VII

1. The proposed average and maximum daily rate and volume to be injected are 2000 PSI and 1500 BWPD.

2. The system will be a closed system.

4. The sources and an appropriate analysis of injection fluid and compatibility with the receiving formation if other than reinjected produced water is attached hereto as Exhibit "A".

XI

Martin Water Laboratories, Inc.

P. O. BOX 1468
MONAHANS. TEXAS 79756
PH. 943-3234 OR 563-1040

709 W. INDIANA
MIDLAND. TEXAS 79701
PHONE 683-4521

RESULT OF WATER ANALYSES

LABORATORY NO. 1189311
TO: Mr. Dan Westover
12777 Jones Road, Suite 375, Houston, TX

SAMPLE RECEIVED 11-27-89
RESULTS REPORTED 12-4-89

COMPANY Greenhill Petroleum Corporation LEASE Lovington San Andres Unit
FIELD OR POOL Lovington
SECTION _____ BLOCK _____ SURVEY _____ COUNTY Lea STATE NM
SOURCE OF SAMPLE AND DATE TAKEN:

NO. 1 Produced water – taken from injection pump discharge. 11-27-89

NO. 2 _____

NO. 3 _____

NO. 4 _____

REMARKS: _____

CHEMICAL AND PHYSICAL PROPERTIES	NO. 1	NO. 2	NO. 3	NO. 4
Specific Gravity at 60° F.	1.0160			
pH When Sampled	6.8			
pH When Received	6.90			
Bicarbonate as HCO_3	1,464			
Supersaturation as $CaCO_3$	70			
Undersaturation as $CaCO_3$	---			
Total Hardness as $CaCO_3$	5,700			
Calcium as Ca	1,540			
Magnesium as Mg	450			
Sodium and/or Potassium	5,369			
Sulfate as SO_4	2,358			
Chloride as Cl	9,730			
Iron as Fe	0.32			
Barium as Ba	0			
Turbidity, Electric	72			
Color as Pt	56			
Total Solids, Calculated	20,910			
Temperature °F.	67			
Carbon Dioxide, Calculated	381			
Dissolved Oxygen. – chemets	0.000			
Hydrogen Sulfide	480			
Resistivity, ohms/m at 77° F.	0.420			
Suspended Oil	15			
Filtrable Solids as mg/l	22.9			
Volume Filtered, ml	850			

Results Reported As Milligrams Per Liter

Additional Determinations And Remarks   The above results show no direct or indirect evidence of air contamination in this study, therefore indicating effective control against this condition is being accomplished. Our microscopic study of the filtrable solids showed them to be essentially all a very fine paraffin, therefore indicating no particular significance to the higher quantity we have encountered as compared to recent studies. We have identified no evidence of any other development of concern and therefore see no need to make any changes at this time.

Form No. 3

cc: Mr. Bryant Bradley, Ozark Training
    & Consulting, Austin
Mr. Cy Jones, Hobbs

By _____
Waylan C. Martin, M.A.

XI

Martin Water Laboratories, Inc.

RESULT OF WATER ANALYSES

P. O. BOX 1468
MONAHANS, TEXAS 79756
PH. 943-3234 OR 563-1040

709 W. INDIANA
MIDLAND, TEXAS 79701
PHONE 683-4521

LABORATORY NO. 98943
SAMPLE RECEIVED 9-1-89
RESULTS REPORTED 9-8-89

TO: Mr. Dan Westover
12777 Jones Road. Suite 375, Houston, TX

COMPANY Greenhill Petroleum Corporation LEASE Lovington Paddock/San Andres Unit
FIELD OR POOL Lovington
SECTION _____ BLOCK _____ SURVEY _____ COUNTY Lea STATE NM

SOURCE OF SAMPLE AND DATE TAKEN:

NO. 1 Raw water - taken from water supply well #1. 9-1-89 ULB SI T 17S R 36E
NO. 2 Raw water - taken from water supply well #2. 9-1-89 ULC SI T 17S R 36E
NO. 3 :
NO. 4

REMARKS:

CHEMICAL AND PHYSICAL PROPERTIES

	NO. 1	NO. 2	NO. 3	NO. 4
Specific Gravity at 60° F.	1.0025	1.0018		
pH When Sampled	7.2	7.4		
pH When Received	7.03	7.34		
Bicarbonate as HCO3	229	249		
Supersaturation as CaCO3	8	4		
Undersaturation as CaCO3	---	---		
Total Hardness as CaCO3	370	164		
Calcium as Ca	120	51		
Magnesium as Mg	17	9		
Sodium and/or Potassium	171	130		
Sulfate as SO4	99	89		
Chloride as Cl	320	107		
Iron as Fe	0.48	0.64		
Barium as Ba	0	0		
Turbidity, Electric	3	5		
Color as Pt	7	3		
Total Solids, Calculated	956	634		
Temperature °F.	65	66		
Carbon Dioxide, Calculated	25	16		
Dissolved Oxygen, Winkler - Chemets	4.7	3.0		
Hydrogen Sulfide	0.0	0.0		
Resistivity, ohms/m at 77° F.	6.75	12.25		
Suspended Oil				
Filtrable Solids as mg/l	2.1	3.2		
Volume Filtered, ml	10,000	1,000		

Results Reported As Milligrams Per Liter

Additional Determinations And Remarks - The primary significance in the above results at water well #1 is that we again identified only a very minor amount of sand in the filtrable solids. This generally confirms the results of the sample taken 7-27-89 and reported on laboratory #789270 that the previously high level of sand was temporary. We also identified no significant sand in the suspended material at water well #2. In general, we find the current chemical and physical properties of these waters to be satisfactory, thereby indicating no need for any action.

Form No. 3

By Waylan C. Martin, M.A.

cc: Mr. Bryant Bradley, Ozark Training
& Consulting, Austin
Mr. Cy Jones, Hobbs

Calcium Carbonate Scale Prediction
Lovington San Andres Unit
Paragon Engineering Services

Water "A": 50% Lovington WSW 1 +50% WSW #2, Analysis No. 1188285
Water "B": Calculated produced water analysis assuming injection water
is 56% produced & 44% source. Analysis No. 1188290
Analysis: Martin Water Laboratories, Inc.
Date Reported: 12/07/88.

Hypothetical Composition of Mixed Waters
mg/l

% Water "A"	100	80	44	40	20	0
% Water "B"	0	20	56	60	80	100
Components:						
CATIONS						
Calcium, Ca	138.50	646.18	1560.00	1661.54	2169.21	2676.89
Magnesium, Mg	15.50	122.82	316.00	337.46	444.79	552.11
Iron, Fe	1.09	1.74	2.90	3.03	3.68	4.32
Barium, Ba	0.00	0.00	0.00	0.00	0.00	0.00
Sodium, Na	150.00	1931.43	5138.00	5494.29	7275.71	9057.14
ANIONS						
Chloride, Cl	323.00	3555.86	9375.00	10021.57	13254.43	16487.29
Sulfate, SO4	99.50	655.04	1655.00	1766.11	2321.64	2877.18
Carbonate, CO3	0.00	0.00	0.00	0.00	0.00	0.00
Bicarbonate, HCO3	223.00	766.57	1745.00	1853.71	2397.29	2940.86
Tot. Dsol'd Solids	950.59	7679.63	19791.90	21137.71	27866.75	34595.79

Measured pH Values	7.00		6.70			
1/H+ = 10^pH	10000000		5011872.34			
H+ = 1/10^pH	.0000001	.0000001355	.0000001995	.000000207	.000000242	.000000278
1/H+ = 10^pH		7377619.17		4839445.40	4129154.49	3600678.77
Calculated pH Values		6.87		6.68	6.62	6.56

Calcium Carbonate Solubility Calculation.
----

1. Calculate molar ionic strength of water, (u).
   (u) = sum of (mg/l x Conv. Factor) for all ions.

	Conv. Factor						
Ca	.00005	.006925	.032309	.078000	.083077	.108461	.133845
Mg	.000082	.001271	.010071	.025912	.027672	.036472	.045273
Ba	.000015	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Na	.000022	.003300	.042491	.113036	.120874	.160066	.199257
Cl	.000014	.004522	.049782	.131250	.140302	.185562	.230822
SO4	.000021	.002090	.013756	.034755	.037088	.048754	.060421
CO3	.000033	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
HCO3	.000008	.001784	.006133	.013960	.014830	.019178	.023527
u =		.02	.15	.40	.42	.56	.69

Calcium Carbonate Stability Index (Cont.)

Water: "A"	100	80	44	40	20	0
Water: "B"	0	20	56	60	80	100

2. Determine K from Stiff & Davis graph for (u); pCa and pAlk are calculated
   by this program from the equations below.

$$pCa = log(1/mols\ Ca++/Liter)$$
$$pAlk = log(1/Equiv.\ Total\ Alk/Liter)$$

Temperature:　　　80F (26.7C)
　　　　　　　　　120F (49C)

Look Up K:

K for 80F	2.06	2.60	3.07	3.08	3.21	3.29
K for 120F	1.68	2.16	2.56	2.58	2.70	2.78

Calculated pCa	2.46	1.79	1.41	1.38	1.27	1.18
Calculated pAlk	2.44	1.90	1.54	1.52	1.41	1.32

3. Calculate the Stiff & Davis CaCO3 Stabillity Index (SI).

$$SI = pH - (K + pCa + pAlk)$$

(K + pCa + pAlk)

At 80F =	6.96	6.29	6.02	5.98	5.88	5.78
At 120F =	6.58	5.85	5.51	5.48	5.37	5.27

CaCO3 SI =

At 80F =	.04	.52	.68	.70	.73	.77
At 120F =	.42	1.0	1.19	1.20	1.24	1.28

SI = Calcium Carbonate Stability Index. A positive value indicates the
water has a tendency to precipitate CaCO3 under these conditions.
A negative SI indicates the water is non-scaling .

Note: All calculations above are made and stored in the computer to
eleven significant figures. Only eight decimal places are shown in
this print out.

Calculation of Oddo & Thomson CaCO3 Scaling Index - Is
Two Phase System (Water & Gas)
Oddo and Thomson Method
Lovington San Andres Unit
Paragon Engineering Services

Water: Calculated produced water composition. See CaCO3 calculation.
Analysis: Martin Water Laboratories, Inc. No. 1188286
Date Reported: 12/07/88.
Approximate Location in System: Reservoir

$$Is = D + (1.549 \times 10^{-2} \times T) - (4.26 \times 10^{-6} \times T^2)$$
$$- (7.44 \times 10^{-5} \times P) + 0.919u - 2.52(u)^{0.5} + 5.89$$

P =	2000.00	psia
X =	.05	Mole Fraction CO2
Ca =	.066755	Moles/l
Alk =	.048211	
D =	-5.80922	log[(C)(Alk)^2/(P)(X)]
T =	120.00	Temp, F
u =	.69	Molar Ionic Strength

$C = Ca(mg/l)/40100 = .066755$
$Alk = (HCO3 + CO3(mg/l))/61000 = .0482108$
$D = \log(((C)(Alk)^2/((P)(X)))) = -5.80922$

Variable	Value	x Constant	=	Product
D	-5.80922	1.00	=	-5.81
T	120.00	.01549	=	1.86
(T)(T)	14400.00	-.000004	=	-.06
P	2000.00	-.000074	=	-.15
u	.69	.919	=	.63
(u)^0.5	.8306624	-2.52	=	-2.09
				5.89
		Sum = Is	=	.27