FILE NOTATIONS

Entered in N I D File	✓	Checked by Chief	RDS
Entered On S R Sheet	✓	Copy N I D to Field Office	✓
Location Map Pinned	✓	Approval Letter	✓
Card Indexed	✓	Disapproval Letter	
I W R for State or Fee Land			

COMPLETION DATA:

Date Well Completed	10-20-60	Location Inspected	✓
OW	WW	TA	Bond released State of Fee Land
GW	OS	PA ✓	

LOGS FILED

Driller's Log ✓ Rec'd. 9-23-60

Electric Logs (No. ✓) 3

E | I | E-I ✓ | GR | GR-N | Micro

Lat ✓ | Mi-L | Sonic ✓ | Others

Form OGCC-1

(SUBMIT IN DUPLICATE)

STATE OF UTAH

OIL & GAS CONSERVATION COMMISSION

STATE CAPITOL BUILDING

SALT LAKE CITY 14, UTAH

LAND:

Fee and Patented ☐
State ☐
Lease No.

Public Domain ☒
Lease No. U-070034

Indian ☐
Lease No.

SUNDRY NOTICES AND REPORTS ON WELLS

Notice of Intention to Drill	X	Subsequent Report of Water Shut-off	
Notice of Intention to Change Plans		Subsequent Report of Altering Casing	
Notice of Intention to Redrill or Repair		Subsequent Report of Redrilling or Repair	
Notice of Intention to Pull or Alter Casing		Supplementary Well History	
Notice of Intention to Abandon Well			

(INDICATE ABOVE BY CHECK MARK NATURE OF REPORT, NOTICE, OR OTHER DATA)

May 13, 19 60

Northwest Lisbon USA-D
Well No. 1 is located 710 ft. from {N/S} line and 1666 ft. from {E/W} line of Sec. 24

NE NW Sec 24 (¼ Sec. and Sec. No.) 30S (Twp.) 24E (Range) Salt Lake (Meridian)

Lisbon (Field) San Juan (County or Subdivision) Utah (State or Territory)

The elevation of the derrick floor above sea level is ..... feet. Will be reported later.

A drilling and plugging bond has been filed with U. S. Gov't.

DETAILS OF WORK

(State names of and expected depths to objective sands; show sizes, weights, and lengths of proposed casings; indicate mudding jobs, cementing points, and all other important work, surface formation, and date anticipate spudding-in.)

Proposed Casing Program:

1000' - 13-3/8" OD Casing, cemented to surface.
8300' - 7-5/8" OD Casing.
1000' - 5-1/2" OD Casing (Liner)

The principle objectivesare the Mississippian and Devonian.

Estimated total depth, 9300'.

Note: The location was stake 50' ~~North~~ South and 314' West of the Center of the NE NW 1/4 because of topographical conditions.

I understand that this plan of work must receive approval in writing by the Commission before operations may be commenced.

Company The Pure Oil Company

Address 1700 Broadway
Denver, Colorado

By T. L. Warburton
Title Division Chief Production Clerk

INSTRUCTIONS: A plat or map must be attached to this form showing the location of all leases, property lines, drilling and producing wells, within an area of sufficient size so that the Commission may determine whether the location of the well conforms to applicable rules, regulations and orders.

FORM 301.8 P100 5M 4-12-55

THE PURE OIL COMPANY
LOCATION REPORT

Date May 12, 1960 A.F.E. No. 307

Division Rocky Mountain Producing ~~Prospect~~ District Northwest Lisbon Lease U.S.A. (S.L. 070034)

Acres 1972 (17/20 of 2320) Lease No. 8360 Elevation Well No. NW Lisbon USA - D 1 (Serial No.)

Quadrangle NE NW Sec. 24 Twp. 30S Rge. 24E Blk. Dist. Twp.

Survey S. L. M. County San Juan State Utah

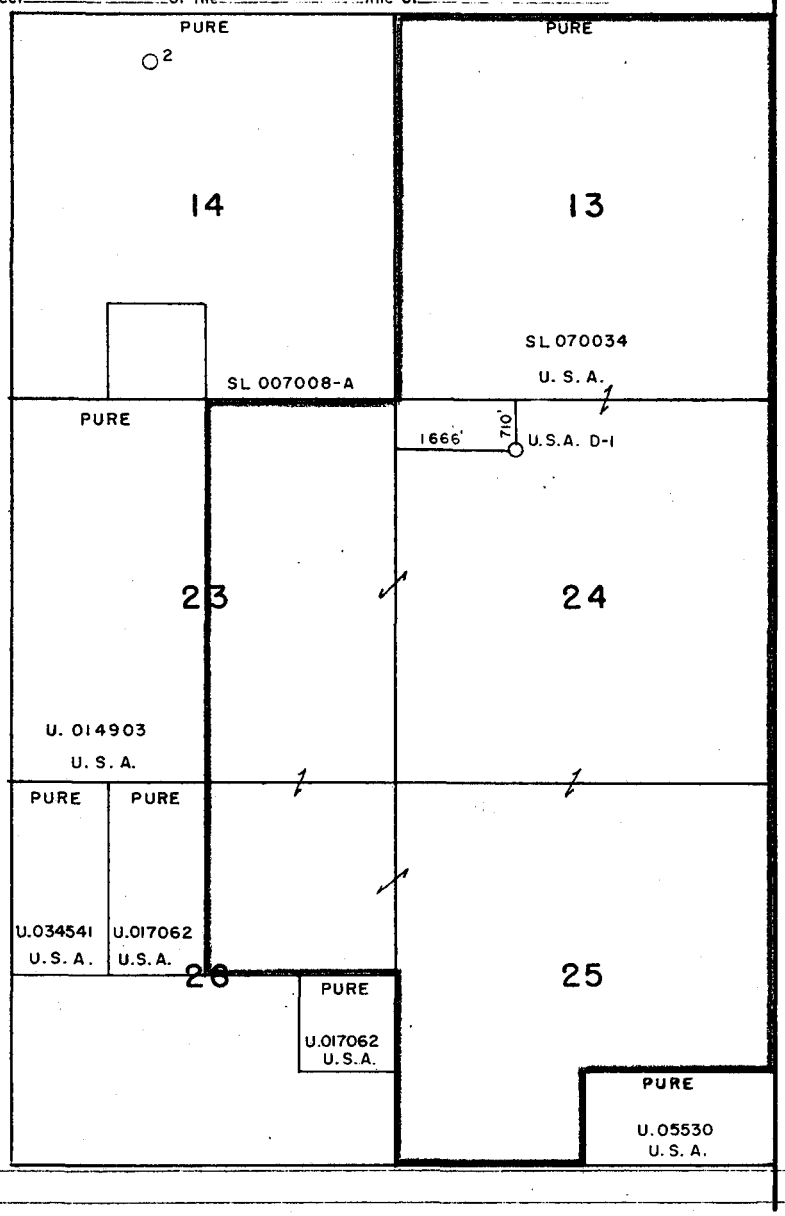
Operator The Pure Oil Company Map

710 Feet South of the North line of Section

1666 Feet East of the West line of Section

Feet of the line of

Feet of the line of



LEGEND

- Location
- Gas Well
- Oil Well
- Gas—Distillate Well
- Dry Hole
- Abandoned Location
- Abandoned Gas Well
- Abandoned Oil Well
- Input Well

N

Scale 2" = 1 MILE

Remarks:

Submitted by Rex Ludwig Civil Engineer

Approved by Division Manager

Approved by Vice-President—General Manager

THE PURE OIL COMPANY

GENERAL OFFICES, 35 EAST WACKER DRIVE, CHICAGO,

ROCKY MOUNTAIN PRODUCING DIVISION
1700 BROADWAY
DENVER 2, COLORADO

May 13, 1960

Utah Oil & Gas Conservation Commission
Mr. C. B. Feight, Secretary
310 Newhouse Building
10 Exchange Place
Salt Lake City 11, Utah

Dear Mr. Feight:

Enclosed in duplicate is Form 9-331A, Notice of Intention To Drill Northwest Lisbon USA-D Well No. 1, located NE NW, Sec. 24, 30S, 24E, San Juan County, Utah. Also enclosed are two copies of Location Plat for this well.

Because of separate government leases and/or ~~our~~ royalty interests we have found it necessary to rename the Northwest Lisbon wells that are now producing or drilling as follows:

Northwest Lisbon USA No. 1 - Northwest Lisbon USA-A No. 1
Northwest Lisbon USA No. 2 - Northwest Lisbon USA-B No. 1
Northwest Lisbon USA No. 3 - Northwest Lisbon USA-C No. 1

If you have any objections to this change ~~and~~ in identity of the foregoing wells, we would appreciate hearing from you as soon as possible.

Yours very truly,

T. L. Warburton
Division Chief Production Clerk

TLW:mc

Enclosure

cc: Mr. Jerry Long

ALL QUOTATIONS SUBJECT TO CHANGE WITHOUT NOTICE.
ALL AGREEMENTS CONTINGENT UPON STRIKES, FIRES, ACTS OF THE GOVERNMENT AND CARRIERS, AND ALL OTHER CAUSES BEYOND OUR CONTROL.

THE PURE OIL COMPANY
GENERAL OFFICES, 35 EAST WACKER DRIVE, CHICAGO
ROCKY MOUNTAIN PRODUCING DIVISION
1700 BROADWAY
DENVER 2, COLORADO

May 13, 1960

Mr. Jerry W. Long
USGS District Engineer
P. O. Box 1809
Durango, Colorado

Dear Mr. Long:

Enclosed in triplicate is Form 9-331A, Notice of Intention To Drill Northwest Lisbon USA-D Well No. 1, located NE NW, Sec 24, 30S, 24E, San Juan County, Utah. Also enclosed are three copies of Location Plat for this well.

Because of separate government leases and/or our royalty interests we have found it necessary to rename the Northwest Lisbon wells that are now producing or drilling as follows:

Northwest Lisbon USA No. 1 - Northwest Lisbon USA-A No. 1
Northwest Lisbon USA No. 2 - Northwest Lisbon USA-B No. 1
Northwest Lisbon USA No. 3 - Northwest Lisbon USA-C No. 1

If you have any objections to this change and identity of the foregoing wells, we would appreciate hearing from you as soon as possible.

Yours very truly,

T. L. Warburton
Division Chief Production Clerk

TLW:mc

Enclosure

cc: Mr. C. B. Feight

May 16, 1960

The Pure Oil Company
1700 Broadway
Denver, Colorado

Attention: T. L. Warburton, Div. Chief Prod. Clerk

Gentlemen:

This is to acknowledge receipt of your notice of intention to drill Well No. Northwest Lisbon USA-D #1, which is to be located 710 feet from the north line and 1666 feet from the west line of Section 24, Township 30 South, Range 24 East, SLM, San Juan County, Utah.

Please be advised that insofar as this office is concerned approval to drill said well is hereby granted, subject to a letter from you stating in more detail the topographical reason necessitating the change in location.

This approval terminates within 90 days if the above mentioned well has not been spudded in within said period.

In your note at the bottom of the page on the notice of intention to drill you state that the location was staked 50' North and 314' West of the Center of the NE NW 1/4; however, the note should state the location was staked 50' South and 314' West of the Center of the NE NW 1/4.

Would you please confirm this correction.

Very truly yours,

OIL & GAS CONSERVATION COMMISSION

CLEON B. FEIGHT,
EXECUTIVE SECRETARY

CBF:awg
cc: Jerry W. Long, Dist. Eng.
U. S. Geological Survey
Durango, Colorado

THE PURE OIL COMPANY

GENERAL OFFICES, 35 EAST WACKER DRIVE, CHICAGO,

ROCKY MOUNTAIN PRODUCING DIVISION
1700 BROADWAY
DENVER 2, COLORADO

May 17, 1960

Mr. Cleon B. Feight, Secretary
Utah Oil & Gas Conservation Commission
310 Newhouse Building
10 Exchange Place
Salt Lake City 11, Utah

Dear Mr. Feight:

Reference is made to your letter of May 16, 1960 concerning the location of our Northwest Lisbon USA-D No. 1. This location was moved from the Center of the NE NW, Section 24 in order to reduce the dirt work to a minimum. The present location is 120 feet lower and closer to the bottom of the canyon. The dirt contractor estimated a cost of an additional $7,000 to $10,000, if the location had been staked in the Center.

You are correct in that the location was staked 50 feet South and 314 feet West of the Center of the NE NW 1/4. I will appreciate your changing the Notice To Drill accordingly.

Yours very truly,

T. L. Warburton
Division Chief Production Clerk

TLW:mc

cc: Mr. Jerry Long

ALL QUOTATIONS SUBJECT TO CHANGE WITHOUT NOTICE.
ALL AGREEMENTS CONTINGENT UPON STRIKES, FIRES, ACTS OF THE GOVERNMENT AND CARRIERS, AND ALL OTHER CAUSES BEYOND OUR CONTROL.

Form 9-331a
(Feb. 1951)

Budget Bureau No. 42-R358.4.
Approval expires 12-31-60.

(SUBMIT IN TRIPLICATE)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Land Office Salt Lake
Lease No. S.L. - 070034
Unit

SUNDRY NOTICES AND REPORTS ON WELLS

NOTICE OF INTENTION TO DRILL		SUBSEQUENT REPORT OF WATER SHUT-OFF	
NOTICE OF INTENTION TO CHANGE PLANS		SUBSEQUENT REPORT OF SHOOTING OR ACIDIZING	
NOTICE OF INTENTION TO TEST WATER SHUT-OFF		SUBSEQUENT REPORT OF ALTERING CASING	
NOTICE OF INTENTION TO RE-DRILL OR REPAIR WELL		SUBSEQUENT REPORT OF RE-DRILLING OR REPAIR	
NOTICE OF INTENTION TO SHOOT OR ACIDIZE		SUBSEQUENT REPORT OF ABANDONMENT	
NOTICE OF INTENTION TO PULL OR ALTER CASING		SUPPLEMENTARY WELL HISTORY	X
NOTICE OF INTENTION TO ABANDON WELL			

(INDICATE ABOVE BY CHECK MARK NATURE OF REPORT, NOTICE, OR OTHER DATA)

May 31, 1960

Northwest Lisbon USA-D (4)
Well No. -1 is located 710 ft. from {N/S} line and 1666 ft. from {E/W} line of sec. 24

NE NW Sec. 24 (¼ Sec. and Sec. No.) 30S (Twp.) 26E (Range) Salt Lake (Meridian)

Lisbon - Ext. (Field) San Juan (County or Subdivision) Utah (State or Territory)

The elevation of the derrick floor above sea level is ____ ft. Will be furnished later.

DETAILS OF WORK

(State names of and expected depths to objective sands; show sizes, weights, and lengths of proposed casings; indicate mudding jobs, cementing points, and all other important proposed work)

Spudded 5/20/60 with dry hole digger.

Set 20" OD casing at 14'.

Set 13-3/8" OD casing at 1000' with 800 sx.

I understand that this plan of work must receive approval in writing by the Geological Survey before operations may be commenced.

Company The Pure Oil Co.

Address 1700 Broadway
Denver, Colorado

By T. L. Warburton
Title Division Chief Production Clerk

GPO 862040

Budget Bureau No. 42-R356.5.
Approval expires 12-31-60.

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

LAND OFFICE Salt Lake City
LEASE NUMBER SI 070034
UNIT

LESSEE'S MONTHLY REPORT OF OPERATIONS

State Utah *County* San Juan *Field* Lisbon

The following is a correct report of operations and production (including drilling and producing wells) for the month of May, *19* 60

Agent's address 1575 Sherman St. *Company* The Pure Oil Company

Denver 3, Colorado *Signed*

Phone AMherst 6-0208 *Agent's title*

Sec. and ¼ of ¼	Twp.	Range	Well No.	Days Produced	Barrels of Oil	Gravity	Cu. Ft. of Gas (In thousands)	Gallons of Gasoline Recovered	Barrels of Water (If none, so state)	REMARKS (If drilling, depth; if shut down, cause; date and result of test for gasoline content of gas)
NE NW Sec. 24 (Northwest Lisbon USA-D No. 1)	30S	24E	1				Spudded 5/20/60 and drilled to 25'. Set 20" OD casing at 14'. Drilled 25' to 1320'. Set. 13-3/8" OD casing at 1000' with 800 sx. Drilled 1320' to 1812'.			

NOTE.—There were None runs or sales of oil; None M cu. ft. of gas sold; None runs or sales of gasoline during the month. (Write "no" where applicable.)

NOTE.—Report on this form is required for each calendar month, regardless of the status of operations, and must be filed in duplicate with the supervisor by the 6th of the succeeding month, unless otherwise directed by the supervisor.

Form 9-329
(January 1950)

16—25766-8 U. S. GOVERNMENT PRINTING OFFICE

THE PURE OIL COMPANY

GENERAL OFFICES, 35 EAST WACKER DRIVE, CHICAGO,

ROCKY MOUNTAIN PRODUCING DIVISION
1700 BROADWAY
DENVER 2, COLORADO

June 16, 1960

Mr. Cleon B. Feight, Secretary
Utah Oil and Gas Conservation Commission
310 Newhouse Building
10 Exchange Place
Salt Lake City 11, Utah

Dear Mr. Feight:

With reference to your inquiry to Mr. J. I. Morris, concerning the location of N. W. Lisbon USA "D" #1, please refer to Mr. T. L. Warburton's letter to you dated May 17, 1960.

The location was moved in order to reduce the dirt work to a minimum. The present location is 120 feet lower and closer to the bottom of the canyon. The dirt contractor estimated a cost of an additional $7000 to $10,000 if the location had been staked in the center of the quarter quarter location. The location was staked 50 feet south and 314 feet west of the center of NE NW.

Yours very truly,

Fred H. Kirby

Fred H. Kirby

FHK:sm

ALL QUOTATIONS SUBJECT TO CHANGE WITHOUT NOTICE.
ALL AGREEMENTS CONTINGENT UPON STRIKES, FIRES, ACTS OF THE GOVERNMENT AND CARRIERS, AND ALL OTHER CAUSES BEYOND OUR CONTROL.

CONFIDENTIAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Budget Bureau No. 42-R356.5.
Approval expires 12-31-60.

LAND OFFICE Salt Lake City
LEASE NUMBER SL 070034
UNIT

LESSEE'S MONTHLY REPORT OF OPERATIONS

State Utah *County* San Juan *Field* Lisbon

The following is a correct report of operations and production (including drilling and producing wells) for the month of June, *19* 60,

Agent's address P. O. Box 265
Moab, Utah

Company The Pure Oil Company

Signed J B Strang

Phone ALpine 3-3581

Agent's title District Chief Clerk

SEC. AND ¼ OF ¼	TWP.	RANGE	WELL NO.	DAYS PRODUCED	BARRELS OF OIL	GRAVITY	CU. FT. OF GAS (In thousands)	GALLONS OF GASOLINE RECOVERED	BARRELS OF WATER (If none, so state)	REMARKS (If drilling, depth; if shut down, cause; date and result of test for gasoline content of gas)
NE NW Sec. 24 (Northwest Lisbon USA-D No. 1)	30S	24E	1				Drilled 1812' to 3710'. Drilled 3710' to 8988'. Drilled 8988' to 9027'.			DST #1, 3600'-3710'. DST #2, 8862'-8988'.

NOTE.—There were No runs or sales of oil; No M cu. ft. of gas sold; No runs or sales of gasoline during the month. (Write "no" where applicable.)

NOTE.—Report on this form is required for each calendar month, regardless of the status of operations, and must be filed in duplicate with the supervisor by the 6th of the succeeding month, unless otherwise directed by the supervisor.

Form 9-329
(January 1950)

16—25766-8 U. S. GOVERNMENT PRINTING OFFICE

CONFIDENTIAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Budget Bureau No. 42-R356.5.
Approval expires 12-31-60.

LAND OFFICE Salt Lake City
LEASE NUMBER SL 070034
UNIT

LESSEE'S MONTHLY REPORT OF OPERATIONS

State Utah *County* San Juan *Field* Lisbon

The following is a correct report of operations and production (including drilling and producing wells) for the month of July, 1960,

Agent's address P. O. Box 265
Moab, Utah

Company The Pure Oil Company

Signed J B Strong

Phone ALpine 3,3581

Agent's title District Chief Clerk

Sec. and ¼ of ¼	Twp.	Range	Well No.	Days Produced	Barrels of Oil	Gravity	Cu. Ft. of Gas (In thousands)	Gallons of Gasoline Recovered	Barrels of Water (If none, so state)	REMARKS (If drilling, depth; if shut down, cause; date and result of test for gasoline content of gas)
NE NW Sec. 24 (Northwest Lisbon USA-D No. 1)	30S	24E	1							Drilled 9027' - 9648' T.D. Drilling completed 7-18-60. DST #3 - 8987' - 9027'; DST #4 - 9502' 9648'. Ran electric logs to total depth. Well plugged with regular cement with drilling mud between cement plugs as follows:

9400' - 9550'	150'	75 sacks
8650' - 8850'	200'	100 sacks
4625' - 4925'	300'	150 sacks
3650' - 3750'	100'	50 sacks
1700' - 1800'	100'	50 sacks
950' - 1000'	50'	45 sacks
0' - 20'	20'	10 sacks

Dry hole marker installed. Well plugged and abandoned 7-20-60. FINAL REPORT.

NOTE.—There were No runs or sales of oil; No M cu. ft. of gas sold; No runs or sales of gasoline during the month. (Write "no" where applicable.)

NOTE.—Report on this form is required for each calendar month, regardless of the status of operations, and must be filed in duplicate with the supervisor by the 6th of the succeeding month, unless otherwise directed by the supervisor.

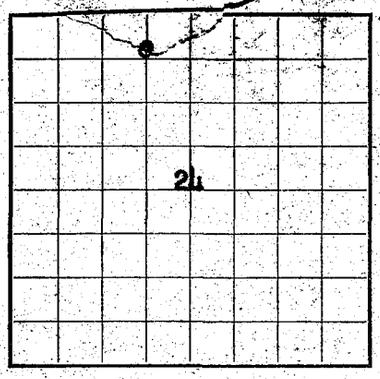
Form 9-329
(January 1950)

16—25766-8 U. S. GOVERNMENT PRINTING OFFICE

Form 9-330

t Bureau No. 42-R355.4.
Approval expires 12-31-60.

U. S. LAND OFFICE Salt Lake City
SERIAL NUMBER SL070034
LEASE OR PERMIT TO PROSPECT



LOCATE WELL CORRECTLY

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

N. W. Lisbon USA "D" #1

LOG OF OIL OR GAS WELL

Company The Pure Oil Company Address 1575 Sherman, Denver 3, Colorado
Lessor or Tract U. S. Government Field Lisbon - Ext. State Utah
Well No. 1 Sec. 24 T. 30S R. 24E Meridian Salt Lake County San Juan
Location 710 ft. [N.] of N Line and 1666 ft. [E.] of W Line of NW/4 Elevation 6318
(Derrick floor relative to sea level)

The information given herewith is a complete and correct record of the well and all work done thereon so far as can be determined from all available records.

Signed Fred H. Kirby Fred H. Kirby

Date September 15, 1960 Title Area Office Manager

The summary on this page is for the condition of the well at above date.

Commenced drilling May 19, 1960 Finished drilling July 18, 1960

OIL OR GAS SANDS OR ZONES

(Denote gas by G)

No. 1, from (See Sample Data) to No. 4, from to
No. 2, from to No. 5, from to
No. 3, from to No. 6, from to

IMPORTANT WATER SANDS

No. 1, from to No. 3, from to
No. 2, from to No. 4, from to

CASING RECORD

Size casing	Weight per foot	Threads per inch	Make	Amount	Kind of shoe	Cut and pulled from	Perforated From—	Perforated To—	Purpose
20"	(Conductor Pipe)			14'	—	—	—	—	—
13-3/8	48#	8 rd.	NS H-40	1000	Baker Guide	—	—	—	—

MUDDING AND CEMENTING RECORD

Size casing	Where set	Number sacks of cement	Method used	Mud gravity	Amount of mud used
20"	14'	8 yds. = 216 ft³	Dumped	—	—
13-3/8	1000'	800 sx.	Halliburton	—	—

PLUGS AND ADAPTERS

Heaving plug—Material Length Depth set
Adapters—Material Size

SHOOTING RECORD

Size	Shell used	Explosive used	Quantity	Date	Depth shot	Depth cleaned out
---None---						

TOOLS USED

Rotary tools were used from Top feet to 9648 feet, and from feet to feet
Cable tools were used from feet to feet, and from feet to feet

DATES

Dry Hole 7/20/60, 19 Put to producing, 19

The production for the first 24 hours was barrels of fluid of which % was oil; % emulsion; % water; and % sediment. Gravity, °Bé.

If gas well, cu. ft. per 24 hours Gallons gasoline per 1,000 cu. ft. of gas

Rock pressure, lbs. per sq. in.

EMPLOYEES

, Driller , Driller
, Driller , Driller

FOLD | MARK

Lessor or Tract U. S. Government Field Lisbon - Ext. State Utah

Well No. 1 Sec. 24 T. 30S R. 24E Meridian Salt Lake County San Juan

Location 710 ft. {N./S.} of N Line and 1666 ft. {E./W.} of W Line of NW/4 Elevation 6318
(Derrick floor relative to sea level)

The information given herewith is a complete and correct record of the well and all work done thereon so far as can be determined from all available records.

Signed Fred H. Kirby Fred H. Kirby

Date September 15, 1960 Title Area Office Manager

The summary on this page is for the condition of the well at above date.

Commenced drilling May 19, 1960 Finished drilling July 18, 1960

OIL OR GAS SANDS OR ZONES

(Denote gas by G)

No. 1, from (See Sample Data) to No. 4, from to

No. 2, from to No. 5, from to

No. 3, from to No. 6, from to

IMPORTANT WATER SANDS

No. 1, from to No. 3, from to

No. 2, from to No. 4, from to

CASING RECORD

Size casing	Weight per foot	Threads per inch	Make	Amount	Kind of shoe	Cut and pulled from	Perforated From—	Perforated To—	Purpose
20"	(Conductor Pipe)			14'	—	—	—	—	—
13-3/8	48#	8 rd.	N.S.K-40	1000	Baker Guide	—	—	—	—

MUDDING AND CEMENTING RECORD

Size casing	Where set	Number sacks of cement	Method used	Mud gravity	Amount of mud used
20"	14'	8 yds. = 216 ft³	Dumped	—	—
13-3/8	1000'	800 sx.	Halliburton	—	—

PLUGS AND ADAPTERS

Heaving plug—Material Length Depth set

Adapters—Material Size

SHOOTING RECORD

Size	Shell used	Explosive used	Quantity	Date	Depth shot	Depth cleaned out
---None---						

TOOLS USED

Rotary tools were used from Top feet to 9648 feet, and from feet to feet

Cable tools were used from feet to feet, and from feet to feet

DATES

Dry Hole 7/20/60, 19 Put to producing, 19

The production for the first 24 hours was barrels of fluid of which % was oil; % emulsion; % water; and % sediment. Gravity, °Bé.

If gas well, cu. ft. per 24 hours Gallons gasoline per 1,000 cu. ft. of gas

Rock pressure, lbs. per sq. in.

EMPLOYEES

, Driller , Driller

, Driller , Driller

FORMATION RECORD

FROM—	TO—	TOTAL FEET	FORMATION
0	25	25	Surface Shale
25	171	146	Sand and Shale
171	1015	844	Shale
1015	1320	305	Sand and Shale
1320	1732	412	Shale
1732			HERMOSA
1732	2026	294	Sand and Shale
2026	2481	455	Sand, Shale and Lime
2481	2821	340	Sand and Shale
2821	3389	568	Lime and Sand
3389			PARADOX "A"
3389	3640	251	Sand and Lime
3640			PARADOX "B"
3640	3732	92	Sand, Lime and Shale
3732			SALT
3732	7711	3979	Salt and Shale
7711	8659	948	Sand, Lime and Salt
8659	8673	14	Sand and Dolomite

[OVER]

FOLD | MARK

SEP 2 2 1960

FORMATION RECORD—Continued

FROM—	TO—	TOTAL FEET	FORMATION
8673			BASE SALT
8673	8718	45	Sand and Dolomite
8718	8770	52	Sand and Lime
8770			NOLAS
8770	8807	37	Sand and Lime
8807			MISS.
8807	8850	43	Sand and Lime
8850	8911	61	Lime and Anhydrite
8911	9038	127	Lime
9038	9053	15	Dolomite
9053	9236	183	Lime and Chert
9236			ORDAY
9236	9318	82	Lime and Shale
9318			ELBERT
9318	9502	184	Lime and Shale
9502			MCCRACKEN
9502	9585	83	Lime, Shale and Sand
9585			CAMBRIAN
9585	9648	63	Dolomite
9648			TOTAL DEPTH

(See attached for Core description and Drill Stem Test data)

16—43094-2 U. S. GOVERNMENT PRINTING OFFICE

HISTORY OF OIL OR GAS WELL

It is of the greatest importance to have a complete history of the well. Please state in detail the dates of redrilling, together with the reasons for the work and its results. If there were any changes made in the casing, state fully, and if any casing was "sidetracked" or left in the well, give its size and location. If the well has been dynamited, give date, size, position, and number of shots. If plugs or bridges were put in to test for water, state kind of material used, position, and results of pumping or bailing.

THE PURE OIL COMPANY
GENERAL OFFICES, 35 EAST WACKER DRIVE, CHICAGO
NORTHERN PRODUCING DIVISION
MOUNTAIN AREA OPERATIONS
1575 SHERMAN STREET
DENVER 3, COLORADO

September 21, 1960

U.S.G.S.
P. O. Box 1809
Durango, Colorado

Attention: Mr. Jerry W. Long, District Engineer

Gentlemen:

We are enclosing in duplicate Log of Oil or Gas Well covering N. W. Lisbon USA "D" #1 Well, located NE NW Section 24-30S-24E, San Juan County, Utah. Also enclosed in duplicate is Supplementary Data Sheet giving detailed core descriptions and DST data covering this well.

Our Geological Department at Durango, Colorado, advise that they have transmitted to you copies of the final electric logs covering this well.

Yours very truly,

Fred H. Kirby

FHK:sm

Enclosures

cc: Gleon B. Feight - w/encls. - including electric logs
Featherstone Corporation - w/encls. - including electric logs
W. W. Weir - w/encls. - including electric logs

Form approved.
Budget Bureau No. 42-R356.5.

UNITED STATES
DEPARTMENT OF INTERIOR
GEOLOGICAL SURVEY

Land Office Salt Lake City
Lease Number USA SL-070034
Unit Lisbon Unit

LESSEE'S MONTHLY REPORT OF OPERATIONS

State Utah *County* San Juan *Field* Lisbon

The following is a correct report of operations and production (including drilling and producing wells) for month of July, *19* 65, The Pure Oil Company - Division

Agent's address P. O. Box 1611 *Company* of Union Oil Co. of Calif.

Casper, Wyoming *Signed* R. E. Davis

Phone 234-1565 *Agent's title* District Office Manager

Sec. and ¼ of ¼	Twp.	Range	Well No.	Days Produced	Barrels of Oil	Gravity	Cu. Ft. of Gas (In Thousands)	Gallons of Gasoline Recovered	Barrels of Water (If none, so state)	REMARKS: (If drilling, depth; if shut down, cause; date and result of test for gasoline content of gas)
Sec. 24 NE NW	30S	24E	B624		Location: 710' FNL - 1,666' FWL. Elevations Gr 6,305', KB 6,318'. (Originally drilled as the Northwest Lisbon U.S.A. D-1, drilled to total depth of 9,648'. Plugged and Abandoned July 20, 1960.)					

July 16, 1965 - MI & RU Arapahoe Drilling Co. Rig to re-enter old hole. Well to be converted to Salt Water Disposal Well. Drilled out cement plugs and cleaned out to 9,623'. Set 5½" OD casing at 9,232' KB as follows: 1st Stage. Cemented with 150 cu. ft. 50/50 Posmix, 2% Gel, salt saturated, 3/4# CFR2 per sack. Spear headed with approximately 25 bbls. Mud Flush, displaced with drilling mud. Good returns indicated. Circulated 8 hours after 1st stage. 2nd Stage. Cemented with 2,900 cu. ft. 50/50 Posmix, 8% Gel, salt saturated through DV Packoff Collar set at 8,896', displaced with drilling mud. Good returns through out job. Circulated for 8 hours before starting 3rd. stage. 3rd Stage. Cemented with 2,400 cu. ft. 50/50 Posmix with 8% Gel, 2% Calcium Chloride through DV Tool set at 3,686'. Displaced with drilling mud. Good returns through out job. Circulated cement to surface. Drilled out 2nd and 3rd Stage Collars. Displaced drilling mud with fresh water. Ran Correlation Logs, Cement Bond Log. Lane-Wells perforated as follows: 8,936'-8,968'; 9004'-9023'; 9028'-9043';9094'-9109'; 9115'-9121'; 9170'-9182' with 4 NCF shot per foot. Ran 2-7/8" OD EUE tubing with Baker Retrievable Bridge Plug and Baker Model R-2 Packer to treat perforations. Acidized perforations as follows: 9170'-9182' acidized with 1,000 gallons 15% HCL acid; 9094'-9109';9115'-9121' acidized with 3,000 gallons 15% HCL acid; 9004'-9023'; 9028'-9043' acidized with 4,000 gallons 15% HCL acid; 8936'-8968' acidized with 2,000 gallons 15% HCL acid. Tested perforations for injection rate. Injected 4 bbls. per minute at 500 psi, 5 bbls per minute at 1,000 psi, 5-3/4 bbls. per minute at 1,500 psi. Fluid level dropped to 2,064' in 1 hour. Ran 2-7/8" OD EUE Internal Plastic Coated Tubing with Baker Model "N" mechanical packer. Packer set at 8,875' with 12,000# on packer. Released Arapahoe Drilling Company Rig July 30, 1965.

Final report until Salt Water Disposal System is completed.

THE PURE OIL COMPANY MERGED INTO UNION OIL COMPANY OF CALIFORNIA EFFECTIVE JULY 16, 1965.

NOTE.—There were No runs or sales of oil; No M cu. ft. of gas sold; No runs or sales of gasoline during the month. (Write "no" where applicable.)

NOTE.—Report on this form is required for each calendar month, regardless of the status of operations, and must be filed in duplicate with the supervisor by the 6th of the succeeding month, unless otherwise directed by the supervisor.

Form 9-329
(January 1950)

Form 9-331
(May 1963)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMIT IN TRIPLICATE*
(Other instructions on reverse side)

Form approved.
Budget Bureau No. 42-R1424.

SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use "APPLICATION FOR PERMIT—" for such proposals.)

5. LEASE DESIGNATION AND SERIAL NO.: U.S.A. SL-07003½

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

7. UNIT AGREEMENT NAME: Lisbon Unit

8. FARM OR LEASE NAME: Lisbon Unit

9. WELL NO.: B-62½

10. FIELD AND POOL, OR WILDCAT: Lisbon - Miss.

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: Sec. 24, T-30S, R-24E

OIL WELL ☐ GAS WELL ☐ OTHER SALT WATER DISPOSAL WELL

2. NAME OF OPERATOR: The Pure Oil Co., A Division of Union Oil Co. of Calif.

3. ADDRESS OF OPERATOR: P. O. Box 1611 - Casper, Wyoming

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements.* See also space 17 below.)
At surface
710' FNL and 1,666' FWL, NE NW

14. PERMIT NO.:

15. ELEVATIONS (Show whether DF, RT, GR, etc.): GR 6,305'; KB 6,318'

12. COUNTY OR PARISH: San Juan

13. STATE: Utah

16. Check Appropriate Box To Indicate Nature of Notice, Report, or Other Data

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
TEST WATER SHUT-OFF	☐	PULL OR ALTER CASING	☐	WATER SHUT-OFF	☐	REPAIRING WELL	☐
FRACTURE TREAT	☐	MULTIPLE COMPLETE	☐	FRACTURE TREATMENT	☐	ALTERING CASING	☐
SHOOT OR ACIDIZE	☐	ABANDON*	☐	SHOOTING OR ACIDIZING	☐	ABANDONMENT*	☐
REPAIR WELL	☐	CHANGE PLANS	☐	(Other) Supplemental Well History			X
(Other)	☐			(NOTE: Report results of multiple completion on Well Completion or Recompletion Report and Log form.)			

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.) *

SEE SUPPLEMENTAL SHEETS ATTACHED

18. I hereby certify that the foregoing is true and correct

SIGNED ORIGINAL SIGNED BY R. F. DAVIS R. F. Davis TITLE District Office Manager DATE August 9, 1965

(This space for Federal or State office use)

APPROVED BY _____ TITLE _____ DATE _____

CONDITIONS OF APPROVAL, IF ANY:

THE PURE OIL COMPANY MERGED INTO
UNION OIL COMPANY OF CALIFORNIA
EFFECTIVE JULY 16, 1965.

*See Instructions on Reverse Side

SUNDRY NOTICES AND REPORTS ON WELLS

Lisbon Unit B-624
NE NW, Sec. 24, T-30S, R-24E
San Juan County, Utah

Salt Lake
SL-070034
August 9, 1965

Arapahoe Drilling Company moved in and rigged up. Started drilling out top plug at 1:00 a.m. July 19, 1965. Drilled cement plugs as follows:

Plug No. 1 -	0' -	5' -	5'
Plug No. 2 -	945' -	995' -	50'
Plug No. 3 -	1,550' -	1,650' -	100'
Plug No. 4 -	3,325' -	3,650' -	325'
Plug No. 5 -	4,650' -	4,828' -	178'
Plug No. 6 -	8,654' -	8,854' -	200'

Ran drill pipe to 9,623'. Did not find cement plug that had been placed from 9,400' to 9,550' when well was P & A July 20, 1960.

On July 25, 1965 ran 280 jts. of 5-1/2" OD 20#, 17# and 15.5# casing and set at 9,232' KB. Ran Weatherford scratchers starting at 9,230' to 8,861', spaced 10' apart. One Weatherford cement basket below the second stage DV packoff collar and one below the third stage DV tool. Ran 22 Howco centralizers. The casing was reciprocated slowly one hour prior to first stage cementing and all through the job and 15 minutes after first stage was displaced.

Cemented 1st stage with 150 cubic feet of 50-50 Pozmix with 2% gel, salt saturated, 3/4# CFR2 per sack. Spearheaded with 25 bbls. (approx.) mud flush. Good returns indicated. Displaced with drilling mud. DV tool open approximately 45 minutes after 1st stage was displaced. Circulation was established. Plug down at 3:00 a.m. 7-25-65.

Circulated approximately 8 hours before cementing 2nd stage with 2,900 cubic feet of 50-50 Pozmix, 8% gel, salt saturated, through DV packoff collar set at 8,896'. Displaced with drilling mud. Good returns throughout job. Plug down at 12:35 a.m. 7-26-65. Established circulation and circulated for 8 hours before starting 3rd stage.

Cemented 3rd stage with 2,400 cubic feet of 50-50 Pozmix with 8% gel, 2% calcium chloride, through DV tool set at 3,686'. Displaced with drilling mud. Good returns throughout job. Circulated cement to surface. Plug down at 9:45 a.m. 7-26-65

Picked up tubing and drilled out 2nd and 3rd stage collars and cleaned out to 9,200' PBTD. Ran Correlation and Cement Bond Logs.

Lane-Wells perforated with 4 NCF shots per foot as follows: 8,936' - 8,968'; 9,004' - 9,023'; 9,028' - 9,043'; 9,094' - 9,109'; 9,115' - 9,121' and 9,170' - 9,182'.

Ran Baker retrievable bridge plug and Baker Model R-3 packer to treat perforations 9,170' - 9,182' with acid.

On July 29 Dowell acidized as follows: 1st Stage: Acidized through perfs 9,170' - 9,182' with 1000 gals. 15% HCl acid. 2nd Stage: Acidized through perfs 9,094' - 9,109'; 9,115' - 9,121' with 3,000 gals. 15% HCl acid. 3rd Stage: Acidized perfs 9,004' - 9,023' and 9,028' - 9,043' with 4,000 gals. 15% HCl acid. 4th Stage: Acidized through perfs 8,936' - 8,968' with 2,000 gals. 15% HCl acid.

Test of all perforations after acidizing for injection rate as follows:

Injected water at rate of 4 bbls. per minute at 500# pressure.
Injected water at rate of 5 bbls. per minute at 1000# pressure.
Injected water at rate of 5-3/4 bbls. per minute at 1500# pressure.

Fluid level dropped to 2,064' in one hour.

On July 30, 1965 ran 2-7/8" OD EUE internal plastic coated tubing with Baker Model "N" mechanical set packer. Packer set at 8,875' with 12,000# on packer. Ran 1" stream of treated water in casing for 12 hours. Hole did not fill up.

Final report on well.

Form approved.
Budget Bureau No. 42-R358.5.

UNITED STATES
DEPARTMENT OF INTERIOR
GEOLOGICAL SURVEY

Land Office Salt Lake
Lease Number SL-070034
Unit Lisbon

LESSEE'S MONTHLY REPORT OF OPERATIONS

State Utah *County* San Juan *Field* Lisbon

The following is a correct report of operations and production (including drilling and producing wells) for month of November, 19 65,

Agent's address P. O. Box 1611 *Company* Union Oil Company of California

Casper, Wyoming *Signed* R. E. Dawe

Phone 234-1565 *Agent's title* District Office Manager

Sec. and ¼ of ¼	Twp.	Range	Well No.	Days Produced	Barrels of Oil	Gravity	Cu. Ft. of Gas (In Thousands)	Gallons of Gasoline Recovered	Barrels of Water (If none, so state)	REMARKS: (If drilling, depth; if shut down, cause; date and result of test for gasoline content of gas)
Sec. 24										
NE NW	30S	24E	9624		Initial disposal on November 9, 1965. Injected 17,444 bbls. of salt water in 22 days, produced in the Lisbon Unit.					

NOTE.—There were -- runs or sales of oil; -- M cu. ft. of gas sold; -- runs or sales of gasoline during the month. (Write "no" where applicable.)

NOTE.—Report on this form is required for each calendar month, regardless of the status of operations, and must be filed in duplicate with the supervisor by the 5th of the succeeding month, unless otherwise directed by the supervisor.

Form 9-329
(January 1950)

Form 9-331
(May 1963)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMIT IN TRIPLICATE
(Other instructions on reverse side)

Form approved.
Budget Bureau No. 42-R1424.

5. LEASE DESIGNATION AND SERIAL NO.
U.S.A. SL-070034

6. IF INDIAN, ALLOTTEE OR TRIBE NAME

SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use "APPLICATION FOR PERMIT—" for such proposals.)

1. OIL WELL ☐ GAS WELL ☐ OTHER SALT WATER DISPOSAL WELL

7. UNIT AGREEMENT NAME
Lisbon Unit

2. NAME OF OPERATOR
Union Oil Company of California

8. FARM OR LEASE NAME
Lisbon Unit

3. ADDRESS OF OPERATOR
P. O. Box 1611 - Casper, Wyoming

9. WELL NO.
B-62

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements.* See also space 17 below.)
At surface
720' FNL and 1,666' FWL, NE NW

10. FIELD AND POOL, OR WILDCAT
Lisbon - Miss.

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA
Sec. 24, T-30S, R-24E

14. PERMIT NO.

15. ELEVATIONS (Show whether DF, RT, GR, etc.)
GR 6,305'; KB 6,318'

12. COUNTY OR PARISH: San Juan

13. STATE: Utah

16. Check Appropriate Box To Indicate Nature of Notice, Report, or Other Data

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
TEST WATER SHUT-OFF	☐	PULL OR ALTER CASING	☐	WATER SHUT-OFF	☐	REPAIRING WELL	☐
FRACTURE TREAT	☐	MULTIPLE COMPLETE	☐	FRACTURE TREATMENT	☐	ALTERING CASING	☐
SHOOT OR ACIDIZE	☐	ABANDON*	☐	SHOOTING OR ACIDIZING	☐	ABANDONMENT*	☐
REPAIR WELL	☐	CHANGE PLANS	☐	(Other) Supplementary Well History			X
(Other)			☐	(NOTE: Report results of multiple completion on Well Completion or Recompletion Report and Log form.)			

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.) *

Started injecting salt water at 4:00 p.m. 11-9-65. In 15 hours injected 1,282.3 bbls. of water. Injection pressure at pump 175#. Well On vacuum. Average injection rate 85.5 bbls. per hour.

FINAL REPORT

18. I hereby certify that the foregoing is true and correct

SIGNED ORIGINAL SIGNED BY R. E. DAVIS R. E. Davis TITLE District Office Manager DATE 11-11-65

(This space for Federal or State office use)

APPROVED BY _____ TITLE _____ DATE _____
CONDITIONS OF APPROVAL, IF ANY:

*See Instructions on Reverse Side

Form approved.
Budget Bureau No. 42-R359.5.

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

LAND OFFICE Salt Lake City
LEASE NUMBER SL-070034
UNIT

LESSEE'S MONTHLY REPORT OF OPERATIONS

State Utah *County* San Juan *Field* Lisbon

The following is a correct report of operations and production (including drilling and producing wells) for the month of September, *19* 66.

Agent's address P. O. Box 1611
Casper, Wyoming
Phone 234-1563

Company Union Oil Company of California
Signed R. E. Davis
Agent's title District Office Manager

Sec. and ¼ of ¼	Twp.	Range	Well No.	Days Produced	Barrels of Oil	Gravity	Cu. Ft. of Gas (In thousands)	Gallons of Gasoline Recovered	Barrels of Water (If none, so state)	REMARKS (If drilling, depth; if shut down, cause; date and result of test for gasoline content of gas)
NE NW Sec. 24	30S	24E	B624		Injected 56,549 bbls. of salt water in September, 1966.					
					Total injected to date: 305,634 bbls.					

On 9-26-66, rigged up Dowell and acidized down tubing with 2000 gals. of 20% HCL with 4 gals. A-130 inhibitor, 4 gal. W-35 anti-sludge and 20# of L-1 iron stabilizer as follows: Well on slight vacuum, started pumping acid down tubing at 4-3/4 bbls. per minute. After 10 bbls. had been pumped, injection pressure increased to 1200 psi. Decreased injection rate to 3 bbls. per minute. Pressure and rate remained same until acid hit perforations. Pressure decreased slightly. Increased injection rate to 4 bbls. per minute and pressure increased to 1400 psi. Pressure and rate remained approximately the same throughout the acid displacement. Displaced acid with 40 bbls. of lease salt water. Shut down pumps and pressure decreased to a slight blow. Well went on a strong vacuum 4 minutes after shut down. Started injecting water at 3:00 p.m.

NOTE.—There were No runs or sales of oil; No M cu. ft. of gas sold; No runs or sales of gasoline during the month. (Write "no" where applicable.)

NOTE.—Report on this form is required for each calendar month, regardless of the status of operations, and must be filed in duplicate with the supervisor by the 6th of the succeeding month, unless otherwise directed by the supervisor.

Form 9-329
(January 1950)

Form 9-331
(May 1963)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMIT IN TRIPLICATE*
(Other instructions on reverse side)

Form approved.
Budget Bureau No. 42-R1424

SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use "APPLICATION FOR PERMIT—" for such proposals.)

5. LEASE DESIGNATION AND SERIAL NO.: U.S.A. SL-070034

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

1. OIL WELL ☐ GAS WELL ☐ OTHER: Salt Water Disposal Well

7. UNIT AGREEMENT NAME: Lisbon Unit

2. NAME OF OPERATOR: Union Oil Company of California

8. FARM OR LEASE NAME: Lisbon Unit

3. ADDRESS OF OPERATOR: P. O. Box 1611 - Casper, Wyoming 82601

9. WELL NO.: B-624

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements.* See also space 17 below.) At surface: 710' FNL and 1,666' FWL (NE NW)

10. FIELD AND POOL, OR WILDCAT: Lisbon - Mississippian

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: Sec. 24, T30S-R24E

14. PERMIT NO.

15. ELEVATIONS (Show whether DF, RT, GR, etc.): 6305' GR - 6318' KB

12. COUNTY OR PARISH: San Juan

13. STATE: Utah

16. Check Appropriate Box To Indicate Nature of Notice, Report, or Other Data

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
TEST WATER SHUT-OFF	☐	PULL OR ALTER CASING	☐	WATER SHUT-OFF	☐	REPAIRING WELL	☐
FRACTURE TREAT	☐	MULTIPLE COMPLETE	☐	FRACTURE TREATMENT	☐	ALTERING CASING	☐
SHOOT OR ACIDIZE	☐	ABANDON*	☐	SHOOTING OR ACIDIZING	☐	ABANDONMENT*	☐
REPAIR WELL	☐	CHANGE PLANS	☐	(Other) Supplemental Well History			X
(Other)				(NOTE: Report results of multiple completion on Well Completion or Recompletion Report and Log form.)			

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.)*

9-11-68 Acidized thru perforations 8936-9182' using Dowell. 5,000 gallons 15% No. 1 acid down tubing. Packer set at 8890'. Max. injection pressure 3150 psi, min. injection pressure 2900 psi. Average injection rate 7.6 BPM. Flushed with 70 bbls. salt water. Instant SI 800 psi; 5 min. 400 psi; 10 min. 200 psi; 15 min 50 psi.

Injection Rate Before 2380 BWPD @ 900 psi
Injection Rate After 2380 BWPD @ 650 psi

18. I hereby certify that the foregoing is true and correct

SIGNED ORIGINAL SIGNED BY HAROLD SIMPSON H. Simpson TITLE District Operations Supt. DATE 10-09-68

(This space for Federal or State office use)

APPROVED BY _____ TITLE _____ DATE _____
CONDITIONS OF APPROVAL, IF ANY:

*See Instructions on Reverse Side

Form 9-331
(May 1963)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMIT IN TRIPLICATE*
(Other instructions on reverse side)

Form approved.
Budget Bureau No. 42-R1424.

5. LEASE DESIGNATION AND SERIAL NO.
U.S.A. SL-070034

6. IF INDIAN, ALLOTTEE OR TRIBE NAME

SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use "APPLICATION FOR PERMIT—" for such proposals.)

1. OIL WELL ☐ GAS WELL ☐ OTHER Salt Water Disposal Well

7. UNIT AGREEMENT NAME
Lisbon Unit

2. NAME OF OPERATOR
Union Oil Company of California

8. FARM OR LEASE NAME
Lisbon Unit

3. ADDRESS OF OPERATOR
P. O. Box 1611 - Casper, Wyoming 82601

9. WELL NO.
B-624

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements.* See also space 17 below.)
At surface
710' FNL and 1666' FWL (NE NW)

10. FIELD AND POOL, OR WILDCAT
Lisbon - Miss.

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA
Sec. 24, T30S, R24E

14. PERMIT NO.

15. ELEVATIONS (Show whether DF, RT, GR, etc.)
6305' GL, 6318' KB

12. COUNTY OR PARISH: San Juan

13. STATE: Utah

16. **Check Appropriate Box To Indicate Nature of Notice, Report, or Other Data**

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
TEST WATER SHUT-OFF		PULL OR ALTER CASING		WATER SHUT-OFF		REPAIRING WELL	
FRACTURE TREAT		MULTIPLE COMPLETE		FRACTURE TREATMENT		ALTERING CASING	
SHOOT OR ACIDIZE	X	ABANDON*		SHOOTING OR ACIDIZING		ABANDONMENT*	
REPAIR WELL		CHANGE PLANS		(Other)			
(Other)							

(NOTE: Report results of multiple completion on Well Completion or Recompletion Report and Log form.)

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.)*

TD 9648'
PBTD 9200'

Casing: 20" conductor pipe at 14' KB
13-3/8" OD, 48#, H-40 casing at 1000'
5-1/2" OD, 20, 17 & 15.5# casing at 9232'

Perforations: 8936-8968', 9004-9023', 9028-9043', 9094-9109', 9115-9121', 9170-9182', 4 SPF

Union Oil Company proposes to acidize this disposal well to reduce the high back pressure. Without water disposal, operation would be in violation of state regulations. The well was acidized last in October, 1969.

APPROVED BY THE DIVISION OF
OIL & GAS CONSERVATION

DATE 6-12-70
BY Paul W. Burchell

18. I hereby certify that the foregoing is true and correct

SIGNED ORIGINAL SIGNED BY A. T. MANNON JR. A. T. Mannon, Jr. TITLE District Drilling Supt. DATE 6-2-70

(This space for Federal or State office use)

APPROVED BY _____ TITLE _____ DATE _____
CONDITIONS OF APPROVAL, IF ANY:

*See Instructions on Reverse Side

Form 9-331
(May 1963)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMIT IN TRIPLICATE*
(Other instructions on reverse side)

Form approved.
Budget Bureau No. 42-R1424.

SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use "APPLICATION FOR PERMIT—" for such proposals.)

5. LEASE DESIGNATION AND SERIAL NO.: USA SL-070034

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

1. OIL WELL [ ] GAS WELL [X] OTHER Salt Water Disposal Well

7. UNIT AGREEMENT NAME: Lisbon Unit

2. NAME OF OPERATOR: Union Oil Company of California

8. FARM OR LEASE NAME: Lisbon Unit

3. ADDRESS OF OPERATOR: P. O. Box 1611 - Casper, Wyoming

9. WELL NO.: B-624

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements.* See also space 17 below.) At surface: 710' FNL and 1666' FWL (NE NW) Sec. 24

10. FIELD AND POOL, OR WILDCAT: Lisbon-Miss.

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: Sec. 24, T.30S., R.24E.

14. PERMIT NO.:

15. ELEVATIONS (Show whether DF, RT, GR, etc.): 6305' GL 6318' KB

12. COUNTY OR PARISH: San Juan

13. STATE: Utah

16. **Check Appropriate Box To Indicate Nature of Notice, Report, or Other Data**

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
TEST WATER SHUT-OFF		PULL OR ALTER CASING		WATER SHUT-OFF		REPAIRING WELL	
FRACTURE TREAT		MULTIPLE COMPLETE		FRACTURE TREATMENT		ALTERING CASING	
SHOOT OR ACIDIZE		ABANDON*		SHOOTING OR ACIDIZING	X	ABANDONMENT*	
REPAIR WELL		CHANGE PLANS		(Other)			
(Other)							

(NOTE: Report results of multiple completion on Well Completion or Recompletion Report and Log form.)

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.) *

Treated interval 8936'-9182' w/5000 gal. 15% HCl down 2-7/8" tbg. @ 3000-3200 psi. @ 8.5 BPM. Flushed w/70 bbls. lease salt water. ISDP 1400 psi, 30 min. SIP, 900 PSI.

Returned well to injection.

Injection rate before treatment: 3150 BPD @ 1720 psi.
Injection rate after treatment: 3150 BPD @ 1600 psi.

Approval for above program received by Form 9-331 on June 4, 1970.

18. I hereby certify that the foregoing is true and correct

SIGNED A. T. Mannon Jr. TITLE District Drilling Supt. DATE 9-10-70
A. T. Mannon, Jr.

(This space for Federal or State office use)

APPROVED BY _____ TITLE _____ DATE _____
CONDITIONS OF APPROVAL, IF ANY:

*See Instructions on Reverse Side

SUPPLEMENTAL WELL DATA

N.W. Lisbon USA "D" #1

Core Record

Core No. 1, 8934-8988, full 54' recovery as follows: 34' Ls, drk gry, fn xln, crinoidal, little blk residue throughout. Good odor on fresh break, small vugular porosity. Slight bleeding filtrate from 8937' to 8953' and 8955' to 8960'. 6' Ls, black, fn xln, sucrosic, black residue throughout. Few crinoidal stems. 14' Ls, lt gry, tan and dense, crinoidal.

Core No. 2, 8988-9026, full 38' recovery as follows: 20' Ls, lt gry, fn xln, dense, crinoidal, little black residue. 1' Dolo., lt gry, very fn xln, very good to excellent vuggy porosity, no flour., slight bleeding filtrate, looks flushed. 14' Ls, lt gry, fn xln, dense, crinoidal, little black residue. 1' Dolo, gry, fn xln, good vuggy porosity with trace of black asphaltic residue on part of porosity, looks flushed, no flour. 2' Ls, gry, fn xln, poor vuggy porosity, trace of black sand, looks flushed, no flour.

Core No. 3, 9026-9027, full 1' recovery of chert, lt and drk gry, brecciated, very hard and dense, trace of pin point porosity, trace of fossils, also trace of black shale.

Core No. 4, 9027-9053, full 26' recovery as follows: 4' Dolo, lt-drk gry, fn xln, dense. 8' Dolo, drk gry, fn xln, dense, trace of pin point porosity, stringers of chert. 12' Dolo, gry, fn xln, dense, hard, trace of pin point porosity, trace of chert. 1' Chert, lt and drk gry, breccia. 1' Dolo, lt brn, fn xln, hard, dense, trace of chert inclusions.

Core No. 5, 9537-9588, full 51' recovery as follows: 20' Sandstone, lt gry, fine grained, tite, quartzitic. 3' Dolo., lt tan, fn xln, sandy. 15' Sandstone, lt tan, very fn grained with few medium grains, quartzitic, slight bleeding lt grn oil at 9562' to 9563'. (No visible porosity, very quartzitic). 2' Dolo, gry, fn xln, dense. 2' Shale, drk brn mica. 5' Sandstone, lt and drk gry mottled, fine grained, shaly in part, dolomitic, hard, dense. 3' Dolo., drk gry to brn, fn xln, glauconitic. 1' Sandstone, lt gry, fine grained, quartzitic.

Core No. 6, 9588-9648, full 60' recovery as follows: 2' Dolo, drk brn and black, fn xln, dense, pyritic & glauconitic. 57' Dolo, drk gry-tan, fn xln, glauconitic with black micaceous shale. 1' Dolo, lt tan, fn xln, dense, calcareous.

Drill Stem Tests

DST #1, 3600-3710. Open 1 hour. Fair blow on opening tool, exhausted in 30 minutes. Recovered 60' muddy salt water and 420' salt water. Initial 30 minute SIP 875# IFP 100# FFP 210#. Final 30 minute SIP 775# IHP 1840# FHP 1840#.

DST #2, 8862-8988. Open 1 hour, very weak blow throughout test. No gas to surface. Recovered 390' of gas-cut drilling fluid. IHP 4695# ISIP 3000# IFP 305# FFP 432# FSIP 3000# FHP 4695#.

DST #3, 8987-9027. Open 1-1/2 hours. Very weak blow throughout test. No gas to surface. Recovered 100' drilling mud and 2825' salt water with very small amount gas in salt water. IHP 4710#, ISIP 3065#, IFP 205#, FFP 1265#, FSIP 2965#, FHP 4635#.

DST #4, 9502-9648. 1000' water cushion. Open 1 hour. Good blow decreasing to weak blow. No gas to surface. Recovered 1000' water cushion 500' gas-cut mud and 700' gas-cut muddy salt water. 30 minute Initial SIP 4010# IFP 1020# FFP 1410# 30 minute Final SIP 3037# IHP and FHP 4945#.

Union Oil and Gas D[illegible]on: Central Region

Union Oil Company of California
Post Office Box 2620, Casper, Wyoming 82602
Telephone (307) 234-1563

115-1

union 76

RECEIVED
MAR 14 1977
DIVISION OF OIL, GAS, & MINING

March 9, 1977

Department of Natural Resources
Division of Oil, Gas & Mining
State of Utah
1588 West North Temple
Salt Lake City, UT 84116

United States Geological Survey
P.O. Box 1809
Durango, CO 81301

Attention: Mr. Jerry Long
District Engineer

B-624

Gentlemen:

In order to remain in compliance with the United States Geological Survey rules on the handling of water produced with oil and gas should anything happen to the present SWD Well B-624, Union Oil Company of California, Operator, applies for approval to temporarily dispose of water into the Mississippian formation through the wellbore of Lisbon Unit Well B-816 located in the NE SW of Section 16, Township 30 South, Range 24 East, San Juan County, Utah.

Unit Well B-816 would only be used as a backup to the present water disposal well in order to prevent curtailing oil and gas production from the unit. In support of the application to temporarily dispose of water in the Mississippian zone in Well B-816, we show:

1) Designated name of proposed disposal well -

Lisbon Unit Well B-816

Location - 1860 FWL and 2250' FSL of Section 16, Township 30 South, Range 24 East, San Juan County, Utah

The well is located on State of Utah Lease - Utah ML 8366

2) The source of water to be injected is water to be produced along with oil and gas from the Mississippian formation in the Lisbon Field. The daily quantity of water injected is estimated to be 5200 BWPD. (Water analyses attached)

3) The formation into which water is to be injected is the Mississippian reservoir at a depth of 8461 feet to 8505 feet. A copy of a portion of the sonic log showing the injection interval is attached.

4) Total dissolved solids for the Mississippian interval are greater than 50,000 ppm as shown in the attached typical water analyses.

5) Water sands of the Cedar Mesa member of the Cutler formation would have to be considered usable in the entire Lisbon Unit. Depth to the base of this sand ranges from 1200 feet to 1800 feet. (Geological Survey Bulletin #841)

6) Eighteen inch OD conductor pipe was set in a 24" hole at 36 feet and cemented with 20 sacks regular cement containing one sack Cal-seal and one sack calcium chloride.

   New 8-5/8" OD, 24#, J-55 casing was set at 2023' and cemented with 410 sacks 50-50 pozmix, 4% gel, 2% HA-5 followed by 100 sacks regular cement containing 2% HA-5 in an 11" hole. The hole was cemented behind pipe with 40 sacks regular cement to bring cement to surface.

   New 5-1/2" OD, 17#, N-80 and J-55 was set from surface to 8732 feet in a 7-7/8" hole. The first stage was 125 sacks neat containing 2% gel, 1/4# per sack Flo-seal followed by 1000 cubic feet containing 40% Diacel, 84% salt saturated cement, and 1/4# Flo-seal per cubic foot. Cement top by temperature log is 5000 feet.

7) Total depth is 8732 feet, PBTD is 8690 feet K.B.

8) Proposed completion method includes setting a Baker Lok-Set injection packer at 8167 feet and installing 2-7/8" CS Hydril tubing. Anticipated injection pressure is 2000-3000 psig. Items (6), (7), and (8) are shown schematically on the attached drawing.

9) Lisbon Unit Well B-816 was completed in April, 1961 in the Mississippian by Belco Petroleum. The well last pumped 386 BWPD plus 1 BOPD in 1973, and is one of the lowest structured wells in the unit. Current plans are to use this well only as a backup to the present water disposal well. The wellhead pressures will be monitored and injection profiles may be run to insure that the water is confined to the injection interval.

Attached is a structure contour map contoured on the top of the Mississippian. The map shows the location of the present salt water disposal well and the proposed temporary disposal well. Also attached is a list showing the names and addresses of owners within a one-half (1/2) mile radius of the proposed disposal well upon whom notice of this application has been served by mailing a copy of this application. Your early approval is respectfully requested.

Yours very truly,

Harold Simpson

Harold Simpson
District Operations Manager

MAM:jh
Attachments

Union Oil and Gas Division: Central Region

Union Oil Company of California
Post Office Box 2620, Casper, Wyoming 82602
Telephone (307) 234-1563

union 76

RECEIVED
JUL 3 1978
DIVISION OF OIL, GAS, & MINING

June 29, 1978

State of Utah
Department of Natural Resources
Division of Oil, Gas, & Mining
1588 West North Temple
Salt Lake City, UT 84116

Attention: Mr. Patrick L. Driscoll
Chief Petroleum Engineer

Gentlemen:

We are in receipt of your letter of June 12, 1978 regarding metering water injected into Lisbon Unit Well B-624, San Juan County, Utah. We presently utilize the displacement of the injection pumps to "meter" the water injected and have confidence in the accuracy of this procedure. In your absence, I have visited by phone with Mr. Cleon Feight, and he stated that your office would be in agreement with this method of metering. Our calculation is as follows:

1) From the 8-day chart time and pressures of injection, it is indicated whether one, two, or three pumps are running and the number of hours each runs.

2) All pumps have 2" plungers, 6" strokes, and run at 310 rpm which calculates 2603 BPD per pump.

3) Our calculation is the summation of:

$$\frac{\text{pump hours running}}{24} \times 2603 \text{ BPD} \times 98\% \text{ efficiency}$$

By telephone conversation we discussed the types of shutdown devices on the disposal pumps:

1) First, we have probes in the storage tank which actuate the pumps, both on and off, so that one pump comes on; then if the level in the tank rises, the second pump comes on, and if the level in the tank continues to rise, the third pump comes on. With three pumps running, the disposal capacity is over 7500 BPD while Lisbon water production is 4000-5000 BWPD. The pumps are shut down one by one as the water

1) (Cont.)
level in the tank decreases.

2) Also, there is an extra probe near the bottom of the tank to shut down all pumps in case of failure of shutdown as described in (1) above.

3) Other safety kill-switches are:

a) Low pressure suction.

b) High pressure discharge.

c) No lubrication on plungers.

d) Low crank case oil.

e) Vibration.

I hope this information is helpful. If you have any further questions, please call the undersigned or Mr. Lloyd Reed, Area Production Superintendent, Moab, Utah, 801-686-2236.

Yours very truly,

UNION OIL COMPANY OF CALIFORNIA

Robert T. Shurtleff

Robert T. Shurtleff
District Production Superintendent

RTS:jh

October 18, 1979

MEMORANDUM

TO: File

FROM: Frank M. Hamner
Chief Petroleum Engineer
Division of Oil, Gas
and Mining

Re: Water Disposal Well (Lisbon B-624)
Union Oil Company of California
Sec. 24, T. 30S, R. 24E.,
San Juan County, Utah

The reserve pit has been breached and needs repair. Injection pressure at 1700 # psi. Hi-lo cutoffs not set on the murphy switches.

btm

cc: USGS

SCOTT M. MATHESON
Governor

GORDON E. HARMSTON
Executive Director,
NATURAL RESOURCES

CLEON B. FEIGHT
Director

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS, AND MINING
1588 West North Temple
Salt Lake City, Utah 84116
(801) 533-5771

OIL, GAS, AND MINING BOARD

CHARLES R. HENDERSON
Chairman

JOHN L. BELL
C. RAY JUVELIN
THADIS W. BOX
CONSTANCE K. LUNDBERG
EDWARD T. BECK
E. STEELE McINTYRE

November 9, 1979

Union Oil Company of California
P. O. Box 760
Moab, Utah 84532

-Well file

Re: Well No. Lisbon B-624
Sec. 24, T. 30S, R. 24E,
San Juan County, Utah

Gentlemen:

Attached hereto please find an inspection memo of Frank Hamner, Petroleum Engineer for the Division of Oil, Gas, and Mining. The enclosed memo lists the problems observed on this date.

It is hereby requested that you take the necessary action to repair the reserve pit and set hi-lo cutoffs on the Murphy switches.

Very truly yours,

DIVISION OF OIL, GAS, AND MINING

Cleon B Feight

CLEON B. FEIGHT
DIRECTOR

MIDNIGHT

6 A.M.

NOON

6 P.M.

LBS. PER SQ. INCH

RECORDING CHARTS
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK

BR 411
(4665)

19

Annulus

Tubing

Union Oil Company of California

Post Office Box 760, Moab, Utah 84532
Telephone (801) 686-2236

union 76

June 27, 1983

Ms. Thalia R. Pratt
Utah Division of Oil, Gas & Mining
4241 State Office Building
Salt Lake City, Utah 84114

WELL NO. B-624 SWD
SEC 24-T30S-R24E
SAN JUAN COUNTY, UTAH

Dear Ms.Pratt:

Union maintains a high annular pressure on the SWD Well #B-624 to reduce the differential pressure across the packer. This is done to minimize the possibility of a packer leak.

Attached is a chart from a dual pressure recorder that was installed on the well. Please note there is only a slight annular pressure charge (±5 psig) with a large tubing pressure change (± 500 psig). This indicates there is no communication between tubing and annulus. The slight annular pressures changes are caused by swelling of the tubing with increased injection pressure and temperature fluctuations.

Sincerely,

B.R. Govreau
Area Supt.

BRG:aj

Attachment

RECEIVED
JUL 05 1983
DIVISION OF
OIL, GAS & MINING

STATE OF UTAH
NATURAL RESOURCES
Oil, Gas & Mining

Scott M. Matheson, Governor
Temple A. Reynolds, Executive Director
Dr. G. A. (Jim) Shirazi, Division Director

4241 State Office Building • Salt Lake City, UT 84114 • 801-533-5771

October 3, 1983

Mr. B.R. Govreau
Union Oil Company
P.O. Box 760
Moab, UT 84532

Re: Pressure Test
Well #B-624 SWD
Sec. 24, T30S, R24E
San Juan County, Utah

Dear Mr. Govreau,

In order to be in compliance with the Underground Injection Control section of the Federal Safe Drinking Water Act of 1974, which the Division of Oil, Gas and Mining administers in Utah, the Division shall pressure test all Class II disposal wells in the State. Your above referenced well should be readied and arrangements made as outlined below for the test.

1. Cellars should be dug out in such a manner to expose outlets from the first string of pipe cemented on the well and all subsequent heads through the tubing head. One opening from all bradenheads should be connected to a second valve above the surface.

2. Operators must furnish connections, and accurate pressure guages, hot oil truck (or other means of pressuring annulus), as well as personnel to assist in opening valves, etc.

3. If mechanical difficulties or workover operations make it impossible for wells to be tested at this time, tests may be reschedualed.

4. Test date will be October 20th, 1983, at 10:00 a.m. Company personnel should meet DOGM representatives at the well site.

5. All bradenhead valves with exception of the tubing on injection wells must be shut-in 24 hours prior to testing.

If you have any questions concerning the preparation of wells or the test schedule, please do not hesitate to call or write.

Very truly yours,

DIVISION OF OIL, GAS AND MINING

Thalia R. Pratt

THALIA R. PRATT
UIC SPECIALIST

GH/TP/tp

an equal opportunity employer • please recycle paper

UTAH DIVISION OF OIL, GAS AND MINING
CASING-BRADENHEAD TEST

OPERATOR: Union oil company of Calif

FIELD: Liston LEASE: SL070034

WELL # B624 SEC. 24 TOWNSHIP 30S RANGE 24E

STATE FED. FEE DEPTH 9648 TYPE WELL SW D MAX. INJ. PRESS.

TEST DATE 3-26-85

CASING STRING	SIZE	SET AT	CMT	PRESSURE READINGS	REMARKS	FUTURE
Conductor ~~SURFACE~~	20	27'	Surface ~~Surf~~		Conductor	
INTERMEDIATE	13 3/8	1000'	Surface			
PRODUCTION						
TUBING						

REMARKS: Depth of injection 8936-9182

STATE OF UTAH
NATURAL RESOURCES
Oil, Gas & Mining

Norman H. Bangerter, Governor
Dee C. Hansen, Executive Director
Dianne R. Nielson, Ph.D., Division Director

355 W. North Temple • 3 Triad Center • Suite 350 • Salt Lake City, UT 84180-1203 • 801-538-5340

August 28, 1985

Union Oil Company of California
P.O. Box 760
Moab, Utah 84532

Gentlemen:

RE: Salt Water Disposal Well Lisbon Unit #B624, Section 24, Township 30 South, Range 24 East, San Juan County, Utah

On August 12, 1985, I inspected the above mentioned well. Everything was in excellent shape except that I was unable to read or change the guage on the casing-tubing annulus. Could you please attach an elbow thru the horizontal pipe and vertically extend the valve and guage above the wooden floor covering the cellar?

Thank you,

Cleon Feight

Cleon B. Feight
UIC Manager

CBF/mfp
0008U-14

Union Oil Company of California

Post Office Box 760, Moab, Utah 84532
Telephone (801) 686-2236

union 76

September 3, 1985

Sec 24, T30S R24E

RECEIVED
SEP 09 1985
DIVISION OF OIL
GAS & MINING

Mr. Cleon B. Feight
UIC Manager
Utah Division of Oil, Gas & Mining
355 W. North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

LISBON UNIT #B-624
SAN JUAN COUNTY, UTAH

Dear Mr. Feight:

As per your request, piping has been installed so a guage could be put on the casing-tubing annulus of the Lisbon Unit #B-624.

Please remember when you or your fellow employees visit Lisbon Field, hydrogen sulfide is present in lethal concentrations even in the vapors off the water. Your knowledge of hydrogen sulfide existence and its characteristics could save your life.

Sincerely,

B.R. Govreau
Area Supt.

BRG:aj

cc: LLR

STATE OF UTAH
NATURAL RESOURCES
Oil, Gas & Mining

[illegible] Bangerter, [illegible]
Lee C. Hansen, Executive Director
Dianne R. Nielson, Ph.D., Division Director

355 [illegible] Road [illegible] Lake City, UT 84180-1203 · 801-538-5340

September 13, 1985

Mr. B.R. Govreau
Union Oil Company of California
P.O. Box 760
Moab, Utah 84532

Dear Mr. Govreau:

RE: Salt Water Disposal Well Lisbon Unit #B624, Section 24, Township 30 South, Range 24 East, San Juan County, Utah

Thank you for your response to my letter of August 28, 1985. I am pleased to hear that the new piping has been installed so that a guage can be easily connected. Do you see any problem with testing the casing-tubing annulus about the middle of October?

If I am not contacted, I will be in touch with you to set up a convenient date for the testing. Thank you for your cooperation in this matter.

Sincerely,

Cleon Feight

Cleon B. Feight
UIC Manager

MFP/mfp
0009U-21

an equal opportunity employer

Norman H. Bangerter
Governor
Dee C. Hansen
Executive Director
Dianne R. Nielson, Ph.D.
Division Director

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
801-538-5340

File

T R S 43-037-16516
30 24 24

December 2, 1988

Union Oil Company of California
P.O. Box 760
Moab, Utah 84532

Gentlemen:

Re: Pressure Test for Mechanical Integrity, Lisbon Unit Wells D-84, D-610, B-614, B-624, San Juan County, Utah

The Underground Injection Control Program which the Division of Oil, Gas and Mining (DOGM) administers in Utah, requires that all Class II injection wells demonstrate mechanical integrity. It has been past policy of the Division to require pressure testing of all Class II salt water disposal wells and other injection wells not reporting monthly annulus pressures in accordance with rule R615-5-5.3 of the Oil and Gas Conservation General Rules. This rule requires that the casing-tubing annulus above the packer be pressure tested at a pressure equal to the maximum authorized injection pressure or 1,000 psi, whichever is lesser, provided that no test pressure is less than 300 psi. This test shall be performed at least every five year period beginning October, 1982. Our records indicate the above referenced wells are due for testing for the second five year period. Please make arrangements and ready the wells for testing on January 4, 1988 as outlined below:

1. Operators must furnish connections, and accurate pressure gauges, hot oil truck (or other means of pressuring annulus), as well as personnel to assist in opening valves etc.

2. If mechanical difficulties or workover operations make it impossible for the well to be tested on this date the test may be rescheduled.

3. Company personnel should meet DOGM representatives at the well site or other location as negotiated.

4. All bradenhead valves with exception of the tubing on the injection well must be shut in 24 hours prior to testing.

Please contact Mr. Dan Jarvis at (801) 538-5340 to arrange a meeting time or negotiate a different date if this one is unacceptable.

Sincerely,

Gil Hunt
Environmental/Geological Supervisor

bd
UI1/13-14

STATE OF UTAH

DIVISION OF OIL, GAS AND MINING

INJECTION WELL - PRESSURE TEST
****

TEST DATE: 1/26/89 WELL OWNER/OPERATOR: UNOCAL

DISPOSAL WELL: ✓ ENHANCED RECOVERY WELL: _____ OTHER: _____

API NO: 43-037-16516 WELL NAME/NUMBER: B-624

SECTION: 24 TOWNSHIP: 30S RANGE: 24E

INITIAL CONDITIONS:

TUBING - rate: _____ pressure: 2000

CASING/TUBING ANNULUS - pressure: 600 psi

CONDITIONS DURING TEST:

TUBING pressure: 2000 psi for 15 minutes

CASING/TUBING ANNULUS pressure: 1000 psi

annulus pressure drop during test: — psi

CONDITIONS AFTER TEST:

TUBING pressure: 2000 psi

CASING/TUBING ANNULUS pressure: 600 psi

REMARKS: 600 psi is left on Backside
well passed MIT

OPERATOR REPRESENTATIVE

DOGM WITNESS

Form 3160-5
(June 1990)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FORM APPROVED
Budget Bureau No. 1004-0135
Expires: March 31, 1993

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill or to deepen or reentry to a different reservoir.
Use "APPLICATION FOR PERMIT—" for such proposals

SUBMIT IN TRIPLICATE

5. Lease Designation and Serial No.: UTSL070034
6. If Indian, Allottee or Tribe Name:
7. If Unit or CA, Agreement Designation: Lisbon Unit
8. Well Name and No.: B - 624
9. API Well No.: 43-037-16516
10. Field and Pool, or Exploratory Area: Lisbon Mississippian
11. County or Parish, State: San Juan Co., Utah

1. Type of Well: [ ] Oil Well [ ] Gas Well [X] Other Water Disposal Well
2. Name of Operator: Union Oil Company of California
3. Address and Telephone No.: 3300 N. Butler, Suite 200, Farmington, NM 87401 (505) 326-7600
4. Location of Well (Footage, Sec., T., R., M., or Survey Description): 710' FNL & 1666' FWL Sec.24, T30S, R24E

12. CHECK APPROPRIATE BOX(s) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION	
[X] Notice of Intent	[ ] Abandonment	[ ] Change of Plans
[ ] Subsequent Report	[ ] Recompletion	[ ] New Construction
[ ] Final Abandonment Notice	[ ] Plugging Back	[ ] Non-Routine Fracturing
	[ ] Casing Repair	[ ] Water Shut-Off
	[ ] Altering Casing	[ ] Conversion to Injection
	[X] Other Repair tbg-csg communication	[ ] Dispose Water (Note: Report results of multiple completion on Well Completion or Recompletion Report and Log form.)

13. Describe Proposed or Completed Operations (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.)*

The Lisbon Unit No. B-624 is one of two water disposal wells for the Lisbon Unit. The well has developed casing pressure indicating tubing-casing communication.

A workover will begin as soon as possible to -

1. Pressure test tubing and packer. POOH and repair.
2. Run and set repaired injection equipment.
3. Perform Mechanical Integrity Test.
4. Acidize perforations.
5. Return to disposal.

A detailed workover procedure is attached.

RECEIVED
JUN 03 1991
DIVISION OF
OIL GAS & MINING

Accepted by the State of Utah Division of Oil, Gas and Mining
Date: 6-5-91
By: [signature]

14. I hereby certify that the foregoing is true and correct
Signed [signature] Title Field Superintendent Date 5/28/91

(This space for Federal or State office use)

Approved by _____ Title _____ Date _____
Conditions of approval, if any:

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

*See Instruction on Reverse Side

Engineering ___
Dist. Engineer ___
Drilling Eng. ___
Dist Drlg Supt ___

UNION OIL COMPANY OF CALIFORNIA
SOUTHWESTERN REGION
FARMINGTON DISTRICT
CONDITION OF HOLE AND PROCEDURE

DATE: 5/6/91

FIELD: Lisbon Mississippian **AREA:** Farmington

LEASE/UNIT: Lisbon Mississippian **WELL NO.** B-624

REASON FOR WORK: To eliminate tubing - casing communication

CONDITION OF HOLE:

TOTAL DEPTH: 9648' **ETD or PBTD:** 9195' KB **DATUM IS** 13' **ABOVE** GL

CASING RECORD: 13 3/8" 48# H-40 @1000'
5 1/2" 15.5, 17, & 20# N-80 & J-55 @ 9232'

PERFORATIONS: Mississippian:
8936' - 68'
9004' - 23'
9028' - 43'
9094' - 9109'
9115' - 21' & 9170' - 82'

TUBING DETAIL: 315 jts. + 1 sub 3 1/2" 9.3# J-55 AB Modified IJ3SS cplgs + locator seal assembly. FHD @ 8875'. Baker Model N pkr @ 8875'.

ROD & PUMP DETAIL: NONE

REGULATORY AGENCY REQUIREMENTS:

Prior to work:
- BLM Sundry Notice
- Copy of BLM Sundry to State

Subsequent to work:
- BLM Sundry Notice
- Copy of BLM Sundry Notice to State
- MIT results to State

PROCEDURE:

1. RU wireline. Set tbg valve @ + 8850'.
2. Blow down annulus.
3. Pressure test tubing to 1000 psi for 30 minutes.

4. A. If tubing did <u>not</u> hold-
   (1.) Sting out of packer. POOH with tbg. Lay tbg down for inspection.
   (2.) RIH with tbg and seal assembly to just above pkr, be sure to include seating nipple. Circulate pkr fluid. Sting into pkr.
   (3.) Drop standing valve.

   B. If tubing did hold-
   (1.) Sting out of packer. POOH with tbg. Lay tbg down for inspection.
   (2.) RIH with Baker Packer Milling Tool.
   (3.) Mill over and retrieve Baker Model N pkr. POOH.
   (4.) RIH with bit. Check ETD. POOH.
   (5.) RU wireline. RIH and set Guiberson Unipkr VI with profile nipples in tailpipe and profile plug in place and on/off tool receptacle @ + 8850' on wireline.
   (6.) RIH with tbg and on/off overshot.
   (7.) Circulate pkr fluid.
   (8.) Latch into on/off tool.

5. Pressure test tbg to 1000 psi for 30 minutes.
6. Pressure test annulus to 1000 psi for 30 minutes. Use pressure chart recorder on annulus. Notify Gil Hunt or Dan Jarvis with State of Utah Oil/Gas and Mining @ (801) 538-5340 at least 3 days in advance to witness test.
7. Retrieve plug from packer.
8. Acidize Mississippian perfs (8936'-9182') with 2000 gals 15% HCL with NE, FE & LST as follows (max rate 1 1/2 BPM):.
   - Pump 500 gals acid
   - Pump 500# GRS (@ 2 ppg) carried in 10 ppg gelled brine.
   - Pump 500 gals acid
   - Pump 500# GRS (@ 2 ppg) carried in 10 ppg gelled brine.
   - Pump 1000 gals acid
   - Flush with produced water
9. Swab back load ASAP.
10. Return to injection.

Calculation Record

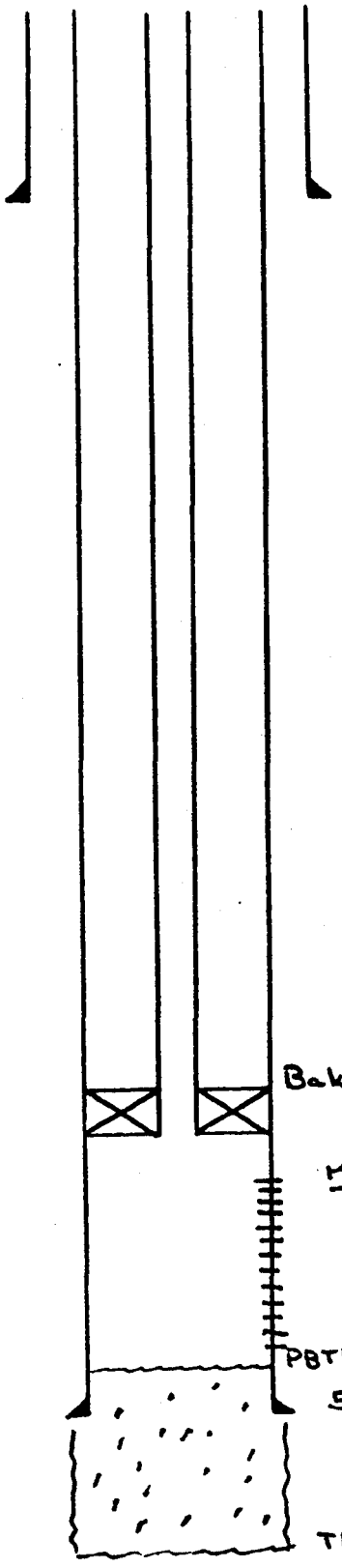
UNOCAL

PREPARED BY	CHECKED BY	DATE	PAGE
CVH		5/22/91	OF

SUBJECT: LISBON UNIT WELL NO. B-624 (WDW)

W.O./A.F.E. NO:

KB : 13' Above GL



13 3/8" 48# H-40 @ 1000'

Tubing Detail:

3.00'	Baker Locator Seal Assembly (2.668" OD x 1.927" ID)
0.70'	2 3/8" x 2 7/8" 8rd Locator Sub
0.80'	2 7/8" 8rd x 3 1/2" AB Mod Crossover
8828.06'	314 jts 3 1/2" 9.3# AB Mod IJ3SS J-55 tbg
7.90'	1 sub 3 1/2" 9.3# J-55 AB Mod
28.54'	1 jt. 3 1/2" 9.3# J-55 AB Mod
8869.00'	

Baker Model N pkr @ 8875' (tbg hung 14,000# comp)

Mississippian: 8936'-68', 9004'-23', 9028'-43', 9094'-9109', 9115'-21' & 9170'-82' w/ 4 SPF

PBTD 9195'

5 1/2" 15.5, 17 & 20# N-80 & J-55 @ 9232'

TD 9648'

FORM 1-2C50 (REV. 2-87) PRINTED IN U.S.A.

Form 3160-5
(June 1990)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FORM APPROVED
Budget Bureau No. 1004-0135
Expires: March 31, 1993

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill or to deepen or reentry to a different reservoir.
Use "APPLICATION FOR PERMIT—" for such proposals

SUBMIT IN TRIPLICATE

5. Lease Designation and Serial No.: UTSL 070034
6. If Indian, Allottee or Tribe Name:
7. If Unit or CA, Agreement Designation: LISBON UNIT
8. Well Name and No.: B-624
9. API Well No.: 43-037-16516
10. Field and Pool, or Exploratory Area: Lisbon Mississippian
11. County or Parish, State: San Juan Co., Utah

1. Type of Well: ☐ Oil Well ☐ Gas Well ☒ Other Water Disposal Well
2. Name of Operator: Union Oil Company of California
3. Address and Telephone No.: 3300 North Butler, Suite 200, Farmington, NM 87401 (505) 326-7600
4. Location of Well (Footage, Sec., T., R., M., or Survey Description): 710' FNL & 1666' FWL, Sec. 24, T30S, R24E

12. CHECK APPROPRIATE BOX(s) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION	
☐ Notice of Intent	☐ Abandonment	☐ Change of Plans
☒ Subsequent Report	☐ Recompletion	☐ New Construction
☐ Final Abandonment Notice	☐ Plugging Back	☐ Non-Routine Fracturing
	☐ Casing Repair	☐ Water Shut-Off
	☐ Altering Casing	☐ Conversion to Injection
	☒ Other Casing Mechanical Intergrity Test	☐ Dispose Water (Note: Report results of multiple completion on Well Completion or Recompletion Report and Log form.)

13. Describe Proposed or Completed Operations (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.)*

6/8/91 MIRU pulling unit. Bled 240 psi from tbg annulus to pit. Pressure tested 5-1/2" casing annulus to 1600 psi for 4 hours (copy of chart attached), casing held ok. Acidized Mississippian perf 8936'-9182' with 2000 gals 15% HCL w/ NE, FE, & LST & 500# GRS @ 2 ppg in 10# gelled brine in 2 stages at 3 BPM and 928-1611-1530 psi. Returned well to injection.

RECEIVED
JUN 17 1991
DIVISION OF
OIL GAS & MINING

14. I hereby certify that the foregoing is true and correct

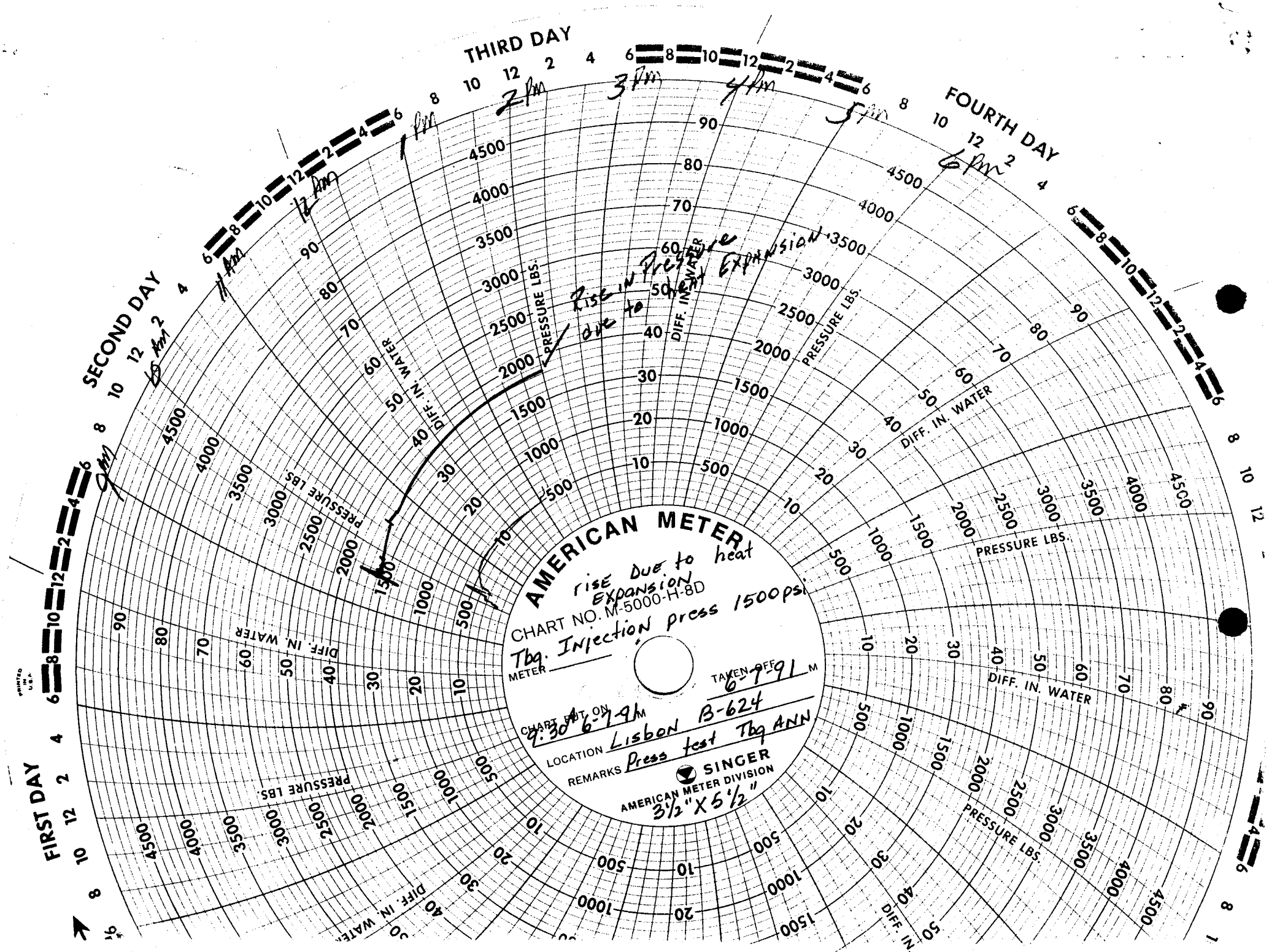
Signed [signature] Title Field Superintendent Date 6/13/91

(This space for Federal or State office use)

Approved by _____ Title _____ Date _____
Conditions of approval, if any:

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

*See Instruction on Reverse Side


FIRST DAY
SECOND DAY
THIRD DAY
FOURTH DAY
PRESSURE LBS.
DIFF. IN. WATER
AMERICAN METER
CHART NO. M-5000-H-8D
METER
TAKEN OFF 6-7-91 M
CHART PUT ON 9:30 6-7-91 M
LOCATION Lisbon B-624
REMARKS Press test Tbg ANN
SINGER
AMERICAN METER DIVISION
3½" X 5½"
rise due to heat expansion
Tbg. Injection press 1500psi
Rise in Pressure due to heat expansion

Unocal Oil & Gas Division
Unocal Corporation
3300 North Butler Avenue
Suite 200
Farmington, New Mexico 87401
Telephone (505) 326-7600
Fax: (505) 326-6145

UNOCAL 76

October 8, 1991

RECEIVED
OCT 1 1 1991
DIVISION OF
OIL, GAS & MINING

Farmington District

State of Utah
Attn: Gil Hunt
Division of Oil, Gas & Mining
3 Triad Center, Suite 350
Salt Lake City, UT 84180-1203

SUBJECT:
Written Report of Produced Water Spill atLisbon Unit B-624 Water Disposal Well
Lisbon (Mississippian) Unit
San Juan County, Utah

Dear Mr. Hunt:

As required by NTL-3A, attached in duplicate is the written report of the produced water spill at the Lisbon Unit B-624 Water Disposal Well.

Approximately 600-800 barrels of produced water leaked from a failure in a weld on the water disposal pipeline sometime late at night October 1, 1991. The leak was discovered the morning of October 2. The line was immediately shut-in and the following agencies were notified:

Bureau of Land Management, Moab District (Dale Manchester)
State of Utah, Water Pollution Control (Steve McNeal)
State of Utah, Division of Oil, Gas & Mining
(message left for Gil Hunt)

The line was repaired and operations resumed. A water containment dike is being constructed at the well location to prevent a water spill from draining off of the location.

If additional information is required, please contact Steve Gregory or me at (505) 326-7600.

Very truly yours,

Union Oil Company of California
dba UNOCAL

Craig A. Van Horn

Craig Van Horn
Field Superintendent

bjt

Enclosure

ing.

UNDESIRABLE EVENT CHECKLIST
WRITTEN REPORT

TELEPHONE
REPORTED BY: Steve Gregory PHONE NUMBER: (505)326-7600

DATE OF OCCURRENCE/DISCOVERY: 10/1/91 TIME OF OCCURRENCE: Sometime during night

DATE REPORTED TO BLM: 10/2/91 TIME REPORTED: 3:15 PM

BLM OFFICE REPORTED TO (RESOURCE AREA/DISTRICT OFFICE/OTHER): Moab Dist. Office

LOCATION: SECTION: 24 T. 30S R. 24E MERIDIAN

COUNTY: San Juan STATE: Utah WELL NAME: Lisbon Unit B-624 WDW 43-037-16516

SURFACE OWNERSHIP (FEDERAL/INDIAN/FEE/STATE): Federal

MINERAL OWNERSHIP (FEDERAL/INDIAN/FEE/STATE): Water Disposal Well

LEASE NO.: UTSL070034 UNIT/CA NO.: Lisbon Unit RIGHT-OF-WAY NO.:

TYPE OF EVENT, CIRCLE APPROPRIATE ITEM(S):

BLOWOUT, FIRE, FATALITY, INJURY, PROPERTY DAMAGE, OIL SPILL, SALTWATER SPILL, TOXIC FLUID SPILL, OIL AND SALTWATER SPILL, OIL AND TOXIC FLUID SPILL, SALTWATER AND TOXIC FLUID SPILL, GAS VENTING, UNCONTROLLED FLOW OF WELLBORE FLUIDS, OR OTHER (SPECIFY):

CAUSE OF EVENT: Crack in a weld on the water disposal pipeline allowing produced water to spill onto well location.

CAUSE AND EXTENT OF PERSONAL INJURIES/CAUSE OF DEATH(S):
None

EFFECTS OF EVENT: During the night, approximately 600-800 barrels of produced water spilled onto the well location before the leak was discovered the following morning.

ACTION TAKEN TO CONTROL THE EVENT AND SUBSEQUENT CLEAN-UP: A full encirclement sleeve was welded onto the line enclosing the failed well.

LENGTH OF TIME TO CONTROL EVENT AND SUBSEQUENT CLEAN-UP: Following discovery, the line was shut-in immediately and repaired within 8 hours.

VOLUME(S) OF FLUIDS (SPECIFY): PRODUCED WATER

DISCHARGED: 600-800 Barrels CONSUMED: All fluid soaked in to sand
RECOVERED: 0

OTHER FEDERAL, STATE, AND LOCAL GOVERNMENT AGENCIES NOTIFIED (INCLUDE MANES AND DATE/TIME): 10/2/91 3:20 State of Utah Water Pollution Control (Steve McNeal) 10/2/91 3:30 State of Utah OCD (Message left for Gil Hunt)

ACTION THAT HAS BEEN OR WILL BE TAKEN TO PREVENT RECURRENCE: Containment dike being constructed to prevent water spill at the well from draining off of the location.

WRITTEN REPORT SUBMITTED BY: CRAIG VAN HORN Craig A. Van Horn

Unocal Oil & Gas Divisio
Unocal Corporation
P.O. Box 760
Moab, Utah 84532
Telephone (801) 686-2236

UNOCAL 76

RECEIVED
FEB 24 1995
DIV OF OIL, GAS & MINING

State of Utah
Board of Oil, Gas, and Mining
Attn: Gil Hunt
355 West North Temple
3 Traid Center, Suite 350
Salt Lake City, Utah 84180-1203

February 17, 1995

SUBJECT: SALTWATER DISPOSAL SPILL ON B-624 LOCATION 43-037-16516

As required by NTL-3A, attached in duplicate is the written report of the saltwater spill which occurred at the Lisbon Field B-624 Saltwater Injection Well location.

The inlet valve to the storage tank at the B-624 location was inadvertently left in the by-pass mode. During the night, the saltwater disposal pump, which pull suction from this storage tank, went down on excessive vibration. Because the inlet valve was in the by-pass mode, saltwater continued to flow into the storage tank and out the overflow. The saltwater ran into a bermed containment. A part of the containment washed out causing a portion of the saltwater to flow down a road into a dry wash.

The by-pass capability to this inlet valve has been removed to prevent this from occurring again. Cleanup was immediately underway.

The following Government Agencies have been notified:

Bureau of Land Management, San Juan Resource Area, Monticello, Utah (Gary Torres)
State of Utah, Oil, Gas & Mining (Gil Hunt)
State of Utah, Dept. of Water Quality (Don Hilden)

If additional information is required please contact Mike Tabet or me at 801-686-2236.

Sincerely,
Union Oil Company of California, dba Unocal

Dave Peters
Field Superintendent

Attachments: Written Report in duplicate/Map
cc: Jay Axtell

Form NM 3162-1
(July 1991)

RECEIVED
FEB 24 1995
DIV OF OIL GAS & MINING

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Land Management
UTAH ~~New Mexico~~ State Office

REPORT OF UNDESIRABLE EVENT

DATE OF OCCURRENCE/DISCOVERY: 02-16-95 TIME OF OCCURRENCE: During night

DATE REPORTED TO BLM: 02-17-95 TIME REPORTED: 8:00 A.M.

BLM OFFICE REPORTED TO: (RESOURCE AREA/DISTRICT/OTHER): San Juan

LOCATION: (¼ ¼) NW/NW SECTION 24 T. 30S R. 24E MERIDIAN SLC

COUNTY: San Juan STATE: Utah WELL NAME B-624 Salt Water Disposa

OPERATOR: COMPANY NAME Unocal PHONE NO. 801-686-2236

CONTACT PERSON'S NAME Mike Tabet

SURFACE OWNER: Federal MINERAL OWNER: Federal
(FEDERAL/INDIAN/FEE/STATE)

LEASE NO.: UTSL070034 RIGHT-OF-WAY NO.:

UNIT NAME / COMMUNITIZATION AGREEMENT NO.: Lisbon Unit

TYPE OF EVENT, CIRCLE APPROPRIATE ITEM(S):

BLOWOUT, FIRE, FATALITY, INJURY, PROPERTY DAMAGE, OIL SPILL, SALTWATER SPILL, OIL AND SALTWATER SPILL, TOXIC FLUID SPILL, HAZARDOUS MATERIAL SPILL, UNCONTROLLED FLOW OF WELLBORE FLUIDS, OTHER (SPECIFY):

CAUSE OF EVENT: Inlet valve to Saltwater Disposal storage tank was inadvertenly left in by-pass condition. Salt water injection pump went down on vibration causing tank to fill and overflow.

HazMat Notified: (for spills) N/A

Law Enforcement Notified: (for thefts) N/A

CAUSE AND EXTENT OF PERSONAL INJURIES/CAUSE OF DEATH(S): N/A

Safety Officer Notified:

EFFECTS OF EVENT: Saltwater ran into containment area. Part of the containment area washout and a portion of saltwater ran down a dry wash

ACTION TAKEN TO CONTROL EVENT: Remove by-pass capability to inlet valve at salt water disposal tank storage.

LENGTH OF TIME TO CONTROL BLOWOUT OR FIRE: N/A

VOLUMES DISCHARGED: OIL WATER Est. 80 BBL GAS

OTHER AGENCIES NOTIFIED: Division of Oil Gas & Mining - Gil Hunt
Dept. of Water Quality - Don Hilden

Enclosure 1

Form NM 3162-1
(July 1991)

RECEIVED
FEB 24 1995
DIV OF OIL GAS & MINING

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Land Management
UTAH ~~New Mexico~~ State Office

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DATE REPORTED TO BLM: 02-17-95 TIME REPORTED: 8:00 A.M.

BLM OFFICE REPORTED TO: (RESOURCE AREA/DISTRICT/OTHER): San Juan

LOCATION: (¼ ¼) NW/NW SECTION 24 T. 30S R. 24E MERIDIAN SLC

COUNTY: San Juan STATE: Utah WELL NAME B-624 Salt Water Disposal

OPERATOR: COMPANY NAME Unocal PHONE NO. 801-686-2236

CONTACT PERSON'S NAME Mike Tabet

SURFACE OWNER: Federal MINERAL OWNER: Federal
(FEDERAL/INDIAN/FEE/STATE)

LEASE NO.: UTSL070034 RIGHT-OF-WAY NO.:

UNIT NAME / COMMUNITIZATION AGREEMENT NO.: Lisbon Unit

TYPE OF EVENT, CIRCLE APPROPRIATE ITEM(S):

BLOWOUT, FIRE, FATALITY, INJURY, PROPERTY DAMAGE, OIL SPILL, SALTWATER SPILL, OIL AND SALTWATER SPILL, TOXIC FLUID SPILL, HAZARDOUS MATERIAL SPILL, UNCONTROLLED FLOW OF WELLBORE FLUIDS, OTHER (SPECIFY):

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HazMat Notified: (for spills) N/A

Law Enforcement Notified: (for thefts) N/A

CAUSE AND EXTENT OF PERSONAL INJURIES/CAUSE OF DEATH(S): N/A

Safety Officer Notified:

EFFECTS OF EVENT: Saltwater ran into containment area. Part of the containment area washout and a portion of saltwater ran down a dry wash

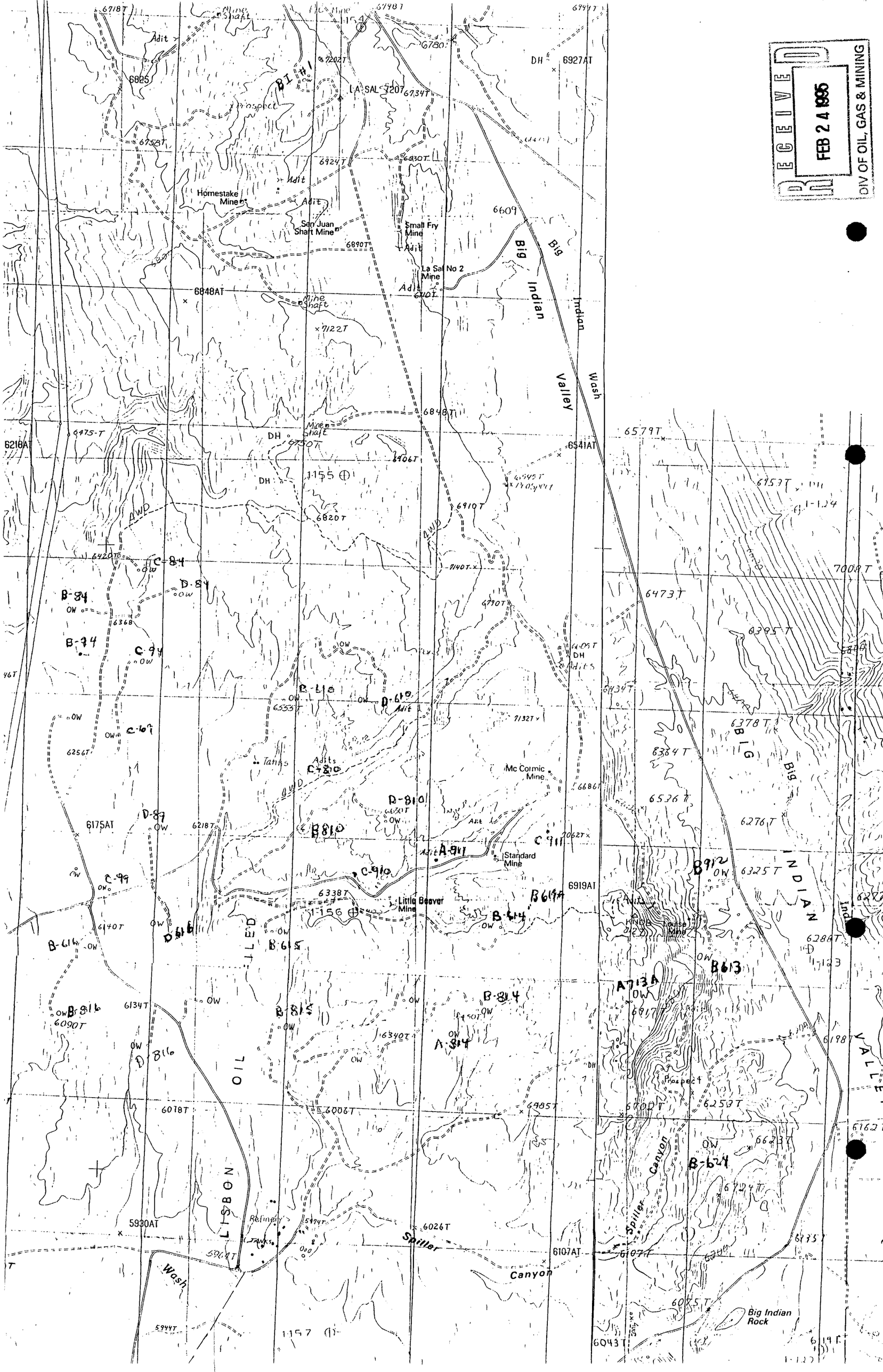
ACTION TAKEN TO CONTROL EVENT: Remove by-pass capability to inlet valve at salt water disposal tank storage.

LENGTH OF TIME TO CONTROL BLOWOUT OR FIRE: N/A

VOLUMES DISCHARGED: OIL WATER Est. 80 BBL GAS

OTHER AGENCIES NOTIFIED: Division of Oil Gas & Mining - Gil Hunt
Dept. of Water Quality - Don Hilden

Enclosure 1



RECEIVED
FEB 24 1995
DIV OF OIL, GAS & MINING

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt
Governor
Ted Stewart
Executive Director
James W. Carter
Division Director

1594 West North Temple, Suite 1210
Box 145801
Salt Lake City, Utah 84114-5801
801-538-5340
801-359-3940 (Fax)
801-538-7223 (TDD)

June 2, 1997

Union Oil Company of California
P.O. Box 760
Moab, Utah 84532-0760

Re: Pressure Test for Mechanical Integrity, B-624, D-610 and B-816 Injection Wells, Lisbon Unit, San Juan County, Utah

Gentlemen:

The Underground Injection Control Program which the Division of Oil, Gas and Mining (DOGM) administers in Utah, requires that all Class II injection wells demonstrate mechanical integrity. Rule R649-5-5.3 of the Oil and Gas Conservation General Rules requires that the casing-tubing annulus above the packer be pressure tested at a pressure equal to the maximum authorized injection pressure or 1,000 psi, whichever is lesser, provided that no test pressure is less than 300 psi. This test shall be performed at least every five year period beginning October 1982. Our records indicate the above referenced wells are due for testing. Please make arrangements and ready the wells for testing during the week of June 16, 1997 as outlined below:

1. Operator must furnish connections, and accurate pressure gauges, hot oil truck (or other means of pressuring annulus), as well as personnel to assist in opening valves etc.

2. The casing-tubing annulus shall be filled prior to the test date to expedite testing, as each well will be required to hold pressure for a minimum of 15 minutes.

3. If mechanical difficulties or workover operations make it impossible for the wells to be tested on this date the tests may be rescheduled.

4. Company personnel should meet DOGM representatives at the field office or other location as negotiated.

5. All bradenhead valves with exception of the tubing on the injection wells must be shut-in 24 hours prior to testing.

Please contact Dan Jarvis at (801)538-5338 to arrange a meeting time and place or negotiate a different date if this one is unacceptable.

Sincerely,

Gil Hunt
Environmental Manager, Oil & Gas

lwp

STATE OF UTAH
Division of Oil, Gas and Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

INJECTION WELL - PRESSURE TEST

Test Date: 6/18/97	Well Owner/Operator: Unocal	
Disposal Well: X	Enhanced Recovery Well: X	Other:
API No.: 43-037-16516	Well Name/Number: B-624	
Section: 24	Township: 30 S	Range: 24E

Initial Conditions:

Tubing - Rate: _____ Pressure: _____ psi

Casing/Tubing Annulus - Pressure: _____ psi

Conditions During Test:

Time (Minutes)	Annulus Pressure	Tubing Pressure
0	200	0
5	1000	0
10	960	0
15	960	0
20		0
25		
30		

Results: Pass/Fail

Conditions After Test:

Tubing Pressure: 0 psi

Casing/Tubing Annulus Pressure: _____ psi

REMARKS: ~~Well p~~ Annulus pressure bled off 40 psi due to cold water injction. Stopped injection ~~with~~ pressure held 15 min. passed MIT.

Rick Cottango
Operator Representative

D. Jarvis
DOGM Witness

CHECKLIST FOR INJECTION WELL APPLICATION AND FILE REVIEW

* * * * * * * * *

Operator: Union oil Company Well No. Sistom Unit B 624

County: San Juan T 30S R 24E Sec. 24 API# 43-037-16516

New Well ___ Conversion X Disposal Well ___ Enhanced Recovery Well ___

	YES	NO
UIC Forms Completed	✓	
Plat including Surface Owners, Leaseholders, and wells of available record	✓	
Schematic Diagram	✓	
Fracture Information	✓	
Pressure and Rate Control	✓	
Adequate Geologic Information	✓	
Fluid Source	Mississippian-McCracken	
Analysis of Injection Fluid	Yes ✓ No ___	TDS 50,000
Analysis of Water in Formation to be injected into	Yes ✓ No ___	TDS 50,000
Known USDW in area	Cutler	Depth 1200-1800'
Number of wells in area of review	1 Prod. 1	P&A 0
	Water 0	Inj. 0
Aquifer Exemption	Yes ___ NA ✓	
Mechanical Integrity Test	Yes ___ No ✓	
	Date ___	Type ___

Comments: _____

Reviewed by: CB Taylor

F-Vaut
Minnie - [illegible]
B-816

Union Oil and Gas D[illegible]on: Central Region

Union Oil Company of California
Post Office Box 2620, Casper, Wyoming 82602
Telephone (307) 234-1563

APPROVED
MAR 18 1977
E. A. SCHMIDT
ACTING DISTRICT ENGINEER

SUBJECT TO APPROVAL BY UTAH O&G CC.

RECEIVED
MAR 24 1977

union 76

HS
RTS
RGL
VLD
File

March 9, 1977

Send copy to L.D. Reel - moab

Department of Natural Resources
Division of Oil, Gas & Mining
State of Utah
1588 West North Temple
Salt Lake City, UT 84116

United States Geological Survey
P.O. Box 1809
Durango, CO 81301

Attention: Mr. Jerry Long
District Engineer

RECEIVED
MAR 14 1977
U. S. GEOLOGICAL SURVEY
DURANGO, COLO.

Gentlemen:

In order to remain in compliance with the United States Geological Survey rules on the handling of water produced with oil and gas should anything happen to the present SWD Well B-624, Union Oil Company of California, Operator, applies for approval to temporarily dispose of water into the Mississippian formation through the wellbore of Lisbon Unit Well B-816 located in the NE SW of Section 16, Township 30 South, Range 24 East, San Juan County, Utah.

Unit Well B-816 would only be used as a backup to the present water disposal well in order to prevent curtailing oil and gas production from the unit. In support of the application to temporarily dispose of water in the Mississippian zone in Well B-816, we show:

1) Designated name of proposed disposal well -

Lisbon Unit Well B-816

Location - 1860 FWL and 2250' FSL of Section 16, Township 30 South, Range 24 East, San Juan County, Utah

The well is located on State of Utah Lease - Utah ML 8366

2) The source of water to be injected is water to be produced along with oil and gas from the Mississippian formation in the Lisbon Field. The daily quantity of water injected is estimated to be 5200 BWPD. (Water analyses attached)

3) The formation into which water is to be injected is the Mississippian reservoir at a depth of 8461 feet to 8505 feet. A copy of a portion of the sonic log showing the injection interval is attached.

7

4) Total dissolved solids for the Mississippian interval are greater than 50,000 ppm as shown in the attached typical water analyses.

5) Water sands of the Cedar Mesa member of the Cutler formation would have to be considered usable in the entire Lisbon Unit. Depth to the base of this sand ranges from 1200 feet to 1800 feet. (Geological Survey Bulletin #841)

6) Eighteen inch OD conductor pipe was set in a 24" hole at 36 feet and cemented with 20 sacks regular cement containing one sack Cal-seal and one sack calcium chloride.

   New 8-5/8" OD, 24#, J-55 casing was set at 2023' and cemented with 410 sacks 50-50 pozmix, 4% gel, 2% HA-5 followed by 100 sacks regular cement containing 2% HA-5 in an 11" hole. The hole was cemented behind pipe with 40 sacks regular cement to bring cement to surface.

   New 5-1/2" OD, 17#, N-80 and J-55 was set from surface to 8732 feet in a 7-7/8" hole. The first stage was 125 sacks neat containing 2% gel, 1/4# per sack Flo-seal followed by 1000 cubic feet containing 40% Diacel, 84% salt saturated cement, and 1/4# Flo-seal per cubic foot. Cement top by temperature log is 5000 feet.

7) Total depth is 8732 feet, PBTD is 8690 feet K.B.

8) Proposed completion method includes setting a Baker Lok-Set injection packer at 8167 feet and installing 2-7/8" CS Hydril tubing. Anticipated injection pressure is 2000-3000 psig. Items (6), (7), and (8) are shown schematically on the attached drawing.

9) Lisbon Unit Well B-816 was completed in April, 1961 in the Mississippian by Belco Petroleum. The well last pumped 386 BWPD plus 1 BOPD in 1973, and is one of the lowest structured wells in the unit. Current plans are to use this well only as a backup to the present water disposal well. The wellhead pressures will be monitored and injection profiles may be run to insure that the water is confined to the injection interval.

Attached is a structure contour map contoured on the top of the Mississippian. The map shows the location of the present salt water disposal well and the proposed temporary disposal well. Also attached is a list showing the names and addresses of owners within a one-half (1/2) mile radius of the proposed disposal well upon whom notice of this application has been served by mailing a copy of this application. Your early approval is respectfully requested.

Yours very truly,

Harold Simpson

Harold Simpson
District Operations Manager

MAM:jh
Attachments

CHEMICAL & GEOLOGICAL LABORATORIES

P. O. Box 2794
Casper, Wyoming

WATER ANALYSIS REPORT

OPERATOR Union Oil Co. of Calif.
WELL NO. B-814
FIELD Lisbon
COUNTY San Juan
STATE Utah

DATE Oct. 23, 1972 LAB NO. 8905
LOCATION Sec. 14-30S-24E
FORMATION Mississippian
INTERVAL
SAMPLE FROM Production water

REMARKS & CONCLUSIONS: Cloudy water with clear filtrate

Cations	mg/l	meq/l	Anions	mg/l	meq/l
Sodium	26283	1143.30	Sulfate	1720	35.78
Potassium	1800	46.08	Chloride	48500	1367.70
Lithium			Carbonate	204	6.79
Calcium	3136	156.49	Bicarbonate	1171	19.20
Magnesium	1017	83.60	Hydroxide	—	—
Iron	Present	Present	Hydrogen sulfide	Present	Present
Total Cations		1429.47	Total Anions		1429.47

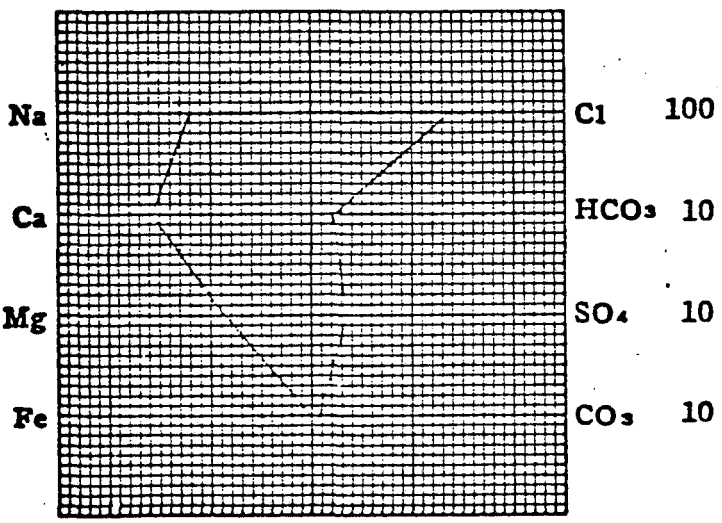
Total dissolved solids, mg/l 83237
NaCl equivalent, mg/l 83029
Observed pH 8.6

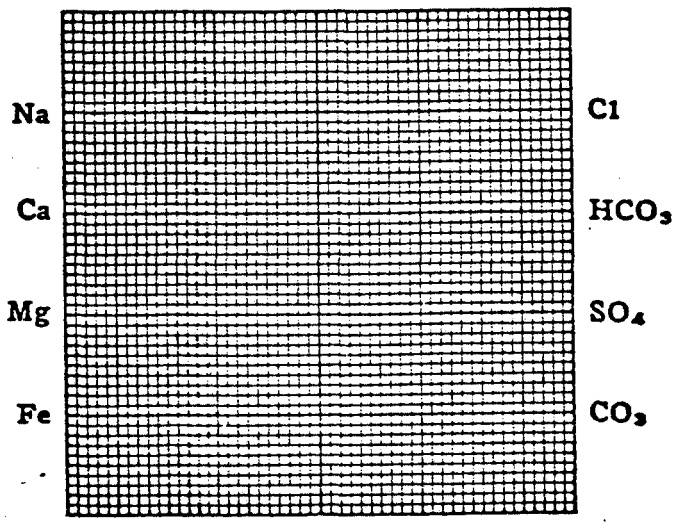
Specific resistance @ 68°F.:
Observed 0.11 ohm-meters
Calculated 0.10 ohm-meters

WATER ANALYSIS PATTERN

Sample above described

Scale
MEQ per Unit





(Na value in above graphs includes Na, K, and Li)
NOTE: Mg/l=Milligrams per liter Meq/l= Milligram equivalents per liter
Sodium chloride equivalent=by Dunlap & Hawthorne calculation from components

DWL-481-2-A

DOWELL DIVISION OF THE DOW CHEMICAL COMPANY

LABORATORY LOCATION Casper

API WATER ANALYSIS REPORT FORM

DATE February 6, 1975

LAB NO. CL 4882

Company: Union Oil of California		Sample No.: 35512	Date Sampled: 1-25-75
Field: Lisbon	Legal Description:	County or Parish: San Juan	State: N. Mex
Lease or Unit: Lisbon	Well: B624	Depth:	Formation: Mississippian
Water, B/D:			
Type of Water (Produced, Supply, etc.): Disposed water	Sampling Point:		Sampled By: Ruttinger

DISSOLVED SOLIDS

CATIONS	mg/l	me/l
Sodium, Na (calc.)	26473	1151
Calcium, Ca	4200	210
Magnesium, Mg	120	10
Barium, Ba		

ANIONS	mg/l	me/l
Chloride, Cl	46500	1329
Sulfate, SO_4	925	19
Carbonate, CO_3	0	
Bicarbonate, HCO_3	1400	23

Total Dissolved Solids (calc.)

Iron, Fe (total) 450

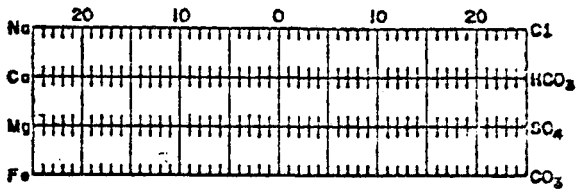
Sulfide, as H_2S present strong

OTHER PROPERTIES

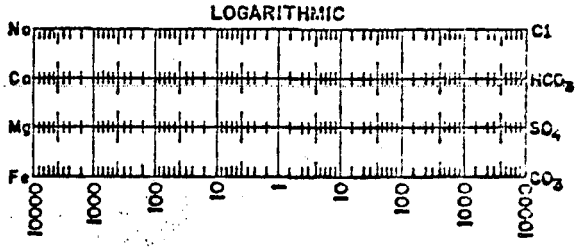
pH	6.4
Specific Gravity, 60/60 F.	1.055
Resistivity (ohm-meters) ____ F.	
SI @ 145°F	+1.5

WATER PATTERNS — me/l

STANDARD



LOGARITHMIC



REMARKS & RECOMMENDATIONS:

ANALYSIS BASED ON API RECOMMENDED PROCEDURE

DWL-635

DOWELL DIVISION OF THE DOW CHEMICAL COMPANY

LABORATORY REPORT

B-624 FILE

FOR: Union Oil of California
See below
Lisbon Field
San Juan County, ~~N. Mexico~~ UTAH

DATE: February 6, 1975

LAB LOCATION: Casper

LAB NO. CL 4882 & 83

S. NO. 35511 & 12

TYPE OF SAMPLE:
Water (2)

DESCRIPTION:
Formation - Mississippian
BHT - 145°

The samples were submitted to the laboratory for analysis of solids in the water.
Sample #1 - Big Indian #1
Sample #2 - Lisbon B624

X-ray Diffraction Analysis

Major (25-100%)	Minor (10-30%)	Low (less than 15%)
#1 Sulfur	none	Quartz (Fe S)
#2 Sulfur	Salt	Fe S, Quartz

Optical Emission Spectrographic Analysis

Major (10-100%)	Minor (1-10%)	Trace (less than 1%)
#1 None	Si Fe, Na (low)	Cd (high) Pb, Sn, Mg, Al Ti, Ca, Cu, Zn, Ag
#2 None	Fe (high) Si, Na, Ca	Mg, Cr, Al (high) Pb, Sn, Mn, Ba Ti, V, Cu, Ag

J. E. White
JEW/ml

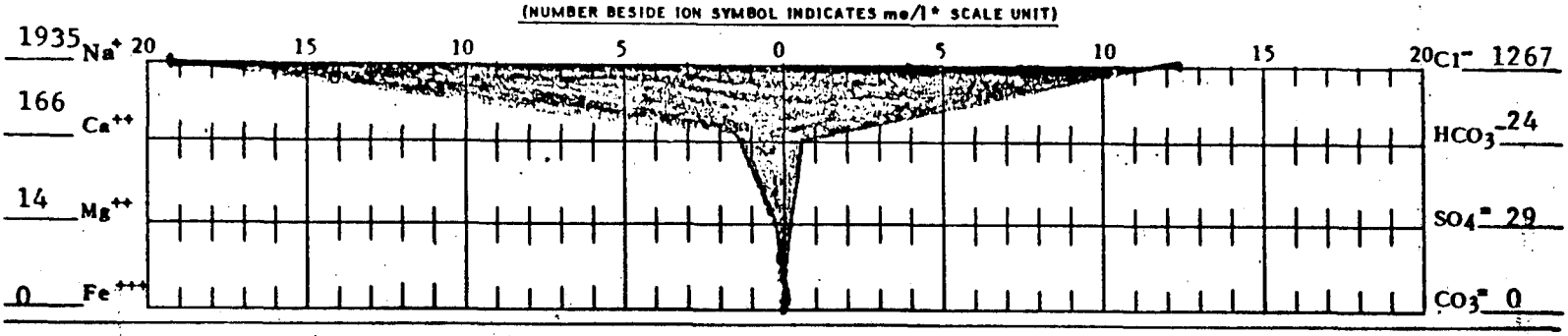
DISTRIBUTION:
A. J. Ruttinger
D15 - Denver Regional Office
Sales - Casper Office File

BAROID DIVISION
NATIONAL LEAD COMPANY
BAROID TREATING CHEMICALS

WATER ANALYSIS TEST REPORT

SHEET NUMBER	
COMPANY	UNION OIL COMPANY OF CALIFORNIA
DATE	MAY 29, 1975
FIELD	
COUNTY OR PARISH	SAN JUAN
STATE	UTAH
LEASE OR UNIT	LISBON UNIT
WELL(S) NAME OR NO.	
WATER SOURCE (FORMATION)	WATER PLANT # 1
DEPTH, FT.	
BHT, F	
SAMPLE SOURCE	
TEMP, F	
WATER, BBL/DAY	
OIL, BBL/DAY	
GAS, MMCF/DAY	
TYPE OF OIL	
API GRAVITY	°
TYPE OF WATER	☐ PRODUCED WATER ☐ INJECTION WATER OTHER

WATER ANALYSIS PATTERN
(NUMBER BESIDE ION SYMBOL INDICATES me/l* SCALE UNIT)



DISSOLVED SOLIDS

CATIONS	me/l*	mg/l*
Total Hardness	180	9,000
Sodium, Na^+ (calc.)	1,935.86	44,525
Calcium, Ca^{++}	166	3,320
Magnesium, Mg^{++}	14	170.1
Iron (Total), Fe^{+++}	0	0
ANIONS		
Chloride, Cl^-	1,267.6	45,000
Sulfate, $SO_4^=$	29.7	1,425
Carbonate, $CO_3^=$	0	0
Bicarbonate, HCO_3^-	24.2	1,476.2
Hydroxyl, OH^-	0	0
Sulfide, $S^=$	1.8	29.4
Phosphate-Meta, PO_3^-	.038	3.00
Phosphate-Ortho, $PO_4^{\equiv}$	.559	13.25
Total Phosphate	.77	18.25
Barium	1.78	50

DISSOLVED GASES

Hydrogen Sulfide, H_2S		mg/l*
Carbon Dioxide, CO_2		mg/l*
Oxygen, O_2		mg/l*

PHYSICAL PROPERTIES

pH	6.4	
Eh (Redox Potential)		MV
Specific Gravity		
Turbidity, JTU Units		
Total Dissolved Solids (Calc.)		mg/l*
Stability Index @ 68 F	.55	
@ 86 F	.74	
$CaSO_4$ Solubility @ F		mg/l*
@ F		mg/l*
Max. $CaSO_4$ Possible (Calc.)		mg/l*
Max. $BaSO_4$ Possible (Calc.)		mg/l*
Residual Hydrocarbons		ppm(Vol/Vol)

SUSPENDED SOLIDS (QUALITATIVE)

Iron Sulfide ☐ Iron Oxide ☐ Calcium Carbonate ☐ Acid Insoluble ☐

* NOTE: me/l and mg/l are commonly used interchangeably for epm and ppm respectively. Where epm and ppm are used, corrections should be made for specific gravity.

REMARKS AND RECOMMENDATIONS:

PIC ENGINEER	DIST. NO.	ADDRESS	OFFICE PHONE	HOME PHONE
BOB CUDD	12	FARMINGTON NEW MEXICO	505-325-5701	505-334-2254
TESTED BY	DATE	DISTRIBUTION		
Heather Mann	5-30-75	☐ CUSTOMER ☐ PIC ENGINEER OR ☐ PIC LAB	☐ AREA OR	☐ DISTRICT OFFICE ☐ PIC SALES SUPERVISOR

FORM #BR-2149A

RMEC
ROCKY MOUNTAIN ENGINEERING CO.
WELL LOGGING—CORE AND WATER ANALYSIS
2580 HIGHWAY 6 • PHONE CHAPEL 3-3044 • GRAND JUNCTION, COLORADO

WATER ANAYLSIS

COMPANY THE PURE OIL CO.
WELL
COUNTY
STATE
LOCATION

FORMATION
DEPTHS
SAMPLE FROM
DATE
REPORT NO. 505

DESCRIPTION OF SAMPLE D-816

Constituents	PPM	MEQ	MEQ%
Sodium	12,221	531.65	26.78
Calcium	7101	355.05	17.87
Magnesium	1294	106.50	5.36
Sulfate	480	10.00	0.50
Chloride	34,500	973.20	48.99
Carbonate			
Bicarbonate	610	10.00	0.50
Hydroxide			

Observed pH 6.8

Chloride as NaCl 31,075

Resistivity @ 68°F., ohm-meters Measured .129

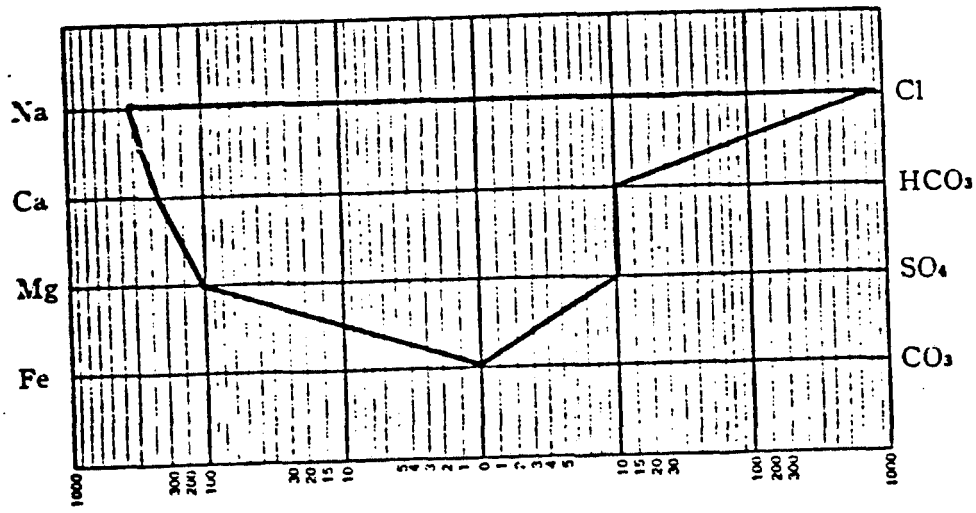
Specific gravity @ 70°F. 1.020

Total Solids in Parts per Million
- By Evaporation 55,432
- After Ignition 55,798
- Calculated 56,206

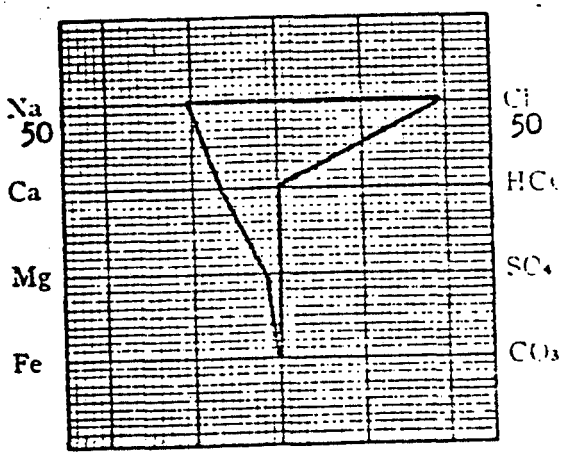
Properties of Reaction in Percent
- Primary Salinity 53.58
- Secondary Salinity 45.42
- Primary Alkalinity 0.00
- Secondary Alkalinity 1.00
- Chloride Salinity 98.99
- Sulfate Salinity 1.01

WATER ANALYSIS PATTERNS
MEQ per unit

Logarithmic



Standard



BAROID DIVISION
N L Industries, Inc.
P.O. Box 1675 Houston, Texas 77001

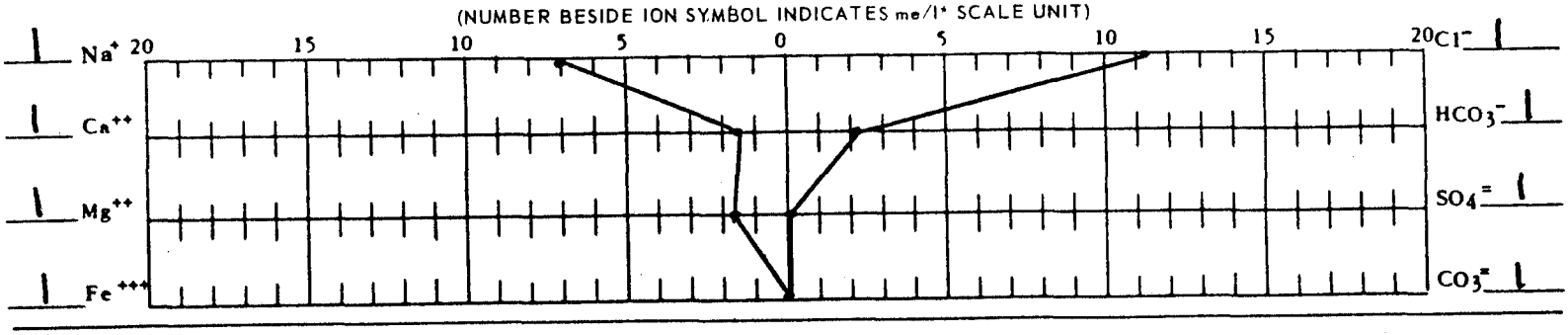
WATER ANALYSIS REPORT

BAROID TREATING CHEMICALS

SHEET NUMBER	
COMPANY	Union Oil of California
DATE	4-21-80
FIELD	
COUNTY OR PARISH	
STATE	
LEASE OR UNIT	
WELL(S) NAME OR NO.	Shop well
WATER SOURCE (FORMATION)	
DEPTH, FT.	
BHT, °F	
SAMPLE SOURCE	Shop well
TEMP, F	
WATER, BBL/DAY	
OIL, BBL/DAY	
GAS, MMCF/DAY	
DATE SAMPLED	
TYPE OF WATER	☐ PRODUCED ☑ SUPPLY ☐ WATERFLOOD ☐ SALT WATER DISPOSAL

WATER ANALYSIS PATTERN

(NUMBER BESIDE ION SYMBOL INDICATES me/l* SCALE UNIT)



DISSOLVED SOLIDS

CATIONS	me/l*	mg/l*
Total Hardness	3.2	
Calcium, Ca^{++}	1.6	32.0
Magnesium, Mg^{++}	1.6	19.52
Iron (Total) Fe^{+++}	0	0.0
Barium, Ba^{++}	0	0.0
Sodium, Na^{+}(calc.)	7.0	
ANIONS		
Chloride, Cl^{-}	11.26	400
Sulfate, SO_4	0.0	0.0
Carbonate, CO_3	0.0	0.0
Bicarbonate, HCO_3^{-}	2.12	129.32
Hydroxyl, OH^{-}	0.0	0.0
Sulfide, $S^{=}$	0.0	0.0

DISSOLVED GASES

Hydrogen Sulfide, H_2S	0	mg/l*
Carbon Dioxide, CO_2	N/D	mg/l*
Oxygen, O_2	N/D	mg/l*

PHYSICAL PROPERTIES

pH	8.0	
Eh (Redox Potential)	—	MV
Specific Gravity	1.001	
Turbidity, JTU Units	—	
Total Dissolved Solids (calc.)		mg/l*
Stability Index @ ___ F		
@ ___ F		
$CaSO_4$ Solubility @ ___ F		mg/l*
@ ___ F		mg/l*
Max. $CaSO_4$ Possible (calc.)		mg/l*
Max. $BaSO_4$ Possible (calc.)		mg/l*
Residual Hydrocarbons		ppm(Vol/Vol)

SUSPENDED SOLIDS (QUALITATIVE)

Iron Sulfide ☐ Iron Oxide ☐ Calcium Carbonate ☐ Acid Insoluble ☐

*NOTE: me/l and mg/l are commonly used interchangeably for epm and ppm respectively. Where epm and ppm are used, corrections should be made for specific gravity.

REMARKS AND RECOMMENDATIONS:

* Minerally Suited for Domestic Use.
*Only two water wells in area, located at Gas Plant.

BTC ENGINEER	DIST. NO.	ADDRESS	OFFICE PHONE	HOME PHONE
Mike Jones - NLTC	12	P.O. Box 2057 Farm. N.M.	505-325-5701	505-325-6344
ANALYZED	DATE	DISTRIBUTION		
	4-21-80	☑ CUSTOMER ☑ BTC ENGINEER OR ☑ BTC LAB	☐ AREA OR ☐ BTC SALES SUPERVISOR	☐ DISTRICT OFFICE

Union Oil Company of California

Post Office Box 760, Moab, Utah 84532
Telephone (801) 686-2236

7

union 76

June 21, 1985

RECEIVED

JUN 28 1985

DIVISION OF OIL
GAS & MINING

Mr. Cleon B. Feight
Utah Oil, Gas & Mining
355 W. North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

LISBON FIELD
UIC REQUIREMENTS

Dear Mr. Feight:

In your letter dated May 18 you requested missing information required by Rule I-4. A location plat of the Lisbon Field is enclosed. Copies of the authorized existing enhanced recovery wells form DOGM-UIC-8, the authorized existing disposal wells form DOGM-UIC-9, and the notice of completion form DOGM-UIC-2 for each authorized existing well are attached. Also attached is a corrected schematic diagram of the Lisbon Unit #D-810 and an analysis of our produced/injected water.

All injection wells are completed in the Mississippian formation. This zone consists of limestone and dolomite. The overlying and underlying strata consists mainly of shale with little or no permeability. The fracturing pressure for the Mississippian is about 5,500 psig BHP. Since the gas injectors are operating at less than 3,000 psig and the water injectors are operating at pressures less than 2,000 psig, all wells are well below any fracture pressures.

Both injection systems are protected by high pressure shut downs. The gas injection compressors shut down at 3,500 psig and the water injection pumps shut down at 3,000 psig. If a well failure should occur, our contingency plan is to shut in the well, isolate the problem and correct the problem. The mechanical integrity of the tubing, casing and packer will be monitored by pressure tests every five years.

FORM DOGM-UIC-2
(Rule I-5 (b) 2
(Revised 1982)

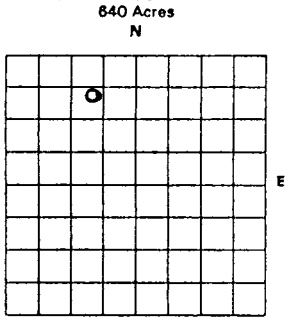
PLEASE TYPE OR USE BLACK INK ONLY

(To be filed within 30 days after drilling is completed)

COUNTY LEASE NO. _____

DEPARTMENT OF NATURAL RESOURCES AND ENERGY
DIVISION OF OIL, GAS, AND MINING
Room 4241 State Office Building
Salt Lake City, Utah 84114

API NO. _____



Locate Well Correctly and Outline Lease

COUNTY S Juan SEC. 24 TWP. 30S RGE. 24E
COMPANY OPERATING Union Oil Co. of Ca.
OFFICE ADDRESS P.O. Box 760
TOWN Moab STATE ZIP UT 84532
FARM NAME Lisbon Unit WELL NO. B-624
DRILLING STARTED 5-24 19 60 DRILLING FINISHED 7-20 19 60
DATE OF FIRST PRODUCTION None COMPLETED 7-30-65
WELL LOCATED ¼ NE ¼ NW ¼
710 FT. FROM N/S L OF ¼ SEC. & 1666 FT. FROM W/E L OF ¼ SEC.
ELEVATION DERRICK FLOOR 6,318' GROUND 6.305'

TYPE COMPLETION
Single Zone X
Multiple Zone _____
Comingled _____

LOCATION EXCEPTION

OIL OR GAS ZONES

Name	From	To	Name	From	To
Mississippian	8807	9236			
McCracken	9502	9587			

CASING & CEMENT

Casing Set				Csg. Test	Cement		
Size	Wgt.	Grade	Feet	Psi	Sax	Fillup	Top
20"			14		8 yds		
13-3/8"	48#	H-20	1000	500	800		Surface
5-1/2"	15.5, 17 & 20#	N-80 & J-55	9232	1000	5550		Surface

TOTAL DEPTH 9,648'

PACKERS SET DEPTH 8875

NOTE: THIS FORM MUST ALSO BE ATTACHED WHEN FILING PLUGGING FORM DOGM-UIC-6

COMPLETION & TEST DATA BY PRODUCING FORMATION

	1	2	3
FORMATION	Mississippian		
SPACING & SPACING ORDER NO.			
CLASSIFICATION (DISPOSAL WELL, ENHANCED RECOVERY, LP GAS STORAGE)	Salt Water Disposal		
PERFORATED	8936-8968'	9115-9121'	
INTERVALS	9004-9023'	9170-9182'	
	9028-9043'		
	9094-9109'		
ACIDIZED?	10,000 gals 15% Hcl		
FRACTURE TREATED?			

INITIAL TEST DATA

Date			
Oil, bbl./day			
Oil Gravity			
Gas, Cu. Ft./day	CF	CF	CF
Gas-Oil Ratio Cu. Ft./Bbl.			
Water-Bbl./day			
Pumping or Flowing			
CHOKE SIZE			
FLOW TUBING PRESSURE			

A record of the formations drilled through, and pertinent remarks are presented on the reverse. (use reverse side)

I, the undersigned, being first duly sworn upon oath, state that this well record is true, correct and complete according to the records of this office and to the best of my knowledge and belief.

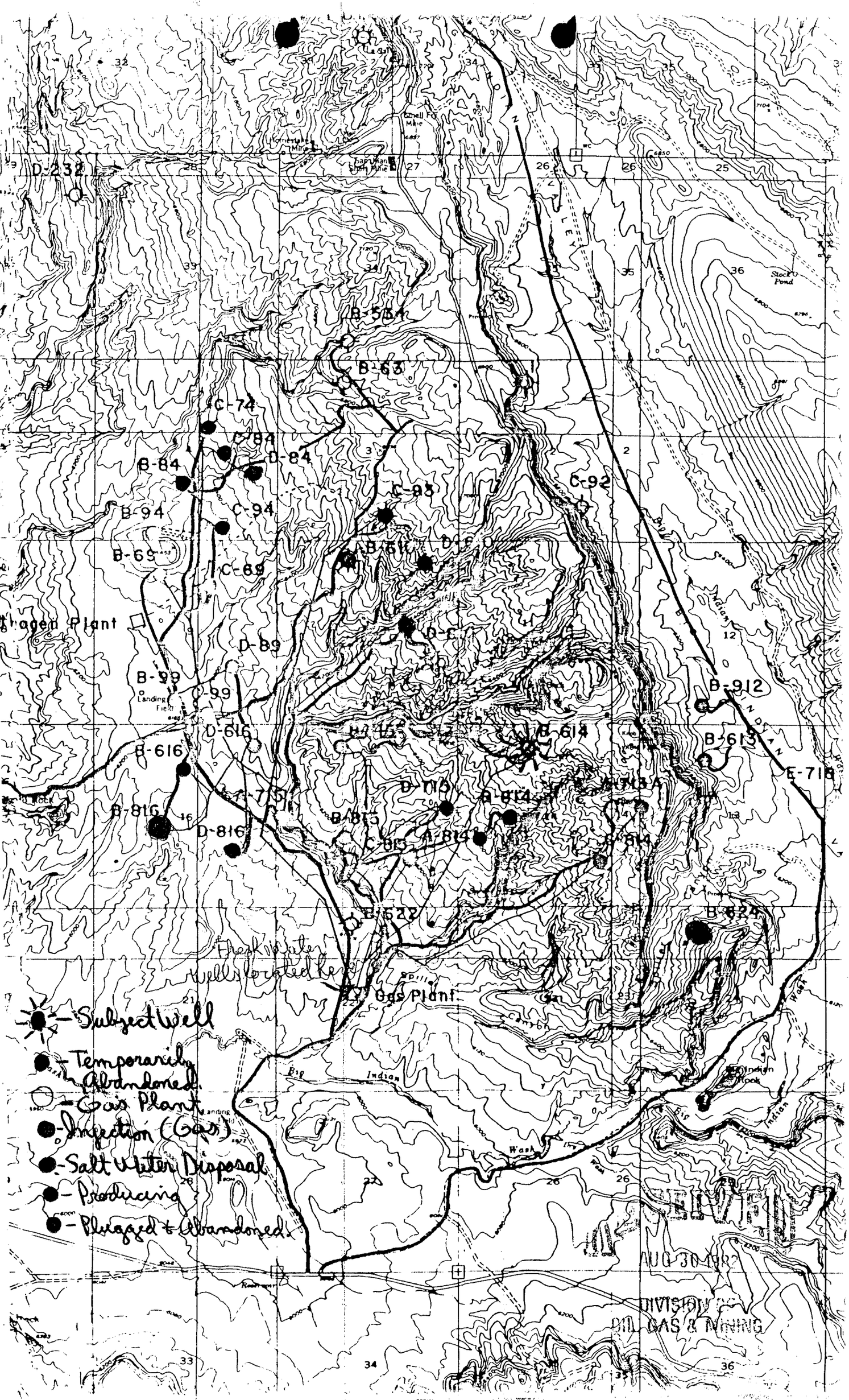
Telephone (801) 686-2236 B R Boreon Area Supt.
Name and title of representative of company

Subscribed and sworn before me this _____ day of _____, 19 _____

(Over)

FORMATION TOPS

Hermosa	1,732'
Paradox A	3,389'
Paradox B	3,640'
Salt	3,733'
Base Salt	8.670'
Mississippian	8,807'
Ouray	9,236'
Elbert	9,318'
McCracken	9,502'
Cambrian	9,587'

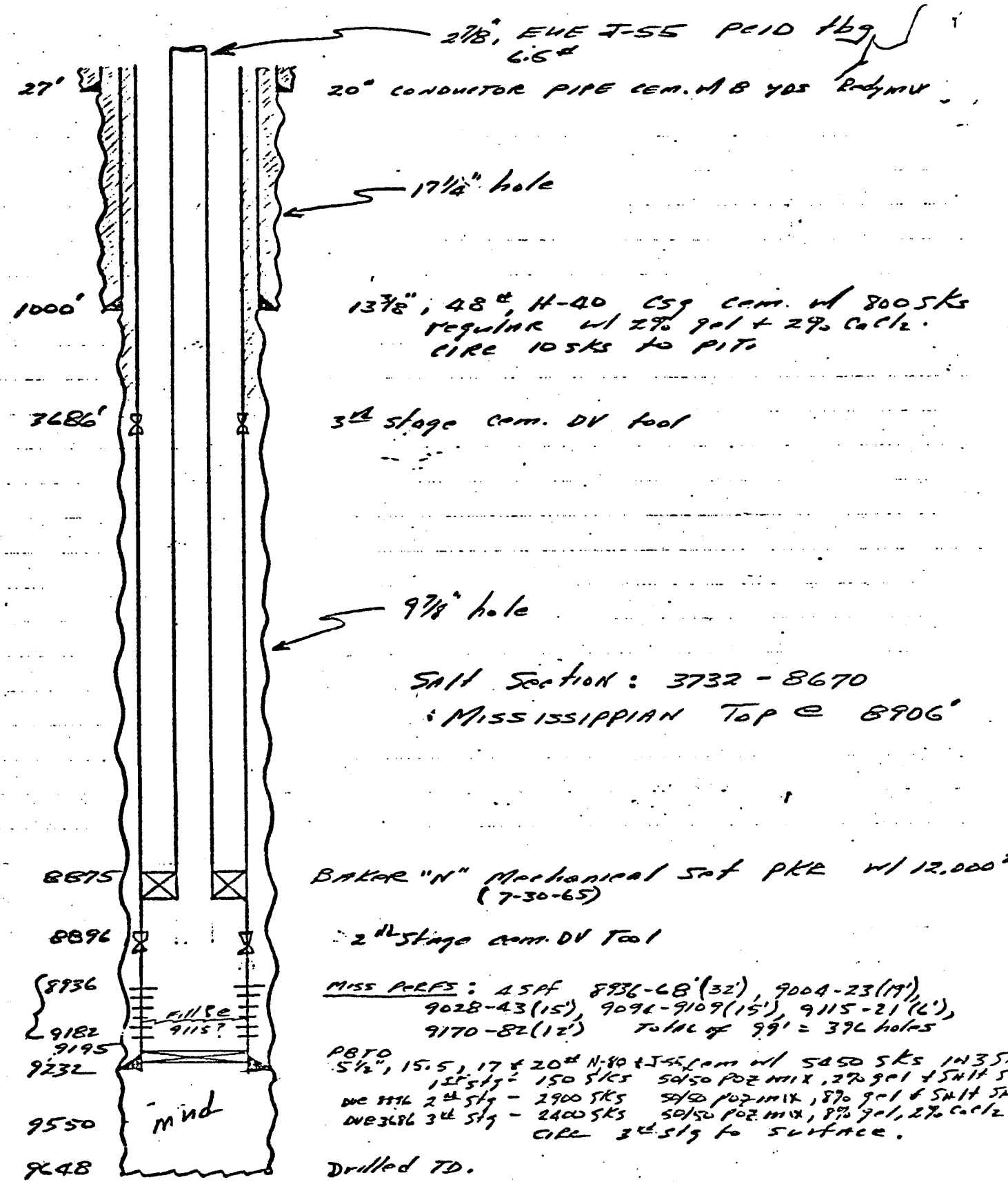


D-232
B-534
B-63
C-74
C-84
D-84
B-84
C-93
C-92
B-94
C-94
B-69
C-69
Nitrogen Plant
D-89
B-99
C-99
Landing Field
D-616
B-616
B-912
B-613
E-718
B-614
D-715
B-814
B-816
D-816
B-815
A-814
C-815
B-622
B-624
Fresh Water Wells located here
Gas Plant
Big Indian Wash
Indian Rock
Stock Pond
Subject Well
Temporarily Abandoned
Gas Plant
Injection (Gas)
Salt Water Disposal
Producing
Plugged & Abandoned
AUG 30 1982
DIVISION OF OIL, GAS & MINING

JDR

11 8 74

LISBON UNIT B-624



INJECTION WELLS

NAME	LOCATION OF WELLS	TOTAL DEPTH (ft)
B-614 43-037-16468	667/N & 2030/W NENW Sec. 14-T30S-R24E	9022
B-610 43-037-16469	563/N & 2050/W NENW Sec. 10-T30S-R24E	8440
D-810 16471	1895/S & 755/E NESE Sec. 10-T30S-R24E	9310
D-84 16250	1980/S & 660/E NESE Sec. 4-T30S-R24E	9126

DISPOSAL WELLS

B-624	710/N & 166/W NENW Sec. 24-T30S-R24E	9648
B-816	1860/W & 2250/S NESW Sec. 16-T30S-R24E	8650

PRODUCTION WELL within 1/2 mile of Injection Wells and Disposal Wells

C-84	2690/N & 1520/E NWSE Sec. 4-T30S-R24E	8964
B-84	1648/S & 2516/W, Sec. 4-T30S-R24E	8766
C-74	1980/N & 1980/E SWNE Sec. 4-T30S-R24E	9017
C-94	330/S & 1600/E SWSE Sec. 4-T30S-R24E	8859
C-93	765/S & 2105/E, Sec. 3-T30S-R24E	8430
D-610	565/N & 964/E, Sec. 10-T30S-R24E	8510
B-616	1310/N & 2660/E NENW Sec. 16-T30S-R24E	8689
D-816	1620/S & 1220/E, Sec. 16-T30S-R24E	8666
D-715	2450/N & 335/E, Sec. 15-T30S-R24E	8896
B-814	1482/W & 2601/S, Sec. 14-T30S-R24E	8735
A-814	1980/S & 660/W, Sec. 14-T30S-R24E	9015

WATER WELLS

Plant Well #1	2780/N & 2450/E from SW corner Sec. 22-T30S-R24E	500
Shop Well #2	2346/N & 2586/E from Sw corner Sec. 22-T30S-R24E	500

All land within a half mile of each injection well is federally, state and Union owned and the operator of all the wells within a half mile of the injection wells is Union Oil of California.

STATE OF UTAH
DIVISION OF OIL, GAS AND MINING

RECEIVED
OCT - 6 1999
DIV. OF OIL, GAS & MINING

TRANSFER OF AUTHORITY TO INJECT - UIC FORM 5

Well name and number: Lisbon B 624

Field or Unit name: Lisbon MS Unit/Mississippian API no. 43-037-16516-00

Well location: QQ NENW section 24 township 30S range 24E county San Juan

Effective Date of Transfer: 01/01/99

CURRENT OPERATOR

Transfer approved by:

Name ROBERT C. GNAGY Company Union Oil Copany of California

Signature Robert C. Gnagy Address 14141 SOUTHWEST FREEWAY

Title ATTORNEY-IN-FACT SUGAR LAND, TX 77479

Date 9/27/99 Phone (281) 287-7600

Comments:

NEW OPERATOR

Transfer approved by:

Name Peter R. Scherer Company Tom Brown, Inc.

Signature Peter R. Scherer Address P.O. Box 760

Title Executive V.P. Moab, Utah 84532

Date Phone (435) 686-7676

Comments:

(State use only)
Transfer approved by D. Hunt Title Tech. Services Manager

Approval Date 5-31-00

(3/89)

BEFORE THE
OIL AND GAS CONSERVATION COMMISSION
OF THE
STATE OF UTAH

IN THE MATTER OF THE ESTABLISHMENT OF UNIT OPERATIONS IN THE LISBON FIELD, SAN JUAN COUNTY, UTAH, TO BE KNOWN AS THE LISBON UNIT, AND THE APPROVAL OF CONDUCTING OF CYCLING OPERATIONS BY PRESSURE MAINTENANCE AS RESPECTS THE MISSISSIPPIAN AGE FORMATION	)	CAUSE NO. 74 O R D E R

This Cause, pursuant to Application of The Pure Oil Company and to notice duly and regularly given by the Commission, came on for hearing before the Oil and Gas Conservation Commission of the State of Utah at 10 o'clock A.M., Thursday, April 5, 1962, in the offices of the Commission, 310 Newhouse Building, Salt Lake City 11, Utah. The following Commissioners were present:

C. R. Henderson, Chairman
W. G. Mann, Presiding
C. S. Thomson
Bryant H. Croft

Appearances were made as follows:

Clair M. Senior, attorney on behalf of The Pure Oil Company
Mary Woolley, representing Roland Rich Woolley
Don Anderson, representing El Paso Natural Gas Company

Mr. Senior directed attention to the letter of March 27, 1962, from Texas Eastern Transmission Corporation to the Commission, which appears in the file, wherein said corporation

waived notice of hearing and any right to receive a copy of the Application and entered its appearance in support of the Application.

Evidence in support of the Application was introduced on behalf of The Pure Oil Company, the Applicant and Unit Operator of the Lisbon Unit. No objection to the granting of the Application was filed or expressed.

FINDINGS OF FACT

The Commission finds that:

1. The Lisbon Unit Area consists of the following described land in San Juan County, Utah:

Township 29½ South, Range 24 East, SLBM

Sections 27 & 28:	All
Sections 32, 33 & 34:	All

Township 30 South, Range 24 East, SLBM

Sections 2, 3, 4 & 5:	All
Sections 8 through 17:	All
Section 20:	E½
Sections 21 through 27:	All
Sections 34, 35 & 36:	All

Township 30 South, Range 25 East, SLBM

Section 7:	All
Sections 18 & 19:	All
Sections 30 & 31:	All

2. The Lisbon Unit Agreement is fair and reasonable and unitized operation of the Lisbon Unit Area is in the public interest, will prevent waste, protect correlative rights and result in greater ultimate recovery of oil and gas.

3. The cycling operations proposed by Applicant, as set out in its Application and in the evidence adduced, are proper and are designed to result in maximum recovery of the oil and gas resources of the unitized lands.

O R D E R

Therefore, IT IS ORDERED by the Commission as follows:

1. Unit operation of the Lisbon Unit under the Lisbon Unit Agreement is approved.

2. The plan and program of cycling operations proposed by Applicant in its Application should be and the same is hereby approved and the Unit Operator is authorized to proceed with and under such plan and program as soon as the Lisbon Unit Agreement becomes effective and operative.

3. If at any time or from time to time it appears to the Unit Operator necessary or desirable to drill any additional injection well or wells or to convert for an injection well any well or wells (other than the initial injection wells "Pure A-1" and "Pure A-2"), notice of intention to drill any injection well or to convert any well to an injection well shall be filed with the Commission for approval. If at any time or from time to time it appears necessary or desirable for the Unit Operator to alter or modify the hereby approved plan of cycling operations, notice of any such proposed alteration or modification of the cycling plan and program shall be submitted to the Commission for

for approval. Approval for the drilling of any proposed additional injection well or wells or for the conversion to injection of any additional well or wells, and approval of any alteration or modification in the hereby-approved cycling program, may be given by the Commission or its delegated representative without notice or hearing unless the Commission shall specifically otherwise order or direct.

IT IS FURTHER ORDERED that the Commission hereby retains jurisdiction of this Cause to make such further order or orders, if any, as may be reasonable and proper in the light of conditions encountered and information developed.

DATED: 5 day of April, 1962.

THE OIL AND GAS CONSERVATION
COMMISSION OF THE STATE OF UTAH

Walter G. Mann
Commissioner Presiding

C. R. Henderson, Chairman

C. S. Thomson, Commissioner

Bryant H. Croft, Commissioner

FORM 5

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

DESIGNATION OF AGENT OR OPERATOR

The undersigned is, on record, the holder of oil and gas lease

LEASE NAME: Lisbon B-624

LEASE NUMBER: UTSL 070034

and hereby designates

NAME: Buys and Associates

ADDRESS: 4720 S. Santa Fe Cir., Suite 6

city Englewood, state CO zip 80110-6488

as his (check one) agent ☑ / operator ☐, with full authority to act in his behalf in complying with the terms of the lease and regulations applicable thereto and on whom the Division Director or Authorized Agent may serve written or oral instructions in securing compliance with the Oil and Gas Conservation General Rules and Procedural Rules of the Board of Oil, Gas and Mining of the State of Utah with respect to:

(Describe acreage to which this designation is applicable. Identify each oil and gas well by API number and name. Attach additional pages as needed.)

This applies to the well named above (Lisbon B-624). Tom Brown Inc. is authorizing Buy's and Associates to be agent in fact for the filing of required doucuments for the permitting of the B-624 disposal well.

It is understood that this designation of agent/operator does not relieve the lessee of responsibility for compliance with the terms of the lease and the Oil and Gas Conservation General Rules and Procedural Rules of the Board of Oil, Gas and Mining of the State of Utah. It is also understood that this designation of agent or operator does not constitute an assignment of any interest in the lease.

In case of default on the part of the designated agent/operator, the lessee will make full and prompt compliance with all rules, lease terms or orders of the Board of Oil, Gas and Mining of the State of Utah or its authorized representative.

The lessee agrees to promptly notify the Division Director or Authorized Agent of any change in this designation.

Effective Date of Designation: 07/01/2002

BY: (Name) Brant Simmeson
(Signature) Brant Simmeson
(Title) Environmental and Safety Manager
(Phone) (303) 260-5030

OF: (Company) Tom Brown Inc.
(Address) 555 17th Street, Suite 1850
city Denver
state CO zip 80202-3918

(5/2000)

INSTRUCTIONS

If a well is to be operated or a company's business is to be conducted by an individual or company other than the lessee, then a designation of agent or operator shall be submitted to the division prior to the commencement of operations. A designation of agent or operator will, for purposes of the general rules and orders, be accepted as evidence of authority of agent to fulfill the obligations of the owner, to sign any required documents or reports on behalf of the owner, and to receive all authorized orders or notices given by the board or the division. All changes of address and any termination of the designated agent's or operator's authority shall be promptly reported in writing to the division, and in the latter case a designation of a new agent or operator shall be promptly made.

Send to:

Utah Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
Box 145801
Salt Lake City, Utah 84114-5801

Phone: 801-538-5340

Fax: 801-359-3940

TOM BROWN, INC. LISBON UNIT B-624
SULFUR RE-INJECTION PROJECT APPLICATION
SAN JUAN COUNTY, UTAH

UTAH DIVISION OF OIL, GAS, AND MINING REVIEW
MONDAY, SEPTEMBER 30, 3:30 PM
AGENDA

• Project Overview and Benefits • TBI Project Timeline and Capital Commitment	Randy Koliba (5 min)
• Regulatory Update (Affidavits, Notifications, etc.)	Brant Gimmeson (10 min)
• Geologic Overview / Injection Well Selection • Well History / Water Disposal Project • Area of Review / Cement Calculations • Cement Bond Log • Condition of Wellbore • Injection Rates and Pressures / Recent Tests - Bottom-hole Injection Pressure - Pressure Fall Off Test - Step Rate Test - Nodal Analysis • Proposed Well Work	Byron Gale (20 min)
• Reservoir Volumetrics • Other Reservoir Considerations	Ray Johnson/ Erin Anderson (15 min)
• Surface Facilities Design / Operations	Doug Rosa (15 min)
• Emergency Response Plan	Brant Gimmeson (10 min)

Tom Brown, Inc. Attendees: Randy Koliba, Area Manager, Grand Junction
Doug Rosa, Lisbon Plant Supervisor, Moab
Brant Gimmeson, Environmental Manager, Denver
Byron Gale, Production/Operations Engineer, Denver
Erin Anderson, Reservoir Engineer, Denver
Ray Johnson, Reservoir Engineering Advisor, Denver

- ammonium sulfate currently produced but market is deteriorating
- needed other options. Pending tore injection many in Canada
- safer for all. More ultimate recovery. Better SO2 emissions. CO2 should go down.

$4 million cost of acid gas injection plant.

BLM surface + BLM pipeline R-O-W. permits acquired
Air emissions permits (modifications) applied for.
affidavit rec'd today & will be noticed.

700 bwpd

1.7 mmcf acid gas.

will inject 1.25 mm b.equiv. which is ~6% of pore volume of triangular area on map.

Site Security?

DIVISION OF OIL, GAS AND MINING
UNDERGROUND INJECTION CONTROL PROGRAM

obsolete

PERMIT
STATEMENT OF BASIS

Applicant: Tom Brown, Incorporated **Well:** Lisbon B - 624

Location: T30S, R24E, S24, San Juan Co. Utah **API:** 4303716516

Ownership Issues:

The well is located on State of Utah lands administered by the School and Institutional Trust Lands Administration within a federal unit. Other landowners within a half mile buffer distance from the proposed injection well are the United States of America (BLM). Tom Brown, Incorporated controls the leases on these three sections. An sworn Affidavit of Mailing of the application and associated documentation to the particular owners/surface owners has been placed in the well file.

Well Integrity:

16", 65 pounds per foot conductor pipe set at 58' and cemented to surface with 125 sacks of "regular" cement with 1 pound of Tufplug per sack, 1/4 pound Flocele per sack and 3% calcium chloride. 10 3/4", 40.5 pounds per foot J-55 surface casing set at 1000' and cemented to surface with 575 sacks (400 sacks 50-50 Pozmix, 4% gel, 1/4 pound per sack Flocele, 1 pound per sack Tufplug, 2% calcium chloride and tailed with 175 sacks "regular" cement, 2% gel, 2% calcium chloride). 5 ½", 17 pounds per foot J-55 production casing set at 8689' and cemented with 2,400 sacks to surface. DV cementing tool at 8268' and cemented in 2 stages (1/8/63). McCullough Gamma Ray Collar Log and CBL were originally run after the 5 ½" casing was set. The Mississippian was originally perfed from 8488' to 8570'. On 5/17/87 the overall perfed interval was increased when the Mississippian was perfed from 8456' to 8462.' An Cement Bond Log was run between 0' and 2000' and between 7150' and 8646'. The top of cement was logged at _____'. This should be adequate to prevent any upward migration of fluid between the 5½" casing and the borehole wall. Tubing (2-7/8", 6.5# J-55) was run into the well and a packer was set at 8,380'. A casing-tubing annular pressure test to 1000 psi was proposed by the Operator as a measure of integrity and will be required prior to commencement of injection.

Ground Water Protection:

The Tom Brown, Inc. proposes to inject into the Mississippian Leadville Limestone

Byron Gale
303 260 5036

through a overall perfed interval from 8,456' to 8,570'. While it is unlikely that a significant ground water resource will be encountered near the surface, the casing and cement must afford effective protection to at least 100' below the base of the Wingate Sandstone, which is the only Formation which is likely to hold a fresh water resource above the base of moderately saline waters (~5000' elevation) in the Lisbon Field area. The confining layer above the injection zone will be the ~3,000' thick Paradox Salt.

Lisbon Field produced water analysis revealed Total Dissolved Solids values in excess of 77,000 Mg/l. The injection water source will be produced water from the same producing formation, in the same field, that is also the interval targeted for injection. The injection zone and injection water and production zone and produced water are coincident, respectively. The zone being permitted for injection is not considered an Underground Source of Drinking Water (USDW; a water source containing less than 10,000 mg/l, total dissolved solids).

After reviewing their documentary submission and application, it is my conclusion that Tom Brown, Incorporated, ought to be granted a permit for injection into the proposed zone at this location. The proposed operations would result in no significant change in the concentration of the already highly saline formation water present in the aquifer and a pressure increase near the well which would dissipate after injection ceases. No negative long term impacts on high quality ground water are anticipated resultant of the subject permitted operations.

Oil/Gas & Other Mineral Resources Protection:

The Lisbon Field Leadville Limestone productive zone has effectively been "watered out" in the injection well by the anticlinal field's active water drive. No other known potentially producible zones are recognized in this well.

A review of the well records of the Division of Oil, Gas and Mining revealed that there were 5 other wells within the one-half mile regulatory buffer radius that were germane to the issuance of an injection permit for this well. Documentary evidence submitted to the Division by the Operator regarding the nature of the casing and cement programs undertaken in these wells supports a favorable judgement of their current integrity.

Bonding:

Tom Brown, Incorporated, has an state-wide $80,000 surety bond (RLB001191) on file with the State School and Institutional Trust Lands Administration which provides coverage for this well.

Actions Taken and Further Approvals Needed:

Notice of this application was published in the Salt Lake Tribune, Deseret News and

San Juan Record. In addition, copies of the notice was provided to the EPA Region 8, the BLM Moab Field Office and Tom Brown, Incorporated. The notice stated the proposed interval for injection to be from 8,456' to 8,570' in the Leadville Limestone (Mississippian). Any future injection into a formation other than that permitted will require administrative approval after appropriate sampling and testing.

A properly designed and constructed injection well, combined with periodic mechanical integrity tests, poses no threat to fresh or useable groundwater supplies. The Division staff recommends administrative approval of this application.

Note: Applicable technical publications concerning water resources in the general vicinity of this project have been reviewed and taken into consideration during the permit review process.

Reviewer(s): Christopher Kierst Date: 5/29/2000

TELEFAX COVER SHEET

DATE: _____

TO: GIL Hunt MAIL CODE: _____

AGENCY/FIRM Utah Div Oil/Gas PHONE: _____

CITY: _____ STATE: _____

TELEFAX MACHINE NUMBER: ( ) _____

PLEASE INCLUDE AREA CODE

NUMBER OF PAGES (INCLUDING COVER SHEET) _____

FROM: Paul Bloom PHONE: 303- _____

U.S. EPA REGION 8
MUNICIPAL SYSTEMS (8P-W-MS)
999 18TH STREET STE 300
DENVER CO 80202-2466

TELEFAX 303-312-6131

REMARKS:

If you encounter any transmittal difficulties, please call sender.

G:\MSGEN\FAXCVR

RECEIVED
JUL 17 2002
DIVISION OF
OIL, GAS AND MINING

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR - 8 1990

OFFICE OF WATER

RECEIVED JAN - 9 1995 DRINKING WATER BRANCH

MEMORANDUM

SUBJECT: Classification of Injection Fluid from a Natural Gas Processing Plant

FROM: Françoise M. Brasier, Chief
Underground Injection Control Branch (WH-550E)

TO: Edward P. Watters, Chief
Underground Injection Control Section, Region V

In your memorandum of February 21, 1990, you requested our advice on the question of whether tail gas from a natural gas processing plant can be classified as a Class II fluid or is it considered an industrial process waste.

The gas resulting from the sweetening of the natural gas in this process, is a fluid brought to the surface in the production of oil or gas. As such, it can be classified as a Class II injection fluid. The analysis of the proposed injectate gas does not show any added components resulting from the contact of the gas with either the amine or the glycol compounds. This confirms that the fluid is a direct byproduct of oil or gas production and not industrial process waste, and a Class II permit would be appropriate. However, the permit should take into consideration the corrosive nature of the injected fluids.

Please feel free to call me at 382-5530 or Don Olson at 382-5558 if you have any questions.

cc: UIC Section Chiefs Regions I-IV & VI-X.

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL # of pages ▶ 8

To Paul Osborne	From Bruce Kobelski
Dept./Agency R8	Phone # 202-260-7275
Fax # 303-293-1234	

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V

Date: FEB 21 1990

SUBJECT: Classification of Injection Fluid from A Natural Gas Processing Plant

From: Edward P. Watters, Chief
Underground Injection Control Section

TO: Francoise M. Brasier, Chief
Underground Injection Control Branch

Recently, a company submitted a Class II permit application for the injection of "tail gas" from a natural gas processing plant. This plant proposes to contract for and receive sour gas from numerous natural gas wells owned by various independent operators. The wells which will be supplying the gas are currently shut-in because they contain sour gas, which is high in hydrogen sulfide content, and cannot be sold as is. The applicant proposes to connect these wells to the amine plant via pipelines, and to remove the hydrogen sulfide. The "sweetened" gas could then be sold as part of the applicant's contract with the well owners, and the tail gas, which would be high in concentrated hydrogen sulfide, would be routed for disposal to the proposed injection well. A process description of the plant's operation is attached.

This is the first of its kind in Region V, and I am unsure as to how far along the processing chain a Class II fluid can go before it is no longer considered a Class II fluid. Specifically, is the tail gas still a Class II fluid or is it considered industrial process waste?

Presently, the applicant's amine plant is non-operational without the injection well permit and the applicant is understandably anxious to obtain this permit. A technical review of the well's construction has already been completed so the only thing we need now is a determination on the injection fluid.

Should you have any questions, feel free to call Miguel Del Toral, of my staff at (312) 886-4298.

Attachment

MANISTEE GAS LIMITED LIABILITY COMPANY

SOUR GAS TREATMENT PLAN

The Manistee Gas Limited Liability Company Sour Gas Treatment Plant was designed and built to process approximately 15 million cubic feet per day (15 MMCFD) of hydrogen sulfide bearing (sour) natural gas produced from wells in the area. Its purpose is to remove the hydrogen sulfide and other sulfur bearing compounds and carbon dioxide from the produced gas to render it suitable for sales.

The plant is located in an area of increasing drilling activity within the northern Michigan Niagaran reef trend (refer to the attached location map). This is an area running southwest to northeast across northern Michigan, containing a great number of highly productive oil and gas reservoirs. The area in which the plant is built is one in which the typical reservoir contains substantial reserves of sour gas, with some associated hydrocarbon liquids (condensate).

Currently in the area there are several sour gas treatment plants owned and operated by Shell Western E&P, Inc., a subsidiary of Shell Oil Company.

The sour gas plant consists of an amine plant designed to remove the H_2S and CO_2 in the natural gas coming from the producers. This process is known as "sweetening". The sweetening of the gas is accomplished by intimate contact of the gas with an organic based solution - the amine solution in a vertical process tower. The amine solution has an affinity for H_2S and CO_2 (acid gas) and will remove these components from the gas stream. The gas leaving the top of the process tower is now suitable for sales.

The amine solution that leaves the bottom of the process tower is rich, that is, it has absorbed all of the acid gas from the produced gas stream. The solution is then lowered greatly in pressure and heated to a higher temperature. This acts to reverse the absorption that took place in the tower and releases the hydrogen sulfide and carbon dioxide from the solution. The amine is now regenerated and ready to be reused in the process contact tower. (Refer to the schematic of the amine process for a simplified flow path through this plant).

The acid gas that is released from the amine solution during the sweetening process during regeneration is the gas that will be

injected into a previous producing well that is currently abandoned, namely the Miller-Lyman 1-18B that gave up 1.24 BCF.

Gas Throughput	Acid Tail Gas Injection
2 MMCFD	.2 MMCFD
4 MMCFD	.4 MMCFD
7 MMCFD	.7 MMCFD
10 MMCFD	1.0 MMCFD

For sour gas removal, the amine process is a standard of the petroleum industry and has been used successfully for many years in many different instances.

The plant will operate at essentially atmospheric pressure and ambient temperatures - less than 120°F. This will increase personnel safety and eliminate the need for expensive high pressure and temperature equipment.

There is one additional processing step the gas requires after being sweetened. At this point the hydrogen sulfide and carbon dioxide have been removed, but the gas still contains a great deal of entrained water vapor. In fact, it is completely saturated with water vapor which means, roughly, that the humidity of the gas is 100%. This water vapor needs to be removed prior to selling the gas.

To accomplish this water removal, the gas is sent through a process known as a dehydrator. In this part of the plant, the gas will come into contact with a glycol solution in a vertical process contact tower. Glycol is another organic based solution, but one that has a strong affinity for water vapor. In the main process tower, the gas is stripped of its water vapor and leaves the tower sufficiently dehydrated to be sold.

The glycol solution leaving the bottom of the tower is rich, that is, it has absorbed and contains the water vapor from the gas. It is then subjected to a much lower pressure and higher temperature (275°F) that will cause all the entrained water to be boiled away. The resulting solution is then cooled and re-circulated back into the main process tower.

To aid in the coordinating of all the plant equipment, a central electronic monitoring and control system is installed at the plant. Various flows through the plant such as inlet gas, acid gas to the injection well, fuel gas consumed, and final sales gas volumes, are constantly monitored as are inlet and outlet hydrogen sulfide concentration. This will allow the efficiency and general operation of the plant to be monitored on a continual basis. In addition, certain critical pressures and temperatures, as well as process solution chemical concentrations, are also monitored continuously to provide a check on the operation of the plant. This system provides the plant operators with up-to-date information necessary to keep the plant operating at maximum efficiency.

AMINE PLANT TAIL GAS ANALYSIS

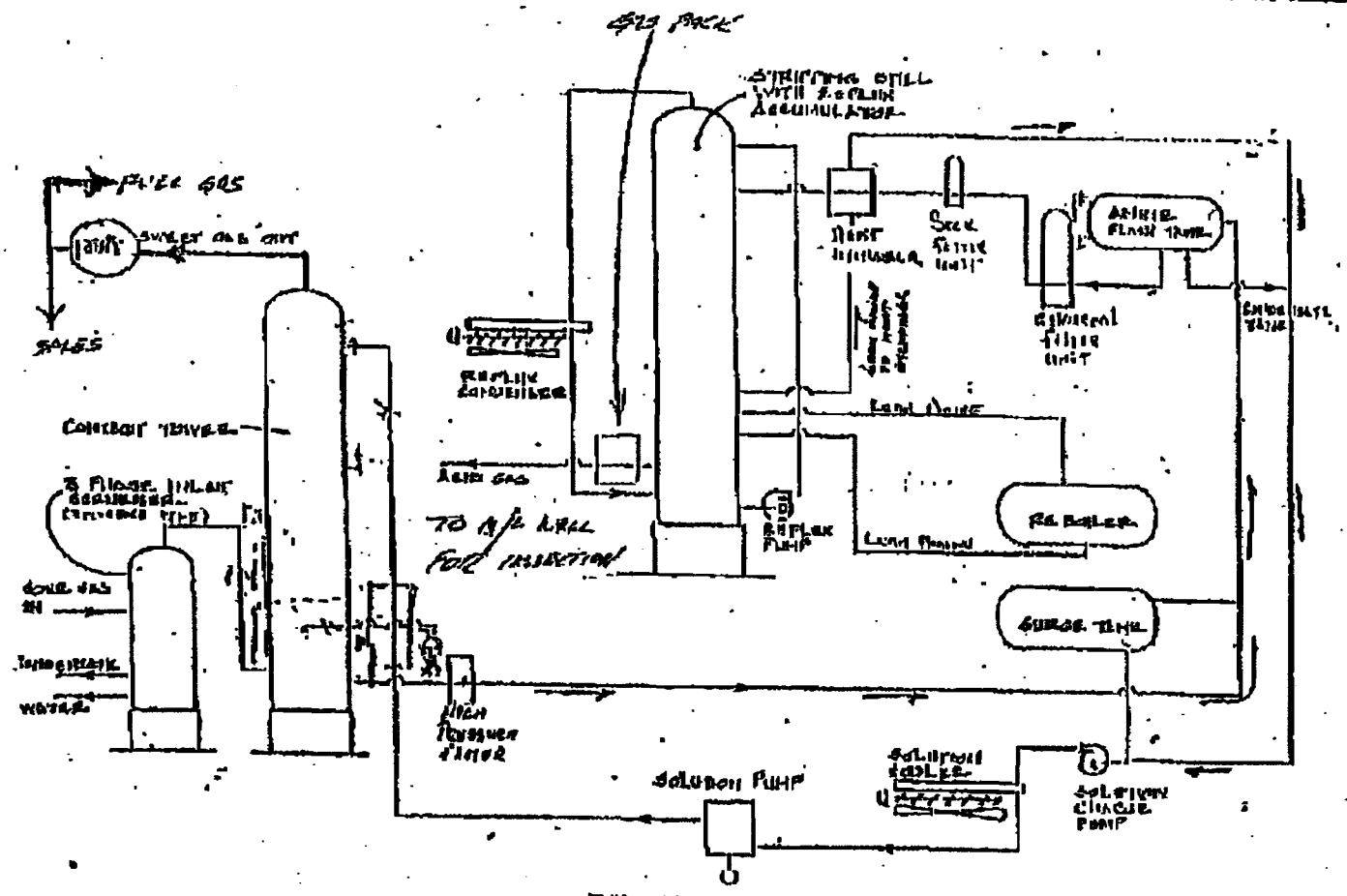
Gas Source	Amine Plant Tail Gas
Gas Flow Rate, dry basis	
SCFM	783.4
MMSCFD	1.128
Gas Composition, dry basis	
Component	Vol. Pct
Carbon Dioxide	61.54
Hydrogen Sulfide	30.85
Methane	5.54
Ethane	.45
Propanes plus	.59
Carbonyl Sulfide	.026
Carbon Disulfide	.007
Methyl Mercaptan	.543
Ethyl Mercaptan	.285
Propyl Mercaptan	.106
Butyl plus Mercaptans	.045
Misc Sulfides	.018
Pressure, PSIG	20
Temperature, °F	100 (Max.), 50 (Min.)

10/6/89

EXHIBIT C

DESIGN GAS COMPOSITION FOR PLANT

COMPONENT	VOLUME PERCENT
Methane	83.82
Ethane	3.51
Propane	1.79
Iso-Butane	1.48
normal-Butane	.69
Iso-Pentane	.33
normal-Pentane	.14
Hexanes	.13
Heptanes plus	.12
Nitrogen	.26
Carbon Dioxide	5.34
Hydrogen Sulfide	2.31
Mercaptans	.07
Sulfides	.01
	100.00



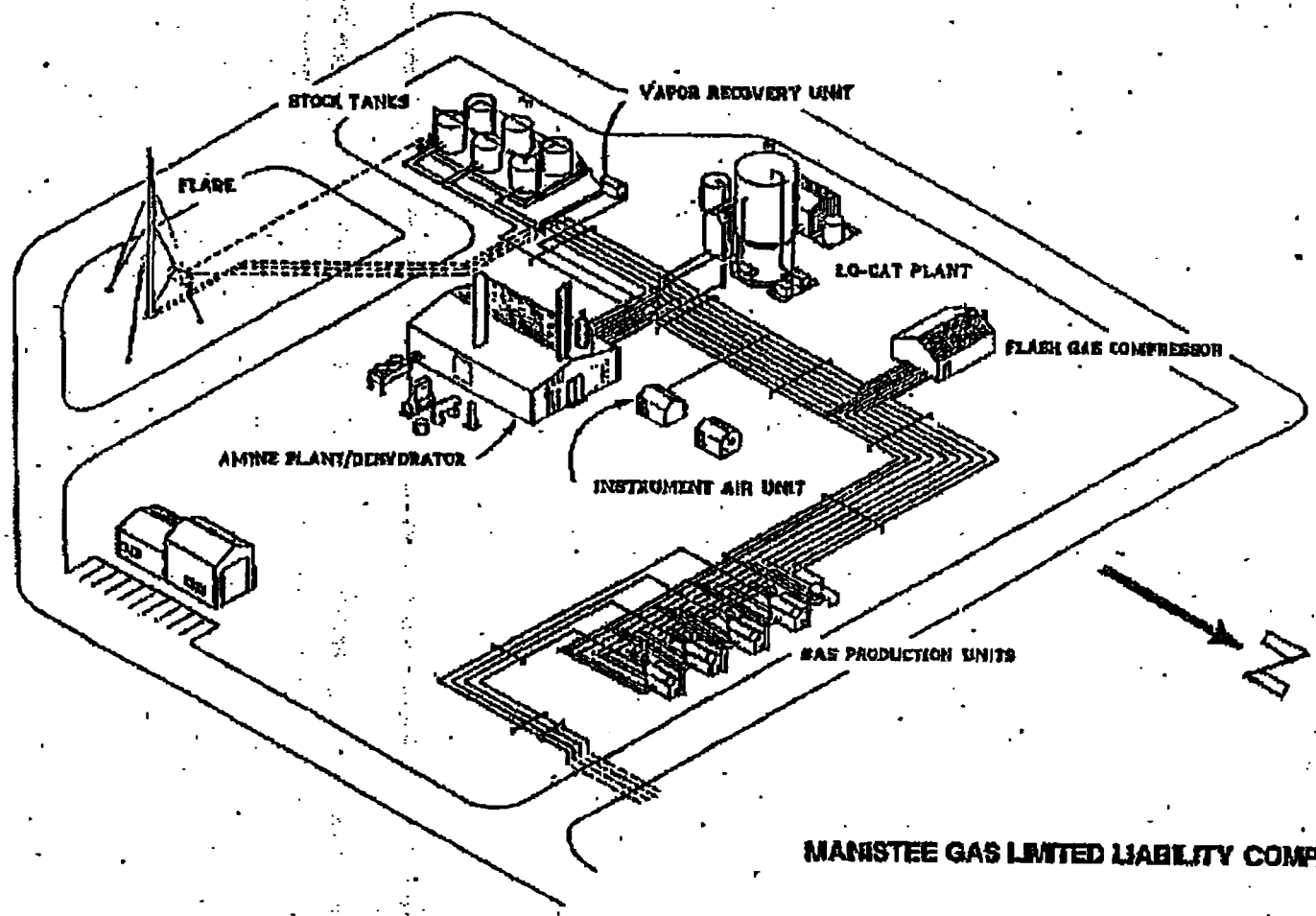
MANISTEE GAS LIMITED LIABILITY COMPANY

SCALE:	APPROVED BY:	DRAWN BY
DATE:		REVISED

AMINE PLANT FLOW SCHEMATIC

BROWN 19 GAS PLANT, MANISTEE COUNTY, MICHIGAN

DRAWING NUMBER



MANISTEE GAS LIMITED LIABILITY COMPANY

BROWN TOWNSHIP, MANISTEE COUNTY, MICHIGAN

B&A Buys & Associates, Inc.
Environmental Consultants

4720 South Santa Fe Circle, Suite 6
Englewood, Colorado 80110-6488
303/781-8211 303/781-1167 Fax

July 18, 2002

Mr. Gil Hunt
State of Utah
Division of Oil, Gas and Mining
1594 W. North Temple, Suite 1210
Salt Lake City, Utah 84114

RE: PERMIT MODIFICATION – **LISBON B-624 SWD WELL**
API # 43-037-16516
NENW Sec. 24 -T30S- R24E
San Juan County, Utah

Actually, an enhancement or upgrade to accept both water, H_2S and CO_2. A new permit was issued, not a modification. CH 2/25/04

Dear Mr Hunt:

Tom Brown Inc. is requesting a permit modification for the Lisbon B-624 SWD well. This well is an existing SWD well injecting into the Mississippian Leadville formation in the Lisbon Field, San Juan County, Utah. TBI is the operator and major working interest owner of wells located in the Lisbon Field, San Juan County, Utah. The Lisbon Field is a unitized field that is managed by the Moab Field office of the BLM

The Lisbon B-624 well was spudded on 5/9/60. It was re-completed as a SWD well on 11/9/1965. During this time, it has received over 42 MM barrels of produced water per day. During the initial production of the field, the wells produced both oil and gas and the gas was separated and re-injected. As the oil production declined, the Lisbon Gas Plant was built to process and sell the gas. The make-up of the gas has changed over time and the plant is currently being re-configured. The new process will concentrate the off gases into an "acid-gas" stream and this acid gas is what will be injected into B-624. The acid gas stream is approximately 4% water, 50% H2S and 46% CO2.

RECEIVED
JUL 19 2002
DIVISION OF
OIL, GAS AND MINING

TBI proposes to utilize the Mississippian Leadville formation (the existing SWD zone) as the disposal zone. This formation is also the producing formation. The gross injection interval in the Lisbon B-624 will be from ~~8896' to 9200'~~. perfs amended in the amending permit informational mailing dated 9/19/02. ck 10/1/02
Please contact me directly at 303.781.8211 if you have questions or require any additional information. Thank you for your help with this project.

Sincerely,
BUYS & ASSOCIATES, INC.

Martin W. Buys

Martin W. Buys
Agent for Tom Brown Inc.

FAX TRANSMISSION
BUYS & ASSOCIATES, INC.
ENVIRONMENTAL CONSULTANTS

4720 South Santa Fe Circle, Suite 6
Englewood, CO 80110
303.781.8211
Fax: 303.781.1167

To: Christopher Kierst

Company: DOGM bgimmeson@tombrown.com

Fax #: 801.359.39

From: Martin Buy

Subject: Affidavit o

COMMENTS

Attached are copies of the
have been sent to you by U

The language of the affidavit does not explicitly address the language of the regulation. Will you accept the language as it is?

RECEIVED

AUG 02 2002

DIVISION OF
OIL, GAS AND MINING

B&A Buys & Associates, Inc.
Environmental Consultants

FAX TRANSMISSION
BUYS & ASSOCIATES, INC.
ENVIRONMENTAL CONSULTANTS

4720 South Santa Fe Circle, Suite 6
Englewood, CO 80110
303.781.8211
Fax: 303.781.1167

To:	Christopher Kierst	**Date:**	August 2, 2002
Company:	DOGM		
Fax #:	801.359.3940	**5 Pages**	**Including Cover**
From:	Martin Buys		
Subject:	Affidavit of mailing		

COMMENTS

Attached are copies of the affidavits of mailing for the B-624 and the A-713A. The originals have been sent to you by USPS mail.

The language of the affidavits does not explicitly address the language of the regulation. Will you accept the language as it is?

RECEIVED

AUG 02 2002

DIVISION OF
OIL, GAS AND MINING

AFFIDAVIT OF MAILING

I, Martin W. Buys, President, Buys & Associates, Inc., being first duly sworn, depose and state as follows; On July 29, 2002, I caused to be mailed by certified mail, postage prepaid, return receipt requested, a copy of the Application to convert the Lisbon A-713-A well to dispose of acid gas. It was sent to all parties on the attached sheet.

Dated this 29th day of July, 2002

Martin W. Buys
President
Buys & Associates, Inc.

The forgoing affidavit was subscribed and sworn to before me by Martin W. Buys.
This 29 day of July, 2002

_____, Notary Public

NIKKI L. BRIGGS
NOTARY
PUBLIC
STATE OF COLORADO

My Commission expires: _____ day of _____

My Commission Expires 9/3/2003

U.S. Postal Service
CERTIFIED MAIL RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)

7002 1140 0002 6003 7046

OFFICIAL USE

Postage $
Certified Fee
Return Receipt Fee (Endorsement Required)
Restricted Delivery Fee (Endorsement Required)
Total Postage

Postmark Here

Sent To
Street, Apt. No or PO Box No.
City, State, ZIP

State of Utah, SITLA
675 East 500 South, Suite 500
Salt Lake City, UT 84102-2818

PS Form 3800, January 2001 See Reverse for Instructions

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City, State, ZI

Bureau of Land Management
Oil & Gas Division
82 East Dogwood
Moab, UT 84532

PS Form 3800, January 2001 See Reverse for Instructions

U.S. Postal Service
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(Domestic Mail Only; No Insurance Coverage Provided)

7002 1140 0002 6003 7060

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Restricted Delivery Fee (Endorsement Required)
Total Postag

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Street, Apt. N or PO Box N
City, State, Z

Chester Gordon Trust
Attn: Wayne Gardenswartz, Trustee
600 17th Street, Suite 1800 North
Denver, CO 80202

PS Form 3800, January 2001 See Reverse for Instructions

AFFIDAVIT OF MAILING

I, Martin W. Buys, President, Buys & Associates, Inc., being first duly sworn, depose and state as follows; On July 25, 2002, I caused to be mailed by certified mail, postage prepaid, return receipt requested, a copy of the Application to modify the Lisbon B-624 SWD Well to dispose of acid gas. It was sent to all parties on the attached sheet.

Dated this 25th day of July, 2002

Martin W. Buys
President
Buys & Associates, Inc.

The forgoing affidavit was subscribed and sworn to before me by Martin W. Buys.
This 29 day of July, 2002

_____, Notary Public

My Commission expires: _____ day of _____
My Commission Expires 9/3/2003

NIKKI L. BRIGGS
NOTARY
PUBLIC
STATE OF COLORADO

U.S. Postal Service
CERTIFIED MAIL RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)

7001 1140 0002 6003 1471

OFFICIAL USE

Postage $
Certified Fee
Return Receipt Fee (Endorsement Required)
Restricted Delivery Fee (Endorsement Required)
Total Postage & Fees $

Postmark Here

Sent To
Bureau of Land Management
Oil & Gas Division
Street, Apt. No.; or PO Box No.
82 East Dogwood
City, State, ZIP+4
Moab, UT 84532

PS Form 3800, June 2000 See Instructions

Sent Certified, return receipt 7/25/02

U.S. Postal Service
CERTIFIED MAIL RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)

7001 1140 0002 6003 1464

OFFICIAL USE

Postage $
Certified Fee
Return Receipt Fee (Endorsement Required)
Restricted Delivery Fee (Endorsement Required)
Total Postage & Fees $

Postmark Here

Sent To
State of Utah, SITLA
Street, Apt. No.; or PO Box No.
675 East 500 South, Suite 500
City, State, ZIP+4
Salt Lake City, UT 84102-2818

PS Form 3800, June 2000 See Instructions

U.S. Postal Service
CERTIFIED MAIL RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)

7001 1140 0002 6003 1488

OFFICIAL USE

Postage $
Certified Fee
Return Receipt Fee (Endorsement Required)
Restricted Delivery Fee (Endorsement Required)
Total Postage & Fees $

Postmark Here

Sent To
Chester Gordon Trust
Attn: Wayne Gardenswartz, Trustee
Street, Apt. No.; or PO Box No.
600 17th Street, Suite 1800 North
City, State, ZIP+4
Denver, CO 80202

PS Form 3800, June 2000 See Instructions

UIC INJECTION PERMIT ANALYSIS FORM
WELL NAME: Lisbon B–624 SW

RG49-5-2. Requirements For Class II Injection Wells Including Water Disposal, Storage And Enhanced Recovery Wells.	Completed Items, Needed Items, & Comments
1. Injection wells shall be completed, equipped, operated, and maintained in a manner that will prevent pollution and damage to any USDW or other resources and will confine injected fluids to the interval approved.	1. OK
2. The application for an injection well shall include a properly completed UIC Form 1 and the following:	2. UIC Form 1 unnecessary for existing permitted Class II well.
2.1. A plat showing the location of the injection well, all abandoned or active wells within a one-half mile radius of the proposed well, and the surface owner and the operator of any lands or producing leases, respectively, within a one-half mile radius of the proposed injection well.	2.1. ~~Waived~~ for existing Class II permit should require because much could have changed since original permitting.
2.2. Copies of electrical or radioactive logs, including gamma ray logs, for the proposed well run prior to the installation of casing and indicating resistivity, spontaneous potential, caliper, and porosity.	2.2. Sonic provided. Division/Geologic library files document a Laterolog and a shallow interval Induction–Electric log for this well.
2.3. A copy of a cement bond or comparable log run for the proposed injection well after casing was set and cemented.	2.3. A CBL or UltraSonic Imager USI (Schlumberger) log will need to be run prior to permitting an injectate enhancement for "acid gas".
2.4. Copies of logs already on file with the division should be referenced, but need not be refiled.	2.4. OK
2.5. A description of the casing or proposed casing program of the injection well and of the proposed method for testing the casing before use of the well.	2.5. A plan will need to be tendered, which includes the maintenance of a 24 month internal MIT schedule. An external MIT schedule is also currently under consideration. A discussion on tubulars & casing & corrosion potential & monitoring of such.
2.6. A statement as to the type of fluid to be used for injection, its source and estimated amounts to be injected daily.	2.6. Information will be required to more closely define the properties, particularly as regards corrosion, of the fluid mixture proposed for injection. At the temp. & press. to be used.
2.7. Standard laboratory analyses of (1) the fluid to be injected, (2) the fluid in the formation into which the fluid is being injected, and (3) the compatibility of the fluids.	2.7. A more comprehensive analysis of the fluids will be required.
2.8. The proposed average and maximum injection pressures.	2.8. No maximum or average injection pressure is specified, only an estimate.
2.9. Evidence and data to support a finding that the proposed injection well will not initiate fractures through the overlying strata or a confining interval that could enable the injected fluid or formation fluid to enter the fresh water strata.	2.9. A step rate test and a reservoir model, which considers the physical and chemical properties of the injectate mixture, will be needed.
2.10. Appropriate geological data on the injection interval and confining beds, and nearby Underground Sources of Drinking Water, including the geologic name, lithologic description, thickness, depth, water quality, and lateral extent; also information relative to geologic structure near the proposed well which may effect the conveyance and/or storage of the injected fluids.	2.10. OK
2.11. A review of the mechanical condition of each well within a one-half mile radius of the proposed injection well to assure that no conduit exists that could enable fluids to migrate up or down the wellbore and enter improper intervals.	2.11. No other wells in AoR. Address other wells in the reservoir which will come in contact with the acid gas + potential for corrosion + future escape of gas. Also possible monitoring for such.
2.12. An affidavit certifying that a copy of the application has been provided to all operators, owners and surface owners within a one-half mile radius of the proposed injection well.	2.12. The affidavit will need to be redone because it makes no statement certifying that a copy of the application has been provided to all operators, owners and surface owners within a one-half mile radius of the proposed injection well.
2.13. Any other additional information that the board or division may determine is necessary to adequately review the application.	2.13. ~~No comment necessary.~~ Address overall safety + monitoring plans including H_2S contingency plan including procedures during workovers

OTHER COMMENTS AND OBSERVATIONS: The Division would like the operator to place a document on file, which designates Buys and Associates as the operator's agent for the purpose of procuring an "acid gas" enhancement to their Class II injection permit for this well.

cc: Eric Jones of BLM
: Tom Brown, Inc.

including procedures during workovers

Reviewed by: Christopher J. Kierst Date: 8/7/02.

4,225,783 654,062

8/6/02

Lisbon Consensus

procedures

- notice, no hearing unless objections
- BLM, will talk to EPA
- name field on subarea

Concerns

- Corrosion
- offset wells
- future drilling
- general safety
- safety precautions
- MIT frequency
- monitoring
- contingency plan

tech. info needed

- corrosion & other property info, specifics of fluid
- safety procedures / watch
- contingency plan in case of escape
- are special tubulars needed?

STAEDTLER® No. 937 811E Engineer's Computation Pad

UIC INJECTION PERMIT ANALYSIS FORM
WELL NAME: Lisbon B–624 SW

RG49-5-2. Requirements For Class II Injection Wells Including Water Disposal, Storage And Enhanced Recovery Wells.	**Completed Items, Needed Items, & Comments**
1. Injection wells shall be completed, equipped, operated, and maintained in a manner that will prevent pollution and damage to any USDW or other resources and will confine injected fluids to the interval approved.	1. OK
2. The application for an injection well shall include a properly completed UIC Form 1 and the following:	2. UIC Form 1 unnecessary for existing permitted Class II well.
2.1. A plat showing the location of the injection well, all abandoned or active wells within a one-half mile radius of the proposed well, and the surface owner and the operator of any lands or producing leases, respectively, within a one-half mile radius of the proposed injection well.	2.1. The plat with the ½ mile circle (Att. #2) only provides all the active or abandoned wells, but nothing about the surface owners and operators within the ½ mile Area of Review. Att. #8 informs that surface owners are BLM and Tom Brown, but the accompanying plat only shows federal (BLM) surface, locally, and no ½ mile AoR circle. Also, please indicate that there have been no changes since the original permitting.
2.2. Copies of electrical or radioactive logs, including gamma ray logs, for the proposed well run prior to the installation of casing and indicating resistivity, spontaneous potential, caliper, and porosity.	2.2. Sonic provided. Division/Geologic library files document a Laterolog and a shallow interval Induction–Electric log for this well.
2.3 pr	2.3. A CBL or UltraSonic Imager USI (Schlumberger) log will need to be run prior to permitting an injectate enhancement for "acid gas."
2.4 ref	2.4. OK
2.5 the ca	2.5. A plan will need to be tendered, which includes the maintenance of a 24-month internal MIT schedule. Please include a discussion of the tubing, casing, the potential for corrosion and a plan for ongoing monitoring of these.
2.6 so	2.6. Information will be required to more closely define the properties, particularly as regards corrosion, at likely temperatures and pressures, of the fluid mixture proposed for injection.
2.7 (2) inj	2.7. A more comprehensive analysis of the fluids will be required.
2.8	2.8. No maximum or average injection pressure is specified, only an estimate.
2.9 inj str or	2.9. A step rate test and a reservoir model, which considers the physical and chemical properties of the injectate mixture, will be needed.
2.10 co W thi inf wh flu	2.10. OK
2.11 on no the	2.11. We would like an analysis of the impact of the proposed injectate stream on the mechanical integrity of the other wells in the field, especially the nearest ones, one of which is also proposed for similar operations (A-713-A), albeit that they are beyond the normal ½ mile AoR.
2.12. An affidavit certifying that a copy of the application has been provided to all operators, owners and surface owners within a one-half mile radius of the proposed injection well.	2.12. The affidavit will need to be redone because it makes no specific statement certifying that a copy of the application has been provided to all operators, owners and surface owners within a one-half mile radius of the proposed injection well.
2.13. Any other additional information that the board or division may determine is necessary to adequately review the application.	2.13. Please address the overall safety issues, which may bear on this type of operation, with comments on H_2S contingency plans for likely ancillary operations such as workovers.

Get email address for Brant Summerson of Tom Brown, Inc. (303) 260-5030 for B-624 acid gas permit info.

OTHER COMMENTS AND OBSERVATIONS: The Division would like the operator to place a document on file, which designates Buys and Associates as the operator's agent for the purpose of procuring an "acid gas" enhancement to their Class II injection permit for this well.

Reviewed by: Christopher J. Kierst Date: 8/7/02 .

UIC INJECTION PERMIT ANALYSIS FORM
WELL NAME: Lisbon B–624 SW

RG49-5-2. Requirements For Class II Injection Wells Including Water Disposal, Storage And Enhanced Recovery Wells.	**Completed Items, Needed Items, & Comments**
1. Injection wells shall be completed, equipped, operated, and maintained in a manner that will prevent pollution and damage to any USDW or other resources and will confine injected fluids to the interval approved.	1. OK
2. The application for an injection well shall include a properly completed UIC Form 1 and the following:	2. UIC Form 1 unnecessary for existing permitted Class II well.
2.1. A plat showing the location of the injection well, all abandoned or active wells within a one-half mile radius of the proposed well, and the surface owner and the operator of any lands or producing leases, respectively, within a one-half mile radius of the proposed injection well.	2.1. The plat with the ½ mile circle (Att. #2) only provides all the active or abandoned wells, but nothing about the surface owners and operators within the ½ mile Area of Review. Att. #8 informs that surface owners are BLM and Tom Brown, but the accompanying plat only shows federal (BLM) surface, locally, and no ½ mile AoR circle. Also, please indicate that there have been no changes since the original permitting.
2.2. Copies of electrical or radioactive logs, including gamma ray logs, for the proposed well run prior to the installation of casing and indicating resistivity, spontaneous potential, caliper, and porosity.	2.2. Sonic provided. Division/Geologic library files document a Laterolog and a shallow interval Induction–Electric log for this well.
2.3. A copy of a cement bond or comparable log run for the proposed injection well after casing was set and cemented.	2.3. A CBL or UltraSonic Imager USI (Schlumberger) log will need to be run prior to permitting an injectate enhancement for "acid gas."
2.4. Copies of logs already on file with the division should be referenced, but need not be refiled.	2.4. OK
2.5. A description of the casing or proposed casing program of the injection well and of the proposed method for testing the casing before use of the well.	2.5. A plan will need to be tendered, which includes the maintenance of a 24-month internal MIT schedule. Please include a discussion of the tubing, casing, the potential for corrosion and a plan for ongoing monitoring of these.
2.6. A statement as to the type of fluid to be used for injection, its source and estimated amounts to be injected daily.	2.6. Information will be required to more closely define the properties, particularly as regards corrosion, at likely temperatures and pressures, of the fluid mixture proposed for injection.
2.7. Standard laboratory analyses of (1) the fluid to be injected, (2) the fluid in the formation into which the fluid is being injected, and (3) the compatibility of the fluids.	2.7. A more comprehensive analysis of the fluids will be required.
2.8. The proposed average and maximum injection pressures.	2.8. No maximum or average injection pressure is specified, only an estimate.
2.9. Evidence and data to support a finding that the proposed injection well will not initiate fractures through the overlying strata or a confining interval that could enable the injected fluid or formation fluid to enter the fresh water strata.	2.9. A step rate test and a reservoir model, which considers the physical and chemical properties of the injectate mixture, will be needed.
2.10. Appropriate geological data on the injection interval and confining beds, and nearby Underground Sources of Drinking Water, including the geologic name, lithologic description, thickness, depth, water quality, and lateral extent; also information relative to geologic structure near the proposed well which may effect the conveyance and/or storage of the injected fluids.	2.10. OK
2.11. A review of the mechanical condition of each well within a one-half mile radius of the proposed injection well to assure that no conduit exists that could enable fluids to migrate up or down the wellbore and enter improper intervals.	2.11. We would like an analysis of the impact of the proposed injectate stream on the mechanical integrity of the other wells in the field, especially the nearest ones, one of which is also proposed for similar operations (A-713-A), albeit that they are beyond the normal ½ mile AoR.
2.12. An affidavit certifying that a copy of the application has been provided to all operators, owners and surface owners within a one-half mile radius of the proposed injection well.	2.12. The affidavit will need to be redone because it makes no specific statement certifying that a copy of the application has been provided to all operators, owners and surface owners within a one-half mile radius of the proposed injection well.
2.13. Any other additional information that the board or division may determine is necessary to adequately review the application.	2.13. Please address the overall safety issues, which may bear on this type of operation, with comments on H_2S contingency plans for likely ancillary operations such as workovers.

OTHER COMMENTS AND OBSERVATIONS: The Division would like the operator to place a document on file, which designates Buys and Associates as the operator's agent for the purpose of procuring an "acid gas" enhancement to their Class II injection permit for this well.

Reviewed by: Christopher J. Kierst Date: 8/7/02 .

UIC INJECTION PERMIT ANALYSIS FORM
WELL NAME: Lisbon B–624 SWD

RG49-5-2. Requirements For Class II Injection Wells Including Water Disposal, Storage And Enhanced Recovery Wells.	**Completed Items, Needed Items, & Comments**
1. Injection wells shall be completed, equipped, operated, and maintained in a manner that will prevent pollution and damage to any USDW or other resources and will confine injected fluids to the interval approved.	1. OK
2. The application for an injection well shall include a properly completed UIC Form 1 and the following:	2. UIC Form 1 unnecessary for existing permitted Class II well.
2.1. A plat showing the location of the injection well, all abandoned or active wells within a one-half mile radius of the proposed well, and the surface owner and the operator of any lands or producing leases, respectively, within a one-half mile radius of the proposed injection well.	2.1. Waived for existing Class II permit
2.2. Copies of electrical or radioactive logs, including gamma ray logs, for the proposed well run prior to the installation of casing and indicating resistivity, spontaneous potential, caliper, and porosity.	2.2. Sonic provided. Division/Geologic library files document a Laterolog and a shallow interval Induction–Electric log for this well.
2.3. A copy of a cement bond or comparable log run for the proposed injection well after casing was set and cemented.	2.3. Waived –no cement bond log was ever run on this well. Need CBL
2.4. Copies of logs already on file with the division should be referenced, but need not be refiled.	2.4. OK
2.5. A description of the casing or proposed casing program of the injection well and of the proposed method for testing the casing before use of the well.	2.5. ~~Waived~~. (?) 60 month internal MIT conducted on 6/18/02. No other tests required for permit enhancement. (?) Need plan (may need more rigorous MIT sched)
2.6. A statement as to the type of fluid to be used for injection. its source and estimated amounts to be injected daily.	2.6. ~~OK~~ Need more specifics
2.7. Standard laboratory analyses of (1) the fluid to be injected, (2) the fluid in the formation into which the fluid is being injected, and (3) the compatibility of the fluids.	2.7. ~~OK~~ Better, more comprehensive, analysis incl. gas.
2.8. The proposed average and maximum injection pressures.	2.8. No maximum or average injection pressure is specified, only an estimate.
2.9. Evidence and data to support a finding that the proposed injection well will not initiate fractures through the overlying strata or a confining interval that could enable the injected fluid or formation fluid to enter the fresh water strata.	2.9. ~~Waived~~ owing to well history of continuous injection. Need the works
2.10. Appropriate geological data on the injection interval and confining beds, and nearby Underground Sources of Drinking Water, including the geologic name, lithologic description, thickness, depth, water quality, and lateral extent; also information relative to geologic structure near the proposed well which may effect the conveyance and/or storage of the injected fluids.	2.10. OK
2.11. A review of the mechanical condition of each well within a one-half mile radius of the proposed injection well to assure that no conduit exists that could enable fluids to migrate up or down the wellbore and enter improper intervals.	2.11. No other wells in AoR.
2.12. An affidavit certifying that a copy of the application has been provided to all operators, owners and surface owners within a one-half mile radius of the proposed injection well.	2.12. ~~Waived~~. Re-do affidavit and inform him that no notice will issue but upon receipt of a proper affidavit.
2.13. Any other additional information that the board or division may determine is necessary to adequately review the application.	2.13. (?)

OTHER COMMENTS AND OBSERVATIONS:

Reviewed by:_____ Date: _____.

Acid Gas Staff Mtg.

8/6/02

Gil, John, Brad, Chris

1 - No special board hearing needed.

2 - a - corrosion

b - fluid content properties???

c - offset wells - may need to increase radius of area of review

d - do you want to alter your stream to dry it out.

e - future drilling

f - unit nomenclature - "acid gas" or "H_2S" unit name.

g - Safety (general safety)

h - MIT frequency increase (2 yrs rather than 5)

i - monitoring (other wells) in an ongoing fashion for surface leaks

j - contingency plan (detail later) (one may already exist)

k - nothing actually extending authority to apply to Marty Burps (cover letter)

- 713 needs a UIC Form 4 Designation of Agent document (naming Marty Burps).

Notice only after receipt of all the parts completeness vs adequacy

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt
Governor
Kathleen Clarke
Executive Director
Lowell P. Braxton
Division Director

1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, Utah 84114-5801
801-538-5340
801-359-3940 (Fax)
801-538-7223 (TDD)

August 8, 2002

Marty Buys
Buys and Associates, Inc.
4720 South Santa Fe Circle, Suite 6
Englewood, CO 80110

Re: Lisbon B-624 SWD, Section 24, Township 30 South, Range 24 East, San Juan County, Utah as a Class II Injection Well

Dear Mr. Buys:

Attached please find a UIC Injection Permit Analysis document for the subject well. This document provides initial comments from the Division of Oil, Gas and Mining (Division) permitting staff regarding the information you submitted on behalf of Tom Brown Inc.'s (operator) proposal to change the conditions of the original UIC Class II Permit. The analysis shows the Divisions required supporting information and staff review concerning the completeness of the submission.

The Division UIC permitting staff considers this proposal as a significant variation from normal disposal practice and as the disposal of a production waste stream, which, as an exempt oilfield waste is, none the less, potentially very corrosive and dangerous, if mishandled. We hope that you and the operator share our concern to the side of caution in permitting this, and the related injection operations.

This well was originally permitted in 1965 as a disposal well and has been in service for nearly 37 years, a period of changes, including environmental regulatory oversight. To be assured that we are informed of any changes, which may have taken place in the ensuing time and to proceed with caution, the operator will need to meet all specified requirements. When these are met, the staff will complete the technical review, draft the Statement of Basis, and publish the Notice of Agency Action, which publicizes your proposal. Listed below is the additional supporting information we need to proceed with the technical review:

- A document from the operator, which designates Buys and Associates as the operator's agent in the "acid gas" enhancement permitting of the B-624 and A-713-A wells.

CBL 8875' Top of Packer on up?

- A plat clearly addressing the requirement for a map showing all wells, of all classifications, and all offset operators and surface owners within a 1/2 mile radius of the B-624 well.
- A workmanlike Cement Bond Log (check with us if you need clarification) or, as an acceptable substitute, an UltraSonic Imager Log (Schlumberger).
- Detailed information which describes the physical and chemical properties of the "acid gas" injectate mixture, its likely downhole and surface behavior and interactions, including corrosion, at working temperatures and pressures and the properties of some possible variations on it.
- An investigation of the adequacy of the casing and tubing, which considers the corrosivity of the "acid gas" injectate across all likely working temperatures and pressures.
- A plan for the ongoing monitoring of the operation and maintenance of a 24-month internal Mechanical Integrity Test regimen and monitoring integrity of any piping, which may come in contact with the acid gas, prior to, and during injection.
- A discussion of other alternatives for the disposition of the "acid gas" waste stream.
- A comprehensive analysis of the injectate fluid, the formation fluid and their compatibility.
- A workmanlike Step Rate test. — takes fluid on a vacuum
- A longitudinal reservoir modeling study, which considers the physical and chemical properties of the "acid gas" mixture upon the integrity of the other wells in the reservoir (outside the 1/2 mile Area of Review), including the other proposed "acid gas" disposal well (A-713-A).
- An affidavit, which explicitly certifies that a copy of the proposal has been provided to all operators, owners and surface owners within a one half-mile radius of the subject well.
- A discussion of the subject of overall safety issues, including H2S contingency plans, which ought, reasonably, to be addressed considering this type of operation and ancillary related operations, such as workovers.

If you have any questions regarding the above, please contact me at (801) 538-5337.

Sincerely,

Christopher Kierst

Christopher Kierst
Reclamation Specialist

er
Attachment
cc: Tom Brown, Inc
Eric Jones, BLM Moab

UIC INJECTION PERMIT ANALYSIS FORM
WELL NAME: Lisbon B–624 SW

RG49-5-2. Requirements For Class II Injection Wells Including Water Disposal, Storage And Enhanced Recovery Wells.	**Completed Items, Needed Items, & Comments**
1. Injection wells shall be completed, equipped, operated, and maintained in a manner that will prevent pollution and damage to any USDW or other resources and will confine injected fluids to the interval approved.	1. OK
2. The application for an injection well shall include a properly completed UIC Form 1 and the following:	2. UIC Form 1 unnecessary for existing permitted Class II well.
2.1. A plat showing the location of the injection well, all abandoned or active wells within a one-half mile radius of the proposed well, and the surface owner and the operator of any lands or producing leases, respectively, within a one-half mile radius of the proposed injection well.	2.1. The plat with the ½ mile circle (Att. #2) only provides all the active or abandoned wells, but nothing about the surface owners and operators within the ½ mile Area of Review. Att. #8 informs that surface owners are BLM and Tom Brown, but the accompanying plat only shows federal (BLM) surface, locally, and no ½ mile AoR circle. Also, please indicate that there have been no changes since the original permitting.
2.2. Copies of electrical or radioactive logs, including gamma ray logs, for the proposed well run prior to the installation of casing and indicating resistivity, spontaneous potential, caliper, and porosity.	2.2. Sonic provided. Division/Geologic library files document a Laterolog and a shallow interval Induction–Electric log for this well.
2.3. A copy of a cement bond or comparable log run for the proposed injection well after casing was set and cemented.	2.3. A CBL or UltraSonic Imager USI (Schlumberger) log will need to be run prior to permitting an injectate enhancement for "acid gas."
2.4. Copies of logs already on file with the division should be referenced, but need not be refiled.	2.4. OK
2.5. A description of the casing or proposed casing program of the injection well and of the proposed method for testing the casing before use of the well.	2.5. A plan will need to be tendered, which includes the maintenance of a 24-month internal MIT schedule. Please include a discussion of the tubing, casing, the potential for corrosion and a plan for ongoing monitoring of these.
2.6. A statement as to the type of fluid to be used for injection, its source and estimated amounts to be injected daily.	2.6. Information will be required to more closely define the properties, particularly as regards corrosion, at likely temperatures and pressures, of the fluid mixture proposed for injection.
2.7. Standard laboratory analyses of (1) the fluid to be injected, (2) the fluid in the formation into which the fluid is being injected, and (3) the compatibility of the fluids.	2.7. A more comprehensive analysis of the fluids will be required.
2.8. The proposed average and maximum injection pressures.	2.8. No maximum or average injection pressure is specified, only an estimate.
2.9. Evidence and data to support a finding that the proposed injection well will not initiate fractures through the overlying strata or a confining interval that could enable the injected fluid or formation fluid to enter the fresh water strata.	2.9. A step rate test and a reservoir model, which considers the physical and chemical properties of the injectate mixture, will be needed.
2.10. Appropriate geological data on the injection interval and confining beds, and nearby Underground Sources of Drinking Water, including the geologic name, lithologic description, thickness, depth, water quality, and lateral extent; also information relative to geologic structure near the proposed well which may effect the conveyance and/or storage of the injected fluids.	2.10. OK
2.11. A review of the mechanical condition of each well within a one-half mile radius of the proposed injection well to assure that no conduit exists that could enable fluids to migrate up or down the wellbore and enter improper intervals.	2.11. We would like an analysis of the impact of the proposed injectate stream on the mechanical integrity of the other wells in the field, especially the nearest ones, one of which is also proposed for similar operations (A-713-A), albeit that they are beyond the normal ½ mile AoR.
2.12. An affidavit certifying that a copy of the application has been provided to all operators, owners and surface owners within a one-half mile radius of the proposed injection well.	2.12. The affidavit will need to be redone because it makes no specific statement certifying that a copy of the application has been provided to all operators, owners and surface owners within a one-half mile radius of the proposed injection well.
2.13. Any other additional information that the board or division may determine is necessary to adequately review the application.	2.13. Please address the overall safety issues, which may bear on this type of operation, with comments on H_2S contingency plans for likely ancillary operations such as workovers.

OTHER COMMENTS AND OBSERVATIONS: The Division would like the operator to place a document on file, which designates Buys and Associates as the operator's agent for the purpose of procuring an "acid gas" enhancement to their Class II injection permit for this well.

Reviewed by: Christopher J. Kierst Date: 8/7/02 .

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt
Governor

Kathleen Clarke
Executive Director

Lowell P. Braxton
Division Director

1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, Utah 84114-5801
801-538-5340
801-359-3940 (Fax)
801-538-7223 (TDD)

August 8, 2002

(303) 260-5036 Tom Brown

Byron Gall

Brant Gemmeson Enviro

Marty Buys
Buys and Associates,
4720 South Santa Fe C
Englewood, CO 80110

Re: Lisbon B-624 SW
County, Utah as a

Dear Mr. Buys:

Attached please find a ... well. This document provides ... Gas and Mining (Division) permitting staff reg... ...mitted on behalf of Tom Brown Inc.'s (operator) propos... ...ditions of the original UIC Class II Permit. The analysis shows the ...ons required supporting information and staff review concerning the completeness of the submission.

The Division UIC permitting staff considers this proposal as a significant variation from normal disposal practice and as the disposal of a production waste stream, which, as an exempt oilfield waste is, none the less, potentially very corrosive and dangerous, if mishandled. We hope that you and the operator share our concern to the side of caution in permitting this, and the related injection operations.

This well was originally permitted in 1965 as a disposal well and has been in service for nearly 37 years, a period of changes, including environmental regulatory oversight. To be assured that we are informed of any changes, which may have taken place in the ensuing time and to proceed with caution, the operator will need to meet all specified requirements. When these are met, the staff will complete the technical review, draft the Statement of Basis, and publish the Notice of Agency Action, which publicizes your proposal. Listed below is the additional supporting information we need to proceed with the technical review:

- A document from the operator, which designates Buys and Associates as the operator's agent in the "acid gas" enhancement permitting of the B-624 and A-713-A wells.

Post-it® Fax Note 7671	Date 8/9/02	# of pages ▶ 3
To Marty Buys	From Chris Kierst	
Co./Dept. Buys & Associates	Co. DOGM	
Phone # (303) 781-8211	Phone # (801) 538-5337	
Fax # (303) 781-1167	Fax # (801) 359-3940	

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt
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801-538-7223 (TDD)

August 8, 2002

Marty Buys
Buys and Associates, Inc.
4720 South Santa Fe Circle, Suite 6
Englewood, CO 80110

Re: Lisbon B-624 SWD, Section 24, Township 30 South, Range 24 East, San Juan County, Utah as a Class II Injection Well

Dear Mr. Buys:

Attached please find a UIC Injection Permit Analysis document for the subject well. This document provides initial comments from the Division of Oil, Gas and Mining (Division) permitting staff regarding the information you submitted on behalf of Tom Brown Inc.'s (operator) proposal to change the conditions of the original UIC Class II Permit. The analysis shows the Divisions required supporting information and staff review concerning the completeness of the submission.

The Division UIC permitting staff considers this proposal as a significant variation from normal disposal practice and as the disposal of a production waste stream, which, as an exempt oilfield waste is, none the less, potentially very corrosive and dangerous, if mishandled. We hope that you and the operator share our concern to the side of caution in permitting this, and the related injection operations.

This well was originally permitted in 1965 as a disposal well and has been in service for nearly 37 years, a period of changes, including environmental regulatory oversight. To be assured that we are informed of any changes, which may have taken place in the ensuing time and to proceed with caution, the operator will need to meet all specified requirements. When these are met, the staff will complete the technical review, draft the Statement of Basis, and publish the Notice of Agency Action, which publicizes your proposal. Listed below is the additional supporting information we need to proceed with the technical review:

- A document from the operator, which designates Buys and Associates as the operator's agent in the "acid gas" enhancement permitting of the B-624 and A-713-A wells.

Post-it® Fax Note 7671	Date 8/9/02 # of pages ▶ 3
To Marty Buys	From Chris Kierst
Co./Dept. Buys & Associates	Co. DOGM
Phone # (303) 781-8211	Phone # (801) 538-5337
Fax # (303) 781-1167	Fax # (801) 359-3940

- A plat clearly addressing the requirement for a map showing all wells, of all classifications, and all offset operators and surface owners within a 1/2 mile radius of the B-624 well.
- A workmanlike Cement Bond Log (check with us if you need clarification) or, as an acceptable substitute, an UltraSonic Imager Log (Schlumberger).
- Detailed information which describes the physical and chemical properties of the "acid gas" injectate mixture, its likely downhole and surface behavior and interactions, including corrosion, at working temperatures and pressures and the properties of some possible variations on it.
- An investigation of the adequacy of the casing and tubing, which considers the corrosivity of the "acid gas" injectate across all likely working temperatures and pressures.
- A plan for the ongoing monitoring of the operation and maintenance of a 24-month internal Mechanical Integrity Test regimen and monitoring integrity of any piping, which may come in contact with the acid gas, prior to, and during injection.
- A discussion of other alternatives for the disposition of the "acid gas" waste stream.
- A comprehensive analysis of the injectate fluid, the formation fluid and their compatibility.
- A workmanlike Step Rate test. We requested this up front rather than later. CK 8/12/02
- A longitudinal reservoir modeling study, which considers the physical and chemical properties of the "acid gas" mixture upon the integrity of the other wells in the reservoir (outside the 1/2 mile Area of Review), including the other proposed "acid gas" disposal well (A-713-A).
- An affidavit, which explicitly certifies that a copy of the proposal has been provided to all operators, owners and surface owners within a one half-mile radius of the subject well.
- A discussion of the subject of overall safety issues, including H2S contingency plans, which ought, reasonably, to be addressed considering this type of operation and ancillary related operations, such as workovers.

If you have any questions regarding the above, please contact me at (801) 538-5337.

Sincerely,

Christopher Kierst
Reclamation Specialist

er
Attachment
cc: Tom Brown, Inc
Eric Jones, BLM Moab

UIC INJECTION PERMIT ANALYSIS FORM
WELL NAME: Lisbon B–624 SW

RG49-5-2. Requirements For Class II Injection Wells Including Water Disposal, Storage And Enhanced Recovery Wells.	**Completed Items, Needed Items, & Comments**
1. Injection wells shall be completed, equipped, operated, and maintained in a manner that will prevent pollution and damage to any USDW or other resources and will confine injected fluids to the interval approved.	1. OK
2. The application for an injection well shall include a properly completed UIC Form 1 and the following:	2. UIC Form 1 unnecessary for existing permitted Class II well.
2.1. A plat showing the location of the injection well, all abandoned or active wells within a one-half mile radius of the proposed well, and the surface owner and the operator of any lands or producing leases, respectively, within a one-half mile radius of the proposed injection well.	2.1. The plat with the ½ mile circle (Att. #2) only provides all the active or abandoned wells, but nothing about the surface owners and operators within the ½ mile Area of Review. Att. #8 informs that surface owners are BLM and Tom Brown, but the accompanying plat only shows federal (BLM) surface, locally, and no ½ mile AoR circle. Also, please indicate that there have been no changes since the original permitting.
2.2. Copies of electrical or radioactive logs, including gamma ray logs, for the proposed well run prior to the installation of casing and indicating resistivity, spontaneous potential, caliper, and porosity.	2.2. Sonic provided. Division/Geologic library files document a Laterolog and a shallow interval Induction–Electric log for this well.
2.3. A copy of a cement bond or comparable log run for the proposed injection well after casing was set and cemented.	2.3. A CBL or UltraSonic Imager USI (Schlumberger) log will need to be run prior to permitting an injectate enhancement for "acid gas."
2.4. Copies of logs already on file with the division should be referenced, but need not be refiled.	2.4. OK
2.5. A description of the casing or proposed casing program of the injection well and of the proposed method for testing the casing before use of the well.	2.5. A plan will need to be tendered, which includes the maintenance of a 24-month internal MIT schedule. Please include a discussion of the tubing, casing, the potential for corrosion and a plan for ongoing monitoring of these.
2.6. A statement as to the type of fluid to be used for injection, its source and estimated amounts to be injected daily.	2.6. Information will be required to more closely define the properties, particularly as regards corrosion, at likely temperatures and pressures, of the fluid mixture proposed for injection.
2.7. Standard laboratory analyses of (1) the fluid to be injected, (2) the fluid in the formation into which the fluid is being injected, and (3) the compatibility of the fluids.	2.7. A more comprehensive analysis of the fluids will be required.
2.8. The proposed average and maximum injection pressures.	2.8. No maximum or average injection pressure is specified, only an estimate.
2.9. Evidence and data to support a finding that the proposed injection well will not initiate fractures through the overlying strata or a confining interval that could enable the injected fluid or formation fluid to enter the fresh water strata.	2.9. A step rate test and a reservoir model, which considers the physical and chemical properties of the injectate mixture, will be needed.
2.10. Appropriate geological data on the injection interval and confining beds, and nearby Underground Sources of Drinking Water, including the geologic name, lithologic description, thickness, depth, water quality, and lateral extent; also information relative to geologic structure near the proposed well which may effect the conveyance and/or storage of the injected fluids.	2.10. OK
2.11. A review of the mechanical condition of each well within a one-half mile radius of the proposed injection well to assure that no conduit exists that could enable fluids to migrate up or down the wellbore and enter improper intervals.	2.11. We would like an analysis of the impact of the proposed injectate stream on the mechanical integrity of the other wells in the field, especially the nearest ones, one of which is also proposed for similar operations (A-713-A), albeit that they are beyond the normal ½ mile AoR.
2.12. An affidavit certifying that a copy of the application has been provided to all operators, owners and surface owners within a one-half mile radius of the proposed injection well.	2.12. The affidavit will need to be redone because it makes no specific statement certifying that a copy of the application has been provided to all operators, owners and surface owners within a one-half mile radius of the proposed injection well.
2.13. Any other additional information that the board or division may determine is necessary to adequately review the application.	2.13. Please address the overall safety issues, which may bear on this type of operation, with comments on H_2S contingency plans for likely ancillary operations such as workovers.

OTHER COMMENTS AND OBSERVATIONS: The Division would like the operator to place a document on file, which designates Buys and Associates as the operator's agent for the purpose of procuring an "acid gas" enhancement to their Class II injection permit for this well.

Reviewed by: Christopher J. Kierst Date: 8/7/02 .

Washington
Industrial/Process

August 20, 2002

Mr. Steve Jones
Tom Brown Inc.
Lisbon Gas Plant

Subject: AGE/AGI Project – UIC Injection Permit Analysis

Washington Group International Inc. (Washington) is providing the following comments to the request for information you received from the State of Utah, Department of Natural Resources, Division of Oil, Gas and Minerals. Specifically, we are responding to items 3, 6 and 7 of Page Two of the letter dated August 8, 2002.

Item 3: Detailed information which describes the physical and chemical properties of the "acid gas" injectate mixture, its likely downhole and surface behavior and interactions, including corrosion, at working temperatures and pressures and the properties of some possible variations on it.

Attached to this letter are tables and figures that represent the physical and chemical properties of the acid gas mixtures used for design of the Lisbon AGE/AGI Project.

Tom Brown Inc. and Washington have considered a wide range of operating conditions and acid gas compositions to ensure that the system can handle the full range of operating and worst case winter and summer ambient conditions.

Regarding corrosion, the acid gas mixtures as encountered at the Lisbon Gas Plant can "hold" a considerable amount of water, much more than typical natural gas, at the operating pressures experienced in the pipeline and the injection well. Therefore, the acid gas will remain "dry" with no free water or hydrates able to form. Without free water, the acid gas (H_2S and CO_2) is non-corrosive to the materials planned for the facilities.

Item 6: A discussion of other alternatives for the disposition of the "acid gas" waste stream.

There are three principal options for disposition of acid gas rejected from sour gas treating applications.

- **The simplest method for disposition is to flare the acid gas.** For the very dilute (low H_2S) acid gas recovered at the Lisbon Gas Plant, flaring requires addition of fuel gas to gain flammability. Thus, direct flaring would result in a large emission of SO_2 to the atmosphere, plus any CO_2 contained in the acid gas and the CO_2 resulting from combustion of any contained hydrocarbons and added fuel gas. This option is generally found unacceptable for environmental and safety concerns, particularly for facilities processing the quantity of acid gas present at the Lisbon Gas Plant.

7800 East Union Ave., Suite 100 • Denver, Colorado USA 80237 • P.O. Box 5888 • Denver, Colorado 80217
Phone: (303) 843-2000 • Fax: (303) 843-2208 • www.wgint.com

- **More conventionally, the acid gas can be processed through a sulfur recovery system, such as the Selectox system now in use at the Lisbon Gas Plant.** A molten sulfur product is obtained for sale as a chemical commodity, and the tail gas from the process is incinerated and vented to the atmosphere. The emitted tail gas is a known source of SO_2 pollutant and contains a high concentration of CO_2. Market conditions for sale of the molten sulfur product from locations such as the Lisbon Gas Plant have become very poor in recent years and are not forecast to improve in the near future. Therefore, Tom Brown Inc. is actually forced to pay substantial amounts for removal of the molten sulfur from their site.

- **The acid gas can be compressed and re-injected into the same or other available underground formation for containment.** This option has gained considerable favor in the past 15 years due to the poor economics of the sulfur market, and to the reduced environmental impact it provides versus other options.

  Injection has been accomplished into depleted hydrocarbon(natural gas or oil) reservoirs, and into water-saturated zones. The acid gas has been injected directly in most cases, but certain installations have found an advantage to mixing the acid gas with waste produced water at the surface,. The acid gas becomes soluble in the water and the mixture is then injected into the reservoir. There are currently more than 50 operating acid gas injection facilities in the western U.S. and Canada alone. Several more are in the planning, design and construction stages.

  Emissions of SO_2 and CO_2 are eliminated from the acid gas processing systems. The acid gas is often returned to the same geological formation, or one of similar nature and integrity to ensure contamination of other reservoirs does not occur.

Item 7: A comprehensive analysis of the injectate fluid, the formation fluid and their compatibility.

Washington cannot comment on the specific nature and analysis of the candidate formation fluids. However, the injectate fluid (as described in Item 3 above) is a mixture of H_2S and CO_2, with very few other contaminants. The acid gas mixture will contain some water but the amount is so small that it remains in the vapor phase. No free water or hydrates can form under all pipeline and injection conditions. Components such as H_2S and CO_2 have long been recognized as mixing readily with hydrocarbon/water reservoir fluids and even improving their flow characteristics from the reservoir to producing equipment. Therefore, they are found to be quite compatible with the natural reservoir fluids. They are also generally non-reactive with the reservoir fluids since they are contained in the natural reservoir itself.

The candidate injection wells for the Lisbon AGE/AGI Project are indeed former producing sour natural gas wells that fed the Lisbon Gas Plant, but are now depleted and used for re-injection of waste produced water. The ability of these wells to accept and contain the injected acid gas should be excellent.

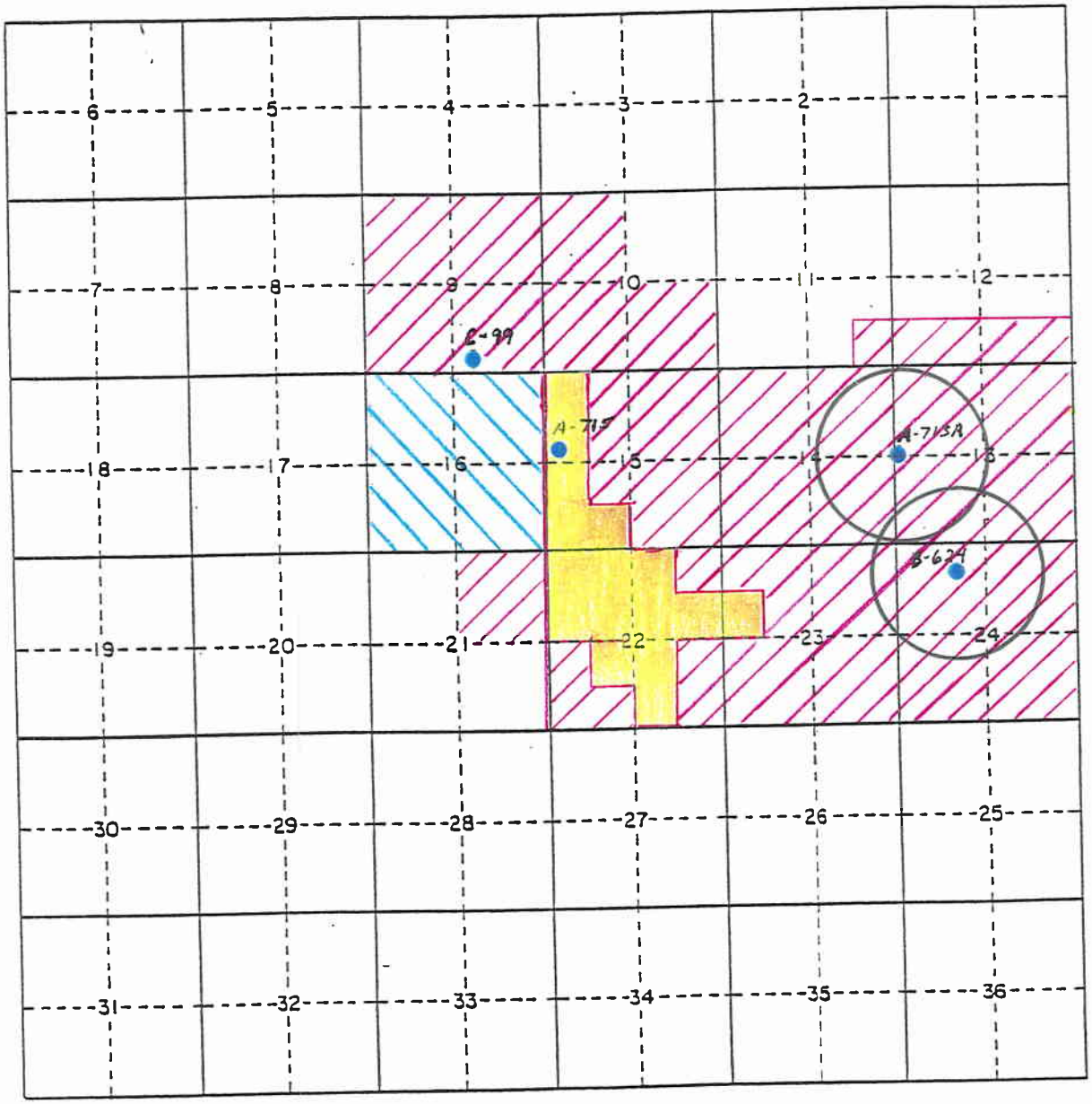
J. E. Johnson

SURFACE OWNERSHIP

Lisbon Field

Section _____ Township 30 North Range 24 East

County San Juan State Utah



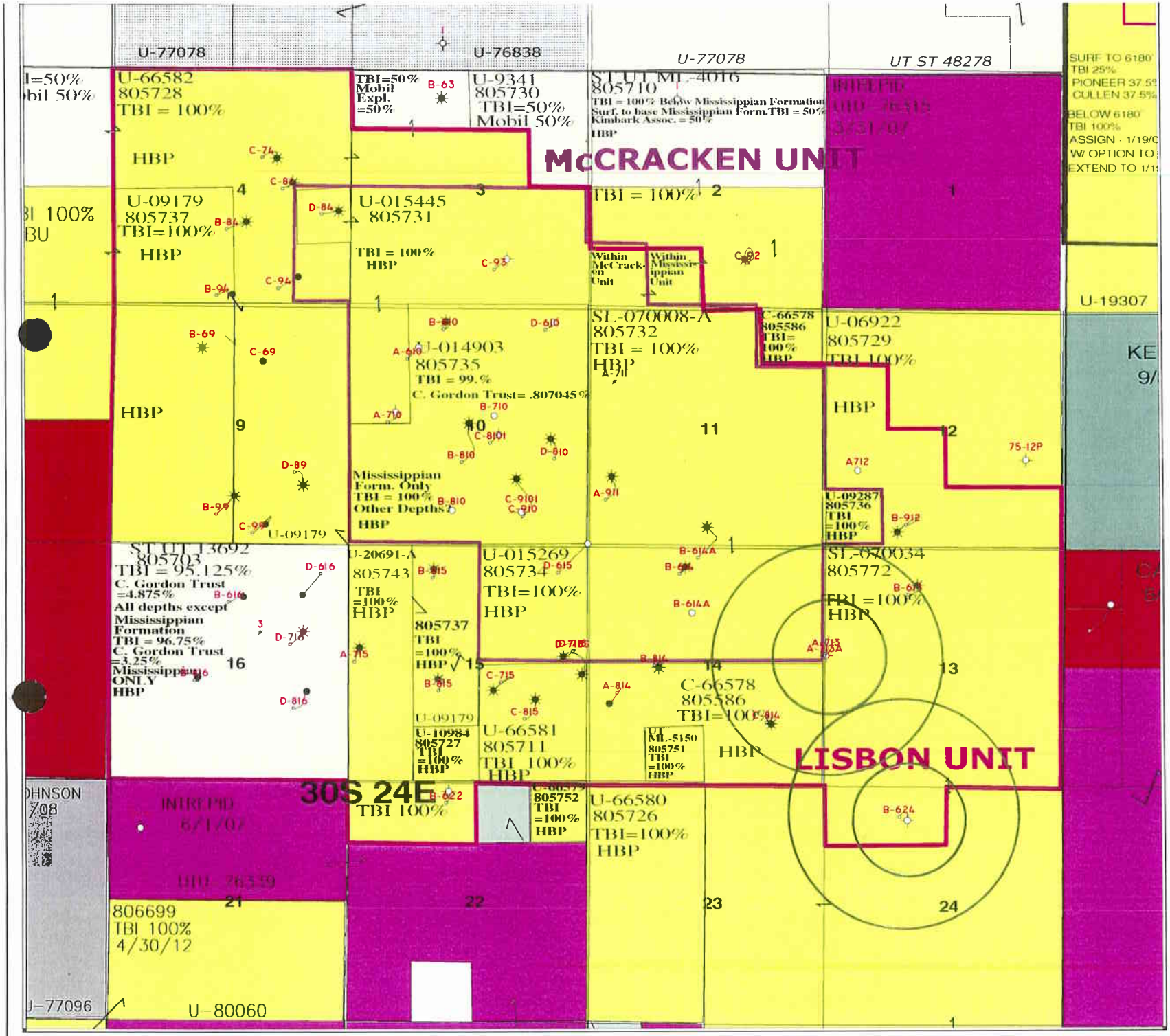
Surface Ownership

SCALE: 1 inch = 1 mile

Federal (BLM)

State of Utah

TBI Fee Ownership


U-77078
U-76838
U-77078
UT ST 48278
U-66582
805728
TBI = 100%
HBP
TBI=50%
Mobil
Expl.
=50%
U-9341
805730
TBI=50%
Mobil 50%
ST UT ML-4016
805710
TBI = 100% Below Mississippian Formation
Surf. to base Mississippian Form.TBI = 50%
Kimbark Assoc. = 50%
HBP
McCRACKEN UNIT
SURF TO 6180'
TBI 25%
PIONEER 37.5%
CULLEN 37.5%
BELOW 6180'
TBI 100%
ASSIGN - 1/19/0
W/ OPTION TO
EXTEND TO 1/1
U-09179
805737
TBI=100%
HBP
U-015445
805731
TBI = 100%
HBP
TBI = 100%
Within McCracken Unit
Within Mississippian Unit
U-19307
U-014903
805735
TBI = 99.%
C. Gordon Trust= .807045%
Mississippian Form. Only
TBI = 100%
Other Depths?
HBP
ST-070008-A
805732
TBI = 100%
HBP
C-66578
805586
TBI=100%
HBP
U-06922
805729
TBI 100%
HBP
U-09287
805736
TBI
=100%
HBP
ST UT 13692
805703
TBI = 95.125%
C. Gordon Trust
=4.875%
All depths except
Mississippian
Formation
TBI = 96.75%
C. Gordon Trust
=3.25%
Mississippian
ONLY
HBP
U-20691-A
805743
TBI
=100%
HBP
805737
TBI
=100%
HBP
U-015269
805734
TBI=100%
HBP
ST-070034
805772
TBI =100%
HBP
C-66578
805586
TBI=100%
HBP
U-09179
U-10984
805727
TBI
=100%
HBP
U-66581
805711
TBI 100%
HBP
UT ML-5150
805751
TBI
=100%
HBP
LISBON UNIT
30S 24E
TBI 100%
INTREPID
6/1/07
805752
TBI
=100%
HBP
U-66580
805726
TBI=100%
HBP
806699
TBI 100%
4/30/12
U-77096
U-80060
PARADOX BASIN, CO-UT
LISBON & McCRACKEN UNITS

Formation Tops
B-624
4303716516

Hermosa 1732'
Para A 3389'
Para B 3640'
Salt 3732
B Salt 8673
Molas 8770
Mississippian 8807
Ouray 9236'

$$\begin{array}{r} 6318 \\ -1732 \\ \hline +4586 \end{array} \qquad \begin{array}{r} 6318 \\ -3389 \\ \hline +2929 \end{array} \qquad \begin{array}{r} 6318 \\ -3640 \\ \hline 2678 \end{array} \qquad \begin{array}{r} 6318 \\ -3732 \\ \hline +2586 \end{array} \qquad \begin{array}{r} -8673 \\ +6318 \\ \hline -2355 \end{array} \qquad \begin{array}{r} -8770 \\ +6318 \\ \hline 2452 \end{array}$$

DRAFT

From: Chris Kierst
To: mbuys@buysandassociates.com
Subject: B-624 SWD well permit enhancement for "acid gas"

Attached please find a UIC Injection Permit Analysis document for the subject well. This document provides initial comments from Division of Oil, Gas and Mining UIC permitting staff regarding the informational submission, which was tendered in support of the operator's proposal to change the conditions of the original UIC Class II Permit. It lists citations of the required supporting information from the governing regulations and juxtaposed staff commentary concerning the sufficiency of the submission.

Please note that the Division UIC permitting staff consider this proposal to be a significant variation from normal disposal practice and an involvement in the disposal of a production waste stream, which, while an exempt oilfield waste, is, none the less, potentially very corrosive and dangerous if mishandled. We ~~hope~~ are confident (?) that you folks share our natural deference to the side of caution in permitting this, and related, injection operations.

This well was originally permitted in 1965 as a disposal well and has been in service for nearly 37 years, a time frame encompassing a period of greatly increasing environmental regulatory oversight. To be assured that we are informed of any changes which may have taken place in the ensuing time and to proceed with caution, we will need to explicitly meet or occasionally exceed each specified informational requirement. A Notice of Agency Action, which publicizes your proposal, will issue upon completion of the technical r[illegible] drafting of our Statement of Basis. Listed below is a recapitulation of the supporting informatio[illegible] technical review.

Byron Gilleson Tom Brown
B-624

Permission given to goahead and CBL interval above the packer as they requested previously. Will run Bond log tuesday or Wednesday.
8/23/02

-A docum[illegible]t in the "acid gas" enh[illegible]
-A plat cl[illegible] and all offset operator[illegible]
-A workr[illegible]ble substitute, an Ultra[illegible]
-Detaile[illegible]" injectate mixture [illegible]orking temper[illegible]
-A inve[illegible]f the "acid gas" injectat[illegible]
-A plar[illegible]al Mechanical Integri[illegible]
-A dis[illegible]
-A cor[illegible]
-A wo[illegible]
-A longitudinal reservoir [illegible]perties of the "acid gas" mixture upon the integrity of the other wells [illegible] Review), including the other proposed "acid gas" disposal well (A-713-A).
-An affidavit which explicitly certifies that a copy of the proposal has been provided to all operators, owners and surface owners within a one half-mile radius of the subject well.
-A visitation of the subject of the overall safety issues, including H2S contingency plans, which ought, reasonably, to be addressed considering this type of operation and related ancillary operations, such as workovers.

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This well was originally permitted in 1965 as a disposal well and has been in service for nearly 37 years, a time frame encompassing a period of greatly increasing environmental regulatory oversight. To be assured that we are informed of any changes which may have taken place in the ensuing time and to proceed with caution, we will need to explicitly meet or occasionally exceed each specified informational requirement. A Notice of Agency Action, which publicizes your proposal, will issue upon completion of the technical review and drafting of our Statement of Basis. Listed below is a recapitulation of the supporting information we will need to proceed with the technical review.

-A document from the operator, which designats Buys and Associates as the operator's agent in the "acid gas" enhancement permitting of the B-624 and A-713-A wells.
-A plat clearly addressing the requirement for a map showing all wells, of all classifications, and all offset operators and surface owners within a 1/2 mile radius of the B-624.
-A workmanlike Cement Bond Log (check with us if you need clarification) or, as an acceptable substitute, an UltraSonic Imager Log (Schlumberger).
-Detailed information which describes the physical and chemical properties of the "acid gas" injectate mixture, its likely downhole and surface behavior and interactions, including corrosion, at working temperatures and pressures and the properties of some possible variations on it.
-A investigation of the adequacy of the casing and tubing, which considers the corrosivity of the "acid gas" injectate across all likely working temperatures and pressures.
-A plan for the ongoing monitoring of the operation and maintanence of a 24 month internal Mechanical Integrity Test regimen.
-A discussion of other alternatives for the disposition of the "acid gas" waste stream.
-A comprehensive analysis of the injectate fluid, the formation fluid and their compatibility.
-A workmanlike Step Rate test.
-A longitudinal reservoir modelling study, which considers the physical and chemical properties of the "acid gas" mixture upon the integrity of the other wells in the field (outside the 1/2 mile Area of Review), including the other proposed "acid gas" disposal well (A-713-A).
-An affidavit which explicitly certifies that a copy of the proposal has been provided to all operators, owners and surface owners within a one half-mile radius of the subject well.
-A visitation of the subject of the overall safety issues, including H2S contingency plans, which ought, reasonably, to be addressed considering this type of operation and related ancillary operations, such as workovers.

TOM BROWN, INC.

August 21, 2002

State of Utah
Division of Oil, Gas and Mining
1594 W. North Temple, Suite 1210
Salt Lake City, Utah 84114

Attn: Gill Hunt

RE: Agent Authorization

Gentleman:

This letter is to inform you that Buys and Associates, Inc 4720 S. Santa Fe Cir., Suite 6, Englewood, CO 80110-6488 is authorized to act as Agent in fact on behalf of Tom Brown Inc. when necessary for filing county, state and federal permits in the State of Utah.

It should be understood that Buys and Associates Inc. are acting as Agent only in those matters stated above and is not responsible for drilling, completion, production or compliance with regulations.

Tom Brown, Inc. agrees to accept full responsibility for operations and regulatory compliance on Tom Brown, Inc. properties in the state of Utah that are permitted for Tom Brown Inc.

Sincerely,

Brant Gimmeson

Brant Gimmeson
Environmental & Safety Manager

BG/bg

555 Seventeenth Street, Suite 1850 • Denver, CO 80202-3918
Phone: 303/260-5000 • Fax 303/260-5001

AFFIDAVIT OF MAILING

I, Martin W. Buys, President, Buys & Associates, Inc., being first duly sworn, depose and state as follows; On July 25, 2002, I caused to be mailed by certified mail, postage prepaid, return receipt requested, a copy of the Application to modify the Lisbon B-624 SWD Well to dispose of acid gas. It was sent to all parties on the attached sheet.

Dated this 25th day of July, 2002

Martin W. Buys
President
Buys & Associates, Inc.

The forgoing affidavit was subscribed and sworn to before me by Martin W. Buys.
This 29 day of July, 2002

_____, Notary Public

My Commission expires: _____ day of _____
My Commission Expires 9/3/2003

NIKKI L. BRIGGS
NOTARY
PUBLIC
STATE OF COLORADO

U.S. Postal Service
CERTIFIED MAIL RECEIPT
(Domestic Mail Only: No Insurance Coverage Provided)

7001 1140 0002 6009 1471

OFFICIAL USE

Postage	$
Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

Postmark Here

Sent Bureau of Land Management
Street, or P Oil & Gas Division
82 East Dogwood
City, Moab, UT 84532

PS F ... structions

Sent Certified, return receipt 7/25/02

U.S. Postal Service
CERTIFIED MAIL RECEIPT
(Domestic Mail Only: No Insurance Coverage Provided)

7001 1140 0002 6009 1464

OFFICIAL USE

Postage	$
Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

Postmark Here

Sent State of Utah, SITLA
Street, or PO 675 East 500 South, Suite 500
City, S Salt Lake City, UT 84102-2818

PS Fo ... ructions

U.S. Postal Service
CERTIFIED MAIL RECEIPT
(Domestic Mail Only: No Insurance Coverage Provided)

7001 1140 0002 6009 1488

OFFICIAL USE

Postage	$
Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

Postmark Here

Sent To Chester Gordon Trust
Street, Attn: Wayne Gardenswartz, Trustee
or PO B 600 17th Street, Suite 1800 North
City, Sta Denver, CO 80202

PS Form ... ctions

Surface, Royalty and Working Interest

1) WI Ownership within Lisbon Mississippian Unit

TBI - 99.50307% WI

Chester Gordon Trust - 0.49693% WI
600 17th Street, Suite #1800 North
Denver, CO 80202
Attn: Wayne Gardenswartz, Trustee

2) WI Ownership within the McCracken Unit

TBI - 100% WI

3) Mineral Ownership

All Minerals are Federal and State of Utah.

4) Base Royalty Ownership

All Base Royalties are paid to the BLM (Federal) and the State of Utah.

5) Surface Ownership

BLM and Tom Brown

METCORR

August 27, 2002

Byron Gale
Tom Brown, Inc
555 17th St., Suite 1850
Denver, CO 80202

Byron:

This letter provides my assessment, from a corrosion and metallurgy standpoint, of the current and proposed well configuration for the Lisbon Unit B-624 well that is planned for acid gas injection. At the present time the current well completion that was carried out in the mid 1960s as a water injection well and the proposed well design for acid gas injection are identical. The tubing string is approximately 8,828 ft of 3-1/2", 9.3 ppf, J-55 and the production casing is 9232 ft of 5-1/2",15.5 ppf, 17 ppf and 20 ppf, N-80 intermittently cemented to surface. The packer is a Baker model N permanent packer. The packer fluid for the proposed well is slated to be inhibited water.

There are two important issues that must be addressed in any wellbore that will be receiving sour acid gas for injection. These two issues are the long term corrosion behavior of the steel tubing, casing and packer components and their resistance to sulfide stress cracking (SSC). The first concern is relatively simple if there is no free water in the wellbore or that would precipitate out of the acid gas during injection. Under the condition where no free water exists, no corrosion will occur. This is in fact the experience of the industry, that steel equipment is often successfully used in acid gas injection wells because no free water is present to cause corrosion. Since MetCorr has not reviewed the plans for injection it must be assumed at this time that Tom Brown, Inc has already performed the phase behavior studies and will not knowingly inject acid gas with free water in it.

The other issue is SSC of all of the metallic components in the wellbore that will be, or may be, contacted by the acid gas. SSC, while also requiring the presence of free water, is a catastrophic cracking event that can occur in a matter of minutes or hours and is therefore, not a long term corrosion issue but a considerable safety problem because it cannot be monitored or predicted. The only means to combat SSC is to use alloys that are resistant to SSC. The leading industry standard for selection of alloys that are resistant to SSC is NACE MR0175. According to MR0175, API 5CT Grade J-55 is suitable for exposure to any concentration of H_2S at any temperature. Therefore, if the J-55 tubing that is currently in the well is sound and in good condition, then it would be acceptable to re-run in the well for acid gas injection. However, N-80 tubing is not acceptable for exposure to H_2S until the well temperature is 150°F and higher. This usually means near the bottom of a well but since this is an injection well then the temperature profile under injection conditions and for shut-in would have to be calculated to determine the safe depth for N-80. Since the 5-1/2" N-80 is 1960s vintage it is probably even less resistant to SSC that more modern N-80 grades (ie, it is probably much harder) used today. There is a risk then that if there is a connection leak or packer leak during injection the casing could be contacted by the sour acid gas and SSC would occur. This problem could be minimized by using a nonconductive packer fluid such as diesel. In this case even if sour gas leaks into the annulus there is no water to create a corrosion cell and SSC will not occur.

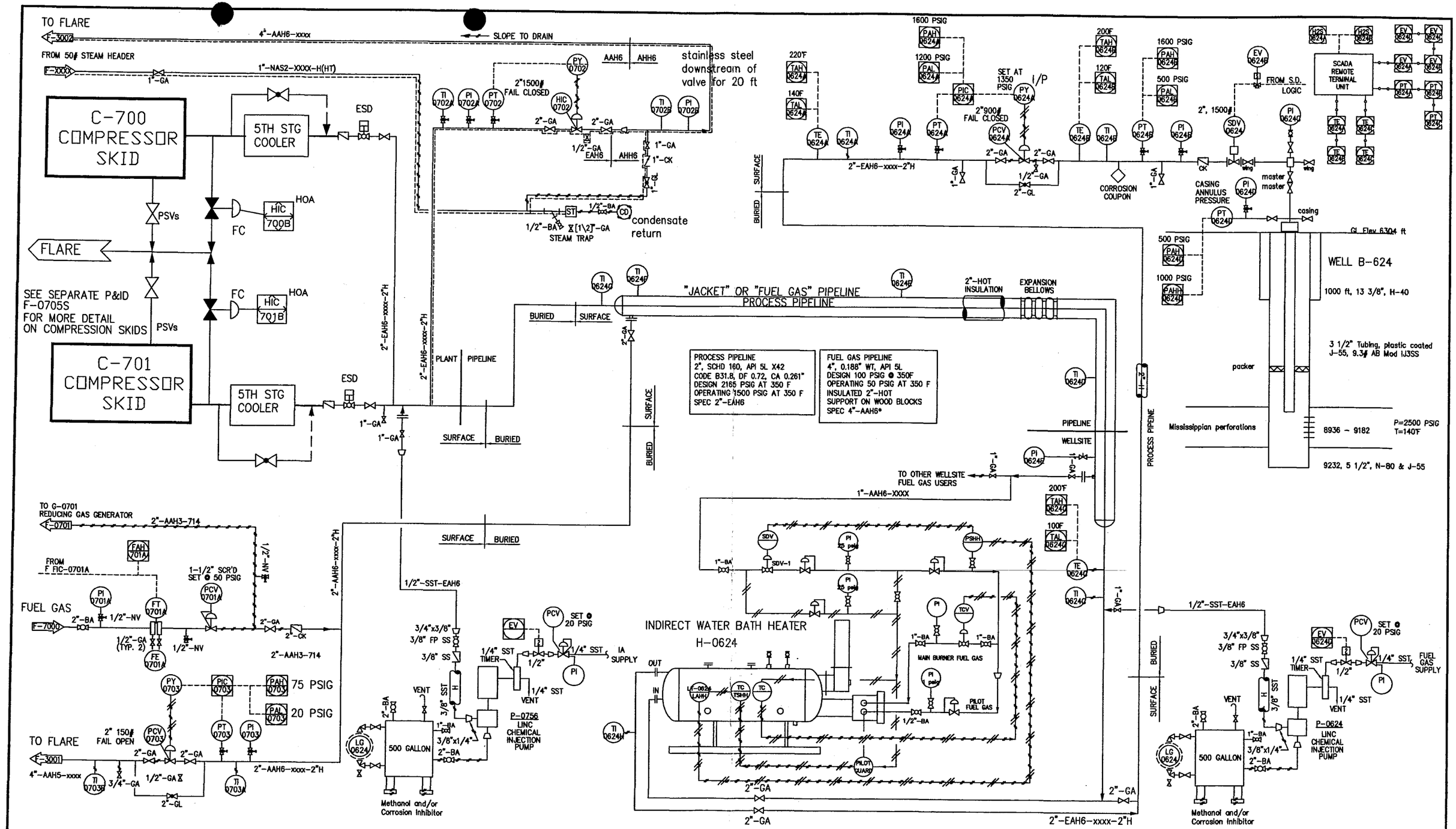
Without knowing the specific details of the packer components it is impossible to determine the susceptibility of the packer to SSC. Suffice it to say that packers made back in the 1960s before MR0175 was even a standard are usually susceptible to SSC.

One last consideration that needs to be addressed is the Christmas tree/wellhead. These components should definitely meet MR0175 since the need to safely shut-in an acid gas well requires that the tree be completely resistant to SSC in the event that as the wellhead cools down if water precipitates SSC is a real possibility.

Sincerely,

Dr. Bruce Craig, P.E.

4600 S. Ulster Suite 700 Denver Colorado 80237 303-740-6750 FAX 303-740-6789



REFERENCE	REV	DATE	REVISION	BY	CHKD	SECT LDR	CHIEF DRAFT	PROJ ENGR
	1	8/23/02	BEFORE HAZOP	SJ				
	2	9/12/02	AFTER HAZOP	SJ				

TOM BROWN INC.

LISBON GAS PLANT

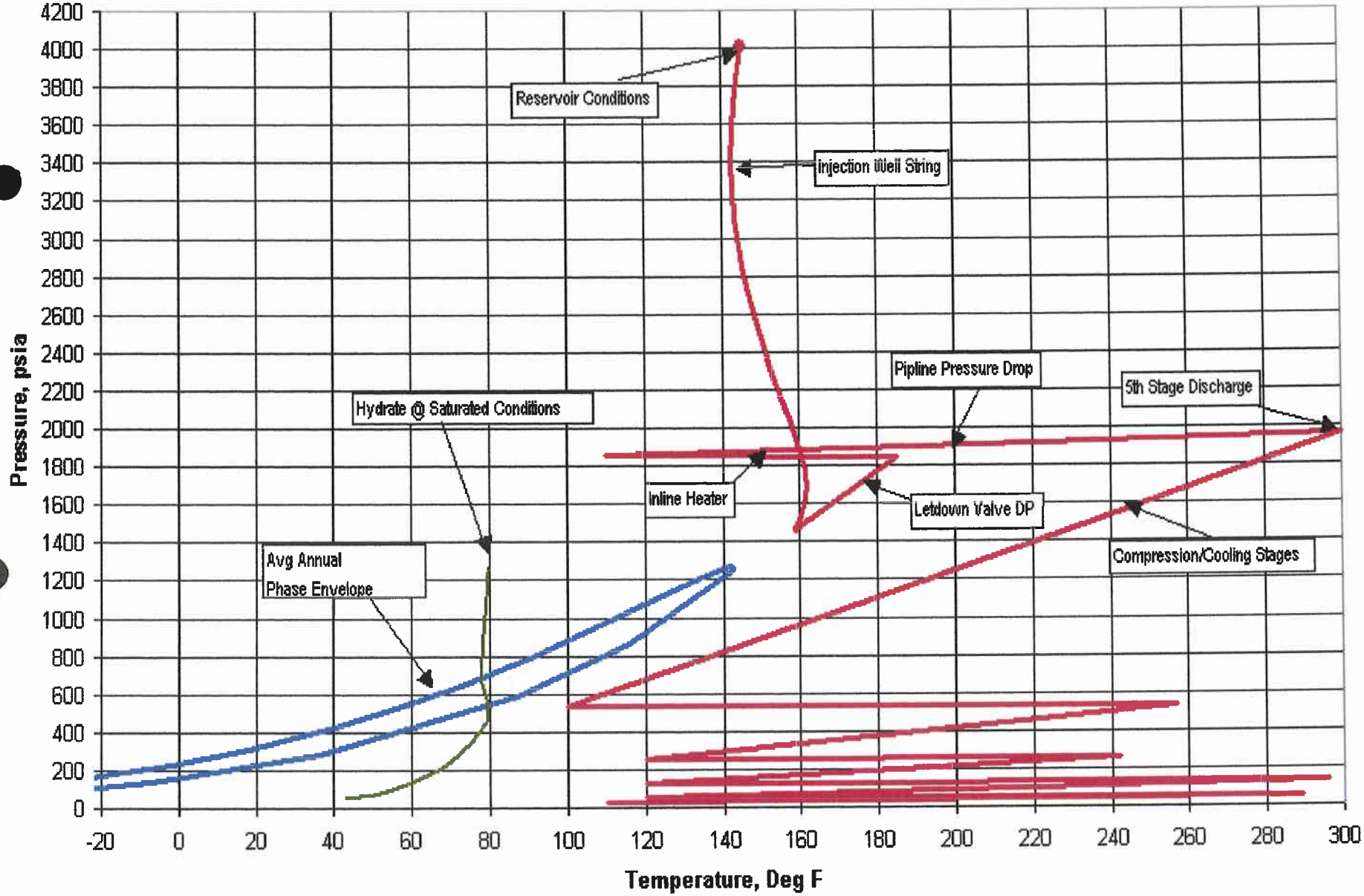
SAN JUAN COUNTY
MOAB, UTAH

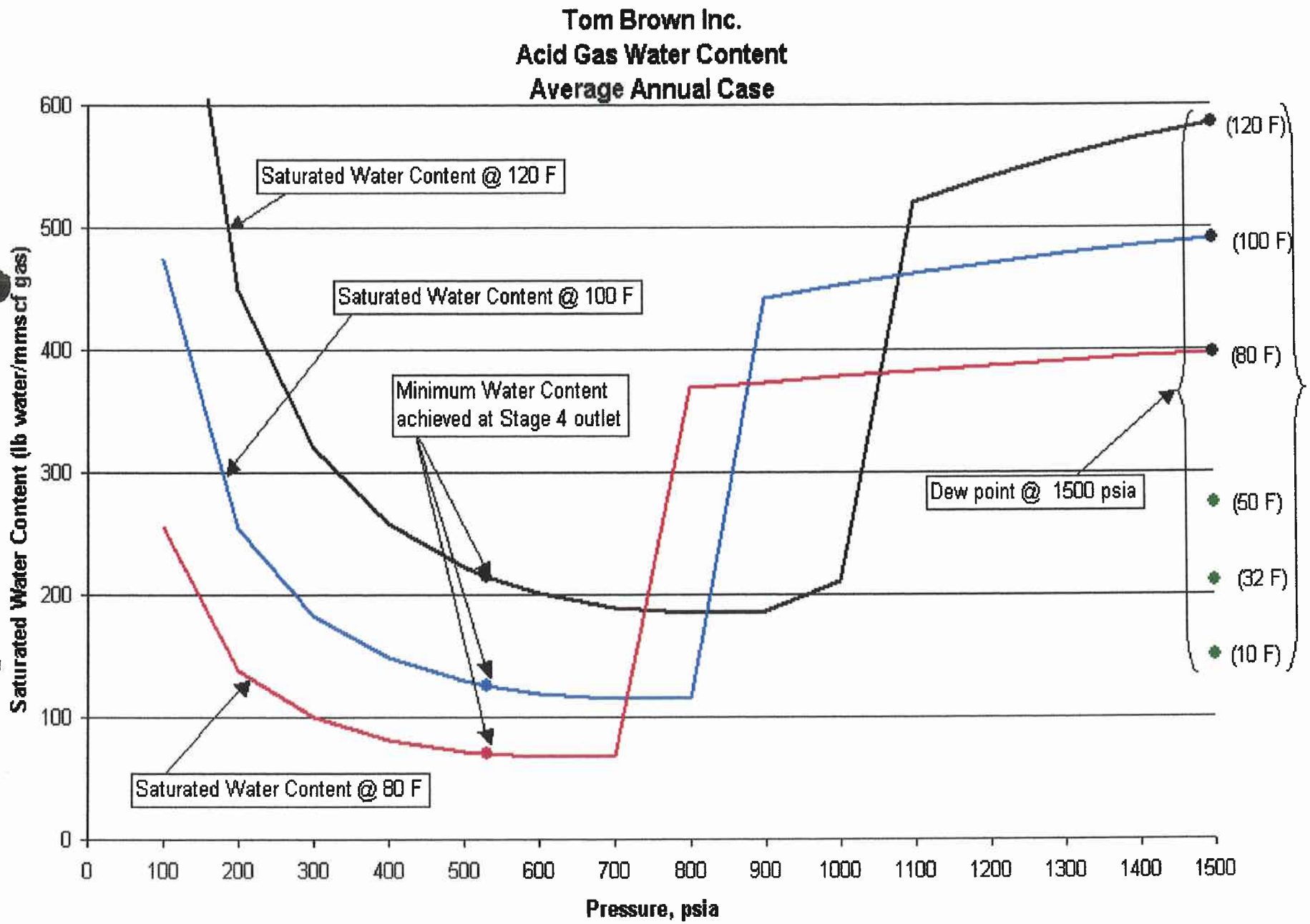
MECHANICAL FLOW DIAGRAM
SULFUR RE-INJECTION PROJECT
INJECTION PIPELINE & WELLBORE

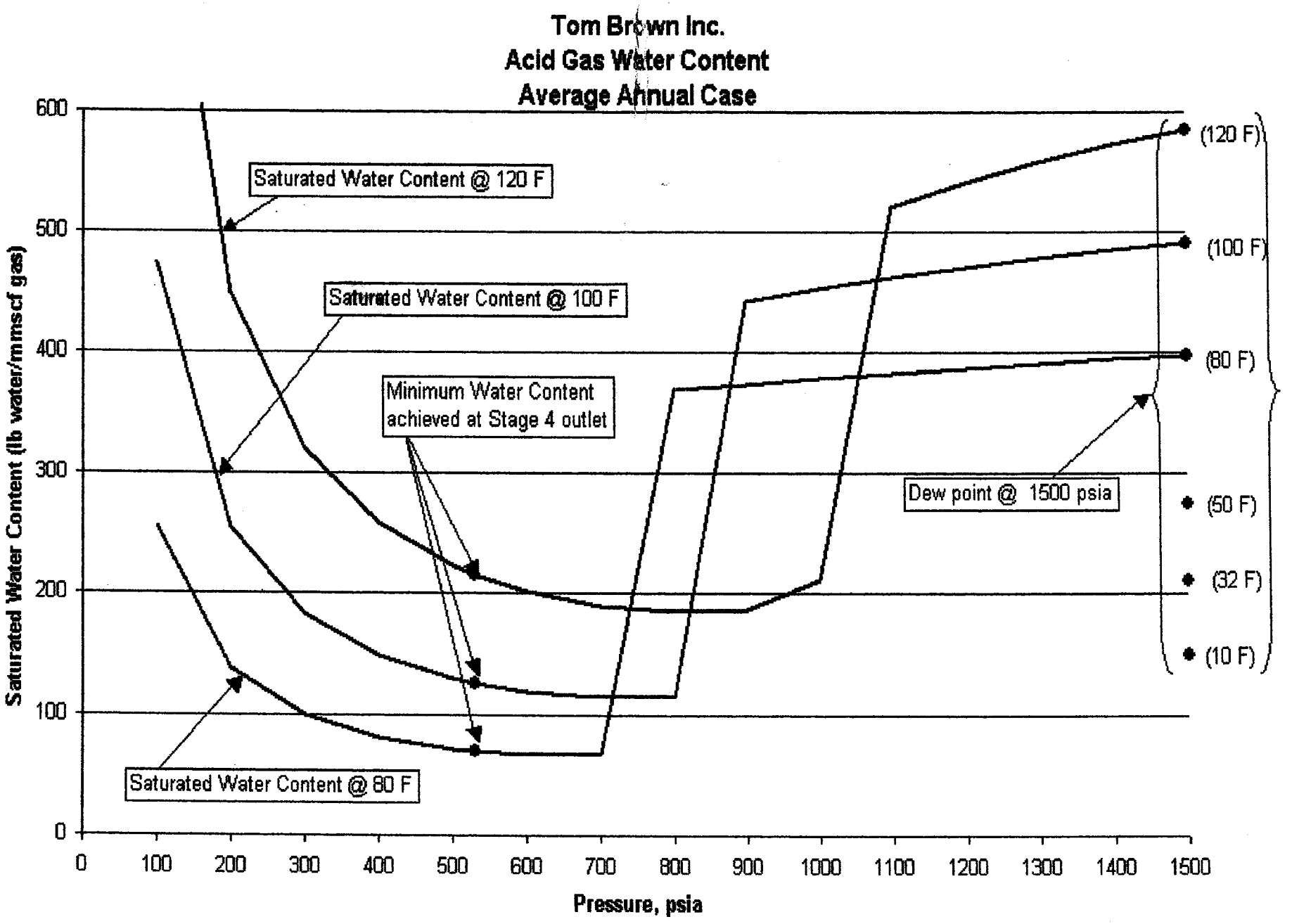
DES.: SGJ	SCALE: NONE	JOB NO.: 9/18/02	
DR.: SGJ	FILE:		
CH.:	DATE:	DWG.NO.: F-0706S	REV. 2
APP.:	DATE:		

AGE_P&ID_F-0706S.DWG

Tom Brown Inc.
Phase Envelope & Compression/Cooling Stages
Average Annual Case (4000 psig Downhole Pressure)




Tom Brown Inc.
Acid Gas Water Content
Average Annual Case
Saturated Water Content @ 120 F
Saturated Water Content @ 100 F
Minimum Water Content achieved at Stage 4 outlet
Dew point @ 1500 psia
Saturated Water Content @ 80 F
(120 F)
(100 F)
(80 F)
(50 F)
(32 F)
(10 F)
Saturated Water Content (lb water/mmscf gas)
Pressure, psia
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500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Pressure, psia
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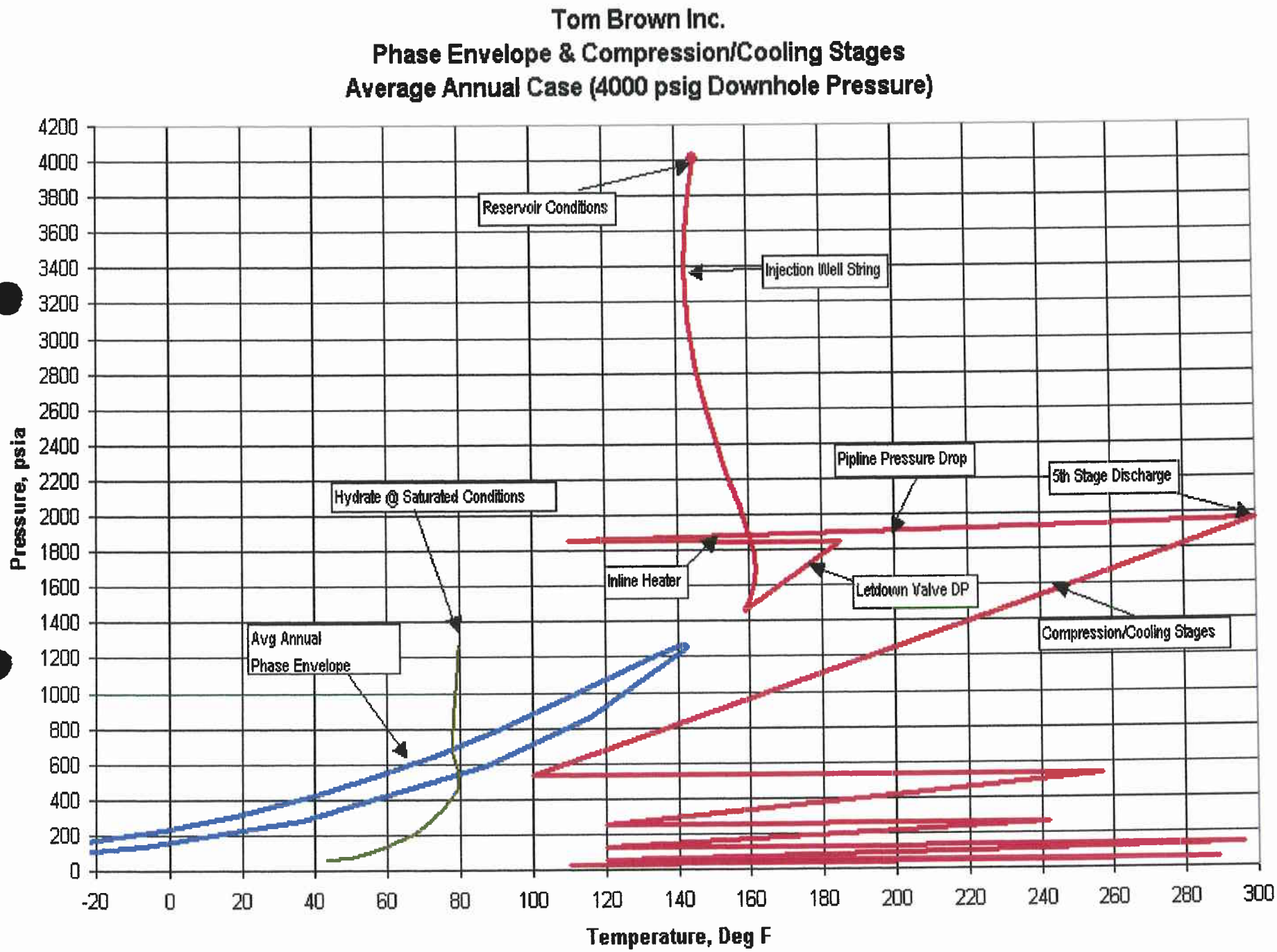
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500


Tom Brown Inc.
Phase Envelope & Compression/Cooling Stages
Average Annual Case (4000 psig Downhole Pressure)
Reservoir Conditions
Injection Well String
Pipline Pressure Drop
5th Stage Discharge
Hydrate @ Saturated Conditions
Inline Heater
Letdown Valve DP
Compression/Cooling Stages
Avg Annual
Phase Envelope
Pressure, psia
Temperature, Deg F
4200
4000
3800
3600
3400
3200
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
-20
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300

EMERGENCY RESPONSE PLAN/
PUBLIC PROTECTION PLAN

SPILLER CANYON FACILITY
ACID GAS INJECTION PIPELINE

PREPARED FOR:
TOM BROWN, INC.

PREPARED BY:
CORDILLERAN COMPLIANCE SERVICES, INC.
826 21½ ROAD
GRAND JUNCTION, COLORADO 81505

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1.00 PURPOSE

This Emergency Response Plan and Public Protection Plan (Plan) is specific to the Spiller Canyon Acid Gas Injection Facility owned and operated by Tom Brown, Inc. (TBI). This document is designed to provide for the safety and welfare of facility personnel, the community, the environment, and property.

This Plan establishes evacuation procedures, assigns response duties to specific individuals, provides for notification of outside agencies, and provides details of actions to alert and protect the public. This Plan will be activated immediately upon the detection of the release of a potentially hazardous volume of hydrogen sulfide (H_2S).

2.00 GENERAL INFORMATION ON AND PHYSIOLOGICAL RESPONSES TO HYDROGEN SULFIDE (H_2S) AND SULFUR DIOXIDE (SO_2)

2.10 HYDROGEN SULFIDE (H_2S)

Hydrogen sulfide is a flammable, highly toxic, colorless gas that is heavier than air, with the odor of rotten eggs. It can be detected by smell at a concentration in air of only 0.002 parts per million (ppm). Above concentrations of 100 ppm, it will deaden the sense of smell in a few minutes, and at a concentration of 700 ppm, a single breath can be fatal. If ignited, it burns with a blue flame. In still air it tends to accumulate in low places in dangerous concentrations. However, if it is warmer than the surrounding air, it may tend to rise. The upper flammability limit of H_2S in air is 44% and the lower flammability in air is 4%.

Breathing low concentrations of H_2S can cause headaches. Higher concentrations (0.01 percent by volume) cause irritation of the eyes, nose, throat, and lungs. Eyes become red and swollen, accompanied by sharp pain in more severe cases. Still higher concentrations (0.05 percent by volume) cause dizziness, unconsciousness, and failure of respiration.

The Threshold Limit Value (TLV) is 10 ppm (0.001%) in air. This is the limit for eight hours of continuous exposure as recommended by the American Conference of Governmental Industrial Hygienists. The health and safety reference values of various concentrations of H_2S are listed in the toxicity chart below. A Manufacturers Safety Data Sheet (MSDS) for hydrogen sulfide is included in Appendix F.

2.20 SULFUR DIOXIDE (SO_2)

Sulfur dioxide is formed with the burning of hydrogen sulfide gas. Sulfur dioxide is a pungent, irritating, suffocating, colorless gas. This gas is normally heavier than air and concentrations above 400 ppm are considered dangerous for even brief exposures.

Under special circumstances hydrogen sulfide gas may be ignited in order to dissipate a gas cloud and reduce the impact on a local area. Often these burning temperatures are enough to raise and mix the SO_2 with air in a ratio well below toxic levels. However, great care and proper monitoring should be used when this is attempted.

Due to the irritating effect of SO_2 at low concentrations of less than 5 ppm, there is usually no doubt as to it's presence in an area, which provides better warning characteristics than H_2S.

2.30 TOXICITY CHART

NAME	SPECIFIC GRAVITY[1]	TLV[2] (ppm)	HAZARDOUS LIMIT[3]	LETHAL CONCENTRATION[4]
Hydrogen Sulfide	1.18	10	100 ppm/1 hr.	700 ppm
Sulfur Dioxide	2.21	2	50 ppm/1 hr.	400 ppm

Notes:
(1) Specific gravity of air = 1.00.
(2) TLV - Threshold Limit Value.
(3) Hazardous Limit - concentration that may cause death with short term exposure.
(4) Lethal concentration - Concentration that may cause death with only a few breaths.

3.00 TREATMENT PROCEDURES FOR H_2S AND SO_2 EXPOSURE

A. Remove the patient to fresh air. Personnel should **always** use fresh air breathing equipment when entering an area to retrieve a person who has been overcome with H_2S.

B. Call a physician and get patient under his care as soon as possible.

C. If breathing has ceased, begin artificial respiration immediately. Give cardiopulmonary resuscitation (CPR) only if there is no pulse and no breathing. Continue revival efforts until physician arrives or, if patient is mobile and it is determined that he should go to the hospital, continue oxygen inhalation under the physician's direction.

D. Administer oxygen to help eliminate toxic substances from blood stream.

E. Keep the patient at rest and protect from chilling.

4.00 OPERATIONAL PRECAUTIONS AND PROCEDURES

4.10 INJECTION WELL SYSTEM

The acid gas injection well system originates at the TBI Lisbon Gas Plant and consists of compression equipment, a piping system, a line heater, and the injection well. A 2-inch high pressure pipeline is used to move a dense phase mixture of H_2S and CO_2 from the Lisbon Gas Plant to the injection well site. The concentration of the H_2S varies from 4 percent to 56 percent by volume. A flow diagram of the system is shown in Appendix A.

The injection well system is constantly monitored via a Supervisory Control and Data Acquisition (SCADA) system integrated into the computer network at the Lisbon Gas Plant control room. Pressures, and temperatures can be monitored on this system. The system can be shut-down by the control room operator by using the SCADA system. The computer monitoring system gathers information from pressure, temperature, and H_2S, monitors attached at several points to the injection well system.

Changed to delete sleeve.

~~The 2-inch high pressure pipe will be ran inside a 4-inch lower pressure pipe jacket. The outer pipe jacket will have a residue gas purge that will be monitored for pressure deviation. Monitoring this pressure assures the integrity of the inner 2-inch line. The residue gas will be used for instrumentation control at the well site. The pipe jacket will be monitored for H2S by sensors strategically placed by the control instrumentation vents. The outer 4-inch pipe will be insulated and supported off the ground on wooden blocks the entire 2.5 miles to the injection~~ well B-624. Internal pipe corrosion is controlled by dehydrating the gas through the compression facility and then operating the process such that free water never condenses anywhere in the piping. There will be no corrosion if there is no free water. The water contained in the high H2S fluid is reduced from almost 1000 lb H2O per MMSCF of gas to less than 250 lb H2O per MMSCF of gas by five stages of compression, cooling and scrubbing in the compression facility. The dehydrated, high pressure, dense phase fluid exiting the compression facility is hot (greater than 200 deg F) and is not allowed to cool to the temperature where water can condense (the water dewpoint); anywhere along the way to the reservoir. ~~The 4" outer "jacket" pipeline containing the 2" inner "process" pipeline will be covered with 4" of external insulation from the compression facility to the wellsite. The insulation will prevent the high H2S dense phase fluid from cooling to the "water dewpoint" temperature.~~ Temperature gauges will be installed along the pipeline to verify that adequate temperature is maintained at all times. Upon reaching the wellsite, the dense phase fluid is heated to over 150 deg F in an indirect fired heater. The "hot" dense phase fluid subsequently flows across a pressure control valve then into the wellbore. The fluid will cool due the pressure drop across the control valve but the line heater will be operated such that the temperature downstream of the control valve is always greater than the "water dewpoint". The fluid then enters the wellbore where it is heated by the ground as it flows deeper into the subsurface. The temperature of the Mississippian carbonate reservoir (at a depth of about 9,000 ft) where the fluid will be injected is about 140 deg F which is well above the "water dewpoint". All piping will be coated with a "corrosion inhibitor fluid" prior to commencing injection; however, continuous injection of corrosion inhibitor is not necessary. The corrosion allowance for the pipeline is 0.262 inch, which is wall thickness above and beyond the thickness needed to safely contain the pressure.

All system components are designed and constructed to withstand the operating conditions of the system. The injection system is protected from overpressure situations by safety pressure relief valves which are connected by a closed system to a flare at the Lisbon Gas Plant. Additionally, any manual or emergency purging of the pipe jacket or injection well system will flow to the plant flare. An existing and continuous supply of nitrogen and residue gas at the Lisbon Gas Plant is available to displace the entire volume of the injection well system, if necessary, to help mitigate hazardous situations.

Only qualified, authorized personnel, trained in TBI operation and safety procedures are allowed to operate and maintain the injection well system. The entire length of the injection pipeline is visually inspected on a quarterly schedule by an operations personnel member walking the pipeline route. Access to the road through the Spiller Canyon area adjacent to the injection well site and injection pipeline is limited to TBI personnel. Access is restricted by locked gates on either end of the road in the controlled area.

4.20 WORST CASE SCENARIO RADIUS OF EXPOSURE

The procedures and systems described above are in place to assure that an emergency or potentially hazardous situation remains a highly unlikely possibility. However, a rupture in the high pressure pipeline and a resulting release of approximately 5,000 pounds of hydrogen sulfide (an estimated 10-minute release) was chosen for analysis as the worst case scenario. With guidance from Bureau of Land Management (BLM) Onshore Order Number 6, a calculation of the radius of exposure has been performed for this worst case release from the injection system.

The Environmental Protection Agency (EPA) software program TSCREEN was used to determine the H_2S concentration levels at 100-meter intervals from the release point. The TSCREEN calculation results are shown in Appendix E. ← not provided in App. E

The BLM Onshore Order Number 6 is particularly concerned with 500 part per million (ppm) and 100 ppm radius of exposure concentration levels. The BLM requires a Public Protection Plan when: the 100 ppm radius of exposure is greater than 50-feet and includes any area that the public could be expected to frequent; the 500 ppm radius of exposure is greater than 50-feet and includes any part of a public road or highway, or; the 100 ppm radius of exposure is equal or greater to 3,000-feet and includes public roads or facilities.

The 500 ppm radius of exposure calculated for this worst case release is approximately 884-feet, and the 100 ppm radius of exposure is approximately 1,592-feet. As there are public roads and public (BLM) lands within these distances, a Public Protection Plan is required for the Spiller Canyon Facility and the injection well system. The Site Map shown in Appendix B includes the radius of exposure information. ← not provided in App. B

4.30 PROTECTION OF PERSONNEL

The following safety equipment is available at the Lisbon Gas Plant or at the injection well site:

- First aid kits: small kits stored in buildings and vehicles.
  large "jump" kits including advanced treatment supplies.
- Self contained breathing apparatus (SCBA) with 30-minute air tanks.

- Self contained breathing apparatus (SCBA) with 5 to 7-minute air tanks (Escape Packs)

- Air line breathing apparatus with escape bottle for prolonged work. (Cascade system)

The following monitoring equipment is available at the Lisbon Gas Plant or at the injection well site:

- Manually operated portable Sensidyne Gastec monitors with detector tubes designed to monitor both H_2S and SO_2 levels in the atmosphere.

- Electronic personnel monitors with constant digital readout of either Lower Explosive Limit (LEL%), Hydrogen Sulfide concentration (H_2S ppm), or Oxygen (O_2%). All three sensors are constantly active and able to sound an alarm.

- Area monitors are located throughout the injection well system and in the plant buildings for H_2S, Fire, and LEL.

These monitors are connected to a Gaitronic emergency alarm horn capable of five distinct alarms:

Evacuation – Siren	Fire – Hi/Lo
H2S – Yelp	Oxygen – Constant Horn
LEL – Warble	

Testing of all emergency alert and monitoring equipment is conducted on a monthly basis using the appropriate calibration and testing equipment and procedures for each type of sensor or alarm. All documentation of testing is kept on file at the Lisbon Gas Plant main office.

4.40 COMMUNICATIONS

Communication systems at the Lisbon Gas Plant and the Spiller Canyon Facility include:

- Telephones: Located throughout plant and offices.
- Hand Held radios: Located on operators, mechanics and personnel.
  - The frequencies are:

    Tx Freq. 456.550
    451.550

    Rx Freq. 451.550

- Emergency Response radios: Located in Lisbon Gas Plant Training Room.
  - The frequencies are:

    Tx Freq. 151.505
    152.870
    151.520

    Rx Freq. 151.505
    152.870
    151.520

- Mobile phones: Located in pickup trucks and control room.

4.50 FIRE CONTROL EQUIPMENT

The following is the fire control equipment available at the Lisbon Gas Plant or at the Spiller Canyon Facility:

30# Dry Chemical Fire Extinguishers	**Located throughout the plant and injection system area at exit locations. Also at key locations outside buildings, where the risk of fire is great.**
350# Dry Chemical Fire Extinguishers	**Located in key locations where large volumes of dry chemical might be needed.**
20# CO2 and Halogen fire extinguishers	**Located at MCC buildings where electrical fires are most likely to occur.**
2½# Fire Extinguishers	**Located at main office in key locations and in company pickups.**
AFFF foam vessel AFFF 55-gal drums	**Located in the Old Process Building area of the Lisbon Gas Plant. It can be distributed to different areas of the plant where oil spills may occur.**
AFFF foam – 5-gallon cans	**Located in Lisbon Gas Plant warehouse. Used to inject foam at any location.**
Automatic deluge system	**Located in the Lisbon Gas Plant**
Fire Hose Stations	**Located at key locations in the plant area.**
Monitor Stations	**Located at key locations in the plant area.**
Foam Station	**Located in the Old Process Building area of the Lisbon Gas Plant.**
Volume of Fire water available - 20,000 Barrels	**Two 10,000 barrel tanks located on hill east of Lisbon Gas Plant.**
Discharge Pressure of Fire water - 150 - 175#	**Pressure is provided by one electric pump and one diesel driven pump when electricity is not available.**

TESTING OF ABOVE EQUIPMENT

- Automatic Sprinkler system – Tested annually and documented.
- 30# Dry Chemical fire extinguishers - tag checked monthly and tested annually/documentation monthly.
- 350 # Dry Chemical fire extinguishers - Tag checked monthly/tested annually/ documentation monthly
- 2 1/2 # Dry Chemical fire extinguishers - Tag checked monthly/tested annually/documentation monthly
- CO2 & Halogen fire extinguishers - Tag checked monthly/tested annually/documentation monthly
- Fire water pumps electric/diesel - Tested weekly/documented
- Volumetric flow rate of fire water - Tested annually
- Monitors and Fire Hose stations - Tested Semi-annually

4.60 DECONTAMINATION EQUIPMENT

Disposable Tyvex suits, SCBA gear, disposable gloves, kiddy pools, pump sprayers, decontamination detergents, neutralizers, rinse water, duct tape, eye protection, brushes, rubber boots and marking tape is available. This equipment is located in the Lisbon Gas Plant Emergency Response Trailer and warehouse.

All equipment used dealing with communication, fire protection, spill control and decontamination is tested, maintained and documented on a regular basis to assure proper operation.

4.70 INTERNAL EMERGENCY RESPONSE

The following emergency response teams/personnel are available at the Lisbon Gas Plant:

- Lisbon Gas Plant Fire Brigade - Certified Trained
- Lisbon Gas Plant HAZMAT Team - Certified Trained
- Confined Space Rescue Team - Certified Trained
- Emergency Medical Technicians - Certified Trained
- All Employees trained in first aid/CPR - Certified Trained

Please refer to the Emergency Contact List in Appendix C for contact information.

4.80 OUTSIDE EMERGENCY AID

External emergency response personnel and services include (but are not limited to) the following:

- Ambulance Service is available from the towns of Moab and Monticello.
- Medical First Responders and Fire response is available from the town of Lasal.
- Air Life Medical transport is available from St. Mary's Hospital in Grand Junction, Colorado.
- Law Enforcement is available from San Juan County Sheriff , Utah Highway Patrol, and the Bureau of Land Management, which respond from Monticello, Utah.

H2S Awareness training is made available annually to all emergency responders.

Please refer to the Emergency Contact List in Appendix C for contact information.

4.90 EMERGENCY PROCEDURES AND NOTIFICATION

All actions taken and procedures used by facility personnel in response to a fire, explosion, or release of hazardous waste are outlined in the Lisbon Gas Plant Emergency Preparedness Plan and Procedure Manual located at the Lisbon Gas Plant Change room and Control room. Other copies are held by key TBI personnel.

Released wastes and liquid are collected and contained using procedures found in the Lisbon Gas Plant Emergency Preparedness Plan and Procedure manual, the Spill Prevention Control and Countermeasure (SPCC) plan, and the Waste Management/Minimization guideline manual. If characterization of a waste is not known, testing is performed to determine the waste

classification. All wastes are handled according to their type. If it is a hydrocarbon waste mixed with soil and contains contaminant concentration levels above the appropriate limits, it is landfarmed on TBI property until it reaches contaminant concentration limits set by the Utah Oil, Gas and Mining Division. If wastes are found that are classified as hazardous wastes, they are disposed of at an appropriate hazardous waste disposal facility.

Notification to Federal, State and Local agencies to report releases of hazardous waste, spills or incidents requiring reporting is accomplished through the Lisbon Gas Plant Spill Prevention Control and Countermeasure plan (SPCC), which follows a formatted initial reporting sequence. This initial report is usually submitted verbally over the phone to the appropriate agency and followed up by a written report within 7 days of the incident.

5.00 HYDROGEN SULFIDE EMERGENCY PROCEDURES

The following procedures should be used when an uncontrolled release of any substance containing H_2S occurs.

- Immediately upon discovery of a potentially hazardous or emergency situation, the Lisbon Gas Plant control room and the on duty supervisor shall be notified. The supervisor who is notified will become the "Incident Commander" and take charge of the response until he is relieved by his supervisor.

- The Emergency will be approached using the "Incident Command System" if no outside aid is required. The "Unified Incident Command System" will be used if public agencies are included in the response.

- At least two people should don fresh air breathing equipment (SCBA) and monitor the air for H_2S to determine both flammable and toxicity and establish safe areas.

- When the emergency response team is in place and equipped for rescue or repair, approach the release with monitors and determine extent of problem from both a flammable and toxic standpoint.

- Determine wind direction and establish a **SAFE ZONE** where response equipment and backup personnel can safely operate.

- Determine if the release threatens county roads or local mines (See Site Map in Appendix B). If either are threatened, activate the Public Protection Procedures in Section 6 of this response guide.

- Conduct a briefing in the **SAFE ZONE** to establish a plan of action for entry and determine what additional personal protective equipment will be required for **ENTRY PERSONNEL AND BACKUP PERSONNEL**.

- Assemble needed equipment in **SAFE ZONE.**

- When a safe plan of action has been agreed upon, **ENTRY PERSONNEL** may approach the release. Backup personnel should remain in the **SAFE ZONE** and be equipped for rescue if it should become necessary.

UNDER NO CIRCUMSTANCES SHOULD CONTROL EFFORTS BE ALLOWED TO PROCEED WHERE PROPER ACTION HAS NOT BEEN TAKEN TO ASSURE THE SAFETY OF RESPONSE PERSONNEL. Workers are considered safe only when they are breathing air with less than 10 parts per million (ppm) of Hydrogen Sulfide.

- Once the release has been controlled and monitoring has shown that the **HOT ZONE** is safe (<10 ppm H_2S and 0% LEL), clean up and repair work may begin.

- Formal notification of the incident should be made through line management.

- A Critique of the incident should follow.

6.00 PROTECTION OF THE GENERAL PUBLIC

6.10 NOTIFICATION OF POTENTIAL DANGER

- Warning signs are prominently displayed at the injection well site and at all access points to the Lisbon Gas Plant and the Spiller Canyon Facility.

- Written notification will be made to all mineral and grazing lease holders within the calculated potential exposure areas.

- Response planning will be coordinated through the San Juan County Emergency Response Coordinator located in Monticello, Utah.

6.20 EMERGENCY EVACUATION AND ISOLATION OF DANGER AREA

In the event toxic gases are released in such quantities as to be a possible hazard to the public the following steps (in addition to the procedure outlined in Section 5.0) will be taken by the person in charge:

- Choose a command post site in a safe area.

- Alert by telephone the Incident Commander or the Safety Manager and notify the person of the situation and your choice of a command posts.

- Notify local Law Enforcement Officials of the need to restrict entry to the area and the **location of your command post.** Request their assistance in restricting entry into the danger area by placing roadblocks or barriers in safe areas.

Note-Alternate command posts and roadblocks may be required, the Incident Commander may make changes in the locations listed above. Care should be taken to notify all responders of the changes.

- Evacuate all active mines in the danger area. Mine owners have received prior notification that conditions could arise that would require their cooperation in clearing the area.

- Notify all grazing lease holders of the danger and what sections need to be evacuated by humans. (See Appendix D for lease holders names and what land Sections they hold grazing rights on.)

- If evacuation cannot be accomplished in a timely manner and the H_2S release is posing an immediate threat to human life, the Incident Commander may chose to ignite the gas. Because of the increased risks igniting the gas can pose for response personnel, only the Incident Commander can give this order.

APPENDIX A
MECHANICAL FLOW DIAGRAM

APPENDIX B
SITE MAP

APPENDIX C
EMERGENCY CONTACT LIST

APPENDIX C
EMERGENCY CONTACT LIST

Utah Division of Environmental Quality		800.458.0145
Utah Division of Water Quality		801.538.6146
EPA 24-Hour Spill Notification Number		303.293.1788
Department of Transportation National Response Center		800.424.8802
Utah Division of Oil, Gas, & Mining		801.538.5340
Utah Oil & Gas Conservation Commission		801.538.5277
*Utah State Highway Patrol		800.492.2400
*Utah State Highway Patrol-Hazardous Materials Division		435.336.4461
*Ambulance Service (Moab)		435.259.8115
*Ambulance Service (Monticello)		435.587.2237
Ambulance Service (Grand Junction Air Life)		800.332.4923
*Hospital (Allen Memorial-Moab)		435.259.7191
*Hospital (San Juan Hospital)		435.587.2116
*Grand County Sheriff	(Moab)	435.259.8115
*San Juan County Sheriff	(Monticello)	435.587.2237
*Moab Area Fire Department		435.259.5551
*LaSal Area Fire Department		435.686.2388
*Monticello Area Fire Department (Contact through San Juan County Sheriff)		435.587.2237
*Blanding Area Fire Department		435.678.2313
U.S. Dept. of Interior, Bureau of Land Management		970.878.5555
Moab Field Office		435.259.6111
Tom Brown Corporate Office		303.260.5000
Tom Brown Lisbon Gas Plant Office		435.686.7600
Tom Brown Lisbon Gas Plant Control Room		435.686.7620
Tom Brown Lisbon Gas Plant Control Room (24 Hour Emergency Number)		435.686.2271
Doug Rosa, Lisbon Gas Plant Superintendent		435.686.7603
Rick Costanza, Field Supervisor		435.686.7612
Kenny Allred, Corporate Safety Manager		435.686.7604

*= these are non-emergency numbers. Emergency calls should dial 911.

APPENDIX D
LEASE HOLDER INFORMATION

APPENDIX D
LEASE HOLDER INFORMATION

MINE OPERATORS & NOTIFICATION ADDRESSES

Anderson, James, Estate,Box 9196,Salt Lake City,UT,84109
Atlas Corporation,Box 1207,Moab,UT,84532
Bailey,Rick,P.O. Box 1129,Monticello,UT,84535
Baker,W.V.,1766 W 4575 S,Roy,UT,89510
Baker,W.V.,Box 10628,Reno,NV,89510
Birch,Arthur,190 W. Canter,Huntington,UT,84501
Boyd,Maxine S.,1490 E. 500 South #28,Price,UT,84501
Brown,Nancy,8604 E. Devonshire,Scottsdale,AZ,85251
Butzow,George,Box 713,Huntington,UT,84528
Butzow,Tonia,Box 713,Huntington,UT,84528
Clemons,Paul B.,8604 E. Devonshire,Scottsdale,AZ,85251
Crowley,Delsie,1501 S. Mesa,Montrose,CO,81401
Dearth,A.E,672 Mivida Dr.,Moab,UT,84532
Dearth,A.F.,54 S. Flora Way,Golden, CO,80401
F804 Inc.,2800 S. University Blvd.,Denver,CO,80210
Francis,Clara,420 Topaz Circle,Moab,Ut,84532
Francis,Lyle G.,420 Topaz Circle,Moab,UT,84532
Francis,Lyle,420 Topaz Circle,Moab,UT,84532
Giles,Albert, % Bob Shumway,3080 Spanish Trail Dr.,Moab,UT,84532
Hart,C.J.,97417 1/4 Rd.,Fruita,CO,81521
Hart,C.J.,Box 1075,Vernal,UT,84078
Hart,C.J.,Box 2492,Durango,CO,81302
Hart,C.J.,Box 267,Durango,CO,81521
Hart,C.J.,Box 3037,Durango,CO,81302
Hart,C.J.,Box 713,Huntington,UT,84528
Heda Mining Company,Box C 8000,Cofeur D Alene,ID,83814
Homestead Mining CO/CA,155 Glendale #18,Sparks,NV,89431
Homestead Mining CO/CA,1726 Cole Boulevard,Golden,CO,80401
Homestead Mining CO/CA,650 California St. 9th Floor,San Francisco,CA,94108
Homestead Mining CO/CA,7625 W. 5th Ave.,Lakewood,CO,80226
Homestead Mining CO/CA,Box 10628,Reno,NV,89510
Homestead Mining CO/CA,Box 89510,Reno,NV,89510

Homestead Mining Co/CA,7625 West 5th Avenue,LakeWood,CO,80226
Hudson,H. Clay,Box 10628,Reno,NV,89510
Hudson,T.C.,Box 10628,Reno,NV,89510
Hudson,W.T.,155 Glendale #18,Sparks,NV,89431
Hudson,W.T.,7625 W. 5th Ave.,Lakewood,CO,80226
Kemper,R.B.,10720 McCume Ave.,Los Angeles,CA,90034
Kunkel,Burton F. % Bob Shumway,3080 Spanish Trail Dr.,Moab,UT,84532
Kunkel,Raymond E.,33 Holiday Haven,Moab,UT,84532
Kunkel,Raymond E.,8664 Monmouth Pl.,Denver,CO,80237
Lawther,Hazel A.,156 N. Fraser Dr. W.,Mesa,AZ,85203
McCormick,Patricia,Box 149,Aurora,MO,62505
Melich,Mitchell,900 Donner Way,Salt Lake City,UT,84108
Mundy,H.N.,Box 10628,Reno,NV,89510
Osanke,Mary Lou,Box 1230,Ely,NV,89301
Osanke,Mary Lou,Box 193,LaSal,UT,84530
Osanke,Steve,Box 1230,Ely,NV,89301
Osanke,Steve,Box 192,LaSal,UT,84530
Powell,Claudette,180 Braewick Rd.,Salt Lake City,UT,84103
Powell,Claudette,Box 713,Huntington,UT,84528
Powell,Cory,Box 713,Huntington,UT,84528
Powell,Phillip,Box 713,Huntington,UT,84528
Powell,Zachary,Box 713,Huntington,UT,84528
Redd,Paul,20923 T5 Road, Paradox,CO,81429
Richardson,Frank,Box 10628,Reno,NV,89510
Robinson,Dean (K.S. Summers),P.O. Box 67,Monticello,UT,84535
Rogers,Anna,Box 10628,Reno,NV,89510
Rogers,L.E.,Box 10628,Reno,NV,89510
Shumway,Bob, 3080 Spanish Trail Dr.,Moab,UT,84532
Standard Metals,P.O. Box 247,Silverton,CO,81433
Steen,Andrew K.,7621 El Monte Dr., Buena Park,CA,90621
Steen,Charles A.,7621 El Monte Dr.,Buena Park,CA,90621
Strode,Gary L.,62266 N. Star Dr.,Montrose,CO,81401
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Uranium King Corporation,Box 1408,Coralles,NM,87045
Westmont Engineering Company % Bob Shumway,3080 Spanish Trail Dr., Moab,UT,84532,

GRAZING LEASE HOLDERS

SECTIONS 19, 24
Rick Bailey, (Spring Creek Ranch) Phone (435) 587-2313
P.O. Box 1129
Monticello, Utah 84535

SECTIONS 10, 11, 14, 15, 21, 22, 23, 26, 27
Dean Robinson (K. S. Summers), Phone (435) 587-2333
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SECTIONS 2, 3, 4, 9, 10, 11, 12, 13, [33 (BI#1)]
Paul Redd, Phone (970) 859-7358
20923 T5 Road
Paradox, Colorado 81429

APPENDIX E
TSCREEN OUTPUT DATA

APPENDIX F
HYDROGEN SULFIDE MSDS

APPENDIX G
EMPLOYEE SIGNOFF SHEET

APPENDIX G
EMPLOYEE SIGNOFF SHEET

I have read the Tom Brown, Inc. Spiller Canyon Facility ***Emergency Response Plan/Public Protection Plan*** and understand its contents. I understand my personal responsibilities under this policy and will make use of this information to contribute to safety of the public and for my own personal safety while an employee of Tom Brown, Inc.

Signed Date

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ADDITIONAL SUPPORTING INFORMATION FOR TECHNICAL REVIEW
WELLBORE OPERATIONS AND RESERVOIR CONSIDERATIONS
TOM BROWN, INC. LISBON UNIT B-624
PROPOSED SULFUR RE-INJECTION WELL
SECTION 24, T30S, R24E, SAN JUAN COUNTY, UTAH

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ADDITIONAL SUPPORTING INFORMATION FOR TECHNICAL REVIEW
WELLBORE OPERATIONS AND RESERVOIR CONSIDERATIONS
TOM BROWN, INC. LISBON UNIT B-624
PROPOSED SULFUR RE-INJECTION WELL
SECTION 24, T30S, R24E, SAN JUAN COUNTY, UTAH

LIST OF ATTACHMENTS

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Attachment 3.	CBL Interpretation (Joe Poole, Schlumberger)
Attachment 4.	Wellbore Condition Assessment (Dr. Bruce Craig, P.E.)
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ADDITIONAL SUPPORTING INFORMATION FOR TECHNICAL REVIEW
WELLBORE OPERATIONS AND RESERVOIR CONSIDERATIONS
TOM BROWN, INC. LISBON UNIT B-624
PROPOSED SULFUR RE-INJECTION WELL
SECTION 24, T30S, R24E, SAN JUAN COUNTY, UTAH

Project Overview and Benefits

Tom Brown, Inc. (TBI), through Buys & Associates, Inc., has applied for a permit modification with the State of Utah to allow for sulfur re-injection into the Lisbon Unit B-624 SWD well. This addendum further supports the favorable nature of the project by providing additional technical information at the State's request relative to wellbore operations and reservoir considerations. Currently, TBI operates a sulfur plant within the overall Lisbon Gas Plant, which generates over 20 long tons per day of solid sulfur, which is then trucked across country to sulfur markets such as fertilizer plants. While the sulfur plant has operated reliably and safely for several years, this mode of operation has several drawbacks compared to the proposed re-injection alternative: safety and environmental risks associated with loading and transporting molten sulfur, complexity of sulfur plant processes with four reactors and multiple conversions, higher operating costs, and operational liabilities such as sulfur pit fire and catalyst changes.

Successful permitting of the Lisbon Unit B-624 to sulfur re-injection will enable TBI to shut down (and eventually sell) the existing sulfur plant, construct a simpler amine plant, and re-inject the sulfur product using electric compression back into the formation from which it was produced. The proposed sulfur re-injection project offers several advantages over current operations:

- Allows for shut down and eventual sale of existing sulfur plant,
- Sulfur plant will be replaced by much simpler amine plant, which will reduce process risk and improve safety,
- Operating costs will be reduced by an estimated $100M per month, which will extend the economic limit of the Lisbon Plant, keeping many TBI workers employed longer,
- The loading and trucking of molten sulfur across country will be eliminated,
- Field production will increase due to improved run times, decreased fuel gas requirements, and decreased flaring, and
- Air quality will improve with decreased emissions and flaring.

Injection Well Selection / Geology

The Lisbon Unit B-624 wellbore was chosen as the top sulfur re-injection candidate based on several criteria that take into account safety, wellbore condition, and geologic position:

- In terms of safety, the B-624 well is located approximately 2.5 miles from the Lisbon Plant and is clear of any/all residential structures,
- The well location is isolated and contained within Spiller Canyon,
- There are no offsetting wellbores within a ½-mile radius of the B-624 well,
- There is no potable water formations at any depth proximal to the B-624 well,
- The B-624 was cemented via three stages, with cement circulated to surface during the third stage,
- The Leadville is sub-normally pressured,
- The well has been an excellent water disposal well for 37 years with no indication of breakthrough to updip producers located nearly a mile away, and
- The sulfur product will be injected into the same formation from which it was produced, but in a down-dip and wet portion of the Leadville (Mississippian) formation.

The Lisbon Unit B-624 was originally drilled to and tested in the down-structure, wet portion of the Leadville; the well did not produce hydrocarbons and was subsequently converted to a SWD well. The Lisbon Field structure is formed by three-way closure up against a large-offset fault. The structure is roughly 5,000 acres and has almost 2,000 feet of closure. The Leadville (which is a carbonate), is overlain by an excellent top seal, the Paradox Salt, which is over 4,000 feet thick in the Lisbon Field area. This geologic setting is ideal for the sulfur re-injection project.

Well History / Water Disposal Project

The Lisbon Unit B-624 was drilled and subsequently plugged and abandoned in 1960. During 1965, the well was re-entered and recompleted as a water disposal well. Injection began in November, 1965 and continues today. The B-624 has taken roughly 42 million barrels of water over its 37-year disposal history.

The B-624 well contains 13-3/8", 48#, H-40 surface casing set at 1,000 feet and cemented with 800 sx with cement circulated to surface. The 5-1/2", 15.5#, 17#, 20# N-80 LT&C production casing was set at 9,232' and cemented in three stages with a total of 5,450 cubic feet of cement with stage tools at depths of 8,896' and 3,696'. The third and final stage circulated cement to surface. The well was completed with 3-1/2" tubing and a packer to inject into six sets of Leadville perforations from 8,936' to 9,182'.

Area of Review / Cement Calculations

There are no other wells within a ½-mile radius of the Lisbon Unit B-624. Up-structure to the northwest of the B-624 are the A-713A, B-613, and C-814 wellbores. The A-713A well is actually planned as a future back-up sulfur re-injection to the B-624. The B-613 is a shut-in producer, and the C-814 is plugged and abandoned. These "first-row" wells have been addressed in the Reservoir Engineering section even though the average distance from the B-624 is roughly one mile.

Therefore, the only well(s) requiring cement tops within the Area of Review is the Lisbon Unit B-624 itself. The first stage was cemented off bottom (9,232' using float equipment) with 150 ft^3 of 50-50 Pozmix, 2% gel, salt saturated with a calculated top of cement of 9,014'. The second stage was through a DV tool at 8,896' using 2,900 ft3 of 50-50 Pozmix, 8% gel, salt saturated with a calculated cement top of 4,676'. The third stage was cemented through a DV tool at 3,696' with 2,400 ft^3 of 50-50 Pozmix w/ 8% gel and 2% $CaCl_2$. The calculated cement top is 204', but cement was circulated to surface. These calculations are based on 5-1/2" casing cemented within a 9-5/8" hole with 30% excess.

The methodology used to calculate cement tops in the B-624 well is based on a volumetric check from the A-713A, which had a cement bond log from 4/4/64 as well as a caliper log. Stage 2 on the A-713A was cemented through a DV tool at 9,031'. Based on the caliper log and the cement volume pumped, the top of cement calculated to be 5,954'. The actual top of cement based on the CBL is 5,586'. The calculated top of cement is therefore within 6.6% of the actual cement top, with the actual cement top being further uphole. Based on the caliper log, the actual hole size averaged 30% excess over the volume based on bit size.

Cement Bond Log

Responding to the State of Utah's request for a workmanlike cement bond log, Tom Brown Inc. ran Schlumberger's CBL on 8/29/02 (See Attachment 2). On 8/23/02, TBI received verbal permission from the State to run the CBL from the permanent packer at 8,875' to surface. Since the packer is only 61' above the top perforation and 68' below the top of the Mississippian, logging from the packer up still gives a clear picture of the cement bond down through the top of the Leadville. On 8/28/02, the tubing was stung out of the permanent packer and tripped out of the hole. The next day, a retrievable plug was set over the permanent packer at 8,865' and the wellbore was filled with water. Schlumberger's CBL was then run from 8,860' to surface. Overall, the cement bond is excellent. The second stage (through DV tool at 8,896') indicates excellent bond from the CBL first reading to the upper DV tool at 3,696' for the most part, with good bond in the intervals 3,820' to 4,020' and from 4,270' to 4,650'. The previously calculated top of cement for Stage 2 was 4,676'. The upper DV tool at 3,696' is evident on the log. Excellent bond continues from this DV tool, well into the surface casing, to an apparent top of cement of 420'. This agrees closely with the calculated cement top of 204', although cement was circulated to surface.

Attachment 3 is an assessment of the Lisbon Unit B-624 bond log from Joe Poole, Senior Engineer with Schlumberger.

Condition of Wellbore

As mentioned, tubing was pulled from the Lisbon B-624 to run the cement bond log on 8/29/02. The 3-1/2", 9.3#, J-55 tubing is internally plastic coated (IPC). The tubing string was in good condition and was re-run in the well less two joints: one joint was crimped

while breaking a tight connection, and one joint had some external corrosion. The threads on the tubing string are AB Modified threads, which are a square, triple-sealing thread.

The cement bond log was run with the wellbore full of water with 1,000 psi surface pressure applied. The casing held this pressure without leakoff during the several hours required to run the CBL. On 8/31/02, after re-running the tubing and stinging into the permanent packer, the casing, tubing, and packer were all tested successfully to 1,000 psi.

Dr. Bruce D. Craig, P.E., of METCORR – Metallurgy and Corrosion Consulting and author of the SPE Monograph Volume 15 "Sour-Gas Design Considerations", has reviewed the current condition of the Lisbon Unit B-624 wellbore relative to utilizing the well for sulfur re-injection and has attached his assessment (see Attachment 4). Dr. Craig's observations and recommendations will be incorporated into the procedure for converting the well to sulfur re-injection.

including using diesel as a non-conductive packer fluid?

Injection Rates and Pressures / Pressure Falloff / Step Rate Test / Nodal Analysis

The Lisbon Unit B-624 SWD well currently disposes of the majority of the water produced in the Lisbon Field (a replacement SWD well will be proposed once the B-624 well is approved for sulfur re-injection). The B-624 well currently injects roughly 1,500 BWIPD at a surface pressure of approximately 300 psi. Operationally, the pumps that inject into the B-624 kick on as the level in the storage tank reaches a certain height. So the well actually accepts water at a rate of 3,600-5,300 BWIPD at surface pressures between 300-900 psi depending on if one or two pumps are running at the time. Actual disposal time averages 6-8 hours per day.

Once converted to sulfur re-injection, the B-624 is expected to inject 1,700 MCFD of acid gas (a 50-50 combination of CO_2 and H_2S) at a surface injection pressure of 1,400 psi. The liquid-equivalent of this injection rate is roughly 700 BPD. This acid gas injection rate is only 13-19% of the current water disposal rate, depending on if one or two pumps are running.

average pressure, not max. pressure

Bottom-hole Injection Pressure

In an effort to determine surface injection pressures for the CO_2/H_2S product to be re-injected, a down-hole injection pressure survey with gradients was conducted by Tefteller, Inc. on 2/28/02 (see Attachment 5). Electronic pressure gauges were run into the well with gradient stops every 2,000'. The gauges were then positioned at 9,000' while water injection continued at roughly 1,200 BWIPD. ~~The bottom-hole injection pressure was then recorded~~ for 30 minutes. The BHIP was fairly constant at 3,958 psi, which translates to an average fluid gradient of 0.460 psi/ft between the 8,000' and 9,000' pressure readings.

Pressure Falloff Test

A pressure fall-off test was also conducted on the Lisbon B-624. The survey was run by Cobra Slickline Corp. on 5/24/02 (see Attachment 6). Tandem electronic gauges were run to a depth of 8,975' with gradient stops every 1,000'. The bottom-hole injection pressure was

less than that recorded during the BHIP survey due to the well being on a vacuum at the time of the falloff test, and there was a fluid level between 2,000' and 3,000'. Bottom-hole injection pressures were recorded over a 3-hour period while the well was taking water at an instantaneous rate of 2,928 BWIPD:

Time	Bbls Wtr in 15 Min	Wtr Rate, BWPH	Tubing Press, psi	Meter Total, bbls
4:41	0	0	0	0
4:56	48	192	0	48
5:11	47	188	0	95
5:26	46	184	0	141
5:41	39	156	0	180
5:56	26	104	0	206
6:11	24	96	5	230
6:26	22	88	29	252
6:41	23	92	85	275
6:56	22	88	110	297
7:11	23	92	150	320
7:26	23	92	190	343
7:41	23	92	230	366

This data again supports the well's ability to take high rates of fluid at low surface injection pressures. After the 3-hour injection period, the well was shut-in and the pressure fall-off was recorded for nearly 90 hours. The final bottom-hole pressure was roughly 2,500 psi as the down-hole gauges were pulled from the well. Pressure gradients were taken while pulling the down-hole gauges out of the well; the fluid level in the tubing was at 3,250'.

Kumar Ramurthy, PhD, Technical Specialist with Halliburton, has analyzed the pressure falloff test (see Attachment 7). Kumar observed both psuedo linear and psuedo radial flow regimes during the falloff test. The falloff data was analyzed using three different methods of flow-time functions: Simon et al, Nolte, and Gu. In all three cases, the reservoir pressure was extrapolated to 2,358 psi. The system kh varied between 13.6-14.8 md-ft, resulting in a permeability of 0.3 md using 52 feet of net pay to injection. This permeability, which may contain a skin component due to 37 years of disposal, was then used in the nodal analysis.

Step Rate Test

At the State's request, a Step Rate Test was also conducted on the B-624 on 9/9 02. Down-hole pressure gauges were again run in the well by Cobra Slickline. Tandem electronic memory gauges were positioned at 8,925'. Halliburton pumped the job and recorded surface injection pressures. Injection rates began at 2.5 BPM and stepped up to 7 BPM in 0.5 BPM increments. Halliburton's results of the Step Rate Test are shown in Attachment 8; the analysis was done by Pat Kundert, Account Leader at Halliburton.

Halliburton plotted down-hole pressures versus surface injection rates. The estimated fracture initiation pressure is roughly 5,300 psi, occurring at approximately 5.3 BPM, which corresponds to 7,632 BWIPD. TBI proposed sulfur re-injection project would inject a fluid

equivalent of roughly 700 BPD. The calculated frac gradient based on this step rate test is 0.59 psi/ft.

Nodal Analysis

Attachment 9 is a nodal analysis performed on the Lisbon B-624 under the conditions of acid gas disposal down 3-1/2" IPC tubing into 0.3 md reservoir rock. The model accounts for friction down the tubing, with no perforation friction (due to the number of perforations) and skin factor set to zero. The analysis is also based on a reservoir pressure of 2,358 psig (from the falloff) and account for the specific gravity of the injected fluid. Surface injection pressure is related to the bottom-hole injection pressure, and a variety of permeability curves are presented, ranging from the base case of 0.3 md up to 2 md. Based on a surface injection pressure of 1,500 psig and permeability of 0.3 md, the wellbore and reservoir will accommodate the 1,700 MCFD of acid gas to be injected. This nodal analysis is conservative based on the permeability of 0.3 md, which may have a built-in skin element due to 37 years of disposal. Once the project is approved and the recommended well work completed, the injection capacity of the B-624 is expected to increase for the same injection rate, surface injection pressure, and permeability.

Proposed Wellwork

Based on geologic setting, current condition of the wellbore, success of the water disposal project, the recent cement bond log, the step rate test results, and the immediate need for a sulfur re-injection well, the Lisbon Unit B-624 is the optimum choice for disposal well for the proposed project. Therefore, the proposed well work as previously submitted basically involves cleaning out fill, conducting pressure tests, and tubular assessments via cased hole logs, if necessary. The following procedure has been modified slightly taking into account recommendations from Dr. Bruce Craig's assessment that relate to packer fluid and replacing the wellhead to meet MR0175, making the wellhead completely resistant to sulfide stress cracking.

1. MIRU coiled tubing unit.
2. Clean out fill through 3-1/2" tubing from 9,000' to 9,200'.
3. RD CT unit.
4. MIRU workover rig.
5. Sting tubing out of permanent packer.
6. Circulate in nonconductive packer fluid such as diesel containing corrosion inhibitor.
7. Sting back in to permanent packer.
8. Replace wellhead to meet NACE MR0175.
9. Pressure test backside to 1,000 psi for 30 minutes.
10. RU WL. Set profile plug at bottom of 3-1/2" tubing.
11. Pressure test tubing to 1,000 psi for 30 minutes.
12. Pull tubing profile plug.
13. Run tubing inspection log.
14. Run subsurface check valve in tubing.

15. Put well on gas re-injection.

This procedure also honors suggestions by E. Wichert (Gascan Resources Ltd.) and T. Royan (Tartan Engineering Corp. Ltd.) in their SPE Paper 35585, "Sulfur Disposal by Acid Gas Injection", 1996. (See Attachment 13.) This proposed work would be carried out only after receiving approval for the sulfur re-injection project.

Lisbon Reservoir Volumetrics

Ray Johnson, Tom Brown, Inc.:
To evaluate the extent of invasion of the injected fluid into the reservoir, and the potential for breakthrough in offset wellbores, a 3D geologic model of the Leadville formation has been constructed (see Attachment 10). A structure map on the top of the Leadville showing well locations is included. The B-624 injection well is approximately 250 feet down dip from the nearest non P&A'd, shut in wellbores (A-713A and B-613), and at least 300 feet down dip from the nearest producers (B-912 and B-614). The B-624 is located below the original oil-water contact. Approximately 42 million barrels of water have been disposed of at this location.

For purposes of this evaluation, it was assumed that the injected 50/50 CO_2 / H_2S mixture would move directly toward the nearest producers. This is represented by the triangular area moving out from the B-624, toward the B-912 and B-614 on the structure map. The reservoir pore volume within this area is 22.6 million barrels. Net pay was determined by applying a gamma ray cutoff of 55, and sonic porosity cutoffs greater than 6% and less than 20%. A cross section showing the model distribution of net pay within the Leadville between the B-624 injection well and B-614 producer is also included.

log cutoffs

Using the anticipated injection schedule, and converting the volume of injected fluid to barrels at reservoir conditions results in 1.25 million barrels of fluid being injected into the formation over the remaining life of the field. This represents less than 6% of the reservoir pore volume within the assumed triangular invasion zone. The extent of the invasion front under this scenario is noted within the triangle on the structure map. It is unlikely that the injected CO_2 / H_2S mixture will reach any offset wellbores during the remaining economic life of the Lisbon field.

estimate of total injectate

Other Reservoir Considerations

According to Gary Strong, Geological Project Analyst for the Wyoming Oil and Gas Conservation Commission, the State of Wyoming focuses on compatibility and confinement when reviewing acid gas disposal projects, which are two of the strengths of the Lisbon project. "Before approving any scheme, the (Alberta) Energy and Utilities Board (EUB) reviews applications in order to satisfy several primary issues: maximizing conservation of hydrocarbon resources, minimizing environmental impact, promoting public safety, and ensuring that the equity interests of mineral owners are protected", according to H.L.

Longworth et al, SPE Paper 35584, "Underground Disposal of Acid Gas in Alberta, Canada: Regulatory Concerns and Case Histories", 1995. (See Attachment 14.) Also from Longworth:

Effect of Acid Gas On Rock Matrix

"In carbonate reservoirs, CO_2 in the acid gas may dissolve some of the carbonate rock matrix and this could increase permeability. Acid gas core slow studies on carbonate and sandstone seem to support this. These increases in permeability would likely result in lower injection pressures early on in the scheme (this is supported by lower than anticipated well head pressures in many of the operating schemes). It remains to be seen if migration of fines or carbonate mineral precipitation would reduce permeability over the longer term."

Physical Properties of Acid Gas

"Numerous studies have been done on natural gas mixes containing acid gas, and individually on CO_2 or H_2S. Based on these studies, correlations have been developed that are used in commercially available computer models to predict how pure binary systems of CO_2 and H_2S should behave under certain conditions of temperature and pressure. No laboratory data has yet been published that confirms the accuracy of these computer simulated predictions over a wide range of conditions. Simulation data on density, solubility, and phase behavior of acid gases has been submitted to the EUB with applications for acid gas disposal schemes. Detailed analyses are beyond the scope of the paper, however, general observations are discussed."

Solubility

"Acid gas is highly soluble in native brines found in disposal reservoirs. Water saturated zones, therefore, make good disposal zones for acid gas provided that the temperature and pressure of the zone is such that the acid will fully dissolve."

Successful Acid Gas Injection Projects

"Acid gas injection has been fairly widely used in Alberta since 1985", according to Westcoast Gas in their acid gas injection application for the Jedney Gas Processing Plant and Pipeline Expansion in Alberta. A significant percentage of active acid gas injection projects are in Alberta or Wyoming. Attachment 11 lists several of the active acid gas projects in North America (from Paul M. Davis, Project Coordinator, Alberta Sulfur Research Ltd). While the list is not entirely complete or up to date, it does give an appreciation of the present day scope of this technology. Attachment 12 lists the 2001 Gas Disposal Wells in Wyoming, according to the Wyoming Oil and Gas Conservation Commission website on 9/13/02. Wyoming has at least 22 gas disposal wells in roughly twelve fields and has more recently approved additional projects for Exxon-Mobil (LaBarge Deep), Devon (Beaver Creek), and IBEX Resources (Pretty Water Creek). A few projects in Wyoming were approved in the mid-1980s, but the majority of the gas disposal projects have been approved since 1994, indicating the trend in recent years for re-injecting acid gas.

Byron R. Gale, P.E.
Senior Production/Operations Engineer
Tom Brown, Inc.

Attachments:

1. Lisbon Field Map
2. Lisbon Unit B-624 Cement Bond Log (Schlumberger)
3. Joe Poole (Schlumberger) CBL Interpretation
4. Wellbore Condition Assessment, Dr. Bruce Craig, P.E.
5. Bottom-hole Injection Pressure Survey (Tefteller)
6. Pressure Falloff Test (Cobra Slickline)
7. Pressure Fall-off Test Interpretation (Halliburton)
8. Step Rate Test Results (Halliburton)
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12. Wyoming Gas Disposal Wells (WOGCC)
13. SPE Paper 35585 by E. Wichert, et al
14. SPE Paper 35584 by H.L. Longworth, et al

ATTACHMENT NO. 1

LISBON FIELD MAP

No Lisbon Valley Field
map included in mailing.
CK 9/24/02

TOM BROWN, INC.
LISBON UNIT B-624 APPLICATION
SULFUR RE-INJECTION CANDIDATE

ATTACHMENT NO. 2

CEMENT BOND LOG
SCHLUMBERGER

2 copies of CBL rec'd.

TOM BROWN, INC.
LISBON UNIT B-624 APPLICATION
SULFUR RE-INJECTION CANDIDATE

ATTACHMENT NO. 3

CEMENT BOND LOG INTERPRETATION
SCHLUMBERGER

TOM BROWN, INC.
LISBON UNIT B-624 APPLICATION
SULFUR RE-INJECTION CANDIDATE

Oilfield Services

6501 S. Fiddler's Green Circle
Suite 400
Greenwood Village, Colorado 80111
Tel 303-486-3200

Schlumberger

Mr. Byron Gale
Tom Brown, Inc.
555 Seventeenth Street
Suite 1850
Denver, Colorado 80202-3918

September 9, 2002

Dear Mr. Gale:

Thank you for using our logging services to evaluate the cement quality and coverage on your **NW Lisbon B-624 well** in **San Juan County, Colorado.** Below is my interpretation of the Cement Bond Log.

INTERVAL	COMMENTS
450'	Cement Top
450'-520'	Good bond, microannulus present
520'-720'	Excellent bond, microannulus present
720'-980'	Good bond, microannulus present
980'-1020'	Excellent bond
1020'-1130'	Good bond, microannulus present
1130'-1196'	Excellent bond
1196'-1214'	Good bond, microannulus present
1214'-1567'	Excellent bond
1567'-1584'	Good bond, microannulus present
1584'-1686'	Excellent bond
1686'-1702'	Good bond, microannulus present
1702'-1900'	Excellent bond
1900'-1906'	Good bond, microannulus present
1906'-1966'	Excellent bond
1966'-1974'	Good bond, microannulus present
1974'-2104	Excellent bond
2104'-2125'	Good bond, microannulus present
2125'-2380'	Excellent bond
2380'-2390'	Good bond, microannulus present
2390'-3676'	Excellent bond, some microannulus
3676'-3720'	Good bond, microannulus present
3720'-3778'	Excellent bond
3778'-3810'	Good bond, microannulus present
3810'-3870'	Channeling present
3870'-3880'	Good bond, microannulus present

INTERVAL	COMMENTS
3880'-3918'	Excellent bond
3918'-3934'	Some channeling
3934'-3940'	Excellent bond
3940'-3994'	Channeling present
3994'-4008'	Excellent bond
4008'-4020'	Channeling present
4020'-4268'	Excellent bond
4268'-4350'	Good bond, microannulus present
4350'-4440'	Channeling present
4440'-4476'	Excellent to good bond
4476'-4518'	Channeling present
4518'-4554'	Good bond, microannulus present
4554'-4636'	Channeling present
4636'-4656'	Good bond, microannulus present
4656'-4660'	Excellent bond, microannulus present
4660'-4688'	Good bond, microannulus present
4688'-4698'	Excellent bond
4698'-4714'	Good bond, microannulus present
4714'-4810'	Excellent bond, some microannulus present
4810'-4850'	Channeling present
4850'-4892'	Good bond, microannulus present
4892'-4974'	Excellent bond
4974'-5152'	Good bond, microannulus present
5152'- 8840'	Excellent bond, some microannulus

Over a ~3,700' interval? cf

Thank you again for using our services, and if you have any questions regarding this interpretation, please call me at **303-572-1301**.

Sincerely,

Joe Poole

Joe Poole
Senior Engineer

All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not, guarantee the accuracy or correctness of any interpretations, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents, or employees. These interpretations are also subject to our General Terms and Conditions as set out in our current Price Schedule.

ATTACHMENT NO. 4

WELLBORE CONDITION ASSESSMENT
DR. BRUCE CRAIG, P.E.

TOM BROWN, INC.
LISBON UNIT B-624 APPLICATION
SULFUR RE-INJECTION CANDIDATE

METCORR

Metallurgy and Corrosion Consulting

August 27, 2002

Ask Tom Brown if they would consider using diesel as a packer fluid in the conversion letter for the well.

Byron Gale
Tom Brown, Inc
555 17th St., Suite 1850
Denver, CO 80202

Byron:

This letter provides my assessment, from a corrosion and metallurgy standpoint, of the current and proposed well configuration for the Lisbon Unit B-624 well that is planned for acid gas injection. At the present time the current well completion that was carried out in the mid 1960s as a water injection well and the proposed well design for acid gas injection are identical. The tubing string is approximately 8,828 ft of 3-1/2", 9.3 ppf, J-55 and the production casing is 9232 ft of 5-1/2",15.5 ppf, 17 ppf and 20 ppf, N-80 intermittently cemented to surface. The packer is a Baker model N permanent packer. The packer fluid for the proposed well is slated to be inhibited water.

Should this be changed to diesel packer fluid as per page 2 of this?

There are two important issues that must be addressed in any wellbore that will be receiving sour acid gas for injection. These two issues are the long term corrosion behavior of the steel tubing, casing and packer components and their resistance to sulfide stress cracking (SSC). The first concern is relatively simple if there is no free water in the wellbore or that would precipitate out of the acid gas during injection. Under the condition where no free water exists, no corrosion will occur. This is in fact the experience of the industry, that steel equipment is often successfully used in acid gas injection wells because no free water is present to cause corrosion. Since MetCorr has not reviewed the plans for injection it must be assumed at this time that Tom Brown, Inc has already performed the phase behavior studies and will not knowingly inject acid gas with free water in it.

Have such studies been performed? CR 9/24/02

4600 S. ULSTER ST. SUITE 700 · DENVER, COLORADO 80237 · PHONE (303) 740-6750 · FAX (303) 694-0613

The other issue is SSC of all of the metallic components in the wellbore that will be, or may be, contacted by the acid gas. SSC, while also requiring the presence of free water, is a catastrophic cracking event that can occur in a matter of minutes or hours and is therefore, not a long term corrosion issue but a considerable safety problem because it cannot be monitored or predicted. The only means to combat SSC is to use alloys that are resistant to SSC. The leading industry standard for selection of alloys that are resistant to SSC is NACE MR0175. According to MR0175, API 5CT Grade J-55 is suitable for exposure to any concentration of H_2S at any temperature. Therefore, if the J-55 tubing that is currently in the well is sound and in good condition, then it would be acceptable to re-run in the well for acid gas injection. However, N-80 tubing is not acceptable for exposure to H_2S until the well temperature is 150°F and higher. This usually means near the bottom of a well but since this is an injection well then the temperature profile under injection conditions and for shut-in would have to be calculated to determine the safe depth for N-80. Since the 5-1/2" N-80 is 1960s vintage it is probably even less resistant to SSC that more modern N-80 grades (ie, it is probably much harder) used today. There is a risk then that if there is a connection leak or packer leak during injection the casing could be contacted by the sour acid gas and SSC would occur. This problem could be minimized by using a nonconductive packer fluid such as diesel. In this case even if sour gas leaks into the annulus there is no water to create a corrosion cell and SSC will not occur.

Without knowing the specific details of the packer components it is impossible to determine the susceptibility of the packer to SSC. Suffice it to say that packers made back in the 1960s before MR0175 was even a standard are usually susceptible to SSC.

One last consideration that needs to be addressed is the Christmas tree/wellhead. These components should definitely meet MR0175 since the need to safely shut-in an acid gas well requires that the tree be completely resistant to SSC in the event that as the wellhead cools down if water precipitates SSC is a real possibility.

Sincerely,

Dr. Bruce Craig, P.E.

ATTACHMENT NO. 5

BOTTOM-HOLE INJECTION PRESSURE SURVEY
TEFTELLER

TOM BROWN, INC.
LISBON UNIT B-624 APPLICATION
SULFUR RE-INJECTION CANDIDATE

FILE

Company: TOM BROWN INC.
Well: LISBON UNIT #B-624
Field: NW LISBON
Engineer: NEIL TEFTELLER
Gauge Type: ELECTRONIC
Gauge Range: 0-5000
Gauge Depth: 9000 ft
Serial No.: 216

County: SAN JUAN
State: UTAH
Date: 02/28/2002
Well Type:
Test Type: GRADIENT
Status: INJECTING 1200BWPD
File Name: 51319A

Tubing: 3-1/2" TO 8875'
Tubing: TO
Casing: TO
Perfs.: 8936'-9182'

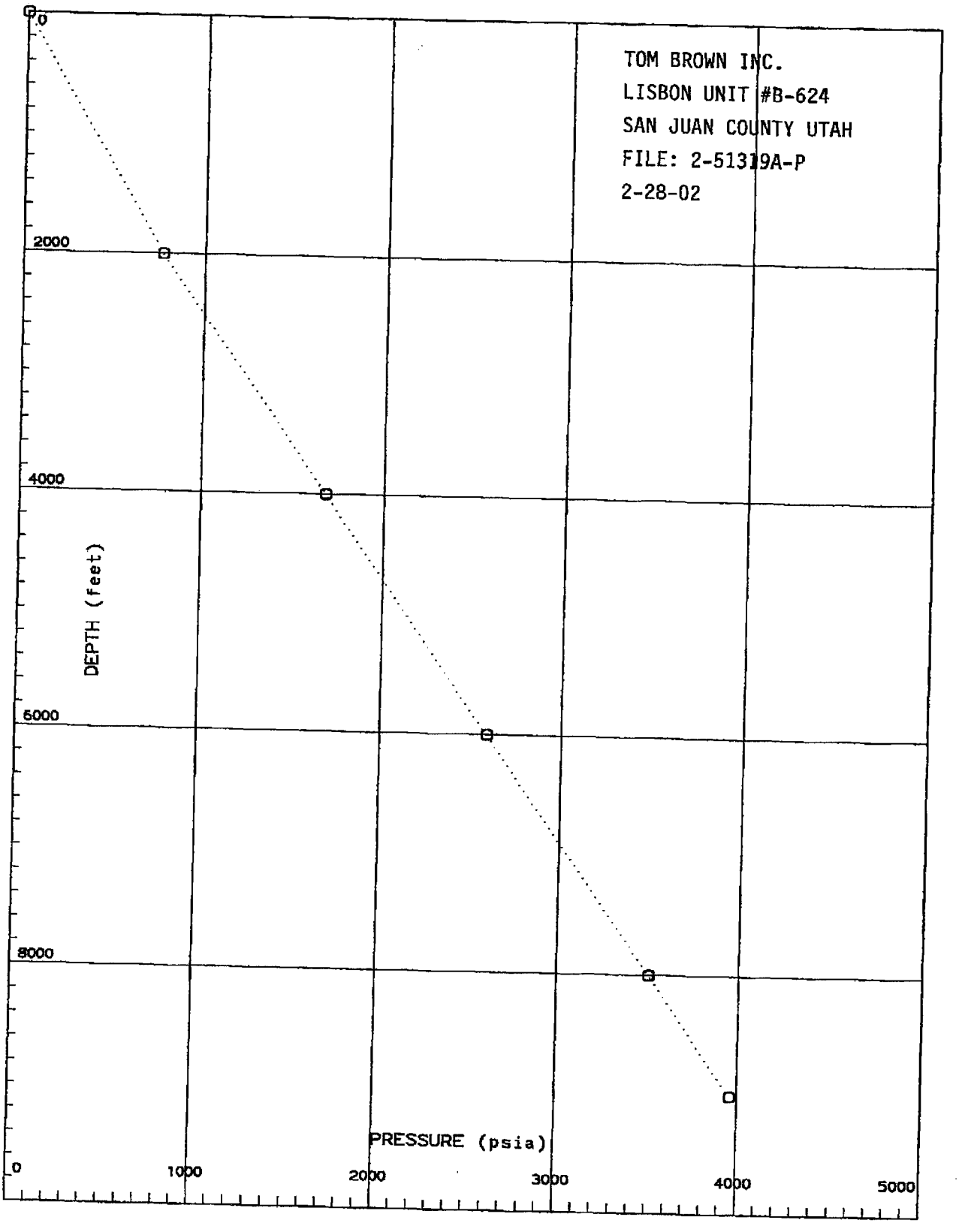
Oil Level
H2O Level

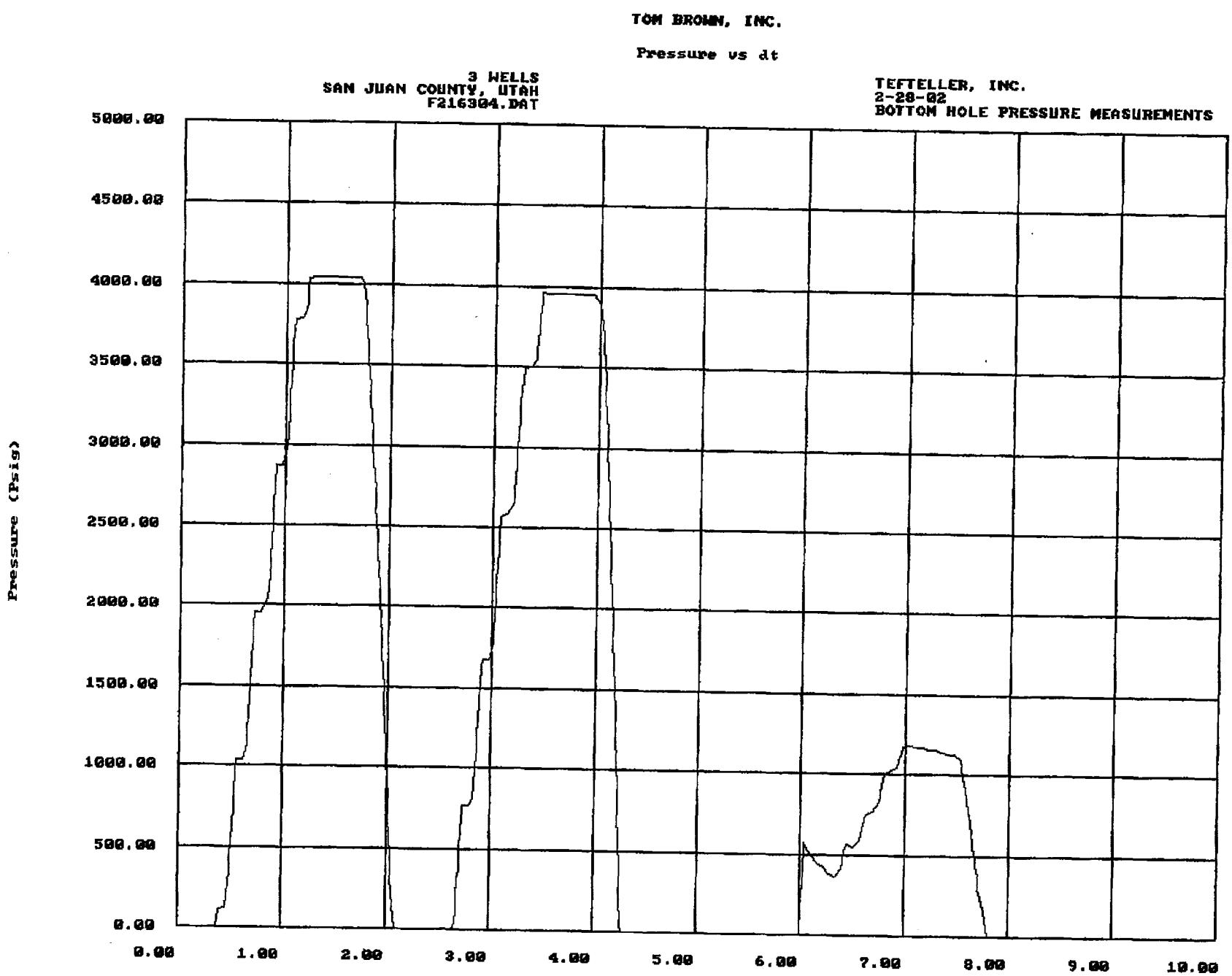
Flowing BHP 3958 @ 9000 ft Flowing BHT 92 F @ 9000 ft

[Tefteller Incorporated]

#	MD	TVD	PRESSURE	PSI/ft
1	0	0	0.00	
2	2000	2000	765.00	0.382
3	4000	4000	1675.00	0.455
4	6000	6000	2587.00	0.456
5	8000	8000	3498.00	0.456
6	9000	9000	3958.00	0.460

BAKER MODEL IN PACKER
SET DOWN @ 9008'
30 MINUTES @ 9000'
5953-5958 PSIG

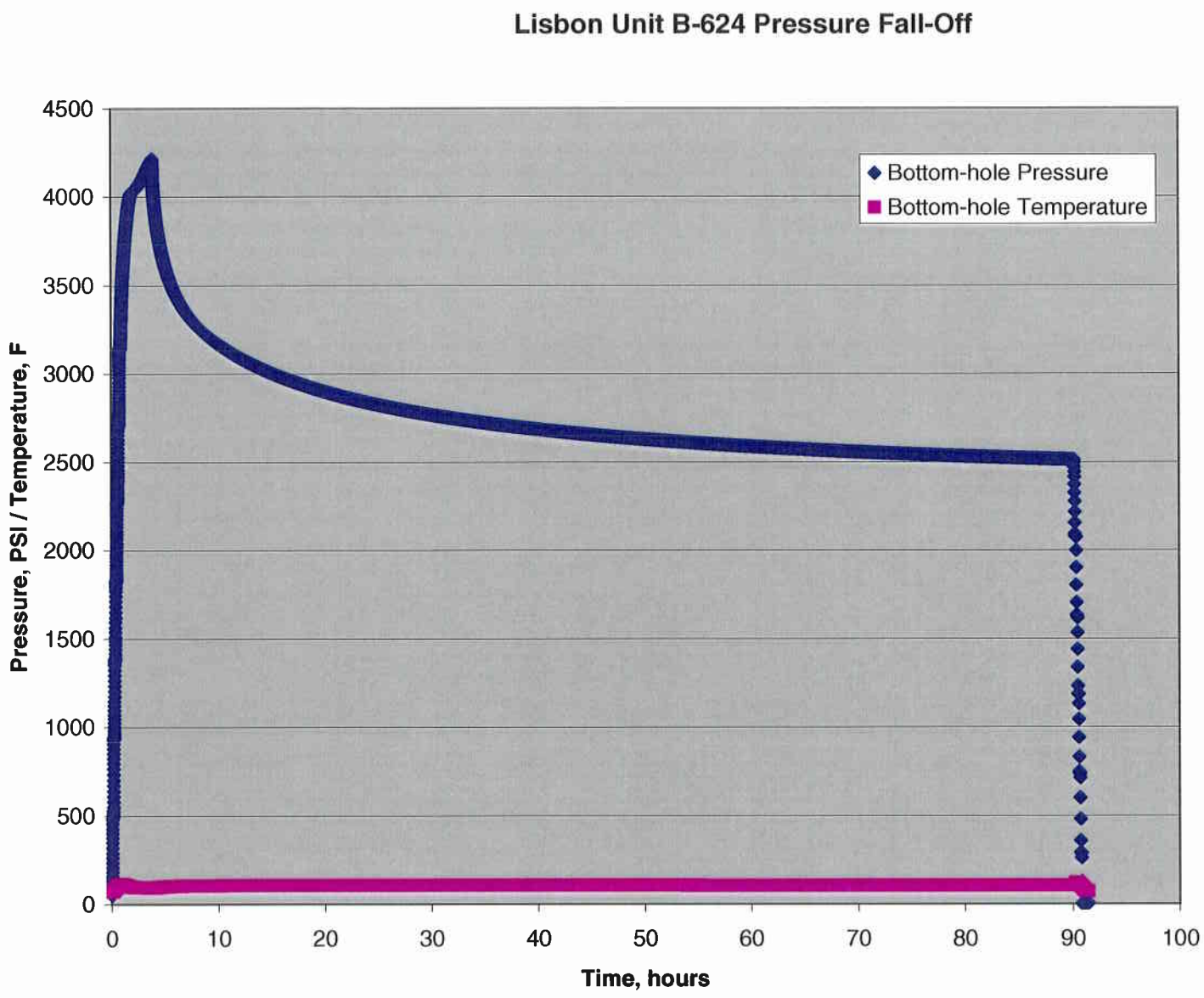

TOM BROWN INC.
LISBON UNIT #B-624
SAN JUAN COUNTY UTAH
FILE: 2-51319A-P
2-28-02
DEPTH (feet)
0
2000
4000
6000
8000
PRESSURE (psia)
0
1000
2000
3000
4000
5000


TOM BROWN, INC.
Pressure vs dt
3 WELLS
SAN JUAN COUNTY, UTAH
F216304.DAT
TEFTELLER, INC.
2-28-02
BOTTOM HOLE PRESSURE MEASUREMENTS
Pressure (Psig)
5000.00
4500.00
4000.00
3500.00
3000.00
2500.00
2000.00
1500.00
1000.00
500.00
0.00
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
dt (Hours)

ATTACHMENT NO. 6

PRESSURE FALLOFF TEST
COBRA SLICKLINE

TOM BROWN, INC.
LISBON UNIT B-624 APPLICATION
SULFUR RE-INJECTION CANDIDATE


Lisbon Unit B-624 Pressure Fall-Off
Bottom-hole Pressure
Bottom-hole Temperature
Pressure, PSI / Temperature, F
Time, hours
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0
10
20
30
40
50
60
70
80
90
100

ATTACHMENT NO. 7

PRESSURE FALLOFF TEST INTERPRETATION
HALLIBURTON

TOM BROWN, INC.
LISBON UNIT B-624 APPLICATION
SULFUR RE-INJECTION CANDIDATE

Tom Brown Inc.
555 17th Street - Suite 1850
Denver, CO 80202

Lisbon B-624
S24-T30S-R24E
San Juan Co, UT

Pressure Fall Off Test

Prepared for: Mr. Byron Gale

September 18, 2002

Halliburton Energy Services
410 17th Street, Suite 900
Denver, CO 80202
303-260-5027

HALLIBURTON

HALLIBURTON

Discussion

Downhole pressure gauges (electronic memory recorders) were run on slickline by Cobra Slickline Corp. Gauges were run to a depth of 8875' feet in the well.

An Injection / Fall Off test was conducted by pumping 366 bbls of water down the tubing and then shutting in the well for approximately 3 days.

The pressure fall off data was analyzed. It appears that both psuedo linear and psuedo radial flow regimes were observed during the fall off test.

(psi)	$F_R(t,t_c)$
2358	0
3710	0.173

m_R = 7815.029
P_R = 2358
kh/μ = 22.50306 md-ft/cp
muf = 0.658636 cp
kh = 14.82133 md-ft
k = 0.285026 mD

Simon etal.'s Radial Flow Plot Results

(psi)	[FL(t,tc)]2
2358	0
3818	0.172

m_{RF} = 8488.372
P_R = 2358
kh/μ = 20.71799 md-ft/cp
muf = 0.658636 cp
kh = 13.64562 md-ft
k = 0.262416 mD

Nolte's Radial Flow Plot Results

(psi)	1/DT
2358	0
2951	0.0000128

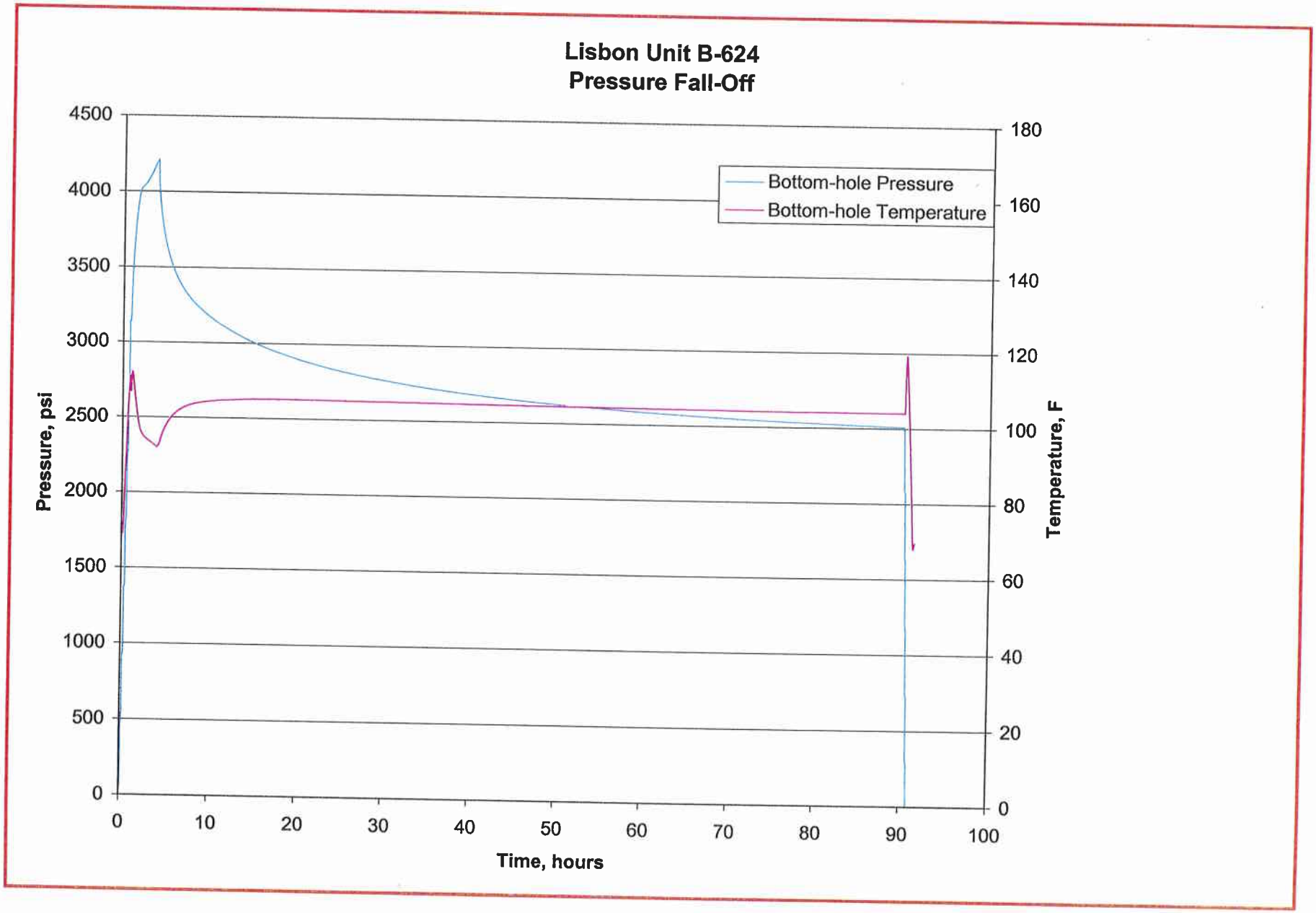
m_{RF} = 46328125
P_R = 2358
kh/μ = 21.09487478 md-ft/cp
muf = 0.658636244 cp
kh = 13.8938491 md-ft
k = 0.267189406 mD

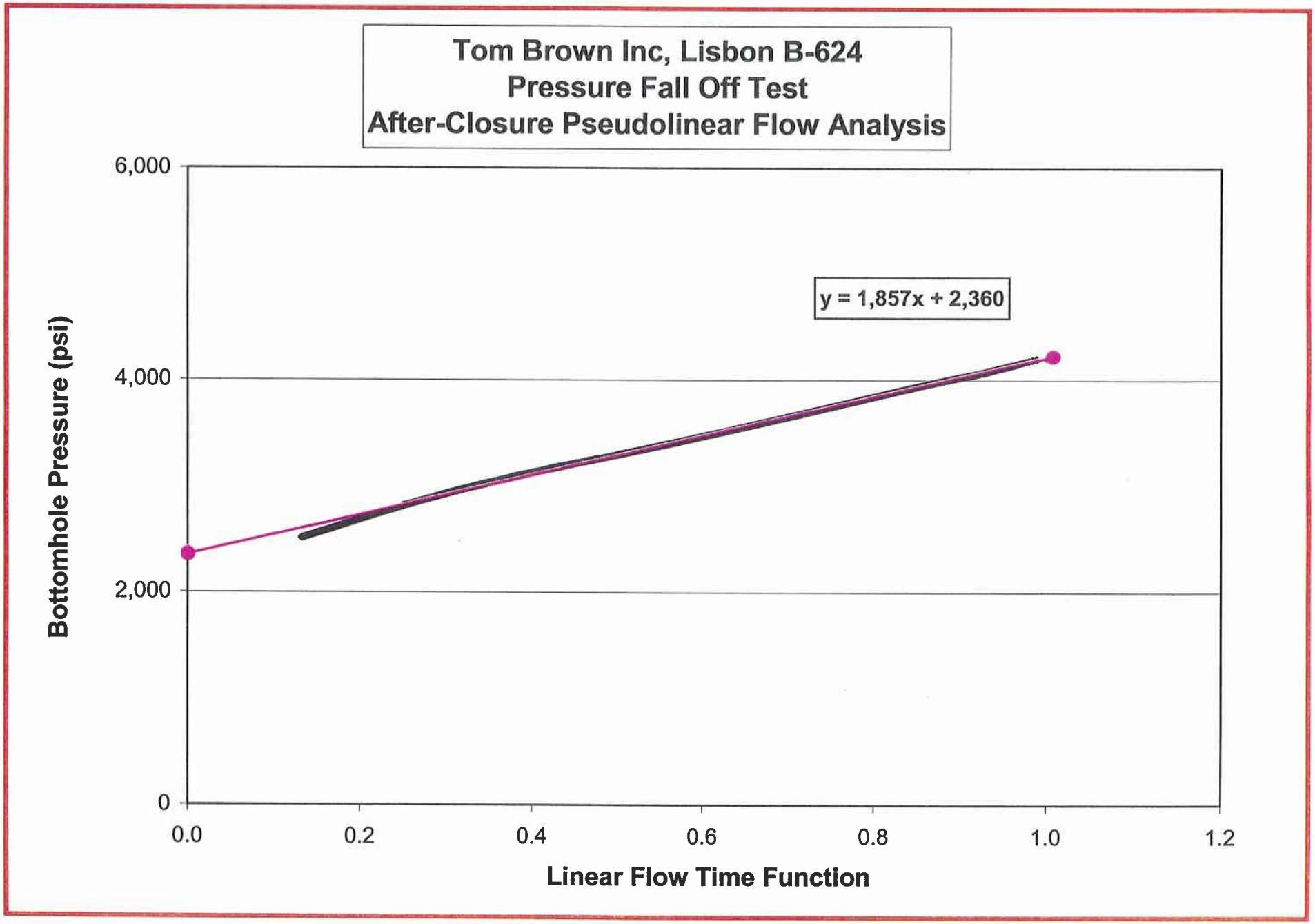
Gu's Radial Flow Plot Results

HALLIBURTON

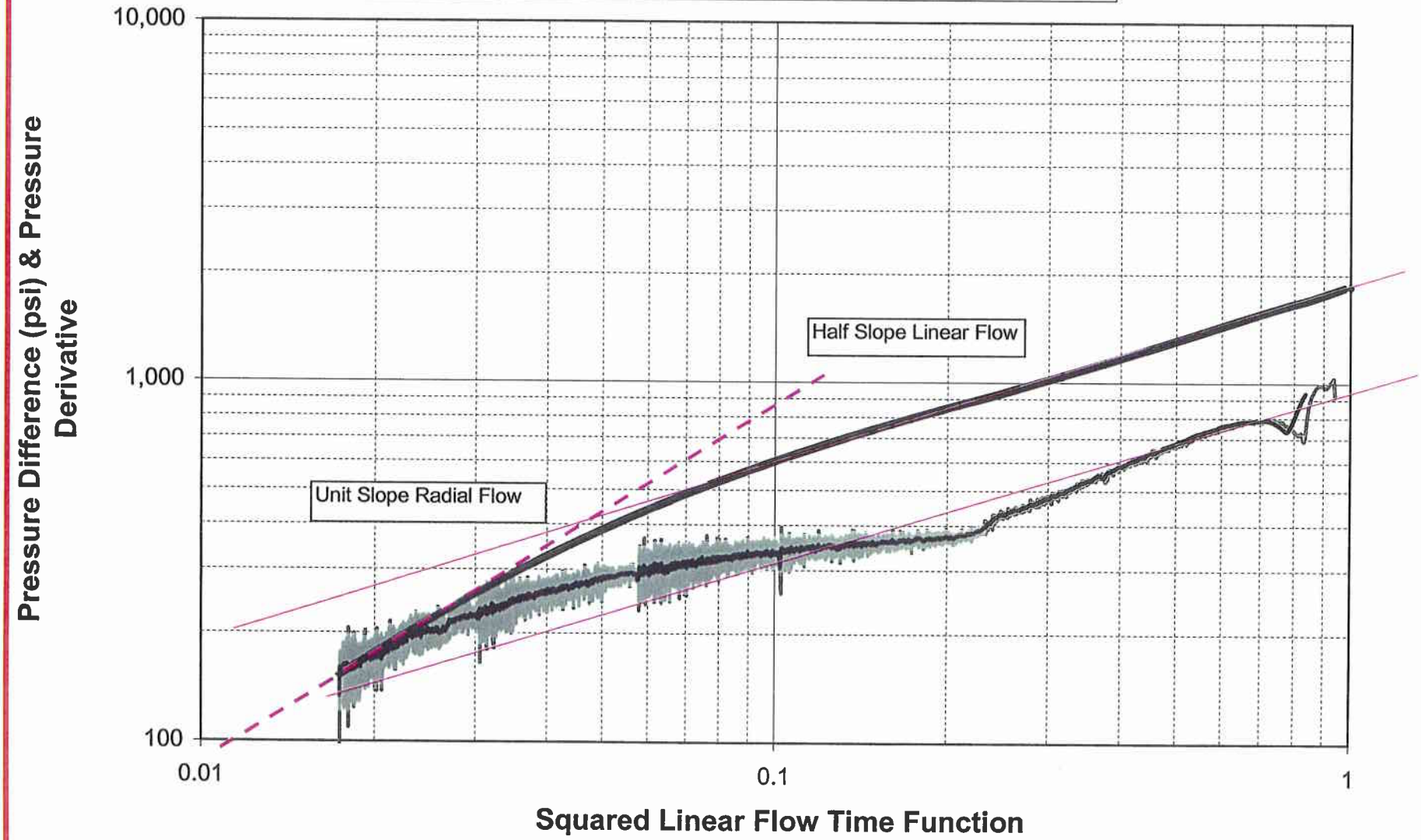
Well Data

Casing	5 1/2"
Tubing	3 1/2"
Tubing Depth	8875'
Formation	Mississippian (Carbonate)
Perforations	8936-8968' 9004-9023' 9028-9043' 9094-9109' 9115-9121' 9170-9182'
Injected Fluid	Water


Lisbon Unit B-624
Pressure Fall-Off
Bottom-hole Pressure
Bottom-hole Temperature
Pressure, psi
Temperature, F
Time, hours
4500
4000
3500
3000
2500
2000
1500
1000
500
0
180
160
140
120
100
80
60
40
20
0
0
10
20
30
40
50
60
70
80
90
100

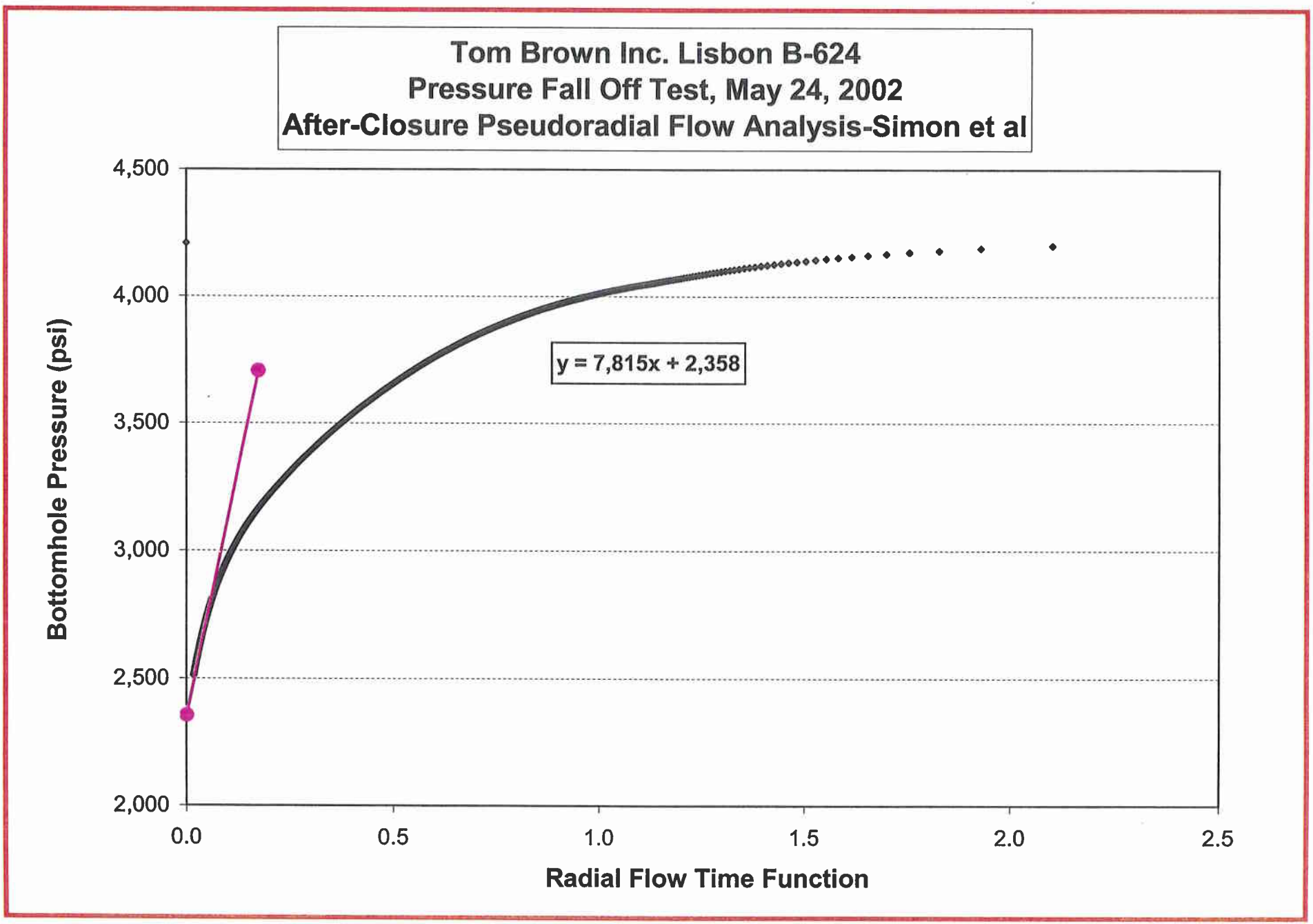

Tom Brown Inc, Lisbon B-624
Pressure Fall Off Test
After-Closure Pseudolinear Flow Analysis
y = 1,857x + 2,360
Bottomhole Pressure (psi)
6,000
4,000
2,000
0
0.0
0.2
0.4
0.6
0.8
1.0
1.2
Linear Flow Time Function

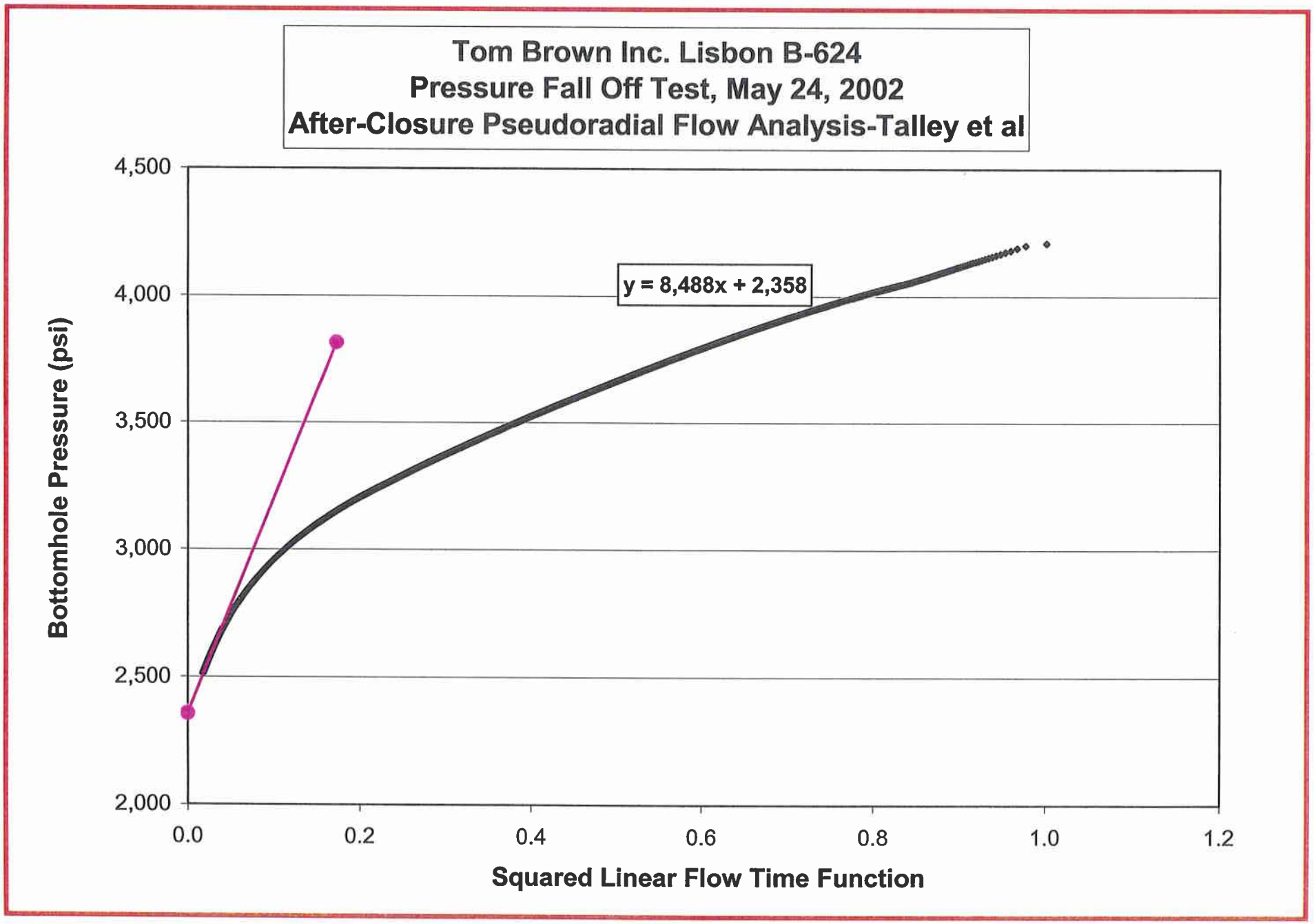
Tom Brown Inc., Lisbon B-624
Pressure Fall Off Test, May 24, 2002
After-Closure Log-Log Diagnostic Analysis Plot

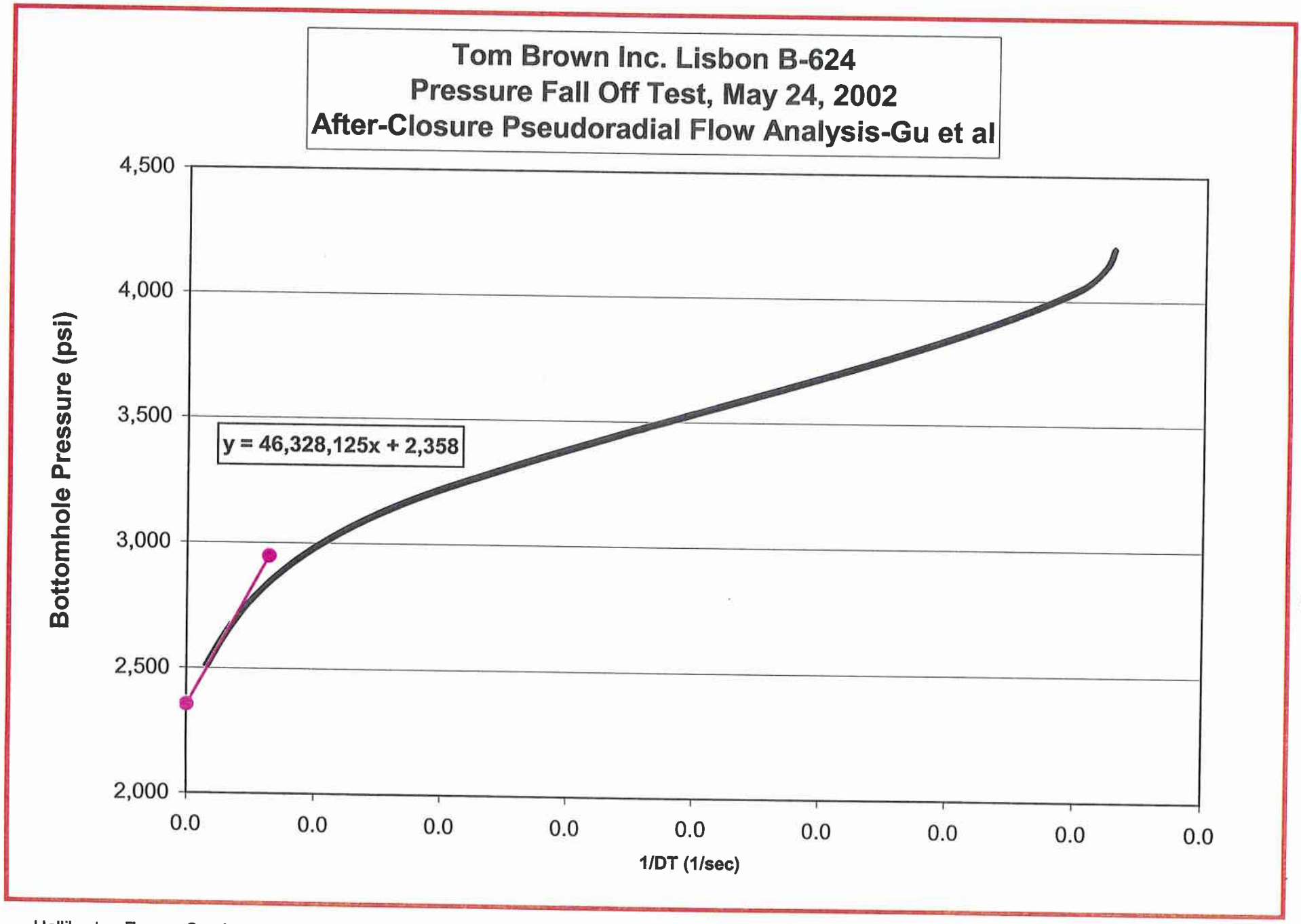


Halliburton Energy Services

9/18/2002


Tom Brown Inc. Lisbon B-624
Pressure Fall Off Test, May 24, 2002
After-Closure Pseudoradial Flow Analysis-Simon et al
y = 7,815x + 2,358
Bottomhole Pressure (psi)
4,500
4,000
3,500
3,000
2,500
2,000
0.0
0.5
1.0
1.5
2.0
2.5
Radial Flow Time Function


Tom Brown Inc. Lisbon B-624
Pressure Fall Off Test, May 24, 2002
After-Closure Pseudoradial Flow Analysis-Talley et al
y = 8,488x + 2,358
Bottomhole Pressure (psi)
4,500
4,000
3,500
3,000
2,500
2,000
0.0
0.2
0.4
0.6
0.8
1.0
1.2
Squared Linear Flow Time Function


Tom Brown Inc. Lisbon B-624
Pressure Fall Off Test, May 24, 2002
After-Closure Pseudoradial Flow Analysis-Gu et al
Bottomhole Pressure (psi)
4,500
4,000
3,500
3,000
2,500
2,000
y = 46,328,125x + 2,358
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
1/DT (1/sec)

ATTACHMENT NO. 8

STEP RATE TEST RESULTS
HALLIBURTON

TOM BROWN, INC.
LISBON UNIT B-624 APPLICATION
SULFUR RE-INJECTION CANDIDATE

Tom Brown Inc.
555 17th Street - Suite 1850
Denver, CO 80202

Lisbon B-624
S24-T30S-R24E
San Juan Co, UT

Step Rate Injection Test

Prepared for: Mr. Byron Gale

September 9, 2002

Submitted by:
Pat Kundert
Halliburton Energy Services
410 17th Street, Suite 900
Denver, CO 80202
303-260-5027

HALLIBURTON

HALLIBURTON

Well Data

Casing	5 1/2"
Tubing	3 1/2"
Tubing Depth	8875'
Formation	Mississippian
Perforations	8936-8968' 9004-9023' 9028-9043' 9094-9109' 9115-9121' 9170-9182'
Injected Fluid	Water

Discussion

Downhole pressure gauges (electronic memory recorders) were run on slickline by Cobra Slickline Corp. Tandem gauges were run to a depth of 8925 feet in the well.

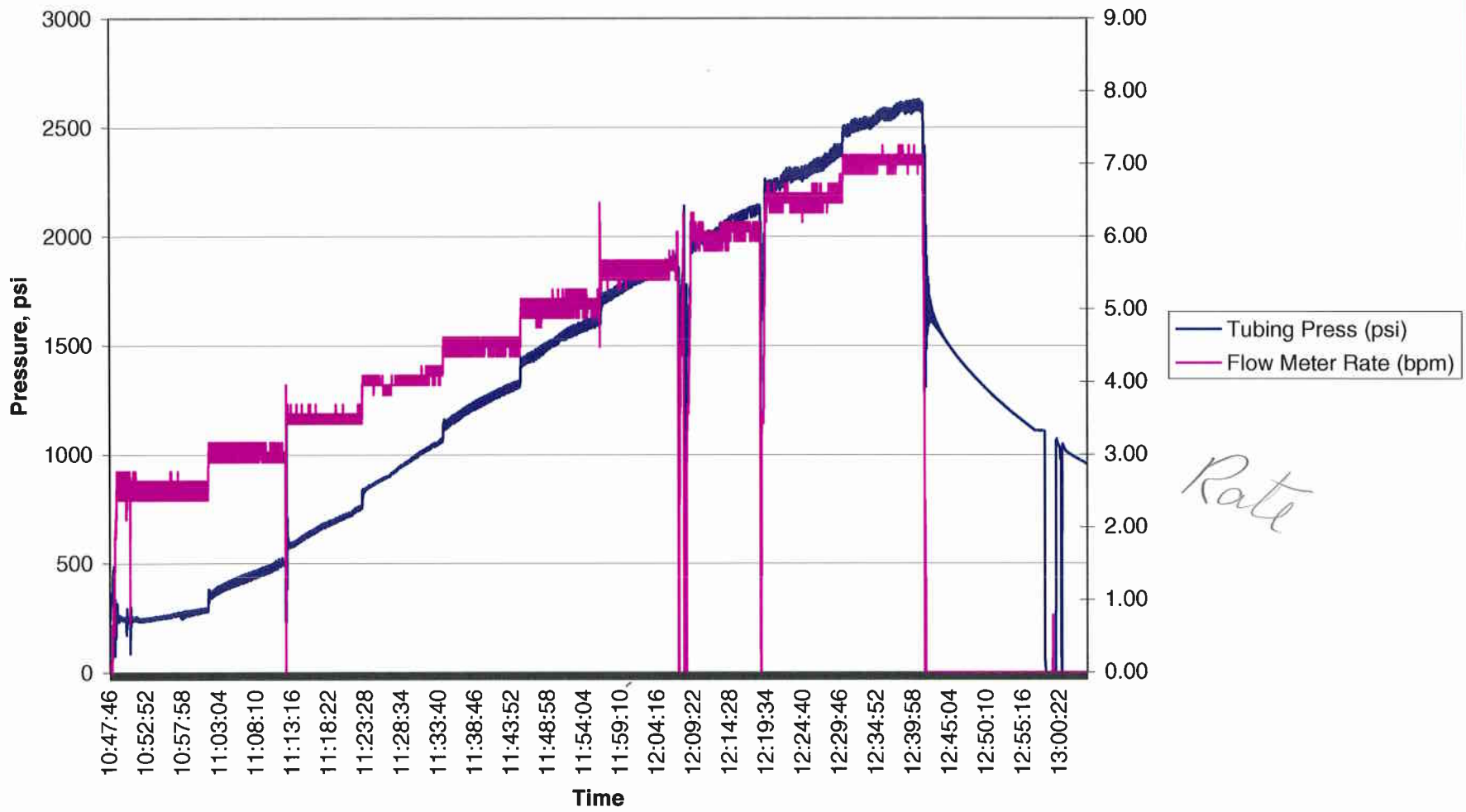
Halliburton pump truck was rigged up to the tubing. Injection with water was established at a rate of 2.5 bpm. The injection rate was increased in increments of ± 0.5 bpm up to a maximum rate of 7 bpm. Surface injection rate and tubing pressure were recorded during the injection test.

A chart was constructed (post job) of the surface injection rate and pressure with the downhole pressure from the EMR also included. The shut down of pumping was used as a time marker to align the downhole pressure with the surface pressure.

A fracture initiation chart was constructed by plotting downhole pressure versus surface injection rate. The downhole pressure was selected near the end of each injection stage prior to the change to the next higher injection rate. Based on this chart, a fracture initiation pressure of ±5300 psi was observed during the step rate test.

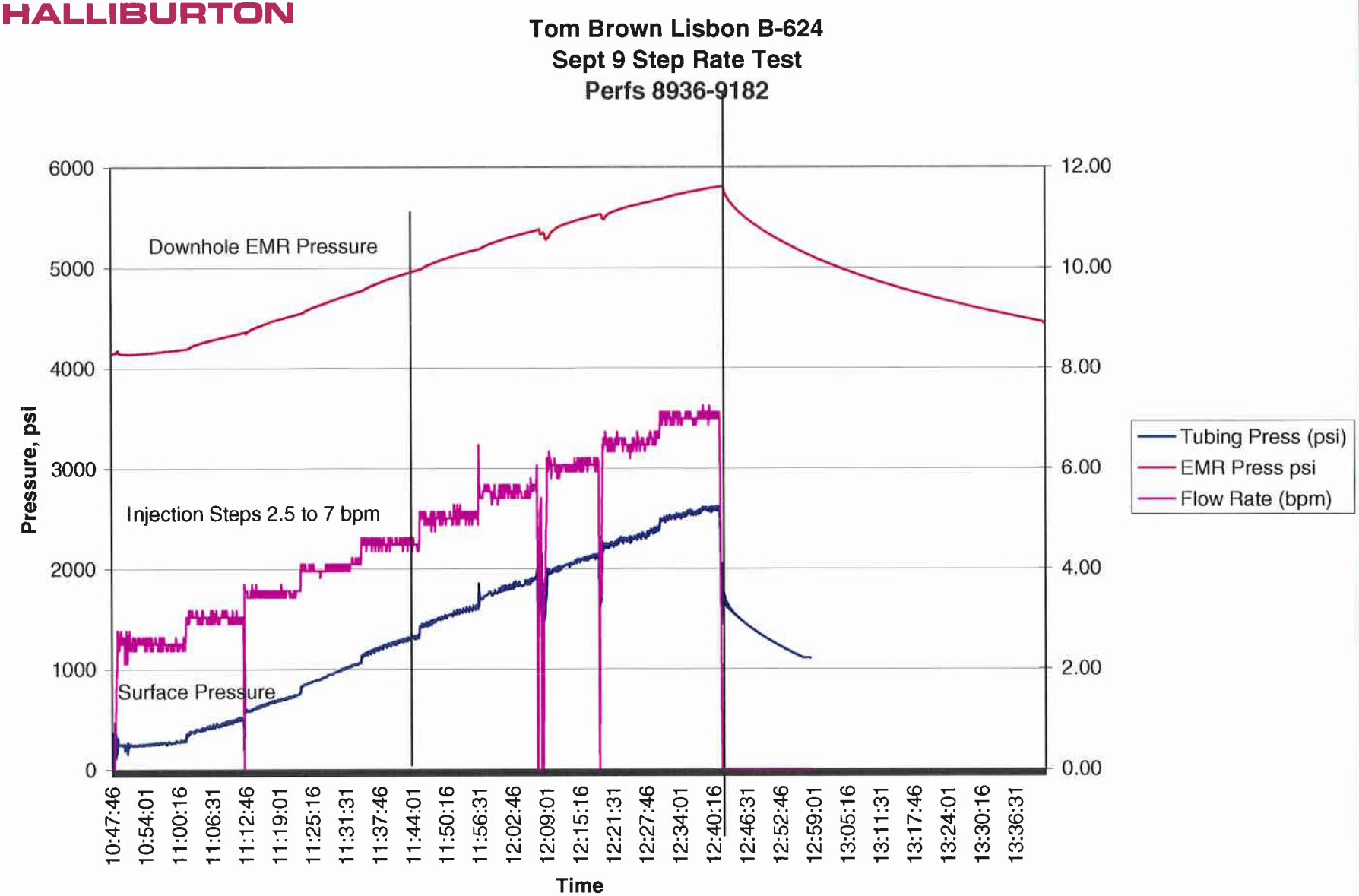
HALLIBURTON

Tom Brown Lisbon B-624
Step Rate Test 9/9/02
Perfs 8936-9182

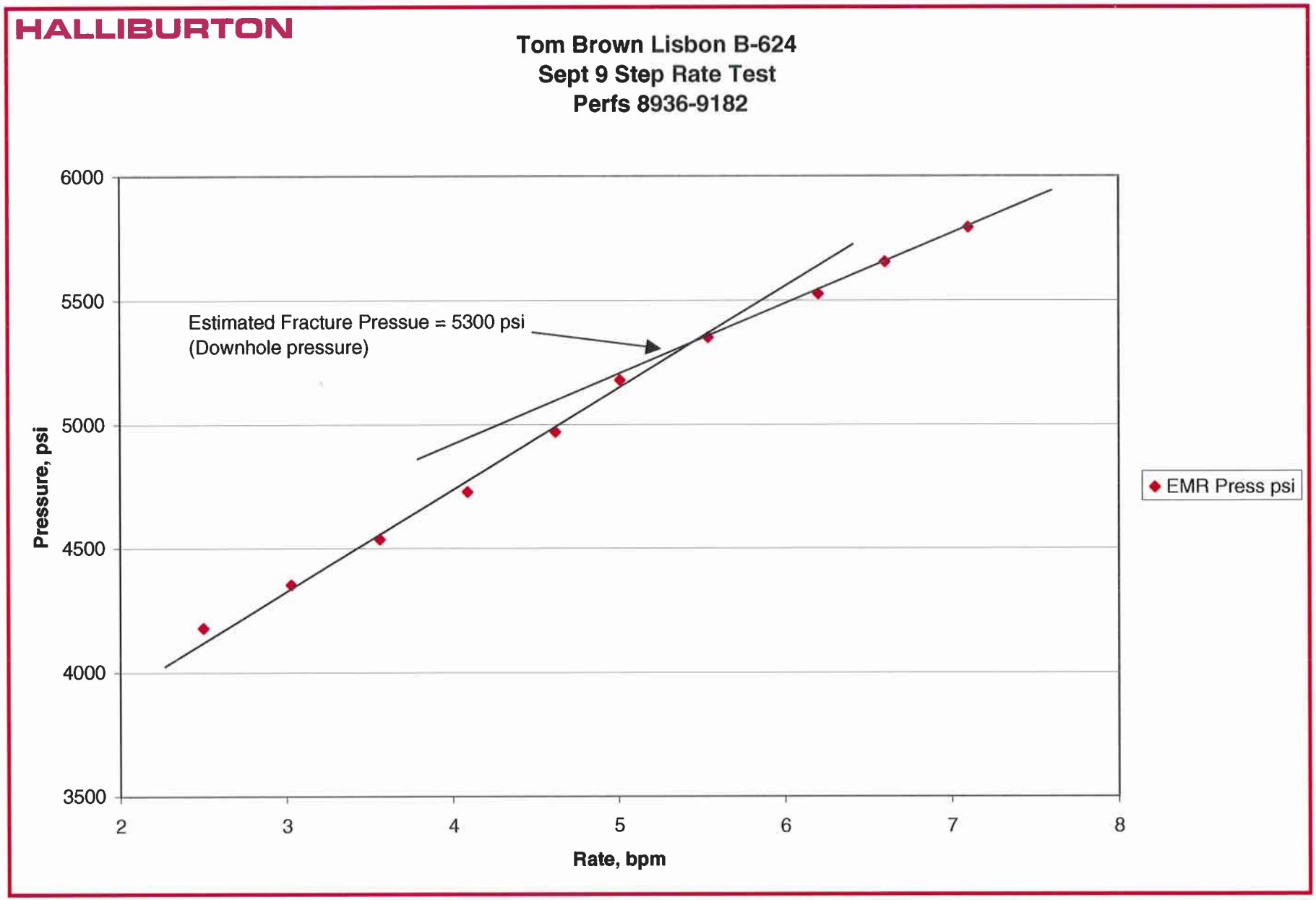


Rate

HALLIBURTON



HALLIBURTON



r. 6 gradient

ATTACHMENT NO. 9

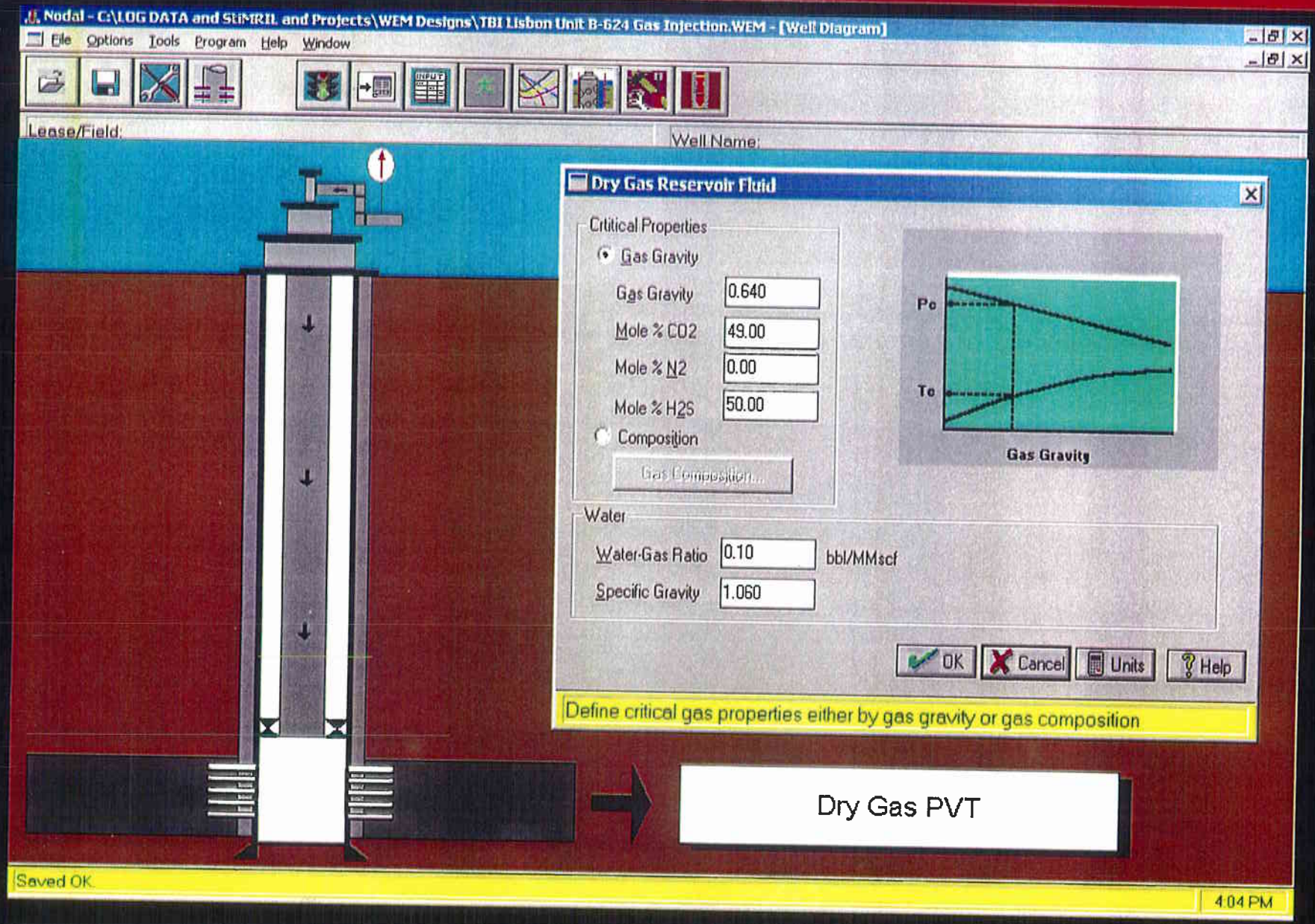
NODAL ANALYSIS
HALLIBURTON

TOM BROWN, INC.
LISBON UNIT B-624 APPLICATION
SULFUR RE-INJECTION CANDIDATE

Nodal Analysis
Lisbon Unit B-624

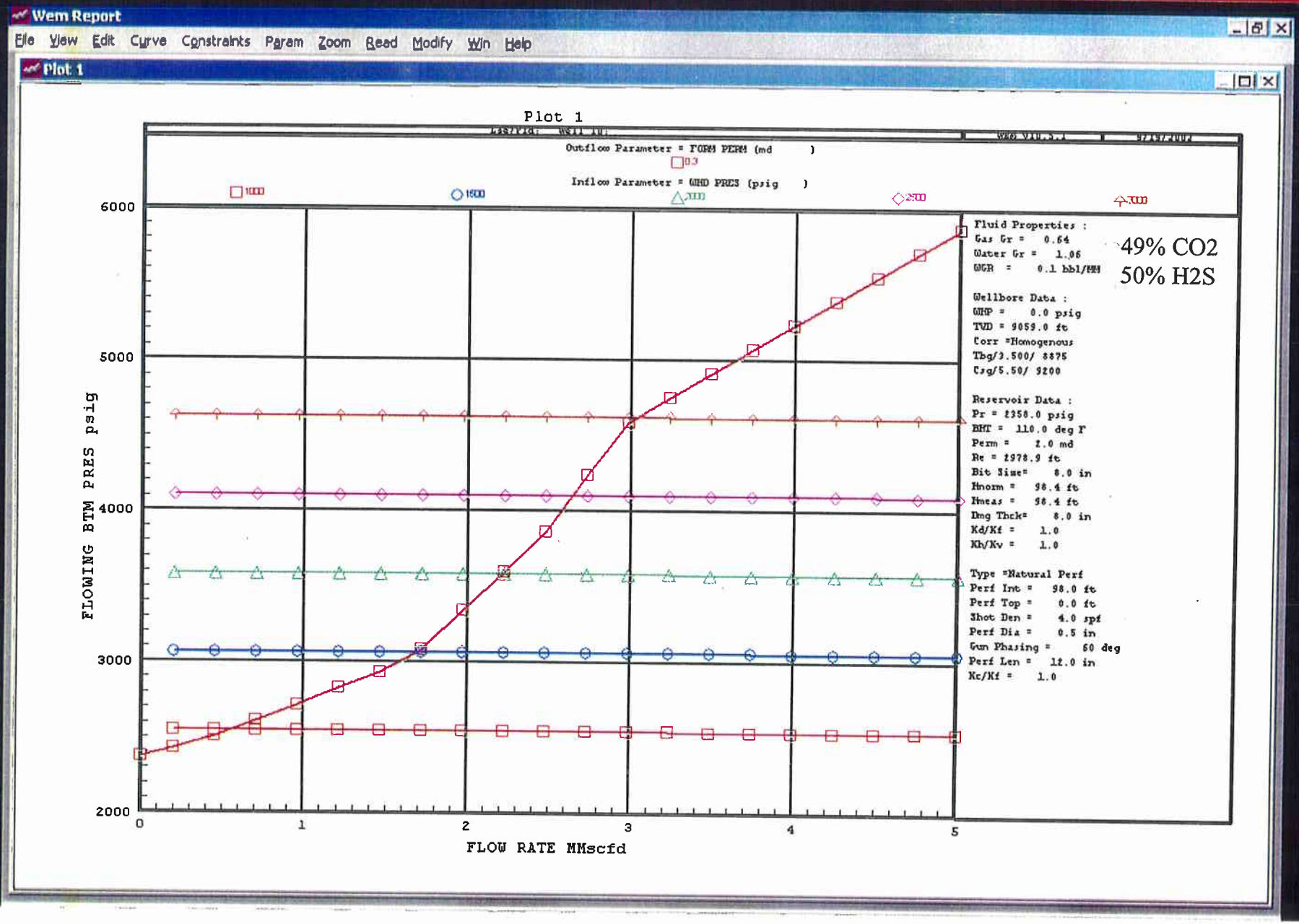
HALLIBURTON

Nodal Analysis Lisbon B-624

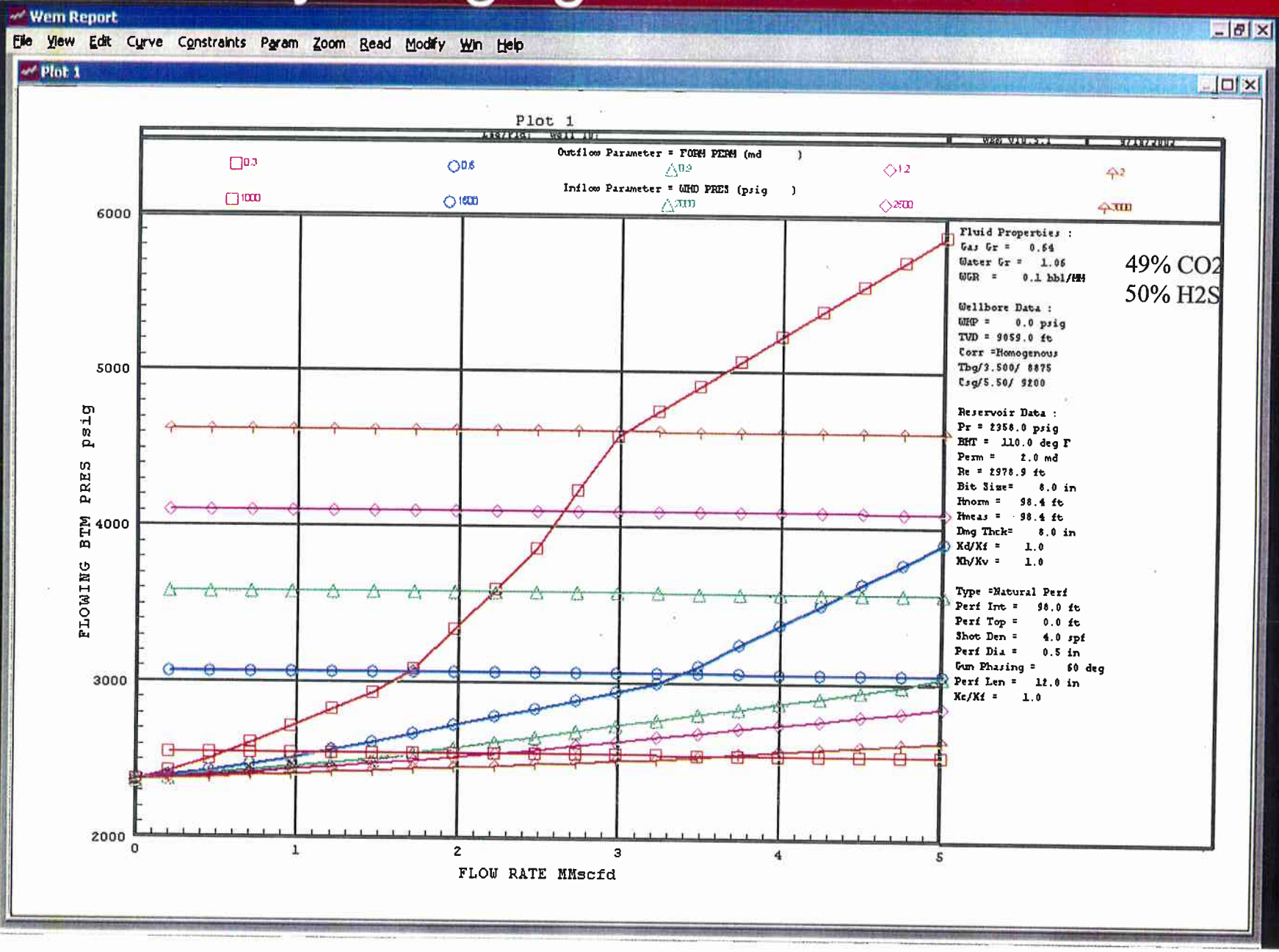


Dry Gas PVT

Nodal Analysis Lisbon B-624 Using Reservoir Permeability = .3 mD (DFIT Test)



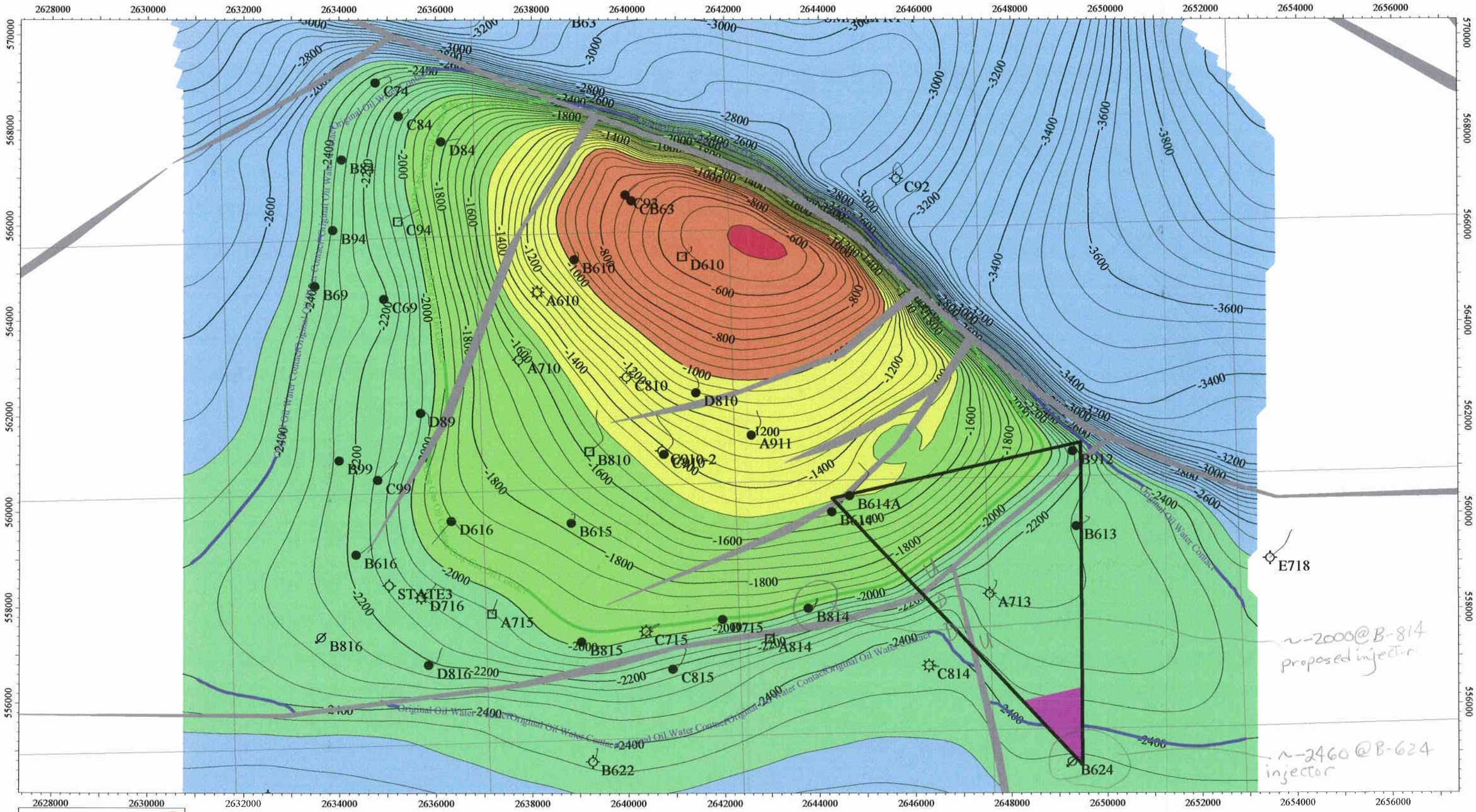
Nodal Analysis Lisbon B-624 Using Permeability Ranging from .3 – 2 mD



ATTACHMENT NO. 10

RESERVOIR VOLUMETRICS
RAY JOHNSON, TBI

TOM BROWN, INC.
LISBON UNIT B-624 APPLICATION
SULFUR RE-INJECTION CANDIDATE



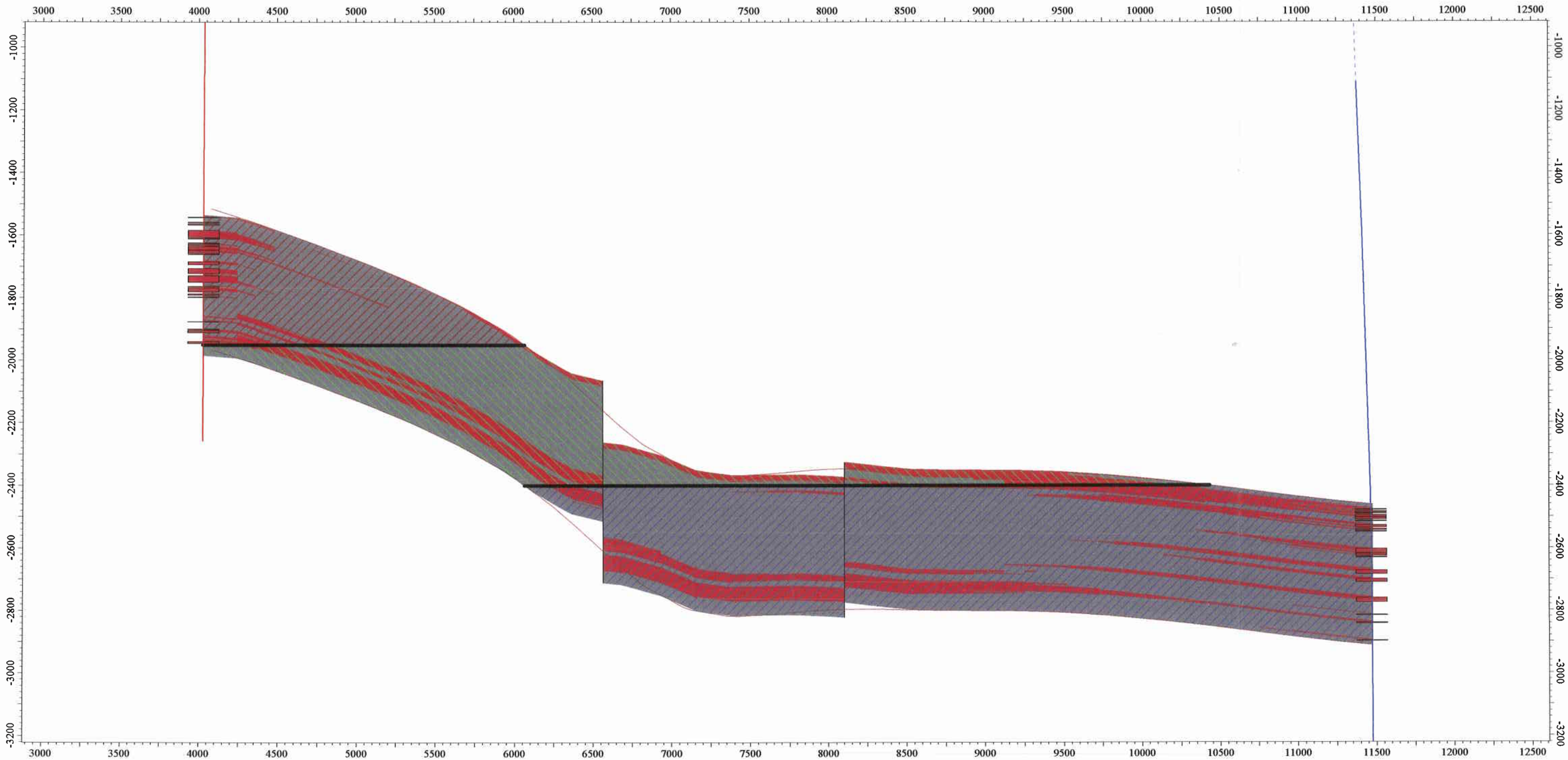
Tom Brown Inc.

Country	*Scale* 1:24000
Block	*Contour inc* 50
License	*User name* hsoetrisno
Project name Lisbon Field 2.pet	*Date* 09/19/2002
Surface name Ldvl Depth grid.xyz	*Projection* SPC UTAH 4303

0 1000 2000 3000 4000 5000ft

1:24000

PETREL



Tom Brown Inc.	
Country	*Scale* 1:7772
Block	*Contour inc*
License	*User name* hsoetrisno
Project name Lisbon Field 2.pet	*Date* 09/19/2002
Surface name Base of Leadville	*Projection* SPC UTAH 4303

Intersection Plane between B614 and B624 (NetPay Curve)

Contact Set	Original Oil Water Contact	Leadville Top	B614	Gas
Orig Gas Oil Contact	Base of Leadville	B624	Injection water	

ATTACHMENT NO. 11

ALBERTA ACID GAS INJECTION PROJECTS
P. DAVIS

TOM BROWN, INC.
LISBON UNIT B-624 APPLICATION
SULFUR RE-INJECTION CANDIDATE

ACID GAS DISPOSAL SCHEMES SURVEY : JANUARY, 2002

ACTIVE (& s/d) PROJECTS (exclusive of sour assoc./residue gas cycling schemes)

		FIELD/PLANT	OPERATOR	START-UP (approx.)	ACID GAS COMPOSITION (mole%) H2S Lic.	H2S Oper.	CO2 (balance)	ACID GAS RATE(1) ($10^3m^3/d$) Lic.	Oper.	SULFUR RATE(1) (metric t/d) Lic.	Oper.	CO2 RATE (t/d)	WHP [approx.] (MPa) Lic.	Oper.	INJECTION ZONE POOL	LITHOLOGY
		INTO DEPLETED HYDROCARBON RESERVOIR														
	1	Acheson	Chevron	Jun.89	15	10	90	6	6	1.2	0.8	10	6	3.8	Blairmore T/ Ostracod	sandstone
	2	Dunvegan	Anderson	Nov.96	41	32	53+C1,C2	5	2.80	2.8	1.2	2.8	7.1	5.8	Kiskatinaw/ Debolt	sandstone
	3	Gordondale	ANG	Feb.96	[Second injector (below) replacedthis well which had permit rescinded]										Halfway K	carbonate
	3a	Gordondale	ANG	~ Jun.98	65	65	35	60	8.5	53	7	5.5	8	4.0	Belloy	
C	4	Paddle River	Keyspan	Apr.96	10	6	94	40	15	2.7	1.2	26	7.5	3.7	Nordegg	sandstone
	5	Puskwaskua	Anderson	Nov.96	63	46	51	12	3.6	10	2.2	3.4	11	8.4	Leduc	carbonate
	6	Zama	Phillips	Apr.95	38	20	80	160	50	82	14	74	12		Keg River X2	carbonate
A	7	Jedney I (B.C.)	PC/WCGS	Dec. 96		51	~47(+C_1+)		95		66	83			Baldonell A	
	8	JedneyII (B.C.)	PC/WCGS	Jul.97		44	~44(+C_1+)		40		24	33			Baldonell A	
	8a	Bubbles (B.C.)	WCGS	Apprv'd:Jun97	[An additional injector for Jedney expansion]											
N	9	Normandville	Anderson	Jan.98	67	16	80(+C_1+)	2.8	1.30	2.5	0.3	1.9	9		D1-E	
	10	Zama (Plant 2)	NGC	~ Feb.98	30	20	75(+C_1+)	210		85			12		Keg River Z3Z	
	11	Zama (Plant 3)	NGC	1999	65	20		210 →	160	85	43	223	9		Slave Point K	
A	12	Bellshill Lake	PC	~ May98				(v. small volumes)							Blairmore	
		INTO WATER SATURATED ZONE														
	13	Clear Hills(Boundary Lake)	ANG	Jun.95	70		30	21	< 14	7.4		19	10	5	Belloy	sandstone
D	s/d	Consort	PCP	Dec.95	0.4		8.4						7.6		Leduc	carbonate
	14	Mulligen (Fourth Creek)	Duke	May-96	25		75	21		7.1		29	14.2	6	Belloy	sandstone
	15	Galahad	Renaissance	Feb.94	20		80	30		8.1		45	9		Leduc	carbonate
A	16	Pembina	Chevron	Nov.94	76		30	30		31		17	12	7.4	Wabamum	carbonate
	17	Provost (Cadogan)	NGC	Sept.94	30		91	24		10		41	10		Keg River	carbonate
	18	Watelet	ATCO Midstr	Jan.97	11	10	70(+C_1+)	15	13	2.2	1.8	17	10		Cooking Lake	carbonate
	19	Wayne-Rosedale	PCP	Dec.95	20	20	80	28	15	7.6	4.1	22	10	5.8	Leduc	carbonate
	20	Beatty Lake	Paramount	Spring97	25		75	75		25		105	9.5		Keg River	
	21	Mitsue (Slave Lake)	Chevron	Spring97	2			5.5		0.1		10	3.75		Wabamum	
	22	Caribou (B.C.)	NGC	Apr.97		~50	~50	~69	28	~47	~19	26				
	23	Ring (B.C.)	Canadian Hunter	Apprv'd:Jan98	80	~80	~20	~22.5		~24		8.4			Debolt	
	24	Redwater	Redwater Disposal	Feb.98	32		68	(v. small volumes)							D-3	
	25	Leduc-Woodbend	Probe	.98	56		43	58		44		46	9		Ellerslie	
	26	W. Stoddart (B.C.)	TCM	Dec.98	~85	85	15	~391	280	~450	323	78			Halfway (2 injectors)	
	27	Dizzy	Gulf	1999	65			42		37		27	7		Keg River	
	28	Golden Spike	Atco	1999	50			33.8		23		31	10		BHL	
	29	Kelsey	Thunder	1999	25			11		3.7		15	9.8		Wabamun	
		MIXED AT SURFACE WITH WATER														
	s/d	Hansman Lake (David)	PCP	Feb.95	30		70						7.5		Cummings I	
	s/d	Mirage	Summit	Dec.95	68	68	24	4.2	3.2					12.3	Halfway B	
	30	Provost (Thompson Lake	PCP	Mar.95	20	18	77	35	30	9.5	7.3	43	8	6	Leduc	carbonate
		NEW PROJECTS(2)														
	31	Pouce Coupe	Duke	1999	70			42					9		Belloy	
	32	Pembina	Northrock	2000	35			16					10.5		Wabamun	
	33	Marlowe	Bearspaw	2000	64			26.3					7.6		Keg River	
	34	Pembina	Chevron	2000	20			34					13		Wabamun	
	35	Eaglesham(West Culp?)	Anderson	2000	80			18.3					12		NorthD 1-N	
	36	Pembina	Burlington	2000	55			28					10.5		Wabamun	
		Approximate Totals (Canada) (3)								820		1042				
		TEXAS														
	s/d	Ozona	UPRC	Sept.96		40	60									
U	1	Garza(Cedar Hill Plant)	Davis	Jan. 92												
	2	Sandhills	Dynegy	00											Ellenberger	
	3	Dumas Plant	GPM	00		27	71.5	12.7					4.24		Granite Wash	
		Note: 11 other wells in Texas referred to as "disposal into productive formation" with injectate permitted to contain H_2S.														
S		**WYOMING**														
	1	Highland (prod. zone)	K&N Energy	Jan. 86		85	N_2,$C_{1,2}$,CO_2		9.9		11	1.8		3	*Phosphoria*	carbonate
	2	Muskrat (deplt' res.)	Wold Oil	.91		82	18		2.0		2.2	0.7		2	1st Frontier	sandstone
A	3	Big Sand Draw (deplt'd res.	Wold Oil	Early .93		78	20 (+C_1)		1.4					2	Alcova	limestone
	4	Garland (w/ H_2O @ surface)*	Marathon Oil	.94		40	60		8.5		4.6	9.5			Madison	carbonate
	5	Salt Creek (non-prod.zone	Amoco	.95		10	90		2.8		0.4	4.7			Sundance	
	6	Beaver Creek (deplt'd res.	Amoco	Mar.95		86	14		21					<<	Phosphoria	carbonate
	7	Brady (deplt'd res.)	UPRC	Mar.98		15	85		311		63	492		12	Nugget (2 injectors)	
	8	Manderson (deplt'd res.)	KCS Mountain Res	Jan. 98		95	5		20		26	1.9		7	Curtis & CM	carbonate
	9	Golden Eagle	KCS Mountain Res	1998											Phosphoria	
	10	Grass Creek	Marathon Oil	1998											Embar	
		* Into producing zone but below oil/water contact														
		OTHER USA (4)														
	1	Eddy Co., New Mexico	Marathon	1997		50	50									
	2	Traverse City, Michigan	Shell Northeast	1997		40	60									
	3	Oklahoma	Marathon	1998		25	5									
	4	Grasslands, N. Dakota	Bear Paw	2002		60-70	30-40		~50-75		40			8		sandstone

(1) Every effort has been made to ensure that the information in the above table was accurate at the time it initially became available. In many instances ownership and operating conditions have changed with time. Therefore, all information, including acid gas rates and/or S8 rates (which may be calculated from one or the other based on information supplied by regulatory authorities or operating companies) and start-up dates, should be considered as approximations only.

(2) Type of target formation not reported

(3) Approximate totals derived from sum of available operating data and where none is available, the design or permitted amounts. Contribution from "new projects" not included.

(4) Information not confirmed with operator. Acid gas mixed at surface with water.

ATTACHMENT NO. 12

WYOMING GAS DISPOSAL WELLS
WOGCC

TOM BROWN, INC.
LISBON UNIT B-624 APPLICATION
SULFUR RE-INJECTION CANDIDATE

2001 GAS DISPOSAL WELLS

FIELD	COUNTY	WELL NAME	LOCATION	INJECTED FORMATION	APPROVAL DATE	OPERATOR
BEAVER CREEK	FREMONT	# 60	SWNE 14-T33N-R96W	PHOSPHORIA	1994-PR	DEVON SFS OPERATING INC.
BEAVER CREEK	FREMONT	# 100	NWSW 13-T33N-R96W	PHOSPHORIA	1994	DEVON SFS OPERATING INC.
BEAVER CREEK	FREMONT	#135	NESW 14-T33N-R96W	PHOSPHORIA	2002	DEVON SFS OPERATING INC.
BIG SAND DRAW	FREMONT	# 32	NWSE 10-T32N-R95W	CHUGWATER	1992	WOLD OIL PROPERTIES INC.
BRADY	SWEETWATER	# 5	NWNW 11-Tl6N-RlOlW	ENTRADA-NUGGET	1997-TA	RME PETROLEUM COMPANY
BRADY	SWEETWATER	#8	NWSE 2-Tl6N-101W	ENTRADA-NUGGET	1997-TA	RME PETROLEUM COMPANY
BURNT WAGON	NATRONA	#11-19	NENW 19-32N-84W	2ND FRONTIER	2000	CARL D. UNDERWOOD OIL & GAS
FRISBY SOUTH	WASHAKIE	# 14-Al TENNECO	SESE 14-T47N-R92W	PHOSPHORIA	1985	HILAND PARTNERS LLC
FRISBY SOUTH	WASHAKIE	# 14-2A TENNECO	SESW 14-T47N-R92W	PHOSPHORIA	1996-PA	GRACE PETROLEUM CORP
FRISBY SOUTH	WASHAKIE	# 23-1 BRENT FEDERAL	NENE 23-T47N-R92W	PHOSPHORIA	1997-SI	HILAND PARTNERS LLC
FRISBY SOUTH - RATTLESNAKE	WASHAKIE	2 LACOY FEDERAL	NWSW 13-T47N-R92W	PHOSPHORIA	1996-PA	TENNECO OIL CO
GARLAND	BIG HORN	VARIOUS WELLS	T56N-R97W	MADISON	1994	MARATHON OIL COMPANY
GOLDEN EAGLE	HOT SPRINGS	#8 GOLDEN EAGLE UNIT	NENW 12-T45N-R97W	PHOSPHORIA	1998	KCS MOUNTAIN RESOURCES, INC.
GRASS CREEK	HOT SPRINGS	1 L. U. SHEEP	SNW 20-T26N-R98W	EMBAR-TENSLEEP	1998	MARATHON OIL COMPANY
HAMILTON DOME	HOT SPRINGS	90 M PLACER	NE SE 14-44N-98W	MADISON	2000-PS	MERIT ENERGY CORPORATION
HAMILTON DOME	HOT SPRINGS	U-76-13-P	NW SW 13-44N-98W	MADISON	2000	MERIT ENERGY CORPORATION
MANDERSON	BIG HORN	#43-19P	NESW 19-T50N-R92W	PHOSPHORIA	1996-SI	KCS MOUNTAIN RESOURCES, INC.
MANDERSON	BIG HORN	#32-19II	SWNE 19-T50N-R92W	CROW MOUNTAIN & CURTIS	1997-TA	KCS MOUNTAIN RESOURCES, INC.
MANDERSON	BIG HORN	#32-19II	SWNE 19-T50N-R92W	TENSLEEP-CURTIS & CROW MOUNTAIN	1997	KCS MOUNTAIN RESOURCES, INC.
MANDERSON	BIG HORN	#24-20P	SESW 20-T50N-R92W	PHOSPHORIA	1997-SI	KCS MOUNTAIN RESOURCES, INC.

MUSKRAT	FREMONT	#A-U UNIT	SW 34-T34N-R92W	1ST FRONTIER	1986-PA	WOLD OIL PROPERTIES, INC.
MUSKRAT	FREMONT	#3-1 FEDERAL	SWNW 3-T33N-R92W	1ST FRONTIER	1992	WOLD OIL PROPERTIES, INC.
PRETTY WATER CREEK	SWEETWATER	1 CAPITOL GOV'T	NENW 11-T15N-R104W	WEBER	2001	IBEX RESOURCES OPERATING INC
SALT CREEK	NATRONA	#6WC2-SW2	NWSW 2-T39N-R79W	SUNDANCE	1993	HOWELL PETROLEUM COMPANY

ATTACHMENT NO. 13

SPE PAPER 35585
SULFUR DISPOSAL BY ACID GAS INJECTION
E. WICHERT, ET AL

TOM BROWN, INC.
LISBON UNIT B-624 APPLICATION
SULFUR RE-INJECTION CANDIDATE

SPE 35585

Sulfur Disposal by Acid Gas Injection

E. Wichert, Gascan Resources Ltd., and T. Royan, Tartan Engineering Corp. Ltd.

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Abstract

When sour natural gases are sweetened with a regenerative solvent, the extracted acid gases H_2S and CO_2 have to be further handled to dispose of the sulfur in the H_2S. The sulfur can be recovered by various processes, which are generally quite expensive. For disposal of small rates of sulfur in the form of H_2S, compression of the acid gas stream and injection into an underground zone may be a suitable option. This paper discusses the unique properties of acid gases upon compression and cooling, and the problems that arise in the handling of high pressure acid gas mixtures saturated with water. Methods of overcoming the problems are also reviewed. Process and metallurgical choices are discussed and opportunities for research to minimize costs in acid gas compression and injection are presented.

Introduction

Sour natural gas contains hydrogen sulfide (H_2S), which has to be removed to meet specifications for sales gas. Sour natural gas also contains carbon dioxide (CO_2). The removal of H_2S and CO_2, usually called acid gases, from sour natural gas is accomplished by means of a regenerative solvent. There are several amine solvents used for this purpose. Upon regeneration of the solvent, the acid gases are liberated, and are usually sent to a modified Claus plant, where most of the H_2S is converted to elemental sulfur. The acid gas stream to the modified Claus plant consists of H_2S, CO_2, water vapor and minor amounts of hydrocarbon gas. When the concentration of CO_2 is considerably greater than the concentration of H_2S in the acid gas mixture, the Claus plant has difficulty in achieving a high sulfur recovery. If the total sulfur rate is small, say less than 5 tonnes/day (t/d), it may be more economical to recover the sulfur by some other process. Such other processes, however, have many drawbacks of their own.

An alternative to recovering sulfur on a small scale is to compress and inject the acid gases into a suitable underground zone, in a manner similar to the disposal of produced water. This is environmentally desireable as it eliminates the emission of sulfur compounds and CO_2 to the atmosphere.

This paper discusses the technical considerations for acid gas compression and injection into an underground zone.

Properties of H_2S and CO_2

Upon removal of the acid gases H_2S and CO_2 from the sour gas, an acid gas mixture is obtained at low pressure that may also contain about 1 % to 3 % hydrocarbon gases, and which is saturated with water vapor. This is the mixture that is compressed through 4 stages of compression, from about 100 kPa (ga) to around 8 to 10 MPa for underground disposal. In this process water condenses, creating the potential for corrosion and hydrate formation. In addition, at such final compressor discharge pressures, the acid gas becomes a liquid or a dense phase when cooled to ambient temperatures.

While experimental results of studies of the physical properties of acid gas mixtures without hydrocarbon components have not been published in the technical literature, the properties of pure CO_2 and H_2S have been examined and reported.[1,2] Additionally, the properties of each of the acid gases have also been studied in the presence of water at elevated pressures and temperatures.[3,4,5,6] These results can be used as a guide to indicate how the mixed acid gas streams would behave under the conditions of pressure and temperature when compressed to the injection pressure level. A brief review of the properties of the pure acid gases and the CO_2-water and H_2S-water binaries is therefore appropriate.

Vapor/Liquid Properties of Pure Compounds. In their pure state, CO_2 and H_2S exhibit the normal vapor/liquid behavior with pressure and temperature, as indicated in Figure 1. On the right

side of each line, the compound is in the vapor phase, and at the pressures and temperatures to the left of each line each respective compound exists as a liquid. At the pressures and temperatures on the lines, the pure compounds exist as liquid and vapor. Methane (CH_4) also exhibits this behaviour, but at much lower temperatures, as shown in Figure 1 also. From this it can be seen that CO_2 and H_2S can readily be liquefied at elevated pressures and at relatively high temperatures, whereas CH_4 can be liquefied only at very low temperatures. Mixtures of the acid gases are also readily liquefied at elevated pressures, but not mixtures containing substantial amounts of CH_4 in their makeup.

The lines in Figure 1 terminate at the upper end at the critical temperature and pressure for each of the compounds. Above the critical points, the compounds exist in a dense phase.

CO_2-Water and H_2S-Water Mixtures. When a mixture of CO_2 or H_2S and water is subjected to elevated pressures, another phase, namely a solid hydrate phase, is formed under certain conditions of temperature and at elevated pressures. The hydrate forming conditions of pressure and temperature are illustrated in Figure 1 as dashed lines for each of these compounds. At temperatures to the left of the dashed lines, solid hydrates will exist if liquid water is present. Two-phase combinations of solid-liquid, liquid-liquid, solid-vapor and liquid-vapor phases of water/hydrate-acid gas can exist at various temperature and pressure ranges, as shown in Figure 1.

As can be seen from Figure 1, hydrates can form at elevated pressures and at fairly high temperatures with H_2S, and at somewhat lower temperatures with CO_2. These pressures and temperatures are usually encountered in acid gas injection processes. The hydrate pressure-temperature line for CH_4 is not shown in Figure 1, as it is close to the hydrate line for CO_2.

Water of Saturation for CO_2 and H_2S. While Figure 1 shows the vapour/liquid/hydrate ranges of pressure and temperature for CO_2 and H_2S, the next figure illustrates the water of saturation of the pure compounds. The first line in Figure 2 shows the water content at saturation at 37.8 °C (100 °F) for H_2S, and the other four lines show the water content at saturation for CO_2 under various conditions.

As shown in Figure 2, the ability of the pure compounds to hold water in the vapor phase is reduced as the pressure increases at the temperature illustrated, up to about 2.7 MPa for H_2S and up to about 6 MPa for CO_2. When pressures are raised above these levels,the acid gases enter into the liquid or dense phase, and their capacity to hold water in solution increases substantially. Both compounds have a higher water absorption capacity in the liquid phase or dense phase as compared with their vapor phases. A small amount of methane reduces the water holding ability of CO_2 at elevated pressure, as shown on Line 5 in Figure 2, for example.

Other water content data at various temperatures and pressures for CO_2 and H_2S are illustrated in Figures 20-4 to 20-7 of the GPSA Engineering Data Book, on page 20-5 of the 1994 edition.

As can be seen from the above discussion, the behaviour of CO_2 and H_2S in combination with water at high pressures and at temperatures within process operating conditions can result in hydrate formation, liquid phases of the compounds, and large variations in the amount of absorbed water. Similar experimental data for mixtures of acid gases and water are not available in the published literature.

Acid Gas Mixtures

It is well known in the natural gas industry that raw sour natural gas mixtures present increased problems as compared to sweet natural gas in mainly two areas: increased potential for corrosion and increased propensity for the formation of hydrates at elevated pressures. It is therefore assumed that acid gases with little or no hydrocarbon content will further exacerbate these two problems. In actual fact, this may not be the case.

Problem of Corrosion. Corrosion of low alloy steel by sour gas occurs mainly in the presence of a liquid aqueous phase. The corrosion manifests itself as general metal loss corrosion or pitting corrosion. When this occurs, atomic hydrogen is generated, which has the ability to penetrate steel. This can lead to hydrogen induced cracking, blistering or sulfide stress cracking, which can result in sudden failures of the confining pipes or vessels. By following the NACE MR0175 standard in materials selection and adhering to recommended construction practices, such failures can usually be avoided. When sour gas is dehydrated, corrosion by H_2S or CO_2 is effectively eliminated. Similarly, the potential for corrosion by acid gas can also be controlled by dehydration.

Problem of Hydrates. The hydrate forming temperature at any pressure of a sour natural gas increases with increasing content of H_2S.[7] The opposite is the case with CO_2. For sour natural gases with low concentrations of H_2S, the concentration of CO_2 is usually much greater than the concentration of H_2S. Thus the acid gas mixture, upon extraction from the sour gas, would be mainly CO_2. Figure 3 shows the hydrate forming temperature for acid gas mixtures containing various H_2S concentrations, with the balance being 1 mol % methane and the rest CO_2. As can be seen, the hydrate temperatures at H_2S contents below 5 % are no higher than what would be the case for sweet natural gas. Hydrates of course will not occur if the gas has no liquid water phase. Figure 3 was generated by HYSIM™ [8], with the Peng-Robinson equation-of-state.

Vapor/Liquid Phase Behaviour. Any gas can be liquefied if it is sufficiently cooled. The vapor/liquid relationships for the pure acid gases are shown in Figure 1. When the acid gases exist in mixtures, a two-phase region is established between the lines shown in Figure 1. Such two-phase envelopes are shown in Figure 4, generated by HYSIM™, for three mixtures containing different concentrations of CH_4, H_2S and CO_2. As can be seen, at low CH_4 content the two-phase envelopes have a very narrow temperature range, and also the mixtures will exist in the liquid phase if the temperature is below 20 °C at a pressure of 6000 kPa or higher. This means that acid gas mixtures at elevated pressures are readily liquefied by cooling to ambient temperatures. If the acid gas mixture contains considerable amounts of light hydrocarbon gas, then the two-phase envelope for the mixture becomes wider in

temperature, as illustrated in Figure 4 by the mixture which contains 10 % CH_4 and 45 % each of H_2S and CO_2. To completely liquefy such mixtures requires somewhat lower temperatures. If an acid gas mixture is ultimately to be liquefied upon compression and aerial cooling, then the sour gas treating plant must be designed and operated to minimize the hydrocarbon gas content of the acid gas mixture. The design should include a rich solution flash tank, and this vessel should be operated at a low pressure so that most of the dissolved hydrocarbon gas can be liberated. The solvent should be operated at the upper range of solvent concentration, and solution circulation should be such that the mole loadings (moles of acid gas picked up in the contactor per mole of solvent circulated) are also at the upper range of the recommended loadings.

Water Vapor Content. A high hydrocarbon content also adversely influences the water carrying capacity of the acid gas mixtures at high pressures. The equilibrium water vapor content of natural gas decreases with increasing pressure at constant temperature. Similarly, in their pure state, both H_2S and CO_2 hold less water in the vapor phase as the pressure is increased, as discussed above and illustrated in Figure 2. However, in the liquid or dense phases of H_2S and CO_2, the water of saturation increases substantially with increasing pressure at a given temperature, due to the molecular attraction between these polar compounds.

It is reasonable to assume that the behaviour of mixtures of H_2S and CO_2 would be similar to their behaviour in the pure states. If this assumption is correct, then the acid gas mixtures without hydrocarbon content will also show a minimum water content at a pressure of about 3000 to 5000 kPa, depending on the relative amounts of H_2S and CO_2 in the mixtures. Thus by separating the condensed water in this pressure range and at a temperature a few degrees above the hydrate temperature as shown in Figure 3, no free water should be present upon compressing the acid gases to substantially higher pressures and cooling to ambient temperatures. At such elevated pressures, the acid gas mixture would be in the liquid phase or the dense phase at normal injection line temperatures. This means that there may not be any need to dehydrate the acid gas mixture, as no liquid water phase would form after the final stage of compression and upon cooling to ambient temperatures. Without liquid water present, no hydrates would occur in the liquid phase of the acid gas mixture, and corrosion would be at a minimum. This aspect of acid gas mixtures and water should be researched to develop the necessary data for optimizing the design and operating conditions for acid gas compression and injection systems.

Disposal Zone

Most porous zones in the western Canada sedimentary basin contain water, and at depths greater than 1000 m, the water is salt water, of no value. It therefore should not be difficult to identify a zone that would be suitable for acid gas disposal. The operating company would have to own the rights to the zone, so that it could best judge whether injection of acid gas into the zone would be suitable. Acid gas injection into any zone is subject to the approval of the Energy and Utilities Board (EUB) in Alberta, and the respective government regulatory agencies in the other provinces.

Acid Gas Compression and Dehydration

The acid gas is liberated from the sweetening solvent in the regenerator tower, and this overhead vapor stream is then cooled. Most of the water and solvent is condensed in the cooler, and the two-phase mixture flows to the reflux drum, where the condensed liquids are separated and returned to the regenerator column as reflux. The vapor stream leaving the reflux drum contains the acid gases, H_2S and CO_2, a small percentage of hydrocarbon gas and some water vapor. The pressure of this gaseous mixture is generally in the order of 80 to 100 kPa (ga), and at a temperature between 20 °C in winter and up to 40 °C in summer. In Alberta, this is the stream that would normally be sent to a flare stack if the sulfur rate is less that 1 t/d, or be sent to a sulfur recovery unit if the sulfur rate is 1 t/d or greater. If the acid gas contains more than say 60 % CO_2, which is usually the case with small amounts of H_2S in the sour natural gas, then a modified Claus plant may not be the best choice for small scale sulfur recovery, and instead a redox unit could be selected to convert the H_2S to sulfur. However, redox processes are expensive to install, difficult to operate, and the resulting sulfur product does not meet the sulfur sales specifications. In such situations, the best solution may be to compress the acid gas stream for disposal into an underground formation. A well designed acid gas compression and injection facility will have great flexibility in rate, and will be independent of fluctuations in the H_2S cocentration.

Compressor Discharge Pressure. The ultimate pressure to which the acid gas has to be compressed depends on the pressure of the reservoir, the permeability of the zone, and the depth of the zone. If the acid gas mixture is compressed to about 6000 kPa and cooled below 20 °C, the mixture will be in the liquid phase, provided the methane content is not greater than 1 % or 2 %. An acid gas mixture in the liquid phase at such conditions will have a density of about 70 % to 80 % of the density of water. Thus the injection pressure into the reservoir will be aided by the density of the acid gas stream in the liquid state. Many zones have a pressure near the hydrostatic head of water. Thus the wellhead injection pressure would generally only be in the order of 6000 to 9000 kPa, and would depend largely on the injectivity of the reservoir as well as reservoir pressure and depth. The pressure of 6000 to 9000 kPa can be achieved by a four-stage compressor.

Table 1 shows the typical operating pressures for a four-stage compressor at a compression ratio of 3 between stages, and Figure 5 presents the variation in temperature between stages for an acid gas mixture containing 1 % CH_4, 49 % CO_2 and 50 % H_2S. The hydrate temperature with increasing pressure is shown with dashes. The total horsepower requirement in the above example is about 7.94 kW per $10^3 m^3/d$ (300 HP per MMscf/d).

Cooler After Final Compression Stage. If the acid gas is to be cooled after the final stage of compression so that it is converted into a liquid or dense phase, the final cooler section has to be designed to remove the equivalent of the latent heat of condensation of the acid gas. In Figure 5, for example, the heat

removed during cooling after the fourth stage is about four times that removed after the third stage.

Metallurgy. The compressor cylinders will compress gas that is at its water dewpoint on the suction side, and undersaturated in the compressor cylinder and on the discharge side, due to the temperature rise as a result of compression. Thus carbon steel meeting NACE MR0175 standard requirements for sour gas should be installed as a minimum. The line to the aerial cooler can be carbon steel meeting the NACE standard. In the interstage coolers, water will condense, and could pose a corrosion problem. Downstream of the coolers, the lines to the interstage scrubbers and the scrubbers themselves will be exposed to the corrosive acid gas and condensed water mixture. Carbon steel meeting NACE specifications for sour gas, coupled with an appropriate corrosion inhibition program, should be all that is required to handle these corrosive fluids. After the third stage of compression, the pressure will be in the order of about 3000 to 4000 kPa. This is the final stage at which water will condense in the cooler. Upon boosting the pressure substantially above 6000 kPa, the acid gas mixture can hold more water in solution than at the previous separation stage. Thus upon cooling after the fourth compression stage, there should theoretically be no water of condensation dropping out. If this is so, then there would be no need to dehydrate the gas, and the downstream facilities could be constructed out of carbon steel meeting NACE specifications, which would save the gas industry a lot of money. This aspect of acid gas phase behaviour should be experimentally investigated, as stated earlier.

If dehydration is chosen to ensure that no water of condensation drops out at the high pressures, the dehydration should take place after the second or third stage of compression. When dehydration occurs after the second stage, the pressure is relatively low, but the acid gas mixture contains more water than after the third stage of compression and cooling. With dehydration occurring after the third stage, the operating pressure of the dehydrator would be about 3 times the pressure after the second stage of compression. This would require less glycol circulation, smaller vessel diameter, but the amount of acid gases absorbed per gallon of glycol circulated would be higher. However, glycol circulation would need to be about one half of the required circulation for dehydration after the second stage of compression, since there is less water to remove from the acid gas stream at the higher pressure.

In general, the selected metallurgy would depend on whether the gas is dehydrated or not. If stainless steel is selected, then the stainless steel equipment includes the suction scrubbers, pulsation bottles, interconnecting piping and cooler tubes.

The metallurgy of valves and instrumentation such as block valves, dump valves, PSV's, gauge glasses, etc., should generally match the material of the vessel and piping.

Compressor cylinder material can be carbon steel that meets sour gas specifications. Compressor suction and discharge valves should be stainless steel. The piston rod should be stainless steel, and may be coated with a tungsten carbide overlay having a maximum hardness of RC22.

Distance pieces can be single compartment with a vacuum pump, or a two piece compartment with a sweet gas purge system.

Because of the low suction pressure in the 1st stage suction scrubber, any liquids must be dumped to an atmospheric tank, or handled by a pump. Any liquids collecting in the remaining suction scrubbers are usually dumped to a sour water treating and disposal system. Ideally, these liquids should be returned to the amine system, to save on make-up water. However, due to potential contamination with compressor oil, it is safest to discard the water that collects in the suction scrubbers.

Compressor units can be equipped with separate cylinder lubrication and flushing oil systems so that lube oils and corrosion inhibitors can be injected separately.

Corrosion allowance in piping generally should be 3 mm in carbon steel materials and 1.5 mm in stainless steel materials.

Compressor skids for Alberta applications can be completely shop fabricated, usually on a 7.5 m wide by about 7 to 12 m long dimension. The skid can be partially filled with concrete, and comes complete with overhead crane, lube oil drain tanks, control panel, cooler and building.

Acid Gas Dehydration. Whether or not acid gas dehydration is necessary is debatable. As mentioned above, under certain conditions of pressure and temperature, no water of condensation should theoretically occur after the final stage of compression and aerial cooling.

If dehydration is installed, then it should be part of the process at pressures of minimum water content in the acid gas stream. At a temperature of about 35 °C after cooling, the optimum pressure range is 3000 to 5000 kPa, depending on the acid gas composition. This is the pressure range in which acid gas mixtures should exhibit a minimum equilibrium water content at the process operating temperature range.

The dehydration equipment would be a normal glycol unit, with a minimum of six trays, using triethylene glycol. In sales gas dehydration, the water content has to be reduced to about 65 mg/m^3 (4 lbs/MM). Since the objective in acid gas dehydration is simply the avoidance of a liquid water phase, the amount of water left in the acid gas can be substantially higher than 65 mg/m^3. Based on Figure 2, a safe water content would be about 500 to 700 mg/m^3 (0.5 to 0.7 kg/10^{3}m^3). Thus the dehydration facilities for acid gas could be operated more economically than for sales gas dehydration.

One of the problems with dehydration of gas in general and with acid gas in particular is the disposal of the reboiler off-gases. There is considerable environmental concern with venting these off-gases into the air. In acid gas dehydration, these off-gases have to be collected and incinerated or cooled and recompressed into the acid gas stream.

Acid Gas Injection Facilities

The acid gas injection facilities beyond the final stage of compression and cooling consist of an injection line, wellsite control facilities and the injection well.

The Disposal Line. Selection of the type of pipeline material for the acid gas injection line between the plant and the injection well is generally related to whether or not the acid gas has been

dehydrated. For dehydrated gas, sour service carbon steel materials can be used, such as CSA-Z662 Grade 359 Cat. II sour service material. The addition of corrosion inhibitor should be considered.

For non-dehydrated acid gas, the line can be of carbon steel with an internal epoxy coating, or a polyethylene liner. Another pipeline material can be 316L stainless steel. One of the key considerations is the length of the line. Stainless steel is more expensive, and if the cost of the line exceeds the cost of a dehydration unit, then it may be more economical to dehydrate the acid gas stream. The proposed pipeline should be fully evaluated with the vendor of the materials to ensure compatibility with anticipated process conditions of pressure, temperature and acid gas composition.

The line diameter should be sized for liquid phase fluids if the acid gas mixture contains no more than about 1 % to 3 % hydrocarbons. This means that the injection rates would be quite low in terms of liquid quantities. An injection rate of 28 $10^3 m^3/d$ (1 MMscf/d) of gaseous CO_2 reduces to 44 litres per minute (l/min) (11.8 US gal/min) in the liquid phase. Thus the pressure drop in a short, 50 mm diameter line would be quite small, at a liquid velocity of about 0.37 m/sec.

If the disposal well is near the plant site, a 50 mm disposal line out of 316L SS would cost about $ 40,000.

Under normal operating conditions, the line between the plant and the injection well would contain the acid gas mixture in the liquid phase or the dense phase. The temperature of the fluid in the line would be at ground temperature, which could be as low as 0 °C in the winter time. If this line had to be depressurized, however, very low temperatures would result in the line. Since the fluid would be blown down to atmospheric pressure, the temperature of the fluid in the line would decrease to the boiling point temperature of the acid gas mixture at atmospheric pressure. This could be as low as - 50 °C, or lower if the line were insulated. Lines that are not insulated would benefit from heat transfer from the surrounding soil. The pipeline material has to be designed for low temperatures, even though under normal conditions such low temperature would not be reached. A safe blow-down design and procedure should be incorporated in such a scheme.

The extremely low temperatures can be avoided by installing a 25 mm carbon steel line to the wellsite in the trench with the 50 mm injection line. The design pressure of this sweet gas line would be 7 MPa, and under normal circumstances, this line would be left idle at a low pressure. The line would be connected at the wellsite to the injection line upstream of the wellhead. If it became necessary to depressurize the injection line, the acid gas would be flowed back to the plant and into the flare system through a standby heat exchanger or a rental line heater. The liquid acid gas mixture would be heated and vaporized prior to the pressure reduction into the plant flare system. To prevent the acid gases from vaporizing in the injection line, sweet gas from the plant would be flowed to the wellsite through the 25 mm line, from where the sweet gas would push the acid gas fluids back to the plant at full pressure.

Wellsite Facilities. At the wellsite, the facilities would be very simple. A meter should be installed to record the flow. This would provide information to the plant SCADA system concerning the injection pressure, temperature, rate and the fluid density. The wellhead would be equipped with a check valve as well as an ESD valve.

The Injection Well. When an acid gas disposal scheme by downhole injection is considered, one of the first questions that arises is whether there is a suitable injection well within a reasonable distance, and the second question is whether the EUB will permit injection of the acid gas into the particular zone that the well is completed in. In general, the Board will allow injection into the zone from which production is being taken provided the operator gives reasonable assurance that the injected acid gas will not adversely affect offsetting wells or hydrocarbon recovery. A well some distance from the plant may not be the best choice, however. Firstly, it usually is not a part of the production scheme to the plant because it missed the producing horizon, or it is so tight that it is incapable of production. In such cases it may not be a suitable candidate for acid gas injection either.

The ideal acid gas injection well would be a well drilled for this purpose within 200 m of the plant perimeter. The zone chosen for acid gas injection should be a zone that contains salt water, which means that the zone in the plant area has no commercial value. Such zones tend to have good thickness, a high permeability and a good areal extent. The Wabamun zone comes to mind, but there are also other horizons with the desirable characteristics. The western Canada sedimentary basin is well enough explored that it should be possible for geologists to identify the appropriate horizon in the plant area.

The drilling and completion costs are largely dependent on the depth of the horizon. The completion would include a downhole check valve, for safety reasons in case of surface equipment failure. The casing would be protected by a downhole packer and a non-corrosive fluid, such as diesel fuel containing corrosion inhibitor, in the annulus between the casing and tubing, as is normally required for water injection or disposal wells.

Optimum Acid Gas Injection Scheme

In light of the above discussions, it is possible to project what an optimum acid gas compression and injection scheme would include.

Injection Well. The injection well should be drilled specifically for the purpose of acid gas injection. It should be located near the plant, so that the injection line would be short, and the well would be within the Emergency Planning Zone of the plant. This would minimize the cost of the pipeline. The selected zone should be an aquifer of large extent, with good permeability. This means that the gas would not be reproduced, as would potentially be the case if the gas were injected into a hydrocarbon bearing zone.

The depth of the well should be between 1000 and 1500 m, so that the injection pressure did not have to be above 8000 kPa. This pressure level would ensure that the acid gas mixture is in the liquid phase upon final cooling, which would aid with the injection into the zone.

The well could be completed with 114.3 mm casing string and a 60.3 mm OD J-55 tubing string, as the liquid injection rate would in all likelihood be less than 100 l/min (27 US gal/min), thereby saving on drilling and completion costs. A subsurface checkvalve should be installed in the tubing.

The Injection Line. Since the well would be located near the plant, the injection line would be relatively short. A 316L stainless steel line, 50 mm in diameter, would likely be the best choice. This line would need to be externally coated for corrosion protection, but would not need to be insulated. Under normal operating conditions, the acid gas liquid or dense stream would not cool sufficiently to have water drop out to cause problems. If the line were shut down for some time, the contents of the line would cool down to ground temperature at burial depth, which would generally not be below 0 °C. Any water that might drop out under shut-down conditions would be minimal, would form a hydrate, and would immediately be reabsorbed upon startup of injection. A small, high pressure, sweet gas line should be included from the plant to the well, for reasons explained above.

Water Removal. From Figure 3 it is evident that free water cannot be tolerated at the injection pressure levels of the acid gas mixture, because hydrates could form. Figure 2 indicates that there is a minimum water of saturation content at certain pressure and temperature conditions. By taking advantage of this situation, it may be possible to lower the water content sufficiently by cooling the acid gas stream, so that dehydration would not be required. A more economical method than dehydration would be to cool the gas stream to about 30 or 35 °C after the third stage of compression. The cooling could be done with an aerial cooler to about 3 or 4 degrees above the hydrate temperature indicated in Figure 3 for the particular acid gas composition. This would condense most of the water while the acid gas mixture is in the vapor phase. Upon compression and cooling after the fourth stage of compression, the acid gas stream would be in the liquid or dense phase. The water of saturation at the temperatures in the short line to the injection well would always be higher than the actual water content at the final separation stage. It is assumed in this example that the hydrocarbon content of the acid gas mixture is less than about 3 %. Higher concentrations of hydrocarbons will adversely affect this acid gas-water relationship.

Acid Gas Compression. An estimate has to be made of the final pressure to which the acid gas stream has to be compressed. This depends mainly on the formation pressure, which depends on the well depth in undisturbed reservoirs. Other factors influencing the injection pressure are the permeability of the zone, the thickness of the zone and the rate of injection. Assuming that the necessary pressure is between 6 MPa and 10 MPa, a four stage compressor should be used.

Concerning the metallurgy of the compressor, the suction scrubbers, the suction lines and the coolers, some items may need to be stainless steel, but with research in the area of water content, some of the lines could probably be constructed with carbon steel meeting NACE specifications for sour gas applications.

Conclusions

1. The compression and injection of acid gas into an underground reservoir is technically feasible.
2. Research should be carried out to determine the water of saturation of acid gas mixtures containing 1 % to 3 % methane, in the pressure range of 3 MPa to 10 MPa, and at temperatures between 0 °C and 40 °C. The results would establish whether the acid gas would need to be dehydrated to avoid the formation of hydrates under operating conditions of acid gas injection systems.
3. Injecting acid gas into an underground formation releases the minimum of greenhouse gases into the atmosphere when compared with the options for small scale sulphur recovery.
4. Compression and injection of acid gas into an underground zone provides great flexibility in operation with changing throughput rate or fluctuating acid gas composition.

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TABLE 1 - TYPICAL INTERSTAGE PRESSURES FOR A FOUR-STAGE COMPRESSOR

Stage No.	Suction P., kPaa	Discharge P., kPaa
1	150	455
2	385	1160
3	1090	3270
4	3200	9600

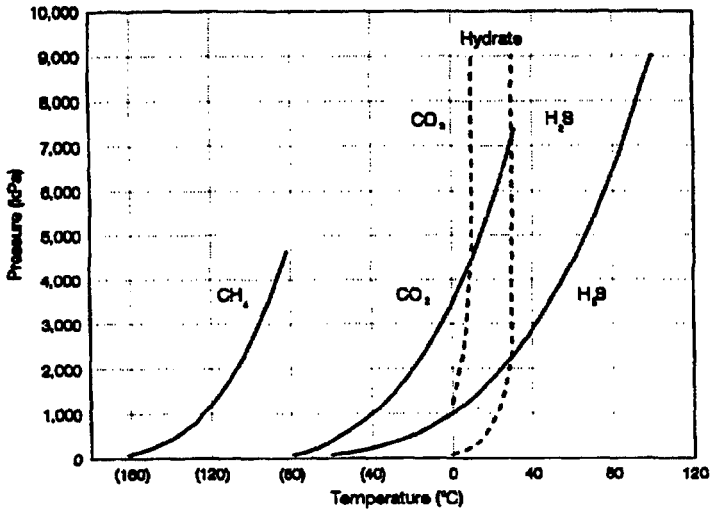

Fig. 1 - Vapor pressure versus temperature and hydrate conditions for CO_2 and H_2S.

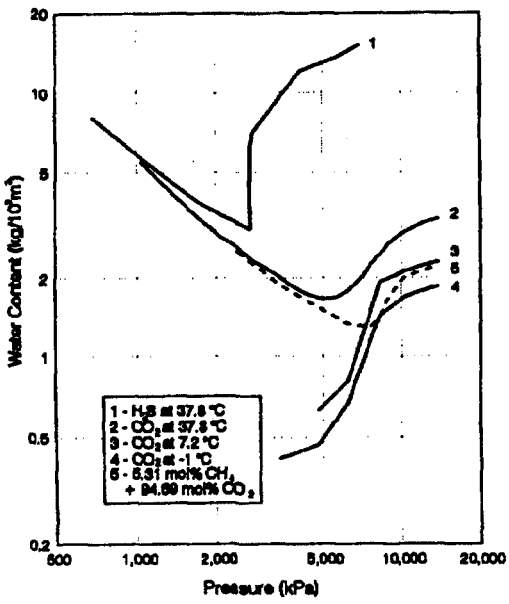

Fig. 2 - Water content versus pressure.

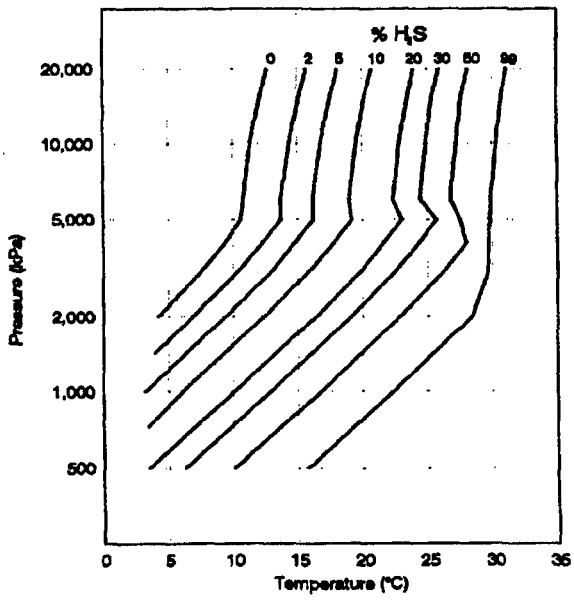

Fig. 3 - Hydrate temperature versus pressure for acid gas mixtures containing 1 % CH_4, CO_2, and H_2S.

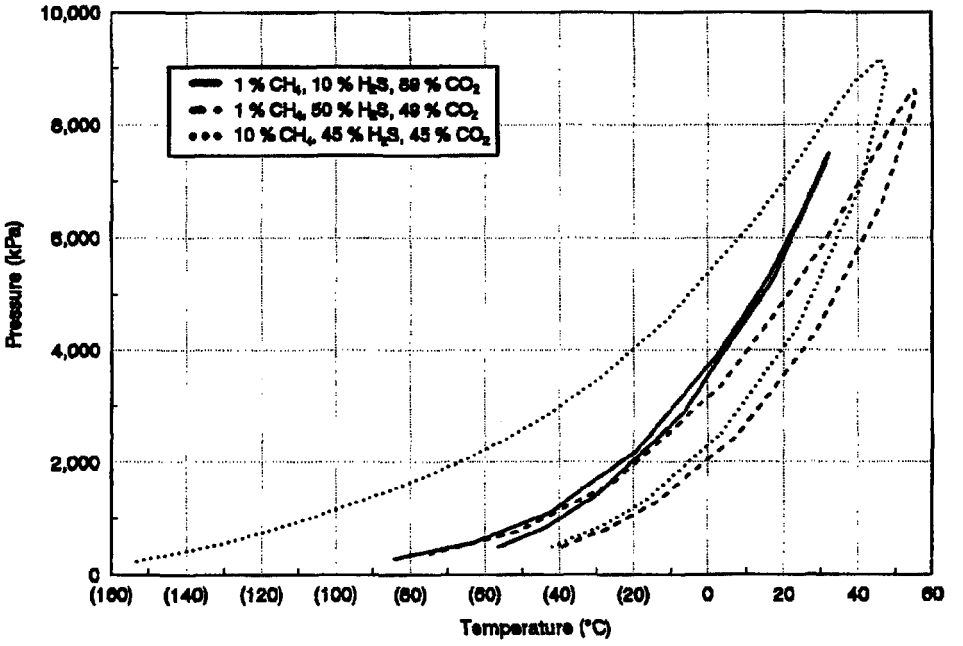

Fig. 4 - Pressure - Temperature phase envelopes for various gas mixtures.

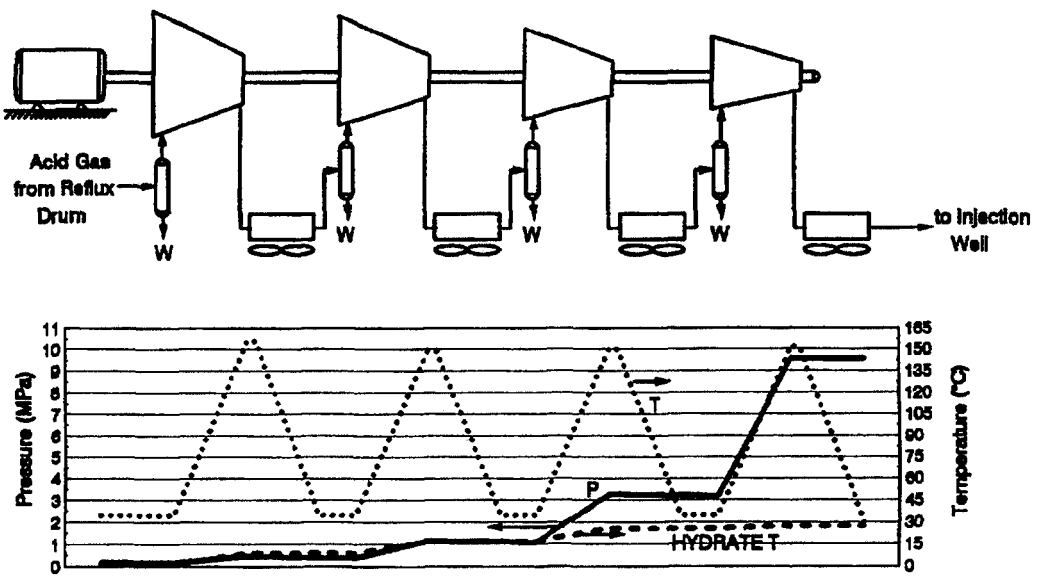

Fig. 5 - Four-stage acid gas compression showing pressure rise and temperature variations.

ATTACHMENT NO. 14

SPE PAPER 35584
UNDERGROUND DISPOSAL OF ACID GAS IN ALBERTA, CANADA: REGULATORY CONCERNS AND CASE HISTORIES
H.L. LONGWORTH, ET AL

TOM BROWN, INC.
LISBON UNIT B-624 APPLICATION
SULFUR RE-INJECTION CANDIDATE

SPE 35584

Underground Disposal of Acid Gas in Alberta, Canada: Regulatory Concerns and Case Histories

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Abstract

Over the past couple of years oil and gas operators in Alberta have been faced with an increasing challenge to reduce atmospheric emissions. One of these emission sources comes from oil and gas pools that contain uneconomic quantities of hydrogen sulphide and carbon dioxide (acid gas). Disposal of this acid gas to underground formations is sometimes a cost effective alternative to sulphur recovery and it also can reduce the public concern resulting from sour gas production and flaring.

In Alberta, the Oil and Gas Conservation Act requires that operators apply for and obtain approval from the Alberta Energy and Utilities Board (EUB) to dispose of the acid gas. Before approving any scheme, the EUB reviews the application in order to satisfy several primary issues: maximizing conservation of hydrocarbon resources, minimizing environmental impact, promoting public safety, and ensuring that the equity interests of mineral rights owners are protected. To adequately address these matters, the EUB requires that applicants submit information regarding surface facilities, disposal well configurations, and reservoir factors. This paper discusses the information required and describes the process that should be followed by operators who wish to obtain EUB approval for underground disposal of acid gas. In addition, this paper discusses the performance of some of the acid gas disposal schemes currently operating in Alberta.

Introduction

(Author's note: The Alberta Energy and Utilities Board (EUB) is empowered by provincial legislation, to regulate the development of energy resources in the Province of Alberta. The EUB replaced its predecessor the Alberta Energy Resources Conservation Board (ERCB) in 1995. References made to both the ERCB and the EUB throughout the text of this paper can be used interchangeably).

A significant portion of raw natural gas production in Alberta contains varying per cent ages of acid gas components, specifically hydrogen sulphide (H_2S) and carbon dioxide (CO_2). In order for this raw sour natural gas to meet pipeline and sales gas specifications, it must pass through gas processing and treating facilities which separate out the acid gas components. Prior to 1988, if sulphur recovery technology could not economically remove the sulphur from the acid gas, the alternative was to burn the acid gas in flare stacks or incinerators. Each point source of flaring was permitted to emit up to 10 tonnes per day of sulphur. In order to reduce the waste and pollution resulting from this sour gas flaring, the ERCB issued Informational Letter (IL) 88-13[1], in August 1988, which outlined a new set of sulphur recovery guidelines for sour gas plants in Alberta. These guidelines stated that new gas plants with a sulphur throughput of 1 or more tonnes per day would be required to recover sulphur (and thus remove much of the H_2S) from the gas stream. Under these new guidelines gas plants with sulphur throughputs between 1 and 5 tonnes per day had to recover 70 per cent of the sulphur; those between 5 and 10 tonnes per day had to recover 90 per cent of the sulphur; and plants with greater than 10 tonnes per day had to recover more than 96 per cent of the sulphur. Even with sulphur recovery in place, these plants still generate significant volumes of tail gas (acid gas) that is then burned in incinerators and emitted to the atmosphere in the form of sulphur dioxide (SO_2) and CO_2.

There are also a number of locations in Alberta that continue to burn uneconomic volumes of sour gas (natural gas with H_2S in it) and acid gas (primarily H_2S and CO_2). The current EUB regulations do not require sulphur recovery at gas plants with inlet gas streams containing less than 1 tonne per day of sulphur. In such cases acid gas is removed from the raw sour gas stream and is burned at gas plant flare stacks. Often additional fuel gas is needed to assist combustion and this adds to the atmospheric emissions of CO_2. Furthermore, a number of sour oil well batteries throughout the province are not tied into gas gathering systems and as a result, sour solution gas produced with the oil is flared from stacks at these battery sites. Alberta production data for the last 5 years shows that sour and acid gas flaring at plants, wells, and oil batteries emitted a yearly average of 290 000 tonnes of SO_2 and

Alberta EUB

5 892 000 tonnes of CO_2 into the atmosphere[2]. The public has expressed concerns about the flaring, including: degradation of the environment, human and animal health impacts, and waste associated with these emissions. The EUB strongly encourage oil and gas operators to reduce emissions wherever and whenever possible and frequently requires that action be taken in areas of relatively high residential density or where strong public concern is raised.[3]

Up until a few years ago, sulphur recovery and acid gas flaring were viewed as the two most economic ways of dealing with the sulphur in sour gas. Since then, a number of operators have developed schemes for disposing of the acid gas (and in some cases uneconomic quantities of raw sour gas) through injection into deep subsurface reservoirs. In many cases this can be operationally, economically, and environmentally superior to a sulphur recovery plant.[3]

Acid Gas Applications at the EUB

Section 26 of the Alberta Oil and Gas Conservation Act[4] requires that operators obtain EUB approval if they want to inject the acid gas underground. Separate approvals are required for surface facilities (gas processing plant, compressors, and surface equipment) and subsurface injection (injection well and disposal reservoir). In addition, section 7 of the Alberta Pipelines Act requires that operators apply for approval to pipeline the acid gas from the plant to the injection well. EUB staff in the departments handling these applications interact closely with the applicant, and with each other, to ensure timely and effective review prior to approval. The EUB review is done in order to determine that reasonable efforts are being made to maximize conservation of hydrocarbons, minimize environmental impact, ensure equity interests are protected, and promote public safety. The EUB must balance these issues and the needs of the applicant in order to best serve the overall public interest. The following sections of this paper discuss a number of factors that should be addressed by operators submitting acid gas disposal applications to the EUB.

Is Disposal the Best Alternative? If it has already been determined that sulphur recovery is uneconomic, and that injection of the acid gas is appropriate, then there are several injection options to consider. Acid gas is miscible with oil and could be used in conjunction with a miscible flood scheme to enhance the recovery of oil. Acid gas could also increase the recovery of oil or gas liquids if it is injected to maintain reservoir pressure or to sweep oil or wet gas to producing wells. Another option is to store the acid gas in an underground reservoir until some later date when it may be economic to recover the sulphur or CO_2. If none of the above conservation-related alternatives is feasible, then a final option is to dispose of the acid gas by injecting it into a suitable, deep subsurface zone.

Preliminary Considerations. Before submitting an application to the EUB, operators should consider where the best location is for the disposal well, the surface facilities, and the pipeline between them.

Selecting a Disposal Site. The general location for a disposal well is often influenced by the proximity to sour oil and gas production that is the source of the acid gas. In some cases a gas plant may already be built in the area and it may be difficult to find a suitable well location close to the gas plant. On the other hand, if a gas plant is still to be built, then more options exist for locating the plant and disposal well close together so as to minimize the pipeline length between them. Surface land use will usually dictate the location of the plant and to a lesser extent the location of the disposal well. The location of the well should also be based on a detailed assessment of the regional geology which should include:

- the location, depth, and extent of potential disposal zones so that the disposal well can be appropriately located and also to confirm that the disposal zone will be large enough to hold all of the injected acid gas over the project life,
- thickness and extent of caprock and any stratigraphic traps or fractures in it that may affect the ability of the caprock to contain the acid gas,
- the location and extent of other bottom or lateral bounding formations is important to determine if other wells in the area are likely to be impacted by the disposal scheme,
- natural fluid flow rates and flow direction along with calculations showing the potential migration of the injected acid gas, and
- folding or faulting in the area and a commentary on how this relates to seismic risk. Seismic risk can be described in two ways. How likely is it that seismic events could affect the integrity of the disposal scheme, and could the disposal scheme increase seismic acitivity in the area? Alberta is considered to be aseismic, which means that seismic risk is very low.

Selecting a Disposal Zone. There are two basic types of zones that should be considered for acid gas disposal: established oil or gas pools, or water saturated zones. A secondary consideration when selecting a disposal zone is to determine if the acid gas will be injected by itself or whether it will be mixed with disposal water prior to injection.

Producing or depleted oil or gas reservoirs are good candidates for acid gas disposal because: they have a proven ability to contain hydrocarbons up to the original discovery pressures; wells, pipelines, and surface facilities may already be in place; and the acid gas could be recovered at a later date if it were economic to do so. If the acid gas is injected into a producing reservoir there could be serious effects if the acid gas migrates to producing wells. Such a disposal scheme would only make economic sense if the producing reservoir was already sour and existing facilities were capable of handling high concentrations of H_2S and CO_2. In some cases, the plants producing the acid gas are not close to the oil or gas reservoirs to be used for disposal. This usually requires long pipelines from plant to disposal well which are likely to be a public concern.

Deep water saturated zones underlie many oil and gas producing areas of Alberta. Using these deep water zones for acid gas

disposal has the advantage that wells can be drilled right on the plant site, thus keeping the plant-to-well pipeline as short as possible. These deep water zones are typically massive and the water has high concentrations of dissolved salts making it unsuitable for domestic or industrial use. There has been little or no economic benefit or reason for exploiting these water zones in the past, therefore, not much is known about their geology or their ability to contain the injected acid gas. In order for the EUB to properly assess the merits of acid gas injection into any zone, including established hydrocarbon reservoirs or deep water zones, applications should include detailed information and discussion on the regional geological data, as well as:

- stratification of the injection zone, homogeneity of the stratification layers, and permeability of the strata,
- a complete chemical analysis of formation water, including a measure of total dissolved solids (an indication of potability) and native H_2S or CO_2 concentrations,
- baseline temperature and pressure in the disposal zone,
- analysis of caprock core, disposal formation core, and disposal zone native water samples,
- a complete and accurate drilling history of offsetting wells within several kilometres of the disposal well to identify any wells or zones that could be impacted by the injection fluid. This should include producing, shut-in, or abandoned wells that may be contacted by the injection fluid, and
- a discussion of the affect of the disposal fluid on existing or potential resource production from the proposed disposal zone.

Public Involvement. Prior to submitting an application for acid gas disposal, the applicant should make any offsetting mineral rights holders and any public in the area aware of the project. The EUB expects the applicant to identify who may be directly impacted by the disposal scheme and to establish effective two-way lines of communication with them. The applicant should also discuss their development plans with the general public in the area. ERCB IL 89-4[6] emphasizes this expected communication by stating that the applicant

> "should present specific project details in language understandable to the lay reader, and the operator should make a strong effort to explain its application to all directly affected citizens both through community meetings and one-on-one. Specifically, project applications should include an understandable executive summary; and those sections of an application dealing with the community, social costs and benefits, the environment, human and animal health, and emergency preparedness, should be described in a form and language that is easily understood".

Environmental Concerns. With regard to acid gas disposal the EUB is concerned with: wellbore integrity and disposal formation suitability (to ensure initial and ongoing containment of the disposal fluid in the interests of both hydrocarbon conservation and groundwater protection), operating parameters (to ensure wellbore and formations integrity), and optimizing use of the subsurface disposal zone (considered a limited resource).

Groundwater Protection and Wellbore Integrity. ERCB Guide G-51[7] designates different disposal well classifications depending on the nature of the fluid to be disposed of. Where acid gas is the only fluid injected into a disposal well, that well is considered a Class III disposal well. If the acid gas is dissolved in produced water prior to injection, then the produced water designation will determine the classification of the well (either Class Ib or II). Completion and logging requirements are similar for both Class II and Class III wells and include the following:

- all potential hydrocarbon bearing zones, in addition to the injection or disposal zone must be hydraulically isolated by cement,
- potable water-bearing zones must be hydraulically isolated with the appropriate combination of surface, intermediate, or production casing cemented to surface from a minimum of 25 metres below the lowest useable groundwater zone,[8,9]
- injection shall be through tubing and the tubing/casing annulus shall be isolated from the injection fluid by means of a packer,
- the tubing/casing annulus shall be filled with a corrosion inhibiting fluid and prior to the start of disposal operations it shall be pressure tested with packer in place to 7000 kilopascals (wellhead) for 15 minutes[10,11]
- annual packer isolation tests shall be performed at a minimum surface pressure of 1400 kilopascals for 15 minutes,
- hydraulic isolation and cement integrity must be confirmed by means of a temperature survey log and a cement integrity log,
- casing integrity must be confirmed by a full length casing inspection log, and
- all geologic zones must be identified using logs or core, and their location indicated on a well completion schematic. (see Figure 1)

The above points are a summary of the completion and logging requirements for an acid gas disposal well. The reader should refer to ERCB Guide G-51[7] for more specific details. It should be noted that the EUB does not require that specific tubing or casing material or metallurgy be used in acid gas disposal wells. The reader is referred to Canadian Standards Association (CSA) standards identified in ERCB IL 91-8[5] for tubing material and sizing. Continuous pressure monitoring of the annular fluid should provide adequate warning of any failure of tubing, casing, or packer such that it can be promptly repaired before acid gas can cause environmental damage.

Safety Devices. The applicant should install safety devices both above ground and in the wellbore to ensure that failure of any component in the disposal system does not result in environmental damage. If injection pressure should drop for any reason the injection well should be automatically shut-in, to prevent backflow of acid gas. Similarily, injection pumps should be automatically shut-down if injection pressure rises too high or drops too low. In a worst case scenario, such as a blowout of the injection well, the acid gas should be automatically ignited.[12,13] The safety devices should be checked regularly and if any are not operating properly

the disposal scheme should be shut-in until the problem has been fixed. All of these safety devices should be connected to alarm systems to alert operating personnel of problems so that remedial action can be promptly carried out.

Reservoir Containment. Knowledge of the geological setting is needed in order to determine the bounding formations around the target zone and whether there is likely to be any breaches in the caprock from faults or fractures along which the injected fluid could migrate to other formations, groundwaters, or to the surface. Oil and gas pools have kept hydrocarbons trapped for millions of years and have proven their ability to contain injected gas. Bounding formations, safe pressure limits, and volume capacity of these reservoirs are usually well defined. With deep water zones, however, there is usually only regional geological information on which to determine their ability to contain the acid gas. Regardless of the disposal zone to be used, applicants must submit data and calculations that define a safe maximum operating pressure for the disposal scheme. The EUB currently recognizes two different methods (discussed below) for calculating maximum operating pressure for acid gas disposal schemes. Both methods should be applied, with the lower of the two pressures accepted as the safe maximum operating pressure for the scheme.

Caprock Threshold Displacement Pressure. Gas is retained in a reservoir by a caprock saturated with water. If water did not fill the pores in a caprock, gas would flow through the caprock at a rate based on the permeability of the caprock to gas.[14] The ability of a caprock to prevent flow of gas through it is expressed in terms of its threshold displacement pressure. This threshold pressure is the minimum pressure difference, between the gas pressure at the lower face of the caprock and the water phase pressure immediately above the gas-water interface, that is needed to push the water out of the caprock pore throats. The forces which act on the gas and water in a caprock are gravity (or buoyancy), viscous friction, pressure differential, and capillary forces.[15] These capillary forces are the same forces which cause liquid to rise up inside a capillary tube when it is put in a container of liquid. The capillary forces are affected by the radius of the capillary, the interfacial tension between wetting (water) and non-wetting (gas) phases, and the contact angle of each phase to the capillary wall. A report prepared by Ibrahim, Tek, and Katz for the American Gas Association[15] contains a thorough discussion of formula and laboratory measurement related to caprock threshold displacement pressure for marketable natural gas storage reservoirs.

Regarding acid gas studies, some limited laboratory work has been done on determining interfacial tension and contact angles for CO_2, but at the time of writing this paper the authors have not yet found any published laboratory data on interfacial tension for H_2S or pure acid gas systems. Interfacial tension between acid gas and water in a caprock is likely to be much less than the interfacial tension between methane gas and water. For that reason it is probable that caprock threshold displacement pressures for acid gas will be considerably lower than for methane. Further laboratory testing would greatly enhance the understanding of interfacial tension and threshold displacement pressure for acid gas situations.

In acid gas injection schemes, overpressuring would not likely occur in depleted gas or oil pools, but could occur in deep water saturated zones where pressures above pool discovery pressures must be used in order to inject the acid gas. Much of the concern in this case is mitigated by the fact that the water zones are so massive compared to the amount of injected gas, that pressures quickly dissipate before affecting the caprock. Where there is a chance that the proposed acid gas disposal scheme may overpressure the caprock, the application to the EUB should include caprock threshold displacement pressure test results or detailed calculations on pressure gradients around the injection well.

Fracture Pressure. If fluids are injected at a high enough pressure the caprock may fracture and disposal fluid could then escape from the disposal zone. Appendix 5 in ERCB G-51[5] (reproduced in this paper as Table 1) sets out maximum allowable wellhead injection pressures to be used for injection or disposal wells. These injection pressure limits are to be used in the absence of step-rate injectivity tests, mini frac test data or reliable offset fracture/injectivity data for the proposed injection well. The pressures indicated in Table 1 represent 90 per cent of the average formation fracture pressure for Alberta, based on province-wide statistical data. The pressures are expressed at wellhead, but can be converted to sandface pressure using a hydrostatic head gradient of 10.52 kilopascals per metre of well depth and neglecting friction losses. The corresponding wellhead pressure for acid gas can then be calculated using an average hydrostatic head gradient for acid gas and again ignoring friction losses. The hydrostatic head gradient for acid gas is difficult to calculate because, at typical temperatures and pressures found in acid gas disposal schemes, the acid gas may change phase, from gas to liquid, in the wellbore. (Acid gas density and phase changes are discussed in more detail in a later section entitled "Physical Properties of Acid Gas").

The approved operating pressure for the proposed acid gas injection scheme will subsequently be based on the lower of caprock threshold displacement pressure or fracture pressure.

Volume Capacity. In addition to knowing the safe maximum operating pressure for the disposal scheme, it is also necessary to determine whether the disposal zone is capable of taking all the acid gas volumes for the life of the project without harmful pressure buildup. For oil or gas reservoirs, production and pressure depletion data provide volumetric information. For water zones; regional geology, well data, and injectivity testing is usually adequate.

Effect of Acid Gas On Rock Matrix. Target zones for acid gas disposal are usually composed of either carbonates or sandstones. Operators should be aware of the affect that the acid gas may have on the reservoir rock in order to determine if the injection scheme would be affected. CO_2 in the acid gas will dissolve some of the carbonate rock matrix and this will increase permeability. In sandstones CO_2 tends to dissolve the carbonate surrounding the sand grains which results in an initial porosity increase in the near wellbore region[16]. Acid gas core flow studies on carbonate[17] and sandstone[18] support this. These increases in permeability would

likely result in lower injection pressures early on in the scheme (this is supported by lower than anticipated well head pressures in many of the operating schemes). It remains to be seen if migration of fines or carbonate mineral precipitation would reduce permeability over the longer term.

Physical Properties of Acid Gas. Numerous studies have been done on natural gas mixes containing acid gas, and individually on CO_2 or H_2S. Based on these studies, correlations have been developed that are used in commercially available computer models to predict how pure binary systems of CO_2 and H_2S should behave under certain conditions of temperature and pressure. No laboratory data has yet been published that confirms the accuracy of these computer simulated predictions over a wide range of conditions. Simulation data on density, solubility, and phase behaviour of acid gases has been submitted to the EUB with applications for acid gas disposal schemes. Detailed analyses are beyond the scope of this paper, however, general observations are discussed in the next few sections.

Phase Behavior and Density. The phase behavior of an acid gas binary mix generally follows that of the individual CO_2 and H_2S components. Figure 2 shows the typical pressure vs temperature curves for CO_2 and H_2S. At the temperatures and pressures indicated by these curves, each respective component exists as a liquid and vapour. At temperatures and pressures to the left of its curve each component exists as a liquid, and to the right of its respective curve each component exists as a vapour. When pressure and temperature of the acid gas mix falls between the two curves, as shown in Figure 2, the gas could exist as either a vapour or liquid depending on the per cent of H_2S and CO_2 in the mix. Operators need to be aware of this phase change as it can often occur in the wellbore at typical operating temperatures and pressures. The phase of the fluid will dictate which density value should be used when calculating sandface pressures on injection or potential release of H_2S during a well failure.

Solubility. Acid gas is highly soluble in native brines found in disposal reservoirs. Water saturated zones, therefore, make good disposal zones for acid gas provided that the temperature and pressure of the zone is such that the acid gas will fully dissolve. Even where the acid gas will initially dissolve into the formation water, it is reasonable to assume that during injection a saturation gradient could build up around the near wellbore region in the reservoir and a gas bubble could form. The presence of this gas bubble should then be factored in to any calculations or determination of operating constraints for the scheme.

Where a large enough volume of disposal water is available above ground, the acid gas can be dissolved into it and the solution can then be injected similar to standard water disposal. Where water disposal systems are to be used with acid gas, extra care should be taken to ensure that the water disposal equipment is suitable for sour service.

Data Requirements. In order for the EUB to ensure that environmental and reservoir matters are being adequately addressed, applicants are requested to submit the following data as part of their disposal application:

- a forecast of daily, yearly, and total acid gas disposal volumes (and disposal water volumes where applicable),
- threshold displacement pressure test results on caprock core samples and laboratory reports on the affect of acid gas on the rock matrix of the caprock,
- for the disposal zone: permeability and porosity measurments, interation of the acid gas with the rock matrix, native fluid compositions, interaction of the acid gas with native fluids, and
- physical properties of the acid gas over a representative range of pressures and temperatures, including: density, phase behavior, formation volume factor, and solubility in reservoir water and disposal water.

Laboratory test data for the above is preferable, but where it can be shown that simulation data has been accurately correlated to previous test data, then simulation data or calculations may be acceptable. In addition to the data items listed above, the EUB recommends[19] that operators follow CSA Standard Z341-93 "Storage of Hydrocarbons in Underground Formations"[20] when applying for an acid gas disposal approval.

Promoting Public Safety.

Emergency Response Planning. Prior to the start up of an acid gas disposal scheme, operators should have in place a detailed emergency response plan (ERP) that sets out a specific course of action that would be taken should any incident arise that may impact workers or the public. The required levels of preparedness, planning, and response are specified in a number of EUB policy documents including Interim Directives ID-OG 76-2 "Emergency Procedure Plans for Sour Gas Facilities"[21], ID 91-2 "Corporate Level Emergency Response Plans"[22], and Informational Letters IL 87-8 "Emergency Response Plans for Sour Gas Facilities"[23], and IL 90-17 "Emergency Procedure Plans for Sour Gas Facilities - Biennial Meeting"[24]. Many of these requirements refer to methods for establishing the emergency planning zone (EPZ) around sour gas facilities. The EPZ is the area of land which may be impacted by a release of H_2S and should encompass the plant, pipeline, and disposal well.[18] The release rate used to determine the EPZ is defined in ERCB ID 87-2[25] as "the maximum potential H_2S flow rate at ground level that can be expected against zero back pressure for the casing flow or open-hole flow configuration of a well". If flow rate testing is not practical for determing the release rate for the acid gas injection well, then it can be calculated using reservoir and wellbore parameters. The release rate is expressed in cubic metres per second.

Residents and others involved with public facilities must be identified within the acid gas disposal scheme's established EPZ. Communication with all parties must take place to promote awareness of what the response procedures are in the event of an incident. At the start-up of an acid gas disposal scheme, the potential public impact area is limited to the sour gas release rate from the pipeline. Over time, pressure may build up in the injection zone such that the sour gas release rate from the well may surpass that of the pipeline. Consequently, for the purposes of determining

the EPZ at the beginning of the project, operators must use pipeline data. Later, as time and injection volumes affect the reservoir pressure, the EPZ might increase in size accordingly. The EPZ, however, must be kept to a reasonable size so that the operator can effectively deal with those publics who may actually be affected and not waste precious time and energy where public safety would clearly not be at risk.

Setbacks. Another method of achieving a level of public safety from a sour gas facility is through the use of setbacks or buffer zones. These are the minimum allowable distances separating a sour gas facility from any surface improvement occupied by the public (including residential dwellings, community buildings, hospitals, campgrounds, etc.).[25,26] The setback is based on "the maximum potential H_2S flow rate at ground level that can be expected against zero back pressure for the tubing flow configuration for a well completed with a packer, or tubing and annulus flow configuration for a well completed without a packer if the well is capable of flowing up the annulus."[18] As stated earlier, if flow testing cannot be used to determine maximum H_2S release rates, it can be calculated using reservoir and wellbore parameters. Since setbacks define minimum distances between sour gas facilities and the public, it is necessary to establish the largest probable setback required over the entire life of the project. This setback would then be put in place at the beginning of the project to eliminate the chance of future encroachment. For example, if at start-up the setback based on the sour gas classification level of the pipeline is 150 metres and residences are later built 250 metres away, the belief would be that the setback is adequate. Later however, as reservoir pressures increase over time, a new setback calculation, based on the well, might establish that distance to be 500 metres. The residences that were constructed outside the intial setback would now be well within the new setback. This problem can be avoided if appropriate setbacks are determined before start-up of the scheme.

Equity Interests. The acid gas disposal scheme applicants must contact all stakeholders who could be directly and adversely impacted by the scheme and advise them of the impacts the scheme could have on them. The application should contain a list of those contacted and confirm that none of them have concerns or objections regarding the scheme.

Mineral Rights Owners. The disposal scheme applicant must contact all offset operators of wells completed in the proposed disposal pool. Since the operation of their wells may be influenced by the disposal operations, they must be informed of the proposal and be provided with an opportunity to express their concerns prior to the approval of the disposal application. Generally all mineral rights owners (including Crown interests) within a 1.6 kilometre radius from the disposal well should be contacted. In cases where the applicant believes the radius of influence of the disposal scheme may extend beyond 1.6 kilometers, it is incumbent on the applicant to provide notice and confirmation of non-objection from mineral rights owners within this extended radius of influence that may be affected by the disposal operations.

Surface Rights Owners and Occupants. Acid gas disposal scheme applicants should also contact all land owners and occupants who could be directly and adversely impacted by the disposal scheme. This would include: communities, farms, private land owners, occupants, trappers, and any other publics who may be impacted.

Operating, Monitoring & Reporting. Operators of acid gas disposal schemes are required to monitor operations and file reports with the EUB on a regular basis. The monitoring and reporting requirements are set out in the approval issued by the EUB.

The operator must ensure that all related EUB licenses and approvals are in place before commencing acid gas injection. This includes, but is not limited to: facility approvals, pipeline approvals, and an EUB approved emergency response plan.

When the injection well has been shut-in for any length of time, water may be standing in the wellbore. For schemes that are injecting acid gas only (ie. not mixed with water) the hydrostatic head of water standing in the wellbore must be considered in calculating sandface pressures during start-up of injection operations. Initial injection should be done in step-rate increases to prevent any hydraulic fracturing and/or unnecessary fracture propagation. Full injection rate can be applied once it is determined that the wellbore is clear of water.

Since acid gas disposal is intended to eliminate the need for continuous flaring from specific plants or wells as identified in the application, and although the operator may have approval for some flaring, the EUB expects that any flaring will be of short duration and only in emergencies or for operational flexibility.

The operator is required to monitor the injection well according to ERCB IL 94-2[27], including continuous monitoring of the annular fluid pressure and annual isolation testing of the annular packer. On a monthly basis, the operator is required to monitor: wellhead pressure, temperature and fluid analysis at the injection well and any other specified offsetting wells, and volumes of injected fluid. The operator should immediately suspend injection operations if any injection equipment, monitoring equipment, or safety devices fail.

The EUB requires acid gas disposal scheme operators to file a progress report, on a semi-annual basis, that should include: a summary of workovers on the disposal well, results and evaluation of monitoring done during the reporting period, and a discussion of the overall scheme performance.

Case Histories

In 1989, Chevron Canada Limited started up the first true acid gas disposal scheme. Acid gas containing 15 per cent H_2S and 85 per cent CO_2 was injected into the Acheson Blairmore T (sandstone) Formation, a depleted oil pool. This disposal scheme experienced elemental sulphur deposition which plugged the injection well perforations on two separate occasions. Treatments of dimethyl disulphide and diaryl disulphide were successfully used to clear the perforations and restore injectivity.

It was not until 5 years later that Renaissance Energy Ltd. commissioned Alberta's next acid gas disposal scheme in the Galahad Field. They were the first to inject acid gas into a deep water saturated zone (the Leduc). The acid gas was 20 per cent H_2S and 80 per cent CO_2. The compressor and piping was made of expensive state-of-the-art stainless steel. Fig.3 shows a basic flow diagram for this scheme.

In February 1995 PanCanadian Petroleum (PCP) Ltd. started mixing acid gas at surface with disposal water and injected the solution into a water zone underlying a producing oil pool in the Hansman Lake area. The mixing point for the acid gas was upstream of the water injection pumps and there was enough disposal water to completely absorb the acid gas at relatively low pressures. This saved money in the compressor design and on compression fuel costs. PCP commissioned their second acid gas disposal scheme at Thompson Lake in the Provost Field in March 1995. In this scheme acid gas was also mixed with disposal water at surface, but in this case, the mixing point was downstream of the water injection pumps. (See Figure 4 depicting optional sites for mixing acid gas with disposal water). This resulted in higher mixing pressures and a more costly compressor design than the one used at the Hansman Lake scheme. In October 1995, PCP experienced main packing leaks in the acid gas compressor at their Thompson Lake project. Acid gas leaked into the crankcase and caused considerable damage to bushings, connector rods and bearings. The damage was repaired at a cost of more than $30,000 and the packing configuration was modified so that the situation would be less likely to occur again.

In April 1995, Pennzoil Canada Inc. started injecting a mix of 40 per cent H_2S and 60 per cent CO_2 into a depleted oil pinnacle reef in the Zama area of northwestern Alberta. Even though the scheme was economically viable as a disposal scheme, Pennzoil also hoped that the acid gas might also enhance more oil recovery in the pool. In October 1995, during routine operations, continuous monitoring of annular fluid detected a potential tubing leak in the Pennzoil disposal well. The well was shut in and the tubing pulled. The leak was traced to the cracked outer housing body of a subsurface safety valve. Both tubing and the damaged safety valve were sent for lab analysis. Some corrosion had occured on the outside of the tubing string where acid gas had leaked into the annulus, but this was minor. Lab tests showed that the safety valve housing had fractured due to sulphide stress cracking likely initiated by cold stressing during installation. In a report submitted to the EUB, Pennzoil recommended that the valve housing material be upgraded from 410 stainless steel to I-925 to reduce the risk of similar problems in the future.

As at 31 December 1995, there were 17 acid gas disposal schemes that have received, or are pending, EUB approval (as listed in Table 2). These schemes are capable of injecting a total of 147.5 tonnes per day of sulphur and 463.5 tonnes per day of CO_2, that might otherwise be emitted to the atmosphere. Having regard for the previously discussed minor problems experienced by several of the operating acid gas disposal schemes, none of the 17 schemes have incurred any problems that would jeopardize public health and safety, or increase risk to the environment. To date, operators, the EUB, and the public have been satisfied with the acid gas injection concept and the success of the existing schemes.

Summary

1. The physical properties of acid gas, over a representative range of pressures and temperatures, should be confirmed by laboratory testing. These test results can then be used to calibrate computer simulators so that they can more accurately predict phase, density, and solubility characteristics of acid gas mixes.

2. Further laboratory testing would greatly enhance the understanding of interfacial tension and threshold displacement pressure for acid gas situations. This would be valuable when evaluating the sealing capability of disposal zone caprocks.

3. Underground disposal of acid gas is developing widespread acceptance because it offers gas processors a technically feasible and cost competitive alternative to sulphur recovery and at the same time reduces emissions of SO_2 and CO_2 to the atmosphere at a time when public concern regarding emissions and flaring is high.

4. Due to the increasing numbers of applications for acid gas disposal, the EUB needs to streamline and simplify the application process for industry. This must be balanced against the role of the EUB to ensure that the public is adequately protected during the development of this emerging technology.

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SI Metric Conversion Factors

feet (ft)	X 3.048*	E-01 = metres (m)
miles (mi)	X 1.609	E 00 = kilometres
psi	X 6.894 757	E+00 = kilopascals (kPa)

*Conversion factor is exact.

Table 1 -- Maximum Allowable Wellhead Injection Pressures (Appendix 5, reproduced from ERCB Guide G-51)[7]

DEPTH INTERVAL (m)	WELLHEAD PRESSURE (kPa)	DEPTH INTERVAL (m)	WELLHEAD PRESSURE (kPa)
401-450	3000	1501-1550	4450
451-500	3200	1551-1600	4500
501-550	3300	1601-1650	4550
551-600	3450	1651-1700	4600
601-650	3550	1701-1750	4650
651-700	3600	1751-1800	4700
701-750	3650	1801- 1850	4800
751-800	3700	1851-1900	5200
801-850	3750	1901-1950	5650
851-900	3800	1951-2000	6000
901-950	3850	2001-2050	6400
951-1000	3900	2051-2100	6750
1001-1050	3950	2101-2150	7150
1051-1100	4000	2151-2200	7550
1101-1150	4050	2201-2250	7950
1151-1200	4100	2251-2300	8350
1201-1250	4150	2301-2350	8750
1251-1300	4200	2351-2400	9150
1301-1350	4250	2401-2450	9500
1351-1400	4300	2451-2500	9900
1401-1450	4350		
1451-1500	4400		

Above 400 metres use Wellhead pressure (kPa) = 7.5 x Depth (m)
Below 2500 metres use Wellhead pressure (kPa) = 4.0 x Depth (m)

Note that the wellhead pressures listed here are based on statistical analysis of province-wide fracture data. The fracture pressures used to calculate the equivalent wellhead pressures are conservative as they are based on a 90 per cent confidence level that injection at this pressure will not fracture the formation.

Wellhead pressures assume injection or disposal of a fluid with a gradient of 10.52 kPa/m and neglect friction losses. For fluids of a different gradient, wellhead pressures can be revised as follows:

(WHIP) revised = (WHIP) table + [(10.52 - gradient) * depth]

where gradient = actual fluid gradient (kPa/m)
depth = top of injection or disposal interval (m)

Table 2 – List of Acid Gas Disposal Schemes in Alberta (as at 31 Dec. 1995)

Field Pool	Operator	Application Number Approval Number	Start-up Date	Acid Gas Composition H_2S % / CO_2 %	Daily Licensed Disposal Volume Sulphur (t/d)	CO_2 (t/d)	Original Pool Pressure (kPa)	Approved Wellhead Pressure (kPa)	Pipeline Length (metres)	Injection Zone	Comment
Acheson Blairmore T	Chevron	880818 5917	Oct. 1989	15 / 83	1.2	9.3	9 300	6 000	2 000	Depleted oil sandstone.	
Dunvegan Kiskatinaw	Anderson Exploration	951560 7870		40 / 58	2.7	5.4	13 035	7 100	4 300	Depleted gas sandstone.	
Gordondale Halfway K	International Colin Energy	951170 7878		65 / 35	7.5	5.5	14 961	9 000	2 200	Depleted gas carbonate.	
Paddle River Nordegg	Canadian Occidental	951281		5 / 95	1.4	36.2	12 240		400	Depleted gas sandstone.	
Puskwaskua Leduc	Anderson Exploration	951924 7898		63 / 31	2.0	1.3	28 588	11 000	280	Depleted oil carbonate	
Zama Keg River	Pennzoil	941796 7732A	Apr. 1995	38 / 61	61.8	136.2	14 749	12 000	4 000	Depleted oil carbonate	
Clear Hills Belloy	Blue Range Resources	950169 7877	Jun. 1995	25 / 75	7.1	29.3	12 855	10 000	400	Water saturated sandstone	TDS=150 000 ppm, no native H_2S.
Consort Leduc	PanCanadian Petroluem	951344 7865	Dec. 1995	0.4 / 8.4	0.2	5.5	7 890	7 600		Water saturated carbonate	TDS=75 000 ppm, trace native H_2S
Fourth Creek Belloy	Canrock Pipeline Ltd.	951514		25 / 75	2.4	9.8	13 744	9 000	150	Water saturated sandstone	TDS = 130 000 ppm, trace native H_2S
Galahad Leduc	Renaissance Energy	931400 7400	Feb. 1994	20 / 80	8.1	44.7	9 465	9 000		Water saturated carbonate	TDS=100 000', trace native H_2S
Pembina Wabamum	Chevron	931492 7434	Nov. 1994	68 / 30	18.4	11.2	28 800	12 000	450	Water saturated carbonate	TDS=100 000', trace native H_2S
Provost Keg River	Novagas Clearinghouse	940719 7647A	Sep. 1994	9 / 91	2.8	39.0	13 000	10 000	280	Water saturated carbonate	TDS = 300 000', no native H_2S
Watelet Cooking Lake	Morrison Petroleum	951535		25 / 72	5.1	20.1	15 000		See notes	Water saturated carbonate	Pipeline is short length of above ground stainless steel
Wayne-Rosedale Leduc	PanCanadian Petroleum	950517 7770		20 / 80	7.6	41.7	15 500	10 000	100	Water saturated carbonate	TDS=100 000', no native H_2S
Hansman Lake Cummings I	PanCanadian Petroleum	940957 7726	Feb. 1995	30 / 70	4.9	15.6	6 700	7 500	800		Mixed at surface with disposal water at ratio of 12 000 m^3 (gas) / 11 000 m^3 (water)
Mirage Halfway B	Summit Resources	951085 7726	Dec. 1995	68 / 24	3.9	1.9	13 000			Producing oil	Mixed at surface with water at ratio of 4 200 m^3 (gas) / 400 m^3 (water) and injected into EOR waterflood.
Thompson Lake Leduc	PanCanadian	941884 7751	Mar. 1995	22 / 78	10.4	50.8	7 500	8 000	43	Water saturated carbonate	Mixed at surface with disposal water at ratio of 35 000 m^3 (gas) / 5 000 m^3 (water)

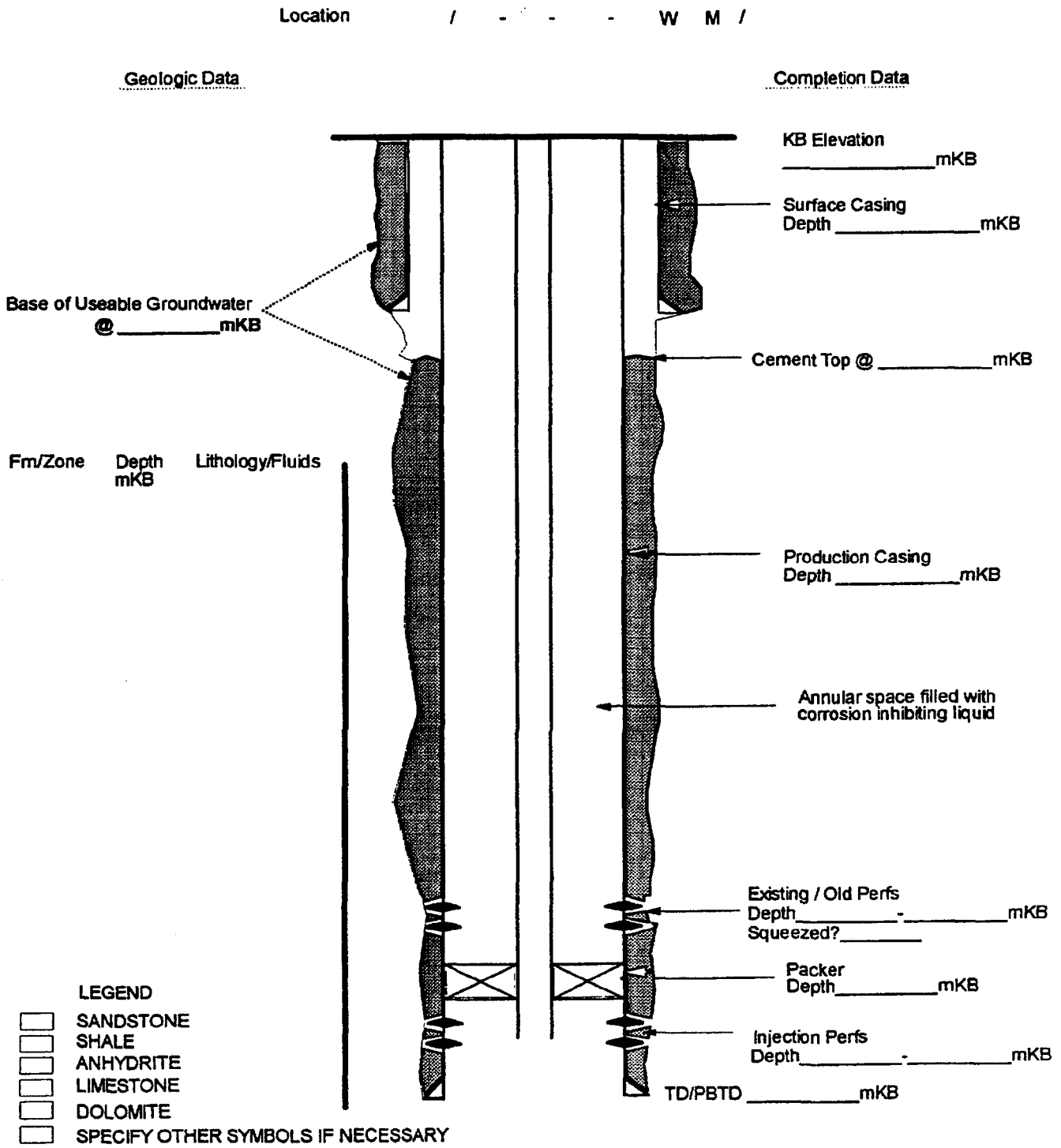


Fig. 1 – Injection/disposal wellbore completion schematic (reproduced from ERCB Guide G-51)[5]

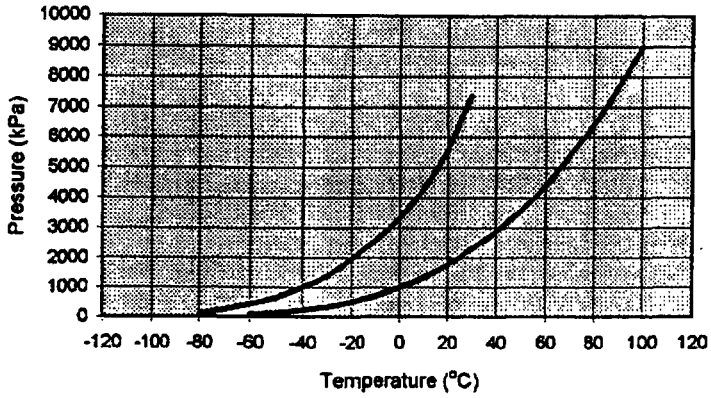


Fig.2 – Pressure vs temperature for H_2S and CO_2.

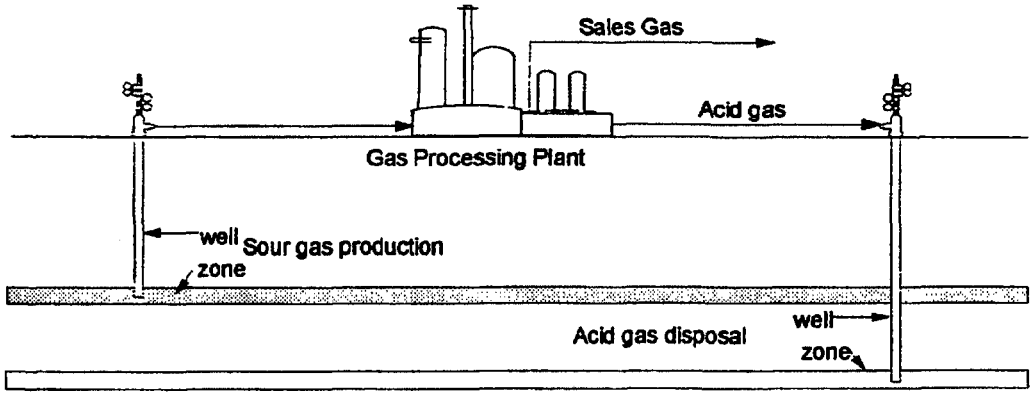


Fig. 3 – Acid Gas Disposal Scheme (simplified)

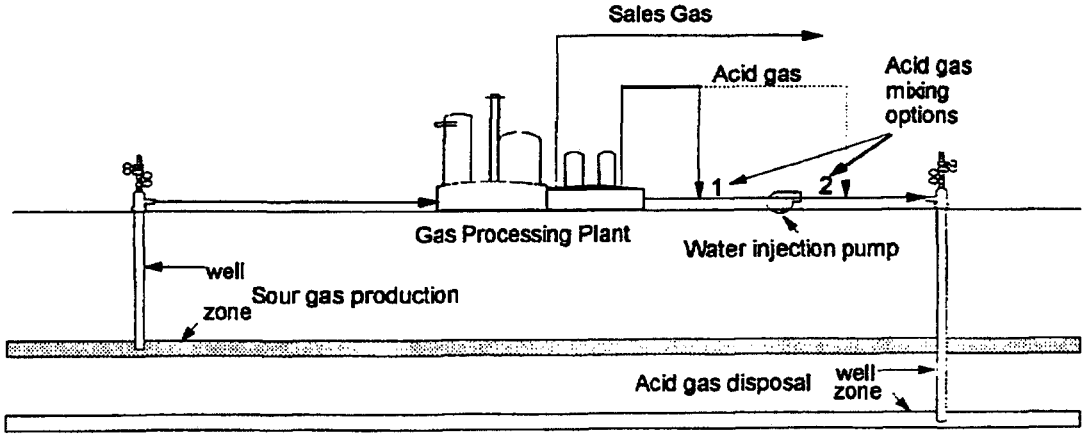


Fig. 4 – Acid gas mixed with disposal water at surface
Option 1: Acid gas injected upstream of water pump
Option 2: Acid gas injected downstreamof water pump

RM 1010
for Meeting on
Monday 9'

Should we require threshold pressure displacement test (like Canadians) on Paradox Salt?

annual MIT planned
Rat 2yr - Will think about it.
Sur USI will be done

Packer fluid will

Tom Brown - What would think about 2yr. RAT and a 5 year USI log to demonstrate no deleterious effects from ops.
What is inhibitive fluid
Hz Scouting.
Conversion letter

1960 @ surface 1,700 MCF
break over year

Life of field 2012
[illegible] will
be added
Prob. go to 2015
prob. go longer

← diesel

12/12/02 conference call w/ Brant Gemmison & engr.
flexibility on rate
[illegible] absolute

monthly avg is 1200 MCFD
or > max
or contingent on pressure

1,960 psi
surface injection pressure

Does acid gas CO_2 exacerbate a mild microannulus?

- Should we require annual packer isolation tests?
- Should we require a full length casing US plug?

TOM BROWN, INC.

BRANT GIMMESON
ENVIRONMENTAL / SAFETY MANAGER

555 SEVENTEENTH STREET
SUITE 1850
DENVER, CO 80202-3918
(303) 260-5000

DIRECT DIAL: (303) 260-5030
HOME: (303) 680-1568
CELLULAR: (303) 883-4665
FAX: (303) 260-5007
E-MAIL: bgimmeson@tombrown.com

TOM BROWN, INC.

September 19, 2002

State of Utah
Department of Natural Resources
Division of Oil, Gas & Mining
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801
Attention Christopher Kierst

RE: Lisbon B-624 SWD, Sec. 24 T30S, R24E, San Juan county, Utah as a Class II Injection well.

Dear Mr. Kierst:

Attached please find the following supporting information that you requested in your August 8, 2002 letter.

- Wellbore & reservoir technical review, includes step rate test.
- Designation of Agent to Buy's and Associates.
- A Plat showing offset operators, mineral owners and surface owners within a ½ mile radius of the B-624, plus affidavits of notifications.
- Cement Bond logs.
- Project Description- Pipeline & Wellsite equipment. This includes maintenance plans.
- Corrosion and metallurgy information from Metcorr.
- Emergency Response Plan/ Public Protection Plan.

555 Seventeenth Street, Suite 1850 • Denver, CO 80202-3918
Phone: 303/260-5000 • Fax 303/260-5001

- Letter from Washington, includes physical and chemical properties of the gas, alternative methods, and fluid compatibility.

After your review of that attached material Tom Brown Inc. would like to setup a meeting in Salt Lake to discuss the permit timeframes and explain any portions of the project the you may still have questions on. We will most likely have Plant, Facilities, Petroleum and Reservoir Engineer available along with myself for the meeting. The economics of this project weigh very heavy on the time factor, the sooner we can proceed with the project the more economical it is. Your early attention to this permit and meeting would be greatly appreciated. If you have any questions or require anything further please let me know.

Respectfully yours,

Brant Gimmeson

Brant Gimmeson
Environmental and Safety Manager
Tom Brown Inc.
555 17th Street, Suite 1850
Denver, CO 80202-3918
(303) 260-5030
cc
Buys & Associates
BLM Moab

Memorandum

Tom Brown, Inc.

Lisbon Gas Plant
Moab, Utah
September 18, 2002

Steven G. Jones, P.E.
Senior Chemical Engineer

SUBJECT
Sulfur Enrichment & Injection Project
Project Description – Pipeline & Wellsite

SUMMARY:
This memorandum provides a description of the Sulfur Enrichment & Injection processing facility (SEI unit) proposed for the Lisbon Gas Plant **with emphasis on the pipeline and wellsite equipment.**

Wellstream gas from the producing wells in the Lisbon field flows to the Lisbon gas plant for processing. The first processing step is removal of H2S (1.1%) and CO2 (27%) using a common "MDEA" amine treating facility. The MDEA facility produces a product stream containing the sweet gas components and nitrogen; which goes on for further processing in the plant. The byproduct stream from the MDEA unit is composed of 4% H2S plus CO2 which becomes the feed stream for the downstream Selectox Sulfur Recovery facility and BSR tail gas conditioning facility (sulfur unit or SRU) at present. However, Tom Brown Inc. plans to replace the SRU with the proposed new Sulfur Enrichment & Injection processing facility (SEI unit).

The SEI Unit will utilize Exxon-Mobil's proprietary FLEXSORB SE amine solvent to selectively enrich the feed gas from the upstream MDEA amine unit (4% H2S) to produce an even more concentrated product stream (50% H_2S), while minimizing the pickup of carbon dioxide (CO_2). The SEI unit is designed to remove the hydrogen sulfide (H_2S) in the feed gas and concentrate it for disposal via underground injection. Sulfur contained in the inlet gas will be injected back into the subsurface reservoir from which it originated instead of being converted into liquid sulfur (current operations). The H_2S-rich gas from the SEI unit will be compressed to 1500 psig then injected into the Mississippian formation in well B-624. Well A-713-A will serve as a back up in the event of mechanical problems in well B-624. The CO_2-rich treated gas from the SEI unit (what is left after most of the H2S is removed) will be incinerated and released to atmosphere. The magnitude of SO_2 emissions to the atmosphere will remain unchanged with the SEI unit (360 lb/hour SO2). The CO2-rich treated gas from the existing SRU is incinerated and released to the atmosphere in the same fashion at present.

ECONOMIC JUSTIFICATION:
The purpose of the proposed SEI unit is to replace the existing sulfur recovery unit. The existing Selectox Sulfur Recovery facility and BSR tail gas conditioning facility (SRU), will be bypassed, shut down and eventually sold. Justification for the investment required to build the SEI unit is

reduction in operating costs, reduction in fuel gas consumption, improved operating run time, and simplified operations.

PROCESS FLOW DISCUSSION:

The feed to the SEI unit (and sulfur unit at present) is a gas that comes from the upstream MDEA unit and contains about 4 mole % H_2S, 91 mole % CO_2, 4% water and other trace compounds (wet basis). The design SEI unit feed flow rate is 14.0 MMSCFD at about 12 psig, which originates from 50 MMSCFD plant wellstream inlet gas. The feed gas is contacted by about 250 gallons/minute of "lean" FLEXSORB SE amine solvent; which is a proprietary gas-treating agent that was developed by the ExxonMobil Research and Engineering Company for selective H_2S removal. The treated gas exiting the contactor (absorber), about 12.9 MMSCFD, is mostly CO2 (over 93%) and water (6%) but contains a small amount of residual H2S. The treated gas flows to the thermal incinerator where it is heated to 1500 deg F then released to the atmosphere. The amount of H2S that may be left in the treated gas is closely regulated by the existing air quality emission permit for the Lisbon plant. The "rich" FLEXSORB SE solvent exiting the absorber is regenerated in the FLEXSORB regenerator thereby releasing the "H2S-rich" gas; which is the feed to the compressors. Heat is input into the bottom of the regenerator, 14 MMBTU/hour, by the reboiler, which uses heat medium oil to indirectly heat the bottom of the tower to around 265 deg F. Steam rises up the regenerator thereby stripping the H2S and CO2 from the rich FLEXSORB SE solvent. The H2S and CO2, exits the top of the regenerator at a temperature of about 230 deg and 19 psig. The H_2S-rich gas, 1.3 MMSCFD, is water saturated and is composed of about 42% H_2S, 54% CO_2 and 4% water in the warmer months of summer. The composition and flow rate of the H_2S-rich gas varies with ambient temperature and operating conditions, with the H_2S concentration reaching 55% in cooler weather while corresponding CO2 and water content decreases to 43% and 2%. The flow rate decreases to 1.1 MMSCFD during the cooler weather. The composition and flow rate changes with ambient temperature because the "selectivity" of the FLEXSORB SE amine solvent to H2S in the feed gas from the MDEA unit is a function of inlet feed gas and amine temperature. In cooler weather, the FLEXSORB SE amine solvent "picks up" or absorbs less CO2 than it does at warmer temperature in the contactor.

THE FLEXSORB AMINE ENRICHMENT FACILITY:

The major SEI unit "enrichment" facility equipment is similar to a typical amine gas-treating unit, of which there are thousands in service around the world. A detailed description of this process is covered separately.

THE COMPRESSION FACILITY:

The H_2S-rich gas, about 1.3 MMSCF/day (summer operation), from the FLEXSORB enrichment facility flows to the suction of two identical 300 HP electric-driven compressors in parallel at 12 psig and 110 deg F suction conditions. SEI facility feed gas (4% H2S from the MDEA facility) is bypassed around the SEI unit and blended with the H2S-rich gas to maintain the flow to the suction of the compressors at a total rate up to 1.7 MMSCF/day; which is the rated capacity of both compressors operating simultaneously. If the H2S-rich gas flow rate is 1.3 MMSCF/day then 0.4 MMSCF/day of SEI facility feed gas or "bypass gas" will be added (blended together) to get the total flow rate of 1.7 MMSCF/day to the compressors. The compressors have five separate stages of compression, cooling, and scrubbing which increases process gas pressure to

about 1500 psig at the discharge (normal operating pressure). The design pressure for the compressors is 2165 psig.

The H_2S-rich gas changes phase as a result of compression, and at 1200 psig (and higher) becomes more dense than a gas, but not as dense as a liquid which is a state commonly referred to as "dense phase" or "super-critical" fluid. The fifth stage of cooling will normally be bypassed thereby allowing the dense fluid to enter the pipeline to well B-624 "hot" (200 to 300 degrees F). The "hot", "dense phase" "high H2S" gas flows through the pipeline to the wellsite, into the wellbore and then into the Mississippian reservoir to a depth of 9,000 ft below surface. Water is condensed during the compression/cooling stages and is collected in the compressor scrubbers. This "water of compression" flows to the existing Lisbon plant sour water disposal system where it is injected back into the Mississippian reservoir from which it originated; along with the produced water from the wells.

The compression facility contains instrumentation, piping and safety systems that serve to ensure that no H_2S is released to the atmosphere. The compressors are sophisticated packaged units that are designed and manufactured specifically for this project. Metallurgy of the compressors is stainless steel wherever the H2S rich gas is water saturated and at lower temperature and pressure. The various stages of compression, cooling, and scrubbing cause significant dehydration of the H_2S-rich gas (discussed in detail below). The gas is dehydrated to the extent that the last stage of compression and the pipeline to the wells is no longer stainless steel, but may instead be constructed using conventional carbon steel metallurgy.

There are numerous pressure, temperature and fluid level instruments throughout the compression facility that are monitored and controlled by a "programmable logic controller" (PLC). There are also six H_2S monitors positioned around the compression facility that can detect very small concentrations of H_2S in the air (a ppm level). Emergency shut down (ESD) valves are located at all inlets and outlets to the compression facility and are controlled by the PLC and also by Lisbon plant's main "distributive computer control system" (DCS). The entire compression facility can be isolated by the ESD valves based on alarms from the PLC, the plant DCS, or locally by the area operator. The H_2S-rich gas in the process can be diverted or "blown down" to the Lisbon Plant flare if necessary. The entire compressor facility and downstream pipeline to the injection well can be swept clear of any H_2S by closing off the H2S rich gas inlet and directing sweet, dry methane fuel gas from the Lisbon Plant's into the system.

THE "PROCESS" PIPELINE:

The "process" pipeline to the well will contain the "H2S rich" or "process" fluid and will be new 2 inch schedule 160 API-5L X42 carbon steel pipe. A pressure control valve in the "process" pipeline, located near the well B-624 wellhead, will maintain pipeline pressure (ie compressor discharge pressure) at the normal operating pressure of 1500 psig. The design pressure of the carbon steel line is 2165 psig at 350 deg F; the compressors will shut down on high pressure at 1950 psig. Backup relief valve pressure protection is afforded at the 2165 psig level.

Under normal conditions there will be no free water in the pipeline therefore little corrosion is anticipated. However, a contingency corrosion allowance in excess of 0.250" has been provided.

The "process" pipeline will originate at the ESD valves on the discharge of the compressor and terminate at the master valve on the wellhead. Connected to the "process" pipeline is the "blowdown to flare" which is an identical pipe that is connected to the Lisbon plant flare at a location near the compressors. The "blowdown to flare" contains an ESD valve that may be opened to allow the contents of the "process" pipeline to safely flow to flare. Corrosion inhibitor may be injected at the inlet to the "process" pipeline or at the wellsite if necessary. A corrosion coupon will be installed inside the pipeline near well B-624 that can be extracted and examined periodically to quantitatively evaluate the extent of metal loss due to corrosion, if any. Initially, there will not be a pipeline connecting to well A-713A, because B-624 is expected to be able to handle all of the H_2S-rich gas. An additional pipeline connection to A-713A will be constructed only if necessary.

There are pressure, temperature and other instruments located at the B-624 wellsite that are monitored and controlled by a "programmable logic controller" (PLC) at the wellsite. The wellsite PLC will communicate with plant's DCS system using a SCADA communications system. The pressure and temperature of the process pipeline will be measured at the pipeline entrance and also on the wellsite. The PLC system will continuously monitor key process variables on the wellsite and will alarm the plant's control operator if operations go outside of normal boundaries.

THE "JACKET" PIPELINE:

The "process" pipeline will be installed inside of a 4" carbon steel "JACKET or fuel gas" pipeline from the compressors to the wellsite. Spacers will be used to center the 2" pipe inside the 4" pipe. Methane fuel gas from the plant will flow in the annulus between the "process" pipeline and the "fuel gas" pipeline at less than 50 psig. The fuel gas will be used in the line heater and instruments to be located on the wellsite (discussed below). The pressure in the annular space will be monitored continuously at a location near the compressor discharge. In the event that the annular pressure exceeds target high (75 psig) or low (20 psig) set point pressures, then an alarm will notify the operators of a possible leak in the "process" pipeline. A pressure control / ESD valve can be opened which will permit gas in the annular space to flow to the Lisbon plant flare (similar to the "blowdown to flare" described above). The "JACKET" pipeline provides excellent early warning and protection from an H2S release in the event of a leak in the "process" pipeline. The "JACKET" pipeline will be insulated and supported off the ground on wooden blocks along the 2.5 mile route to primary injection well, B-624.

Jacket pipeline was deleted from design.

THE WELLSITE:

The SEI injection equipment at the wellsite consists of an indirect fired heater (1 MMBtu/hr), a pressure control valve, an ESD valve, plus pressure and temperature instruments located both upstream and downstream of the pressure control valve. The line heater will be identical to line heaters at many of the Mississippian producing wells in the area and will heat the H_2S-rich fluid to ensure that water does not condense and hydrates do not form downstream of the wellsite pressure control valve, in the wellhead, or in the vertical tubing string in the wellbore (see discussion below).

After the H_2S-rich fluid is heated in the line heater, it will flow across the wellsite pressure control valve, decreasing the pressure from about 1350 psig to the surface pressure required to inject the fluid into the reservoir via the wellbore. Note that the pressure drop in the "process" pipeline from the compressor (1500 psig) to the wellsite (1350 psig) is about 150 psig. The pressure at the wellsite upstream of the pressure control valve is maintained at 1350 psig which is 150 psig above the "critical pressure" of the process fluid (1200 psig) at all times to prevent condensation of liquid from the process gas. The pressure downstream of the wellsite pressure control valve is the surface pressure required for injection into the wellbore, which is expected to be 900 to 1200 psig initially. Over time the wellhead surface injection pressure should decrease as the Mississippian reservoir pressure is depleted. When the pressure of the process fluid decreases across the wellsite pressure control valve, the fluid temperature is decreased via the physical phenomena of JT expansion. The pressure and temperature drop is measured continuously and then moderated or controlled by heat input upstream of the valve via the line heater. Downstream of the pressure control valve, the fluid flows into the wellhead valves of B-624 then into the vertical tubing stream and finally into the perforations in the Mississippian reservoir at a depth of about 9,000 ft below the surface.

THE INJECTION WELL:

The annular pressure on well B-624 (the space between tubing and casing) will be measured by a pressure transmitter and monitored by the PLC control system. In the event of casing/tubing communication, the annular pressure should increase to a point, which would trigger an operator alarm and closure of the wellsite ESD. A separate discussion of the subsurface equipment configuration of well B-624 and a wellbore diagram depicting tubulars is available upon request. Well B-624 has been used for disposal of produced water for over 30 years. There is sufficient space on the existing wellsite for the new SEI injection equipment. There is a complete water injection facility present at the wellsite, including a storage tank, 3 large positive displacement injection pumps enclosed in an insulated building, plus electric power distribution equipment. The water disposal equipment will be maintained in-place, at least initially, in the event that it is necessary to load well B-624 with water to commence injection.

The safety of the wellsite is ensured by the engineering design features discussed above. However, there will also be one H_2S monitor near the B-624 wellhead and a second H_2S monitor placed about 1,000 ft from the wellsite along the entrance road. These two monitors will check for H_2S releases to the atmosphere. Information from these monitors (and the other instruments on the wellsite) will be monitored by the wellsite PLC. The ESD valves (compressor discharge and/or at the wellsite) can be closed if H_2S is detected by the monitors on the wellsite. When injection into well B-624 is stopped, the compressors, pipeline and the well's tubing string can be purged with methane fuel gas. An "emergency response plan / public protection plan" has been prepared by TBI and submitted to the Bureau of Land Management.

CORROSION PREVENTION:

One peculiar characteristic of the "H2S rich" gas is that its ability to hold water without condensation passes through a minimum in the range of 400 to 1000 psig. At the final discharge and pipeline operating pressure of 1500 psig it can hold more water without experiencing condensation than it can in the lower pressure range. This allows dehydration to occur during the

acid gas compression step since the third and fourth stages of compression fall in the range of the minimum water content. Typically, the temperature and pressure at the outlet of the fourth stage compressor discharge cooler determines the water content of the H2S rich gas entering the pipeline to the injection well.

Corrosion of the 2" schd 160 pipeline containing the H2S rich fluid is controlled by dehydrating the gas through the compression facility and then operating the process such that free water never condenses anywhere in the piping. There will be no corrosion if there is no free water. The water contained in the high H2S fluid is reduced from almost 1000 lb H2O per MMSCF of gas to less than 200 lb H2O per MMSCF of gas by five stages of compression, cooling and scrubbing in the compression facility. The dehydrated, high pressure, dense phase fluid exiting the compression facility is hot (greater than 200 deg F) and is not allowed to cool to the temperature where water can condense (the water dewpoint); anywhere along the way to the reservoir. The 4" outer "JACKET/fuel gas" pipeline containing the 2" inner "process" pipeline will be covered with external insulation from the compression facility to the wellsite. The insulation will prevent the high H2S dense phase fluid from cooling to the "water dewpoint" temperature. Temperature gauges will be installed along the pipeline to verify that adequate temperature is maintained at all times. Upon reaching the wellsite, the dense phase fluid is heated to over 100 deg F in the indirect fired heater. The "hot" dense phase fluid subsequently flows across the pressure control valve then into the wellbore. The fluid will cool due the pressure drop across the control valve but the line heater will be operated such that the temperature downstream of the control valve is always greater than the "water dewpoint". The fluid then enters the wellbore where it is heated by the ground as it flows deeper into the subsurface. The temperature of the Mississippian carbonate reservoir (at a depth of about 9,000 ft) where the fluid will be injected is about 140 deg F which is well above the "water dewpoint". All piping will be coated with a "corrosion inhibitor fluid" prior to commencing injection; however, continuous injection of corrosion inhibitor is not necessary.

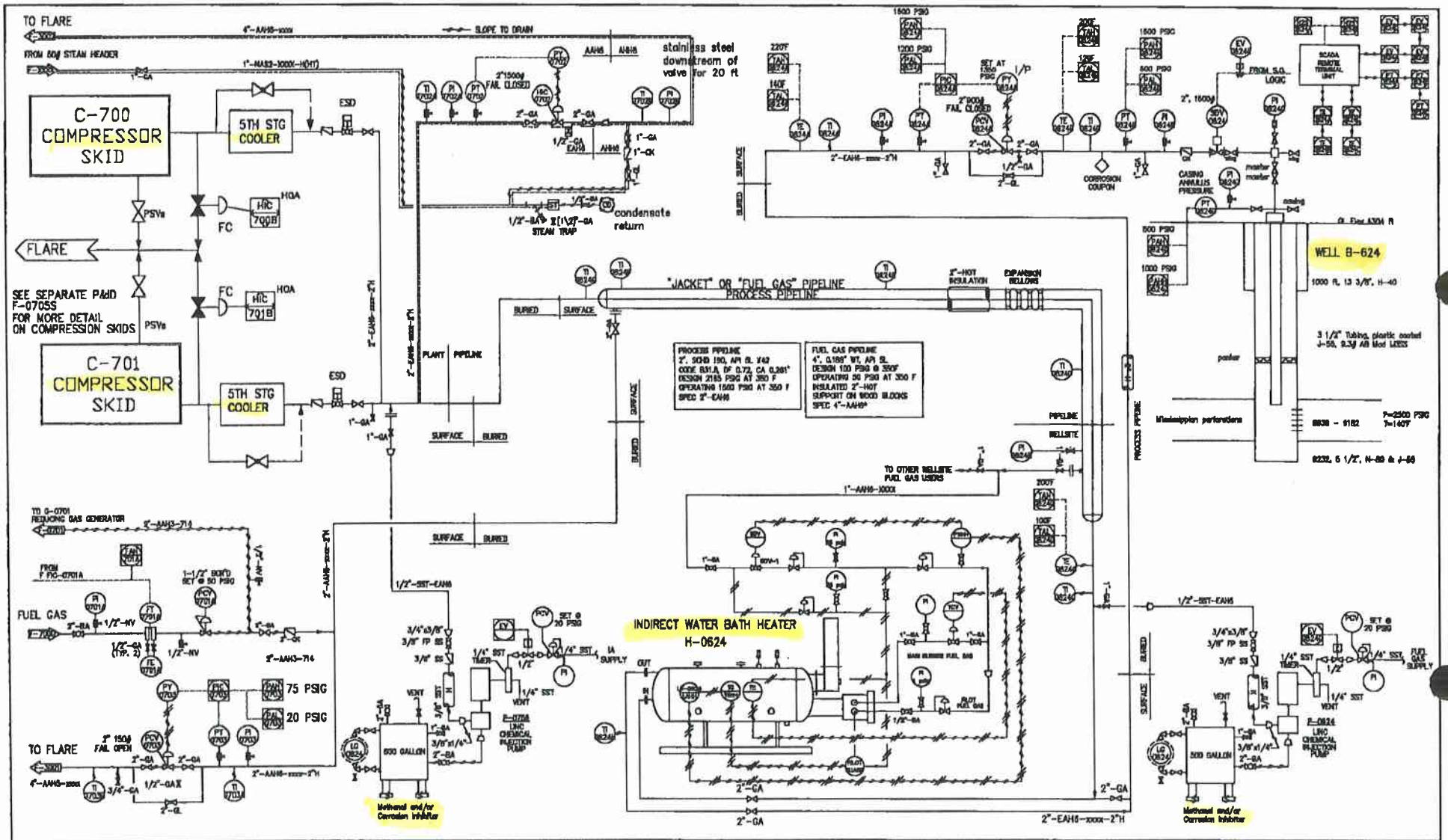
DRAWINGS: available upon request

Sulfur Re-injection Project
Pipeline/Wellsite Safety Features:

Pipeline/Well Site Safety Features

- ✓ Heavy wall process pipeline with huge corrosion allowance 0.261"
- ✓ 6 H2S monitors around compressor facility
- ✓ 2 H2S monitors at wellsite
- ✓ Safety shut down valves at compressor discharge & wellsite
- ✓ Process pipeline contained inside of JACKET/fuel gas pipeline with pressure monitoring.
- ✓ Corrosion coupon at wellsite to measure rate of metal loss
- ✓ Displace compressor & pipeline with fuel gas as needed
- ✓ Compressor & pipeline blowdown to flare as needed
- ✓ Jacket pipeline blowdown to flare as needed
- ✓ Controlled, gated access to pipeline corridor & wellsite
- ✓ Pressure & temperature monitors at start & end of pipeline & at wellhead
- ✓ Methanol and corrosion inhibitor injection at compressor & wellsite

- ✓ Design and operation to prevent condensation of free water anywhere. Pressure control valve on process pipeline near wellhead.
- ✓ Process gas discharge from compressors into pipeline is hot
- ✓ Line heater at wellsite to maintain process fluid temperature
- ✓ Pressure monitor on well B-624 casing/tubing annulus
- ✓ Insulation on surface pipeline from plant to wellsite
- ✓ Capability to pump produced water into well B-624 if needed.
- ✓ 24 hour/day, 365 day/year operator supervision by Lisbon plant personnel
- ✓ Continuous supervision of key process variables by SCADA & DCS computer control systems.



REFERENCE	REV	DATE	REVISION	BY	CHKD	SECT LDR	CHIEF DRAFT	PROJ ENGR
	1	8/23/02	BEFORE HAZOP	SJ				
	2	9/12/02	AFTER HAZOP	SJ				

TOM BROWN INC.
LISBON GAS PLANT
SAN JUAN COUNTY
MOAB, UTAH

MECHANICAL FLOW DIAGRAM
SULFUR RE-INJECTION PROJECT
INJECTION PIPELINE & WELLBORE

DES.: RGJ	SCALE: NONE	JOB NO.: 9/18/02	
DR.: RGJ	FILE:		
CHK:	DATE:	DWG.NO.: F-0708S	REV. 2
APP.:	DATE:		

Tom Brown Inc.
555 17TH Street
Suite 1850
Denver CO 80202-3918

Engineering Dept.
FAX

From: Brant Gimmeson
Environmental & Safety Manager
(303)260-5030
fax (303)260-5007
E-MAIL bgimmeson@tombrown.com

To. Christopher Kierst/ Gil Hunt

Fax 801-359-3940

Here is a copy of our planned agenda for the meeting on Monday Sept 30, 2002. If you have any other items you would like covered or would like to put these items in a different order because of people from the department that may need to leave early please let me know. If you have any questions or concerns give me a call 303-260-5030. We will be traveling on Monday, however if you need to reach me on Monday please try my cell phone 303-883-4665.

RECEIVED
SEP 27 2002
DIVISION OF
OIL, GAS AND MINING

TOM BROWN, INC. LISBON UNIT B-624
SULFUR RE-INJECTION PROJECT APPLICATION
SAN JUAN COUNTY, UTAH

UTAH DIVISION OF OIL, GAS, AND MINING REVIEW
MONDAY, SEPTEMBER 30, 3:30 PM
AGENDA

• Project Overview and Benefits • TBI Project Timeline and Capital Commitment	Randy Koliba (5 min)
• Regulatory Update (Affidavits, Notifications, etc.)	Brant Gimmeson (10 min)
• Geologic Overview / Injection Well Selection • Well History / Water Disposal Project • Area of Review / Cement Calculations • Cement Bond Log • Condition of Wellbore • Injection Rates and Pressures / Recent Tests - Bottom-hole Injection Pressure - Pressure Fall Off Test - Step Rate Test - Nodal Analysis • Proposed Well Work	Byron Gale (20 min)
• Reservoir Volumetrics • Other Reservoir Considerations	Ray Johnson/ Erin Anderson (15 min)
• Surface Facilities Design / Operations	Doug Rosa (15 min)
• Emergency Response Plan	Brant Gimmeson (10 min)

Tom Brown, Inc. Attendees: Randy Koliba, Area Manager, Grand Junction
Doug Rosa, Lisbon Plant Supervisor, Moab
Brant Gimmeson, Environmental Manager, Denver
Byron Gale, Production/Operations Engineer, Denver
Erin Anderson, Reservoir Engineer, Denver
Ray Johnson, Reservoir Engineering Advisor, Denver

AFFIDAVIT OF MAILING

I, Martin W. Buys, President, Buys & Associates, Inc. being first duly sworn, dispose and state as follows:

On July 25, 2002, I caused to be mailed by certified mail, postage prepaid, return receipt requested, a copy of the application to convert the Lisbon A-713A Well to dispose of acid gas. This application was sent to all operators, owners and surface owners within a one half-mile radius of the subject well.

Dated this 27th day of September, 2002

Martin W. Buys
President
Buys & Associates, Inc.

The forgoing affidavit was subscribed and sworn to me by Martin W. Buys.
This 27 day of Sept, 2002

Notary Public

My Commission expires: 3 day of May

CHRISTINA ARNOLD
NOTARY
PUBLIC
STATE OF COLORADO

My Commission Expires 5/3/2006

Surface, Royalty and Working Interest

1) WI Ownership within Lisbon Mississippian Unit

TBI - 99.50307% WI

Chester Gordon Trust - 0.49693% WI
600 17th Street, Suite #1800 North
Denver, CO 80202
Attn: Wayne Gardenswartz, Trustee

2) WI Ownership within the McCracken Unit

TBI - 100% WI

3) Mineral Ownership

All Minerals are Federal and State of Utah.

4) Base Royalty Ownership

All Base Royalties are paid to the BLM (Federal) and the State of Utah.

5) Surface Ownership

BLM and Tom Brown

Sent Certified, return receipt 7/25/02

U.S. Postal Service
CERTIFIED MAIL RECEIPT
(Domestic Mail Only: No Insurance Coverage Provided)

7001 1140 0002 6003 1471

OFFICIAL USE

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Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

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City,

Bureau of Land Management
Oil & Gas Division
82 East Dogwood
Moab, UT 84532

PS F ... nstructions

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City, S

State of Utah, SITLA
675 East 500 South, Suite 500
Salt Lake City, UT 84102-2818

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Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

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Sent To
Street, A or PO B
City, Sta

Chester Gordon Trust
Attn: Wayne Gardenswartz, Trustee
600 17th Street, Suite 1800 North
Denver, CO 80202

PS Form ... uctions

July 29, 2002

CERTIFIED MAIL NO. 7001 1140 0002 6003 7060

Mineral, Surface and Working Interest Owners

RE: **Notification of Water Disposal**
Lisbon A-713-A Well
SWNW, Section 13, T30S – R24E
San Juan County, Utah

To Whom it May Concern;

On July 26, 2002, we submitted to the Utah Division of Oil, Gas and Mining an application requesting approval to convert the above mentioned well to dispose of acid gas.

Anyone who would be directly and adversely affected by the authorization of the underground disposal into the Mississippian Leadville formation (9038'-9362') may file a written request for a public hearing before the division. Logs and additional information on the subject well are on file with the State of Utah, Division of Oil, Gas and Mining, 1590 W. North Temple, Suite 1210, Salt Lake City, Utah 84114.

Please contact Marty Buys at 303.781.8211 if you have any questions.

Sincerely,

Martin W. Buys
Agent for Tom Brown, Inc.

Enclosure

AFFIDAVIT OF MAILING

I, Martin W. Buys, President, Buys & Associates, Inc., being first duly sworn, depose and state as follows; On July 25, 2002, I caused to be mailed by certified mail, postage prepaid, return receipt requested, a copy of the Application to modify the Lisbon B-624 SWD Well to dispose of acid gas. It was sent to all parties on the attached sheet.

Dated this 25th day of July, 2002

Martin W. Buys
President
Buys & Associates, Inc.

The forgoing affidavit was subscribed and sworn to before me by Martin W. Buys.
This 29 day of July, 2002

_____, Notary Public

My Commission expires: _____ day of _____
My Commission Expires 9/3/2003

NIKKI L. BRIGGS
NOTARY PUBLIC
STATE OF COLORADO

RECEIVED
AUG 0 1 2002
DIVISION OF
OIL, GAS AND MINING

Sent Certified, return receipt 7/25/02

U.S. Postal Service
CERTIFIED MAIL RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)

7001 1140 0002 6003 1471

OFFICIAL USE

Postage	$
Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

Postmark Here

Ser
Stre or P
City,

Bureau of Land Management
Oil & Gas Division
82 East Dogwood
Moab, UT 84532

PS F ... nstructions

U.S. Postal Service
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(Domestic Mail Only; No Insurance Coverage Provided)

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State of Utah, SITLA
675 East 500 South, Suite 500
Salt Lake City, UT 84102-2818

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City, Sta

Chester Gordon Trust
Attn: Wayne Gardenswartz, Trustee
600 17th Street, Suite 1800 North
Denver, CO 80202

PS Form ... uctions

B&A Buys & Associates, Inc.
Environmental Consultants

4720 South Santa Fe Circle, Suite 6
Englewood, Colorado 80110-6488
303/781-8211 303/781-1167 Fax

September 27, 2002

Mr. Christopher Kierst
State of Utah
Division of Oil, Gas and Mining
1594 W. North Temple, Suite 1210
Salt Lake City, Utah 84114

RECEIVED
SEP 30 2002
DIVISION OF
OIL, GAS AND MINING

RE: Affidavits of Mailing
L isbon A-713-A Well
Lisbon B-624 Well

Dear Mr Kierst:

Enclosed are the revised affidavits that you requested. Please let me know if this revised language is acceptable to you.

Please contact me directly at 303.781.8211 if you have questions or require any additional information. Thank you for your help with this project.

Sincerely,
BUYS & ASSOCIATES, INC.

Martin W. Buys
Agent for Tom Brown Inc.

AFFIDAVIT OF MAILING

I, Martin W. Buys, President, Buys & Associates, Inc. being first duly sworn, dispose and state as follows:

On July 25, 2002, I caused to be mailed by certified mail, postage prepaid, return receipt requested, a copy of the application to modify the Lisbon B-624 SWD Well to dispose of acid gas. This application was sent to all operators, owners and surface owners within a one half-mile radius of the subject well.

Dated this 27th day of September, 2002

Martin W. Buys
President
Buys & Associates, Inc.

The forgoing affidavit was subscribed and sworn to me by Martin W. Buys.
This 27 day of Sept, 2002

Notary Public

My Commission expires: 3 day of May

CHRISTINA ARNOLD
NOTARY
PUBLIC
STATE OF COLORADO

My Commission Expires 5/3/2006

Sent Certified, return receipt 7/25/02

U.S. Postal Service
CERTIFIED MAIL RECEIPT
(Domestic Mail Only: No Insurance Coverage Provided)

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Ser. Bureau of Land Management
Stre or P Oil & Gas Division
82 East Dogwood
City, Moab, UT 84532

PS F ... nstructions

U.S. Postal Service
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(Domestic Mail Only: No Insurance Coverage Provided)

7001 1140 0002 6003 1464

OFFICIAL USE

Postage	$
Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

Postmark Here

Sent State of Utah, SITLA
675 East 500 South, Suite 500
Street, or PO
Salt Lake City, UT 84102-2818
City, S

PS Fo ... tructions

U.S. Postal Service
CERTIFIED MAIL RECEIPT
(Domestic Mail Only: No Insurance Coverage Provided)

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OFFICIAL USE

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Certified Fee	
Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

Postmark Here

Sent To Chester Gordon Trust
Attn: Wayne Gardenswartz, Trustee
Street, or PO B 600 17th Street, Suite 1800 North
City, Sta Denver, CO 80202

PS Form ... uctions

Surface, Royalty and Working Interest

1) WI Ownership within Lisbon Mississippian Unit
   TBI - 99.50307% WI

   Chester Gordon Trust - 0.49693% WI
   600 17th Street, Suite #1800 North
   Denver, CO 80202
   Attn: Wayne Gardenswartz, Trustee

2) WI Ownership within the McCracken Unit
   TBI - 100% WI

3) Mineral Ownership
   All Minerals are Federal and State of Utah.

4) Base Royalty Ownership
   All Base Royalties are paid to the BLM (Federal) and the State of Utah.

5) Surface Ownership
   BLM and Tom Brown

July 29, 2002

CERTIFIED MAIL NO. 7001 1140 0002 6003 1464

Mineral, Surface and Working Interest Owners

RE: **Notification of Water Disposal**
Lisbon B-624 Well
NENW Section 24, T30S – R24E
San Juan County, Utah

To Whom it May Concern;

On July 18, 2002, we submitted to the Utah Division of Oil, Gas and Mining an application requesting approval to modify the above mentioned well to dispose of acid gas.

Anyone who would be directly and adversely affected by the authorization of the underground disposal into the Mississippian Leadville formation (8896'-9200') may file a written request for a public hearing before the division. Logs and additional information on the subject well are on file with the State of Utah, Division of Oil, Gas and Mining, 1590 W. North Temple, Suite 1210, Salt Lake City, Utah 84114.

Please contact Marty Buys at 303.781.8211 if you have any questions.

Sincerely,

Martin W. Buys
Agent for Tom Brown, Inc.

Enclosure

FAX TRANSMISSION
BUYS & ASSOCIATES, INC.
ENVIRONMENTAL CONSULTANTS

4720 South Santa Fe Circle, Suite 6
Englewood, CO 80110
303.781.8211
Fax: 303.781.1167

To:	Christopher Kierst	**Date:**	September 27, 2002
Company:	DOGM		
Fax #:	801.~~599~~ 359.3940 275-28	**9 Pages**	**Including Cover**
From:	Martin Buys		
Subject:	Affidavit of mailing		

COMMENTS

Attached are copies of the revised affidavits of mailing for the B-624 and the A-713A. The originals have been sent to you by USPS mail.

RECEIVED
SEP 27 2002
DIVISION OF
OIL, GAS AND MINING

B&A Buys & Associates, Inc.
Environmental Consultants

AFFIDAVIT OF MAILING

I, Martin W. Buys, President, Buys & Associates, Inc. being first duly sworn, dispose and state as follows:

On July 25, 2002, I caused to be mailed by certified mail, postage prepaid, return receipt requested, a copy of the application to modify the Lisbon B-624 SWD Well to dispose of acid gas. This application was sent to all operators, owners and surface owners within a one half-mile radius of the subject well.

Dated this 27th day of September, 2002

Martin W. Buys
President
Buys & Associates, Inc.

The forgoing affidavit was subscribed and sworn to me by Martin W. Buys.
This 27 day of Sept, 2002

Notary Public

My Commission expires: 3 day of May

CHRISTINA ARNOLD
NOTARY
PUBLIC
STATE OF COLORADO
My Commission Expires 5/3/2006

Sent Certified, return receipt 7/25/02

U.S. Postal Service
CERTIFIED MAIL RECEIPT
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Certified Fee
Return Receipt Fee (Endorsement Required)
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Sent To: Bureau of Land Management
Oil & Gas Division
Street or PO: 82 East Dogwood
City, St: Moab, UT 84532

PS Form ... Instructions

U.S. Postal Service
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Restricted Delivery Fee (Endorsement Required)
Total Postage & Fees $

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Street or PO: 675 East 500 South, Suite 500
City, St: Salt Lake City, UT 84102-2818

PS Form ... Instructions

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Total Postage & Fees $

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Sent To: Chester Gordon Trust
Street, Apt. or PO Box: Attn: Wayne Gardenswartz, Trustee
City, State: 600 17th Street, Suite 1800 North
Denver, CO 80202

PS Form ... Instructions

Surface, Royalty and Working Interest

1) WI Ownership within Lisbon Mississippian Unit
   TBI - 99.50307% WI

   Chester Gordon Trust - 0.49693% WI
   600 17th Street, Suite #1800 North
   Denver, CO 80202
   Attn: Wayne Gardenswartz, Trustee

2) WI Ownership within the McCracken Unit
   TBI - 100% WI

3) Mineral Ownership
   All Minerals are Federal and State of Utah.

4) Base Royalty Ownership
   All Base Royalties are paid to the BLM (Federal) and the State of Utah.

5) Surface Ownership
   BLM and Tom Brown

July 29, 2002

CERTIFIED MAIL NO. 7001 1140 0002 6003 1464

Mineral, Surface and Working Interest Owners

RE: **Notification of Water Disposal**
Lisbon B-624 Well
NENW Section 24, T30S – R24E
San Juan County, Utah

To Whom it May Concern;

On July 18, 2002, we submitted to the Utah Division of Oil, Gas and Mining an application requesting approval to modify the above mentioned well to dispose of acid gas.

Anyone who would be directly and adversely affected by the authorization of the underground disposal into the Mississippian Leadville formation (8896'-9200') may file a written request for a public hearing before the division. Logs and additional information on the subject well are on file with the State of Utah, Division of Oil, Gas and Mining, 1590 W. North Temple, Suite 1210, Salt Lake City, Utah 84114.

Please contact Marty Buys at 303.781.8211 if you have any questions.

Sincerely,

Martin W. Buys
Agent for Tom Brown, Inc.

Enclosure

AFFIDAVIT OF MAILING

I, Martin W. Buys, President, Buys & Associates, Inc. being first duly sworn, dispose and state as follows:

On July 25, 2002, I caused to be mailed by certified mail, postage prepaid, return receipt requested, a copy of the application to convert the Lisbon A-713A Well to dispose of acid gas. This application was sent to all operators, owners and surface owners within a one half-mile radius of the subject well.

Dated this 27th day of September, 2002

Martin W. Buys
President
Buys & Associates, Inc.

The forgoing affidavit was subscribed and sworn to me by Martin W. Buys.
This 27 day of Sept, 2002

Notary Public

My Commission expires: 3 day of May

CHRISTINA ARNOLD NOTARY PUBLIC STATE OF COLORADO

My Commission Expires 5/3/2006

Surface, Royalty and Working Interest

1) WI Ownership within Lisbon Mississippian Unit
   TBI - 99.50307% WI

   Chester Gordon Trust - 0.49693% WI
   600 17th Street, Suite #1800 North
   Denver, CO 80202
   Attn: Wayne Gardenswartz, Trustee

2) WI Ownership within the McCracken Unit
   TBI - 100% WI

3) Mineral Ownership
   All Minerals are Federal and State of Utah.

4) Base Royalty Ownership
   All Base Royalties are paid to the BLM (Federal) and the State of Utah.

5) Surface Ownership
   BLM and Tom Brown

Sent Certified, return receipt 7/25/02

U.S. Postal Service
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Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

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City,

Bureau of Land Management
Oil & Gas Division
82 East Dogwood
Moab, UT 84532

PS F... ...structions

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State of Utah, SITLA
675 East 500 South, Suite 500
Salt Lake City, UT 84102-2818

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Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

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Sent T
Street, or PO B
City, Sta

Chester Gordon Trust
Attn: Wayne Gardenswartz, Trustee
600 17th Street, Suite 1800 North
Denver, CO 80202

PS Form ...ctions

July 29, 2002

CERTIFIED MAIL NO. 7001 1140 0002 6003 7060

Mineral, Surface and Working Interest Owners

RE: **Notification of Water Disposal**
Lisbon A-713-A Well
SWNW, Section 13, T30S – R24E
San Juan County, Utah

To Whom it May Concern;

On July 26, 2002, we submitted to the Utah Division of Oil, Gas and Mining an application requesting approval to convert the above mentioned well to dispose of acid gas.

Anyone who would be directly and adversely affected by the authorization of the underground disposal into the Mississippian Leadville formation (9038'-9362') may file a written request for a public hearing before the division. Logs and additional information on the subject well are on file with the State of Utah, Division of Oil, Gas and Mining, 1590 W. North Temple, Suite 1210, Salt Lake City, Utah 84114.

Please contact Marty Buys at 303.781.8211 if you have any questions.

Sincerely,

Martin W. Buys
Agent for Tom Brown, Inc.

Enclosure

BEFORE THE DIVISION OF OIL, GAS AND MINING
DEPARTMENT OF NATURAL RESOURCES
STATE OF UTAH

1960 psia
as per Brent 11/22/02
Gemmison CK

IN THE MATTER OF THE APPLICATION OF TOM BROWN, INC. FOR ADMINISTRATIVE APPROVAL OF THE NW USA D-1 (B-624) WELL LOCATED IN SECTION 24, TOWNSHIP 30 SOUTH, RANGE 24 EAST, SAN JUAN COUNTY, UTAH, AS A CLASS II WASTE GAS DISPOSAL WELL

NOTICE OF AGENCY ACTION

CAUSE NO. UIC 297.1

Ben Minor

Byron Gale Tom Brown
(303) 260-5036

THE STATE OF UTAH TO ALL PERSONS INT
MATTER.

Notice is hereby given that the Division of (
an informal adjudicative proceeding to consider the
approval of the well, located in Section 24, Townsh
for conversion to a Class II Gas Reinjection well. T
adjudicative proceeding will be conducted informal
Administrative Procedures.

Selective zones in the Leadville Limestone
proposes to inject a gas mixture of approximately 5
injection pressure of ~~1,400~~ psia and injection rate o
operator wants 1,960 psia max CK

Any person desiring to object to the propos
proceeding, must file a written protest or notice of i
following publication of this notice. The Division'
Associate Director at PO Box 145801, Salt Lake C
If such a protest or notice of intervention is receive
aforementioned administrative procedure rule. Pro
demonstrate at the hearing how this matter affects t

Dated this 2nd day of October, 2002.

only
affects downhole
in place

1,960 psia maximum
~2,600 psia
CK 11/22/02

John R. Baza
Associate Director

~1500 psia normal operating pressure

BEFORE THE DIVISION OF OIL, GAS AND MINING
DEPARTMENT OF NATURAL RESOURCES
STATE OF UTAH

IN THE MATTER OF THE APPLICATION OF TOM BROWN, INC. FOR ADMINISTRATIVE APPROVAL OF THE NW USA D-1 (B-624) WELL LOCATED IN SECTION 24, TOWNSHIP 30 SOUTH, RANGE 24 EAST, SAN JUAN COUNTY, UTAH, AS A CLASS II WASTE GAS DISPOSAL WELL	:	NOTICE OF AGENCY ACTION CAUSE NO. UIC 297.1

THE STATE OF UTAH TO ALL PERSONS INTERESTED IN THE ABOVE ENTITLED MATTER.

Notice is hereby given that the Division of Oil, Gas and Mining (the "Division") is commencing an informal adjudicative proceeding to consider the application of Tom Brown, Inc. for administrative approval of the well, located in Section 24, Township 30 South, Range 24 East, San Juan County, Utah, for conversion to a Class II Gas Reinjection well. This well is located in the Lisbon Unit. The adjudicative proceeding will be conducted informally according to Utah Admin.Rule R649-10, Administrative Procedures.

Renotice?

Selective zones in the Leadville Limestone will be used for gas reinjection. The operator proposes to inject a gas mixture of approximately 50% CO_2 and 50% H_2S at a maximum requested injection pressure of ~~1,400~~ psia and injection rate of 1,700 MCFD. — won't change

operator wants 1,960 psia max CK 11/22/02

Any person desiring to object to the proposed application or otherwise intervene in the proceeding, must file a written protest or notice of intervention with the Division within fifteen days following publication of this notice. The Division's Presiding Officer for this proceeding is John R. Baza, Associate Director at PO Box 145801, Salt Lake City, Utah 84114-5801, phone number (801) 538-5334. If such a protest or notice of intervention is received, a hearing will be scheduled in accordance with the aforementioned administrative procedure rule. Protestants and/or interveners should be prepared to demonstrate at the hearing how this matter affects their interests.

Dated ~~this 2~~nd day of October, 2002.

2800# parting pressure by Step Rate

only affects downhole not phases

1,960 ~2,600 psia maximum CK 11/22/02

STATE OF UTAH
DIVISION OF OIL, GAS & MINING

John R. Baza

John R. Baza
Associate Director

~1500 psia normal operating pressure

Tom Brown, Inc.
Lisbon B-624 SWD
Cause No. UIC 297.1

Publication Notices were sent to the following:

Tom Brown, Inc.
PO Box 2608
Midland TX 79702

San Juan Record
PO Box 879
Monticello, UT 84535-0879

via E-Mail and Facsimile (801) 237-2776
Salt Lake Tribune
PO Box 45838
Salt Lake City, UT 84145

Moab District Office
Bureau of Land Management
82 East Dogwood
Moab UT 84531

San Juan County Planning
117 South Main
Monticello UT 84535

Dan Jackson
US EPA Region VIII, Suite 5000
999 18th Street
Denver, CO 80202-2466

Earlene Russell

Earlene Russell
Executive Secretary
October 3, 2002

O:\O&G\UIC\UIC Notice master.doc

From: "NAC LEGAL" <naclegal@nacorp.com>
To: "Earlene Russell" <EARLENERUSSELL@utah.gov>
Date: 10/3/02 4:49PM
Subject: Re: UIC 297.1

Plese check your ad on Oct. 8th. Thank you.

----- Original Message -----
From: Earlene Russell
To: naclegal@nacorp.com
Sent: Thursday, October 03, 2002 3:48 PM
Subject: UIC 297.1

Please notify me of the publishing date. Thanks.

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt
Governor

Robert L. Morgan
Executive Director

Lowell P. Braxton
Division Director

1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, Utah 84114-5801
(801) 538-5340 telephone
(801) 359-3940 fax
(801) 538-7223 TTY
www.nr.utah.gov

October 3, 2002

SENT VIA E-MAIL AND FAX (801) 237-2776

Salt Lake Tribune
PO Box 45838
Salt Lake City, UT 84145

RE: Notice of Agency Action - Cause No. UIC 297.1

Gentlemen:

Enclosed is a copy of the referenced Notice of Agency Action. Please publish the Notice, once only, as soon as possible. Please send proof of publication and billing to the Division of Oil, Gas and Mining, Suite 1210, PO Box 145801, Salt Lake City, Utah 84114-5801.

Sincerely,

Earlene Russell

Earlene Russell
Executive Secretary

encl.

TRANSACTION REPORT

P.01

OCT-03-2002 THU 03:45 PM

FOR: OIL, GAS & MINING 801 359 3940

DATE	START	RECEIVER	TX TIME	PAGES	TYPE	NOTE	M#	DP
OCT-03	03:44 PM	2372776	44"	2	SEND	OK	114	

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State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, Utah 84114-5801
(801) 538-5340 telephone
(801) 359-3940 fax
(801) 538-7223 TTY
www.nr.utah.gov

Michael O. Leavitt
Governor

Robert L. Morgan
Executive Director

Lowell P. Braxton
Division Director

October 3, 2002

SENT VIA E-MAIL AND FAX (801) 237-2776

Salt Lake Tribune
PO Box 45838
Salt Lake City, UT 84145

RE: Notice of Agency Action - Cause No. UIC 297.1

Gentlemen:

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Sincerely,

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt
Governor
Robert L. Morgan
Executive Director
Lowell P. Braxton
Division Director

1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, Utah 84114-5801
(801) 538-5340 telephone
(801) 359-3940 fax
(801) 538-7223 TTY
www.nr.utah.gov

October 3, 2002

San Juan Record
PO Box 879
Monticello, UT 84535-0879

RE: Notice of Agency Action - Cause No. UIC 297.1

Gentlemen:

Enclosed is a copy of the referenced Notice of Agency Action. Please publish the Notice, once only, as soon as possible. Please send proof of publication and billing to the Division of Oil, Gas and Mining, Suite 1210, PO Box 145801, Salt Lake City, Utah 84114-5801.

Sincerely,

Earlene Russell

Earlene Russell
Executive Secretary

encl.

BEFORE THE DIVISION OF OIL, GAS AND MINING
DEPARTMENT OF NATURAL RESOURCES
STATE OF UTAH

NW USA D-1 (B-624) 43-037-16516

IN THE MATTER OF THE APPLICATION OF TOM BROWN, INC. FOR ADMINISTRATIVE APPROVAL OF THE ~~LISBON B-624~~ SWD WELL LOCATED IN SECTION 24, TOWNSHIP 30 SOUTH, RANGE 24 EAST, SAN JUAN COUNTY, UTAH, AS A CLASS II WASTE GAS DISPOSAL WELL	:	NOTICE OF AGENCY ACTION CAUSE NO. UIC 115 assign new # UIC-297.1

THE STATE OF UTAH TO ALL PERSONS INTERESTED IN THE ABOVE ENTITLED MATTER.

Notice is hereby given that the Division of Oil, Gas and Mining (the "Division") is commencing an informal adjudicative proceeding to consider the application of Tom Brown, Inc. for administrative approval of the ~~Lisbon B-624 S~~WD well, located in Section 24, Township 30 South, Range 24 East, San Juan County, Utah, for conversion to a Class II ~~Waste~~ Gas ~~Disposal~~ reinjection well. This well is located in the Lisbon Unit. The adjudicative proceeding will be conducted informally according to Utah Admin.Rule R649-10, Administrative Procedures.

Selective zones in the Leadville Limestone will be used for ~~waste~~ gas ~~disposal~~ reinjection. The operator proposes to inject a ~~waste~~ gas mixture of approximately 50% CO_2 and 50% H_2S at a maximum requested injection pressure of 1,400 psia and injection rate of 1,700 MCFD.

Any person desiring to object to the proposed application or otherwise intervene in the proceeding, must file a written protest or notice of intervention with the Division within fifteen days following publication of this notice. The Division's Presiding Officer for this proceeding is John R. Baza, Associate Director at PO Box 145801, Salt Lake City, Utah 84114-5801, phone number (801) 538-5334. If such a protest or notice of intervention is received, a hearing will be scheduled in accordance with the aforementioned administrative procedure rule. Protestants and/or interveners should be prepared to demonstrate at the hearing how this matter affects their interests.

Dated this 1st day of October, 2002.

STATE OF UTAH
DIVISION OF OIL, GAS & MINING

John R. Baza
Associate Director

Saved in N:\OG Reviewed Docs/CK

BEFORE THE DIVISION OF OIL, GAS AND MINING
DEPARTMENT OF NATURAL RESOURCES
STATE OF UTAH

IN THE MATTER OF THE Tom Brown, Inc. APPLICATION OF «operator» FOR ADMINISTRATIVE APPROVAL OF THE «well» WELL LOCATED IN SECTION «section», TOWNSHIP «twnshp» T.39S., RANGE «range», «county» San Juan COUNTY, UTAH, AS A CLASS II INJECTION WELL	:	NOTICE OF AGENCY ACTION 115-1.1 CAUSE NO. UIC «causeno»

Lisbon B-624 SWD S.24 R.24E

THE STATE OF UTAH TO ALL PERSONS INTERESTED IN THE ABOVE ENTITLED MATTER.

Notice is hereby given that the Division of Oil, Gas and Mining (the "Division") is commencing an informal adjudicative proceeding to consider the application of «operator» for administrative approval of the «well» well, located in Section «section», Township «twnshp», Range «range», «county» County, Utah, for conversion to a Class II injection well. Th~~ese~~is well~~s~~ is ~~are~~ located in the «unitname» Units respectively. The adjudicative proceeding will be conducted informally according to Utah Admin.Rule R649-10, Administrative Procedures.

Selective zones in the «formation» ~~Formation~~ Leadville Limestone will be used for water injection. The maximum requested injection pressure and rate ~~will be determined based on fracture gradient information submitted by «operator»~~. is 1,200 psig and 1.3 mmscf/day, respectively.

Any person desiring to object to the proposed application or otherwise intervene in the proceeding, must file a written protest or notice of intervention with the Division within fifteen days following publication of this notice. The Division's Presiding Officer for this proceeding is John R. Baza, Associate Director at PO Box 145801, Salt Lake City, Utah 84114-5801, phone number (801) 538-5334. If such a protest or notice of intervention is received, a hearing will be scheduled in accordance with the aforementioned administrative procedure rule. Protestants and/or interveners should be prepared to demonstrate at the hearing how this matter affects their interests.

Dated this «day» day of «month», 2002.

STATE OF UTAH
DIVISION OF OIL, GAS & MINING

John R. Baza
Associate Director

«operator»
«well»
Cause No. UIC «causeno»

Publication Notices were sent to the following:

«operator»
«operAdd»
«operCity»

«paper1»
«paper1Add»
«paper1City»

via E-Mail and Facsimile (801) 237-2776
Salt Lake Tribune
PO Box 45838
Salt Lake City, UT 84145

«blmdist» District Office
Bureau of Land Management
«blmdistAdd»
«blmdistCity»

«county» County Planning
«CountyAdd»
«CountyCity»

«cc1»
«cc1Add»
«cc1City»

«cc2»
«cc2Add»
«cc2City»

Dan Jackson
US EPA Region VIII, Suite 5000
999 18th Street
Denver, CO 80202-2466

Earlene Russell
Executive Secretary
August 1, 2002

TOM BROWN, INC.
LISBON VALLEY INDUSTRIAL AREA
P.O. BOX 760
MOAB, UTAH 84532

PROVO UT 84603
PM
10 OCT
2002

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OCT 15 2002
DIVISION OF
OIL, GAS AND MINING

Division of Oil, Gas & Mining
John R. Baza
Associate Director
P O Box 145801
Salt Lake City, Ut. 84114-5801

84114X5801

Public notice

BEFORE THE DIVISION OF OIL, GAS AND MINING
DEPARTMENT OF NATURAL RESOURCES
STATE OF UTAH
IN THE MATTER OF THE APPLICATION OF TOM BROWN, INC.
FOR ADMINISTRATIVE APPROVAL OF THE NW USA D-1 (B-624) WELL LOCATED IN SECTION 24, TOWNSHIP 30 SOUTH, RANGE 24 EAST, SAN JUAN COUNTY, UTAH, AS A CLASS II WASTE GAS DISPOSAL WELL
NOTICE OF AGENCY ACTION
CAUSE NO. UIC 297.1

THE STATE OF UTAH TO ALL PERSONS INTERESTED IN THE ABOVE ENTITLED MATTER

Notice is hereby given that the Division of Oil, Gas and Mining (the "Division") is commencing an informal adjudicative proceeding to consider the application of Tom Brown, Inc. for administrative approval of the well, located in Section 24, Township 30 South, Range 24 East, San Juan County, Utah, for conversion to a Class II Gas Reinjection well. This well is located in the Lisbon Unit. The adjudicative proceeding will be conducted informally according to Utah Admin.Rule R649-20, Administrative Procedures.

Selective zones in the Leadville Limestone will be used for gas reinjection. The operator proposes to inject a gas mixture of approximately 50% CO_2 and 50% H_2S at a maximum requested injection pressure of 1,400 psia and injection rate of 1,700 MCFD.

Any person desiring to object to the proposed application or otherwise intervene in the proceeding, must file a written protest or notice of intervention with the Division within fifteen days following publication of this notice. The Division's Presiding Officer for this proceeding is John R. Baza, Associate Director at PO Box 145801, Salt Lake City, Utah 84114-5801, phone number (801) 538-5334. If such a protest or notice of intervention is received, a hearing will be scheduled in accordance with the aforementioned administrative procedure rule. Protestants and/or interveners should be prepared to demonstrate at the hearing how this matter affects their interests.

Dated this 2nd day of October, 2002.

STATE OF UTAH
DIVISION OF OIL, GAS & MINING
s/ John R. Baza
Associate Director

Published October 9, 2002 in the San Juan Record, Monticello, Utah.

SCAN THIS PAGE INSTEAD OF THE NEWSPAPER

From: Chris Kierst
To: Gil Hunt
Date: 12/9/03 2:02PM
Subject: Re: Acid Gas Disposal Wells??

My inclination is to err on the side of the nature of the operation rather than the phase being dealt with. I suggest lumping it with WD rather than GI.

>>> Gil Hunt 12/09/03 01:42PM >>>
I think to avoid adding any additional complications to our various reporting activities we should just use one of the existing well types, I don't really care which one. This will allow all of our beans to be counted. I am more concerned with the duel completed wells which at present are not being counted, at least in injection related ways.

>>> Don Staley 12/05/03 08:20AM >>>
This morning, Chris asked Carol if we are going to set up a database well type code for acid gas disposal wells. Is this something that you technical boys want? With my very limited background knowledge of the situation, I guess our only current options are to show them as Gas Injection or Water Disposal wells. Please get your heads together and let me know how you want to see these wells in the database. Your wish is my command. Thanks.

Don

Tom Brown, Inc
Lisbon Valley Industrial Area
P.O. Box 780
Moab, Utah 84532
Telephone (435) 686-2236
Facsimile (435) 686-2341

FACSIMILE TRANSMITTAL

☐ *ORIGINAL WILL BE SENT BY U.S. MAIL*
☐ *ORIGINAL WILL NOT BE SENT*
☐ *ORIGINAL WILL BE SENT IN OVERNIGHT MAIL.*

Date: 12/11/02

TO: Chris Kierst
Utah Oil, Gas & Mining

FROM: Kenny Allred **COVER +** ____ **PAGES**
Tom Brown, Inc

To Facsimile No: 801 359 3940 **Telephone No:** _____

SUBJECT: Spiller Canyon AGE project ER Plan

MESSAGE: Call me at 435-686-7604 if you have questions or require further information

Kenny

RECEIVED
DEC 11 2002
DIV. OF OIL, GAS & MINING

EMERGENCY RESPONSE PLAN/ PUBLIC PROTECTION PLAN

SPILLER CANYON FACILITY ACID GAS INJECTION PIPELINE

PREPARED FOR:
TOM BROWN, INC.
Final version of 12/11/02
KJA

PREPARED BY:
CORDILLERAN COMPLIANCE SERVICES, INC.
826 21½ ROAD
GRAND JUNCTION, COLORADO 81505

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1.00 PURPOSE

This Emergency Response Plan and Public Protection Plan (Plan) is specific to the Spiller Canyon Acid Gas Injection Facility owned and operated by Tom Brown, Inc. (TBI). This document is designed to provide for the safety and welfare of facility personnel, the community, the environment, and property.

This Plan establishes evacuation procedures, assigns response duties to specific individuals, provides for notification of outside agencies, and provides details of actions to alert and protect the public. This Plan will be activated immediately upon the detection of the release of a potentially hazardous volume of hydrogen sulfide (H_2S).

2.00 GENERAL INFORMATION ON AND PHYSIOLOGICAL RESPONSES TO HYDROGEN SULFIDE (H_2S) AND SULFUR DIOXIDE (SO_2)

2.10 HYDROGEN SULFIDE (H_2S)

Hydrogen sulfide is a flammable, highly toxic, colorless gas that is heavier than air, with the odor of rotten eggs. It can be detected by smell at a concentration in air of only 0.002 parts per million (ppm). Above concentrations of 100 ppm, it will deaden the sense of smell in a few minutes, and at a concentration of 700 ppm, a single breath can be fatal. If ignited, it burns with a blue flame. In still air it tends to accumulate in low places in dangerous concentrations. However, if it is warmer than the surrounding air, it may tend to rise. The upper flammability limit of H_2S in air is 44% and the lower flammability in air is 4%.

Breathing low concentrations of H_2S can cause headaches. Higher concentrations (0.01 percent by volume) cause irritation of the eyes, nose, throat, and lungs. Eyes become red and swollen, accompanied by sharp pain in more severe cases. Still higher concentrations (0.05 percent by volume) cause dizziness, unconsciousness, and failure of respiration.

The Threshold Limit Value (TLV) is 10 ppm (0.001%) in air. This is the limit for eight hours of continuous exposure as recommended by the American Conference of Governmental Industrial Hygienists. The health and safety reference values of various concentrations of H_2S are listed in the toxicity chart below. A Manufacturers Safety Data Sheet (MSDS) for hydrogen sulfide is included in Appendix F.

2.20 SULFUR DIOXIDE (SO_2)

Sulfur dioxide is formed with the burning of hydrogen sulfide gas. Sulfur dioxide is a pungent, irritating, suffocating, colorless gas. This gas is normally heavier than air and concentrations above 400 ppm are considered dangerous for even brief exposures.

Under special circumstances hydrogen sulfide gas may be ignited in order to dissipate a gas cloud and reduce the impact on a local area. Often these burning temperatures are enough to raise and mix the SO_2 with air in a ratio well below toxic levels. However, great care and proper monitoring should be used when this is attempted.

Due to the irritating effect of SO_2 at low concentrations of less than 5 ppm, there is usually no doubt as to it's presence in an area, which provides better warning characteristics than H_2S.

2.30 TOXICITY CHART

NAME	SPECIFIC GRAVITY[1]	TLV[2] (ppm)	HAZARDOUS LIMIT[3]	LETHAL CONCENTRATION[4]
Hydrogen Sulfide	1.18	10	100 ppm/1 hr.	700 ppm
Sulfur Dioxide	2.21	2	50 ppm/1 hr.	400 ppm

Notes:
(1) Specific gravity of air = 1.00.
(2) TLV - Threshold Limit Value.
(3) Hazardous Limit - concentration that may cause death with short term exposure.
(4) Lethal concentration - Concentration that may cause death with only a few breaths.

3.00 TREATMENT PROCEDURES FOR H_2S AND SO_2 EXPOSURE

A. Remove the patient to fresh air. Personnel should **always** use fresh air breathing equipment when entering an area to retrieve a person who has been overcome with H_2S.

B. Call a physician and get patient under his care as soon as possible.

C. If breathing has ceased, begin artificial respiration immediately. Give cardiopulmonary resuscitation (CPR) only if there is no pulse and no breathing. Continue revival efforts until physician arrives or, if patient is mobile and it is determined that he should go to the hospital, continue oxygen inhalation under the physician's direction.

D. Administer oxygen to help eliminate toxic substances from blood stream.

E. Keep the patient at rest and protect from chilling.

4.00 OPERATIONAL PRECAUTIONS AND PROCEDURES

4.10 INJECTION WELL SYSTEM

The acid gas injection well system originates at the TBI Lisbon Gas Plant and consists of compression equipment, a piping system, a line heater, and the injection well. A 2-inch, high pressure pipeline is used to move a dense phase mixture of H_2S and CO_2 from the Lisbon Gas Plant to the injection well site. The concentration of the H_2S varies from 4 percent to 56 percent by volume. A flow diagram of the system is shown in Appendix A.

The "process" pipeline to the well will contain the "H2S rich" or "process" fluid and will be new 2 inch schedule 160 API-5L X42 carbon steel pipe. A pressure control valve in the "process" pipeline, located near the well B-624 wellhead, will maintain pipeline pressure (ie compressor discharge pressure) at the normal operating pressure of 1500 psig. The design pressure of the carbon steel line is 2165 psig at 350 deg F; the compressors will shut down on high pressure at 1950 psig. Backup relief valve pressure protection is afforded at the 2165 psig level.

Under normal conditions there will be no free water in the pipeline therefore little corrosion is anticipated. However, a contingency corrosion allowance in excess of 0.250" has been provided. The "process" pipeline will originate at the emergency shut down (ESD) valves on the discharge of the compressor and terminate at the master valve on the wellhead. Connected to the "process" pipeline is the "blowdown to flare" which is an identical pipe that is connected to the Lisbon plant flare at a location near the compressors. The "blowdown to flare" contains an ESD valve that may be opened to allow the contents of the "process" pipeline to safely flow to flare. Corrosion inhibitor may be injected at the inlet to the "process" pipeline or at the wellsite if necessary. A corrosion coupon will be installed inside the pipeline near well B-624 that can be extracted and examined periodically to quantitatively evaluate the extent of metal loss due to corrosion, if any. Initially, there will not be a pipeline connecting to well A-713A, because B-624 is expected to be able to handle all of the H_2S-rich gas. An additional pipeline connection to A-713A will be permitted and constructed only if necessary.

There are pressure, temperature and other instruments located at the B-624 wellsite that are monitored and controlled by a "programmable logic controller" (PLC) at the wellsite. The wellsite PLC will communicate with plant's distributive computer control system (DCS) system using a Supervisory Control and Data Acquisition (SCADA) communications system. The pressure and temperature of the process pipeline will be measured at the pipeline entrance and also on the wellsite. The PLC system will continuously monitor key process variables on the wellsite and will alarm the plant's control operator if operations go outside of normal boundaries.

The injection well system is constantly monitored via a SCADA system integrated into the computer network at the Lisbon Gas Plant control room. Pressures, and temperatures can be monitored on this system. The system can be shut-down by the control room operator by using the SCADA system. The computer monitoring system gathers information from pressure, temperature, and H_2S, monitors attached at several points to the injection well system.

All system components are designed and constructed to withstand the operating conditions of the system. The injection system is protected from overpressure situations by safety pressure relief

valves which are connected by a closed system to a flare at the Lisbon Gas Plant. Additionally, any manual or emergency purging of the pipeline or injection well system will flow to the plant flare. An existing and continuous supply of nitrogen and residue gas at the Lisbon Gas Plant is available to displace the entire volume of the injection well system, if necessary, to help mitigate hazardous situations.

Only qualified, authorized personnel, trained in TBI operation and safety procedures are allowed to operate and maintain the injection well system. The entire length of the injection pipeline is visually inspected on a regular basis, by operations personnel. Access to the road through the Spiller Canyon area adjacent to the injection well site and injection pipeline is limited to TBI personnel. Access is restricted by locked gates on either end of the road in the controlled area.

4.20 WORST CASE SCENARIO RADIUS OF EXPOSURE

The procedures and systems described above are in place to assure that an emergency or potentially hazardous situation remains a highly unlikely possibility. However, a rupture in the high pressure pipeline and a resulting release of approximately 5,000 pounds of hydrogen sulfide (an estimated 10-minute release) was chosen for analysis as the worst case scenario. With guidance from Bureau of Land Management (BLM) Onshore Order Number 6, a calculation of the radius of exposure has been performed for this worst case release from the injection system.

The Environmental Protection Agency (EPA) software program TSCREEN was used to determine the H_2S concentration levels at 100-meter intervals from the release point. The TSCREEN calculation results are shown in Appendix E.

The BLM Onshore Order Number 6 is particularly concerned with 500 part per million (ppm) and 100 ppm radius of exposure concentration levels. The BLM requires a Public Protection Plan when: the 100 ppm radius of exposure is greater than 50-feet and includes any area that the public could be expected to frequent; the 500 ppm radius of exposure is greater than 50-feet and includes any part of a public road or highway, or; the 100 ppm radius of exposure is equal or greater to 3,000-feet and includes public roads or facilities.

The 500 ppm radius of exposure calculated for this worst case release is approximately 884-feet, and the 100 ppm radius of exposure is approximately 1,592-feet. As there are public roads and public (BLM) lands within these distances, a Public Protection Plan is required for the Spiller Canyon Facility and the injection well system. The Site Map shown in Appendix B includes the radius of exposure information.

4.30 PROTECTION OF PERSONNEL

The following safety equipment is available at the Lisbon Gas Plant or at the injection well site:

- First aid kits: small kits stored in buildings and vehicles.
  large "jump" kits including advanced treatment supplies.
- Self contained breathing apparatus (SCBA) with 30-minute air tanks.
- Self contained breathing apparatus (SCBA) with 5 to 7-minute air tanks (Escape Packs)
- Air line breathing apparatus with escape bottle for prolonged work. (Cascade system)

The following monitoring equipment is available at the Lisbon Gas Plant or at the injection well site:

- Manually operated portable Sensidyne Gastec monitors with detector tubes designed to monitor both H_2S and SO_2 levels in the atmosphere.

- Electronic personnel monitors with constant digital readout of either Lower Explosive Limit (LEL%), Hydrogen Sulfide concentration (H_2S ppm), or Oxygen (O_2%). All three sensors are constantly active and able to sound an alarm.

- Area monitors are located throughout the injection well system and in the plant buildings for H_2S, Fire, and LEL.
  These monitors are connected to a Gaitronic emergency alarm horn capable of five distinct alarms:

Evacuation – Siren	Fire – Hi/Lo
H2S – Yelp	Oxygen – Constant Horn
LEL – Warble	

Testing of all emergency alert and monitoring equipment is conducted on a monthly basis using the appropriate calibration and testing equipment and procedures for each type of sensor or alarm. All documentation of testing is kept on file at the Lisbon Gas Plant main office.

4.40 COMMUNICATIONS

Communication systems at the Lisbon Gas Plant and the Spiller Canyon Facility include:

- Telephones: Located throughout plant and offices.
- Hand Held radios: Located on operators, mechanics and personnel.
  - The frequencies are:
    Tx Freq. 456.550
    451.550

    Rx Freq. 451.550

- Emergency Response radios: Located in Lisbon Gas Plant Training Room.
  - The frequencies are:
    Tx Freq. 151.505
    152.870
    151.520

    Rx Freq. 151.505
    152.870
    151.520

- Mobile phones: Located in pickup trucks and control room.

4.50 FIRE CONTROL EQUIPMENT

The following is the fire control equipment available at the Lisbon Gas Plant or at the Spiller Canyon Facility:

30# Dry Chemical Fire Extinguishers	**Located throughout the plant and injection system area at exit locations. Also at key**

	locations outside buildings, where the risk of fire is great.
350# Dry Chemical Fire Extinguishers	**Located in key locations where large volumes of dry chemical might be needed.**
20# CO2 and Halogen fire extinguishers	**Located at MCC buildings where electrical fires are most likely to occur.**
2½# Fire Extinguishers	**Located at main office in key locations and in company pickups.**
AFFF foam vessel AFFF 55-gal drums	**Located in the Old Process Building area of the Lisbon Gas Plant. It can be distributed to different areas of the plant where oil spills may occur.**
AFFF foam – 5-gallon cans	**Located in Lisbon Gas Plant warehouse. Used to inject foam at any location.**
Automatic deluge system	**Located in the Lisbon Gas Plant**
Fire Hose Stations	**Located at key locations in the plant area.**
Monitor Stations	**Located at key locations in the plant area.**
Foam Station	**Located in the Old Process Building area of the Lisbon Gas Plant.**
Volume of Fire water available - 20,000 Barrels	**Two 10,000 barrel tanks located on hill east of Lisbon Gas Plant.**
Discharge Pressure of Fire water - 150 - 175#	**Pressure is provided by one electric pump and one diesel driven pump when electricity is not available.**

TESTING OF ABOVE EQUIPMENT

- Automatic Sprinkler system – Tested annually and documented.
- 30# Dry Chemical fire extinguishers - tag checked monthly and tested annually/documentation monthly.
- 350 # Dry Chemical fire extinguishers - Tag checked monthly/tested annually/ documentation monthly
- 2 1/2 # Dry Chemical fire extinguishers - Tag checked monthly/tested annually/documentation monthly
- CO2 & Halogen fire extinguishers - Tag checked monthly/tested annually/documentation monthly
- Fire water pumps electric/diesel - Tested weekly/documented
- Volumetric flow rate of fire water - Tested annually
- Monitors and Fire Hose stations - Tested Semi-annually

4.60 DECONTAMINATION EQUIPMENT

Disposable Tyvex suits, SCBA gear, disposable gloves, kiddy pools, pump sprayers, decontamination detergents, neutralizers, rinse water, duct tape, eye protection, brushes, rubber boots and marking tape is available. This equipment is located in the Lisbon Gas Plant Emergency Response Trailer and warehouse.

All equipment used dealing with communication, fire protection, spill control and decontamination is tested, maintained and documented on a regular basis to assure proper operation.

4.70 INTERNAL EMERGENCY RESPONSE

The following emergency response teams/personnel are available at the Lisbon Gas Plant:

- Lisbon Gas Plant Fire Brigade - Certified Trained
- Lisbon Gas Plant HAZMAT Team - Certified Trained
- Confined Space Rescue Team - Certified Trained
- Emergency Medical Technicians - Certified Trained
- All Employees trained in first aid/CPR - Certified Trained

Please refer to the Emergency Contact List in Appendix C for contact information.

4.80 OUTSIDE EMERGENCY AID

External emergency response personnel and services include (but are not limited to) the following:

- Ambulance Service is available from the towns of Moab and Monticello.
- Medical First Responders and Fire response is available from the town of Lasal.
- Air Life Medical transport is available from St. Mary's Hospital in Grand Junction, Colorado.
- Law Enforcement is available from San Juan County Sheriff , Utah Highway Patrol, and the Bureau of Land Management, which respond from Monticello, Utah.

H2S Awareness training is made available annually to all emergency responders.

Please refer to the Emergency Contact List in Appendix C for contact information.

4.90 EMERGENCY PROCEDURES AND NOTIFICATION

All actions taken and procedures used by facility personnel in response to a fire, explosion, or release of hazardous waste are outlined in the Lisbon Gas Plant Emergency Preparedness Plan and Procedure Manual located at the Lisbon Gas Plant Change room and Control room. Other copies are held by key TBI personnel.

Released wastes and liquid are collected and contained using procedures found in the Lisbon Gas Plant Emergency Preparedness Plan and Procedure manual, the Spill Prevention Control and Countermeasure (SPCC) plan, and the Waste Management/Minimization guideline manual. If characterization of a waste is not known, testing is performed to determine the waste

classification. All wastes are handled according to their type. If it is a hydrocarbon waste mixed with soil and contains contaminant concentration levels above the appropriate limits, it is landfarmed on TBI property until it reaches contaminant concentration limits set by the Utah Oil, Gas and Mining Division. If wastes are found that are classified as hazardous wastes, they are disposed of at an appropriate hazardous waste disposal facility.

Notification to Federal, State and Local agencies to report releases of hazardous waste, spills or incidents requiring reporting is accomplished through the Lisbon Gas Plant Spill Prevention Control and Countermeasure plan (SPCC), which follows a formatted initial reporting sequence. This initial report is usually submitted verbally over the phone to the appropriate agency and followed up by a written report within 7 days of the incident.

5.00 HYDROGEN SULFIDE EMERGENCY PROCEDURES

The following procedures should be used when an uncontrolled release of any substance containing H_2S occurs.

- Immediately upon discovery of a potentially hazardous or emergency situation, the Lisbon Gas Plant control room and the on duty supervisor shall be notified. The supervisor who is notified will become the "Incident Commander" and take charge of the response until he is relieved by his supervisor.

- The Emergency will be approached using the "Incident Command System" if no outside aid is required. The "Unified Incident Command System" will be used if public agencies are included in the response.

- At least two people should don fresh air breathing equipment (SCBA) and monitor the air for H_2S to determine both flammable and toxicity and establish safe areas.

- When the emergency response team is in place and equipped for rescue or repair, approach the release with monitors and determine extent of problem from both a flammable and toxic standpoint.

- Determine wind direction and establish a **SAFE ZONE** where response equipment and backup personnel can safely operate.

- Determine if the release threatens county roads or local mines (See Site Map in Appendix B). If either are threatened, activate the Public Protection Procedures in Section 6 of this response guide.

- Conduct a briefing in the **SAFE ZONE** to establish a plan of action for entry and determine what additional personal protective equipment will be required for **ENTRY PERSONNEL AND BACKUP PERSONNEL.**

- Assemble needed equipment in **SAFE ZONE.**

- When a safe plan of action has been agreed upon, **ENTRY PERSONNEL** may approach the release. Backup personnel should remain in the **SAFE ZONE** and be equipped for rescue if it should become necessary.

UNDER NO CIRCUMSTANCES SHOULD CONTROL EFFORTS BE ALLOWED TO PROCEED WHERE PROPER ACTION HAS NOT BEEN TAKEN TO ASSURE THE SAFETY OF RESPONSE PERSONNEL. Workers are considered safe only when they are breathing air with less than 10 parts per million (ppm) of Hydrogen Sulfide.

- Once the release has been controlled and monitoring has shown that the **HOT ZONE** is safe (<10 ppm H_2S and 0% LEL), clean up and repair work may begin.

- Formal notification of the incident should be made through line management.

- A Critique of the incident should follow.

6.00 PROTECTION OF THE GENERAL PUBLIC

6.10 NOTIFICATION OF POTENTIAL DANGER

- Warning signs are prominently displayed at the injection well site and at all access points to the Lisbon Gas Plant and the Spiller Canyon Facility.

- Written notification will be made to all mineral and grazing lease holders within the calculated potential exposure areas.

- Response planning will be coordinated through the San Juan County Emergency Response Coordinator located in Monticello, Utah.

6.20 EMERGENCY EVACUATION AND ISOLATION OF DANGER AREA

In the event toxic gases are released in such quantities as to be a possible hazard to the public the following steps (in addition to the procedure outlined in Section 5.0) will be taken by the person in charge:

- Choose a command post site in a safe area.

- Alert by telephone the Incident Commander or the Safety Manager and notify the person of the situation and your choice of a command posts.

- Notify local Law Enforcement Officials of the need to restrict entry to the area and the **location of your command post.** Request their assistance in restricting entry into the danger area by placing roadblocks or barriers in safe areas.

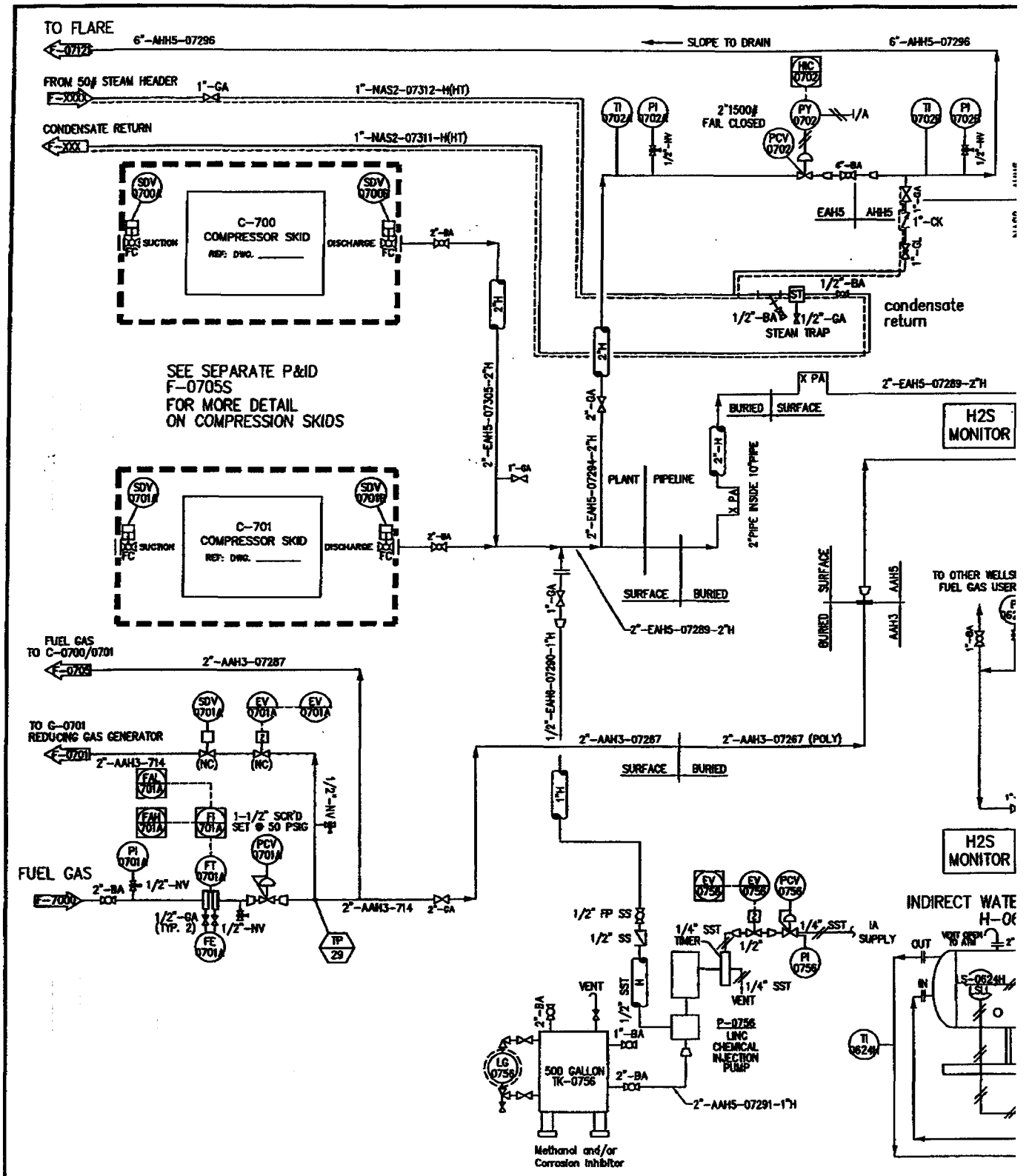
Note-Alternate command posts and roadblocks may be required, the Incident Commander may make changes in the locations listed above. Care should be taken to notify all responders of the changes.

- Evacuate all active mines in the danger area. Mine owners have received prior notification that conditions could arise that would require their cooperation in clearing the area.

- Notify all grazing lease holders of the danger and what sections need to be evacuated by humans. (See Appendix D for lease holders names and what land Sections they hold grazing rights on.)

- If evacuation cannot be accomplished in a timely manner and the H_2S release is posing an immediate threat to human life, the Incident Commander may chose to ignite the gas. Because of the increased risks igniting the gas can pose for response personnel, only the Incident Commander can give this order.

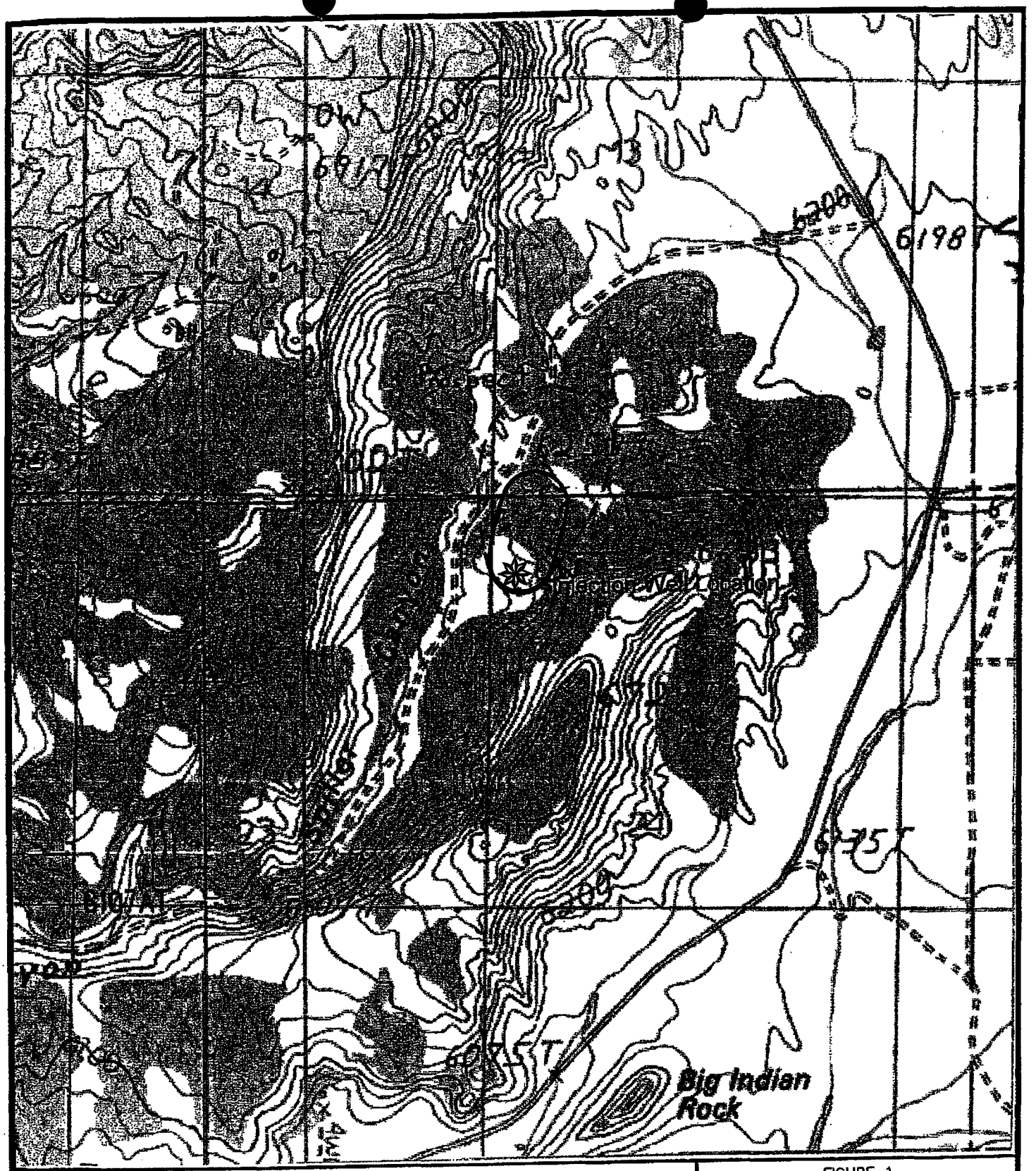
APPENDIX A
MECHANICAL FLOW DIAGRAM



REFERENCE	REV	DATE
	1	8/23/0
	2	9/12/0
	3	10/23/0
	4	10/30/0
	5	11/21/0

AGE_P&ID_F-0706S.DWG

APPENDIX B
SITE MAP



LEGEND

= 100 ppm RADIUS OF EXPOSURE

= 500 ppm RADIUS OF EXPOSURE

N

MAP SOURCE: 7.5 MINUTE U.S.G.S. TOPOGRAPHIC MAP (LISBON VALLEY QUADRANGLE)
SITE LEGAL LOCATION: NE NW, SECTION 24, TOWNSHIP 30 SOUTH, RANGE 24 EAST

FIGURE 1
SITE MAP
TOM BROWN, INC.
SPILLER CANYON FACILITY
SAN JUAN COUNTY, UTAH

REVISION DATE:	7/18/02
REVISION NUMBER:	002
DRAWN BY:	DMP
PROJECT #	EG02084
SCALE:	1:12,000

CORDILLERAN

APPENDIX C
EMERGENCY CONTACT LIST

APPENDIX C
EMERGENCY CONTACT LIST

Utah Division of Environmental Quality		800.458.0145
Utah Division of Water Quality		801.538.6146
EPA 24-Hour Spill Notification Number		303.293.1788
Department of Transportation National Response Center		800.424.8802
Utah Division of Oil, Gas, & Mining		801.538.5340
Utah Oil & Gas Conservation Commission		801.538.5277
*Utah State Highway Patrol		800.492.2400
*Utah State Highway Patrol-Hazardous Materials Division		435.336.4461
*Ambulance Service (Moab)		435.259.8115
*Ambulance Service (Monticello)		435.587.2237
Ambulance Service (Grand Junction Air Life)		800.332.4923
*Hospital (Allen Memorial-Moab)		435.259.7191
*Hospital (San Juan Hospital)		435.587.2116
*Grand County Sheriff	(Moab)	435.259.8115
*San Juan County Sheriff	(Monticello)	435.587.2237
*Moab Area Fire Department		435.259.5551
*LaSal Area Fire Department		435.686.2388
*Monticello Area Fire Department (Contact through San Juan County Sheriff)		435.587.2237
*Blanding Area Fire Department		435.678.2313
U.S. Dept. of Interior, Bureau of Land Management		970.878.5555
Moab Field Office		435.259.6111
Tom Brown Corporate Office		303.260.5000
Tom Brown Lisbon Gas Plant Office		435.686.7600
Tom Brown Lisbon Gas Plant Control Room		435.686.7620
Tom Brown Lisbon Gas Plant Control Room (24 Hour Emergency Number)		435.686.2271
Doug Rosa, Lisbon Gas Plant Superintendent		435.686.7603
Rick Costanza, Field Supervisor		435.686.7612
Kenny Allred, Corporate Safety Manager		435.686.7604

*= these are non-emergency numbers. Emergency calls should dial 911.

APPENDIX D
LEASE HOLDER INFORMATION

APPENDIX D
LEASE HOLDER INFORMATION

MINE OPERATORS & NOTIFICATION ADDRESSES

Anderson, James, Estate,Box 9196,Salt Lake City,UT,84109
Atlas Corporation,Box 1207,Moab,UT,84532
Bailey,Rick,P.O. Box 1129,Monticello,UT,84535
Baker,W.V.,1766 W 4575 S,Roy,UT,89510
Baker,W.V.,Box 10628,Reno,NV,89510
Birch,Arthur,190 W. Canter,Huntington,UT,84501
Boyd,Maxine S.,1490 E. 500 South #28,Price,UT,84501
Brown,Nancy,8604 E. Devonshire,Scottsdale,AZ,85251
Butzow,George,Box 713,Huntington,UT,84528
Butzow,Tonia,Box 713,Huntington,UT,84528
Clemons,Paul B.,8604 E. Devonshire,Scottsdale,AZ,85251
Crowley,Delsie,1501 S. Mesa,Montrose,CO,81401
Dearth,A.E,672 Mivida Dr.,Moab,UT,84532
Dearth,A.F.,54 S. Flora Way,Golden, CO,80401
F804 Inc.,2800 S. University Blvd.,Denver,CO,80210
Francis,Clara,420 Topaz Circle,Moab,Ut,84532
Francis,Lyle G.,420 Topaz Circle,Moab,UT,84532
Francis,Lyle,420 Topaz Circle,Moab,UT,84532
Giles,Albert, % Bob Shumway,3080 Spanish Trail Dr.,Moab,UT,84532
Hart,C.J.,97417 1/4 Rd.,Fruita,CO,81521
Hart,C.J.,Box 1075,Vernal,UT,84078
Hart,C.J.,Box 2492,Durango,CO,81302
Hart,C.J.,Box 267,Durango,CO,81521
Hart,C.J.,Box 3037,Durango,CO,81302
Hart,C.J.,Box 713,Huntington,UT,84528
Heda Mining Company,Box C 8000,Cofeur D Alene,ID,83814
Homestead Mining CO/CA,155 Glendale #18,Sparks,NV,89431
Homestead Mining CO/CA,1726 Cole Boulevard,Golden,CO,80401
Homestead Mining CO/CA,650 California St. 9th Floor,San Francisco,CA,94108
Homestead Mining CO/CA,7625 W. 5th Ave.,Lakewood,CO,80226
Homestead Mining CO/CA,Box 10628,Reno,NV,89510
Homestead Mining CO/CA,Box 89510,Reno,NV,89510

Homestead Mining Co/CA,7625 West 5th Avenue,LakeWood,CO,80226
Hudson,H. Clay,Box 10628,Reno,NV,89510
Hudson,T.C.,Box 10628,Reno,NV,89510
Hudson,W.T.,155 Glendale #18,Sparks,NV,89431
Hudson,W.T.,7625 W. 5th Ave.,Lakewood,CO,80226
Kemper,R.B.,10720 McCume Ave.,Los Angeles,CA,90034
Kunkel,Burton F. % Bob Shumway,3080 Spanish Trail Dr.,Moab,UT,84532
Kunkel,Raymond E.,33 Holiday Haven,Moab,UT,84532
Kunkel,Raymond E.,8664 Monmouth Pl.,Denver,CO,80237
Lawther,Hazel A.,156 N. Fraser Dr. W.,Mesa,AZ,85203
McCormick,Patricia,Box 149,Aurora,MO,62505
Melich,Mitchell,900 Donner Way,Salt Lake City,UT,84108
Mundy,H.N.,Box 10628,Reno,NV,89510
Osanke,Mary Lou,Box 1230,Ely,NV,89301
Osanke,Mary Lou,Box 193,LaSal,UT,84530
Osanke,Steve,Box 1230,Ely,NV,89301
Osanke,Steve,Box 192,LaSal,UT,84530
Powell,Claudette,180 Braewick Rd.,Salt Lake City,UT,84103
Powell,Claudette,Box 713,Huntington,UT,84528
Powell,Cory,Box 713,Huntington,UT,84528
Powell,Phillip,Box 713,Huntington,UT,84528
Powell,Zachary,Box 713,Huntington,UT,84528
Redd,Paul,20923 T5 Road, Paradox,CO,81429
Richardson,Frank,Box 10628,Reno,NV,89510
Robinson,Dean (K.S. Summers),P.O. Box 67,Monticello,UT,84535
Rogers,Anna,Box 10628,Reno,NV,89510
Rogers,L.E.,Box 10628,Reno,NV,89510
Shumway,Bob, 3080 Spanish Trail Dr.,Moab,UT,84532
Standard Metals,P.O. Box 247,Silverton,CO,81433
Steen,Andrew K.,7621 El Monte Dr., Buena Park,CA,90621
Steen,Charles A.,7621 El Monte Dr.,Buena Park,CA,90621
Strode,Gary L.,62266 N. Star Dr.,Montrose,CO,81401
Umetco Minerals Corporation,Box 1029,Grand Junction,CO,81502
Uranium King Corporation,Box 1408,Coralles,NM,87045
Westmont Engineering Company % Bob Shumway,3080 Spanish Trail Dr., Moab,UT,84532,

GRAZING LEASE HOLDERS

SECTIONS 19, 24
Rick Bailey, (Spring Creek Ranch) Phone (435) 587-2313
P.O. Box 1129
Monticello, Utah 84535

SECTIONS 10, 11, 14, 15, 21, 22, 23, 26, 27
Dean Robinson (K. S. Summers), Phone (435) 587-2333
P.O. Box 67
Monticello, Utah 84535

SECTIONS 2, 3, 4, 9, 10, 11, 12, 13, [33 (BI#1)]
Paul Redd, Phone (970) 859-7358
20923 T5 Road
Paradox, Colorado 81429

APPENDIX E
TSCREEN OUTPUT DATA

Spiller Canyon Release Run 7

```
    TOTAL AMOUNT OF MATERIAL RELEASED (G):    .2300E+07
          RELEASE HEIGHT ABOVE GROUND (M):    1.000
 INITIAL LATERAL DISPERSION SIGMA (Y) (M):    .0000
INITIAL VERTICAL DISPERSION SIGMA (Z) (M):    .0000
```

****
*** SUMMARY OF PUFF MODEL RESULTS ***
****

THE MAXIMUM CONCENTRATION AND THE DISTANCE TO MAXIMUM CONCENTRATION FOR DISTANCES BEYOND FENCELINE .010 (KM).
FOR NEAR SURFACE RELEASE MAXIMUM CONCENTRATION WILL OCCUR AT THE FENCELINE.

AVERAGING TIME (MIN)	MAXIMUM CONCENTRATION (G/M**3)	DISTANCE TO MAX. CONC. (KM)	STABILITY CLASS
INSTANTANEOUS	2.312E+07	.010	S
1	3.859E+05	.010	S
5	7.717E+04	.010	S
15	2.572E+04	.010	S
60	6.431E+03	.010	S

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

****
*** PUFF DISTANCES ***
****

THE MAXIMUM CONCENTRATION AS A FUNCTION OF DOWNWIND DISTANCE AND THE CONDITIONS THAT PRODUCED THE MAXIMUM AT THAT DISTANCE.

MIXING HEIGHT (M) 320.
WIND SPEED (M/SEC) 1.0

AVERAGING TIME (MIN) — DOWNWIND DISTANCE (KM)
MAXIMUM CONCENTRATION (G/M**3) AT VARIOUS DOWNWIND DISTANCES.
STABILITY CLASS THAT PRODUCED THE MAX. LISTED BELOW

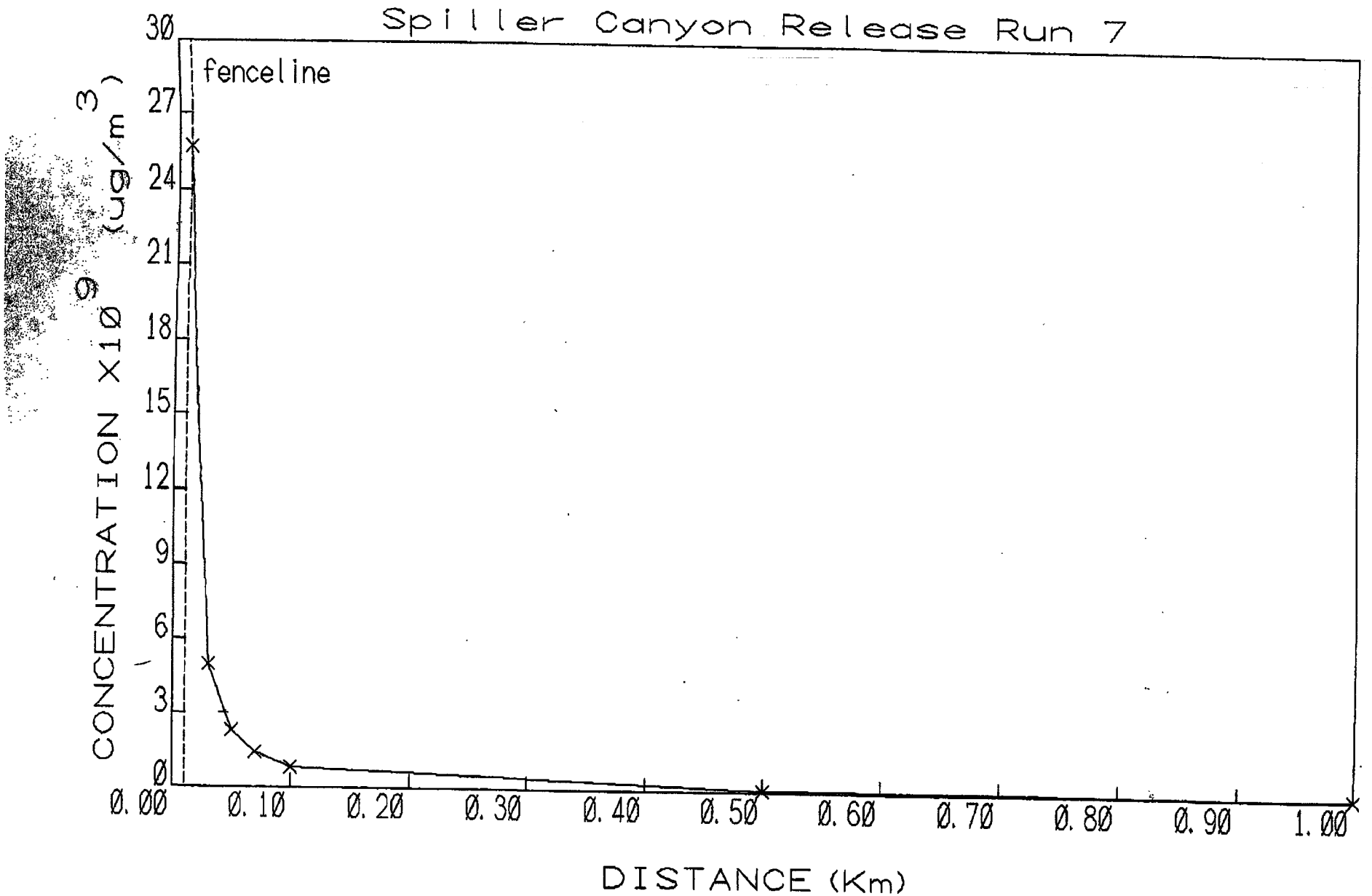
	0.01	0.03	0.05	0.07	0.1	0.5
INST.	2.312E+07	3.450E+06	1.156E+06	5.391E+05	2.356E+05	5.167E+03
	S	S	S	S	S	S
1	3.859E+05	7.426E+04	3.451E+04	2.083E+04	1.220E+04	1.091E+03
	S	S	S	S	S	S
5	7.717E+04	1.485E+04	6.902E+03	4.167E+03	2.440E+03	2.183E+02
	S	S	S	S	S	S
15	2.572E+04	4.951E+03	2.301E+03	1.389E+03	8.135E+02	7.276E+01
	S	S	S	S	S	S
60	6.431E+03	1.238E+03	5.752E+02	3.472E+02	2.034E+02	1.819E+01
	S	S	S	S	S	S

AVERAGING TIME (MIN)	DOWNWIND DISTANCE (KM) MAXIMUM CONCENTRATION (G/M**3) AT VARIOUS DOWNWIND DISTANCES. STABILITY CLASS THAT PRODUCED THE MAX. LISTED BELOW					
	1.0	3.0	5.0	7.0	10.0	30.0
INST.	9.868E+02	7.147E+01	2.108E+01	9.433E+00	4.022E+00	2.911E-01
	S	S	S	S	S	S
1	3.853E+02	5.735E+01	1.919E+01	8.951E+00	3.911E+00	2.900E-01
	S	S	S	S	S	S
5	7.717E+01	1.485E+01	6.902E+00	4.148E+00	2.346E+00	2.643E-01
	S	S	S	S	S	S
*15	2.572E+01	4.951E+00	2.301E+00	1.389E+00	8.135E-01	1.535E-01
	S	S	S	S	S	S
60	6.431E+00	1.238E+00	5.752E-01	3.472E-01	2.034E-01	3.914E-02
	S	S	S	S	S	S

STABILITY CLASSES
U = UNSTABLE
N = NEUTRAL
S = STABLE

* INDICATES AVERAGING TIME THAT WAS SELECTED FOR PLOTTING

****
*** END OF PUFF MODEL OUTPUT ***
****



Maximum concentration 2.572E+010 micrograms/cubic meter at 0.010 Km

APPENDIX F
HYDROGEN SULFIDE MSDS

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MATERIAL SAFETY DATA SHEET

Hydrogen Sulfide

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: Hydrogen Sulfide **Formula:** H_2S **Molecular Weight:** 34.08
Chemical Name: Hydrogen Sulfide **Chemical Family:** Inorganic Sulfides **CAS#** 7783-06-4
Synonyms: Hydrogen sulphide, sulfuretted hydrogen, hydrosulfuric acid
Product Use: Purification of acids, and wastewater and in the manufacture of sulfur and organosulfur compounds

MARSULEX Inc.
111 Gordon Baker Road
Suite 300
North York, ON
M2H 3R1
(416) 496-9655

MARSULEX Inc.
11652 -99th Avenue
Fort Saskatchewan
Alberta T8L 2T2
(780) 998-2225

Emergency Telephone Number
Chemtrec 1-800-424-9300
Canutec (613) 996-6666

2. COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous Ingredients	% by Wt.	CAS Number
Hydrogen Sulfide	99.9	7783-06-4

3. HAZARD INFORMATION

EMERGENCY OVERVIEW:
DANGER! Colorless gas with rotten egg odor. POISON. EXTREMELY FLAMMABLE. May be fatal if inhaled. Causes eye irritation. Heavier than air. May accumulate in low places such as pits, trenches, well cellars and sumps. Odor of rotten eggs is not a dependable indicator of presence of hydrogen sulfide at concentrations over 100 ppm. When burned, hydrogen sulfide forms sulfur dioxide, a poisonous, colorless gas with a pungent odor. Read the entire MSDS for a more thorough evaluation of the hazards.

National Fire Protection Association (NFPA) Rating
Hazardous Materials Identification System (HMIS) Rating

	NFPA	HMIS
HEALTH	4	4
FIRE	4	4
REACTIVITY	0	0
SPECIAL		

4 = Extreme/Severe
3 = High/Serious
2 = Moderate
1 = Slight
0 = Minimum
W = Water Reactive

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MATERIAL SAFETY DATA SHEET

Hydrogen Sulfide

3. HAZARD INFORMATION (continued)

POTENTIAL HEALTH EFFECTS:

Exposure Limits:

	ACGIH (TLV)*	OSHA (PEL)
Hydrogen Sulfide	10 ppm (14 mg/m^3) (TWA)	10 ppm (14 mg/m^3) (TWA)
	15 ppm (21mg/m^3) (STEL)	15 ppm (21mg/m^3) (STEL)
		20 ppm (Ceiling)

*-NOTICE OF INTENDED CHANGE: A decrease of the TLV-TWA to 5 ppm and the deletion of the STEL are proposed.

POTENTIAL HEALTH EFFECTS:

Eye Contact: Inflammation and irritation of the eyes can occur at very low airborne concentrations (sometimes less than 10 ppm). Exposure over several hours or days may result in "gas eyes" or "sore eyes" with symptoms of scratchiness, irritation, tearing and burning. Above 50 ppm, there is intense tearing, blurring of vision and pain when looking at light. The victim may see rings around bright lights. Most symptoms disappear when exposure ceases. However, in serious cases the eye may be permanently damaged. Contact with liquid H_2S may freeze the eye and cause severe damage or blindness.

Skin Contact: Rarely, the gas may irritate the skin. Contact with liquid H_2S can cause frostbite (freezing of the tissue).

Inhalation: At concentrations of 0.13 to 30 ppm, the odor is obvious and unpleasant. At 50 ppm, marked dryness and irritation of the nose and throat occurs. Prolonged exposure may cause a runny nose, cough, hoarseness, shortness of breath and pneumonia. At 100-150 ppm, there is a temporary loss of smell. At 200 to 250 ppm, H_2S causes severe irritation as well as symptoms such as headache, nausea, vomiting and dizziness. Prolonged exposure may cause lung damage (build-up of fluid in the lungs). Exposure for 4 to 8 hours can cause death. Concentrations of 300-500 ppm cause these same effects sooner and more severely. Death can occur in 1 to 4 hours. At 500 ppm, excitement, headache, dizziness, staggering, unconsciousness and respiratory failure occur in 5 minutes to 1 hour. Death can occur in 30 minutes to 1 hour. Exposures above 500 ppm rapidly cause unconsciousness and death. Severe exposures, which do not result in death, may cause long-term symptoms such as memory loss, paralysis of facial muscles or nerve tissue damage.

Ingestion: Not applicable.

Existing Medical Conditions Possibly Aggravated By Exposure: Breathing of vapors may aggravate neurological, eye and respiratory conditions .

Chronic Effects: No evidence.

Carcinogenicity: Hydrogen sulfide is not classified as a carcinogen by NTP (National Toxicology Program), IARC (International Agency for Research on Cancer),). ACGIH (American Conference of Governmental Industrial Hygienists) and not regulated as a carcinogen by OSHA (Occupational Safety and Health Administration).

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MATERIAL SAFETY DATA SHEET

Hydrogen Sulfide

4. FIRST AID MEASURES

General: Take proper precautions to ensure your own safety before attempting rescue; e.g., wear appropriate protective equipment. Effects of contact or inhalation may be delayed. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Skin Contact: If the liquid is splashed on the skin, as quickly as possible, flush contaminated area with lukewarm, gently running water for at least 20 minutes. Under running water, carefully cut around clothing that sticks to damaged skin and remove rest of garment. Obtain medical attention immediately. Completely decontaminate clothing, shoes and leather goods before re-use, or discard.

Eye Contact: If irritation occurs, immediately flush eyes with running water for a **minimum** of 20 minutes. Hold eyelids open during flushing. Obtain medical attention IMMEDIATELY.

Inhalation: Remove source of contamination or move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give Cardiopulmonary Resuscitation (CPR) only if there is no pulse AND no breathing. Oxygen may be beneficial if administered by a person trained in its use, preferably on a physician's advice. Obtain medical attention IMMEDIATELY.

Ingestion: Not applicable.

5. FIRE FIGHTING MEASURES

Flash Point (method): Not applicable, product is a gas.
Autoignition Temperature: 260°C (500°F)
Flammability Limits in air(%): UEL: 44% **LEL:** 4.0%

Fire and Explosion Hazards: Oxides of sulfur may be produced in fire.

Extinguishing Media: Water spray, dry chemical, "alcohol" foam or carbon dioxide

Special Fire Fighting Procedures: H_2S is extremely toxic. Fight fires from safe distance or protected location. Stay upwind. Wear full protective equipment. H_2S may travel some distance along the ground to a source of ignition and flash back. It may collect in lower, poorly ventilated areas. Water or foam may cause frothing. Use water to keep fire-exposed containers cool, to flush spills away from populated areas and to dilute spills to non-combustible mixtures. Stop escaping flow of gas rather than extinguish the fire. If fire is extinguished and gas continues to escape, an explosive mixture could form. If necessary to extinguish the fire, use carbon dioxide or dry chemical.

NOTE: Also see "Section 10 - Stability and Reactivity"

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MATERIAL SAFETY DATA SHEET

Hydrogen Sulfide

6. ACCIDENTAL RELEASE MEASURES

Steps to be taken in the event of a spill or leak: Evacuate area immediately. Restrict access to area until completion of clean up. Ensure clean up is conducted by trained personnel only. Remove all ignition sources (no smoking, flares, sparks or flames). All equipment should be grounded. Ventilate area and stay upwind. Use appropriate Personal Protection Equipment. Stop or reduce leak if safe to do so.
Liquid H_2S: Do not touch spilled material. Prevent material from entering sewers or confined spaces. Stop or reduce leak if safe to do so. If not, allow liquid to vaporize.
Gaseous H_2S: Stop or reduce leak if safe to do so. If source of the leak is a cylinder and the leak cannot be stopped safely, move the cylinder to a safe place in the open air. If possible, repair the leak or allow the cylinder to empty.
In the case of a large spill, evacuation of populated areas downwind may have to be considered. Deliberate ignition and controlled burn of escaping hydrogen sulfide should be considered in order to reduce the risk to adjacent areas.
Comply with Federal, Provincial/State and local regulations on reporting releases.

Note -Spills are subject to CERCLA reporting requirements: RQ = 100 lbs (45.4 kg).

AIHA- Emergency Response Planning Guidelines (ERPGs)
ERPGs are for community emergency planning limits and not workplace exposure limits.

ERPG-1 : 0.1 ppm
ERPG-2 : 30 ppm
ERPG-3 : 100 ppm

The ERPG-1 is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing other than mild transient adverse health effects or perceiving a clearly defined, objectionable odor.

The ERPG-2 is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing or developing irreversible or other serious health effects or symptoms, which could impair an individual's ability to take protective action.

The ERPG-3 is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing or developing life-threatening health effects.

7. HANDLING AND STORAGE

Precautions: Never work alone when handling H_2S. Someone must be in communication at all times and be equipped and trained to rescue. If H_2S is released, immediately put on a respirator and leave the area until the severity of the release is determined. If necessary to enter an area contaminated with H_2S, follow precautions for confined space entry including use of a supplied-air respirator with full facepiece, adequate communication, safety belts and lifelines. People working with this chemical should be properly trained regarding its hazards and its safe use.

Handling Procedures and Equipment: Keep H_2S away from sparks, flames and other ignition sources. Post "NO SMOKING" signs in area of use. Do not use near welding operations, flames, or hot surfaces. Prevent release of gas into workplace air. Since the sense of smell cannot be relied upon to detect the presence of H_2S, the concentration should be measured by the use of fixed or portable devices. Ground all cylinders. Move cylinders by hand-truck or cart designed for that purpose. Do not lift cylinders by their caps or handle them with oily hands. Secure cylinders in an upright position at all times. Do not drop or permit cylinders to bang against each other. Leave valve cap on cylinder until it is secured and ready for use. Close all valves when not in actual use. Make sure valves on cylinders are fully opened when used. Open and shut valves at least once a day, while cylinder is in use, to avoid valve "freezing". Use the smallest amount possible

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MATERIAL SAFETY DATA SHEET

Hydrogen Sulfide

7. HANDLING AND STORAGE (continued)

in designated areas with adequate ventilation. Have emergency equipment available. Label containers and keep closed when not in use. Empty containers may contain hazardous residues.

Storage Requirements: Store in a cool, dry, well-ventilated area, out of direct sunlight. Outside or detached storage is preferred. Store away from heat and ignition sources, incompatible materials, and cylinders or other containers under high pressure. Use grounded, non-sparking ventilation systems and electrical equipment that does not provide a source of ignition. Use corrosion-resistant structural materials, lighting and ventilation systems in storage area. Store cylinders at or above ground level, upright on a level, fireproof floor. Keep cylinders secured in position and protected from damage. Keep cylinder valve cover on. Label empty cylinders. Store full cylinders separately from empty ones. Consider leak detection and alarm systems, as required. Limit quantity in storage. Restrict access to storage area and post warning signs. Keep storage area separate from populated work areas. Inspect periodically for deficiencies such as damage or leaks. Have fire extinguishers available in and near the storage area. Comply with all applicable regulations for the storage and handling of compressed gases and flammable materials.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Recommendations listed in this section indicate the type of equipment, which will provide protection against overexposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.

Engineering Controls: Engineering control methods to reduce hazardous exposures are preferred. Methods include mechanical ventilation (dilution and local exhaust) and process or personnel enclosure. Administrative controls and personal protective equipment may also be required. Because of the high potential hazard associated with this substance,
stringent control measures such as enclosure or isolation may be necessary. A continuous monitoring system with alarm is recommended in areas where H_2S is used. Use a non-sparking, grounded, corrosion-resistant ventilation system separate from other exhaust ventilation systems. Exhaust through a scrubber directly to the outside. Supply sufficient replacement air to make up for air removed by exhaust systems.

Skin Protection: Chemical protective gloves, coveralls, boots, and/or other resistant protective clothing should be worn if there is potential for contact with the liquid. Have a safety shower/eye-wash fountain readily available in the immediate work area. A chemical protective full-body encapsulating suit and respiratory protection may be required in some operations.
Resistance of materials for protective clothing : Guidelines for hydrogen sulfide:
RECOMMENDED (resistance to breakthrough longer than 8 hours): Tychem 10000(TM).
RECOMMENDED (resistance to breakthrough longer than 4 hours): Teflon(TM).(8)
RECOMMENDED (estimated resistance to breakthrough longer than 4 hours): Responder(TM).
NOT RECOMMENDED for use (resistance to breakthrough less than 1 hour): CPF3(TM).
Recommendations are valid for permeation rates reaching 0.1 ug/cm2/min or 1 mg/m2/min and over. Resistance of specific materials can vary from product to product. Breakthrough times are obtained under conditions of continuous contact, generally at room temperature. Evaluate resistance under conditions of use and maintain clothing carefully.

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MATERIAL SAFETY DATA SHEET

Hydrogen Sulfide

8. EXPOSURE CONTROLS/PERSONAL PROTECTION (continued)

Respiratory Protection: NIOSH recommendations for hydrogen sulfide concentrations in air.

- Up to 100 ppm: Powered air-purifying respirator with cartridge(s) to protect against hydrogen sulfide; or gas mask with canister to protect against hydrogen sulfide; or SAR*; or full-facepiece SCBA.
- Emergency or planned entry into unknown concentrations or IDLH conditions: Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.
- ESCAPE: Gas mask with canister to protect against hydrogen sulfide; or escape-type SCBA.
- NOTE: The IDLH concentration for hydrogen sulfide is 100 ppm.

*NOTE: Substance reported to cause eye irritation or damage; may require eye protection.
ABBREVIATIONS: SAR = supplied-air respirator; SCBA = self-contained breathing apparatus. IDLH = Immediately Dangerous to Life or Health.

Eye Protection: Tight-fitting chemical safety goggles. A face shield may also be necessary if there is potential for contact with liquid H_2S.

EXPOSURE GUIDELINES:

HAZARDOUS INGREDIENT(S):
Hydrogen Sulfide:

ACGIH TLV	10 ppm (14 mg/m^3) (TWA)*
ACGIH STEL	15 ppm (21 mg/m^3))*
OSHA PEL	10 ppm (14 mg/m^3) (TWA)
NIOSH Immediately Dangerous to Life and Health Level (IDLH)	100 ppm (IDLH)

TLV COMMENTS :*NOTICE OF INTENDED CHANGE: A decrease of the TLV-TWA to 5 ppm and the deletion of the STEL are proposed.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Gas
Appearance and Odor: Colorless gas or pressurised liquid with offensive odor
Odor Threshold: 0.13 ppm.
Boiling Point: -60.2°C (-76.4°F) at 1 atm,
Melting/Freezing Point: -82.9°C (-117.2°F) at 1 atm,
Vapor Pressure: 1875 kPa at 20°C
Vapor Density: 1.189 (air = 1)
Bulk Density: Saturated Gas: 31.04 kg/m^3 at 21.1°C (70° F)
Saturated Liquid: 774.2 kg/m^3 at 21.1°C (70° F)
Evaporation Rate: Not applicable
Solubility: 437 mL of gas in 100 mL of water at 0°C; 186 mL of gas in 100 mL of water at 40°C. Soluble in hydrocarbon solvents, ether, alcohol, glycerol and carbon disulfide.
pH: 4.1 (0.1N aqueous solution)

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MATERIAL SAFETY DATA SHEET

Hydrogen Sulfide

10. STABILITY AND REACTIVITY

Stability: Stable

Conditions to Avoid: Keep away from heat and sources of ignition.

Materials to Avoid:

- Oxidizing agents (e.g. peroxides and nitrates) - May react violently or explosively.
- Forms explosive reactions with bromine pentafluoride, chlorine trifluoride, nitrogen triiodide, nitrogen trichloride, oxygen difluoride and phenyl diazonium chloride.
- Metals (e.g. copper, lead) - Forms metal sulfides.
- Metal oxides (e.g. nickel oxide) - Oxidizes and can ignite.

Corrosivity to Metals: Corrosive. Reacts to form metal sulfides. Anhydrous hydrogen sulfide has low general corrosivity toward carbon steel, aluminum, Inconel, Stellite and 300-series stainless steels at moderate temperatures. Temperatures greater than ca 260°C can produce severe sulfidation of carbon steel. Wet hydrogen sulfide can be quite corrosive to carbon steel.

Hazardous Decomposition or Combustion Products: Toxic oxides of sulfur.

Hazardous Polymerization: Will not occur

11. TOXICOLOGICAL INFORMATION

Toxicological Data:

Human toxicity values:
Man: lethal: 600 ppm/30 min; 800 ppm, immediate /lethality/
severe toxic effects 200 ppm = 280 mg/cu m 1 min
symptoms of illness 50 ppm = 70 mg/cu m
Animal toxicity values:
LC50 (rats): 444 ppm; 4-hr exposure
LC50 (mice): 673 ppm; 1-hr exposure.
LC50 (rats and mice): 1000 ppm; 15-30 min exposure
LC50 (female mice): 985 ppm; 15-30 min exposure

Carcinogenicity: Hydrogen sulfide is not classified as a carcinogen by NTP (National Toxicology Program), IARC (International Agency for Research on Cancer), ACGIH (American Conference of Governmental Industrial Hygienists) and not regulated as a carcinogen by OSHA (Occupational Safety and Health Administration).

Reproductive Effects: No evidence.

Mutagenicity Data: No evidence.

Teratogenicity Data: No evidence.

Synergistic Materials: None known

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MATERIAL SAFETY DATA SHEET

Hydrogen Sulfide

12. ECOLOGICAL INFORMATION

Atmospheric Fate: The lifetime of hydrogen sulfide is affected by ambient temperature and other atmospheric variables including humidity, sunshine, and presence of other pollutants. Once released into the atmosphere, hydrogen sulfide will behave like many other gaseous pollutants and be dispersed and eventually removed. Residence times in the atmosphere range from about one day to more than 40 days, depending upon season, latitude, and atmospheric conditions.

Soil Adsorption/Mobility: When it is spilled onto soil, much will evaporate. However, since it is very soluble in water, the presence of water in soil or falling as precipitation at the time of the spill may contribute to movement in the soil. If the soil surface is saturated with moisture at the time of the spill as might be the case after a rainfall, the spilled chemical will run off and/or evaporate away.

Degradation: Microorganisms in soil and water are involved in oxidation-reduction reactions, which oxidize hydrogen sulfide to elemental sulfur. Abiotic Degradation: Hydrogen sulfide does not absorb solar radiation reaching the tropsphere. It does not, therefore, undergo photolysis or react photochemically with oxygen. The primary chemical transformation of hydrogen sulfide in the atmosphere is oxidation by oxygen containing radicals to sulfur dioxide and sulfates.

Bioconcentration: Does not have bioaccumulation or food chain contamination potential.

Ecotoxic Effects: Harmful to aquatic life. Fish toxicity;
TLm Lepomis macrochirus (bluegill sunfish) eggs 0.0190 mg/l/72 hr at 21-22° C in a flow through bioassay
TLm Lepomis macrochirus (bluegill sunfish) 35 day old fry 0.0131 mg/l/96 hr at 21-22°C in a flow through bioassay.
TLm Lepomis macrochirus (bluegill sunfish) juveniles 0.0478 mg/l/96 hr at 21-22°C in a flow through bioassay
TLm Lepomis macrochirus (bluegill sunfish) adults 0.0448 mg/l/96 hr at 21-22 °C in a flow through bioassay
TLm Pimephales promelas (fathead minnow) 0.0071-0.55 mg/l/96 hr at 6-24°C in a flow through bioassay
TLm Salvelinus fontinalis (brook trout) 0.0216-0.038 mg/l/96 hr at 8-12.5°C in a flow through bioassay

Invertebrate And Microbial Toxicity: Black sea mussels exposed to hydrogen sulfide exhibited changes in protein-carbohydrate metabolism, total proteins, lactate and pyruvate, and transamination enzyme activity in the mussel haemolymph. LC50 (96 hr) Asellus 0.11 mg / l.

13. DISPOSAL CONSIDERATIONS

Do not dispose of waste with normal garbage, or to sewer systems.

- Responsibility for proper waste disposal is with the owner of the waste. Work with the appropriate regulatory bodies to ensure compliance with regulations.
- It may be possible to make waste H_2S gas harmless by dissolving it in a sodium hydroxide scrubber, or by burning the H_2S and absorbing the resulting sulfur dioxide.
- Trained, experienced personnel must perform waste treatment procedures with appropriate protective equipment in approved treatment facilities.
- Clean-up material may be a RCRA Hazardous Waste on disposal.
- Provincial/State or local regulations or restrictions are complex and may differ from Federal regulations.
- The information applies to the material as manufactured. Processing, neutralizing, use or contamination may make the information inappropriate, inaccurate or incomplete.

MARSULEX

MATERIAL SAFETY DATA SHEET

Hydrogen Sulfide

14. TRANSPORT INFORMATION

U.S. (Under DOT)

Shipping Name: Hydrogen Sulfide
Hazard Class or Division: 2.3
Product Identification No. (PIN): UN1053
LABEL(S): 2.3 - Poison Gas
2.1 - Flammable Gas

RQ: 100 lb (45.4 kg)

Special Provisions :
T26 - Minimum shell thickness
B14 –Insulation required on bulk packaging.
B9 - Bottom outlets not authorized.
2 – Poison, Inhalation Hazard, Hazard Zone B.

Limits to Mode or Method of Transport :

PACKAGING EXCEPTIONS: None
PASSENGER AIRCRAFT/RAIL: Forbidden
CARGO AIRCRAFT ONLY: Forbidden

Canada (Under TC)

Shipping Name: Hydrogen sulphide
Classification(s): 2.3 (2.1)
Product Identification No. (PIN): UN1053

Regulated Limits: 230 Kg

Special Provisions :
102. "SPECIAL COMMODITY" or "MARCHANDISE SPECIALE" required on shipping document when transported by rail.

Other Requirements: ERAP required for quantities exceeding 3,000 kg

Limits to Mode or Method of Transport :
CONSUMER COMMODITY: Prohibited
LIMITED QUANTITY: Prohibited
PASSENGER VEHICLES: Prohibited
PASSENGER SHIP: Prohibited

15. REGULATORY INFORMATION

U.S.A.

SARA Title III HAZARD CATEGORIES AND LISTS

Product Hazard Categories		Lists	
Acute (Immediate) Health:	Yes	Extremely Hazardous Substance (40 CFR 355, SARA Title III Section 302)	Yes
Chronic (Delayed) Health:	No		
Fire:	Yes	CERCLA Hazardous Substance (40 CFR 302.4)	Yes
Reactivity:	No		
Sudden Release of Pressure:	No	Toxic Chemical (40 CFR 372.65, SARA Title III Section 313)	Yes

Reportable Quantity (RQ) under U.S. EPA CERCLA: RQ=100 lb / 45.4 kg

OSHA Classification: Highly Hazardous Chemical (29 CFR 1910.119)
The Threshold Quantity (TQ) for this substance is 1,500 lbs.

MARSULEX INC.

MATERIAL SAFETY DATA SHEET

Hydrogen Sulfide

TSCA Inventory Status: Reported/Included

Right-To-Know: Illinois, Massachusetts, New Jersey, Pennsylvania

MARSULEX INC.

MATERIAL SAFETY DATA SHEET

Hydrogen Sulfide

CANADA

Workplace Hazardous Materials Information System (WHMIS)

WHMIS Classification(s): Class A – Compressed gas
Class B1- Flammable gas
Class D1A - Very Toxic
Class D2B – Other effects-Toxic

WHMIS Health Effects Index: Acute Lethality - very toxic – immediate
Eye irritation - toxic - other
TDG Class 2.3 - very toxic - immediate

WHMIS Ingredient Disclosure List: Confirmed A; Meets criteria for disclosure at 1% or greater.

CEPA / Canadian Domestic Substances List (DSL): The substances in this product are on the Canadian Domestic Substances List (CEPA DSL).

EINECS Number : 231-977-3

16. OTHER INFORMATION

REFERENCES:

1. "CHEMINFO" through "CCINFOdisc", Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada, May 2001.
2. CHEMLIST, American Chemical Society, 2001.
3. CESARS: Chemical Evaluation Search And Retrieval, Canadian Centre for Occupational Health and Safety, Issue : 2001-2, May, 2001.
4. Handbook of Compressed Gases, 3rd Edition, Compressed Gas Association, Arlington, Virginia, 1990.
5. HSDB-Hazardous Substances Data Bank , through "CCINFO disc", Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada, (May 2001).
6. RTECS- Registry of Toxic Effects of Chemical Substances, On-line search, Canadian Centre for Occupational Health and Safety RTECS database, May, 2001.
7. Transportation of Dangerous Goods Act and Regulations, Canadian Centre for Occupatioal Health and Safety, May 2001.
8. Threshold Limit Values for Chemical Substances and Physical Agents, Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, 2001.

MARSULEX

MATERIAL SAFETY DATA SHEET

Hydrogen Sulfide

16. OTHER INFORMATION (Continued)

Legend:

CAS #	- Chemical Abstracts Service Registry Number
CERCLA	- Comprehensive Environmental Response, Compensation, and Liability Act
CFR	- Code of Federal Regulations
DOT	- Department of Transportation
EPA	- Environmental Protection Agency
ERAP	- Emergency Response Assistance Planning
LC_{50}	- The concentration of material in air expected to kill 50% of a group of test animals
LD_{50}	- Lethal Dose expected to kill 50% of a group of test animals
LEL	- Lower Explosive Limit
MSHA	- Mine Safety and Health Administration
NIOSH	- National Institute for Occupational Safety and Health
PEL	- Permissible Exposure Limit
PVC	- Polyvinyl chloride
RCRA	- Resource Conservation and Recovery Act
SARA	- Superfund Amendments and Reauthorization Act of the U.S. EPA
STEL	- Short Term Exposure Limit
TDG	- Transportation of Dangerous Goods Act/Regulations
TLm	- Median Threshold Level
TLV	- Threshold Limit Value
TSCA	- Toxic Substances Control Act
TWA	- Time-Weighted Average
UEL	- Upper Explosive Limit

Prepared by PIONEER (905) 403-4745

The information contained herein has been approved by MARSULEX Inc. and is offered only as a guide to the handling of this specific material and has been prepared in good faith by technically knowledgeable personnel. It is not intended to be all-inclusive and the manner and conditions of use and handling may involve other and additional considerations. No warranty of any kind is given or implied and MARSULEX Inc. will not be liable for any damages, losses, injuries or consequential damages that may result from the use or reliance of any information contained herein.

APPENDIX G
EMPLOYEE SIGNOFF SHEET

APPENDIX G
EMPLOYEE SIGNOFF SHEET

I have read the Tom Brown, Inc. Spiller Canyon Facility ***Emergency Response Plan/Public Protection Plan*** and understand its contents. I understand my personal responsibilities under this policy and will make use of this information to contribute to safety of the public and for my own personal safety while an employee of Tom Brown, Inc.

Signed Date

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, Utah 84114-5801
(801) 538-5340 telephone
(801) 359-3940 fax
(801) 538-7223 TTY
www.nr.utah.gov

Michael O. Leavitt
Governor
Robert L. Morgan
Executive Director
Lowell P. Braxton
Division Director

UNDERGROUND INJECTION CONTROL PERMIT

Cause No. UIC-297.1

Operator: Tom Brown, Incorporated

Wells: NW USA D-1 (B-624)

Location: Section 24, Township 30 South, Range 24 East (SLBM), San Juan County, Utah

API No.: 43-037-16516

Well Type: Waste Gas Disposal Well

Stipulations of Permit Approval

1. Approval for conversion to Injection Well issued on December 11, 2002.
2. Maximum Allowable Surface Injection Pressure: 1,960 psi.
3. Injection Interval: Selective zones in the Leadville Limestone.
4. Conduct radioactive tracer surveys every two years to verify integrity of well and placement of fluid, and log the interval from the base of the Leadville Limestone to 300' above it, every 5 years with an UltraSonic Imager (USI, Schlumberger) or similar cased hole log as approved by the Division.
5. The operator may request a waiver of the above extraordinary integrity requirements, or to change the survey or logging cycle, if experience shows well integrity is being maintained.

Approved by: Lil Hunt
(for) John R. Baza
Associate Director

12-17-02
Date

CK:er
cc: Dan Jackson, Environmental Protection Agency
Eric Jones, BLM Moab Office
San Juan County Planning

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State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

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Michael O. Leavitt
Governor
Robert L. Morgan
Executive Director
Lowell P. Braxton
Division Director

December 11, 2002

Brant Gimmeson
Tom Brown, Inc.
555 17th Street, Suite 1850
Denver, CO 80202-3918

Re: NW USA D-1 (Lisbon B-624) Waste Gas Disposal Well, Section 24, Township 30 South, Range 24 East (SLBM), San Juan County, Utah

Gentlemen:

Pursuant to Utah Admin. Code R649-5-3-3, the Division of Oil, Gas and Mining (the "Division") issues its administrative approval for conversion of the referenced well to a Class II waste gas disposal well for re-injection of sulfur gas. Accordingly, the following stipulations shall apply for full compliance with this approval:

1. Compliance with all applicable requirements for the operation, maintenance and reporting for Underground Injection Control ("UIC") Class II injection wells pursuant to Utah Admin. Code R649-1 et seq.

2. Conformance with all conditions and requirements of the complete application submitted by Tom Brown, Incorporated.

If you have any questions regarding this approval or the necessary requirements, please contact Christopher Kierst at (801) 538-5337 at this office.

Sincerely,

John R. Baza
Associate Director

CK:er
cc: Dan Jackson, Environmental Protection Agency
Eric Jones, BLM Moab Office
San Juan County Planning

Utah!
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DIVISION OF OIL, GAS AND MINING
UNDERGROUND INJECTION CONTROL PROGRAM

PERMIT
STATEMENT OF BASIS

Applicant: Tom Brown, Incorporated **Well:** Lisbon Unit B - 624

Location: T30S, R24E, S24, San Juan Co. Utah **API:** 4303716516

Ownership Issues:

The well is located on federal lands administered by the Bureau of Land Management within the Lisbon Federal Unit. There are no other landowners within a half mile buffer distance from the proposed injection well. Tom Brown, Incorporated retains a lease on the hydrocarbon mineral estate on Section 24. A sworn Affidavit of Mailing (of the application and associated documentation to the particular owners, operators and surface owners) has been placed in the well file.

Well Integrity:

Description of the Casings and Cement:

CASING PROGRAM

String Type	Hole Size	Depth	Feet	Casing Diameter	Weight	Grade	Connection Type
Conductor	?	14'	14'	20"	?	?	?
Surface	?	1000'	1000'	13 3/8"	48#	H-40	ST&C?
Production	?	9232'	280 jts.	5 ½"	20, 17, 15.5#	N-80	LT&C

CEMENT PROGRAM

String Type	DV Depth	Stage Lead/Tail	Cement Bottom	Cement Top	Number Sacks	Cement Type	Cement Yield	Cement Weight
Conductor	-	-	25'	0"	"dumped"	?	?	?
Surface	-	-	455'	?	800	"regular"	?	?
Production	3696' 3686'?	3rd Stg	8840' logger	Circ. to surface 204' calc. 450' log	2400 ft^3	50/50POZ	?	?
	-	2nd Stg.	?	4647' calc.	2900 ft^3	50/50POZ	?	?
	8896'	1st Stg.	off bottom	9014' calc.	150 ft^3	50/50POZ	?	?

Ground Water Protection:

Tom Brown, Inc. proposes to inject a 50% CO_2, 50% H_2S produced "acid gas" mixture into the gases' strata of origin, the Mississippian Leadville Limestone, through an overall perfed interval from 8,936' to 9,182', which is the interval used in previous salt water disposal operations. No good quality ground water resource is likely be encountered in that Formation near the injection well location and, particularly, at that depth.

The operator asks to be permitted to inject the "acid gas" waste stream into the formation at a **Maximum Allowable Surface Injection Pressure of 1,960 psi, a pressure that is supportable by step rate test results. They hope to inject at an average rate of 1,700 MCFD.** The injectate gas mixture will be injected "dry", that is, with all the free water removed, and at sufficiently high temperature and pressure that no water is permitted to condense. This will be done to preclude the possibility of water and H_2S combining to create a sulfide stress cracking (SSC) corrosion problem for the 1960s' era, N-80 Grade, production casing, the 3½" tubing and the packer. The operator has conducted phase behavior studies in order to inject the proposed gas mixture with no free water. They propose to conduct their operations to properly process the waste gas stream and maintain the necessary temperatures and pressures needed to ensure that injection will occur safely within the requisite phase envelope.

The base of moderately saline waters (encountered at about the 4500' elevation) occurs over 7000' higher, at about 1800' of depth in the B-624 injection well. The primary confining layer above the injection zone will be approximately 3,000' to 4,000' of Paradox Salt. The operator estimates that the proposal will eventuate the injection of a converted volume of 1.25 MMB, which is about 6% of the reservoir pore volume. A 10-year breakeven term is forecast for this phase of the operator's project, but the overall injection project life is likely to be somewhat longer. The mixture is not expected to reach any offset wellbores during the remaining economic life of the field. The mixture is expected to be highly soluble in the Leadville Limestone connate water and may slightly increase the reservoir permeability, commensurately lowering injection pressure.

Analysis of the typical composite of field-produced water injectate revealed a Total Dissolved Solids (TDS) value of 76,671 mg/l. Another individual sample from the Leadville Limestone reservoir tested in excess of 110,000 mg/l TDS. The permit for this well will be issued based on a design that is intended exclusively for the injection of an acid gas stream. It will be necessary to inject the stripped produced water into another salt-water disposal well. In this area, the Leadville Limestone is not considered an Underground Source of Drinking Water (USDW; a water source containing less than 10,000 mg/l, total dissolved solids).

There are no subsurface water rights filed within a mile of the B-624 and the only

other water rights filed are for the surface water of nearby Lisbon Spring.

The operator had a down hole injection pressure survey conducted to determine the surface injection pressures for injecting the waste gas mixture. A 30 minute bottom hole injection pressure (BHIP) of 3,958 psi was determined with an average fluid gradient of 0.46 psi/ft between the 8,000' and 9,000' pressure measurements.

Next, a pressure falloff test was run. Analysis of the results indicated that both pseudo linear and pseudo radial flow regimes were encountered, that the reservoir pressure was extrapolated to 2,358 psi and that there was a permeability of 0.3 md over 52' of net injection zone.

A step rate test was run and from this the fracture initiation pressure was estimated to be 5,300 psi at 5.3 BPM, which corresponds to 7,632 BWIPD. The calculated fracture gradient was 0.59 psi/ft. In addition, subsequent nodal analysis revealed that the wellbore and reservoir could conservatively accommodate the injection of 1,700 MCFD of waste gas.

The operator amended the original system design by deleting the 4" pipe jacket from around the 2" "process pipeline" that runs from the compressors to the wellhead.

Oil/Gas & Other Mineral Resources Protection:

The Lisbon Field Leadville Limestone productive zone has effectively been "watered out" in the injection well by the anticlinal field's active water drive. No other known potentially producible zones are recognized in this well.

A review of the well records of the Division of Oil, Gas and Mining revealed that there were no other wells within the one-half mile regulatory area of review.

Uranium mining has historically occurred in the Lisbon Valley area, as recently as during the late 1970's or early 1980's. The lateral extent of the subsurface workings of these mines is not available to the Division's Geographic Information System and it is not known with certainty if that information has been archived anywhere. For this reason, no attempt has been made to determine the proximity of the nearest subsurface workings in the mines either laterally or in terms of elevation above the injection zone. Division Abandoned Mines management suggests that some information may be located at a University of Wyoming repository specifically dedicated to the archival storage of such information. From personal experience, I know that the nearby mines were working in the Chinle Formation and possibly the uppermost Cutler Formation, both of which are above the confining Paradox Salt section. The portal to the Louise Mine lies ~1 mile north of the B-624 well.

Bonding:

Tom Brown, Incorporated, has an state-wide $80,000 surety bond (RLB001191) filed with the State School and Institutional Trust Lands Administration which provides coverage for plugging this well.

Safety Considerations:

The operator has taken several positive measures to ensure the safe operation of the proposed facility. In addition, safety benefits are optimized within the design parameters of the operation. Safety considerations include:

- Well location is 2.5 miles remote from the gas plant.
- Well location is isolated and contained in Spiller Canyon.
- No other well bores are within ½ mile of the well.
- There is little quality ground water in the area.
- The well has a 37-year record of safe, successful (42 MMBW) SWD operation.
- The Leadville Limestone takes injected fluid on a vacuum.
- The well was cemented in 3 stages; the last stage circulated cement to surface.
- The waste gases will be returned to their formation of origin.
- Emplacement of a wellhead meeting the NACE MR0175 standard for corrosion.
- **Utilization of a nonconductive diesel oil packer fluid for corrosion.**
- Automatic monitoring of injection parameters with out-of-bounds alarms and automatic shutoffs.
- **An acceptable hydrogen sulfide contingency and safety plan has been proposed by the operator.**
- **The operator has agreed to conduct radioactive tracer surveys on a 2 year cycle and log the relevant portion of the well with a UltraSonic Imager (USI) log (Schlumberger), on a 5 year cycle. Upon written petition of the operator, the Division at some point may waive the extraordinary surveys and logging cycles described above or reduce the frequency of either cycle if the system appears to be functioning with minimal deterioration of integrity.**

Actions Taken and Further Approvals Needed:

Notice of this application was published in the Salt Lake Tribune and San Juan Record. In addition, copies of the notice was provided to the EPA Region 8, the BLM Moab Field Office and Tom Brown, Incorporated. The notice stated the proposed interval for injection to be selective zones in the Leadville Limestone (Mississippian). Any future injection into a formation other than that permitted will require administrative approval after appropriate sampling and testing.

After reviewing their documentary submission and application, it is my conclusion that Tom Brown, Incorporated, ought to be granted a permit to utilize the B-624 well

for injecting the proposed sulfur and carbon dioxide waste gas mixture into the proposed zone. The proposed operations would not result in any meaningful diminution in the quality of the noxious formation water. A pressure increase should be experienced near the wellbore, which would dissipate after injection ceases. No negative impacts on any high quality ground water resource are anticipated resultant of the subject permitted operations.

A properly designed and constructed injection well, combined with periodic mechanical integrity tests, demonstrably poses no threat to fresh or useable groundwater supplies. The Division staff recommends administrative approval of this application.

Note: Applicable technical publications concerning water resources in the general vicinity of this project have been reviewed and taken into consideration during the permit review process.

Reviewer(s): Christopher Kierst Date: 12/13/2002

UNDERGROUND INJECTION CONTROL PERMIT

Cause No. UIC-297.1

Latest Draft 12/13/02

Operator: Tom Brown, Incorporated

Wells: NW USA D-1 (B-624)

Location: Section 24, Township 30 South, Range 24 East (SLBM), San Juan County, Utah

API No.: 43-037-16516

Well Type: Waste Gas Disposal Well

Stipulations of Permit Approval

1. Approval for conversion to Injection Well issued on 12/11/2002.

2. Maximum Allowable Surface Injection Pressure: 1,960 psi.

3. Injection Interval: Selective zones in the Leadville Limestone.

4. Compliance with all applicable requirements for the operation, maintenance and reporting for Underground Injection Control ("UIC") Class II injection wells pursuant to Utah Admin. Code 'R649-1 et seq.

5. Conformance with all conditions and requirements of the complete application, with approved amendments, as submitted by Tom Brown, Inc.

6. Conduct biennial radioactive tracer surveys and log the interval from its base to 300' above the Leadville Limestone every 5 years with an UltraSonic Imager (USI, Schlumberger) or similar cased hole log as approved by the Division.

7. The operator may petition the Division for a waiver of the need for the above extraordinary casing integrity documentation or to change the survey or logging cycle.

Approved by: _____ _____

John R. Baza
Associate Director

Date

State of Utah

Department of
Natural Resources

Division of
Oil, Gas & Mining

ROBERT L. MORGAN
Executive Director

LOWELL P. BRAXTON
Division Director

December 18, 2003

Arsie Jaramillo
Tom Brown, Inc.
PO Box 760
Moab, UT 84532

RE: UIC-2 Enhanced Recovery Project and UIC-3 Monthly Injection Reports for B-624

Dear Arsie:

It is my understanding that in April 2003,Tom Brown Inc. stopped injection (or disposal) of water into the B-624 and in May you started injection (or disposal) of acid gas into this well bore.

The UIC-3 is for injection, disposal or storage wells, whereas the UIC-2 is for injection wells to enhance or stimulate the oil or gas recovery or production in other wells in the same area.

Therefore, it will be necessary to correct the monthly and cumulative amounts on theUIC-2 reports from May 2002 through September 2002. I also need UIC-3 reports on the B-624 from May through current month. I have enclosed a copy of each beginning report that needs to be changed.

Please advise me of the status on the B-614, D-84 and the D-810 wells. Are they plugged or just not being injected into?

Thanks for your assistance in correcting these reports. You can call me at (801) 538-5336, if you have any questions.

Sincerely,

E Russell

Earlene Russell
Engineering Technician

enclosures

1594 West North Temple, Suite 1210, PO Box 145801, Salt Lake City, UT 84114-5801
telephone (801) 538-5340 • facsimile (801) 359-3940 • TTY (801) 538-7223 • *www.ogm.utah.gov*

Utah!
Where ideas connect

The design of an acid-gas injection system requires numerous design considerations, as shown in this second of two articles on the Lisbon gas plant, Moab, Utah.

This part covers the design and operation of the compression and injection portions of the facility. The first part (OGJ, Mar. 1, 2004, p. 54) discussed the acid-gas enrichment portion with emphasis on the Flexsorb selective amine-treating unit.

LISBON GAS PLANT— Conclusion

Acid-gas injection design requires numerous considerations

Steven G. Jones
Doug R. Rosa
Tom Brown Inc.
Moab, Utah

Johnny E. Johnson
Washington Group International Inc.
Denver

Acid-gas injection

Fig. 1 shows the block-flow diagram for the acid-gas injection (AGI) unit. Enriched acid gas from the Flexsorb regenerator is mixed with methyldiethanolamine (MDEA) raw acid-gas feed that was bypassed around the Flexsorb treating unit.

The resulting blended acid-gas mixture flows to the suction of the injection compressors. Blended acid-gas composition varies from 32% to 38% H_2S (plus CO_2 and water).

High-pressure blended acid gas flows from the compressor discharge through the pipeline to the wellsite, into the wellbore, down the well tubing, and finally into the reservoir.

Acid-gas injection compressors

Each injection compressor is a five stage, six-throw Ariel Model JGA/6 compressor (Fig. 2) with five double-acting cylinders and no tandem cylinder. The driver is a 250-hp electric motor operating at 1,200 rpm (4,160 v AC).

The two injection compressors operate in parallel and compress 0.5-1.0 MMscfd each, depending upon suction and discharge pressures. Capacity control is limited to an adjustable pocket on the first stage of compression.

Metallurgy for all compressor piping, gas cooler, and scrubbers is 304L stainless steel. The compressor cylinders are carbon steel or "gray iron." The transition from stainless to carbon steel is the entrance to the pipeline following the discharge from the fifth stage.

The double-distance piece on each throw and the packing on each stage are purged with nitrogen.

The combined total flow rate from the injection compressors averages 1.5 MMscfd (Fig. 3a).

Flow rate of enriched acid gas (50% H_2S) from the Flexsorb regenerator is about 1.0 MMscfd; therefore about 0.5 MMscfd of the MDEA raw acid-gas feed (4-5% H_2S) bypasses around the Flexsorb treating unit.

The bypass is intended to keep the compressors fully loaded and maintain constant suction pressure control. Bypass flow rate can reach 100% of the compressor capacity at times such as start-up. The compressors are started up with MDEA raw acid gas.

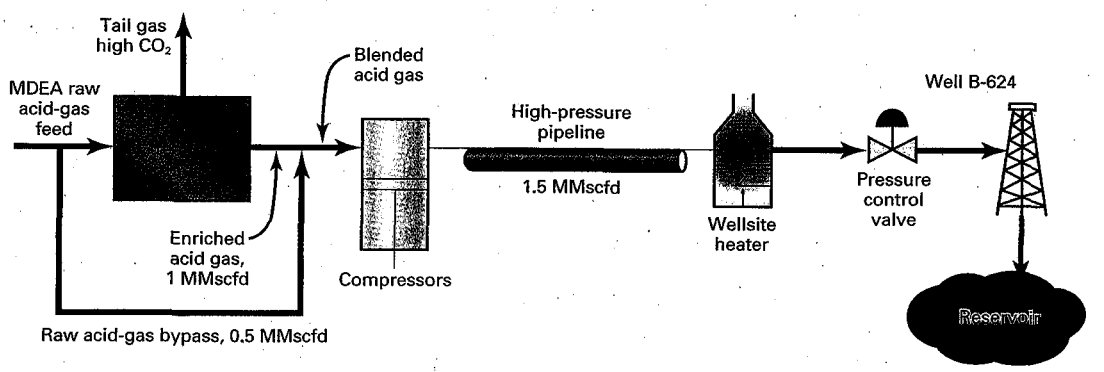
Injection into the wellbore continues until the entire system warms up to normal operating temperatures. After that, the flow of enriched acid gas from the regenerator starts.

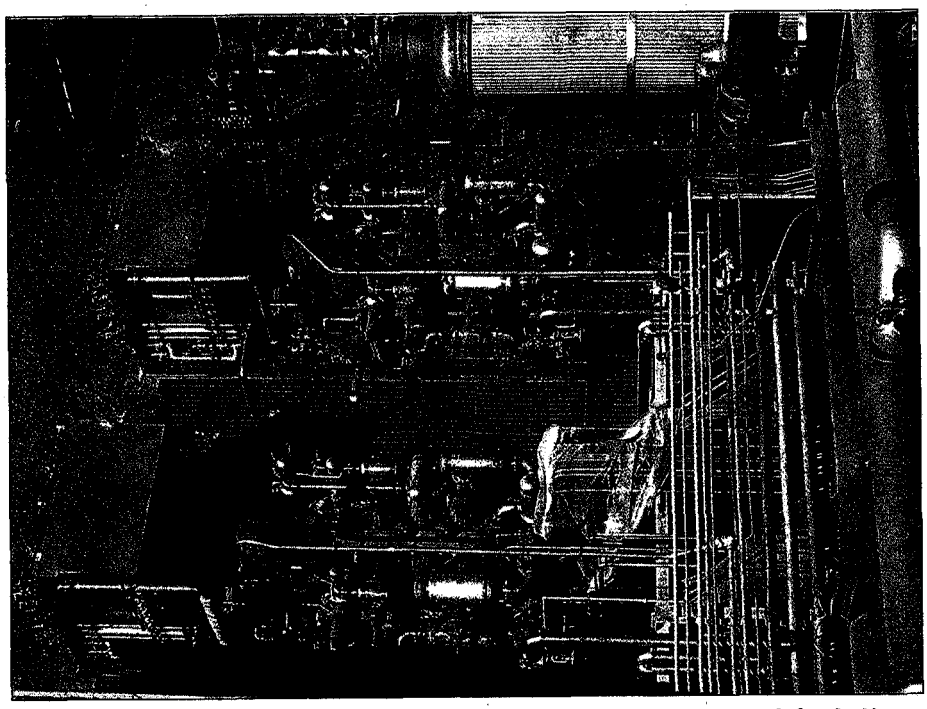
Compressor performance

Fig. 4 shows the compressor inter-

LISBON PLANT ACID-GAS INJECTION

Fig. 1





Each injection compressor is a five-stage, six-throw Ariel Model JGA/6 compressor with five double-acting cylinders and no tandem cylinder. The driver is a 250-hp electric motor operating at 1,200 rpm (Fig. 2).

stage pressure profile design with the phase envelope based on the enriched acid-gas composition. Fig. 3b shows actual compressor interstage suction scrubber operating pressures. Also shown is the trend of the fifth-stage discharge pressure, about 1,500 psig.

The design limits the compression ratio for each compression stage to keep the discharge temperature below 300° F. (upstream of the coolers).

Variable-speed motors installed on the compressor's gas coolers reduce the variation in outlet temperature (suction temperature for the next compression stage). Fig. 3c shows actual compressor interstage suction-scrubber operating temperatures.

Normal operations bypass the compressor's fifth-stage gas cooler so that the high-pressure blended acid gas discharges into the pipeline at about 240° F. (Fig. 3c). It is important to maintain operating pressures and temperatures so that the blended acid gas does not enter the two-phase envelope.

Entering the two-phase region would cause liquid acid gas to form, which is undesirable in the compressors, pipeline, or wellbore under normal operating conditions.

Liquid water condensed in the interstage coolers, particularly the second, third, and fourth stages, collects in the suction scrubbers.

Compressor lube oil also collects in the suction scrubbers. Level controllers on these scrubbers allow liquid flow to cascade in sequence from the high-pressure scrubbers to the inlet scrubber.

The liquids in the inlet scrubber are pumped to the sour-water handling system. These liquids have been a problem to pump and handle in part because the lube oil and water form a white foamy emulsion.

High levels and level instrument failures in the scrubbers have caused numerous compressor shutdowns. The float indicator in a level instrument does not work well when the liquid in the scrubbers is an emulsion.

Water content

The fifth-stage suction conditions are key to successfully dehydrating the blended acid gas using the compression cycle. Fig. 5 shows water content of the enriched acid gas from the regenerator as a function of pressure and temperature.

Water content of the blended acid gas should be analogous. Water content of saturated acid gas is high at low pressure, but as the pressure approaches 500-1,000 psig, the water content goes through a minimum then rapidly increases again as pressure increases. This acid-gas characteristic has the advantage that one can achieve partial dehydration of the acid gas during compression.

As pressure increases in the first four stages, water content drops continuously until the fifth-stage suction where it hits the minimum, about 125 lb/MMscf at 100° F. The fifth-stage of compression increases the pressure to more than 1,500 psig where the acid gas can now hold much more water, about 500 lb/MMscf at 100° F., before reaching saturation.

The fifth-stage suction temperature determines the water content of the blended acid gas in the pipeline and wellbore. The cooler the temperature of the fifth-stage suction, the lower the water content. The lower the water content, the better the protection against water condensation and hydrate formation in the pipeline and wellbore.

The fifth-stage suction temperature varies from 80° F. to as much as 110° F. (Fig. 3c). The swing is due to changing ambient air temperature and the gas coolers. When the fifth-stage suction temperature is 100° F., the corresponding water dewpoint temperature of the compressed enriched acid gas is 5° F. (Fig. 5).

When the fifth-stage suction temperature swings to as low as 80° F., the corresponding water dewpoint temperature of the compressed enriched acid-gas is 0° F. This means that the temperature of the enriched acid gas following the fifth stage of compression, in the pipeline or wellbore, would have to fall to +5° F. or 0° F. before water could condense.

At these temperatures any water that did condense out would actually form ice. The ice might not cause corrosion immediately but would eventually become a problem when temperature increased at the wellsite or in the injection wellbore.

Liquid water in the carbon steel piping in the pipeline, wellsite, or in the wellbore could cause severe and rapid

corrosion. The fifth-stage compressor discharge flows hot into the entrance of the insulated pipeline to take advantage of the heat of compression. This serves to maintain the blended acid-gas temperature in the pipeline well above the point where free water, ice, hydrates, or liquid acid gas might form.

Corrosion inhibitor is injected into the high-pressure blended acid gas at the discharge of the compressors continuously but at a low flow rate of about 1 qt/day just for good measure.

Design considerations

The design basis governs the operation of the facility to ensure that the high-pressure blended acid gas is safely contained and disposed of. The specified operating conditions will prevent condensation of water or liquid acid gas at any point in the system. The plan calls for operation above the critical point and also at temperatures greater than the water dewpoint and hydrate point, at all times.

Washington Group International prepared phase envelopes and physical property predictions describing the behavior of the acid gas during compression, transmission, and injection for numerous operating scenarios, including start-up and shutdown.

The peculiar nature of supercritical acid-gas mixtures must be carefully considered to account for significant and unusual changes in density, viscosity, heat capacity, and thermodynamic behavior.

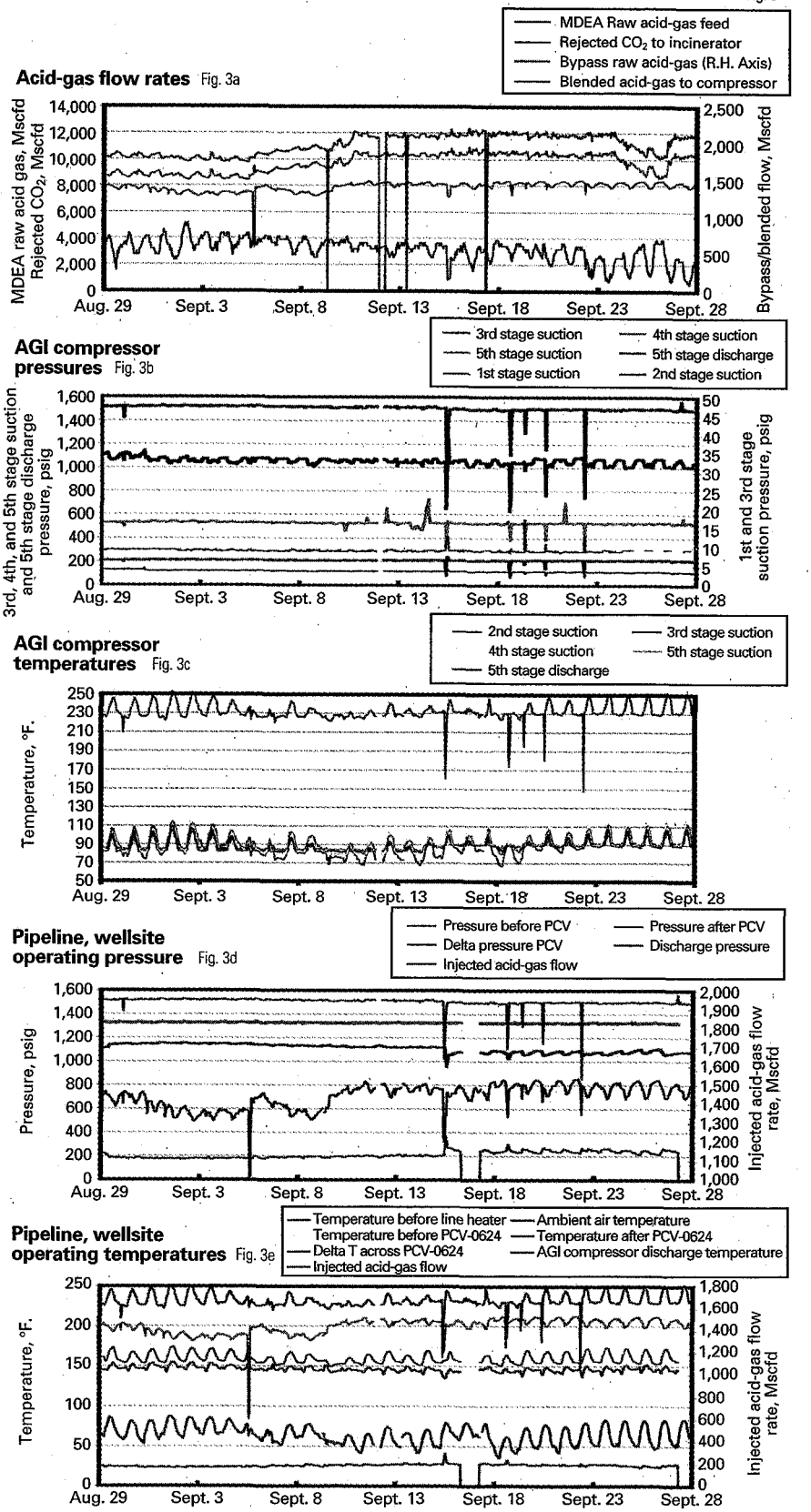
As shown in Fig. 4, the wellsite and wellhead operate particularly close to the critical region where physical properties (such as density) can vary widely with small changes in temperature and pressure.

This could lead to instability; so, considerable effort is made to stay out of this thermodynamic region. Fortunately, the phase envelope and critical region for acid gas shifts left (relative to that shown in Fig. 4 for enriched acid gas) when MDEA raw acid gas is blended with the enriched acid gas from the regenerator.

Blending the two acid gases reduces the H_2S content, which shifts the phase envelope toward cooler temperatures. Shifting the phase envelope moves the

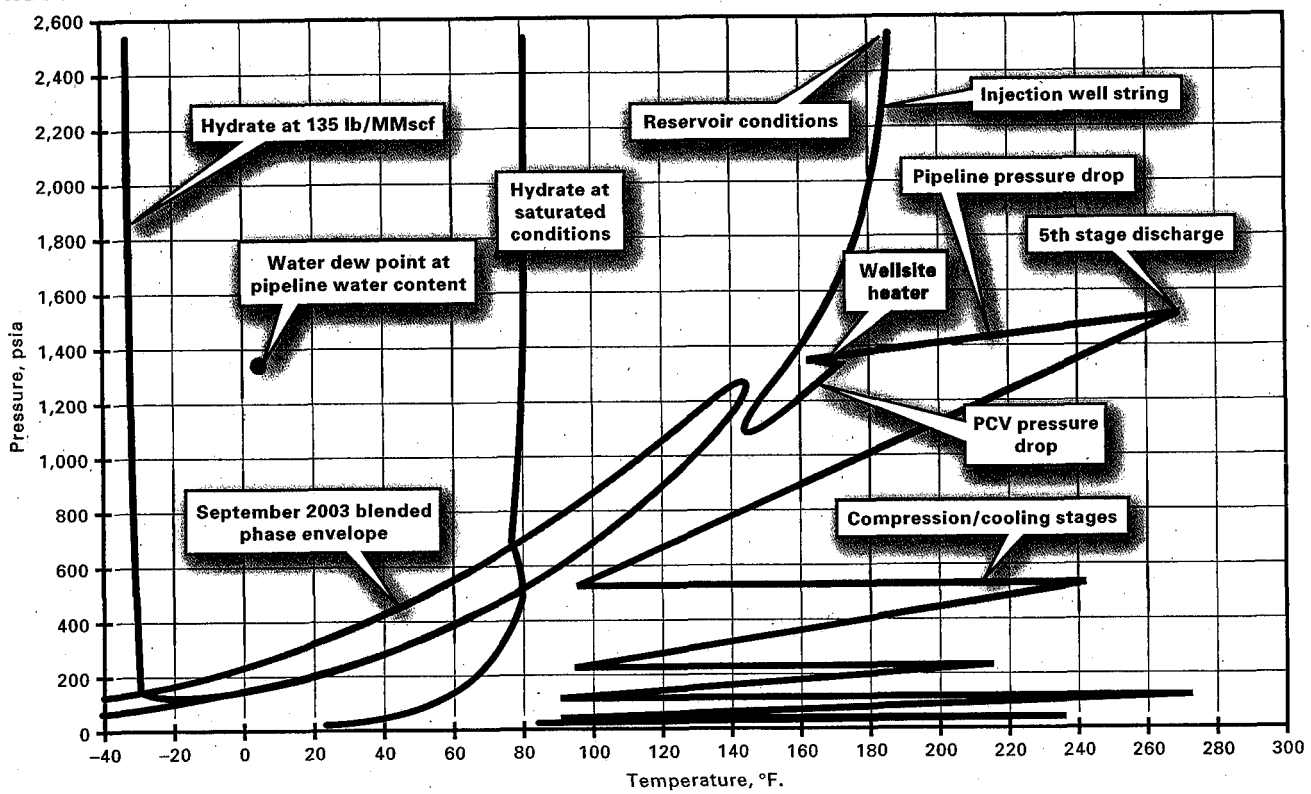
System performance

Fig. 3



PHASE ENVELOPE SUPERIMPOSED WITH COMPRESSION, PIPELINE, WELL CONDITIONS

Fig. 4



critical region further from the normal operating conditions for the pipeline and wellsite.

High-pressure pipeline

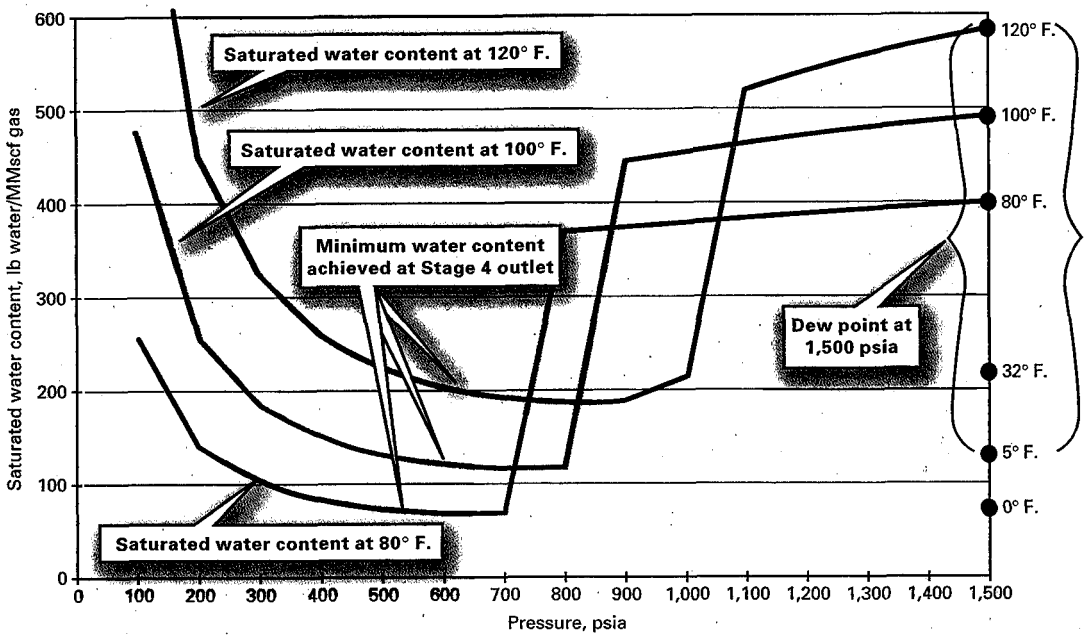
The high pressure acid-gas pipeline originates at the compressor discharge in the Lisbon plant yard, then winds through a red rock canyon for 2.5 miles before reaching the injection well (Fig. 6).

Elevation at the plant is 6,000 ft above sea level, and the wellsite is 300 ft higher than the plant. The pipeline route twists and turns back and forth and up and down as it snakes its way along an intermittent streambed.

The pipeline is 2-in. OD Schedule 160, API X-42, 0.343-in. WT carbon steel pipe. Pipeline maximum allowable pressure is 2,150 psig that is limited by the stainless steel flanges on the

WATER CONTENT OF ENRICHED ACID-GAS

Fig. 5



compressor discharge.

Compressor high-pressure shut down is 90% of the maximum pressure or 1,935 psig. Maximum operating temperature is 350° F.; although normal operating temperature is less than 300° F. The pipeline has a 0.72 location class factor. Corrosion allowance is 0.25 in., which is over and above the wall thickness required to contain the maximum pressure.

The pipeline was designed according to ASME Code B31.8 outside of the plant boundary. It has a corrosion probe installed at Well B-624. Two H_2S monitors, supervisory control and data acquisition (SCADA) operated, are along the pipeline route in addition to H_2S monitors at the plant and B-624 wellsite.

All H_2S monitors alarm in the plant's control room. Welding procedures were according to NACE MR-01-75, and 100% of the welds were X-ray inspected.

To retain heat, a 2-in. black fiberglass foam insulation covers the pipeline. The pipeline lies on the ground supported by and clamped to wooden blocks at 10-15 ft intervals. Expansion loops are installed in key areas to minimize thermal pipe stress.

The pipeline shifted its position in numerous places upon start-up due to thermal expansion.

Thermal expansion ranges from 1.5 to 3.0 in./100 ft, or as much as 22 ft of total change in length over the 2.5 mile distance.

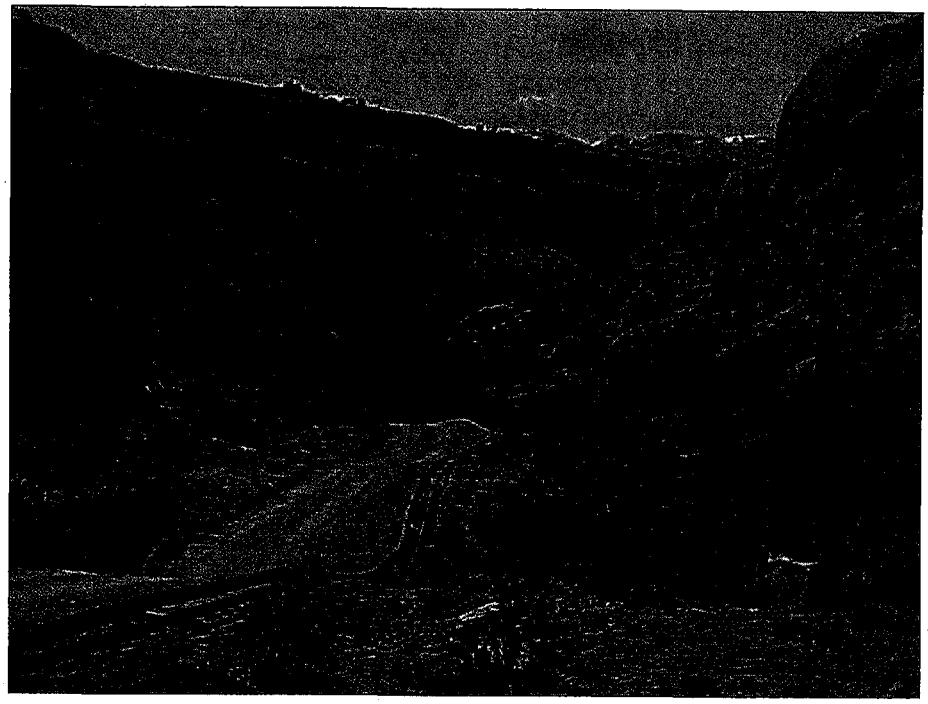
The design concept allows the pipeline to move with temperature changes because there is sufficient room to wiggle in the numerous turns of the circuitous route.

For more than 27 years, the operators injected sour gas (1.1% H_2S, 25% CO_2 plus hydrocarbons) compressed in the plant back into the reservoir via gas-cap injection wells.

During this time, they observed that it was a good practice to allow the surface injection pipelines to move around as necessary to accommodate thermal expansion.

The installation allows for the purging of the acid-gas pipeline by the compressors with methane fuel gas in order to remove the blended acid gas. The compressors have a maximum allowable operating pressure of 1,935 psig, which is below the injection pressure needed to displace either nitrogen or methane fuel gas fully into the reservoir.

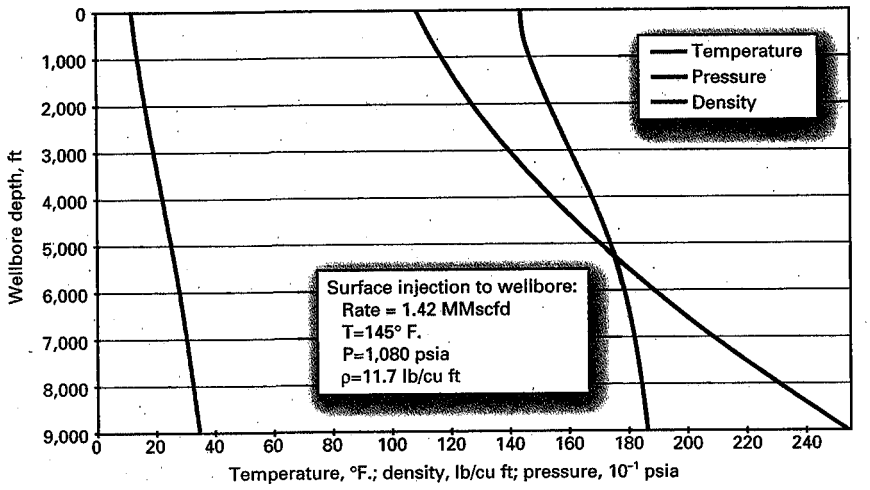
The specific gravity of nitrogen or methane is less than that of the blended acid gas; therefore wellhead injection pressure is correspondingly higher. However, fuel gas will displace the blended acid gas to the wellhead and down into the wellbore some distance. At this point the wellhead valves can be closed, effectively removing the blended acid gas from the pipeline.



The high pressure, acid-gas pipeline originates at the compressor discharge in the Lisbon plant yard, then winds through a red-rock canyon for 2.5 miles before reaching the injection well (Fig. 6).

At the wellsite the acid-gas flows through a wellhead heater and a pressure control valve (Fig. 7).

WELLBORE ACID-GAS PROPERTIES Fig. 8



Methane fuel gas should not normally be mixed with the blended acid gas to be compressed and injected into the well.

Fuel gas increases the water dew-point temperature of the acid gas, which increases the chance that water will condense.

Fuel gas is used only to displace the acid gas in the pipeline into the wellbore but then the fuel gas is blown down.

If both compressors are shut down for more than a few hours during very cold weather, the operators can displace the blended acid gas into the wellbore with fuel gas. The fuel gas is then blown down to evacuate the pipeline.

Injection wellsite

The pipeline ends are on the injection wellsite at the inlet to a wellhead heater (Fig. 7). Pressure at the compressor discharge, about 1,500 psig, has declined to about 1,350 psig (no less than 1,300 psig) at the wellsite (Fig. 3e).

Pressure drop along the pipeline route is about 200 psig. Temperature at the discharge of the compressors, about 240° F., has declined to about 160° F. at the wellsite (Fig. 3d). Temperature drop along the pipeline route is about 70° F., depending on the ambient air temperature.

The wellsite heater heats the blended acid gas exiting the pipeline to about 175° F. The wellsite heater is a conventional carbon steel indirect line heater.

Hot, high-pressure blended acid gas subsequently flows through the wellsite pressure control valve (PCV), then into the wellhead. The PCV controls the discharge pressure of the compressors. The PCV set pressure plus the pressure drop in the pipeline determines the compressor discharge pressure.

Downstream of the PCV, wellhead injection pressure is about 1,100 psig (Fig. 3d). The density and flow rate of acid gas, the nature of the subsurface reservoir into which the acid gas is injected, and the size of the vertical tubulars in the wellbore determine wellhead pressure.

Wellhead injection temperature is a function of the pressure drop and subsequent Joule-Thomson cooling that takes place across the PCV. Pressure drop across the PCV is normally about 200 psig (Fig. 3d), which causes the temperature to decrease by about 25° F. (Fig. 3e).

The wellsite heater adds sufficient heat upstream of the PCV to offset the pipeline heat loss and the temperature decrease due to expansion through the PCV.

This ensures that the blended acid-gas temperature does not become too cold at the wellhead or in the wellstring. Wellhead injection temperature during September 2003 was just under 150° F. (Fig. 3e).

Pressure and temperature elements, installed upstream and downstream of the wellsite heater and the PCV, continuously transmit to the plant's control room using SCADA technology and wireless radio transmitter.

Two H_2S and one lower explosive limit (LEL) hydrocarbon monitor are placed on the wellsite and access to the area is restricted to authorized personnel only. There is no provision to blow down blended acid gas to the atmosphere on the wellsite or anywhere along the pipeline.

Wellhead

Wellhead valves and fittings are essential to safely contain subsurface pressure and blended acid gas under all conditions. Wellhead equipment meets NACE MR-01-75 and API specifications.

Metallurgy in the wellhead valves and fittings is 316L stainless or higher. On the wellhead just above the master valve is a SCADA-operated tight shutoff emergency shutdown (ESD) valve.

The ESD valve allows the plant control operator to shut in the well and isolate the pipeline.

Injection Well B-624

In Well B-624, the injection tubing is 2⅞-in. internally plastic coated L-80 TK7 tubing that runs from the wellhead to just above the Mississippian reservoir.

The bottom of the tubing is landed in a Baker Model N packer placed at 8,875 ft. The annulus between the tubing and packer is filled with diesel fluid.

A pressure element is placed at the wellhead to monitor the pressure in the casing-tubing annulus. The well production casing string is 5½-in., 17-20 lb/ft N-80, long thread and collar (LT&C) landed at 9,232 ft and fully cemented to surface.

The blended acid gas entering the wellhead flows down the tubing string to the perforations in the casing at a depth of 8,936-9,182 ft before entering the Mississippian limestone reservoir.

The temperature of the blended acid gas initially cools after entering the wellbore because the temperature of the earth in the upper portion of the wellbore is cooler than the acid gas. This cooling is offset by heat input at the wellsite heater.

Once the blended acid gas is a few

thousand feet below the surface, the temperature in the rock layers through which it is passing becomes more favorable, gradually increasing to the bottomhole temperature of 140° F.

The pressure of the blended acid gas increases continuously in the wellbore as the depth increases due to increasing hydrostatic head. Autocompression of the acid gas as the depth and static head increases down the wellbore causes a slight increase in the acid-gas temperature above the formation temperature (Fig. 8).

The blended acid-gas density in the tubing string changes with depth because pressure and temperature change with depth (Fig. 8). The surface wellhead injection pressure is principally a function of the average acid-gas density in the wellbore, assuming constant flow rate. If the average density increases, the surface injection pressure decreases and vice versa.

Surface injection temperature is the most important determinant of average wellbore acid-gas density and therefore surface injection pressure. Changing the outlet temperature of the wellsite heater will change the surface injection pressure and the associated pressure drop across the PCV.

Mississippian limestone reservoir

The Mississippian limestone is the productive formation for the Lisbon oil and gas reservoir. Perforations in injection Well B-624 are several hundred feet structurally downdip to those in the nearest producing wells.

Well B-624 is 4,000 ft from the next nearest Mississippian wellbore, which is temporarily abandoned Well A-713.

Well B-624 is 7,200 ft from the nearest producing well B-614-A.

Static reservoir pressure was measured as 2,500 psig at a depth of 8,800 ft on May 20, 2002, after a reasonable shut-in period.

The static reservoir temperature was 140° F. at 8,800 ft at the same time.

A pressure fall-off test conducted at the same time using Lisbon produced water (specific gravity 1.05) indicated the B-624 had a 2-md permeability.

The Mississippian reservoir is a 500-ft thick limestone regionally extensive at a depth of about 9,000 ft below surface.

The thick, fractured limestone has dozens of dolomitic vuggy intervals that enhance permeability and therefore the well's capability to take water or high-pressure acid gas.

Operators injected more than 50 million bbl of salt water into Well B-624 from 1965 to May 2003.

Disposing of the blended acid gas into Well B-624 is ideal because it is going into the essentially infinite sour water aquifer underlying the oil and gas accumulation from which it came from. ✦

1ST DEALMAKERS ROUNDTABLE

M&A Strategies and Opportunities in the Oil and Gas Industry of Russia

APRIL 12-13, 2004 J. W. MARRIOTT HOTEL, HOUSTON, TEXAS

Key Topics

- Post-election Russia: anticipated policy and actions affecting the Russian oil and gas industry
- Russia as part of strategy of international oil companies
- M&A activity in the Russian oil and gas sector
- M&A entry and exit strategies
- Structuring M&A deals, assessing risks and evaluating assets
- After an M&A deal: challenges and lessons
- Practical issues specific to medium and small oil companies
- Practical issues specific to oilfield services companies

ORGANIZED BY: RPI PennWell

FOR MORE INFORMATION PLEASE CONTACT

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e-mail: lcarls@pennwell.com

YULIA SIROTA (Moscow)
phone: +7(095)778-9332/4597
e-mail: julias@rpi-inc.com

www.russiastrategies.com

31. INITIAL PRODUCTION

INTERVAL A (As shown in Item #26)

DATE FIRST PRODUCED:		TEST DATE:		HOURS TESTED:		TEST PRODUCTION RATES: →	OIL – BBL:	GAS – MCF:	WATER – BBL:	PROD. METHOD:
1/3/2003		1/3/2003		24			35	0	65	Rod Pump
CHOKE SIZE:	TBG. PRESS.	CSG. PRESS.	API GRAVITY	BTU – GAS	GAS/OIL RATIO	24 HR PRODUCTION RATES: →	OIL – BBL:	GAS – MCF:	WATER – BBL:	INTERVAL STATUS:
		0	42.00							

INTERVAL B (As shown in Item #26)

DATE FIRST PRODUCED:		TEST DATE:		HOURS TESTED:		TEST PRODUCTION RATES: →	OIL – BBL:	GAS – MCF:	WATER – BBL:	PROD. METHOD:
CHOKE SIZE:	TBG. PRESS.	CSG. PRESS.	API GRAVITY	BTU – GAS	GAS/OIL RATIO	24 HR PRODUCTION RATES: →	OIL – BBL:	GAS – MCF:	WATER – BBL:	INTERVAL STATUS:

INTERVAL C (As shown in Item #26)

DATE FIRST PRODUCED:		TEST DATE:		HOURS TESTED:		TEST PRODUCTION RATES: →	OIL – BBL:	GAS – MCF:	WATER – BBL:	PROD. METHOD:
CHOKE SIZE:	TBG. PRESS.	CSG. PRESS.	API GRAVITY	BTU – GAS	GAS/OIL RATIO	24 HR PRODUCTION RATES: →	OIL – BBL:	GAS – MCF:	WATER – BBL:	INTERVAL STATUS:

INTERVAL D (As shown in Item #26)

DATE FIRST PRODUCED:		TEST DATE:		HOURS TESTED:		TEST PRODUCTION RATES: →	OIL – BBL:	GAS – MCF:	WATER – BBL:	PROD. METHOD:
CHOKE SIZE:	TBG. PRESS.	CSG. PRESS.	API GRAVITY	BTU – GAS	GAS/OIL RATIO	24 HR PRODUCTION RATES: →	OIL – BBL:	GAS – MCF:	WATER – BBL:	INTERVAL STATUS:

32. DISPOSITION OF GAS (Sold, Used for Fuel, Vented, Etc.)

Flared

33. SUMMARY OF POROUS ZONES (Include Aquifers):

Show all important zones of porosity and contents thereof: Cored intervals and all drill-stem tests, including depth interval tested, cushion used, time tool open, flowing and shut-in pressures and recoveries.

Formation	Top (MD)	Bottom (MD)	Descriptions, Contents, etc.
Navajo	3,384	3,428	Oil-bearing Porosity
Navajo	3,428	3,922	Water-bearing Porosity
Kayenta	3,962	3,996	Oil / Water Bearing Porosity
Wingate	4,058	4,064	Oil / Water Bearing Porosity
Wingate	4,246	4,272	Oil / Water Bearing Porosity
Wingate	4,332	4,356	Oil / Water Bearing Porosity
Wingate	4,494	4,528	Oil / Water Bearing Porosity
DST #1	4,236	4,272	See Attached DST Report
DST #2	4,496	4,521	See Attached DST Report

34. FORMATION (Log) MARKERS:

Name	Top (Measured Depth)
Mancos	0
Dakota	2,718
Morrison	3,012
Salt Wash	3,226
Carmel	3,250
Navajo	3,334
Kayenta	3,840
Wingate	4,058
Chinle	4,632

35. ADDITIONAL REMARKS (Include plugging procedure)

Well is currently shut-in, pending evaluation of horizontal drilling in the upper Navajo Sandstone.

36. I hereby certify that the foregoing and attached information is complete and correct as determined from all available records.

NAME (PLEASE PRINT) A.W. Allred TITLE Agent

SIGNATURE [signature] DATE 04/02/03

This report must be submitted within 30 days of

- completing or plugging a new well
- drilling horizontal laterals from an existing well bore
- recompleting to a different producing formation
- reentering a previously plugged and abandoned well
- significantly deepening an existing well bore below the previous bottom-hole depth
- drilling hydrocarbon exploratory holes, such as core samples and stratigraphic tests

* ITEM 20: Show the number of completions if production is measured separately from two or more formations.

** ITEM 24: Cement Top – Show how reported top(s) of cement were determined (circulated (CIR), calculated (CAL), cement bond log (CBL), temperature survey (TS)).

Send to: Utah Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
Box 145801
Salt Lake City, Utah 84114-5801

Phone: 801-538-5340

Fax: 801-359-3940

(5/2000)

FORM 9

STATE OF UTAH
DIVISION OF OIL, GAS AND MINING

5. Lease Designation and Serial No.
UTSL070034

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill new wells, deepen existing wells, or to reenter plugged and abandoned wells.
Use APPLICATION FOR PERMIT TO DRILL OR DEEPEN form for such proposals.

6. If Indian, Allotte or Tribe Name
NA

7. Unit Agreement Name
Lisbon Unit

1. Type of Well
☐ Oil Well ☐ Gas Well ☑ Other

8. Well Name and Number
Lisbon B-624

2. Name of Operator:
Tom Brown, Inc.

Contact: Byron Gale
Phone: 303-260-5036

9. API Well Number
43-037-16516

3. Address and Telephone No.
555 Seventeenth Street, Suite 1850, Denver, CO 80202

10. Field and Pool, or Exploratory Area
Lisbon Mississippian

4. Location of Well
Footages: 710' FNL, 1666' FWL
QQ, Sec T,R,M: NENW Sec. 24-T30S-R24E
County: San Juan
State: Utah

11. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

NOTICE OF INTENT
(Submit in Duplicate)

☐ Abandon
☐ Repair Casing
☐ Change Plans
☐ Convert to Injection
☐ Fracture Treat or Acidize
☐ Multiple Completion
☐ Other

☐ New Construction
☐ Pull or Alter Casing
☐ Recomplete
☐ Reperforate
☐ Vent or Flare
☐ Water Shut-Off

Approximate date work will start _____

SUBSEQUENT REPORT
(Submit Original Form Only)

☐ Abandon*
☐ Repair Casing
☐ Change Plans
☑ Convert to Injection
☐ Fracture Treat or Acidize
☑ Other Converted to Acid Gas Injection Well

☐ New Construction
☐ Pull or Alter Casing
☑ Recomplete
☐ Reperforate
☐ Vent or Flare
☐ Water Shut-Off

Date of work completion 4/19/2003

Report results of Multiple Completions and Recompletions to different reservoirs on WELL COMPLETION OR RECOMPLETION REPORT AND LOG form.
* Must be accompanied by a cement verification report.

12. Describe Proposed or completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with the BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, A form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.)

Tom Brown, Inc. converted this well from SWD to acid gas injection per the following procedure:

04/14/03 Spotted all equipment and rigged up pulling unit. SDFN.

04/15/03 Shut off and secured injection facilities. ND WH, NU BOP. Stung out of packer. POH and LD 2 jts 3.5" 8rd EUE and 313 jts 3.5" IJ3SS IPC tbg. SDFN.

04/16/03 SD, waiting on tubing delivery.

04/17/03 Safety meeting. ND BOP. Break out and remove old tubing head. Replaced w/new Cameron tbg head. NU BOP. Prep to run 2-7/8" tbg. Waiting on delivery of tbg. SDFN.

04/18/03 Safety meeting. Unloaded, racked and tallied 295 jts 2-7/8" L-80 IPC tbg. Made up new seal assembly and 2-3/8" x 2-7/8" crossover. PU and RIH w/284 jts. Tagged packer @ 8875'. Spaced out tubing using no subs. Filled casing w/140 bbls diesel packer fluid. Landed tubing w/30,000# on packer. ND BOP. NU wellhead. SDFN.

04/19/03 Topped off packer fluid. Tested casing to 1000 psi for 20 min. Rigged down pulling unit. Turned well over to production department. Moved off all equipment.

13.
Name (Printed/Typed) Chris Mathewson
Title Engineering Technician
Signature Chris Mathewson
Date 5/22/2003

RECEIVED
JUN 16 2003
DIV. OF OIL, GAS & MINING

(This space for State use only)

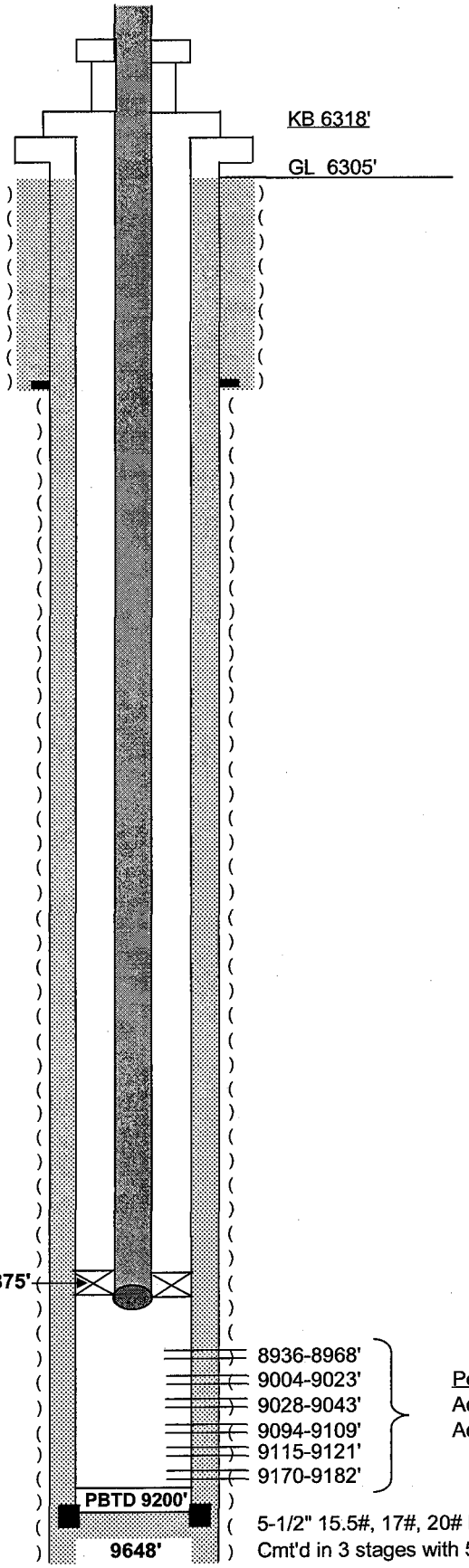
WELLBORE DIAGRAM

710' FNL & 1666' FWL

Operator:	Tom Brown, Inc.
Well Name:	Lisbon B-624
Lease Number:	UTSL 070034
Location:	NENW Sec. 24-T30S-R24E
Field:	Lisbon - Mississippian
County, State:	San Juan County, UT
API Number:	43-037-16516
Diagram Date:	05/22/2003

FORMATIONS

Hermosa	1732'
Paradox "A"	3389'
Paradox "B"	3640'
Salt	3732'
Base Salt	8673'
Molas	8770'
Mississippian	8807'
Ouray	9236'
Elbert	9318'
McCracken	9502'
Cambrian	9585'



Perforated 07/1965: 4 SPF
Acidized in 4 stages w/ ttl 10,000 gals 15% HCl acid.
Acidized 9/11/1968 w/5000 gals 15% HCl acid dn tbg.

5-1/2" 15.5#, 17#, 20# N-80 LT&C csg set @**9232'.**
Cmt'd in 3 stages with 5450 cu ft.

Well History

Spud Date: 5/19/1960
TD Reached: 7/18/1960
Completion Date: 7/20/1960 (P&A'd)

(Cut 6 cores and ran 4 DST's before P&A.)

Recompleted as SW Injection: 11/9/1965

First SW Injection: 11/9/1965, AIR 85.5 BPH @ 175# inj pressure at pump.

CONVERTED TO ACID GAS INJECTION 4/19/2003

Tubing Detail: (4/19/2003)	**Depth:**
KB	8'
284 jts 2-7/8" L-80 IPC TK7 tbg	
2-3/8" x 2-7/8" crossover sub	
2.668" x 1.927" Seal Assembly	
PACKER DEPTH	**8875'**
EOT	**8878.66'**

Tom Brown, Inc.

555 Seventeenth Street, Suite 1850
Denver, CO 80202-3918
(303) 260-5000

WellWork AFE Chronological Regulatory Report

Well Name : Lisbon B 624 (SWD)					
Prospect:	Lisbon			AFE #:	40288
Sec/Twp/Rge:	24 / 30S / 24E			Operator:	Tom Brown, Inc.
API #:	043-037-16516	Field:	Lisbon Unit	Supervisor:	Rex Thompson
Work Type:	Workover	County , St.:	San Juan, Ut	Phone:	
Production Current/Expected	Oil: /	Gas: /		Water: /	
Job Purpose :	Convert from SWD well to acid gas injection well.				

Wellwork Details

Date :	4/14/2003	Activity:	Move Rig	Rig Name:	MWS	Days :	1
Daily Report Summary :							
Daily Report Detail:	Road rig to location. Spotted all equipment. RUPU. SD for night.						
Date :	4/15/2003	Activity:	Lay down 3 1/2 tubing	Rig Name:	MWS	Days :	2
Daily Report Summary :							
Daily Report Detail:	Safety meeting. Shut off and secured injection facilities. ND WH. NU BOP. Stung out of packer. POH and laid down 2 jts 3-1/2" 8rd EUE and 313 jts 3-1/2" IJ3SS IPC tbg. SD for night.						
Date :	4/16/2003	Activity:	SD	Rig Name:	MWS	Days :	3
Daily Report Summary :							
Daily Report Detail:	Shut down. Waiting on tbg.						
Date :	4/17/2003	Activity:	Change wellhead	Rig Name:	MWS	Days :	4
Daily Report Summary :							
Daily Report Detail:	Safety meeting. ND BOP. Break out and remove old tbg head. Replace w/new Cameron tbg head. NU BOP. Prep to run 2-7/8" tbg. Waiting on tbg delivery. SD for night.						
Date :	4/18/2003	Activity:	Run tubing	Rig Name:	MWS	Days :	5
Daily Report Summary :							
Daily Report Detail:	Safety meeting. Unloaded, racked and tallied 295 jts 2-7/8" L-80, IPC tbg. Made up new seal assembly and 2-3/8"X2-7/8" cross over. Picked up and RIH w/284 jts. Tagged packer @ 8875'. Spaced out tbg using no subs. Filled casing w/140 bbls diesel packer fluid. Landed tbg w/30,000# on packer. ND BOP. NU Wellhead. SD for night.						
Date :	4/19/2003	Activity:	rig down	Rig Name:	MWS	Days :	6
Daily Report Summary :							
Daily Report Detail:	Topped off packer fluid. Tested casing to 1000 psi for 20 min. RDPU. Turned well over to production department. Moved off all equipment.						

From: Thomas Maunder <tom_maunder@admin.state.ak.us>
To: Mark Bohrer <mfb@saturn.ndic.state.nd.us>, Morris Korphage <m.korphage@kcc.state.ks.us>, Gil Hunt <gilhunt@utah.gov>, Chris Kierst <CHRISKIERST@utah.gov>, Mike Cochran <mcochran@kdhe.state.ks.us>, Richard Ginn <richard.f.ginn@earthlink.net>
Date: 6/21/2004 2:15:00 PM
Subject: Re: Class II "Ideas"

Mark, Morris, Gil, Chris and Richard,
I am one of the co-chairs of the Class II division for GWPC. We are working to set the agenda/presentations for the upcoming meeting in Charleston, SC in late September. CO2 injection for sequestration purposes is a topic gaining more and more interest these days. In your states, there are injection projects involving CO2 and/or H2S and I am soliciting your comments/proposals for possible presentations at the upcoming meeting. Mike Paque's response to my earlier message asks about finding companies that might be able to address the gathering. I am not in a position to suggest possible candidates for that, but I am wondering if you gentlemen might?? I think it would also be appropriate to have presentations from the regulatory point of view since there are obviously rules that operators had to comply with to put the projects in place and ongoing requirements that must be met to keep them operating. Thanks in advance for any ideas or suggestions any of you may be able to contribute. Also, if you have colleagues that might find this message of interest please forward it to them.
Tom Maunder, PE
Sr. Petroleum Engineer
AOGCC
Class II Division Co-Chair, GWPC

Mike Paque wrote:

>I wonder if we could get 1-2 companies to attend and talk. Theymight be
>very happy to if they knew that there will be senior EAP HQ management
>folks there to see/hear their talks.
>
>Names of companies???
>
>-----Original Message-----
>From: Thomas Maunder [mailto:tom_maunder@admin.state.ak.us]
>Sent: Friday, June 18, 2004 1:26 PM
>To: Paul Jehn -- Home
>Cc: Mike Paque; Ben Grunewald; Dan Arthur
>Subject: Class II "Ideas"
>
>Paul, et al:
>Following your call, I have been thinking about possible topics for
>Charleston. What has come to mind has to do with CO2 injection which is
>
>a topic coming to the forefront. There are a number of enhanced
>recovery projects in Texas and I believe New Mexico as well. There are
>acid gas (H2S and CO2) disposal projects in North Dakota, Texas, Utah
>and maybe Wyoming and in Canada. I would suggest topics such as
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>stream. The actual injection operations would be Class II. Separation

>technology wouldn't necessarily be Class II, but there may be other
>waste streams produced by the processes that might need disposal.
>
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>
>Tom
>
>
>

CC: Mike Paque <Mike@gwpc.org>, Paul Jehn -- Home <pauljehn@adelphia.net>, Ben Grunewald <Ben@gwpc.org>, Dan Arthur <darthur@all-llc.com>

From: Thomas Maunder <tom_maunder@admin.state.ak.us>
To: Mark Bohrer <mfb@saturn.ndic.state.nd.us>, Morris Korphage <m.korphage@kcc.state.ks.us>, Gil Hunt <gilhunt@utah.gov>, Chris Kierst <CHRISKIERST@utah.gov>, Mike Cochran <mcochran@kdhe.state.ks.us>, Richard Ginn <richard.f.ginn@earthlink.net>
Date: 6/21/2004 2:15:00 PM
Subject: Re: Class II "Ideas"

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CC: Mike Paque <Mike@gwpc.org>, Paul Jehn -- Home <pauljehn@adelphia.net>, Ben Grunewald <Ben@gwpc.org>, Dan Arthur <darthur@all-llc.com>

Division of Oil, Gas and Mining

OPERATOR CHANGE WORKSHEET

ROUTING
1. GLH
2. CDW
3. FILE

Change of Operator (Well Sold) — Designation of Agent/Operator

X Change of Name — **Merger**

The operator of the well(s) listed below has changed, effective: **1/1/2005**

FROM: (Old Operator):	**TO:** (New Operator):
N9885-Tom Brown, Inc. 555 17th St, Suite 1850 Denver, CO 80202	N2175-EnCana Oil & Gas (USA) Inc. 370 17th St, Suite 1700 Denver, CO 80202
Phone: 1-(720) 876-5157	Phone: 1-(720) 876-5068

CA No. **Unit:** **LISBON**

WELL(S)

NAME	SEC	TWN	RNG	API NO	ENTITY NO	LEASE TYPE	WELL TYPE	WELL STATUS
LISBON C-94	04	300S	240E	4303716247	8123	Federal	OW	S
LISBON UNIT D-84	04	300S	240E	4303716250	8123	Federal	OW	P
LISBON B-84	04	300S	240E	4303730054	8123	Federal	OW	S
LISBON B-94	04	300S	240E	4303730695	8123	Federal	OW	S
LISBON C-69	09	300S	240E	4303716245	8123	Federal	OW	S
LISBON D-89	09	300S	240E	4303716251	8123	Federal	OW	P
LISBON C-99	09	300S	240E	4303730693	8123	Federal	OW	P
NW LISBON USA A-2 (D-810)	10	300S	240E	4303716471	8123	Federal	GW	P
LISBON C-910 I	10	300S	240E	4303731805	12892	Federal	D	PA
LISBON B912	12	300S	240E	4303715769	8123	Federal	OW	S
LISBON A-713A	13	300S	240E	4303716236	8123	Federal	GW	PA
LISBON B-613	13	300S	240E	4303716240	8123	Federal	OW	S
NW LISBON USA B-1 (B-614)	14	300S	240E	4303716468	8123	Federal	OW	P
LISBON B-814	14	300S	240E	4303730082	8123	Federal	OW	S
LISBON B-615	15	300S	240E	4303715123	8123	Federal	OW	P
LISBON A-715	15	300S	240E	4303716237	8123	Federal	WD	A
NW USA D-1 (B-624)	24	300S	240E	4303716516	99990	Federal	WD	A

OPERATOR CHANGES DOCUMENTATION

Enter date after each listed item is completed

1. (R649-8-10) Sundry or legal documentation was received from the **FORMER** operator on: 1/27/2005
2. (R649-8-10) Sundry or legal documentation was received from the **NEW** operator on: 1/27/2005
3. The new company was checked on the **Department of Commerce, Division of Corporations Database on:** 2/23/2005
4. Is the new operator registered in the State of Utah: YES Business Number: 5053175-0143
5. If **NO**, the operator was contacted contacted on:

6a. (R649-9-2)Waste Management Plan has been received on: In PLACE

6b. Inspections of LA PA state/fee well sites complete on: n/a

7. **Federal and Indian Lease Wells:** The BLM and or the BIA has approved the merger, name change, or operator change for all wells listed on Federal or Indian leases on: BLM not yet BIA

8. **Federal and Indian Units:**
The BLM or BIA has approved the successor of unit operator for wells listed on: n/a

9. **Federal and Indian Communization Agreements ("CA"):**
The BLM or BIA has approved the operator for all wells listed within a CA on: n/a

10. **Underground Injection Control ("UIC")** The Division has approved UIC Form 5, **Transfer of Authority to Inject,** for the enhanced/secondary recovery unit/project for the water disposal well(s) listed on: n/a

DATA ENTRY:

1. Changes entered in the **Oil and Gas Database on:** 2/24/2005
2. Changes have been entered on the **Monthly Operator Change Spread Sheet on:** 2/24/2005
3. Bond information entered in RBDMS on: 2/24/2005
4. Fee/State wells attached to bond in RBDMS on: 2/24/2005
5. Injection Projects to new operator in RBDMS on: 2/24/2005
6. Receipt of Acceptance of Drilling Procedures for APD/New on: n/a

FEDERAL WELL(S) BOND VERIFICATION:

1. Federal well(s) covered by Bond Number: UT1005

INDIAN WELL(S) BOND VERIFICATION:

1. Indian well(s) covered by Bond Number: n/a

FEE & STATE WELL(S) BOND VERIFICATION:

1. (R649-3-1) The **NEW** operator of any fee well(s) listed covered by Bond Number RLB0007875

2. The **FORMER** operator has requested a release of liability from their bond on: n/a
The Division sent response by letter on: n/a

LEASE INTEREST OWNER NOTIFICATION:

3. (R649-2-10) The **FORMER** operator of the fee wells has been contacted and informed by a letter from the Division of their responsibility to notify all interest owners of this change on: n/a

COMMENTS:
Merger and rider of bond from Tom Brown, Inc.

FORM 9

STATE OF UTAH
DIVISION OF OIL, GAS AND MINING

5. Lease Designation and Serial No.

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill new wells, deepen existing wells, or to reenter plugged and abandoned wells.
Use APPLICATION FOR PERMIT TO DRILL OR DEEPEN form for such proposals.

6. If Indian, Allotte or Tribe Name

7. Unit Agreement Name

1. Type of Well
☐ Oil Well ☐ Gas Well ☐ Other

8. Well Name and Number

2. Name of Operator: EnCana Oil & Gas (USA) Inc.
(successor in interest of Tom Brown, Inc. effective 1/1/05)
Contact: Jane Washburn
Phone: 720/876-5431

9. API Well Number

3. Address and Telephone No.
370 Seventeenth Street, Suite 1700, Denver, CO 80202

10. Field and Pool, or Exploratory Area

4. Location of Well
Footages: **SEE ATTACHED LIST OF WELLS** County:
QQ, Sec T,R,M: State:

11. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

NOTICE OF INTENT (Submit in Duplicate)		SUBSEQUENT REPORT (Submit Original Form Only)	
☐ Abandon	☐ New Construction	☐ Abandon*	☐ New Construction
☐ Repair Casing	☐ Pull or Alter Casing	☐ Repair Casing	☐ Pull or Alter Casing
☐ Change Plans	☐ Recomplete	☐ Change Plans	☐ Recomplete
☐ Convert to Injection	☐ Reperforate	☐ Convert to Injection	☐ Reperforate
☐ Fracture Treat or Acidize	☐ Vent or Flare	☐ Fracture Treat or Acidize	☐ Vent or Flare
☐ Multiple Completion	☐ Water Shut-Off		☐ Water Shut-Off
☐ Other		☑ Other Change of Operator	
Approximate date work will start _____		Date of work completion _____	
		Report results of Multiple Completions and Recompletions to different reservoirs on WELL COMPLETION OR RECOMPLETION REPORT AND LOG form.	
		* Must be accompanied by a cement verification report.	

12. Describe Proposed or completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with the BLM/BIA. *Required subsequent reports shall be filed within 30 days* following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, A form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.)

N9885 N2175

The merger of Tom Brown, Inc. with EnCana Oil & Gas (USA) Inc. was effective January 1, 2005. It is, therefore, requested that the Operator of all properties on the attached list be changed from Tom Brown, Inc. to EnCana Oil & Gas (USA) Inc.

RECEIVED
JAN 27 2005
DIV. OF OIL, GAS & MINING

13.
Name (Printed/Typed): Jane Washburn
Title: Operations Engineering Tech
Signature: Jane Washburn
Date: 01/24/2005

(This space for State use only)

APPROVED 2/24/05
ER

Division of Oil, Gas and Mining
Earlene Russell, Engineering Technician

well_name	sec	twsp	rng	api	entity	lease	well	stat	flag	unit_name	lease_num	qtr_qtr	td_md	d_apd	op no
BIG INDIAN 36-42	36	290S	240E	4303731827		State	GW	APD			ST-UT-37067	SESW		5750	N9885
FEDERAL 14-18	18	250S	060E	4301530060	436	Federal	NA	PA			UTU-69447	SWSW			N9885
NW USA D-1 (B-624)	24	300S	240E	4303716516	99990	Federal	WD	A			UTU-070034	NENW			N9885
FEDERAL 15-25	25	290S	230E	4303730317	4776	Federal	GW	S			UTU-986	SWSE			N9885
BIG INDIAN 35-24	35	290S	240E	4303731829	14409	Federal	GW	DRL	C		UTU-077077	SENE			N9885
BIG INDIAN 27-34	27	290S	240E	4303731828		Federal	GW	APD	C		N9885				
BIG INDIAN UNIT 1	33	290S	240E	4303716219	8122	Federal	OW	S		BIG INDIAN	UTSL-067131	SENE			N9885
BIG INDIAN 4	14	300S	250E	4303716221	8124	Federal	GW	TA		BIG INDIAN	UTSL-089097	SWSW			N9885
BIG INDIAN 34-11	34	290S	240E	4303731818	14004	Federal	D	PA	C	BIG INDIAN	UTU-014905	NWNW			N9885
BULL HORN U 10-43	10	300S	250E	4303731831	14393	Federal	GW	DRL	C	BULL HORN	UT-73190	SWSE			N9885
LISBON B-615	15	300S	240E	4303715123	8123	Federal	OW	P		LISBON	UTU-09179	NENW			N9[illegible]
LISBON FED 2-21F	21	300S	250E	4303715768	410	Federal	GW	S		LISBON	UTU-094674	SENW			N988[illegible]
LISBON B912	12	300S	240E	4303715769	8123	Federal	OW	S		LISBON	UTU-06922	SESW			N9885
LISBON A-713A	13	300S	240E	4303716236	8123	Federal	GW	PA		LISBON	UTSL-070034	SWNW			N9885
LISBON A-715	15	300S	240E	4303716237	8123	Federal	WD	A		LISBON	UTU-020691A	SWNW			N9885
LISBON B-613	13	300S	240E	4303716240	8123	Federal	OW	S		LISBON	UTSL-070034	NENW			N9885
LISBON C-69	09	300S	240E	4303716245	8123	Federal	OW	S		LISBON	UTU-09179	NWNE			N9885
LISBON C-94	04	300S	240E	4303716247	8123	Federal	OW	S		LISBON	UTU-66582	SWSE			N9885
LISBON UNIT D-84	04	300S	240E	4303716250	8123	Federal	OW	P		LISBON	UTU-015445	NESE			N9885
LISBON D-89	09	300S	240E	4303716251	8123	Federal	OW	P		LISBON	UTU-015445	NESE			N9885
NW LISBON USA B-1 (B-614)	14	300S	240E	4303716468	8123	Federal	OW	P		LISBON	UTSL-070008A	NENW			N9885
NW LISBON USA A-2 (D-810)	10	300S	240E	4303716471	8123	Federal	GW	P		LISBON	UTU-14903	NESE			N9885
LISBON B-84	04	300S	240E	4303730054	8123	Federal	OW	S		LISBON	UTU-09179	NESW			N9885
LISBON B-814	14	300S	240E	4303730082	8123	Federal	OW	S		LISBON	UTSL-070008A	NESW			N9885
LISBON C-99	09	300S	240E	4303730693	8123	Federal	OW	P		LISBON	UTU-09179	SWSE			N9885
LISBON B-94	04	300S	240E	4303730695	8123	Federal	OW	S		LISBON	UTU-015445	SESW			N98[illegible]
LISBON C-910 I	10	300S	240E	4303731805	12892	Federal	D	PA		LISBON	UTU-0141903	SWSE			N9[illegible]
LISBON D-616	16	300S	240E	4303715049	8123	State	OW	P		LISBON	ML-13692	NENE	9120	9120	N9885
LISBON B-616	16	300S	240E	4303716242	8123	State	OW	S		LISBON	ML-8366	NESW	8689	8689	N9885
BELCO ST 4 (LISBON B-816)	16	300S	240E	4303716244	8123	State	WD	A		LISBON	ML-8366	NESW	8730	9100	N9885
LISBON UNIT D-716	16	300S	240E	4303731034	8123	State	OW	P		LISBON	ML-13692	SENE	8794	8775	N9885
LISBON U B-610	10	300S	240E	4303716469	8123	Federal	OW	P		LISBON (MCCRACKEN)	UTU-014903	NENW			N9885
LISBON U B-610	10	300S	240E	4303716469	9740	Federal	OW	P		LISBON (MCCRACKEN)	UTU-014903	NENW			N9885
LISBON U D-610	10	300S	240E	4303730694	9740	Federal	GW	P		LISBON (MCCRACKEN)	UTU-014903	NENE			N9885
LISBON UNIT A-911	11	300S	240E	4303731014	9740	Federal	GW	P		LISBON (MCCRACKEN)	UTSL-070008A	SWSW			N9885
LISBON C-910	10	300S	240E	4303731323	9740	Federal	OW	P		LISBON (MCCRACKEN)	UTU-014903	SWSE			N9885
LISBON B-614A	14	300S	240E	4303731351	9740	Federal	OW	TA		LISBON (MCCRACKEN)	UTSL-070008A	NENW			N9885
LISBON B-810	10	300S	240E	4303731433	9740	Federal	OW	P		LISBON (MCCRACKEN)	UTU-014903	NESW			N9885
LISBON (MCCRACKEN) D-615	15	300S	240E	4303731817		Federal	OW	LA		LISBON (MCCRACKEN)	N9885				
LISBON (MCCRACKEN) A-610	10	300S	240E	4303731821		Federal	OW	LA		LISBON (MCCRACKEN)	N9885				

Delaware

The First State

I, HARRIET SMITH WINDSOR, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE CERTIFICATE OF MERGER, WHICH MERGES:

"TBI PIPELINE COMPANY", A DELAWARE CORPORATION,

"TBI WEST VIRGINIA, INC.", A DELAWARE CORPORATION,

"TOM BROWN, INC.", A DELAWARE CORPORATION,

WITH AND INTO "ENCANA OIL & GAS (USA) INC." UNDER THE NAME OF "ENCANA OIL & GAS (USA) INC.", A CORPORATION ORGANIZED AND EXISTING UNDER THE LAWS OF THE STATE OF DELAWARE, AS RECEIVED AND FILED IN THIS OFFICE THE TWENTY-SECOND DAY OF DECEMBER, A.D. 2004, AT 6:15 O'CLOCK P.M.

AND I DO HEREBY FURTHER CERTIFY THAT THE EFFECTIVE DATE OF THE AFORESAID CERTIFICATE OF MERGER IS THE FIRST DAY OF JANUARY, A.D. 2005.

A FILED COPY OF THIS CERTIFICATE HAS BEEN FORWARDED TO THE NEW CASTLE COUNTY RECORDER OF DEEDS.

Harriet Smith Windsor

Harriet Smith Windsor, Secretary of State

2137895 8100M

040934710

AUTHENTICATION: 3584585

DATE: 12-29-04

State of Delaware
Secretary of State
Division of Corporations
Delivered 06:15 PM 12/22/2004
FILED 06:15 PM 12/22/2004
SRV 040934710 - 2137895 FILE

STATE OF DELAWARE
CERTIFICATE OF MERGER OF
DOMESTIC CORPORATIONS

Pursuant to Title 8, Section 251(c) of the Delaware General Corporation Law, the undersigned corporation executed the following Certificate of Merger:

FIRST: The name of the surviving corporation is EnCana Oil & Gas (USA) Inc., and the names and jurisdictions of the corporations being merged into this surviving corporation are as follows:

Name	Jurisdiction of Incorporation
Tom Brown, Inc.	Delaware corporation
TBI Pipeline Company	Delaware corporation
TBI West Virginia, Inc.	Delaware corporation

SECOND: The Agreement and Plan of Merger has been approved, adopted, certified, executed and acknowledged by each of the constituent corporations.

THIRD: The name of the surviving corporation is EnCana Oil & Gas (USA) Inc., a Delaware corporation.

FOURTH: The Certificate of Incorporation of the surviving corporation shall be its Certificate of Incorporation.

FIFTH: The merger is to become effective on January 1, 2005.

SIXTH: The Agreement and Plan of Merger is on file at 950 17th Street, Suite 2600, Denver, Colorado 80202, the place of business of the surviving corporation.

SEVENTH: A copy of the Agreement and Plan of Merger will be furnished by the surviving corporation on request, without cost, to any stockholder of the constituent corporations.

IN WITNESS WHEREOF, said surviving corporation has caused this certificate to be signed by an authorized officer, the 17th day of December, A.D., 2004.

ENCANA OIL & GAS (USA) INC.

By: Mary A. Viviano
Mary A. Viviano, Secretary

STATE OF UTAH
DIVISION OF OIL, GAS AND MINING

MONTHLY INJECTION - UIC FORM 3

OPERATOR TOM BROWN INC.
ADDRESS P.O. BOX 760
MOAB, UTAH 84532

MONTH/YEAR May 2003

CORRECTED REPORT ☒

Well name and number: B-624

Field or Unit name: LISBON API no. 4303716516

Well location: QQ section 24 township 30 range 24 county SAN JUAN

Date	Volume Disposed	Hours In Service	Maximum Pressure	Average Operating Pres.	Tubing/Casing Annulus Pres.
1	0	0	2000	1100	
2	0	0	"	"	
3	0	0	"	"	
4	0	0	"	"	
5	0	0	"	"	
6	0	0	"	"	
7	0	0	"	"	
8	0	0	"	"	
9	700	24	"	"	
10	820	24	"	"	
11	1100	24	"	"	
12	1250	24	"	"	
13	1156	24	"	"	
14	1268	24	"	"	
15	1257	24	"	"	
16	1098	24	"	"	
17	1279	24	"	"	
18	1258	24	"	"	
19	1246	24	"	"	
20	1284	24	"	"	
21	1275	24	"	"	
22	1262	24	"	"	
23	1258	24	"	"	
24	1246	24	"	"	
25	1225	24	"	"	
26	1244	24	"	"	
27	1235	24	"	"	
28	1227	24	"	"	
29	1269	24	"	"	
30	1281	24	"	"	
31	1277	24	"	"	

Start Waste (acid) Gas Injection
CK 2/20/04

Total volume injected for month 27,515
All time cumulative volume injected 27,515

I certify that this report is true and complete to the best of my knowledge

Name Arsie Jaramillo
Title Area Clerk
Phone No. 435-686-7601

Signature Arsie Jaramillo
Date January 15, 2004

RECEIVED
JAN 2 8 2004
DIV. OF OIL, GAS & MINING

STATE OF UTAH
DIVISION OF OIL, GAS AND MINING

MONTHLY INJECTION - UIC FORM 3

OPERATOR	TOM BROWN INC.	MONTH/YEAR	April 2003
ADDRESS	P.O. BOX 760		
	MOAB, UTAH 84532	CORRECTED REPORT [ ]	

Well name and number: B-624

Field or Unit name: LISBON API no. 4303716516

Well location: QQ section 24 township 30 range 24 county SAN JUAN

Date	Volume Disposed	Hours In Service	Maximum Pressure	Average Operating Pres.	Tubing/Casing Annulus Pres.
1	397	24	2500	1300	
2	709	24	"	"	
3	0	24	"	"	
4	0	24	"	"	
5	505	24	"	"	
6	505	24	"	"	
7	505	24	"	"	
8	0	24	"	"	
9	413	24	"	"	
10	841	24	"	"	
11	714	24	"	"	
12	464	24	"	"	
13	464	24	"	"	
14	464	24	"	"	
15	0	0	"	"	
16	0	0	"	"	
17	0	0	"	"	
18	0	0	"	"	
19	0	0	"	"	
20	0	0	"	"	
21	0	0	"	"	
22	0	0	"	"	
23	0	0	"	"	
24	0	0	"	"	
25	0	0	"	"	
26	0	0	"	"	
27	0	0	"	"	
28	0	0	"	"	
29	0	0	"	"	
30	0	0	"	"	

no longer H2O injection
acid gas inj
ER

Total volume injected for month 5,981
All time cumulative volume injected 42,882,579

I certify that this report is true and complete to the best of my knowledge

Name Arsie Jaramillo
Title Area Clerk
Phone No. 435-686-7601

Signature Arsie Jaramillo
Date May 1, 2003

RECEIVED
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STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

UIC FORM 5

TRANSFER OF AUTHORITY TO INJECT

Well Name and Number: See Attached List of Wells	API Number:
Location of Well Footage : QQ, Section, Township, Range: County : SAN JUAN State : UTAH	Field or Unit Name: LISBON Lease Designation and Number:

EFFECTIVE DATE OF TRANSFER: 1/1/2005

CURRENT OPERATOR

Company: Tom Brown, Inc.
Address: 555 17th Street, Suite 1850
city Denver state CO zip 80202
Phone: (720) 876-5157
Comments:

Name: Darrin Henke
Signature: D. J. Henke
Title: Attorney-in-fact
Date: 3/7/2005

NEW OPERATOR

Company: EnCana Oil & Gas (USA) Inc.
Address: 370 17th Street, Suite 1700
city Denver state CO zip 80202
Phone: (720) 876-5068
Comments:

Name: Doug VanSteelandt
Signature: Doug VanSteelandt
Title: Attorney-in-fact
Date: 3/7/2005

(This space for State use only)

Transfer approved by: [signature]
Title: Pet. Services Manager

Approval Date: 3-14-05

RECEIVED
MAR 10 2005
DIV. OF OIL, GAS & MINING

Comments: Cause UIC-307, UIC-297
The A-911, C-910 + B-810 never received UIC permits according to our records.

(5/2000)

Attachment to UIC Form 5
Date: 03/07/2005

API Well Number	Well Name	Lease Number	Field Name	County Name	Qtr/Qtr	Section	Location (Twn-Rng)
43-037-16237-00-00	LISBON A-715	U 20691A	LISBON	SAN JUAN	SWNW	15	30S-24E
~~43-037-16516-00-00~~	NW USA D-1 (B-624)	UTSL 070034	LISBON	SAN JUAN	NENW	~~24~~	~~30S-24E~~
43-037-31014-00-00	LISBON UNIT A-911	UTSL 070008A	LISBON	SAN JUAN	SWSW	11	30S-24E - NO
43-037-31323-00-00	LISBON C-910	UTU 014903	LISBON	SAN JUAN	SWSE	10	30S-24E - NO
43-037-31433-00-00	LISBON B-810	UTU 014903	LISBON	SAN JUAN	NESW	10	30S-24E - NO

Cement Bond Log Gamma Ray Collars
can be viewed by going to our web site
www.ogm.utah.gov
Go to the
Oil & Gas Program
Well Data Search
Enter the Oil and Gas Information System
Using the bar on the top of the screen
Click on
    Well Logs
    Search Well Logs
Click on Use Comma for Multiples and type
   4303716516
Click on Submit
Click on View or Download

vld 01-18-2007

TOM BROWN, INC.

KENNETH J. (KENNY) ALLRED
SAFETY MANAGER

LISBON VALLEY INDUSTRIAL AREA
P.O. BOX 760
MOAB, UTAH 84532
(435) 686-2236

PHONE: (435) 686-7604
FAX: (435) 686-2341
CELL: (435) 260-1669
PAGER: (435) 259-2065
E-MAIL: kjallred@tombrown.com

EMERGENCY RESPONSE PLAN/
PUBLIC PROTECTION PLAN

SPILLER CANYON FACILITY
ACID GAS INJECTION PIPELINE

PREPARED FOR:
TOM BROWN, INC.
Final version of 12/11/02
KJA

PREPARED BY:
CORDILLERAN COMPLIANCE SERVICES, INC.
826 21½ ROAD
GRAND JUNCTION, COLORADO 81505

RECEIVED
DEC 12 2002
DIV. OF OIL, GAS & MINING

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1.00 PURPOSE

This Emergency Response Plan and Public Protection Plan (Plan) is specific to the Spiller Canyon Acid Gas Injection Facility owned and operated by Tom Brown, Inc. (TBI). This document is designed to provide for the safety and welfare of facility personnel, the community, the environment, and property.

This Plan establishes evacuation procedures, assigns response duties to specific individuals, provides for notification of outside agencies, and provides details of actions to alert and protect the public. This Plan will be activated immediately upon the detection of the release of a potentially hazardous volume of hydrogen sulfide (H_2S).

2.00 GENERAL INFORMATION ON AND PHYSIOLOGICAL RESPONSES TO HYDROGEN SULFIDE (H_2S) AND SULFUR DIOXIDE (SO_2)

2.10 HYDROGEN SULFIDE (H_2S)

Hydrogen sulfide is a flammable, highly toxic, colorless gas that is heavier than air, with the odor of rotten eggs. It can be detected by smell at a concentration in air of only 0.002 parts per million (ppm). Above concentrations of 100 ppm, it will deaden the sense of smell in a few minutes, and at a concentration of 700 ppm, a single breath can be fatal. If ignited, it burns with a blue flame. In still air it tends to accumulate in low places in dangerous concentrations. However, if it is warmer than the surrounding air, it may tend to rise. The upper flammability limit of H_2S in air is 44% and the lower flammability in air is 4%.

Breathing low concentrations of H_2S can cause headaches. Higher concentrations (0.01 percent by volume) cause irritation of the eyes, nose, throat, and lungs. Eyes become red and swollen, accompanied by sharp pain in more severe cases. Still higher concentrations (0.05 percent by volume) cause dizziness, unconsciousness, and failure of respiration.

The Threshold Limit Value (TLV) is 10 ppm (0.001%) in air. This is the limit for eight hours of continuous exposure as recommended by the American Conference of Governmental Industrial Hygienists. The health and safety reference values of various concentrations of H_2S are listed in the toxicity chart below. A Manufacturers Safety Data Sheet (MSDS) for hydrogen sulfide is included in Appendix F.

2.20 SULFUR DIOXIDE (SO_2)

Sulfur dioxide is formed with the burning of hydrogen sulfide gas. Sulfur dioxide is a pungent, irritating, suffocating, colorless gas. This gas is normally heavier than air and concentrations above 400 ppm are considered dangerous for even brief exposures.

Under special circumstances hydrogen sulfide gas may be ignited in order to dissipate a gas cloud and reduce the impact on a local area. Often these burning temperatures are enough to raise and mix the SO_2 with air in a ratio well below toxic levels. However, great care and proper monitoring should be used when this is attempted.

Due to the irritating effect of SO_2 at low concentrations of less than 5 ppm, there is usually no doubt as to it's presence in an area, which provides better warning characteristics than H_2S.

2.30 TOXICITY CHART

NAME	SPECIFIC GRAVITY[1]	TLV[2] (ppm)	HAZARDOUS LIMIT[3]	LETHAL CONCENTRATION[4]
Hydrogen Sulfide	1.18	10	100 ppm/1 hr.	700 ppm
Sulfur Dioxide	2.21	2	50 ppm/1 hr.	400 ppm

Notes:
(1) Specific gravity of air = 1.00.
(2) TLV - Threshold Limit Value.
(3) Hazardous Limit - concentration that may cause death with short term exposure.
(4) Lethal concentration - Concentration that may cause death with only a few breaths.

3.00 TREATMENT PROCEDURES FOR H_2S AND SO_2 EXPOSURE

A. Remove the patient to fresh air. Personnel should **always** use fresh air breathing equipment when entering an area to retrieve a person who has been overcome with H_2S.

B. Call a physician and get patient under his care as soon as possible.

C. If breathing has ceased, begin artificial respiration immediately. Give cardiopulmonary resuscitation (CPR) only if there is no pulse and no breathing. Continue revival efforts until physician arrives or, if patient is mobile and it is determined that he should go to the hospital, continue oxygen inhalation under the physician's direction.

D. Administer oxygen to help eliminate toxic substances from blood stream.

E. Keep the patient at rest and protect from chilling.

4.00 OPERATIONAL PRECAUTIONS AND PROCEDURES

4.10 INJECTION WELL SYSTEM

The acid gas injection well system originates at the TBI Lisbon Gas Plant and consists of compression equipment, a piping system, a line heater, and the injection well. A 2-inch, high pressure pipeline is used to move a dense phase mixture of H_2S and CO_2 from the Lisbon Gas Plant to the injection well site. The concentration of the H_2S varies from 4 percent to 56 percent by volume. A flow diagram of the system is shown in Appendix A.

The "process" pipeline to the well will contain the "H2S rich" or "process" fluid and will be new 2 inch schedule 160 API-5L X42 carbon steel pipe. A pressure control valve in the "process" pipeline, located near the well B-624 wellhead, will maintain pipeline pressure (ie compressor discharge pressure) at the normal operating pressure of 1500 psig. The design pressure of the carbon steel line is 2165 psig at 350 deg F; the compressors will shut down on high pressure at 1950 psig. Backup relief valve pressure protection is afforded at the 2165 psig level.

Under normal conditions there will be no free water in the pipeline therefore little corrosion is anticipated. However, a contingency corrosion allowance in excess of 0.250" has been provided. The "process" pipeline will originate at the emergency shut down (ESD) valves on the discharge of the compressor and terminate at the master valve on the wellhead. Connected to the "process" pipeline is the "blowdown to flare" which is an identical pipe that is connected to the Lisbon plant flare at a location near the compressors. The "blowdown to flare" contains an ESD valve that may be opened to allow the contents of the "process" pipeline to safely flow to flare. Corrosion inhibitor may be injected at the inlet to the "process" pipeline or at the wellsite if necessary. A corrosion coupon will be installed inside the pipeline near well B-624 that can be extracted and examined periodically to quantitatively evaluate the extent of metal loss due to corrosion, if any. Initially, there will not be a pipeline connecting to well A-713A, because B-624 is expected to be able to handle all of the H_2S-rich gas. An additional pipeline connection to A-713A will be permitted and constructed only if necessary.

There are pressure, temperature and other instruments located at the B-624 wellsite that are monitored and controlled by a "programmable logic controller" (PLC) at the wellsite. The wellsite PLC will communicate with plant's distributive computer control system (DCS) system using a Supervisory Control and Data Acquisition (SCADA) communications system. The pressure and temperature of the process pipeline will be measured at the pipeline entrance and also on the wellsite. The PLC system will continuously monitor key process variables on the wellsite and will alarm the plant's control operator if operations go outside of normal boundaries.

The injection well system is constantly monitored via a SCADA system integrated into the computer network at the Lisbon Gas Plant control room. Pressures, and temperatures can be monitored on this system. The system can be shut-down by the control room operator by using the SCADA system. The computer monitoring system gathers information from pressure, temperature, and H_2S, monitors attached at several points to the injection well system.

All system components are designed and constructed to withstand the operating conditions of the system. The injection system is protected from overpressure situations by safety pressure relief

valves which are connected by a closed system to a flare at the Lisbon Gas Plant. Additionally, any manual or emergency purging of the pipeline or injection well system will flow to the plant flare. An existing and continuous supply of nitrogen and residue gas at the Lisbon Gas Plant is available to displace the entire volume of the injection well system, if necessary, to help mitigate hazardous situations.

Only qualified, authorized personnel, trained in TBI operation and safety procedures are allowed to operate and maintain the injection well system. The entire length of the injection pipeline is visually inspected on a regular basis, by operations personnel. Access to the road through the Spiller Canyon area adjacent to the injection well site and injection pipeline is limited to TBI personnel. Access is restricted by locked gates on either end of the road in the controlled area.

4.20 WORST CASE SCENARIO RADIUS OF EXPOSURE

The procedures and systems described above are in place to assure that an emergency or potentially hazardous situation remains a highly unlikely possibility. However, a rupture in the high pressure pipeline and a resulting release of approximately 5,000 pounds of hydrogen sulfide (an estimated 10-minute release) was chosen for analysis as the worst case scenario. With guidance from Bureau of Land Management (BLM) Onshore Order Number 6, a calculation of the radius of exposure has been performed for this worst case release from the injection system.

The Environmental Protection Agency (EPA) software program TSCREEN was used to determine the H_2S concentration levels at 100-meter intervals from the release point. The TSCREEN calculation results are shown in Appendix E.

The BLM Onshore Order Number 6 is particularly concerned with 500 part per million (ppm) and 100 ppm radius of exposure concentration levels. The BLM requires a Public Protection Plan when: the 100 ppm radius of exposure is greater than 50-feet and includes any area that the public could be expected to frequent; the 500 ppm radius of exposure is greater than 50-feet and includes any part of a public road or highway, or; the 100 ppm radius of exposure is equal or greater to 3,000-feet and includes public roads or facilities.

The 500 ppm radius of exposure calculated for this worst case release is approximately 884-feet, and the 100 ppm radius of exposure is approximately 1,592-feet. As there are public roads and public (BLM) lands within these distances, a Public Protection Plan is required for the Spiller Canyon Facility and the injection well system. The Site Map shown in Appendix B includes the radius of exposure information.

4.30 PROTECTION OF PERSONNEL

The following safety equipment is available at the Lisbon Gas Plant or at the injection well site:

- First aid kits: small kits stored in buildings and vehicles.
  large "jump" kits including advanced treatment supplies.
- Self contained breathing apparatus (SCBA) with 30-minute air tanks.
- Self contained breathing apparatus (SCBA) with 5 to 7-minute air tanks (Escape Packs)
- Air line breathing apparatus with escape bottle for prolonged work. (Cascade system)

The following monitoring equipment is available at the Lisbon Gas Plant or at the injection well site:

- Manually operated portable Sensidyne Gastec monitors with detector tubes designed to monitor both H_2S and SO_2 levels in the atmosphere.

- Electronic personnel monitors with constant digital readout of either Lower Explosive Limit (LEL%), Hydrogen Sulfide concentration (H_2S ppm), or Oxygen (O_2%). All three sensors are constantly active and able to sound an alarm.

- Area monitors are located throughout the injection well system and in the plant buildings for H_2S, Fire, and LEL.

These monitors are connected to a Gaitronic emergency alarm horn capable of five distinct alarms:

Evacuation – Siren	Fire – Hi/Lo
H2S – Yelp	Oxygen – Constant Horn
LEL – Warble	

Testing of all emergency alert and monitoring equipment is conducted on a monthly basis using the appropriate calibration and testing equipment and procedures for each type of sensor or alarm. All documentation of testing is kept on file at the Lisbon Gas Plant main office.

4.40 COMMUNICATIONS

Communication systems at the Lisbon Gas Plant and the Spiller Canyon Facility include:

- Telephones: Located throughout plant and offices.
- Hand Held radios: Located on operators, mechanics and personnel.
  - The frequencies are:

    Tx Freq. 456.550
    451.550

    Rx Freq. 451.550

- Emergency Response radios: Located in Lisbon Gas Plant Training Room.
  - The frequencies are:

    Tx Freq. 151.505
    152.870
    151.520

    Rx Freq. 151.505
    152.870
    151.520

- Mobile phones: Located in pickup trucks and control room.

4.50 FIRE CONTROL EQUIPMENT

The following is the fire control equipment available at the Lisbon Gas Plant or at the Spiller Canyon Facility:

30# Dry Chemical Fire Extinguishers	**Located throughout the plant and injection system area at exit locations. Also at key**

	locations outside buildings, where the risk of fire is great.
350# Dry Chemical Fire Extinguishers	**Located in key locations where large volumes of dry chemical might be needed.**
20# CO2 and Halogen fire extinguishers	**Located at MCC buildings where electrical fires are most likely to occur.**
2½# Fire Extinguishers	**Located at main office in key locations and in company pickups.**
AFFF foam vessel AFFF 55-gal drums	**Located in the Old Process Building area of the Lisbon Gas Plant. It can be distributed to different areas of the plant where oil spills may occur.**
AFFF foam – 5-gallon cans	**Located in Lisbon Gas Plant warehouse. Used to inject foam at any location.**
Automatic deluge system	**Located in the Lisbon Gas Plant**
Fire Hose Stations	**Located at key locations in the plant area.**
Monitor Stations	**Located at key locations in the plant area.**
Foam Station	**Located in the Old Process Building area of the Lisbon Gas Plant.**
Volume of Fire water available - 20,000 Barrels	**Two 10,000 barrel tanks located on hill east of Lisbon Gas Plant.**
Discharge Pressure of Fire water - 150 - 175#	**Pressure is provided by one electric pump and one diesel driven pump when electricity is not available.**

TESTING OF ABOVE EQUIPMENT

- Automatic Sprinkler system – Tested annually and documented.
- 30# Dry Chemical fire extinguishers - tag checked monthly and tested annually/documentation monthly.
- 350 # Dry Chemical fire extinguishers - Tag checked monthly/tested annually/ documentation monthly
- 2 1/2 # Dry Chemical fire extinguishers - Tag checked monthly/tested annually/documentation monthly
- CO2 & Halogen fire extinguishers - Tag checked monthly/tested annually/documentation monthly
- Fire water pumps electric/diesel - Tested weekly/documented
- Volumetric flow rate of fire water - Tested annually
- Monitors and Fire Hose stations - Tested Semi-annually

4.60 DECONTAMINATION EQUIPMENT

Disposable Tyvex suits, SCBA gear, disposable gloves, kiddy pools, pump sprayers, decontamination detergents, neutralizers, rinse water, duct tape, eye protection, brushes, rubber boots and marking tape is available. This equipment is located in the Lisbon Gas Plant Emergency Response Trailer and warehouse.

All equipment used dealing with communication, fire protection, spill control and decontamination is tested, maintained and documented on a regular basis to assure proper operation.

4.70 INTERNAL EMERGENCY RESPONSE

The following emergency response teams/personnel are available at the Lisbon Gas Plant:

- Lisbon Gas Plant Fire Brigade - Certified Trained
- Lisbon Gas Plant HAZMAT Team - Certified Trained
- Confined Space Rescue Team - Certified Trained
- Emergency Medical Technicians - Certified Trained
- All Employees trained in first aid/CPR - Certified Trained

Please refer to the Emergency Contact List in Appendix C for contact information.

4.80 OUTSIDE EMERGENCY AID

External emergency response personnel and services include (but are not limited to) the following:

- Ambulance Service is available from the towns of Moab and Monticello.
- Medical First Responders and Fire response is available from the town of Lasal.
- Air Life Medical transport is available from St. Mary's Hospital in Grand Junction, Colorado.
- Law Enforcement is available from San Juan County Sheriff , Utah Highway Patrol, and the Bureau of Land Management, which respond from Monticello, Utah.

H2S Awareness training is made available annually to all emergency responders.

Please refer to the Emergency Contact List in Appendix C for contact information.

4.90 EMERGENCY PROCEDURES AND NOTIFICATION

All actions taken and procedures used by facility personnel in response to a fire, explosion, or release of hazardous waste are outlined in the Lisbon Gas Plant Emergency Preparedness Plan and Procedure Manual located at the Lisbon Gas Plant Change room and Control room. Other copies are held by key TBI personnel.

Released wastes and liquid are collected and contained using procedures found in the Lisbon Gas Plant Emergency Preparedness Plan and Procedure manual, the Spill Prevention Control and Countermeasure (SPCC) plan, and the Waste Management/Minimization guideline manual. If characterization of a waste is not known, testing is performed to determine the waste

classification. All wastes are handled according to their type. If it is a hydrocarbon waste mixed with soil and contains contaminant concentration levels above the appropriate limits, it is landfarmed on TBI property until it reaches contaminant concentration limits set by the Utah Oil, Gas and Mining Division. If wastes are found that are classified as hazardous wastes, they are disposed of at an appropriate hazardous waste disposal facility.

Notification to Federal, State and Local agencies to report releases of hazardous waste, spills or incidents requiring reporting is accomplished through the Lisbon Gas Plant Spill Prevention Control and Countermeasure plan (SPCC), which follows a formatted initial reporting sequence. This initial report is usually submitted verbally over the phone to the appropriate agency and followed up by a written report within 7 days of the incident.

5.00 HYDROGEN SULFIDE EMERGENCY PROCEDURES

The following procedures should be used when an uncontrolled release of any substance containing H_2S occurs.

- Immediately upon discovery of a potentially hazardous or emergency situation, the Lisbon Gas Plant control room and the on duty supervisor shall be notified. The supervisor who is notified will become the "Incident Commander" and take charge of the response until he is relieved by his supervisor.

- The Emergency will be approached using the "Incident Command System" if no outside aid is required. The "Unified Incident Command System" will be used if public agencies are included in the response.

- At least two people should don fresh air breathing equipment (SCBA) and monitor the air for H_2S to determine both flammable and toxicity and establish safe areas.

- When the emergency response team is in place and equipped for rescue or repair, approach the release with monitors and determine extent of problem from both a flammable and toxic standpoint.

- Determine wind direction and establish a **SAFE ZONE** where response equipment and backup personnel can safely operate.

- Determine if the release threatens county roads or local mines (See Site Map in Appendix B). If either are threatened, activate the Public Protection Procedures in Section 6 of this response guide.

- Conduct a briefing in the **SAFE ZONE** to establish a plan of action for entry and determine what additional personal protective equipment will be required for **ENTRY PERSONNEL AND BACKUP PERSONNEL**.

- Assemble needed equipment in **SAFE ZONE.**

- When a safe plan of action has been agreed upon, **ENTRY PERSONNEL** may approach the release. Backup personnel should remain in the **SAFE ZONE** and be equipped for rescue if it should become necessary.

UNDER NO CIRCUMSTANCES SHOULD CONTROL EFFORTS BE ALLOWED TO PROCEED WHERE PROPER ACTION HAS NOT BEEN TAKEN TO ASSURE THE SAFETY OF RESPONSE PERSONNEL. Workers are considered safe only when they are breathing air with less than 10 parts per million (ppm) of Hydrogen Sulfide.

- Once the release has been controlled and monitoring has shown that the **HOT ZONE** is safe (<10 ppm H_2S and 0% LEL), clean up and repair work may begin.

- Formal notification of the incident should be made through line management.

- A Critique of the incident should follow.

6.00 PROTECTION OF THE GENERAL PUBLIC

6.10 NOTIFICATION OF POTENTIAL DANGER

- Warning signs are prominently displayed at the injection well site and at all access points to the Lisbon Gas Plant and the Spiller Canyon Facility.

- Written notification will be made to all mineral and grazing lease holders within the calculated potential exposure areas.

- Response planning will be coordinated through the San Juan County Emergency Response Coordinator located in Monticello, Utah.

6.20 EMERGENCY EVACUATION AND ISOLATION OF DANGER AREA

In the event toxic gases are released in such quantities as to be a possible hazard to the public the following steps (in addition to the procedure outlined in Section 5.0) will be taken by the person in charge:

- Choose a command post site in a safe area.

- Alert by telephone the Incident Commander or the Safety Manager and notify the person of the situation and your choice of a command posts.

- Notify local Law Enforcement Officials of the need to restrict entry to the area and the **location of your command post.** Request their assistance in restricting entry into the danger area by placing roadblocks or barriers in safe areas.

Note-Alternate command posts and roadblocks may be required, the Incident Commander may make changes in the locations listed above. Care should be taken to notify all responders of the changes.

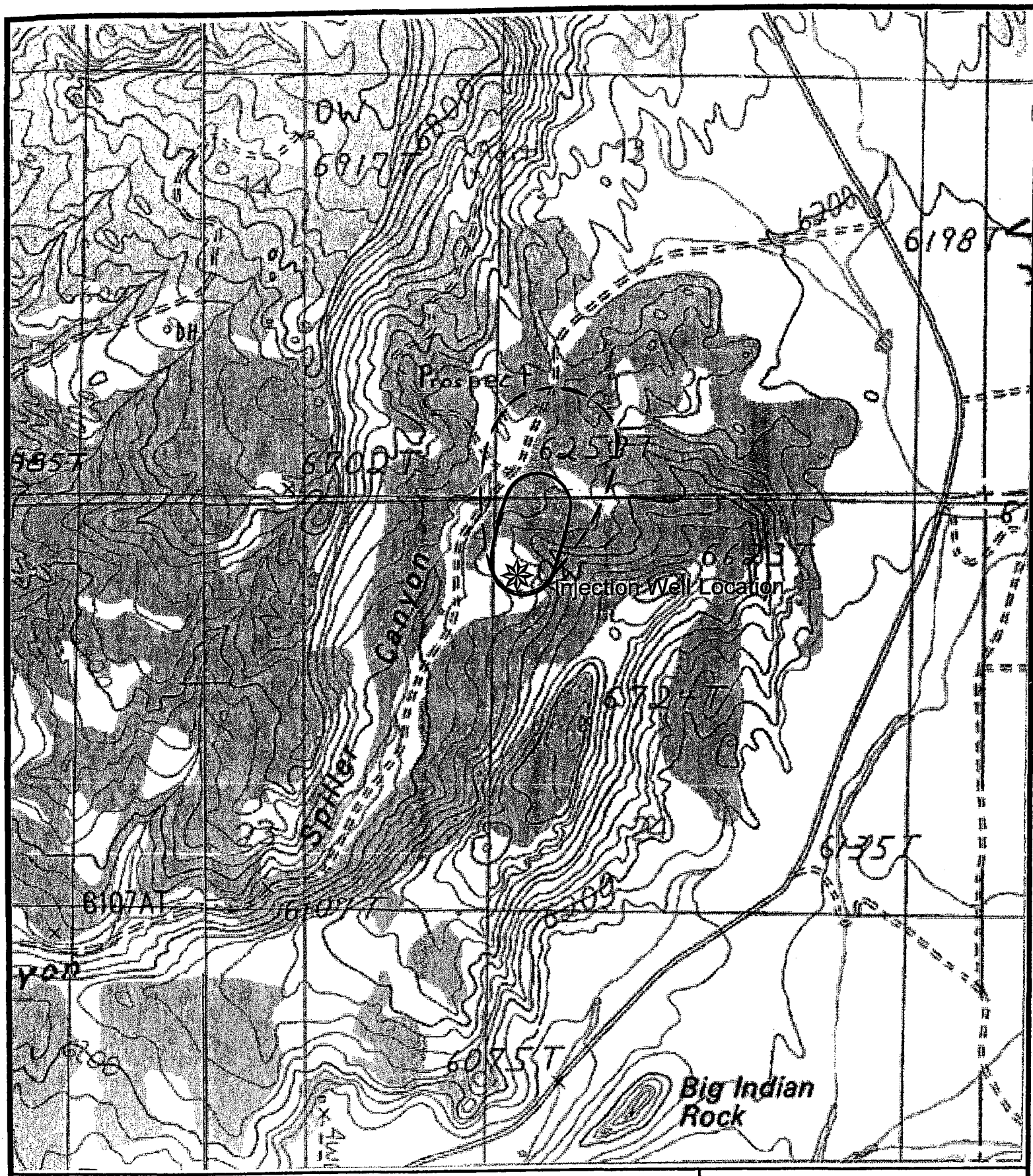
- Evacuate all active mines in the danger area. Mine owners have received prior notification that conditions could arise that would require their cooperation in clearing the area.

- Notify all grazing lease holders of the danger and what sections need to be evacuated by humans. (See Appendix D for lease holders names and what land Sections they hold grazing rights on.)

- If evacuation cannot be accomplished in a timely manner and the H_2S release is posing an immediate threat to human life, the Incident Commander may chose to ignite the gas. Because of the increased risks igniting the gas can pose for response personnel, only the Incident Commander can give this order.

APPENDIX A
MECHANICAL FLOW DIAGRAM

APPENDIX B
SITE MAP



LEGEND

= 100 ppm RADIUS OF EXPOSURE

= 500 ppm RADIUS OF EXPOSURE

N

MAP SOURCE: 7.5 MINUTE U.S.G.S. TOPOGRAPHIC MAP (LISBON VALLEY QUADRANGLE)
SITE LEGAL LOCATION: NE NW, SECTION 24, TOWNSHIP 30 SOUTH, RANGE 24 EAST

FIGURE 1
SITE MAP
TOM BROWN, INC.
SPILLER CANYON FACILITY
SAN JUAN COUNTY, UTAH

REVISION DATE:	7/18/02
REVISION NUMBER:	002
DRAWN BY:	DMP
PROJECT #	EG02064
SCALE:	1:12,000

CORDILLERAN

APPENDIX C
EMERGENCY CONTACT LIST

APPENDIX C
EMERGENCY CONTACT LIST

Utah Division of Environmental Quality	800.458.0145
Utah Division of Water Quality	801.538.6146
EPA 24-Hour Spill Notification Number	303.293.1788
Department of Transportation National Response Center	800.424.8802
Utah Division of Oil, Gas, & Mining	801.538.5340
Utah Oil & Gas Conservation Commission	801.538.5277
*Utah State Highway Patrol	800.492.2400
*Utah State Highway Patrol-Hazardous Materials Division	435.336.4461
*Ambulance Service (Moab)	435.259.8115
*Ambulance Service (Monticello)	435.587.2237
Ambulance Service (Grand Junction Air Life)	800.332.4923
*Hospital (Allen Memorial-Moab)	435.259.7191
*Hospital (San Juan Hospital)	435.587.2116
*Grand County Sheriff (Moab)	435.259.8115
*San Juan County Sheriff (Monticello)	435.587.2237
*Moab Area Fire Department	435.259.5551
*LaSal Area Fire Department	435.686.2388
*Monticello Area Fire Department (Contact through San Juan County Sheriff)	435.587.2237
*Blanding Area Fire Department	435.678.2313
U.S. Dept. of Interior, Bureau of Land Management	970.878.5555
Moab Field Office	435.259.6111
Tom Brown Corporate Office	303.260.5000
Tom Brown Lisbon Gas Plant Office	435.686.7600
Tom Brown Lisbon Gas Plant Control Room	435.686.7620
Tom Brown Lisbon Gas Plant Control Room (24 Hour Emergency Number)	435.686.2271
Doug Rosa, Lisbon Gas Plant Superintendent	435.686.7603
Rick Costanza, Field Supervisor	435.686.7612
Kenny Allred, Corporate Safety Manager	435.686.7604

*= these are non-emergency numbers. Emergency calls should dial 911.

APPENDIX D
LEASE HOLDER INFORMATION

APPENDIX D
LEASE HOLDER INFORMATION

MINE OPERATORS & NOTIFICATION ADDRESSES

Anderson, James, Estate,Box 9196,Salt Lake City,UT,84109
Atlas Corporation,Box 1207,Moab,UT,84532
Bailey,Rick,P.O. Box 1129,Monticello,UT,84535
Baker,W.V.,1766 W 4575 S,Roy,UT,89510
Baker,W.V.,Box 10628,Reno,NV,89510
Birch,Arthur,190 W. Canter,Huntington,UT,84501
Boyd,Maxine S.,1490 E. 500 South #28,Price,UT,84501
Brown,Nancy,8604 E. Devonshire,Scottsdale,AZ,85251
Butzow,George,Box 713,Huntington,UT,84528
Butzow,Tonia,Box 713,Huntington,UT,84528
Clemons,Paul B.,8604 E. Devonshire,Scottsdale,AZ,85251
Crowley,Delsie,1501 S. Mesa,Montrose,CO,81401
Dearth,A.E,672 Mivida Dr.,Moab,UT,84532
Dearth,A.F.,54 S. Flora Way,Golden, CO,80401
F804 Inc.,2800 S. University Blvd.,Denver,CO,80210
Francis,Clara,420 Topaz Circle,Moab,Ut,84532
Francis,Lyle G.,420 Topaz Circle,Moab,UT,84532
Francis,Lyle,420 Topaz Circle,Moab,UT,84532
Giles,Albert, % Bob Shumway,3080 Spanish Trail Dr.,Moab,UT,84532
Hart,C.J.,97417 1/4 Rd.,Fruita,CO,81521
Hart,C.J.,Box 1075,Vernal,UT,84078
Hart,C.J.,Box 2492,Durango,CO,81302
Hart,C.J.,Box 267,Durango,CO,81521
Hart,C.J.,Box 3037,Durango,CO,81302
Hart,C.J.,Box 713,Huntington,UT,84528
Heda Mining Company,Box C 8000,Cofeur D Alene,ID,83814
Homestead Mining CO/CA,155 Glendale #18,Sparks,NV,89431
Homestead Mining CO/CA,1726 Cole Boulevard,Golden,CO,80401
Homestead Mining CO/CA,650 California St. 9th Floor,San Francisco,CA,94108
Homestead Mining CO/CA,7625 W. 5th Ave.,Lakewood,CO,80226
Homestead Mining CO/CA,Box 10628,Reno,NV,89510
Homestead Mining CO/CA,Box 89510,Reno,NV,89510

Homestead Mining Co/CA,7625 West 5th Avenue,LakeWood,CO,80226
Hudson,H. Clay,Box 10628,Reno,NV,89510
Hudson,T.C.,Box 10628,Reno,NV,89510
Hudson,W.T.,155 Glendale #18,Sparks,NV,89431
Hudson,W.T.,7625 W. 5th Ave.,Lakewood,CO,80226
Kemper,R.B.,10720 McCume Ave.,Los Angeles,CA,90034
Kunkel,Burton F. % Bob Shumway,3080 Spanish Trail Dr.,Moab,UT,84532
Kunkel,Raymond E.,33 Holiday Haven,Moab,UT,84532
Kunkel,Raymond E.,8664 Monmouth Pl.,Denver,CO,80237
Lawther,Hazel A.,156 N. Fraser Dr. W.,Mesa,AZ,85203
McCormick,Patricia,Box 149,Aurora,MO,62505
Melich,Mitchell,900 Donner Way,Salt Lake City,UT,84108
Mundy,H.N.,Box 10628,Reno,NV,89510
Osanke,Mary Lou,Box 1230,Ely,NV,89301
Osanke,Mary Lou,Box 193,LaSal,UT,84530
Osanke,Steve,Box 1230,Ely,NV,89301
Osanke,Steve,Box 192,LaSal,UT,84530
Powell,Claudette,180 Braewick Rd.,Salt Lake City,UT,84103
Powell,Claudette,Box 713,Huntington,UT,84528
Powell,Cory,Box 713,Huntington,UT,84528
Powell,Phillip,Box 713,Huntington,UT,84528
Powell,Zachary,Box 713,Huntington,UT,84528
Redd,Paul,20923 T5 Road, Paradox,CO,81429
Richardson,Frank,Box 10628,Reno,NV,89510
Robinson,Dean (K.S. Summers),P.O. Box 67,Monticello,UT,84535
Rogers,Anna,Box 10628,Reno,NV,89510
Rogers,L.E.,Box 10628,Reno,NV,89510
Shumway,Bob, 3080 Spanish Trail Dr.,Moab,UT,84532
Standard Metals,P.O. Box 247,Silverton,CO,81433
Steen,Andrew K.,7621 El Monte Dr., Buena Park,CA,90621
Steen,Charles A.,7621 El Monte Dr.,Buena Park,CA,90621
Strode,Gary L.,62266 N. Star Dr.,Montrose,CO,81401
Umetco Minerals Corporation,Box 1029,Grand Junction,CO,81502
Uranium King Corporation,Box 1408,Coralles,NM,87045
Westmont Engineering Company % Bob Shumway,3080 Spanish Trail Dr., Moab,UT,84532,

GRAZING LEASE HOLDERS

SECTIONS 19, 24

Rick Bailey, (Spring Creek Ranch) Phone (435) 587-2313
P.O. Box 1129
Monticello, Utah 84535

SECTIONS 10, 11, 14, 15, 21, 22, 23, 26, 27

Dean Robinson (K. S. Summers), Phone (435) 587-2333
P.O. Box 67
Monticello, Utah 84535

SECTIONS 2, 3, 4, 9, 10, 11, 12, 13, [33 (BI#1)]

Paul Redd, Phone (970) 859-7358
20923 T5 Road
Paradox, Colorado 81429

APPENDIX E
TSCREEN OUTPUT DATA

Spiller Canyon Release Run 7

TOTAL AMOUNT OF MATERIAL RELEASED (G): .2300E+07
RELEASE HEIGHT ABOVE GROUND (M): 1.000
INITIAL LATERAL DISPERSION SIGMA (Y) (M): .0000
INITIAL VERTICAL DISPERSION SIGMA (Z) (M): .0000

****
*** SUMMARY OF PUFF MODEL RESULTS ***
****

THE MAXIMUM CONCENTRATION AND THE DISTANCE TO MAXIMUM CONCENTRATION FOR DISTANCES BEYOND FENCELINE .010 (KM).
FOR NEAR SURFACE RELEASE MAXIMUM CONCENTRATION WILL OCCUR AT THE FENCELINE.

AVERAGING TIME (MIN)	MAXIMUM CONCENTRATION (G/M**3)	DISTANCE TO MAX. CONC. (KM)	STABILITY CLASS
INSTANTANEOUS	2.312E+07	.010	S
1	3.859E+05	.010	S
5	7.717E+04	.010	S
* 15	2.572E+04	.010	S
60	6.431E+03	.010	S

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

****
*** PUFF DISTANCES ***
****

THE MAXIMUM CONCENTRATION AS A FUNCTION OF DOWNWIND DISTANCE AND THE CONDITIONS THAT PRODUCED THE MAXIMUM AT THAT DISTANCE.

MIXING HEIGHT (M) 320.
WIND SPEED (M/SEC) 1.0

AVERAGING TIME (MIN) — DOWNWIND DISTANCE (KM)
MAXIMUM CONCENTRATION (G/M**3) AT VARIOUS DOWNWIND DISTANCES.
STABILITY CLASS THAT PRODUCED THE MAX. LISTED BELOW

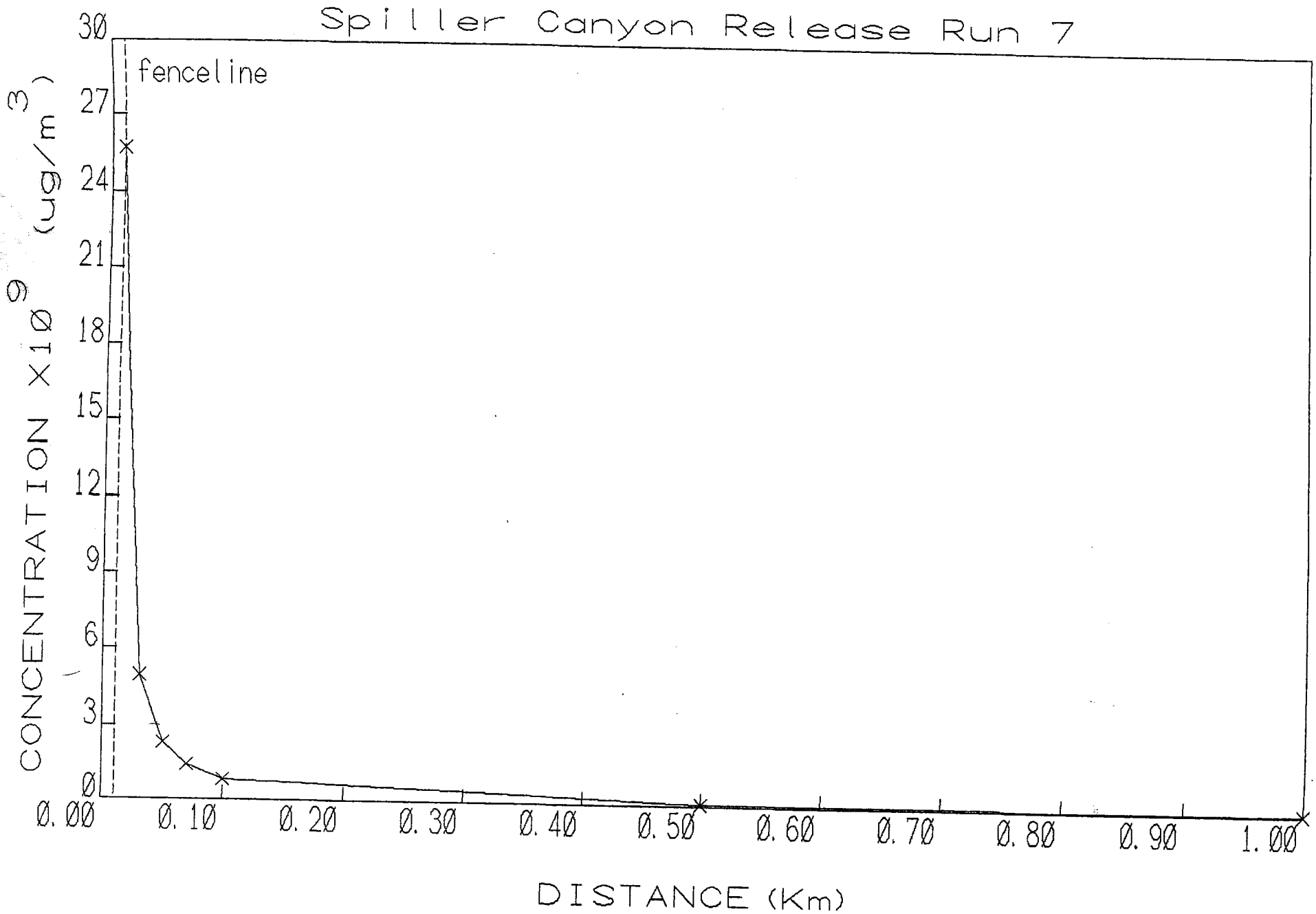
	0.01	0.03	0.05	0.07	0.1	0.5
INST.	2.312E+07	3.450E+06	1.156E+06	5.391E+05	2.356E+05	5.167E+03
	S	S	S	S	S	S
1	3.859E+05	7.426E+04	3.451E+04	2.083E+04	1.220E+04	1.091E+03
	S	S	S	S	S	S
5	7.717E+04	1.485E+04	6.902E+03	4.167E+03	2.440E+03	2.183E+02
	S	S	S	S	S	S
15	2.572E+04	4.951E+03	2.301E+03	1.389E+03	8.135E+02	7.276E+01
	S	S	S	S	S	S
60	6.431E+03	1.238E+03	5.752E+02	3.472E+02	2.034E+02	1.819E+01
	S	S	S	S	S	S

AVERAGING TIME (MIN)	DOWNWIND DISTANCE (KM) 1.0	3.0	5.0	7.0	10.0	30.0
	MAXIMUM CONCENTRATION (G/M**3) AT VARIOUS DOWNWIND DISTANCES. STABILITY CLASS THAT PRODUCED THE MAX. LISTED BELOW					
INST.	9.868E+02 S	7.147E+01 S	2.108E+01 S	9.433E+00 S	4.022E+00 S	2.911E-01 S
1	3.853E+02 S	5.735E+01 S	1.919E+01 S	8.951E+00 S	3.911E+00 S	2.900E-01 S
5	7.717E+01 S	1.485E+01 S	6.902E+00 S	4.148E+00 S	2.346E+00 S	2.643E-01 S
*15	2.572E+01 S	4.951E+00 S	2.301E+00 S	1.389E+00 S	8.135E-01 S	1.535E-01 S
60	6.431E+00 S	1.238E+00 S	5.752E-01 S	3.472E-01 S	2.034E-01 S	3.914E-02 S

STABILITY CLASSES
U = UNSTABLE
N = NEUTRAL
S = STABLE

* INDICATES AVERAGING TIME THAT WAS SELECTED FOR PLOTTING

****
*** END OF PUFF MODEL OUTPUT ***
****



Maximum concentration 2.572E+010 micrograms/cubic meter at 0.010 Km

APPENDIX F
HYDROGEN SULFIDE MSDS

MARSULEX

MATERIAL SAFETY DATA SHEET

Hydrogen Sulfide

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: Hydrogen Sulfide **Formula:** H_2S **Molecular Weight:** 34.08
Chemical Name: Hydrogen Sulfide **Chemical Family:** Inorganic Sulfides **CAS#** 7783-06-4
Synonyms: Hydrogen sulphide, sulfuretted hydrogen, hydrosulfuric acid
Product Use: Purification of acids, and wastewater and in the manufacture of sulfur and organosulfur compounds

MARSULEX Inc.
111 Gordon Baker Road
Suite 300
North York, ON
M2H 3R1
(416) 496-9655

MARSULEX Inc.
11652 -99th Avenue
Fort Saskatchewan
Alberta T8L 2T2
(780) 998-2225

Emergency Telephone Number
Chemtrec 1-800-424-9300
Canutec (613) 996-6666

2. COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous Ingredients	% by Wt.	CAS Number
Hydrogen Sulfide	99.9	7783-06-4

3. HAZARD INFORMATION

EMERGENCY OVERVIEW:
DANGER! Colorless gas with rotten egg odor. POISON. EXTREMELY FLAMMABLE. May be fatal if inhaled. Causes eye irritation. Heavier than air. May accumulate in low places such as pits, trenches, well cellars and sumps. Odor of rotten eggs is not a dependable indicator of presence of hydrogen sulfide at concentrations over 100 ppm. When burned, hydrogen sulfide forms sulfur dioxide, a poisonous, colorless gas with a pungent odor. Read the entire MSDS for a more thorough evaluation of the hazards.

National Fire Protection Association (NFPA) Rating
Hazardous Materials Identification System (HMIS) Rating

	NFPA	HMIS
HEALTH	4	4
FIRE	4	4
REACTIVITY	0	0
SPECIAL		

4 = Extreme/Severe
3 = High/Serious
2 = Moderate
1 = Slight
0 = Minimum
W = Water Reactive

3. HAZARD INFORMATION (continued)

POTENTIAL HEALTH EFFECTS:

Exposure Limits:

	ACGIH (TLV)*	OSHA (PEL)
Hydrogen Sulfide	10 ppm (14 mg/m^3) (TWA)	10 ppm (14 mg/m^3) (TWA)
	15 ppm (21mg/m^3) (STEL)	15 ppm (21mg/m^3) (STEL)
		20 ppm (Ceiling)

*-NOTICE OF INTENDED CHANGE: A decrease of the TLV-TWA to 5 ppm and the deletion of the STEL are proposed.

POTENTIAL HEALTH EFFECTS:

Eye Contact: Inflammation and irritation of the eyes can occur at very low airborne concentrations (sometimes less than 10 ppm). Exposure over several hours or days may result in "gas eyes" or "sore eyes" with symptoms of scratchiness, irritation, tearing and burning. Above 50 ppm, there is intense tearing, blurring of vision and pain when looking at light. The victim may see rings around bright lights. Most symptoms disappear when exposure ceases. However, in serious cases the eye may be permanently damaged. Contact with liquid H_2S may freeze the eye and cause severe damage or blindness.

Skin Contact: Rarely, the gas may irritate the skin. Contact with liquid H_2S can cause frostbite (freezing of the tissue).

Inhalation: At concentrations of 0.13 to 30 ppm, the odor is obvious and unpleasant. At 50 ppm, marked dryness and irritation of the nose and throat occurs. Prolonged exposure may cause a runny nose, cough, hoarseness, shortness of breath and pneumonia. At 100-150 ppm, there is a temporary loss of smell. At 200 to 250 ppm, H_2S causes severe irritation as well as symptoms such as headache, nausea, vomiting and dizziness. Prolonged exposure may cause lung damage (build-up of fluid in the lungs). Exposure for 4 to 8 hours can cause death. Concentrations of 300-500 ppm cause these same effects sooner and more severely. Death can occur in 1 to 4 hours. At 500 ppm, excitement, headache, dizziness, staggering, unconsciousness and respiratory failure occur in 5 minutes to 1 hour. Death can occur in 30 minutes to 1 hour. Exposures above 500 ppm rapidly cause unconsciousness and death. Severe exposures, which do not result in death, may cause long-term symptoms such as memory loss, paralysis of facial muscles or nerve tissue damage.

Ingestion: Not applicable.

Existing Medical Conditions Possibly Aggravated By Exposure: Breathing of vapors may aggravate neurological, eye and respiratory conditions .

Chronic Effects: No evidence.

Carcinogenicity: Hydrogen sulfide is not classified as a carcinogen by NTP (National Toxicology Program), IARC (International Agency for Research on Cancer),). ACGIH (American Conference of Governmental Industrial Hygienists) and not regulated as a carcinogen by OSHA (Occupational Safety and Health Administration).

4. FIRST AID MEASURES

General: Take proper precautions to ensure your own safety before attempting rescue; e.g., wear appropriate protective equipment. Effects of contact or inhalation may be delayed. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Skin Contact: If the liquid is splashed on the skin, as quickly as possible, flush contaminated area with lukewarm, gently running water for at least 20 minutes. Under running water, carefully cut around clothing that sticks to damaged skin and remove rest of garment. Obtain medical attention immediately. Completely decontaminate clothing, shoes and leather goods before re-use, or discard.

Eye Contact: If irritation occurs, immediately flush eyes with running water for a **minimum** of 20 minutes. Hold eyelids open during flushing. Obtain medical attention IMMEDIATELY.

Inhalation: Remove source of contamination or move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give Cardiopulmonary Resuscitation (CPR) only if there is no pulse AND no breathing. Oxygen may be beneficial if administered by a person trained in its use, preferably on a physician's advice. Obtain medical attention IMMEDIATELY.

Ingestion: Not applicable.

5. FIRE FIGHTING MEASURES

Flash Point (method): Not applicable, product is a gas.
Autoignition Temperature: 260°C (500°F)
Flammability Limits in air(%): UEL: 44% **LEL:** 4.0%

Fire and Explosion Hazards: Oxides of sulfur may be produced in fire.

Extinguishing Media: Water spray, dry chemical, "alcohol" foam or carbon dioxide

Special Fire Fighting Procedures: H_2S is extremely toxic. Fight fires from safe distance or protected location. Stay upwind. Wear full protective equipment. H_2S may travel some distance along the ground to a source of ignition and flash back. It may collect in lower, poorly ventilated areas. Water or foam may cause frothing. Use water to keep fire-exposed containers cool, to flush spills away from populated areas and to dilute spills to non-combustible mixtures. Stop escaping flow of gas rather than extinguish the fire. If fire is extinguished and gas continues to escape, an explosive mixture could form. If necessary to extinguish the fire, use carbon dioxide or dry chemical.

NOTE: Also see "Section 10 - Stability and Reactivity"

6. ACCIDENTAL RELEASE MEASURES

Steps to be taken in the event of a spill or leak: Evacuate area immediately. Restrict access to area until completion of clean up. Ensure clean up is conducted by trained personnel only. Remove all ignition sources (no smoking, flares, sparks or flames). All equipment should be grounded. Ventilate area and stay upwind. Use appropriate Personal Protection Equipment. Stop or reduce leak if safe to do so.
Liquid H_2S: Do not touch spilled material. Prevent material from entering sewers or confined spaces. Stop or reduce leak if safe to do so. If not, allow liquid to vaporize.
Gaseous H_2S: Stop or reduce leak if safe to do so. If source of the leak is a cylinder and the leak cannot be stopped safely, move the cylinder to a safe place in the open air. If possible, repair the leak or allow the cylinder to empty.
In the case of a large spill, evacuation of populated areas downwind may have to be considered. Deliberate ignition and controlled burn of escaping hydrogen sulfide should be considered in order to reduce the risk to adjacent areas.
Comply with Federal, Provincial/State and local regulations on reporting releases.

Note -Spills are subject to CERCLA reporting requirements: RQ = 100 lbs (45.4 kg).

AIHA- Emergency Response Planning Guidelines (ERPGs)
ERPGs are for community emergency planning limits and not workplace exposure limits.

ERPG-1 : 0.1 ppm
ERPG-2 : 30 ppm
ERPG-3 : 100 ppm

The ERPG-1 is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing other than mild transient adverse health effects or perceiving a clearly defined, objectionable odor.

The ERPG-2 is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing or developing irreversible or other serious health effects or symptoms, which could impair an individual's ability to take protective action.

The ERPG-3 is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing or developing life-threatening health effects.

7. HANDLING AND STORAGE

Precautions: Never work alone when handling H_2S. Someone must be in communication at all times and be equipped and trained to rescue. If H_2S is released, immediately put on a respirator and leave the area until the severity of the release is determined. If necessary to enter an area contaminated with H_2S, follow precautions for confined space entry including use of a supplied-air respirator with full facepiece, adequate communication, safety belts and lifelines. People working with this chemical should be properly trained regarding its hazards and its safe use.

Handling Procedures and Equipment: Keep H_2S away from sparks, flames and other ignition sources. Post "NO SMOKING" signs in area of use. Do not use near welding operations, flames, or hot surfaces. Prevent release of gas into workplace air. Since the sense of smell cannot be relied upon to detect the presence of H_2S, the concentration should be measured by the use of fixed or portable devices. Ground all cylinders. Move cylinders by hand-truck or cart designed for that purpose. Do not lift cylinders by their caps or handle them with oily hands. Secure cylinders in an upright position at all times. Do not drop or permit cylinders to bang against each other. Leave valve cap on cylinder until it is secured and ready for use. Close all valves when not in actual use. Make sure valves on cylinders are fully opened when used. Open and shut valves at least once a day, while cylinder is in use, to avoid valve "freezing". Use the smallest amount possible

7. HANDLING AND STORAGE (continued)

in designated areas with adequate ventilation. Have emergency equipment available. Label containers and keep closed when not in use. Empty containers may contain hazardous residues.

Storage Requirements: Store in a cool, dry, well-ventilated area, out of direct sunlight. Outside or detached storage is preferred. Store away from heat and ignition sources, incompatible materials, and cylinders or other containers under high pressure. Use grounded, non-sparking ventilation systems and electrical equipment that does not provide a source of ignition. Use corrosion-resistant structural materials, lighting and ventilation systems in storage area. Store cylinders at or above ground level, upright on a level, fireproof floor. Keep cylinders secured in position and protected from damage. Keep cylinder valve cover on. Label empty cylinders. Store full cylinders separately from empty ones. Consider leak detection and alarm systems, as required. Limit quantity in storage. Restrict access to storage area and post warning signs. Keep storage area separate from populated work areas. Inspect periodically for deficiencies such as damage or leaks. Have fire extinguishers available in and near the storage area. Comply with all applicable regulations for the storage and handling of compressed gases and flammable materials.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Recommendations listed in this section indicate the type of equipment, which will provide protection against overexposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.

Engineering Controls: Engineering control methods to reduce hazardous exposures are preferred. Methods include mechanical ventilation (dilution and local exhaust) and process or personnel enclosure. Administrative controls and personal protective equipment may also be required. Because of the high potential hazard associated with this substance,
stringent control measures such as enclosure or isolation may be necessary. A continuous monitoring system with alarm is recommended in areas where H_2S is used. Use a non-sparking, grounded, corrosion-resistant ventilation system separate from other exhaust ventilation systems. Exhaust through a scrubber directly to the outside. Supply sufficient replacement air to make up for air removed by exhaust systems.

Skin Protection: Chemical protective gloves, coveralls, boots, and/or other resistant protective clothing should be worn if there is potential for contact with the liquid. Have a safety shower/eye-wash fountain readily available in the immediate work area. A chemical protective full-body encapsulating suit and respiratory protection may be required in some operations.
Resistance of materials for protective clothing : Guidelines for hydrogen sulfide:
RECOMMENDED (resistance to breakthrough longer than 8 hours): Tychem 10000(TM).
RECOMMENDED (resistance to breakthrough longer than 4 hours): Teflon(TM).(8)
RECOMMENDED (estimated resistance to breakthrough longer than 4 hours): Responder(TM).
NOT RECOMMENDED for use (resistance to breakthrough less than 1 hour): CPF3(TM).
Recommendations are valid for permeation rates reaching 0.1 ug/cm2/min or 1 mg/m2/min and over. Resistance of specific materials can vary from product to product. Breakthrough times are obtained under conditions of continuous contact, generally at room temperature. Evaluate resistance under conditions of use and maintain clothing carefully.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION (continued)

Respiratory Protection: NIOSH recommendations for hydrogen sulfide concentrations in air.

- Up to 100 ppm: Powered air-purifying respirator with cartridge(s) to protect against hydrogen sulfide; or gas mask with canister to protect against hydrogen sulfide; or SAR*; or full-facepiece SCBA.
- Emergency or planned entry into unknown concentrations or IDLH conditions: Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.
- ESCAPE: Gas mask with canister to protect against hydrogen sulfide; or escape-type SCBA.
- NOTE: The IDLH concentration for hydrogen sulfide is 100 ppm.

*NOTE: Substance reported to cause eye irritation or damage; may require eye protection.
ABBREVIATIONS: SAR = supplied-air respirator; SCBA = self-contained breathing apparatus. IDLH = Immediately Dangerous to Life or Health.

Eye Protection: Tight-fitting chemical safety goggles. A face shield may also be necessary if there is potential for contact with liquid H_2S.

EXPOSURE GUIDELINES:

HAZARDOUS INGREDIENT(S):
Hydrogen Sulfide:

ACGIH TLV	10 ppm (14 mg/m^3) (TWA)*
ACGIH STEL	15 ppm (21 mg/m^3))*
OSHA PEL	10 ppm (14 mg/m^3) (TWA)
NIOSH Immediately Dangerous to Life and Health Level (IDLH)	100 ppm (IDLH)

TLV COMMENTS :*NOTICE OF INTENDED CHANGE: A decrease of the TLV-TWA to 5 ppm and the deletion of the STEL are proposed.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Gas
Appearance and Odor: Colorless gas or pressurised liquid with offensive odor
Odor Threshold: 0.13 ppm.
Boiling Point: -60.2°C (-76.4°F) at 1 atm,
Melting/Freezing Point: -82.9°C (-117.2°F) at 1 atm,
Vapor Pressure: 1875 kPa at 20°C
Vapor Density: 1.189 (air = 1)
Bulk Density: Saturated Gas: 31.04 kg/m^3 at 21.1°C (70° F)
Saturated Liquid: 774.2 kg/m^3 at 21.1°C (70° F)
Evaporation Rate: *Not applicable*
Solubility: 437 mL of gas in 100 mL of water at 0°C; 186 mL of gas in 100 mL of water at 40°C. Soluble in hydrocarbon solvents, ether, alcohol, glycerol and carbon disulfide.
pH: 4.1 (0.1N aqueous solution)

10. STABILITY AND REACTIVITY

Stability: Stable

Conditions to Avoid: Keep away from heat and sources of ignition.

Materials to Avoid:

- Oxidizing agents (e.g. peroxides and nitrates) - May react violently or explosively.
- Forms explosive reactions with bromine pentafluoride, chlorine trifluoride, nitrogen triiodide, nitrogen trichloride, oxygen difluoride and phenyl diazonium chloride.
- Metals (e.g. copper, lead) - Forms metal sulfides.
- Metal oxides (e.g. nickel oxide) - Oxidizes and can ignite.

Corrosivity to Metals: Corrosive. Reacts to form metal sulfides. Anhydrous hydrogen sulfide has low general corrosivity toward carbon steel, aluminum, Inconel, Stellite and 300-series stainless steels at moderate temperatures. Temperatures greater than ca 260°C can produce severe sulfidation of carbon steel. Wet hydrogen sulfide can be quite corrosive to carbon steel.

Hazardous Decomposition or Combustion Products: Toxic oxides of sulfur.

Hazardous Polymerization: Will not occur

11. TOXICOLOGICAL INFORMATION

Toxicological Data:

Human toxicity values:
Man: lethal: 600 ppm/30 min; 800 ppm, immediate /lethality/
severe toxic effects 200 ppm = 280 mg/cu m 1 min
symptoms of illness 50 ppm = 70 mg/cu m
Animal toxicity values:
LC50 (rats): 444 ppm; 4-hr exposure
LC50 (mice): 673 ppm; 1-hr exposure.
LC50 (rats and mice): 1000 ppm; 15-30 min exposure
LC50 (female mice): 985 ppm; 15-30 min exposure

Carcinogenicity: Hydrogen sulfide is not classified as a carcinogen by NTP (National Toxicology Program), IARC (International Agency for Research on Cancer), ACGIH (American Conference of Governmental Industrial Hygienists) and not regulated as a carcinogen by OSHA (Occupational Safety and Health Administration).

Reproductive Effects: No evidence.

Mutagenicity Data: No evidence.

Teratogenicity Data: No evidence.

Synergistic Materials: None known

12. ECOLOGICAL INFORMATION

Atmospheric Fate: The lifetime of hydrogen sulfide is affected by ambient temperature and other atmospheric variables including humidity, sunshine, and presence of other pollutants. Once released into the atmosphere, hydrogen sulfide will behave like many other gaseous pollutants and be dispersed and eventually removed. Residence times in the atmosphere range from about one day to more than 40 days, depending upon season, latitude, and atmospheric conditions.

Soil Adsorption/Mobility: When it is spilled onto soil, much will evaporate. However, since it is very soluble in water, the presence of water in soil or falling as precipitation at the time of the spill may contribute to movement in the soil. If the soil surface is saturated with moisture at the time of the spill as might be the case after a rainfall, the spilled chemical will run off and/or evaporate away.

Degradation: Microorganisms in soil and water are involved in oxidation-reduction reactions, which oxidize hydrogen sulfide to elemental sulfur. Abiotic Degradation: Hydrogen sulfide does not absorb solar radiation reaching the tropsphere. It does not, therefore, undergo photolysis or react photochemically with oxygen. The primary chemical transformation of hydrogen sulfide in the atmosphere is oxidation by oxygen containing radicals to sulfur dioxide and sulfates.

Bioconcentration: Does not have bioaccumulation or food chain contamination potential.

Ecotoxic Effects: Harmful to aquatic life. Fish toxicity;
TLm Lepomis macrochirus (bluegill sunfish) eggs 0.0190 mg/l/72 hr at 21-22° C in a flow through bioassay
TLm Lepomis macrochirus (bluegill sunfish) 35 day old fry 0.0131 mg/l/96 hr at 21-22°C in a flow through bioassay.
TLm Lepomis macrochirus (bluegill sunfish) juveniles 0.0478 mg/l/96 hr at 21-22°C in a flow through bioassay
TLm Lepomis macrochirus (bluegill sunfish) adults 0.0448 mg/l/96 hr at 21-22 °C in a flow through bioassay
TLm Pimephales promelas (fathead minnow) 0.0071-0.55 mg/l/96 hr at 6-24°C in a flow through bioassay
TLm Salvelinus fontinalis (brook trout) 0.0216-0.038 mg/l/96 hr at 8-12.5°C in a flow through bioassay

Invertebrate And Microbial Toxicity: Black sea mussels exposed to hydrogen sulfide exhibited changes in protein-carbohydrate metabolism, total proteins, lactate and pyruvate, and transamination enzyme activity in the mussel haemolymph. LC50 (96 hr) Asellus 0.11 mg / l.

13. DISPOSAL CONSIDERATIONS

Do not dispose of waste with normal garbage, or to sewer systems.

- Responsibility for proper waste disposal is with the owner of the waste. Work with the appropriate regulatory bodies to ensure compliance with regulations.
- It may be possible to make waste H_2S gas harmless by dissolving it in a sodium hydroxide scrubber, or by burning the H_2S and absorbing the resulting sulfur dioxide.
- Trained, experienced personnel must perform waste treatment procedures with appropriate protective equipment in approved treatment facilities.
- Clean-up material may be a RCRA Hazardous Waste on disposal.
- Provincial/State or local regulations or restrictions are complex and may differ from Federal regulations.
- The information applies to the material as manufactured. Processing, neutralizing, use or contamination may make the information inappropriate, inaccurate or incomplete.

14. TRANSPORT INFORMATION

U.S. (Under DOT)

Shipping Name: Hydrogen Sulfide
Hazard Class or Division: 2.3
Product Identification No. (PIN): UN1053
LABEL(S): 2.3 - Poison Gas
2.1 - Flammable Gas

RQ: 100 lb (45.4 kg)

Special Provisions :
T26 - Minimum shell thickness
B14 –Insulation required on bulk packaging.
B9 - Bottom outlets not authorized.
2 – Poison, Inhalation Hazard, Hazard Zone B.

Limits to Mode or Method of Transport :

PACKAGING EXCEPTIONS: None
PASSENGER AIRCRAFT/RAIL: Forbidden
CARGO AIRCRAFT ONLY: Forbidden

Canada (Under TC)

Shipping Name: Hydrogen sulphide
Classification(s): 2.3 (2.1)
Product Identification No. (PIN): UN1053

Regulated Limits: 230 Kg

Special Provisions :
102. "SPECIAL COMMODITY" or "MARCHANDISE SPECIALE" required on shipping document when transported by rail.

Other Requirements: ERAP required for quantities exceeding 3,000 kg

Limits to Mode or Method of Transport :
CONSUMER COMMODITY: Prohibited
LIMITED QUANTITY: Prohibited
PASSENGER VEHICLES: Prohibited
PASSENGER SHIP: Prohibited

15. REGULATORY INFORMATION

U.S.A.

SARA Title III HAZARD CATEGORIES AND LISTS

Product Hazard Categories		Lists	
Acute (Immediate) Health:	Yes	Extremely Hazardous Substance (40 CFR 355, SARA Title III Section 302)	Yes
Chronic (Delayed) Health:	No		
Fire:	Yes	CERCLA Hazardous Substance (40 CFR 302.4)	Yes
Reactivity:	No		
Sudden Release of Pressure:	No	Toxic Chemical (40 CFR 372.65, SARA Title III Section 313)	Yes

Reportable Quantity (RQ) under U.S. EPA CERCLA: RQ=100 lb / 45.4 kg

OSHA Classification: Highly Hazardous Chemical (29 CFR 1910.119)
The Threshold Quantity (TQ) for this substance is 1,500 lbs.

TSCA Inventory Status: Reported/Included

Right-To-Know: Illinois, Massachusetts, New Jersey, Pennsylvania

CANADA

Workplace Hazardous Materials Information System (WHMIS)

WHMIS Classification(s):
Class A – Compressed gas
Class B1- Flammable gas
Class D1A - Very Toxic
Class D2B – Other effects-Toxic

WHMIS Health Effects Index:
Acute Lethality - very toxic – immediate
Eye irritation - toxic - other
TDG Class 2.3 - very toxic - immediate

WHMIS Ingredient Disclosure List: Confirmed A; Meets criteria for disclosure at 1% or greater.

CEPA / Canadian Domestic Substances List (DSL): The substances in this product are on the Canadian Domestic Substances List (CEPA DSL).

EINECS Number : 231-977-3

16. OTHER INFORMATION

REFERENCES:

1. "CHEMINFO" through "CCINFOdisc", Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada, May 2001.
2. CHEMLIST, American Chemical Society, 2001.
3. CESARS: Chemical Evaluation Search And Retrieval, Canadian Centre for Occupational Health and Safety, Issue : 2001-2, May, 2001.
4. Handbook of Compressed Gases, 3rd Edition, Compressed Gas Association, Arlington, Virginia, 1990.
5. HSDB-Hazardous Substances Data Bank , through "CCINFO disc", Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada, (May 2001).
6. RTECS- Registry of Toxic Effects of Chemical Substances, On-line search, Canadian Centre for Occupational Health and Safety RTECS database, May, 2001.
7. Transportation of Dangerous Goods Act and Regulations, Canadian Centre for Occupatioal Health and Safety, May 2001.
8. Threshold Limit Values for Chemical Substances and Physical Agents, Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, 2001.

16. OTHER INFORMATION (Continued)

Legend:

CAS #	- Chemical Abstracts Service Registry Number
CERCLA	- Comprehensive Environmental Response, Compensation, and Liability Act
CFR	- Code of Federal Regulations
DOT	- Department of Transportation
EPA	- Environmental Protection Agency
ERAP	- Emergency Response Assistance Planning
LC_{50}	- The concentration of material in air expected to kill 50% of a group of test animals
LD_{50}	- Lethal Dose expected to kill 50% of a group of test animals
LEL	- Lower Explosive Limit
MSHA	- Mine Safety and Health Administration
NIOSH	- National Institute for Occupational Safety and Health
PEL	- Permissible Exposure Limit
PVC	- Polyvinyl chloride
RCRA	- Resource Conservation and Recovery Act
SARA	- Superfund Amendments and Reauthorization Act of the U.S. EPA
STEL	- Short Term Exposure Limit
TDG	- Transportation of Dangerous Goods Act/Regulations
TLm	- Median Threshold Level
TLV	- Threshold Limit Value
TSCA	- Toxic Substances Control Act
TWA	- Time-Weighted Average
UEL	- Upper Explosive Limit

Prepared by PIONEER (905) 403-4745

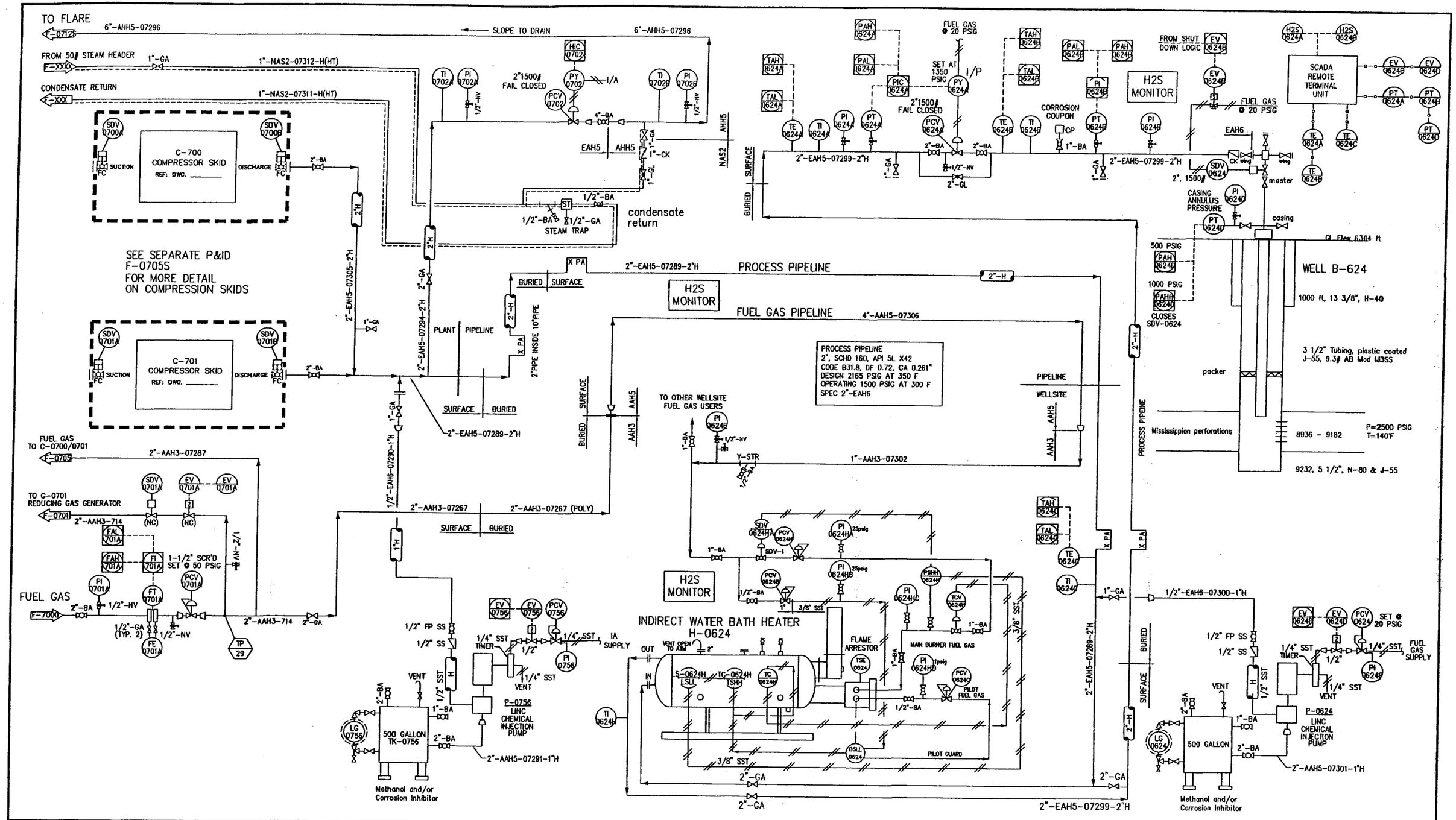
The information contained herein has been approved by MARSULEX Inc. and is offered only as a guide to the handling of this specific material and has been prepared in good faith by technically knowledgeable personnel. It is not intended to be all-inclusive and the manner and conditions of use and handling may involve other and additional considerations. No warranty of any kind is given or implied and MARSULEX Inc. will not be liable for any damages, losses, injuries or consequential damages that may result from the use or reliance of any information contained herein.

APPENDIX G
EMPLOYEE SIGNOFF SHEET

APPENDIX G
EMPLOYEE SIGNOFF SHEET

I have read the Tom Brown, Inc. Spiller Canyon Facility ***Emergency Response Plan/Public Protection Plan*** and understand its contents. I understand my personal responsibilities under this policy and will make use of this information to contribute to safety of the public and for my own personal safety while an employee of Tom Brown, Inc.

Signed Date



REFERENCE	REV	DATE	REVISION	BY	CHKD	SECT LDR	CHIEF DRAFT	PROJ ENGR
	1	8/23/02	BEFORE HAZOP	SJ				
	2	9/12/02	AFTER HAZOP	SJ				
	3	10/23/02	AFTER EXXON MOBIL REVIEW	DSM	SJ			
	4	10/30/02	ISSUED FOR INST. & CONTROLS REVIEW	DSM	SJ			
	5	11/21/02	ISSUED FOR CONSTRUCTION	DSM	SJ			

AGE_P&ID_F-0706S.DWG

TOM BROWN INC.
LISBON GAS PLANT

SAN JUAN COUNTY
MOAB, UTAH

MECHANICAL FLOW DIAGRAM
SULFUR RE-INJECTION PROJECT
INJECTION PIPELINE & WELLBORE
WITH OUT JACKET PIPE

DES.: SGJ	SCALE: NONE	JOB NO.:	
DR.: SGJ	FILE:	11/21/02	
CH.:	DATE:	DWG.NO.:	REV.
APP.:	DATE:	F-0706S	5

UNDERGROUND INJECTION CONTROL

PERMIT MODIFICATION

LISBON B-624 SWD
NENW Sec. 24 -T30S- R24E
San Juan County, Utah

July 22, 2002

Prepared for:

Mr.Gil Hunt
State of Utah
Division of Oil, Gas and Mining
1594 W. North Temple
Suite 1210
Salt Lake City, Utah 84114

Prepared by:

BUYS & ASSOCIATES, INC.
4720 S. Santa Fe Circle, Suite 6
Englewood, Colorado 80110
(303) 781-8211
FAX (303) 781-1167

UNDERGROUND INJECTION CONTROL

PERMIT MODIFICATION

LISBON B-624 SWD
NENW Sec. 24 -T30S- R24E
San Juan County, Utah

mbuys@buysandassociates.com

July 22, 2002

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RECEIVED
JUL 19 2002
DIVISION OF
OIL, GAS AND MINING

FORM 9

STATE OF UTAH
DIVISION OF OIL, GAS AND MINING

5. Lease Designation and Serial No.
UTSL 070034

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill new wells, deepen existing wells, or to reenter plugged and abandoned wells.

Use APPLICATION FOR PERMIT TO DRILL OR DEEPEN form for such proposals.

6. If Indian, Allotte or Tribe Name

7. Unit Agreement Name
Lisbon Unit

1. Type of Well
☐ Oil Well ☐ Gas Well ☑ Other UIC well

8. Well Name and Number
Lisbon B-624

2. Name of Operator:
Tom Brown, Inc.

Contact: Brant B. Gimmeson
Phone: 303.260.5030

9. API Well Number
43-037-16516

3. Address and Telephone No.
555 Seventeenth Street, Suite 1850, Denver, CO 80202

10. Field and Pool, or Exploratory Area
Lisbon-Mississippian

4. Location of Well
Footages: 710 FNL, 1666 FWL
QQ, Sec T,R,M: NENW, 24, T30S, R24E

County: San Juan
State: Utah

11. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

NOTICE OF INTENT
(Submit in Duplicate)

☐ Abandon
☐ Repair Casing
☐ Change Plans
☐ Convert to Injection
☐ Fracture Treat or Acidize
☐ Multiple Completion
☑ Other Modify Permit
☐ New Construction
☐ Pull or Alter Casing
☐ Recomplete
☐ Reperforate
☐ Vent or Flare
☐ Water Shut-Off

Approximate date work will start _____ Sep-02

SUBSEQUENT REPORT
(Submit Original Form Only)

☐ Abandon*
☐ Repair Casing
☐ Change Plans
☐ Convert to Injection
☐ Fracture Treat or Acidize
☐ Other
☐ New Construction
☐ Pull or Alter Casing
☐ Recomplete
☐ Reperforate
☐ Vent or Flare
☐ Water Shut-Off

Date of work completion _____

Report results of Multiple Completions and Recompletions to different reservoirs on WELL COMPLETION OR RECOMPLETION REPORT AND LOG form.

* Must be accompanied by a cement verification report.

12. Describe Proposed or completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with the BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, A form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.)

TBI proposes to modify the permit for this UIC well to include the injection of acid gas into the well.

Name (Printed/Typed)
Martin W. Buys

Title Agent to TBI

Signature M. W. Buys

Date 7 18 2002

(This space for State use only)

RECEIVED
JUL 19 2002
DIVISION OF
OIL, GAS AND MINING

LISBON B-624 SWD

LIST OF ATTACHMENTS

Attachment No. 1	Site Map
Attachment No. 2	Map of Adjacent Wells
Attachment No. 3	Cross-Section, Structure Map, Completion Data and Summary
Attachment No. 4	Open Hole Log
Attachment No. 5	Proposed Completion and Well Bore Diagram
Attachment No. 6	Water Analysis
Attachment No. 7	List of Producing Wells
Attachment No. 8	Ownership Map, List of Owners, Affidavit Notification

SWD WELL PERMIT MODIFICATION

Lisbon B-624 SWD
API # 43-037-16516

Tom Brown Inc. is requesting a permit modification for the Lisbon B-624 well. This well is an existing SWD well injecting into the Mississippian Leadville formation in the Lisbon Field, San Juan County, Utah.

The following document contains information to support this modification.

1. TBI is the operator and major working interest owner of wells located in the Lisbon Field, San Juan County, Utah. TBI's business address is provided below:

   Tom Brown Inc.
   555 17th Street
   Suite 1850
   Denver, CO 80202

2. The Lisbon B-624 is an existing water disposal well. The well was spudded on 5/9/60. It was re-completed as a SWD well on 11/9/1965. During this time, it has received over 42 MM barrels of produced water per day.

3. During the initial production of the field, the wells produced both oil and gas and the gas was separated and re-injected. As the oil production declined, the Lisbon Gas Plant was built to process and sell the gas. The make-up of the gas has changed over time and the plant is currently being re-configured. The new process will concentrate the off gases into an "acid-gas" stream and this acid gas is what will be injected into B-624.

   The acid gas stream is approximately 4% water, 50% H2S and 46% CO2.

4. Enclosed as Attachment No. 1 (Site Map), is a plat of the B-624.

5. Enclosed as Attachment No. 2 (Site Diagram of Adjacent Wells), is a plat showing that portion of the Lisbon Field in the area adjacent to the Lisbon B-624. The legal location for the well is 710' FNL, 1666' FWL, Sec. 24, T30S, R24E, San Juan County, Utah.

   Shown on the plat is a circle of one-half mile radius centered on the Lisbon B-624 well. The ½ mile radius encompasses the area of the review, within which TBI is required to

investigate all wells for mechanical integrity. The ½ mile radius also identifies those lands, the owners thereof, which must be provided notice of this application. There are no wells within this area.

6. TBI proposes to utilize the Lisbon B-624 as a disposal well for gas re-injection from the Lisbon Gas Plant. This gas was produced from wells in the Lisbon Field. The Lisbon Field is a unitized field that is managed by the Moab Field office of the BLM.

7. TBI proposes to utilize the Mississippian Leadville formation (the existing SWD zone) as the disposal zone. This formation is also the producing formation. The gross injection interval in the Lisbon B-624 will be from 8896' to 9200'.

8. The Lisbon Field is located upon a large faulted anticlinal feature that encompasses approximately 5,000 acres. Structural closure on the field is almost 2,000 feet. When discovered the Lisbon structure was filled to the spill point with hydrocarbons. The northeast boundary of the anticline is bordered by a high angle reverse fault. Displacements on this fault are as much as 2,100 feet. The entire Lisbon anticline is totally encased by the Paradox salt. The Tom Brown, Inc. B-624 well that is being proposed for the re-injection of acid gas is located on the southeast flank of the Lisbon anticline, approximately 1,700 feet to 1,800 feet low to the anticline's crest.

   It is proposed that the B-624 well will be utilized in the field as a acid gas re-injection well. The Mississippian Leadville is the recipient formation. The Leadville Formation is overlain by the Pennsylvanian Molas Formation, a vari-colored shale; the Pennsylvanian Pinkerton Trail Formation, a gray-brown dense dolomite interbedded with anhydrite, gray dolomitic siltstones, and thin gray-green shales; and the Pennsylvanian Paradox Salt, a thick salt containing beds of black shale, dolomite, dolomitic sands and anhydrite. Taken together, any or all of these beds would provide a top seal for the Leadville Formation. The Devonian Ouray Formation, a white, gray, or buff limestone, largely lacking effective porosity and permeability in the Lisbon Field area, underlies the Leadville Formation. The Ouray Formation will form an effective bottom seal at the B-624. The lower 100' +/- of the Leadville Formation in the area of the B-624 is also devoid of effective porosity and permeability and would serve to re-enforce a bottom seal.

   USDW - There are no sources of underground drinking water near the Lisbon B-624.

   Attachment No. 3 contains a structure map, cross-section, completion summary and data.

9. The open hole log for the Lisbon B-624 is included in Attachment No. 4. A cement bond Log was never run for this well.

   No CBL ever run

   The write up for the completion of the Lisbon B-624 and the wellbore diagram is

included in Attachment No. 5.

Enhancement to existing permit (upgrade to include H_2S bearing "acid gas")

10. The source of fluid and gases for disposal in the Lisbon B-624 will be from the wells in the Lisbon Field that have been processed in the Lisbon Plant. Enclosed as Attachment No. 6 are standard analyses of formation produced water.

Various produced water samples were mixed with each other and with the Lisbon B-624 water. The water Deposition Potential Indicators analysis shows that there is little scaling potential in the mixed waters.

The analysis of the Mississippian Leadville water from the Lisbon B-624 is 76,671 mg/L of total dissolved solids. This is above the 10,000 ppm value utilized by the Board as the upper threshold for "fresh water."

11. A list of wells that may use the Lisbon B-624 well for disposal is included in Attachment No. 7.

12. The maximum injection volume in the Lisbon B-624 is estimated to be 1.0-1.3 MMSCF/day. The estimated injection pressure is 1000-1200 psig at the surface.

No maximum is specified, only an estimate!

13. Enclosed as Attachment No. 8 is a list of all the owners, operators, and surface interest owners located within ½ mile radius of the Lisbon B-624 .

The affidavit certifying that TBI has notified all of the operators, owners, and surface interest owners located within ½ mile radius of the Lisbon B-624 well will be sent to you under separate cover.

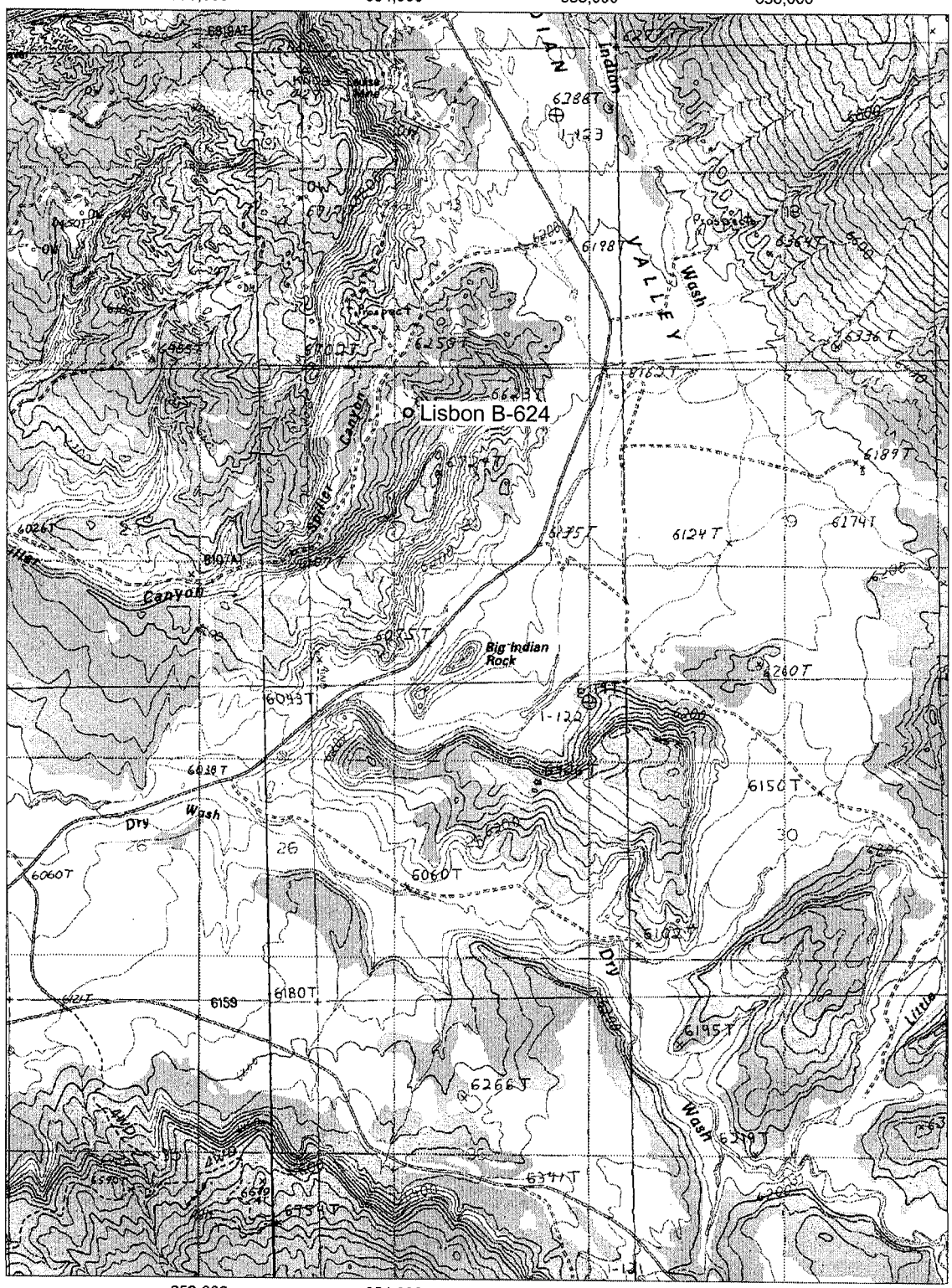
Can't NOTICE this well until it is provided. SF 7/30/02

ATTACHMENT NO. 1

SITE MAP

W 109° 15' 51.551"
N 38° 11' 13.777"

W 109° 12' 33.179"
N 38° 11' 10.797"



N 38° 7' 45.004"
W 109° 15' 56.499"

N 38° 7' 42.031"
W 109° 12' 38.284"

0 ¼ ½ 1 M
0 1000 2000 3000 5000 F
0 0.5 1 Kilometer

Lisbon B-624
710' FNL, 1666' FWL,
Sec. 24, T30S, R24E,
San Juan County, Utah

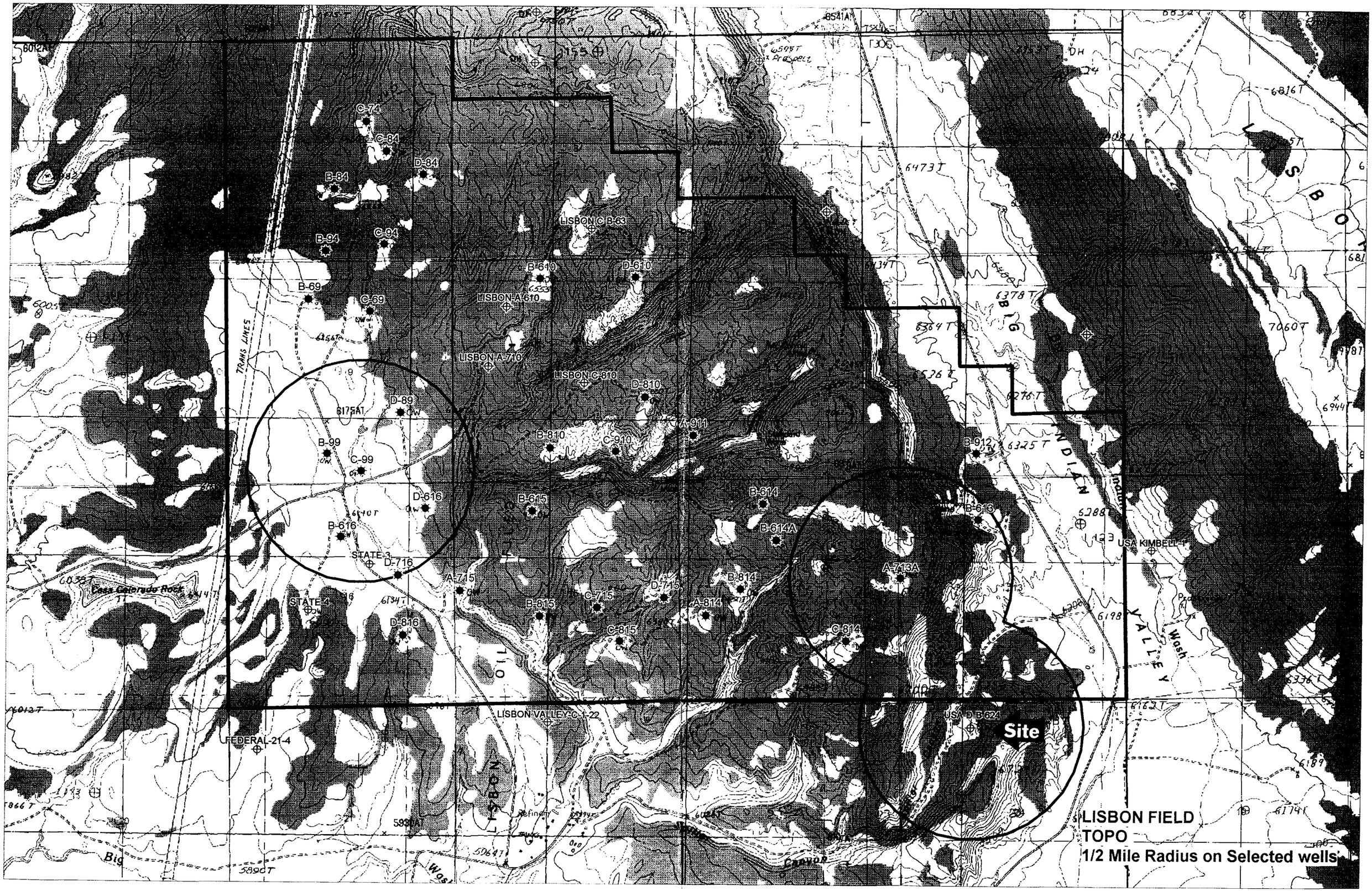
1927 North American Datum; UTM grid zone 12
Generated by BigTopoPro (www.igage.com)
Map compiled from USGS Quads: Sandstone Draw; UT Lisbon Valley; UT

BigTopo Map

'Lisbon B624.it3'; Scale: 1" = 0.351Mi 565Mt 1,855Ft, 1 Mi = 2.846" , 1 cm = 223Mt

ATTACHMENT NO. 2

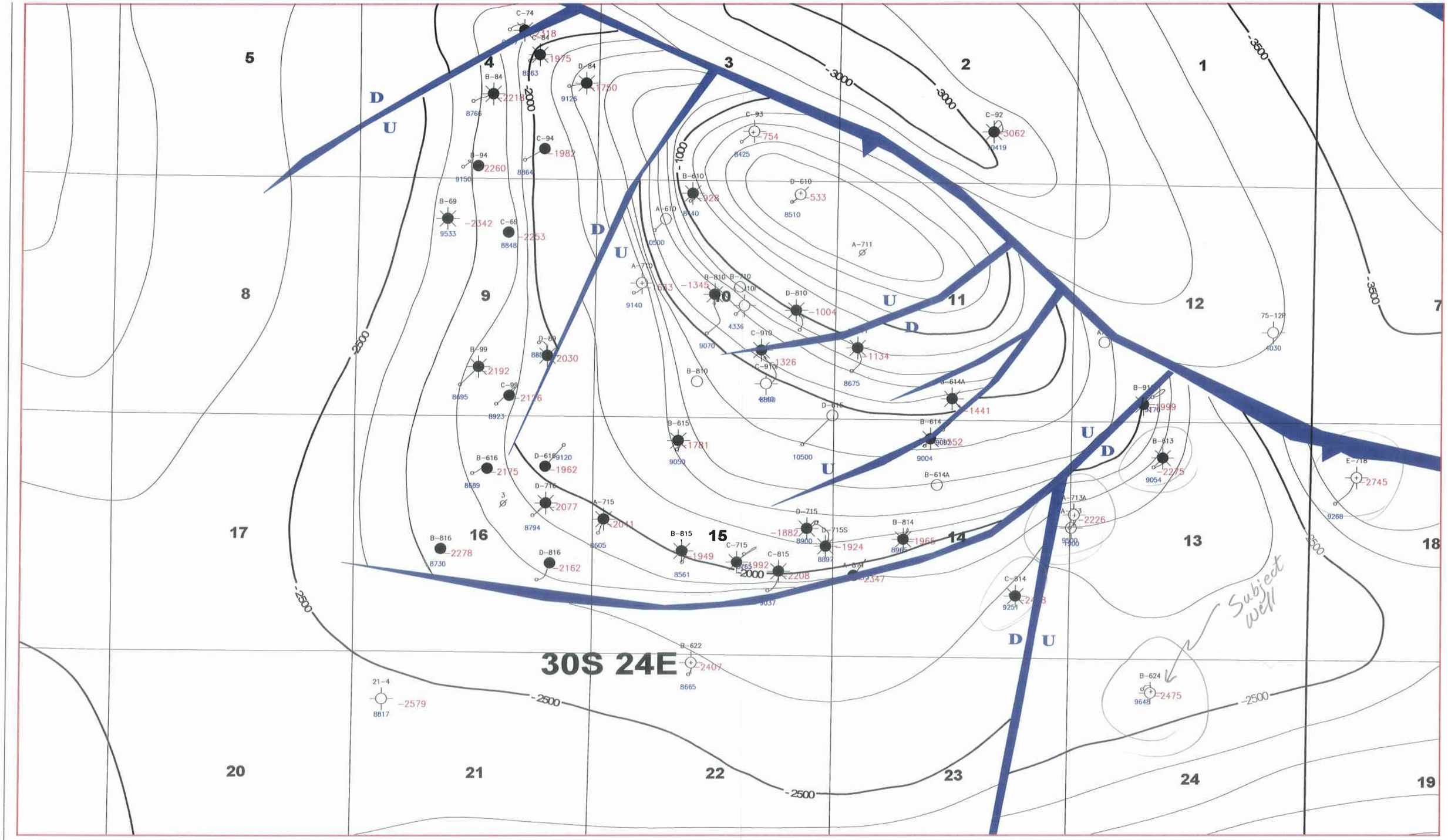
MAP OF
ADJACENT WELLS



C-74
C-84
D-84
B-84
B-94
C-94
B-69
C-69
LISBON C-B-63
B-610
D-610
LISBON-A-610
LISBON-A-710
LISBON-C-810
D-810
D-89
B-99
C-99
B-810
C-910
A-911
B-912
D-616
B-615
B-614
B-614A
B-613
B-616
STATE-3
D-716
A-715
A-713A
USA KIMBELL-1
STATE-4
B-815
C-715
D-715
B-814
A-814
D-816
C-815
C-814
LISBON VALLEY-C-1-22
USA-D-B-624
Site
FEDERAL-21-4
TRANS LINES
Casa Colorado Rock
LISBON
BIG INDIAN VALLEY
Wash
Canyon
Big
LISBON FIELD
TOPO
1/2 Mile Radius on Selected wells

ATTACHMENT NO. 3

CROSS-SECTION, STRUCTURE MAP, COMPLETION DATA



TOM BROWN INC.

Lisbon Field
San Juan County, Utah
Structure top of Miss. Leadville

Mullen/Miller	Scale 1:24000	Sept. 10, 1980
CI = 100 ft	Lisbon4	Basemap.gif

B-624
OFFSET WELL COMPLETION DATA
REVISED:

	SURFACE CASING				PRODUCTION CASING			
WELL	SIZE	DEPTH	CEMENT AMOUNT	CEMENT TOP	SIZE	DEPTH	CEMENT AMOUNT	ESTIMATED CEMENT TOP
B-624	133/8", 48#	1000'	800 sx	Circ to surface	51/2", 15.5# 17#, 20#	9232'	5450 cu.ft. 3 stgs	circ to surface in stage 3

no cement grade specified.

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Date: 6/6/2002
Time: 9:12 AM

PI/Dwights PLUS on CD Scout Ticket

Lisbon
B-624 SWD
old

1 USA-D

State: UTAH
County: SAN JUAN
Operator: PURE OIL CO THE
API: 43037165160000 IC:
Initial Class: WO
Target Objective:
Final Well Class: WO
Status: D&A-O
Field: LISBON
Permit: on MAY 09, 1960
First Report Date: SEP 15, 1972
Projected TD: 9300 Formation: DEVONIAN
Hole Direction: VERTICAL

Location

Section, Twp., Range: 24 30 S 24 E
Spot Code: NE NW
Footage NS, EW: 710 FNL 1666 FWL
Surface remark:
Principal Meridian: SALT LAKE

Lat/Long: 38.1687700 / -109.2415100 US
PBHL: Sec
PHBL remark:
PHBL: From Surface: TVD:
ABHL: Sec
ABHL remark:
ABHL: From Surface: TVD:

Dates and Depths

Spud: MAY 19, 1960 Spud Date Code:
TD: on
LTD: 9648
PlugBack Depth:
Completed: JUL 20, 1960
Formation @ TD: 159CMBR Name: CAMBRIAN
Ref. Elevation: 6317 DF
KB. Elevation:
Ground Elevation: 6304 GR
Contractor: LOFFLAND BROTHERS
Rig Release Date: Rig #

DST # 001

Show: Formation: PARADOX /SH/
Interval: 3600 - 3710 BHT
Choke: Top: Bottom:
Recovery: 1 60 FT MXW Rec Method: PIPE
Recovery: 2 420 FT XW Rec Method: PIPE
Pressures and Times:

Hydro Init	Hydro Final	Init Flow Init	Init Flow Final	Final Flow Init	Final Flow Final	Shut-in Init	Shut-in Final	Open Time Init	Open Time Final	Shut-in Time Init	Shut-in Time Final
1840	1840	100	210			875	775	60		30	30

DST # 002

Show: S Formation: MISSISSIPPIAN

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[/Dwights PLUS on CD Scout Ticket

Interval: 8862 - 8988 BHT
Choke: Top: Bottom:
Recovery: 1 390 FT GCM Rec Method: PIPE

Pressures and Times:

Hydro Init	Hydro Final	Init Flow Init	Init Flow Final	Final Flow Init	Final Flow Final	Shut-in Init	Shut-in Final	Open Time Init	Open Time Final	Shut-in Time Init	Shut-in Time Final
	4270	305	432			3000	3000	60		30	30

ST # 003

Show: Formation: MISSISSIPPIAN
Interval: 8987 - 9027 BHT
Choke: Top: Bottom:
Recovery: 1 100 FT M Rec Method: PIPE
Recovery: 2 2825 FT XW Rec Method: PIPE

Pressures and Times:

Hydro Init	Hydro Final	Init Flow Init	Init Flow Final	Final Flow Init	Final Flow Final	Shut-in Init	Shut-in Final	Open Time Init	Open Time Final	Shut-in Time Init	Shut-in Time Final
4710	4635	205	1265			3065	2965	90		30	30

DST # 004

Show: S Formation: MC CRACKEN
Overlapping Formation: CAMBRIAN
Interval: 9502 - 9648 BHT 190
Choke: Top: Bottom:
Recovery: 1 1000 FT W Rec Method: PIPE
Recovery: 2 500 FT GCM Rec Method: PIPE
Recovery: 3 700 FT GCMXW Rec Method: PIPE
Cushion: 1000 WTR

Pressures and Times:

Hydro Init	Hydro Final	Init Flow Init	Init Flow Final	Final Flow Init	Final Flow Final	Shut-in Init	Shut-in Final	Open Time Init	Open Time Final	Shut-in Time Init	Shut-in Time Final
4945	4945	1020	1410			1010	3037	60		30	30

Core Id: 001

Formation: 359MSSP MISSISSIPPIAN
Interval: 8934 - 8988 Rec: 54 FT
Core Type: CONV Show Type:
Description: 34 LM, DARK GREY, FINE CRYS, CRINOIDAL, LITTLE BLACK RESIDUE THROUGH OUT, GOOD ODOR ON FRESH BREAK, SMALL VUGGY PORO, SLI BLEEDING FILTRATE FROM 8937-53, 8955 -60. 6 LS, BLACK FINE CRYS, SUCROSIC, BLACK RESIDUE THROUGHOUT, FEW CRINOIDAL STEMS. 14 SD LIGHT GRAY, DEN, CRINOIDAL.

Core Id: 002

Formation: 359MSSP MISSISSIPPIAN
Interval: 8988 - 9026 Rec: 38 FT
Core Type: CONV Show Type:
Description: 20 LM, LIGHT GREY, FINE CRYS, DEN, CRINOIDAL, LITTLE BLACK RESIDUE. 1 DOLO, LIGHT GRAY, VERY FINE CRYS. VERY GOOD TO EXCELLENT SMALL VUGGY PORO. LOOKS FLUSHED SLI BLEEDING FILTRATE. 14 LS, LIGHT GRAY, FINE CRY DEN, CRINOIDAL. LITTLE BLACK RESIDUE. 1 DOLO, GRAY, FINE CRYS, GOOD VUGGY PORO. TRACE OF

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PI/Dwights PLUS on CD Scout Ticket

BLACK ASPHALTIC RESIDUE ON PART OF PORO. LOOKS FLUSHED. 2 LS, GRAY, FINE CRYS, POOR VUGGY PORO. SOME BLACK RESIDUE. LOOKS FLUSHED.

Core Id: 003

Formation: 359MSSP MISSISSIPPIAN
Interval: 9026 - 9027 Rec: 1 FT
Core Type: Show Type:
Description: 1 CHERT, LIGHT-DARK GREY BRECCIA, VERY HARD AND DEN, TRACE PPP, TRACE OF FOSS AND TRACE OF BLACK SHALE.

Core Id: 004

Formation: 359MSSP MISSISSIPPIAN
Interval: 9027 - 9053 Rec: 26 FT
Core Type: CONV Show Type:
Description: 4 DOLO, LIGHT-DARK GREY FINE CRYS, DEN. 8 DOLO, DARK GRAY FINE CRYS, DEN, TRACE PPP, STRINGERS OF CHERT 12 DOLO, GRAY, FINE CRYS, DEN, HARD, TRACE PPP. TRACE CHERT. 1 CHERT, LIGHT-DARK GRAY, BRECCIATED. 1 DOLO, LIGHT BROWN, FINE CRYS, HARD, DEN, TRACE OF CHERT INCLUSIONS.

Core Id: 005

Formation: 306MCCK MC CRACKEN
Interval: 9537 - 9588 Rec: 51 FT
Core Type: CONV Show Type: BLDO
Description: 20 SS, LIGHT GREY, FINE GRAIN, TIGHT, QUARTZITIC 3 DOLO LIGHT TAN, FINE CRYS, SANDY. 15 SD, LIGHT TAN, VERY FINE GRAIN W/FEW MED GRAINS, QUARTZITIC SLI BLEEDING OF LIGHT GREEN OIL FROM 9562-63. 2 DOLO, GRAY, FINE CRYS, DEN. 2 SH, DARK BROWN MICA. 5 SD, LIGHT-DARK GRAY MOTTLED, FINE GRAIN, SHY IN PART. DOLO, HARD, DEN. 3 DOLO DARK GRAY-BROWN, FINE CRYS, GLAU. 1 SD, LIGHT GRAY, FINE CRYS.

Core Id: 006

Formation: 159CMBR CAMBRIAN
Interval: 9588 - 9648 Rec: 60 FT
Core Type: CONV Show Type:
Description: 6 DOLO, DARK BROWN BLACK, FINE CRYS, DENSE, PYRITIC AND GLAUCONITIC. 27 DOLO, DARK GREY TO TAN, FINE CRYS, GLAUCONITIC W/BLACK MICA SH. 27 DOLO, LIGHT TAN, FINE CRYS, DENSE, CALC.

Casing, Liner, Tubing

Casing	20 IN	@	14	w/	8	sx
Casing	13 3/8 IN	@	1000	w/	800	sx

Formations and Logs

Top Formation	Measured Depth	Top TVD	Base Depth	Base TVD	Source	Lith-ology	Age code
HERMOSA	1732				LOG		409
PARADOX /SH/	3389				LOG		409

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Date: 6/6/2002
Time: 9:12 AM

PI/Dwights PLUS on CD Scout Ticket

ormations and Logs

PARADOX /SH/	3640	LOG	409
SALT	3732	LOG	000
MISSISSIPPIAN	8807	LOG	359
OURAY LM	9236	LOG	306
ELBERT	9318	LOG	306
MC CRACKEN	9502	LOG	306
CAMBRIAN	9587	LOG	159

Dwights Energydata Narrative

Accumulated through 1997

IP: 8384-8524 SALT WATER DISPOSAL WELL

Dwights number: R8428310

Operator Address

Street or PO Box:

City:

State, Zip: ,

Country:

Phone: Fax:

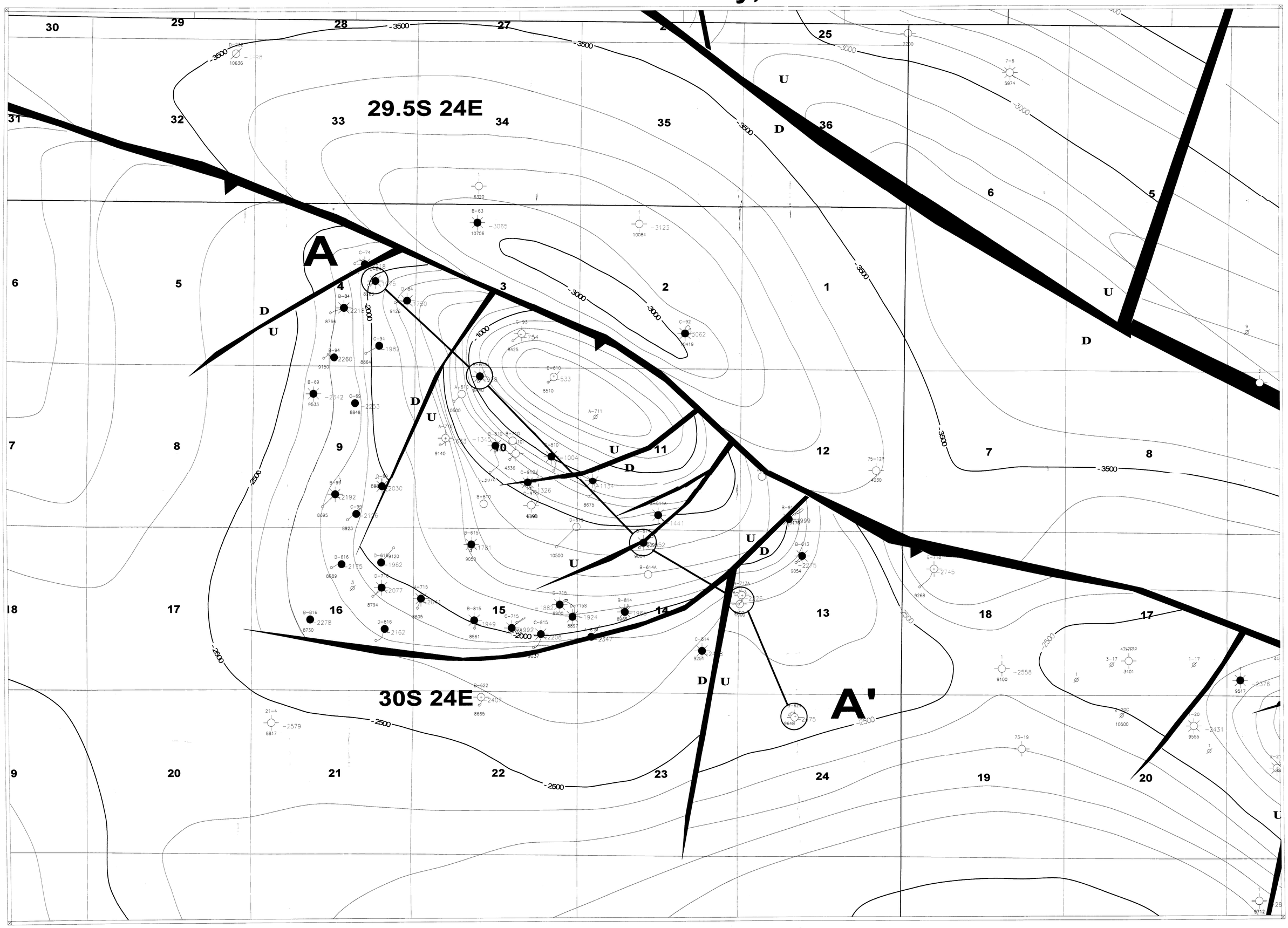
E-Mail:

Agent Name: Agent Code:

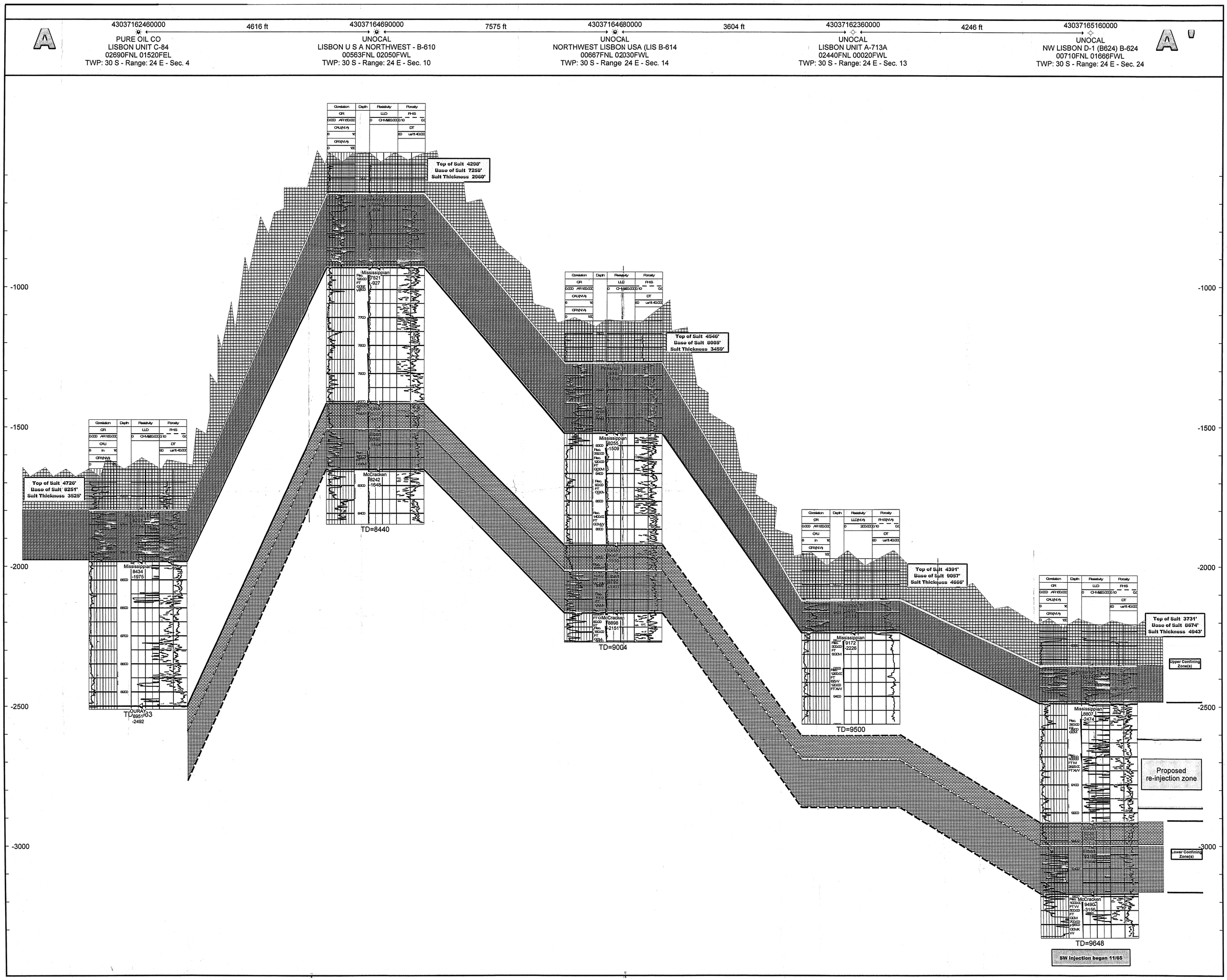
Agent Remark:

Lisbon Field

San Juan County, Utah



Structure top of Mississippian


A
43037162460000
PURE OIL CO
LISBON UNIT C-84
02690FNL 01520FEL
TWP: 30 S - Range: 24 E - Sec. 4
4616 ft
43037164690000
UNOCAL
LISBON U S A NORTHWEST - B-610
00563FNL 02050FWL
TWP: 30 S - Range: 24 E - Sec. 10
7575 ft
43037164680000
UNOCAL
NORTHWEST LISBON USA (LIS B-614
00667FNL 02030FWL
TWP: 30 S - Range 24 E - Sec. 14
3604 ft
43037162360000
UNOCAL
LISBON UNIT A-713A
02440FNL 00020FWL
TWP: 30 S - Range: 24 E - Sec. 13
4246 ft
43037165160000
UNOCAL
NW LISBON D-1 (B624) B-624
00710FNL 01666FWL
TWP: 30 S - Range: 24 E - Sec. 24
A'
-1000
-1500
-2000
-2500
-3000
Top of Salt 4298'
Base of Salt 7258'
Salt Thickness 2960'
Top of Salt 4546'
Base of Salt 8005'
Salt Thickness 3459'
Top of Salt 4726'
Base of Salt 8251'
Salt Thickness 3525'
Top of Salt 4391'
Base of Salt 9057'
Salt Thickness 4666'
Top of Salt 3731'
Base of Salt 8674'
Salt Thickness 4943'
Mississippian
McCracken
TD=8440
TD=9004
TD=9500
TD=9648
Upper Confining Zone(s)
Proposed re-injection zone
Lower Confining Zone(s)
SW Injection began 11/65

ATTACHMENT NO. 4

OPEN HOLE LOG

This Open Hole Log (Sonic Log) can be viewed by going to our web site
www.ogm.utah.gov
Go to the
Oil & Gas Program
Well Data Search
Enter the Oil and Gas Information System
Using the bar on the top of the screen
Click on
    Well Logs
    Search Well Logs
Click on Use Comma for Multiples and type
  4303716516
Click on Submit
Click on View or Download

vld 01-18-2007

ATTACHMENT NO. 5

PROPOSED COMPLETION AND WELLBORE DIAGRAM

Completion Procedures for the B-624 SWD Well

1. MIRU coiled tubing unit.
2. Clean out fill through 3-1/2" tubing from 9000' to 9200'.
3. RD CT unit.
4. Pressure test backside to 1000 psi for 30 minutes.
5. RU WL. Set profile plug at bottom of 3-1/2" tubing.
6. Pressure test tubing to 1000 psi for 30 minutes.
7. Pull tubing profile plug.
8. Run tubing inspection log.
9. Put well on gas re-injection

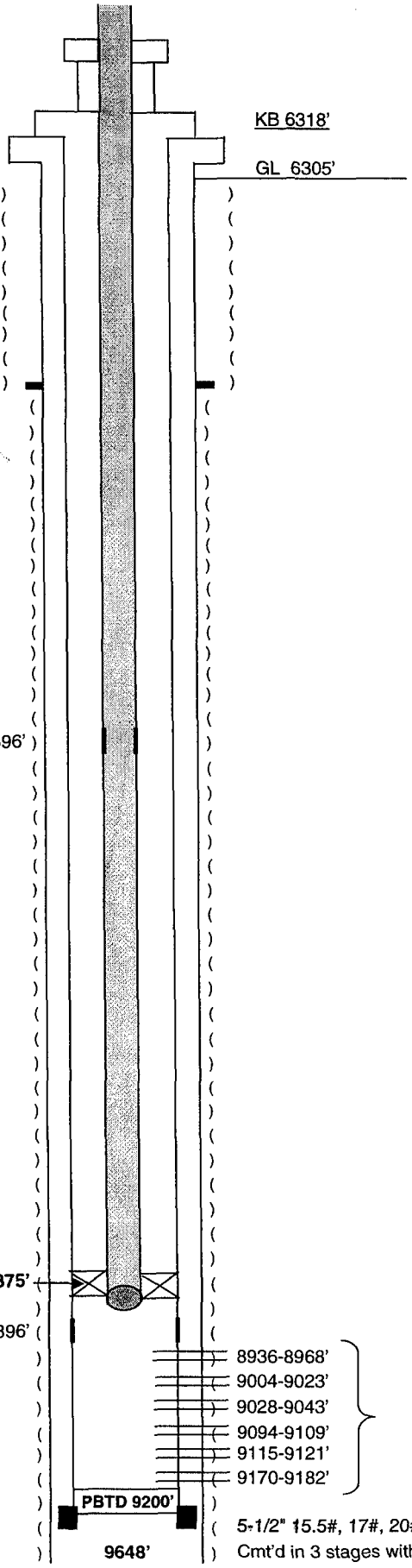
WELLBORE DIAGRAM

Operator:	Tom Brown, Inc.
Well Name:	Lisbon B-624
Lease Number:	UTSL 070034
Location:	NENW Sec. 24-T30S-R24E
Field:	Lisbon - Mississippian
County, State:	San Juan County, UT
API Number:	43-037-16516
Diagram Date:	04/29/2002

710' FNL & 1666' FWL

FORMATIONS

[redacted]	1732'
Paradox "A"	3389'
Paradox "B"	3640'
Salt	3732'
Base Salt	8673'
Molas	8770'
Mississippian	8807'
Ouray	9236'
Elbert	9318'
McCracken	9502'
Cambrian	9585'



Well History

Spud Date: 5/19/1960
TD Reached: 7/18/1960
Completion Date: 7/20/1960 (P&A'd)

(Cut 6 cores and ran 4 DST's before P&A.)

Recompleted as SW Injection: 11/9/1965

First SW Injection: 11/9/1965, AIR 85.5 BPH @ 175# inj pressure at pump.

Tubing Detail:	**Depth:**
KB	13'
1 jt 3-1/2" 9.3# J-55 AB Mod tbg	28.54'
3-1/2" tbg sub	7.90'
314 jts 3-1/2" 9.3# J-55 AB Mod IJ 355 tbg	8,828.06'
3-1/2" IJ x 2-7/8" 8rd X-over	.80'
2-3/8" x 2-7/8" locator sub	.70'
Bak Loc Seal Assy 2.688 x 1.927	4.52'
PACKER DEPTH	**8875'**
EOT	**8876.52'**

Perforated 07/1965: 4 SPF
Acidized in 4 stages w/ ttl 10,000 gals 15% HCl acid.
Acidized 9/11/1968 w/5000 gals 15% HCl acid dn tbg.

5-1/2" 15.5#, 17#, 20# N-80 LT&C csg set @ 9232'.
Cmt'd in 3 stages with 5450 cu ft.

No cement grade specified.

ATTACHMENT NO. 6

WATER ANALYSIS

Analytical Laboratory Report for:

Tom Brown

BJ Unichem Chemical Services

UNICHEM Representative: Clyde Willis

Production Water Analysis

Listed below please find water analysis report from: Lisbon Unit, B-624 . water injected into SWDW B-624

Lab Test No;	2002125772	Sample Date:	07/03/2002
Specific Gravity:	1.051		
TDS:	76671		
pH:	6.29		

Cations:	mg/L	as:
Calcium	5740	(Ca^{++})
Magnesium	682	(Mg^{++})
Sodium	22964	(Na^{+})
Iron	4.80	(Fe^{++})
Barium	16.20	(Ba^{++})
Strontium	257.00	(Sr^{++})
Manganese	5.20	(Mn^{++})
Anions:	**mg/L**	**as:**
Bicarbonate	1452	(HCO_3^{-})
Sulfate	1050	($SO_4^{=}$)
Chloride	44500	(Cl^{-})
Gases:		
Carbon Dioxide	229	(CO_2)
Hydrogen Sulfide	97	(H_2S)

Tom Brown Lab Test No: 2002125772

BJ Unichem Chemical Services

DownHole SAT™ Scale Prediction @ 90 deg. F

Mineral Scale	Saturation Index	Momentary Excess (lbs/1000 bbls)
Calcite ($CaCO_3$)	6.27	.122
Aragonite ($CaCO_3$)	5.35	.118
Witherite ($BaCO_3$)	.00434	-19.23
Strontianite ($SrCO_3$)	.484	-.228
Magnesite ($MgCO_3$)	.806	-.0294
Anhydrite ($CaSO_4$)	1.01	.972
Gypsum ($CaSO_4 \cdot 2H_2O$)	1.28	65.58
Barite ($BaSO_4$)	47.25	9.38
Celestite ($SrSO_4$)	.59	-68.76
Silica (SiO_2)	0	-44.74
Brucite ($Mg(OH)_2$)	< 0.001	-.494
Magnesium silicate	0	-114.13
Iron hydroxide ($Fe(OH)_3$)	< 0.001	< 0.001
Strengite ($FePO_4 \cdot 2H_2O$)	0	>-0.001
Siderite ($FeCO_3$)	7.31	.144
Halite (NaCl)	.0139	-168331
Thenardite (Na_2SO_4)	< 0.001	-75391
Iron sulfide (FeS)	13.4	2.57

Interpretation of DHSat Results:

The Saturation Index is calculated for each mineral species independently and is a measure of the degree of supersaturation (driving force for precipitation) under the conditions modeled. This value ranges from 0 to infinity with 1.0 representing a condition of equilibrium where scale will neither dissolve nor precipitate. Values less than 1.0 are undersaturated and values greater than 1.0 are supersaturated. The scale is logarithmic, i.e. a Saturation Index of 3 is 10 times more saturated than a value of 2.

The Momentary excess is a measure of how much scale would have to precipitate to bring the system back to a non-scaling condition. This value ranges from negative (dissolving) infinity to positive (precipitating) infinity. The Momentary Excess represents the amount of scale possible while the Saturation Level represents the probability that scale will form.

Analytical Laboratory Report for:

Tom Brown

BJ Unichem Chemical Services

UNICHEM Representative: Clyde Willis

Production Water Analysis

Listed below please find water analysis report from: Lisbon Unit, B-912

water produced from Mississippian Reservoir

Lab Test No:	2002125773	Sample Date:	07/03/2002
Specific Gravity:	1.072		
TDS:	110032		
pH:	6.13		

Cations:	mg/L	as:
Calcium	4165	(Ca^{++})
Magnesium	871	(Mg^{++})
Sodium	37473	(Na^{+})
Iron	3.10	(Fe^{++})
Barium	0.70	(Ba^{++})
Strontium	117.00	(Sr^{++})
Manganese	0.39	(Mn^{--})
Anions:	**mg/L**	**as:**
Bicarbonate	952	(HCO_3^{-})
Sulfate	1650	($SO_4^{=}$)
Chloride	64800	(Cl^{-})
Gases:		
Carbon Dioxide	185	(CO_2)
Hydrogen Sulfide	202	(H_2S)

Tom Brown

Lab Test No: 2002125773

BJ Unichem Chemical Services

DownHole SAT™ Scale Prediction @ 90 deg. F

Mineral Scale	Saturation Index	Momentary Excess (lbs/1000 bbls)
Calcite (CaCO3)	2.06	.0919
Aragonite (CaCO3)	1.76	.0267
Witherite (BaCO3)	< 0.001	-24.81
Strontianite (SrCO3)	.0802	-1.03
Magnesite (MgCO3)	.487	-.0551
Anhydrite (CaSO4)	1.16	44.45
Gypsum (CaSO4*2H2O)	1.41	138.68
Barite (BaSO4)	2.62	.256
Celestite (SrSO4)	.345	-113.37
Silica (SIO2)	0	-42.21
Brucite (Mg(OH)2)	< 0.001	-.411
Magnesium silicate	0	-111.8
Iron hydroxide (Fe(OH)3)	< 0.001	< 0.001
Strengite (FePO4*2H2O)	0	>-0.001
Siderite (FeCO3)	1.75	.0302
Halite (NaCl)	.0349	-149771
Thenardite (Na2SO4)	< 0.001	-79346
Iron sulfide (FeS)	8.03	1.64

Interpretation of DHSat Results:
The Saturation Index is calculated for each mineral species independently and is a measure of the degree of supersaturation (driving force for precipitation) under the conditions modeled. This value ranges from 0 to infinity with 1.0 representing a condition of equilibrium where scale will neither dissolve nor precipitate. Values less than 1.0 are undersaturated and values greater than 1.0 are supersaturated. The scale is logarithmic, i.e. a Saturation Index of 3 is 10 times more saturated than a value of 2.
The Momentary excess is a measure of how much scale would have to precipitate to bring the system back to a non-scaling condition. This value ranges from negative (dissolving) infinity to positive (precipitating) infinity. The Momentary Excess represents the amount of scale possible while the Saturation Level represents the probability that scale will form.

DownHole SAT(tm)
MIXED WATER DEPOSITION POTENTIAL INDICATORS

1) TB B-624 (50%) 2) TB B-912 (50%)

Report Date: 07-08-2002

SATURATION LEVEL		MOMENTARY EXCESS (Lbs/1000 Barrels)	
Calcite (CaCO3)	3.73	Calcite (CaCO3)	0.0630
Aragonite (CaCO3)	3.18	Aragonite (CaCO3)	0.0590
Witherite (BaCO3)	0.00135	Witherite (BaCO3)	-20.97
Strontianite (SrCO3)	0.210	Strontianite (SrCO3)	-0.477
Magnesite (MgCO3)	0.654	Magnesite (MgCO3)	-0.0384
Anhydrite (CaSO4)	1.22	Anhydrite (CaSO4)	45.56
Gypsum (CaSO4*2H2O)	1.50	Gypsum (CaSO4*2H2O)	119.13
Barite (BaSO4)	29.88	Barite (BaSO4)	4.83
Celestite (SrSO4)	0.520	Celestite (SrSO4)	-78.84
Silica (SiO2)	0.00	Silica (SiO2)	-40.47
Brucite (Mg(OH)2)	< 0.001	Brucite (Mg(OH)2)	-0.407
Magnesium silicate	0.00	Magnesium silicate	-105.89
Iron hydroxide (Fe(OH)3)	< 0.001	Iron hydroxide (Fe(OH)3)	< 0.001
Strengite (FePO4*2H2O)	0.00	Strengite (FePO4*2H2O)	>-0.001
Siderite (FeCO3)	3.63	Siderite (FeCO3)	0.0715
Halite (NaCl)	0.0263	Halite (NaCl)	-146838
Thenardite (Na2SO4)	< 0.001	Thenardite (Na2SO4)	-73629
Iron sulfide (FeS)	9.47	Iron sulfide (FeS)	2.10

SIMPLE INDICES	
Langelier	0.981
Ryznar	4.18
Puckorius	0.931
Larson-Skold Index	84.26
Stiff Davis Index	0.346
Oddo-Tomson	-0.0394

OPERATING CONDITIONS	
Temperature (°F)	90.00
Time(secs)	1.00

UNICHEM - Midland Analytical Laboratory
P.O. Box 61427, Midland, Texas 79711

DownHole SAT(tm)
MIXED WATER DEPOSITION POTENTIAL INDICATORS

1) TB B-624 (75%) 2) TB B-912 (25%)

Report Date: 07-08-2002

SATURATION LEVEL		MOMENTARY EXCESS (Lbs/1000 Barrels)	
Calcite (CaCO3)	4.86	Calcite (CaCO3)	0.0849
Aragonite (CaCO3)	4.14	Aragonite (CaCO3)	0.0811
Witherite (BaCO3)	0.00252	Witherite (BaCO3)	-19.70
Strontianite (SrCO3)	0.319	Strontianite (SrCO3)	-0.335
Magnesite (MgCO3)	0.732	Magnesite (MgCO3)	-0.0329
Anhydrite (CaSO4)	1.15	Anhydrite (CaSO4)	30.42
Gypsum (CaSO4*2H2O)	1.44	Gypsum (CaSO4*2H2O)	97.69
Barite (BaSO4)	40.70	Barite (BaSO4)	7.12
Celestite (SrSO4)	0.577	Celestite (SrSO4)	-69.07
Silica (SiO2)	0.00	Silica (SiO2)	-41.35
Brucite (Mg(OH)2)	< 0.001	Brucite (Mg(OH)2)	-0.431
Magnesium silicate	0.00	Magnesium silicate	-107.11
Iron hydroxide (Fe(OH)3)	< 0.001	Iron hydroxide (Fe(OH)3)	< 0.001
Strengite (FePO4*2H2O)	0.00	Strengite (FePO4*2H2O)	>-0.001
Siderite (FeCO3)	5.14	Siderite (FeCO3)	0.0988
Halite (NaCl)	0.0204	Halite (NaCl)	-152565
Thenardite (Na2SO4)	< 0.001	Thenardite (Na2SO4)	-72991
Iron sulfide (FeS)	10.76	Iron sulfide (FeS)	2.33

SIMPLE INDICES	
Langelier	1.09
Ryznar	4.01
Puckorius	0.743
Larson-Skold Index	68.40
Stiff Davis Index	0.450
Oddo-Tomson	0.0959

OPERATING CONDITIONS	
Temperature (°F)	90.00
Time(secs)	1.00

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DownHole SAT(tm)
MIXED WATER DEPOSITION POTENTIAL INDICATORS

1) TB B-624 (25%) 2) TB B-912 (75%)

Report Date: 07-08-2002

SATURATION LEVEL		MOMENTARY EXCESS (Lbs/1000 Barrels)	
Calcite (CaCO3)	2.74	Calcite (CaCO3)	0.0424
Aragonite (CaCO3)	2.34	Aragonite (CaCO3)	0.0382
Witherite (BaCO3)	< 0.001	Witherite (BaCO3)	-22.23
Strontianite (SrCO3)	0.128	Strontianite (SrCO3)	-0.664
Magnesite (MgCO3)	0.562	Magnesite (MgCO3)	-0.0438
Anhydrite (CaSO4)	1.26	Anhydrite (CaSO4)	58.69
Gypsum (CaSO4*2H2O)	1.54	Gypsum (CaSO4*2H2O)	138.60
Barite (BaSO4)	17.15	Barite (BaSO4)	2.55
Celestite (SrSO4)	0.448	Celestite (SrSO4)	-90.86
Silica (SiO2)	0.00	Silica (SiO2)	-39.59
Brucite (Mg(OH)2)	< 0.001	Brucite (Mg(OH)2)	-0.384
Magnesium silicate	0.00	Magnesium silicate	-104.56
Iron hydroxide (Fe(OH)3)	< 0.001	Iron hydroxide (Fe(OH)3)	< 0.001
Strengite (FePO4*2H2O)	0.00	Strengite (FePO4*2H2O)	>-0.001
Siderite (FeCO3)	2.45	Siderite (FeCO3)	0.0451
Halite (NaCl)	0.0332	Halite (NaCl)	-140979
Thenardite (Na2SO4)	< 0.001	Thenardite (Na2SO4)	-74160
Iron sulfide (FeS)	7.68	Iron sulfide (FeS)	1.87

SIMPLE INDICES	
Langelier	0.856
Ryznar	4.37
Puckorius	1.14
Larson-Skold Index	104.33
Stiff Davis Index	0.236
Oddo-Tomson	-0.188

OPERATING CONDITIONS	
Temperature (°F)	90.00
Time(secs)	1.00

UNICHEM - Midland Analytical Laboratory
P.O. Box 61427, Midland, Texas 79711

DownHole SAT(tm)
MIXED WATER DEPOSITION POTENTIAL INDICATORS

1) TB B-624 (25%) 2) TB B-912 (75%)

Report Date: 07-08-2002

SATURATION LEVEL		MOMENTARY EXCESS (Lbs/1000 Barrels)	
Calcite (CaCO3)	3.58	Calcite (CaCO3)	0.0430
Aragonite (CaCO3)	2.90	Aragonite (CaCO3)	0.0390
Witherite (BaCO3)	< 0.001	Witherite (BaCO3)	-23.15
Strontianite (SrCO3)	0.0472	Strontianite (SrCO3)	-1.74
Magnesite (MgCO3)	1.30	Magnesite (MgCO3)	0.0114
Anhydrite (CaSO4)	1.77	Anhydrite (CaSO4)	106.48
Gypsum (CaSO4*2H2O)	0.847	Gypsum (CaSO4*2H2O)	-10.19
Barite (BaSO4)	2.48	Barite (BaSO4)	1.61
Celestite (SrSO4)	0.343	Celestite (SrSO4)	-125.36
Silica (SiO2)	0.00	Silica (SiO2)	-110.84
Brucite (Mg(OH)2)	< 0.001	Brucite (Mg(OH)2)	-0.518
Magnesium silicate	0.00	Magnesium silicate	-165.09
Iron hydroxide (Fe(OH)3)	< 0.001	Iron hydroxide (Fe(OH)3)	< 0.001
Strengite (FePO4*2H2O)	0.00	Strengite (FePO4*2H2O)	>-0.001
Siderite (FeCO3)	5.51	Siderite (FeCO3)	0.0562
Halite (NaCl)	0.0241	Halite (NaCl)	-171107
Thenardite (Na2SO4)	< 0.001	Thenardite (Na2SO4)	-78151
Iron sulfide (FeS)	10.07	Iron sulfide (FeS)	1.88

SIMPLE INDICES	
Langelier	1.35
Ryznar	3.38
Puckorius	0.145
Larson-Skold Index	103.85
Stiff Davis Index	1.79
Oddo-Tomson	0.726

OPERATING CONDITIONS	
Temperature (°F)	180.00
Time(secs)	1.00

UNICHEM - Midland Analytical Laboratory
P.O. Box 61427, Midland, Texas 79711

DownHole SAT(tm)
MIXED WATER DEPOSITION POTENTIAL INDICATORS

1) TB B-624 (75%) 2) TB B-912 (25%)

Report Date: 07-08-2002

SATURATION LEVEL		MOMENTARY EXCESS (Lbs/1000 Barrels)	
Calcite (CaCO3)	6.36	Calcite (CaCO3)	0.0808
Aragonite (CaCO3)	5.14	Aragonite (CaCO3)	0.0772
Witherite (BaCO3)	0.00211	Witherite (BaCO3)	-20.49
Strontianite (SrCO3)	0.119	Strontianite (SrCO3)	-1.04
Magnesite (MgCO3)	1.69	Magnesite (MgCO3)	0.0328
Anhydrite (CaSO4)	1.66	Anhydrite (CaSO4)	80.03
Gypsum (CaSO4*2H2O)	0.813	Gypsum (CaSO4*2H2O)	-24.30
Barite (BaSO4)	6.07	Barite (BaSO4)	6.07
Celestite (SrSO4)	0.456	Celestite (SrSO4)	-99.57
Silica (SiO2)	0.00	Silica (SiO2)	-115.78
Brucite (Mg(OH)2)	< 0.001	Brucite (Mg(OH)2)	-0.582
Magnesium silicate	0.00	Magnesium silicate	-168.85
Iron hydroxide (Fe(OH)3)	< 0.001	Iron hydroxide (Fe(OH)3)	< 0.001
Strengite (FePO4*2H2O)	0.00	Strengite (FePO4*2H2O)	>-0.001
Siderite (FeCO3)	11.63	Siderite (FeCO3)	0.101
Halite (NaCl)	0.0149	Halite (NaCl)	-183416
Thenardite (Na2SO4)	< 0.001	Thenardite (Na2SO4)	-76729
Iron sulfide (FeS)	13.48	Iron sulfide (FeS)	2.34

SIMPLE INDICES	
Langelier	1.59
Ryznar	3.01
Puckorius	-0.257
Larson-Skold Index	68.08
Stiff Davis Index	1.99
Oddo-Tomson	1.01

OPERATING CONDITIONS	
Temperature (°F)	180.00
Time(secs)	1.00

UNICHEM - Midland Analytical Laboratory
P.O. Box 61427, Midland, Texas 79711

DownHole SAT(tm)
MIXED WATER DEPOSITION POTENTIAL INDICATORS

1) TB B-624 (50%) 2) TB B-912 (50%)

Report Date: 07-08-2002

SATURATION LEVEL		MOMENTARY EXCESS (Lbs/1000 Barrels)	
Calcite (CaCO3)	4.87	Calcite (CaCO3)	0.0614
Aragonite (CaCO3)	3.94	Aragonite (CaCO3)	0.0576
Witherite (BaCO3)	0.00112	Witherite (BaCO3)	-21.83
Strontianite (SrCO3)	0.0778	Strontianite (SrCO3)	-1.33
Magnesite (MgCO3)	1.51	Magnesite (MgCO3)	0.0219
Anhydrite (CaSO4)	1.73	Anhydrite (CaSO4)	94.27
Gypsum (CaSO4*2H2O)	0.837	Gypsum (CaSO4*2H2O)	-15.89
Barite (BaSO4)	4.38	Barite (BaSO4)	3.85
Celestite (SrSO4)	0.405	Celestite (SrSO4)	-111.49
Silica (SiO2)	0.00	Silica (SiO2)	-113.30
Brucite (Mg(OH)2)	< 0.001	Brucite (Mg(OH)2)	-0.549
Magnesium silicate	0.00	Magnesium silicate	-167.07
Iron hydroxide (Fe(OH)3)	< 0.001	Iron hydroxide (Fe(OH)3)	< 0.001
Strengite (FePO4*2H2O)	0.00	Strengite (FePO4*2H2O)	>-0.001
Siderite (FeCO3)	8.20	Siderite (FeCO3)	0.0781
Halite (NaCl)	0.0192	Halite (NaCl)	-177352
Thenardite (Na2SO4)	< 0.001	Thenardite (Na2SO4)	-77497
Iron sulfide (FeS)	12.10	Iron sulfide (FeS)	2.11

SIMPLE INDICES	
Langelier	1.48
Ryznar	3.18
Puckorius	-0.0670
Larson-Skold Index	83.86
Stiff Davis Index	1.89
Oddo-Tomson	0.875

OPERATING CONDITIONS	
Temperature (°F)	180.00
Time(secs)	1.00

UNICHEM - Midland Analytical Laboratory
P.O. Box 61427, Midland, Texas 79711

ATTACHMENT NO. 7

LIST OF PRODUCING WELLS

WellName	Field	APICode	FOOTAGES	Qtr1	Qtr2
Lisbon B 610 (MC)	Lisbon McCracken	043-037-16469		NE	NW
Lisbon D 610 (MC)	Lisbon McCracken	043-037-30694		NE	NE
Lisbon Fed B 614 A (MC) (P&A)	Lisbon McCracken	043-037-31351			
Egnar Unit 01	Lisbon SE	005-113-05012		SE	NE
Horse Range 01	Lisbon SE	005-113-06016		SE	NW
Horse Range 19-24	Lisbon SE	005-113-06105	590 FEL, 1690 FNL	SE	NE
Lisbon A 713A	Lisbon Unit	043-037-16236			
Lisbon A 715	Lisbon Unit	043-037-16237	125 FWL, 2620 FNL	SE	SW
Lisbon A 814 (P&A)	Lisbon Unit	043-037-16238		NW	SW
Lisbon B 084	Lisbon Unit	043-037-30054	1648 FSL, 2516 FWL	NE	SW
Lisbon B 094	Lisbon Unit	043-037-30695		SE	SW
Lisbon B 610 (MS)	Lisbon Unit	043-037-16469		NE	NW
Lisbon B 613	Lisbon Unit	043-037-16240		NE	NW
Lisbon B 614	Lisbon Unit	043-037-16468		NE	NW
Lisbon B 615	Lisbon Unit	043-037-15123	1840 FEL, 765 FNL	NE	NW
Lisbon B 616	Lisbon Unit	043-037-16242		NE	NW
Lisbon B 810	Lisbon Unit	043-037-31433		NE	SW
Lisbon B 814	Lisbon Unit	043-037-30082		NE	SW
Lisbon B 815	Lisbon Unit	043-037-16243		NE	SW
Lisbon B 912	Lisbon Unit	043-037-15769	1825 FWL, 505 FSL	SE	SW
Lisbon C 069	Lisbon Unit	043-037-16245	1935 FWL, 1288 FNL	NW	NE
Lisbon C 094	Lisbon Unit	043-037-16247		SW	SE
Lisbon C 715	Lisbon Unit	043-037-31074		NE	SW
Lisbon C 910	Lisbon Unit	043-037-31323		SW	SE
Lisbon D 084	Lisbon Unit	043-037-16250		NE	SE
Lisbon D 616	Lisbon Unit	043-037-15049	660 FEL, 660 FNL	NE	NE
Lisbon D 716	Lisbon Unit	043-037-31034	1325 FEL, 2240 FNL	SW	NE
Lisbon D 810	Lisbon Unit	043-037-16471		NE	SE
Lisbon D 89	Lisbon Unit	043-037-16251		NE	SE
Lisbon Fed 02-21 F	Lisbon Unit	043-037-15768		SE	NW
Lisbon Fed A 911	Lisbon Unit	043-037-31014		SW	SW
Lisbon Fed B 614 A (MS)	Lisbon Unit	043-037-31351		NE	NW
Lisbon Fed C 099	Lisbon Unit	043-037-30693	236 FSL, 2154 FEL	SE	SW
McIntyre Canyon 17-21	Lisbon SE	005-113-06080	1176 FWL, 2410 FNL	SW	NW
McIntyre Canyon Unit 01	Lisbon SE	005-113-05017		NE	NW
McIntyre Canyon Unit 06-H-18	Lisbon SE	005-113-06011		SE	NE
McIntyre Canyon Unit 08-34	Lisbon SE	005-113-06106	502 FEL, 970 FNL	NE	NE
Lisbon B 610 R (INJ)	Lisbon Unit				
Lisbon B 614 R (INJ)	Lisbon Unit	043-037-16468		NE	NW
Lisbon B 624 (SWD)	Lisbon Unit	043-037-16516		NE	NW
Lisbon B 810 (MS)	Lisbon Unit	043-037-31433		NE	SW
Lisbon B 816 (SWD)	Lisbon Unit	043-037-16244		NE	SW
Lisbon C 910 I (P&A)	Lisbon Unit	043-037-31805		SW	SE
Lisbon D 610 R (MC-Inj)	Lisbon Unit				
Lisbon D 810 R (INJ)	Lisbon Unit				

Section	Township	Range	County	Status	SpudDate	FirstSalesDate	FORMATION
10	30S	24E	San Juan, Ut	PR		03/11/1961	McCracken
10	30S	24E	San Juan, Ut	PR		10/03/1982	McCracken
14	30S	24E	San Juan, Ut	PA			McCracken
30	44N	19W	San Miguel, Co	SI	09/07/1960	11/26/1960	Mississippian
20	44N	19W	San Miguel, Co	WO	01/18/1975	06/17/1975	Mississippian
19	44N	19W	San Miguel, Co	APD			Mississippian
13	30S	24E	San Juan, Ut	SI		05/14/1964	Mississippian
15	30S	24E	San Juan, Ut	PR	06/08/1965	08/19/1965	Mississippian
14	30S	24E	San Juan, Ut	PA			Mississippian
4	30S	24E	San Juan, Ut	SI	05/08/1971	07/01/1971	Mississippian
4	30S	24E	San Juan, Ut	SI		05/06/1982	Mississippian
10	30S	24E	San Juan, Ut	PR			Mississippian
13	30S	24E	San Juan, Ut	SI		06/06/1961	Mississippian
14	30S	24E	San Juan, Ut	PR			Mississippian
15	30S	24E	San Juan, Ut	PR	09/06/1960	03/07/1961	Mississippian
16	30N	24E	San Juan, Ut	TA		02/06/1963	Mississippian
10	30S	24E	San Juan, Ut	NCA		10/01/1988	Mississippian
14	30S	24E	San Juan, Ut	SI		09/23/1972	Mississippian
15	30S	24E	San Juan, Ut	PA			Mississippian
12	30S	24E	San Juan, Ut	PR	07/09/1960	10/24/1960	Mississippian
9	30S	24E	San Juan, Ut	SI	05/19/1962	07/13/1962	Mississippian
4	30S	24E	San Juan, Ut	WO		01/31/1963	Mississippian
15	30S	24E	San Juan, Ut	PA			Mississippian
10	30S	24E	San Juan, Ut	PR		09/08/1987	Mississippian
4	30S	24E	San Juan, Ut	PR		04/11/1965	Mississippian
16	30S	24E	San Juan, Ut	PR	04/10/1960	10/11/1960	Mississippian
16	30S	24E	San Juan, Ut	PR	08/23/1984	10/24/1984	Mississippian
10	30S	24E	San Juan, Ut	PR			Mississippian
9	30S	24E	San Juan, Ut	PR			Mississippian
21	30S	25E	San Juan, Ut	SI			Mississippian
11	30S	24E	San Juan, Ut	PR		10/18/1984	Mississippian
14	30S	24E	San Juan, Ut	PR			Mississippian
9	30S	24E	San Juan, Ut	PR	10/11/1981	04/07/1982	Mississippian
17	44N	19W	San Miguel, Co	PR	03/16/2001	06/18/2001	Mississippian
5	44N	19W	San Miguel, Co	TA		06/19/1960	Mississippian
18	44N	19W	San Miguel, Co	TA		08/03/1971	Mississippian
8	44N	19W	San Miguel, Co	APD			Mississippian
			San Juan, Ut	SI			
14	30S	24E	San Juan, Ut	SI		05/31/1960	
24	30S	24E	San Juan, Ut	AI		07/20/1960	
10	30S	24E	San Juan, Ut	PR			
16	30S	24E	San Juan, Ut	AI		12/07/1962	
10	30S	24E	San Juan, Ut	PA	06/11/2000		
			San Juan, Ut	SI			
			San Juan, Ut	SI			

ATTACHMENT NO. 8

OWNERSHIP MAP & LIST OF OWNERS

Surface, Royalty and Working Interest

1) WI Ownership within Lisbon Mississippian Unit

TBI - 99.50307% WI

Chester Gordon Trust - 0.49693% WI
600 17th Street, Suite #1800 North
Denver, CO 80202
Attn: Wayne Gardenswartz, Trustee

2) WI Ownership within the McCracken Unit

TBI - 100% WI

3) Mineral Ownership

All Minerals are Federal and State of Utah.

4) Base Royalty Ownership

All Base Royalties are paid to the BLM (Federal) and the State of Utah.

5) Surface Ownership

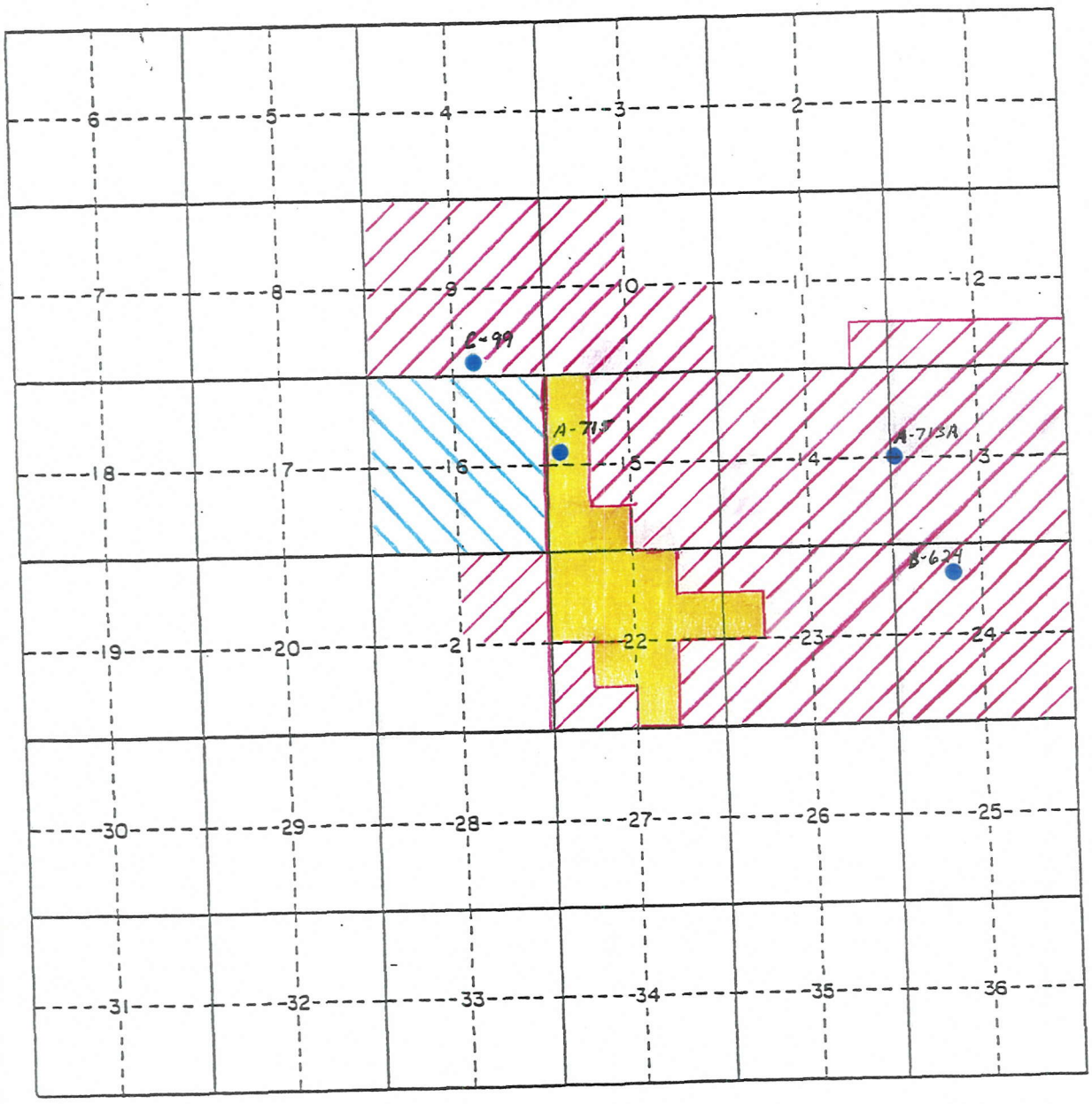
BLM and Tom Brown

SURFACE OWNERSHIP

Lisbon Field

Section _____ Township 30 North Range 24 East

County San Juan State Utah



Surface Ownership

SCALE: 1 inch = 1 mile

Federal (BLM)

State of Utah

TBI Fee Ownership

FORM 9

STATE OF UTAH
DIVISION OF OIL, GAS AND MINING

5. Lease Designation and Serial No.
UTSL070034

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill new wells, deepen existing wells, or to reenter plugged and abandoned wells.
Use APPLICATION FOR PERMIT TO DRILL OR DEEPEN form for such proposals.

6. If Indian, Allotte or Tribe Name
NA

7. Unit Agreement Name
Lisbon Unit

1. Type of Well
☐ Oil Well ☐ Gas Well ☑ Other

8. Well Name and Number
Lisbon B-624

2. Name of Operator:
EnCana Oil & Gas (USA) Inc.

Contact: Jane Washburn
Phone: 720/876-5431

9. API Well Number
43-037-16516

3. Address and Telephone No.
370 17th Street, Suite 1700, Denver, CO 80202

10. Field and Pool, or Exploratory Area
Lisbon Mississippian

4. Location of Well
Footages: 710' FNL, 1666' FWL
QQ, Sec T,R,M: NENW Sec. 24-T30S-R24E
County: San Juan
State: Utah

11. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

NOTICE OF INTENT
(Submit in Duplicate)

☐ Abandon
☐ Repair Casing
☐ Change Plans
☐ Convert to Injection
☐ Fracture Treat or Acidize
☐ Multiple Completion
☑ Other
☐ New Construction
☐ Pull or Alter Casing
☐ Recomplete
☐ Reperforate
☐ Vent or Flare
☐ Water Shut-Off

Test downhole equipment/MIT

Approximate date work will start 10/31/2007

SUBSEQUENT REPORT
(Submit Original Form Only)

☐ Abandon*
☐ Repair Casing
☐ Change Plans
☐ Convert to Injection
☐ Fracture Treat or Acidize
☐ Other
☐ New Construction
☐ Pull or Alter Casing
☐ Recomplete
☐ Reperforate
☐ Vent or Flare
☐ Water Shut-Off

Date of work completion

Report results of Multiple Completions and Recompletions to different reservoirs on WELL COMPLETION OR RECOMPLETION REPORT AND LOG form.
* Must be accompanied by a cement verification report.

12. Describe Proposed or completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with the BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, A form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.)

EnCana Oil & Gas Inc. requests permission to test downhole equipment for leaks and run a mechanical integrity test on the Lisbon B-624 as detailed in the attached procedures.

Approved by the Utah Division of Oil, Gas and Mining

Date: 10-31-07
By:

COPY SENT TO OPERATOR
Date: 11-1-07
Initials: CHD

13.
Name (Printed/Typed): Jane Washburn
Title: Operations Technologist
Signature: Jane Washburn
Date: 10/31/2007

(This space for State use only)

LISBON B-624

Procedures to test downhole equipment and perform Mechanical Integrity Test:

1 MIRU Well Servicing Unit. Spot rig pump and tank. RU H2S safety equipment.
2 Pump 60 bbls. of 3% KCL down 2-7/8" tubing.
3 NDWH. NU BOP's. Wellhead will be purged on location before being shipped to Cameron in Rock Springs for inspection and repair.
4 Unsting seal assembly from packer with slight upstrain above neutral and right hand rotation then straight upward pull. **(Note: Annulus filled with diesel. H2S is soluble in diesel. Any diesel circulated to surface could have extremely high H2S content!!!)**
5 POOH with 2-7/8" tubing. Cover racking boards with carpet to protect coated pin ends.
6 MIRU Wireline Service and run JB/GR to top of packer @ 8875'.
7 Pump 25 BBL of 3% KCL fluid down casing.
8 MIRU Schlumberger USI tool.
9 RIH and log 8875 to 8600 (contingent upon State of Utah approval).
10 POOH.
11 RDMO Schlumberger.
12 RIH w/ Baker Model FB-1 production packer w/ 6' pup & 1.875" XN nipple with WEG on bottom with blanking plug installed on wireline. Set packer as close to existing packer as possible.
13 Load 5-1/2" casing with 3% KCL water. Pressure test casing to 3000# for 30 minutes. Record pressure test on two pen recorder. Proceed to step #14 if there is no casing leak evident. Please call the Denver office for further instructions should a casing leak exist.
14 RU hydro-testers and test tubing to 7000# below the slips. **(Note: Internally coated tubing, therefore, testing service must use non-slip rubber type test tools to avoid damaging internal coating. Use provided stabbing guides to protect pins during run-in procedure.)** Replace any defective joints with new coated tubing. RIH w/ anchor tubing seal assembly on 2-7/8" tubing and sting into packer.
15 Unsting and circulate hole full of diesel.
16 Space out and land tubing in tubing head. Install new Cameron wellhead (Sour Service H2S/CO2 trimmed-may be delivered after job is completed).
17 MIRU radioactive tracer survey service company.
18 RIH with tracer tool and run from 9,200 ft to 8,600 ft.
19 POOH with tracer tool.
20 RDMO tracer survey service company.
21 RDMO pulling unit.
22 Install inspected wellhead after it is returned from Cameron.
23 Place well on injection.

FORM 9

STATE OF UTAH
DIVISION OF OIL, GAS AND MINING

5. Lease Designation and Serial No.
UTSL070034

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill new wells, deepen existing wells, or to reenter plugged and abandoned wells.
Use APPLICATION FOR PERMIT TO DRILL OR DEEPEN form for such proposals.

6. If Indian, Allotte or Tribe Name
NA

7. Unit Agreement Name
Lisbon Unit

1. Type of Well
☐ Oil Well ☐ Gas Well ☑ Other

8. Well Name and Number
~~Lisbon B-624~~ NW USA D-1 (B-624)

2. Name of Operator:
EnCana Oil & Gas (USA) Inc.
Contact: Jane Washburn
Phone: 720/876-5431

9. API Well Number
43-037-16516

3. Address and Telephone No.
370 17th Street, Suite 1700, Denver, CO 80202

10. Field and Pool, or Exploratory Area
Lisbon Mississippian

4. Location of Well
Footages: 710' FNL, 1666' FWL
QQ, Sec T,R,M: NENW Sec. 24-T30S-R24E
County: San Juan
State: Utah

11. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

NOTICE OF INTENT
(Submit in Duplicate)

☐ Abandon
☐ Repair Casing
☐ Change Plans
☐ Convert to Injection
☐ Fracture Treat or Acidize
☐ Multiple Completion
☐ Other
☐ New Construction
☐ Pull or Alter Casing
☐ Recomplete
☐ Reperforate
☐ Vent or Flare
☐ Water Shut-Off

Approximate date work will start: _____

SUBSEQUENT REPORT
(Submit Original Form Only)

☐ Abandon*
☐ Repair Casing
☐ Change Plans
☐ Convert to Injection
☐ Fracture Treat or Acidize
☐ New Construction
☐ Pull or Alter Casing
☐ Recomplete
☐ Reperforate
☐ Vent or Flare
☐ Water Shut-Off
☑ Other Test downhole equipment/MIT

Date of work completion 11/16/2007

Report results of Multiple Completions and Recompletions to different reservoirs on WELL COMPLETION OR RECOMPLETION REPORT AND LOG form.
* Must be accompanied by a cement verification report.

12. Describe Proposed or completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with the BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, A form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.)

EnCana Oil & Gas Inc. moved on the Lisbon B-624 to test the downhole equipment. A RBP was set @ 8857, and tested to 3100 psi; lost 30 psi in 35 min. A casing log was run from surface to 8857', and a portion of collapsed casing was identified. Attempt to run liner was not successful. The plug was left in place at 8857', 2-7/8" tubing set at 8744', and well was SI. Operations ran from 11/2/08 - 11/16/08. An updated wellbore diagram is attached.

EnCana intends to plug the Lisbon B-624, and a Notice of Intent to P&A will be filed.

13.
Name (Printed/Typed): Jane Washburn
Title: Operations Technologist
Signature: Jane Washburn
Date: 10/22/2008

(This space for State use only)

Faxed 10/23/08

RECEIVED
OCT 23 2008
DIV. OF OIL, GAS & MINING

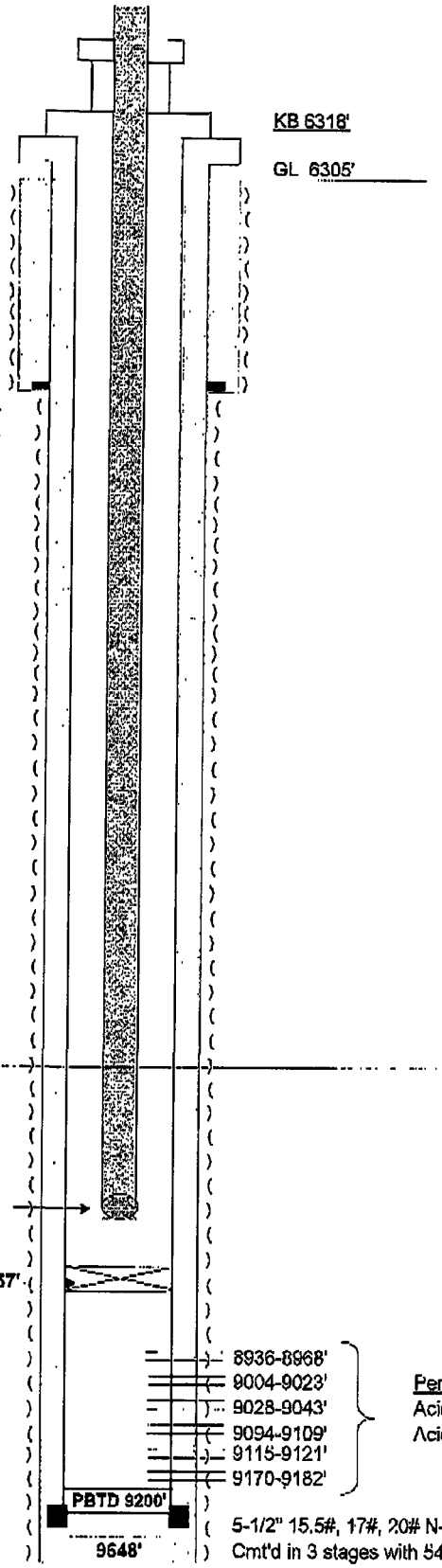
WELLBORE DIAGRAM

710' FNL & 1666' FWL

Operator:	Tom Brown, Inc.
Well Name:	Lisbon B-624
Lease Number:	UTSL 070034
Location:	NENW Sec. 24-T30S-R24E
Field:	Lisbon - Mississippian
County, State:	San Juan County, UT
API Number:	43-037-16516
Diagram Date:	10/07/2008

FORMATIONS

Hermosa	1732'
Paradox "A"	3389'
Paradox "B"	3640'
Salt	3732'
Base Salt	8673'
Molas	8770'
Mississippian	8807'
Ouray	9236'
Elbert	9318'
McCracken	9502'
Cambrian	9585'



Well History

Spud Date: 5/19/1960
TD Reached: 7/18/1960
Completion Date: 7/20/1960 (P&A'd)

(Cut 6 cores and ran 4 DST's before P&A.)

Recompleted as SW Injection: 11/9/1965

First SW Injection: 11/9/1965, AIR 85.5 BPH @ 175# inj pressure at pump.

CONVERTED TO ACID GAS INJECTION 4/19/2003

Tubing Detail: (10/07/2008)	Depth:
KB	
280 jts 2-7/8" PC TK7 tbg	
1- 2.31 F/N, & Baker retrieving head	
PACKER DEPTH	**8857'**
EOT	**8744'**

Perforated 07/1965: 4 SPF
Acidized in 4 stages w/ ttl 10,000 gals 15% HCl acid.
Acidized 9/11/1968 w/5000 gals 15% HCl acid dn tbg.

5-1/2" 15.5#, 17#, 20# N-80 LT&C csg set @ 9232'.
Cmt'd in 3 stages with 5450 cu ft.

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

FORM 9

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.

5. LEASE DESIGNATION AND SERIAL NUMBER: UTSL070034
6. IF INDIAN, ALLOTTEE OR TRIBE NAME:
7. UNIT or CA AGREEMENT NAME: Lisbon
8. WELL NAME and NUMBER: Lisbon B-624
9. API NUMBER: 4303716516
10. FIELD AND POOL, OR WILDCAT: Lisbon

1. TYPE OF WELL: OIL WELL ☐ GAS WELL ☐ OTHER Injection Well

2. NAME OF OPERATOR: EnCana Oil & Gas (USA) Inc.

3. ADDRESS OF OPERATOR: 370 17th Street, Suite 1700 CITY Denver STATE CO ZIP 80202 PHONE NUMBER: (720) 876-5339

4. LOCATION OF WELL
FOOTAGES AT SURFACE: 710' FNL & 1666' FWL COUNTY: San Juan
QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN: NENW 24 30S 24E S STATE: UTAH

11. CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION		
☑ NOTICE OF INTENT (Submit in Duplicate)	☐ ACIDIZE	☐ DEEPEN	☐ REPERFORATE CURRENT FORMATION
Approximate date work will start:	☐ ALTER CASING	☐ FRACTURE TREAT	☐ SIDETRACK TO REPAIR WELL
11/1/2008	☐ CASING REPAIR	☐ NEW CONSTRUCTION	☐ TEMPORARILY ABANDON
	☐ CHANGE TO PREVIOUS PLANS	☐ OPERATOR CHANGE	☐ TUBING REPAIR
	☐ CHANGE TUBING	☑ PLUG AND ABANDON	☐ VENT OR FLARE
☐ SUBSEQUENT REPORT (Submit Original Form Only)	☐ CHANGE WELL NAME	☐ PLUG BACK	☐ WATER DISPOSAL
Date of work completion:	☐ CHANGE WELL STATUS	☐ PRODUCTION (START/RESUME)	☐ WATER SHUT-OFF
	☐ COMMINGLE PRODUCING FORMATIONS	☐ RECLAMATION OF WELL SITE	☐ OTHER:
	☐ CONVERT WELL TYPE	☐ RECOMPLETE - DIFFERENT FORMATION	

12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.

EnCana Oil & Gas (USA) Inc. plans to plug and abandon the subject well upon approval and reclaim the well site per the BLM's instructions.

Please find attached the Plug and Abandon Procedure and a current and proposed wellbore diagram for the subject well.

COPY SENT TO OPERATOR
Date: 12.4.2008
Initials: KS

NAME (PLEASE PRINT) Jevin Croteau TITLE Regulatory Analyst
SIGNATURE DATE 10/24/2008

(This space for State use only) APPROVED BY THE STATE OF UTAH DIVISION OF OIL, GAS, AND MINING
DATE: 11/26/08
BY:
* See Conditions of Approval (Attached)

Federal Approval Of This Action Is Necessary

RECEIVED
OCT 27 2008
DIV. OF OIL, GAS & MINING

(5/2000) (See Instructions on Reverse Side)

EnCana Oil & Gas
P&A Procedure

Lisbon B-624
NENW Sec 24, T30S, R24E
710 ft FNL, 1666 ft FWL

Prepared by:	Marlene Axness
Office:	720-876-5653
AFE Number:	
API Number:	4303716516
Working Interest:	100 %
Spud Date:	05/19/1960
KB to GL:	13'
GL Elevation:	6305'
TD:	9648' MD
PBTD:	9200'
Surface Casing:	13 3/8" 48" H-40 @ 1000' Cmt'd w/ 800 sacks regular Cement
Production Casing:	5 ½" 15.5#, 17#, & 20# N-80 set @ 9232' Cmt'd w/ 5450 cu. Ft. cement in 3 stages TOC @ surface
Perforations:	Leadville 8936 - 8968 9004 – 9023 9028 – 9043 9094 – 9109 9115 – 9121 9170 – 9182

EnCana Oil & Gas
P&A Procedure
Lisbon B-624

P&A Procedure

1. MIRU pulling unit. Blow down well.
2. Lower tubing to tag RBP @ 8857' – confirm depth.
3. Dump bail 100' cement plug on RBP.
4. Circulate hole full of 9 ppg brine. POOH.
5. PU CIBP and set 60' below surface. Spot cement to surface.
6. RDMO pulling unit.
7. Cut off casing 5' below ground level and weld on plate. (NOTE: Follow OSHA trenching rules and shoring guidelines to cut casing).

EnCana Oil & Gas
P&A Procedure
Maverick Draw #20-42

EnCana Contacts:

Name	Title, Location	Telephone Number
Kelvin Edsall	Operations Engineer, Denver	720-876-9564 office 303-909-1046 cell 303-424-4017 home
Joe Kauffmann	Completion Superintendent	720-685-8522 office 303-549-1478 cell
David Hill	Team Lead, Denver	720-876-3689 office
Jane Washburn	Engineering Tech, Denver	720-876-5431 office
Chris Amador	Geologist, Denver	720-876-5004 office
Chris Williams	HSE, Denver	720-876-5485 office 303-888-6978 cell

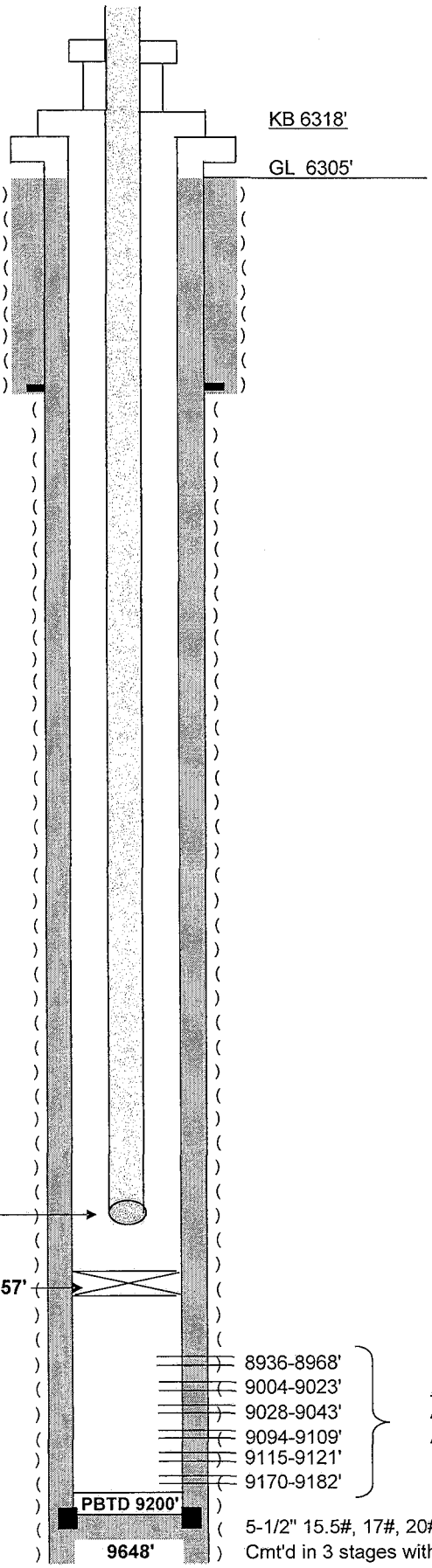
WELLBORE DIAGRAM

Operator:	Tom Brown, Inc.
Well Name:	Lisbon B-624
Lease Number:	UTSL 070034
Location:	NENW Sec. 24-T30S-R24E
Field:	Lisbon - Mississippian
County, State:	San Juan County, UT
API Number:	43-037-16516
Diagram Date:	10/07/2008

710' FNL & 1666' FWL

FORMATIONS

Hermosa	1732'
Paradox "A"	3389'
Paradox "B"	3640'
Salt	3732'
Base Salt	8673'
Molas	8770'
Mississippian	8807'
Ouray	9236'
Elbert	9318'
McCracken	9502'
Cambrian	9585'



Perforated 07/1965: 4 SPF
Acidized in 4 stages w/ ttl 10,000 gals 15% HCl acid.
Acidized 9/11/1968 w/5000 gals 15% HCl acid dn tbg.

5-1/2" 15.5#, 17#, 20# N-80 LT&C csg set @ **9232'.**
Cmt'd in 3 stages with 5450 cu ft.

Well History

Spud Date: 5/19/1960
TD Reached: 7/18/1960
Completion Date: 7/20/1960 (P&A'd)

(Cut 6 cores and ran 4 DST's before P&A.)

Recompleted as SW Injection: 11/9/1965

First SW Injection: 11/9/1965, AIR 85.5 BPH @ 175# inj pressure at pump.

CONVERTED TO ACID GAS INJECTION 4/19/2003

Tubing Detail: (10/07/2008)	**Depth:**
KB	
280 jts 2-7/8" PC TK7 tbg	
1- 2.31 F/N, & Baker retrieving head	
PACKER DEPTH	**8857'**
EOT	**8744'**

WELLBORE DIAGRAM
PROPOSED P&A

710' FNL & 1666' FWL

Operator:	Tom Brown, Inc.
Well Name:	Lisbon B-624
Lease Number:	UTSL 070034
Location:	NENW Sec. 24-T30S-R24E
Field:	Lisbon - Mississippian
County, State:	San Juan County, UT
API Number:	43-037-16516
Diagram Date:	10/07/2008

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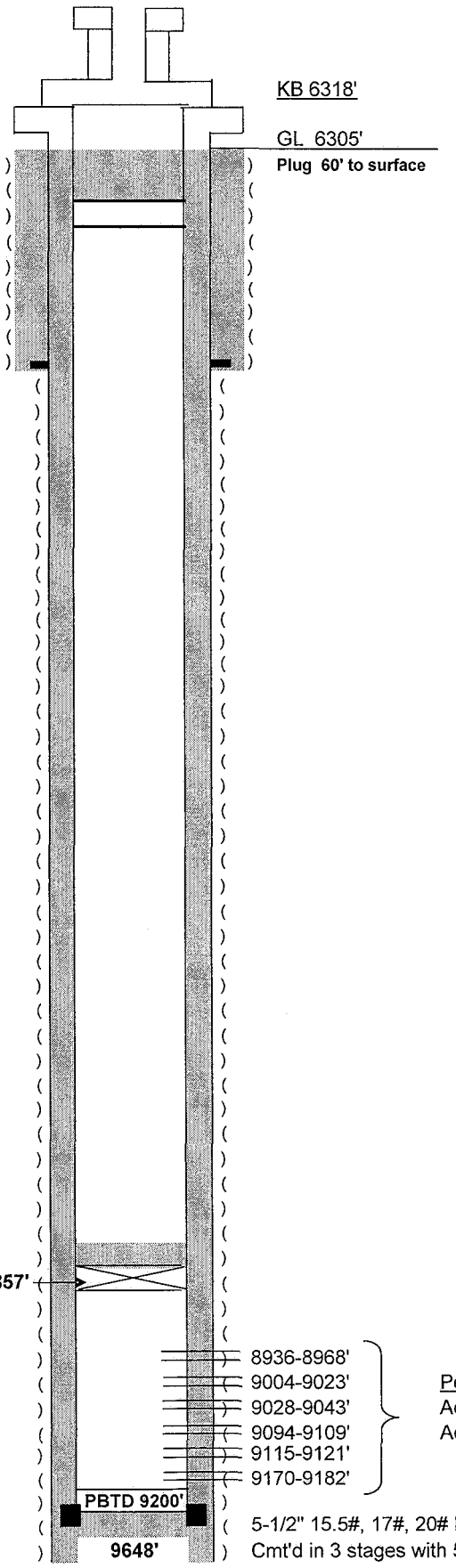

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CONVERTED TO ACID GAS INJECTION 4/19/2003

JON M. HUNTSMAN, JR.
Governor

GARY R. HERBERT
Lieutenant Governor

State of Utah

DEPARTMENT OF NATURAL RESOURCES

MICHAEL R. STYLER
Executive Director

Division of Oil Gas and Mining

JOHN R. BAZA
Division Director

CONDITIONS OF APPROVAL TO PLUG AND ABANDON WELL

Well Name and Number:	Lisbon NW USA D-1 (B-624)
API Number:	43-037-16516
Operator:	Encana Oil & Gas (USA) Inc.
Reference Document:	Original Sundry Notice dated October 24, 2008, received by DOGM on October 27, 2008

Approval Conditions:

1. Notify Jeff Brown with the BLM at 435.587.1525 at least 24 hours prior to conducting abandonment operations.

2. **Change Plug #1 (procedural step #3)**: Plug #1 shall be 200' in length (±23 sx), not 100' as proposed.

3. **Add Plug #2:** A 200' plug (±24 sx) shall be balanced from ±3800' to 3600' in order to isolate the isolate the top of the Paradox Salt formation.

4. **Add Plug #3:** A 832' plug (±97 sx) shall be added from ±1782' to 950' in order to isolate the Hermosa formation, the uranium rich Chinle formation, and the surface shoe.

5. All annuli shall be cemented from a minimum depth of 60' to the surface.

6. All requirements in the Oil and Gas Conservation General Rule R649-3-24 shall apply.

7. If there are any changes to the plugging procedure or the wellbore configuration, notify Dustin Doucet at 801-538-5281 (Office) or 801-733-0983 (Home) prior to continuing with the procedure.

8. All other requirements for notice and reporting in the Oil and Gas Conservation General Rules shall apply.

9. Federal approval of this action is required.

Dustin K. Doucet
Petroleum Engineer

November 26, 2008
Date

1594 West North Temple, Suite 1210, PO Box 145801, Salt Lake City, UT 84114-5801
telephone (801) 538-5340 • facsimile (801) 359-3940 • TTY (801) 538-7458 • *www.ogm.utah.gov*

UTAH DNR OIL, GAS & MINING

Wellbore Diagram

API Well No: 43-037-16516-00-00 **Permit No:** 115-1 **Well Name/No:** NW USA D-1 (B-624)

Company Name: ENCANA OIL & GAS (USA) INC

Location: Sec: 24 T: 30S R: 24E Spot: NENW

Coordinates: X: 654062 Y: 4225783

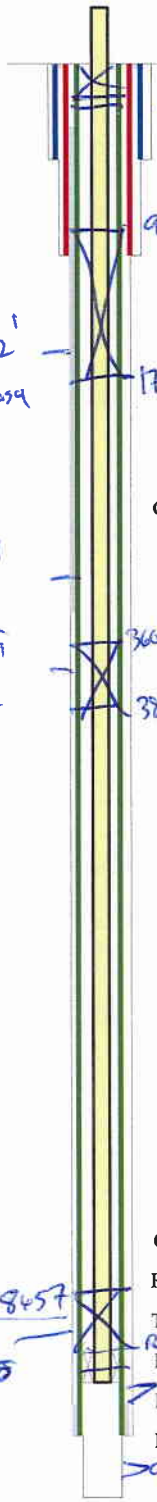
Field Name: UNDESIGNATED

County Name: SAN JUAN

Plug #4 (Surface plug step #5)

60'/(1.15)(7.483) = 75sx

Annulus must be filled minimum 60' to surface



Add Plug #3 (top of Hermosa, isolate Chinle & surface shoe)

Plug from 1782' to 950'

832'/(1.15)(7.483) = 97sx reqd.

Add Plug #2 (top of salt)

200'/(1.15)(7.483) = 24 sx reqd.

3800' to 3600'

Plug #1 (step #3)

Propose 100', require 200'

200'/(1.15)(7.661) = 23sx reqd.

TD: 9648 **TVD:** **PBTD:** 9232

String Information

String	Bottom (ft sub)	Diameter (inches)	Weight (lb/ft)	Length (ft)	Capacity (f/cf)
COND	14	20			
SURF	1000	13.325	48	1000	
PROD	9232	5.5	20		
PROD	9232	5.5	17		7.661
PROD	9232	5.5	15.5		7.483
TI	8875	3.5	9.3		
PKR	8875				

Cement Information

String	BOC (ft sub)	TOC (ft sub)	Class	Sacks
COND	25	0		
PROD	9232	9014	PC	
PROD	8896	3696	PC	
PROD	3696	420	PC	
SURF	1000	0	UK	800

Perforation Information

Top (ft sub)	Bottom (ft sub)	Shts/Ft	No Shts	Dt Squeeze
8936	9182			

Formation Information

Formation	Depth
HRMS	1732
PRDX	3389
MOLAS	8770
MSSP	8807
OURAY	9236
ELBT	9318
MCRKN	9502
CMBRN	9585

FORM 9

STATE OF UTAH
DIVISION OF OIL, GAS AND MINING

5. Lease Designation and Serial No.
UTSL070034

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill new wells, deepen existing wells, or to reenter plugged and abandoned wells.
Use APPLICATION FOR PERMIT TO DRILL OR DEEPEN form for such proposals.

6. If Indian, Allotte or Tribe Name
NA

7. Unit Agreement Name
Lisbon Unit

1. Type of Well
☐ Oil Well ☐ Gas Well ☑ Other

8. Well Name and Number
Lisbon B-624

2. Name of Operator:
EnCana Oil & Gas (USA) Inc.
Contact: Jane Washburn
Phone: 720/876-5431

9. API Well Number
43-037-16516

3. Address and Telephone No.
370 17th Street, Suite 1700, Denver, CO 80202

10. Field and Pool, or Exploratory Area
Lisbon Mississippian

4. Location of Well
Footages: 710' FNL, 1666' FWL
QQ, Sec T,R,M: NENW Sec. 24-T30S-R24E
County: San Juan
State: Utah

11. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

NOTICE OF INTENT
(Submit in Duplicate)

☐ Abandon
☐ Repair Casing
☐ Change Plans
☐ Convert to Injection
☐ Fracture Treat or Acidize
☐ Multiple Completion
☐ Other
☐ New Construction
☐ Pull or Alter Casing
☐ Recomplete
☐ Reperforate
☐ Vent or Flare
☐ Water Shut-Off

Approximate date work will start _____

SUBSEQUENT REPORT
(Submit Original Form Only)

☐ Abandon*
☐ Repair Casing
☐ Change Plans
☐ Convert to Injection
☐ Fracture Treat or Acidize
☑ Other P&A
☐ New Construction
☐ Pull or Alter Casing
☐ Recomplete
☐ Reperforate
☐ Vent or Flare
☐ Water Shut-Off

Date of work completion _____
Report results of Multiple Completions and Recompletions to different reservoirs on WELL COMPLETION OR RECOMPLETION REPORT AND LOG form.
* Must be accompanied by a cement verification report.

12. Describe Proposed or completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with the BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, A form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.)

The Lisbon B 624 was plugged and abandoned on 5/15/09. Plugs were set as follows:

Plug #1, RBP @ 8849', 200' cmt plug
Plug #2, RBP @ 3832', 200' cmt plug
Plug #3, RBP @ 1732', 950' cmt plug
Surface Plug - CIBP set, 60' cmt to surface

Attached is a wellbore diagram, a cement report and daily reports detailing the P&A.

13.
Name (Printed/Typed): Jane Washburn
Title: Production Engineering Tech
Signature: Jane Washburn
Date: 07/21/2009

(This space for State use only)

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WELLBORE DIAGRAM

Operator:	EnCana Oil & Gas (USA) Inc.
Well Name:	Lisbon B-624
Lease Number:	UTSL 070034
Location:	NENW Sec. 24-T30S-R24E
Field:	Lisbon - Mississippian
County, State:	San Juan County, UT
API Number:	43-037-16516
Diagram Date:	07/14/2009

710' FNL & 1666' FWL

FORMATIONS

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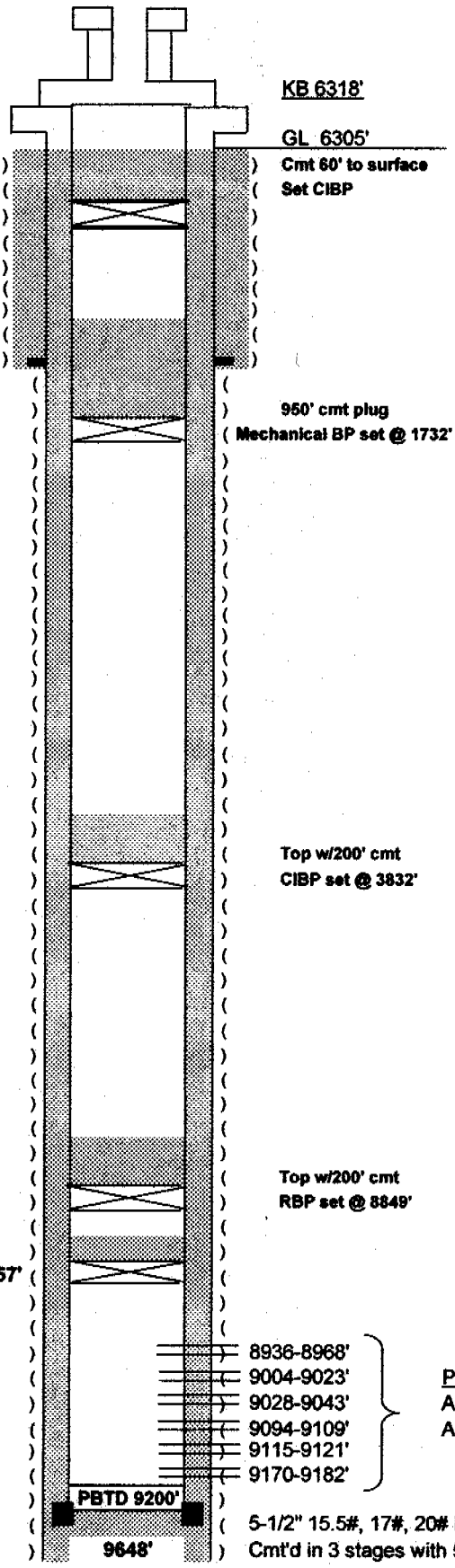

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CONVERTED TO ACID GAS INJECTION 4/19/2003

P&A 5/15/09

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ENCANA OIL & GAS (USA) INC. - EBUS

LISBON B 624

San Juan County , Utah

Plug to Abandon Service

13-May-2009

Job Site Documents

SUMMIT Version: 7.20.130 Saturday, May 16, 2009 03:49:00

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HALLIBURTON *Cementing Job Summary*

The Road to Excellence Starts with Safety

Sold To #: 340078	**Ship To #:** 2726034	**Quote #:**	**Sales Order #:** 6665586
Customer: ENCANA OIL & GAS (USA) INC. - EBUS		**Customer Rep:** Zunich, Todd	
Well Name: LISBON B	**Well #:** 624		**API/UWI #:** 43-037-16516
Field:	**City (SAP):** MONTICELLO	**County/Parish:** San Juan	**State:** Utah
Contractor: WORKOVER	**Rig/Platform Name/Num:** WORKOVER		
Job Purpose: Plug to Abandon Service			
Well Type: Development Well	**Job Type:** Plug to Abandon Service		
Sales Person: METLI, MARSHALL	**Srvc Supervisor:** PHILLIPS, MARK	**MBU ID Emp #:** 445272	

Job Personnel

HES Emp Name	Exp Hrs	Emp #	HES Emp Name	Exp Hrs	Emp #	HES Emp Name	Exp Hrs	Emp #
ANDREWS, ANTHONY Michael		321604	GREGORY, JON D		439067	MUHLESTEIN, RYAN Herrick		453609
PHILLIPS, MARK Bejar		445272	Talarovich, Jeremy		425449			

Equipment

HES Unit #	Distance-1 way	HES Unit #	Distance-1 way	HES Unit #	Distance-1 way	HES Unit #	Distance-1 way
10025041	160 mile	10741119	160 mile	10784064	160 mile	10822535	160 mile
10871245	160 mile	10951244	160 mile	11006314	160 mile		

Job Hours

Date	On Location Hours	Operating Hours	Date	On Location Hours	Operating Hours	Date	On Location Hours	Operating Hours
TOTAL				Total is the sum of each column separately				

Job

Formation Name			
Formation Depth (MD)	**Top**	**Bottom**	
Form Type		**BHST**	
Job depth MD	8849. ft	**Job Depth TVD**	8849. ft
Water Depth		**Wk Ht Above Floor**	3. ft
Perforation Depth (MD)	*From*	**To**	

Job Times

	Date	Time	Time Zone
Called Out	12 - May - 2009	04:00	MST
On Location	12 - May - 2009	13:00	MST
Job Started	13 - May - 2009	09:05	MST
Job Completed	13 - May - 2009	00:00	MST
Departed Loc			

Well Data

Description	New / Used	Max pressure psig	Size in	ID in	Weight lbm/ft	Thread	Grade	Top MD ft	Bottom MD ft	Top TVD ft	Bottom TVD ft
5 1/2 Production Casing	Unknown		5.5	4.892	17.			.	8800.		
2 .875 Tubing	Unknown		2.375	1.995	4.7			.	8839.		

Tools and Accessories

Type	Size	Qty	Make	Depth	Type	Size	Qty	Make	Depth	Type	Size	Qty	Make
Guide Shoe					**Packer**					**Top Plug**			
Float Shoe					**Bridge Plug**					**Bottom Plug**			
Float Collar					**Retainer**					**SSR plug set**			
Insert Float										**Plug Container**			
Stage Tool										**Centralizers**			

Miscellaneous Materials

Gelling Agt		**Conc**		**Surfactant**		**Conc**		**Acid Type**		**Qty**		*Conc*	*%*
Treatment Fld		**Conc**		*Inhibitor*		**Conc**		**Sand Type**		*Size*		*Qty*	

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HALLIBURTON *Cementing Job Summary*

Fluid Data									
Stage/Plug #: 1									
Fluid #	Stage Type	Fluid Name	Qty	Qty uom	Mixing Density lbm/gal	Yield ft3/sk	Mix Fluid Gal/sk	Rate bbl/min	Total Mix Fluid Gal/sk
1	Fresh Water Spacer			bbl	.	.0	.0	.0	
2	Tail Cement	HALCEM (TM) SYSTEM (452986)		sacks	15.8	1.15	5.0		4.99
	4.989 Gal	FRESH WATER							
3	Displacement			bbl	.	.0	.0	.0	

Calculated Values		Pressures		Volumes					
Displacement		Shut In: Instant		Lost Returns		Cement Slurry		Pad	
Top Of Cement		5 Min		Cement Returns		Actual Displacement		Treatment	
Frac Gradient		15 Min		Spacers		Load and Breakdown		Total Job	

Rates							
Circulating		Mixing		Displacement		Avg. Job	

Cement Left In Pipe	Amount	0 ft	Reason	Shoe Joint

Frac Ring # 1 @	ID	Frac ring # 2 @	ID	Frac Ring # 3 @	ID	Frac Ring # 4 @	ID

The Information Stated Herein Is Correct	Customer Representative Signature

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HALLIBURTON

Cementing Job Log

The Road to Excellence Starts with Safety

Sold To #: 340078	**Ship To #:** 2726034	**Quote #:**	**Sales Order #:** 6665586
Customer: ENCANA OIL & GAS (USA) INC. - EBUS		**Customer Rep:** Zunich, Todd	
Well Name: LISBON B	**Well #:** 624		**API/UWI #:** 43-037-16516
Field:	**City (SAP):** MONTICELLO	**County/Parish:** San Juan	**State:** Utah
Legal Description:			
Lat: N 0 deg. OR N 0 deg. 0 min. 0 secs.		**Long:** E 0 deg. OR E 0 deg. 0 min. 0 secs.	
Contractor: WORKOVER	**Rig/Platform Name/Num:** WORKOVER		
Job Purpose: Plug to Abandon Service			**Ticket Amount:**
Well Type: Development Well	**Job Type:** Plug to Abandon Service		
Sales Person: METLI, MARSHALL	**Srvc Supervisor:** PHILLIPS, MARK		**MBU ID Emp #:** 445272

Activity Description	Date/Time	Cht #	Rate bbl/min	Volume bbl Stage	Volume bbl Total	Pressure psig Tubing	Pressure psig Casing	Comments
Call Out	05/12/2009 04:00							MECHANICAL ISSUES WITH BULK TRUCK HAD TO BLOW CEMENT OFF INTO ANOTHER TRUCK.
Pre-Convoy Safety Meeting	05/12/2009 05:30							ALL HES EMPLOYEES
Assessment Of Location Safety Meeting	05/12/2009 07:20							VERY HIGH POTENTIAL OF H2S ON LOCATION. 3RD PARTY SAFETY OBSERVERS ON LOCATION. H2S EMERGENCY PLAN DISCUSSED WITH ENTIRE CREW.
Arrive At Loc	05/12/2009 13:00							HAD PAPERWORK ISSUES AT UTAH PORT AUTHORITY
Rig-Up Equipment	05/13/2009 07:23							1 HT-400 PUMP TRUCK, 2 660 BULK TRUCKS, 1 F-450 P/U, 1 F-250 P/U
Pre-Job Safety Meeting	05/13/2009 08:30							ALL HES EMPLOYEES, WORK-OVER RIG CREW, ENCANA REPS AND 3RD PARTY VENDORS AND 3RD PARTY SFETY OBSERVERS.
Start Job	05/13/2009 09:04							#1 PLUG TO BE SET AT 8849'
Pump Water	05/13/2009 09:05							FILL LINES PRIOR TO PRESSURE TESTING
Pressure Test	05/13/2009 09:08					3500.0		NO LEAKS

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HALLIBURTON

Cementing Job Log

Activity Description	Date/Time	Cht #	Rate bbl/min	Volume bbl Stage	Volume bbl Total	Pressure psig Tubing	Pressure psig Casing	Comments
Circulate Well	05/13/2009 09:18		4	200		1050.0		DISPLACE ALL EXISTING WELL FLUID OUT OF HOLE (BRINE WATER) PER BLM. 185.8 BBLS FULL CAPACITY, WILL PUMP 200 BBLS TO CLEAR HOLE.
Shutdown	05/13/2009 10:09							SHUT DOWN POST CICULATING WELL TO REMOVE ALL EXISTING BRINE WATER FROM WELL PER BLM REP.
Pump Spacer 1	05/13/2009 10:43		2	5		350.0		FRESH WATER, SPACER AHEAD.
Pump Tail Cement	05/13/2009 10:46		3	4.6		415.0		HALCEM CMT MIXED AT 15.8 PPG, 1.15 YIELD, 5.0 GAL/SK ADDITIVES TO BE ADDED WHILE PUMPING.
Pump Spacer 2	05/13/2009 10:47		2	1.4		400.0		FRESH WATER SPACER BEHIND
Pump Displacement	05/13/2009 10:48		5	48.6		300.0		GELLED WATER PER HES DESIGN. 9.0 PPG
Shutdown	05/13/2009 11:09							RIG TO PULL 9 JOINTS OF TUBING, RIG WILL PULL SLOW. FIRST 5 JOINTS PULLED WET.
Reverse Circ Well	05/13/2009 11:31		4	65.5			1150.0	REVERSE OUT TO CLEAN TBG
End Job	05/13/2009 11:32							WAIT ON RIG CREW TO PULL COMPLETLY OUT OF HOLE THEN WILL RUN BACK INTO HOLE TO SET NEXT BRIDGE PLUG.
Clean Lines	05/13/2009 12:33							CLEAN AND WASH PUMP TO PIT USE SUGAR.
Start Job	05/13/2009 13:04							2 ND PLUG, MECHANICAL BRIDGE PLUG SET AT3839', 200' PLUG WILL BE SET
Pump Water	05/13/2009 13:04			1				FILL LINES

Sold To # : 340078 Ship To # :2726034 Quote # : Sales Order # : 6665586

SUMMIT Version: 7.20.130 Saturday, May 16, 2009 03:49:00

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JUL 23 2009

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HALLIBURTON

Cementing Job Log

Activity Description	Date/Time	Cht #	Rate bbl/ min	Volume bbl Stage	Volume bbl Total	Pressure psig Tubing	Pressure psig Casing	Comments
Pressure Test	05/13/2009 13:04			0.5		3100.0		NO LEAKS
Pump Spacer 1	05/13/2009 13:04		2	5		30.0		FRESH WATER
Pump Tail Cement	05/13/2009 13:05		2	4.6		220.0		HALCEM CMT MIXED AT 15.8 PPG, 1.15 YIELD, 5.0 GAL/SK CEMENT TO WEIGHEDD VIA PRESSURE BALANCE MUD SCALES
Pump Spacer 2	05/13/2009 13:05		2	1.4		87.0		FERSH WATER
Pump Displacement	05/13/2009 13:05		4	19.6		550.0		9.0 PPG WELL FLUID MIXED AND PUMPED VIA HT-400
Shutdown	05/13/2009 13:05							SWAP VALVES TO AT MANIFOLD TO REVERSE OUT
Reverse Circ Well	05/13/2009 13:05		4	26			920.0	RIG TO PULL 12 JOINTS OUT OF HOLE BEFORE REVERSE OUT, THEN RIG PULLED ADDITIIONAL 4 JOINTS FOR A TTL OF 16 OUT OF HOLE. RIG TO TAG CMT IN THE AM.
End Job	05/13/2009 13:05							
Clean Lines	05/13/2009 13:05							WASH UP PUMPS AND LINES TO PIT.
Pre-Job Safety Meeting	05/14/2009 07:00							ALL HES EMPLOYEES, MONUMENT RIG CREW, ENCANA RIG CREW, 3RD PARTY SAFETY OBSERVERS FOR H2S MONITORING, BAKER HUGHES REP.
Start Job	05/14/2009 10:26							200 FT PLUG TO BE SET FROM 3698' TOP OF PLUG WILL BE AT 3498'.
Pump Water	05/14/2009 10:27		1	1		100.0		FILL LINES
Pressure Test	05/14/2009 10:29		0.5			3100.0		NO LEAKS

Sold To # : 340078 Ship To # :2726034 Quote # : Sales Order # : 6665586

SUMMIT Version: 7.20.130 Saturday, May 16, 2009 03:49:00

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HALLIBURTON

Cementing Job Log

Activity Description	Date/Time	Cht #	Rate bbl/ min	Volume bbl Stage	Volume bbl Total	Pressure psig Tubing	Pressure psig Casing	Comments
Pump Spacer 1	05/14/2009 10:30		5	2		40.0		FRESH WATER SPACER AHEAD
Pump Tail Cement	05/14/2009 10:38		2	4.8		130.0		HALCEM CEMENT MIXED AT 15.8 PPG, 1.15 YIELD, 5.0 GAL/SK CEMENT TO WEIGHED WITH PRESSURE BALANCED MUD SCALES
Pump Spacer 2	05/14/2009 10:42		2	1.8		120.0		FRESH WATR BEHIND
Pump Displacement	05/14/2009 10:43		4	18.2		480.0		WELL BORE FLUID MIXED AT 9 PPG AND PUMPED VIA HT-400
Shutdown	05/14/2009 10:49							RIG TO PULL 9 JOINTS OUT OF HOLE BEFORE REVERSING OUT
Reverse Circ Well	05/14/2009 11:07		4	28			480.0	WELL BORE FLUID MIXED AT 9 PPG AND PUMPED VIA HT-400
End Job	05/14/2009 11:14							RIG TO POOH, THEN TRIP MECH BRIDGE PLUG TOOL IN, THEN POOH REMOVE TOOL, THEN TRIP INTO HOLE TO A DEPTH OF1732'.
Clean Lines	05/14/2009 11:20							WASH TO PIT USE SUGAR, VAC TRUCK TO REMOVE FLUID FROM TANK SO AS WE WILL HAVE ENOUGH ROOM FOR FLUID BEING REMOVED FROM WELL.
Pre-Job Safety Meeting	05/14/2009 14:30							ALL HES EMPLOYEES, ENCANA REP, 3RD PARTY SAFETY REP, MONUMENT RIG CREW,BAKER HUGHES REP
Start Job	05/14/2009 14:55							MECHANICAL BRIDGE PLUG SET AT1732', A 950' PLUG WILL BE SET WITH TOP AT 782'
Pump Water	05/14/2009 14:56		1	1				FILL LINES

Sold To # : 340078 Ship To # :2726034 Quote # : Sales Order # : 6665586

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HALLIBURTON

Cementing Job Log

Activity Description	Date/Time	Cht #	Rate bbl/ min	Volume bbl Stage	Volume bbl Total	Pressure psig Tubing	Pressure psig Casing	Comments
Pressure Test	05/14/2009 14:57		0.5			3500.0		NO LEAKS
Pump Spacer 1	05/14/2009 15:07			5				FRESH WATER SPACER AHEAD
Pump Tail Cement	05/14/2009 15:08			22.6				HALCEM CMT MIXED AT 15.8 PPG, 1.15 YIELD, 5.0 GAL/SK PRESSURE BALANCED MUD SCALES TO BE USED.
Pump Spacer 2	05/14/2009 15:15			1.8				FRESH WATER SPACER BEHIND
Pump Displacement	05/14/2009 15:16			2.6				WILL HOLD .6 BBL SHORT TTL DISPLACEMENT PUMPED 2.0 BBLS
Shutdown	05/14/2009 15:17							RIG TO PULL 37 JOINTS
Clean Lines	05/14/2009 15:18							WASH UP PUMP AND LINES TO PIT USE SUGAR
Reverse Circ Well	05/14/2009 16:02			6				WELL BORE FLUID MIXED AT 9.0 PPG VIA HT-400 WILL BE PUMPED USING HT-400 PUMP TRUCK.
End Job	05/14/2009 16:05							
Pre-Job Safety Meeting	05/15/2009 08:00							
Start Job	05/15/2009 08:00							#4 PLUG TAGGED AT 733'. #5 PLUG WILL BE FROM 60' TO SURFACE.
Pump Water	05/15/2009 08:00		0.5	1				
Pressure Test	05/15/2009 08:00		0.5			3100.0		
Pump Tail Cement	05/15/2009 08:00		1	1.4		78.0		HALCEM CMT MIXED AT 15.8 PPG, 1.15 YIELD, 5.0 GAL/SK CEMENT TO BE WEIGHED VIA PRESSURE BALANCED MUD SCALES.
Clean Lines	05/15/2009 08:00							T0 PIT MAKE SURE TO USE SUGAR

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