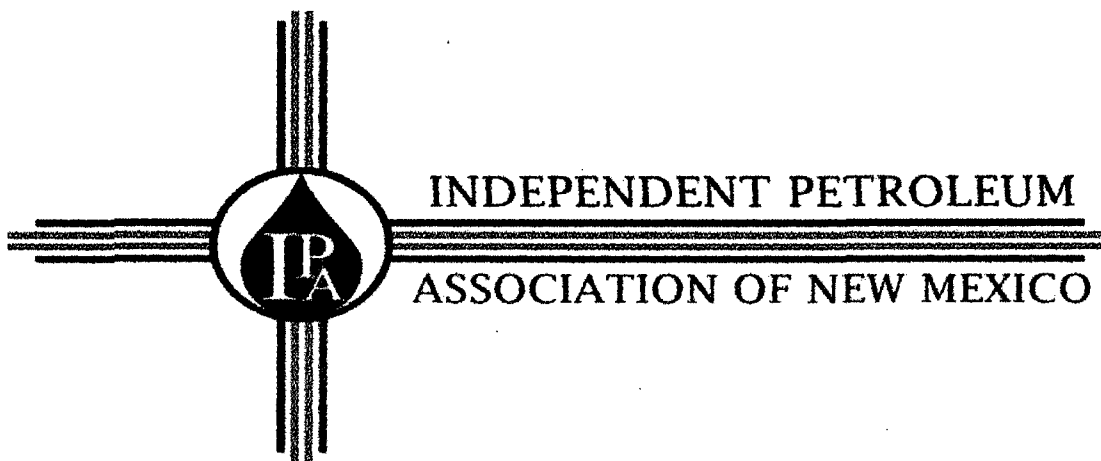




OCD CASE NOS. 14784 AND 14785

IPANM Petition to amend Title 19, Chapter 15,
part 17 (The PIT Rule)

May 14 - 18, 2012

IPANM exhibit 16
Rebuttal Modeling - Mullins

RECEIVED OCD
2012 JUN 12 P 2 1-15

Pit Release Modeling

Temporary Drilling Reserve Pit Risk Assessment Modeling for
New Mexico Rule 17 Modifications

Case # 14784 (NMOGA)
Case # 14785 (IPANM)

Prepared by Thomas E. Mullins, P.E.
June 11, 2012

Prepared for the Independent Petroleum Association of New Mexico

Risk Based Assessment

HELP & MULTIMED Modeling for 25' to Ground Water, Low Chloride Drilling Fluids (< 15,000 mg/l)

100' Distance to a receptor

Utilized Aztec, NM Climatological Conditions & Carlsbad, NM Conditions

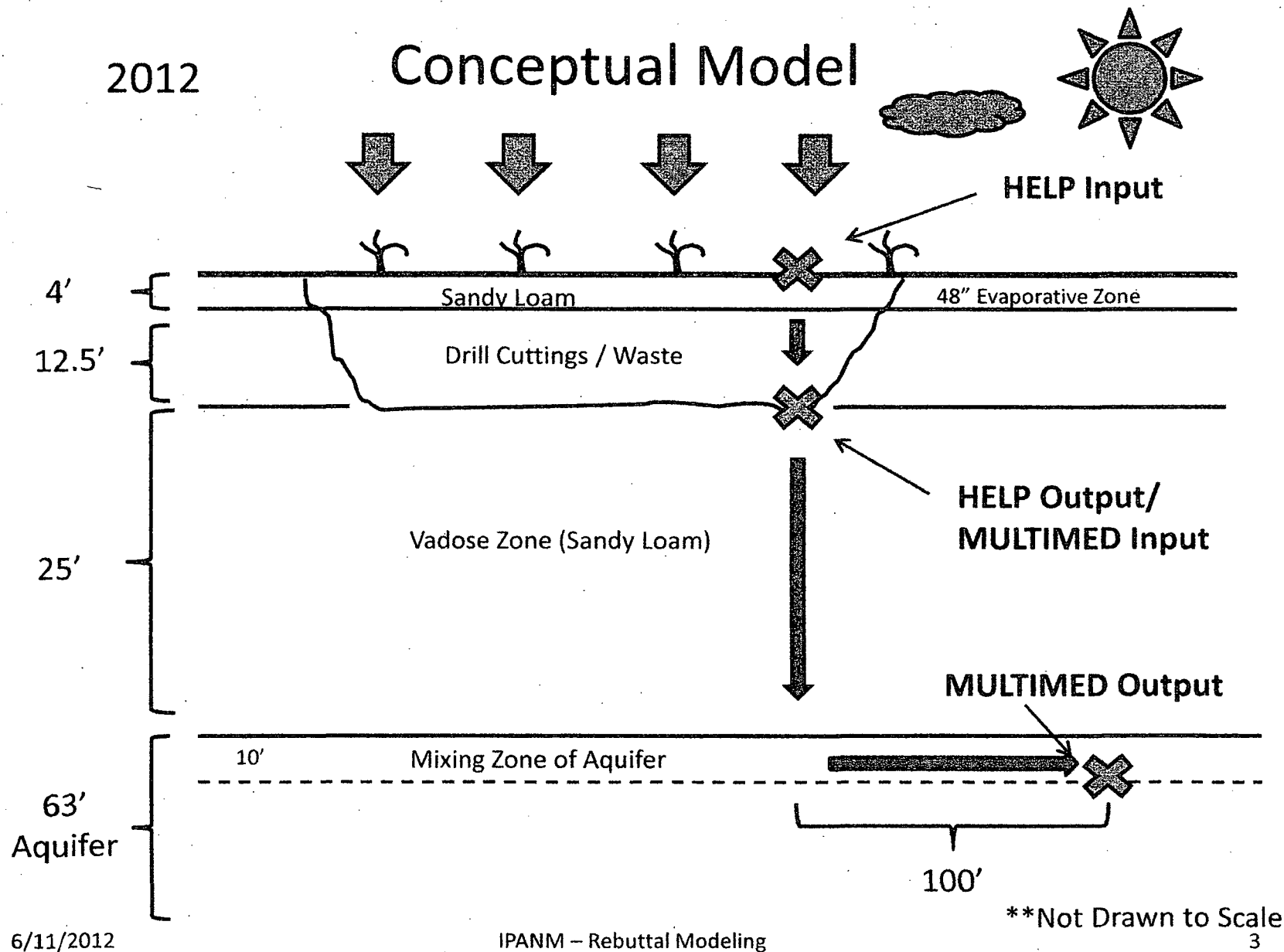
Highest NW Reading (5,290 mg/kg) diluted 20:1 SPLP yields 265 mg/l

Modeled Leachate at: 1,000 mg/l

Results indicate siting recommendations protective of Fresh Water, Human Health and the Environment

2012

Conceptual Model



25' to Ground Water - Low Chloride Focus

48" Evaporative Depth Annual Average Precipitation:	Carlsbad 14.1"	Aztec 10.8"
Elevation (m):	950	1,714
HELP Model Infiltration Rates Liner (mm/yr):	1.53	0.01
Years until reaching 100' Lateral @ 25' depth:	950	n/a
Years until max Cl:	1,350	n/a
Max Cl (mg/l) @ 100' lateral distance:	2.3	n/a

Conclusions

4' of Soil Cover protective in all instances.

No liner necessary on top of pit.

25' Ground Water is protective for burial in place, Low Chloride Drilling Fluids

100' Siting Requirement is protective of fresh water, human health & environment for Low Chloride Drilling Cuttings buried in place

Pit Rule - HELP Model Simulations
Summary of Basic Parameters

	2007 & 2009	2007	2007 & 2009	2007	2007	2007	2012	2012	2012	2012	2012	2012
	Permian # 1	Permian # 2	Permian # 3	SJB # 1	SJB # 2	SJB # 3	Artesia - 48"	Carlsbad - 48"	Hobbs - 48"	Maljamar - 48"	Roswell - 48"	Aztec - 48"
	Hobbs - 50	Hobbs - 50	Hobbs - 50	Dulce - 50	Dulce - 50	Dulce - 50	Artesia - 50	Carlsbad - 50	Hobbs - 50	Maljamar - 50	Roswell - 50	Aztec - 50
	2' - No Liner	4' - Poor Liner	4' - Good Liner	2' - No Liner	4' - Poor Liner	4' - Good Liner	4' - Good Liner	4' - Good Liner	4' - Good Liner	4' - Good Liner	4' - Good Liner	4' - Good Liner
Layer # 1 (Root Zone Covering)												
Soil Texture Number	6	7	7	6	7	7	7	7	7	7	7	7
Layer Thickness (inches)	24	6	6	24	6	6	6	6	6	6	6	6
Layer Porosity	0.453	0.473	0.473	0.453	0.473	0.473	0.473	0.473	0.473	0.473	0.473	0.473
Layer Field Capacity	0.19	0.222	0.222	0.19	0.222	0.222	0.222	0.222	0.222	0.222	0.222	0.222
Layer Wilting Point	0.085	0.104	0.104	0.085	0.104	0.104	0.104	0.104	0.104	0.104	0.104	0.104
Layer Initial Sw	0.1113	0.1335	0.1335	0.1113	0.1335	0.1335	0.1335	0.1335	0.1335	0.1335	0.1335	0.1335
Hydraulic Conductivity (cm/s)	7.20E-04	5.20E-04	5.20E-04	7.20E-04	5.20E-04	5.20E-04	5.20E-04	5.20E-04	5.20E-04	5.20E-04	5.20E-04	5.20E-04
Layer # 2 (Main Vertical Cover)												
Soil Texture Number		8	8		8	8	8	8	8	8	8	8
Layer Thickness (inches)		36	36		36	36	42	42	42	42	42	42
Layer Porosity		0.463	0.463		0.463	0.463	0.463	0.463	0.463	0.463	0.463	0.463
Layer Field Capacity		0.232	0.232		0.232	0.232	0.232	0.232	0.232	0.232	0.232	0.232
Layer Wilting Point		0.116	0.116		0.116	0.116	0.116	0.116	0.116	0.116	0.116	0.116
Layer Initial Sw		0.145	0.145		0.145	0.145	0.145	0.145	0.145	0.145	0.145	0.145
Hydraulic Conductivity (cm/s)		3.70E-04	3.70E-04		3.70E-04	3.70E-04	3.70E-04	3.70E-04	3.70E-04	3.70E-04	3.70E-04	3.70E-04
Layer # 3 (Top Run-Off Layer)												
Soil Texture Number		8	8		8	8						
Layer Thickness (inches)		6	6		6	6						
Layer Porosity		0.463	0.463		0.463	0.463						
Layer Field Capacity		0.232	0.232		0.232	0.232						
Layer Wilting Point		0.116	0.116		0.116	0.116						
Layer Initial Sw		0.145	0.145		0.145	0.145						
Hydraulic Conductivity (cm/s)		3.70E-04	3.70E-04		3.70E-04	3.70E-04						
Drainage Slope (%)		1	1		1	1						
Drainage Length (ft)		10	10		10	10						
Layer # 4 (Top Liner)												
Soil Texture Number		36	36		36	36						
Layer Thickness (inches)		0.02	0.02		0.02	0.02						
Hydraulic Conductivity (cm/s)		3.99E-13	3.99E-13		3.99E-13	3.99E-13						
Pin Hole Density (holes/acre)		1	1		1	1						
Installation Defects (holes/acre)		10	4		10	4						
Placement Quality		4 - Poor	3 - Good		4 - Poor	3 - Good						
Layer # 5 (Stabilized Cuttings)												
Soil Texture Number	9	9	9	9	9	9	9	9	9	9	9	9
Layer Thickness (inches)	150	150	150	150	150	150	150	150	150	150	150	150
Layer Porosity	0.501	0.501	0.501	0.501	0.501	0.501	0.501	0.501	0.501	0.501	0.501	0.501
Layer Field Capacity	0.284	0.284	0.284	0.284	0.284	0.284	0.284	0.284	0.284	0.284	0.284	0.284
Layer Wilting Point	0.135	0.135	0.135	0.135	0.135	0.135	0.135	0.135	0.135	0.135	0.135	0.135
Layer Initial Sw	0.283	0.283	0.283	0.283	0.283	0.283	0.283	0.283	0.283	0.283	0.283	0.283
Hydraulic Conductivity (cm/s)	1.90E-04	1.90E-04	1.90E-04	1.90E-04	1.90E-04	1.90E-04	1.90E-04	1.90E-04	1.90E-04	1.90E-04	1.90E-04	1.90E-04
Layer # 6 (Bottom Liner)												
Soil Texture Number		36	36		36	36						
Layer Thickness (inches)		0.02	0.02		0.02	0.02						
Hydraulic Conductivity (cm/s)		3.99E-13	3.99E-13		3.99E-13	3.99E-13						
Pin Hole Density (holes/acre)		1	1		1	1						
Installation Defects (holes/acre)		10	4		10	4						
Placement Quality		4 - Poor	3 - Good		4 - Poor	3 - Good						
Total Inches Modeled:	174	198.04	198.04	174	198.04	198.04	198.02	198.02	198.02	198.02	198.02	198.02
Leachate thru btm layer (inches/yr)	1.1716	0.1937	0.09107	0.526	0.12275	0.05902	0.0421	0.06037	0.0559	0.02004	0.04617	0.00042
Convert to (ft / yr)	0.097633333	0.016141667	0.007589167	0.043833333	0.010229167	0.004918333	0.003508333	0.005030833	0.004658333	0.00167	0.0038475	0.000035
Convert to (cm/yr)	2.975864	0.491998	0.2313178	1.33604	0.311785	0.1499108	0.106934	0.1533398	0.141986	0.0509016	0.1172718	0.0010668
Convert to (m/yr)	0.02975864	0.00491998	0.002313178	0.0133604	0.00311785	0.001499108	0.00106934	0.001533398	0.00141986	0.000509016	0.001172718	0.000010668
Convert to (mm/yr)	29.75864	4.91998	2.313178	13.3604	3.11785	1.499108	1.06934	1.533398	1.41986	0.509016	1.172718	0.010668

u.s. climate data

Temperature - Precipitation - Sunshine

Climate - Aztec - New Mexico

AdChoices

California

Florida

Georgia

Illinois

Michigan

Massachusetts

New Jersey

New York

North Carolina

Ohio

Pennsylvania

Texas

Other States

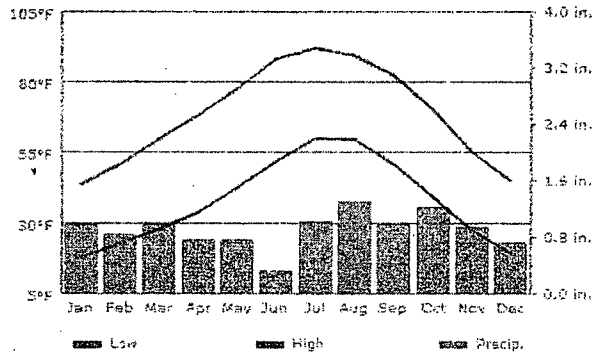
Temperature - Precipitation

Q1F

	Jan	Feb	March	April	May	June
Average high in °F	43	51	60	68	77	88
Average low in °F	18	23	28	34	42	51
Av. precipitation - inch	0.98	0.83	0.98	0.75	0.75	0.31
CALCULATED MEAN	30.5	37	44	51	59.5	69.5
	July	Aug	Sep	Oct	Nov	Dec
Average high in °F	92	89	82	70	55	45
Average low in °F	60	59	51	39	27	19
Av. precipitation - inch	1.02	1.3	0.98	1.22	0.94	0.71

Free climate chart on your website

Aztec Climate Graph - New Mexico Climate Chart



TI High Temperature Parts

Features An Extended Temp Range Of -55°C to 210°C w/1,000 Hour Op Life

TI.com/HighTemp

AdChoices

Totals and averages

Annual average high temperature	68.3 °F
Annual average low temperature	37.5 °F
Average temperature	52.9 °F
Average annual precipitation	10.8 in.

Map of Aztec

Humidity & Temp Loggers

USB, Wireless & Network Models Starting Under \$100. Best Prices www.DataLoggerInc.com

Dating Aztec Girls

Beautiful Blonde. Short Skirt. High Heels. Discover Aztec Dating Now. Amolating.com

Events in New Mexico

Savor Albuquerque: June 7-16, 2012. Arts, Culture, Cuisine. Explore! savorabq.com

The Best Places to Retire

World's Best Locations to Retire in Style Today. Free Report. www.InternationalLiving.com

Spiritual Video Game

Support a Kickstarter campaign for a video game about Mayan wisdom www.KickStarter.com

5,623 + T
1,713.89 m

8

AZTEC.OUT

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HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 3.07 (1 NOVEMBER 1997)
DEVELOPED BY ENVIRONMENTAL LABORATORY
USAE WATERWAYS EXPERIMENT STATION
FOR USEPA RISK REDUCTION ENGINEERING LABORATORY

PRECIPITATION DATA FILE: C:\HELP3\EXAMPLES\AZTEC.D4
TEMPERATURE DATA FILE: C:\HELP3\EXAMPLES\AZTEC.D7
SOLAR RADIATION DATA FILE: C:\HELP3\EXAMPLES\AZTEC.D13
EVAPOTRANSPIRATION DATA: C:\HELP3\EXAMPLES\AZTEC.D11
SOIL AND DESIGN DATA FILE: C:\HELP3\EXAMPLES\LINER.D10
OUTPUT DATA FILE: C:\HELP3\EXAMPLES\AZTEC.OUT

TIME: 8:52 DATE: 6/11/2012

TITLE: 4'COVER, LINER, 48" EVAP ZONE, NW NEW MEXICO

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
WERE SPECIFIED BY THE USER.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 7

THICKNESS = 6.00 INCHES
POROSITY = 0.4730 VOL/VOL
FIELD CAPACITY = 0.2220 VOL/VOL
WILTING POINT = 0.1040 VOL/VOL
INITIAL SOIL WATER CONTENT = 0.1335 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.520000001000E-03 CM/SEC
NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 2.49
FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

LAYER 2

AZTEC.OUT

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 8

THICKNESS = 42.00 INCHES
 POROSITY = 0.4630 VOL/VOL
 FIELD CAPACITY = 0.2320 VOL/VOL
 WILTING POINT = 0.1160 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.1450 VOL/VOL
 EFFECTIVE SAT. HYD. COND. = 0.369999994000E-03 CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 9

THICKNESS = 150.00 INCHES
 POROSITY = 0.5010 VOL/VOL
 FIELD CAPACITY = 0.2840 VOL/VOL
 WILTING POINT = 0.1350 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.2840 VOL/VOL
 EFFECTIVE SAT. HYD. COND. = 0.190000006000E-03 CM/SEC

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 36

THICKNESS = 0.02 INCHES
 POROSITY = 0.0000 VOL/VOL
 FIELD CAPACITY = 0.0000 VOL/VOL
 WILTING POINT = 0.0000 VOL/VOL
 INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL
 EFFECTIVE SAT. HYD. COND. = 0.399999993000E-12 CM/SEC
 FML PINHOLE DENSITY = 1.00 HOLES/ACRE
 FML INSTALLATION DEFECTS = 4.00 HOLES/ACRE
 FML PLACEMENT QUALITY = 3 - GOOD

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
 SOIL DATA BASE USING SOIL TEXTURE # 7 WITH A
 POOR STAND OF GRASS, A SURFACE SLOPE OF 1.0%
 AND A SLOPE LENGTH OF 75. FEET.

SCS RUNOFF CURVE NUMBER = 83.90
 FRACTION OF AREA ALLOWING RUNOFF = 100.0 PERCENT
 AREA PROJECTED ON HORIZONTAL PLANE = 0.500 ACRES
 EVAPORATIVE ZONE DEPTH = 48.0 INCHES
 INITIAL WATER IN EVAPORATIVE ZONE = 6.891 INCHES
 UPPER LIMIT OF EVAPORATIVE STORAGE = 22.284 INCHES
 LOWER LIMIT OF EVAPORATIVE STORAGE = 5.496 INCHES
 INITIAL SNOW WATER = 0.000 INCHES

AZTEC.OUT

INITIAL WATER IN LAYER MATERIALS	=	49.491	INCHES
TOTAL INITIAL WATER	=	49.491	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA -----

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
AZTEC NEW MEXICO

STATION LATITUDE	=	36.82 DEGREES
MAXIMUM LEAF AREA INDEX	=	1.60
START OF GROWING SEASON (JULIAN DATE)	=	98
END OF GROWING SEASON (JULIAN DATE)	=	299
EVAPORATIVE ZONE DEPTH	=	48.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	9.00 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	50.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	45.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	40.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	50.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ALBUQUERQUE NEW MEXICO

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
-----	-----	-----	-----	-----	-----
0.51	0.47	0.71	0.59	0.55	0.24
0.98	1.14	1.02	0.98	0.79	0.43

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ALBUQUERQUE NEW MEXICO

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
-----	-----	-----	-----	-----	-----
30.50	37.00	44.00	51.00	59.50	69.50
76.00	74.00	66.50	54.50	41.00	32.00

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR PUEBLO COLORADO
AND STATION LATITUDE = 36.82 DEGREES

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 50

AZTEC.OUT

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

PRECIPITATION						

TOTALS	0.47 0.93	0.48 1.17	0.75 1.05	0.60 1.07	0.47 0.76	0.26 0.48
STD. DEVIATIONS	0.44 0.47	0.36 0.51	0.69 0.61	0.66 0.93	0.40 0.75	0.25 0.35
RUNOFF						

TOTALS	0.014 0.000	0.007 0.000	0.000 0.000	0.007 0.002	0.000 0.002	0.000 0.003
STD. DEVIATIONS	0.040 0.000	0.022 0.000	0.002 0.002	0.048 0.007	0.000 0.007	0.000 0.011
EVAPOTRANSPIRATION						

TOTALS	0.381 0.878	0.569 1.138	0.993 0.910	0.814 0.757	0.705 0.520	0.392 0.416
STD. DEVIATIONS	0.250 0.463	0.227 0.477	0.448 0.504	0.546 0.451	0.441 0.374	0.360 0.245
PERCOLATION/LEAKAGE THROUGH LAYER 4						

TOTALS	0.0000 0.0001	0.0000 0.0001	0.0000 0.0001	0.0000 0.0000	0.0000 0.0000	0.0001 0.0000
STD. DEVIATIONS	0.0000 0.0002	0.0000 0.0001	0.0000 0.0001	0.0000 0.0001	0.0001 0.0001	0.0002 0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	0.0001 0.0008	0.0000 0.0007	0.0000 0.0006	0.0000 0.0004	0.0003 0.0002	0.0010 0.0001
STD. DEVIATIONS	0.0002 0.0023	0.0001 0.0016	0.0000 0.0011	0.0000 0.0008	0.0011 0.0005	0.0030 0.0003

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 50

	INCHES		CU. FEET	PERCENT
PRECIPITATION	8.48	(1.774)	15395.9	100.00
RUNOFF	0.035	(0.0632)	62.95	0.409

	AZTEC.OUT			
EVAPOTRANSPIRATION	8.474	(1.7111)	15380.35	99.899
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00042	(0.00079)	0.761	0.00494
AVERAGE HEAD ON TOP OF LAYER 4	0.000	(0.001)		
CHANGE IN WATER STORAGE	-0.027	(0.8984)	-48.14	-0.313

□

PEAK DAILY VALUES FOR YEARS		1 THROUGH	50
		(INCHES)	(CU. FT.)
PRECIPITATION		2.44	4428.600
RUNOFF		0.342	620.8238
PERCOLATION/LEAKAGE THROUGH LAYER 4		0.000036	0.06561
AVERAGE HEAD ON TOP OF LAYER 4		0.018	
SNOW WATER		1.05	1903.7914
MAXIMUM VEG. SOIL WATER (VOL/VOL)			0.1999
MINIMUM VEG. SOIL WATER (VOL/VOL)			0.1145

□

FINAL WATER STORAGE AT END OF YEAR			50
LAYER	(INCHES)	(VOL/VOL)	
1	0.6426	0.1071	
2	4.9221	0.1172	
3	42.5999	0.2840	
4	0.0000	0.0000	
SNOW WATER	0.000		

AZTEC.OUT

11

AZTEC.OUT

1

AGENCY U. S. ENVIRONMENTAL PROTECTION
EXPOSURE ASSESSMENT
MULTIMEDIA MODEL
MULTIMED (Version 1.01, June 1991)

1

Run options

CARLSBAD, NM - 4' COVER - 25' TO GROUNDWATER - 100' TO RECEPTOR

20 yr pulse. - loam cover - good liner - 1K chloride - 10' mixing zone
Chemical simulated is CHLORIDE

Option Chosen Saturated and unsaturated zone models
Run was DETERMIN
Infiltration input by user
Run was transient
Reject runs if Y coordinate outside plume
Do not reject runs if Z coordinate outside plume
Gaussian source used in saturated zone model

1

1

UNSATURATED ZONE FLOW MODEL PARAMETERS
(input parameter description and value)
NP - Total number of nodal points

240

AZTEC.OUT

NMAT	- Number of different porous materials	1
KPROP	- Van Genuchten or Brooks and Corey	1
IMSHGN	- Spatial discretization option	1
NVFLAYR	- Number of layers in flow model	1

OPTIONS CHOSEN

Van Genuchten functional coefficients
User defined coordinate system

1

Layer information

LAYER NO.	LAYER THICKNESS	MATERIAL PROPERTY
1	7.62	1

DATA FOR MATERIAL 1

VADOSE ZONE MATERIAL VARIABLES

PARAMETERS		VARIABLE NAME LIMITS		UNITS	DISTRIBUTION
MEAN	STD DEV	MIN	MAX		
3.60	-999.	0.100E-10	0.100E+05	cm/hr	CONSTANT
0.250	-999.	0.100E-08	0.990	--	CONSTANT
0.700	-999.	0.000E+00	-999.	m	CONSTANT
7.62	-999.	0.100E-08	-999.	m	CONSTANT

DATA FOR MATERIAL 1

VADOSE ZONE FUNCTION VARIABLES

PARAMETERS		VARIABLE NAME LIMITS		UNITS	DISTRIBUTION
MEAN	STD DEV	MIN	MAX		
0.116	-999.	0.100E-08	1.00	--	CONSTANT
				--	CONSTANT

AZTEC.OUT

0.000E+00	-999.	0.000E+00	10.0		
		ALFA coefficient		1/cm	CONSTANT
0.500E-02	-999.	0.000E+00	1.00		
		Van Genuchten exponent, ENN		--	CONSTANT
1.09	-999.	1.00	5.00		
1					

UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

NLAY	- Number of different layers used	1
NTSTPS	- Number of time values concentration calc	40
DUMMY	- Not presently used	1
ISOL	- Type of scheme used in unsaturated zone	1
N	- Stehfest terms or number of increments	18
NTEL	- Points in Lagrangian interpolation	3
NGPTS	- Number of Gauss points	104
NIT	- Convolution integral segments	2
IBOUND	- Type of boundary condition	2
ITSGEN	- Time values generated or input	1
TMAX	- Max simulation time	-- 0.0
WTFUN	- Weighting factor	-- 1.2

OPTIONS CHOSEN

 Stehfest numerical inversion algorithm
 Nondecaying pulse source
 Computer generated times for computing concentrations
 1

DATA FOR LAYER 1

 VADOSE TRANSPORT VARIABLES

PARAMETERS				VARIABLE NAME	UNITS	DISTRIBUTION
				LIMITS		
MEAN	STD DEV	MIN	MAX			

7.62	-999.	0.100E-08	-999.	Thickness of layer	m	CONSTANT
1.00	-999.	0.100E-02	0.100E+05	Longitudinal dispersivity of layer	m	DERIVED
0.000E+00	-999.	0.000E+00	100.	Percent organic matter	--	CONSTANT
1.73	-999.	0.100E-01	5.00	Bulk density of soil for layer	g/cc	CONSTANT
0.000E+00	-999.	0.000E+00	-999.	Biological decay coefficient	1/yr	CONSTANT
1						

CHEMICAL SPECIFIC VARIABLES

PARAMETERS		VARIABLE NAME LIMITS		AZTEC.OUT UNITS	DISTRIBUTION
MEAN	STD DEV	MIN	MAX		

-999.		Solid phase decay coefficient		1/yr	DERIVED
-999.	-999.	0.000E+00	0.100E+11		
-999.		Dissolved phase decay coefficient		1/yr	DERIVED
-999.	-999.	0.000E+00	0.100E+11		
-999.		Overall chemical decay coefficient		1/yr	DERIVED
-999.	-999.	0.000E+00	0.100E+11		
0.000E+00	-999.	Acid catalyzed hydrolysis rate		1/M-yr	CONSTANT
0.000E+00	-999.	0.000E+00	-999.		
0.000E+00	-999.	Neutral hydrolysis rate constant		1/yr	CONSTANT
0.000E+00	-999.	0.000E+00	-999.		
0.000E+00	-999.	Base catalyzed hydrolysis rate		1/M-yr	CONSTANT
0.000E+00	-999.	0.000E+00	-999.		
20.0	-999.	Reference temperature		C	CONSTANT
0.000E+00	-999.	0.000E+00	100.		
0.000E+00	-999.	Normalized distribution coefficient		ml/g	CONSTANT
-999.	-999.	0.000E+00	-999.		
-999.	-999.	Distribution coefficient		--	DERIVED
0.000E+00	-999.	0.000E+00	0.100E+11		
0.000E+00	-999.	Biodegradation coefficient (sat. zone)		1/yr	CONSTANT
0.000E+00	-999.	0.000E+00	-999.		
0.000E+00	-999.	Air diffusion coefficient		cm2/s	CONSTANT
0.000E+00	-999.	0.000E+00	10.0		
20.0	-999.	Reference temperature for air diffusion		C	CONSTANT
0.000E+00	-999.	0.000E+00	100.		
0.000E+00	-999.	Molecular weight		g/M	CONSTANT
0.000E+00	-999.	0.000E+00	-999.		
0.000E+00	-999.	Mole fraction of solute		--	CONSTANT
0.000E+00	-999.	0.100E-08	1.00		
0.000E+00	-999.	Vapor pressure of solute		mm Hg	CONSTANT
0.000E+00	-999.	0.000E+00	100.		
0.000E+00	-999.	Henry's law constant		atm-m^3/M	CONSTANT
0.000E+00	-999.	0.100E-09	1.00		
0.000E+00	-999.	Overall 1st order decay sat. zone		1/yr	DERIVED
0.000E+00	0.000E+00	0.000E+00	1.00		
-999.	-999.	Not currently used			CONSTANT
-999.	-999.	0.000E+00	1.00		
-999.	-999.	Not currently used			CONSTANT
-999.	-999.	0.000E+00	1.00		

SOURCE SPECIFIC VARIABLES

PARAMETERS		VARIABLE NAME LIMITS		UNITS	DISTRIBUTION
MEAN	STD DEV	MIN	MAX		

0.153E-02	-999.	Infiltration rate		m/yr	CONSTANT
167.	-999.	0.100E-09	0.100E+11		
	-999.	Area of waste disposal unit		m^2	CONSTANT
	-999.	0.100E-01	-999.		

AZTEC.OUT					
20.0	-999.	0.100E-08	-999.	yr	CONSTANT
		Spread of contaminant source		m	DERIVED
-999.	-999.	0.100E-08	0.100E+11		
		Recharge rate		m/yr	CONSTANT
0.000E+00	-999.	0.000E+00	0.100E+11		
		Source decay constant		1/yr	CONSTANT
0.000E+00	-999.	0.000E+00	-999.		
		Initial concentration at landfill		mg/l	CONSTANT
0.100E+04	-999.	0.000E+00	-999.		
		Length scale of facility		m	DERIVED
-999.	-999.	0.100E-08	0.100E+11		
		Width scale of facility		m	DERIVED
-999.	-999.	0.100E-08	0.100E+11		
		Near field dilution			DERIVED
1.00	0.000E+00	0.000E+00	1.00		
1					

AQUIFER SPECIFIC VARIABLES

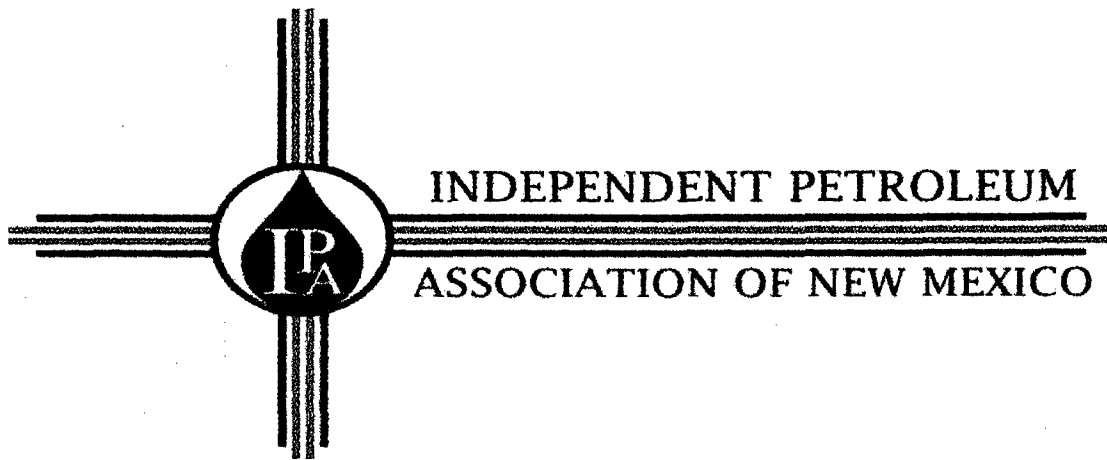
PARAMETERS		VARIABLE NAME LIMITS		UNITS	DISTRIBUTION
MEAN	STD DEV	MIN	MAX		
0.500E-01		0.100E-08	100.	cm	CONSTANT
		Aquifer porosity		--	CONSTANT
0.300		0.100E-08	0.990		
		Bulk density		g/cc	CONSTANT
1.70		0.100E-01	5.00		
		Aquifer thickness		m	CONSTANT
21.0		0.100E-08	0.100E+06		
		Source thickness (mixing zone depth)		m	CONSTANT
3.05		0.100E-08	0.100E+06		
		Conductivity (hydraulic)		m/yr	CONSTANT
30.0		0.100E-06	0.100E+09		
		Gradient (hydraulic)			CONSTANT
0.100E-02		0.100E-07	-999.		
		Groundwater seepage velocity		m/yr	DERIVED
-999.		0.100E-09	0.100E+09		
		Retardation coefficient		--	DERIVED
1.00		1.00	0.100E+09		
		Longitudinal dispersivity		m	FUNCTION OF X
-999.		0.100E-02	0.100E+05		
		Transverse dispersivity		m	FUNCTION OF X
-999.		-999.	-999.		
		Vertical dispersivity		m	FUNCTION OF X
-999.		0.100E-02	0.100E+05		
		Temperature of aquifer		C	CONSTANT
20.0		0.000E+00	100.		
		pH		--	CONSTANT
7.00		0.300	14.0		
		Organic carbon content (fraction)			CONSTANT
0.000E+00		0.100E-05	1.00		
		Well distance from site		m	CONSTANT
30.4		1.00	-999.		
		Angle off center		degree	CONSTANT

19

0.000E+00 -999. 0.000E+00 360. AZTEC.OUT
 well vertical distance
 0.000E+00 -999. 0.000E+00 1.00
 1

m CONSTANT

TIME	CONCENTRATION
0.800E+03	0.22057E-07
0.850E+03	0.58235E-03
0.900E+03	0.44574E-01
0.950E+03	0.21399E+00
0.100E+04	0.48098E+00
0.105E+04	0.82864E+00
0.110E+04	0.12084E+01
0.115E+04	0.15781E+01
0.120E+04	0.19005E+01
0.125E+04	0.21494E+01
0.130E+04	0.23108E+01
0.135E+04	0.23822E+01
0.140E+04	0.23692E+01
0.145E+04	0.22828E+01
0.150E+04	0.21376E+01
0.155E+04	0.19503E+01
0.160E+04	0.17340E+01
0.165E+04	0.15050E+01
0.170E+04	0.12708E+01
0.175E+04	0.10459E+01



OCD CASE NOS. 14784 AND 14785

IPANM Petition to amend Title 19, Chapter 15,
part 17 (The PIT Rule)

May 14 – 18, 2012

IPANM exhibit 17
Rebuttal Economic testimony

Cost Comparison Reserve Pit versus Closed Loop System

Eddy BD State No. 2
Unit Letter B, Section 32, T-20S, R-30E

Reserve Pit

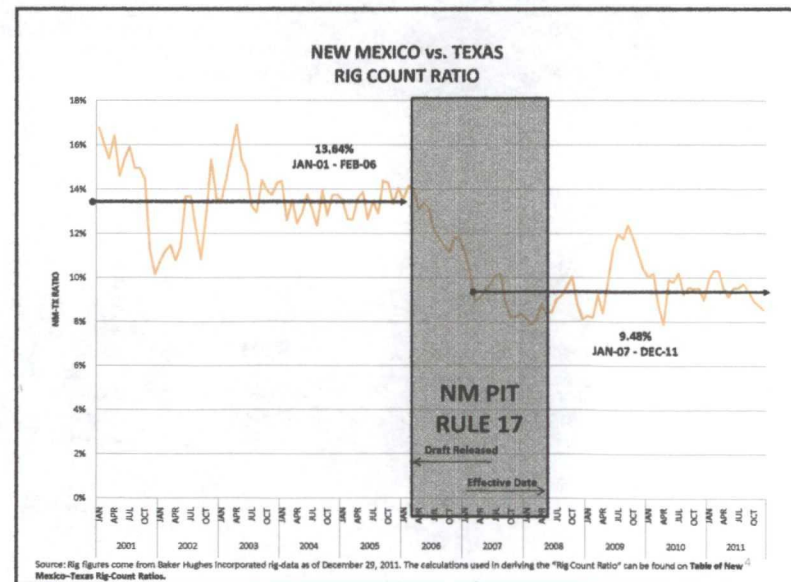
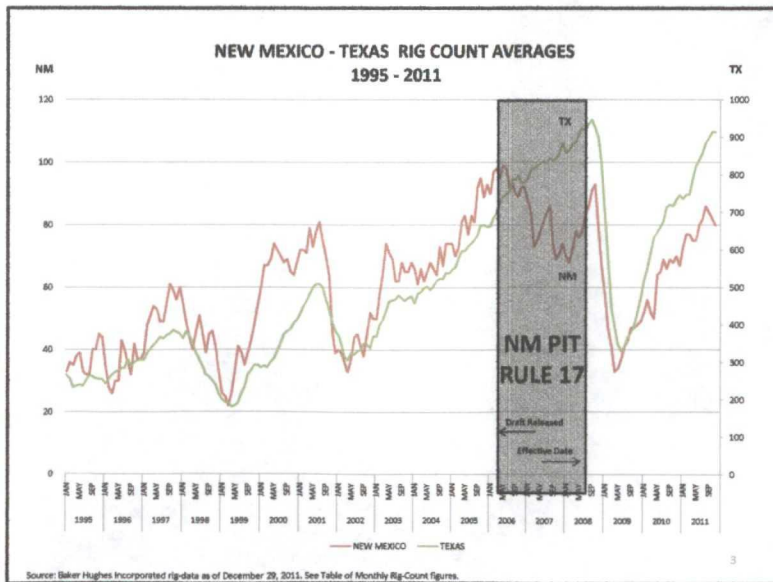
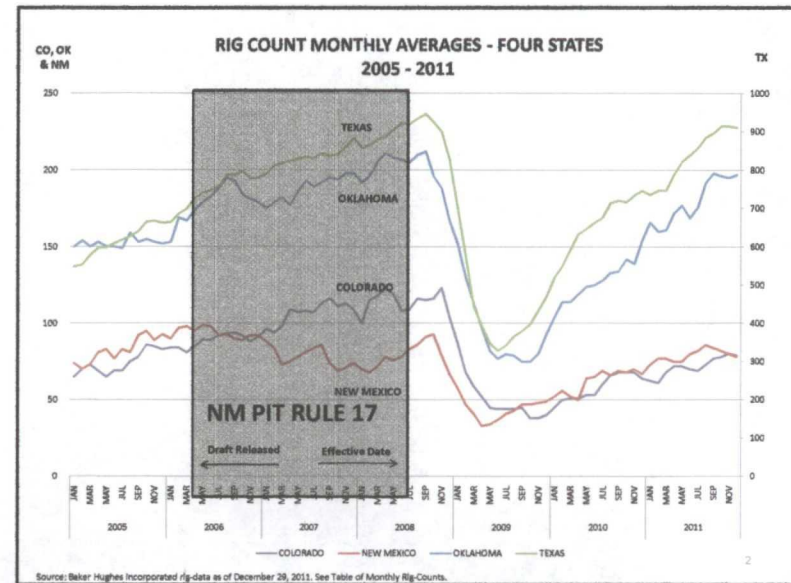
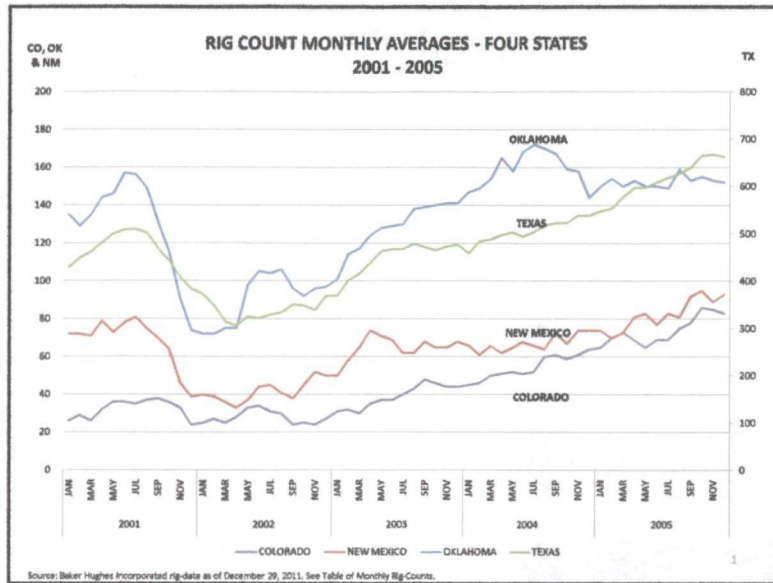
Banta Oilfield Service, Inc.	\$353.01
Diamondback Disposal	\$25,347.88
Mesquite Services, Inc.	\$1,990.99
TFH Rental Tools	\$24,895.26
Total	<u>\$52,587.14</u>

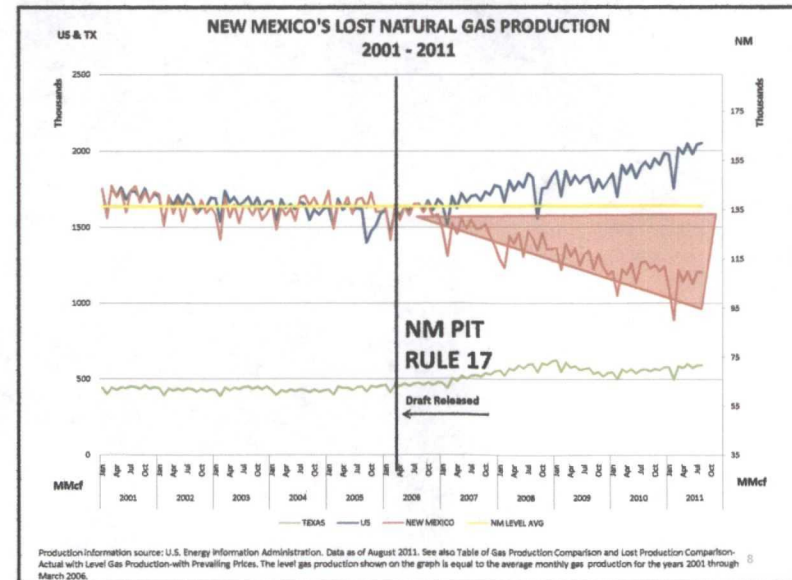
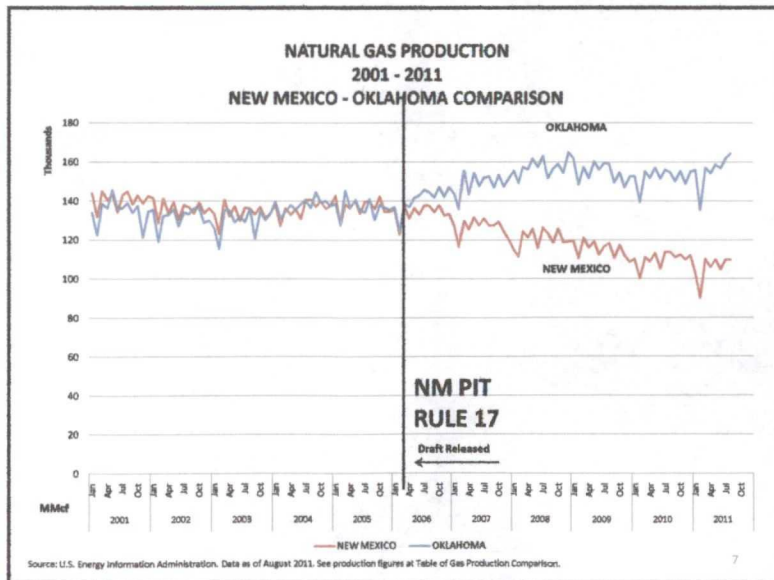
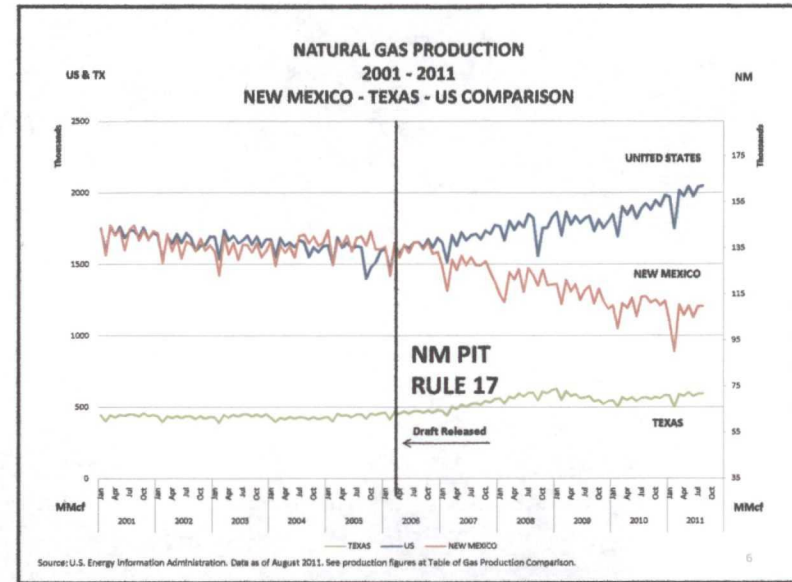
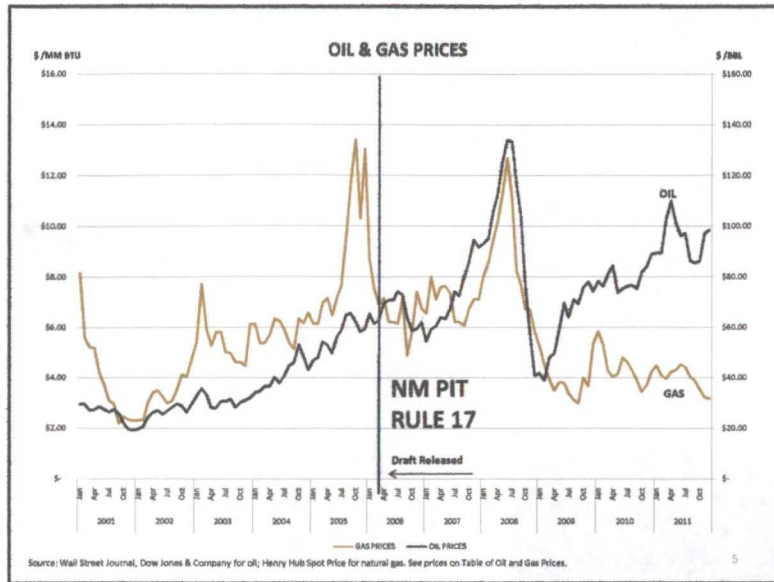
Eddy BD State No. 3
Unit Letter G, Section 32, T-20S, R-30E

Closed Loop System

Closed Loop Specialties	\$113,864.40
CRI Holdings, LLC	\$78,037.34
Dorado	\$11,734.85
Mesquite Services, Inc.	\$51,957.57
R.T. Hicks Consultants, Ltd.	\$5,675.11
Roadrunner Environmental	\$703.24
Total	<u>\$261,972.51</u>

Prepared by Lynx Petroleum
June 2012





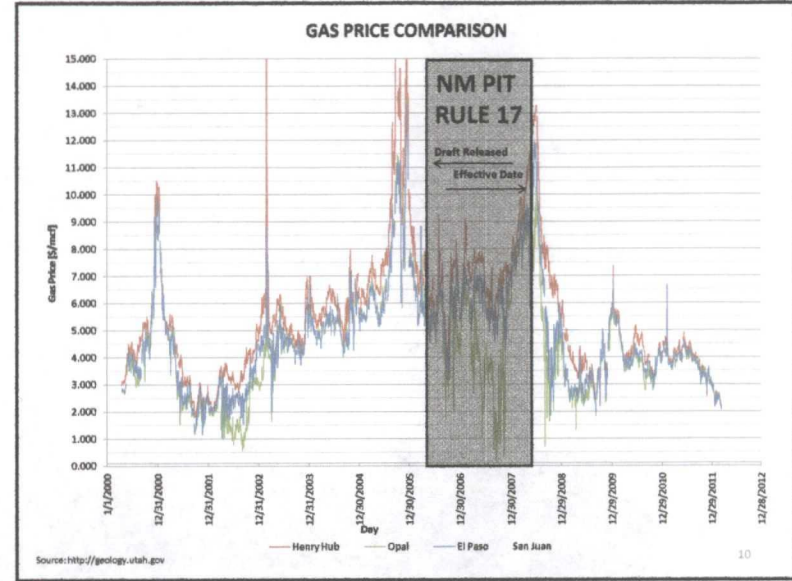
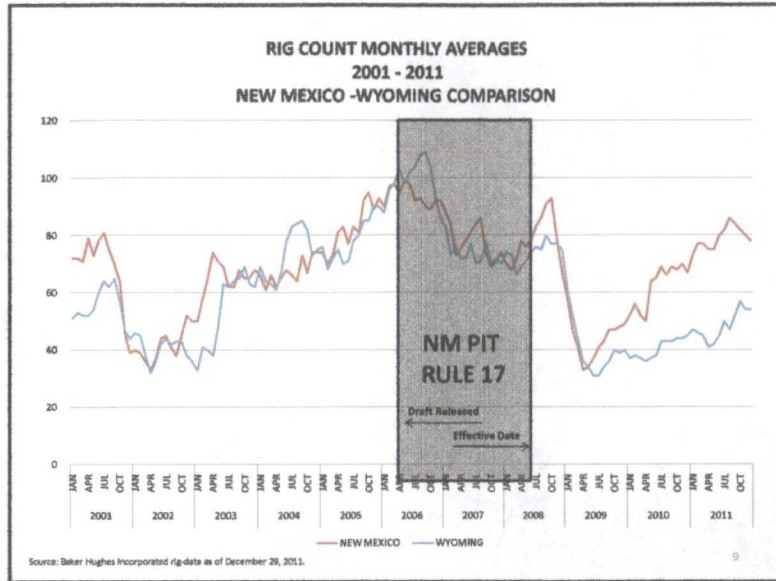


Table of Monthly Rig-Counts

2006												2007											
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CO	32	26	14	11	10	12	16	14	11	11	14	12	14	16	20	39	12	11	12	11	12	11	15
NM	33	36	35	36	39	33	32	32	40	45	44	35	28	26	30	30	43	40	36	32	42	37	37
OK	103	94	93	95	86	87	100	100	93	93	103	119	97	95	101	111	113	106	108	100	107	112	110
TX	264	256	233	237	240	236	251	265	262	255	263	255	267	274	278	284	285	308	291	299	305	307	

2008												2009											
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CO	18	17	16	13	16	15	16	19	18	17	14	17	18	14	17	15	14	15	13	10	9	6	8
NM	39	48	51	54	53	49	49	55	61	59	56	60	55	49	44	40	44	51	45	39	45	46	41
OK	132	110	111	105	110	113	107	109	99	88	90	96	87	98	92	87	85	91	78	90	89	81	69
TX	306	325	337	346	356	368	363	375	376	365	361	379	363	363	370	351	325	307	290	266	261	251	240

2010												2011											
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CO	10	11	11	8	11	13	13	14	15	17	18	18	17	18	16	17	16	15	16	15	15	22	24
NM	26	25	22	28	33	41	39	35	38	43	48	54	60	67	67	69	74	72	70	68	69	65	64
OK	64	82	60	60	56	53	50	55	58	66	73	81	78	71	79	83	85	93	91	114	117	126	111
TX	201	192	191	180	183	190	217	233	266	278	282	293	285	290	286	300	310	329	350	374	382	386	404

2012											
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CO	26	29	26	32	36	36	35	37	38	33	24
NM	72	72	71	79	73	78	81	75	70	64	46
OK	135	129	135	144	146	157	150	149	131	113	93
TX	425	449	462	481	500	508	509	502	468	443	407

2013											
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CO	31	32	30	30	37	37	40	43	48	46	44
NM	50	58	65	74	71	69	62	62	62	68	65
OK	101	114	117	124	128	129	130	138	139	140	141
TX	370	401	415	436	463	467	466	479	472	465	473

Source: Average Monthly Rig-Counts Baker Hughes Incorporated rig-data as of December 29, 2011.

Table of Monthly Rig-Counts (cont.)

2007												2008											
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CO	96	94	98	109	107	108	107	113	116	111	113	109	100	115	118	123	119	108	109	116	115	116	113
NM	68	64	73	75	78	83	84	86	74	69	71	74	70	68	72	78	76	78	83	86	91	93	79
OK	175	179	182	177	186	193	189	192	195	194	188	198	192	194	206	211	208	207	205	210	212	198	186
TX	790	815	818	824	829	834	831	844	837	842	860	864	858	866	881	887	906	923	920	934	946	925	899

2009												2010											
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CO	67	68	59	52	45	44	44	44	45	46	38	40	45	50	51	51	53	53	60	66	68	68	64
NM	58	67	61	83	34	37	45	43	47	47	48	49	52	56	52	50	64	65	69	66	68	68	70
OK	152	130	113	97	82	77	80	79	75	75	80	93	104	114	114	113	124	125	128	133	134	142	139
TX	701	574	445	393	347	320	342	366	380	398	453	470	519	549	593	633	647	663	676	714	721	717	734

2011											
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CO	63	61	68	72	72	70	69	73	77	78	80
NM	73	77	77	75	75	80	82	86	84	82	80
OK	166	160	161	172	177	169	176	192	168	196	195
TX	736	747	748	789	822	839	856	865	897	914	914

Source: Average Monthly Rig-Counts Baker Hughes Incorporated rig-data as of December 29, 2011.

16

**Table of Lost Production Comparison-Actual with Level Gas Production-with
Prevailing Prices**

NATURAL GAS (MMBtu)							NATURAL GAS (MMBtu)						
DATE	MMBtu	MMBtu	MMBtu	DIFFERENCE	LOSS (\$/MMBtu)	LOSS (\$)	DATE	MMBtu	MMBtu	MMBtu	DIFFERENCE	LOSS (\$/MMBtu)	LOSS (\$)
Nov	131,979	136,489	5,509	136,489	0	7.41	Dec	110,141	136,489	26,348	136,489	0	5.83
Dec	128,509	136,489	7,980	136,489	0	6.19	Jan	100,173	136,489	36,316	136,489	0	5.32
Jan	137,184	136,489	-6,995	136,489	0	6.53	Feb	111,074	136,489	25,415	136,489	0	4.29
Feb	136,489	136,489	0	136,489	0	8.00	Mar	106,834	136,489	29,655	136,489	0	4.01
Mar	136,489	136,489	0	136,489	0	7.11	Apr	113,360	136,489	23,129	136,489	0	4.14
Apr	136,489	136,489	0	136,489	0	7.60	May	109,266	136,489	27,223	136,489	0	4.80
May	136,489	136,489	0	136,489	0	7.84	Jun	118,705	136,489	17,784	136,489	0	4.68
Jun	137,442	136,489	-9,953	136,489	0	7.85	Jul	113,961	136,489	22,528	136,489	0	4.32
Jul	136,489	136,489	0	136,489	0	6.21	Aug	111,347	136,489	25,142	136,489	0	5.89
Aug	137,138	136,489	-6,649	136,489	0	6.13	Sep	112,504	136,489	23,985	136,489	0	5.43
Sep	137,949	136,489	-1,460	136,489	0	6.08	Oct	108,872	136,489	27,617	136,489	0	5.71
Oct	136,489	136,489	0	136,489	0	6.74	Nov	112,125	136,489	24,364	136,489	0	4.29
Nov	136,489	136,489	0	136,489	0	7.10	Dec	100,466	136,489	36,023	136,489	0	4.89
Dec	136,489	136,489	0	136,489	0	7.11	Jan	90,380	136,489	46,109	136,489	0	4.09
Jan	136,489	136,489	0	136,489	0	7.99	Feb	116,169	136,489	20,320	136,489	0	5.97
Feb	136,489	136,489	0	136,489	0	6.54	Mar	105,960	136,489	30,529	136,489	0	4.24
Mar	136,489	136,489	0	136,489	0	9.41	Apr	110,018	136,489	26,471	136,489	0	4.31
Apr	136,489	136,489	0	136,489	0	10.14	May	106,814	136,489	29,675	136,489	0	4.26
May	136,489	136,489	0	136,489	0	11.27	Jun	108,868	136,489	27,621	136,489	0	4.41
Jun	136,489	136,489	0	136,489	0	12.89	Jul	109,772	136,489	26,717	136,489	0	4.06
Jul	136,489	136,489	0	136,489	0	11.09	Aug	109,772	136,489	26,717	136,489	0	4.06
Aug	136,489	136,489	0	136,489	0	8.28	Sep	109,772	136,489	26,717	136,489	0	4.06
Sep	136,489	136,489	0	136,489	0	7.87	Oct	109,772	136,489	26,717	136,489	0	4.06
Oct	136,489	136,489	0	136,489	0	6.74	Nov	109,772	136,489	26,717	136,489	0	4.06
Nov	136,489	136,489	0	136,489	0	6.88	Dec	109,772	136,489	26,717	136,489	0	4.06
Dec	136,489	136,489	0	136,489	0	6.82	Jan	136,489	136,489	0	136,489	0	5.24
Jan	136,489	136,489	0	136,489	0	5.24	Feb	136,489	136,489	0	136,489	0	4.10
Feb	136,489	136,489	0	136,489	0	3.80	Mar	136,489	136,489	0	136,489	0	3.80
Mar	136,489	136,489	0	136,489	0	3.80	Apr	136,489	136,489	0	136,489	0	3.80
Apr	136,489	136,489	0	136,489	0	3.80	May	136,489	136,489	0	136,489	0	3.80
May	136,489	136,489	0	136,489	0	3.80	Jun	136,489	136,489	0	136,489	0	3.80
Jun	136,489	136,489	0	136,489	0	3.80	Jul	136,489	136,489	0	136,489	0	3.80
Jul	136,489	136,489	0	136,489	0	3.80	Aug	136,489	136,489	0	136,489	0	3.80
Aug	136,489	136,489	0	136,489	0	3.80	Sep	136,489	136,489	0	136,489	0	3.80
Sep	136,489	136,489	0	136,489	0	3.80	Oct	136,489	136,489	0	136,489	0	3.80
Oct	136,489	136,489	0	136,489	0	3.80	Nov	136,489	136,489	0	136,489	0	3.80
Nov	136,489	136,489	0	136,489	0	3.80	Dec	136,489	136,489	0	136,489	0	3.80
Dec	136,489	136,489	0	136,489	0	3.80	Jan	136,489	136,489	0	136,489	0	3.80
Jan	136,489	136,489	0	136,489	0	3.80	Feb	136,489	136,489	0	136,489	0	3.80
Feb	136,489	136,489	0	136,489	0	3.80	Mar	136,489	136,489	0	136,489	0	3.80
Mar	136,489	136,489	0	136,489	0	3.80	Apr	136,489	136,489	0	136,489	0	3.80
Apr	136,489	136,489	0	136,489	0	3.80	May	136,489	136,489	0	136,489	0	3.80
May	136,489	136,489	0	136,489	0	3.80	Jun	136,489	136,489	0	136,489	0	3.80
Jun	136,489	136,489	0	136,489	0	3.80	Jul	136,489	136,489	0	136,489	0	3.80
Jul	136,489	136,489	0	136,489	0	3.80	Aug	136,489	136,489	0	136,489	0	3.80
Aug	136,489	136,489	0	136,489	0	3.80	Sep	136,489	136,489	0	136,489	0	3.80
Sep	136,489	136,489	0	136,489	0	3.80	Oct	136,489	136,489	0	136,489	0	3.80
Oct	136,489	136,489	0	136,489	0	3.80	Nov	136,489	136,489	0	136,489	0	3.80
Nov	136,489	136,489	0	136,489	0	3.80	Dec	136,489	136,489	0	136,489	0	3.80
Dec	136,489	136,489	0	136,489	0	3.80	Jan	136,489	136,489	0	136,489	0	3.80
Jan	136,489	136,489	0	136,489	0	3.80	Feb	136,489	136,489	0	136,489	0	3.80
Feb	136,489	136,489	0	136,489	0	3.80	Mar	136,489	136,489	0	136,489	0	3.80
Mar	136,489	136,489	0	136,489	0	3.80	Apr	136,489	136,489	0	136,489	0	3.80
Apr	136,489	136,489	0	136,489	0	3.80	May	136,489	136,489	0	136,489	0	3.80
May	136,489	136,489	0	136,489	0	3.80	Jun	136,489	136,489	0	136,489	0	3.80
Jun	136,489	136,489	0	136,489	0	3.80	Jul	136,489	136,489	0	136,489	0	3.80
Jul	136,489	136,489	0	136,489	0	3.80	Aug	136,489	136,489	0	136,489	0	3.80
Aug	136,489	136,489	0	136,489	0	3.80	Sep	136,489	136,489	0	136,489	0	3.80
Sep	136,489	136,489	0	136,489	0	3.80	Oct	136,489	136,489	0	136,489	0	3.80
Oct	136,489	136,489	0	136,489	0	3.80	Nov	136,489	136,489	0	136,489	0	3.80
Nov	136,489	136,489	0	136,489	0	3.80	Dec	136,489	136,489	0	136,489	0	3.80
Dec	136,489	136,489	0	136,489	0	3.80	Jan	136,489	136,489	0	136,489	0	3.80
Jan	136,489	136,489	0	136,489	0	3.80	Feb	136,489	136,489	0	136,489	0	3.80
Feb	136,489	136,489	0	136,489	0	3.80	Mar	136,489	136,489	0	136,489	0	3.80
Mar	136,489	136,489	0	136,489	0	3.80	Apr	136,489	136,489	0	136,489	0	3.80
Apr	136,489	136,489	0	136,489	0	3.80	May	136,489	136,489	0	136,489	0	3.80
May	136,489	136,489	0	136,489	0	3.80	Jun	136,489	136,489	0	136,489	0	3.80
Jun	136,489	136,489	0	136,489	0	3.80	Jul	136,489	136,489	0	136,489	0	3.80
Jul	136,489	136,489	0	136,489	0	3.80	Aug	136,489	136,489	0	136,489	0	3.80
Aug	136,489	136,489	0	136,489	0	3.80	Sep	136,489	136,489	0	136,489	0	3.80
Sep	136,489	136,489	0	136,489	0	3.80	Oct	136,489	136,489	0	136,489	0	3.80
Oct	136,489	136,489	0	136,489	0	3.80	Nov	136,489	136,489	0	136,489	0	3.80
Nov	136,489	136,489	0	136,489	0	3.80	Dec	136,489	136,489	0	136,489	0	3.80
Dec	136,489	136,489	0	136,489	0	3.80	Jan	136,489	136,489	0	136,489	0	3.80
Jan	136,489	136,489	0	136,489	0	3.80	Feb	136,489	136,489	0	136,489	0	3.80
Feb	136,489	136,489	0	136,489	0	3.80	Mar	136,489	136,489	0	136,489	0	3.80
Mar	136,489	136,489	0	136,489	0	3.80	Apr	136,489	136,489	0	136,489	0	3.80
Apr	136,489	136,489	0	136,489	0	3.80	May	136,489	136,489	0	136,489	0	3.80
May	136,489	136,489	0	136,489	0	3.80	Jun	136,489	136,489	0	136,489	0	3.80
Jun	136,489	136,489	0	136,489	0	3.80	Jul	136,489	136,489	0	136,489	0	3.80
Jul	136,489	136,489	0	136,489	0	3.80	Aug	136,489	136,489	0	136,489	0	3.80
Aug	136,489	136,489	0	136,489	0	3.80	Sep	136,489	136,489	0	136,489	0	3.80
Sep	136,489	136,489	0	136,489	0	3.80	Oct	136,489	136,489	0	136,489	0	3.80
Oct	136,489	136,489	0	136,489	0	3.80	Nov	136,489	136,489	0	136,489	0	3.80
Nov	136,489	136,489	0	136,489	0	3.80	Dec	136,489	136,489	0	136,489	0	3.80
Dec	136,489	136,489	0	136,489	0	3.80	Jan	136,489	136,489	0	136,489	0	3.80
Jan	136,489	136,489	0	136,489	0	3.80	Feb	136,489	136,489	0	136,489	0	3.80
Feb	136,489	136,489	0	136,489	0	3.80	Mar	136,489	136,489	0	136,489	0	3.80
Mar	136,489	136,489	0	136,489	0	3.80	Apr	136,489	136,489	0	136,489	0	3.80
Apr	136,489	136,489	0	136,489	0	3.80	May	136,489	136,489				