

|             |             |              |              |          |                |
|-------------|-------------|--------------|--------------|----------|----------------|
| DATE 5/6/03 | SUSPENSE NA | ENGINEER WVS | LOGGED IN KW | TYPE DHC | PR V0312648725 |
|-------------|-------------|--------------|--------------|----------|----------------|

ABOVE THIS LINE FOR DIVISION USE ONLY

# NEW MEXICO OIL CONSERVATION DIVISION

- Engineering Bureau -

1220 South St. Francis Drive, Santa Fe, NM 87505



## ADMINISTRATIVE APPLICATION CHECKLIST

THIS CHECKLIST IS MANDATORY FOR ALL ADMINISTRATIVE APPLICATIONS FOR EXCEPTIONS TO DIVISION RULES AND REGULATIONS WHICH REQUIRE PROCESSING AT THE DIVISION LEVEL IN SANTA FE

### Application Acronyms:

[NSL-Non-Standard Location] [NSP-Non-Standard Proration Unit] [SD-Simultaneous Dedication]  
 [DHC-Downhole Commingling] [CTB-Lease Commingling] [PLC-Pool/Lease Commingling]  
 [PC-Pool Commingling] [OLS - Off-Lease Storage] [OLM-Off-Lease Measurement]  
 [WFX-Waterflood Expansion] [PMX-Pressure Maintenance Expansion]  
 [SWD-Salt Water Disposal] [IPI-Injection Pressure Increase]  
 [EOR-Qualified Enhanced Oil Recovery Certification] [PPR-Positive Production Response]

RECEIVED

- [1] **TYPE OF APPLICATION** - Check Those Which Apply for [A]  
 [A] Location - Spacing Unit - Simultaneous Dedication  
☐ NSL ☐ NSP ☐ SD  
 Check One Only for [B] or [C]  
 [B] Commingling - Storage - Measurement  
☒ DHC ☐ CTB ☐ PLC ☐ PC ☐ OLS ☐ OLM  
 [C] Injection - Disposal - Pressure Increase - Enhanced Oil Recovery  
☐ WFX ☐ PMX ☐ SWD ☐ IPI ☐ EOR ☐ PPR  
 [D] Other: Specify \_\_\_\_\_
- [2] **NOTIFICATION REQUIRED TO:** - Check Those Which Apply, or ☒ Does Not Apply  
 [A] ☐ Working, Royalty or Overriding Royalty Interest Owners  
 [B] ☐ Offset Operators, Leaseholders or Surface Owner  
 [C] ☐ Application is One Which Requires Published Legal Notice  
 [D] ☐ Notification and/or Concurrent Approval by BLM or SLO  
U.S. Bureau of Land Management - Commissioner of Public Lands, State Land Office  
 [E] ☐ For all of the above, Proof of Notification or Publication is Attached, and/or,  
 [F] ☐ Waivers are Attached
- [3] **SUBMIT ACCURATE AND COMPLETE INFORMATION REQUIRED TO PROCESS THE TYPE OF APPLICATION INDICATED ABOVE.**

[4] **CERTIFICATION:** I hereby certify that the information submitted with this application for administrative approval is **accurate** and **complete** to the best of my knowledge. I also understand that **no action** will be taken on this application until the required information and notifications are submitted to the Division.

Note: Statement must be completed by an individual with managerial and/or supervisory capacity.

Mary Corley  
 Print or Type Name

*Mary Corley*  
 Signature

Sr. Regulatory Analyst 04/30/2003  
 Title Date  
 corleym@bp.com  
 e-mail Address

District I  
1625 N. French Drive, Hobbs, NM 88240  
2000  
District II  
811 South First Street, Artesia, NM 88210  
District III  
1000 Rio Brazos Road, Aztec, NM 87410  
Pools  
District IV  
2040 South Pacheco, Santa Fe, NM 87505

State of New Mexico  
Energy, Minerals and Natural Resources Department

Form C-107A  
Revised May 15,

OIL CONSERVATION DIVISION  
2040 South Pacheco  
Santa Fe, New Mexico 87505

APPLICATION TYPE  
☒ Single Well  
☐ Establish Pre-Approved  
  
EXISTING WELLBORE  
☒ Yes ☐ No

APPLICATION FOR DOWNHOLE COMMINGLING

BP America Production Company P. O. Box 3092 Houston, TX 77253  
Operator Address  
Warren A LS 2 Unit A Section 23 T28N, R09W San Juan  
Lease Well No. Unit Letter-Section-Township-Range County  
OGRID No. 000778 Property Code 001210 API No. 30-045-07353 Lease Type: ☒ Federal ☐ State ☐ Fee

| DATA ELEMENT                                                      | UPPER ZONE            | INTERMEDIATE ZONE | LOWER ZONE       |
|-------------------------------------------------------------------|-----------------------|-------------------|------------------|
| Pool Name                                                         | Aztec Pictured Cliffs | Otero Chacra      | Blanco Mesaverde |
| Pool Code                                                         | 71280                 | 82329             | 72319            |
| Top & Bottom of Pay Section<br>(Perforated or Open-Hole Interval) | 2416' - 2468'         | 3385' - 3520      | 4422' - 4801'    |
| Method of Production<br>(Flowing or Artificial Lift)              | Flowing               | Flowing           | Flowing          |
| Bottomhole Pressure                                               | 270                   | 425               | 499              |
| Oil Gravity or Gas BTU<br>(Degree API or Gas BTU)                 | 1294                  | 1202.6            | 1256             |
| Producing, Shut-In or<br>New Zone                                 | Producing             | New Zone          | Producing        |
| Date and Oil/Gas/Water Rates<br>of Last Production.               | Date:<br>Rates:       | Date:<br>Rates:   | Date:<br>Rates:  |
| Fixed Allocation Percentage                                       | Oil % Gas %           | Oil % Gas %       | Oil % Gas %      |

ADDITIONAL DATA

Are all working, royalty and overriding royalty interests identical in all commingled zones? Yes ☒ No ☐  
If not, have all working, royalty and overriding royalty interest owners been notified by certified mail? Yes ☐ No ☐  
  
Are all produced fluids from all commingled zones compatible with each other? Yes ☒ No ☐  
  
Will commingling decrease the value of production? Yes ☐ No ☒  
  
If this well is on, or communitized with, state or federal lands, has either the Commissioner of Public Lands or the United States Bureau of Land Management been notified in writing of this application? Yes ☐ No ☐  
  
NMOCD Reference Case No. applicable to this well: \_\_\_\_\_

Attachments:  
C-102 for each zone to be commingled showing its spacing unit and acreage dedication.  
Production curve for each zone for at least one year. (If not available, attach explanation.)  
For zones with no production history, estimated production rates and supporting data.  
Data to support allocation method or formula.  
Notification list of working, royalty and overriding royalty interests for uncommon interest cases.  
Any additional statements, data or documents required to support commingling.

PRE-APPROVED POOLS

If application is to establish Pre-Approved Pools, the following additional information will be required:

List of other orders approving downhole commingling within the proposed Pre-Approved Pools  
List of all operators within the proposed Pre-Approved Pools  
Proof that all operators within the proposed Pre-Approved Pools were provided notice of this application.  
Bottomhole pressure data.

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

SIGNATURE Mary Corley TITLE Sr. Regulatory Analyst DATE 04/30/2003  
TYPE OR PRINT NAME Mary Corley TELEPHONE NO. ( 281 ) 366-4491

## Warren A LS #2 Recompletion and Trimingle Procedure

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### Procedure:

1. Check anchors. MIRU workover rig.
2. Check and record tubing, casing, and bradenhead pressures.
3. Blow down well. Kill with 2% KCL water ONLY if necessary.
4. Nipple down WH. NU BOPs.
5. Tag for fill and tally OH with 2-3/8" production tubing currently set at 4784'.
6. TIH with bit and scraper for 5-1/2" casing to 4801'. Work casing scraper across Mesaverde perforations (4422' – 4801') and new Chacra interval (3375' – 3575').
7. RU WL unit. RIH with 5-1/2" CIBP. Set CIBP at 3700'.
8. Load well with 2% KCL to the bottom of the Pictured Cliffs perforations.
9. RU WL unit. Run cased-hole dipole sonic log across Chacra interval from 3200' – 3700'.
11. RIH with 3-1/8" casing guns. Perforate Chacra formation (correlate to GR log).

#### Chacra perforations, 2 spf (20 shots/40 holes):

3385' – 3390'  
3415' – 3420'  
3500' – 3505'  
3515' – 3520'

12. RIH with 2-7/8" X 3-1/2" tapered frac string and 5-1/2" packer. Set packer at 3350'.
13. Spearhead 500 gal 15% HCL, establish injection rate, and proceed with fracture stimulation according to Schlumberger schedule.
14. Flowback frac immediately.
15. Release packer. TOH and LD frac string and packer.
16. TIH with tubing and bit. Cleanout fill and drill bridge plug set at 3700'. Cleanout fill to PBTD at 4864'. Blow well dry at PBTD.
17. RIH with 2-3/8" production tubing.
18. Land 2-3/8" production tubing at 4775'.
19. ND BOP's. NU WH. Test well for air. Return well to production and downhole trimingle Pictured Cliffs, Chacra, and Mesaverde production.

## Warren A LS #2

Sec 23, T28N, R9W

API # 30-045-07353

### History:

Completed in 12/57

Aug 1974: Replace short string & leaky packer

Apr 2001: Refrac'd PC and DHC'd PC/MV

**Tubing: 1-1/4" 2.4#, K55 @ 2508'**

### PC Perforations

2416' - 2440' 2 spf

2448' - 2468' 2 spf

frac'd w/ 34,000# sand

re-frac'd w/ 102,000# sand

### MV Perforations (MF & PL)

4422' - 4438' 2 spf

4480' - 4488' 2 spf

4572' - 4594' 2 spf

4641' - 4660' 2 spf

4684' - 4709' 2 spf

4717' - 4727' 2 spf

4750' - 4764' 2 spf

4767' - 4801' 2 spf

PBTD: 4864'

est. TOC @ surface (circ)

**10-3/4" 32# Armco S.W. @ 162'**  
150 sxs cmt (circulated)

Est. TOC @ 1300' (1957 temp surv)

Burns Liner Hanger @ 2518'

**7-5/8" 26#, J55 @ 2564'**  
250 sxs cmt

Est TOC @ 2518' (1957 temp surv)

**Tubing: 2-3/8" 4.7#, J55 @ 4784'**  
(w/ F-nipple at 4781')

**5-1/2" liner, 15.5#, J55 @ 5693'**  
300 sxs cmt

### NOTES:

updated: 4/14/03 jad

Allocation Method  
Warren A LS 2

BP America Production Company request permission to complete the subject well into the Otero Chacra and tricomingle production downhole with the existing Aztec Pictured Cliffs and Blanco Mesaverde Pools as per the attached procedure.

The interest owners are identical between these three Pools, therefore, no additional notification is required prior to downhole commingling approval.

Production is proposed to be allocated based on the subtraction method using the projected future decline for production from the Pictured Cliffs and Mesaverde Pools. This production shall serve as a base for production subtracted from the total production for the commingled well. The balance of the production will be attributed to the Chacra. Attached are the future production decline estimates for the Pictured Cliffs & Mesaverde Pools.

Commingling Production Downhole in the subject well from the proposed pools with not reduce the value of the total remaining production.

Application has also been submitted to BLM on Form 3160-5, Federal Lease No. SF ~ 077112.

Pre Approved Pool:

Blanco-Mesaverde (72319) & Aztec-Pictured Cliffs (71280) Pools

Blanco-Mesaverde (72319) & Otero-Chacra (82329) Pools

Aztec-Pictured Cliffs (71280) & Otero-Chacra (82329) Pools

# **Future Production Decline Estimate Mesaverde** **(Monthly Factor .0302)**

| Month    | Gas Volume |
|----------|------------|
| Jan-2002 | 87         |
| Feb-2002 | 90         |
| Mar-2002 | 86         |
| Apr-2002 | 84         |
| May-2002 | 77         |
| Jun-2002 | 84         |
| Jul-2002 | 83         |
| Aug-2002 | 78         |
| Sep-2002 | 73         |
| Oct-2002 | 80         |
| Nov-2002 | 72         |
| Dec-2002 | 76         |
| Jan-2003 | 76         |
| Feb-2003 | 76         |
| Mar-2003 | 76         |
| Apr-2003 | 76         |
| May-2003 | 76         |
| Jun-2003 | 76         |
| Jul-2003 | 75         |
| Aug-2003 | 75         |
| Sep-2003 | 75         |
| Oct-2003 | 75         |
| Nov-2003 | 75         |
| Dec-2003 | 75         |
| Jan-2004 | 75         |
| Feb-2004 | 75         |
| Mar-2004 | 75         |
| Apr-2004 | 75         |
| May-2004 | 75         |
| Jun-2004 | 75         |
| Jul-2004 | 75         |
| Aug-2004 | 74         |
| Sep-2004 | 74         |
| Oct-2004 | 74         |
| Nov-2004 | 74         |
| Dec-2004 | 74         |

$\ln(Q_f/Q_i) = -dt$   
 $Q_i = 84 \text{ MCFD (04/2002)}$   
 $Q_f = 73 \text{ MCFD (9/2002)}$   
 $t = 5 \text{ months (.41666 yrs)}$   
 $d = 0.32 \text{ annual decline}$   
 $0.027 \text{ monthly decline (0.32/12)}$

## **Corrected Volumes**

$73/84 = .86905$   
 $.86905 * .41666 = .36210$   
 $0.030175$

| Month    | Gas Volume |
|----------|------------|
| Jan-2005 | 74         |
| Feb-2005 | 74         |
| Mar-2005 | 74         |
| Apr-2005 | 74         |
| May-2005 | 74         |
| Jun-2005 | 74         |
| Jul-2005 | 74         |
| Aug-2005 | 74         |
| Sep-2005 | 74         |
| Oct-2005 | 73         |
| Nov-2005 | 73         |
| Dec-2005 | 73         |
| Jan-2006 | 73         |
| Feb-2006 | 73         |
| Mar-2006 | 73         |
| Apr-2006 | 73         |
| May-2006 | 73         |
| Jun-2006 | 73         |
| Jul-2006 | 73         |
| Aug-2006 | 73         |
| Sep-2006 | 73         |
| Oct-2006 | 73         |
| Nov-2006 | 73         |
| Dec-2006 | 72         |
| Jan-2007 | 72         |
| Feb-2007 | 72         |
| Mar-2007 | 72         |
| May-2007 | 72         |
| Jun-2007 | 72         |
| Jul-2007 | 72         |
| Aug-2007 | 72         |
| Sep-2007 | 72         |
| Oct-2007 | 72         |
| Nov-2007 | 72         |
| Dec-2007 | 72         |
| Jan-2008 | 72         |

| Month    | Gas Volume |
|----------|------------|
| Feb-2008 | 71         |
| Mar-2008 | 71         |
| Apr-2008 | 71         |
| May-2008 | 71         |
| Jun-2008 | 70         |
| Jul-2008 | 70         |
| Aug-2008 | 70         |
| Sep-2008 | 70         |
| Oct-2008 | 69         |
| Nov-2008 | 69         |
| Dec-2008 | 69         |
| Jan-2009 | 69         |
| Feb-2009 | 68         |
| Mar-2009 | 68         |
| Apr-2009 | 68         |
| May-2009 | 68         |
| Jun-2009 | 67         |
| Jul-2009 | 67         |
| Aug-2009 | 67         |
| Sep-2009 | 67         |
| Oct-2009 | 67         |
| Nov-2009 | 66         |
| Dec-2009 | 66         |
| Jan-2010 | 66         |
| Feb-2010 | 66         |
| Mar-2010 | 65         |
| Apr-2010 | 65         |
| May-2010 | 65         |
| Jun-2010 | 65         |
| Jul-2010 | 65         |
| Aug-2010 | 64         |
| Sep-2010 | 64         |
| Oct-2010 | 64         |
| Nov-2010 | 64         |
| Dec-2010 | 63         |
| Jan-2011 | 63         |

**Future Production Decline Estimate Mesaverde**  
**(Monthly Factor .0302)**

| Month    | Gas Volume |
|----------|------------|
| Feb-2011 | 63         |
| Mar-2011 | 63         |
| Apr-2011 | 63         |
| May-2011 | 62         |
| Jun-2011 | 62         |
| Jul-2011 | 62         |
| Aug-2011 | 62         |
| Sep-2011 | 61         |
| Oct-2011 | 61         |
| Nov-2011 | 61         |
| Dec-2011 | 61         |
| Jan-2012 | 61         |
| Feb-2012 | 60         |
| Mar-2012 | 60         |
| Apr-2012 | 60         |
| May-2012 | 60         |
| Jun-2012 | 60         |
| Jul-2012 | 59         |
| Aug-2012 | 59         |
| Sep-2012 | 59         |
| Oct-2012 | 59         |
| Nov-2012 | 59         |
| Dec-2012 | 58         |
| Jan-2013 | 58         |
| Feb-2013 | 58         |
| Mar-2013 | 58         |
| Apr-2013 | 58         |
| May-2013 | 57         |
| Jun-2013 | 57         |
| Jul-2013 | 57         |
| Aug-2013 | 57         |
| Sep-2013 | 57         |
| Oct-2013 | 56         |
| Nov-2013 | 56         |
| Dec-2013 | 56         |
| Jan-2014 | 56         |

| Month    | Gas Volume |
|----------|------------|
| Feb-2014 | 56         |
| Mar-2014 | 55         |
| Apr-2014 | 55         |
| May-2014 | 55         |
| Jun-2014 | 55         |
| Jul-2014 | 55         |
| Aug-2014 | 55         |
| Sep-2014 | 54         |
| Oct-2014 | 54         |
| Nov-2014 | 54         |
| Dec-2014 | 54         |
| Jan-2015 | 54         |
| Feb-2015 | 54         |
| Mar-2015 | 53         |
| Apr-2015 | 53         |
| May-2015 | 53         |
| Jun-2015 | 53         |
| Jul-2015 | 53         |
| Aug-2015 | 53         |
| Sep-2015 | 53         |
| Oct-2015 | 52         |
| Nov-2015 | 52         |
| Dec-2015 | 52         |
| Jan-2016 | 52         |
| Feb-2016 | 52         |
| Mar-2016 | 52         |
| Apr-2016 | 51         |
| May-2016 | 51         |
| Jun-2016 | 51         |
| Jul-2016 | 51         |
| Aug-2016 | 51         |
| Sep-2016 | 51         |
| Oct-2016 | 51         |
| Nov-2016 | 50         |
| Dec-2016 | 50         |
| Jan-2017 | 50         |

| Month    | Gas Volume |
|----------|------------|
| Feb-2017 | 50         |
| Mar-2017 | 50         |
| Apr-2017 | 50         |
| May-2017 | 49         |
| Jun-2017 | 49         |
| Jul-2017 | 49         |
| Aug-2017 | 49         |
| Sep-2017 | 49         |
| Oct-2017 | 49         |
| Nov-2017 | 49         |
| Dec-2017 | 48         |
| Jan-2018 | 48         |
| Feb-2018 | 48         |
| Mar-2018 | 48         |
| Apr-2018 | 48         |
| May-2018 | 48         |
| Jun-2018 | 48         |
| Jul-2018 | 47         |
| Aug-2018 | 47         |
| Sep-2018 | 47         |
| Oct-2018 | 47         |
| Nov-2018 | 47         |
| Dec-2018 | 47         |
| Jan-2019 | 47         |
| Feb-2019 | 46         |
| Mar-2019 | 46         |
| Apr-2019 | 46         |
| May-2019 | 46         |
| Jun-2019 | 46         |
| Jul-2019 | 46         |
| Aug-2019 | 46         |
| Sep-2019 | 45         |
| Oct-2019 | 45         |
| Nov-2019 | 45         |
| Dec-2019 | 45         |
| Jan-2020 | 45         |

| Month    | Gas Volume |
|----------|------------|
| Feb-2020 | 45         |
| Mar-2020 | 44         |
| Apr-2020 | 44         |
| May-2020 | 44         |
| Jun-2020 | 44         |
| Jul-2020 | 44         |
| Aug-2020 | 43         |
| Sep-2020 | 43         |
| Oct-2020 | 43         |
| Nov-2020 | 43         |
| Dec-2020 | 43         |
| Jan-2021 | 42         |
| Feb-2021 | 42         |
| Mar-2021 | 42         |
| Apr-2021 | 42         |
| May-2021 | 41         |
| Jun-2021 | 41         |
| Jul-2021 | 41         |
| Aug-2021 | 41         |
| Sep-2021 | 41         |
| Oct-2021 | 40         |
| Nov-2021 | 40         |
| Dec-2021 | 40         |
| Jan-2022 | 40         |
| Feb-2022 | 40         |
| Mar-2022 | 39         |
| Apr-2022 | 39         |
| May-2022 | 39         |
| Jun-2022 | 39         |
| Jul-2022 | 39         |
| Aug-2022 | 38         |
| Sep-2022 | 38         |
| Oct-2022 | 38         |
| Nov-2022 | 38         |
| Dec-2022 | 38         |
| Jan-2023 | 38         |

# **Future Production Decline Estimate Mesaverde** **(Monthly Factor .0302)**

| Month    | Gas Volume |
|----------|------------|
| Feb-2023 | 37         |
| Mar-2023 | 37         |
| Apr-2023 | 37         |
| May-2023 | 37         |
| Jun-2023 | 37         |
| Jul-2023 | 36         |
| Aug-2023 | 36         |
| Sep-2023 | 36         |
| Oct-2023 | 36         |
| Nov-2023 | 36         |
| Dec-2023 | 36         |
| Jan-2024 | 35         |
| Feb-2024 | 35         |
| Mar-2024 | 35         |
| Apr-2024 | 35         |
| May-2024 | 35         |
| Jun-2024 | 34         |
| Jul-2024 | 34         |
| Aug-2024 | 34         |
| Sep-2024 | 34         |
| Oct-2024 | 34         |
| Nov-2024 | 34         |
| Dec-2024 | 33         |
| Jan-2025 | 33         |
| Feb-2025 | 33         |
| Mar-2025 | 33         |
| Apr-2025 | 33         |
| May-2025 | 33         |
| Jun-2025 | 32         |
| Jul-2025 | 32         |
| Aug-2025 | 32         |
| Sep-2025 | 32         |
| Oct-2025 | 32         |
| Nov-2025 | 32         |
| Dec-2025 | 31         |
| Jan-2026 | 31         |

| Month    | Gas Volume |
|----------|------------|
| Feb-2026 | 31         |
| Mar-2026 | 31         |
| Apr-2026 | 31         |
| May-2026 | 31         |
| Jun-2026 | 31         |
| Jul-2026 | 30         |
| Aug-2026 | 30         |
| Sep-2026 | 30         |
| Oct-2026 | 30         |
| Nov-2026 | 30         |
| Dec-2026 | 30         |
| Jan-2027 | 29         |
| Feb-2027 | 29         |
| Mar-2027 | 29         |
| Apr-2027 | 29         |
| May-2027 | 29         |
| Jun-2027 | 29         |
| Jul-2027 | 29         |
| Aug-2027 | 28         |
| Sep-2027 | 28         |
| Oct-2027 | 28         |
| Nov-2027 | 28         |
| Dec-2027 | 28         |
| Jan-2028 | 28         |
| Feb-2028 | 28         |
| Mar-2028 | 27         |
| Apr-2028 | 27         |
| May-2028 | 27         |
| Jun-2028 | 27         |
| Jul-2028 | 27         |
| Aug-2028 | 27         |
| Sep-2028 | 27         |
| Oct-2028 | 27         |
| Nov-2028 | 26         |
| Dec-2028 | 26         |
| Jan-2029 | 26         |

| Month    | Gas Volume |
|----------|------------|
| Feb-2029 | 26         |
| Mar-2029 | 26         |
| Apr-2029 | 26         |
| May-2029 | 26         |
| Jun-2029 | 26         |
| Jul-2029 | 25         |
| Aug-2029 | 25         |
| Sep-2029 | 25         |
| Oct-2029 | 25         |
| Nov-2029 | 25         |
| Dec-2029 | 25         |
| Jan-2030 | 25         |
| Feb-2030 | 25         |
| Mar-2030 | 24         |
| Apr-2030 | 24         |
| May-2030 | 24         |
| Jun-2030 | 24         |
| Jul-2030 | 24         |
| Aug-2030 | 24         |
| Sep-2030 | 24         |
| Oct-2030 | 24         |
| Nov-2030 | 23         |
| Dec-2030 | 23         |
| Jan-2031 | 23         |
| Feb-2031 | 23         |
| Mar-2031 | 23         |
| Apr-2031 | 23         |
| May-2031 | 23         |
| Jun-2031 | 23         |
| Jul-2031 | 23         |
| Aug-2031 | 22         |
| Sep-2031 | 22         |
| Oct-2031 | 22         |
| Nov-2031 | 22         |
| Dec-2031 | 22         |
| Jan-2032 | 22         |

| Month    | Gas Volume |
|----------|------------|
| Feb-2032 | 22         |
| Mar-2032 | 22         |
| Apr-2032 | 21         |
| May-2032 | 21         |
| Jun-2032 | 21         |
| Jul-2032 | 21         |
| Aug-2032 | 21         |
| Sep-2032 | 21         |
| Oct-2032 | 21         |
| Nov-2032 | 21         |
| Dec-2032 | 21         |
| Jan-2033 | 20         |
| Feb-2033 | 20         |
| Mar-2033 | 20         |
| Apr-2033 | 20         |
| May-2033 | 20         |
| Jun-2033 | 20         |
| Jul-2033 | 20         |
| Aug-2033 | 20         |
| Sep-2033 | 20         |
| Oct-2033 | 20         |
| Nov-2033 | 19         |
| Dec-2033 | 19         |
| Jan-2034 | 19         |
| Feb-2034 | 19         |
| Mar-2034 | 19         |
| Apr-2034 | 19         |
| May-2034 | 19         |
| Jul-2034 | 19         |
| Aug-2034 | 19         |
| Sep-2034 | 19         |
| Oct-2034 | 18         |
| Nov-2034 | 18         |
| Dec-2034 | 18         |
| Jan-2035 | 18         |

# Warren A LS 2

## Future Production Decline Estimate Pictured Cliffs

### (Monthly Factor .034)

| Month    | Gas Volume |
|----------|------------|
| Jan-2002 | 274        |
| Feb-2002 | 286        |
| Mar-2002 | 273        |
| Apr-2002 | 267        |
| May-2002 | 245        |
| Jun-2002 | 266        |
| Jul-2002 | 261        |
| Aug-2002 | 248        |
| Sep-2002 | 230        |
| Oct-2002 | 253        |
| Nov-2002 | 227        |
| Dec-2002 | 248        |
| Jan-2003 | 248        |
| Feb-2003 | 248        |
| Mar-2003 | 247        |
| Apr-2003 | 247        |
| May-2003 | 247        |
| Jun-2003 | 247        |
| Jul-2003 | 246        |
| Aug-2003 | 246        |
| Sep-2003 | 246        |
| Oct-2003 | 246        |
| Nov-2003 | 245        |
| Dec-2003 | 245        |
| Jan-2004 | 245        |
| Feb-2004 | 245        |
| Mar-2004 | 244        |
| Apr-2004 | 244        |
| May-2004 | 244        |
| Jun-2004 | 244        |
| Jul-2004 | 243        |
| Aug-2004 | 243        |
| Sep-2004 | 243        |
| Oct-2004 | 243        |
| Nov-2004 | 242        |
| Dec-2004 | 242        |

$\ln(Q_f/Q_i) = -dt$   
 $Q_i = 274 \text{ MCFD (01/2002)}$   
 $Q_f = 266 \text{ MCFD (6/2002)}$   
 $t = 5 \text{ months (.41666 yrs)}$   
 $d = 0.32 \text{ annual decline}$   
 $0.027 \text{ monthly decline (0.32/12)}$

#### Corrected Volumes

$266/274 = .97080$   
 $.97080 * .41666 = .40449$   
 $0.0337075$

| Month    | Gas Volume |
|----------|------------|
| Jan-2005 | 242        |
| Feb-2005 | 242        |
| Mar-2005 | 241        |
| Apr-2005 | 241        |
| May-2005 | 241        |
| Jun-2005 | 241        |
| Jul-2005 | 240        |
| Aug-2005 | 240        |
| Sep-2005 | 240        |
| Oct-2005 | 240        |
| Nov-2005 | 239        |
| Dec-2005 | 239        |
| Jan-2006 | 239        |
| Feb-2006 | 239        |
| Mar-2006 | 239        |
| Apr-2006 | 238        |
| May-2006 | 238        |
| Jun-2006 | 238        |
| Jul-2006 | 238        |
| Aug-2006 | 237        |
| Sep-2006 | 237        |
| Oct-2006 | 237        |
| Nov-2006 | 237        |
| Dec-2006 | 236        |
| Jan-2007 | 236        |
| Feb-2007 | 236        |
| Mar-2007 | 236        |
| May-2007 | 235        |
| Jun-2007 | 235        |
| Jul-2007 | 235        |
| Aug-2007 | 235        |
| Sep-2007 | 234        |
| Oct-2007 | 234        |
| Nov-2007 | 234        |
| Dec-2007 | 234        |
| Jan-2008 | 234        |

| Month    | Gas Volume |
|----------|------------|
| Feb-2008 | 233        |
| Mar-2008 | 232        |
| Apr-2008 | 231        |
| May-2008 | 230        |
| Jun-2008 | 230        |
| Jul-2008 | 229        |
| Aug-2008 | 228        |
| Sep-2008 | 227        |
| Oct-2008 | 226        |
| Nov-2008 | 226        |
| Dec-2008 | 225        |
| Jan-2009 | 224        |
| Feb-2009 | 223        |
| Mar-2009 | 223        |
| Apr-2009 | 222        |
| May-2009 | 221        |
| Jun-2009 | 220        |
| Jul-2009 | 219        |
| Aug-2009 | 219        |
| Sep-2009 | 218        |
| Oct-2009 | 217        |
| Nov-2009 | 216        |
| Dec-2009 | 216        |
| Jan-2010 | 215        |
| Feb-2010 | 214        |
| Mar-2010 | 213        |
| Apr-2010 | 213        |
| May-2010 | 212        |
| Jun-2010 | 211        |
| Jul-2010 | 211        |
| Aug-2010 | 210        |
| Sep-2010 | 209        |
| Oct-2010 | 208        |
| Nov-2010 | 208        |
| Dec-2010 | 207        |
| Jan-2011 | 206        |

# **Future Production Decline Estimate Pictured Cliffs** **(Monthly Factor .034)**

| Month    | Gas Volume |
|----------|------------|
| Feb-2011 | 205        |
| Mar-2011 | 205        |
| Apr-2011 | 204        |
| May-2011 | 203        |
| Jun-2011 | 203        |
| Jul-2011 | 202        |
| Aug-2011 | 201        |
| Sep-2011 | 201        |
| Oct-2011 | 200        |
| Nov-2011 | 199        |
| Dec-2011 | 199        |
| Jan-2012 | 198        |
| Feb-2012 | 197        |
| Mar-2012 | 196        |
| Apr-2012 | 196        |
| May-2012 | 195        |
| Jun-2012 | 194        |
| Jul-2012 | 194        |
| Aug-2012 | 193        |
| Sep-2012 | 192        |
| Oct-2012 | 192        |
| Nov-2012 | 191        |
| Dec-2012 | 190        |
| Jan-2013 | 190        |
| Feb-2013 | 189        |
| Mar-2013 | 188        |
| Apr-2013 | 188        |
| May-2013 | 187        |
| Jun-2013 | 187        |
| Jul-2013 | 186        |
| Aug-2013 | 185        |
| Sep-2013 | 185        |
| Oct-2013 | 184        |
| Nov-2013 | 183        |
| Dec-2013 | 183        |
| Jan-2014 | 182        |

| Month    | Gas Volume |
|----------|------------|
| Feb-2014 | 182        |
| Mar-2014 | 181        |
| Apr-2014 | 180        |
| May-2014 | 180        |
| Jun-2014 | 179        |
| Jul-2014 | 179        |
| Aug-2014 | 178        |
| Sep-2014 | 178        |
| Oct-2014 | 177        |
| Nov-2014 | 177        |
| Dec-2014 | 176        |
| Jan-2015 | 176        |
| Feb-2015 | 175        |
| Mar-2015 | 175        |
| Apr-2015 | 174        |
| May-2015 | 174        |
| Jun-2015 | 173        |
| Jul-2015 | 172        |
| Aug-2015 | 172        |
| Sep-2015 | 171        |
| Oct-2015 | 171        |
| Nov-2015 | 170        |
| Dec-2015 | 170        |
| Jan-2016 | 169        |
| Feb-2016 | 169        |
| Mar-2016 | 168        |
| Apr-2016 | 168        |
| May-2016 | 167        |
| Jun-2016 | 167        |
| Jul-2016 | 166        |
| Aug-2016 | 166        |
| Sep-2016 | 165        |
| Oct-2016 | 165        |
| Nov-2016 | 164        |
| Dec-2016 | 164        |
| Jan-2017 | 163        |

| Month    | Gas Volume |
|----------|------------|
| Feb-2017 | 163        |
| Mar-2017 | 162        |
| Apr-2017 | 162        |
| May-2017 | 161        |
| Jun-2017 | 161        |
| Jul-2017 | 160        |
| Aug-2017 | 160        |
| Sep-2017 | 160        |
| Oct-2017 | 159        |
| Nov-2017 | 159        |
| Dec-2017 | 158        |
| Jan-2018 | 158        |
| Feb-2018 | 157        |
| Mar-2018 | 157        |
| Apr-2018 | 156        |
| May-2018 | 156        |
| Jun-2018 | 155        |
| Jul-2018 | 155        |
| Aug-2018 | 154        |
| Sep-2018 | 154        |
| Oct-2018 | 153        |
| Nov-2018 | 153        |
| Dec-2018 | 152        |
| Jan-2019 | 152        |
| Feb-2019 | 152        |
| Mar-2019 | 151        |
| Apr-2019 | 151        |
| May-2019 | 150        |
| Jun-2019 | 150        |
| Jul-2019 | 149        |
| Aug-2019 | 149        |
| Sep-2019 | 148        |
| Oct-2019 | 148        |
| Nov-2019 | 148        |
| Dec-2019 | 147        |
| Jan-2020 | 147        |

| Month    | Gas Volume |
|----------|------------|
| Feb-2020 | 146        |
| Mar-2020 | 145        |
| Apr-2020 | 144        |
| May-2020 | 144        |
| Jun-2020 | 143        |
| Jul-2020 | 142        |
| Aug-2020 | 142        |
| Sep-2020 | 141        |
| Oct-2020 | 140        |
| Nov-2020 | 139        |
| Dec-2020 | 139        |
| Jan-2021 | 138        |
| Feb-2021 | 137        |
| Mar-2021 | 137        |
| Apr-2021 | 136        |
| May-2021 | 135        |
| Jun-2021 | 135        |
| Jul-2021 | 134        |
| Aug-2021 | 133        |
| Sep-2021 | 133        |
| Oct-2021 | 132        |
| Nov-2021 | 131        |
| Dec-2021 | 131        |
| Jan-2022 | 130        |
| Feb-2022 | 129        |
| Mar-2022 | 129        |
| Apr-2022 | 128        |
| May-2022 | 127        |
| Jun-2022 | 127        |
| Jul-2022 | 126        |
| Aug-2022 | 126        |
| Sep-2022 | 125        |
| Oct-2022 | 124        |
| Nov-2022 | 124        |
| Dec-2022 | 123        |
| Jan-2023 | 122        |

# **Future Production Decline Estimate Pictured Cliffs** **(Monthly Factor .034)**

| Month    | Gas Volume |
|----------|------------|
| Feb-2023 | 122        |
| Mar-2023 | 121        |
| Apr-2023 | 121        |
| May-2023 | 120        |
| Jun-2023 | 119        |
| Jul-2023 | 119        |
| Aug-2023 | 118        |
| Sep-2023 | 118        |
| Oct-2023 | 117        |
| Nov-2023 | 116        |
| Dec-2023 | 116        |
| Jan-2024 | 115        |
| Feb-2024 | 115        |
| Mar-2024 | 114        |
| Apr-2024 | 114        |
| May-2024 | 113        |
| Jun-2024 | 112        |
| Jul-2024 | 112        |
| Aug-2024 | 111        |
| Sep-2024 | 111        |
| Oct-2024 | 110        |
| Nov-2024 | 110        |
| Dec-2024 | 109        |
| Jan-2025 | 109        |
| Feb-2025 | 108        |
| Mar-2025 | 107        |
| Apr-2025 | 107        |
| May-2025 | 106        |
| Jun-2025 | 106        |
| Jul-2025 | 105        |
| Aug-2025 | 105        |
| Sep-2025 | 104        |
| Oct-2025 | 104        |
| Nov-2025 | 103        |
| Dec-2025 | 103        |
| Jan-2026 | 102        |

| Month    | Gas Volume |
|----------|------------|
| Feb-2026 | 102        |
| Mar-2026 | 101        |
| Apr-2026 | 101        |
| May-2026 | 100        |
| Jun-2026 | 100        |
| Jul-2026 | 99         |
| Aug-2026 | 99         |
| Sep-2026 | 98         |
| Oct-2026 | 98         |
| Nov-2026 | 97         |
| Dec-2026 | 97         |
| Jan-2027 | 96         |
| Feb-2027 | 96         |
| Mar-2027 | 95         |
| Apr-2027 | 95         |
| May-2027 | 94         |
| Jun-2027 | 94         |
| Jul-2027 | 93         |
| Aug-2027 | 93         |
| Sep-2027 | 92         |
| Oct-2027 | 92         |
| Nov-2027 | 92         |
| Dec-2027 | 91         |
| Jan-2028 | 91         |
| Feb-2028 | 90         |
| Mar-2028 | 90         |
| Apr-2028 | 89         |
| May-2028 | 89         |
| Jun-2028 | 88         |
| Jul-2028 | 88         |
| Aug-2028 | 88         |
| Sep-2028 | 87         |
| Oct-2028 | 87         |
| Nov-2028 | 86         |
| Dec-2028 | 86         |
| Jan-2029 | 85         |

| Month    | Gas Volume |
|----------|------------|
| Feb-2029 | 85         |
| Mar-2029 | 84         |
| Apr-2029 | 84         |
| May-2029 | 84         |
| Jun-2029 | 83         |
| Jul-2029 | 83         |
| Aug-2029 | 82         |
| Sep-2029 | 82         |
| Oct-2029 | 82         |
| Nov-2029 | 81         |
| Dec-2029 | 81         |
| Jan-2030 | 80         |
| Feb-2030 | 80         |
| Mar-2030 | 80         |
| Apr-2030 | 79         |
| May-2030 | 79         |
| Jun-2030 | 78         |
| Jul-2030 | 78         |
| Aug-2030 | 78         |
| Sep-2030 | 77         |
| Oct-2030 | 77         |
| Nov-2030 | 76         |
| Dec-2030 | 76         |
| Jan-2031 | 76         |
| Feb-2031 | 75         |
| Mar-2031 | 75         |
| Apr-2031 | 75         |
| May-2031 | 74         |
| Jun-2031 | 74         |
| Jul-2031 | 73         |
| Aug-2031 | 73         |
| Sep-2031 | 73         |
| Oct-2031 | 72         |
| Nov-2031 | 72         |
| Dec-2031 | 72         |
| Jan-2032 | 71         |

| Month    | Gas Volume |
|----------|------------|
| Feb-2032 | 71         |
| Mar-2032 | 70         |
| Apr-2032 | 70         |
| May-2032 | 70         |
| Jun-2032 | 69         |
| Jul-2032 | 69         |
| Aug-2032 | 69         |
| Sep-2032 | 68         |
| Oct-2032 | 68         |
| Nov-2032 | 67         |
| Dec-2032 | 67         |
| Jan-2033 | 67         |
| Feb-2033 | 66         |
| Mar-2033 | 66         |
| Apr-2033 | 66         |
| May-2033 | 65         |
| Jun-2033 | 65         |
| Jul-2033 | 65         |
| Aug-2033 | 65         |
| Sep-2033 | 64         |
| Oct-2033 | 64         |
| Nov-2033 | 64         |
| Dec-2033 | 63         |
| Jan-2034 | 63         |
| Feb-2034 | 63         |
| Mar-2034 | 62         |
| Apr-2034 | 62         |
| May-2034 | 61         |
| Jul-2034 | 61         |
| Aug-2034 | 61         |
| Sep-2034 | 60         |
| Oct-2034 | 60         |
| Nov-2034 | 60         |
| Dec-2034 | 60         |
| Jan-2035 | 59         |