# Statement of Basis

Sklar Exploration Company, LLC (Sklar) operates Castleberry Oil & Gas Field, Area No. 3 (Area 3) under Major Source Operating Permit (MSOP) No. 502-0090 in northern Escambia County, east of Castleberry, AL. Area 3 is comprised of several oil & gas wells. On October 23, 2018, the Department issued the first renewal of MSOP 502-0090.

On January 9, 2019, Sklar submitted an application to modify their MSOP to include the addition of three wells acquired from Pruet Production Company (Pruet)—the CCL&T 32-11, CCL&T 32-9 (Range 12 East), and CCL&T 33-10 (the "Pruet wells"). However the CCL&T 32-11 is not included in the aforementioned additional operating wells because the well is dry and no equipment is present; Sklar intends to construct the well as a water injection well with no appreciable sources of emissions, so only two will be added to the permit. The wells came under the control of Sklar as of January 1, 2019, after the Alabama Oil & Gas Board unitized the oil field into several large, contiguous, single-operator units rather than the patchwork of ¼ square mile sections of mineral rights that had existed previously. The Department had been in communication with Pruet and Sklar regarding the impending change of ownership prior to the new year.

Additionally, the permit application seeks to remove nine wells—the CCL&T 33-4, CCL&T 33-2, CCL&T 35-8, Jones 34-4, Hamiter 32-3, Kennedy 36-12, Ralls 30-8, Boothe & Casey 29-6, and Thomasson 29-10—which are now operated by Pruet. Not included in the application, the CCL&T 35-10, which was not transferred to Pruet but shares a well site with CCL&T 35-8, has been shut in and will not be operated again. Also not included in the application, all five 46 HP booster compressors originally permitted in Air Permit 502-0090-X008 have been removed from their sites (their purpose being served by the compressors at the Escambia Booster Station added by Air Permits –X009 and –X010).

Corrections and formatting changes to the MSOP being made at this time include: inclusion of the OOOOa requirements for the booster station originally in Air Permit X009; correcting typos of the Subpart JJJJ emission limits in the provisos and Appendix A; renaming "Provisos for Facility Engines" to "Provisos for the Escambia Booster Station"; renaming the engine at the Escambia Booster Station to *E-01* instead of *3508E* to better match Sklar's internal designations; and adjusting the reporting period for OOOOa to a calendar year period to match the format of Sklar's previous OOOOa reports.

## PROJECT DESCRIPTION

Sklar seeks a direct modification of their MSOP, since no construction permit is warranted for these Pruet wells which have been in operation for years.

## PROCESS DESCRIPTION

At each well, the produced full well-stream is separated into gas and liquid phases in the high-pressure separator and heater treater before the liquid phase flows to the power oil tank and flashes. An electrically driven pump may be used to recirculate crude from the power oil tank back into the well to a bottom-hole venturi pump. Flash vapor from the power oil tank and breathing and working losses from all the storage tanks is collected and sent to the flare for combustion or to the pipeline for sales. Each well is connected to the power grid and requires no generator. This process for the Pruet wells is identical to that of the existing, permitted Sklar wells.

## EMISSIONS

The potential emissions of the produced gas at the Pruet wells, accounting for their flares, are based on continuously burning well gas at a rate of 110 mscf/d, which is the average production for the two wells over the last year. Tank vapor emissions are determined using EPA's Tanks 4.0.9 program and the Vasquez-Beggs Equation. The emissions from the wells' heaters are based on AP-42 factors. Table 1 below reflects the

potential emissions from the project, and Table 2 shows the potential emissions of the facility as a whole from the project added to existing facility emissions. The existing facility emissions are derived from the October 23, 2018 Statement of Basis and the first Title V renewal application, but adjusted to account for the 10 wells no longer operated (9 transferred and 1 plugged) and the 5 small booster engines removed.

| | Pollutant | Heaters | Flares | Total Emissions |
|---|---|---|---|---|
| Criteria Pollutant Emissions (TPY) | PM | 0.033 | 0.102 | 0.135 |
| | $SO_2$ | 0.001 | 0.008 | 0.009 |
| | $NO_X$ | 0.429 | 3.150 | 3.579 |
| | CO | 0.361 | 17.137 | 17.498 |
| | VOC | 0.024 | 8.228 | 8.252 |
| | Total HAPs | -- | 0.753 | 0.753 |
| GHG Emissions ( TPY) | $CO_2$ | 511.974 | 5,659.318 | 6,171.292 |
| | $N_2O$ | 0.288 | 634.827 | 635.115 |
| | $CH_4$ | 0.241 | 3.043 | 3.284 |
| | $CO_{2e}$ | 512.503 | 6,297.188 | 6,809.691 |

*Table 1 – Pruet Wells Potential Emissions*

| | Pollutant | Heaters | Engines | Flares | Total Emissions |
|---|---|---|---|---|---|
| Criteria Pollutant Emissions (TPY) | PM | 0.327 | 4.897 | 1.403 | 6.626 |
| | $SO_2$ | 0.090 | 0.000 | 1.690 | 1.780 |
| | $NO_X$ | 4.294 | 20.510 | 53.997 | 78.800 |
| | CO | 3.607 | 20.591 | 293.803 | 318.002 |
| | VOC | 0.237 | 3.097 | 323.463 | 326.797 |
| | Total HAPs | -- | 3.409 | 44.008 | 47.417 |
| GHG Emissions ( TPY) | $CO_2$ | 5,119.737 | 4,766.688 | 101,568.575 | 111,455.000 |
| | $N_2O$ | 2.878 | 0.022 | 7,110.911 | 7,113.812 |
| | $CH_4$ | 2.414 | 22.581 | 52.168 | 77.163 |
| | $CO_{2e}$ | 5,125.028 | 5,337.822 | 108,731.654 | 119,194.504 |

*Table 2 – Facility Potential Emissions*

Sklar would retain their facility-wide anti-PSD limits of 245 TPY for criteria pollutants. Those limits would be met by Sklar not flaring continuously and instead selling their gas; actual emissions from the wells would be significantly less than their potential emissions.

## REGULATIONS

The Pruet wells acquired by Sklar have the same regulatory status as their existing wells in terms of both state and federal regulations.

## RECOMMENDATIONS

I recommend that MSOP 502-0090 be modified to include the two aforementioned Pruet wells to be included in the Summary Page of Facility Wells. I also recommend that the wells and engines no longer in service by Sklar be removed from the permit. Additionally the corrections and format changes outlined on page 1 of this analysis ought to be implemented.

May 1, 2019
Date

R. Jackson Rogers, Jr.
Industrial Minerals Section
Energy Branch
Air Division
ADEM

**APPENDIX A**

**CALCULATIONS**

## Well emissions

| Data | Total | | Separator Gas | | Tank Gas | | Pilot Gas | | GWP (11/29/2013) | | 40 CFR Part 98 Sub C GHG Emission Factors (Table C-1) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Volume | **9,262.401** | scf/hr (Ind.) | 220.0 | Mscf/day | 0.6 | Mscf/day | 1.7 | Mscf/day | $N_20$= | 298 | | | |
| $H_2S$ mol% | 0.0001% | mol% | 0.0001% | mol% | 0.0000% | mol% | 0.0000% | mol% | $CO_2$= | 1 | $N_20$= | 0.0001 | kg/MMBtu |
| Heat Content | 1146.88 | Btu/scf (Ind) | 1145.10 | Btu/scf (Ind) | 2124.62 | Btu/scf (Ind) | 1020.00 | Btu/scf (Ind) | $CH_4$= | 25 | AP 42 Emissions Factors[7] | | |
| VOC MW | **3.84** | lb/lb-mol[2] | **3.80** | lb/lb-mol[2] | **27.41** | lb/lb-mol[2] | **0.15** | lb/lb-mol[2] | | | $NO_X$= | 0.068 | lb/MMBtu |
| $CO_2$ | **0.26%** | mol% | **0.26%** | mol% | **0.18%** | mol% | **0.50%** | mol% | | | CO= | 0.37 | lb/MMBtu |
| $CH_4$ | **74.95%** | mol% | **74.92%** | mol% | **30.03%** | mol% | **95.00%** | mol% | | | $PM_1$= | 40 | µg/L |
| $C_6$ | **0.21** | lb/lb-mol[2] | **0.21** | lb/lb-mol[2] | **1.17** | lb/lb-mol[2] | **0.01** | lb/lb-mol[2] | | | | | |
| OP Hours | 8760 | Hrs | | | | | | | (Ind. STP) | scf/lbmol= | 380.67 | 60 °F | 14.65 psia |
| Destruction Eff | **98.00%** | DRE | Heat Input | | **10.62** | MMBtu/hr[1] | | | (EPA STP) | scf/lbmol= | 385.5 | 68 °F | 14.696 psia |

**Potential Flare Emission Calculations**

| Pollutants | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **$PM_1$** | 40 µg / L | 9262.4 scf (Ind.) / Hr | 2.2E-9 lb / µg | 8,760 Hr / Year | 1 Ton / 2,000 Lb | 28.31685 L / scf (EPA) | 1.01 scf(EPA) / 1 scf(Ind.) | = | **0.103 Tons / Year** |
| **$SO_2$** | 168.3 Lb $SO_2$[4] / MScf (Ind.) | 9.262 MScf (Ind.) / Hr | 0.000% $H_2S$ Mol% | 8,760 Hr / Year | 1 Ton / 2,000 Lb | | | = | **0.008 Tons / Year** |
| **$NO_X$** | 0.068 lb / MMBtu | 10.623 MMBtu / Hr | 8,760 Hr / Year | 1 Ton / 2,000 Lb | | | | = | **3.164 Tons / Year** |
| **CO** | 0.37 lb / MMBtu | 10.623 MMBtu / Hr | 8,760 Hr / Year | 1 Ton / 2,000 Lb | | | | = | **17.215 Tons / Year** |
| **VOC[5]** | 9,262.4 Scf (Ind.) / Hr | 1 lb-mol / 380.67 scf (Ind.) | 3.84 Lb VOC / Lb-Mole | 8,760 Hr / Year | 1 Ton / 2,000 Lb | 2.00% | Inv. DRE | = | **8.176 Tons / Year** |
| **HAPs[8]** | 9,262.4 Scf (Ind.) / Hr | 1 lb-mol / 380.67 scf (Ind.) | 0.21 Lb $C_6$ / Lb-Mole | 8,760 Hr / Year | 1 Ton / 2,000 Lb | 2.00% | Inv. DRE | = | **0.453 Tons / Year** |
| **$CO_2$[5,6] of Combustion** | 98.00% DRE | 8.11E+07 Scf (Ind.) / Yr | 1.23 lb-mol $CO_2$ (stoich.) / 1 lb-mol gas (stoich.) | 1 lb-mol gas / 380.67 scf (Ind.) | 44.01 lb $CO_2$ / lb-mole $CO_2$ | 1 Ton / 2,000 Lb | | = | **5,670.08 Tons / Year** |
| **$CO_2$ of Fuel** | 8.11E+07 Scf (Ind.) / Yr | 0.26% mol% $CO_2$ | 1 lb-mol / 380.67 scf (Ind.) | 44.01 Lb CO2 / Lb-mole | 1 Ton / 2,000 Lb | | | = | **12.41 Tons / Year** |
| **$N_2O$** | 0.001 M Ton / kg | 0.001147 MMBtu / Scf (Ind.) | 9,262.4 Scf (Ind.) / Hr | 0.0001 kg / MMBtu | 8,760 Hr / Year | 1.1023 Tons / 1 Metric Ton | | = | **0.0103 Tons / Year** |
| **$CH_4$ Uncombusted** | 8.11E+07 Scf (Ind.) / Yr | 2.00% | Inv. DRE | 74.95% mol% $CH_4$ | 1 lb-mol / 380.675 scf (Ind.) | 16.043 Lb CH4 / Lb-mole | 1 Ton / 2,000 Lb | = | **25.63 Tons / Year** |
| **Mass Sum** | 5,682.49 Tons / Year (CO2) | + | 0.0103 Tons / Year (N2O) | + | 25.63 Tons / Year (CH4) | | | = | **5,708.13 Tons / Year** |
| **$CO_2e$** | 5,682.49 TPY / 5,682.49 (CO2) | X 1 + | 0.0103 TPY / 3.06 (N2O) | X 298 + | 25.63 TP / 640.68 (CH4) | X 25 | | = | **6,326.23 Tons / Year** |

[1] Rated Heat Capacity (MMBtu/Hr) = Flowrate (Scf/Hr) * Heat Content (Btu/Scf) * (MMBtu/$10^6$ Btu)

[2] VOC (Lb/Lb-mole) = Σ(Mole% of Each Compound)* (1%/100)*MW of Each Compound) -See Flare GHG Spreed Sheet for gas analysis

[3] Has to be maintained <500 lb/hr or 20 ppbv offsite concentration could potentially be exceeded

$H_2S$ (Lb/hr) = Volume (Scf/hr) * (1 lb-mol/380.67) *($H_2S$ mol%) * (34.08 Lb $H_2S$/Lb-mol)

[4] $SO_2$ Conversion Factor 168.3 Lb $SO_2$/MScf of Gas

=(1,000 Scf/MScf) *(1Lb-Mole/380.67 Scf)* (64.066 Lb $SO_2$/Lb-Mole)

[5] Assuming the flare is 98% efficient

[6] Calculated using the gas analysis:

$\Sigma Y_j * R_j$ where, $Y_j$= mole fraction of gas hydrocarbon constituents' j (such as methane, ethane, propane, carbon dioxide, etc.) and $R_j$= number of carbon atoms in gas hydrocarbon constituent j: 1 for methane and carbon dioxide, 2 for ethane, 3 for propane, etc.

[7] Flare assumed to be "lightly smoking" in AP-42 table 13.5-1

[8] n-Hexane, Benzene, Toluene, etc are HAPs, but i-Hexanes, n-Heptane, n-Octane, etc are not. Assume by mass 50% Hexanes and 10% Heptanes+ are HAPS

## Tank vapor emissions

[1] 42 barrels = 1 US Gallon

[2] If the tanks are in series only the 1st tanks that the condensate enters from the separator would have flash emissions based on the total throughput. If the tanks are parallel, each tank will have flash emissions (ie if 4 tanks and the total throughput is 60 bbl/day of condensate then the flash emissions will be based on each tank having a throughput of 15 bbl/day). Branching assumes that the Condensate Tanks are parallel to each other and in series after the Power Oil tank.

[3] Working and Breathing Losses in lbs/year are obtained from EPA's Tanks 4.0d program

[4] Flash emissions are typically determined using laboratory measurement of the gas-oil-ratio (GOR) from a pressurized liquid sample. Other methods many be used.

[5] Default tank vapor MW assumed by EPA's Tanks 4.0d program is 50. If more specific data is available, results may be algebraically modified

[6] The convention used here for SCF is the industry/AI.OGB STP@ 60 F and 14.65 psia, at which there are 380.675 scf/lbmol. Vasques-Beggs Equation (VBE) outputs for scf/bbl from the VBE worksheet distributed by the ODEQ use the WAQS&R definition of 385 scf/lbmol @ 68 F & 14.7 psia and must be corrected accordingly (multiplied by ratio 380.675/385).

[7] Recirculated oil has already flashed but may still have working/breathing losses. The increased throughput from the power oil is therefore only calculated for the latter.

| Multiplier for Power Oil Recirculation Rate[7] | 3 | In Series, Parallel, or Branching?[2] | Branching | **Production bbl/day** | 35.0 | scf/bbl[6] | 11.89 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Tank Information** | | | **FLASH Emissions** | | | **EPA Tanks 4.09 Program Outputs** | | **Total Working & Breathing Emissions @ MW = 39.228** | | | **VOC only emissions** | | | | |
| | | | | | | | | | | | | | TOTALS | 16230.56 | **8.12** |
| Tanks | Material Stored | Capacity (barrel)[1] | bbl/day | scf/day | lbs/yr | Working Loss[3] (lbs/yr) | Breathing Loss[3] (lbs/yr) | Working Loss[5] (lbs/yr) | Breathing Loss[5] (lbs/yr) | Breathing & Working Losses (scf/day)[6] | Working Loss[3] (lbs/yr) | Breathing Loss[3] (lbs/yr) | Flash Emissions[4,6] (lbs/yr) | Total VOC (lbs/yr) | Total VOC TPY |
| T-01 | Power Oil | 500.0 | 35.0 | 416.3 | 15744.29 | 1747.96 | 900.34 | 4114.19 | 2119.14 | 165.72 | 2874.49 | 1480.59 | 10940.68 | 15295.76 | 7.65 |
| T-02 | Condensate | 400.0 | | | | 873.98 | 831.35 | 342.85 | 326.13 | 17.79 | 239.54 | 227.86 | | 467.40 | 0.23 |
| T-03 | Condensate | 400.0 | | | | | | 342.85 | 326.13 | 17.79 | 239.54 | 227.86 | | 467.40 | 0.23 |
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