AFMSS

U.S. Department of the Interior
BUREAU OF LAND MANAGEMENT

Application Data Report

01/31/2019

APD ID: 10400033134 **Submission Date:** 08/17/2018

Operator Name: LEGACY RESERVES OPERATING LP

Well Name: LEA UNIT **Well Number:** 102H

Well Type: OIL WELL **Well Work Type:** Drill

Highlighted data reflects the most recent changes

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Section 1 - General

APD ID: 10400033134 **Tie to previous NOS?** **Submission Date:** 08/17/2018

BLM Office: CARLSBAD **User:** Kayley Thurber **Title:** Permitting Specialist

Federal/Indian APD: FED **Is the first lease penetrated for production Federal or Indian?** FED

Lease number: NMNM0006531 **Lease Acres:** 40

Surface access agreement in place? **Allotted?** **Reservation:**

Agreement in place? NO **Federal or Indian agreement:**

Agreement number:

Agreement name:

Keep application confidential? YES

Permitting Agent? YES **APD Operator:** LEGACY RESERVES OPERATING LP

Operator letter of designation: Authorization_Letter_for_Reagan_Smith_Lea_102H_20180816143511.pdf

Operator Info

Operator Organization Name: LEGACY RESERVES OPERATING LP

Operator Address: 303 West Wall St., Ste 1800 **Zip:** 79701

Operator PO Box:

Operator City: Midland **State:** TX

Operator Phone: (432)689-5287

Operator Internet Address:

Section 2 - Well Information

Well in Master Development Plan? EXISTING **Mater Development Plan name:** Lea Unit Master Dev Plan

Well in Master SUPO? NO **Master SUPO name:**

Well in Master Drilling Plan? NO **Master Drilling Plan name:**

Well Name: LEA UNIT **Well Number:** 102H **Well API Number:**

Field/Pool or Exploratory? Field and Pool **Field Name:** LEA **Pool Name:** UPPER WOLFCAMP

Is the proposed well in an area containing other mineral resources? USEABLE WATER,NATURAL GAS,OIL

Operator Name: LEGACY RESERVES OPERATING LP

Well Name: LEA UNIT **Well Number:** 102H

Describe other minerals:

Is the proposed well in a Helium production area? N **Use Existing Well Pad?** YES **New surface disturbance?** N

Type of Well Pad: MULTIPLE WELL **Multiple Well Pad Name:** LEA UNIT 102H **Number:** 7

Well Class: HORIZONTAL **Number of Legs:** 1

Well Work Type: Drill

Well Type: OIL WELL

Describe Well Type:

Well sub-Type: INFILL

Describe sub-type:

Distance to town: 26 Miles **Distance to nearest well:** 50 FT **Distance to lease line:** 140 FT

Reservoir well spacing assigned acres Measurement: 2559.68 Acres

Well plat: Agency_Lease_Plat___Lea_Unit_102H_20180816143609.pdf

Lea_Unit_102H_Signed_C102_04_10_18_20180817135100.pdf

Well work start Date: 10/16/2018 **Duration:** 45 DAYS

Section 3 - Well Location Table

Survey Type: RECTANGULAR

Describe Survey Type:

Datum: NAD83 **Vertical Datum:** NAVD88

Survey number:

	NS-Foot	NS Indicator	EW-Foot	EW Indicator	Twsp	Range	Section	Aliquot/Lot/Tract	Latitude	Longitude	County	State	Meridian	Lease Type	Lease Number	Elevation	MD	TVD
SHL Leg #1	140	FNL	1215	FEL	20S	34E	11	Aliquot NENE	32.5944948	-103.5262744	LEA	NEW MEXICO	NEW MEXICO	F	NMNM 0006531	3666	0	0
KOP Leg #1	140	FNL	957	FEL	20S	34E	11	Aliquot NENE	32.59449	-103.525463	LEA	NEW MEXICO	NEW MEXICO	F	NMNM 0006531	-7156	10837	10822
PPP Leg #1	611	FNL	1003	FEL	20S	34E	11	Aliquot NENE	32.593219	-103.525619	LEA	NEW MEXICO	NEW MEXICO	F	NMNM 0006531	-7633	11575	11299

Operator Name: LEGACY RESERVES OPERATING LP

Well Name: LEA UNIT **Well Number:** 102H

	NS-Foot	NS Indicator	EW-Foot	EW Indicator	Twsp	Range	Section	Aliquot/Lot/Tract	Latitude	Longitude	County	State	Meridian	Lease Type	Lease Number	Elevation	MD	TVD
PPP Leg #1	1320	FNL	942	FEL	20S	34E	11	Aliquot SENE	32.591273	-103.52564	LEA	NEW MEXICO	NEW MEXICO	F	NMNM 000653 1A	-7634	12300	11300
PPP Leg #1	1320	FNL	1011	FEL	20S	34E	14	Aliquot SENE	32.57675	-103.525637	LEA	NEW MEXICO	NEW MEXICO	F	NMNM 0080262	-7634	17600	11300
PPP Leg #1	0	FNL	1037	FEL	20S	34E	14	Aliquot SENE	32.580373	-103.525638	LEA	NEW MEXICO	NEW MEXICO	F	NMNM 0053434	-7634	16300	11300
EXIT Leg #1	2310	FNL	1020	FEL	20S	34E	14	Aliquot SENE	32.574016	-103.525361	LEA	NEW MEXICO	NEW MEXICO	F	NMNM 0080262	-7634	18561	11300
BHL Leg #1	2310	FNL	1020	FEL	20S	34E	14	Aliquot SENE	32.574016	-103.525361	LEA	NEW MEXICO	NEW MEXICO	F	NMNM 0080262	-7634	18562	11300

LEGACY
RESERVES
303 W. Wall, Suite 1800 - Midland, Texas 79701
(432) 689-5200

March 20, 2018

Bureau of Land Management
Division of Oil and Gas
620 E. Greene Street
Carlsbad, NM 88220-6292
Attn: Land Law Examiner

Re: Legacy Reserves Operating, L.P.
Designation of Agent
Lea Unit 102H
11-20S-34E NMPM
Lea County, NM

To whom it may concern:

Legacy Reserves Operating, L.P. has contracted with Reagan Smith Energy Solutions, Inc. to assist in regulatory compliance associated with the Lea Unit 102H. Reagan Smith Energy Solutions, Inc. has the authority to act as Legacy Reserves Operating, L.P.'s agent to maintain regulatory compliance for the Lea Unit 102H. This includes the submittal of an APD, Communitization Agreement, Designations of Operator, Sundry Notices, and any other regulatory documents on behalf of Legacy Reserves Operating, L.P. in order to maintain regulatory compliance with the Bureau of Land Management in regard to the above referenced project.

Sincerely,

Matthew Dickson
Legacy Reserves Operating, L.P.

AFMSS

U.S. Department of the Interior
BUREAU OF LAND MANAGEMENT

Drilling Plan Data Report

01/31/2019

APD ID: 10400033134 **Submission Date:** 08/17/2018

Operator Name: LEGACY RESERVES OPERATING LP

Well Name: LEA UNIT **Well Number:** 102H

Well Type: OIL WELL **Well Work Type:** Drill

Highlighted data reflects the most recent changes

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Section 1 - Geologic Formations

Formation ID	Formation Name	Elevation	True Vertical Depth	Measured Depth	Lithologies	Mineral Resources	Producing Formation
1	RUSTLER	1965	1699	1700	SANDSTONE,SILTSTONE	NONE	No
2	YATES	241	3424	3426	LIMESTONE,SANDSTONE,DOLOMITE,ANHYDRITE,SILTSTONE	NONE	No
3	SEVEN RIVERS	-144	3809	3811	DOLOMITE,SALT,ANHYDRITE,GYPSUM,SILTSTONE	NONE	No
4	QUEEN	-2669	4634	4635	MUDSTONE,SANDSTONE,DOLOMITE,ANHYDRITE,GYPSUM	NONE	No
5	BELL CANYON	-1923	5588	5591	LIMESTONE,SHALE,SANDSTONE	NONE	No
6	CHERRY CANYON	-4507	6472	6475	LIMESTONE,SHALE,SANDSTONE	NONE	No
7	BRUSHY CANYON	-3442	7107	7114	LIMESTONE,SHALE,CHERT,CONGLOMERATE	NONE	No
8	BONE SPRING	-6232	8197	8210	LIMESTONE,SANDSTONE	USEABLE WATER,NATURAL GAS,OIL	No
9	UPPER AVALON SHALE	-6818	8783	8798	SHALE,SILTSTONE	USEABLE WATER,NATURAL GAS,OIL	No
10	BONE SPRING 1ST	-5839	9504	9520	LIMESTONE,DOLOMITE	USEABLE WATER,NATURAL GAS,OIL	No
11	BONE SPRING 2ND	-6376	10041	10057	SANDSTONE	USEABLE WATER,NATURAL GAS,OIL	No
12	BONE SPRING 3RD	-7034	10699	10715	SHALE,SANDSTONE	USEABLE WATER,NATURAL GAS,OIL	No
13	WOLFCAMP	-7344	11009	11029	LIMESTONE,SHALE	USEABLE WATER,NATURAL GAS,OIL	Yes

Section 2 - Blowout Prevention

Operator Name: LEGACY RESERVES OPERATING LP

Well Name: LEA UNIT **Well Number:** 102H

Pressure Rating (PSI): 5M **Rating Depth:** 11300

Equipment: Ten thousand (10M) psi working pressure Blind Rams and Pipe Rams and a five thousand (5M) psi Annular Preventer will be installed on all casing. Three (3) chokes; two (2) hydraulic and one (1) manual, will be used.
Requesting Variance? YES

Variance request: A variance is requested to use a 5M annular on the 10 M BOP. A variance to the requirement of a rigid steel line connecting to the choke manifold is requested. Specifications for the flex hose are provided with BOP schematic in exhibit section.
Testing Procedure: A third party testing company will conduct pressure tests and record prior to drilling out below 13-3/8s" casing. The BOP, Choke, Choke Manifold, Top Drive Valves and Floor Safety Valves will be tested to 5000 psi prior to drilling below the 13-3/8s" surface casing shoe and to 100% of full working pressure (10,000 psi) prior to drilling below the 9-5/8s" intermediate casing shoe. The Annular Preventer will be tested to 2500 psi prior to drilling below the 13-3/8s" surface casing shoe and to 100% of working pressure (5,000 psi) prior to drilling below the 9-5/8" intermediate casing shoe. In addition, the BOP equipment will be tested after any repairs to the equipment as well as drilling out below any casing string. Pipe rams, blind rams, and annular preventer will be activated on each trip, and weekly BOP drills will be held with each crew. Floor Safety Valves that are full open and sized to fit Drill Pipe and Collars will be available on the rig floor in the open position when the Kelly is not in use.

Choke Diagram Attachment:

McVay_2_Choke_Manifold_Diagram_20180816120910.pdf

BOP Diagram Attachment:

McVay_2_BOP_Diagram_20180816120944.pdf

Section 3 - Casing

Casing ID	String Type	Hole Size	Csg Size	Condition	Standard	Tapered String	Top Set MD	Bottom Set MD	Top Set TVD	Bottom Set TVD	Top Set MSL	Bottom Set MSL	Calculated casing length MD	Grade	Weight	Joint Type	Collapse SF	Burst SF	Joint SF Type	Joint SF	Body SF Type	Body SF
1	SURFACE	17.5	13.375	NEW	API	N	0	1800	0	1799			1800	J-55	54.5	BUTT	1.42	3.5	DRY	4.3	DRY	4.3
2	INTERMEDIATE	12.25	9.625	NEW	API	N	0	5600	0	5597			5600	HCL-80	47	BUTT	1.97	1.34	DRY	2.99	DRY	2.99
3	INTERMEDIATE	8.5	7.0	NEW	API	N	0	10700	0	10684			10700	HCP-110	32	BUTT	2.31	1.98	DRY	2.31	DRY	2.31
4	PRODUCTION	6	4.5	NEW	API	N	10700	18561	10200	11300			7861	P-110	13.5	BUTT	1.89	1.26	DRY	1.91	DRY	1.91

Casing Attachments

Operator Name: LEGACY RESERVES OPERATING LP

Well Name: LEA UNIT **Well Number:** 102H

Casing Attachments

Casing ID: 1 **String Type:** SURFACE

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

Lea_Unit__102H_Drilling_Program_20180817112327.pdf

Casing ID: 2 **String Type:** INTERMEDIATE

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

Lea_Unit__102H_Drilling_Program_20180817112341.pdf

Casing ID: 3 **String Type:** INTERMEDIATE

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

Lea_Unit__102H_Drilling_Program_20180817112350.pdf

Operator Name: LEGACY RESERVES OPERATING LP

Well Name: LEA UNIT **Well Number:** 102H

Casing Attachments

Casing ID: 4 **String Type:** PRODUCTION

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

Lea_Unit__102H_Drilling_Program_20180817112358.pdf

Section 4 - Cement

String Type	Lead/Tail	Stage Tool Depth	Top MD	Bottom MD	Quantity(sx)	Yield	Density	Cu Ft	Excess%	Cement type	Additives
SURFACE	Lead		0	1600	1300	1.72	13.5	2236	100	Class C	4%Bentonite, 0.4 pps Defoamer, 0.125 pps Cellophane, 9.102 H2O GPS
SURFACE	Tail		1600	1800	200	1.32	14.8	264	60	Class C Neat	6.304 H2O GPS
INTERMEDIATE	Lead		0	5000	1700	1.94	12.6	3298	180	35:65 POZ-Class C	6% Bentonite, 0.5% Fluidloss, 0.15% Retarder, 0.4pps Defoamer, 10.542 H2O GPS
INTERMEDIATE	Tail		5000	5600	350	1.18	15.6	413	140	Class H	0.3% Fluidloss, 5.216 H2O GPS
INTERMEDIATE	Lead		0	5300	820	1.18	15.6	968	15	Class H	0.2% Retarder, 6.3 H2O GPS
INTERMEDIATE	Tail		5300	10700	550	1.62	12.6	891	30	PVL	1.3% Salt, 5% Expanding Cement, 0.5% Fluidloss, 0.3% Retarder, 0.1% Antisettling, 0.4 pps Defoamer, 8.621 H2O GPS
PRODUCTION	Lead		10200	18561	700	1.34	14.2	938	30	50:50 Poz (fly ash) Class H	5% Salt, 2% Bentonite, 0.5% Fluidloss, 0.2% Retarder, 0.2% Dispersant, 0.4pps

Operator Name: LEGACY RESERVES OPERATING LP

Well Name: LEA UNIT **Well Number:** 102H

String Type	Lead/Tail	Stage Tool Depth	Top MD	Bottom MD	Quantity(sx)	Yield	Density	Cu Ft	Excess%	Cement type	Additives
											Defoamer, 6.088 H2O GPS

Section 5 - Circulating Medium

Mud System Type: Closed

Will an air or gas system be Used? NO

Description of the equipment for the circulating system in accordance with Onshore Order #2:

Diagram of the equipment for the circulating system in accordance with Onshore Order #2:

Describe what will be on location to control well or mitigate other conditions: In the event that circulation is lost (> 50%) while drilling the 12-1/4" intermediate hole in the Capitan Reef at +/-4000', we will plan to install a DV tool and external casing packer within 200' of the top depth where lost circulation occurred and will pump a two-stage cement job with the potential to add an additional DV tool for a three-stage cement job. If there is no lost circulation a single stage cementing procedure will be followed. Legacy plans to cement to surface regardless of whether a single stage, 2-stage or 3-stage procedure is implemented.

Describe the mud monitoring system utilized: A Pason PVT system will be rigged up prior to spudding this well. A volume monitoring system that measures, calculates, and displays readings from the mud system on the rig to alert the rig crew of impending gas kicks and lost circulation. In order to effectively run casing, the mud viscosity and fluid loss properties may be adjusted.

Circulating Medium Table

Top Depth	Bottom Depth	Mud Type	Min Weight (lbs/gal)	Max Weight (lbs/gal)	Density (lbs/cu ft)	Gel Strength (lbs/100 sqft)	PH	Viscosity (CP)	Salinity (ppm)	Filtration (cc)	Additional Characteristics
5600	10700	OTHER : Cut brine	9	9.2							
1800	5600	OTHER : Brine	10	10							
0	1800	OTHER : Fresh Water	8.5	9							
10700	11300	OIL-BASED MUD	10.5	11							

Operator Name: LEGACY RESERVES OPERATING LP

Well Name: LEA UNIT **Well Number:** 102H

Section 6 - Test, Logging, Coring

List of production tests including testing procedures, equipment and safety measures:

Mud logging, H2S plan, BOP and choke plans all in place for testing, equipment, safety

List of open and cased hole logs run in the well:

CBL,GR,MWD,MUDLOG

Coring operation description for the well:

No coring planned

Section 7 - Pressure

Anticipated Bottom Hole Pressure: 5880 **Anticipated Surface Pressure:** 3394

Anticipated Bottom Hole Temperature(F): 200

Anticipated abnormal pressures, temperatures, or potential geologic hazards? YES

Describe:

Capitan Reef

Contingency Plans geoharzards description:

If lost circulation (50% or greater) occurs below the Base of the Salt, the operator shall switch to fresh water mud to protect the Capitan Reef and use fresh water mud until setting the intermediate casing. The appropriate BLM office is to be notified for a PET to witness the switch to fresh water.

Contingency Plans geohazards attachment:

Hydrogen Sulfide drilling operations plan required? YES

Hydrogen sulfide drilling operations plan:

H2S_Contingency_Plan_Briefing_Areas_Alarm_Loc._Legacy_Lea_Unit_102H_20180817091632.pdf

Section 8 - Other Information

Proposed horizontal/directional/multi-lateral plan submission:

Lea_Unit__102H_Plot_Plan_1_20180817092005.pdf

Lea_Unit__102H_Planning_Report_Plan_1_20180817092011.pdf

Other proposed operations facets description:

Other proposed operations facets attachment:

Lea_Unit__102H_AC_Report_Plan_1_20180817092035.pdf

Flex_Hose_Specs_20180817092046.pdf

McVay_Rig2_Schematic_20180817092056.pdf

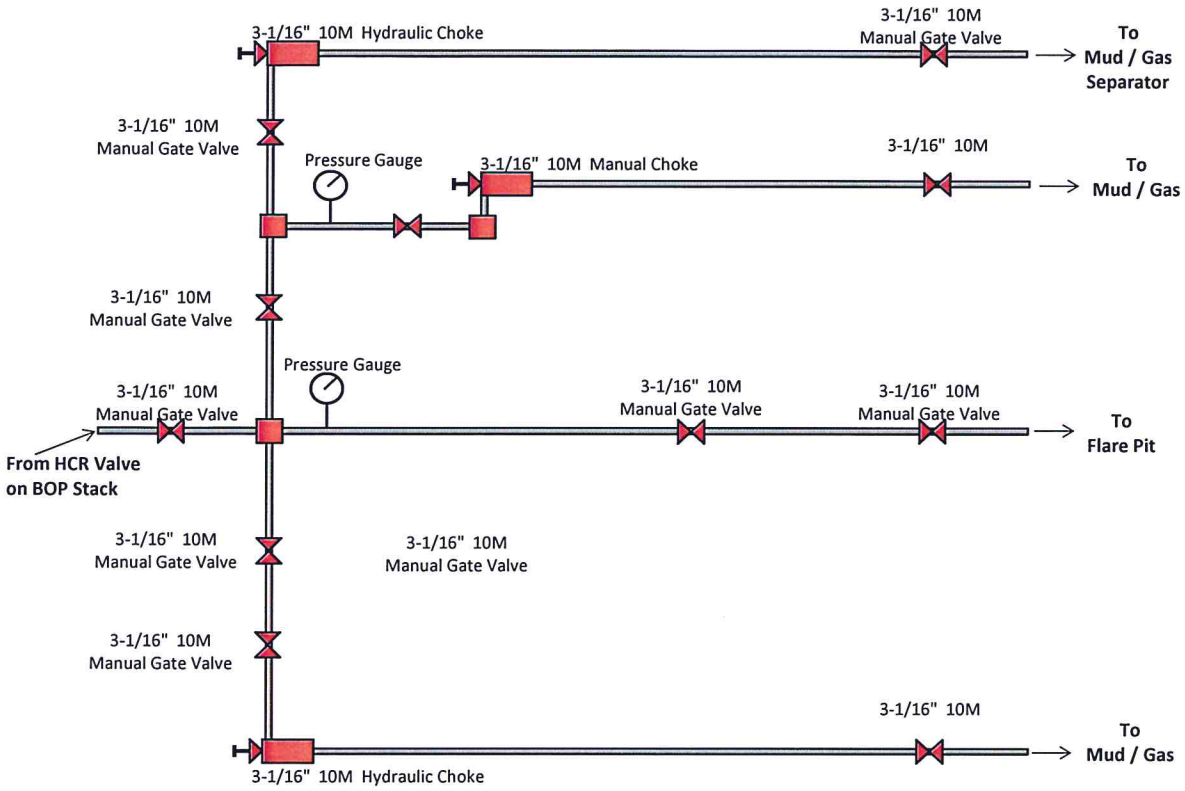
Lea_Unit_102H_GasCapturePlanFormAPD_20180817092105.pdf

Other Variance attachment:

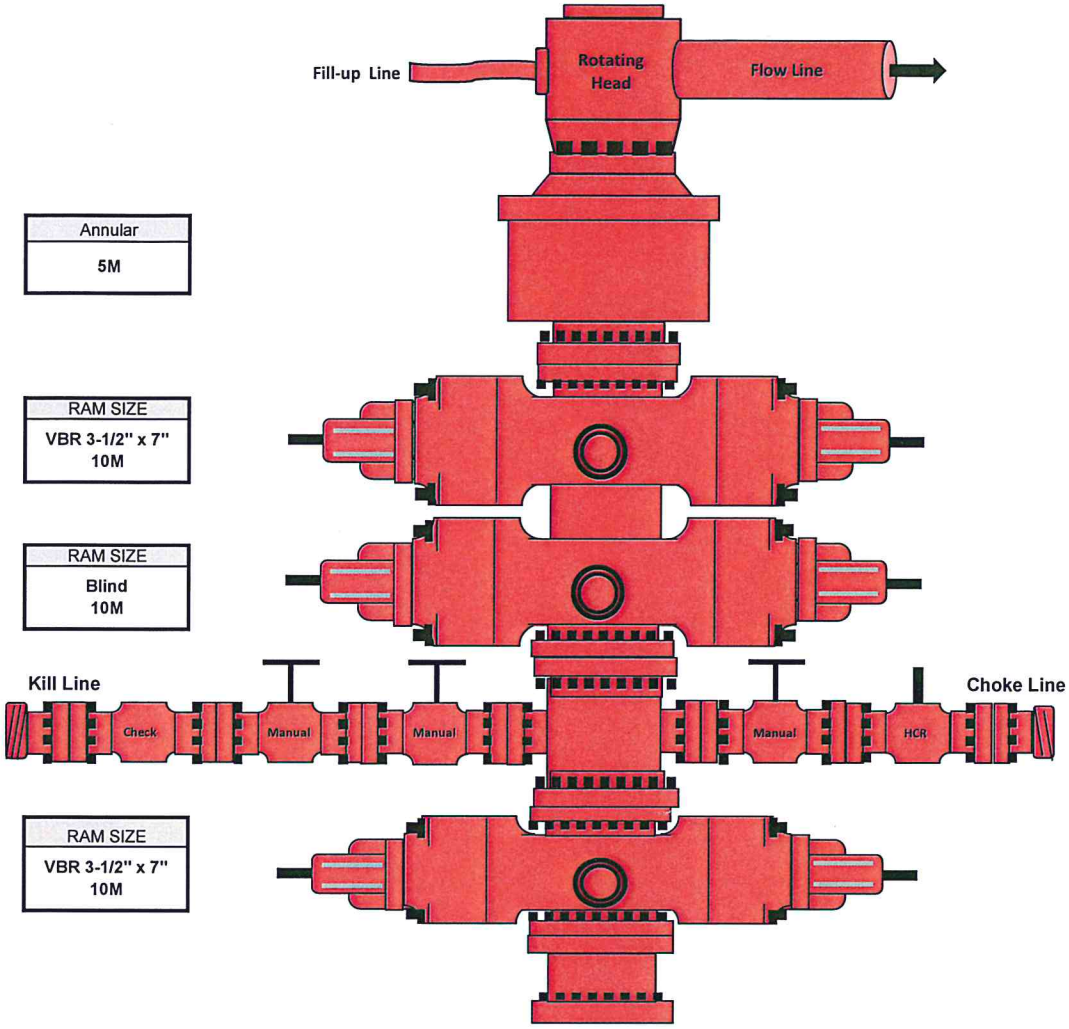
Operator Name: LEGACY RESERVES OPERATING LP

Well Name: LEA UNIT **Well Number:** 102H

Choke Manifold (10M)



13-5/8" BOP Stack (10M)



DRILLING PROGRAM

Operator:
LEGACY RESERVES OPERATING LP

Project Name:
LEA UNIT 102H

Project Location:
Lea County, New Mexico

Prepared By:
Matt Dickson
Drilling Engineer

Submitted To:
Bureau of Land Management
Carlsbad Field Office

Please address inquiries, questions, scheduling of meetings and deficiency statements, if any, to Scott St. John and/or Monica Smith Griffin at the address shown below:

Reagan Smith Energy Solutions, Inc.
1219 Classen Drive
Oklahoma City, OK 73103
405-286-9326

sstjohn@rsenergysolutions.com msmith@rsenergysolutions.com

1.0 Drilling Program

1.1 Estimated Formation Tops

FORMATION	*TVD @ Surface Loc*	*TVD @ KB*	*TVD @ TD*
Rustler	1,700'	1,728'	1,728'
Yates	3,424'	3,452'	3,452'
Seven Rivers	3,809'	3,837'	3,837'
Queen	4,632'	4,660'	4,660'
Bell Canyon	5,588'	5,616'	5,616'
Cherry Canyon	6,471'	6,499'	6,499'
Brushy Canyon	7,107'	7,135'	7,135'
Bone Spring	8,191'	8,219'	8,219'
Avalon Shale	8,782'	8,810'	8,810'
1st BS	9,504'	9,532'	9,532'
2nd BS	10,041'	10,069'	10,069'
3rd BS	10,699'	10,727'	10,727'
Wolfcamp	11,009'	11,037'	11,085'
Upper Wolfcamp	11,212'	11,240'	11,300'

Target Formation and Total Depth:

The total depth of the proposed well is approximately 18,561' MD located in the Upper Wolfcamp.

According to New Mexico EMNRD 19.15.15.9 NMAC a well shall be located no closer than 330' feet to a boundary of the unit.

1.2 Estimated Depths of Anticipated Fresh Water, Oil, and Gas

Substance	**Depth**
Fresh Water	0' to 250'
Base of Treatable Water	125'
Hydrocarbons	7,191' to TD

1.2.2 State Water Protection Compliance

Bureau of Land Management requires surface casing to be set at a minimum of 25' into the Rustler Anhydrite and above the salt section. Operator proposes to set the surface casing at a depth of 1800' (measured from the surface) and use 13-3/8" casing.

Special Capitan Reef requirements
If lost circulation (50% or greater) occurs below the Base of the Salt, the operator shall switch to fresh water mud to protect the Capitan Reef and use fresh water mud until setting the intermediate casing. The appropriate BLM office is to be notified for a PET to witness the switch to fresh water.

1.3 Pressure Control Equipment

Ten thousand (10M) psi working pressure Blind Rams and Pipe Rams and a five thousand (5M) psi Annular Preventer will be installed on all casing. Three (3) chokes; two (2) hydraulic and one (1) manual, will be used.

A variance to the requirement of a rigid steel line connecting to the choke manifold is requested. Specifications for the flex hose are provided with BOP schematic in exhibit section.

A third party testing company will conduct pressure tests and record prior to drilling out below 13-3/8s" casing. The BOP, Choke, Choke Manifold, Top Drive Valves and Floor Safety Valves will be tested to 5000 psi prior to drilling below the 13-3/8s" surface casing shoe and to 100% of full working pressure (10,000 psi) prior to drilling below the 9-5/8s" intermediate casing shoe. The Annular Preventer will be tested to 2500 psi prior to drilling below the 13-3/8s" surface casing shoe and to 100% of working pressure (5,000 psi) prior to drilling below the 9-5/8" intermediate casing shoe.

In addition, the BOP equipment will be tested after any repairs to the equipment as well as drilling out below any casing string. Pipe rams, blind rams, and annular preventer will be activated on each trip, and weekly BOP drills will be held with each crew.

Floor Safety Valves that are full open and sized to fit Drill Pipe and Collars will be available on the rig floor in the open position when the Kelly is not in use.

1.4 Proposed Casing and Cementing Program

1.4.1 Proposed Casing Program

Interval	Depth	Size	Weight/ft	Grade	Thread	Condition	Hole size
Conductor	120'	20"	94.00#	H-40		New	26"
Surface	1,800'	13-3/8"	54.50#	J-55	BTC	New	17-1/2"
Intermediate	5,600'	9-5/8"	47#	HCL-80	BTC	New	12-1/4"
Intermediate Liner	10,700	7"	32.00#	P-110HC	BTC	New	8-1/2"
Production	18,561.8'	4-1/2"	13.5#	P-110	BTC	New	6"

Conductor: 20", H-40# line pipe to a depth of 120'.
Wall thickness of 0.250".

Surface Casing:

Top	Bottom	Size	Weight/ Ft	Grade	Thread	Collapse psi	Internal Yld psi	Body Yld Strength	Joint Strength
Surface	1,800'	13-3/8"	54.50	J-55	BTC	1130	2730	853,000	909,000

Intermediate Casing:

Top	Bottom	Size	Weight/Ft	Grade	Thread	Collapse psi	Internal Yld psi	Body Yld Strength	Joint Strength
Surface	5,600'	9-5/8"	47#	HCL-80	BTC	5,740	6,870	1,086,000	1,122,000

Intermediate Liner:

Top	Bottom	Size	Weight/Ft	Grade	Thread	Collapse psi	Internal Yld psi	Body Yld Strength	Joint Strength
Surface	10,700'	7"	32#	P-110HC	BTC	11,890	12,450	1,025,000	1,053,000

Production Casing:

Top	Bottom	Size	Weight/Ft	Grade	Thread	Collapse psi	Internal Yld psi	Body Yld Strength	Joint Strength
10,200	18,561.8'	4-1/2"	13.5#	P-110	BTC	10,690	12,420	422,000	443,000

1.4.2 Proposed Cement Program

Conductor: Grout to Surface (est. 8 cu. yds on backside)

13-3/8" Surface:

Surface Casing String	
LEAD	
Top of MD	0
Bottom of MD	1600
Cement Type	Class C
Additives	4%Bentonite, 0.4 pps Defoamer, 0.125 pps Cellophane, 9.102 H2O GPS
# of SKS	1300
Yield (ft3/sk)	1.72
Density (lbs/gal)	13.5
Volume (ft3)	2236
Excess (%)	100%
TAIL	
Top of MD	1600
Bottom of MD	1800
Cement Type	Class C Neat
Additives	6.304 H2O GPS
# of SKS	200
Yield (ft3/sk)	1.32
Density (lbs/gal)	14.8
Volume (ft3)	264
Excess (%)	60%

9-5/8" Intermediate (No DV Tool):

Intermediate Casing String	
LEAD	
Top of MD	0
Bottom of MD	5000
Cement Type	35:65 POZ-Class C
Additives	6% Bentonite, 0.5% Fluidloss, 0.15% Retarder, 0.4pps Defoamer, 10.542 H2O GPS
# of SKS	1700
Yield (ft3/sk)	1.94
Density (lbs/gal)	12.6
Volume (ft3)	3298
Excess (%)	180%
TAIL	
Top of MD	5000
Bottom of MD	5600
Cement Type	Class H
Additives	0.3% Fluidloss, 5.216 H2O GPS
# of SKS	350
Yield (ft3/sk)	1.18
Density (lbs/gal)	15.6
Volume (ft3)	413
Excess (%)	140%

9-5/8" Intermediate (With 1 DV Tool):

Intermediate Casing String	
***Stage 1**	
LEAD	
Top of MD	0
Bottom of MD	5000
Cement Type	35:65 POZ-Class C
Additives	6% Bentonite, 0.5% Fluidloss, 0.15% Retarder, 0.4pps Defoamer, 10.542 H2O GPS
# of SKS	1700
Yield (ft3/sk)	1.94
Density (lbs/gal)	12.6
Volume (ft3)	3298
Excess (%)	180%
TAIL	
Top of MD	500

Bottom of MD	5600
Cement Type	Class H
Additives	0.3% Fluidloss, 5.216 H2O GPS
# of SKS	350
Yield (ft3/sk)	1.18
Density (lbs/gal)	15.6
Volume (ft3)	413
Excess (%)	140%
***Stage 2**	
Stage Tool Depth	+/- 3900'
LEAD	
Top of MD	0
Bottom of MD	3500
Cement Type	35:65 POZ-Class C
Additives	6% Bentonite, 0.5% Fluidloss, 0.15% Retarder, 0.4pps Defoamer, 10.543 H2O GPS
# of SKS	1200
Yield (ft3/sk)	1.94
Density (lbs/gal)	12.6
Volume (ft3)	2328
Excess (%)	200%
TAIL	
Top of MD	3500
Bottom of MD	3900
Cement Type	Class H
Additives	0.3% Fluidloss, 5.216 H2O GPS
# of SKS	200
Yield (ft3/sk)	1.18
Density (lbs/gal)	15.6
Volume (ft3)	236
Excess (%)	100%

9-5/8" Intermediate (With 2 DV Tools):

Intermediate Casing String	
***Stage 1**	
LEAD	
Top of MD	0
Bottom of MD	5000
Cement Type	35:65 POZ-Class C
Additives	6% Bentonite, 0.5% Fluidloss, 0.15% Retarder, 0.4pps Defoamer, 10.542 H2O GPS
# of SKS	1700
Yield (ft3/sk)	1.94
Density (lbs/gal)	12.6
Volume (ft3)	3298
Excess (%)	180%
TAIL	
Top of MD	5000
Bottom of MD	5600
Cement Type	Class H
Additives	0.3% Fluidloss, 5.216 H2O GPS
# of SKS	350
Yield (ft3/sk)	1.18
Density (lbs/gal)	15.6
Volume (ft3)	413
Excess (%)	140%
***Stage 2**	
Stage Tool Depth	+/- 3900'
LEAD	
Top of MD	0
Bottom of MD	3500
Cement Type	35:65 POZ-Class C
Additives	6% Bentonite, 0.5% Fluidloss, 0.15% Retarder, 0.4pps Defoamer, 10.543 H2O GPS
# of SKS	1200
Yield (ft3/sk)	1.94
Density (lbs/gal)	12.6
Volume (ft3)	2328
Excess (%)	200%
TAIL	
Top of MD	3500
Bottom of MD	3900
Cement Type	Class H
Additives	0.3% Fluidloss, 5.216 H2O GPS
# of SKS	200

Yield (ft3/sk)	1.18
Density (lbs/gal)	15.6
Volume (ft3)	236
Excess (%)	100%
***Stage 3**	
Stage Tool Depth	+/- 1900'
TAIL	
Top of MD	0
Bottom of MD	1900
Cement Type	Class C Neat
Additives	6.304 H2O GPS
# of SKS	700
Yield (ft3/sk)	1.32
Density (lbs/gal)	14.8
Volume (ft3)	924
Excess (%)	30%

7" Intermediate Liner:

Intermediate Casing String	
LEAD	
Top of MD	0
Bottom of MD	5300
Cement Type	Class H
Additives	0.2% Retarder, 6.3 H2O GPS
# of SKS	820
Yield (ft3/sk)	1.18
Density (lbs/gal)	15.6
Volume (ft3)	968
Excess (%)	15%
TAIL	
Top of MD	5300
Bottom of MD	10,700
Cement Type	PVL
Additives	1.3% Salt, 5% Expanding Cement, 0.5% Fluidloss, 0.3% Retarder, 0.1% Antisettling, 0.4 pps Defoamer, 8.621 H2O GPS
# of SKS	550
Yield (ft3/sk)	1.62
Density (lbs/gal)	12.6

Volume (ft3)	891
Excess (%)	30%

4-1/2" Production Liner:

Production Casing String	
LEAD	
Top of MD	10,200
Bottom of MD	18,561.8
Cement Type	50:50 POZ-Class H
Additives	5% Salt, 2% Bentonite, 0.5% Fluidloss, 0.2% Retarder, 0.2% Dispersant, 0.4pps Defoamer, 6.088 H2O GPS
# of SKS	700
Yield (ft3/sk)	1.34
Density (lbs/gal)	14.2
Volume (ft3)	938
Excess (%)	30%

Cement volumes are based on bringing cement to surface on all strings and TOC to ~10,200' (top of liner) on production.

Operator reserves the right to change cement designs as hole conditions may warrant.

1.5 Proposed Mud Program

Top TVD	Bottom TVD	Type	Max Mud Weight for Hole Control Design	Viscosity (sec/qt)
SURFACE	1,800	Fresh Water	9.0	28-38
1800	5,600	Brine	10.0	28-30
5,600	10,700	Cut Brine	9.2	28-30
10,700	TD	OBM	11.0	55-65

The operator must include the minimum design criteria, including casing loading assumptions and corresponding safety factors for burst, collapse, and tensions (body yield, and joint strength).

1.6 Casing Design

1.6.1 Drilling Design Analysis

Interval	Max TVD (ft)	Anticipated Mud Weight (ppg)	Estimated Max Pore Pressure (psi)	Internal Yield Strength (psi)	Collapse Strength (psi)	Joint Strength (lbs)	Body Strength (lbs)	Burst Safety Factor (Min 1.25)	Collpase Safety Factor (Min 1.25)	Tensile Safety Factor (Min 1.6)
Surface	1,800	8.5	780	2,730	1,130	909,000	853,000	3.5	1.42	4.3
Interm.	5,600	10	2,420	6,870	5,740	1,122,000	1,086,000	1.34	1.97	2.99
Tie-Back	10,700	9.0	4,730	12,450	11,890	1,053,000	1,025,000	1.98	2.31	2.31
Prod.	11,300	10.5	5,880	12,420	10,690	443,000	422,000	1.26	1.89	1.91

Surface Casing Design Notes:

- **Burst Design Assumptions: Calculations assume complete evacuation behind pipe.**
- **Collapse Design Assumptions: Calculations assume complete evacuation inside pipe.**
- **Tension Design Assumptions: Calculations include 100,000 lb. max over-pull and do not consider the effects of buoyancy, with string held in tension.**

Intermediate Casing Design Notes:

- **Burst Design Assumptions: Calculations assume a .7psi/ft shoe test, and 0.22 psi/ft gas gradient.**
- **Collapse Design Assumptions: Calculations assume complete evacuation inside pipe.**
- **Tension Design Assumptions: Calculations include 100,000 lb. max over-pull and do not consider the effects of buoyancy, with string held in tension.**

Intermediate Liner w/ Tie-Back Design Notes:

- **Burst Design Assumptions: Calculations assume a .7psi/ft shoe test, and 0.22 psi/ft gas gradient.**
- **Collapse Design Assumptions: Calculations assume complete evacuation inside pipe.**
- **Tension Design Assumptions: Calculations include 100,000 lb. max over-pull and do not consider the effects of buoyancy, with string held in tension.**

Production Design Notes:

- **Burst Design Assumptions: Calculations assume surface frac pressure of 9500 psi along with a fluid gradient of 0.49psi/ft, with an external force equivalent to 0.44 psi/ft.**
- **Collapse Design Assumptions: Calculations assume complete evacuation inside pipe.**
- **Tension Design Assumptions: Calculations include 100,000 lb. max over-pull and do not consider the effects of buoyancy, with string held in tension.**

*Notes:

1) Collapse DSF: If < 1.125 calculations are required.
2) Burst DSF: If < 1.0 calculations are required.
3) Body Tensile DSF: If < 1.6 (dry) or < 1.8 (buoyant) calculations are required.
4) Joint Tensile DSF: If < 1.6 (dry) or < 1.8 (buoyant) calculations are required.
5) Will an offset pressure variance request be requested to meet safety factors? Max. 0.22 psi/ft. Please indicate offset pressure variance requested.

Mud weight increases at shoe depths are for pressure control. Mud weight increases in the curve and lateral sections of the hole are for hole stability, not pressure control. Mud weight assumptions for casing load designs exceed anticipated maximum mud weight for balanced drilling in all hole sections. Expected mud weights in the Upper Wolfcamp Horizontal will be 0.5 to 1.0 ppg greater than formation pressure (i.e. overbalanced drilling.)

The Mud System will run as a closed loop system with PVT monitoring. All drill cuttings and liquid mud will be hauled to an approved NMOCD site for disposal or soiled farmed upon receiving appropriate approval.

1.7 Completion Program and Casing Design

Hydraulic fracturing will occur through the production casing. The burst design calculation assumes TOC at surface and therefore, the backside of the production casing is not evacuated. The maximum pumping pressure is 10,000 psi with a maximum proppant fluid weight of 9.5 ppg. The design safety factor for burst is 1.25.

Upon request, operator will provide proof of cement bonding by bond log. Operator is responsible for log interpretation and certification prior to frac treatment.

Upon request, operator will provide estimated fracture lengths, flowback storage, volumes of fluids and amount of sand to be used, and number of stages of frac procedure. Furthermore, a report of the annulus pressures before and after each stage of treatment may be requested by the BLM. The report may include chemical additives (other than proprietary), dissolved solids in frac fluid, and depth of perforations.

1.8 Evaluation Program

Required Testing, Logging, and Coring procedures noted below:

- Mud Logging/Gamma Ray/MWD.
- Cased hole CBL on production casing.

1.9 Downhole Conditions

Zones of possible lost circulation:	Capitan Reef
Zones of possible abnormal pressure:	Upper Wolfcamp
Maximum bottom hole temperature:	200° F
Maximum bottom hole pressure:	5,880 psi or less.

1.10 Overview of Drilling Procedure

- Drill 17.5" surface hole to 1,800'; run 13.375" casing to 1,800' and cement to surface; install 10M stack, set isolation plug and test BOPE and casing independently to regulatory requirements.
- Drill 12.25" intermediate hole to 5,600', run 9.625" casing and cement; set isolation plug and test BOPE and casing independently to regulatory requirements.
- Drill 8-1/2" intermediate hole to approximately 10,700' and run 7" liner with a tie-back sleeve, and cement to top of liner set at +/- 5,300'.

- Drill 6" production hole to +/- 18,500'; run 4.5" liner from TD to +/- 10,200' and cement per cement program and test.
- Run 7" tie-back string from +/- 5300' to surface and cement per cement program, circulate cement to surface.

1.11 Overview of Completion for Equipment Sizing

- A Sundry Notice will be submitted with the proposed completion procedure prior to the job.