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# FracCAT Treatment Report

**Well** : MIP UNIT5H
**Field** : UNDESIGNAT
**Formation** : Marcellus

**Well Location** : Westover
**County** : Monongalia
**State** : West Virginia
**Country** : United States

**Prepared for**
Client : NORTHEAST NATURAL ENERGY LLC
Client Rep : Mr.Max Oliver
Proposal No : 1
Date Prepared : 10-28-2015

**Prepared by**
Name : Robert Boner
Division : Schlumberger
Phone :
Service Point : Weston
Fax Number :

**Comments** : Stage 1


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Client: NORTHEAST NATURAL ENERGY LLC
Well: MIP UNIT5H
Formation: Marcellus
District: Weston
Country: United States
Loadcase: Stage 1

# Section 1: Stage 1, Propped Frac: Designed Pump Sched. - Ramp

**Designed Pump Schedule Ramp**

| Step # | Step Name | Slurry Volume (bbl) | Pump Rate (bbl/min) | Pump Time (min) | Fluid Name | Fluid Volume (gal) | Prop Name | Prop Conc (PPA) | Prop Mass (lb) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rate | 20.0 | 30.0 | 0.7 | Slickwater | 840 | | 0.0 | 0 |
| 2 | Acid 7.5% HC | 71.4 | 15.0 | 4.8 | HCl 07.5 | 3000 | | 0.0 | 0 |
| 3 | PAD | 1071.4 | 80.0 | 13.4 | Slickwater | 45000 | | 0.0 | 0 |
| 4 | 0.25 PPA | 192.6 | 80.0 | 2.4 | Slickwater | 8000 | 100 Mesh Sand | 0.2 | 2000 |
| 5 | 0.5 PPA | 243.5 | 80.0 | 3.0 | Slickwater | 10000 | 100 Mesh Sand | 0.5 | 5000 |
| 6 | 0.75 PPA | 262.6 | 80.0 | 3.3 | Slickwater | 10667 | 100 Mesh Sand | 0.7 | 8000 |
| 7 | 1.00 PPA | 373.4 | 80.0 | 4.7 | Slickwater | 15000 | 100 Mesh Sand | 1.0 | 15000 |
| 8 | 2.00 PPA | 519.4 | 80.0 | 6.5 | Slickwater | 20000 | 100 Mesh Sand | 2.0 | 40000 |
| 9 | 2.5 PPA | 618.6 | 80.0 | 7.7 | Slickwater | 23333 | 100 Mesh Sand | 2.5 | 58332 |
| 10 | 3.0 PPA | 631.2 | 80.0 | 7.9 | Slickwater | 23333 | 100 Mesh Sand | 3.0 | 69999 |
| 11 | 1.50 PPA | 508.7 | 80.0 | 6.4 | Slickwater | 20000 | 40/70 White | 1.5 | 30000 |
| 12 | 2.00 PPA | 779.4 | 80.0 | 9.7 | Slickwater | 30000 | 40/70 White | 2.0 | 60000 |
| 13 | 2.5 PPA | 848.7 | 80.0 | 10.6 | Slickwater | 32000 | 40/70 White | 2.5 | 80000 |
| 14 | 3.0 PPA | 811.9 | 80.0 | 10.1 | Slickwater | 30000 | 40/70 White | 3.0 | 90000 |
| 15 | Flush | 315.3 | 80.0 | 3.9 | Slickwater | 13241 | | 0.0 | 0 |

**Designed Ramp Totals**

| Slurry (bbl) | Pump Time (min) | Clean Fluid (gal) | Proppant (lb) |
|---|---|---|---|
| 7268.2 | 95.1 | 284414 | 400000 |

# Section 2: Stage 1, Propped Frac: As Measured Pump Schedule

**As Measured Pump Schedule**

| Step # | Step Name | Slurry Volume (bbl) | Slurry Rate (bbl/min) | Pump Time (min) | Fluid Name | Fluid Volume (gal) | Proppant Name | Max Prop Conc (PPA) | Prop Conc (PPA) | Prop Mass (lb) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Rate | 19.3 | 9.0 | 2.4 | Slickwater | 804 | | 0.0 | 0.0 | 0 |
| 2 | Acid 7.5% HC | 124.2 | 9.7 | 13.0 | HCl 07.5 | 5215 | | 0.0 | 0.0 | 0 |
| 3 | PAD | 375.9 | 43.3 | 9.4 | Slickwater | 15758 | | 0.0 | 0.0 | 0 |
| 4 | 0.25 PPA | 179.7 | 48.8 | 3.7 | Slickwater | 7467 | 100 Mesh Sand | 0.2 | 0.0 | 1768 |
| 5 | 0.25 PPA | 408.9 | 58.1 | 7.7 | Slickwater | 16973 | 100 Mesh Sand | 0.3 | 0.0 | 4226 |
| 6 | 0.5 PPA | 385.1 | 59.5 | 6.5 | Slickwater | 15817 | 100 Mesh Sand | 0.5 | 0.0 | 7827 |
| 7 | 0.75 PPA | 551.7 | 62.4 | 8.9 | Slickwater | 22410 | 100 Mesh Sand | 0.8 | 0.0 | 16741 |
| 8 | 1.00 PPA | 458.9 | 64.9 | 7.1 | Slickwater | 18438 | 100 Mesh Sand | 1.0 | 0.0 | 18396 |
| 9 | 2.00 PPA | 1024.8 | 67.9 | 15.1 | Slickwater | 39465 | 100 Mesh Sand | 2.0 | 0.0 | 78644 |
| 10 | 2.5 PPA | 284.0 | 71.0 | 4.0 | Slickwater | 10716 | 100 Mesh Sand | 2.5 | 0.0 | 26677 |
| 11 | 3.0 PPA | 176.3 | 71.0 | 2.5 | Slickwater | 6520 | 100 Mesh Sand | 3.0 | 0.0 | 19498 |
| 12 | 1.50 PPA | 508.7 | 71.2 | 7.1 | Slickwater | 19983 | 40/70 White | 3.0 | 0.7 | 30422 |
| 13 | 2.00 PPA | 944.6 | 76.0 | 12.4 | Slickwater | 36361 | 40/70 White | 2.0 | 0.0 | 72554 |

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Well: MIP UNIT5H
Formation: Marcellus
District: Weston
Country: United States
Loadcase: Stage 1

## As Measured Pump Schedule

| Step # | Step Name | Slurry Volume (bbl) | Slurry Rate (bbl/min) | Pump Time (min) | Fluid Name | Fluid Volume (gal) | Proppant Name | Max Prop Conc (PPA) | Prop Conc (PPA) | Prop Mass (lb) |
|---|---|---|---|---|---|---|---|---|---|---|
| 14 | 2.5 PPA | 954.9 | 79.7 | 12.0 | Slickwater | 36087 | 40/70 White | 2.5 | 0.0 | 88290 |
| 15 | Flush | 281.4 | 63.5 | 6.3 | Slickwater | 11873 | | 0.0 | 0.0 | 0 |

## Stage Pressures & Rates

| Step # | Step Name | Average Slurry Rate (bbl/min) | Maximum Slurry Rate (bbl/min) | Average Treating Pressure (psi) | Maximum Treating Pressure (psi) | Minimum Treating Pressure (psi) |
|---|---|---|---|---|---|---|
| 1 | Rate | 9.0 | 9.9 | 6027 | 6266 | 4205 |
| 2 | Acid 7.5% HC | 9.7 | 9.9 | 6136 | 6222 | 5432 |
| 3 | PAD | 43.3 | 51.2 | 8489 | 8979 | 6018 |
| 4 | 0.25 PPA | 48.8 | 50.1 | 9062 | 9199 | 8644 |
| 5 | 0.25 PPA | 58.1 | 59.0 | 8316 | 9116 | 8186 |
| 6 | 0.5 PPA | 59.5 | 60.5 | 8200 | 8338 | 8120 |
| 7 | 0.75 PPA | 62.4 | 65.0 | 8128 | 8225 | 8008 |
| 8 | 1.00 PPA | 64.9 | 65.0 | 8288 | 8397 | 8207 |
| 9 | 2.00 PPA | 67.9 | 71.1 | 8315 | 8473 | 8021 |
| 10 | 2.5 PPA | 71.0 | 71.1 | 8370 | 8422 | 8327 |
| 11 | 3.0 PPA | 71.0 | 71.1 | 8312 | 8326 | 8281 |
| 12 | 1.50 PPA | 71.2 | 72.4 | 8180 | 8280 | 8014 |
| 13 | 2.00 PPA | 76.0 | 77.1 | 8188 | 8308 | 8003 |
| 14 | 2.5 PPA | 79.7 | 79.9 | 8398 | 8783 | 8083 |
| 15 | Flush | 63.5 | 79.8 | 9001 | 9253 | 6535 |

## As Measured Totals

| Slurry (bbl) | Pump Time (min) | Clean Fluid (gal) | Proppant (lb) |
|---|---|---|---|
| 6678.3 | 118.1 | 263886 | 365044 |

| | |
|---|---|
| Average Treating Pressure: | 8305 psi |
| Maximum Treating Pressure: | 9253 psi |
| Minimum Treating Pressure: | 4205 psi |
| Average Injection Rate: | 69.8 bbl/min |
| Maximum Injection Rate: | 79.9 bbl/min |
| Average Horsepower: | 14214.9 hhp |
| Maximum Horsepower: | 17693.3 hhp |
| Maximum Prop Concentration: | 3.0 PPA |

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Loadcase: Stage 1

# Section 3: Stage 1, Propped Frac: Job Messages

| Message Log | | | | | | | |
|---|---|---|---|---|---|---|---|
| # | Time | Message | Treating Pressure (psi) | Annulus Pressure (psi) | Total Slurry (bbl) | Slurry Rate (bbl/min) | Prop. Conc. (PPA) |
| 1 | | Reset Executed Steps | 0 | 0 | 0.0 | 0.0 | 0.0 |
| 2 | | Reset Executed Steps | 0 | 0 | 0.0 | 0.0 | 0.0 |
| 3 | 15:31:13 | Remark | 2290 | 8 | 0.0 | 0.0 | 0.0 |
| 4 | 15:31:31 | low pressure test | 4836 | 8 | 0.0 | 0.0 | 0.0 |
| 5 | 15:33:39 | Remark | 9501 | 8 | 0.0 | 0.0 | 0.0 |
| 6 | 15:36:49 | Remark | 9408 | 9 | 0.0 | 0.0 | 0.0 |
| 7 | 15:37:12 | Remark | 4988 | 8 | 0.0 | 0.0 | 0.0 |
| 8 | 15:40:35 | Start Rate Automatically | 4206 | 8 | 0.0 | 0.0 | 0.0 |
| 9 | 15:40:35 | Start Propped Frac Automatically | 4206 | 8 | 0.0 | 0.0 | 0.0 |
| 10 | 15:40:35 | Start Stage 1 Automatically | 4206 | 8 | 0.0 | 0.0 | 0.0 |
| 11 | 15:40:35 | Started Pumping | 4206 | 8 | 0.0 | 0.0 | 0.0 |
| 12 | 15:40:40 | Activated Extend Stage | 4206 | 9 | 0.0 | 0.0 | 0.0 |
| 13 | 15:43:07 | Deactivated Extend Stage | 6225 | 9 | 19.3 | 9.9 | 0.0 |
| 14 | 15:43:07 | Start Acid 7.5% HC Manually | 6225 | 9 | 19.3 | 9.9 | 0.0 |
| 15 | 15:49:38 | Activated Extend Stage | 6157 | 9 | 83.7 | 9.9 | 0.0 |
| 16 | 15:56:42 | Deactivated Extend Stage | 6024 | 9 | 143.5 | 9.4 | 0.0 |
| 17 | 15:56:42 | Start PAD Manually | 6024 | 9 | 143.5 | 9.4 | 0.0 |
| 18 | 15:56:48 | Activated Extend Stage | 6037 | 9 | 144.4 | 9.4 | 0.0 |
| 19 | 16:02:34 | Stage at Perfs: Rate | 8480 | 9 | 345.7 | 43.3 | 0.0 |
| 20 | 16:03:01 | Stage at Perfs: Acid 7.5% HC | 8426 | 9 | 365.2 | 43.3 | 0.0 |
| 21 | 16:05:30 | Stage at Perfs: PAD | 8910 | 8 | 489.8 | 51.3 | 0.0 |
| 22 | 16:06:07 | Deactivated Extend Stage | 8827 | 9 | 519.3 | 48.9 | 0.0 |
| 23 | 16:06:07 | Start 0.25 PPA Manually | 8827 | 9 | 519.3 | 48.9 | 0.0 |
| 24 | 16:06:07 | Started Pumping Prop | 8827 | 9 | 519.3 | 48.9 | 0.0 |
| 25 | 16:07:09 | Activated Extend Stage | 9079 | 9 | 570.4 | 50.0 | 0.2 |
| 26 | 16:09:48 | Deactivated Extend Stage | 9120 | 9 | 699.0 | 47.7 | 0.2 |
| 27 | 16:09:48 | Start 0.25 PPA Manually | 9120 | 9 | 699.0 | 47.7 | 0.2 |
| 28 | 16:10:22 | Activated Extend Stage | 9057 | 9 | 726.0 | 47.7 | 0.2 |
| 29 | 16:13:16 | Stage at Perfs: 0.25 PPA | 8486 | 8 | 865.0 | 51.4 | 0.2 |
| 30 | 16:16:28 | Stage at Perfs: 0.25 PPA | 8351 | 8 | 1045.0 | 59.0 | 0.3 |
| 31 | 16:17:32 | Deactivated Extend Stage | 8327 | 8 | 1107.9 | 58.9 | 0.3 |
| 32 | 16:17:32 | Start 0.5 PPA Manually | 8327 | 8 | 1107.9 | 58.9 | 0.3 |
| 33 | 16:17:34 | Activated Extend Stage | 8329 | 8 | 1109.8 | 59.0 | 0.3 |
| 34 | 16:23:21 | Stage at Perfs: 0.25 PPA | 8160 | 7 | 1453.7 | 60.5 | 0.5 |
| 35 | 16:24:00 | Deactivated Extend Stage | 8145 | 8 | 1493.0 | 60.5 | 0.5 |
| 36 | 16:24:00 | Start 0.75 PPA Manually | 8145 | 8 | 1493.0 | 60.5 | 0.5 |
| 37 | 16:24:02 | Activated Extend Stage | 8136 | 8 | 1495.0 | 60.5 | 0.5 |
| 38 | 16:29:40 | Stage at Perfs: 0.5 PPA | 8137 | 8 | 1839.3 | 63.5 | 0.8 |
| 39 | 16:32:51 | Deactivated Extend Stage | 8203 | 8 | 2044.7 | 64.9 | 0.8 |
| 40 | 16:32:51 | Start 1.00 PPA Manually | 8203 | 8 | 2044.7 | 64.9 | 0.8 |
| 41 | 16:36:40 | Activated Extend Stage | 8275 | 8 | 2292.5 | 64.9 | 1.0 |
| 42 | 16:38:11 | Stage at Perfs: 0.75 PPA | 8354 | 8 | 2391.0 | 64.9 | 1.0 |
| 43 | 16:39:55 | Deactivated Extend Stage | 8403 | 7 | 2503.6 | 65.0 | 1.0 |
| 44 | 16:39:55 | Start 2.00 PPA Manually | 8403 | 7 | 2503.6 | 65.0 | 1.0 |
| 45 | 16:40:02 | Activated Extend Stage | 8392 | 8 | 2511.2 | 64.9 | 2.0 |
| 46 | 16:45:14 | Stage at Perfs: 1.00 PPA | 8153 | 8 | 2848.9 | 65.0 | 2.0 |
| 47 | 16:55:02 | Deactivated Extend Stage | 8404 | 8 | 3528.4 | 71.1 | 2.0 |

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Loadcase: Stage 1

| Message Log | | | | | | | |
|---|---|---|---|---|---|---|---|
| # | Time | Message | Treating Pressure (psi) | Annulus Pressure (psi) | Total Slurry (bbl) | Slurry Rate (bbl/min) | Prop. Conc. (PPA) |
| 48 | 16:55:02 | Start 2.5 PPA Manually | 8404 | 8 | 3528.4 | 71.1 | 2.0 |
| 49 | 16:59:02 | Start 3.0 PPA Manually | 8331 | 8 | 3812.4 | 71.0 | 2.5 |
| 50 | 16:59:06 | Activated Extend Stage | 8322 | 8 | 3817.1 | 71.0 | 2.5 |
| 51 | 16:59:54 | Stage at Perfs: 2.00 PPA | 8324 | 7 | 3873.9 | 70.9 | 3.0 |
| 52 | 17:01:31 | Deactivated Extend Stage | 8268 | 8 | 3988.7 | 70.9 | 3.0 |
| 53 | 17:01:31 | Start 1.50 PPA Manually | 8268 | 8 | 3988.7 | 70.9 | 3.0 |
| 54 | 17:03:54 | Stage at Perfs: 2.5 PPA | 8245 | 8 | 4157.9 | 71.0 | 1.5 |
| 55 | 17:06:23 | Stage at Perfs: 3.0 PPA | 8146 | 9 | 4334.2 | 71.0 | 1.5 |
| 56 | 17:08:40 | Start 2.00 PPA Automatically | 8107 | 8 | 4498.0 | 72.3 | 1.5 |
| 57 | 17:13:19 | Stage at Perfs: 1.50 PPA | 8270 | 9 | 4843.7 | 77.0 | 2.0 |
| 58 | 17:18:08 | Activated Extend Stage | 8196 | 7 | 5214.7 | 77.0 | 2.0 |
| 59 | 17:21:05 | Deactivated Extend Stage | 8082 | 8 | 5442.0 | 77.0 | 2.0 |
| 60 | 17:21:05 | Start 2.5 PPA Manually | 8082 | 8 | 5442.0 | 77.0 | 2.0 |
| 61 | 17:25:26 | Stage at Perfs: 2.00 PPA | 8321 | 9 | 5788.3 | 79.6 | 2.5 |
| 62 | 17:27:04 | Activated Extend Stage | 8479 | 8 | 5918.5 | 79.8 | 2.5 |
| 63 | 17:32:47 | Cut Prop | 8737 | 9 | 6374.3 | 79.6 | 2.5 |
| 64 | 17:33:04 | Deactivated Extend Stage | 8805 | 8 | 6396.9 | 79.6 | 0.0 |
| 65 | 17:33:04 | Start Flush Manually | 8805 | 8 | 6396.9 | 79.6 | 0.0 |
| 66 | 17:33:55 | Activated Extend Stage | 9100 | 8 | 6464.4 | 77.7 | 0.0 |
| 67 | 17:41:48 | Stopped Pumping Prop | 6492 | 7 | 6678.3 | 0.0 | 0.0 |
| 68 | 17:41:48 | Stopped Pumping | 6492 | 7 | 6678.3 | 0.0 | 0.0 |

# Section 4: Stage 1, Propped Frac: Material Balance

| Material Balance | |
|---|---|
| Material Name | Quantity Pumped |
| Slickwater | 258671 gal |
| HCl 15.0 | 8941 gal |
| 100 Mesh Sand | 140,560 lb |
| 40/70 White | 188,320 lb |
| B317, Scale | 35 gal |
| B385, Biocide | 80 gal |
| ammonium per | 0 lb |
| J609, Water Friction-Reducing Agent | 330 gal |
| J218, Breaker | 0 lb |
| A264, Corros | 18 gal |
| L058, Iron C | 90 lb |

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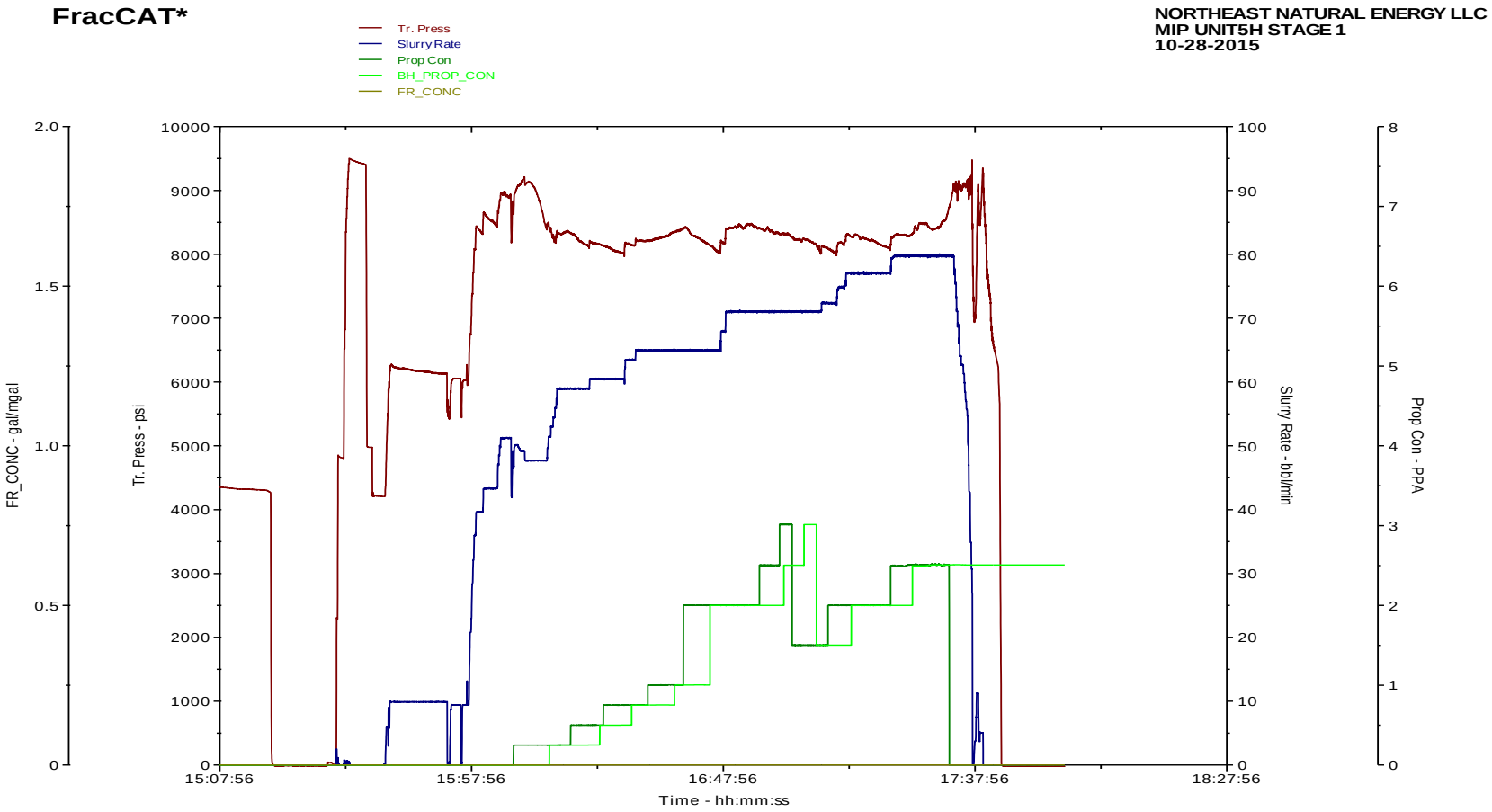
Loadcase: Stage 1

# Section 5: Stage 1, Propped Frac: Post Job PRC Monitoring Panel

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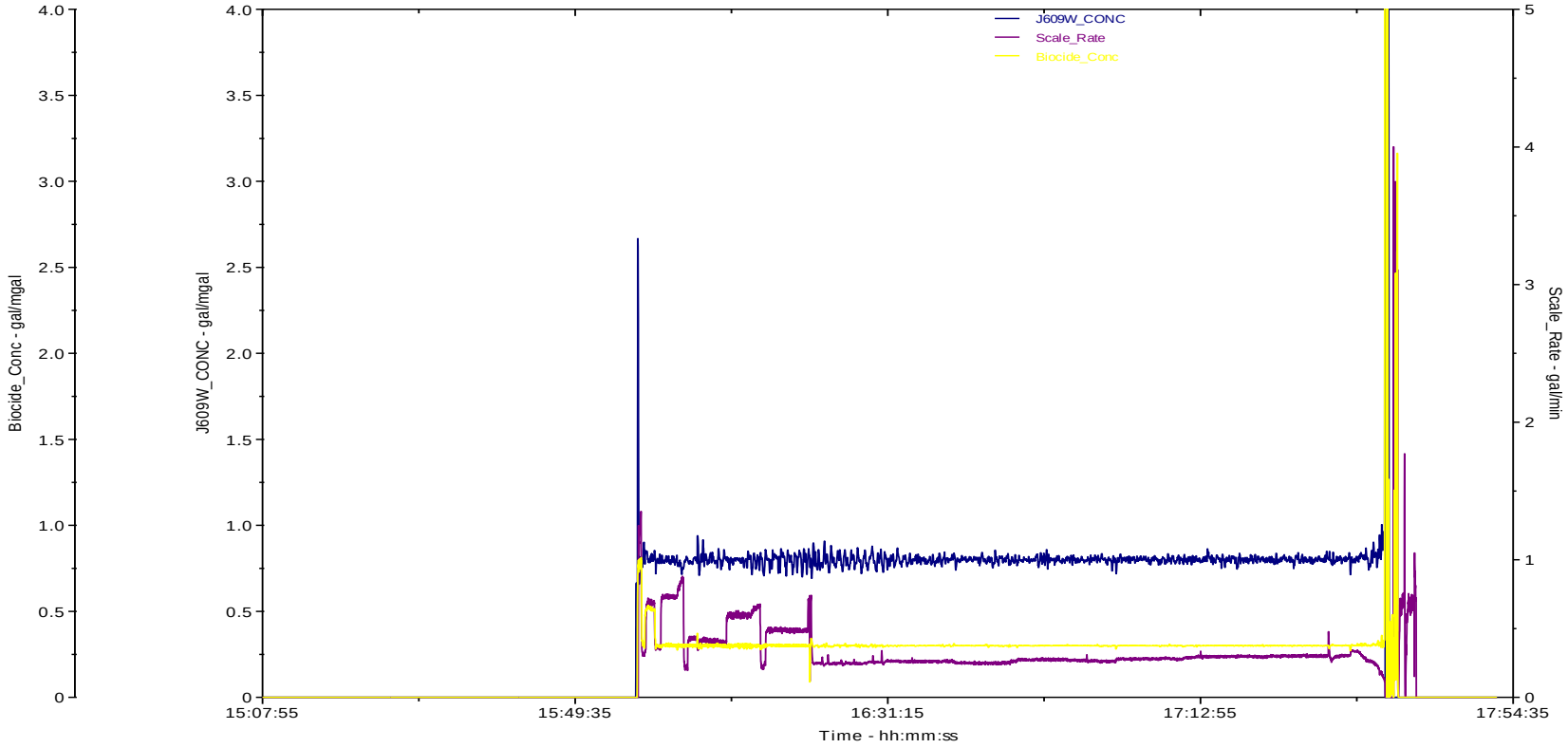
# Section 6: Stage 1, Propped Frac: Post Job Chemical Plot

**FracCAT***

**NORTHEAST NATURAL ENERGY LLC**
**MIP UNIT5H**
**10-28-2015**

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