Chevron

Chevron U.S.A. Inc.
P. O. Box 5355, Bakersfield, CA 93388

March 4, 1983

RECEIVED
MAR 4 1983
DIVISION OF OIL & GAS
BAKERSFIELD

C. D. Fiddler
Division Manager
Northern California Division
Production Department

KERN RIVER INJECTION
WELL NO. 2-D, CHANAC ZONE

Chanac is
an exempted aquifer

Mr. A. G. Hluza
Division of Oil and Gas
4800 Stockdale Hwy., Suite 417
Bakersfield, CA 93309

Attention: Mr. David Mitchell

Gentlemen:

Chevron U.S.A. Inc. is submitting the attached information in response to your correspondence of January 29, 1983. You requested we supply (1) a statement of hardship resulting from stopping injection into the subject well, and (2) water analyses of the current injection waters.

Eliminating injection at this well could under certain circumstances directly reduce our Kern River oil production by 1,000 barrels per day. It could also reduce or affect the Kern River production activities of Kaplan Oil Company, Star Oil Company, and Santa Fe Energy Company, and our total production. Chevron, West Coast, and Witco Refineries are also somewhat dependent on this well.

All of the above listed companies deliver waste water to the Chevron U.S.A. water plant for treatment and disposal. Normally, our water plant discharges cleaned produced water to the Beardsley Canal. Well No. 2-D is the only backup disposal for this canal discharge. This backup system is necessary at times when there is a plant upset or when a number of steam generators are down. The water plant is also used to treat steam generator feedwaters.

When plant upsets occur, this well is used to supplement water discharges. During these episodes, this well and on-site sumps allow the production and refining activities to proceed usually for a long enough period to restore the plant without adversely affecting any of the users. Without this well, shutdowns would be required of any or all users. These shutdowns would require that oil production be stopped.

As you know, any shutdown of producing wells results in a number of wells sanding up. These in turn require expensive and time-consuming workovers before production can be restored. The cost of such an event is difficult to determine.

A cost more easily determined is that of directly affecting production which could depend on this well. The injection rate of this well is 30,000 B/D. Assuming an average water to oil ratio of 30 to 1, elimination of the well would mean an oil production decrease of 1,000 B/D.

Also included are water analyses of water that would be injected. Analyses were made by both BC Laboratories (Attachment I) and our company laboratory (Attachment II). A water plant flow schematic is included with each set of analyses. Sample points A, B, and C are identified. Point B is the most representative as it is a combined stream of A and C.

As discussed with you, we have been unable to prove actual oil content in Chanac formation waters. Though we do believe the Chanac sand to be lower sand bodies of China Grade production sand. It is our belief that the Chanac sands most likely have some oil content and actually have continuity with China Grade production zones.

A review of DOG literature (see Attachment III) classifies the Chanac as undifferentiated. No known barrier is identified. We believe these zones to actually be the bottom of the China Grade sands.

We appreciate your effort in appealing the proposed ruling. We are continuing our search for data sources to provide support for the appeal. If there is any additional information you need in this matter, please contact Mr. D. O. Culbertson at (805) 393-1312.

Very truly yours,

C. D. FIDDLER

Attachments

ATTACHMENT I

1

CHEMICAL ANALYSIS
PETROLEUM

BC LABORATORIES INC

J. J. EGLIN REG CHEM ENGR
3016 UNION AVE BAKERSFIELD, CALIFORNIA 93305 PHONE 324-1815
MAIN OFFICE 4100 PIERCE ROAD, BAKERSFIELD CA 93308 PHONE 327-4911

Chevron U.S.A., Inc.
P. O. Box 5355
Bakersfield, California 93388

Attention Mr. C. E. Fieber

Date Reported: 2/9/83
Date Received: 2/3/83
Laboratory No.: 1285 to 1290

P. O. #M-609575 PFOD

RECEIVED
MAR 4 1983
DIVISION OF OIL & GAS
BAKERSFIELD

WATER ANALYSES

Sample Description	Oil & Grease, PPM
Kern River Water Reclamation Plant:	
Pt. A 2/2/83 1300 hrs.	38.
Sample Pt. A 2/3/83	45.
Pt. B 2/2/83 1300 hrs	36.
Sample Pt. B 2/3/83	36.
Pt. C 2/2/83 1300 hrs.	26.
Sample Pt. C 2/3/83	23.

B C LABORATORIES, INC.

BY J. J. Eglin
J. J. Eglin

cl

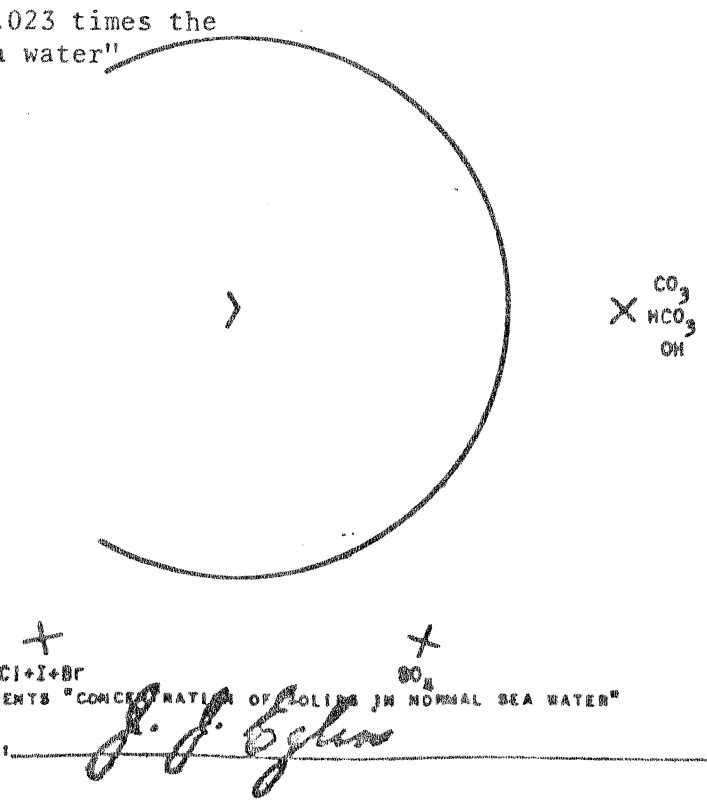
DATE OF REPORT	2/9/83	WELL NO.	Kern River Water Reclamation Plant
DATE OF SAMPLING	2/1/83	COMPANY	Chevron USA
SAMPLED BY		FIELD	
LABORATORY NO.	1291	ZONE	
ANALYST		SAMPLE SOURCE	A

RADICALS		CONCENTRATION MILLIGRAMS PER LITER	REACTING VALUE EQUIVALENTS PER MILLION	REACTING VALUE PERCENT
SODIUM	Na	161.	7.00	36.68
CALCIUM	Ca	34.5	1.73	9.07
MAGNESIUM	Mg	5.4	0.44	2.31
BARIUM	Ba	(-) 1.		
STRONTIUM	Sr			
POTASSIUM	K	13.2	0.34	1.78
Iron	Fe	0.60	0.03	0.16
SULPHATE	SO_4	44.	0.92	4.82
CHLORIDE	Cl	145.5	4.11	21.52
CARBONATE	CO_3	0.		
BICARBONATE	HCO_3	275.5	4.52	23.66
HYDROXIDE	OH			
IODIDE	I			
SILICA	SiO_2	126.		
IRON, ALUMINA	R_2O_3			
TOTAL		806.	19.09	100.0

GROUP	CHEMICAL CHARACTER		MISCELLANEOUS		
ALKALIS	PRIMARY SALINITY	52.68	BORON	1.6	Mg/LB
EARTHS	SECONDARY SALINITY	-	HYDROGEN SULFIDE	less than 0.1 ppm	
STRONG ACIDS	PRIMARY ALKALINITY	24.24	EQUIVALENT SALT	508.	Mg/L NaCl
WEAK ACIDS	SECONDARY ALKALINITY	23.08	RESISTIVITY @ 77°F	11.49	O.M.
Ca/EARTHS			CHLORINITY	240.	Mg/L NaCl
Ca/Mg = 3.93					
CHLORIDE SALINITY	Total	100.0	SPECIFIC GRAVITY	1.000	
SULPHATE SALINITY	CARBONATE/CHLORIDE		pH	6.6	

REMARKS

TICKELL GRAPH %REACTING VALUE



Note: The subject water contains 0.023 times the solids content of "normal sea water"

(-) refers to "less than".

ARC REPRESENTS "CONCENTRATION OF SOLIDS IN NORMAL SEA WATER"

SIGNED: J. J. Eglin

PRO-391 (Rev 7-80)
PRINTED IN U.S.A.

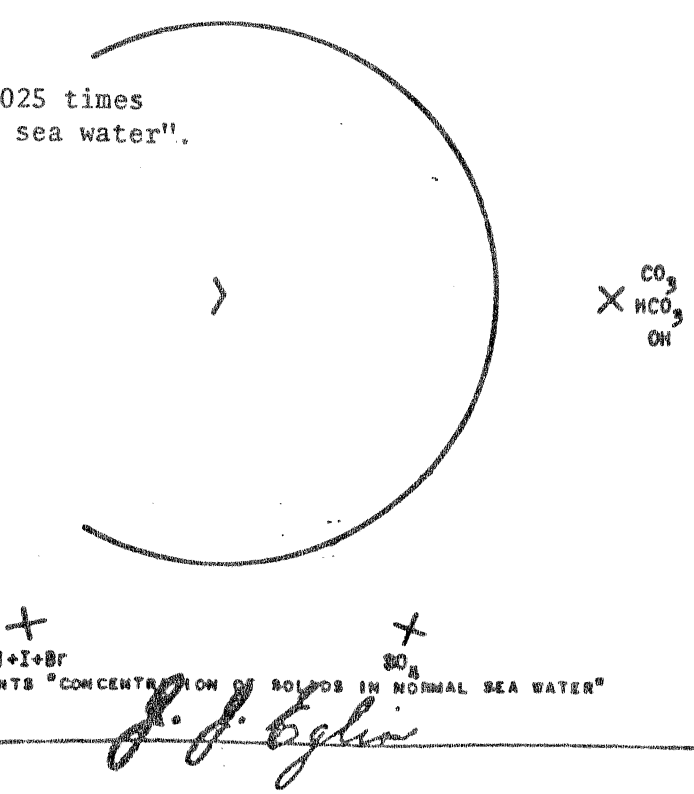
DATE OF REPORT	2/9/83	WELL NO.	Kern River Water Reclamation Plant
DATE OF SAMPLING	2/3/82	COMPANY	Chevron USA
SAMPLED BY		FIELD	
LABORATORY NO.	1293	ZONE	
ANALYST		SAMPLE SOURCE	Sample Point A 1300 hrs.

RADICALS		CONCENTRATION MILLIGRAMS PER LITER	REACTING VALUE EQUIVALENTS PER MILLION	REACTING VALUE PERCENT
SODIUM	Na	192.	8.35	37.71
CALCIUM	Ca	37.	1.85	8.36
MAGNESIUM	Mg	5.9	0.49	2.21
BARIUM	Ba	(-) 1.		
STRONTIUM	Sr			
POTASSIUM	K	13.8	0.35	1.58
Iron	Fe	0.62	0.03	0.14
SULPHATE	SO_4	43.	0.90	4.12
CHLORIDE	Cl	194.4	5.49	25.17
CARBONATE	CO_3	0.		
BICARBONATE	HCO_3	275.5	4.52	20.71
HYDROXIDE	OH			
IODIDE	I			
SILICA	SiO_2	126.		
IRON, ALUMINA	R_2O_3			
TOTAL		888.	21.98	100.

GROUP	CHEMICAL CHARACTER		MISCELLANEOUS		
ALKALIS	PRIMARY SALINITY	58.58	BORON	1.5	Mg/LB
EARTHS	SECONDARY SALINITY	-	HYDROGEN SULFIDE	less than 0.1 ppm	
STRONG ACIDS	PRIMARY ALKALINITY	20.00	EQUIVALENT SALT	607	Mg/L NaCl
WEAK ACIDS	SECONDARY ALKALINITY	21.42	RESISTIVITY @ 77°F	9.62	O.M.
Ca/EARTHS Ca/Mg = 3.78			CHLORINITY	321.	Mg/L NaCl
CHLORIDE SALINITY	Totals	100.0	SPECIFIC GRAVITY	1.000	
SULPHATE SALINITY	CARBONATE/CHLORIDE		pH	6.7	

REMARKS

TICKELL GRAPH
% REACTING VALUE



Note: The subject water contains 0.025 times the solids content of "normal sea water".

(-) refers to "less than".

ARC REPRESENTS "CONCENTRATION OF SOLIDS IN NORMAL SEA WATER"

SIGNED: J. J. Eglin

Pro-391 (Rev. 7-80)
Printed in U.S.A.

CHEMICAL ANALYSIS OF WATER 110-371

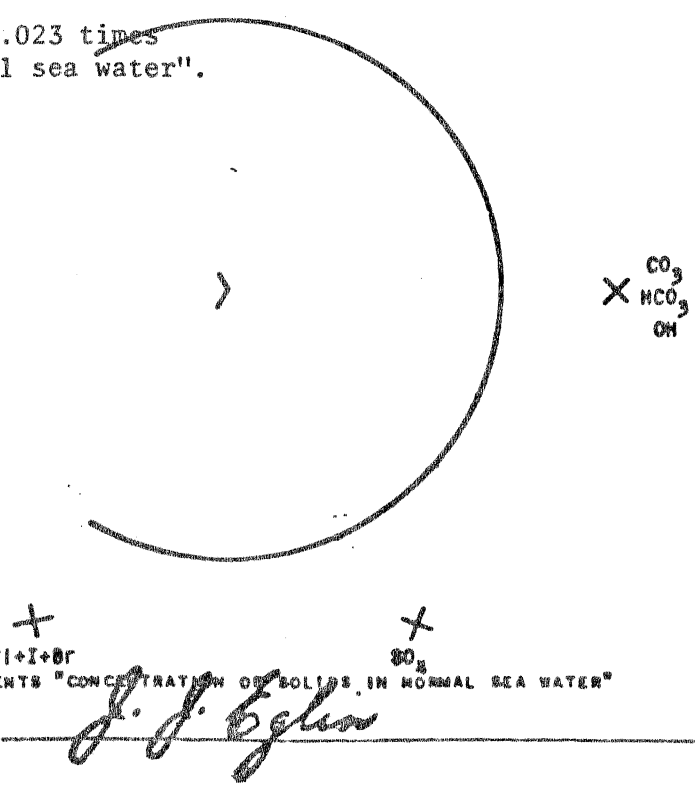
DATE OF REPORT	2/9/83	WELL NO.	Kern River Water Reclamation Plant
DATE OF SAMPLING	2/2/83	COMPANY	Chevron U.S.A.
SAMPLED BY		FIELD	
LABORATORY NO.	1292	ZONE	
ANALYST		SAMPLE SOURCE	Sample A 1300 hrs.

RADICALS		CONCENTRATION MILLIGRAMS PER LITER	REACTING VALUE EQUIVALENTS PER MILLION	REACTING VALUE PERCENT
SODIUM	Na	168.	7.30	37.26
CALCIUM	Ca	34.	1.70	8.67
MAGNESIUM	Mg	5.2	0.43	2.19
BARIUM	Ba	(-) 1.0		
STRONTIUM	Sr			
POTASSIUM	K	13.4	0.34	1.73
Iron	Fe	0.63	0.03	0.15
SULPHATE	SO_4	41.	0.85	4.40
CHLORIDE	Cl	148.	4.18	21.64
CARBONATE	CO_3	0.		
BICARBONATE	HCO_3	282.4	4.63	23.96
HYDROXIDE	OH			
IODIDE	I			
SILICA	SiO_2	128.		
IRON, ALUMINA	R_2O_3			
TOTAL		821.	19.46	100.

GROUP	CHEMICAL CHARACTER		MISCELLANEOUS		
ALKALIS	PRIMARY SALINITY	52.08	BORON	1.7	Mg/LS
EARTHS	SECONDARY SALINITY	-	HYDROGEN SULFIDE	less than 0.1 ppm	
STRONG ACIDS	PRIMARY ALKALINITY	25.90	EQUIVALENT SALT	526.	Mg/L NaCl
WEAK ACIDS	SECONDARY ALKALINITY	22.02	RESISTIVITY @ 77°F	11.11	O.M.
Ca/EARTHS			CHLORINITY 244		Mg/L NaCl
Ca/Mg = 3.95	Totals	100.			
CHLORIDE SALINITY			SPECIFIC GRAVITY	1.000	
SULPHATE SALINITY	CARBONATE/CHLORIDE		pH 6.7		

REMARKS

TICKELL GRAPH — REACTING VALUE



Note: The subject water contains 0.023 times the solids content of "normal sea water".

(-) refers to "less than".

ARC REPRESENTS "CONCENTRATION OF SOLIDS IN NORMAL SEA WATER"

SIGNED: J. J. Eglin

Pro-391 (Rev 7-80)
Printed in U.S.A.

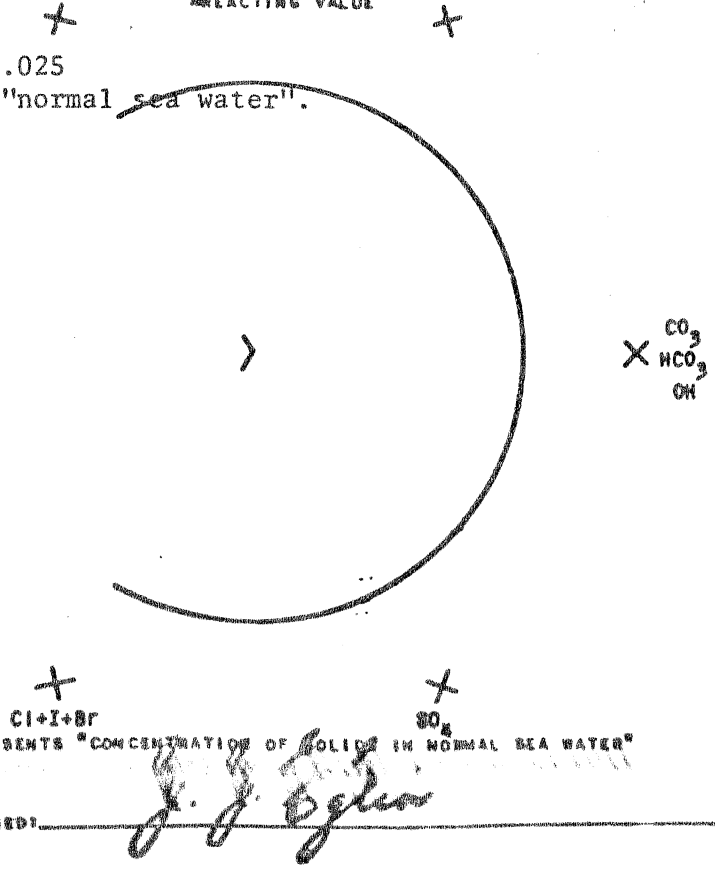
DATE OF REPORT	2/10/83	WELL NO.	Kern River Water Reclamation Plant
DATE OF SAMPLING	2/3/83	COMPANY	Chevron USA
SAMPLED BY		FIELD	
LABORATORY NO.	1296	ZONE	
ANALYST		SAMPLE SOURCE	Sample Point B 1300 hrs.

RADICALS		CONCENTRATION MILLIGRAMS PER LITER	REACTING VALUE EQUIVALENTS PER MILLION	REACTING VALUE PERCENT
SODIUM	Na	182.	7.91	37.36
CALCIUM	Ca	37.	1.85	8.73
MAGNESIUM	Mg	5.5	0.45	2.12
BARIUM	Ba	(-) 1.0		
STRONTIUM	Sr			
POTASSIUM	K	13.6	0.35	1.65
Iron	FE	0.62	0.03	0.14
SULPHATE	SO_4	43.	0.90	4.24
CHLORIDE	Cl	187.3	5.29	24.90
CARBONATE	CO_3	0.		
BICARBONATE	HCO_3	270.3	4.43	20.86
HYDROXIDE	OH			
IODIDE	I			
SILICA	SiO_2	126.		
IRON, ALUMINA	R_2O_3			
TOTAL		865.	21.21	100.

GROUP	CHEMICAL CHARACTER		MISCELLANEOUS		
ALKALIS	PRIMARY SALINITY	58.28	BORON	1.4	Mg/LB
EARTHS	SECONDARY SALINITY	-	HYDROGEN SULFIDE	(-) 0.1	ppm
STRONG ACIDS	PRIMARY ALKALINITY	19.74	EQUIVALENT SALT	590.	Mg/L NaCl
WEAK ACIDS	SECONDARY ALKALINITY	21.98	RESISTIVITY @ 77°F	9.90	O.M.
Ca/EARTHS			CHLORINITY	309.	Mg/L NaCl
Ca/Mg = 4.11		Totals 100.0			
CHLORIDE SALINITY			SPECIFIC GRAVITY	1.000	
SULPHATE SALINITY	CARBONATE/CHLORIDE		pH	6.7	

REMARKS

TICKELL GRAPH
% REACTING VALUE



Note: The subject water contains 0.025 times the solids content of "normal sea water".

(-) refers to "less than".

ARC REPRESENTS "CONCENTRATION OF SOLIDS IN NORMAL SEA WATER"

SIGNED: J. J. Eglin

Pac. 331 (Rev. 7-60)
Printed in U.S.A.

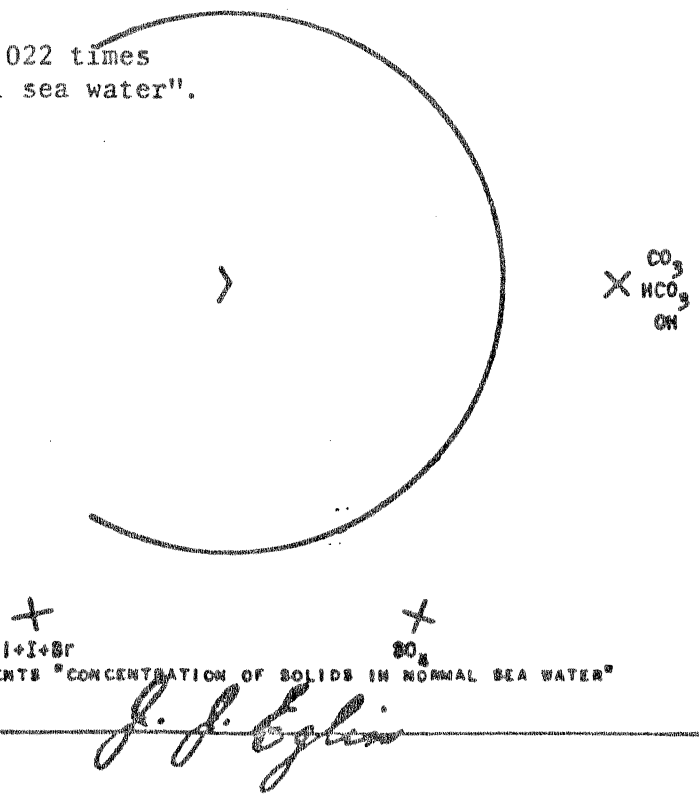
DATE OF REPORT	2/10/83	WELL NO.	Kern River Water Reclamation Plant
DATE OF SAMPLING	2/2/83	COMPANY	Chevron USA
SAMPLED BY		FIELD	
LABORATORY NO.	1295	ZONE	
ANALYST		SAMPLE SOURCE	Sample Point B 1300 hrs.

RADICALS		CONCENTRATION MILLIGRAMS PER LITER	REACTING VALUE EQUIVALENTS PER MILLION	REACTING VALUE PERCENT
SODIUM	Na	157.	6.83	37.08
CALCIUM	Ca	33.5	1.68	9.12
MAGNESIUM	Mg	4.	0.33	1.79
BARIUM	Ba	(-) 1.0		
STRONTIUM	Sr			
POTASSIUM	K	13.3	0.34	1.85
Iron	Fe	0.53	0.03	0.16
SULPHATE	SO_4	46.	0.96	5.19
CHLORIDE	Cl	147.3	4.16	22.52
CARBONATE	CO_3	0.		
BICARBONATE	HCO_3	251.2	4.12	22.29
HYDROXIDE	OH			
IODIDE	I			
SILICA	SiO_2	130.		
IRON, ALUMINA	R_2O_3			
TOTAL		783.	18.45	100.

GROUP	CHEMICAL CHARACTER		MISCELLANEOUS		
ALKALIS	PRIMARY SALINITY	55.42	BORON	1.7	Mg/LB
EARTHS	SECONDARY SALINITY	-	HYDROGEN SULFIDE	less than 0.1 ppm	
STRONG ACIDS	PRIMARY ALKALINITY	22.44	EQUIVALENT SALT	520.	Mg/L NaCl
WEAK ACIDS	SECONDARY ALKALINITY	22.14	RESISTIVITY @ 77°F	11.24	O.M.
Ca/EARTHS			CHLORINITY	243.	Mg/L NaCl
Ca/Mg = 5.09	Totals	100.			
CHLORIDE SALINITY			SPECIFIC GRAVITY	1.000	
SULPHATE SALINITY	CARBONATE/CHLORIDE		pH	6.8	

REMARKS

TICKELL GRAPH
% REACTING VALUE



Note: The subject water contains 0.022 times the solids content of "normal sea water".

(-) refers to "less than".

ARC REPRESENTS "CONCENTRATION OF SOLIDS IN NORMAL SEA WATER"

SIGNED: J. J. Eglin

Pro-391 (Rev 7-80)
Printed in U.S.A.

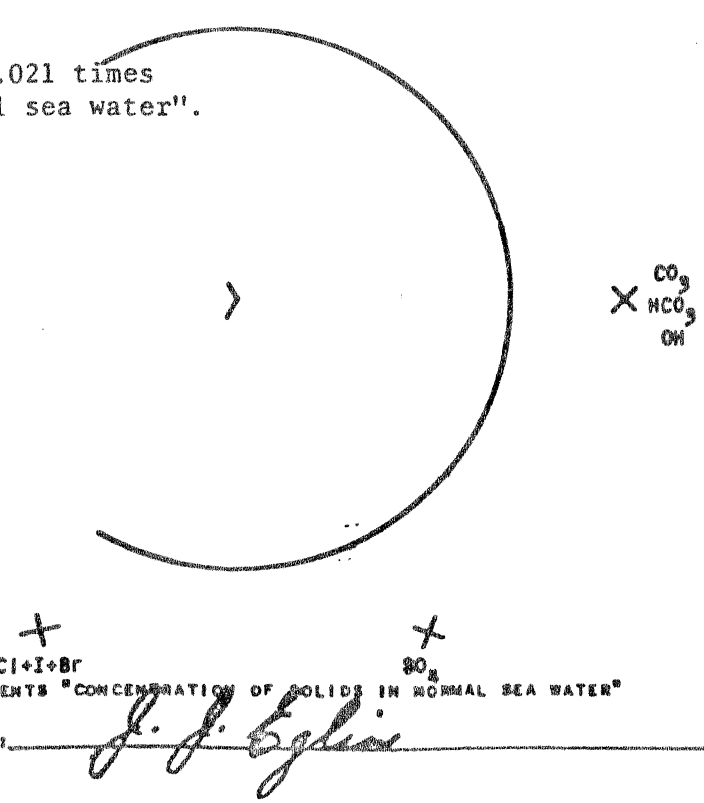
DATE OF REPORT	2/10/83	WELL NO.	Kern River Water Reclamation Plant
DATE OF SAMPLING		COMPANY	Chevron USA
SAMPLED BY	2/1/83	FIELD	
LABORATORY NO.	1294	ZONE	
ANALYST		SAMPLE SOURCE	B

RADICALS		CONCENTRATION MILLIGRAMS PER LITER	REACTING VALUE EQUIVALENTS PER MILLION	REACTING VALUE PERCENT
SODIUM	Na	152.	6.61	37.42
CALCIUM	Ca	31.5	1.58	8.95
MAGNESIUM	Mg	3.4	0.28	1.59
BARIUM	Ba	(-) 1.0		
STRONTIUM	Sr			
POTASSIUM	K	13.	0.33	1.87
Iron	Fe	0.52	0.03	0.17
SULPHATE	SO_4	45.	0.94	5.31
CHLORIDE	Cl	142.3	4.02	22.71
CARBONATE	CO_3	0.		
BICARBONATE	HCO_3	237.3	3.89	21.98
HYDROXIDE	OH			
IODIDE	I			
SILICA	SiO_2	126.		
IRON, ALUMINA	R_2O_3			
TOTAL		751.	17.68	100.

GROUP	CHEMICAL CHARACTER		MISCELLANEOUS		
ALKALIS	PRIMARY SALINITY	56.04	BORON	1.8	Mg/LB
EARTHS	SECONDARY SALINITY	-	HYDROGEN SULFIDE	less than 0.1	ppm
STRONG ACIDS	PRIMARY ALKALINITY	22.54	EQUIVALENT SALT	496.	Mg/L NaCl
WEAK ACIDS	SECONDARY ALKALINITY	21.42	RESISTIVITY @ 77°F	11.76	O.M.
Ca/EARTHS Ca/Mg = 5.62			CHLORINITY	235.	Mg/L NaCl
CHLORIDE SALINITY	Total	100.0	SPECIFIC GRAVITY	1.000	
SULPHATE SALINITY	CARBONATE/CHLORIDE		pH	6.7	

REMARKS

TICKELL GRAPH % REACTING VALUE



Note: The subject water contains 0.021 times the solids content of "normal sea water".

(-) refers to "less than".

ARC REPRESENTS "CONCENTRATION OF SOLIDS IN NORMAL SEA WATER"

SIGNED: J. J. Eglin

PRO-391 (Rev 7-80)
PRINTED IN U.S.A.

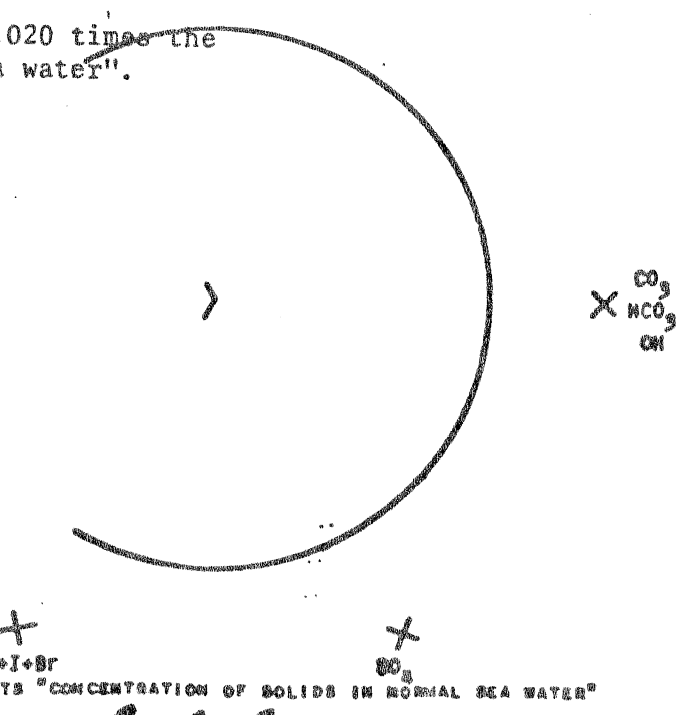
DATE OF REPORT	2/10/83	WELL NO.	Kern River Water Reclamation Plan
DATE OF SAMPLING	2/1/83	COMPANY	Chevron USA
SAMPLED BY		FIELD	
LABORATORY NO.	1297	ZONE	
ANALYST		SAMPLE SOURCE	C

RADICALS		CONCENTRATION MILLIGRAMS PER LITER	REACTING VALUE EQUIVALENTS PER MILLION	REACTING VALUE PERCENT
SODIUM	Na	140.	6.09	36.86
CALCIUM	Ca	32.5	1.63	9.87
MAGNESIUM	Mg	2.5	0.21	1.27
BARIUM	Ba	(-) 1.0		
STRONTIUM	Sr			
POTASSIUM	K	12.5	0.32	1.94
Iron	Fe	0.23	0.01	0.06
SULPHATE	SO_4	45.	0.94	5.72
CHLORIDE	Cl	135.9	3.84	23.36
CARBONATE	CO_3	0.		
BICARBONATE	HCO_3	209.6	3.44	20.92
HYDROXIDE	OH			
IODIDE	I			
SILICA	SiO_2	121.		
IRON, ALUMINA	R_2O_3			
TOTAL		699.	16.48	100.

GROUP	CHEMICAL CHARACTER		MISCELLANEOUS		
ALKALIS	PRIMARY SALINITY	58.16	BORON	1.9	Mg/LB
EARTHS	SECONDARY SALINITY	-	HYDROGEN SULFIDE	(-) 0.1	ppm
STRONG ACIDS	PRIMARY ALKALINITY	19.44	EQUIVALENT SALT	467.	Mg/L NaCl
WEAK ACIDS	SECONDARY ALKALINITY	22.40	RESISTIVITY @ 77°F	12.50	O.M.
Ca/EARTHS Ca/Mg = 7.76			CHLORINITY	224.	Mg/L NaCl
CHLORIDE SALINITY	Totals	100.0	SPECIFIC GRAVITY	1.000	
SULPHATE SALINITY	CARBONATE/CHLORIDE		pH	6.6	

REMARKS

TICKELL GRAPH % REACTING VALUE



Note: The subject water contains 0.020 times the solids content of "normal sea water".

(-) refers to "less than".

ARC REPRESENTS "CONCENTRATION OF SOLIDS IN NORMAL SEA WATER"

SIGNED: J. J. Eglin

PRO-391 (Rev 7-80)
PRINTED IN U.S.A.

GEOCHEMICAL ANALYSIS OF WATER Pro-391

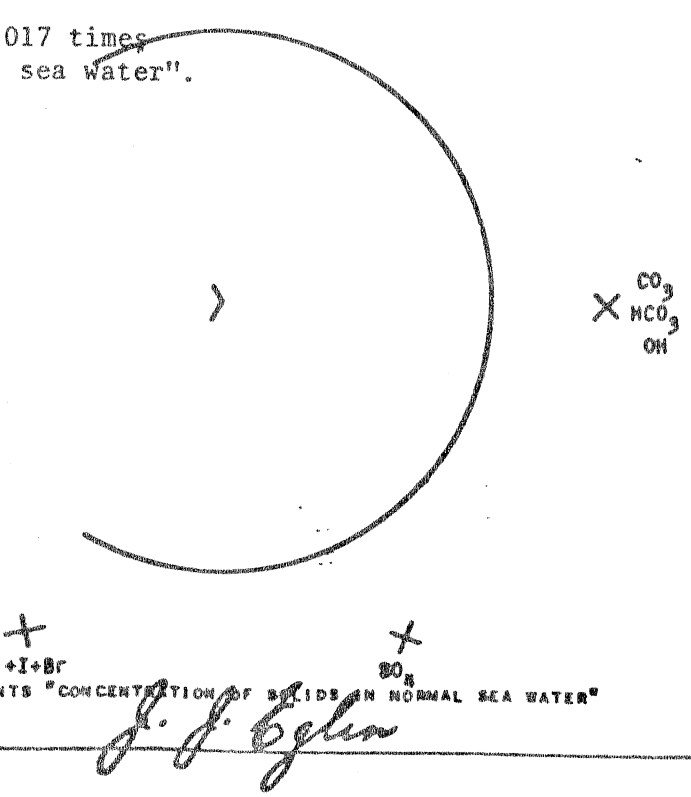
DATE OF REPORT	2/10/83	WELL NO.	Kern River Water Reclamation Plant
DATE OF SAMPLING	2/3/82	COMPANY	Chevron USA
SAMPLED BY		FIELD	
LABORATORY NO.	1299	ZONE	
ANALYST		SAMPLE SOURCE	Sample Point C 1300 hrs.

RADICALS		CONCENTRATION MILLIGRAMS PER LITER	REACTING VALUE EQUIVALENTS PER MILLION	REACTING VALUE PERCENT
SODIUM	Na	142.	6.17	37.21
CALCIUM	Ca	31.5	1.58	9.53
MAGNESIUM	Mg	2.4	0.20	1.21
BARIUM	Ba	(-) 1.0		
STRONTIUM	Sr			
POTASSIUM	K	12.2	0.31	1.87
Iron	Fe	0.47	0.03	0.18
SULPHATE	SO_4	45.	0.94	5.66
CHLORIDE	Cl	139.1	3.93	23.64
CARBONATE	CO_3	0.		
BICARBONATE	HCO_3	209.6	3.44	20.70
HYDROXIDE	OH			
IODIDE	I			
SILICA	SiO_2	123.		
IRON, ALUMINA	R_2O_3			
TOTAL		582.	16.60	100.

GROUP	CHEMICAL CHARACTER		MISCELLANEOUS		
ALKALIS	PRIMARY SALINITY	58.60	BORON	1.8	Mg/LB
EARTHS	SECONDARY SALINITY	-	HYDROGEN SULFIDE	(-) 0.1	ppm
STRONG ACIDS	PRIMARY ALKALINITY	19.56	EQUIVALENT SALT	473.	Mg/L NaCl
WEAK ACIDS	SECONDARY ALKALINITY	21.84	RESISTIVITY @ 77°F	12.35	O.M.
Ca/EARTHS Ca/Mg = 7.90			CHLORINITY	230.	Mg/L NaCl
CHLORIDE SALINITY	Totals	100.0	SPECIFIC GRAVITY	1.000	
SULPHATE SALINITY	CARBONATE/CHLORIDE		pH	6.6	

REMARKS

TICKELL GRAPH % REACTING VALUE



Note: The subject water contains 0.017 times the solids content of "normal sea water".

(-) refers to "less than".

ARC REPRESENTS "CONCENTRATION OF SOLIDS IN NORMAL SEA WATER"

SIGNED: J. J. Eglin

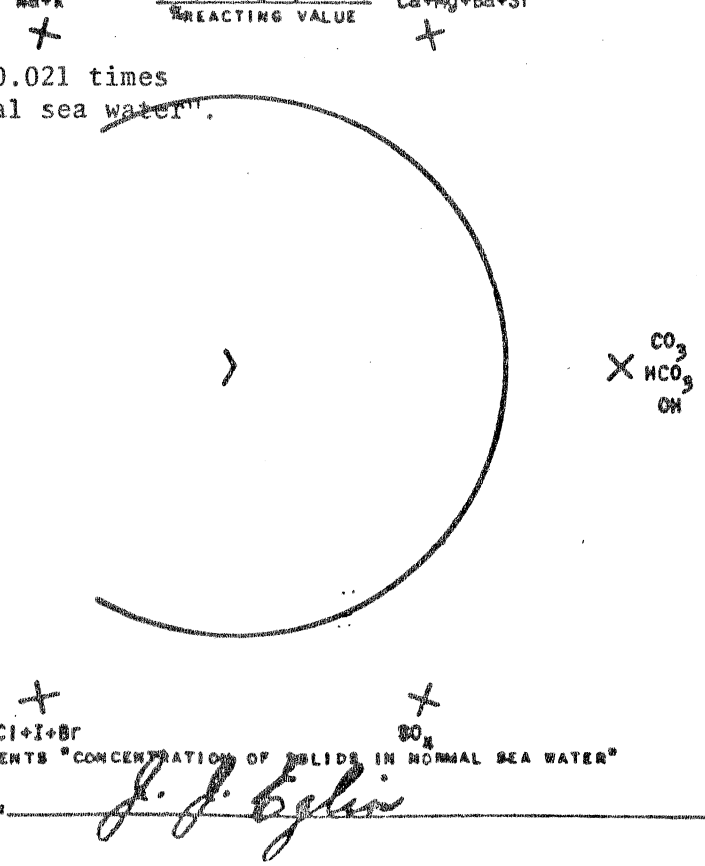
DATE OF REPORT	2/10/83	WELL NO.	Kern River Water Reclamation Plant
DATE OF SAMPLING	2/2/83	COMPANY	Chevron U.S.A.
SAMPLED BY		FIELD	
LABORATORY NO.	1298	ZONE	Sample Point C 1300 hrs.
ANALYST		SAMPLE SOURCE	

RADICALS		CONCENTRATION MILLIGRAMS PER LITER	REACTING VALUE EQUIVALENTS PER MILLION	REACTING VALUE PERCENT
SODIUM	Na	156.	6.78	37.84
CALCIUM	Ca	33.	1.65	9.21
MAGNESIUM	Mg	2.3	0.18	1.00
BARIUM	Ba	(-) 1.0		
STRONTIUM	Sr			
POTASSIUM	K	12.8	0.33	1.84
Iron	Fe	0.43	0.02	0.11
SULPHATE	SO_4	51.	1.06	6.05
CHLORIDE	Cl	148.	4.18	23.86
CARBONATE	CO_3	0.		
BICARBONATE	HCO_3	214.8	3.52	20.09
HYDROXIDE	OH			
IODIDE	I			
SILICA	SiO_2	132.		
IRON, ALUMINA	R_2O_3			
TOTAL		750.	17.72	100.

GROUP	CHEMICAL CHARACTER		MISCELLANEOUS		
ALKALIS	PRIMARY SALINITY	59.82	BORON	1.9	Mg/LB
EARTHS	SECONDARY SALINITY	-	HYDROGEN SULFIDE	(-) 0.1 ppm	
STRONG ACIDS	PRIMARY ALKALINITY	19.54	EQUIVALENT SALT	508.	Mg/L NaCl
WEAK ACIDS	SECONDARY ALKALINITY	20.64	RESISTIVITY @ 77°F	11.49	O.M.
Ca/EARTHS			CHLORINITY	244.	Mg/L NaCl
Ca/Mg = 9.17		Totals 100.			
CHLORIDE SALINITY			SPECIFIC GRAVITY	1.000	
SULPHATE SALINITY	CARBONATE/CHLORIDE		pH	6.6	

REMARKS

TICKELL GRAPH % REACTING VALUE



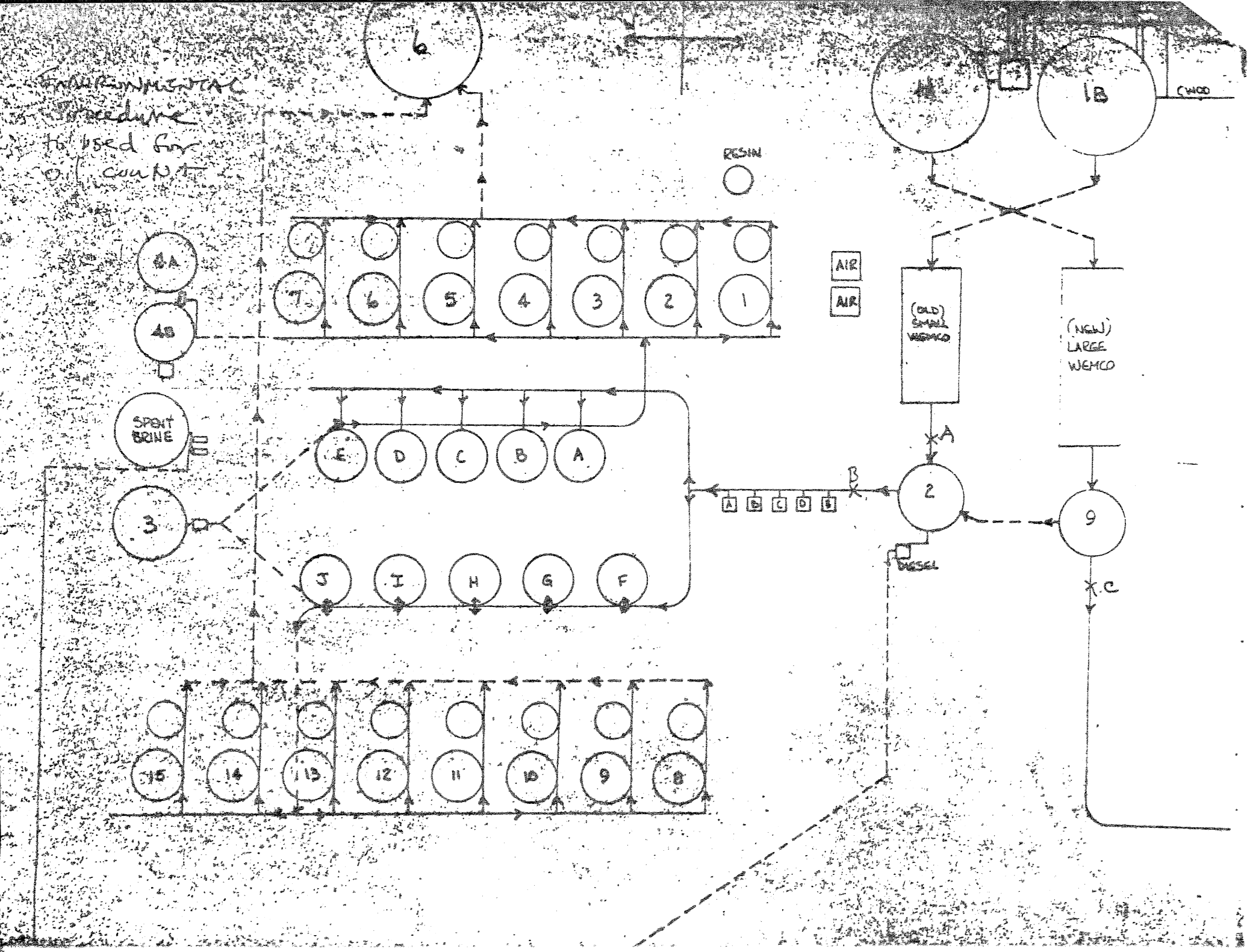
Note: The subject water contains 0.021 times the solids content of "normal sea water".

(-) refers to "less than".

ARC REPRESENTS "CONCENTRATION OF SOLIDS IN NORMAL SEA WATER"

SIGNED: J. J. Eglin

PRO-391 (Rev 7-80)
PRINTED IN U.S.A.


ENVIRONMENTAL
procedure
to be used for
oil count
6
1A
1B
CWOD
RESIN
AIR
AIR
(OLD) SMALL WEMCO
(NEW) LARGE WEMCO
4A
4B
SPENT BRINE
3
7
6
5
4
3
2
1
E
D
C
B
A
J
I
H
G
F
A
B
C
D
E
2
9
DIESEL
A
B
C
15
14
13
12
11
10
9
8

ATTACHMENT II

GEOCHEMICAL ANALYSIS OF WATER Pro-391

DATE OF REPORT	February 10, 1983	WELL NO.	KELP
DATE OF SAMPLING	February 3, 1983	COMPANY	Chevron USA
SAMPLED BY		FIELD	Kern River
LABORATORY NO.	12-83H-30	ZONE	
ANALYST	Shaw	SAMPLE SOURCE	Sample lt. A 1300 hrs.

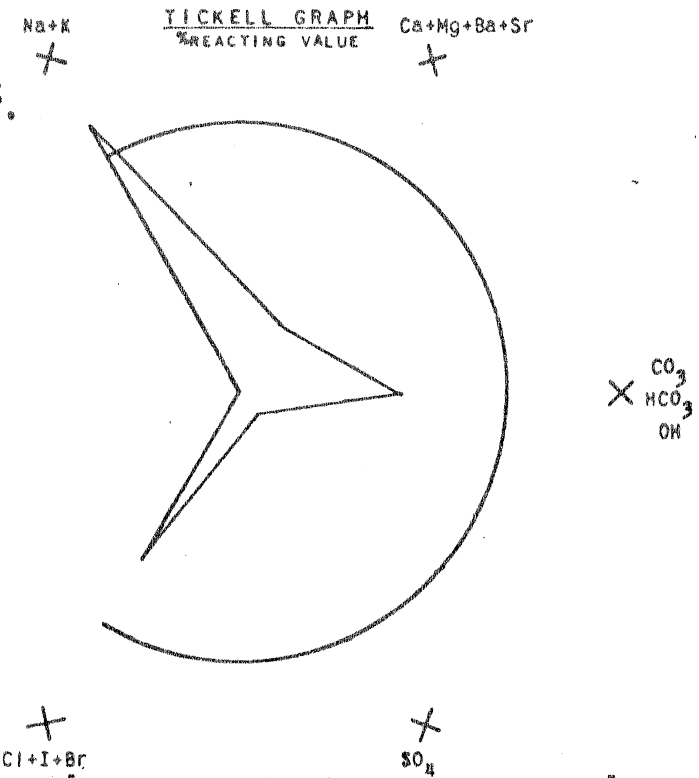
RADICALS		CONCENTRATION MILLIGRAMS PER LITER	REACTING VALUE EQUIVALENTS PER MILLION	REACTING VALUE PERCENT
SODIUM	Na	198.2	8.62	38.45
CALCIUM	Ca	34.7	1.73	7.72
MAGNESIUM	Mg	7.3	0.60	2.67
BARIUM	Ba			
STRONTIUM	Sr			
POTASSIUM	K	10	0.26	1.16
SULPHATE	SO_4	45.6	0.95	4.24
CHLORIDE	Cl	196.1	5.53	24.66
CARBONATE	CO_3	0.0	0.00	0.00
BICARBONATE	HCO_3	289.9	4.73	21.10
HYDROXIDE	OH			
IODIDE	I			
SILICA	SiO_2	118.5		
IRON, ALUMINA	R_2O_3			
TOTAL		899.3	22.42	100.00

GROUP	CHEMICAL CHARACTER	MISCELLANEOUS		
ALKALIS	PRIMARY SALINITY	BORON	0.5	Mg/L8
EARTHS	SECONDARY SALINITY	HYDROGEN SULFIDE	Absent	
STRONG ACIDS	PRIMARY ALKALINITY	EQUIVALENT SALT	550	Mg/L NaCl
WEAK ACIDS	SECONDARY ALKALINITY	RESISTIVITY @ 77°F	8.51	O.M.
Ca/EARTHS		CHLORINITY	323	Mg/L NaCl
CHLORIDE SALINITY		SPECIFIC GRAVITY	1.0014	
SULPHATE SALINITY	CARBONATE/CHLORIDE	pH	7.28	

REMARKS

Total hardness: 116.6mg/L as $CaCO_3$
Conductivity: 1175 uhmos/cm @ 60°F.
Oil Content: 41.8 mg/L oil

TICKELL GRAPH
%REACTING VALUE



ARC REPRESENTS "CONCENTRATION OF SOLIDS IN NORMAL SEA WATER"

E. W. Brubaker
D. L. Johnston
C. E. Fieber
1-C Laboratory

R. H. Yamada

SIGNED: [signature]

PWO-391 (Rev. 7-80)
PRINTED IN U.S.A.

GEOCHEMICAL ANALYSIS OF WATER Pro-391

DATE OF REPORT	February 10, 1983	WELL NO.	KRWP
DATE OF SAMPLING	February 2, 1983	COMPANY	Chevron USA
SAMPLED BY		FIELD	Kern River
LABORATORY NO.	12-83W-27	ZONE	
ANALYST	Shaw	SAMPLE SOURCE	Cripple Jt. A 1300 hrs.

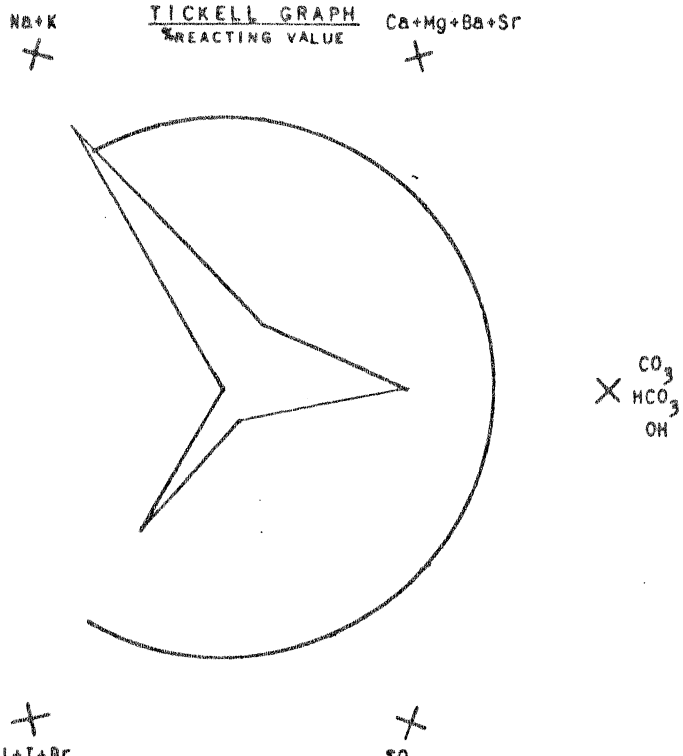
RADICALS		CONCENTRATION MILLIGRAMS PER LITER	REACTING VALUE EQUIVALENTS PER MILLION	REACTING VALUE PERCENT
SODIUM	Na	174.3	7.58	38.09
CALCIUM	Ca	31.1	1.55	7.79
MAGNESIUM	Mg	6.8	0.56	2.81
BARIUM	Ba			
STRONTIUM	Sr			
POTASSIUM	K	10	0.26	1.31
SULPHATE	SO_4	43.2	0.90	4.52
CHLORIDE	Cl	150.0	4.23	21.26
CARBONATE	CO_3	0.0	0.00	0.00
BICARBONATE	HCO_3	294.4	4.82	24.22
HYDROXIDE	OH			
IODIDE	I			
SILICA	SiO_2	129.4		
IRON, ALUMINA	R_2O_3			
TOTAL		839.2	19.90	100.00

GROUP	CHEMICAL CHARACTER	MISCELLANEOUS		
ALKALIS	PRIMARY SALINITY	BORON	1.0	Mg/L
EARTHS	SECONDARY SALINITY	HYDROGEN SULFIDE	Absent	
STRONG ACIDS	PRIMARY ALKALINITY	EQUIVALENT SALT	480	Mg/L NaCl
WEAK ACIDS	SECONDARY ALKALINITY	RESISTIVITY @ 77°F	9.75	O.M.
Ca/EARTHS		CHLORINITY	247	Mg/L NaCl
CHLORIDE SALINITY		SPECIFIC GRAVITY	1.0014	
SULPHATE SALINITY	CARBONATE/CHLORIDE	pH	7.28	

REMARKS

Total hardness: 105.5mg/L as $CaCO_3$
Conductivity: 1026 uhmos/cm @ 60°F.
Oil Content: 47.2 mg/L oil

TICKELL GRAPH
%REACTING VALUE



ARC REPRESENTS "CONCENTRATION OF SOLIDS IN NORMAL SEA WATER"

E. W. Brubaker
D. L. Johnston
C. E. Fieber
1-C Laboratory

Signed R. M. Yamada

Pro-391 (Rev. 7-80)
Printed in U.S.A.

GEOCHEMICAL ANALYSIS OF WATER Pro-391

DATE OF REPORT	February 10, 1983	WELL NO.	KEUP
DATE OF SAMPLING	February 1, 1983	COMPANY	Chevron USA
SAMPLED BY		FIELD	Kern River
LABORATORY NO.	12-831-24	ZONE	
ANALYST	Shaw	SAMPLE SOURCE	Sample Pt. A

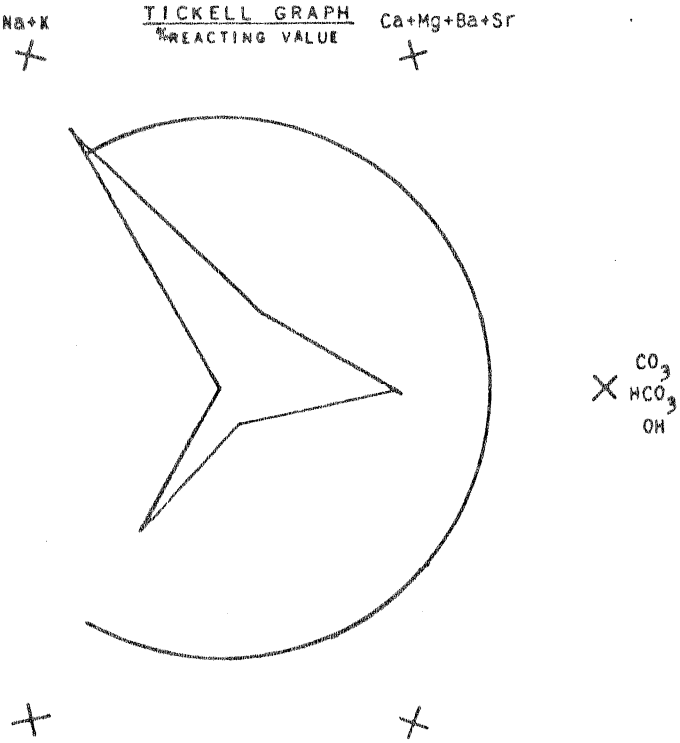
RADICALS		CONCENTRATION MILLIGRAMS PER LITER	REACTING VALUE EQUIVALENTS PER MILLION	REACTING VALUE PERCENT
SODIUM	Na	169.2	7.36	37.78
CALCIUM	Ca	30.1	1.50	7.70
MAGNESIUM	Mg	7.5	0.62	3.18
BARIUM	Ba			
STRONTIUM	Sr			
POTASSIUM	K	10	0.26	1.33
SULPHATE	SO_4	46.0	0.96	4.93
CHLORIDE	Cl	147.5	4.16	21.36
CARBONATE	CO_3	0.0	0.00	0.00
BICARBONATE	HCO_3	282.2	4.62	23.72
HYDROXIDE	OH			
IODIDE	I			
SILICA	SiO_2	118.3		
IRON, ALUMINA	R_2O_3			
TOTAL		810.8	19.48	100.00

GROUP	CHEMICAL CHARACTER	MISCELLANEOUS		
ALKALIS	PRIMARY SALINITY	BORON	0.4	Mg/LB
EARTHS	SECONDARY SALINITY	HYDROGEN SULFIDE	Absent	
STRONG ACIDS	PRIMARY ALKALINITY	EQUIVALENT SALT	465	Mg/L NaCl
WEAK ACIDS	SECONDARY ALKALINITY	RESISTIVITY @ 77°F	10.04	O.M.
Ca/EARTHS		CHLORINITY	243	Mg/L NaCl
CHLORIDE SALINITY		SPECIFIC GRAVITY	1.0010	
SULPHATE SALINITY	CARBONATE/CHLORIDE	pH	7.28	

REMARKS

Total hardness: 106.0 mg/L as $CaCO_3$
Conductivity: 966 uhmos/cm @ 60°F.

TICKELL GRAPH
%REACTING VALUE



ARC REPRESENTS "CONCENTRATION OF SOLIDS IN NORMAL SEA WATER"

E. W. Brubaker
D. L. Johnston
C. E. Fieber
1-C Laboratory

R. L. Yamada

Pro-391 (Rev 7-80)
PRINTED IN U.S.A.

GEOCHEMICAL ANALYSIS OF WATER Pro-391

DATE OF REPORT	February 10, 1983	WELL NO.	KKP
DATE OF SAMPLING	February 1, 1983	COMPANY	Chevron USA
SAMPLED BY		FIELD	Fern River
LABORATORY NO.	12-83X-25	ZONE	
ANALYST	Shaw	SAMPLE SOURCE	Sample Pt. B

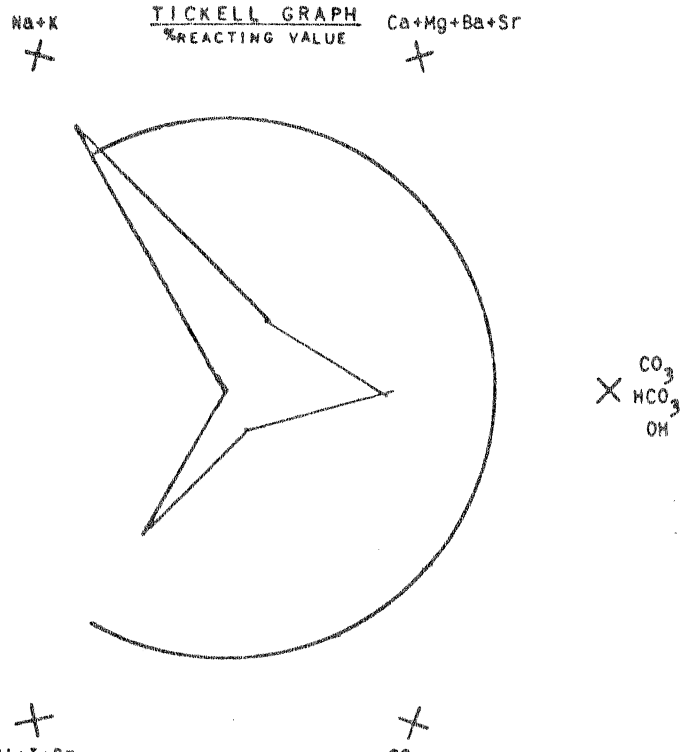
RADICALS		CONCENTRATION MILLIGRAMS PER LITER	REACTING VALUE EQUIVALENTS PER MILLION	REACTING VALUE PERCENT
SODIUM	Na	159.8	6.95	37.98
CALCIUM	Ca	29.2	1.46	7.98
MAGNESIUM	Mg	5.8	0.48	2.62
BARIUM	Ba			
STRONTIUM	Sr			
POTASSIUM	K	10	0.26	1.42
SULPHATE	SO_4	45.3	0.94	5.14
CHLORIDE	Cl	145.7	4.11	22.46
CARBONATE	CO_3	0.0	0.00	0.00
BICARBONATE	HCO_3	250.2	4.10	22.40
HYDROXIDE	OH			
IODIDE	I			
SILICA	SiO_2	112.8		
IRON, ALUMINA	R_2O_3			
TOTAL		758.8	18.30	100.00

GROUP	CHEMICAL CHARACTER	MISCELLANEOUS		
ALKALIS	PRIMARY SALINITY	BORON	0.5	Mg/LB
EARTHS	SECONDARY SALINITY	HYDROGEN SULFIDE	Absent	
STRONG ACIDS	PRIMARY ALKALINITY	EQUIVALENT SALT	445	Mg/L NaCl
WEAK ACIDS	SECONDARY ALKALINITY	RESISTIVITY @ 77°F	10.50	O.M.
Ca/EARTHS		CHLORINITY	240	Mg/L NaCl
CHLORIDE SALINITY		SPECIFIC GRAVITY	1.0012	
SULPHATE SALINITY	CARBONATE/CHLORIDE	pH	7.11	

REMARKS

Total hardness: 96.6 mg/L as $CaCO_3$
Conductivity: 952 uhmos/cm @ 60°F.

TICKELL GRAPH
%REACTING VALUE



ARC REPRESENTS "CONCENTRATION OF SOLIDS IN NORMAL SEA WATER"

E. W. Brubaker
D. L. Johnston
C. E. Fieber
1-C Laboratory

SIGNED: [illegible]

Pro-391 (Rev 7-80)
Printed in U.S.A.

GEOCHEMICAL ANALYSIS OF WATER Pro-391

DATE OF REPORT	February 10, 1983	WELL NO.	KRUP
DATE OF SAMPLING	February 2, 1983	COMPANY	Chevron USA
SAMPLED BY		FIELD	Kern River
LABORATORY NO.	12-83K-28	ZONE	
ANALYST	Shaw	SAMPLE SOURCE	Sample Pt. B 1300 hrs.

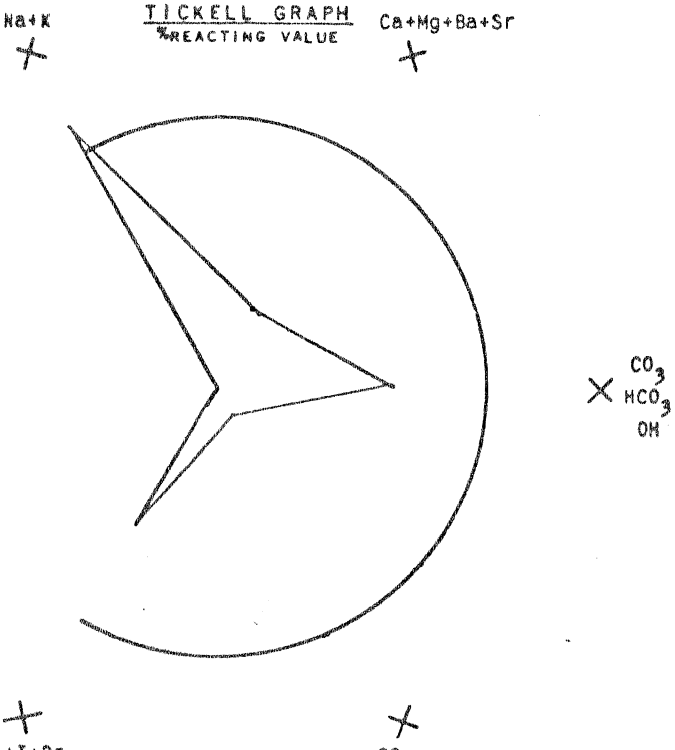
RADICALS		CONCENTRATION MILLIGRAMS PER LITER	REACTING VALUE EQUIVALENTS PER MILLION	REACTING VALUE PERCENT
SODIUM	Na	169.7	7.38	38.32
CALCIUM	Ca	30.6	1.53	7.94
MAGNESIUM	Mg	5.6	0.46	2.39
BARIUM	Ba			
STRONTIUM	Sr			
POTASSIUM	K	10	0.26	1.35
SULPHATE	SO_4	41.4	0.86	4.47
CHLORIDE	Cl	151.7	4.28	22.22
CARBONATE	CO_3	0.0	0.00	0.00
BICARBONATE	HCO_3	273.7	4.49	23.31
HYDROXIDE	OH			
IODIDE	I			
SILICA	SiO_2	121.8		
IRON, ALUMINA	R_2O_3			
TOTAL		804.5	19.26	100.00

GROUP	CHEMICAL CHARACTER	MISCELLANEOUS		
ALKALIS	PRIMARY SALINITY	BORON	1.0	Mg/LB
EARTHS	SECONDARY SALINITY	HYDROGEN SULFIDE	Absent	
STRONG ACIDS	PRIMARY ALKALINITY	EQUIVALENT SALT	450	Mg/L NaCl
WEAK ACIDS	SECONDARY ALKALINITY	RESISTIVITY @ 77°F	10.25	O.M.
Ca/EARTHS		CHLORINITY	250	Mg/L NaCl
CHLORIDE SALINITY		SPECIFIC GRAVITY	1.0014	
SULPHATE SALINITY	CARBONATE/CHLORIDE	pH	7.22	

REMARKS

Total hardness: 99.6 mg/L as $CaCO_3$
Conductivity: 975.6 uhmos/cm @ 60°F.
Oil Content: 43.6 mg/L oil

TICKELL GRAPH
%REACTING VALUE



ARC REPRESENTS "CONCENTRATION OF SOLIDS IN NORMAL SEA WATER"

E. W. Brubaker
D. L. Johnston
C. E. Fieber
1-C Laboratory

SIGNED: [illegible] Yamada

PRO-391 (Rev 7-80)
PRINTED IN U.S.A.

GEOCHEMICAL ANALYSIS OF WATER Pro-391

DATE OF REPORT	February 10, 1983	WELL NO.	KEMP
DATE OF SAMPLING	February 3, 1983	COMPANY	Ch. vo.n USA
SAMPLED BY		FIELD	Kern River
LABORATORY NO.	12-83M-31	ZONE	
ANALYST	Shaw	SAMPLE SOURCE	Sample Pt. B 1300 hrs.

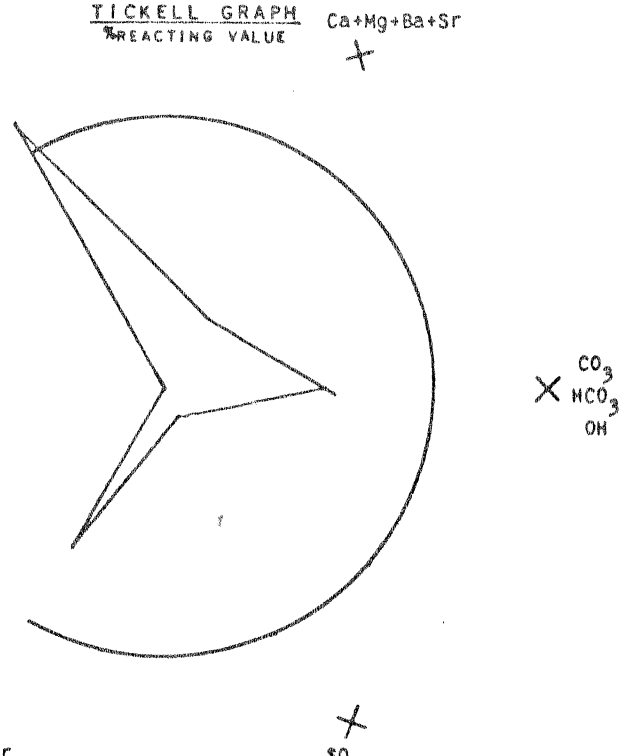
RADICALS		CONCENTRATION MILLIGRAMS PER LITER	REACTING VALUE EQUIVALENTS PER MILLION	REACTING VALUE PERCENT
SODIUM	Na	190.6	8.29	38.38
CALCIUM	Ca	33.9	1.69	7.83
MAGNESIUM	Mg	6.8	0.56	2.59
BARIUM	Ba			
STRONTIUM	Sr			
POTASSIUM	K	10	0.26	1.20
SULPHATE	SO_4	44.4	0.92	4.26
CHLORIDE	Cl	187.9	5.30	24.54
CARBONATE	CO_3	0.0	0.00	0.00
BICARBONATE	HCO_3	279.2	4.58	21.20
HYDROXIDE	OH			
IODIDE	I			
SILICA	SiO_2	116.6		
IRON, ALUMINA	R_2O_3			
TOTAL		869.4	21.60	100.00

GROUP	CHEMICAL CHARACTER	MISCELLANEOUS	
ALKALIS	PRIMARY SALINITY	BORON	0.2 Mg/LB
EARTHS	SECONDARY SALINITY	HYDROGEN SULFIDE	Absent
STRONG ACIDS	PRIMARY ALKALINITY	EQUIVALENT SALT	530 Mg/L NaCl
WEAK ACIDS	SECONDARY ALKALINITY	RESISTIVITY @ 77°F	8.72 O.M.
Ca/EARTHS		CHLORINITY	310 Mg/L NaCl
CHLORIDE SALINITY		SPECIFIC GRAVITY	1.0011
SULPHATE SALINITY	CARBONATE/CHLORIDE	pH	7.21

REMARKS

Total hardness: 112.6 mg/L as $CaCO_3$
Conductivity: 1147 uhmos/cm @ 60°F.
Oil Content: 46.3 mg/L oil

TICKELL GRAPH
%REACTING VALUE



ARC REPRESENTS "CONCENTRATION OF SOLIDS IN NORMAL SEA WATER"

E. W. Brubaker
D. L. Johnston
C. E. Fieber
L-C Laboratory

SIGNED: H. M. Yamada

Pro-391 (Rev 7-80)
PRINTED IN U.S.A.

GEOCHEMICAL ANALYSIS OF WATER Pro-391

DATE OF REPORT	February 10, 1983	WELL NO.	KEIF
DATE OF SAMPLING	February 3, 1983	COMPANY	Chevron USA
SAMPLED BY		FIELD	Kern River
LABORATORY NO.	12-23K-32	ZONE	
ANALYST	Shaw	SAMPLE SOURCE	Sample lt. C 1300 hrs.

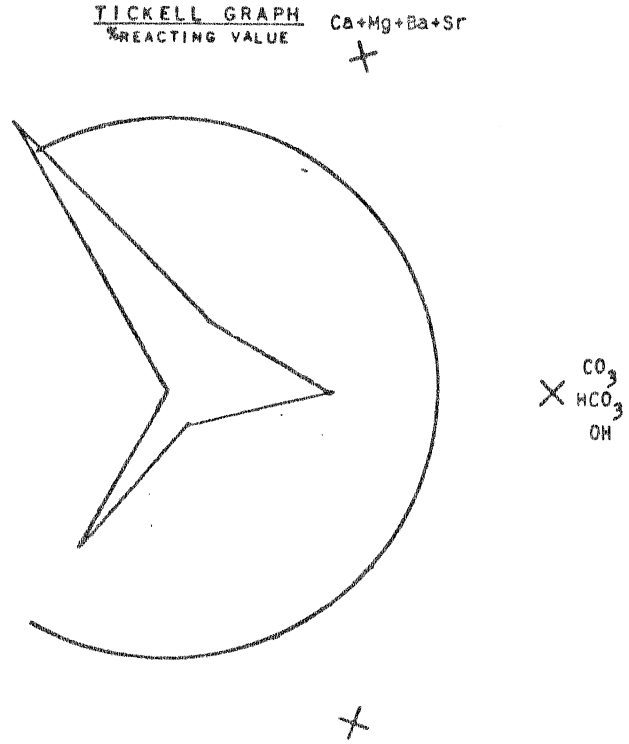
RADICALS		CONCENTRATION MILLIGRAMS PER LITER	REACTING VALUE EQUIVALENTS PER MILLION	REACTING VALUE PERCENT
SODIUM	Na	152.7	6.64	38.52
CALCIUM	Ca	29.2	1.46	8.47
MAGNESIUM	Mg	3.5	0.29	1.68
BARIUM	Ba			
STRONTIUM	Sr			
POTASSIUM	K	9	0.23	1.33
SULPHATE	SO_4	44.3	0.92	5.34
CHLORIDE	Cl	143.9	4.06	23.55
CARBONATE	CO_3	0.0	0.00	0.00
BICARBONATE	HCO_3	222.3	3.64	21.11
HYDROXIDE	OH			
IODIDE	I			
SILICA	SiO_2	115.5		
IRON, ALUMINA	R_2O_3			
TOTAL		720.4	17.24	100.00

GROUP	CHEMICAL CHARACTER	MISCELLANEOUS	
ALKALIS	PRIMARY SALINITY	BORON	1.3 Mg/LB
EARTHS	SECONDARY SALINITY	HYDROGEN SULFIDE	Absent
STRONG ACIDS	PRIMARY ALKALINITY	EQUIVALENT SALT	420 Mg/L NaCl
WEAK ACIDS	SECONDARY ALKALINITY	RESISTIVITY @ 77°F	10.99 O.M.
Ca/EARTHS		CHLORINITY	237 Mg/L NaCl
CHLORIDE SALINITY		SPECIFIC GRAVITY	1.0011
SULPHATE SALINITY	CARBONATE/CHLORIDE	pH	7.05

REMARKS

Total hardness: 87.4 mg/L as $CaCO_3$
Conductivity: 910 uhmos/cm @ 60°F.
Oil Content: 30.9mg/L oil

TICKELL GRAPH
%REACTING VALUE



ARC REPRESENTS "CONCENTRATION OF SOLIDS IN NORMAL SEA WATER"

E. W. Brubaker
D. L. Johnston
C. E. Fieber
1-C Laboratory

Pro-391 (Rev 7-80)
PRINTED IN U.S.A.

APPROVED: R. M. Yamada

GEOCHEMICAL ANALYSIS OF WATER Pro-391

DATE OF REPORT	February 10, 1983	WELL NO.	KRP
DATE OF SAMPLING	February 2, 1983	COMPANY	Chevron USA
SAMPLED BY		FIELD	Kern River
LABORATORY NO.	12-83W-29	ZONE	
ANALYST	Shaw	SAMPLE SOURCE	Sample Pt, C 1300 hrs.

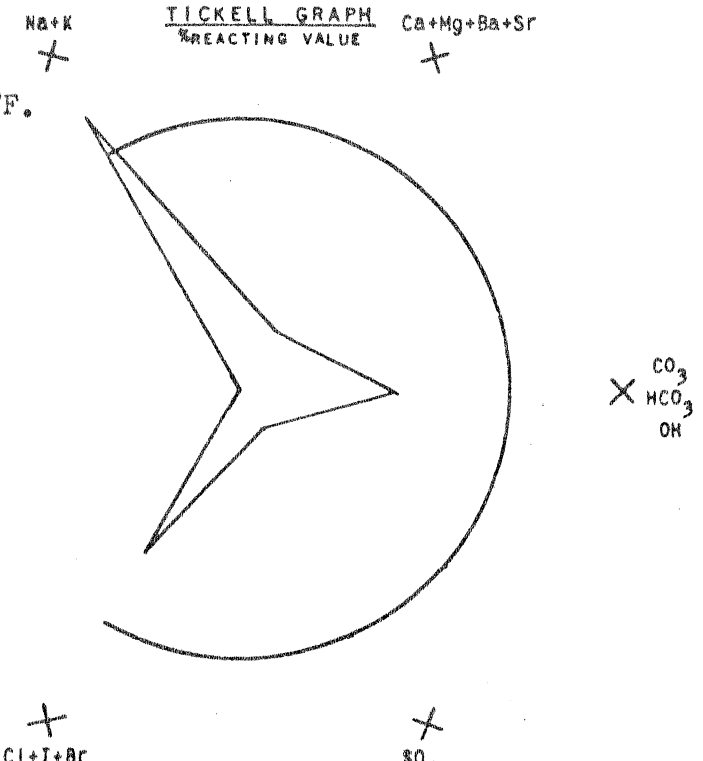
RADICALS		CONCENTRATION MILLIGRAMS PER LITER	REACTING VALUE EQUIVALENTS PER MILLION	REACTING VALUE PERCENT
SODIUM	Na	165.1	7.18	38.85
CALCIUM	Ca	30.0	1.50	8.12
MAGNESIUM	Mg	3.4	0.28	1.52
BARIUM	Ba			
STRONTIUM	Sr			
POTASSIUM	K	11	0.28	1.51
SULPHATE	SO_4	52.6	1.10	5.95
CHLORIDE	Cl	156.0	4.40	23.81
CARBONATE	CO_3	0.0	0.00	0.00
BICARBONATE	HCO_3	228.0	3.74	20.24
HYDROXIDE	OH			
IODIDE	I			
SILICA	SiO_2	121.3		
IRON, ALUMINA	R_2O_3			
TOTAL		767.4	18.48	100.00

GROUP	CHEMICAL CHARACTER	MISCELLANEOUS		
ALKALIS	PRIMARY SALINITY	BORON	1.1	Mg/LB
EARTHS	SECONDARY SALINITY	HYDROGEN SULFIDE	Absent	
STRONG ACIDS	PRIMARY ALKALINITY	EQUIVALENT SALT	450	Mg/L NaCl
WEAK ACIDS	SECONDARY ALKALINITY	RESISTIVITY @ 77°F	10.29	O.M.
Ca/EARTHS		CHLORINITY	257	Mg/L NaCl
CHLORIDE SALINITY		SPECIFIC GRAVITY	1.0012	
SULPHATE SALINITY	CARBONATE/CHLORIDE	pH	7.05	

REMARKS

Total hardness: 88.7mg/L as $CaCO_3$
Conductivity: 971.8 uhmos/cm @ 68°F.
Oil Content: 30.7 mg/L oil

TICKELL GRAPH
%REACTING VALUE



ARC REPRESENTS "CONCENTRATION OF SOLIDS IN NORMAL SEA WATER"

E. W. Brubaker
D. L. Johnston
C. E. Fieber
1-Laboratory

SIGNED: R. M. Yamada

PRO-391 (Rev. 7-80)
PRINTED IN U.S.A.

GEOCHEMICAL ANALYSIS OF WATER Pro-391

DATE OF REPORT	February 10, 1983	WELL NO.	[illegible]P
DATE OF SAMPLING	February 1, 1983	COMPANY	[illegible]vron USA
SAMPLED BY		FIELD	Horn River
LABORATORY NO.	12-63[illegible]-26	ZONE	
ANALYST	Shaw	SAMPLE SOURCE	[illegible]

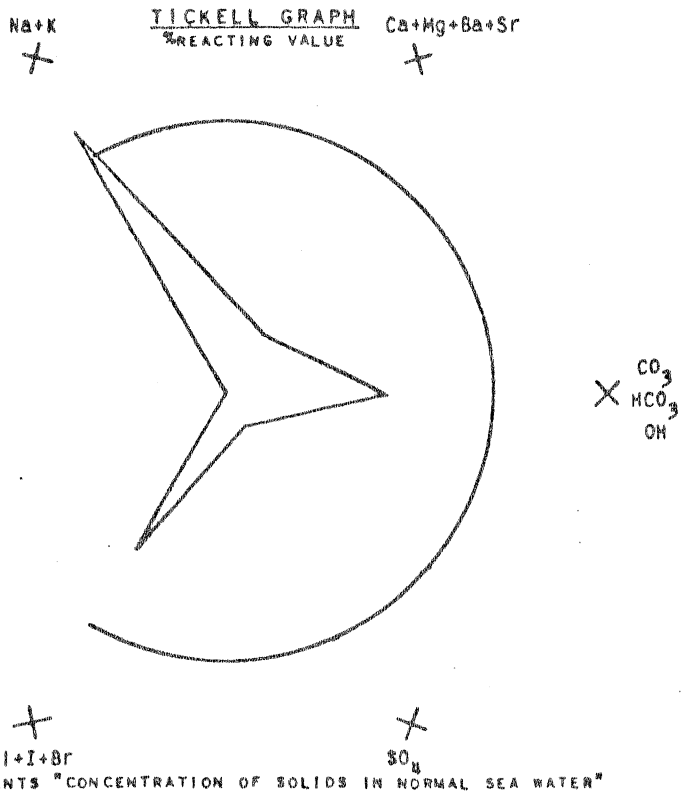
RADICALS		CONCENTRATION MILLIGRAMS PER LITER	REACTING VALUE EQUIVALENTS PER MILLION	REACTING VALUE PERCENT
SODIUM	Na	149.0	6.48	38.25
CALCIUM	Ca	28.5	1.42	8.38
MAGNESIUM	Mg	3.8	0.31	1.83
BARIUM	Ba			
STRONTIUM	Sr			
POTASSIUM	K	10	0.26	1.54
SULPHATE	SO_4	42.7	0.89	5.25
CHLORIDE	Cl	142.2	4.01	23.67
CARBONATE	CO_3	0.0	0.00	0.00
BICARBONATE	HCO_3	217.8	3.57	21.08
HYDROXIDE	OH			
IODIDE	I			
SILICA	SiO_2	113.4		
IRON, ALUMINA	R_2O_3			
TOTAL		707.4	16.94	100.00

GROUP	CHEMICAL CHARACTER	MISCELLANEOUS		
ALKALIS	PRIMARY SALINITY	BORON	0.8	Mg/LB
EARTHS	SECONDARY SALINITY	HYDROGEN SULFIDE	Absent	
STRONG ACIDS	PRIMARY ALKALINITY	EQUIVALENT SALT	420	Mg/L NaCl
WEAK ACIDS	SECONDARY ALKALINITY	RESISTIVITY @ 77°F	11.12	O.M.
Ca/EARTHS		CHLORINITY	234	Mg/L NaCl
CHLORIDE SALINITY		SPECIFIC GRAVITY	1.0010	
SULPHATE SALINITY	CARBONATE/CHLORIDE	pH	7.10	

REMARKS

Total hardness: 86.7 mg/L as $CaCO_3$
Conductivity: 899 uhmos/cm @ 60°F.

TICKELL GRAPH
%REACTING VALUE

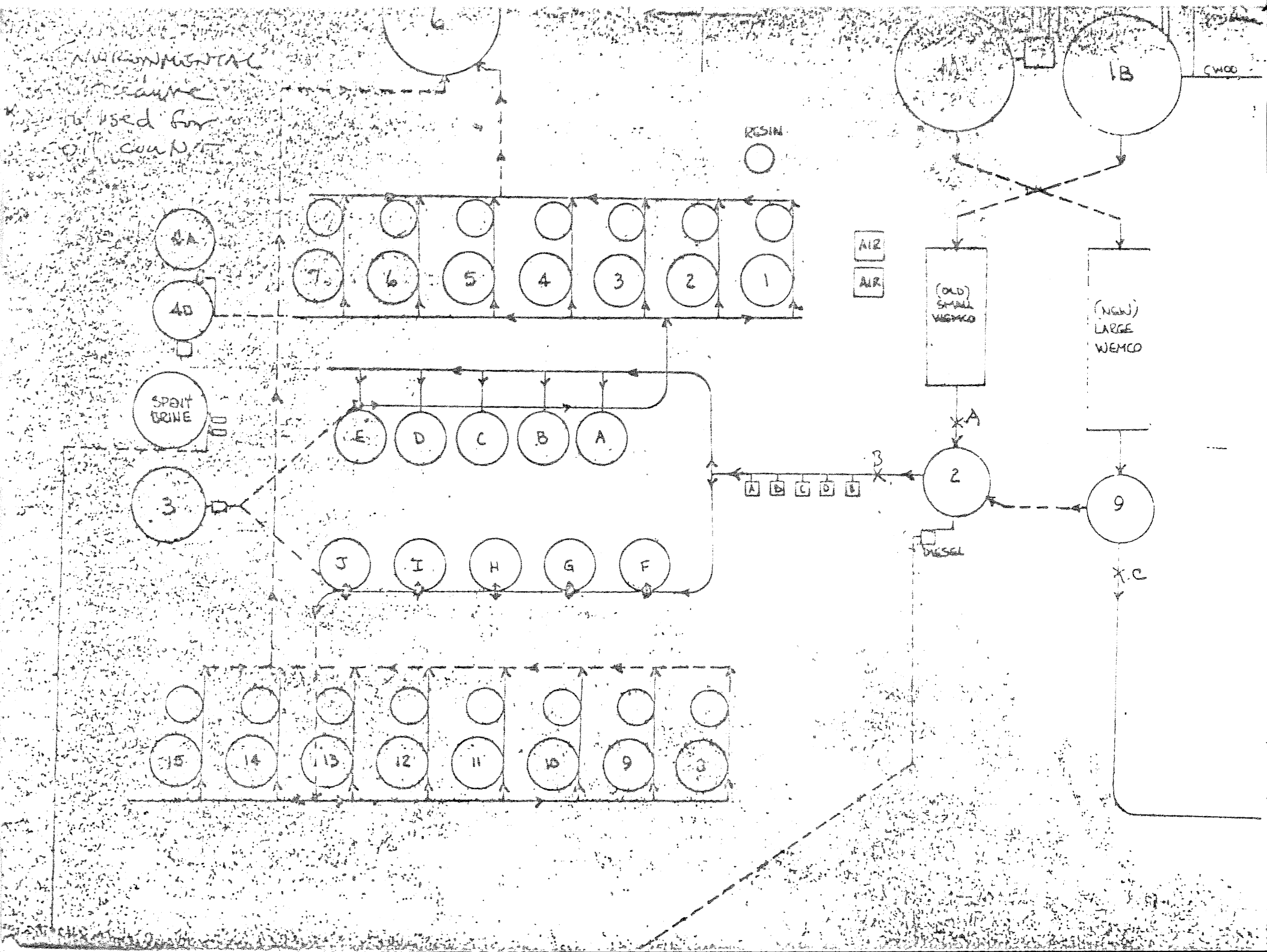


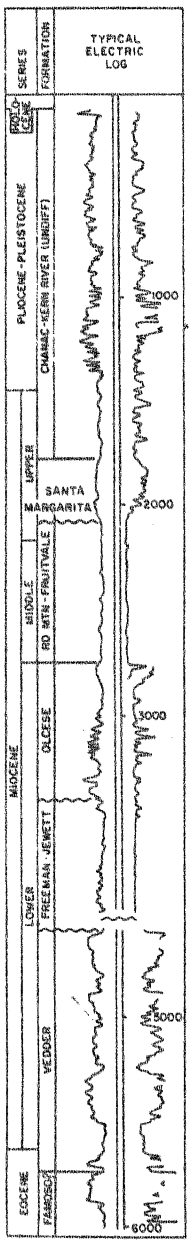
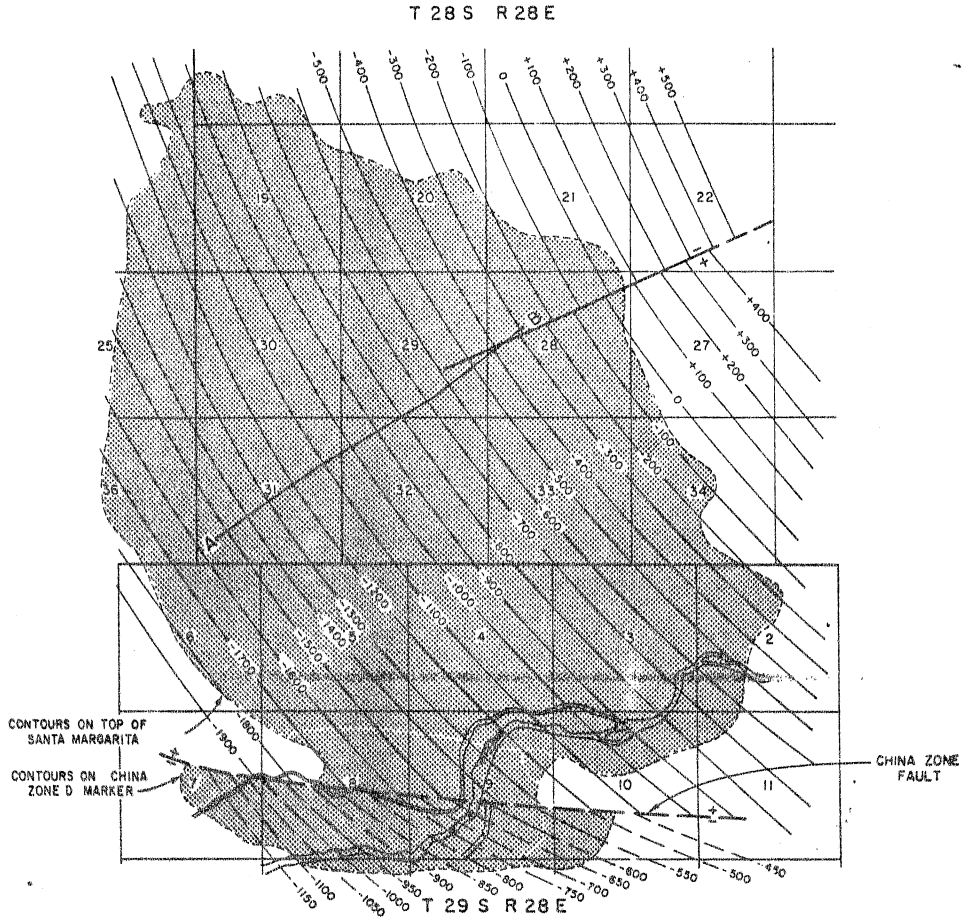
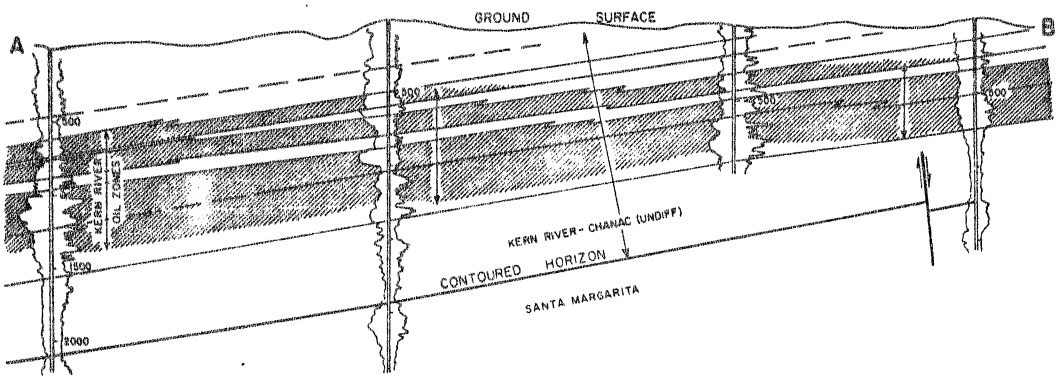
ARC REPRESENTS "CONCENTRATION OF SOLIDS IN NORMAL SEA WATER"

E. W. Brubaker
D. L. Johnston
C. E. Fieber
1-C Laboratory

PRO-391 (Rev. 7-80)
PRINTED IN U.S.A.

SIGNED: T. M. Yamada


ENVIRONMENTAL
Treatment
to used for
OIL COUNT
6
1A
1B
CWOD
RESIN
AIR
AIR
4A
4D
7
6
5
4
3
2
1
(OLD)
SMALL
WEMCO
(NEW)
LARGE
WEMCO
SPENT
BRINE
E
D
C
B
A
A
B
C
D
E
A
B
2
9
DIESEL
C
3
J
I
H
G
F
15
14
13
12
11
10
9
8

ATTACHMENT III

KERN RIVER OIL FIELD