

NORTH SQUARE LAKE UNIT
CONVERT TO INJECTION
NMOCD Form C-108 Section VII thru XII

VII. Data on proposed operation.

1. Proposed average injection rate: 150 BWPD per well
 Proposed maximum injection rate: 300 BWPD per well
2. The system will be a closed system.
3. Proposed average injection pressure: 500 PSI
 Proposed maximum injection pressure: 600 PSI (In no instance will the pressure exceed
 a .2 PSI/FT gradient to the upper perf or top of the openhole interval)
4. The proposed injection fluid is produced water Capitan Reef water. These fluids are
 compatible with the reservoir fluids in the proposed injection horizon. This is shown on
 the attached compatibility analysis.
5. A chemical analysis of the formation water in the proposed injection horizon is attached.

- VIII. The proposed injection interval is located in the Yts-Qn-Grbg-SA Sand formation. This Permian age horizon is nearly 2000' thick in this area. The top of the Queen formation is at a depth of about 2050' with the base of the San Andres at a depth of about 4000'.

There are three known Quaternary age fresh water wells within one mile of the proposed unit. The pertinent information on these wells are:

<u>Location</u>	<u>Depth</u>	<u>Chlorides</u>
Section 24 T-16-S, R-30-E	45'	156 ppm
Section 33 T-16-S, R-30-E	385'	3780 ppm
Section 24 T-16-S, R-30-E	167'	66 ppm

There are no fresh water zones underlying the proposed injection zone.

- IX. No proposed recompletion or re-stimulations are planned at this time.
- X. Logs have previously been submitted to the OCD.
- XI. An analysis of the fresh water in the area is attached.
- XII. An examination of this area has determined there are no open faults or other hydrologic connection between the disposal zone and any underground drinking water.

ILLEGIBLE

0	PSA	78/07/19	SED	IRR	16S.26E.35.123411	0.00	YT	1130	5540	0	0	0	0	0186	0
0	PSA	85/08/27	SED	IRR	16S.26E.35.123411	0.00	DP	304	2691	0	71	1185	0	0	0
0	PAT	88/10/21	SED	STK	16S.27E.03.14121	0.00	DP	623	4685	0	69	0289	0	0	0
0	PAT	57/05/01	US6	STK	16S.27E.03.141212	3495.00	DP	695	4940	0	66	X	0	0	15-05184
0	PAT	85/06/03	SED	STK	16S.27E.03.141212	3499.00	DP	740	4946	0	73	0655	0	0	15-05184
0	PAT	88/10/21	SED	STK	16S.27E.03.141212	3495.00	DP	623	4685	0	69	0689	0	0	15-05184
131	PAT	40/10/03	US6	STK	16S.27E.06.444424	3439.00	DP	435	4100	0	0	X	0	0	15-05185
131	PAT	57/05/01	US6	STK	16S.27E.06.444424	3439.00	DP	435	4220	0	66	X	0	0	15-05185
131	PAT	85/06/03	SED	STK	16S.27E.06.444424	3439.00	DP	448	4143	0	72	0685	0	0	15-05185
131	PAT	88/10/25	SED	STK	16S.27E.06.444424	3439.00	DP	514	4333	0	70	1158	0	0	15-05185
0	PSA	60/05/11	DNR	DIL	16S.27E.23.14000	0.00	EL2900	*****	0	0	0	X	0	0	0
0	PAT	60/04/26	DLR	DIL	16S.27E.26.43200	0.00	BLR153	6860	21630	0	0	0	0	0	0
60	PAT	57/05/01	US6	STK	16S.27E.36.212114	3454.00	DP	2540	11300	0	65	X	0	0	15-05186
60	PAT	85/10/08	SED	STK	16S.27E.36.212114	3454.00	DP	1240	7221	0	64	0186	0	0	15-05186
60	PAT	88/10/27	SED	STK	16S.27E.36.212114	3454.00	DP	1544	8339	0	64	1188	0	0	15-05186
54	FAT	86/06/12	SED	STK	16S.28E.12.22132	3589.00	DP	352	5784	0	68	0287	0	0	0
54	FAT	90/09/14	SED	STK	16S.28E.12.22132	3580.00	DP	790	4620	0	66	0191	0	0	0
0	FAT	53/12/13	SED	STK	16S.28E.12.22132A	3580.00	DP	714	3760	0	66	0674	0	0	0
0	GAL	86/06/12	SED	STK	16S.28E.24.22423A	3588.00	DP	28	2413	0	70	0287	0	0	15-05186
0	PAT	93/12/13	SED	STK	16S.29E.24.22423A	3580.00	DP	136	2560	0	60	0694	0	0	0
85	FAT	90/09/18	SED	STK	16S.28E.25.33243	3577.00	DP	214	3200	0	66	0191	0	0	15-05189
45	GAL	93/12/13	SED	STK	16S.28E.25.33243	3577.00	DP	0	4470	0	0	0	0	0	15-05189
0	TRE	80/12/30	DEC		16S.30E.24.12233	0.00		101	0	0	0	X	0	0	0
0	TRE	85/03/12	SED	STK	16S.30E.24.12233	0.00	DP	840	699	0	0	0	0	0	0
15	BL	02/18	SED	STK	16S.30E.25.33243	3577.00	DP	456	3081	0	68	0187	0	0	15-05189
385	TRE	86/04/25	SED	NOT	16S.30E.33.42443	3729.00	158383	4330	14576	0	0	0	0	0	15-05133
385	TRE	90/09/18	SED	NOT	16S.30E.33.42443	0.00	158383	3780	13570	0	0	0	0	0	15-05133
433	TRE	58/11/26	DNR	SRG	16S.30E.33.44233	3727.00	DP	6730	0	0	0	X	0	0	15-05134
433	TRE	86/04/25	SED	NOT	16S.30E.33.44233	3727.00	158430	51000	52130	0	0	0	0	0	15-05134
320	TRE	48/12/09	US6	STK	16S.31E.02.12124	4416.00	DP	82	616	0	0	X	0	0	15-71000
320	TRE	76/12/21	SED	STK	16S.31E.02.12124	4416.00	DP	82	758	0	58	0	0	0	15-71000
320	TRE	79/10/26	SED	STK	16S.31E.02.12124	4416.00	DP	74	682	0	66	0	0	0	15-71000
320	TRE	84/12/04	SED	STK	16S.31E.02.12124	4416.00	DP	95	819	0	0	0	0	0	15-71000
320	TRE	90/07/16	SED	DOM	16S.31E.02.12124	4416.00	DP	115	532	0	0	0	0	0	15-71000
0	TRE	95/09/25	SED	DIL	16S.31E.02.12124	4416.00	DP	95	720	0	0	0	0	0	15-71000
0	TRE	42/12/06	US6	STK	16S.31E.12.42300	4365.00	DP	14	612	0	0	X	0	0	15-12562
0	TRE	76/12/21	SED	STK	16S.31E.14.24444	4395.00	DP	19	485	0	69	0	0	0	15-71001
0	TRE	79/11/13	SED	STK	16S.31E.14.24444	4396.00	DP	36	527	0	67	0	0	0	15-71001
0	TRE	84/12/04	SED	STK	16S.31E.14.24444	4396.00	DP	21	461	0	65	0185	0	0	15-71001
0	TRE	85/12/03	SED	STK	16S.31E.14.24444	4396.00	DP	23	477	0	65	0185	0	0	15-71001
0	TRE	90/07/16	SED	STK	16S.31E.14.24444	4396.00	DP	54	555	0	65	0185	0	0	15-71001
0	TRE	45/12/06	US6	STK	16S.31E.14.24444	4396.00	DP	23	530	0	65	0185	0	0	15-71001
137	TRE	81/09/29	SED	STK	16S.31E.23.44321	4250.00	DP	72	678	0	69	0382	0	0	15-71002
137	TRE	81/09/29	SED	STK	16S.31E.23.44321	4250.00	TANK	76	685	0	0	0	0	0	15-71002
137	TRE	84/12/13	SED	STK	16S.31E.23.44321	4250.00	DP	53	499	0	67	0185	0	0	15-71002
137	TRE	86/06/12	SED	STK	16S.31E.23.44321	4250.00	DP	164	653	0	67	0185	0	0	15-71002
0	TRE	79/12/13	SED	STK	16S.32E.03.34324	4315.00	DP	14	779	0	66	0	0	0	15-11950
0	TRE	84/10/11	SED	STK	16S.32E.03.34324	4315.00	SELR	32	766	0	0	0	0	0	15-11050
0	TRE	79/11/13	SED	STK	16S.32E.11.34140	4295.00	DP	54	410	0	65	0	0	0	15-11053
0	TRE	79/11/13	SED	STK	16S.32E.11.34140	4295.00	DP	17	710	0	6	0	0	0	15-11057

LEWISPORT OIL CO

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Enviro-Chem, Inc.

WATER ANALYSIS REPORT

SAMPLE

Oil Co. : G.P. II Energy

Lease : Grier

Well No. : Sample # 2 25% Produced

Lab No. : 101698.001 75% Fresh

Sample Loc. : 25p/75c

Date Analyzed: 16-October-1998

Date Sampled : 09-October-1998

ANALYSIS

1. pH 6.780
2. Specific Gravity 60/60 F. 1.018
3. CaCO₃ Saturation Index 80 F. -0.477
140 F. +0.453

Dissolved Gases

4. Hydrogen Sulfide
5. Carbon Dioxide
6. Dissolved Oxygen

Not Present
Not Determined
Not Determined

Cations

7. Calcium (Ca++)
8. Magnesium (Mg++)
9. Sodium (Na+)
10. Barium (Ba++)

(Calculated)

MG/L EQ. WT. MEQ/L

836 / 20.1 = 41.42
442 / 12.2 = 36.23
8.375 / 23.0 = 364.30
Not Determined

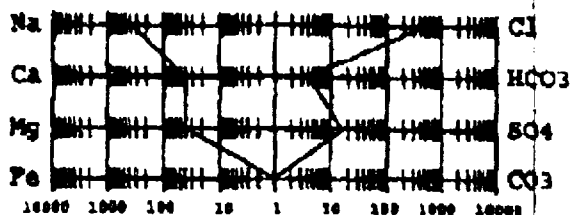
Anions

11. Hydroxyl (OH-)
12. Carbonate (CO₃++)
13. Bicarbonate (HCO₃-)
14. Sulfate (SO₄++)
15. Chloride (Cl-)

0 / 17.0 = 0.00
0 / 30.0 = 0.00
226 / 61.1 = 3.63
750 / 48.8 = 15.37
14.997 / 35.5 = 422.49

16. Total Dissolved Solids 25,436
17. Total Iron (Fe) 3
18. Total Hardness As CaCO₃ 2,903
19. Resistivity @ 75 F. (Calculated) 0.273 /cm.

LOGARITHMIC WATER PATTERN



Calcium Sulfate Solubility Profile



PROBABLE MINERAL COMPOSITION

COMPOUND	EQ. WT. X	MEQ/L = MG/L.	
Ca(HCO ₃) ₂	81.04	3.83	310
CaSO ₄	68.07	15.37	1,046
CaCl ₂	55.50	22.29	1,237
Mg(HCO ₃) ₂	73.17	0.00	0
MgSO ₄	60.19	0.00	0
MgCl ₂	47.62	36.23	1,725
NaHCO ₃	84.00	0.00	0
NaSO ₄	71.03	0.00	0
NaCl	58.46	363.93	21,275

*Milli Equivalents per Liter

This water is slightly corrosive due to the pH observed on analysis.
The corrosivity is increased by the content of mineral salts in solution.

ILLEGIBLE

Enviro-Chem, Inc. WATER ANALYSIS REPORT

SAMPLE

Oil Co. : C.P.22 Energy

Lease : Grier

Well No. : Sample # 1

Lab No. : 181898.001

50% Passures

50% FRESH

Sample Loc. : 50/50 4

Date Analyzed: 16-October-1998

Date Sampled : 09-October-1998

ANALYSIS

1. pH
2. Specific Gravity 60/60 F.
3. CaCO_3 Saturation Index @ 80

6.380
1.038
-0.436
+0.189

Dissolved Gases

4. Hydrogen Sulfide
5. Carbon Dioxide
6. Dissolved Oxygen

Not Present
Not Determined
Not Determined

Cations

7. Calcium (Ca^{++})
8. Magnesium (Mg^{++})
9. Sodium (Na^+)
10. Barium (Ba^{++})

(Calculated)

2.084 / 20.1 = 103.68
11.138 / 12.2 = 91.29
18.797 / 23.0 = 818.53
Not Determined

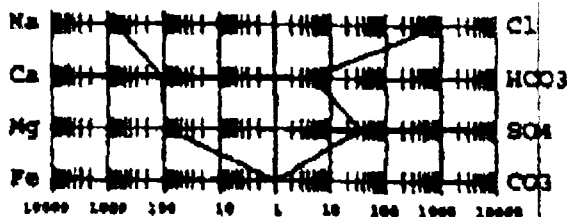
Anions

11. Hydroxyl (OH^-)
12. Carbonate (CO_3^{--})
13. Bicarbonate (HCO_3^-)
14. Sulfate (SO_4^{--})
15. Chloride (Cl^-)

16. Total Dissolved Solids
17. Total Iron (Fe)
18. Total Hardness As CaCO_3
19. Resistivity @ 75 F. (Calculated)

0 / 17.0 = 0.00
26.000 / 30.0 = 0.87
1.650 / 61.1 = 27.17
29.953 / 48.8 = 614.82
50.930 / 35.5 = 844.87
3.883 / 18.2 = 0.21
0.161 / cm.

LOGARITHMIC WATER PATTERN



Calcium Sulfate Solubility Profile



COMPOUND	EQ. WT. %	*MEQ/L	mg/L.
$\text{Ca}(\text{HCO}_3)_2$	81.04	4.39	355
CaSO_4	68.07	33.81	2,302
CaCl_2	55.50	65.48	3,634
$\text{Mg}(\text{HCO}_3)_2$	73.17	0.00	0
MgSO_4	60.19	0.00	0
MgCl_2	47.62	93.28	4,442
NaHCO_3	84.00	0.00	0
Na_2SO_4	71.03	0.00	0
NaCl	58.46	585.11	40,110

*Milli Equivalents per liter

This water is slightly corrosive due to the pH observed on analysis.
The corrosivity is increased by the content of mineral salts in solution.

ILLEGIBLE

Enviro-Chem, Inc. WATER ANALYSIS REPORT

SAMPLE

Oil Co. : G.P.IX Energy
Lease : Grier
Well No. : Sample # 3
Lab No. : 101698.001
75% Produced
25% FRESH

Sample Loc. : 352/72p 8
Date Analyzed: 15-October-1998
Date Sampled : 09-October-1998

ANALYSIS

1. pH
2. Specific Gravity 60/60 F.
3. CaCO_3 Saturation Index @ 80 F. @ 140

6.580
1.053
P. -0.188
F. -0.750

Dissolved Gases

4. Hydrogen Sulfide
5. Carbon Dioxide
6. Dissolved Oxygen

Not Present
Not Determined
Not Determined

Cations

7. Calcium (Ca^{++})
8. Magnesium (Mg^{++})
9. Sodium (Na^{+})
10. Barium (Ba^{++})

(Calculated)

3.126 / 20.1 = 153.52
1.191 / 12.2 = 97.62
24.148 / 23.0 = 1,049.91
Not Determined

Anions

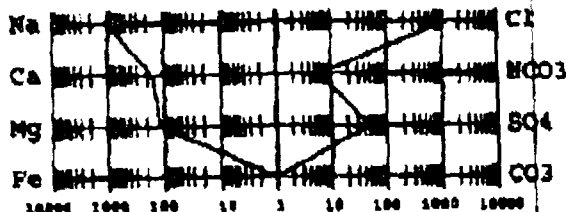
11. Hydroxyl (OH^{-})
12. Carbonate (CO_3^{--})
13. Bicarbonate (HCO_3^{-})
14. Sulfate (SO_4^{--})
15. Chloride (Cl^{-})

0 / 17.0 = 0.00
0 / 30.0 = 0.00
385 / 61.1 = 6.30
2,100 / 48.8 = 42.85
44,990 / 35.5 = 1,267.32
76.221 / 18.2 = 4.20

16. Total Dissolved Solids
17. Total Iron (Fe)
18. Total Hardness As CaCO_3
19. Resistivity @ 75 F. (Calculated)

0.126 / cm.

LOGARITHMIC WATER PATTERN



Calcium Sulfate Solubility Profile



PROBABLE MINERAL COMPOSITION

COMPOUND	Eq. Wt.	X	*mg/L = mg/L.
$\text{Ca}(\text{HCO}_3)_2$	81.04	5.99	485
CaSO_4	68.07	45.08	3,069
CaCl_2	55.50	104.45	5,797
$\text{Mg}(\text{HCO}_3)_2$	73.17	0.00	0
MgSO_4	60.19	0.00	0
MgCl_2	47.62	114.02	5,429
NaHCO_3	64.00	0.00	0
NaSO_4	71.03	0.00	0
NaCl	58.46	1,048.86	61,316

*Milli Equivalents per Liter

This water is slightly corrosive due to the pH observed on analysis.
The corrosivity is increased by the content of mineral salts in solution.

ILLEGIBLE

Enviro-Chem, Inc. WATER ANALYSIS REPORT

SAMPLE

Oil Co. : G.P.II Energy
Lease : Griner
Well No. : Fresh Water
Lab No. : 101000.001

Sample Loc. :
Date Analyzed: 16-October-1998
Date Sampled : 09-October-1998

ANALYSIS

1. pH 8.460
2. Specific Gravity 60/60 F. 1.003
3. CaCO_3 Saturation Index 0.80 P. +0.960
0.140 F. +1.580

Dissolved Gases

4. Hydrogen Sulfide Not Present
5. Carbon Dioxide Not Determined
6. Dissolved Oxygen Not Determined

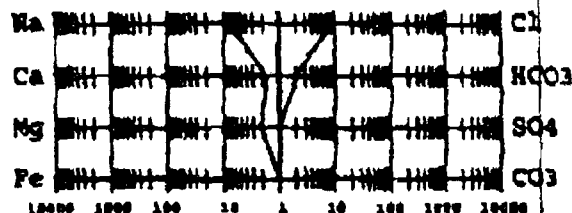
Cations

		MG/L	EQ. WT.	*MEQ/L
7. Calcium	(Ca^{++})	31	/ 20.1	= 1.54
8. Magnesium	(Mg^{++})	28	/ 12.2	= 2.05
9. Sodium	(Na^+)	177	/ 23.0	= 7.70
10. Barium	(Ba^{++})	0	/ 68.7	= 0.00
(Calculated)				

Anions

11. Hydroxyl	(OH^-)	0	/ 17.0	= 0.00
12. Carbonate	(CO_3^{--})	19	/ 30.0	= 0.63
13. Bicarbonate	(HCO_3^-)	117	/ 61.1	= 1.93
14. Sulfate	(SO_4^{--})	46	/ 48.0	= 0.96
15. Chloride	(Cl^-)	300	/ 35.5	= 8.48
16. Total Dissolved Solids		695		
17. Total Iron (Fe)		2		
18. Total Hardness As CaCO_3		182	/ 18.2	= 0.00
19. Resistivity @ 75 F. (Calculated)		2.802	/cm.	

LOGARITHMIC WATER PATTERN *mg/L.



Calcium Sulfate Solubility Profile



PROBABLE MINERAL COMPOSITION COMPOUND EQ. WT. X *MEQ/L = mg/L.

$\text{Ca}(\text{HCO}_3)_2$	81.04	1.54	125
CaSO_4	68.07	0.00	0
CaCl_2	55.50	0.00	0
$\text{Mg}(\text{HCO}_3)_2$	73.17	0.37	27
MgSO_4	60.19	0.92	36
MgCl_2	47.62	0.75	36
NaHCO_3	84.00	0.00	0
NaSO_4	71.03	0.00	0
NaCl	58.46	7.70	450

*Milli Equivalents per Liter

This water is slightly corrosive due to the pH observed on analysis.
The corrosivity is increased by the content of mineral salts in solution.

ILLEGIBLE

Enviro-Chem, Inc.

WATER ANALYSIS REPORT

SAMPLE

Oil Co. : S.F. II Energy

Lease : Oriskany

Well No. : Water Tank Property H₂O

Lab No. : 101688.001

Sample Loc. :

Date Analyzed: 16-October-1998

Date Sampled : 09-October-1998

ANALYSIS

1. pH 7.030
2. Specific Gravity 60/60 F. 1.068
3. CaCO₃ Saturation Index @ 60 F. +0.603
@ 140 F. +1.529

Dissolved Gases

4. Hydrogen Sulfide
5. Carbon Dioxide
6. Dissolved Oxygen

Not Present
Not Determined
Not Determined

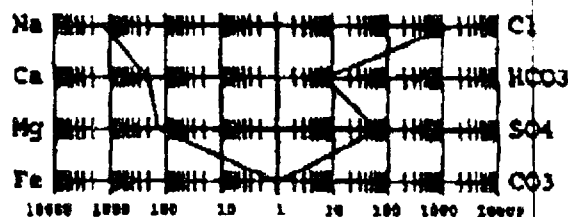
Cations

- | | | | |
|----------------------------------|----------------|----------|----------|
| 7. Calcium (Ca ⁺⁺) | 4.188 | / 20.1 = | 207.36 |
| 8. Magnesium (Mg ⁺⁺) | 1.580 | / 12.2 = | 129.51 |
| 9. Sodium (Na ⁺) | 29.433 | / 23.0 = | 1,279.68 |
| 10. Barium (Ba ⁺⁺) | Not Determined | | |

Anions

- | | | | |
|--|------------|----------|----------|
| 11. Hydroxyl (OH ⁻) | 0 | / 17.0 = | 0.00 |
| 12. Carbonate (CO ₃ ⁼) | 0 | / 30.0 = | 0.00 |
| 13. Bicarbonate (HCO ₃ ⁻) | 41.5 | / 61.1 = | 67.93 |
| 14. Sulfate (SO ₄ ⁼) | 2,800 | / 48.6 = | 57.82 |
| 15. Chloride (Cl ⁻) | 54,988 | / 35.5 = | 1,548.96 |
| 16. Total Dissolved Solids | 93,483 | | |
| 17. Total Iron (Fe) | 2 | / 10.2 = | 0.08 |
| 18. Total Hardness As CaCO ₃ | 16,918 | | |
| 19. Resistivity @ 75 F. (Calculated) | 0.101 /cm. | | |

LOGARITHMIC WATER PATTERN



Calcium Sulfate Solubility Profile



PROBABLE MINERAL COMPOSITION

COMPOUND	EQ. WT. X	*MEQ/L =	mg/L.
Ca(HCO ₃) ₂	81.04	6.79	550
CaSO ₄	68.07	59.43	4,045
CaCl ₂	55.50	141.14	7,834
Mg(HCO ₃) ₂	73.17	0.00	0
MgSO ₄	60.19	0.00	0
MgCl ₂	47.62	129.51	6,167
NaHCO ₃	84.00	0.00	0
NaSO ₄	71.03	0.00	0
NaCl	58.46	1,278.30	74,730

*Milli Equivalents per Liter

This water is mildly corrosive due to the pH observed on analysis.
The corrosivity is increased by the content of mineral salts in solution.

ILLEGIBLE