24-APR-96
Location:					
Water 1 S EDD - DISK DEL.					
Water 1 S GC2					
Water 1 S INORG TYPE 2 RPT +					
Water 1 S RAD RPT TYPE 2					

* ADDED 6010 ICP TRACE (Sb, As, Se, Tl)

Signature: R. Callaway

Date: 3-21-96

0017

0320596

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST L6649

Page 1 of 2

Data Turnaround
☐ Priority
■ Normal

Collector: A. Rizzo / M Mahlhan	Company Contact: J. V. Borghese	Telephone: (509) 373-4790
Project Designation: 100-NR-2 Groundwater Sampling - Round 9	Sampling Location: 100 N	SAF No.: B96-089
Ice Chest No.: SMC-444	Field Logbook No.: SL-10338	Method of Shipment: Federal Express
Shipped To: Lockheed	Offsite Property No.: W96-0-0640-32	Bill of Lading/Air Bill No.: 2904653403

Possible Sample Hazards/Remarks	Preservation	HNO3	Cool 4°C	H2SO4	HCl	Cool 4°C	HNO3		Cool 4°C	None	
	Type of Container	P/G	P/G	G	G	P	P/G		G	P/G	
	No. of Container(s)	1	1	4	4	1	9		1	1	
Special Handling and/or Storage: Maintain samples between 2°C and 6°C.	Volume	500mL	500mL	1L	1L	25mL	1L		500mL	20mL	
SAMPLE ANALYSIS		ICP Metals - 6010A (TAL) (Unfiltered)	*1	Oil and Grease - 413.1	TPH (Total) - 418.1	Conductivity - 9050	*2		Tritium - H3	Activity Scan	

Sample No.	Matrix*	Date Sampled	Time Sampled										
B0H8G2	W	3-18-96	1145	✓	✓	✓	✓	✓	✓		✓	✓	

CHAIN OF POSSESSION	Sign/Print Names		
Relinquished By: A.C. Rizzo (ERC)	Date/Time: 3-18-96 1445	Received By: Bechtel	Date/Time: 3-18-96 1445
Relinquished By: Bechtel	Date/Time: 3-19-96 0900	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

SPECIAL INSTRUCTIONS

*1 IC Anions - 300.0 - Cl, F, NO2, NO3, PO4, SO4 (Unfiltered)

*2 Gross Alpha, Gross Beta, Sr-89/90, Gamma Spec

Sample analysis for NO2, NO3, and PO4 by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time 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	Title	Date/Time
	A. Miller	Sample Custodian	3-20-96/0845

FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

9513146.0761

0018

C3057

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Data Turnaround
☐ Priority
■ Normal

Collector: A. Rizzo / M. Mehlhorn	Company Contact: J. V. Borghese	Telephone: (509) 373-4790
Project Designation: 100-NR-2 Groundwater Sampling - Round 9	Sampling Location: 100 N	SAF No.: B96-089
Ice Chest No.: SML-444	Field Logbook No.: EL-1288	Method of Shipment: Federal Express
Shipped To: Lockheed	Offsite Property No.: W96-0-0640-32	Bill of Lading/Air Bill No.: 2904653403

Possible Sample Hazards/Remarks

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

Preservation	HNO3	Cool 4°C										
Type of Container	P/G	P/G										
No. of Container(s)	1	1										
Volume	500mL	500mL										
SAMPLE ANALYSIS	ICP Metals - 6010A (TAL) (Filtered)	*3										
Sample No. / Matrix* / Date Sampled / Time Sampled												
B0H8G3 / W / 3-18-96 / 1145	Y	Y										

CHAIN OF POSSESSION	Sign/Print Names		
Relinquished By: A. G. Rizzo (CEM)	Date/Time: 3-18-96 1445	Received By: Bechtel	Date/Time: 3-18-96 1445
Relinquished By: Bechtel	Date/Time: 3-19-96 0900	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:

SPECIAL INSTRUCTIONS
*3 IC Anions - 300.0 - Cl, F, NO2, NO3, PO4, SO4 (Filtered)

Refer to Activity Scan on page 1 of 2.

Sample analysis for NO2, NO3, and PO4 by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time 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	Title	Date/Time
	[illegible]	Sample Custodian	3-20-96/0845

FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

9706190.0762

0019 ⊘ 3-20-96

9713516.0763

028288

Environmental Restoration Contractor **ERC Team**

Interoffice Memorandum

Job No. 22192
Written Response Required: NO
CCN: N/A
OU: N/A
TSD: N/A
ERA: N/A
Subject Code: 5850

TO:	W. S. Thompson	N1-28	DATE:	February 29, 1996
	G. C. Henckel	H4-80		
COPIES:	K. A. Smith	X0-23	FROM:	S. K. De Mers
	T. L. Lafreniere	X0-23		Radiological Controls
	D. E. Gergely	X0-23		T7-05/373-1913

SUBJECT: **Total Activities for Off-Site Shipments of Groundwater Samples to NRC Licensed Laboratories**

There is no need to perform total activities prior to offsite shipment to NRC licensed labs of samples taken from ground water wells located on the Hanford Site.

All wells reviewed to date for radiological content have shown no well with a total activity in excess of 2,000,000 pCi/l (2,000 pCi/gm), the Department Of Transportation limit for radioactive material. The highest activity in any known well is 1.56×10^6 pCi/l H^3.

While this does not constitute any release from radiological controls for worker protection, it does allow samples to be shipped based on historical laboratory data and save the expense of doing radiochemical analysis.

A copy of the most recent analytical data should be provided to the NRC licensed laboratory with the samples being shipped or if no data is available for new wells, the most recent data from adjacent wells.

0020 0320591

9713516.0764

LOCKHEED MARTIN

Sample Login
Login Review Checklist

Lot Number L6649

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

LOGIN CHAIN OF CUSTODY	YES	NO	N/A	Comment
1. Are the collect, receive, and due dates correct for every sample?	X			
2. Have all appropriate comments been indicated in the comment section?			X	

SAMPLE RECEIVING CHECKLIST	YES	NO	N/A	Comment
1. Are all discrepancies between the COC and the login noted (if applicable)?			X	

[illegible signature] 3-20-96
primary review signature date

[illegible signature] 3-20-96
secondary review signature date

0021 0320596

SAMPLE CHECK-IN LIST

Date/Time Received: 3-20-96/0845 SDG#: ~~B96-089~~ 3-20-96

Work Order Number: N/A SAF #: B96-089

Shipping Container ID: SML-444 Chain of Custody # N/A

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

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

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

9. Is the information on the COC and Sample bottles in agreement?

   Yes [X] No [ ]

Notes: _____

Sample Custodian/Laboratory: [signature] Date: 3-20-96

Telephoned To: Kathleen Hall On 3-20-96 By Anthony M. [illegible]

0022032096

Lockheed Analytical Services
Sample Receiving Checklist

290 4653 403

Client Name: Bechtel - Hanford Job No. LC6649 Cooler ID:

COOLER CONDITION UPON RECEIPT

Temperature of cooler upon receipt: 3°C

temperature of temp. blank upon receipt:

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

SAMPLE CONDITION UPON RECEIPT

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

MISCELLANEOUS ITEMS

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

ADDITIONAL COMMENTS/DISCREPANCIES

Completed by / date: [illegible] 3-20-96

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*

version 2.0 (11/11/94)

9713516.0766

0023 032096

9713516.0767

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

Client Sample Number	LAL Sample Number	SDG Number	Matrix	Method
B0H8G2	L6649-1		Water	SCREENING
	L6649-2		Water	6010 ICP METALS
	L6649-3		Water	300.0 CHLORIDE
	L6649-3		Water	300.0 FLUORIDE
	L6649-3		Water	300.0 NITRATE
	L6649-3		Water	300.0 NITRITE
	L6649-3		Water	300.0 PHOSPHATE
	L6649-3		Water	300.0 SULFATE
	L6649-4		Water	413.1 OIL AND GR
	L6649-8		Water	418.1 TPH
	L6649-12		Water	9050 CONDUCTIVIT
	L6649-13		Water	GAMMA SPEC LAL-0
	L6649-13		Water	GR ALP/BETA LAL-
	L6649-13		Water	SR-89/90 LAL-006
	L6649-22		Water	TRITIUM(H3) LAL-
B0H8G3	L6649-23		Filt H20	300.0 CHLORIDE
	L6649-23		Filt H20	300.0 FLUORIDE
	L6649-23		Filt H20	300.0 NITRATE
	L6649-23		Filt H20	300.0 NITRITE
	L6649-23		Filt H20	300.0 PHOSPHATE
	L6649-23		Filt H20	300.0 SULFATE
	L6649-24		Filt H20	6010 ICP METALS
REPORT TYPE	L6649-25		Water	EDD - DISK DEL
	L6649-25		Water	GC2
	L6649-25		Water	INORG TYPE 2 RP
	L6649-25		Water	RAD RPT TYPE 2

0024 032059

9713516.0768

LOCKHEED ANALYTICAL SERVICES
LOGIN CHAIN OF CUSTODY REPORT (ln01)
Mar 22 1996, 10:58 am

Login Number: L6661
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
L6661-1	B0H8F0	19-MAR-96	22-MAR-96	26-APR-96
temp 4				
Location: 157				
Water 1 S SCREENING		Hold:15-SEP-96		
L6661-2	B0H8F0	19-MAR-96	22-MAR-96	26-APR-96
temp 4				
Location: 157				
Water 1 S 6010 ICP METALS		Hold:15-SEP-96		
Water 1 S 6010 ICP TRACE		Hold:15-SEP-96		
L6661-3	B0H8F0	19-MAR-96	22-MAR-96	26-APR-96
temp 4				
Location: 157				
Water 1 S 300.0 CHLORIDE		Hold:16-APR-96		
Water 1 S 300.0 FLUORIDE		Hold:16-APR-96		
Water 1 S 300.0 NITRATE		Hold:21-MAR-96		
Water 1 S 300.0 NITRITE		Hold:21-MAR-96		
Water 1 S 300.0 PHOSPHATE		Hold:21-MAR-96		
Water 1 S 300.0 SULFATE		Hold:16-APR-96		
L6661-4	B0H8F0	19-MAR-96	22-MAR-96	26-APR-96
temp 4				
Location: 157				
Water 1 S 413.1 OIL AND GREASE		Hold:16-APR-96		
L6661-5	B0H8F0	19-MAR-96	22-MAR-96	26-APR-96
temp 4				
Location: 157				
L6661-6	B0H8F0	19-MAR-96	22-MAR-96	26-APR-9
temp 4				
Location: 157				
L6661-7	B0H8F0	19-MAR-96	22-MAR-96	26-APR-9
temp 4				
Location: 157				
L6661-8	B0H8F0	19-MAR-96	22-MAR-96	26-APR-9
temp 4				
Location: 157				
Water 1 S 418.1 TPH		Hold:16-APR-96		

0025 03225

9713516.0769

LOCKHEED ANALYTICAL SERVICES
LOGIN CHAIN OF CUSTODY REPORT (ln01)
Mar 22 1996, 10:58 am

Login Number: L6661
Account: 596 Bechtel Hanford, Inc. * Richland, WA
Project: BECHTEL-HANFORD Bechtel Hanford Project

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	PR	Due Date
L6661-9	B0H8F0	19-MAR-96	22-MAR-96		26-APR-96
temp 4					
Location: 157					
L6661-10	B0H8F0	19-MAR-96	22-MAR-96		26-APR-96
temp 4					
Location: 157					
L6661-11	B0H8F0	19-MAR-96	22-MAR-96		26-APR-96
temp 4					
Location: 157					
L6661-12	B0H8F0	19-MAR-96	22-MAR-96		26-APR-96
temp 4					
Location: 157					
Water 1 S 9050 CONDUCTIVITY	Hold:	16-APR-96			
L6661-13	B0H8F0	19-MAR-96	22-MAR-96		26-APR-96
temp 4					
Location: 157					
Water 1 S GAMMA SPEC LAL-0063	Hold:	15-SEP-96			
Water 1 S GR ALP/BETA LAL-0060	Hold:	15-SEP-96			
Water 1 S SR-89/90 LAL-0065	Hold:	15-SEP-96			
L6661-14	B0H8F0	19-MAR-96	22-MAR-96		26-APR-96
temp 4					
Location: 157					
L6661-15	B0H8F0	19-MAR-96	22-MAR-96		26-APR-96
temp 4					
Location: 157					
L6661-16	B0H8F0	19-MAR-96	22-MAR-96		26-APR-9
temp 4					
Location: 157					
L6661-17	B0H8F0	19-MAR-96	22-MAR-96		26-APR-9
temp 4					
Location: 157					
L6661-18	B0H8F0	19-MAR-96	22-MAR-96		26-APR-9
temp 4					
Location: 157					

0026

0322590

9713516.0770

LOCKHEED ANALYTICAL SERVICES
LOGIN CHAIN OF CUSTODY REPORT (ln01)
Mar 22 1996, 10:58 am

Login Number: L6661
Account: 596 Bechtel Hanford, Inc. * Richland, WA
Project: BECHTEL-HANFORD Bechtel Hanford Project

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	PR	Due Date
L6661-19	B0H8F0	19-MAR-96	22-MAR-96		26-APR-96
temp 4					
Location: 157					
L6661-20	B0H8F0	19-MAR-96	22-MAR-96		26-APR-96
temp 4					
Location: 157					
L6661-21	B0H8F0	19-MAR-96	22-MAR-96		26-APR-96
temp 4					
Location: 157					
L6661-22	B0H8F0	19-MAR-96	22-MAR-96		26-APR-96
temp 4					
Location: 157					
Water 1 S TRITIUM(H3) LAL-0066 Hold:15-SEP-96					
L6661-23	B0H8F1	19-MAR-96	22-MAR-96		26-APR-96
temp 4					
Location: 157					
Filt H20 15 S 6010 ICP METALS Hold:15-SEP-96					
Filt H20 15 S 6010 ICP TRACE Hold:15-SEP-96					
L6661-24	B0H8F1	19-MAR-96	22-MAR-96		26-APR-96
temp 4					
Location: 157					
Filt H20 15 S 300.0 CHLORIDE Hold:16-APR-96					
Filt H20 15 S 300.0 FLUORIDE Hold:16-APR-96					
Filt H20 15 S 300.0 NITRATE Hold:21-MAR-96					
Filt H20 15 S 300.0 NITRITE Hold:21-MAR-96					
Filt H20 15 S 300.0 PHOSPHATE Hold:21-MAR-96					
Filt H20 15 S 300.0 SULFATE Hold:16-APR-96					
L6661-25	REPORT TYPE	22-MAR-96	22-MAR-96		26-APR-9
Location:					
Water 1 S EDD - DISK DEL.					
Water 1 S GC2					
Water 1 S INORG TYPE 2 RPT +					
Water 1 S RAD RPT TYPE 2					

Signature: [illegible]

Date: 3-22-96 0027

032259

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST 66661

Data Turnaround
☐ Priority
■ Normal

Collector: A. Rizzo / M. Mathews	Company Contact: J. V. Borghese	Telephone: (509) 373-4790
Project Designation: 100-NR-2 Groundwater Sampling - Round 9	Sampling Location: 100 N	SAF No.: B96-089
Ice Chest No.: ER-40	Field Logbook No.: EL-1285	Method of Shipment: Federal Express
Shipped To: Lockheed	Offsite Property No.: W96-0-0640-33	Bill of Lading/Air Bill No.: 2904653613

Possible Sample Hazards/Remarks	Preservation	HNO3	Cool 4°C	H2SO4	HCl	Cool 4°C	HNO3		Cool 4°C	None	
	Type of Container	P/G	P/G	G	G	P	P/G		G	P/G	
	No. of Container(s)	1	1	4	4	1	9		1	1	
Special Handling and/or Storage: Maintain samples between 2°C and 6°C.	Volume	500mL	500mL	1L	1L	~~125mL~~ 250 mL	1L		500mL	20mL	
SAMPLE ANALYSIS		ICP Metals - 6010A (TAL) (Unfiltered)	*1	Oil and Grease - 413.1	TPH (Total) - 418.1	Conductivity - 9050	*2		Tritium - H3	Activity Scan	

Sample No.	Matrix*	Date Sampled	Time Sampled										
B0H8F0	W	3/19/96	1245	✓	✓	✓	✓	✓	✓		✓	✓	

CHAIN OF POSSESSION	Sign/Print Names		
Relinquished By: A. Rizzo (SA)	Date/Time: 3/20/96 0800	Received By: Butler	Date/Time: 3-20-96 0800
Relinquished By: Butler	Date/Time: 3-21-96 0900	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

SPECIAL INSTRUCTIONS

*1 IC Anions - 300.0 - Cl, F, NO2, NO3, PO4, SO4 (Unfiltered)

*2 Gross Alpha, Gross Beta, Sr-89/90, Gamma Spec

Sample analysis for NO2, NO3, and PO4 by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time 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	Title	Date/Time
	Paul C. Davis	Sample Custodian	3-22-96/9:00a
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

9716516.3771

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Data Turnaround
☐ Priority
■ Normal

Collector: A R. Rice / Jim Williams	Company Contact: J. V. Borghese	Telephone: (509) 373-4790
Project Designation: 100-NR-2 Groundwater Sampling - Round 9	Sampling Location: 100 N	SAF No.: B96-089
Ice Chest No.: ER-40	Field Logbook No.: EL-12.88	Method of Shipment: Federal Express
Shipped To: Lockheed	Offsite Property No.: W96-0-0640-33	Bill of Lading/Air Bill No.: 2904653613

Possible Sample Hazards/Remarks	Preservation	HNO3	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 - 6010A (TAL) (Filtered)	*3								

Sample No.	Matrix*	Date Sampled	Time Sampled										
B0H8F1	W	3/18/96	1245	✓	✓								

CHAIN OF POSSESSION	Sign/Print Names		
Relinquished By: A. Rice (ER)	Date/Time: 0600 3/20/96	Received By: ER B. Whitten	Date/Time: 0800 3-20-96
Relinquished By: ER B. Whitten	Date/Time: 0900 3-21-96	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

SPECIAL INSTRUCTIONS
*3 IC Anions - 300.0 - Cl, F, NO2, NO3, PO4, SO4 (Filtered)

Refer to Activity Scan on page 1 of 2.

Sample analysis for NO2, NO3, and PO4 by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time 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: Paul C. Dawd	Title: Sample Custodian	Date/Time: 3-22-96/9:00
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

9715514.0272

0.00

9715516.0773

028288

Environmental Restoration Contractor **ERC Team**

Interoffice Memorandum

Job No. 22192
Written Response Requested: NO
CCN: N/A
OU: N/A
TSD: N/A
EAA: N/A
Subject Code: 5830

TO:	W. S. Thompson	N1-28	DATE:	February 29, 1996
	G. C. Henckel	H4-80		
COPIES:	K. A. Smith	X0-23	FROM:	S. K. De Mers
	T. L. Lafreniere	X0-23		Radiological Controls
	D. E. Gergely	X0-23		T7-05/373-1913

SUBJECT: **Total Activities for Off-Site Shipments of Groundwater Samples to NRC Licensed Laboratories**

There is no need to perform total activities prior to offsite shipment to NRC licensed labs of samples taken from ground water wells located on the Hanford Site.

All wells reviewed to date for radiological content have shown no well with a total activity in excess of 2,000,000 pCi/l (2,000 pCi/gm), the Department Of Transportation limit for radioactive material. The highest activity in any known well is 1.56×10^6 pCi/l H^3.

While this does not constitute any release from radiological controls for worker protection, it does allow samples to be shipped based on historical laboratory data and save the expense of doing radiochemical analysis.

A copy of the most recent analytical data should be provided to the NRC licensed laboratory with the samples being shipped or if no data is available for new wells, the most recent data from adjacent wells.

9713516.0774

LOCKHEED MARTIN

Sample Login
Login Review Checklist

Lot Number 16661

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

LOGIN CHAIN OF CUSTODY	YES	NO	N/A	Comment
1. Are the collect, receive, and due dates correct for every sample?	X			
2. Have all appropriate comments been indicated in the comment section?			X	

SAMPLE RECEIVING CHECKLIST	YES	NO	N/A	Comment
1. Are all discrepancies between the COC and the login noted (if applicable)?			X	

[signature] 3-22-96
primary review signature — date

[signature] 3-22-96
secondary review signature — date

0031032259

Lockheed Analytical Services
Sample Receiving Checklist

Client Name: Bechtel - Hanford Job No. LL661 Cooler ID:

COOLER CONDITION UPON RECEIPT			
Temperature of cooler upon receipt:	4°C		
temperature of temp. blank upon receipt:			
	Yes	No	* Comments/Discrepancies
custody seals intact	X		
chain of custody present	X		
blue ice (or equiv.) present/frozen	X		
rad survey completed	X		

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

MISCELLANEOUS ITEMS			
	Yes	No	* Comments/Discrepancies
samples with short holding times	X		Nitrate, Nitrite HT exceeded
samples to subcontract		X	

ADDITIONAL COMMENTS/DISCREPANCIES

Completed by / date: [illegible] 3-22-94

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*

version 2.0 (11/11/94)

9713516.0775

0032534

SAMPLE CHECK-IN LIST

Date/Time Received: 3-22-96 SDG#: N/A

Work Order Number: N/A SAF #: B96-089

Shipping Container ID: ER-40 Chain of Custody # N/A

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

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

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

9. Is the information on the COC and Sample bottles in agreement?

   Yes [X] No [ ]

Notes: Nitrate, Nitrite HT exceeded

Sample Custodian/Laboratory: AM Miller Date: 3-22-96

Telephoned To: Kathleen Hall On 3-22-96 By Anthony Miller

9713516.0777

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

Client Sample Number	LAL Sample Number	SDG Number	Matrix	Method
B0H8F0	L6661-1		Water	SCREENING
	L6661-2		Water	6010 ICP METALS
	L6661-2		Water	6010 ICP TRACE
	L6661-3		Water	300.0 CHLORIDE
	L6661-3		Water	300.0 FLUORIDE
	L6661-3		Water	300.0 NITRATE
	L6661-3		Water	300.0 NITRITE
	L6661-3		Water	300.0 PHOSPHATE
	L6661-3		Water	300.0 SULFATE
	L6661-4		Water	413.1 OIL AND G
	L6661-8		Water	418.1 TPH
	L6661-12		Water	9050 CONDUCTIVI
	L6661-13		Water	GAMMA SPEC LAL-
	L6661-13		Water	GR ALP/BETA LAL
	L6661-13		Water	SR-89/90 LAL-OC
	L6661-22		Water	TRITIUM(H3) LAL
B0H8F1	L6661-23		Filt H20	6010 ICP METALS
	L6661-23		Filt H20	6010 ICP TRACE
	L6661-24		Filt H20	300.0 CHLORIDE
	L6661-24		Filt H20	300.0 FLUORIDE
	L6661-24		Filt H20	300.0 NITRATE
	L6661-24		Filt H20	300.0 NITRITE
	L6661-24		Filt H20	300.0 PHOSPHATE
	L6661-24		Filt H20	300.0 SULFATE
REPORT TYPE	L6661-25		Water	EDD - DISK DEL.
	L6661-25		Water	GC2
	L6661-25		Water	INORG TYPE 2 RP
	L6661-25		Water	RAD RPT TYPE 2

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0H8G2	Date Collected: 18-MAR-96
Matrix: Water	Date Received: 20-MAR-96
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch|ID	LAS Sample|ID
Chloride	mg/L	300.0	23.	0.020		21-MAR-96	35075	L6649-3
Fluoride	mg/L	300.0	< 0.007	0.10	U	21-MAR-96	35077	L6649-3
Nitrate-N	mg/L	300.0	5.2	0.020	H	21-MAR-96	35079	L6649-3
Nitrite-N	mg/L	300.0	< 0.002	0.010	HU	21-MAR-96	35082	L6649-3
Ortho Phosphate	mg/L	300.0	0.029	0.10	HB	21-MAR-96	35084	L6649-3
Sulfate	mg/L	300.0	270	0.10		21-MAR-96	35086	L6649-3
Conductivity	uS/cm	9050	990	1.0		12-APR-96	35253	L6649-12

9713516.0779

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0H8F0	Date Collected: 19-MAR-96
Matrix: Water	Date Received: 22-MAR-96
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch|ID	LAS Sample|ID
Chloride	mg/L	300.0	7.8	0.020		26-MAR-96	35222	L6661-3
Fluoride	mg/L	300.0	0.47	0.10		25-MAR-96	35224	L6661-3
Nitrate-N	mg/L	300.0	3.0	0.020	H	26-MAR-96	35226	L6661-3
Nitrite-N	mg/L	300.0	< 0.002	0.010	HU	26-MAR-96	35228	L6661-3
Ortho Phosphate	mg/L	300.0	0.088	0.10	HB	25-MAR-96	35230	L6661-3
Sulfate	mg/L	300.0	130	0.10		26-MAR-96	35232	L6661-3
Conductivity	uS/cm	9050	530	1.0		12-APR-96	35253	L6661-12

9713516.0780

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0H8G3	Date Collected: 18-MAR-96
Matrix: Filt H20	Date Received: 20-MAR-96
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Chloride	mg/L	300.0	23.	0.020		21-MAR-96	35076	L6649-23
Fluoride	mg/L	300.0	< 0.007	0.10	U	21-MAR-96	35078	L6649-23
Nitrate-N	mg/L	300.0	5.2	0.020	H	21-MAR-96	35080	L6649-23
Nitrite-N	mg/L	300.0	< 0.002	0.010	HU	21-MAR-96	35083	L6649-23
Ortho Phosphate	mg/L	300.0	< 0.002	0.10	HU	25-MAR-96	35085	L6649-23
Sulfate	mg/L	300.0	270	0.10		21-MAR-96	35087	L6649-23

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0H8F1	Date Collected: 19-MAR-96
Matrix: Filt H20	Date Received: 22-MAR-96
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch|ID	LAS Sample|ID
Chloride	mg/L	300.0	9.1	0.020		26-MAR-96	35223	L6661-24
Fluoride	mg/L	300.0	0.50	0.10		25-MAR-96	35225	L6661-24
Nitrate-N	mg/L	300.0	200	0.20	HD(1:10)	26-MAR-96	35227	L6661-24
Nitrite-N	mg/L	300.0	< 0.002	0.010	HU	26-MAR-96	35229	L6661-24
Ortho Phosphate	mg/L	300.0	0.067	0.10	HB	25-MAR-96	35231	L6661-24
Sulfate	mg/L	300.0	140	0.10		26-MAR-96	35233	L6661-24

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0H8G2	Date Collected: 18-MAR-96
Matrix: Water	Date Received: 20-MAR-96
Percent Solids: N/A	

Constituent	Units	Method	Result	MDL	RDL	Data Qual	Dilution	Date Analyzed	LAS Batch ID	LAS Sample ID
ALUMINUM, TOTAL	mg/l	6010	< 0.036	0.036	0.20	U	1	05-APR-96	35540	L6649-2
BARIUM, TOTAL	mg/l	6010	0.062	0.0050	0.20	B	1	05-APR-96	35540	L6649-2
BERYLLIUM, TOTAL	mg/l	6010	< 0.0010	0.0010	0.0050	U	1	05-APR-96	35540	L6649-2
CADMIUM, TOTAL	mg/l	6010	< 0.0050	0.0050	0.0050	U	1	05-APR-96	35540	L6649-2
CALCIUM, TOTAL	mg/l	6010	130	0.0090	5.0		1	05-APR-96	35540	L6649-2
CHROMIUM, TOTAL	mg/l	6010	0.013	0.0060	0.010		1	05-APR-96	35540	L6649-2
COBALT, TOTAL	mg/l	6010	< 0.0070	0.0070	0.050	U	1	05-APR-96	35540	L6649-2
COPPER, TOTAL	mg/l	6010	< 0.0070	0.0070	0.025	U	1	05-APR-96	35540	L6649-2
IRON, TOTAL	mg/l	6010	0.057	0.0060	0.10	B	1	05-APR-96	35540	L6649-2
MAGNESIUM, TOTAL	mg/l	6010	21.	0.066	5.0		1	05-APR-96	35540	L6649-2
MANGANESE, TOTAL	mg/l	6010	< 0.0010	0.0010	0.015	U	1	05-APR-96	35540	L6649-2
NICKEL, TOTAL	mg/l	6010	< 0.013	0.013	0.040	U	1	05-APR-96	35540	L6649-2
POTASSIUM, TOTAL	mg/l	6010	5.5	1.2	5.0		1	05-APR-96	35540	L6649-2
SILVER, TOTAL	mg/l	6010	< 0.0070	0.0070	0.010	U	1	05-APR-96	35540	L6649-2
SODIUM, TOTAL	mg/l	6010	50.	0.039	5.0		1	05-APR-96	35540	L6649-2
VANADIUM, TOTAL	mg/l	6010	< 0.0070	0.0070	0.050	U	1	05-APR-96	35540	L6649-2
ZINC, TOTAL	mg/l	6010	0.015	0.0030	0.020	B	1	05-APR-96	35540	L6649-2
Antimony	mg/l	6010	< 0.0030	0.0030	0.060	U	1	24-APR-96	35541	L6649-2
Arsenic	mg/l	6010	< 0.0030	0.0030	0.010	U	1	24-APR-96	35541	L6649-2
Lead	mg/l	6010	< 0.0020	0.0020	0.0030	U	1	24-APR-96	35541	L6649-2
Selenium	mg/l	6010	< 0.0030	0.0030	0.0050	U	1	24-APR-96	35541	L6649-2
Thallium	mg/l	6010	< 0.0050	0.0050	0.010	U	1	24-APR-96	35541	L6649-2

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0H8F0	Date Collected: 19-MAR-96
Matrix: Water	Date Received: 22-MAR-96
Percent Solids: N/A	

Constituent	Units	Method	Result	MDL	RDL	Data Qual	Dilution	Date Analyzed	LAS Batch ID	LAS Sample ID
ALUMINUM, TOTAL	mg/l	6010	0.33	0.036	0.20		1	05-APR-96	35540	L6661-2
BARIUM, TOTAL	mg/l	6010	0.036	0.0050	0.20	B	1	05-APR-96	35540	L6661-2
BERYLLIUM, TOTAL	mg/l	6010	< 0.0010	0.0010	0.0050	U	1	05-APR-96	35540	L6661-2
CADMIUM, TOTAL	mg/l	6010	< 0.0050	0.0050	0.0050	U	1	05-APR-96	35540	L6661-2
CALCIUM, TOTAL	mg/l	6010	22.	0.0090	5.0		1	05-APR-96	35540	L6661-2
CHROMIUM, TOTAL	mg/l	6010	< 0.0060	0.0060	0.010	U	1	05-APR-96	35540	L6661-2
COBALT, TOTAL	mg/l	6010	< 0.0070	0.0070	0.050	U	1	05-APR-96	35540	L6661-2
COPPER, TOTAL	mg/l	6010	< 0.0070	0.0070	0.025	U	1	05-APR-96	35540	L6661-2
IRON, TOTAL	mg/l	6010	0.20	0.0060	0.10		1	05-APR-96	35540	L6661-2
MAGNESIUM, TOTAL	mg/l	6010	5.6	0.066	5.0		1	05-APR-96	35540	L6661-2
MANGANESE, TOTAL	mg/l	6010	0.024	0.0010	0.015		1	05-APR-96	35540	L6661-2
NICKEL, TOTAL	mg/l	6010	< 0.013	0.013	0.040	U	1	05-APR-96	35540	L6661-2
POTASSIUM, TOTAL	mg/l	6010	2.8	1.2	5.0	B	1	05-APR-96	35540	L6661-2
SILVER, TOTAL	mg/l	6010	< 0.0070	0.0070	0.010	U	1	05-APR-96	35540	L6661-2
SODIUM, TOTAL	mg/l	6010	100	0.039	5.0		1	05-APR-96	35540	L6661-2
VANADIUM, TOTAL	mg/l	6010	0.012	0.0070	0.050	B	1	05-APR-96	35540	L6661-2
ZINC, TOTAL	mg/l	6010	0.35	0.0030	0.020		1	05-APR-96	35540	L6661-2
Antimony	mg/l	6010	< 0.0030	0.0030	0.060	U	1	24-APR-96	35541	L6661-2
Arsenic	mg/l	6010	0.0055	0.0030	0.010	B	1	24-APR-96	35541	L6661-2
Lead	mg/l	6010	< 0.0020	0.0020	0.0030	U	1	24-APR-96	35541	L6661-2
Selenium	mg/l	6010	0.0045	0.0030	0.0050	B	1	24-APR-96	35541	L6661-2
Thallium	mg/l	6010	< 0.0050	0.0050	0.010	U	1	24-APR-96	35541	L6661-2

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0H8G3	Date Collected: 18-MAR-96
Matrix: Filt H20	Date Received: 20-MAR-96
Percent Solids: N/A	

Constituent	Units	Method	Result	MDL	RDL	Data Qual	Dilution	Date Analyzed	LAS Batch ID	LAS Sample ID
ALUMINUM, DISSOLVED	mg/l	6010	< 0.036	0.036	0.20	U	1	05-APR-96	35542	L6649-24
BARIUM, DISSOLVED	mg/l	6010	0.066	0.0050	0.20	B	1	05-APR-96	35542	L6649-24
BERYLLIUM, DISSOLVED	mg/l	6010	< 0.0010	0.0010	0.0050	U	1	05-APR-96	35542	L6649-24
CADMIUM, DISSOLVED	mg/l	6010	< 0.0050	0.0050	0.0050	U	1	05-APR-96	35542	L6649-24
CALCIUM, DISSOLVED	mg/l	6010	140	0.0090	5.0		1	05-APR-96	35542	L6649-24
CHROMIUM, DISSOLVED	mg/l	6010	< 0.0060	0.0060	0.010	U	1	05-APR-96	35542	L6649-24
COBALT, DISSOLVED	mg/l	6010	< 0.0070	0.0070	0.050	U	1	05-APR-96	35542	L6649-24
COPPER, DISSOLVED	mg/l	6010	< 0.0070	0.0070	0.025	U	1	05-APR-96	35542	L6649-24
IRON, DISSOLVED	mg/l	6010	< 0.0060	0.0060	0.10	U	1	05-APR-96	35542	L6649-24
MAGNESIUM, DISSOLVED	mg/l	6010	22.	0.066	5.0		1	05-APR-96	35542	L6649-24
MANGANESE, DISSOLVED	mg/l	6010	< 0.0010	0.0010	0.015	U	1	05-APR-96	35542	L6649-24
NICKEL, DISSOLVED	mg/l	6010	< 0.013	0.013	0.040	U	1	05-APR-96	35542	L6649-24
POTASSIUM, DISSOLVED	mg/l	6010	5.0	1.2	5.0		1	05-APR-96	35542	L6649-24
SILVER, DISSOLVED	mg/l	6010	< 0.0070	0.0070	0.010	U	1	05-APR-96	35542	L6649-24
SODIUM, DISSOLVED	mg/l	6010	54.	0.039	5.0		1	05-APR-96	35542	L6649-24
VANADIUM, DISSOLVED	mg/l	6010	< 0.0070	0.0070	0.050	U	1	05-APR-96	35542	L6649-24
ZINC, DISSOLVED	mg/l	6010	< 0.0030	0.0030	0.020	U	1	05-APR-96	35542	L6649-24
Antimony	mg/l	6010	< 0.0030	0.0030	0.060	U	1	24-APR-96	35543	L6649-24
Arsenic	mg/l	6010	0.0066	0.0030	0.010	B	1	24-APR-96	35543	L6649-24
Lead	mg/l	6010	< 0.0020	0.0020	0.0030	U	1	24-APR-96	35543	L6649-24
Selenium	mg/l	6010	< 0.0030	0.0030	0.0050	U	1	24-APR-96	35543	L6649-24
Thallium	mg/l	6010	0.0064	0.0050	0.010	B	1	24-APR-96	35543	L6649-24

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0H8F1	Date Collected: 19-MAR-96
Matrix: Filt H20	Date Received: 22-MAR-96
Percent Solids: N/A	

Constituent	Units	Method	Result	MDL	RDL	Data Qual	Dilution	Date Analyzed	LAS Batch ID	LAS Sample ID
ALUMINUM, DISSOLVED	mg/l	6010	< 0.036	0.036	0.20	U	1	05-APR-96	35542	L6661-23
BARIUM, DISSOLVED	mg/l	6010	0.037	0.0050	0.20	B	1	05-APR-96	35542	L6661-23
BERYLLIUM, DISSOLVED	mg/l	6010	< 0.0010	0.0010	0.0050	U	1	05-APR-96	35542	L6661-23
CADMIUM, DISSOLVED	mg/l	6010	< 0.0050	0.0050	0.0050	U	1	05-APR-96	35542	L6661-23
CALCIUM, DISSOLVED	mg/l	6010	23.	0.0090	5.0		1	05-APR-96	35542	L6661-23
CHROMIUM, DISSOLVED	mg/l	6010	< 0.0060	0.0060	0.010	U	1	05-APR-96	35542	L6661-23
COBALT, DISSOLVED	mg/l	6010	< 0.0070	0.0070	0.050	U	1	05-APR-96	35542	L6661-23
COPPER, DISSOLVED	mg/l	6010	< 0.0070	0.0070	0.025	U	1	05-APR-96	35542	L6661-23
IRON, DISSOLVED	mg/l	6010	0.024	0.0060	0.10	B	1	05-APR-96	35542	L6661-23
MAGNESIUM, DISSOLVED	mg/l	6010	5.9	0.066	5.0		1	05-APR-96	35542	L6661-23
MANGANESE, DISSOLVED	mg/l	6010	0.022	0.0010	0.015		1	05-APR-96	35542	L6661-23
NICKEL, DISSOLVED	mg/l	6010	< 0.013	0.013	0.040	U	1	05-APR-96	35542	L6661-23
POTASSIUM, DISSOLVED	mg/l	6010	2.7	1.2	5.0	B	1	05-APR-96	35542	L6661-23
SILVER, DISSOLVED	mg/l	6010	< 0.0070	0.0070	0.010	U	1	05-APR-96	35542	L6661-23
SODIUM, DISSOLVED	mg/l	6010	110	0.039	5.0		1	05-APR-96	35542	L6661-23
VANADIUM, DISSOLVED	mg/l	6010	0.014	0.0070	0.050	B	1	05-APR-96	35542	L6661-23
ZINC, DISSOLVED	mg/l	6010	< 0.0030	0.0030	0.020	U	1	05-APR-96	35542	L6661-23
Antimony	mg/l	6010	< 0.0030	0.0030	0.060	U	1	24-APR-96	35543	L6661-23
Arsenic	mg/l	6010	0.0067	0.0030	0.010	B	1	24-APR-96	35543	L6661-23
Lead	mg/l	6010	< 0.0020	0.0020	0.0030	U	1	24-APR-96	35543	L6661-23
Selenium	mg/l	6010	0.0032	0.0030	0.0050	B	1	24-APR-96	35543	L6661-23
Thallium	mg/l	6010	< 0.0050	0.0050	0.010	U	1	24-APR-96	35543	L6661-23

LOCKHEED ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS BY FTIR
418.1 TPH

Client Sample ID:	B0H8G2	LAL Sample ID:	L6649-8
Date Collected:	18-MAR-96	Date Received:	20-MAR-96
Date Analyzed:	24-MAR-96	Date Extracted:	24-MAR-96
Matrix:	Water	Analytical Batch ID:	032496PM-418.1
QC Group:	418.1 TPH_35184	Dilution Factor:	1

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

LOCKHEED ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS BY FTIR
418.1 TPH

Client Sample ID:	B0H8F0	LAL Sample ID:	L6661-8
Date Collected:	19-MAR-96	Date Received:	22-MAR-96
Date Analyzed:	24-MAR-96	Date Extracted:	24-MAR-96
Matrix:	Water	Analytical Batch ID:	032496PM-418.1
QC Group:	418.1 TPH_35184	Dilution Factor:	1

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

LOCKHEED ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS BY FTIR
418.1 TPH

Client Sample ID:	Method Blank	LAL Sample ID:	35184MB
Date Collected:	N/A	Date Received:	N/A
Date Analyzed:	24-MAR-96	Date Extracted:	24-MAR-96
Matrix:	Water	Analytical Batch ID:	032496PM-418.1
QC Group:	418.1 TPH_35184	Dilution Factor:	1

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

9713516.0789

LOCKHEED ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS BY FTIR
418.1 TPH

Client Sample ID:	BOH8G2	LAL Sample ID:	35184MS
Date Collected:	18-MAR-96	Date Received:	20-MAR-96
Date Analyzed:	24-MAR-96	Date Extracted:	24-MAR-96
Matrix:	Water	Analytical Batch ID:	032496PM-418.1
QC Group:	418.1 TPH_35184	Dilution Factor:	1

CONSTITUENT	RESULT mg/L	PRACTICAL QUANTITATION LIMIT mg/L	DATA QUALIFIER(s)
TRPH	2.60	1.00	

LOCKHEED ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS BY FTIR
418.1 TPH

Client Sample ID:	BOH8G2	LAL Sample ID:	35184MSD
Date Collected:	18-MAR-96	Date Received:	20-MAR-96
Date Analyzed:	24-MAR-96	Date Extracted:	24-MAR-96
Matrix:	Water	Analytical Batch ID:	032496PM-418.1
QC Group:	418.1 TPH_35184	Dilution Factor:	1

CONSTITUENT	RESULT mg/L	PRACTICAL QUANTITATION LIMIT mg/L	DATA QUALIFIER(s)
TRPH	2.59	1.00	

LOCKHEED ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS BY FTIR
418.1 TPH

Client Sample ID:	Lab Ctrl Sample	LAL Sample ID:	35184LCS
Date Collected:	N/A	Date Received:	N/A
Date Analyzed:	24-MAR-96	Date Extracted:	24-MAR-96
Matrix:	Water	Analytical Batch ID:	032496PM-418.1
QC Group:	418.1 TPH_35184	Dilution Factor:	1

CONSTITUENT	RESULT mg/L	PRACTICAL QUANTITATION LIMIT mg/L	DATA QUALIFIER(s)
TRPH	2.52	1.00	

LOCKHEED ANALYTICAL SERVICES

MATRIX SPIKE DATA SUMMARY
TOTAL PETROLEUM HYDROCARBONS BY FTIR
418.1 TPH

Client Sample ID:	BOH8G2	LAL Sample ID:	35184MS
Date Collected:	18-MAR-96	Date Received:	20-MAR-96
Date Analyzed:	24-MAR-96	Date Extracted:	24-MAR-96
Matrix:	Water	Analytical Batch ID:	032496PM-418.1
QC Group:	418.1 TPH_35184	Dilution Factor:	1

Constituent	Spike Added mg/L	Sample Concentration mg/L	Matrix Spike Concentration mg/L	% Recovery	QC Limits % Recovery
TRPH	2.49	0.320	2.60	92	64-114

LOCKHEED ANALYTICAL SERVICES

MATRIX SPIKE DUPLICATE DATA SUMMARY
TOTAL PETROLEUM HYDROCARBONS BY FTIR
418.1 TPH

Client Sample ID:	B0H8G2	LAL Sample ID:	35184MSD
Date Collected:	18-MAR-96	Date Received:	20-MAR-96
Date Analyzed:	24-MAR-96	Date Extracted:	24-MAR-96
Matrix:	Water	Analytical Batch ID:	032496PM-418.1
QC Group:	418.1 TPH_35184	Dilution Factor:	1

Constituent	Spike Added mg/L	Matrix Spike Duplicate Concentration mg/L	% Recovery	RPD	QC Limits RPD	QC Limits % Recovery
TRPH	2.49	2.59	91	0	20	64-114

LOCKHEED ANALYTICAL SERVICES

LCS DATA SUMMARY
TOTAL PETROLEUM HYDROCARBONS BY FTIR
418.1 TPH

Client Sample ID:	Lab Ctrl Sample	LAL Sample ID:	35184LCS
Date Collected:	N/A	Date Received:	N/A
Date Analyzed:	24-MAR-96	Date Extracted:	24-MAR-96
Matrix:	Water	Analytical Batch ID:	032496PM-418.1
QC Group:	418.1 TPH_35184	Dilution Factor:	1

Constituent	Spike Added mg/L	LCS Concentration mg/L	LCS % Recovery	QC Limits
TRPH	2.49	2.52	101	64-114

LOCKHEED ANALYTICAL SERVICES

OIL AND GREASE - GRAVIMETRIC METHOD
413.1 OIL AND GREASE

Client Sample ID:	B0H8G2	LAL Sample ID:	L6649-4
Date Collected:	18-MAR-96	Date Received:	20-MAR-96
Date Analyzed:	25-MAR-96	Date Extracted:	25-MAR-96
Matrix:	Water	Analytical Batch ID:	032596AM-413.1
QC Group:	413.1 OIL AND GREASE_35188	Dilution Factor:	1

CONSTITUENT	RESULT mg/L	PRACTICAL QUANTITATION LIMIT mg/L	DATA QUALIFIER(s)
Oil and Grease	6.11	5.00	

LOCKHEED ANALYTICAL SERVICES

OIL AND GREASE - GRAVIMETRIC METHOD
413.1 OIL AND GREASE

Client Sample ID:	B0H8F0	LAL Sample ID:	L6661-4
Date Collected:	19-MAR-96	Date Received:	22-MAR-96
Date Analyzed:	25-MAR-96	Date Extracted:	25-MAR-96
Matrix:	Water	Analytical Batch ID:	032596AM-413.1
QC Group:	413.1 OIL AND GREASE_35188	Dilution Factor:	1

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

LOCKHEED ANALYTICAL SERVICES

OIL AND GREASE - GRAVIMETRIC METHOD
413.1 OIL AND GREASE

Client Sample ID:	Method Blank	LAL Sample ID:	35188MB
Date Collected:	N/A	Date Received:	N/A
Date Analyzed:	25-MAR-96	Date Extracted:	25-MAR-96
Matrix:	Water	Analytical Batch ID:	032596AM-413.1
QC Group:	413.1 OIL AND GREASE_35188	Dilution Factor:	1

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

9713516.0798

LOCKHEED ANALYTICAL SERVICES

OIL AND GREASE - GRAVIMETRIC METHOD
413.1 OIL AND GREASE

Client Sample ID:	B0H8G2	LAL Sample ID:	35188MS
Date Collected:	18-MAR-96	Date Received:	20-MAR-96
Date Analyzed:	25-MAR-96	Date Extracted:	25-MAR-96
Matrix:	Water	Analytical Batch ID:	032596AM-413.1
QC Group:	413.1 OIL AND GREASE_35188	Dilution Factor:	1

CONSTITUENT	RESULT mg/L	PRACTICAL QUANTITATION LIMIT mg/L	DATA QUALIFIER(s)
Oil and Grease	189	5.00	

LOCKHEED ANALYTICAL SERVICES

OIL AND GREASE - GRAVIMETRIC METHOD
413.1 OIL AND GREASE

Client Sample ID:	BOH8G2	LAL Sample ID:	35188MSD
Date Collected:	18-MAR-96	Date Received:	20-MAR-96
Date Analyzed:	25-MAR-96	Date Extracted:	25-MAR-96
Matrix:	Water	Analytical Batch ID:	032596AM-413.1
QC Group:	413.1 OIL AND GREASE_35188	Dilution Factor:	1

CONSTITUENT	RESULT mg/L	PRACTICAL QUANTITATION LIMIT mg/L	DATA QUALIFIER(s)
Oil and Grease	187	5.00	

9713516.0800

LOCKHEED ANALYTICAL SERVICES

OIL AND GREASE - GRAVIMETRIC METHOD
413.1 OIL AND GREASE

Client Sample ID:	Lab Ctrl Sample	LAL Sample ID:	35188LCS
Date Collected:	N/A	Date Received:	N/A
Date Analyzed:	25-MAR-96	Date Extracted:	25-MAR-96
Matrix:	Water	Analytical Batch ID:	032596AM-413.1
QC Group:	413.1 OIL AND GREASE_35188	Dilution Factor:	1

CONSTITUENT	RESULT mg/L	PRACTICAL QUANTITATION LIMIT mg/L	DATA QUALIFIER(s)
Oil and Grease	186	5.00	

LOCKHEED ANALYTICAL SERVICES

MATRIX SPIKE DATA SUMMARY
OIL AND GREASE - GRAVIMETRIC METHOD
413.1 OIL AND GREASE

Client Sample ID:	B0H8G2	LAL Sample ID:	35188MS
Date Collected:	18-MAR-96	Date Received:	20-MAR-96
Date Analyzed:	25-MAR-96	Date Extracted:	25-MAR-96
Matrix:	Water	Analytical Batch ID:	032596AM-413.1
QC Group:	413.1 OIL AND GREASE_35188	Dilution Factor:	1

Constituent	Spike Added mg/L	Sample Concentration mg/L	Matrix Spike Concentration mg/L	% Recovery	QC Limits % Recovery
Oil and Grease	200	6.11	189	91	78-110

LOCKHEED ANALYTICAL SERVICES

MATRIX SPIKE DUPLICATE DATA SUMMARY
OIL AND GREASE - GRAVIMETRIC METHOD
413.1 OIL AND GREASE

Client Sample ID:	B0H8G2	LAL Sample ID:	35188MSD
Date Collected:	18-MAR-96	Date Received:	20-MAR-96
Date Analyzed:	25-MAR-96	Date Extracted:	25-MAR-96
Matrix:	Water	Analytical Batch ID:	032596AM-413.1
QC Group:	413.1 OIL AND GREASE_35188	Dilution Factor:	1

Constituent	Spike Added mg/L	Matrix Spike Duplicate Concentration mg/L	% Recovery	RPD	QC Limits RPD	QC Limits % Recovery
Oil and Grease	200	187	90	1	20	78-110

LOCKHEED ANALYTICAL SERVICES

LCS DATA SUMMARY
OIL AND GREASE - GRAVIMETRIC METHOD
413.1 OIL AND GREASE

Client Sample ID:	Lab Ctrl Sample	LAL Sample ID:	35188LCS
Date Collected:	N/A	Date Received:	N/A
Date Analyzed:	25-MAR-96	Date Extracted:	25-MAR-96
Matrix:	Water	Analytical Batch ID:	032596AM-413.1
QC Group:	413.1 OIL AND GREASE_35188	Dilution Factor:	1

Constituent	Spike Added mg/L	LCS Concentration mg/L	LCS % Recovery	QC Limits
Oil and Grease	200	186.	93	78-110

LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0H8G2 LAL Sample ID: L6649-13

Date Collected: 18-MAR-96 Date Received: 20-MAR-96

Matrix: Water Login Number: L6649

SDG: LK6649/LK6661

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
Ac-228(Ra-228)	25-MAR-96	GAMMA SPEC LAL-0063_35166	10	25.	39.		pCi/L
Co-58	25-MAR-96	GAMMA SPEC LAL-0063_35166	-0.4	6.8	8.9		pCi/L
Co-60	25-MAR-96	GAMMA SPEC LAL-0063_35166	-0.2	3.9	9.5		pCi/L
Cs-137	25-MAR-96	GAMMA SPEC LAL-0063_35166	0.4	5.4	9.2		pCi/L
Eu-152	25-MAR-96	GAMMA SPEC LAL-0063_35166	-9.2	7.7	39.		pCi/L
Eu-154	25-MAR-96	GAMMA SPEC LAL-0063_35166	-6.5	6.7	40.		pCi/L
Eu-155	25-MAR-96	GAMMA SPEC LAL-0063_35166	-2.	15.	19.		pCi/L
Fe-59	25-MAR-96	GAMMA SPEC LAL-0063_35166	-0.5	8.6	19.		pCi/L
Pb-212	25-MAR-96	GAMMA SPEC LAL-0063_35166	-3.	11.	15.		pCi/L
Pb-214(Ra-226)	25-MAR-96	GAMMA SPEC LAL-0063_35166	42.	15.	18.		pCi/L
Ra-226(GAMMA)	25-MAR-96	GAMMA SPEC LAL-0063_35166	-30	130	190		pCi/L
Ru-106	25-MAR-96	GAMMA SPEC LAL-0063_35166	-38.	31.	99.		pCi/L
U-235(GAMMA)	25-MAR-96	GAMMA SPEC LAL-0063_35166	22.	31.	42.		pCi/L
Gross Alpha	09-APR-96	GR ALP/BETA LAL-0060_35168	2.5	2.9	4.7	C	pCi/L
Gross Beta	09-APR-96	GR ALP/BETA LAL-0060_35168	764.	42.	4.4	C	pCi/L
Sr-89,90	03-APR-96	SR-89/90 LAL-0065_35403	233.	12.	0.93		pCi/L

LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0H8G2 LAL Sample ID: L6649-22

Date Collected: 18-MAR-96 Date Received: 20-MAR-96

Matrix: Water Login Number: L6649

SDG: LK6649/LK6661

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
H-3	09-APR-96	TRITIUM(H3) LAL-0066_35178	5820	520	240		pCi/L

LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0H8F0 | LAL Sample ID: L6661-13

Date Collected: 19-MAR-96 | Date Received: 22-MAR-96

Matrix: Water | Login Number: L6661

SDG: LK6649/LK6661

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
Ac-228(Ra-228)	25-MAR-96	GAMMA SPEC LAL-0063_35166	1.6	9.9	18.		pCi/L
Co-58	25-MAR-96	GAMMA SPEC LAL-0063_35166	-0.6	1.0	3.3		pCi/L
Co-60	25-MAR-96	GAMMA SPEC LAL-0063_35166	-0.3	1.8	4.4		pCi/L
Cs-137	25-MAR-96	GAMMA SPEC LAL-0063_35166	0.9	2.8	3.6		pCi/L
Eu-152	25-MAR-96	GAMMA SPEC LAL-0063_35166	-0.9	5.5	15.		pCi/L
Eu-154	25-MAR-96	GAMMA SPEC LAL-0063_35166	-0.3	3.8	15.		pCi/L
Eu-155	25-MAR-96	GAMMA SPEC LAL-0063_35166	2.	11.	15.		pCi/L
Fe-59	25-MAR-96	GAMMA SPEC LAL-0063_35166	-0.2	2.2	7.0		pCi/L
Pb-212	25-MAR-96	GAMMA SPEC LAL-0063_35166	4.4	6.1	8.9		pCi/L
Pb-214(Ra-226)	25-MAR-96	GAMMA SPEC LAL-0063_35166	16.4	6.8	8.7		pCi/L
Ra-226(GAMMA)	25-MAR-96	GAMMA SPEC LAL-0063_35166	-34.	68.	110		pCi/L
Ru-106	25-MAR-96	GAMMA SPEC LAL-0063_35166	-25.	12.	39.		pCi/L
U-235(GAMMA)	25-MAR-96	GAMMA SPEC LAL-0063_35166	-11.	15.	27.		pCi/L
Gross Alpha	09-APR-96	GR ALP/BETA LAL-0060_35168	1.4	1.8	3.0	C	pCi/L
Gross Beta	09-APR-96	GR ALP/BETA LAL-0060_35168	3.8	1.7	2.6		pCi/L
Sr-89,90	03-APR-96	SR-89/90 LAL-0065_35403	0.22	0.59	1.0		pCi/L

LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0H8F0 LAL Sample ID: L6661-22

Date Collected: 19-MAR-96 Date Received: 22-MAR-96

Matrix: Water Login Number: L6661

SDG: LK6649/LK6661

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
H-3	09-APR-96	TRITIUM(H3) LAL-0066_35178	400	220	240		pCi/L

ISOTOPES DILUTION RECORD

Secondary/Working Level Dilution

Date: 4/8/93 Preparer's Name: A. Wong

Pipet Check / Balance Wt. Check Done (✓)

Diluent used: 0.1 M HCl

I. Isotope #1: Cs-137

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

A: Source activity: 940.831 pCi/ml decay corrected from 975.134

B: Amount of source transferred: 0.2 ml

C: Total amount of dilution: 100 ml

D: Isotope activity (A*B/C): 1.8817 pCi/ml

II. Isotope #2: Co-60

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

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

F: Amount of source transferred: 0.2 ml

G: Total amount of dilution: 100 ml

H: Isotope activity (E*F/G): 1.9962 pCi/ml

Dilution Log Book ID: 92-353-78

Reviewed by: [signature] Date: 4/9/93

ISOTOPES DILUTION RECORD

Secondary/Working Level Dilution

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

Pipet Check / Balance Wt. Check Done (✓)

Diluent used: 0.1 M HCl

I. Isotope #1: Cs-137

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

A: Source activity: 940.831 pCi/ml decay corrected from 975.1348 pCi

B: Amount of source transferred: 2 ml

C: Total amount of dilution: 10 ml

D: Isotope activity (A*B/C): 188.1662 pCi/ml

II. Isotope #2: Co-60

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

E: Source activity: 998.1087 pCi/ml

F: Amount of source transferred: 2 ml

G: Total amount of dilution: 10 ml

H: Isotope activity (E*F/G): 199.6217 pCi/ml

★ Dilution Log Book ID: 92-353-79

Reviewed by: [illegible] Date: 4/9/93

92135160810

PROJECT γ Spec Std Cs-137 & Co-60

Notebook No. 353

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: 0.1 M HCl

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

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

A: Source activity: 940.831 pCi/ml decay corrected from 975.1348 pCi/ml

B: Amount of source transferred: 0.3 ml

C: Total amount of dilution: 1500 ml

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

= 295 pCi ^{137}Cs 4-2-91

II. Isotope #2: Co-60 ⇒ ~~388.6~~ 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

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

= 327 pCi ^{60}Co 4-2-91

Dilution Log Book ID: 92-353-80

Reviewed by: [signature] Date: 4/9/93

Continued on Page

Read and Understood By

Signed	Date	Signed	Date
Agnes Wong	4-9-93	[signature]	6/4/93

0205

CERTIFICATE OF CALIBRATION
GAMMA STANDARD SOLUTION

Radionuclide	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 µCi.

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

Radionuclide Concentration

0.202 µCi/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)

QUALITY CONTROL

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

Mass of solution 4.9149
injected 1/4/92
ID # 91-0225-P

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

Calibration Certificate

Description

Principal radionuclide: Cobalt-60 Half-life: 5.271 years

Nominal activity: 110 nano curies

Nominal volume: 5 ml in ampoule/bottle number: 2506-2

Measurement Activity of principal radionuclide

Activity per gram of this solution

22.2 nano curies of Cobalt-60

at 0400 hours PST on April 2, 1991

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

APPROX. 5.0 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 0.6 half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after January 2000

9713516.0813

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 ± 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 ($+\delta$ - δ'). 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) + δ], - [t(sm) + δ']
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:	Other components:
30 micrograms cobalt	0.1 M HCl

Preservative:

Remarks

Date Certificate Prepared May 31, 1991

Approval Signature Paul B. Hahn

Revised 1/84

0211

AA0025

9713516.0814

Diluted to 100m

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

Calibration Certificate

Description

Principal radionuclide: Cobalt-60 Half-life: 5.271 years

Nominal activity: 110 nano curies

Nominal volume: 5 ml in ampoule/bottle number: 2506-2

Measurement Activity of principal radionuclide

Activity per gram of this solution

22.2 nano curies of Cobalt-60

at 0400 hours PST on April 2, 1991

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

APPROX. 5.0 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 0.6 half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after January 2000

9713516.0815

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 stated	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 ± 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:	Other components:
30 micrograms cobalt	0.1 M HCl

Preservative:

Remarks

Date Certificate Prepared May 31, 1991

Approval Signature Paul B. Hahn

Revised 1/84

CERTIFICATE OF CALIBRATION
GAMMA STANDARD SOLUTION

Radionuclide	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 µCi.

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

Radionuclide Concentration

0.202 µCi/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)

QUALITY CONTROL

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

PROJECT Spec Cs-137 & Co-60 Continued From Page

Agnes Wong 4-9-93

ISOTOPES DILUTION RECORD

Secondary/Working Level Dilution

10 ml volume (aqueous) in 60 ml poly bottle AC3409

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

Pipet Check / Balance Wt. Check Done (✓)

Diluent used: 0.1 M HCl

I. Isotope #1: Cs-137 ⟹ 195 pCi ^{137}Cs 7-1-91

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

A: Source activity: 940.831 pCi/ml decay corrected from 975.1348 pCi/ml

B: Amount of source transferred: 0.2 ml

C: Total amount of dilution: 10 ml

D: Isotope activity (A*B/C): 188.1662 pCi/ml ⟹ 197 pCi 4-2-91

II. Isotope #2: Co-60

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

E: Source activity: 998.1087 pCi/ml

F: Amount of source transferred: 0.2 ml

G: Total amount of dilution: 10 ml ⟹ 218 pCi 4-2-91

H: Isotope activity (E*F/G): 199.6217 pCi/ml decay corrected from 1091.1 pCi/ml

* Dilution Log Book ID: 92-353-79

Reviewed by: [illegible] Date: 4/9/93

Continued on Page

Read and Understood By

Signed	Date	Signed	Date
Agnes Wong	4-9-93	RJB	4/9/93

Notebook No. 0526

Continued From Page ____

PROJECT 500 ml Aqueous Marinelli LCS

Prepared LCS using 0.5 N HCL — Added 499 ml to 1 liter marinelli.
repetted 1.000 ml of ^{60}Co ^{137}Cs mixed standard
(barcode no. A121VZ) ref. 92-353-79 (Lab Emphasis)
188.1 pCi/ml ^{60}Co on 4-8-93
used 1000 ml pipette no. #71008 (Lab 155)
Calibrated activities at 4-1-91 ^{137}Cs = 197 pCi
^{60}Co = 218 pCi

USE FOR GAMMA LCS

LCS-1 ^{238}U

LCS 4-13-94

200g/200 ml Tuna Can

@ 200.09 ms

= 3.402 pCi/gm

Tuna can AC2007 200.09 ms/200 ml full

U S Department of Energy
New Brunswick Laboratory

AC2401

Jackie Schutt 4-18-94

New Brunswick Laboratory
Certified Reference Materials
Certificate of Analysis

COMBINATION OF 4-50g CONTAINERS

CRM 105-A

Pitchblende Ore - Silica Mixture
(Uranium Standard)

Uranium ..... 0.00102, ± 0.00002, Wt.%
(α = 0.05, df = 28)

*[Radium (calculated) ..... 3.52×10^{-10} Wt.%]

This reference material was prepared by milling and blending NBL CRM 6-A Pitchblende Ore (67.91 ± 0.05 Wt.% U_3O_8) with silica (99.9% SiO_2) to obtain a uniform mixture of desired uranium concentration. Characterization and certification analyses for uranium content were performed on ten (10) units selected from the packaged final product.

The certified value listed above is expressed in terms of 95% confidence limits, defined as $\bar{X} \pm s_{\bar{X}} \cdot t$, where $\bar{X}$ is the pooled mean of the measurement data, $s_{\bar{X}}$ is the pooled standard deviation of the pooled mean, and t is the Student's t value for the indicated degrees of freedom (df) and at the 5% significance level (α).

REFERENCE METHODS OF ANALYSIS: Spectrophotometry verified with NBL Uranium Oxide (U_3O_8) and Fluorimetry verified with NBL CRM 112-A Uranium Metal.

*Calculation is based on the radium/uranium ratio of 3.44×10^{-7}g Ra/g U for NBL CRM 6-A Pitchblende Ore.

$^{238}U \Rightarrow .7410$ dpm ^{238}U = 1 µgm Nat U

$\frac{.741 \text{ dpm } ^{238}U}{1 \text{ µg Nat U}} * \frac{10^6 \text{ µg Nat U}}{1 \text{ g Nat U}} * \frac{.0000102 \text{ g Nat U}}{1 \text{ g pitchblende}}$ = 7.558 dpm/g ^{238}U * $\frac{1 \text{ pCi}}{2.22 \text{ dpm}}$ = 3.402 pCi/g ^{238}U

3.5×10^{-9} µCi Unnatural × 4 / 14×10^{-3} µCi

February 1981
Argonne, Illinois

Carleton D. Bingham
Director

TOTAL Unnatural ^{238}U = 1512 dpm = 25.19 dpm = 68.2 pCi

Signed

Date

Jackie Schutt 4-18-94

02219

T-19-9250-7-7

26-81-15 SSG

PROJECT Gross Alpha/Beta LCS

Continued From Page _____

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information

Isotope:	Am-241 and Sr/Y-90
Parent Barcode Number	AA0030 AA0046
Vendor or Certificate I.D. # of Parent Standard:	Am-241 IPL 388-100-1 Sr/Y-90 NIST SRM 4919G
Diluted Source Logbook I.D. #:	Am-241 91-0225-60-1 Sr/Y-90 91-0225-30-2
Balance Verification?:	Yes
Diluent Used:	0.1 N HNO_3

Dilution

*Diluent:	0.1 N HNO_3 + 42mg $Sr(NO_3)_2$/mL
*Density of diluent (g/ml):	NA
a: Parent Specific Activity:	Am-241 981 pCi/mL Sr-90 600 pCi/mL on 8/1/90
b: Amount of Source Transferred:	Am-241 0.5 mL Sr-90 0.5 ~~g~~ mL
c: Total amount of Dilution:	500 ~~g~~ 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/Y-90 12 pCi/mL on 8/1/90
Dilution Logbook I.D. #:	95-721-13-1

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

Reviewed By: [illegible] 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

0226

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: AmCl3 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)

Gary F. Gilmore
QUALITY CONTROL

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

9713516.0821 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	4.514×10^3 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 ± 0.2 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
[illegible]uary, 1991

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

*Notes on back

0229

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:	AmCl3 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)

Gary A. Gilmore
QUALITY CONTROL

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

0231

CERTIFICATE OF CALIBRATION
BETA STANDARD SOLUTION

Radionuclide	Sr-90	Customer:	LOCKHEED ENGINEERING & SCIENCES Co.
Half Life:	28.5 ± 0.2 years	P.O.No.:	06LAB1245
Catalog No.:	7090	Reference Date:	November 1 1991 12:00 PST.
Source No.:	388-99-2	Contained Radioactivity:	1.018 µCi.

Description of Solution

a. Mass of solution:	5.0012	grams.
b. Chemical form:	SrCl2 in 0.1N HCl	
c. Carrier content:	None added	
d. Density:	0.9996	gram/ml @ 20°C.

Radioimpurities

None (Y-90 daughter in equilibrium)

Radioactive Daughters

Y-90 daughter in equilibrium

Radionuclide Concentration

0.203 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:	±1.5%
b. Random uncertainty in assay:	±0.5%
c. Random uncertainty in weighing(s):	±0.0%
d. Total uncertainty at the 99% confidence level:	±2.0%

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)

Gary A Gilmore
QUALITY CONTROL

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

9713516.0824

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information

Isotope:	(432.7 yr) Am-241 ; (29.1 yr) Sr/Y 90 MS
Parent ~~Barcode~~ Logbook Number	92-353-81-1 ; 94-0677-92-1
Vendor or Certificate I.D. # of Parent Standard:	
Diluted Source Logbook I.D. #:	SEE ABOVE
Balance Verification?:	Yes
Diluent Used:	1 M HNO3

Dilution

*Diluent:	1 M HNO3 + 10 ml Sr Carrier (10 mg/ml)		
*Density of diluent (g/ml):	1.0290	g/ml	
a: Parent Specific Activity:	Am-241 1002.1 ; Sr/Y-90 * 1000.2	pCi/g	@ 1/5/96
b: Amount of Source Transferred:	4.070 ; 4.065	g	
c: Total amount of Dilution:	500.01	g	
d: Total Volume of Dilution:	514.5	ml	
e: Activity of Dilution [a * b / c]:	Am-241 8.16 ; Sr/Y-90 8.13	pCi/g	@ 1/5/96
f: Activity of Dilution (a * b / d):	8.40 ; 8.37	pCi/ml	
Dilution Logbook I.D. #:	94-0677-93-1		

* Sr/Y-90 in equilibrium. Activity reported = known Sr 90 activity * 2.

Prepared By: [signature] Preparation Date: 1/5/96

Reviewed By: Joe Hutchinson Review Date: 1/5/96

*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.

Page

Read and Understood By

Signed	Date	Signed	Date

INITIAL STANDARD DILUTION RECORD

Standard Information:			
Isotope:	Sr-90	Vendor:	IPL
Activity of Standard Received:	~~5.001~~ 1.018 uCi	Vendor I.D. #	—
Weight of Standard Received (g):	5.0012 g	LAL I.D. #:	AAØØ49
Standard Activity (pCi/g):	2.036E5 pCi/g	NIST Traceable ?	Yes
Halflife in Years or Days:	29.1 yrs	Certificate #:	388-99-2
Reference Date:	11/1/91	Receiver's Name:	FREE
		Date Received:	12/91

Primary Dilution		
Balance Verification?:	Yes	
Diluent Used:	1 M HNO_3	(1.0290 g/ml)
a: Decay Corrected Standard Activity (pCi/g):	1.844 E5	pCi/g @ 1/5/96
b: Weight of the Source Transferred (g):	4.949	g
c: Total diluted weight (g):	100.01	g
d: Total Diluted Volume (mL)	97.19	mL
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:	9125.0	pCi/g @ 1/5/96
f: Calculated Density of Solution (g/ml) [c / d]:	~~9389.8~~ 1.0290	g/mL
g: Activity of Dilution by Volume (pCi/mL) [e * f]:	9389.8	pCi/mL
h. Dilution Logbook I.D. #:	94-0677-91-1	

Prepared By: [signature] Preparation Date: 1/5/96

Reviewed By: Joe Hutchison Review Date: 1/5/96

Purity/Cross Check Performed By: _____ Check Date: _____

Signed	Date	Signed	Date

9713516.0826

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information

Isotope:	Sr-90
Parent Barcode Number	AA0049
Vendor or Certificate I.D. # of Parent Standard:	~~94-0677-91-1~~ 388-99-2
Diluted Source Logbook I.D. #:	94-0677-91-1
Balance Verification?:	Yes
Diluent Used:	1.0 M HNO_3

Dilution

*Diluent:	1.0 M HNO_3	
*Density of diluent (g/ml):	1.0290	g/ml
a: Parent Specific Activity:	9125.0	pCi/g @ 1/5/96
b: Amount of Source Transferred:	6.012	g
c: Total amount of Dilution:	109.70	g
d: Total Volume of Dilution:	106.61	ml
e: Activity of Dilution [a * b / c]:	500.09	pCi/g 1/5/96
f: Activity of Dilution (a * b / d):	514.6	pCi/ml
Dilution Logbook I.D. #:	94-0677-92-1	

Prepared By: [signature] Preparation Date: 1/5/96

Reviewed By: Joe Hutchison Review Date: 1/5/96

*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

9735116.0027

ISOTOPE DILUTION RECORD

Agnes Wong 4-9-93

Isotope: Am-241

Secondary/Working Level Dilution

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

Pipet Check / Balance Wt. Check Done (✓)

Diluted Source ID (log#): 91-225-60-1

Diluent used: 0.5 N HCl

A: Source activity: 21700 dpm/g (9774.8 pCi/g)

B: Amount of source transferred: 10.3235 g

C: Total amount of dilution: 100.1029 g

D: Activity of dilution (A*B/C): 2237.90 dpm/g

E: Density of Diluent: 1.0010 g/ml

* F: Activity by volume (D*E): 2240.14 dpm/ml

Dilution Log Book ID: ~~92-335~~ RW 92-353-81-1

Reviewed by: EJ Date: 4/9/93

1.6" diameter filter LCS for Gamma Spec. (14 petri dish and sealed) JSS 5/18/93

Prepared by Nee Van Nuyen 5/10/93 — Cut Whatman Glass Microfiber Filter paper (originally 3" dia.) to 1.6" dia. — Pipetted on filter:

^{137}Cs	LAC-0199-	0.200 ml	* 975.18 pCi/ml = 195.0 pCi	(≡ 197.8 pCi 4-2-91)
^{60}Co	LAC-0225-80-1	0.200 ml	* 990.11 pCi/ml 40.3 Bq/ml = 199.6 pCi	(≡ 259.1 pCi 4-2-91)

(same pipette amounts as p.80R)

Continued on Page N/A

Read and Understood By

Signed	Date	Signed	Date
Agnes Wong	4-9-93	Jack S Schuett	5-18-93

9713516.0828

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HA0046

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	4.514×10^3 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 ± 0.2 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
[illegible]uary, 1991

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

*Notes on back

NOTES

(1) Approximately five milliliters of solution. Ampoule specifications:

body diameter	16.5 ± 0.5 mm
wall thickness	0.60 ± 0.04 mm
barium content	less than 2.5 percent
lead oxide content	less than 0.02 percent
other heavy elements	trace quantities

(2) Solution density is 1.014 ± 0.002 g/mL at 21.5 °C.

(3) The overall uncertainty was formed by taking three times the quadratic combination of standard deviations of the mean, or approximations thereof, for the following:

a) liquid-scintillation measurements	0.01 percent
b) gravimetric measurements	0.05 percent
c) dead time	0.10 percent
d) background	0.01 percent
e) detection efficiency	0.30 percent
f) decay-scheme data	0.10 percent
g) half life	0.01 percent
h) radionuclidic impurities	0.10 percent

(4) The limit of detection for photon-emitting impurities is:

$$0.01\ \gamma\ s^{-1}g^{-1} \text{ between 50 and 1900 keV.}$$

(5) The limit of detection for alpha-particle-emitting impurities is:

$$0.05\ \alpha\ s^{-1}g^{-1}.$$

(6) NCRP Report No. 58, 2nd Edition, February 1985, p. 365.

For further information please contact Dr. Larry Lucas at (301) 975-5546.

4919-G

9713516.0830

NOTES ON THE USE OF STANDARD REFERENCE MATERIAL 4919G, STRONTIUM-90

The activity of the strontium-90 in the ampoule is given per gram of solution. If transfers are made by volume, the density given on the certificate can be used to compute the activity per unit volume. The activity given is the strontium-90 activity only. Because the strontium-90 is in equilibrium with its yttrium-90 daughter, which is also a beta-particle emitter, the activity given should be doubled to get the corresponding total beta-particle-emission rate.

If the solution is to be used for making quantitative sources, it should be kept tightly sealed so that evaporation, and the consequent change in the radioactivity concentration, is minimized. Glass containers are best for storage.

Dilute solutions of strontium-90 are often assayed by liquid-scintillation counting. We recommend that carrier solution containing approximately 1 mg of non-radioactive strontium be added first to the liquid-scintillation cocktail. We typically use a carrier solution containing 4 mg of strontium per mL of 0.5- molar hydrochloric acid. When 0.25 mL of this solution is added to 10 mL of emulsion type liquid-scintillation cocktail, the resulting 1 mg of strontium per vial is generally sufficient to prevent the radioactive strontium-90 from plating out on the vial walls. A set of liquid-scintillation vials that cover a range of sample-solution masses should be prepared and monitored over several days to ensure that the efficiency is constant.

The beta-particle counting efficiency will be somewhat less than unity. A correction for the loss of low-energy beta particles can be computed using the integral-discriminator-extrapolation technique (G. Goldstein, Nucleonics 23 (1965) 67) or using the liquid-scintillation efficiency-tracing technique with tritium (B.M. Coursey et al, Int. J. Radiat. Isotopes 37 (1986) 403).

The activity concentration given on the certificate is as of 1200 hours Eastern Standard Time, August 9, 1990. To convert from EST to your local time, the table given below can be used.

TO CONVERT FROM EST TO:

EDT	Add	1 hour
CDT	Same as EST	
CST	Subtract	1 hour
MDT	Subtract	1 hour
MST	Subtract	2 hours
PDT	Subtract	2 hours
PST	Subtract	3 hours
UTC	Add	5 hours

PROJECT _____ Continued From Page _____

9713516.0831

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

9-7-C. Mo 4/26/

Dilution Source Information

Isotope:	Sr-90
Parent Barcode Number	AA0046
Vendor or Certificate I.D. # of Parent Standard:	—
Diluted Source Logbook I.D. #:	91-0225-30-2
Balance Verification?:	Yes
Diluent Used:	1 M HCl

Dilution

*Diluent:	1 M HCl	
*Density of diluent (g/ml):	1.0121	g/ml
a: Parent Specific Activity:	6000.69	pCi/~~g~~ ml
b: Amount of Source Transferred:	~~3.000~~ 2.00	g
c: Total amount of Dilution:	~~101.21~~ 303.63	g
d: Total Volume of Dilution:	300.0	ml
e: Activity of Dilution (a * b / c):	~~40.00~~ 40.49	pCi/g @ 8/1/90
f: Activity of Dilution (a * b / d):	~~40.00~~ 40.00	pCi/ml
Dilution Logbook I.D. #:	LAL-94-0677-49	

Prepared By: J. C. Mo[illegible] Preparation Date: 4/7/95

Reviewed By: Joe Hutchinson Review Date: 6/1/95

*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
		[illegible]	6/8/95

0246

9713516.0832

ACS277

RECEIVED 11/25/95 RKC

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

21.9 nano curies of Tritium

at 0400 hours PST on June 3, 1992

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

APPROX. 5.0 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 0.0 half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after December 1999

9713516.0833

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

	NIST DATA	EMSL DATA
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	$4\pi\beta$ 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

PROJECT H-3 LCS 971516.0854

Continued From Page _____

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information

Isotope:	H-3 LCS
Parent Barcode Number	AC5299 (exp. 2/97)
Vendor or Certificate I.D. # of Parent Standard:	2606-1 REF 6/3/92
Diluted Source Logbook I.D. #:	~~95-725-104~~ 4/15/96 95-721-1
Balance Verification?:	Yes
Diluent Used:	Deed water

Dilution

*Diluent:	Deep Well water	
*Density of diluent (g/ml):	0.9977	g/ml
a: Parent Specific Activity:	2190	pCi/~~g~~ml
b: Amount of Source Transferred:	~~2 ml~~ 12 ml	~~g~~ Glass Class "A" pipet
c: Total amount of Dilution:	5600 ml	~~g~~
d: Total Volume of Dilution:	5600 ml	ml
e: Activity of Dilution (a * b / c):	~~2.74~~ 4.69	pCi/~~g~~ml
f: Activity of Dilution (a * b / d):	~~2.74~~ 4.69	pCi/ml EXPIRES 2/97
Dilution Logbook I.D. #:	95-0721-17-1	

Prepared By: [signature] Preparation Date: 2/1/96

Reviewed By: [signature] Review Date: 2/1/96

*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 _____

PROJECT 11-3 97135FG.0835 Continued From Page NA

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. #:	AC 5299
Standard Activity (pCi/g):	21.9 ~~pCi/g~~ nCi/g 2/7/95	NIST Traceable ?	Yes
Halflife in Years or Days:	12.43 yrs	Certificate #:	2600-1
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 (Deed Water)	
a: Decay Corrected Standard Activity (pCi/g):	~~4.939~~ 21.9 nCi/g 2/7/95	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~~ 49.5 2/7/95	mL
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:	2190	pCi/g
f: ~~Calculated~~ Known 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. #:	LAL-95-0721-1	

Prepared By: Joe Hutchinson / J. Morales / C. Ponieway Preparation Date: 2/7/95

Reviewed By: Joe Hutchinson Review Date: 2/7/95

Purity/Cross Check Performed By: _____ Check Date: _____

Signed _____ Date _____ CP 5/8/95 Signed _____ Date _____

9713516.0836 91-18 AA0017

National Institute of Standards & Technology

Certificate

Standard Reference Material 4927D
Radioactivity Standard

Radionuclide	Hydrogen-3
Source identification	SRM 4927-D
Source description	^{3}H-water flame-sealed in NBS glass ampoule (1)*
Volume	3 mL
Radioactivity concentration	6.286×10^{5} Bq g^{-1}
Reference time	1200 EST January 1, 1989
Overall uncertainty	0.82 percent (2)
Measuring instrument	$4\pi\beta$ liquid-scintillation counter (3)
Half life	12.43 ± 0.05 years (4)

This Standard Reference Material was prepared in the Center for Radiation Research, Nuclear Radiation Division, Radioactivity Group, Dale D. Hoppes, Group Leader.

Gaithersburg, MD 20899
January, 1989

Stanley D. Rasberry, Chief
Office of Standard Reference Materials

*Notes on back

NOTES

(1) Ampoule contains approximately three milliliters of solution. Ampoule specifications:

body diameter	16.5 ± 0.5 mm
wall thickness	0.60 ± 0.04 mm
barium content	less than 2.5 percent
lead oxide content	less than 0.02 percent
other heavy elements	trace quantities

(2) The overall uncertainty was formed by taking three times the quadratic combination of standard deviations of the mean, or approximations thereof, for the following:

a) n = 6 gas counting measurements	0.05 percent
b) gram-mole measurements	0.08 percent
c) extrapolation and length-compensation in gas counting	0.05 percent
d) liquid-scintillation intercomparison of 1961 and 1978 standards	0.10 percent
e) half-life correction for Δ = 10.5 years	0.23 percent

(3) The master solution for SRM 4927-D was the same as for the 1978 standards, SRM 4927-B, described in reference (4). The 1985 and 1989 standards were also intercompared by liquid-scintillation counting and were found to agree to within 0.1 percent.

(4) Unterweger, M.P., Coursey, B.M., Schima, F.J., and Mann, W.B., Int. J. Appl. Radiat. Isot., 31, 611 (1980).

For further information please contact J.M Calhoun at (301) 975-5538.

9213516.0838

PROJECT H-3 MS

Notebook No.

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information

Isotope:	H-3 MS
Parent Barcode Number	91-0225-8-1 EXP 8/21/
Vendor or Certificate I.D. # of Parent Standard:	—
Diluted Source Logbook I.D. #:	91-0225-8-1
Balance Verification?:	N/A
Diluent Used:	Deadwater

Dilution

*Diluent:	Deep well water	
*Density of diluent (g/ml):	1	g/ml
a: Parent Specific Activity:	33937.3 pCi/ml	~~pCi/g~~ @ 2/6/96
b: Amount of Source Transferred:	1.0	g
c: Total amount of Dilution:	150	~~g~~
d: Total Volume of Dilution:	150	ml
e: Activity of Dilution (a * b / c):	226.2 pCi/m	~~pCi/g~~ Pipet # 139746
f: Activity of Dilution (a * b / d):	226.2	pCi/ml @ 2/6/96
Dilution Logbook I.D. #:	94-0677-98-1	

Prepared By: [signature] Preparation Date: 2/29/96

Reviewed By: Joe Hutchinson Review Date: 2/29/96

*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

0261

9713516.0839

Golder Associates Inc.

4104-148th Avenue, NE
Redmond, WA 98052
Telephone (206) 883-0777
Fax (206) 882-5498

Golder Associates

May 17, 1996

Our ref: 943-1610.127.0400
94-1610/O/516

CH2M Hill
1022 Lee Blvd.
Richland, Washington 99352

ATTENTION: Ms. Jeanette Duncan

RE: TRANSMITTAL OF DATA VALIDATION PACKAGE, CONTRACT NO. MSH-SWV-315905

MAY 1996
RECEIVED
Validation
Log In

Dear Ms. Duncan:

This letter is to transmit the following data validation package:

SAF#	Project	Data Package	Analyses
B96-089	100-NR-2 Groundwater Sampling Round 9	LK6649-LAS	General Chemistry, Inorganics, Radiochemistry

Please call if you have any questions.

Sincerely,

GOLDER ASSOCIATES INC.

Tom Stapp

Thomas M. Stapp
Project Manager

Enclosures

p:\enviros\whc\dv\dptran.ltr

9713516.0840

MEMORANDUM

TO: 100 NR 2 Groundwater Sampling Round 9 Project QA Record May 24, 1996

FR: Heidi Gregerson, Golder Associates Inc. HRG

RE: GENERAL CHEMISTRY DATA VALIDATION SUMMARY FOR DATA PACKAGE LK6649-LAS (943-1610.127 6649GEN.NR2)

INTRODUCTION

This memo presents the results of data validation for the analysis indicated below on data package LK6649-LAS prepared by Lockheed Analytical Services. Sample information is provided in the following table.

SAMPLE ID	COMMENTS	ANALYSIS	MEDIA
B0H8G3	FIELD SPLIT	GENERAL CHEMISTRY	WATER
B0H8F1	FIELD SPLIT		WATER
B0H8G2	FIELD SPLIT	SEE ATTACHMENT 4	WATER
B0H8F0	FIELD SPLIT		WATER

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

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

DATA QUALITY OBJECTIVES

This section presents a summary of the data quality in terms of the referenced validation criteria.

Precision. Goals for precision were met.

Accuracy. Goals for accuracy were met.

Completeness. The data package was complete for all requested analyses. A total of four samples were validated in this data package with a total of 30 determinations reported, 27 of which were deemed valid. This results in a completeness of 90%, which meets the 90% objective of the work plan.

001
Revised HRG
5/24/96

Detection Limits. Detection limit goals were met for all sample results, with the exception of TRPH for samples B0H8F0 and B0H8G2. The CRDL for oil and grease method 413.1 is not specified in the data validation procedures.

MAJOR DEFICIENCIES

The following major deficiencies were identified during data validation which required qualification of data as unusable:

Holding Times

- The holding times for nitrite-N and ortho-phosphate were exceeded by greater than twice the limit and the associated samples were qualified accordingly. Attachments 2 and 5 provide a summary of data qualifications applied and supporting documentation.

MINOR DEFICIENCIES

The following minor deficiencies were identified during data validation which required qualification of data:

Holding Times

- The holding times for nitrate-N, nitrite-N, and ortho-phosphate exceeded the control limit. Attachments 2 and 5 provide a summary of data qualifications applied and supporting documentation.

DATA REPORTING

- Sample analysis and validation for ortho-phosphate, nitrate-N, and nitrite-N was requested for informational purposes only as stated in the validation services request document.

- Sample results reported as less than or "<" by the laboratory have been qualified as undetected (U) on the laboratory results form. See Attachment 3.

FIELD QC

- Samples B0H8G3, B0H8F1, B0H8G2, and B0H8F0 were identified as field splits. The associated samples are in another sample delivery group, therefore, the RPDs will be evaluated in the final summary report.

002
Revised HLG
5/24/96

REFERENCES

WHC 1993, Data Validation Procedures for Chemical Analyses, WHC-SD-EN-SPP-002, Rev. 2, 1993. Westinghouse Hanford Company, Richland, Washington.

WHC 1994, Environmental and Waste Characterization Analytical Data Validation, Purchase Order MSH-SWV-315905; Validation Statement of Work, Revision 1.0, September 7, 1994; Westinghouse Hanford Company, Richland, Washington.

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ATTACHMENT 1

GLOSSARY OF DATA REPORTING QUALIFIERS

Glossary of Inorganic Data Reporting Qualifiers.

B - Indicates the constituent was analyzed for and detected. The concentration reported is less than the contract required detection limit (CRDL) but greater than the instrument detection limit (IDL). The associated data should be considered usable for decision making purposes.

U - Indicates the constituent was analyzed for and not detected. The concentration reported is the sample detection limit corrected for aliquot size, dilution and percent solids (in the case of solid matrices) by the laboratory. The associated data should be considered usable for decision making purposes.

UJ - Indicates the constituent was analyzed for and not detected. Due to a minor quality control deficiency identified during data validation the concentration may not accurately reflect the sample detection limit. The associated data have been qualified as estimated but should be considered usable for decision making purposes.

BJ - Indicates the constituent was analyzed for and detected at a concentration less than the contract required detection limit (CRDL) but greater than the instrument detection limit (IDL). Due to a minor quality control deficiency identified during data validation the associated data have been qualified as estimated, but should be considered usable for decision making purposes.

J - Indicates the constituent was analyzed for and detected. Due to a minor quality control deficiency identified during data validation the associated data have been qualified as estimated, but should be considered usable for decision making purposes.

UR - Indicates the constituent was analyzed for and not detected. Due to a major quality control deficiency identified during data validation, the associated data have been qualified as unusable for decision making purposes.

R - Indicates the constituent was analyzed for and detected. Due to a major quality control deficiency identified during data validation, the associated data have been qualified as unusable for decision making purposes.

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ATTACHMENT 2

SUMMARY OF DATA QUALIFICATIONS

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WHC-SD-EN-SPP-002, REV.2

DATA QUALIFICATION SUMMARY - FORM B-7

SDG: LK6649-LAS	REVIEWER: Heidi Gregerson	DATE: 5-15-96	PAGE 1 OF 1
COMMENTS: GENERAL CHEMISTRY			
COMPOUND/ANALYTE	QUALIFIER	SAMPLES AFFECTED	REASON
NITRATE-N	J	ALL SAMPLES	HOLDING TIME EXCEEDED
NITRITE-N	UJ	B0H8G3 B0H8G2	HOLDING TIME EXCEEDED
NITRITE-N	UR	B0H8F1 B0H8F0	HOLDING TIME EXCEEDED BY GREATER THAN TWICE THE LIMIT
ORTHO-PHOSPHATE	BJ	B0H8G2	HOLDING TIME EXCEEDED
ORTHO-PHOSPHATE	UR/BJ	B0H8G3 B0H8F1 B0H8F0	HOLDING TIME EXCEEDED BY GREATER THAN TWICE THE LIMIT

Revised HRG
5/24/96

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ATTACHMENT 3

QUALIFIED DATA SUMMARY and ANNOTATED LABORATORY REPORTS

Validated Data Summary, Data Package: LK6649-LAS

	Sample #	B0H8G3		B0H8F1		B0H8G2		B0H8F0	
	Date	3/18/96		3/19/96		3/18/96		3/19/96	
	Location	199-N-54		199-N-25		199-N-54		199-N-25	
	Depth								
	Type	Water		Water		Water		Water	
	Comments	Field Split		Field Split		Field Split		Field Split	
Parameter	Units	Results	Q	Results	Q	Results	Q	Results	Q
CHLORIDE	MG/L	23.000		9.100		23.000		7.800	
FLUORIDE	MG/L	0.007	U	0.500		0.007	U	0.470	
NITRATE-N	MG/L	5.200	J	200.000	J	5.200	J	3.000	J
NITRITE-N	MG/L	0.002	UJ	0.002	UR	0.002	UJ	0.002	UR
ORTHO-PHOSPHATE	MG/L	0.002	UR	0.067	BJ	0.029	BJ	0.088	BJ
SULFATE	MG/L	270.000		140.000		270.000		130.000	
CONDUCTIVITY	uS/CM					990.000		530.000	
OIL & GREASE	MG/L					6.110		5.000	U
TOTAL RECOVERABLE PETROLEUM HYDROCARBONS	MG/L					1.000	U	1.000	U

The decimal places shown do not reflect the precision reported by the laboratory.

Verified HRG
5/24/96

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Revised HRG
5/24/96

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LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0H8G3	Date Collected: 18-MAR-96
Matrix: Filt H20	Date Received: 20-MAR-96
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch|ID	LAS Sample|ID	Q
Chloride	mg/L	300.0	23.	0.020		21-MAR-96	35076	L6649-23	
Fluoride	mg/L	300.0	< 0.007	0.10	U	21-MAR-96	35078	L6649-23	
Nitrate-N	mg/L	300.0	5.2	0.020	~~H~~	21-MAR-96	35080	L6649-23	J
Nitrite-N	mg/L	300.0	< 0.002	0.010	~~HU~~	21-MAR-96	35083	L6649-23	UJ
Ortho Phosphate	mg/L	300.0	< 0.002	0.10	~~HU~~	25-MAR-96	35085	L6649-23	~~UJ~~ UR
Sulfate	mg/L	300.0	270	0.10		21-MAR-96	35087	L6649-23	

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Revised HRG 5/24/96

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LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0H8F1	Date Collected: 19-MAR-96
Matrix: Filt H20	Date Received: 22-MAR-96
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch|ID	LAS Sample|ID	Q
Chloride	mg/L	300.0	9.1	0.020		26-MAR-96	35223	L6661-24	
Fluoride	mg/L	300.0	0.50	0.10		25-MAR-96	35225	L6661-24	
Nitrate-N	mg/L	300.0	200	0.20	~~HB~~(1:10)	26-MAR-96	35227	L6661-24	J
Nitrite-N	mg/L	300.0	< 0.002	0.010	~~HB~~	26-MAR-96	35229	L6661-24	UR
Ortho Phosphate	mg/L	300.0	0.067	0.10	~~HB~~	25-MAR-96	35231	L6661-24	BJ
Sulfate	mg/L	300.0	140	0.10		26-MAR-96	35233	L6661-24	

HRG 5/15/96

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LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0H8G2	Date Collected: 18-MAR-96
Matrix: Water	Date Received: 20-MAR-96
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch|ID	LAS Sample|ID	Q
Chloride	mg/L	300.0	23.	0.020		21-MAR-96	35075	L6649-3	
Fluoride	mg/L	300.0	< 0.007	0.10	U	21-MAR-96	35077	L6649-3	
Nitrate-N	mg/L	300.0	5.2	0.020	~~U~~	21-MAR-96	35079	L6649-3	J
Nitrite-N	mg/L	300.0	< 0.002	0.010	~~UB~~	21-MAR-96	35082	L6649-3	UJ
Ortho Phosphate	mg/L	300.0	0.029	0.10	~~UB~~	21-MAR-96	35084	L6649-3	BJ
Sulfate	mg/L	300.0	270	0.10		21-MAR-96	35086	L6649-3	
Conductivity	uS/cm	9050	990	1.0		12-APR-96	35253	L6649-12	

HRG 5/15/96
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LOCKHEED ANALYTICAL SERVICES

OIL AND GREASE - GRAVIMETRIC METHOD
413.1 OIL AND GREASE

Client Sample ID:	B0H8G2	LAL Sample ID:	L6649-4
Date Collected:	18-MAR-96	Date Received:	20-MAR-96
Date Analyzed:	25-MAR-96	Date Extracted:	25-MAR-96
Matrix:	Water	Analytical Batch ID:	032596AM-413.1
QC Group:	413.1 OIL AND GREASE_35188	Dilution Factor:	1

CONSTITUENT	RESULT mg/L	PRACTICAL QUANTITATION LIMIT mg/L	DATA QUALIFIER(s)
Oil and Grease	6.11	5.00	

HRG 5/15/96
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LOCKHEED ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS BY FTIR
418.1 TPH

Client Sample ID:	B0H8G2	LAL Sample ID:	L6649-8
Date Collected:	18-MAR-96	Date Received:	20-MAR-96
Date Analyzed:	24-MAR-96	Date Extracted:	24-MAR-96
Matrix:	Water	Analytical Batch ID:	032496PM-418.1
QC Group:	418.1 TPH_35184	Dilution Factor:	1

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

HRG 5/15/96
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LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0H8F0	Date Collected: 19-MAR-96
Matrix: Water	Date Received: 22-MAR-96
Percent Solids: N/A	

Constituent	Units	Method	Result	Project Reporting Limit	Data Qualifier(s)	Date Analyzed	LAS Batch|ID	LAS Sample|ID	Q
Chloride	mg/L	300.0	7.8	0.020		26-MAR-96	35222	L6661-3	
Fluoride	mg/L	300.0	0.47	0.10		25-MAR-96	35224	L6661-3	
Nitrate-N	mg/L	300.0	3.0	0.020	~~H~~	26-MAR-96	35226	L6661-3	J
Nitrite-N	mg/L	300.0	< 0.002	0.010	~~HU~~	26-MAR-96	35228	L6661-3	UR
Ortho Phosphate	mg/L	300.0	0.088	0.10	~~HB~~	25-MAR-96	35230	L6661-3	BJ
Sulfate	mg/L	300.0	130	0.10		26-MAR-96	35232	L6661-3	
Conductivity	uS/cm	9050	530	1.0		12-APR-96	35253	L6661-12	

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LOCKHEED ANALYTICAL SERVICES

OIL AND GREASE - GRAVIMETRIC METHOD
413.1 OIL AND GREASE

Client Sample ID:	B0H8F0	LAL Sample ID:	L6661-4
Date Collected:	19-MAR-96	Date Received:	22-MAR-96
Date Analyzed:	25-MAR-96	Date Extracted:	25-MAR-96
Matrix:	Water	Analytical Batch ID:	032596AM-413.1
QC Group:	413.1 OIL AND GREASE_35188	Dilution Factor:	1

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

HRG 5/15/96

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LOCKHEED ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS BY FTIR
418.1 TPH

Client Sample ID:	BOH8F0	LAL Sample ID:	L6661-8
Date Collected:	19-MAR-96	Date Received:	22-MAR-96
Date Analyzed:	24-MAR-96	Date Extracted:	24-MAR-96
Matrix:	Water	Analytical Batch ID:	032496PM-418.1
QC Group:	418.1 TPH_35184	Dilution Factor:	1

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

HRG 5/15/96

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ATTACHMENT 4

LABORATORY NARRATIVE and CHAIN-OF-CUSTODY DOCUMENTATION

Lockheed Analytical Services

Log-in No.: L6649/L6661
Quotation No.: Q400000-B
SAF: B96-089
Document File No.: 0320596/0322596
WHC Document File No.: 339
SDG No.: LK6649
Page No.: 1

CASE NARRATIVE
INORGANIC NON METALS ANALYSES

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), duplicate sample(s).

Preparation and Analysis Requirements

- One water and one filtered water sample were received for LK6649 and analyzed in batches 320 bh, 320 bh1 and 320 bh2 for selected analytes as requested on the chain of custody. Quality control analysis was performed on the following samples:

Client ID	LAL #		Method
BOH8G2	L6649-3	MS, DUP	300.0 Chloride, Fluoride, Nitrate as Nitrogen, Nitrite as Nitrogen, Orthophosphate and Sulfate
BOH8G3	L6649-23	MS, DUP	300.0 Chloride, Fluoride, Nitrate as Nitrogen, Nitrite as Nitrogen, Orthophosphate and Sulfate
BOH8G3	L6649-12	DUP	9050 Conductivity

Holding Time Requirements

- All samples were received within method-specified holding times with the following exceptions which are flagged with an "H": Method 300.0 Nitrate as Nitrogen, Nitrite as Nitrogen and Orthophosphate.

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

April 19, 1996
Date

HRG 5/15/96

Lockheed Analytical Services

Log-in No.: L6649/L6661
Quotation No.: Q400000-B
SAF: B96-089
Document File No.: 0320596/0322596
WHC Document File No.: 339
SDG No.: LK6649
Page No.: 2

CASE NARRATIVE
INORGANIC NON METALS ANALYSES

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), duplicate sample(s).

Preparation and Analysis Requirements

- One water and one filtered water sample were received for LK6649 and analyzed in batches 320 bh, 322 bh1 and 322 bh2 for selected analytes as requested on the chain of custody. Quality control analysis was performed on the following samples:

Client ID	LAL #		Method
BOH8F0	L6661-3	MS, DUP	300.0 Chloride, Fluoride, Nitrate as Nitrogen, Nitrite as Nitrogen, Orthophosphate and Sulfate
BOH8F1	L6661-24	MS, DUP	300.0 Chloride, Fluoride, Nitrate as Nitrogen, Nitrite as Nitrogen, Orthophosphate and Sulfate
BOH8F0	L6661-12	DUP	9050 Conductivity

Holding Time Requirements

- All samples were received within method-specified holding times with the following exceptions which are flagged with an "H": Method 300.0 Nitrate as Nitrogen, Nitrite as Nitrogen and Orthophosphate.

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

April 19, 1996
Date

HRG 5/15/96
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Lockheed Analytical Services

Log-in No.: L6649/L6661
Quotation No.: Q400000-B
SAF: B96-089
Document File No.: 0320596/0322596
WHC Document File No.: 339
SDG No.: LK6649
Page No.: 4

CASE NARRATIVE
ORGANIC ANALYSES

Analytical Method 418.1

Analytical Batch 032496PM-418.1

NOTE: Client sample B0H8G2 (L6649-8) was the native sample used for the Matrix Spike (MS) and Matrix Spike Duplicate (MSD).

The samples were extracted and analyzed within the required holding time on March 24, 1996. All initial and continuing calibrations met criteria. Total Recoverable Petroleum Hydrocarbon (TRPH) was not detected in the Method Blank (MB). The compound recovery of TRPH 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 413.1

Analytical Batch 032596AM-413.1

NOTE: Client sample B0H8G2 (L6649-4) was the native sample used for the MS and MSD.

The samples were extracted and analyzed within the required holding time on March 25, 1996. Oil and Grease was not detected in the MB. The compound recovery of Oil and Grease was within QC limits in the MS, MSD and LCS. The RPD between the MS and MSD recoveries was within QC limits.

Prepared By
Patricia Lonergan

April 26, 1996

HRG 5/15/96
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Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

LL661

Data Turnaround: ☐ Priority ■ Normal

Collector: A. Reed / M. Stahlhut	Company Contact: J. V. Borghese	Telephone: (509) 373-4790
Project Designation: 100-NR-2 Groundwater Sampling - Round 9	Sampling Location: 100 N	SAF No.: B96-089
Ice Chest No.: ER-40	Field Logbook No.: EC-12BP	Method of Shipment: Federal Express
Shipped To: Lockheed	Offsite Property No.: W96-0-0640-33	Bill of Lading/Air Bill No.: 2904653613
Possible Sample Hazards/Remarks		

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

SAMPLE ANALYSIS												
			Preservation	HNO3	Cool 4°C	H2SO4	HCl	Cool 4°C	HNO3		Cool 4°C	None
			Type of Container	P/G	P/G	G	G	P	P/G		G	P/G
			No. of Container(s)	1	1	4	4	1	9		1	1
			Volume	500mL	500mL	1L	1L	~~125mL~~ 250 filtered	1L		500mL	20mL
				ICP Metals - 6010A (TAL) (Unfiltered)	*1	Oil and Grease - 413.1	TPH (Total) - 418.1	Conductivity - 9050	*2		Tritium - H3	Activity Scan
Sample No.	Matrix*	Date Sampled	Time Sampled									
B0H8F0	W	3/19/96	1245	✓	✓	✓	✓	✓	✓		✓	✓

CHAIN OF POSSESSION	Sign/Print Names		
Relinquished By: A. Reed (ER)	Date/Time: 3/20/96 0800	Received By: ER B. Whitten	Date/Time: 3-20-96 0800
Relinquished By: ER B. Whitten	Date/Time: 3-21-96 0900	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:

SPECIAL INSTRUCTIONS

*1 IC Anions - 300.0 - Cl, F, NO2, NO3, PO4, SO4 (Unfiltered)

*2 Gross Alpha, Gross Beta, Sr-89/90, Gamma Spec

Sample analysis for NO2, NO3, and PO4 by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time 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: Paul C. Davis	Title: Sample Custodian	Date/Time: 3-22-96/9:00am
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

022

HCG 5/15/96

9735160861

Bechtel Hanford, Inc.	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	Page 2 of 2

Data Turnaround: ☐ Priority ■ Normal

Collector: A R. Zee / Jim Mathews	Company Contact: J. V. Borghese	Telephone: (509) 373-4790
Project Designation: 100-NR-2 Groundwater Sampling - Round 9	Sampling Location: 100 N	SAF No.: B96-089
Ice Chest No.: ER-40	Field Logbook No.: EL-1289	Method of Shipment: Federal Express
Shipped To: Lockheed	Offsite Property No.: W96-0-0640-33	Bill of Lading/Air Bill No.: 2904653613

Possible Sample Hazards/Remarks	Preservation	HNO3	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 - 6010A (TAL) (Filtered)	*3								

Sample No.	Matrix*	Date Sampled	Time Sampled										
B0H8F1	W	3/18/96	1245	6	6								

CHAIN OF POSSESSION	Sign/Print Names		
Relinquished By: A. Zee (ERC)	Date/Time: 3/18/96 0600	Received By: ERC Bechtel	Date/Time: 3-20-96 0800
Relinquished By: ERC Bechtel	Date/Time: 3-21-96 0900	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:

SPECIAL INSTRUCTIONS

*3 IC Anions - 300.0 - Cl, F, NO2, NO3, PO4, SO4 (Filtered)

Refer to Activity Scan on page 1 of 2.

Sample analysis for NO2, NO3, and PO4 by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time 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: Paul C. Dawn	Title: Sample Custodian	Date/Time: 3-22-96 / 0100
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

9713561.0842

023

HLG 5/15/96

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST L6649

Page 1 of 2

Data Turnaround: ☐ Priority ■ Normal

Collector: A. Rizzo / M Mehlhorn	Company Contact: J. V. Borghese	Telephone: (509) 373-4790
Project Designation: 100-NR-2 Groundwater Sampling - Round 9	Sampling Location: 100 N	SAF No.: B96-089
Ice Chest No.: SMC-444	Field Logbook No.: EL-10344	Method of Shipment: Federal Express
Shipped To: Lockheed	Offsite Property No.: W96-0-0640-32	Bill of Lading/Air Bill No.: 2904653403

Possible Sample Hazards/Remarks

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

Preservation	HNO3	Cool 4°C	H2SO4	HCl	Cool 4°C	HNO3		Cool 4°C	None
Type of Container	P/G	P/G	G	G	P	P/G		G	P/G
No. of Container(s)	1	1	4	4	1	9		1	1
Volume	500mL	500mL	1L	1L	25mL ~~125mL~~	1L		500mL	20mL
SAMPLE ANALYSIS	ICP Metals - 6010A (TAL) (Unfiltered)	*1	Oil and Grease - 413.1	TPH (Total) - 418.1	Conductivity - 9050	*2		Tritium - H3	Activity Scan

Sample No.	Matrix*	Date Sampled	Time Sampled									
B0H8G2	W	3-18-96	1145	✓	✓	✓	✓	✓	✓		✓	✓

CHAIN OF POSSESSION	Sign/Print Names		
Relinquished By: A.G. Rizzo (ERC)	Date/Time: 3-18-96 1445	Received By: ERC B. Butler	Date/Time: 3-18-96 1445
Relinquished By: ERC B. Butler	Date/Time: 3-19-96 0900	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:

SPECIAL INSTRUCTIONS

*1 IC Anions - 300.0 - Cl, F, NO2, NO3, PO4, SO4 (Unfiltered)

*2 Gross Alpha, Gross Beta, Sr-89/90, Gamma Spec

Sample analysis for NO2, NO3, and PO4 by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time 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	Title	Date/Time
	A L Miller	Sample Custodian	3-20-96/0845

FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

024

HCG 5/15/96 0018

9753016.0863

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Data Turnaround
☐ Priority
■ Normal

Collector: A. Rizza / M. Mehlhorn	Company Contact: J. V. Borghese	Telephone: (509) 373-4790
Project Designation: 100-NR-2 Groundwater Sampling - Round 9	Sampling Location: 100 N	SAF No.: B96-089
Ice Chest No.: SML-444	Field Logbook No.: EL-1244	Method of Shipment: Federal Express
Shipped To: Lockheed	Offsite Property No.: W96-0-0640-32	Bill of Lading/Air Bill No.: 2904653403

Possible Sample Hazards/Remarks

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

SAMPLE ANALYSIS													
Preservation				HNO3	Cool 4°C								
Type of Container				P/G	P/G								
No. of Container(s)				1	1								
Volume				500mL	500mL								
				ICP Metals - 6010A (TAL) (Filtered)	*3								
Sample No.	Matrix*	Date Sampled	Time Sampled										
B0H8G3	W	3-18-96	1145	Y	Y								

CHAIN OF POSSESSION	Sign/Print Names		
Relinquished By: A. G. Rizza (CRU)	Date/Time: 3-18-96 1445	Received By: Bechtel	Date/Time: 3-18-96 1445
Relinquished By: Bechtel	Date/Time: 3-19-96 0900	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

SPECIAL INSTRUCTIONS
*3 IC Anions - 300.0 - Cl, F, NO2, NO3, PO4, SO4 (Filtered)

Refer to Activity Scan on page 1 of 2.

Sample analysis for NO2, NO3, and PO4 by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time 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
Wt = Wipe
L = Liquid
V = Vegetation
X = Other

LABORATORY SECTION	Received By	Title	Date/Time
	[illegible]	Sample Custodian	3-20-96/0845

FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

9713514.0864

025

HRG 5/15/96

0019 ESC 940

9713516.0865

ATTACHMENT 5

DATA VALIDATION SUPPORTING DOCUMENTATION

GENERAL CHEMISTRY DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E

PROJECT: 100 NRZ GH2O Rnd 9	DATA PACKAGE: LK6649-LAS	
VALIDATOR: H. GREGERSON	LAB: LOCKHEED	DATE: 5/15/96
CASE:	SDG:	

ANALYSES PERFORMED

☒ Anions/IC	☐ TOC	☐ TOX	☒ TPH-418.1	Oil and Grease	Alkalinity
☐ Ammonia	☐ BOD/COD	☐ Chloride	☐ Chromium-VI	☐ pH	☐ NO_3/NO_2
☐ Sulfate	☐ TDS	☐ TKN	☐ Phosphate	☐	☐
☐	☐	☐	☐	☐	☐

SAMPLES/MATRIX BOH8G3 BOH8F1 BOH8G2 BOH8F0 / WATER

HRG 5/15/96

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[1] N/A

Comments:

1. The holding times for NO_3, NO_2, and ortho PO_4 were exceeded and associated samples were qualified. See supporting document.

027

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

023

GENERAL CHEMISTRY DATA VALIDATION CHECKLIST

Comments:

1. BOH8G3, BOH8F1, BOH8G2, and BOH8F0 are split samples. The associated samples are in another SPG, therefore, the RPDs will be evaluated in the final summary report.

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 1. N/A

Comments:

1. CRDLs were not met for TRPH for samples BOH8F0 and BOH8G2. CRDLs for Oil and Grease is not defined in the data validation procedures for method. 413.1.

HOLDING TIME SUMMARY

SDG: LK6649-LAS | VALIDATOR: HEIDI GREGERSON | DATE: 5/15/96 | 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
B0H8G3	Anions	3/18/96	—	3/21/96	—	3	NO_3 J NO_2 UJ ~~PO_4 UR~~ HRG 5/24/96
B0H8F1	Anions	3/19/96	—	3/26/96	—	7	NO_3 J NO_2 UR PO_4 J
B0H8G2	Anions	3/18/96	—	3/21/96	—	3	NO_3 J NO_2 UJ PO_4 J
↓	Cond.	3/18/96	—	4/12/96	—	25	none
	Oil + Grease	3/18/96	3/25/96	3/25/96	7	7	none
	TRPH	3/18/96	3/24/96	3/24/96	6	6	none
B0H8F0	Anions	3/19/96	—	3/26/96	—	7	NO_3 J NO_2 UR PO_4 J
↓	Cond.	3/19/96	—	4/12/96	—	24	none
	Oil + Grease	3/19/96	3/25/96	3/25/96	6	6	none
	TRPH	3/19/96	3/24/96	3/24/96	5	5	none
B0H8G3	O-PO_4	3/18/96	—	3/25/96	—	7	UR HRG 5/24/96

WHC-SD-EN-SPP-002, REV.2

9613516.0869

030 Revised HRG 5/24/96

9713516.0870

MEMORANDUM

TO: 100 NR 2 Groundwater Sampling Round 9 Project QA Record May 16, 1996

FR: Heidi Gregerson, Golder Associates Inc. HRG

RE: INORGANIC DATA VALIDATION SUMMARY FOR DATA PACKAGE LK6649-LAS (943-1610.127 6649INO.NR2)

INTRODUCTION

This memo presents the results of data validation for the analysis specified below on data package LK6649-LAS prepared by Lockheed Analytical Services. Sample information is provided in the following table.

SAMPLE ID	COMMENTS	ANALYSIS	MEDIA
B0H8G3	FIELD SPLIT	INORGANICS	WATER
B0H8F1	FIELD SPLIT		WATER
B0H8G2	FIELD SPLIT	SEE ATTACHMENT 4	WATER
B0H8F0	FIELD SPLIT		WATER

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

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

DATA QUALITY OBJECTIVES

This section presents a summary of the data quality in terms of the referenced validation criteria.

Precision. Goals for precision were met.

Accuracy. Goals for accuracy were met.

Detection Limits. Detection limit goals were met for all sample results.

Completeness. The data package was complete for all requested analyses. A total of four samples were validated in this data package with a total of 88 determinations reported, all of which were deemed valid. This results in a completeness of 100%, which meets the 90% objective of the work plan.

MAJOR DEFICIENCIES

No major deficiencies were identified during data validation which required qualification of data as unusable.

MINOR DEFICIENCIES

No minor deficiencies were identified during data validation which required qualification of data.

REFERENCES

WHC 1993, Data Validation Procedures for Chemical Analyses, WHC-SD-EN-SPP-002, Rev. 2, 1993. Westinghouse Hanford Company, Richland, Washington.

WHC 1994, Environmental and Waste Characterization Analytical Data Validation, Purchase Order MSH-SWV-315905; Validation Statement of Work, Revision 1.0, September 7, 1994; Westinghouse Hanford Company, Richland, Washington.

9713516.0872

ATTACHMENT 1

GLOSSARY OF DATA REPORTING QUALIFIERS

Glossary of Inorganic Data Reporting Qualifiers.

B - Indicates the constituent was analyzed for and detected. The concentration reported is less than the contract required detection limit (CRDL) but greater than the instrument detection limit (IDL). The associated data should be considered usable for decision making purposes.

U - Indicates the constituent was analyzed for and not detected. The concentration reported is the sample detection limit corrected for aliquot size, dilution and percent solids (in the case of solid matrices) by the laboratory. The associated data should be considered usable for decision making purposes.

UJ - Indicates the constituent was analyzed for and not detected. Due to a minor quality control deficiency identified during data validation the concentration may not accurately reflect the sample detection limit. The associated data have been qualified as estimated but should be considered usable for decision making purposes.

BJ - Indicates the constituent was analyzed for and detected at a concentration less than the contract required detection limit (CRDL) but greater than the instrument detection limit (IDL). Due to a minor quality control deficiency identified during data validation the associated data have been qualified as estimated, but should be considered usable for decision making purposes.

J - Indicates the constituent was analyzed for and detected. Due to a minor quality control deficiency identified during data validation the associated data have been qualified as estimated, but should be considered usable for decision making purposes.

UR - Indicates the constituent was analyzed for and not detected. Due to a major quality control deficiency identified during data validation, the associated data have been qualified as unusable for decision making purposes.

R - Indicates the constituent was analyzed for and detected. Due to a major quality control deficiency identified during data validation, the associated data have been qualified as unusable for decision making purposes.

9713516.0874

ATTACHMENT 2

SUMMARY OF DATA QUALIFICATIONS

WHC-SD-EN-SPP-002, REV.2

DATA QUALIFICATION SUMMARY - FORM B-7

SDG: LK6649-LAS	REVIEWER: H. Gregerson	DATE: 5-16-96	PAGE 1 OF 1
COMMENTS: INORGANICS			
COMPOUND/ANALYTE	QUALIFIER	SAMPLES AFFECTED	REASON
NO SAMPLES QUALIFIED			

ATTACHMENT 3

QUALIFIED DATA SUMMARY and ANNOTATED LABORATORY REPORTS

Validated Data Summary, Data Package: LK6649-LAS

	Sample #	B0H8G3		B0H8F1	
	Date	3/18/96		3/19/96	
	Location	199-N-54		199-N-25	
	Depth				
	Type	Water		Water	
	Comments	Field Split Filtered		Field Split Filtered	
Parameter	Units	Results	Q	Results	Q
ALUMINUM(DISSOLVED)	MG/L	0.036	U	0.036	U
BARIUM(DISSOLVED)	MG/L	0.066	B	0.037	B
BERYLLIUM(DISSOLVED)	MG/L	0.001	U	0.001	U
CADMIUM(DISSOLVED)	MG/L	0.005	U	0.005	U
CALCIUM(DISSOLVED)	MG/L	140.000		23.000	
CHROMIUM(DISSOLVED)	MG/L	0.006	U	0.006	U
COBALT(DISSOLVED)	MG/L	0.007	U	0.007	U
COPPER(DISSOLVED)	MG/L	0.007	U	0.007	U
IRON(DISSOLVED)	MG/L	0.006	U	0.024	B
MAGNESIUM(DISSOLVED)	MG/L	22.000		5.900	
MANGANESE(DISSOLVED)	MG/L	0.001	U	0.022	
NICKEL(DISSOLVED)	MG/L	0.013	U	0.013	U
POTASSIUM(DISSOLVED)	MG/L	5.000		2.700	B
SILVER(DISSOLVED)	MG/L	0.007	U	0.007	U
SODIUM(DISSOLVED)	MG/L	54.000		110.000	
VANADIUM(DISSOLVED)	MG/L	0.007	U	0.014	B
ZINC(DISSOLVED)	MG/L	0.003	U	0.003	U
ANTIMONY	MG/L	0.003	U	0.003	U
ARSENIC	MG/L	0.007	B	0.007	B
LEAD	MG/L	0.002	U	0.002	U
SELENIUM	MG/L	0.003	U	0.003	B
THALLIUM	MG/L	0.006	B	0.005	U

The decimal places shown do not reflect the precision reported by the laboratory.

Verified HRG
5/17/96

9713516.0877

Validated Data Summary, Data Package: LK6649-LAS

	Sample #	B0H8G2		B0H8F0	
	Date	3/18/96		3/19/96	
	Location	199-N-54		199-N-25	
	Depth				
	Type	Water		Water	
	Comments	Field Split Unfiltered		Field Split Unfiltered	
Parameter	Units	Results	Q	Results	Q
ALUMINUM(TOTAL)	MG/L	0.036	U	0.330	
BARIUM(TOTAL)	MG/L	0.062	B	0.036	B
BERYLLIUM(TOTAL)	MG/L	0.001	U	0.001	U
CADMIUM(TOTAL)	MG/L	0.005	U	0.005	U
CALCIUM(TOTAL)	MG/L	130.000		22.000	
CHROMIUM(TOTAL)	MG/L	0.013		0.006	U
COBALT(TOTAL)	MG/L	0.007	U	0.007	U
COPPER(TOTAL)	MG/L	0.007	U	0.007	U
IRON(TOTAL)	MG/L	0.057	B	0.200	
MAGNESIUM(TOTAL)	MG/L	21.000		5.600	
MANGANESE(TOTAL)	MG/L	0.001	U	0.024	
NICKEL(TOTAL)	MG/L	0.013	U	0.013	U
POTASSIUM(TOTAL)	MG/L	5.500		2.800	B
SILVER(TOTAL)	MG/L	0.007	U	0.007	U
SODIUM(TOTAL)	MG/L	50.000		100.000	
VANADIUM(TOTAL)	MG/L	0.007	U	0.012	B
ZINC(TOTAL)	MG/L	0.015	B	0.350	
ANTIMONY	MG/L	0.003	U	0.003	U
ARSENIC	MG/L	0.003	U	0.006	B
LEAD	MG/L	0.002	U	0.002	U
SELENIUM	MG/L	0.003	U	0.005	B
THALLIUM	MG/L	0.005	U	0.005	U

The decimal places shown do not reflect the precision reported by the laboratory.

Verified HRG
5/17/96

9713516.0878

9713516.0829

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0H8G3	Date Collected: 18-MAR-96
Matrix: Filt H20	Date Received: 20-MAR-96
Percent Solids: N/A	

Constituent	Units	Method	Result	MDL	RDL	Data Qual	Dilution	Date Analyzed	LAS Batch ID	LAS Sample ID
ALUMINUM, DISSOLVED	mg/l	6010	< 0.036	0.036	0.20	U	1	05-APR-96	35542	L6649-24
BARIUM, DISSOLVED	mg/l	6010	0.066	0.0050	0.20	B	1	05-APR-96	35542	L6649-24
BERYLLIUM, DISSOLVED	mg/l	6010	< 0.0010	0.0010	0.0050	U	1	05-APR-96	35542	L6649-24
CADMIUM, DISSOLVED	mg/l	6010	< 0.0050	0.0050	0.0050	U	1	05-APR-96	35542	L6649-24
CALCIUM, DISSOLVED	mg/l	6010	140	0.0090	5.0		1	05-APR-96	35542	L6649-24
CHROMIUM, DISSOLVED	mg/l	6010	< 0.0060	0.0060	0.010	U	1	05-APR-96	35542	L6649-24
COBALT, DISSOLVED	mg/l	6010	< 0.0070	0.0070	0.050	U	1	05-APR-96	35542	L6649-24
COPPER, DISSOLVED	mg/l	6010	< 0.0070	0.0070	0.025	U	1	05-APR-96	35542	L6649-24
IRON, DISSOLVED	mg/l	6010	< 0.0060	0.0060	0.10	U	1	05-APR-96	35542	L6649-24
MAGNESIUM, DISSOLVED	mg/l	6010	22.	0.066	5.0		1	05-APR-96	35542	L6649-24
MANGANESE, DISSOLVED	mg/l	6010	< 0.0010	0.0010	0.015	U	1	05-APR-96	35542	L6649-24
NICKEL, DISSOLVED	mg/l	6010	< 0.013	0.013	0.040	U	1	05-APR-96	35542	L6649-24
POTASSIUM, DISSOLVED	mg/l	6010	5.0	1.2	5.0		1	05-APR-96	35542	L6649-24
SILVER, DISSOLVED	mg/l	6010	< 0.0070	0.0070	0.010	U	1	05-APR-96	35542	L6649-24
SODIUM, DISSOLVED	mg/l	6010	54.	0.039	5.0		1	05-APR-96	35542	L6649-24
VANADIUM, DISSOLVED	mg/l	6010	< 0.0070	0.0070	0.050	U	1	05-APR-96	35542	L6649-24
ZINC, DISSOLVED	mg/l	6010	< 0.0030	0.0030	0.020	U	1	05-APR-96	35542	L6649-24
Antimony	mg/l	6010	< 0.0030	0.0030	0.060	U	1	24-APR-96	35543	L6649-24
Arsenic	mg/l	6010	0.0066	0.0030	0.010	B	1	24-APR-96	35543	L6649-24
Lead	mg/l	6010	< 0.0020	0.0020	0.0030	U	1	24-APR-96	35543	L6649-24
Selenium	mg/l	6010	< 0.0030	0.0030	0.0050	U	1	24-APR-96	35543	L6649-24
Thallium	mg/l	6010	0.0064	0.0050	0.010	B	1	24-APR-96	35543	L6649-24

HRG 5/16/96

~~0123~~

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0H8F1	Date Collected: 19-MAR-96
Matrix: Filt H20	Date Received: 22-MAR-96
Percent Solids: N/A	

Constituent	Units	Method	Result	MDL	RDL	Data Qual	Dilution	Date Analyzed	LAS Batch ID	LAS Sample ID
ALUMINUM, DISSOLVED	mg/l	6010	< 0.036	0.036	0.20	U	1	05-APR-96	35542	L6661-23
BARIUM, DISSOLVED	mg/l	6010	0.037	0.0050	0.20	B	1	05-APR-96	35542	L6661-23
BERYLLIUM, DISSOLVED	mg/l	6010	< 0.0010	0.0010	0.0050	U	1	05-APR-96	35542	L6661-23
CADMIUM, DISSOLVED	mg/l	6010	< 0.0050	0.0050	0.0050	U	1	05-APR-96	35542	L6661-23
CALCIUM, DISSOLVED	mg/l	6010	23.	0.0090	5.0		1	05-APR-96	35542	L6661-23
CHROMIUM, DISSOLVED	mg/l	6010	< 0.0060	0.0060	0.010	U	1	05-APR-96	35542	L6661-23
COBALT, DISSOLVED	mg/l	6010	< 0.0070	0.0070	0.050	U	1	05-APR-96	35542	L6661-23
COPPER, DISSOLVED	mg/l	6010	< 0.0070	0.0070	0.025	U	1	05-APR-96	35542	L6661-23
IRON, DISSOLVED	mg/l	6010	0.024	0.0060	0.10	B	1	05-APR-96	35542	L6661-23
MAGNESIUM, DISSOLVED	mg/l	6010	5.9	0.066	5.0		1	05-APR-96	35542	L6661-23
MANGANESE, DISSOLVED	mg/l	6010	0.022	0.0010	0.015		1	05-APR-96	35542	L6661-23
NICKEL, DISSOLVED	mg/l	6010	< 0.013	0.013	0.040	U	1	05-APR-96	35542	L6661-23
POTASSIUM, DISSOLVED	mg/l	6010	2.7	1.2	5.0	B	1	05-APR-96	35542	L6661-23
SILVER, DISSOLVED	mg/l	6010	< 0.0070	0.0070	0.010	U	1	05-APR-96	35542	L6661-23
SODIUM, DISSOLVED	mg/l	6010	110	0.039	5.0		1	05-APR-96	35542	L6661-23
VANADIUM, DISSOLVED	mg/l	6010	0.014	0.0070	0.050	B	1	05-APR-96	35542	L6661-23
ZINC, DISSOLVED	mg/l	6010	< 0.0030	0.0030	0.020	U	1	05-APR-96	35542	L6661-23
Antimony	mg/l	6010	< 0.0030	0.0030	0.060	U	1	24-APR-96	35543	L6661-23
Arsenic	mg/l	6010	0.0067	0.0030	0.010	B	1	24-APR-96	35543	L6661-23
Lead	mg/l	6010	< 0.0020	0.0020	0.0030	U	1	24-APR-96	35543	L6661-23
Selenium	mg/l	6010	0.0032	0.0030	0.0050	B	1	24-APR-96	35543	L6661-23
Thallium	mg/l	6010	< 0.0050	0.0050	0.010	U	1	24-APR-96	35543	L6661-23

HRG 5/16/96

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0H8G2	Date Collected: 18-MAR-96
Matrix: Water	Date Received: 20-MAR-96
Percent Solids: N/A	

Constituent	Units	Method	Result	MDL	RDL	Data Qual	Dilution	Date Analyzed	LAS Batch ID	LAS Sample ID
ALUMINUM, TOTAL	mg/l	6010	< 0.036	0.036	0.20	U	1	05-APR-96	35540	L6649-2
BARIUM, TOTAL	mg/l	6010	0.062	0.0050	0.20	B	1	05-APR-96	35540	L6649-2
BERYLLIUM, TOTAL	mg/l	6010	< 0.0010	0.0010	0.0050	U	1	05-APR-96	35540	L6649-2
CADMIUM, TOTAL	mg/l	6010	< 0.0050	0.0050	0.0050	U	1	05-APR-96	35540	L6649-2
CALCIUM, TOTAL	mg/l	6010	130	0.0090	5.0		1	05-APR-96	35540	L6649-2
CHROMIUM, TOTAL	mg/l	6010	0.013	0.0060	0.010		1	05-APR-96	35540	L6649-2
COBALT, TOTAL	mg/l	6010	< 0.0070	0.0070	0.050	U	1	05-APR-96	35540	L6649-2
COPPER, TOTAL	mg/l	6010	< 0.0070	0.0070	0.025	U	1	05-APR-96	35540	L6649-2
IRON, TOTAL	mg/l	6010	0.057	0.0060	0.10	B	1	05-APR-96	35540	L6649-2
MAGNESIUM, TOTAL	mg/l	6010	21.	0.066	5.0		1	05-APR-96	35540	L6649-2
MANGANESE, TOTAL	mg/l	6010	< 0.0010	0.0010	0.015	U	1	05-APR-96	35540	L6649-2
NICKEL, TOTAL	mg/l	6010	< 0.013	0.013	0.040	U	1	05-APR-96	35540	L6649-2
POTASSIUM, TOTAL	mg/l	6010	5.5	1.2	5.0		1	05-APR-96	35540	L6649-2
SILVER, TOTAL	mg/l	6010	< 0.0070	0.0070	0.010	U	1	05-APR-96	35540	L6649-2
SODIUM, TOTAL	mg/l	6010	50.	0.039	5.0		1	05-APR-96	35540	L6649-2
VANADIUM, TOTAL	mg/l	6010	< 0.0070	0.0070	0.050	U	1	05-APR-96	35540	L6649-2
ZINC, TOTAL	mg/l	6010	0.015	0.0030	0.020	B	1	05-APR-96	35540	L6649-2
Antimony	mg/l	6010	< 0.0030	0.0030	0.060	U	1	24-APR-96	35541	L6649-2
Arsenic	mg/l	6010	< 0.0030	0.0030	0.010	U	1	24-APR-96	35541	L6649-2
Lead	mg/l	6010	< 0.0020	0.0020	0.0030	U	1	24-APR-96	35541	L6649-2
Selenium	mg/l	6010	< 0.0030	0.0030	0.0050	U	1	24-APR-96	35541	L6649-2
Thallium	mg/l	6010	< 0.0050	0.0050	0.010	U	1	24-APR-96	35541	L6649-2

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LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: B0H8F0	Date Collected: 19-MAR-96
Matrix: Water	Date Received: 22-MAR-96
Percent Solids: N/A	

Constituent	Units	Method	Result	MDL	RDL	Data Qual	Dilution	Date Analyzed	LAS Batch ID	LAS Sample ID
ALUMINUM, TOTAL	mg/l	6010	0.33	0.036	0.20		1	05-APR-96	35540	L6661-2
BARIUM, TOTAL	mg/l	6010	0.036	0.0050	0.20	B	1	05-APR-96	35540	L6661-2
BERYLLIUM, TOTAL	mg/l	6010	< 0.0010	0.0010	0.0050	U	1	05-APR-96	35540	L6661-2
CADMIUM, TOTAL	mg/l	6010	< 0.0050	0.0050	0.0050	U	1	05-APR-96	35540	L6661-2
CALCIUM, TOTAL	mg/l	6010	22.	0.0090	5.0		1	05-APR-96	35540	L6661-2
CHROMIUM, TOTAL	mg/l	6010	< 0.0060	0.0060	0.010	U	1	05-APR-96	35540	L6661-2
COBALT, TOTAL	mg/l	6010	< 0.0070	0.0070	0.050	U	1	05-APR-96	35540	L6661-2
COPPER, TOTAL	mg/l	6010	< 0.0070	0.0070	0.025	U	1	05-APR-96	35540	L6661-2
IRON, TOTAL	mg/l	6010	0.20	0.0060	0.10		1	05-APR-96	35540	L6661-2
MAGNESIUM, TOTAL	mg/l	6010	5.6	0.066	5.0		1	05-APR-96	35540	L6661-2
MANGANESE, TOTAL	mg/l	6010	0.024	0.0010	0.015		1	05-APR-96	35540	L6661-2
NICKEL, TOTAL	mg/l	6010	< 0.013	0.013	0.040	U	1	05-APR-96	35540	L6661-2
POTASSIUM, TOTAL	mg/l	6010	2.8	1.2	5.0	B	1	05-APR-96	35540	L6661-2
SILVER, TOTAL	mg/l	6010	< 0.0070	0.0070	0.010	U	1	05-APR-96	35540	L6661-2
SODIUM, TOTAL	mg/l	6010	100	0.039	5.0		1	05-APR-96	35540	L6661-2
VANADIUM, TOTAL	mg/l	6010	0.012	0.0070	0.050	B	1	05-APR-96	35540	L6661-2
ZINC, TOTAL	mg/l	6010	0.35	0.0030	0.020		1	05-APR-96	35540	L6661-2
Antimony	mg/l	6010	< 0.0030	0.0030	0.060	U	1	24-APR-96	35541	L6661-2
Arsenic	mg/l	6010	0.0055	0.0030	0.010	B	1	24-APR-96	35541	L6661-2
Lead	mg/l	6010	< 0.0020	0.0020	0.0030	U	1	24-APR-96	35541	L6661-2
Selenium	mg/l	6010	0.0045	0.0030	0.0050	B	1	24-APR-96	35541	L6661-2
Thallium	mg/l	6010	< 0.0050	0.0050	0.010	U	1	24-APR-96	35541	L6661-2

HLG 5/16/96

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ATTACHMENT 4

LABORATORY NARRATIVE and CHAIN-OF-CUSTODY DOCUMENTATION

Lockheed Analytical Services

Log-in No.: L6649/L6661
Quotation No.: Q400000-B
SAF: B96-089
Document File No.: 0320596/0322596
WHC Document File No.: 339
SDG No.: LK6649
Page No.: 3

CASE NARRATIVE
INORGANIC METALS ANALYSES

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 March 20, and 22, 1996. The samples were logged in as L6649 and L6661 and were prepared and analyzed in batches 320 btT for total metals and 320 btD for dissolved metals.

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

April 26, 1996
Date

HRG 5/16/96
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Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

LL666

Data Turnaround
☐ Priority
■ Normal

Collector: A. Rizzo / M. Stahlhut	Company Contact: J. V. Borghese	Telephone: (509) 373-4790
Project Designation: 100-NR-2 Groundwater Sampling - Round 9	Sampling Location: 100 N	SAF No.: B96-089
Ice Chest No.: ER-40	Field Logbook No.: EL-1258	Method of Shipment: Federal Express
Shipped To: Lockheed	Offsite Property No.: W96-0-0640-33	Bill of Lading/Air Bill No.: 2904653613
Possible Sample Hazards/Remarks		

SAMPLE ANALYSIS												
			Preservation	HNO3	Cool 4°C	H2SO4	HCl	Cool 4°C	HNO3		Cool 4°C	None
			Type of Container	P/G	P/G	G	G	P	P/G		G	P/G
			No. of Container(s)	1	1	4	4	1	9		1	1
Special Handling and/or Storage: Maintain samples between 2°C and 6°C.			Volume	500mL	500mL	1L	1L	~~125mL~~ 250mL	1L		500mL	20mL
				ICP Metals - 6010A (TAL) (Unfiltered)	*1	Oil and Grease - 413.1	TPH (Total) - 418.1	Conductivity - 9050	*2		Tritium - H3	Activity Scan
Sample No.	Matrix*	Date Sampled	Time Sampled									
B0H8F0	W	3/19/96	1245	✓	✓	✓	✓	✓	✓		✓	✓

9703516.0805

CHAIN OF POSSESSION	Sign/Print Names		
Relinquished By: A.G. Rizzo (ERC)	Date/Time: 3/20/96 0800	Received By: ERC B. Ashton	Date/Time: 3-20-96 0800
Relinquished By: ERC B. Ashton	Date/Time: 3-21-96 0800	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:

SPECIAL INSTRUCTIONS

*1 IC Anions - 300.0 - Cl, F, NO2, NO3, PO4, SO4 (Unfiltered)

*2 Gross Alpha, Gross Beta, Sr-89/90, Gamma Spec

Sample analysis for NO2, NO3, and PO4 by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time will not be met.

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

LABORATORY SECTION	Received By: Paul C. Davis	Title: Sample Custodian	Date/Time: 3-22-96/9:00a
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

016

HBS 5/16/96

3-22-96

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Data Turnaround
☐ Priority
■ Normal

Collector: A Rizzo / Jim McMillan	Company Contact: J. V. Borghese	Telephone: (509) 373-4790
Project Designation: 100-NR-2 Groundwater Sampling - Round 9	Sampling Location: 100 N	SAF No.: B96-089
Ice Chest No.: ER-40	Field Logbook No.: EL-1288	Method of Shipment: Federal Express
Shipped To: Lockheed	Offsite Property No.: W96-0-0640-33	Bill of Lading/Air Bill No.: 2904653613

Possible Sample Hazards/Remarks												
	Preservation	HNO3	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 - 6010A (TAL) (Filtered)	*3									

Sample No.	Matrix*	Date Sampled	Time Sampled										
B0H8F1	W	3/15/96	1245	X	X								

CHAIN OF POSSESSION	Sign/Print Names		
Relinquished By: A.G. Rizzo (ERC)	Date/Time: 3/20/96 0800	Received By: Ken Whitten BCH/HEN ERC	Date/Time: 3-20-96 0800
Relinquished By: Ken Whitten BCH/HEN ERC	Date/Time: 3-21-96 0900	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

SPECIAL INSTRUCTIONS

*3 IC Anions - 300.0 - Cl, F, NO2, NO3, PO4, SO4 (Filtered)

Refer to Activity Scan on page 1 of 2.

Sample analysis for NO2, NO3, and PO4 by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time 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: [illegible]	Title: Sample Custodian	Date/Time: 3-22-96/9:00
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

9735160886

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST L6649

Data Turnaround: ☐ Priority ■ Normal

Collector: A. Rizzo / M. Mehlhorn	Company Contact: J. V. Borghese	Telephone: (509) 373-4790
Project Designation: 100-NR-2 Groundwater Sampling - Round 9	Sampling Location: 100 N	SAF No.: B96-089
Ice Chest No.: SMC-444	Field Logbook No.: EL-10328	Method of Shipment: Federal Express
Shipped To: Lockheed	Offsite Property No.: W96-0-0640-32	Bill of Lading/Air Bill No.: 2904653403

Possible Sample Hazards/Remarks

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

SAMPLE ANALYSIS												
Preservation				HNO3	Cool 4°C	H2SO4	HCl	Cool 4°C	HNO3		Cool 4°C	None
Type of Container				P/G	P/G	G	G	P	P/G		G	P/G
No. of Container(s)				1	1	4	4	1	9		1	1
Volume				500mL	500mL	1L	1L	~~125mL~~ 25mL 3-18-96	1L		500mL	20mL
				ICP Metals - 6010A (TAL) (Unfiltered)	*1	Oil and Grease - 413.1	TPH (Total) - 418.1	Conductivity - 9050	*2		Tritium - H3	Activity Scan
Sample No.	Matrix*	Date Sampled	Time Sampled									
B0H8G2	W	3-18-96	1145	✓	✓	✓	✓	✓	✓		✓	✓

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CHAIN OF POSSESSION	Sign/Print Names		
Relinquished By: A. Rizzo (ERC)	Date/Time: 1445 3-18-96	Received By: ERC Bubtter	Date/Time: 1445 3-18-96
Relinquished By: ERC Bubtter	Date/Time: 0900 3-19-96	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

SPECIAL INSTRUCTIONS

*1 IC Anions - 300.0 - Cl, F, NO2, NO3, PO4, SO4 (Unfiltered)

*2 Gross Alpha, Gross Beta, Sr-89/90, Gamma Spec

Sample analysis for NO2, NO3, and PO4 by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time 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: A. M. Miller	Title: Sample Custodian	Date/Time: 3-20-96/0845
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

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Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Data Turnaround
☐ Priority
■ Normal

Collector: A. Rizzo / M. Mehlhorn	Company Contact: J. V. Borghese	Telephone: (509) 373-4790
Project Designation: 100-NR-2 Groundwater Sampling - Round 9	Sampling Location: 100 N	SAF No.: B96-089
Ice Chest No.: SML-444	Field Logbook No.: EL-1238	Method of Shipment: Federal Express
Shipped To: Lockheed	Offsite Property No.: W96-0-0640-32	Bill of Lading/Air Bill No.: 2904653403

Possible Sample Hazards/Remarks

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

Preservation	HNO3	Cool 4°C									
Type of Container	P/G	P/G									
No. of Container(s)	1	1									
Volume	500mL	500mL									
SAMPLE ANALYSIS	ICP Metals - 6010A (TAL) (Filtered)	*3									

Sample No.	Matrix*	Date Sampled	Time Sampled										
B0H8G3	W	3-18-96	1145	Y	Y								

CHAIN OF POSSESSION	Sign/Print Names		
Relinquished By: A. G. Rizzo (CH2M)	Date/Time: 1445 3-18-96	Received By: Bechtel	Date/Time: 1445 3-18-96
Relinquished By: Bechtel	Date/Time: 0900 3-19-96	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:

SPECIAL INSTRUCTIONS
*3 IC Anions - 300.0 - Cl, F, NO2, NO3, PO4, SO4 (Filtered)

Refer to Activity Scan on page 1 of 2.

Sample analysis for NO2, NO3, and PO4 by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time 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	Title	Date/Time
	[illegible]	Sample Custodian	3-20-96/0845

FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

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ATTACHMENT 5

DATA VALIDATION SUPPORTING DOCUMENTATION

INORGANIC ANALYSIS DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E
PROJECT: 100 NR2 GH2O Rnd 9			DATA PACKAGE: LK6649-LAS		
VALIDATOR: H. GREGERSON		LAB: LOCKHEED		DATE: 5/15/96	
CASE:			SDG:		
ANALYSES PERFORMED					
☐ CLP/ICP	☐ CLP/GFAA	☐ CLP/Hg	☐ CLP/Cyanide	☐	☐
☒ SW-846/ICP	☐ SW-846/GFAA	☐ SW-846/Hg	☐ SW-846 Cyanide	☐	☐
SAMPLES/MATRIX	B0H8G3	B0H8F1	B0H8G2	B0H8F0 / WATER	

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:

021

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~~ HG 5/16/96
Are field/trip blank results acceptable? . . . . . Yes No N/A

Comments:

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:

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 1.

Comments:

1. BDH8G3, BDH8F1, BDH8G2, and BDH8F0 are field split samples. The associated samples are in another SPG, therefore the RPDs will be evaluated in the final summary report.

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:

HOLDING TIME SUMMARY

SDG: LK10649-LAS | VALIDATOR: HEIDI GREGERSON | DATE: 5/15/96 | 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
B0H8G3	ICP Metals	3/18/96	—	4/5/96	—	18	none
↓	Sb, As, Pb, Se, Th	↓	—	4/24/96	—	37	none
B0H8F1	ICP Metals	3/19/96	—	4/5/96	—	17	none
↓	Sb, As, Pb, Se, Th	↓	—	4/24/96	—	36	none
B0H8G2	ICP Metals	3/18/96	—	4/5/96	—	18	none
↓	Sb, As, Pb, Se, Th	↓	—	4/24/96	—	37	none
B0H8F0	ICP Metals	3/19/96	—	4/5/96	—	17	none
↓	Sb, As, Pb, Se, Th	↓	—	4/24/96	—	36	none

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WHC-SD-EN-SPP-002, REV.2

9713516.0894

MEMORANDUM

TO: 100 NR 2 Groundwater Sampling Round 9 Project QA Record May 16, 1996

FR: Heidi Gregerson, Golder Associates Inc. HCG

RE: RADIOCHEMISTRY DATA VALIDATION SUMMARY FOR DATA PACKAGE LK6649-LAS (943-1610.127 6649RAD.NR2)

INTRODUCTION

This memo presents the results of data validation for the analysis specified below on data package LK6649-LAS prepared by Lockheed Analytical Services. Sample information is provided in the following table.

SAMPLE ID	COMMENTS	ANALYSIS	MEDIA
B0H8G2 B0H8F0	FIELD SPLIT FIELD SPLIT	RADIOCHEMISTRY SEE ATTACHMENT 4	WATER WATER

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

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

DATA QUALITY OBJECTIVES

This section presents a summary of the data quality in terms of the referenced validation criteria.

Precision. Goals for precision were met.

Accuracy. Goals for accuracy were met.

Detection Limits. Detection limit goals were met for all sample results with the exception of gross alpha, radium 226, ruthenium 106, uranium 235, europium 152, europium 154, and actinium 228 for sample B0H8G2, and radium 226, ruthenium 106, and uranium 235 for sample B0H8F0. Qualification of data is not required according to data validation procedures.

Completeness. The data package was complete for all requested analyses. A total of two samples were validated in this data package with a total of 34 determinations reported, all of which were deemed valid. This results in a completeness of 100%, which meets the 90% objective of the work plan.

MAJOR DEFICIENCIES

No major deficiencies were identified during data validation which required qualification of data as unusable.

MINOR DEFICIENCIES

No minor deficiencies were identified during data validation which required qualification of data.

DATA REPORTING

- Reported sample results which are less than the minimum detectable activity (MDA) have been qualified as undetected (U) on the laboratory results form (see Attachment 3).

REFERENCES

WHC 1993, Data Validation Procedures for Radiochemical Analyses, WHC-SD-EN-SPP-001, Rev. 1, 1993. Westinghouse Hanford Company, Richland, Washington.

WHC 1994, Environmental and Waste Characterization Analytical Data Validation, Purchase Order MSH-SWV-315905; Validation Statement of Work, Revision 1.0, September 7, 1994; Westinghouse Hanford Company, Richland, Washington.

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ATTACHMENT 1

GLOSSARY OF DATA REPORTING QUALIFIERS

GLOSSARY OF RADIOCHEMISTRY DATA REPORTING QUALIFIERS

U- Indicates the constituent was analyzed for, but was not detected at a concentration above the minimum detectable activity (MDA). The concentration reported is the laboratory result corrected for sample aliquot size, dilution factors and percent solids (in the case of solid matrices) by the laboratory. The associated data should be considered usable for decision making purposes.

UJ- Indicates the constituent was analyzed for and was not detected at a concentration above the MDA. Due to a quality control deficiency identified during data validation, the concentration reported may not accurately reflect the sample quantitation limit. The associated data should be considered usable for decision making purposes.

J- Indicates the constituent was analyzed for and detected. The concentration reported is qualified as estimated due to a quality control deficiency identified during data validation. The associated data should be considered usable for decision making purposes.

UR- Indicates the constituent was analyzed for and detected. The concentration reported is qualified as unusable due to a quality control deficiency identified during data validation. The associated data should be considered unusable for decision making purposes.

R- Indicates the constituent was analyzed for and detected. The concentration reported is qualified as unusable due to a quality control deficiency identified during data validation. The associated data should be considered unusable for decision making purposes.

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ATTACHMENT 2

SUMMARY OF DATA QUALIFICATIONS

WHC-SD-EN-SPP-002, REV.2

DATA QUALIFICATION SUMMARY - FORM B-7

SDG: LK6649-LAS	REVIEWER: H. Gregerson	DATE: 5-16-96	PAGE 1 OF 1
COMMENTS: RADIOCHEMISTRY			
COMPOUND/ANALYTE	QUALIFIER	SAMPLES AFFECTED	REASON
NO SAMPLES QUALIFIED			

9713516.0900

ATTACHMENT 3

QUALIFIED DATA SUMMARY and ANNOTATED LABORATORY REPORTS

Validated Data Summary, Data Package: LK6649-LAS

	Sample #	B0H8G2		B0H8F0	
	Date	3/18/96		3/19/96	
	Location	199-N-54		199-N-25	
	Depth				
	Type	Water		Water	
	Comments	Field Split		Field Split	
Parameter	Units	Results	Q	Results	Q
ACTINIUM-228	pCi/L	10.000	U	1.600	U
COBALT-58	pCi/L	-0.400	U	-0.600	U
COBALT-60	pCi/L	-0.200	U	-0.300	U
CESIUM-137	pCi/L	0.400	U	0.900	U
EUROPIUM-152	pCi/L	-9.200	U	-0.900	U
EUROPIUM-154	pCi/L	-6.500	U	-0.300	U
EUROPIUM-155	pCi/L	-2.000	U	2.000	U
IRON-59	pCi/L	-0.500	U	-0.200	U
LEAD-212	pCi/L	-3.000	U	4.400	U
LEAD-214	pCi/L	42.000		16.400	
RADIUM-226	pCi/L	-30.000	U	-34.000	U
RUTHENIUM-106	pCi/L	-38.000	U	-25.000	U
URANIUM-235	pCi/L	22.000	U	-11.000	U
GROSS ALPHA	pCi/L	2.500	U	1.400	U
GROSS BETA	pCi/L	764.000		3.800	
STRONTIUM-89,90	pCi/L	233.000		0.220	U
TRITIUM	pCi/L	5820.000		400.000	

The decimal places shown do not reflect precision reported by the laboratory.

Verified HRG
5/17/96

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9713516.0902

LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: B0H8G2 | LAL Sample ID: L6649-13

Date Collected: 18-MAR-96 | Date Received: 20-MAR-96

Matrix: Water | Login Number: L6649

SDG: LK6649/LK6661

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units	Q
Ac-228(Ra-228)	25-MAR-96	GAMMA SPEC LAL-0063_35166	10	25.	39.		pCi/L	U
Co-58	25-MAR-96	GAMMA SPEC LAL-0063_35166	-0.4	6.8	8.9		pCi/L	U
Co-60	25-MAR-96	GAMMA SPEC LAL-0063_35166	-0.2	3.9	9.5		pCi/L	U
Cs-137	25-MAR-96	GAMMA SPEC LAL-0063_35166	0.4	5.4	9.2		pCi/L	U
Eu-152	25-MAR-96	GAMMA SPEC LAL-0063_35166	-9.2	7.7	39.		pCi/L	U
Eu-154	25-MAR-96	GAMMA SPEC LAL-0063_35166	-6.5	6.7	40.		pCi/L	U
Eu-155	25-MAR-96	GAMMA SPEC LAL-0063_35166	-2.	15.	19.		pCi/L	U
Fe-59	25-MAR-96	GAMMA SPEC LAL-0063_35166	-0.5	8.6	19.		pCi/L	U
Pb-212	25-MAR-96	GAMMA SPEC LAL-0063_35166	-3.	11.	15.		pCi/L	U
Pb-214(Ra-226)	25-MAR-96	GAMMA SPEC LAL-0063_35166	42.	15.	18.		pCi/L	
Ra-226(GAMMA)	25-MAR-96	GAMMA SPEC LAL-0063_35166	-30	130	190		pCi/L	U
Ru-106	25-MAR-96	GAMMA SPEC LAL-0063_35166	-38.	31.	99.		pCi/L	U
U-235(GAMMA)	25-MAR-96	GAMMA SPEC LAL-0063_35166	22.	31.	42.		pCi/L	U
Gross Alpha	09-APR-96	GR ALP/BETA LAL-0060_35168	2.5	2.9	4.7	C	pCi/L	U
Gross Beta	09-APR-96	GR ALP/BETA LAL-0060_35168	764.	42.	4.4	C	pCi/L	
Sr-89,90	03-APR-96	SR-89/90 LAL-0065_35403	233.	12.	0.93		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: B0H8G2 LAL Sample ID: L6649-22

Date Collected: 18-MAR-96 Date Received: 20-MAR-96

Matrix: Water Login Number: L6649

SDG: LK6649/LK6661

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
H-3	09-APR-96	TRITIUM(H3) LAL-0066_35178	5820	520	240		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: B0H8F0 | LAL Sample ID: L6661-13

Date Collected: 19-MAR-96 | Date Received: 22-MAR-96

Matrix: Water | Login Number: L6661

SDG: LK6649/LK6661

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units	Q
Ac-228(Ra-228)	25-MAR-96	GAMMA SPEC LAL-0063_35166	1.6	9.9	18.		pCi/L	U
Co-58	25-MAR-96	GAMMA SPEC LAL-0063_35166	-0.6	1.0	3.3		pCi/L	U
Co-60	25-MAR-96	GAMMA SPEC LAL-0063_35166	-0.3	1.8	4.4		pCi/L	U
Cs-137	25-MAR-96	GAMMA SPEC LAL-0063_35166	0.9	2.8	3.6		pCi/L	U
Eu-152	25-MAR-96	GAMMA SPEC LAL-0063_35166	-0.9	5.5	15.		pCi/L	U
Eu-154	25-MAR-96	GAMMA SPEC LAL-0063_35166	-0.3	3.8	15.		pCi/L	U
Eu-155	25-MAR-96	GAMMA SPEC LAL-0063_35166	2.	11.	15.		pCi/L	U
Fe-59	25-MAR-96	GAMMA SPEC LAL-0063_35166	-0.2	2.2	7.0		pCi/L	U
Pb-212	25-MAR-96	GAMMA SPEC LAL-0063_35166	4.4	6.1	8.9		pCi/L	U
Pb-214(Ra-226)	25-MAR-96	GAMMA SPEC LAL-0063_35166	16.4	6.8	8.7		pCi/L	
Ra-226(GAMMA)	25-MAR-96	GAMMA SPEC LAL-0063_35166	-34.	68.	110		pCi/L	U
Ru-106	25-MAR-96	GAMMA SPEC LAL-0063_35166	-25.	12.	39.		pCi/L	U
U-235(GAMMA)	25-MAR-96	GAMMA SPEC LAL-0063_35166	-11.	15.	27.		pCi/L	U
Gross Alpha	09-APR-96	GR ALP/BETA LAL-0060_35168	1.4	1.8	3.0	C	pCi/L	U
Gross Beta	09-APR-96	GR ALP/BETA LAL-0060_35168	3.8	1.7	2.6		pCi/L	
Sr-89,90	03-APR-96	SR-89/90 LAL-0065_35403	0.22	0.59	1.0		pCi/L	U

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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: B0H8F0 LAL Sample ID: L6661-22

Date Collected: 19-MAR-96 Date Received: 22-MAR-96

Matrix: Water Login Number: L6661

SDG: LK6649/LK6661

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
H-3	09-APR-96	TRITIUM(H3) LAL-0066_35178	400	220	240		pCi/L

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ATTACHMENT 4

LABORATORY NARRATIVE and CHAIN-OF-CUSTODY DOCUMENTATION

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, and duplicate samples.

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

Holding Time Requirements

All holding time requirements were met.

Gamma Spectrometry

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 35166. The instrument calibration verification met criteria. The method blank was within QC criteria. The laboratory control sample (LCS) recoveries were within QC criteria. The duplicate (DUP) recoveries were within QC criteria. No re-analyses were performed.

Gas Proportional Counter

Analytical Method Gross Alpha/Beta

The gross alpha/beta analysis was performed using SOP, LAL-91-SOP-0060. The samples were analyzed in workgroup 35168. The instrument calibration verification met criteria. The method blank was within QC criteria. The beta LCS recovery was within QC criteria, however, the alpha LCS recovery was out of QC criteria. Since all other QC criteria were met data quality is not believed to be adversely affected. The matrix spike (MS) recovery was within QC criteria. The DUP recoveries were within QC criteria. 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.

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Analytical Method Strontium-90

The strontium-90 analysis was performed using SOP, LAL-91-SOP-0065. The samples were analyzed in workgroup 35403. The instrument calibration verification met criteria. The method blank was within QC criteria. The LCS recovery was within QC criteria. The DUP recoveries were within QC criteria. No re-analyses were performed.

Liquid Scintillation Counter

Analytical Method Tritium

The tritium analysis was performed using SOP, LAL-91-SOP-0066. The samples were analyzed in workgroup 35178. The instrument calibration verification met criteria. The method blank was within QC criteria. The LCS and MS recoveries were within QC criteria. The DUP recoveries were within QC criteria. The quench value was within curve limitations. No re-analyses were performed.

Andrea Tippett
Prepared By

April 16, 1996
Date

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

LL661

Data Turnaround: ☐ Priority ■ Normal

Collector: A. R. Reed / M. Mathews	Company Contact: J. V. Borghese	Telephone: (509) 373-4790
Project Designation: 100-NR-2 Groundwater Sampling - Round 9	Sampling Location: 100 N	SAF No.: B96-089
Ice Chest No.: ER-40	Field Logbook No.: EL-1258	Method of Shipment: Federal Express
Shipped To: Lockheed	Offsite Property No.: W96-0-0640-33	Bill of Lading/Air Bill No.: 2904653613
Possible Sample Hazards/Remarks		
Special Handling and/or Storage: Maintain samples between 2°C and 6°C.		

SAMPLE ANALYSIS												
			Preservation	HNO3	Cool 4°C	H2SO4	HCl	Cool 4°C	HNO3		Cool 4°C	None
			Type of Container	P/G	P/G	G	G	P	P/G		G	P/G
			No. of Container(s)	1	1	4	4	1	9		1	1
			Volume	500mL	500mL	1L	1L	~~125mL~~ 250 2L/1L	1L		500mL	20mL
				ICP Metals - 6010A (TAL) (Unfiltered)	*1	Oil and Grease - 413.1	TPH (Total) - 418.1	Conductivity - 9050	*2		Tritium - H3	Activity Scan
Sample No.	Matrix*	Date Sampled	Time Sampled									
B0H8F0	W	3/19/96	1245	✓	✓	✓	✓	✓	✓		✓	✓

CHAIN OF POSSESSION	Sign/Print Names		
Relinquished By: A. R. Reed (ER)	Date/Time: 0800 3/20/96	Received By: BWHatten	Date/Time: 0800 3-20-96
Relinquished By: BWHatten	Date/Time: 0800 3-21-96	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

SPECIAL INSTRUCTIONS

*1 IC Anions - 300.0 - Cl, F, NO2, NO3, PO4, SO4 (Unfiltered)

*2 Gross Alpha, Gross Beta, Sr-89/90, Gamma Spec

Sample analysis for NO2, NO3, and PO4 by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges thet the 48-hour holding time 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	Title	Date/Time
	Paul C. Davis	Sample Custodian	3-22-96/9:00am
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

9713516.0909

HLG 5/10/96 016

Bechtel Hanford, Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST L6649

Data Turnaround: ☐ Priority ■ Normal

Collector: A. Rizzo / M Mehlhorn	Company Contact: J. V. Borghese	Telephone: (509) 373-4790
Project Designation: 100-NR-2 Groundwater Sampling - Round 9	Sampling Location: 100 N	SAF No.: B96-089
Ice Chest No.: SML-444	Field Logbook No.: EL-18338	Method of Shipment: Federal Express
Shipped To: Lockheed	Offsite Property No.: W96-0-0640-32	Bill of Lading/Air Bill No.: 2904653403

Possible Sample Hazards/Remarks	Preservation	HNO3	Cool 4°C	H2SO4	HCl	Cool 4°C	HNO3		Cool 4°C	None
	Type of Container	P/G	P/G	G	G	P	P/G		G	P/G
	No. of Container(s)	1	1	4	4	1	9		1	1
Special Handling and/or Storage: Maintain samples between 2°C and 6°C.	Volume	500mL	500mL	1L	1L	25mL ~~125mL~~	1L		500mL	20mL
SAMPLE ANALYSIS		ICP Metals - 6010A (TAL) (Unfiltered)	*1	Oil and Grease - 413.1	TPH (Total) - 418.1	Conductivity - 9050	*2		Tritium - H3	Activity Scan

Sample No.	Matrix*	Date Sampled	Time Sampled									
B0H8G2	W	3-18-96	1145	✓	✓	✓	✓	✓	✓		✓	✓

CHAIN OF POSSESSION	Sign/Print Names		
Relinquished By: A. Rizzo (ERC)	Date/Time: 3-18-96 1445	Received By: Bechtel	Date/Time: 3-18-96 1445
Relinquished By: Bechtel	Date/Time: 3-19-96 0900	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received By:	Date/Time:

SPECIAL INSTRUCTIONS

*1 IC Anions - 300.0 - Cl, F, NO2, NO3, PO4, SO4 (Unfiltered)

*2 Gross Alpha, Gross Beta, Sr-89/90, Gamma Spec

Sample analysis for NO2, NO3, and PO4 by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time 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	Title	Date/Time
	M Miller	Sample Custodian	3-20-96/0845

FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

9713516.0910

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HRG 5/16/96 0018

E3 0546

9713516.0911

ATTACHMENT 5

DATA VALIDATION SUPPORTING DOCUMENTATION

9713516.0912

RADIOCHEMICAL DATA VALIDATION CHECKLIST

VALIDATION LEVEL:	A	B	C	D	E
PROJECT: 100 NR2 GH2O Rnd 9.			DATA PACKAGE: LK6649-LAS		
VALIDATOR: H. GREGERSON		LAB: LOCKHEED		DATE: 5/10/96	
CASE:			SDG:		
ANALYSES PERFORMED					
☒ Gross Alpha/Beta	☒ Strontium-90	☐ Technetium-99	☐ Alpha Spectroscopy	☒ Gamma Spectroscopy	
☐ Total Uranium	☐ Radium-22	☒ Tritium	☐		
SAMPLES/MATRIX B0H8G2 B0H8F0 / 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:

019

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 No 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:_____

020

6. Laboratory Control Samples . . . . . ☐ N/A

LCS analyzed? . . . . . Yes No 1. N/A
LCS recoveries acceptable? . . . . . Yes No N/A
LCS traceable? . . . . . Yes No N/A
Transcription/Calculation Errors? . . . . . Yes No N/A

Comments: 1. The %R for gross alpha was outside the control limit, however, gross alpha was detected at levels below the MDA so no qualification was applied.

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:

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:

021

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) 1.
Performance audit sample(s) analyzed? . . . . . Yes (No) N/A
Performance audit sample results acceptable? . . . . . Yes No (N/A)

Comments:
1. BOH8G2 and BOH8F0 are field split samples. Associated samples are in another SDG, therefore, the RPDs will be evaluated in the final summary report.

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 1. (No) N/A
Transcription/calculation errors? . . . . . Yes No (N/A)

Comments:
1. For sample BOH8G2 the MDAs did not meet the CRQL for gross alpha, Ra-226, Ru-106, U-235, Eu-152, Eu-154, and Ac-228. For sample BOH8F0 the MDA's did not meet the CRQL for Ra-226, Ru-106, and U-235. Qualification is not required.

HOLDING TIME SUMMARY

SDG: LK6649-LAS | VALIDATOR: HEIDI GREGERSON | DATE: 5/16/96 | 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
B0H8G2	Gamma	3/18/96	3/22/96	3/25/96	4	1	none
	Gross α β	3/18/96	4/8/96	4/9/96	21	1	none
	Sr 90	3/18/96	4/1/96	4/3/96	14	2	none
	H_3	3/18/96	4/8/96	4/9/96	21	1	none
B0H8F0	Gamma	3/19/96	3/22/96	3/25/96	3	3	none
	Gross α β	3/19/96	4/8/96	4/9/96	20	1	none
	Sr 90	3/19/96	4/1/96	4/3/96	13	2	none
	H_3	3/19/96	4/8/96	4/9/96	20	1	none

97135180916 WHC-SD-EN-SPP-002, REV.2

LOCKHEED ANALYTICAL SERVICES

RADIOCHEMISTRY ANALYTES

QC Data Summary For Laboratory Control Sample Analysis

SDG: LK6649/LK6661

Analyte	Batch|ID	Date Analyzed	LCS Result	Error 2|Sigma	True Value	(%) Recovery	Data Qualifiers
Co-60	35166	03/25/96	206	26.1	218	94	
Cs-137	35166	03/25/96	190	26.3	197	96	
Gross Alpha	35168	04/09/96	54.9	5.88	38.9	141	*
Gross Beta	35168	04/09/96	42.2	3.67	41.9	101	
H-3	35178	04/09/96	3380	402	3780	89	
Sr-89,90	35403	04/03/96	59.7	3.52	69.9	85	

Associated samples were not qualified.
HRG
5/17/96

HRG 5/16/96
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