NATURAL RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF CONSERVATION
DIVISION OF OIL, GAS & GEOTHERMAL RESOURCES
5816 Corporate Ave., Suite 200 Cypress, CA 90630 - 4731

OIL, GAS & GEOTHERMAL

PERMIT TO CONDUCT WELL OPERATIONS

Critical Well

No. P 114-0753

Old	New	
--	849	FIELD CODE
--	03	AREA CODE
--	15	POOL CODE

Cypress, California
September 30, 2014

Mr. Mike McAdams, Agent
E & B Natural Resources Management Corporation (E0100)
1600 Norris Rd.
Bakersfield, CA 93308

Your proposal to **DRILL (water source)** well **"Wnf-I" 22**, A.P.I. No. **037-30425**, Section **19**, T. **04S**, R. **13E**, **SB** B. & M., (Lat: **33.805019** Long: **-118.275010** Datum: **83**), **Wilmington** field, **Fault Block I** area, **Tar** pool, **Los Angeles** County, dated **8/29/2014**, received **9/2/2014**, has been examined in conjunction with records filed in this office.

THE PROPOSAL IS APPROVED PROVIDED:

1. Blowout prevention equipment, as defined by this Division's publication No. M07, shall be installed and maintained in operating condition and meet the following minimum requirements:
   a. Class **IIIB 2M,** for **drilling** operations.
   b. A **2M lubricator** for **wireline and completion** operations.
2. Blowout prevention practice drills are conducted at least weekly and recorded on the tour sheet. A practice drill may be required at the time of the test/inspection.
3. Hole fluid of a quality and in sufficient quantity to control all subsurface conditions in order to prevent blowouts shall be used.
4. Sufficient material to control lost circulation of hole fluid shall be available for immediate use at the well site.
5. Zonal isolation is demonstrated by the running of a cement **imaging log** from the casing shoe to **500**' above the upper most hydrocarbon zone (UHZ).
6. The **13 3/8**" casing is cemented with sufficient cement to fill behind the casing from the shoe to the surface.
7. The **9 5/8**" casing is cemented with sufficient cement to fill behind the casing to at least 500' above all oil, gas zones and/or anomalous pressure intervals and to at least 100' above the base of freshwater zone.
8. Prior to injecting produced water, a representative chemical water analysis of the produced water shall be submitted to this Division for review.
9. A directional survey shall be made and filed with this division within 15 days of completion of drilling.
10. No program changes are made without prior Division approval.
11. **THIS DIVISION SHALL BE NOTIFIED TO:**
    a. Witness a test of the installed blowout prevention equipment on the **13 3/8"** casing prior to drilling below **610'**.
    b. Witness a test of the installed blowout prevention equipment on the **9 5/8"** casing prior to drilling below **3076'**.

(**Continued on Page 2**)

Steven Bohlen
State Oil and Gas Supervisor

By
For Daniel J. Dudak, *District Deputy*

Blanket Bond
cc: EDP, Update

Engineer Michel Vasconcellos
Office (714) 816-6847

MV/mv

A copy of this permit and the proposal must be posted at the well site prior to commencing operations. Records for work done under this permit are due within 60 days after the work has been completed or the operations have been suspended. Issuance of this permit does not affect the Operator's responsibility to comply with other applicable state, federal, and local laws, regulations, and ordinances.

OG111 (revised 6/2011)

Well #: **"Wnf-I" 22**
API #: **037-30425**
Permit : **P 114-0753**
Date: September 30, 2014

NOTE:

1. The base of the freshwater zone is at **1918'±**.
2. Well operations shall be conducted in compliance with field rules No. 107 - 004, dated March 1, 2007.
3. Issuance of this permit was delayed pending receipt and review of additional data.

Vasconcellos, Michel@DOC

From: Brandy Fellers <bfellers@ebresources.com>
Sent: Tuesday, September 23, 2014 10:15 AM
To: Vasconcellos, Michel@DOC
Subject: RE: WNF-I 22

Thanks Mike. If we decide to run the larger liner because we can get it in time, is this just a phone call? The hole size will not change.

From: Vasconcellos, Michel@DOC [mailto:Michel.Vasconcellos@conservation.ca.gov]
Sent: Tuesday, September 23, 2014 9:29 AM
To: Brandy Fellers
Subject: RE: WNF-I 22

Thanks Brandy.

Going to the smaller WWS won't change any requirements. I'll replace the drilling program. I got all your messages, thanks.

I played with deepening the surface casing to 700', as you suggested. The pressure differential between shoe pressure and estimated frac pressure is less than the differential at 610'. I'll leave the permit as is per the NOI and recommend that my supervisor sign it.

Thanks Brandy.

mike

From: Brandy Fellers [mailto:bfellers@ebresources.com]
Sent: Monday, September 22, 2014 5:20 PM
To: Vasconcellos, Michel@DOC
Cc: Dan Fouts; Lou Zylstra; 'Rickey Bird'
Subject: WNF-I 22

Mike,

It is unclear that we will be able to get a 7" WWS for the production liner so I have modified the program to run a 4-1/2" WWS in the production interval. Everything else is the same. I know that you said you were going to make a final review of the permit in the morning so I am sending this in with the slight modification. If this will cause any issues, please let me know.

Thanks,
Brandy Fellers
562-673-8015

Vasconcellos, Michel@DOC

From: Brandy Fellers <bfellers@ebresources.com>
Sent: Friday, September 19, 2014 3:10 PM
To: Vasconcellos, Michel@DOC
Subject: FW: Surface Casing Design
Attachments: Casing Design.xlsx

From: Brandy Fellers
Sent: Friday, September 19, 2014 2:20 PM
To: 'Vasconcellos, Michel@DOC'
Subject: Surface Casing Design

Mike,

Per the attached spreadsheet WNF-I 22 could support 126% of hydrostatic at depth before the surface casing at 600' hits the limit of the kick tolerance. This area is at or below hydrostatic so 600' appears to be more than adequate for the hydrostatic reservoir.

As a note, the dashed line in the Well Plan Chart can be moved around to visualize casing limits.

Vasconcellos, Michel@DOC

From: Vasconcellos, Michel@DOC
Sent: Tuesday, September 16, 2014 3:25 PM
To: 'Brandy Fellers'
Subject: RE: WSW 22

Yes Brandy, thank you for making the changes. I wrote the permit and it should be signed and sent out sometime tomorrow.

mike

From: Brandy Fellers [mailto:bfellers@ebresources.com]
Sent: Tuesday, September 16, 2014 3:18 PM
To: Vasconcellos, Michel@DOC
Subject: WSW 22

Mike,

Were you able to review the revisions to 22?

Brandy Fellers
Sr. Reservoir Engineer
601 Cypress Ave
Hermosa Beach, CA 90254
Office: 424-903-7493
Cell: 562-673-8015

P#114-0753

NATURAL RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF CONSERVATION
DIVISION OF OIL, GAS, AND GEOTHERMAL RESOURCES

FOR DIVISION USE ONLY			
	Forms		
Bond	OGD114	OGD121	
BB	09/02/14	09/03/14	TW

NOTICE OF INTENTION TO DRILL NEW WELL

Detailed instructions can be found at: www.conservation.ca.gov/dog/

In compliance with Section 3203, Division 3, Public Resources Code, notice is hereby given that it is our intention to drill well WNF I-22 WS, well type Water Source, API No. 037-30425 (Assigned by Division),

Sec. 19, T.4S, R. 13E, SB B.&M., Wilmigton Field, Los Angeles County.

Legal description of mineral-right lease, consisting of 731.66 acres (attach map or plat to scale), is as follows:
See attachments: Legal Description; Figure 1- Parcel Map No. 24965; Figure 2- Exhibit A

Do mineral and surface leases coincide? Yes☐ No☒. If answer is no, attach legal description of both surface and mineral leases, and map or plat to scale.

Location of well 336 feet North (Direction) along section ☒ / property ☐ (Check one) line and 343 feet West (Direction)

at right angles to said line from the South East corner of section ☒ / property ☐ (Check one) 19 and

Lat./Long. in decimal degrees, to six decimal places, NAD 83 format: Latitude: 33.805019 Longitude: 118.275010

If well is to be directionally drilled, show proposed coordinates (from surface location) and true vertical depth at total depth:

_____ feet _____ (Direction) and _____ feet _____ (Direction). Estimated true vertical depth _____. Elevation of ground

above sea level 43 feet. All depth measurements taken from top of Kelly Bushing (Derrick Floor, Rotary Table, or Kelly Bushing) that is 15 feet above ground.

Is this a critical well as defined in the California Code of Regulations, Title 14, Section 1720(a) (see next page)? Yes☒ No☐

Is a California Environmental Quality Act (CEQA) document required by a local agency? Yes☐ No☒ If yes, see next page.

PROPOSED CASING PROGRAM

SIZE OF CASING (Inches API)	WEIGHT	GRADE AND TYPE	TOP	BOTTOM	CEMENTING DEPTHS	FORMATION PRESSURE (Estimated Maximum)	CALCULATED FILL BEHIND CASING (Linear Feet)
16"			surface	70'	70	25 psig	70
13 3/8"	61 ppf	K-55	surface	550'	~~550~~ 600'	238 psig	550
9 5/8"	36 ppf	K-55	surfact	3,050'	~~3,050~~ 3076	1,320 psig	3050

(Attach a complete drilling program including wellbore schematics in addition to the above casing program.)

Estimated depth of base of fresh water: 1,918 Anticipated geological markers: Tar 3,071; Ranger 3,395; Terminal, 3,693 (Name, depth)

Intended zone(s) of completion: Tar, 3,071 ft, 1,357 psi (Name, depth and expected pressure) Estimated total depth: 3,700 ED 3,225

The Division must be notified immediately of changes to the proposed operations. Failure to provide a true and accurate representation of the well and proposed operations may cause rescission of the permit.

Name of Operator			
E&B Natural Resources Management Corp.			
Address: 1600 James Road		City/State: Bakersfield	Zip Code: 93308
Name of Person Filing Notice: Stephen E. Johnson	Telephone Number: 661.337.9243	Signature: Stephen E. Dickson	Date: 8/29/14
Individual to contact for technical questions: Stephen E. Johnson	Telephone Number: 661.337.9243	E-Mail Address: sejohnson@ebresources.com	

This notice and an indemnity or cash bond shall be filed, and approval given, before drilling begins. If operations have not commenced within one year of the Division's receipt of the notice, this notice will be considered cancelled.

DOGGR Received – SEP 02 2014

OG105 (08/09)

INFORMATION FOR COMPLIANCE WITH THE CALIFORNIA ENVIRONMENTAL QUALITY ACT OF 1970 (CEQA)

If an environmental document has been prepared by the lead agency, submit a copy of the ***Notice of Determination*** or ***Notice of Exemption*** with this notice.

CRITICAL WELL DEFINITION

As defined in the California Code of Regulations, Title 14, Section 1720 (a), "Critical well" means a well within:

(1) 300 feet of the following:
  (A) Any building intended for human occupancy that is not necessary to the operation of the well; or
  (B) Any airport runway.
(2) 100 feet of the following:
  (A) Any dedicated public street, highway or the nearest rail of an operating railway that is in general use;
  (B) Any navigable body of water or watercourse perennially covered by water;
  (C) Any public recreational facility such as a golf course, amusement park, picnic ground, campground or any other area of periodic high-density population; or
  (D) Any officially recognized wildlife preserve.

This form may be printed from the DOGGR website at www.conservation.ca.gov/dog/

DRILLING PROGRAM FOR
Vertical Water Source Well
Wilmington North Flank Field
Well: 1-22WS
Location: Section 19 T4S R13W SBBM (Pad 1 slot 22)
Lat. 33.805019, Long. 118.275010
NAD 83 N: 2,347,580.5360 E: 6,219016.6620

Wilmington Gravel Packed WS – 9 5/8" Casing X 7 5/8" Liner

PROCEDURE:

1. MIRU Kenai #5 and mud system to prepared graded well location at Section 2 (T29S/R26E). 14" Conductor cemented at 40'GL. Install starter head and a Class II BOPE with 6" diverter on the conductor as required by the DOGGR. Condition Gel spud mud to 55 sec./qt
2. **Loggers need a 6 hour notice before TD.**
3. Drill 17 ½" Hole using straight BHA, Gel spud mud. Break over to Cypan low solids mud system @ 300'. Survey every 250'. Drill 17 ½" hole to casing point @ 615'.
4. Condition hole for casing. Circulate hole clean and wipe hole as necessary to run surface casing. POOH and LDDP and 17 ½" BHA.
5. Pick up and run 615' of 13 3/8" 61# K-55 to permitted 615' casing depth. Casing as follows:

   CASING DESIGN

Casing:	550' of 13 3/8" 61# K-55 LT&C casing
Shoe:	Top-Co T202 Guide Shoe.
Insert Float:	Top-Co II-B Float collar with LPS valve
Centralizers:	17 ½" x 13 3/8" centralizers as follows: 1- Top-Co T321 bow spring turbolizer on top 3 jts 1- Top-Co T300 bow spring on every 3rd jt over the casing coupling

6. MIRU cementers. Fill and test lines to 2000psi. Drop ball, mix and pump cement slurry. Displace plug w/lease water. Bump plug, (if insert fails to hold, bump plug and hold at 1000psi).

   SLURRY DESIGN:

Pre-flush :	40 bbls of Sap & MD mixture
Volume :	If casing set to 615' with returns to surface use nominal plus 30% which will be 555 ft^3.
Slurry:	Type III + 3% CC + 2% Econolite + 35% Silica Flour + .25lb/sk PolyFlake at 13 ppg. (2.5 ft^3/sk - 13.28 gal/sk water) or equivalent slurry
WOC:	5 hours

7. Remove BOPE and cut off starter head, conductor and casing. Install 13 3/8", 3M X 11" well head.
8. Re-install and function test Class II BOPE.
9. Make up and RIH with 12 ¼" straight BHA and RIH, tag TOC. At TOC, test casing and Class II 2M BOPE to 500 psi. Clean out insert and cement in casing shoe and drill out shoe.
10. Drill 12 ¼" Hole using straight BHA, Cypan low solids mud system. Survey every 500'. Drill 12 ¼" hole to casing point @ 3,050'.

LINER DESIGN:

Design:	9 5/8" X 7" OTTO GP Assembly 23# VFJ 13CR 10ga SSWWS w/ at least 50' of SSWWS liner inside the 9 5/8" shoe.
Shoe:	Spade Shoe and Bailing plate
Adaptor:	Weld on Steel seal adaptor (SSA) to 10' blank liner

30. Run 2 7/8" tubing stinger to liner shoe and RIH to TD. Gravel Pack liner in place w/ 20/40 gravel, adding breaker to formation water while gravel packing.

31. Release liner and set SSA. Spot bleach breaker fluid/water in liner. POOH LDDP.

32. Removed BOP, install top flange and secure well.

33. Release drilling rig.

E&B Natural Resources Contact List:

Steve Johnson – Drilling Engineer:	661-337-9243
Bernadette Jurica – Jr. Drilling Engineer:	661-428-5908
Greg Hummel – Geologist	661-327-7822
Mike McAdams – Director of Operation:	661-619-8675
Dan Fouts – Production Engineer:	661-619-7813

34. Pull into casing shoe and wait 1 hour. Dump and clean mud pit. RIH to TD and tag for fill, if clean POOH. If more than 3' of fill, circulate clean and retag.

35. MU and RIH w/ 5 ½" 17# K-55 liner w/ 2 7/8" tubing stinger. While running liner, clean mud pit and fill with formation water.

TUBING LINER DESIGN:

Design:	5 ½" 17# K-55 Slotted liner w/ .050" x 48R slots w/ at least 50' of slotted liner inside the 7" shoe with top 2 joints with MAX II threads.
Shoe:	Spade Shoe and Bailing plate
Adaptor:	Weld on Steel seal adaptor (SSA) to 10' blank liner
Perf Zone:	Place semi-perf across wet zones if necessary as per geologist.

36. Run 2 7/8" tubing stinger to liner shoe and RIH to TD. Gravel Pack liner in place w/ 6x9 gravel, adding breaker to formation water while gravel packing.

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Vertical Water Source Well
Wilmington North Flank Field
Well: 1-22WS
Location: Section 19 T4S R13W SBBM (Pad 1 slot 22)
Lat. 33.805019, Long. 118.275010
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PROCEDURE:

1. MIRU Kenai #5 and mud system to prepared graded well location at Section 2 (T29S/R26E). 14" Conductor cemented at 40'GL. Install starter head and a Class II BOPE with 6" diverter on the conductor as required by the DOGGR. Condition Gel spud mud to 55 sec./qt
2. **Loggers need a 6 hour notice before TD.**
3. Drill 17 ½" Hole using straight BHA, Gel spud mud. Break over to Cypan low solids mud system @ 300'. Survey every 250'. Drill 17 ½" hole to casing point @ 615'.
4. Condition hole for casing. Circulate hole clean and wipe hole as necessary to run surface casing. POOH and LDDP and 17 ½" BHA.
5. Pick up and run 615' of 13 3/8" 61# K-55 to permitted 615' casing depth. Casing as follows:

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   SLURRY DESIGN:

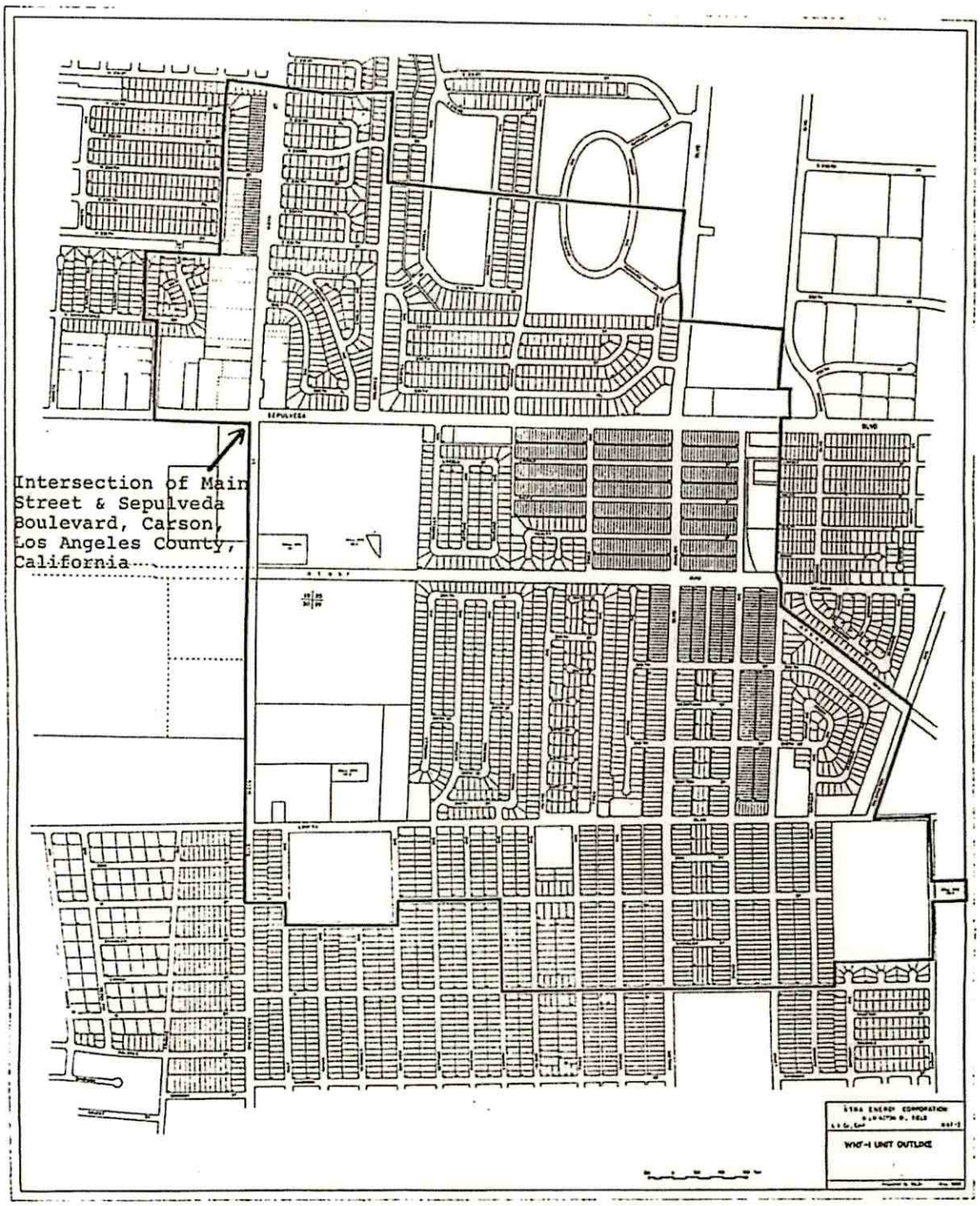
Pre-flush :	40 bbls of Sap & MD mixture
Volume :	If casing set to 615' with returns to surface use nominal plus 30% which will be 555 ft^3.
Slurry:	Type III + 3% CC + 2% Econolite + 35% Silica Flour + .25lb/sk PolyFlake at 13 ppg. (2.5 ft^3/sk - 13.28 gal/sk water) or equivalent slurry
WOC:	5 hours

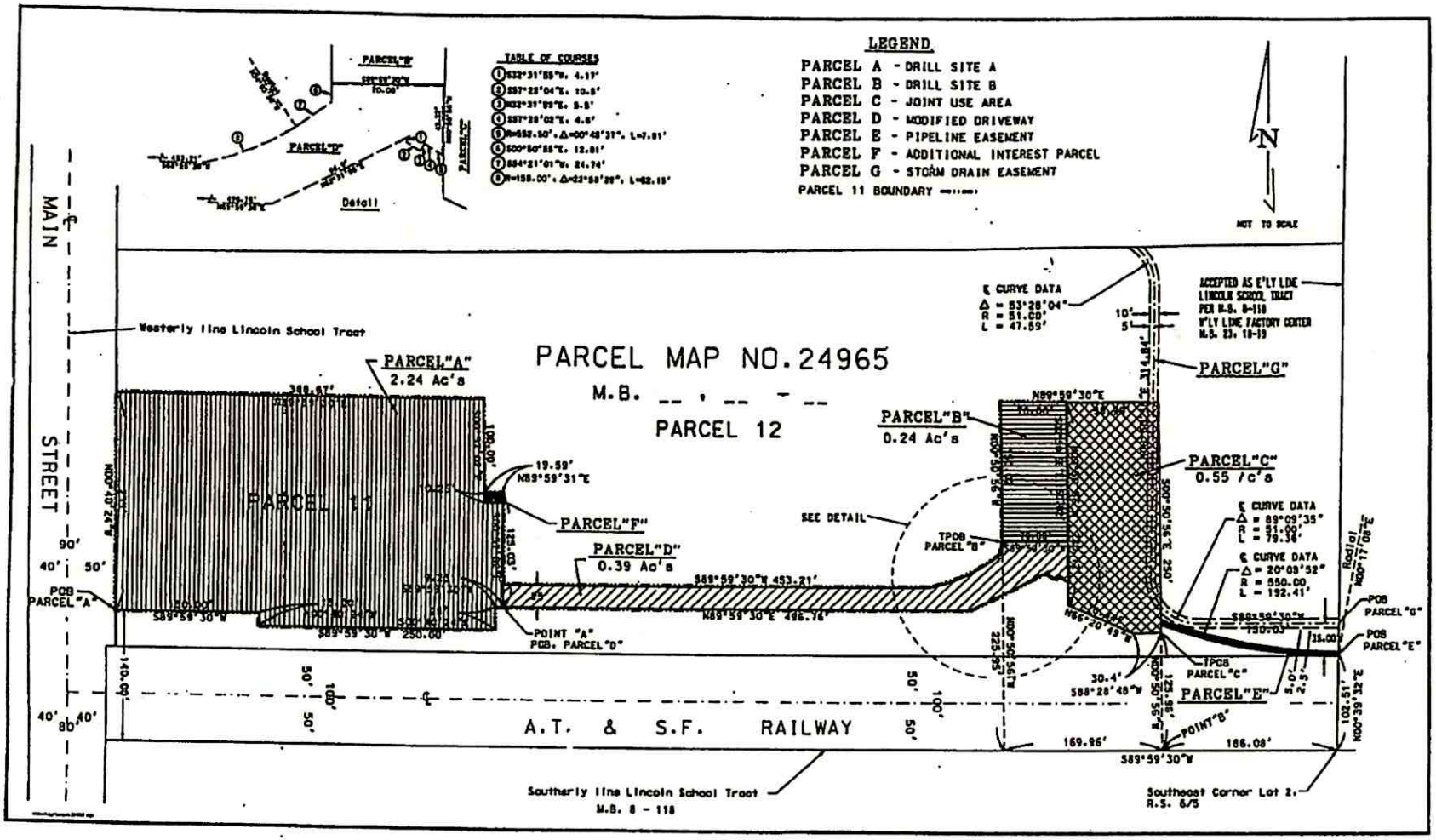
7. Remove BOPE and cut off starter head, conductor and casing. Install 13 3/8", 3M X 11" well head.
8. Re-install and function test Class II BOPE.
9. Make up and RIH with 12 ¼" straight BHA and RIH, tag TOC. At TOC, test casing and Class II 2M BOPE to 500 psi. Clean out insert and cement in casing shoe and drill out shoe.
10. Drill 12 ¼" Hole using straight BHA, Cypan low solids mud system. Survey every 500'. Drill 12 ¼" hole to casing point @ 3,050'.

EXHIBIT A

ATTACHED TO UNIT AGREEMENT FOR THE WILMINGTON NORTH
FLANK FAULT BLOCK-I (WNF-I) UNIT
LOS ANGELES COUNTY, CALIFORNIA, DATED AUGUST 1, 1983

UNIT AREA




LEGEND
PARCEL A - DRILL SITE A
PARCEL B - DRILL SITE B
PARCEL C - JOINT USE AREA
PARCEL D - MODIFIED DRIVEWAY
PARCEL E - PIPELINE EASEMENT
PARCEL F - ADDITIONAL INTEREST PARCEL
PARCEL G - STORM DRAIN EASEMENT
PARCEL 11 BOUNDARY
TABLE OF COURSES
Detail
NOT TO SCALE
MAIN STREET
Westerly line Lincoln School Tract
PARCEL MAP NO. 24965
M.B. -- , -- - --
PARCEL 12
PARCEL "A"
2.24 Ac's
PARCEL 11
PARCEL "B"
0.24 Ac's
PARCEL "C"
0.55 Ac's
PARCEL "D"
0.39 Ac's
PARCEL "E"
PARCEL "F"
PARCEL "G"
POB PARCEL "A"
POINT "A"
POB. PARCEL "D"
SEE DETAIL
TPOB PARCEL "B"
TPOB PARCEL "C"
POINT "B"
POB PARCEL "G"
POB PARCEL "E"
℄ CURVE DATA
Δ = 53°28'04"
R = 51.00'
L = 47.59'
℄ CURVE DATA
Δ = 89°09'35"
R = 51.00'
L = 79.36'
℄ CURVE DATA
Δ = 20°09'52"
R = 550.00
L = 192.41'
ACCEPTED AS E'LY LINE LINCOLN SCHOOL TRACT PER M.B. 8-118
W'LY LINE FACTORY CENTER M.B. 23, 18-19
A.T. & S.F. RAILWAY
Southerly line Lincoln School Tract
M.B. 8 - 118
Southeast Corner Lot 2, R.S. 6/5

"SITE MAP"

Legal Descriptions

"Surface Lease"

That portion of Lincoln School Tract, City of Carson, County of Los Angeles, State of California, as per map recorded in Book 8 of Maps at Page 118, records of Los Angeles County, California more particularly described as follows:

Beginning at the point of intersection of a line parallel with and 125.00 feet northerly of, measured at right angles, the southerly line of said Lincoln School Tract, and the easterly right-of-way line of Main Street, 100.00 feet wide and 50.00 feet on each side of the center line of Main Street as said center line as shown in Book 6 of Licensed Surveyors Maps at page 5; thence N 88° 58′ 29" E, parallel with said southerly tract line a distance of 250.00 feet; thence S 88° 58′ 29" W, parallel with said southerly tract line, a distance of 400.00 feet to a point on the said easterly right-of-way line of Main Street; thence S 01° 42′ 20" E, along said right-of-way, a distance of 250.00 feet to the point of beginning.

Shown as Parcel A on Parcel Map No. 24965, attached.

"Mineral Lease"

The Wilmington North Flank Fault Block I Unit ("WNF Unit"), comprising approximately 731 acres, in the Wilmington Field, California, as described in the Unit Agreement for said WNF Unit dated August 1, 1983, recorded February 1, 1984, as document number 84-134927 of the Official Records of the Recorder's Office for Los Angeles County, State of California and in that certain Declaration of Inclusion dated December 12, 1991, recorded May 4, 1992 as document number 92-792545 of the Official Records of the Recorder's Office for Los Angeles County, State of California.

P#114-0784

FOR DIVISION USE ONLY			
Bond	Forms OGD114	Forms OGD121	
BB	09/22/14	09/15/14	FW

WS
MV

NATURAL RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF CONSERVATION
DIVISION OF OIL, GAS, AND GEOTHERMAL RESOURCES

Addendum

~~SUPPLEMENTARY NOTICE~~

Detailed instructions can be found at: www.conservation.ca.gov/dog/

A notice to the Division of Oil, Gas, and Geothermal Resources, dated 8/29/14, stating the intention to Drill (Drill, Rework, Abandon) well WNF-I 22 WS, API No. 037-30425,

Sec. 19, T. 4S, R. 13E, SB B.&M., Wilmington Field, Los Angeles County

should be amended because of changed conditions.

The complete casing record of the well (present hole), including plugs and perforations, is as follows: (Attach wellbore schematics diagram also.)
Conductor 40'

The total depth is: N/A feet. The effective depth is: N/A feet.

Present completion zone(s): None (Name). Anticipated completion zone(s): Tar (Name).

Present zone pressure: N/A psi. Anticipated/existing new zone pressure: 1357 psi.

We now propose: (A complete program is preferred and may be attached.)
Lower the surface casing from 550' to 600' and lower the intermediate casing from 3,050' to 3,076'. See revised program and wellbore diagram for detail.

If well is to be redrilled or deepened, show proposed coordinates (from surface location) and true vertical depth at total depth: 0 feet North (Direction) and 0 feet East (Direction) Estimated true vertical depth: 3700

Will the Field and/or Area change? Yes☐ No☒ If yes, specify New Field: _____ New Area: _____

The Division must be notified immediately of changes to the proposed operations. Failure to provide a true and accurate representation of the well and proposed operations may cause rescission of the permit.

Name of Operator			
E&B Natural Resources			
Address: 1600 Norris Rd		City/State: Bakersfield/CA	Zip Code: 93308
Name of Person Filing Notice: Brandy Fellers	Telephone Number: 424-903-7493	Signature	Date: September 12, 2014
Individual to contact for technical questions: Dan Fouts	Telephone Number: 424-903-7492	E-Mail Address: dfouts@ebresources.com	

This notice must be filed, and approval given, before the operations begin. If operations have not commenced within one year of the Division's receipt of this supplementary notice, this notice will be considered cancelled.

DOGGR
Received
SEP 12 2014
MV 09/15/14

OG123 (1/09)

CRITICAL WELL DEFINITION

As defined in the California Code of Regulations, Title 14, Section 1720 (a), "Critical well" means a well within:

(1) 300 feet of the following:
  (A) Any building intended for human occupancy that is not necessary to the operation of the well; or
  (B) Any airport runway.
(2) 100 feet of the following:
  (A) Any dedicated public street, highway or the nearest rail of an operating railway that is in general use;
  (B) Any navigable body of water or watercourse perennially covered by water;
  (C) Any public recreational facility such as a golf course, amusement park, picnic ground, campground or any other area of periodic high-density population; or
  (D) Any officially recognized wildlife preserve.

WELL OPERATIONS REQUIRING BONDING

1. Drilling, redrilling, or deepening any well.
2. Milling out or removing a casing or liner.
3. Running and cementing casing or tubing.
4. Running and cementing liners and inner liners.
5. Perforating casing in a previously unperforated interval for production, injection, testing, observation, or cementing purposes.
6. Drilling out any type of permanent plug.
7. Reentering an abandoned well having no bond.

This form may be printed from the DOGGR website at **www.conservation.ca.gov/dog/**

E&B Natural Resources
Wilmington North Flank Unit I
Well: WNF-I 22
Vertical Water Source Well
Drilling Program

Planning and Preparation:

Current well condition: 16" conductor set @ 40'
Remove pumping units from and isolate adjacent wells 18, 20, and 25
Grade surface from well 23 to the east end of the cellar
Long lead items:

- Speed-head wellhead
- 4-1/2" WWS and hanger
- ESP and auxiliary equipment

Drilling Procedure:

Surface Casing:

1. MIRU drilling rig and mud system. Install riser with 6" diverter. Condition starter mud.
2. PU 10-5/8" bit on locked-up BHA. Clean out conductor and drill 10-5/8" hole to 610'. Break over to Cypan low solids mud @ 300'.
3. PU 14-1/2" x 17-1/2" RWD2 bit on locked-up BHA. Drill 14-1/2" x 17-1/2" hole to 610'. Condition hole for casing
4. Run 13-3/8", J55, 54.5#, FMax casing to 600'.
5. Run stab-in on drill pipe and cement 13-3/8" casing to surface.
6. Remove riser, cut off casing, and install 13-5/8" x 3M speed-head wellhead.
7. Install Class III BOPE. Test BOPE. Test 13-3/8" casing to 1000 psi.

Intermediate Casing:

8. PU 12-1/4" bit on locked-up BHA. Drill out float and cement to 595' (5' above casing shoe).
9. Change over to 9.1 ppg clay based mud.
10. Drill out 13-3/8" casing shoe @ 600', 10' of cement, and 10' of new hole to 620'. Perform FIT.
11. Drill 12-1/4" hole to 3086'. Wipe and condition hole as needed.
12. MIRU loggers. Run induction/SP/GR from TD to 13-3/8" casing shoe.
13. Run 9-5/8", J55, 36#, LTC casing to 3076' (5' below top of Tar estimated @ 3071').
14. Cement 9-5/8" casing with TOC @ 1500' +/- (418' above estimated BFW @ 1918').
15. Install mandrel hanger and land 9-5/8" casing.
16. Test Class III BOPE. Test 9-5/8" casing to 1000 psi.

Production Liner:

17. PU 8-3/4" bit on locked-up BHA. Drill out float and cement to 3071' (5' above casing shoe).
18. MIRU loggers. Run CBL/GR/CCL from TD to surface.
19. Change over to 9.1 ppg non damaging KCl polymer mud system.
20. Drill out 9-5/8" casing shoe @ 3081'. Drill 8-3/4" hole to 3700'. Wipe hole and condition for logs.
21. MIRU loggers and run triple combo from TD to 9-5/8" casing shoe.
22. Clean out with 8-3/4" bit to TD.
23. Plug back from TD to bottom of Tar as directed by asset team.
24. PU 8-3/4" x 12-1/4" hole opener. Open hole from 3050' to bottom of Tar.
25. Run 4-1/2" WWS liner to TD with 9-5/8" x 4-1/2" liner hanger packer at 2980' +/- (at least 100' above 9-5/8" shoe).
26. Run 2-7/8" tubing stinger to liner shoe. Gravel pack liner in place with 20/40 gravel using 3% KCl.

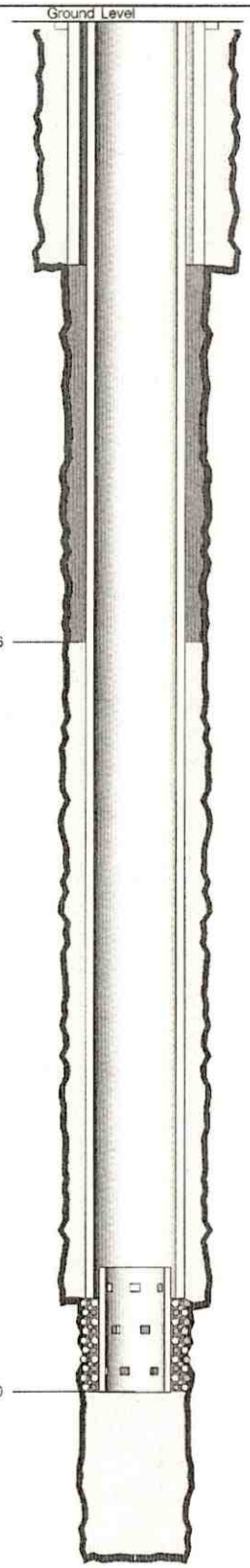
27. Release liner and set seal adaptor.
28. LDDP.

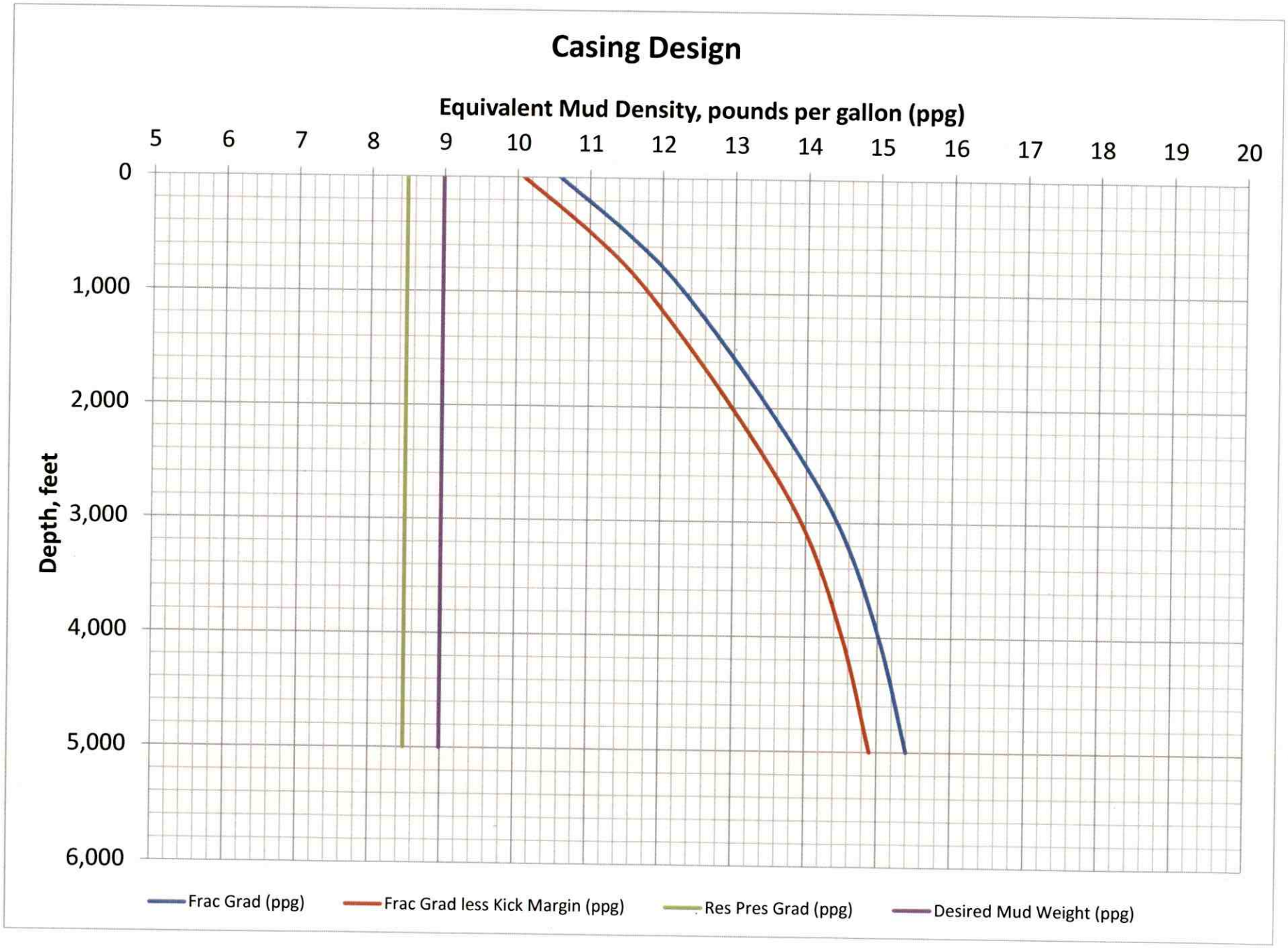
Completion:

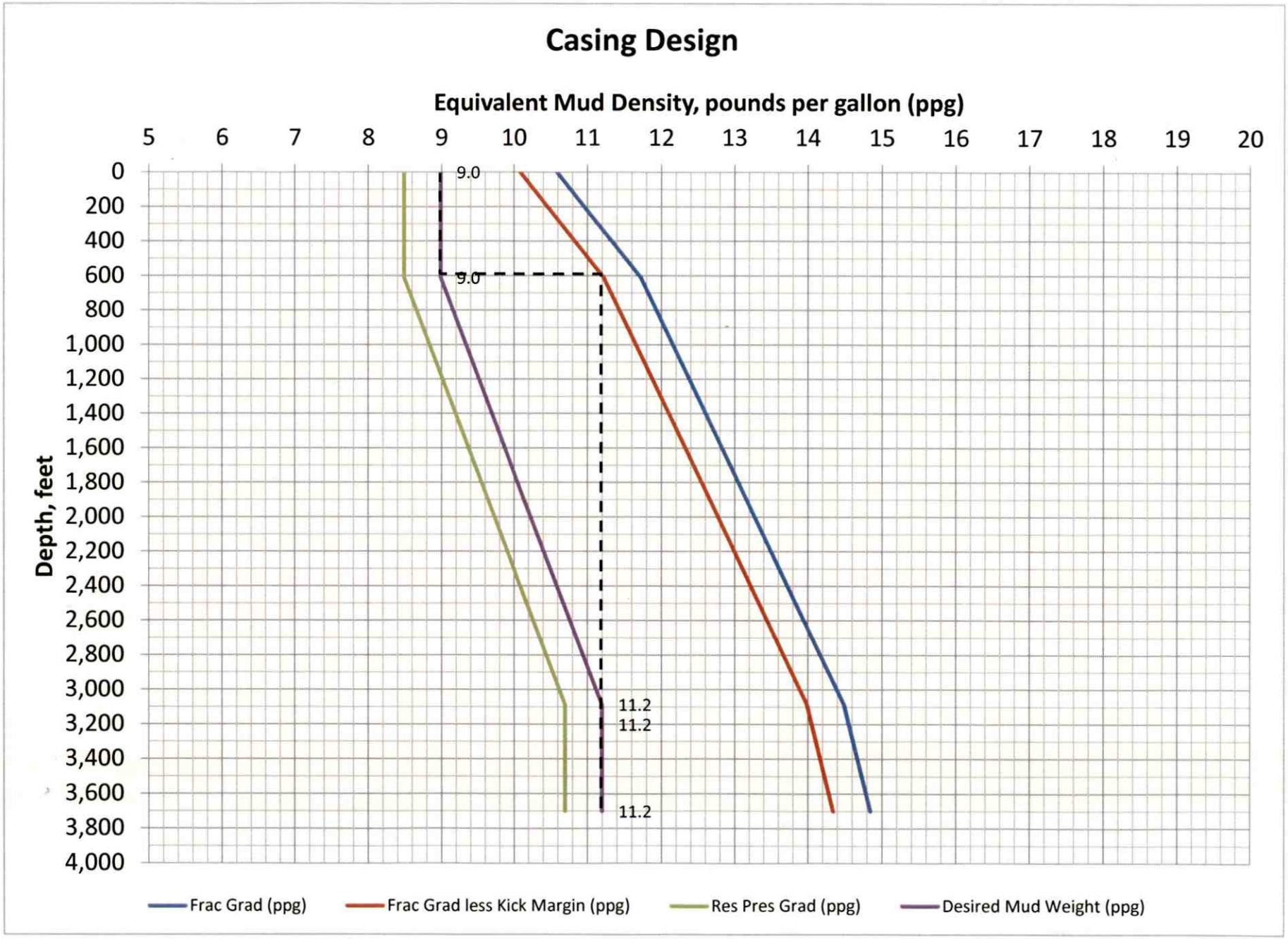
29. Pick up 2-7/8", 6.5#, N80, EUE tubing string.
30. Make up ESP. MIRU banders. RIH ESP to nearest whole tubing joint above TOL.
31. Land tubing, nipple down BOPE, and install production tree.
32. RDMO drilling rig.
33. Place well on production as directed by engineering.

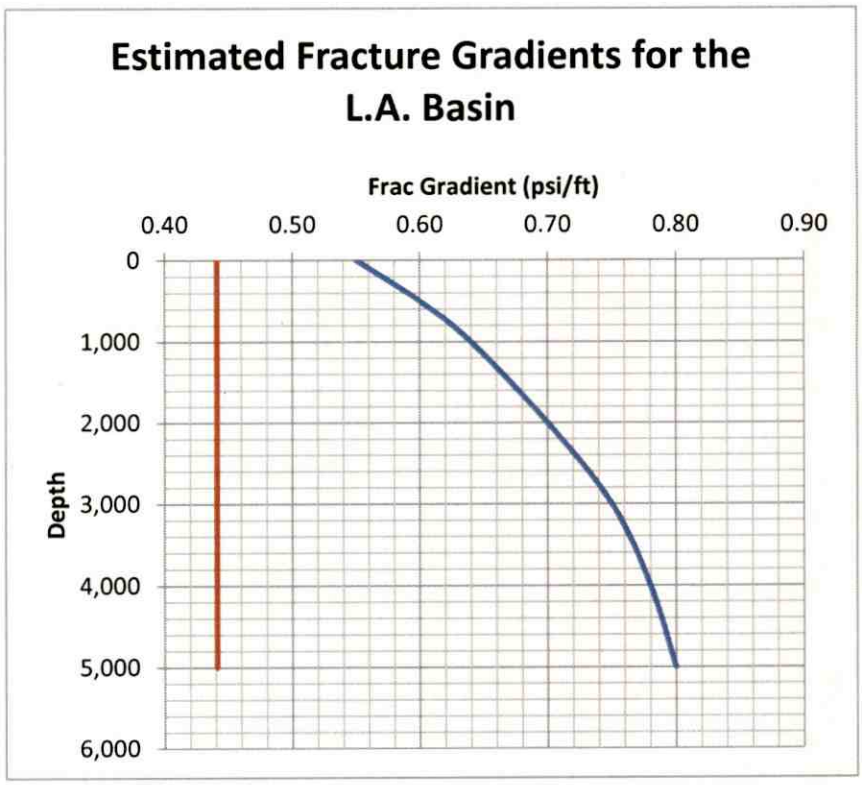
Operator: E&B Natural Resources Legal name: WNF-I 22 ST/RD No.: 0 Field: Wilmington API No.: Spud Date: Current Status: PROPOSED Status Date: 12/31/2014	Section: 19 Township: 4 Township: S Range: 13 Range: W Longitude: Latitude: State/Province: CALIFORNIA County: Los Angeles	Datum: KB Datum Height: 22.0ft KOP: 22ft PBTD: TVD BH: 3,700ft TD: 3,700ft	

HOLE INFO		CASING DETAILS			CEMENT DETAILS						EQUIPMENT		PERFS / SLOTS		GEO INFO
Size	Top-Btm (ft)	Size	Weight, Grade	Top-Btm (ft)	Type	Class	Vol (bbl)	Yield (ft³/sk)	Top-Btm (ft)	Schematic	Top-Btm	Desc	Top-Btm (ft)	Status, Date	Marker Top (ft)
17.500	40-610	16.000	, J-55	22-40	PRIM CMT	CLASS G	87.0	1.18	22-610						
12.250	610-3086	13.375	54.5ppf, J-55	22-600											
					PRIM CMT	CLASS G	89.0	1.18	1,500-3,086						
															BFW 1,918
8.750	3,086-3700	9.625	36.0ppf, J-55	22-3,076											Tar 3,071
													3,076-3,300	OPEN,11/1/2014	
		7.000	13-CR WWS	3,000-3,300	CMT PLUG	CLASS G	30.0	1.18	3,300-3,700						
															Ranger 3,395
															Terminal 3,693




Casing Design
Equivalent Mud Density, pounds per gallon (ppg)
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Depth, feet
0
1,000
2,000
3,000
4,000
5,000
6,000
Frac Grad (ppg)
Frac Grad less Kick Margin (ppg)
Res Pres Grad (ppg)
Desired Mud Weight (ppg)


Casing Design
Equivalent Mud Density, pounds per gallon (ppg)
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Depth, feet
0
200
400
600
800
1,000
1,200
1,400
1,600
1,800
2,000
2,200
2,400
2,600
2,800
3,000
3,200
3,400
3,600
3,800
4,000
9.0
9.0
11.2
11.2
11.2
Frac Grad (ppg)
Frac Grad less Kick Margin (ppg)
Res Pres Grad (ppg)
Desired Mud Weight (ppg)


Estimated Fracture Gradients for the L.A. Basin
Frac Gradient (psi/ft)
0.40
0.50
0.60
0.70
0.80
0.90
Depth
0
1,000
2,000
3,000
4,000
5,000
6,000

Anchor String check for

E&B WNF I 22 Tar water producer

9/15/2014

INPUT (GREY BOXES)

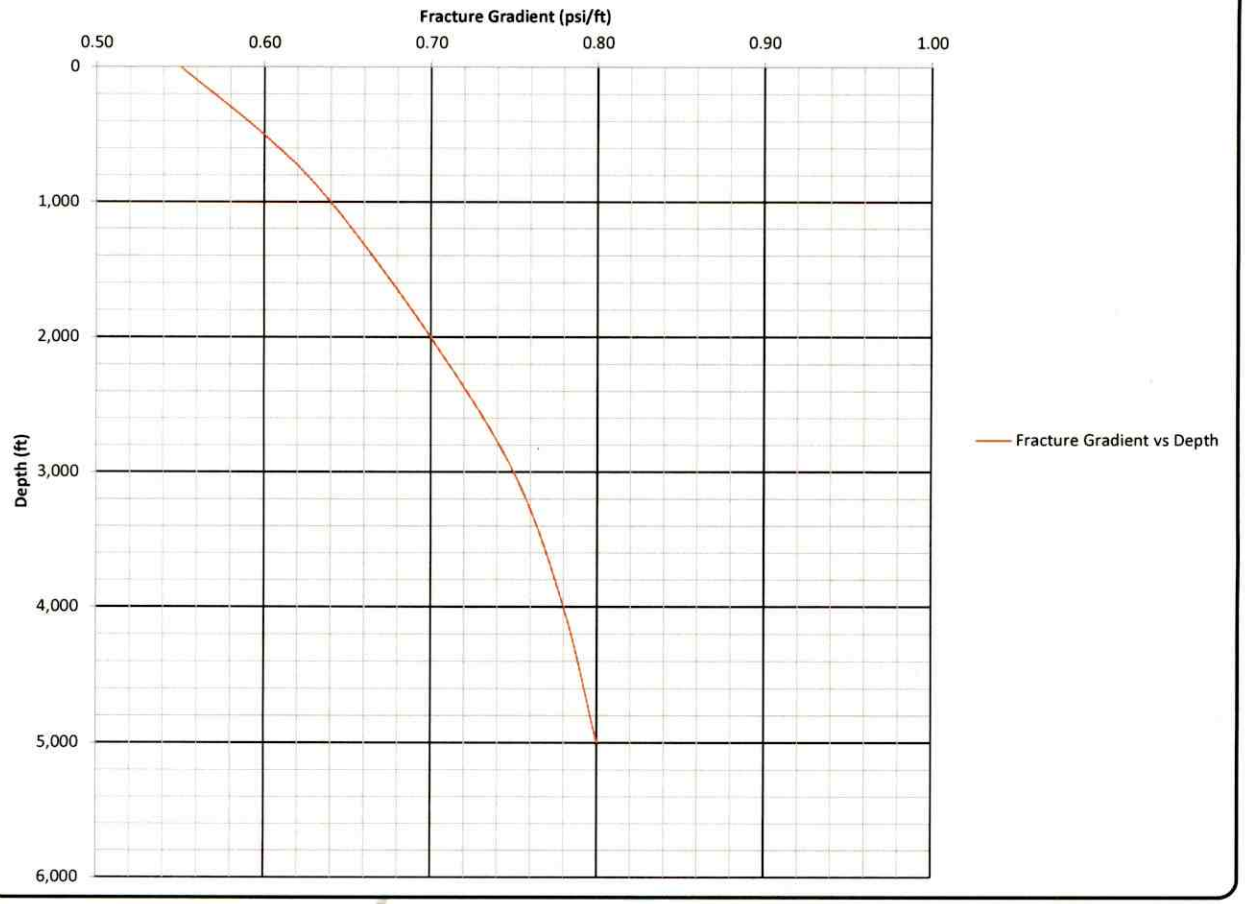
Proposed TVD of Anchor String (feet)	Estimated Fracture Gradient at Anchor String TVD (psi/ft)	Proposed TVD of well's Total Depth (feet)	Estimated Maximum Formation Pressure at TVD (psi)	Overbalanced Margin, a percentage of the Formation Pressure Gradient (5% = 0.05)	Kick Margin, a percentage of the Drilling Mud Gradient (5% = 0.05)
610	0.61	3,700	1,320	0.05	0.05

Formation Pressure Gradient (psi/ft)	Drilling Mud Gradient (psi/ft)	Fracture Pressure of Anchor String Shoe (psi)	Pressure @ Shoe due to Drilling Mud (psi)	Potential Pressure @ Shoe due to Estimated Kick (psi)	Total Potential Pressure @ Shoe (psi)
0.441	0.375	372	229	69	298

(never less than 0.44)

Eqv Mud weight (ppg)
7.20

Estimated Fracture Gradients for the L.A. Basin



Anchor String check for

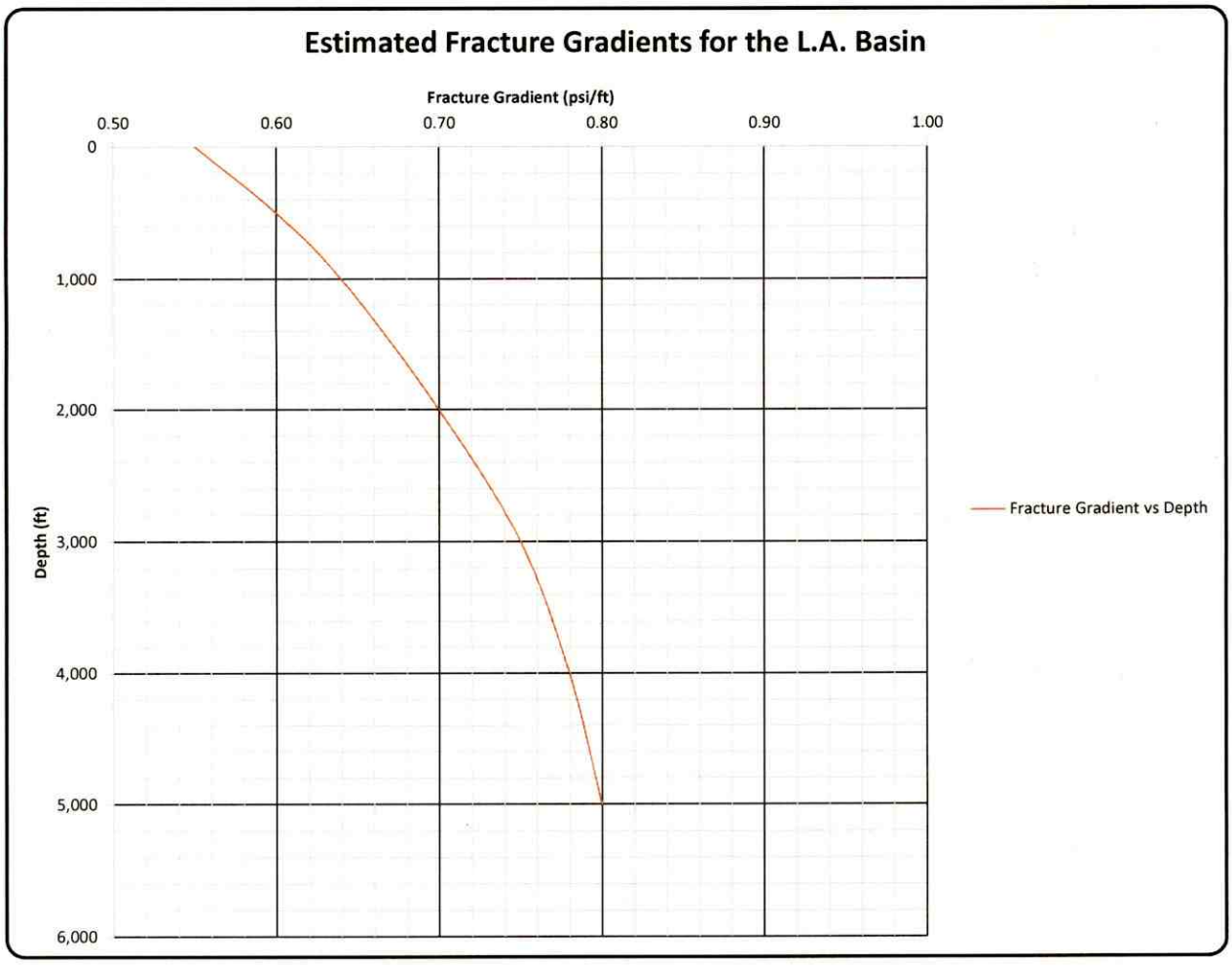
E&B WNF I 22 Tar water producer

9/15/2014

INPUT (GREY BOXES)

Proposed TVD of Anchor String (feet)	Estimated Fracture Gradient at Anchor String TVD (psi/ft)	Proposed TVD of well's Total Depth (feet)	Estimated Maximum Formation Pressure at TVD (psi)	Overbalanced Margin, a percentage of the Formation Pressure Gradient (5% = 0.05)	Kick Margin, a percentage of the Drilling Mud Gradient (5% = 0.05)
700	0.610	3,700	1,320	0.05	0.05

Formation Pressure Gradient (psi/ft)	Drilling Mud Gradient (psi/ft)	Fracture Pressure of Anchor String Shoe (psi)	Pressure @ Shoe due to Drilling Mud (psi)	Potential Pressure @ Shoe due to Estimated Kick (psi)	Total Potential Pressure @ Shoe (psi)
0.444	0.375	427	262	69	332

(never less than 0.44)

Eqv Mud weight (ppg)
7.20