



AMTECH

Chemical Analysis — Consultation
Research — Product Development

American Technical Laboratories, Inc.
8909 Complex Drive — Suite F
San Diego, California 92123
(714) 560-7717

Phillips Petroleum Company
11526 Sorrento Valley Road
San Diego, California 92121

LABORATORY NO. 0272-77
DATE OF REPORT May 23, 1977
DATE RECEIVED May 17, 1977

~~and depth 540'~~
Roosevelt Field, well 82-33 depth water 2160' A+S

SPECIES		VALUE FOUND		VALUE FOUND	
CALCIUM	Ca	60-5	eq/L	12.	ppm
MAGNESIUM	Mg	40-5	eq/L	4.8	ppm
SODIUM	Na	31-4	eq/L	72.	ppm
POTASSIUM	K	74-5	eq/L	29.	ppm
CARBONATE	CO ₃	22-4	eq/L	132.	ppm
BICARBONATE	HCO ₃				
SULFATE	SO ₄	12-4	eq/L	58.0	ppm
CHLORIDE	Cl	15-4	eq/L	52.	ppm
SILICA	SiO ₂	0	moles/L		ppm
TEMPERATURE		0	°C		
CONDUCTIVITY @ 25°C		50-5	μmhos/cm	499.	
pH		0.78		7.83	
BORON	B	40-6	moles/L	0.43	ppm
LITHIUM	Li	< 58-7	eq/L	< 0.04	ppm
NITRATE	NO ₃	54-6	eq/L	3.34	ppm
NITRITE	NO ₂				
AMMONIUM	NH ₄	0	eq/L		ppm
DATE COLLECTED		0577			
BASIN NUMBER		0022			
SAMPLE NUMBER		45504			



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San Diego, California 92121

LABORATORY NO.
DATE OF REPORT
DATE RECEIVED

0587-77
December 27, 1977
November 29, 1977

Well 82-33 flowline 335.5°F

SPECIES		VALUE FOUND		VALUE FOUND	
CALCIUM	Ca	39-5	eq/L	7.9	ppm
MAGNESIUM	Mg	<82-6	eq/L	<1.0	ppm
SODIUM	Na	91-3	eq/L	2100.	ppm
POTASSIUM	K	12-3	eq/L	460.	ppm
CARBONATE BICARBONATE	CO ₃ HCO ₃ }	29-4	eq/L	176.	ppm
SULFATE	SO ₄	15-4	eq/L	72.	ppm
CHLORIDE	Cl	99-3	eq/L	3500.	ppm
SILICA	SiO ₂	<i>20 x 58-5 = 123</i> moles/L		35.20-700	ppm
TEMPERATURE		<i>051</i> °C			
CONDUCTIVITY @ 25°C		<i>10-3</i> μmhos/cm		10030. 12050. (1:100)	
pH		<i>063</i>		6.26	
BORON	B	23-4	moles/L	25.0	ppm
LITHIUM	Li	16-4	eq/L	10.8	ppm
NITRATE NITRITE	NO ₃ NO ₂ }	<71-7	eq/L	<0.44	ppm
AMMONIUM	NH ₄	<i>0</i>	eq/L		ppm
DATE COLLECTED		<i>1177</i>			
BASIN NUMBER		<i>0022</i>			
SAMPLE NUMBER		45898			

*11-17-77 (Lenzer) - Uran filtered SiO₂ dilution, 250 ml unfiltered,
250 ml filtered + acidified, 250 ml filtered*



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San Diego, California 92121

LABORATORY NO. 0665-77
DATE OF REPORT January 23, 1978
DATE RECEIVED December 20, 1977

Roosevelt 82-33 11:00am Injection line 46

FLUORIDE F 23-5 eq/L 4.4 ppm

SPECIES	VALUE FOUND	VALUE FOUND
CALCIUM Ca	34-5 eq/L	6.9 ppm
MAGNESIUM Mg	<82-6 eq/L	<1.0 ppm
SODIUM Na	80-3 eq/L	1850. ppm
POTASSIUM K	12-3 eq/L	450. ppm
CARBONATE CO ₃ } BICARBONATE HCO ₃ }	27-4 eq/L	164. ppm
SULFATE SO ₄	81-5 eq/L	39. ppm
CHLORIDE Cl	87-3 eq/L	3100. ppm
* SILICA SiO ₂	<i>11-3</i> 57-5 <i>moles/L</i>	34. <i>x 20 = 680</i> ppm
TEMPERATURE	<i>046</i> °C	
CONDUCTIVITY @ 25°C	<i>92-4</i> μ mhos/cm	9220. 11700. (1:100)
pH	<i>058</i>	5.80
BORON B	26-4 moles/L	28. ppm
LITHIUM Li	16-4 eq/L	11. ppm
NITRATE NO ₃ } NITRITE NO ₂ }	<71-7 eq/L	<0.44 ppm
AMMONIUM NH ₄	<i>0</i> eq/L	ppm
DATE COLLECTED	<i>12 77</i>	
BASIN NUMBER	<i>0022</i>	
SAMPLE NUMBER	45913	

*diluted brown bottle

12-15-77 (Lenzer) - filtered 250ml, alkalinity, acidified, silica dilution



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LABORATORY NO. 0272-77
DATE OF REPORT May 23, 1977
DATE RECEIVED May 17, 1977

~~and depth 5750'~~
Roosevelt Field, well 82-33 depth water 2160' A+S

SPECIES		VALUE FOUND		VALUE FOUND	
CALCIUM	Ca	60-5	eq/L	12.	ppm
MAGNESIUM	Mg	40-5	eq/L	4.8	ppm
SODIUM	Na	31-4	eq/L	72.	ppm
POTASSIUM	K	74-5	eq/L	29.	ppm
CARBONATE	CO ₃ }	22-4	eq/L	132.	ppm
BICARBONATE	HCO ₃ }				
SULFATE	SO ₄	12-4	eq/L	58.0	ppm
CHLORIDE	Cl	15-4	eq/L	52.	ppm
SILICA	SiO ₂	0	moles/L		ppm
TEMPERATURE		0	°C		
CONDUCTIVITY @ 25°C		50-5	μmhos/cm	499.	
pH		078		7.83	
BORON	B	40-6	moles/L	0.43	ppm
LITHIUM	Li	< 58-7	eq/L	< 0.04	ppm
NITRATE	NO ₃ }	54-6	eq/L	3.34	ppm
NITRITE	NO ₂ }				
AMMONIUM	NH ₄	0	eq/L		ppm
DATE COLLECTED		0577			
BASIN NUMBER		0022			
SAMPLE NUMBER		45504			



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LABORATORY NO. 0284-77
DATE OF REPORT May 31, 1977
DATE RECEIVED May 25, 1977

82-33 Depth 5600'

SPECIES		VALUE FOUND		VALUE FOUND	
CALCIUM	Ca	35-5	eq/L	7.0	ppm
MAGNESIUM	Mg	12-5	eq/L	1.4	ppm
SODIUM	Na	33-4	eq/L	75.	ppm
POTASSIUM	K	79-5	eq/L	31.	ppm
CARBONATE	CO ₃	19-4	eq/L	115.	ppm
BICARBONATE	HCO ₃				
SULFATE	SO ₄	14-4	eq/L	67.1	ppm
CHLORIDE	Cl	16-4	eq/L	58.	ppm
SILICA	SiO ₂	52-5	moles/L	31	ppm
TEMPERATURE		073	°C		
CONDUCTIVITY @ 25°C		55-5	μmhos/cm	549.	
pH		08.2		8.19	
BORON	B	65-6	moles/L	0.70	ppm
LITHIUM	Li	< 58-7	eq/L	< 0.04	ppm
NITRATE	NO ₃	< 71-7	eq/L	< 0.44	ppm
NITRITE	NO ₂				
AMMONIUM	NH ₄	0	eq/L		ppm
DATE COLLECTED		0577			
BASIN NUMBER		0022			
SAMPLE NUMBER		2 B			

Field Cl. uses
quantab = 78 ppm
Lab Cl.

Field cond.
= 710 umhos.
LAB Cond.
Field pH = 8.4
Lab pH

Field data taken on 5/21/77 at 12:00 p.m. by Ron Forrest



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LABORATORY NO. 0284-77
DATE OF REPORT May 31, 1977
DATE RECEIVED May 25, 1977

82-33 *Depth 5600'*

SPECIES		VALUE FOUND		VALUE FOUND
CALCIUM	Ca	34-5	eq/L	6.9 ppm
MAGNESIUM	Mg	12-5	eq/L	1.4 ppm
SODIUM	Na	40-4	eq/L	93. ppm
POTASSIUM	K	87-5	eq/L	34. ppm
CARBONATE	CO ₃ }	15-4	eq/L	94.4 ppm
BICARBONATE	HCO ₃ }			
SULFATE	SO ₄	14-4	eq/L	66.3 ppm
CHLORIDE	Cl	26-4	eq/L	91. ppm
SILICA	SiO ₂	62-5	moles/L	37 ppm
TEMPERATURE		074	°C	
CONDUCTIVITY @ 25°C		63-5	μmhos/cm	627.
pH		082		8.16
BORON	B	40-6	moles/L	0.43 ppm
LITHIUM	Li	19-6	eq/L	0.13 ppm
NITRATE	NO ₃ }	14-6	eq/L	0.86 ppm
NITRITE	NO ₂ }			
AMMONIUM	NH ₄	0	eq/L	ppm
DATE COLLECTED		0577		
BASIN NUMBER		0022		
SAMPLE NUMBER		2 A		

Field Cl. using
quan-tabs = 702 ppm
Lab Cl.

Field cond. =
780 μmhos
Lab cond.

Field pH = 7.5
Lab pH

Field data taken on 5/21/77 at 11:35 a.m. by Ron Forrest.



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LABORATORY NO. 0284-77
DATE OF REPORT May 31, 1977
DATE RECEIVED May 25, 1977

82-33 Depth 2,500'

SPECIES		VALUE FOUND		VALUE FOUND
CALCIUM	Ca	11-4	eq/L	21. ppm
MAGNESIUM	Mg	60-5	eq/L	7.3 ppm
SODIUM	Na	27-3	eq/L	610. ppm
POTASSIUM	K	31-4	eq/L	120. ppm
CARBONATE	CO ₃	38-4	eq/L	232. ppm
BICARBONATE	HCO ₃			
SULFATE	SO ₄	32-4	eq/L	156. ppm
CHLORIDE	Cl	28-3	eq/L	1,000. ppm
SILICA	SiO ₂	15-4	moles/L	91 ppm
TEMPERATURE		062	°C	
CONDUCTIVITY @ 25°C		38-4	μmhos/cm	3830. 4220. (1:10)
pH		080		7.96
BORON	B	83-5	moles/L	9.0 ppm
LITHIUM	Li	27-5	eq/L	1.85 ppm
NITRATE	NO ₃	13-6	eq/L	0.81 ppm
NITRITE	NO ₂			
AMMONIUM	NH ₄	0	eq/L	ppm
DATE COLLECTED		0577		
BASIN NUMBER		0022		
SAMPLE NUMBER		1		

Field cl. using
gran tabs = 552 ppm
lab cl.

Field cond.
2700 μmhos
Lab cond.
Field pH = 8.4
Lab pH

Field data taken on 5/21/77 at 9:20 a.m. by Ron Forrest.



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LABORATORY NO. 0284-77
DATE OF REPORT May 31, 1977
DATE RECEIVED May 25, 1977

82-33 Depth 2,500'

SPECIES		VALUE FOUND		VALUE FOUND
CALCIUM	Ca	38-4	eq/L	77. ppm
MAGNESIUM	Mg	14-4	eq/L	17. ppm
SODIUM	Na	63-3	eq/L	1450. ppm
POTASSIUM	K	61-4	eq/L	240. ppm
CARBONATE	CO ₃ }	79-4	eq/L	482. ppm
BICARBONATE	HCO ₃ }			
SULFATE	SO ₄	21-4	eq/L	103. ppm
CHLORIDE	Cl	65-3	eq/L	2300. ppm
SILICA	SiO ₂	28-4	moles/L	166 ppm
TEMPERATURE		0	°C	
CONDUCTIVITY @ 25°C		78-4	μmhos/cm	7840. 8870. (1:10)
pH		080		7.98
BORON	B	18-4	moles/L	19.0 ppm
LITHIUM	Li	92-5	eq/L	6.4 ppm
NITRATE	NO ₃ }	24-6	eq/L	1.50 ppm
NITRITE	NO ₂ }			
AMMONIUM	NH ₄	0	eq/L	ppm
DATE COLLECTED		0577		
BASIN NUMBER		0022		
SAMPLE NUMBER		1 A		



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LABORATORY NO. 0284-77
DATE OF REPORT May 31, 1977
DATE RECEIVED May 25, 1977

82-33

SPECIES		VALUE FOUND		VALUE FOUND	
CALCIUM	Ca	55-5	eq/L	11.	ppm
MAGNESIUM	Mg	29-5	eq/L	3.5	ppm
SODIUM	Na	13-3	eq/L	300.	ppm
POTASSIUM	K	18-4	eq/L	70.	ppm
CARBONATE	CO ₃	26-4	eq/L	158.	ppm
BICARBONATE	HCO ₃				
SULFATE	SO ₄	13-4	eq/L	63.8	ppm
CHLORIDE	Cl	11-3	eq/L	375.	ppm
SILICA	SiO ₂	14-4	moles/L	83	ppm
TEMPERATURE		068	°C		
CONDUCTIVITY @ 25°C		16-4	μmhos/cm	1588. 1722. (1:10)	
pH		08.2		8.21	
BORON	B	37-5	moles/L	4.0	ppm
LITHIUM	Li	14-5	eq/L	0.98	ppm
NITRATE	NO ₃	11-6	eq/L	0.66	ppm
NITRITE	NO ₂				
AMMONIUM	NH ₄	0	eq/L		ppm
DATE COLLECTED		0577			
BASIN NUMBER		0022			
SAMPLE NUMBER		1 B			

Field Cl.
using Quantabs
1176 = 2.6
444 ppm
1175 = 2.0
360 ppm
Lab Cl.

Field Cond.
= 1750 μmhos
Lab cond.
Field pH = 7.2
Lab pH.

Field data collected by Ron Forrest on 5/21/77 at 10:20 a.m.



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LABORATORY NO. 0284-77
DATE OF REPORT May 31, 1977
DATE RECEIVED May 25, 1977

82-33 Depth 5600'

SPECIES		VALUE FOUND		VALUE FOUND	
CALCIUM	Ca	28-5	eq/L	5.7	ppm
MAGNESIUM	Mg	12-5	eq/L	1.4	ppm
SODIUM	Na	39-4	eq/L	90.	ppm
POTASSIUM	K	87-5	eq/L	34.	ppm
CARBONATE	CO ₃	16-4	eq/L	98.2	ppm
BICARBONATE	HCO ₃				
SULFATE	SO ₄	15-4	eq/L	72.8	ppm
CHLORIDE	Cl	24-4	eq/L	84.	ppm
SILICA	SiO ₂	85-5	moles/L	51	ppm
TEMPERATURE		078	°C		
CONDUCTIVITY @ 25°C		60-54	μmhos/cm	599.	
pH		080		8.05	
BORON	B	15-5	moles/L	1.65	ppm
LITHIUM	Li	17-6	eq/L	0.12	ppm
NITRATE	NO ₃	14-6	eq/L	0.87	ppm
NITRITE	NO ₂				
AMMONIUM	NH ₄	0	eq/L		ppm
DATE COLLECTED		0577			
BASIN NUMBER		0022			
SAMPLE NUMBER		2			

Field Cl using
quantabs
1176 = 0.8
80 ppm
1175 = 0.8
78 ppm
Lab Cl

Field cond.
= 720 μmhos
lab cond.
Field pH = 7.1
Lab pH

Field data collected at 11:10 a.m. by Ron Forrester on 5/21/77.



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Phillips-Del Mar ATL #0587-77

FLUORIDE

Well Head
Steam Line
Water Line
3 Fluorine

<u>Sample</u>	<u>eq/L</u>	<u>ppm</u>
45898	29-5	5.6 82-33

STRONTIUM

<u>Sample</u>	<u>eq/L</u>	<u>ppm</u>
45898	14-7	0.06

RUBIDIUM

<u>Sample</u>	<u>eq/L</u>	<u>ppm</u>
45898	11-5	9.8



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San Diego, California 92121

LABORATORY NO. 0176-76
DATE OF REPORT February 23, 1976
DATE RECEIVED February 5, 1976
IDENTIFICATION 10 water samples (4) listed below
REQUEST 6 samples complete plus Li; 4 samples B, Li, K, F

KGRA 82-33

A. Boron

<u>Sample</u>	<u>moles/L B</u>	<u>ppm B</u>
44462	23-6	0.25
44463	18-7	0.02
44464	18-7	0.02
44465	15-6	0.16

B. Lithium

<u>Sample</u>	<u>eq/L Li</u>	<u>ppm Li</u>
44462	< 58-7	< 0.04
44463	< 58-7	< 0.04
44464	< 58-7	< 0.04
44465	86-7	0.06

C. Potassium

<u>Sample</u>	<u>eq/L K</u>	<u>ppm K</u>
44462	24-5	9.5
44463	< 13-6	< 0.5
44464	< 13-6	< 0.5
44465	32-5	12.5

44462: 2gms Dapp / 250ml. distilled water = 226ppm

44463: 25ul Surflo H-35 / 250 " " = 100ppm

44464: .25gms Caustic Soda / 250 " " = 1000ppm

44465: 2gms Dapp + 25ul Surflo H-35 + .25gms caustic soda / 250ml. distilled water


Phillips Petroleum Company (Lab. #0176-76)
Page 2

KGRH 82-33

D. Fluoride

<u>Sample</u>	<u>eq/L F</u>	<u>ppm F</u>
44462	26-4	50.0
44463	< 53-7	< 0.10
44464	< 53-7	< 0.10
44465	30-4	56.0

Respectfully,


David H. Elgas
Laboratory Director



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Phillips-Del Mar ATL #0587-77

FLUORIDE

	<u>Sample</u>	<u>eq/L</u>	<u>ppm</u>
Well Head	45895	28-5	5.4 54-3
3 Steam Line	45896	19-5	3.6 54-3
Water Line	45897	29-5	5.6 54-3
3 Fluorine	45898	29-5	5.6 82-33

STRONTIUM

<u>Sample</u>	<u>eq/L</u>	<u>ppm</u>
45895	91-8	0.04
45896	91-8	0.04
45897	16-7	0.07
45898	14-7	0.06

RUBIDIUM

<u>Sample</u>	<u>eq/L</u>	<u>ppm</u>
45895	11-5	9.5
45896	71-6	6.1
45897	12-5	9.9
45898	11-5	9.8



12-30-75

INTER-OFFICE CORRESPONDENCE / SUBJECT: Chloride Results

✓Stu Johnson:
Dick Lenzer:

The following are the results of the chloride analysis of KGRA 82-33 (4460', 5000', 5400', 5900') analyzed on 12-30-75.

<u>KGRA 82-33</u>	<u>Field Temp °F</u>	<u>ppm Cl⁻</u>
4460' IN	130	222
4460' OUT	148	222
5000' IN	137	168
5000' OUT	153	168
5400' IN	130	114
5400' OUT	149	144
5900' IN	150	186
5900' OUT	163	204



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11526 Sorrento Valley Rd.
San Diego, CA 92121

LABORATORY NO.	0284-77
DATE OF REPORT	June 7, 1977
DATE RECEIVED	May 25, 1977
IDENTIFICATION	Water samples (Supplement report)
REQUEST	Silica

SiO₂

<u>Sample</u>	<u>moles/L</u>	<u>ppm</u>
1	15-4	91.
1A	28-4	166.
1B	14-4	83.
2	85-5	51.
2A	62-5	37.
2B	52-5	31.
45575	13-4	81.
45576	12-4	72.

Respectfully,


David H. Elgas
Laboratory Director



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San Diego, California 92121

LABORATORY NO.
DATE OF REPORT
DATE RECEIVED
IDENTIFICATION
REQUEST

0176-76
February 23, 1976
February 5, 1976
10 water samples (4) listed below
6 samples complete plus Li; 4 samples B, Li, K, F

KGRA 82-33

A. Boron

<u>Sample</u>	<u>moles/L B</u>	<u>ppm B</u>
44462	23-6	0.25
44463	18-7	0.02
44464	18-7	0.02
44465	15-6	0.16

B. Lithium

<u>Sample</u>	<u>eq/L Li</u>	<u>ppm Li</u>
44462	< 58-7	< 0.04
44463	< 58-7	< 0.04
44464	< 58-7	< 0.04
44465	86-7	0.06

C. Potassium

<u>Sample</u>	<u>eq/L K</u>	<u>ppm K</u>
44462	24-5	9.5
44463	< 13-6	< 0.5
44464	< 13-6	< 0.5
44465	32-5	12.5

44462: 2gms DaPP / 250ml. distilled water = 226/barel

44463: 25ul Surflo H-35 / 250 " " = 100ppm

44464: .25gms Caustic Soda / 250 " " = 1000ppm


44465: 2gms DaPP + 25ul Surflo H-35 + .25gms caustic soda / 250ml. distilled water

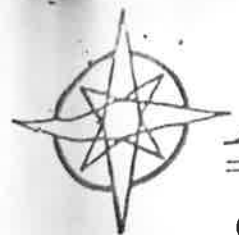
KGRH 82-33

D. Fluoride

<u>Sample</u>	<u>eq/L F</u>	<u>ppm F</u>
44462	26-4	50.0
44463	< 53-7	< 0.10
44464	< 53-7	< 0.10
44465	30-4	56.0

Respectfully,


David H. Elgas
Laboratory Director



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LABORATORY NO.
DATE OF REPORT
DATE RECEIVED
IDENTIFICATION
REQUEST

KGRA 82-33

0176-76

February 23, 1976

February 5, 1976

10 water samples (4) listed below

6 samples complete plus Li; 4 samples B, Li, K, F

A. Boron

<u>Sample</u>	<u>moles/L B</u>	<u>ppm B</u>
44462	23-6	0.25
44463	18-7	0.02
44464	18-7	0.02
44465	15-6	0.16

B. Lithium

<u>Sample</u>	<u>eq/L Li</u>	<u>ppm Li</u>
44462	< 58-7	< 0.04
44463	< 58-7	< 0.04
44464	< 58-7	< 0.04
44465	86-7	0.06

C. Potassium

<u>Sample</u>	<u>eq/L K</u>	<u>ppm K</u>
44462	24-5	9.5
44463	< 13-6	< 0.5
44464	< 13-6	< 0.5
44465	32-5	12.5

44462: 2gms Dapp / 250ml. distilled water = 250ppm

44463: 25ul Surflo H-35 / 250 " " = 100ppm

44464: .25gms Caustic Soda / 250 " " = 100ppm

44465: 2gms Dapp + 25ul Surflo H-35 + .25gms caustic soda / 250ml. distilled water



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Phillips-Del Mar ATL #0587-77

FLUORIDE

*Well Head
Steam Line
Water Line
Pilot Line*

<u>Sample</u>	<u>eq/L</u>	<u>ppm</u>
45898	29-5	5.6 82-33

STRONTIUM

<u>Sample</u>	<u>eq/L</u>	<u>ppm</u>
45898	14-7	0.06

RUBIDIUM

<u>Sample</u>	<u>eq/L</u>	<u>ppm</u>
45898	11-5	9.8



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LABORATORY NO. 0284-77
DATE OF REPORT May 31, 1977
DATE RECEIVED May 25, 1977

82-33 Depth 5600'

SPECIES		VALUE FOUND		VALUE FOUND	
CALCIUM	Ca	28-5	eq/L	5.7	ppm
MAGNESIUM	Mg	12-5	eq/L	1.4	ppm
SODIUM	Na	39-4	eq/L	90.	ppm
POTASSIUM	K	87-5	eq/L	34.	ppm
CARBONATE	CO ₃	16-4	eq/L	98.2	ppm
BICARBONATE	HCO ₃				
SULFATE	SO ₄	15-4	eq/L	72.8	ppm
CHLORIDE	Cl	24-4	eq/L	84.	ppm
SILICA	SiO ₂	85-5	moles/L	51	ppm
TEMPERATURE		078	°C		
CONDUCTIVITY @ 25°C		60-5	μmhos/cm	599.	
pH		080		8.05	
BORON	B	15-5	moles/L	1.65	ppm
LITHIUM	Li	17-6	eq/L	0.12	ppm
NITRATE	NO ₃	14-6	eq/L	0.87	ppm
NITRITE	NO ₂				
AMMONIUM	NH ₄	0	eq/L		ppm
DATE COLLECTED		0577			
BASIN NUMBER		0022			
SAMPLE NUMBER		2			

Field Cl using
quantabs
1176 = .8
80 ppm
1175 = 2.0
78 ppm
Lab Cl.

Field cond.
= 720 μmhos
Lab cond.
Field pH = 7.1
Lab pH

Field data collected at 11:10 a.m. by Ron Forrester on 5/21/77.



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LABORATORY NO. 0284-77
DATE OF REPORT May 31, 1977
DATE RECEIVED May 25, 1977

82-33

SPECIES		VALUE FOUND		VALUE FOUND	
CALCIUM	Ca	55-5	eq/L	11.	ppm
MAGNESIUM	Mg	29-5	eq/L	3.5	ppm
SODIUM	Na	13-3	eq/L	300.	ppm
POTASSIUM	K	18-4	eq/L	70.	ppm
CARBONATE	CO ₃	26-4	eq/L	158.	ppm
BICARBONATE	HCO ₃				
SULFATE	SO ₄	13-4	eq/L	63.8	ppm
CHLORIDE	Cl	11-3	eq/L	375.	ppm
SILICA	SiO ₂	14-4	moles/L	83	ppm
TEMPERATURE		068	°C		
CONDUCTIVITY @ 25°C		16-4	μmhos/cm	1588. 1722. (1:10)	
pH		08.2		8.21	
BORON	B	37-5	moles/L	4.0	ppm
LITHIUM	Li	14-5	eq/L	0.98	ppm
NITRATE	NO ₃	11-6	eq/L	0.66	ppm
NITRITE	NO ₂				
AMMONIUM	NH ₄	0	eq/L		ppm
DATE COLLECTED		0577			
BASIN NUMBER		0022			
SAMPLE NUMBER		1 B			

Field Cl
using quantabs
1176 = 2.6
444 ppm
1175 = 2.0
346 ppm
Lab Cl.

Field Cond.
= 1750 μmhos
Lab cond.
Field pH = 7.2
Lab pH.

Field data collected by Ron Forrest on 5/21/77 at 10:20 a.m.



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LABORATORY NO. 0284-77
DATE OF REPORT May 31, 1977
DATE RECEIVED May 25, 1977

52-33 Depth 2,500'

SPECIES		VALUE FOUND		VALUE FOUND	
CALCIUM	Ca	38-4	eq/L	77.	ppm
MAGNESIUM	Mg	14-4	eq/L	17.	ppm
SODIUM	Na	63-3	eq/L	1450.	ppm
POTASSIUM	K	61-4	eq/L	240.	ppm
CARBONATE	CO ₃	79-4	eq/L	482.	ppm
BICARBONATE	HCO ₃				
SULFATE	SO ₄	21-4	eq/L	103.	ppm
CHLORIDE	Cl	65-3	eq/L	2300.	ppm
SILICA	SiO ₂	28-4	moles/L	166	ppm
TEMPERATURE		0	°C		
CONDUCTIVITY @ 25°C		78-4	μmhos/cm	7840. 8870. (1:10)	
pH		080		7.98	
BORON	B	18-4	moles/L	19.0	ppm
LITHIUM	Li	92-5	eq/L	6.4	ppm
NITRATE	NO ₃	24-6	eq/L	1.50	ppm
NITRITE	NO ₂				
AMMONIUM	NH ₄	0	eq/L		ppm
DATE COLLECTED.		0577			
BASIN NUMBER		0022			
SAMPLE NUMBER		1 A			



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LABORATORY NO. 0284-77
DATE OF REPORT May 31, 1977
DATE RECEIVED May 25, 1977

82-33 Depth 2,500'

SPECIES		VALUE FOUND		VALUE FOUND	
CALCIUM	Ca	11-4	eq/L	21.	ppm
MAGNESIUM	Mg	60-5	eq/L	7.3	ppm
SODIUM	Na	27-3	eq/L	610.	ppm
POTASSIUM	K	31-4	eq/L	120.	ppm
CARBONATE	CO ₃	38-4	eq/L	232.	ppm
BICARBONATE	HCO ₃				
SULFATE	SO ₄	32-4	eq/L	156.	ppm
CHLORIDE	Cl	28-3	eq/L	1,000.	ppm
SILICA	SiO ₂	15-4	moles/L	91	ppm
TEMPERATURE		062	°C		
CONDUCTIVITY @ 25°C		38-4	μmhos/cm	3830. 4220. (1:10)	
pH		080		7.96	
BORON	B	83-5	moles/L	9.0	ppm
LITHIUM	Li	27-5	eq/L	1.85	ppm
NITRATE	NO ₃	13-6	eq/L	0.81	ppm
NITRITE	NO ₂				
AMMONIUM	NH ₄	0	eq/L		ppm
DATE COLLECTED		0577			
BASIN NUMBER		0022			
SAMPLE NUMBER		1			

Field Cl using
9 mm tabs = 552 ppm
lab Cl.

Field cond.
= 2700 μmhos
lab cond.
Field pH = 8.4
lab pH

Field data taken on 5/21/77 at 9:20 a.m. by Ron Forrest.



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LABORATORY NO. 0284-77
DATE OF REPORT May 31, 1977
DATE RECEIVED May 25, 1977

82-33 Depth 5600'

SPECIES		VALUE FOUND		VALUE FOUND	
CALCIUM	Ca	34-5	eq/L	6.9	ppm
MAGNESIUM	Mg	12-5	eq/L	1.4	ppm
SODIUM	Na	40-4	eq/L	93.	ppm
POTASSIUM	K	87-5	eq/L	34.	ppm
CARBONATE	CO ₃	15-4	eq/L	94.4	ppm
BICARBONATE	HCO ₃				
SULFATE	SO ₄	14-4	eq/L	66.3	ppm
CHLORIDE	Cl	26-4	eq/L	91.	ppm
SILICA	SiO ₂	62-5	moles/L	37	ppm
TEMPERATURE		074	°C		
CONDUCTIVITY @ 25°C		63-5	μmhos/cm	627.	
pH		082		8.16	
BORON	B	40-6	moles/L	0.43	ppm
LITHIUM	Li	19-6	eq/L	0.13	ppm
NITRATE	NO ₃	14-6	eq/L	0.86	ppm
NITRITE	NO ₂				
AMMONIUM	NH ₄	0	eq/L		ppm
DATE COLLECTED		0577			
BASIN NUMBER		0022			
SAMPLE NUMBER		2A			

Field cl. using
quant-tabs = 1024
Lab Cl.

Field cond. =
780 μmhos
Lab cond.
Field pH = 7.5
Lab pH

Field data taken on 5/21/77 at 11:35 a.m. by Rev Forrest.



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LABORATORY NO. 0284-77
DATE OF REPORT May 31, 1977
DATE RECEIVED May 25, 1977

82-33

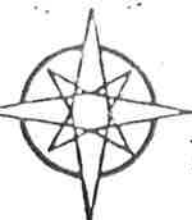
Depth 5600'

SPECIES		VALUE FOUND		VALUE FOUND	
CALCIUM	Ca	35-5	eq/L	7.0	ppm
MAGNESIUM	Mg	12-5	eq/L	1.4	ppm
SODIUM	Na	33-4	eq/L	75.	ppm
POTASSIUM	K	79-5	eq/L	31.	ppm
CARBONATE	CO ₃	19-4	eq/L	115.	ppm
BICARBONATE	HCO ₃				
SULFATE	SO ₄	14-4	eq/L	67.1	ppm
CHLORIDE	Cl	16-4	eq/L	58.	ppm
SILICA	SiO ₂	52-5	moles/L	31	ppm
TEMPERATURE		073	°C		
CONDUCTIVITY @ 25°C		55-5	μmhos/cm	549.	
pH		082		8.19	
BORON	B	65-6	moles/L	0.70	ppm
LITHIUM	Li	< 58-7	eq/L	< 0.04	ppm
NITRATE	NO ₃	< 71-7	eq/L	< 0.44	ppm
NITRITE	NO ₂				
AMMONIUM	NH ₄	0	eq/L		ppm
DATE COLLECTED		0577			
BASIN NUMBER		0022			
SAMPLE NUMBER		2 B			

Field Cl. using
quantab = 78 ppm
← Lab Cl.

Field cond.
= 710 μmhos
← Lab Cond.
Field pH = 7.4
← Lab pH

Field data taken on 5/21/77 at 12:00 p.m. by Ron Forrest



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LABORATORY NO. 0272-77
DATE OF REPORT May 23, 1977
DATE RECEIVED May 17, 1977

~~and depth 5750'~~
Rosenfeld Field, well 82-33 depth water 2160' A+S

SPECIES		VALUE FOUND		VALUE FOUND
CALCIUM	Ca	60-5	eq/L	12. ppm
MAGNESIUM	Mg	40-5	eq/L	4.8 ppm
SODIUM	Na	31-4	eq/L	72. ppm
POTASSIUM	K	74-5	eq/L	29. ppm
CARBONATE	CO ₃ }	22-4	eq/L	132. ppm
BICARBONATE	HCO ₃ }			
SULFATE	SO ₄	12-4	eq/L	58.0 ppm
CHLORIDE	Cl	15-4	eq/L	52. ppm
SILICA	SiO ₂	0	moles/L	ppm
TEMPERATURE		0	°C	
CONDUCTIVITY @ 25°C		50-5	μmhos/cm	499.
pH		0.78		7.83
BORON	B	40-6	moles/L	0.43 ppm
LITHIUM	Li	< 58-7	eq/L	< 0.04 ppm
NITRATE	NO ₃ }	54-6	eq/L	3.34 ppm
NITRITE	NO ₂ }			
AMMONIUM	NH ₄	0	eq/L	ppm
DATE COLLECTED		0577		
BASIN NUMBER		0022		
SAMPLE NUMBER		45504		



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LABORATORY NO. 0665-77
DATE OF REPORT January 23, 1978
DATE RECEIVED December 20, 1977

Roosevelt 82-33 11:00am Injection line 46

FLUORIDE F 23-5 eq/L 4.4 ppm

SPECIES		VALUE FOUND		VALUE FOUND	
CALCIUM	Ca	34-5	eq/L	6.9	ppm
MAGNESIUM	Mg	<82-6	eq/L	<1.0	ppm
SODIUM	Na	80-3	eq/L	1850.	ppm
POTASSIUM	K	12-3	eq/L	450.	ppm
CARBONATE	CO ₃	27-4	eq/L	164.	ppm
BICARBONATE	HCO ₃				
SULFATE	SO ₄	81-5	eq/L	39.	ppm
CHLORIDE	Cl	87-3	eq/L	3100.	ppm
SILICA	SiO ₂	11-3 57-5 $\times 10^{-3}$	moles/L	34 $\times 10^{-3} = 680$	ppm
TEMPERATURE		046	°C		
CONDUCTIVITY @ 25°C		92-4	µmhos/cm	9220. 11700.	(1:100)
pH		058		5.80	
BORON	B	26-4	moles/L	28.	ppm
LITHIUM	Li	16-4	eq/L	11.	ppm
NITRATE	NO ₃	<71-7	eq/L	<0.44	ppm
NITRITE	NO ₂				
AMMONIUM	NH ₄	0	eq/L		ppm
DATE COLLECTED		12 77			
BASIN NUMBER		0022			
SAMPLE NUMBER		45913			

*diluted brown bottle

12-15-77 (Lenzer) - filtered 250 ml, alkalinity, acidified, silica dilution



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LABORATORY NO.
DATE OF REPORT
DATE RECEIVED

0587-77
December 27, 1977
November 29, 1977

Well 82-33 flowline 335.5°F

SPECIES		VALUE FOUND		VALUE FOUND	
CALCIUM	Ca	39-5	eq/L	7.9	ppm
MAGNESIUM	Mg	<82-6	eq/L	<1.0	ppm
SODIUM	Na	91-3	eq/L	2100.	ppm
POTASSIUM	K	12-3	eq/L	460.	ppm
CARBONATE	CO ₃	29-4	eq/L	176.	ppm
BICARBONATE	HCO ₃				
SULFATE	SO ₄	15-4	eq/L	72.	ppm
CHLORIDE	Cl	99-3	eq/L	3500.	ppm
SILICA	SiO ₂	20 x 58-5-123 moles/L		35	ppm
TEMPERATURE		051 °C			
CONDUCTIVITY @ 25°C		10-3 μmhos/cm		10030. 12050. (1:100)	
pH		063		6.26	
BORON	B	23-4	moles/L	25.0	ppm
LITHIUM	Li	16-4	eq/L	10.8	ppm
NITRATE	NO ₃	<71-7	eq/L	<0.44	ppm
NITRITE	NO ₂				
AMMONIUM	NH ₄	0	eq/L		ppm
DATE COLLECTED		1177			
BASIN NUMBER		0022			
SAMPLE NUMBER		45898			

*11-17-77 (Lenzer) - Uran filtered SiO₂ dilution, 250 ml unfiltered,
250 ml filtered + acidified, 250 ml filtered.*



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LABORATORY NO. 0272-77
DATE OF REPORT May 23, 1977
DATE RECEIVED May 17, 1977

~~and depth 5700'~~
Roosevelt Field, well 82-33 depth water 2160' A+S

SPECIES	VALUE FOUND	VALUE FOUND
CALCIUM Ca	60-5 eq/L	12. ppm
MAGNESIUM Mg	40-5 eq/L	4.8 ppm
SODIUM Na	31-4 eq/L	72. ppm
POTASSIUM K	74-5 eq/L	29. ppm
CARBONATE CO ₃ } BICARBONATE HCO ₃ }	22-4 eq/L	132. ppm
SULFATE SO ₄	12-4 eq/L	58.0 ppm
CHLORIDE Cl	15-4 eq/L	52. ppm
SILICA SiO ₂	0 moles/L	ppm
TEMPERATURE	0 °C	
CONDUCTIVITY @ 25°C	50-54 mhos/cm	499.
pH	0.78	7.83
BORON B	40-6 moles/L	0.43 ppm
LITHIUM Li	< 58-7 eq/L	< 0.04 ppm
NITRATE NO ₃ } NITRITE NO ₂ }	54-6 eq/L	3.34 ppm
AMMONIUM NH ₄	0 eq/L	ppm
DATE COLLECTED	0577	
BASIN NUMBER	0022	
SAMPLE NUMBER	45504	

303 - 740-7447



LEGAL DIVISION - Minerals Group
Englewood, Colorado

INTER-OFFICE CORRESPONDENCE / SUBJECT:

Indemnification Clauses Phillips
Petroleum Company ("Phillips")
and Ex Log/Smith ("Ex Log")

March 25, 1982

Doug Lenzer
Geothermal

As we discussed yesterday, paragraph 8 of Phillips' "Terms and Conditions" and the last three sentences of paragraph 3 of "General Terms" are contradictory with respect to indemnification and defense in the event of negligence. You indicated you do not object to the first three sentences of the Ex Log paragraph relating to use of drilling logs or interpretations, and these sentences are not affected by the following.

A simple resolution is to cross out the contradictory language in both forms and to have the deletions initialed on behalf of Phillips and Ex Log. These deletions will simply leave the potential liability of Phillips and Ex Log to applicable law.

A second resolution is to make the deletions described in the preceding paragraph and to add the following (on a separate sheet of paper if necessary):

Ex Log/Smith and Phillips each agree to indemnify and hold harmless the other from any claim, liability, damages and causes of action of, to or by any person or persons, including without limitation the subcontractors employees of subcontractors or employees of each party hereto, for injury or death of any persons and for damage or destruction of any property belonging to third persons or to the other party hereto, directly or indirectly connected with the performance of any work provided for herein and each will defend at its own expense any claim or litigation in connection herewith.

The above states the generally applicable rule of law for negligence and does not really add anything to the contract, but may clarify the parties' intent that each will assume the risk of its own negligence.

Either of the above is acceptable, or Phillips' standard language can be used, but Paragraph 3 of Ex Log's General Terms (except for the first three sentences) is not acceptable. The deletion of "at your sole cost, risk and expense" by Ex Log in the first sentence on the face of the contract, is not acceptable. Ex Log cannot avoid assuming the risk of performing its contract, which apparently is the purpose of the deletion.

Please call if you have any questions or if you need me to talk with Ex Log's counsel.

SUSAN L. EDWARDS

SLE/ob

Sent from Denver on 3/25/82 @ 10:30 a.m.
Received by Jean Moore



PHILLIPS PETROLEUM COMPANY

SALT LAKE CITY, UTAH 84107
655 EAST 4500 SOUTH PHONE: 801 263-3129

MINERALS GROUP
Geothermal and
Strategic Minerals Division

March 25, 1982

Re: Work contract between Phillips
and Exlog Smith
Roosevelt Hot Springs Unit 27-3 well

Robert Smith
Exlog Smith Geothermal Division
3740 Industry Ave. #303
Lakewood, California 90712

Dear Bob:

There are serious problems with the work contract as modified between Phillips and Exlog Smith. Our Legal Department has examined the changes made by Exlog's attorney and finds several of the changes unacceptable from Phillips' point of view.

The deletion of "at your sole cost, risk and expense" by Exlog in the first sentence on the face of the contract is not acceptable to Phillips.

Paragraph 8 of Phillips' "Terms and Conditions" and the last four sentences of paragraph 3 of "General Terms" Exhibit "B" are contradictory with respect to indemnification and defense in the event of negligence. Paragraph 3 of Exlog's "General Terms" Exhibit "B" (except for the first three sentences) is not acceptable to Phillips.

Phillips has prepared a new contract containing all the agreed changes and proposes the following with respect to the objections listed above:

1. That the first sentence on the face of the contract stand as written without modification.
2. That the conflict over indemnity and release be resolved by each side agreeing to indemnify and hold harmless the other party. I wish to point out that this compromise position is a major change for Phillips.

Robert Smith
March 25, 1982
Page two

Language covering indemnity and release acceptable to Phillips has been added as exhibit "E" to the contract attached to this letter.

Two copies of the revised contract, executed by Phillips, have been sent to Sacramento for Exlog approval. I hope the contract as now written is acceptable to Exlog.

Very truly yours,

Richard C. Lenzer
Exploration Director

RCL:sdm
Enclosure



ROOSEVELT
WELL 82-33

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER RIGHTS

DEE C. HANSEN
STATE ENGINEER

JOHN BENE
DEPUTY

442 STATE CAPITOL
SALT LAKE CITY, UTAH 84114

(801) 533-6071

February 10, 1978

DIRECTING ENGINEERS
HAROLD D. DONALDSON
DONALD C. NORSETH
STANLEY GREEN

Phillips Petroleum Company
Natural Resources Group
Energy Minerals Division
Geothermal Operations
Box 752
DEL MAR, CA 92014

Issue Date: February 10, 1978
Expiration Date: August 10, 1978

Attention: Mr. Richard C. Lenzer

RE: Geothermal Well

Dear Mr. Lenzer:

In accordance with your letter of January 30, 1978, you are hereby given permission to re-enter well #82-33 to do whatever is necessary to adapt it for re-injection of waste waters.

Should this fail, you are also permitted to re-drill it at a point North 1262 feet and West 203 feet from the E $\frac{1}{4}$ Corner of Section 33, T26S, R9W.

This is to be done in accordance with the plan which you have submitted to us and which is hereby made a part of that approval. It is intended that this well will be developed only for re-injection purposes.

Please contact this office or Gerald W. Stoker at the area office in Cedar City when drilling is to commence and as required throughout the drilling and testing program.

Yours very truly,

Stanley Green
Directing Appropriations Engineer

SG:lmv
Enclosure
cc: Gerald W. Stoker