Final Report for 2017 Southern Ute Indian Tribe Comprehensive Emissions Inventory for Criteria Pollutants, Hazardous Air Pollutants, and Greenhouse Gases

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List of Acronyms

AP-42	EPA Compilation of Air Pollutant Emission Factors
API	American Petroleum Institute
AQP	Air Quality Program
BIA	United States Bureau of Indian Affairs
BSFC	Brake Specific Fuel Consumption
BTEX	Benzene, Toluene Ethyl-Benzene, Xylene
bbl	Barrel (42 U.S. Gallons)
CAA	Clean Air Act
CARMMS	Colorado Air Resource Management Modeling Study
CDPHE	Colorado Department of Health and Environment
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CO2*e*	Carbon Dioxide Equivalent
COGCC	Colorado Oil and Gas Conservation Commission
CY	Calendar Year
CFR	Code of Federal Regulations
DRMS	Colorado Division of Reclamation Mining and Safety
EI	Emissions Inventory
EIA	Environmental Impact Assessment
EPA	United States Environmental Protection Agency
FAA	Federal Aviation Administration
GHG	Greenhouse gas
GSJB	Greater San Juan Basin
HAP	Hazardous Air Pollutants
hp	Horse Power
H_2S	Hydrogen Sulfide
ICR	Information Collection Request
ITEP	Institute for Tribal Environmental Professionals
Kdf	Cretaceous Fruitland Formation
Kpcl	Cretaceous Picture Cliffs Sandstone
LFG	Landfill Gas

LP	Liquid Petroleum
LTO	Landing and Take-off Cycles
MMscf	Million Standard Cubic Feet
MSW	Municipal Solid Waste
NEI	National Emissions Inventory
NMHC	Non-methane Hydrocarbons
NMOC	Non-methane Organic Compounds
NO_x	Oxides of Nitrogen
NPS	National Park Service
O_3	Ozone
Pb	Lead
PM_{10}	Particulate Matter 10 microns and smaller
$PM_{2.5}$	Particulate Matter 2.5 microns and smaller
PSD	Prevention of Significant Deterioration
PTE	Potential to Emit
QA	Quality Assurance
RICE	Reciprocating internal combustion engine
scf	Standard Cubic Feet
SO_2	Sulfur Dioxide
SUIT	Southern Ute Indian Tribe
TEG	Tri-ethylene Glycol
TEISS	Tribal Emissions Inventory Software Solutions
THC	Total Hydrocarbons
TMNSR	Tribal Minor New Source Review Program
TOC	Total Organic Compounds
tpy	Tons per Year
USFS	United States Forest Service
VOC	Volatile Organic Compounds
WIAC	Waste Industry Air Coalition
WRAP	Western Regional Air Partnership
4SLB	Four stroke lean burn
4SRB	Four stroke rich burn

2SLB	Two stroke lean burn

I. Executive Summary

The Southern Ute Indian Tribe (Tribe) Air Quality Program (AQP) has prepared an emissions inventory of all quantifiable point and non-point sources on the Southern Ute Indian Reservation (Reservation) for calendar year 2017 (CY2017). The emissions inventory was prepared according to the Environmental Protection Agency Class II emission inventory guidelines of using measured data when available or data and emissions factors from reputable sources when measured data were not available.

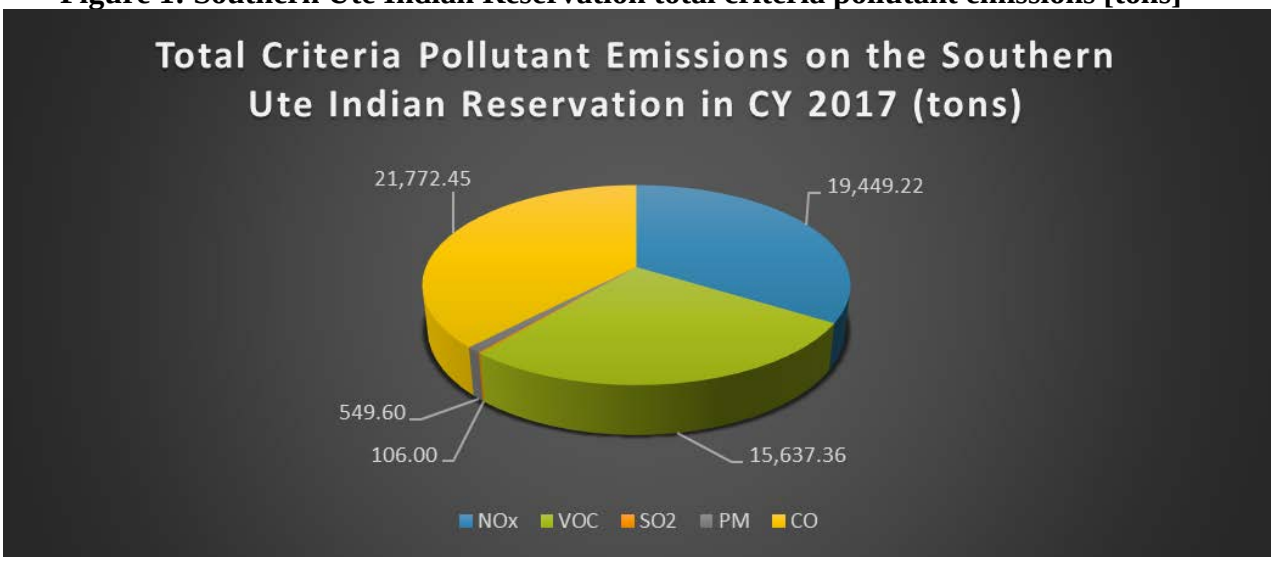
Oil and natural gas production is the predominant industry on the Reservation and emissions data for these sources were collected directly from source operators through annual emission inventories, registrations from sources under the Tribal Minor New Source Review (TMNSR) program (true minor sources), and a Clean Air Act (CAA) Section 114 information collection request issued by the Tribe in June 2018. Data for other sources were collected from various reputable state, local, and federal data sources.

As of January 2018, there were a total of 3,102 oil and gas production sources operating on the Reservation. These sources consisted of 35 sources operating under Title V operating permits, 6 sources operating under TMNSR permits (synthetic minor sources), 301 true minor sources, and 2,760 non-point sources with emissions below the TMNSR program thresholds, referred to in this emissions inventory as “small oil and gas sources”.

Reservation emission totals for CY 2017 were 19,449.22 tons of oxides of Nitrogen (NOx), 15,637.36 tons of Volatile Organic Compounds (VOC), 106.00 tons of Sulfur Dioxide (SO_2), 384.58 tons of Particulate Matter 10 micrometers or less in diameter (PM_{10}), 165.02 tons of Particulate Matter 2.5 micrometers or less in diameter ($PM_{2.5}$), 21,772.45 tons of Carbon Monoxide (CO), 2,428.60 tons of total Hazardous Air Pollutants (HAP), and 6,294,881.55 metric tonnes of Greenhouse Gas (GHG) emissions measured in Carbon Dioxide Equivalent (CO2*e*).

Total criteria pollutant (NOx, VOC, SO_2, PM_{10}, $PM_{2.5}$, CO) and HAP emissions on the Reservation for 2017 are presented below in Figure 1.

Figure 1: Southern Ute Indian Reservation total criteria pollutant emissions [tons]



II. Overview

1. Purpose of Inventory

The purpose of this Emissions Inventory (EI) was to establish baseline emissions estimates for the 2017 calendar year for all quantifiable air emission sources located within the exterior boundaries of Reservation. The emissions data for the Reservation presented in this EI has been organized by source category and pollutant. The EI will be used for future air quality planning purposes, such as development of air quality regulations targeted at ozone precursors for maintaining attainment with the National Ambient Air Quality Standards, emissions modeling, and Title V permitting fee analysis.

The primary air pollutants included in this EI are NOx, CO, PM_{10}, $PM_{2.5}$, VOC, HAP and GHG.

2. Geographic Location of Southern Ute Indian Reservation

The Reservation is in southwestern Colorado. The Reservation land area covers 1,066 square miles in three counties (La Plata, Archuleta, and Montezuma) and borders New Mexico to the south. The total area covered by this inventory is approximately 682,590 acres, which encompasses all land within the external boundaries of the Reservation. The Southern Ute Indian Tribe (Tribe) and/or its members own approximately 320,000 acres, while the remaining land mass is comprised of non-Indian and government land in a checkerboard fashion. The primary land use is agricultural, and the predominant industry is oil and natural gas production.

3. Climate

The Reservation remains generally semi-arid throughout the year. Located north of northern New Mexico desert land and south of the Colorado alpines, the average temperature range during the winter months is between twenty- and forty-degrees Fahrenheit. Freezing temperatures are common throughout the winter and during the 2017 calendar year the coldest month was February with a low of -3.05 degrees Fahrenheit and a monthly average of 26.8 degrees Fahrenheit. During the summer months the temperature typically remains in the high eighties to low nineties. The warmest month of 2017 was July with a high of 93.87 degrees Fahrenheit, and a monthly average of 71.3 degrees Fahrenheit. Snow is the dominant form of precipitation on the Reservation and total precipitation for calendar year 2017 was 8.81 inches. The driest months were June and December with 0 inches of precipitation and the wettest month was July with 2.48 inches of precipitation.[1]

4. Geology

The Reservation is situated in the northern portion of the San Juan Basin, a geologic structural basin underlying southwestern Colorado and northwestern New Mexico. The basin is composed of Cambrian to Holocene aged sedimentary rocks and contains one of the largest coal-bed methane natural gas fields in the world within the Cretaceous aged Fruitland Formation.[2] The majority of the natural gas production on the Reservation is coalbed methane from the Fruitland Formation, but conventional natural gas is also produced from Cretaceous aged sandstone reservoirs of the Pictured Cliffs Formation, Mesa Verde Group, and the Dakota Sandstone. Tight gas reservoirs of the Cretaceous aged Mancos Shale have also been drilled, however, no significant exploration and production has occurred within the Reservation as of 2017.

5. Sources

The sources included in this emissions inventory were organized according to source type and size. These sources are as follows:

A. Point Sources

1) Title V permitted oil and natural gas sources
2) TMNSR minor oil and natural gas sources, including:

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[1] Southern Ute Indian Tribe: Ambient Monitoring. (2017). *2017 AQS Ute 3 Humidity and Temperature Hourly Data.* Retrieved from: http://www.southernute-nsn.gov/environmental-programs/air-quality/ambient-monitoring/.

[2] Fasset, J. E., & Hinds, J. S. (1971). Geology and Fuel Resources of the Fruitland Formation and Kirtland Shale of the San Juan Basin, New Mexico and Colorado. Geological Survey Professional Paper 676. United States Government Printing Office. Retrieved from https://pubs.usgs.gov/pp/0676/report.pdf.

a. Permitted minor TMNSR sources,
b. Registered minor TMNSR sources,

3) Municipal solid waste landfills, and
4) Airports.

B. Non-point Sources

1) Small oil and gas sources,
2) Fruitland Formation Outcrop natural gas seeps,
3) Gasoline stations,
4) Aviation gasoline dispensing,
5) Gravel pits,
6) Residential heating, and
7) Agricultural burning.

C. Mobile Sources

1) On-road vehicles, and
2) Non-road equipment.

D. Events

1) Fire events (wildland fires and prescribed burns).

E. Biogenic Sources

III. Data Quality Objectives

Data objectives for this inventory are as follows:

1. Accuracy

- Data for this EI were collected according to EPA level II EI guidelines using measured data when available or data from reputable sources such as EPA, the Colorado Oil and Gas Conservation Commission (COGCC) and professional organizations when measured data were not available.
- Emission factors were developed using measured data or commonly accepted emissions factors and assumptions from EPA and professional organizations.
- All data sources, emission factors, assumptions, and emission calculation methodologies were documented.
- Emission calculation models were utilized when available (GRI-GLYCalc 4.0, Tanks 4.09d, etc.) and all inputs are provided in annual emission reports or 2017 CAA Section 114 Information Collection Request (ICR) worksheets.

- Results of the 2017 SUIT EI were compared with results from the 2015 SUIT EI and the CY2014 WRAP EI for the Greater San Juan Basin.
- Quality Assurance review of emission totals, assumptions, emission factors, and calculation methodologies was conducted by a third-party contractor.

2. Uncertainty

- Reported emissions may be inaccurate.
- The number of unreported oil and gas sources is unknown and can only be estimated based on sources reported to COGCC.
- Emissions differences between CY2017 SUIT EI with CY2015 SUIT EI and the WRAP CY2014 EI may occur due to different preparation methodologies and assumptions.

3. Completeness

- Capture 100% of point source emissions reported in the annual emission fees for CY2017.
- Capture 95% of non-point oil and gas sources in the 2018 CAA 114 ICR.
- Reported information will be used to extrapolate emissions to 100% to fill data gaps.
- Capture 80% of area sources (gas stations, etc.).

4. Comparability

- EI results will be compared with results from the 2015 SUIT EI and the CY2014 WRAP EI for the Greater San Juan Basin.
- Emission factors and assumptions will be compared with methodologies used in similar emission calculation applications.

IV. Point Sources

1. Title V Permitted Oil and Gas Sources

Description of Sources

Thirty-five oil and gas Title V sources operated on the Reservation during calendar year 2017. Sources include natural gas compressor stations, central delivery points, treating plants, and processing plants.

Title V sources are defined as sources with the potential to emit (PTE) 100 tons per year (tpy) of a single criteria pollutant, 25 tpy of HAP in aggregate, or ten tpy of an individual HAP. The Tribe has full delegation of a Title V operating permit program under 40 CFR Part 70 and during calendar year 2017, 35 oil and gas sources operated under Tribally-issued Title V permits.

Data Collection

Title V sources are required to report emissions annually and pay a per-ton emission fee for pollutants emitted. Emissions data for Title V sources were collected directly from the calendar year 2017 fee calculation worksheets submitted by each source to the Tribe. Actual emissions data were available for all 35 Title V oil and gas sources. GHG emissions, reported as carbon dioxide equivalent (CO2*e*) were obtained from fee calculation worksheets (if provided) or were calculated using operator data and an emission calculation tool developed by the AQP. This data collection methodology adheres to the EPA level II EI guidelines for utilizing measured data when available.

Emissions

Total criteria pollutant, HAP, and GHG emissions estimated from Title V sources for the 2017 calendar year are displayed below in Table 1.

Table 1: Title V criteria pollutant, HAP, and GHG emissions estimations [tons]*

Pollutant	NOx	VOC	SO_2	PM	CO	HAP	GHG (CO_2e)
Emissions	2,381.89	947.55	28.62	75.97	2,388.07	298.40	1,453,124.10

*CO2*e* emissions for all Title V sources are reported values obtained from annual Title V fee forms and EPA GHG data and are reported in metric tonnes

Total criteria pollutant and HAP emissions by equipment type from Title V sources for the 2017 calendar year are displayed below in Figures 2 through 4.

Figure 2: Criteria pollutant and HAP emissions at Title V sources [tons]

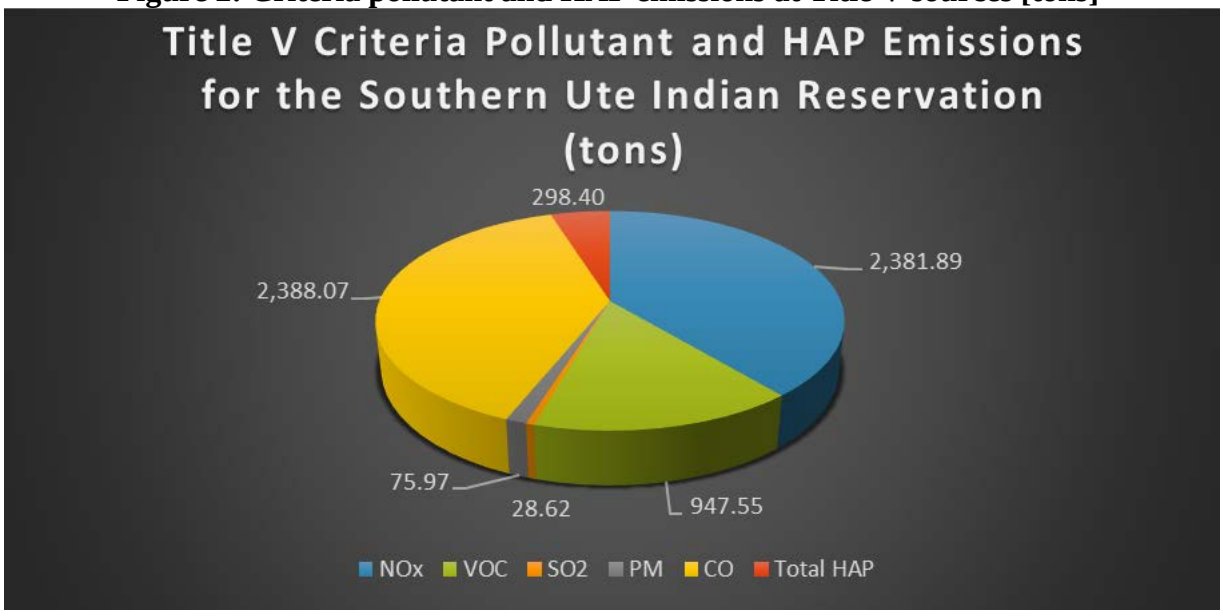
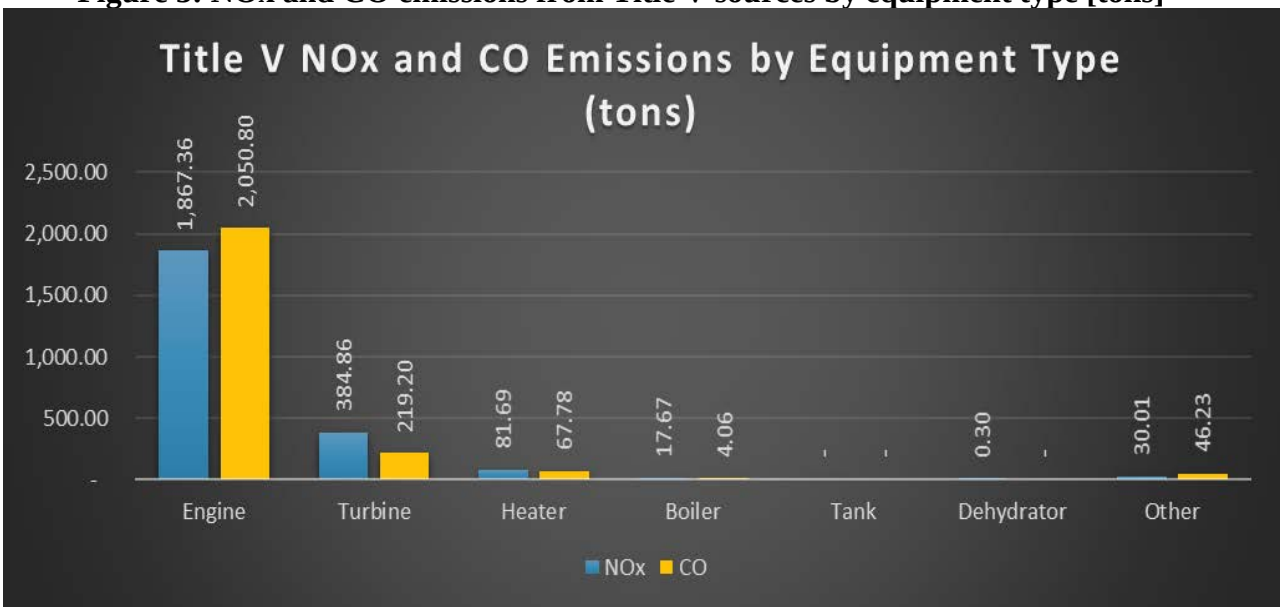
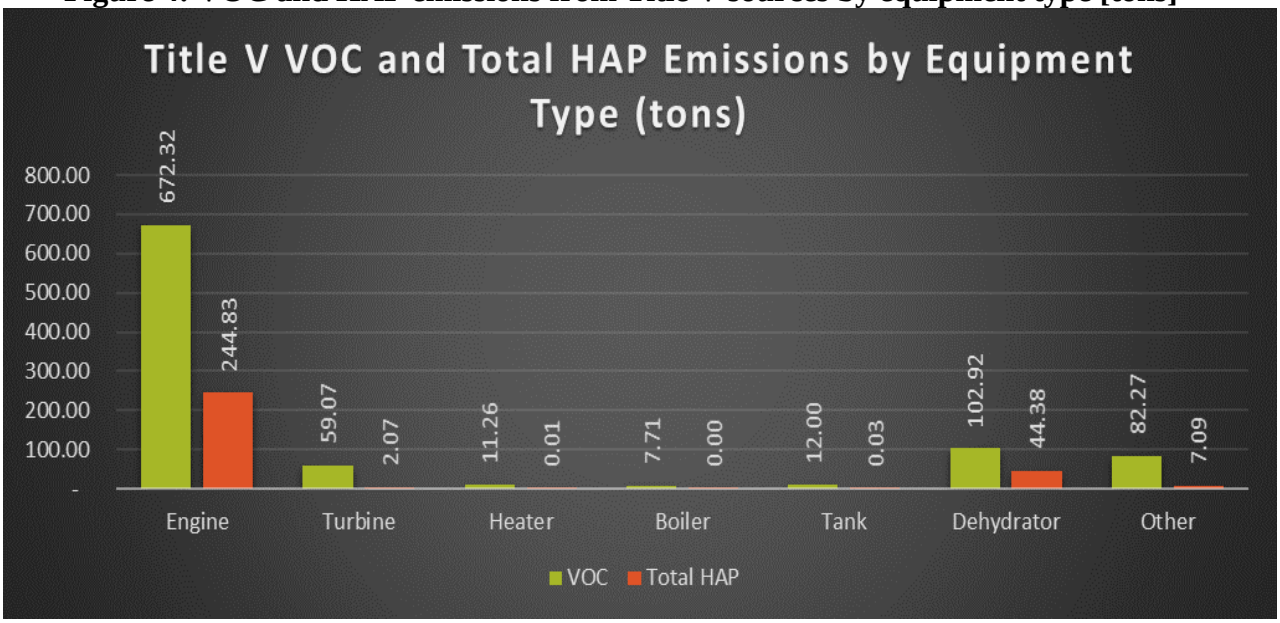


Figure 3: NOx and CO emissions from Title V sources by equipment type [tons]



*"Other" includes emissions from amine units, excess emission events, blowdowns, maintenance, and fugitive emission sources

Figure 4: VOC and HAP emissions from Title V sources by equipment type [tons]



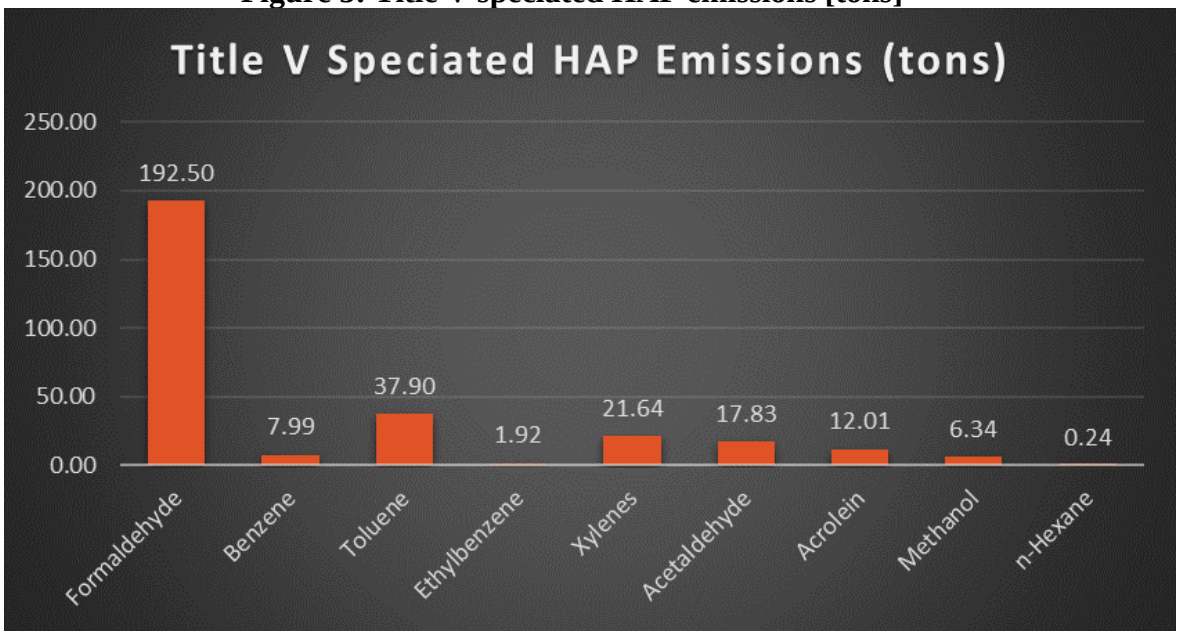
*"Other" includes emissions from amine units, excess emission events, blowdowns, maintenance, and fugitive emission sources

Speciated HAP emissions from Title V sources are displayed below in Table 2 and Figure 5.

Table 2: Title V HAP emissions [tons]

Pollutant	Formaldehyde	Benzene	Toluene	Xylenes	Ethylbenzene	Acetaldehyde	Acrolein	Methanol	n-Hexane
Emissions	192.50	7.99	37.90	21.64	1.92	17.83	12.01	6.34	0.24

Figure 5: Title V speciated HAP emissions [tons]



2. Minor Oil and Gas Point Sources

The Tribal Minor New Source Review (TMNSR) permitting program is found at 40 CFR Part §49.151 through §49.164.[3] The TMNSR permitting program includes new or modified source permitting, permits by rule, and a registration program. For the purposes of this inventory, two main categories of emission sources under this program were considered: a.) Permitted TMNSR oil and gas sources, and b.) Registered TMNSR Oil and Gas Sources.

The emission thresholds for the TMNSR permitting program are located at 40 CFR Part §49.153. Minor sources with emissions less than the levels displayed in Table 3 below are not required to obtain a permit or register under the program.

The emission thresholds from 40 CFR Part §49.153 are displayed below in Table 3.

[3] 40 CFR Part 49 - Indian Country: Air Quality Planning and Management. (2016). U.S. Government Publishing Office. Retrieved from http://www.ecfr.gov/cgi-bin/text-idx?SID=bc4187dbf0b08beb092efe4251fe4493&mc=true&tpl=/ecfrbrowse/Title40/40cfr49_main_02.tpl

Table 3: 40 CFR Part 49 Minor New Source Review Program Emissions Thresholds

Regulated NSR Pollutant	Minor NSR Thresholds for Attainment/ Unclassifiable [tpy]
Carbon Monoxide (CO)	10
Nitrogen Oxides (NO_x)	10
Sulfur Dioxide (SO_2)	10
Volatile Organic Compounds (VOC)	5
PM Total	10
PM_{10}	5
$PM_{2.5}$	3
Lead	0.1
Fluorides	1
Sulfuric Acid Mist	2
Hydrogen Sulfide (H_2S)	2
Total Reduced Sulfur (including H_2S)	2
Reduced Sulfur Compounds (including H_2S)	2
Municipal Waste Combustor Emissions	2
Municipal Solid Waste Landfill Emissions (measured as non-methane organic compounds)	10

A. Synthetic minor Oil and Gas Sources

Description of Sources

This category reflects larger emission sources that would be subject to either the Prevention of Significant Deterioration (PSD), Title V operating permit program, or both programs absent enforceable emission limitations to reduce the source's PTE. These types of permits are often referred to as "synthetic minor permits".

During calendar year 2017, eleven sources on the Reservation operated under TMNSR permits. Of the eleven sources in this category, nine sources are natural gas compressor stations, one source is a natural gas processing plant, and one source is a gravel pit (permitted point source). Seven sources have permits to reduce emissions below Title V permitting thresholds and four sources have permits for various other reasons.

Data Collection

Only the six oil and gas sources with TMNSR permitted emissions below the Title V permitting thresholds were included in this category to avoid double counting emissions. Emissions from the remaining four oil and gas sources, which hold Title V operating permits issued by the Tribe, were already accounted for under the Title V Oil and Gas Sources category of this inventory.

Synthetic minor sources are required to submit annual emissions inventories to EPA Region 8 for the pollutants regulated under each permit and emissions data was collected directly from the annual emissions inventories submitted for calendar year

2017[4]. For the pollutants that were not reported to EPA Region 8, AQP calculated emissions or utilized data that was submitted for its 2015 emission inventory. This data collection methodology adheres to the EPA level II EI guidelines for using measured data when available.

Emissions

Total 2017 criteria pollutant, HAP, and GHG emissions from permitted TMNSR oil and gas sources on the Southern Ute Indian Reservation are presented below in Table 4.

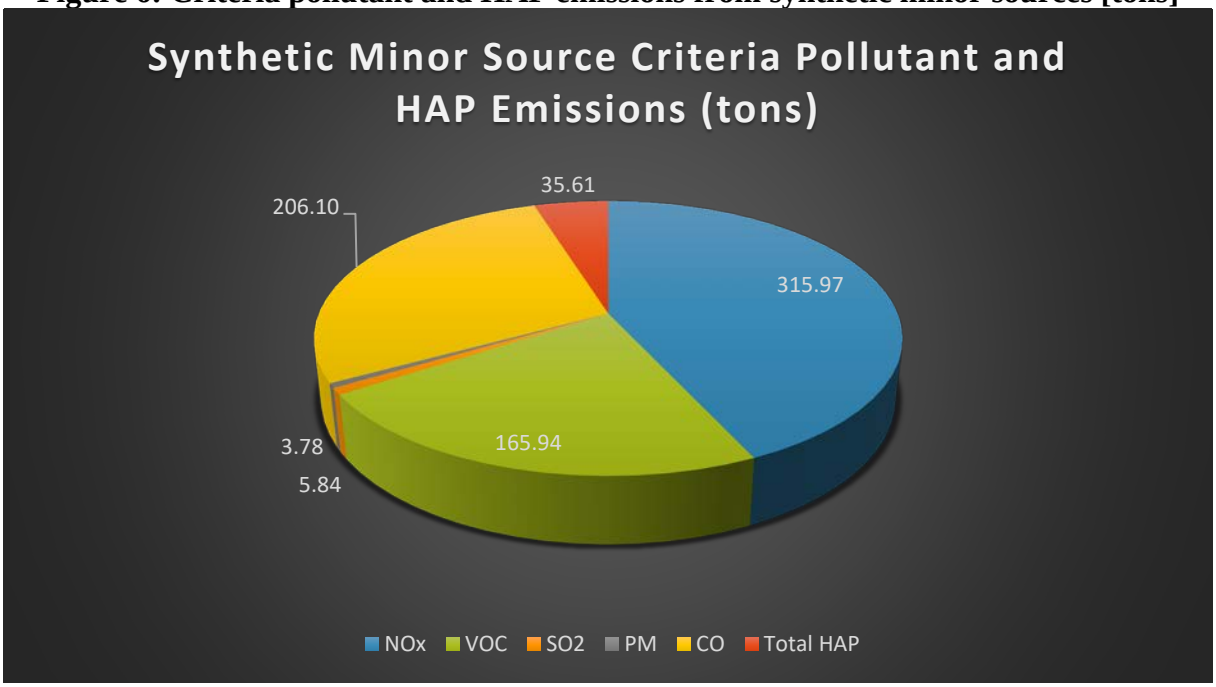
Table 4: Criteria Pollutant, HAP, and GHG emissions for synthetic minor sources [tons]*

Pollutant	NOx	CO	VOC	PM	SO_2	Total HAP	GHG (CO_2e)
Emissions	315.97	206.10	165.94	3.78	5.84	35.61	98,310.54

*GHG emissions reported in metric tonnes.

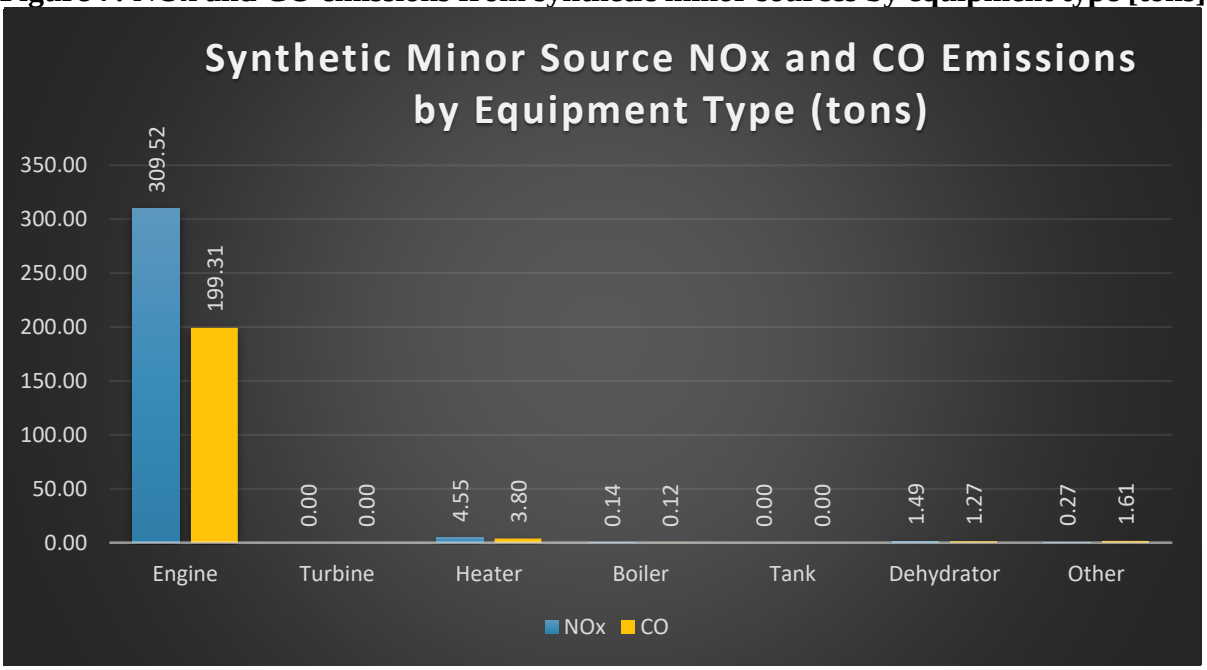
Total criteria pollutant and HAP emissions from synthetic minor sources on the Southern Ute Indian Reservation by equipment type are presented below in Figure 6, Figure 7, and Figure 8.

Figure 6: Criteria pollutant and HAP emissions from synthetic minor sources [tons]



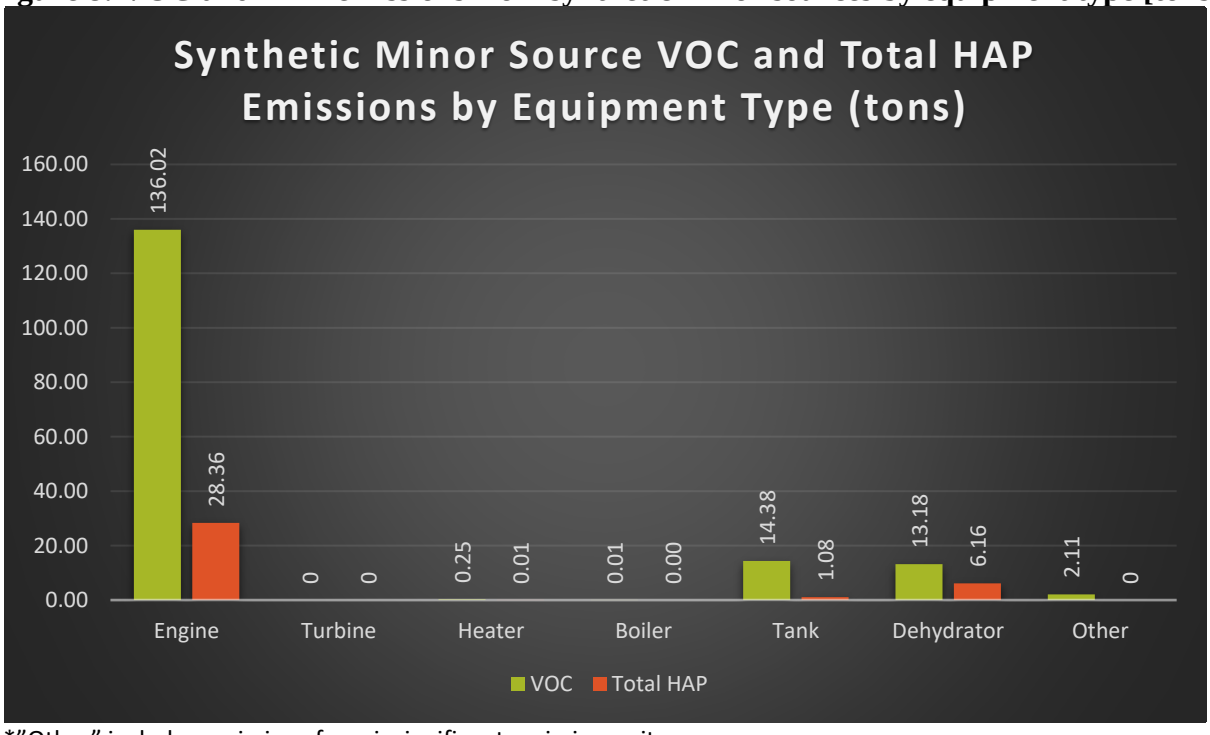
[4] Emissions from Southern Ute Indian Tribe (2018). CY 2017 EPA TMNSR Fee Forms.

Figure 7: NOx and CO emissions from synthetic minor sources by equipment type [tons]



*"Other" includes emissions from insignificant emission units

Figure 8: VOC and HAP emissions from synthetic minor sources by equipment type [tons]



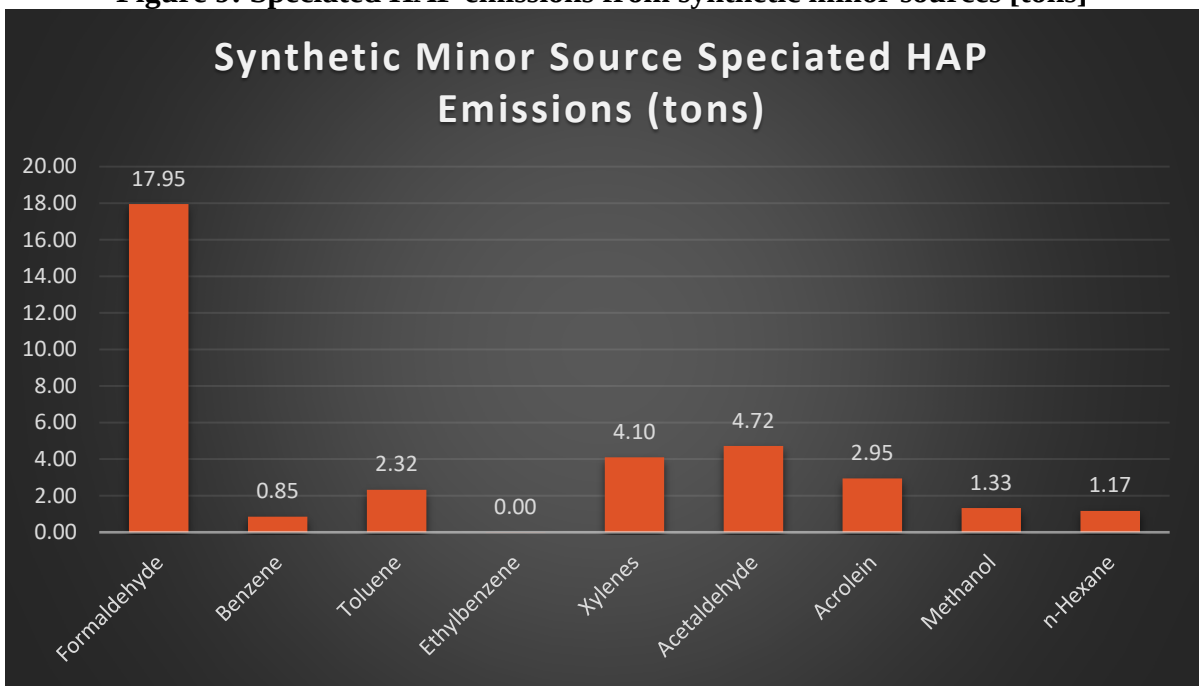
*"Other" includes emissions from insignificant emission units

Total 2017 speciated HAP emissions from synthetic minor sources on the Southern Ute Indian Reservation are displayed below in Table 5 and Figure 9.

Table 5: Speciated HAP emissions from synthetic minor sources [tons]

Pollutant	Formaldehyde	Benzene	Toluene	Xylenes	Methanol	Acetaldehyde	Acrolein	n-Hexane
Emissions	17.95	0.85	2.32	4.10	1.33	4.72	2.95	1.17

Figure 9: Speciated HAP emissions from synthetic minor sources [tons]



B. Registered Tribal Minor New Source Review Oil and Gas Sources

Description of Sources

The TMNSR program required operators of true minor sources as defined in §49.152, to register each oil and gas source with EPA Region 8 by no later than March 1, 2013. Existing oil and gas sources constructed or modified after March 1, 2013, but before October 3, 2016 were also required to register. All oil and gas sources constructed after March 1, 2013 are required to apply for a site-specific TMSNR permit or comply with the Oil and Gas Federal Implementation Plan for Indian Country at 40 CFR Part 49, Subpart C.

As of January 2018, EPA Region 8 had received 301 oil and gas source registrations for the Reservation.[5] The registrations included source locations, emission unit descriptions, and actual emissions calculations. All the registered sources are natural gas production sources, primarily well-sites. Certain non-oil and gas sources, such as hot mix asphalt plants and stone quarrying, crushing and screening operations, also required registration with the EPA under the TMNSR program, but to date, no such sources have been registered. Presumably, non-oil and gas sources that did not register

[5] Southern Ute Indian Tribe. (2018). Information Collection Request.

with the EPA may exist on the Reservation, and this issue will be addressed below in the data collection section.

Data Collection

For the purposes of this emission inventory section, only emissions from true minor sources were included. Sources with Title V operating permits or synthetic minor permits were not required to register under 40 CFR Part 49; therefore, there is little risk of double counting emissions from these sources. Emissions from Title V sources and synthetic minor sources were assessed separately, as discussed in Chapter IV Section 1 and 2A of this report.

Due to the potential for registration information to be stale or out of date, the AQP issued a mandatory Clean Air Act Chapter 114 ICR in June 2018 to obtain updated and reconciled registration data from each facility operator. The ICR also included data for non-registered oil and gas sources. Specifically, the ICR requested reconciliation of the operational status of each previously registered source, equipment located at each source, and the actual emissions for calendar year 2017.

The ICR also requested information that was exempted from TMNSR registration including emissions estimates for engines less than or equal to 50-hp and facility-wide emissions of HAP and GHG. It was anticipated that the ICR could also result in emissions reporting by sources that had never registered with the EPA. This data collection methodology adheres to the EPA level II EI guidelines for utilizing measured data when available.

Emissions

Total 2017 emissions of criteria pollutants, HAP, and GHG from true minor sources on the Reservation are displayed below in Table 6.

Table 6: Criteria pollutant and HAP emissions from true minor sources [tons]*

Pollutant	NOx	CO	VOC	PM	SO_2	Total HAP	CO_2e
Emissions	4,609.43	3,507.64	897.09	52.36	25.56	298.65	1,365,890.40

*GHG emissions reported in metric tonnes.

Total 2017 criteria pollutant and HAP emissions from true minor sources on the Reservation by equipment type are displayed below in Figures 10 through 12. GHG emissions from true minor sources are displayed below in Figure 13.

Figure 10: Criteria pollutant and HAP emissions from true minor oil and gas sources [tons]

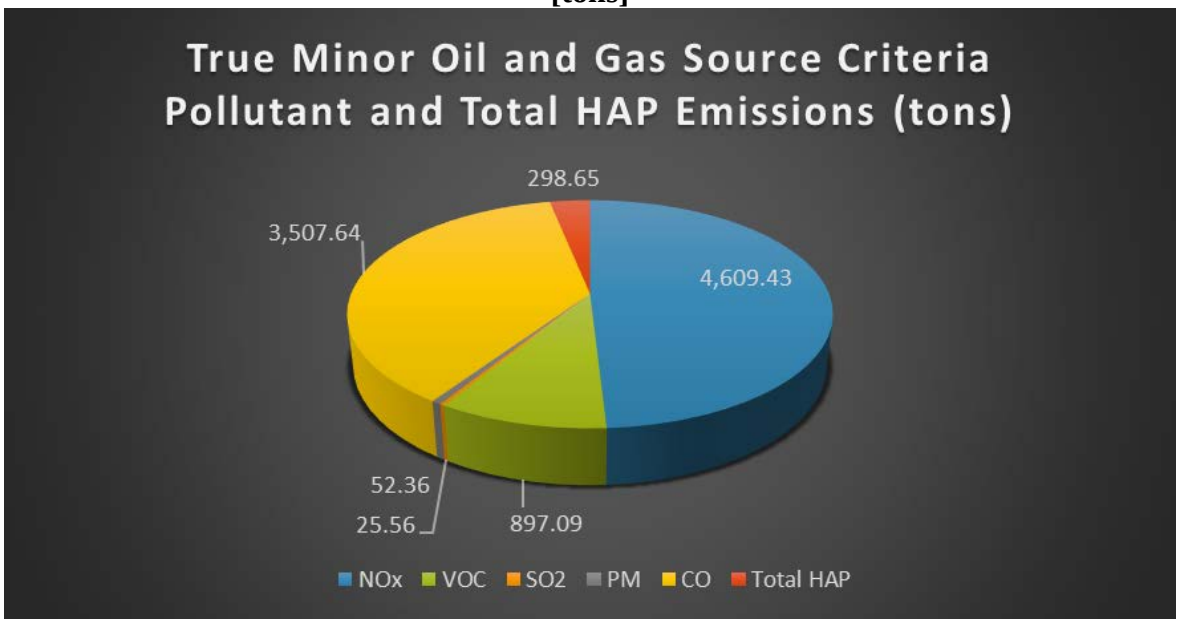
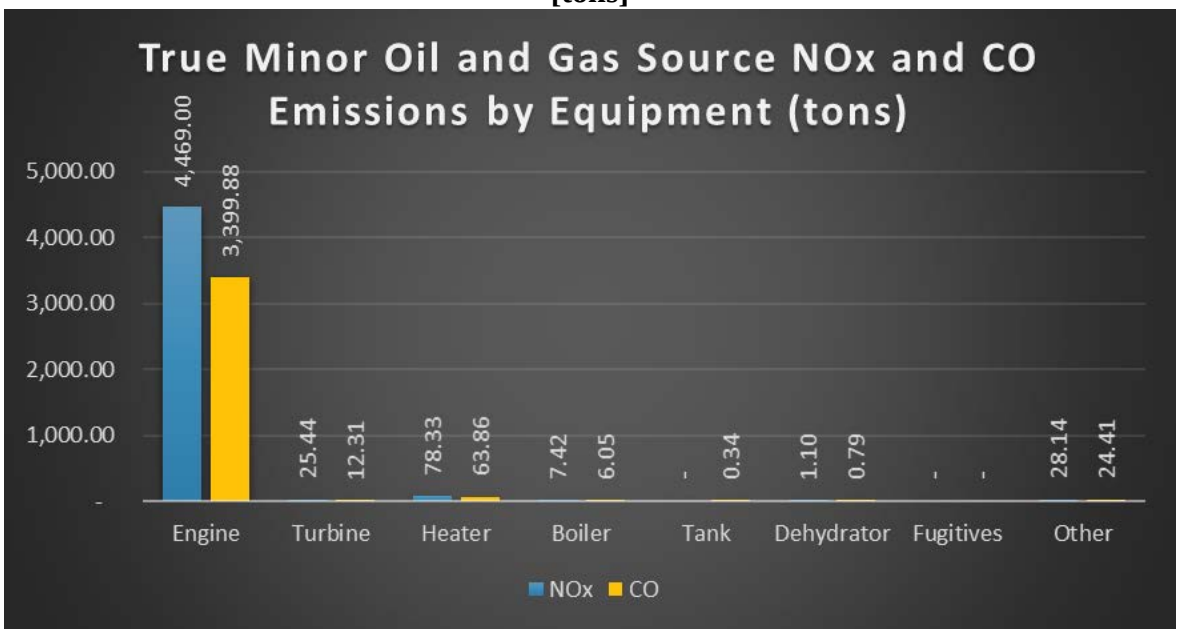
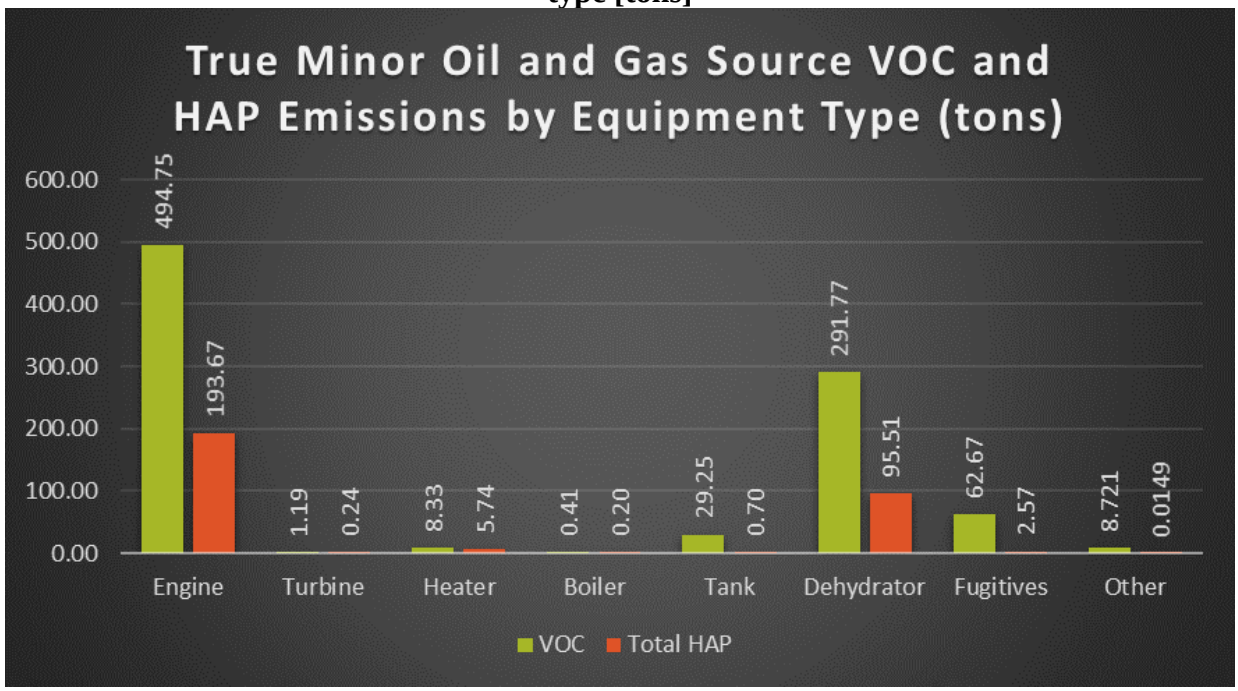


Figure 11: NOx and CO emissions from true minor oil and gas sources by equipment type [tons]



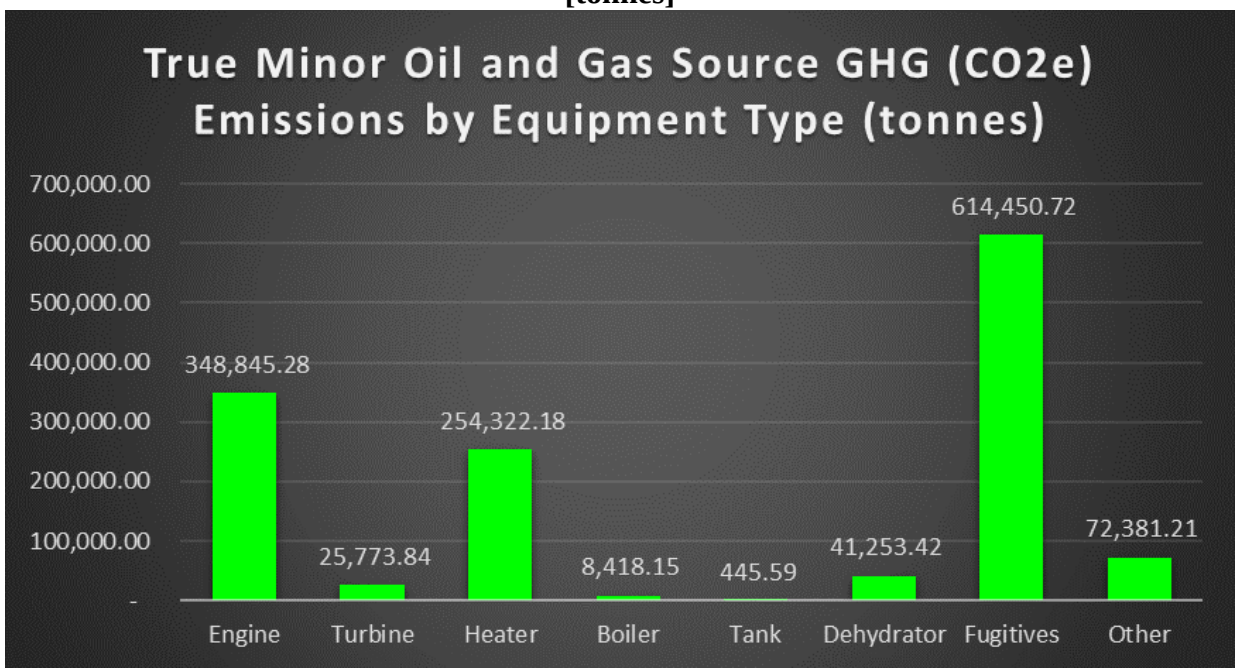
*"Other" consists of combustors, flares, and undefined equipment

Figure 12: VOC and HAP emissions from true minor oil and gas sources by equipment type [tons]



*"Other" consists of combustors, flares, and undefined equipment

Figure 13: GHG emissions from true minor oil and gas sources by equipment type [tonnes]



*"Other" consists of combustors, flares, and undefined equipment

3. Permitted Point Sources

In 2017, one non-oil and gas source operated under a TMNSR permit on the Reservation. This source is a gravel pit. Emissions from the gravel pit were obtained from the 2015 Minor Source Air Permit Application as displayed in Table 7.

Table 7: Criteria pollutant and HAP emissions from permitted non-oil and gas point sources [tons]

Pollutant	NOx	CO	VOC	PM_{10}	$PM_{2.5}$	PM	SO_2	Total HAP	CO_2e
Emissions	23.79	6.97	0.81	13.03	1.94	28.76	37.17	0.05	29.21

4. Landfill Gas

The Southern Ute Indian Tribe has two Class II municipal solid waste (MSW) landfills within the Reservation boundaries. The first one is the Bondad Recycling Center and Depository (Bondad Landfill) located in Bondad, Colorado and the second one is the Archuleta County Landfill, located south of Pagosa Springs, Colorado. Both MSW disposal sites accept non-hazardous residential, commercial, and industrial waste. The Bondad Landfill is owned and operated by Transit Waste, LLC and has been in operation since 1997. The Archuleta County Landfill is owned and operated by Archuleta County and began operation in 1985. The Bondad Landfill operates under a tribally issued Title V operating permit and the Archuleta County Landfill reports annual landfill gas emissions to the Colorado Department of Public Health and Environment (CDPHE).

Data Collection

Emission data for the Archuleta County Landfill were provided by the Archuleta County Solid Waste Department and included a CY 2017 greenhouse gas report and an Air Pollution Emission Notice and Application for Construction Permit and Design Capacity Report. The Archuleta County Landfill only submitted emissions in CY 2015. AQP extrapolated SW Acceptance volumes for 2016 and 2017 for input in LandGEM 3.02 with a density 0.79 Megagram/cubic yard. The density was estimated from the reported Megagrams per cubic yard for the years 2013 through 2015. All reports were previously submitted by Archuleta County to the CDPHE. Emissions data for the Bondad Landfill were directly obtained from the CY 2017 Title V emissions fee form submitted to the Tribe.

Emission Calculation Methodology

Emissions for both the Archuleta County and Bondad landfills were estimated using the EPA's MSW landfill emissions model, LandGEM version 3.02 (LandGEM).[6] The LandGEM

[6] U.S. EPA - Landfill Gas Emissions Model. (2018). Retrieved from https://www.epa.gov/catc/clean-air-technology-center-products#software.

model estimates total landfill gas, non-methane organic compounds (NMOC), and hazardous air pollutants (HAP).

The LandGEM model is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in MSW landfills.

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} kL_0 \left(\frac{M_i}{10} \right) e^{-kt_{ij}}$$

Where:

Q_{CH4} = annual methane generation in the year of calculation (m^3/year)
i = 1 year time increment
n = (year of the calculation) – (initial year of waste acceptance)
j = 0.1 year time increment
k = methane generation rate (year-1)
Lo = potential methane generation capacity (m^3/Mg)
M_i = mass of waste accepted in the i^{th} year (Mg)
t_{ij} = age of the j^{th} section of waste mass M_i accepted the i^{th} year (decimal years, e.g., 3.2 years)

LandGEM Inputs and Assumptions

Complex microbial and biochemical reactions occur within the landfill's interior after the waste has been deposited. The two primary constituents of landfill gas (LFG) are methane (CH_4) and carbon dioxide (CO_2). LFG also contains small amounts of non-methane organic compounds, which includes VOC, HAP, and GHG. LandGEM estimates the LFG from anaerobic decomposition of the waste with CH_4 and CO_2 content between 40 and 60 percent. The LandGEM default used for methane is 50 percent by volume (the model default value). The production of LFG is a continuous process until microbial reactions are limited by substrate or moisture. Other factors include climate, moisture conditions, and types of solid waste accepted (degradable vs. inert).

Parameters for climatic conditions used in the LandGEM model were a k-value of 0.02 $year^{-1}$ (an arid area that receives less than 25 inches of rain annually) and a L_o-value of 170 cubic meter per megagram. The VOC concentrations are assumed to be 39 percent of NMOC concentrations, consistent with the footnote C Table 2.4-2 of the EPA's publication titled *AP-42, Fifth Edition Compilation of Air Emission Factors* (EPA AP-42).[7] For the Bondad Landfill, the concentrations of HAPs in the LFG were taken from the values reported in the Waste Industry Air Coalition (WIAC) report titled *Comparison of Recent Landfill Gas*

[7] U.S. Environmental Protection Agency. (2018). *AP-42: Compilation of Air Emission Factors*. Retrieved from https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors.

Analyses with Historic AP-42 Values.[8] For HAP compounds not listed in the WIAC report, emission factors from EPA AP-42 Table 2.4-1 and Section 2.4-4 were used. HAP emissions for the Archuleta County Landfill are from the LandGEM report using default emissions factors from EPA AP-42. The total estimated emissions of LFG were estimated using the flow rate and molecular weights.

Emissions

The estimated LandGEM emissions for Bondad Landfill were provided to the Tribe in a Title V emissions fee form package submitted by Transit Waste for calendar year 2017. Emissions estimates for Archuleta County Landfill were calculated by the Tribe using LandGEM and the waste acceptance rates and waste-in-place data values for 2017 taken from the 2017 GHG report previously submitted by Archuleta County to the CDPHE. The AQP used the same assumptions and climatic parameters used in the report for Bondad Landfill as these values have been previously reviewed and deemed acceptable when preparing the Title V permit for the Bondad Landfill.

To avoid double counting emissions from the Bondad Landfill, emissions from Bondad Landfill were only included in the Landfill gas emission totals and not included in the Title V emission totals presented in Section IV.1 of this report.

Total refuse in place in tons and total emissions of GHG, VOC and HAP from MSP landfills on the Reservation for 2017 are displayed below in Table 8 and Figure 14.

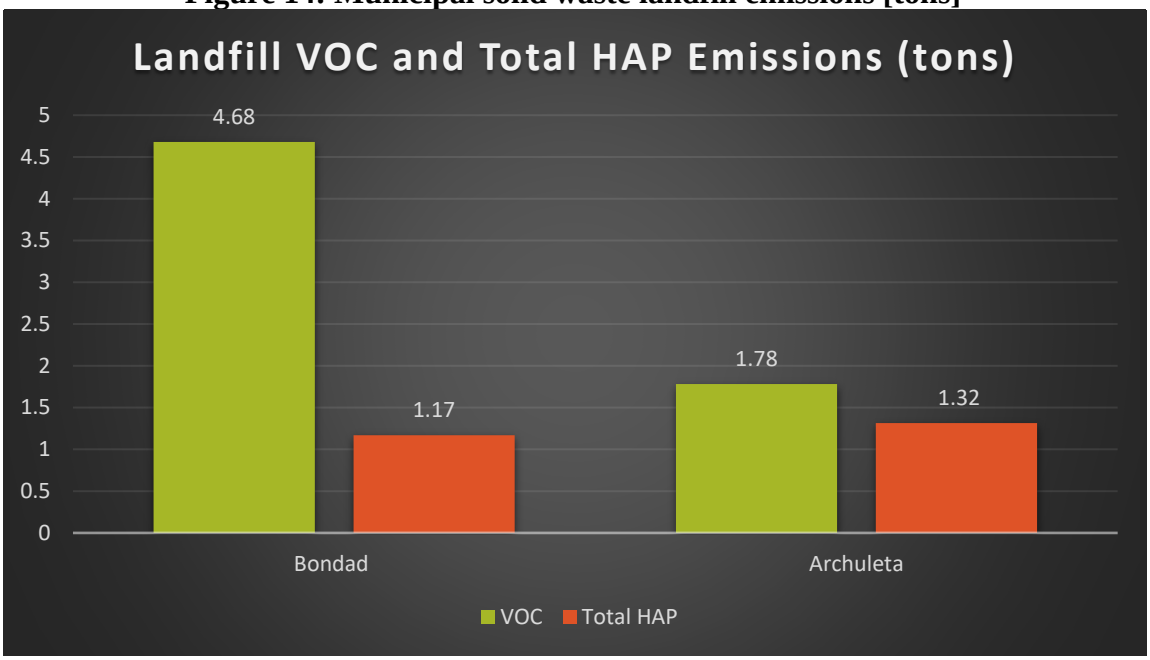
Table 8: Municipal solid waste landfill refuse in place [tons] and emissions [tons]*

	Refuse in Place	GHG	VOC	HAPs[1]
Bondad Landfill	1,151,013	3,364.60	4.68	1.17
Archuleta County Landfill	386,525	11,016.28	1.78	1.32
Totals	**1,537,538**	**14,379.88**	**6.46**	**2.49**

*An insignificant quantity of double counting of VOCs occurs because many reported HAPs are also considered VOCs.

[8] Waste Industry Coalition. (2001, January). Comparison of Recent Landfill Gas Analysis with Historic AP-42 Values.

Figure 14: Municipal solid waste landfill emissions [tons]



5. Airports

There are three airports located within the Reservation, the Durango-La Plata County Airport, the Animas Air Park, and the Animas Air Park Helipark.

Data Collection

The AQP obtained CY 2015 data from EPA's National Emissions Inventory database (NEI), which includes total landing and take-off cycles (LTOs) and piston and turbine engine emission estimates for the heliport, taxi, and general aviation at the Animas Air Park.[9] The LTOs were from the Federal Aviation Administration (FAA). The methodologies used by EPA to calculate airport emissions are detailed in the Eastern Research Group's document titled *Documentation for Aircraft Component of the National Emissions Inventory Methodology.*[10]

Emissions data for the Animas Air Park and Animas Air Park Heliport were submitted to the NEI by EPA. Emissions data for the Durango-La Plata airport were reported to the NEI by the CDPHE.

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[9] U.S. EPA National Emission Inventory Emissions Inventory System. (2016). Retrieved from https://www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei.

[10] Eastern Research Group. (2001, January). Documentation for Aircraft Component of the National Emissions Inventory Methodology. (ERG No. 0245.03402.011).

Assumptions

Calendar year 2016 airport emissions are assumed to be similar to emissions from the airports during CY 2017.

Emissions

Total criteria pollutant and HAP emissions from airports on the Reservation for 2017 are displayed in Table 9 and Figure 15 and Figure 16 below.

Table 9: Criteria pollutant and HAP emission from airports [tons]*

	NOx	VOC	SO_2	$PM_{2.5}$	PM_{10}	Lead	CO	Total HAP
Animas Air Park Heliport	0.01	0.01	0.00	0.01	0.01	0.00	0.27	0.00
Animas Air Park	0.40	0.84	0.08	0.51	0.66	0.03	30.93	0.31
Durango-La Plata County	34.47	16.64	4.20	3.30	3.84	0.1	167.24	4.71
Total	**34.87**	**17.50**	**4.28**	**3.82**	**4.51**	**0.13**	**198.43**	**5.02**

*Emissions estimations for airports are from the 2016 EPA National Emission Inventory Database and assumed to be realistic estimations of airport emissions for 2017.

Figure 15: CO and NOx emissions from airports [tons]

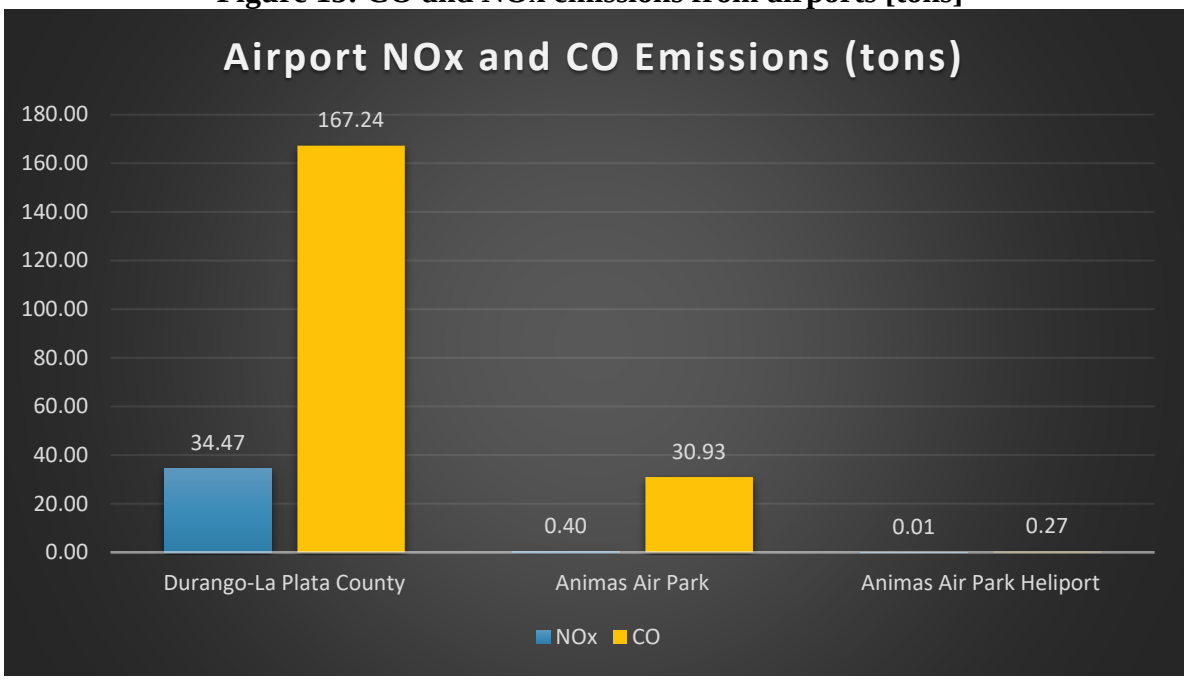
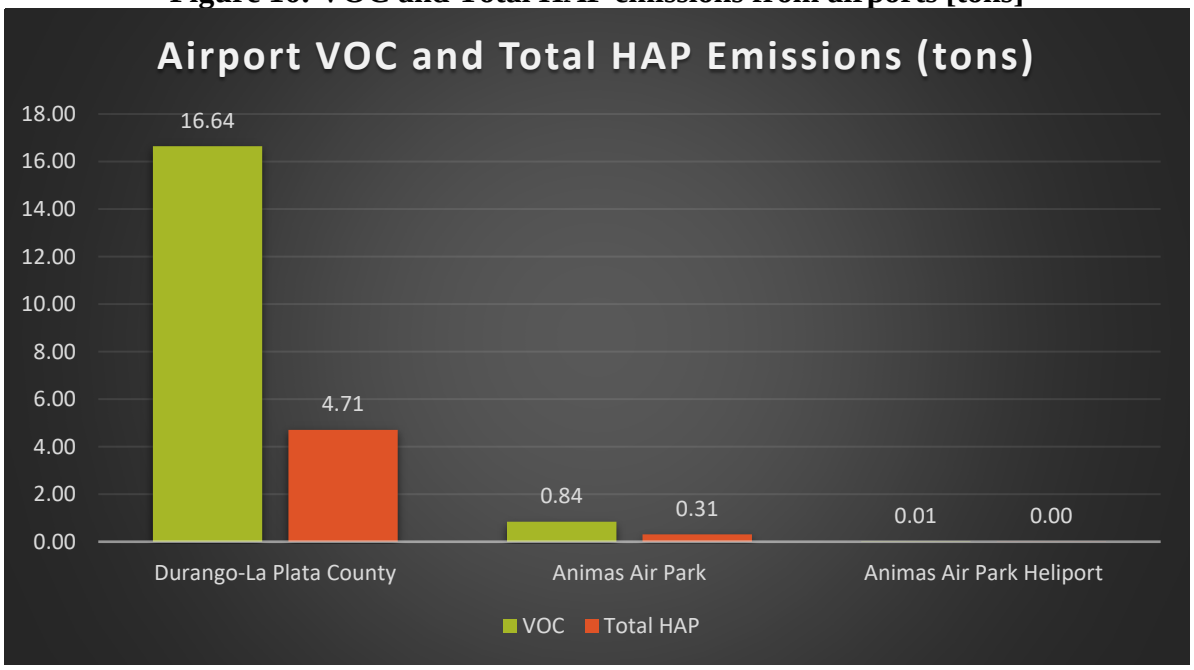


Figure 16: VOC and Total HAP emissions from airports [tons]



V. Non-Point Sources

1. Small Oil and Gas Sources

Description of Sources

For the purpose of this EI small oil and gas sources are defined as: *oil and gas sources with emissions below the thresholds that require registration under the EPA Tribal Minor New Source Review (TMNSR) Program at 40 CFR Part 49*. The majority of these sources are natural gas and oil well-sites, which are comprised of artificial lift engines, separators, filter coalescers, compressor engines, reciprocating compressors, lube oil tanks, tank heaters, dehydration units, and produced water, condensate, and oil tanks.

Data Collection

Source information for small oil and gas sources was obtained through a mandatory Clean Air Act Section 114 ICR issued by the AQP in June of 2018 to each known operator with sources operating on the Reservation. To identify the operators within the Reservation and estimate the total number of small oil and gas sources on the Reservation, the AQP compiled site and ownership data from the COGCC and Drilling Edge databases.[11,12]

[11] COGCC. (2018). Production Data. La Plata. Retrieved from http://cogcc.state.co.us/data2.html#/downloads.

[12] Drilling Edge Database (2018). Retrieved from http://www.drillingedge.com/colorado.

The ICR was the basis for collecting the information necessary to calculate emissions from small oil and gas sources and required each recipient to provide actual equipment counts and production information. Data was requested for each company's operations on the Reservation in its entirety and not specific to any single source location.

Completed ICRs were submitted by 100% of the companies that reported production on the Reservation in CY 2017 to the COGCC or Drilling Edge databases. Data obtained from the ICRs accounted for the equipment and production associated with the 2,760 known non-registered oil and gas sources on the Reservation. The AQP used ground surveys to estimate equipment counts for the remaining unreported sources.

Calculation Methodology

The AQP calculated emissions for small oil and gas sources on an equipment basis using measured data, widely accepted emission factors and emission calculation methodologies, the equipment counts reported in the ICR, and CY 2017 production data from the COGCC and Drilling Edge databases. Descriptions of how emissions were calculated for each equipment type are included later in this section.

Emissions

Criteria pollutant, HAP, and GHG emission estimations from small oil and gas sources on the Reservation in 2017 are displayed below in Table 10.

Table 10: Emissions from small oil and gas sources [tons]

Pollutant	NOx	VOC	SO_2	PM	CO	Total HAP	GHG (CO_2e)
Emissions	11,388.39	1,091.58	3.95	176.37	9,362.51	256.12	1,222,159.41

Criteria pollutant, HAP, and GHG emissions from small oil and gas sources on the Reservation by equipment type are displayed below in Figures 17 through 20.

Figure 17: Criteria pollutant and HAP emissions from small oil and gas sources [tons]

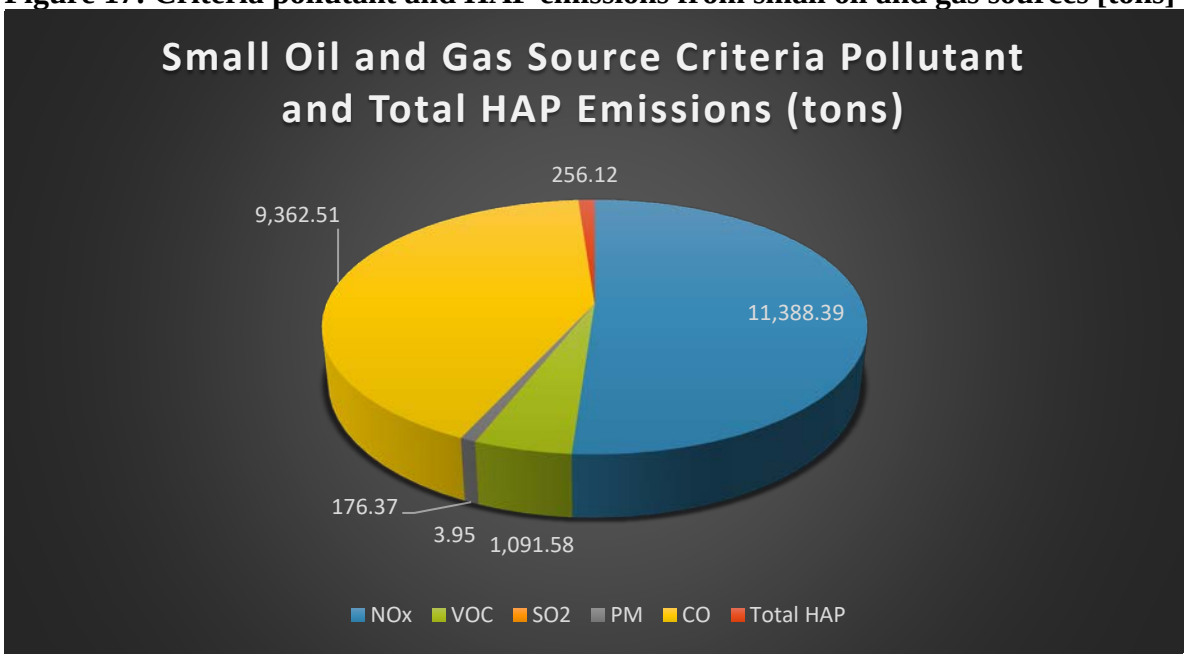
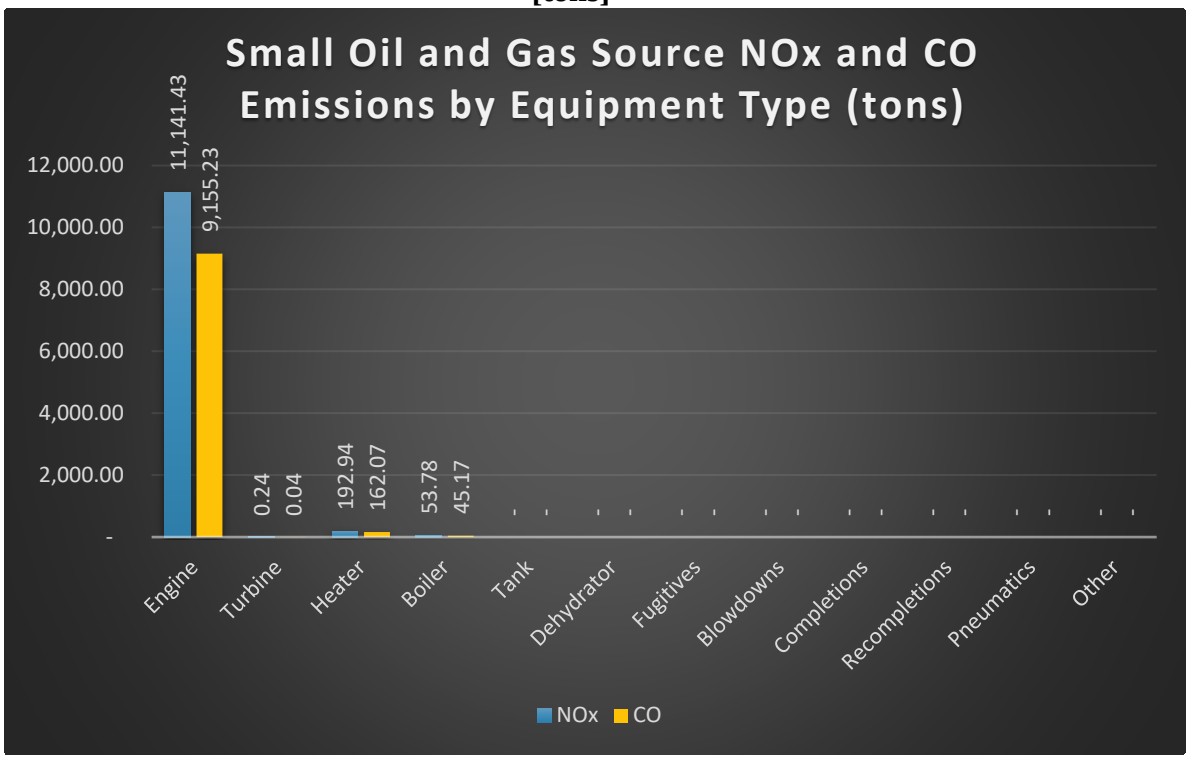
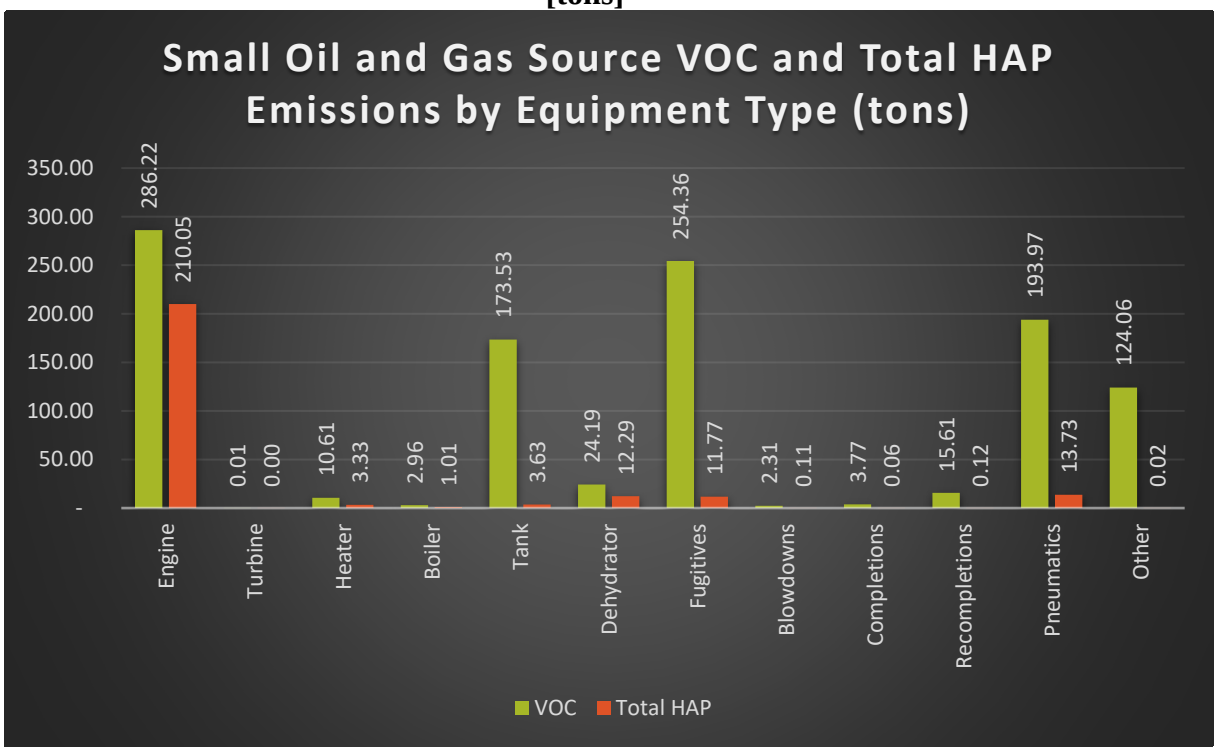


Figure 18: NOx and CO emissions from small oil and gas sources by equipment type [tons]



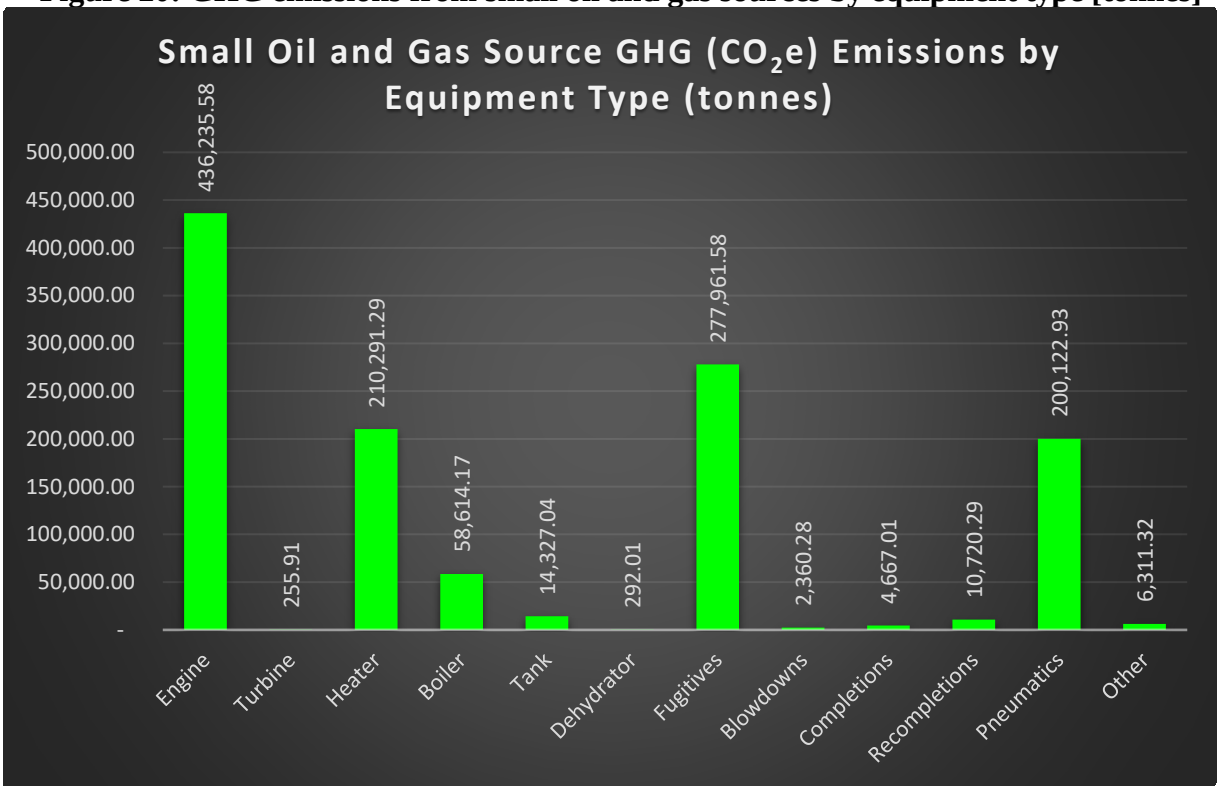
*"Other" consists of venting wells

Figure 19: VOC and HAP emissions from small oil and gas sources by equipment type [tons]



*"Other" consists of venting wells

Figure 20: GHG emissions from small oil and gas sources by equipment type [tonnes]



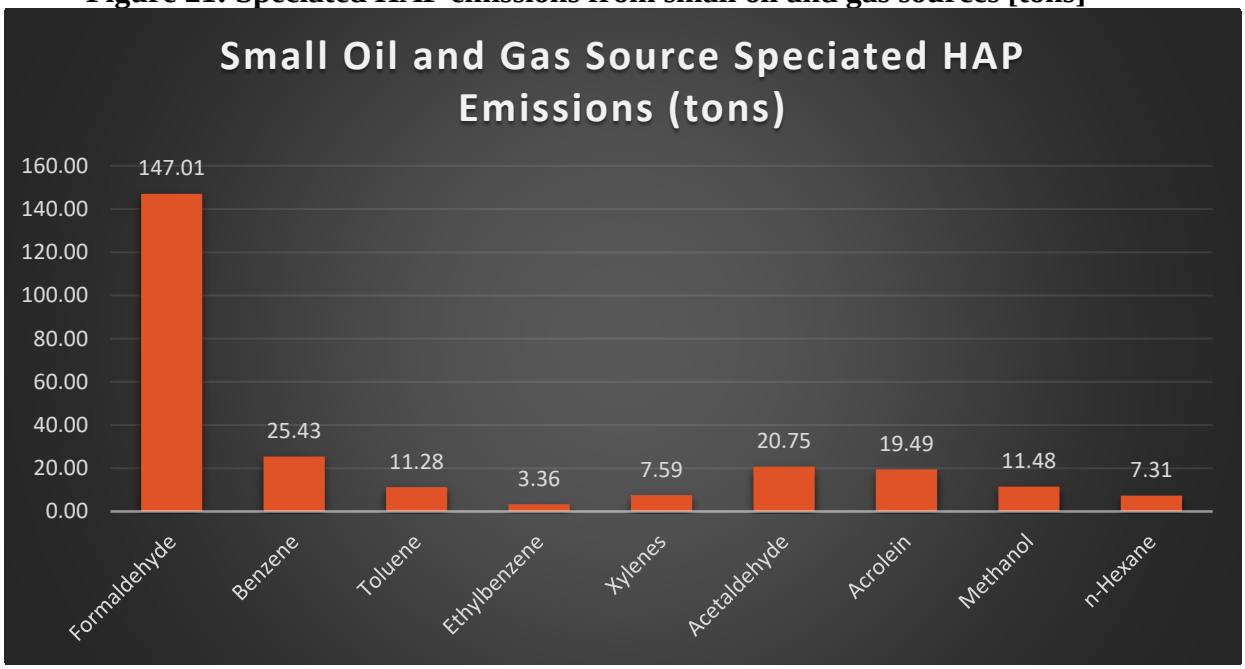
*"Other" consists of venting wells

2017 Speciated HAP emissions are displayed below in Table 11 and Figure 21.

Table 11: Speciated HAP emissions from small oil and gas sources [tons]

Pollutant	Formal-dehyde	Benzene	Toluene	Xylenes	Ethyl-benzene	Acetal-dehyde	Acrolein	Methanol	n-Hexane
Emissions	147.01	25.43	11.28	7.59	3.36	20.75	19.49	11.48	7.31

Figure 21: Speciated HAP emissions from small oil and gas sources [tons]



A. Natural Gas-Fired Reciprocating Internal Combustion Engines

Description of Units

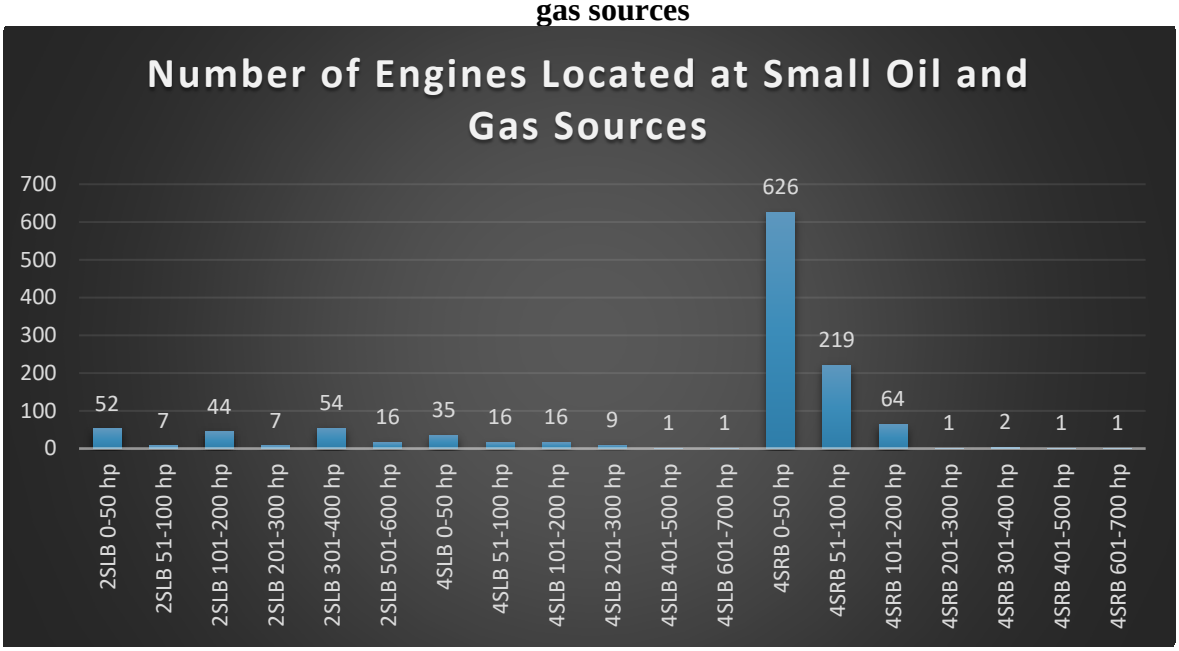
Natural gas-fired spark-ignited reciprocating internal combustion engines (RICE) are used by the oil and gas industry to compress natural gas, pump liquids, generate electricity, and to provide artificial lift. The most prevalent pollutants emitted from natural gas-fired RICE are NOx, CO, VOC, and HAP.

Data Collection

The ICR required recipients to list the total number of natural gas-fired spark-ignition and compression ignition RICE operated by their company on the Reservation. Engines were reported according to horsepower range, and engine configuration. Engine configurations included two-stroke lean-burn (2SLB), four-stroke lean-burn (4SLB), four-stroke rich-burn (4SRB), and diesel. The ICR included assumed values for engine operating hours and average brake specific fuel consumption (BSFC) and provided recipients the option to provide values more representative of their operations. A

summary of reported engines at small oil and gas sources on the Reservation in 2017 are displayed below in Figure 22.

Figure 22: Engine counts by engine configuration and horsepower at small oil and gas sources



Emission Calculation Methodology

Criteria Pollutant and HAP Emissions:

Criteria pollutant and HAP emissions were calculated for each engine configuration and horsepower rating category reported in the ICR. Emission calculations were based on the maximum horsepower of each reported horsepower range, the appropriate emission factors for stationary internal combustion sources from Chapter 3 of EPA AP-42, an assumed BSFC of 7,500 Btu/hp-hr (if the operator did not input anything more representative of their operating conditions), an assumed 100% engine operating load, and assumed operating schedule of 8,760 hours per year (if the operator did not input a different number of annual operating hours). The assumed BSFC value was derived by averaging the BSCF from all natural gas-fired engines in the Caterpillar Gas Engine Rating Pro software.[13] All emissions were calculated for uncontrolled operation. The natural gas on the Reservation contains negligible amounts of sulfur, therefore SO_2 emissions from engines are minimal.

GHG Emissions:

[13] Caterpillar, Inc. (2015). Gas Engine Rating Pro Emissions Estimation Software. Retrieved from http://www.cat.com/en_US/articles/solutions/oil-gas/gas_engine_rating_pro.html.

Greenhouse gas emissions were calculated using the default values from Tables C-1 and C-2 of 40 CFR Part 98, Subpart C and the same methodology as used for criteria pollutants and HAP.[14]

Example Calculation

Calculation of engine heat rate (MMBtu/hr) using AQP's assumed brake specific fuel consumption (Btu/hp-hr):

$$HR\ (MMBtu/hr) = BSFC\ (7500\ Btu/hp\text{-}hr)/10^{6} \times hp$$

Where:

HR = heat rating (MMBtu/hr)
BSFC = brake-specific fuel consumption
hp = engine horsepower

Engine emission calculation:

$$tpy = (EF) \times HR \times OH/2000\ pounds/ton$$

Where:

tpy = tons per year
EF = emission factor (lb/MMBtu)
HR = heat rate
OH = annual operating hours

Example NOx emissions calculation for a 200 hp four-stroke rich-burn engine operating 8,760 hours per year:

$$tpy = (2.21\ lb/MMBtu) \times (1.5\ MMBtu/hr) \times (8760\ hr)/2000\ lb/ton = 14.52\ tpy\ NOx$$

Emissions

Total criteria pollutant, HAP, and GHG emissions from natural gas-fired RICE at small oil and gas sources are displayed below in Table 12 and Figures 23 and 24.

[14] 40 CFR Part 98 - Mandatory Greenhouse Gas Reporting. (2016). U.S. Government Publishing Office. Retrieved from http://www.ecfr.gov/cgi-bin/text-idx?SID=32c4baa0d0aff54fa651d1cdb1cd7934&mc=true&tpl=/ecfrbrowse/Title40/40cfr98_main_02.tpl.

Table 12: Natural gas-fired reciprocating internal combustion engine counts and criteria pollutant, HAP, and GHG emissions for small oil and gas sources [tons]*[*]

Engine Configuration and Horsepower [hp]	Number of Engines	NOx	CO	SO_2	PM	VOC	Total HAP	GHG (CO_2e)
2SLB 0-50 hp	52	260.14	31.68	0.05	6.30	9.85	6.31	8717.25
2SLB 51-100 hp	7	72.89	8.88	0.01	1.77	2.76	1.77	2442.75
2SLB 101-200 hp	44	916.38	111.58	0.17	22.20	34.69	22.03	30708.83
2SLB 201-300 hp	7	218.68	26.68	0.04	5.30	8.28	5.31	7328.24
2SLB 301-400 hp	54	2249.31	273.89	0.42	54.49	85.15	54.60	75376.21
2SLB 501-600 hp	16	999.69	121.73	0.19	24.22	37.84	24.27	33500.54
4SLB 0-50 hp	35	304.62	151.88	0.05	0.70	7.57	5.28	9690.52
4SLB 51-100 hp	16	214.44	16.66	0.03	0.01	6.20	3.62	5583.42
4SLB 101-200 hp	16	428.89	33.32	0.06	0.02	12.40	7.46	11166.84
4SLB 201-300 hp	9	361.88	28.12	0.05	0.01	10.47	6.30	9422.03
4SLB 401-500 hp	1	67.01	5.21	0.01	0.00	1.94	1.17	1744.82
4SLB 601-700 hp	1	93.82	7.29	0.01	0.00	2.72	1.63	2442.75
4SRB 0-50 hp	626	2267.53	3816.83	0.60	19.49	30.37	32.22	108994.75
4SRB 51-100 hp	219	1589.91	2676.22	0.42	13.6	21.30	22.54	76423.09
4SRB 101-200 hp	64	929.26	1564.19	0.25	7.99	12.45	13.18	44667.38
4SRB 201-300 hp	1	21.78	36.66	0.01	0.19	0.29	0.31	1046.89
4SRB 301-400 hp	2	58.08	97.76	0.02	0.50	0.78	0.82	2791.71
4SRB 401-500 hp	1	36.30	61.10	0.01	0.31	0.49	0.51	1744.82
4SRB 601-700 hp	1	50.82	85.54	0.01	0.44	0.68	0.72	2442.75
Total	1,172	11,141.43	9,155.23	2.42	157.61	286.22	210.05	436,235.58

*GHG reported in metric tonnes.

Figure 23: CO and NOx emission from small oil and gas sources by engine type [tons]

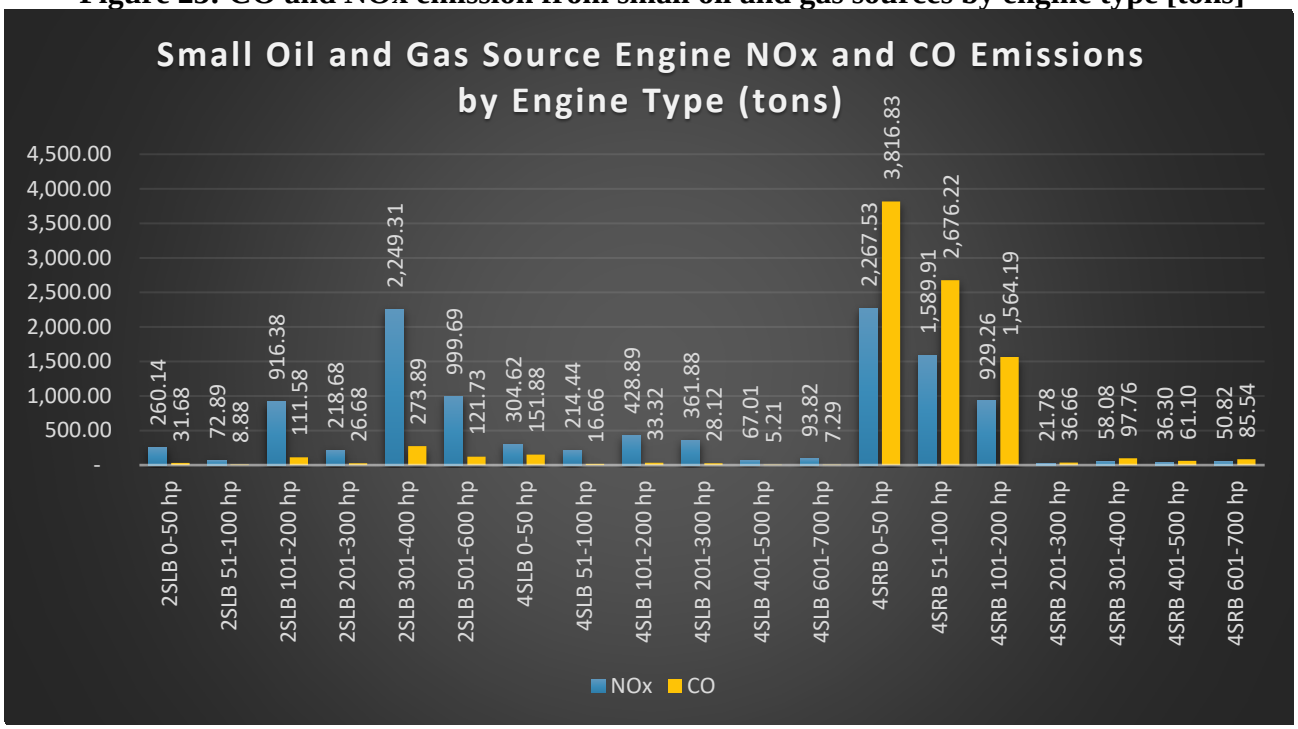
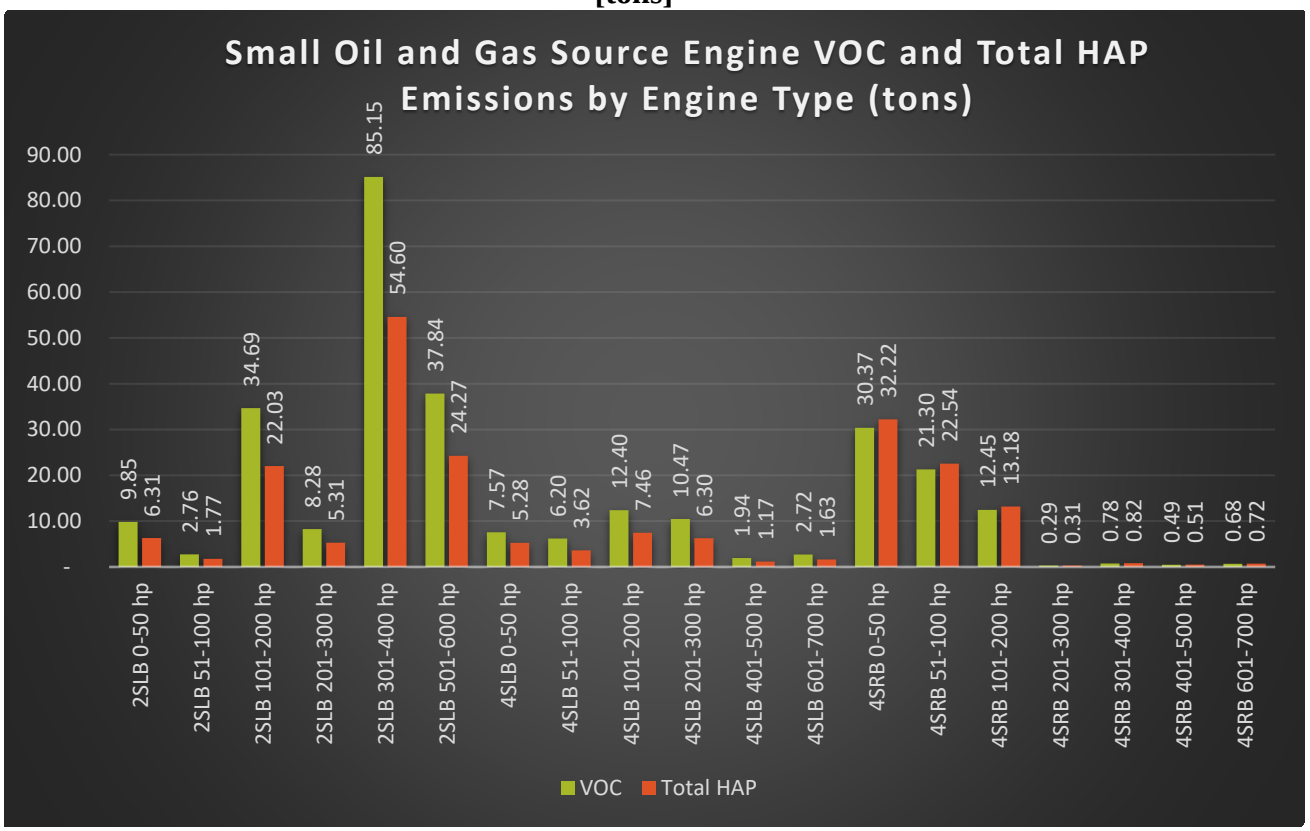


Figure 24: VOC and Total HAP emissions from small oil and gas sources by engine type [tons]



B. Stationary Natural Gas Turbines:

Description of Units

Natural gas-fired stationary turbines are a type of rotary internal combustion engine used by the natural gas industry for natural gas transmission and for electric generation. Turbines operate by introducing compressed air and fuel into a combustion chamber to generate hot gases, which are expanded into the power turbine to rotate the power shaft and create work. Two types of combustion processes are used in turbines, the first being lean-premix staged combustion in which a lean air and fuel mixture is introduced into the combustion chamber, and the second type being diffusion flame combustion where the air and fuel mixing occurs within the combustion chamber. The power shaft is used to run a centrifugal compressor for gas transmission, or to rotate an alternator when used for electric generation.

Data Collection

The ICR required recipients to list the total number of natural gas-fired turbines operated by their company on the Reservation. Turbines were reported according to horsepower or kilowatt range and, turbine configuration. Turbine configurations included uncontrolled, water-steam injection, and lean-premix. The AQP assumed turbines to operate for 8,760 hours per year. Average brake specific fuel consumption (BSFC) was assumed to be 11,000 Btu/hp-hr, as established in the document titled *Stationary Combustion Turbines in the United States*.[15] If an operator specific BSFC was reported in the ICR, this value was used in place of the assumed BSFC value.

Only one turbine was reported at a small oil and gas source in the ICR. The turbine was a 0-50 hp, lean pre-mix unit, operated 8,760 hours per year, with a BSFC of 11,000 Btu/hp-hr.

Emission Calculation Methodology

Criteria Pollutant and HAP Emissions:

Criteria pollutant and HAP emissions were calculated based on the maximum reported horsepower, emission factors for stationary gas turbines from Chapter 3.1 of EPA AP-42, 100% engine operating load, an operating schedule of 8,760 hours per year and a reported BSFC of 11,000 Btu/hp-hr. The calculation methodology for natural gas turbines is the same methodology used for reciprocating internal combustion engines and displayed in an example calculation earlier in this section. The natural gas on the

[15] McGowin (1973) Stationary Combustion Turbines in the United States.

Reservation contains negligible amounts of sulfur, therefore SO_2 emissions from turbines are minimal.

GHG Emissions:

Greenhouse gas emissions were calculated using the default values from Tables C-1 and C-2 of 40 CFR Part 98, Subpart C and the same methodology as used for criteria pollutants and HAP.

Emissions

Criteria pollutant, HAP, and GHG emissions from natural gas turbines on the Southern Ute Reservation for 2017 are displayed in Table 13.

Table 13: Turbine count and criteria pollutant, HAP, and GHG emissions at small oil and gas sources [tons]*

Turbine configuration and horsepower	Number of turbines	NOx	CO	PM_{10}	VOC	Total HAP	GHG (CO_2e)
Lean-Premix 0-50 hp	1	0.24	0.04	0.02	0.01	0.002	255.91

*GHG reported in metric tonnes.

C. Tri-Ethylene Glycol Dehydration Units

Description of Units

Tri-ethylene glycol (TEG) dehydration units are commonly used in the natural gas industry to remove entrained water from the natural gas stream to meet pipeline contract water specifications. The dehydration process begins with routing the natural gas stream through TEG in an absorber (or contactor tower) where the entrained water is absorbed by the TEG. During this step, hydrocarbons present in the natural gas stream are also absorbed in the glycol. Following the absorption step, the water saturated (rich) glycol is then distilled to drive off absorbed water before being re-circulated to the absorber. The distillation step results in emissions of VOC and HAP from the reboiler still-vent. The common still-vent HAP emissions are benzene, toluene, ethyl-benzene, and xylene.

Data Collection

The AQP collected dehydration unit counts from the ICR, which required operators to enter the total number of dehydration units operated by their company at small oil and gas sources on the Reservation during calendar year 2017. The ICR included assumed dehydration unit operating parameters and a theoretical extended natural gas analysis, as described later in this section, which could be accepted or overridden with values

more representative of the operators' operations. The theoretical extended gas analysis is displayed below in Table 14.

55 dehydration units were reported in the ICR submittals and all submittals accepted the AQP's assumed operation and natural gas composition values.

Emissions Calculation Methodology

Emissions for glycol dehydration units were calculated using the GRI-GLYCalc 4.0 model (GLYCalc), the AQP's theoretical values for dehydration unit operating parameters and natural gas composition, and the methodology outlined in the GLYCalc user's manual.[16] GLYCalc is the EPA's preferred method of quantifying emissions from glycol dehydration units for the development of tribal/state/local emissions inventories.[17]

Product of combustion emissions from dehydration unit reboilers were included in the emission totals for heaters and boilers presented in Section V.1.E. of this report to avoid double counting.

[16] Gas Research Institute. (2000). GLYCalc Version 4.0. Retrieved from http://sales.gastechnology.org/000102.html.

[17] U.S. EPA. (1995). Glycol Dehydrator Emissions Test Report and Emissions Estimation Methodology. Retrieved from https://www3.epa.gov/ttn/chief/old/efdocs/glycoldehydratortestreport.pdf.

Table 14: Theoretical extended natural gas analysis - average of 34 natural gas analyses from the Southern Ute Indian Reservation

Component	Average
Methane	92.2564%
Ethane	1.1672%
Propane	0.3324%
Isobutane	0.0548%
n-Butane	0.0811%
Isopentane	0.0200%
n-Pentane	0.0132%
n-Hexane	0.0089%
Carbon Dioxide	5.9084%
Nitrogen	0.1370%
Hydrogen Sulfide	0.0000%
Helium	0.0000%
2,2 Dimethylbutane	0.0002%
2,3 Dimethylbutane	0.0007%
Cyclopentane	0.0000%
2-Methylpentane	0.0018%
3-Methylpentane	0.0010%
2,2 Dimethylpentane	0.0000%
Methylcyclopentane	0.0000%
2,4-Dimethylpentane	0.0000%
2,2,3-Trimethylbutane	0.0000%
Benzene	0.0007%
3,3-Dimethylpentane	0.0000%
Cyclohexane	0.0013%
2-Methylhexane	0.0000%
2,3-Dimethylpentane	0.0000%
1,1-Dimethylcyclopentane	0.0000%
3-Methylhexane	0.0000%
1,t-3-Dimethylcyclopentane	0.0000%
1,c-3-Dimethylcyclopentane	0.0000%
3-Ethylpentane	0.0000%
1,t-2-Dimethylcyclopentane	0.0000%
2,2,4 Trimethylpentane	0.0002%
n-Heptane	0.0032%
Methylcyclohexane	0.0017%
Toluene	0.0012%
n-Octane	0.0018%
Ethylbenzene	0.0001%
2,3-Dimethylheptane	0.0000%
m-Xylene	0.0003%
p-Xylene	0.0002%
o-Xylene	0.0001%
n-Nonane	0.0006%
n-Decane	0.0005%
n-Undecane	0.0001%
n-Dodecane	0.0000%
n-Tridecane	0.0000%

Total:	**100.00%**
Total VOC:	**0.53%**

GRI-GLYCalc Model Input Parameters

The AQP developed assumed dehydration unit operational values for natural gas temperature, pressure, and flowrate by averaging operational information from dehydration units at non-registered oil and gas sources provided by two of the largest operators on the Reservation. An assumed extended natural gas analysis was prepared by averaging 34 individual extended gas analyses from natural gas production sector compressor stations that were reported to the AQP in Title V operating permit applications between 2012 and 2014.

The AQP's assumed values were input into the GLYCalc emissions model using a pipeline water content specification of seven pounds of water per MMscf of natural gas, 1.5% H_2O lean glycol, and assuming uncontrolled operation with no flash tank.
The assumed GLYCalc input parameter values are provided below in Table 15.

Table 15: GRI-GLYCalc Model input parameters for TEG Dehydration units at small oil and gas sources

Wet Gas Temperature [°F]	68.5
Wet Gas Pressure [psig]	353.5
Dry Gas Flowrate/ Throughput [MMscf/day]	0.9
Lean Glycol Water Content [weight % H2O]	1.5
Glycol Pump Type	Electric/ Pneumatic
Pipeline Water Content Specification [lb H2O/MMscf]	7.0

GRI-GLYCalc Model Emissions Output:

Fifty-five dehydration units were reported for small oil and gas sources in the ICR submittals and all dehydration unit emissions were calculated using the AQP's default GRI-GLYCalc emissions report. The GRI-GLYCalc report was applied once to each of the 55 dehydration units reported in the ICR, and then summed to derive a reservation-wide emissions estimate for glycol dehydration units located at small oil and gas sources.

No operator specific GLYCalc reports or dehydration unit emission estimations were provided in the ICR submittals.

Modeled GRI-GLYCalc emissions for a single TEG dehydration unit and using the AQP's assumed model inputs are provided in Table 16.

Table 16: GRI-GLYCalc Model emissions output for TEG Dehydration units [tons]

Pollutant	Uncontrolled Emissions
Methane	0.2341
Ethane	0.0226
Propane	0.0211
Isobutane	0.0076
n-Butane	0.0156
Isopentane	0.0057
n-Pentane	0.0050
Cyclopentane	0.0000
n-Hexane	0.0080
Cyclohexane	0.0048
Other Hexanes	0.0000
Heptanes	0.0000
Methylcyclohexane	0.0097
2,2,4-Trimethylpentane	0.0002
Benzene	0.0237
Toluene	0.0796
Ethylbenzene	0.0122
Xylenes	0.0998
C8+ Heavies	0.1469
Total HC Emissions	**0.6966**
Total VOC Emissions	**0.4399**
Total HAP Emissions	**0.3849**
Total BTEX Emissions	**0.2153**

Example Calculation

Example calculation for VOC emissions from ICR Reported dehydration units:

VOC Emissions (tpy) = AQP Generated GRI-GLYCalc Emissions Output x Number of 2018 ICR Reported Dehydration Units

Example:

24.2 tpy annual VOC emissions = 0.4399 tpy VOC x 55 reported dehydration units

Emissions

VOC and HAP emissions from 55 TEG Dehydration Units at non-registered oil and gas sources on the Reservation are provided in Table 17.

Table 17: HAP and VOC Emissions from 55 TEG Dehydration Units from small oil and gas sources [tons]

	Number of Dehydration Units	VOC	HAP
Totals	55	24.19	12.29

D. Liquid Storage Tanks

Description of Equipment and Emissions Categories

The oil and gas industry utilize liquid storage tanks for the storage of produced water, condensate, oil, coolants, and lubricants. The primary emissions from liquid storage tanks are methane, VOC and HAPs. Emission categories include breathing and working losses, flash emissions, and tank loadout.

Breathing and Working Losses:

Breathing losses occur when vapor expansion generated during temperature fluctuations increases the vapor pressure within a tank and cause fugitive emissions to escape from the roof vent. Light colored tanks and tank heaters can help maintain more consistent tank temperatures and reduce breathing losses by reducing vapor pressure variations. Full tanks also produce lower breathing losses due to less space for vapors to expand and escape from roof vents. Working losses occur when liquids are pumped into and out of storage tanks. The displacement of vapors within the tank and the turbulence caused by the movement of the liquid create airborne vapors. Submerged fill tanks can be effective for reducing turbulence and the creation of airborne vapors.

Flash Emissions:

Flash emissions are emissions that occur when liquid dumped from the separator into the liquid storage tank goes from higher pressure to lower pressure, resulting in the entrained gas being released as a vapor from the liquid. The gas to liquid ratio, pressure and temperature of the liquids in the separator, and the temperature and pressure of the liquid storage tank influence the amount of flashing losses.

Tank Loadout Emissions:

Tank loadout emissions are vapor loss from transport tanks that occur during the transfer of liquids from a storage tank to a transport tank. Loadout emissions occur due to the generation of vapors in transport tanks during liquid loading, the transfer of vapors from the liquid storage tank to the transport tank, and the displacement of vapors trapped in transport tanks from previous loads during loading.

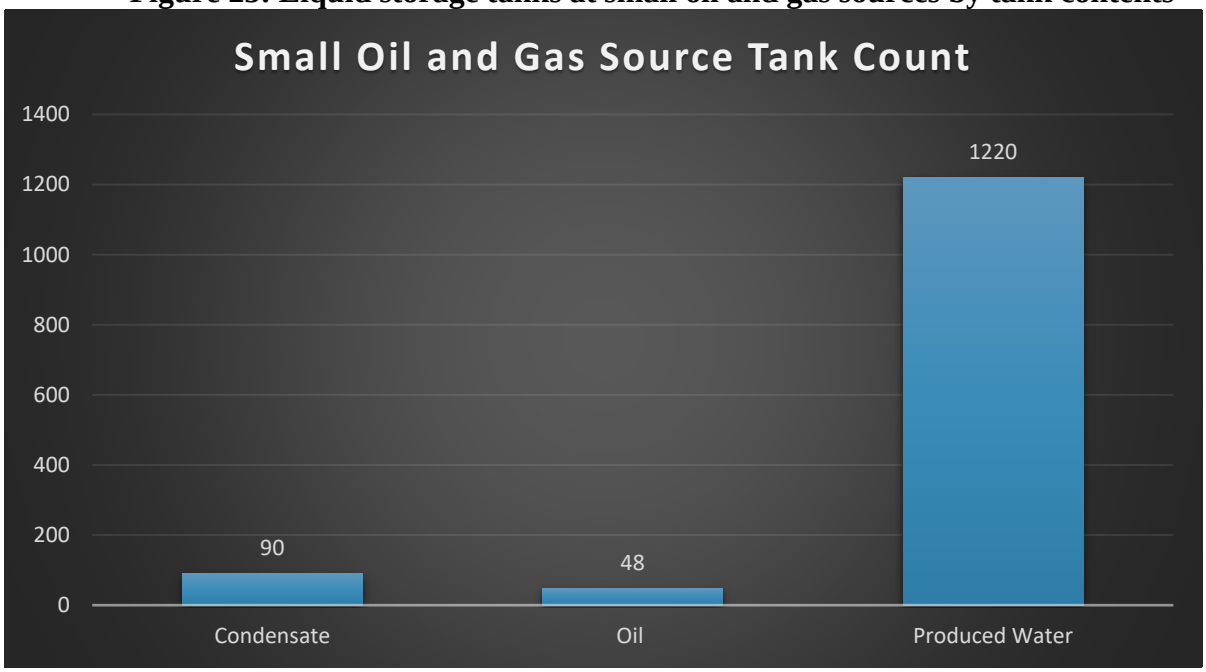
Data Collection

Tank Counts and Data for Calculating Breathing and Working Losses:

The ICR required each operator to provide the total number of produced water, condensate, and oil tanks located at their small oil and gas sources on the Reservation. Reported tank counts were based on tank capacity and contents.

A summary of tanks reported in the ICR, by tank contents, is displayed below in Figure 25.

Figure 25: Liquid storage tanks at small oil and gas sources by tank contents



The ICR also provided operators with the opportunity to override assumed data values for annual liquid throughput, Reid Vapor Pressure, and general tank characteristics with values more representative of their operations. Tank characteristics include roof type, color, condition, and presence of a tank heater. Development of liquid throughput values is discussed later in this section. Emissions from lubricant oil and glycol storage tanks were assumed to be negligible and no data was requested for these sources.

Methodology for Deriving Average Liquid Throughput Values:

The AQP developed two types of annual liquid throughput values, based on the availability of data in the COGCC database for sources in La Plata County, Colorado for CY 2017. If data were available from COGCC, the AQP used operator-specific throughput values and if the data were not available, the AQP developed assumed annual average liquid throughput values. The operator-specific annual average liquid throughput values were derived by dividing their total reported produced water and condensate/oil production numbers by the total number of sources that reported production for CY 2017.

Assumed average annual liquid throughput values were developed for operators that reported active sources to the COGCC in 2017 but did not report production. The assumed annual throughput value for produced water was derived by dividing the total

CY 2017 produced water production values reported to the COGCC database by the total number of reported sources. A combined condensate and oil assumed annual average tank throughput value was derived by dividing the total CY 2017 combined condensate and oil production value reported to the COGCC database by the number of small oil and gas sources that reported condensate or oil production. Not all companies reported condensate or oil production to COGCC, and four companies reported much larger condensate and oil production numbers than other companies producing condensate and oil. Companies that did not produce any condensate or oil and the few companies with large production numbers were dropped from the calculations to avoid skewed production numbers. Assumed annual average liquid throughput values for the produced water, oil, and condensate at non-registered oil and gas sources on the Reservation are displayed below in Table 18.

Table 18: Assumed annual average liquid throughput values for produced water, oil, and condensate tanks at small oil and gas sources*

Number of Sources Operating in 2017	2,760
2017 Oil/Condensate Produced [bbl]	15,466
2017 Water Produced [bbl]	13,992,494
Average Oil/Condensate per source per year [bbl]	0.15
Average Water per source per year [bbl]	2,186

*Throughput numbers were derived from averaging production numbers from COGCC (2017). Production Data. Retrieved from http://cogcc.state.co.us/data2.html#/downloads.

Emission Calculation Methodology

Liquid storage tank emissions are calculated based on three separate emission event categories that occur during normal tank operation at atmospheric pressures, as described earlier in this section. The emissions categories include: breathing and working losses, flash emissions, and loadout emissions. Discussions are provided below the methodologies used to calculate emissions for each tank emissions category.

Breathing and Working Losses

Data Collection and Assumptions:

Emission totals for the Reservation were developed for each individual operator by running the EPA TANKS 4.09d Emissions Estimation Software (TANKS) model once for each tank size and production type category reported in the ICR and then multiplying each modeled emissions total by the number of corresponding tanks reported.[18]

[18] U.S. EPA. (2006). TANKS 4.09d Emissions Estimation Software. Retrieved from https://www3.epa.gov/ttnchie1/software/tanks.

Reported liquid throughput values were used when provided and assumed throughput values were used when data was not provided.

Emission Calculations:

Standing, and working losses were calculated using the TANKS model and reported or assumed input data values for liquid throughput, Reid vapor pressure, and tank characteristics. An equal distribution through all tanks was assumed by dividing the total production by the total number of tanks in a given category. Produced water was assumed to consist of a mixture of 99% water and 1% condensate. Condensate was assumed to have a Reid Vapor Pressure of 10 in the TANKS model. The default values for crude oil were used for oil tank calculations. The model was run for tanks operating at atmospheric pressure and the TANKS model meteorological conditions for Albuquerque, New Mexico. Emission estimates using this geographic location may be biased slightly higher, as average temperatures in Albuquerque are warmer than within the Reservation. All tanks were assumed to have a cone shaped roof, to be gray in color, and equipped with a tank heater.

Liquid Storage Tanks Flash Emissions

Data Collection and Assumptions:

The ICR requested flash gas liberation data from produced water, condensate, and oil, to aid in calculating flash emissions. No ICR submittals were returned with flash liberation data, as this type of sampling is not common practice on the Reservation.

In September 2016, the AQP contracted a third-party vendor to perform flash liberation sampling at well-site locations operated by two different companies on the Reservation. Sampling was performed on the separator at each well-site in order to obtain a pressurized sample. In total, seven produced water samples were obtained from coal-bed methane wells of the Fruitland Coal Formation on the east and west sides of the Reservation. Two produced water samples and one condensate sample were obtained from conventional natural gas wells of the Picture Cliffs Sandstone Formation in the south central portion of the Reservation.[19] Due to the very low oil production numbers reported to the COGCC database for La Plata County Colorado in CY2017 and the absence of viable sampling locations, the AQP elected to not obtain oil flash gas samples, but to use the condensate flash sampling results to estimate oil flash emissions

Two additional condensate flash samples were provided by an operator that performed sampling in August 2016 from liquid knockout locations on a well-site gathering pipeline

[19] Air Pollution Testing, Inc. (2016). Southern Ute Indian Tribe Flash Liberation Analyses.

containing natural gas from conventional wells in the southern portion of the Reservation.

All sampling reports included an extended gas analysis, gas to water ratio, gas specific gravity, separator temperature and pressure, and ambient temperature and pressure.

Results from the six valid produced water samples were averaged to obtain assumed gas composition, gas to water ratio values, gas molecular weight, and gas component weight percent to be used in the development of emission factors for estimating storage tank flash emissions. The same methodology was applied for deriving average composition values from the three valid condensate samples.

Averaged extended gas analysis values for produced water and condensate are displayed below in Table 19 and Table 20, respectively. Averaged gas to water and gas to condensate values are displayed below in Table 21.

Table 19: Produced water flash gas analysis from small oil and gas sources on the Southern Ute Indian Reservation [Mol %]*[*]

Flash Gas Component	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Average
Hydrogen Sulfide	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
Nitrogen	0.0373%	0.0000%	1.0883%	1.0464%	2.6862%	0.5921%	0.9084%
Carbon Dioxide	72.3236%	68.4996%	36.5680%	29.7757%	5.8668%	16.3515%	38.2309%
Methane	26.6076%	31.0289%	62.2021%	67.0612%	91.4075%	76.3697%	59.1128%
Ethane	0.3200%	0.0271%	0.1155%	0.0138%	0.0119%	4.0640%	0.7587%
Propane	0.0359%	0.0231%	0.0124%	0.037%	0.0079%	1.0078%	0.1874%
Isobutane	0.0036%	0.0035%	0.0012%	0.0049%	0.0007%	0.1582%	0.0287%
N-Butane	0.0100%	0.0160%	0.0015%	0.0163%	0.0029%	0.1689%	0.0359%
2,2 Dimethylpropane	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
Isopentane	0.0028%	0.0037%	0.0003%	0.0071%	0.0005%	0.1027%	0.0195%
N-Pentane	0.0039%	0.0078%	0.0005%	0.0117%	0.0012%	0.0612%	0.0144%
2,2 Dimethylbutane	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
Cyclopentane	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0108%	0.0018%
2,3 Dimethylbutane	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
2 Methylpentane	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
3 Methylpentane	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
N-Hexane	0.4360%	0.1881%	0.0005%	1.8678%	0.0035%	0.2114%	0.4512%
Methylcyclopentane	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
Benzene	0.0085%	0.0000%	0.0000%	0.0227%	0.0000%	0.1056%	0.0228%
Cyclohexane	0.0084%	0.0000%	0.0000%	0.0418%	0.0021%	0.0481%	0.0167%
2-Methylhexane	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
3-Methylhexane	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
2,2,4 Trimethylpentane	0.0000%	0.0000%	0.0000%	0.0000%	0.0003%	0.0088%	0.0015%
Other C7's	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
N-Heptane	0.0000%	0.0000%	0.0006%	0.0000%	0.0026%	0.2092%	0.0354%
Methylcyclohexane	0.0037%	0.0000%	0.0000%	0.0081%	0.0029%	0.0865%	0.0169%
Toluene	0.0108%	0.0000%	0.0000%	0.0514%	0.0016%	0.1397%	0.0339%
Other C'8s	0.1872%	0.0000%	0.0091%	0.0196%	0.0011%	0.2745%	0.0819%
N-Octane	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
Ethylbenzene	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0049%	0.0008%
M&P Xylenes	0.0008%	0.0000%	0.0000%	0.0141%	0.0000%	0.0242%	0.0065%
O-Xylene	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
Other C9's	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
N-Nonane	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
Other C10's	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
N-Decane	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
Undecanes(11)	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
Totals:	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Total VOC:	**0.7116%**	**0.2422%**	**0.0261%**	**2.1029%**	**0.0273%**	**2.6225%**	**0.9554%**
Total HAP:	**0.4561%**	**0.1881%**	**0.0005%**	**1.9560%**	**0.0054%**	**0.4946%**	**0.5168%**

*Air Pollution Testing, Inc. (2016, September). Southern Ute Indian Reservation Flash Liberation Analyses.

Table 20: Condensate flash gas analysis from small oil and gas sources on the Southern Ute Indian Reservation [Mol %]*

Flash Gas Component	Sample 1	Sample 2	Sample 3	Average
Hydrogen Sulfide	0.000%	0.000%	0.0000%	0.000%
Nitrogen	6.633%	5.170%	0.5871%	4.130%
Carbon Dioxide	3.053%	2.564%	2.8208%	2.813%
Methane	62.466%	62.678%	50.2222%	58.455%
Ethane	14.918%	16.162%	20.4293%	17.170%
Propane	6.279%	7.028%	12.0540%	8.454%
Isobutane	1.371%	1.353%	3.2488%	1.991%
N-Butane	1.738%	1.840%	3.6206%	2.400%
2,2 Dimethylpropane	0.000%	0.000%	0.0000%	0.000%
Isopentane	0.794%	0.769%	1.7594%	1.107%
N-Pentane	0.551%	0.560%	1.0198%	0.710%
2,2 Dimethylbutane	0.000%	0.000%	0.0000%	0.000%
Cyclopentane	0.000%	0.000%	0.1844%	0.061%
2,3 Dimethylbutane	0.000%	0.000%	0.0000%	0.000%
2 Methylpentane	0.000%	0.000%	0.0000%	0.000%
3 Methylpentane	0.000%	0.000%	0.0000%	0.000%
N-Hexane	0.869%	0.748%	1.4232%	1.013%
Methylcyclopentane	0.000%	0.000%	0.0000%	0.000%
Benzene	0.105%	0.076%	0.1128%	0.098%
Cyclohexane	0.000%	0.000%	0.0000%	0.000%
2-Methylhexane	0.000%	0.000%	0.0000%	0.000%
3-Methylhexane	0.000%	0.000%	0.0000%	0.000%
2,2,4 Trimethylpentane	0.003%	0.003%	0.0291%	0.012%
Other C7's	0.000%	0.000%	0.0000%	0.000%
N-Heptane	0.557%	0.461%	0.7371%	0.585%
Methylcyclohexane	0.000%	0.000%	0.2793%	0.093%
Toluene	0.166%	0.126%	0.1768%	0.156%
Other C'8s	0.000%	0.000%	0.8700%	0.290%
N-Octane	0.304%	0.247%	0.0000%	0.184%
Ethylbenzene	0.008%	0.007%	0.0076%	0.008%
M&P Xylenes	0.071%	0.074%	0.1086%	0.085%
O-Xylene	0.000%	0.000%	0.0000%	0.000%
Other C9's	0.000%	0.000%	0.0000%	0.000%
N-Nonane	0.088%	0.088%	0.0000%	0.059%
Other C10's	0.000%	0.000%	0.0000%	0.000%
N-Decane	0.027%	0.048%	0.0000%	0.025%
Undecanes(11)	0.000%	0.000%	0.0000%	0.000%
Totals:	**100%**	**100%**	**100%**	**100%**
Total VOC:	**12.9310%**	**13.4280%**	**25.6315%**	**17.3302%**
Total HAP:	**1.2220%**	**1.0340%**	**1.8581%**	**1.3714%**

*Air Pollution Testing, Inc. (2016, September). Southern Ute Indian Reservation Flash Liberation Analyses.

Table 21: Average gas to water and gas to condensate ratios for small oil and gas sources*

Gas/Water [scf/bbl]	Gas/Condensate [scf/bbl]
3.3	16.5

*Air Pollution Testing, Inc. (2016, September). Southern Ute Indian Reservation Flash Liberation Analyses.

Flash Emission Calculation Methodology:

Flash emission factors in pounds per barrel (lb/bbl) were developed for VOC, BTEX, methane, and carbon dioxide. The measured gas oil/gas water ratio (scf/bbl) was divided by the ideal gas law conversion factor (scf/lb-mol) and then multiplied by the molecular weight of the flash gas (lb/lb-mol) and then multiplied by the weight percent of each specific component to derive the emission factors. The total emissions were calculated by multiplying the emission factors for each component by the total reported production in barrels. Tank throughput values in barrels per day were either reported values or the assumed values developed by AQP, as described previously in this section. Flash emission totals for the Reservation were developed for each individual operator using either reported or assumed liquid throughput values.

Example Emission Factor Development for Flash Emissions:

$$Emission\ Factor\ (lb/bbl) = GOR/R*MW*Wt\%$$

Where:

GOR = measured gas oil/gas water ratio (scf/bbl)
R = ideal gas law conversion factor (scf/lb-mol)
MW = molecular weight of flash gas (lb/lb-mol)
Wt% = weight percent of desired component in flash gas

Example Emission Calculation:

$$Emissions\ (ton/year) = EF*P/2000$$

Where:

EF = emission factor (lb/bbl)
P = annual production (bbl/year)
2000 = conversion factor (lb/ton)

Liquid Storage Tank Loadout Emissions

Data Collection and Assumptions:

Tank loadout emissions were calculated by conservatively assuming that all liquid storage tanks are unloaded manually by truck, and not sent through pipeline. Emission factors and emission calculations were derived from Section 5.2 of EPA AP-42 for Transportation and Marketing of Petroleum Liquids. Loading was assumed to be submerged fill and the saturation emission factor for submerged dedicated normal service was selected for calculating loading losses. Truck tank capacity was assumed to be 100 bbl per loadout event and reported or assumed liquid production numbers were used for calculating the number or loadout events per year. Each loadout event was assumed to be one-hour in duration and the assumed annual hours of unloading operations for each operator were directly correlated to the reported or assumed annual liquid production. Molecular weight and true vapor pressure values were derived from TANKS model runs for produced water and condensate.

Example Tank Loadout Emissions Calculation Methodology:

Tank loadout emissions are calculated using two separate calculations. The first equation is used to estimate the total molecular weight of loading emissions losses and a second equation is used to estimate the total emission rate on a pollutant basis. Both calculations are displayed below:

Loading Losses Calculation:

$$L = 12.46 \times (S) \times (P) \times ((MW)/T) \times (1\text{-}eff)$$

Where:

L=Loading Losses (lb/1000 gallons)
S = Saturation Factor
P = True Vapor Pressure (Pva @ T)
MW = Molecular Weight (lb/lb-mol)
T = Temperature
E = Control Efficiency of Loading

Total Emission Rate Calculation:

$$\text{Tons Per Year} = L * \text{Annual Throughput} / 2000 * Wt\%$$

Where:

L = Loading Losses (lb/1000 gallons)
Annual Throughput = annual throughput (1000 gallons)
2000 = conversion factor (lb/ton)
Wt% = Component Weight Percentage from Flash Gas Analysis

Liquid Storage Tank GHG Emissions

Tank Flash Greenhouse Gas Emissions:

Flash greenhouse gas (GHG) emissions for storage tanks were calculated using the measured data from the flash liberation sampling completed in 2016 from well-sites on the Reservation. Emission factors for Methane and Carbon Dioxide were developed as cited in the *Flash Emission Calculation Methodology* section of this report. These emission factors were multiplied by the total production and divided by a conversion factor to provide an output in tons per year. This was then multiplied by a conversion factor to convert to metric tonnes and then multiplied by the global warming potential of each component, found in 40 CFR Part 98 Table A-1, to provide an output total in metric tonnes of carbon dioxide equivalent.

Example Calculation for Tank Flash GHG Emission:

$$CH4\ (CO2e) = (EF*P/CF1)*CF2*GWP$$

Where:

EF = emission factor (lb/bbl)
P = annual production (bbl/year)
CF1 = conversion factor (2000lb/ton)
CF2 = conversion factor (0.907185 metric tonnes/ton)
GWP = global warming potential (25 for Methane)

Tank Loadout GHG Emissions

GHG emissions from tank loadout were calculated using the same methodology found in the *Liquid Storage Tank Loadout Emissions* section of this report. Once the loadout emissions, in tons per year, are determined for a GHG, it is multiplied by a conversion factor to convert it to metric tonnes. This metric tonnes number is then multiplied by the global warming potential of the individual component to provide an output in metric tonnes of carbon dioxide equivalent.

Example Tank Loadout GHG Calculations:

$$CO2e = tpy*CF*GWP$$

Where:

CO2e = carbon dioxide equivalent (metric tonnes)
tpy = emissions (tons per year)
CF = conversion factor (0.907185 metric tonnes/ton)
GWP = global warming potential of individual pollutant

Total Liquid Storage Tank Emissions

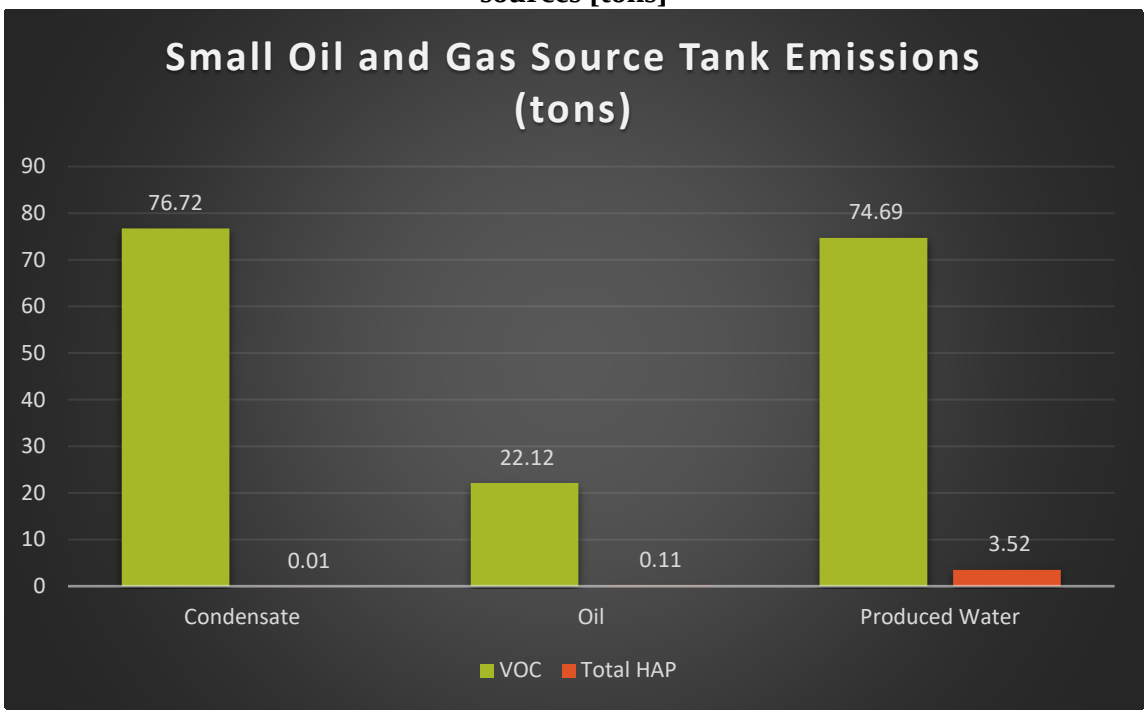
Total liquid storage tank emissions at small oil and gas sources from working and breathing losses, flash emissions, tank loadout, and GHG emissions on the Reservation are displayed in below in Table 22 and Figure 26. Emissions are displayed by tank contents.

Table 22: VOC, HAP, and GHG Emissions from liquid storage tanks at small oil and gas sources [tons]*

Tank Contents and Capacity	Tank Count	VOC	HAP	GHG (CO_2e)
Condensate	90	76.72	0.01	5.12
Produced Water	1220	74.69	3.52	14,249.88
Oil	48	22.12	0.11	72.05
Total Tank Count and Total Emissions	**1,358**	**173.53**	**3.63**	**14,327.04**

*GHG emissions reported in metric tonnes

Figure 26: VOC and HAP emissions from liquid storage tanks at small oil and gas sources [tons]



E. External Combustion Sources

Description of Sources

Natural gas-fired external combustion sources are widely used by the natural gas industry as tank heaters, heated separators, reboilers, and boilers.

Data Collection

The ICR required each operator to report the total number of heaters and boilers operated by their company on the Reservation. Heater and boiler counts were reported according to heat rate range in MMBTU/hr. Operators were also given the option to report average heater and boiler operating hours to override the AQP's assumed operating hours. A description of the AQP's assumed values is included in the emission calculation discussion.

Assumptions

If no hours of operation were reported in the ICR, AQP assumed heaters to operate 24 hours per day for half of the year (183 days per year) which equates to 4,392 hours per year. Boilers were assumed to operate for 24 hours per day, 365 days a year, which equates to 8,760 hours per year.

Emission Calculation Methodology

Criteria pollutant and HAP emissions for external combustion sources were calculated using the emission factors from EPA AP-42 Chapter 1.4 for uncontrolled natural gas-fired external combustion sources, the maximum heat rating from each heat rating category reported in the ICR, a default natural gas heating value of 1,026 Btu/scf and assumed or reported operating hours.

The AQP used the default natural gas heating value of 1,026 Btu/scf from 40 CFR Part 98 to convert the EPA emission factors from lbs/MMscf to lbs/MMBtu.

GHG emissions were calculated using the Tier 1 calculation methodology, the natural gas emission factors from Tables C-1 and C-2 of 40 CFR Part 98 and assumed or reported operating hours.

Example Calculations

Criteria and HAP Example Calculations:

$$lb/hr = (EF/HV) \times (HR)$$

Where:

EF = Emission Factor (lb/MMscf)
HV = Default Heat Value of Natural Gas fuel (Btu/scf)
HR = Heat Rate of Boiler/Heater (MMBtu/hr)

Example NOx lb/hr calculation for 0.5 MMBtu/hr natural gas-fired boiler/heater:

$$lb/hr = (100/1{,}026) \times 0.5 = 0.05$$

$$tpy = (lb/hr) \times OH/2000$$

Where:

(lb/hr) = Emission Rate
OH = Annual Operating Hours
2000 = Pounds per ton

Example NOx tpy calculation for 0.5 MMBtu/hr natural gas-fired boiler/heater operating 4392 hours per year:

$$tpy = (0.05) \times 4392/2000 = 0.1098$$

GHG Example Calculation:

GHG Calculation Methodology:

$$= EF \times HR \times CF \times GWP$$

Where:

EF = fuel specific default emission factor, from tables C-1 and C-2 of Part 98 (kg/MMBtu)
HR = heat rate (MMBtu/hr)
CF = conversion factor (lb/kg)
GWP = global warming potential

Emissions

Criteria pollutant, HAP, and GHG emissions from external combustion sources located at non-registered oil and gas sources on the Reservation for calendar year 2017 are displayed below in Table 23. Emissions are displayed by unit count and heat rating in MMBtu/hr.

Table 23: Criteria pollutant, HAP, and GHG emissions from heaters and boilers at small oil and gas sources [tons]*

Equipment Type and Heat Rating	Unit Count	NOx	VOC	SO_2	PM	CO	HAP	GHG (CO_2e)
Heaters	3343	192.94	10.61	1.21	14.66	162.07	3.33	210,291.29
Boilers	8	53.78	2.96	0.32	4.09	45.17	1.01	58,614.17
Total	**3351**	**246.72**	**13.57**	**1.53**	**18.75**	**207.25**	**4.34**	**268,905.46**

*GHG reported in metric tonnes.

F. Equipment Leaks and Fugitive Emissions

Description of Sources

Natural gas leaks from components commonly used in the natural gas industry result in emissions of methane, CO_2, VOC, and HAP. Components include: valves, pumps, pressure relief valves, connectors, flanges, and, open-ended lines. These components are ancillary equipment to many larger equipment source types including: headers, separators, heaters, filters, engines, compressors, dehydration units, and storage tanks.

Data Collection

The ICR provided operators with the option to report average fugitive component counts for single and co-located well-sites. In the absence of ICR provided component counts, the AQP relied on assumed component counts, as detailed below.

Assumptions

Fugitive component counts were assumed based on component counts for natural gas production contained in the Canadian Association of Petroleum Producers (CAPP) document titled *Guide to Calculating Greenhouse Gas Emissions*.[20] Component counts for single and co-located well-site locations are displayed below in Table 24.

Table 24: Assumed fugitive emission component counts at single and co-located natural gas well-sites

Component Type-Service	Component count for a Single well	Component count for Two co-located wells	Component count for Three Co-located wells	Component count for Four Co-located wells
Valves-Gas/Vapor	16	32	48	64
Connectors-Gas/Vapor	60	120	180	240
Open-Ended Lines-Gas/Vapor	3	6	9	12

Emission Calculation Methodology

GHG, VOC, and HAP Emission Calculations:

GHG, VOC, and HAP emissions from equipment leaks and fugitive emissions were calculated using the average emission factor approach and the gas/vapor total organic compound (TOC) emission factors for oil and gas production from Table 2-4 of EPA's OAQPS document titled *Protocol for Equipment Leak Emission Estimates.* The TOC

[20] Canadian Association of Petroleum Producers. (2003). *Guide to Calculating Greenhouse Gas Emissions.* Retrieved from http://www.capp.ca/publications-and-statistics/publications/241974.

emission factor for gas/vapor was chosen as the most representative of production on the Reservation in CY2017 and is the most conservative emission factor available. TOC emissions were calculated by multiplying the gas/vapor emission factor by component counts calculated using the *CAPP* generic fugitive component count and the number of sources entered in the ICR. Each source was assumed to operate for 8,760 hours annually. GHG, VOC, and HAP emissions were then derived by multiplying the TOC emissions by the GHG, VOC, and HAP molecular weight fraction percentages of an assumed extended natural gas analysis for the Reservation. If component counts were provided by operators in the ICR, emissions for their company's productions were calculated using their reported counts in place of the CAPP component counts.

Example Calculations

GHG, *VOC, and HAP Emission Calculation Methodology:*

GHG, VOC, or HAP Emissions = EPA OAQPS Average Emission Factor for Gas Valves x CAPP Generic Valve Count x Annual Operating Hours x (Ton/2000lb0 x weight percent (GHG, VOC, or HAP) = tpy GHG, VOC, or HAP emissions

Valves VOC Emissions (tpy) = (0.00992 lb/hr/valve) x 1000 valves x (8760 hr/yr) x (Ton/2000 lb) x (1.51%) = 0.66 tons/year

Emissions

Volatile organic compound, HAP, and GHG emissions from equipment leak and fugitive emission sources located at non-registered oil and gas sources on the Reservation for calendar year 2017 are displayed below in Table 25.

Table 25: Emissions of VOC, HAP, and GHG from equipment leaks and fugitive emission sources at small oil and gas sources [tons]*

Pollutant	VOC	HAP	GHG (CO_2e)
Emission Totals	254.36	11.77	277,961.58

*GHG reported in metric tonnes.

G. Natural Gas Driven Pneumatic Devices

Description of Sources

Natural gas-driven pneumatic controllers and pumps are used in the oil and natural gas industry for maintaining liquid levels, pressures, pressure differentials, and temperature. Many devices are designed to leak, or "bleed", natural gas and in doing so emit natural gas containing methane, CO_2, VOC, and HAP. Pneumatic devices are classified as high or

low continuous bleed controllers, intermittent bleed controllers, or zero bleed controllers.

Data Collection

The AQP assigned an assumed value for the average number of pneumatic devices located at a single wellsite from the 2014 Environmental Science and Technology report titled *Methane Emissions from Process Equipment at Natural Gas Production Sites in the United States*.[21] The assumed pneumatic device count value was provided in the ICR and operators were provided the opportunity to override the assumed value with values more representative of their operations.

Emission Calculation Methodology

Pneumatic device emissions were calculated by applying the generic natural gas emission factors found in EPA's April 2014 Report for Oil and Natural Gas Sector Pneumatic Devices to the AQP's assumed average device count or average device counts reported in the ICR.

Example Emission Calculation:

$$lb/hr = Count \times Bleed\ Rate \times R \times MW \times Y$$

Where:

Count = total number of devices
Bleed Rate = bleed rate from device (scf/hr/device)
R = Universal gas constant (lb-mol/379.4scf)
MW = molecular weight of the component (lb/lb-mol)
Y = volume fraction of component in the vented gas

Example for Methane:

$$lb/hr = 2695 \times 5.5 \times 1/379.4 \times 16.01 \times 92\% = 575.4\ lb/hr$$

$$tpy = lb/hr \times OH/2000$$

Where:
lb/hr = emission rate in pounds per hour
OH = annual operating hours

[21] Allen, D. (2014). Methane Emissions from Process Equipment at Natural Gas Production Sites in the United States: Pneumatic Controllers. *Environmental Science & Technology, 49*, 633-640. Retrieved from http://pubs.acs.org/doi/pdf/10.1021/es5040156.

2000 = pounds per ton

tpy methane = 575.4 x 8760/2000 = 2520.3 tpy

Emissions

VOC, HAP, and GHG emissions from natural gas driven pneumatic devices on the Reservation during 2017 are displayed below in Table 26.

Table 26: VOC, HAP, and GHG emissions from natural gas driven pneumatic devices at small oil and gas sources [tons]*

Pollutant	VOC	HAP	GHG (CO_2e)
Emission Totals	193.97	13.73	200,122.93

*GHG reported in metric tonnes.

H. Natural Gas Blowdowns

Description of Sources

Natural gas blowdowns are intentional and unintentional gas releases during maintenance, routine operations, and emergencies. Blowdowns occur from gas compressors, compressor startups, gas wellbores, vessels, pipelines, and various equipment.

Data Collection

The ICR requested emissions resultant from maintenance and emergency natural gas blowdowns from compressors. Due to the burden of capturing actual emissions for each blown down event at a large number of small oil and gas sources, emissions from such events are based on assumptions on the amount of gas released, the AQP's assumed extended gas analysis, and an assumed number of events anticipated during a calendar year. The ICR provided operators with the opportunity to override the AQP's assumed values with values more representative of their operations.

Assumptions

The AQP developed assumed values for the number and time duration of annual compressor blowdowns that occur per year and the volume of natural gas vented per event. Assumed values were based on the 2015 Colorado Air Resources Management

Modeling Study (CARMMS)[22]. The values assumed for 2017 are displayed below in Table 27.

Table 27: Assumed values for annual natural gas compressor blowdown events occurring at small oil and gas sources in 2017

Compressors	
Annual compressor blowdowns per compressor	2
Estimated amount of gas lost per blowdown [Mscf/event]	10

Emissions Calculation Methodology

Emissions from natural gas blowdowns were calculated using either the AQP's assumed extended gas analysis or reported natural gas analysis, and assumed or reported event frequencies, duration, and gas loss values.

Example Calculations:

tpy = Totalvented x Ideal Gas Density/2000

Where:

Totalvented = total volume of gas vented (for specific component) (scf/yr)

= (volume vented per blowdown (Mscf/event) x frequency (events/yr) x 1000scf/Mscf) x %vol of component

*Ideal Gas Density (lb/scf) = MW/(R*T)*
MW = molecular weight of the component
R = universal gas constant (0.730235 scf.atm/°R.lb-mol)
T = temperature (60 °F converted to 519.67 °R)
2000 = pounds per ton

Emissions

Emissions from natural gas blowdown activities occurring on the Reservation during 2017 are displayed below in Table 28.

[22] ENVIRON International Corp.; Carter Lake Consulting; Environmental Management and Planning Solutions. (2015). *Colorado Air Resources Management Modeling Study.* Retrieved from https://www.blm.gov/sites/blm.gov/files/documents/files/program_natural%20resources_soil%20air%20water_airco_quicklins_CARMMS2.0.pdf.

Table 28: VOC, HAP, and GHG emissions from natural gas blowdowns at small oil and gas sources [tons]*

Pollutant	VOC	Total HAP	GHG (CO_2e)
Emission Totals	2.31	0.11	2,360.28

*GHG reported in metric tonnes.

I. Well Completion and Re-completion Venting

Description of Sources

Well completions and recompletions, when not employing closed vent system techniques, also known as "green completions", release natural gas during the "flow back" stage of the process. Flow back is the stage in which drilling fluid and hydrocarbon reservoir fluids return to the surface prior to well production. Green completion techniques capture flow back materials, including natural gas.

Data Collection

The number of well completions that occurred in calendar year 2017 were obtained from the COGCC database. A total of 39 well completions occurred on the Reservation in calendar year 2017. No data were available for well recompletions in the COGCC database and an assumed recompletion value of 1% of all operating wells per year was obtained from the 2015 CARMMS.

The ICR also provided the opportunity for operators to report the number of well completion and recompletion events that occurred in calendar year 2017, including natural gas lost per event, and completion by type (conventional or green completion).

Assumptions

Fifty percent of all well completions were assumed to utilize green completion technology with no natural gas vented to atmosphere. Conventional well completions and recompletions were assumed to vent 1,000 Mscf of natural gas per event. These assumptions were derived from the 2015 CARMMS.

For well recompletions, the assumed well recompletion value of 1% of all operating wells per year was obtained from the CARMMS study and assumed to be accurate and representative of operations on the Reservation.

All completion and recompletion activities were assumed to be either conventional or green completions, based on information provided by two large natural gas operators on the Reservation. Therefore, the AQP did not estimate emissions from flaring events that

may occur during well completion or re-completion activities. Assumed well completion and recompletion values for 2017 are displayed below in Table 29.

Table 29: Assumed values for well completion and recompletion activities at small oil and gas sources*

Completion Type	Conventional	Green Technology
Percent of completions by type:	50%	50%
Estimated amount of gas vented to atmosphere per event [Mscf/event]:	1000	0
Estimated amount of gas controlled via closed loop system per event [Mscf/event]:	0	1000

*Assumed values are based on the 2015 CARMMS.

Emission Calculation Methodology

Emissions from well completion and recompletions were calculated using an assumed extended gas analysis and reported or assumed event frequencies and gas loss values. Emissions from drilling engines that are employed during well completion and re-completion activities were not calculated.

Emissions

Emissions from well completion and recompletion venting on the Reservation in calendar year 2017 are displayed below in Table 30.

Table 30: VOC, HAP, and GHG emissions from well completion and recompletion activities at small oil and gas sources [tons]*

Pollutant	VOC	Total HAPs	GHG (CO_2e)
Emission Totals	19.38	0.18	15,387.30

*GHG reported in metric tonnes.

VOC, HAP, and GHG emissions from Fugitives, Blowdowns, Completions, Recompletions, and Pneumatics are displayed below in Figure 27 and Figure 28.

Figure 27: VOC and HAP emissions from Fugitives, Blowdowns, Completions, Recompletions, and Pneumatics [tons]

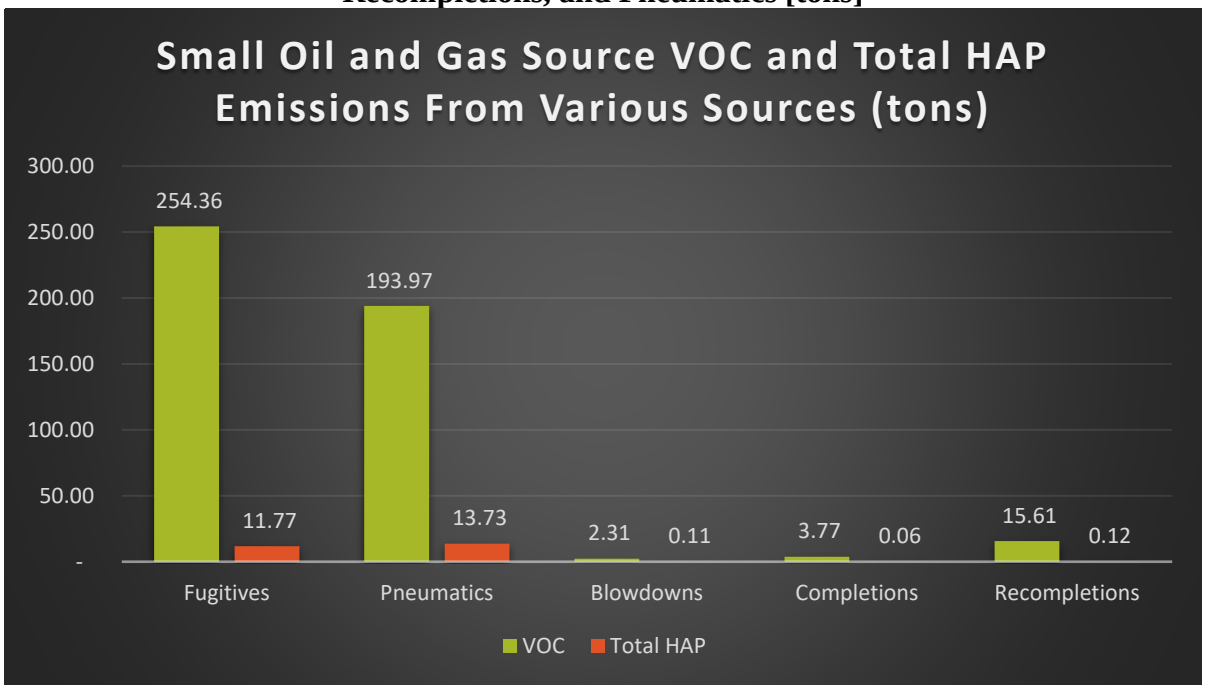
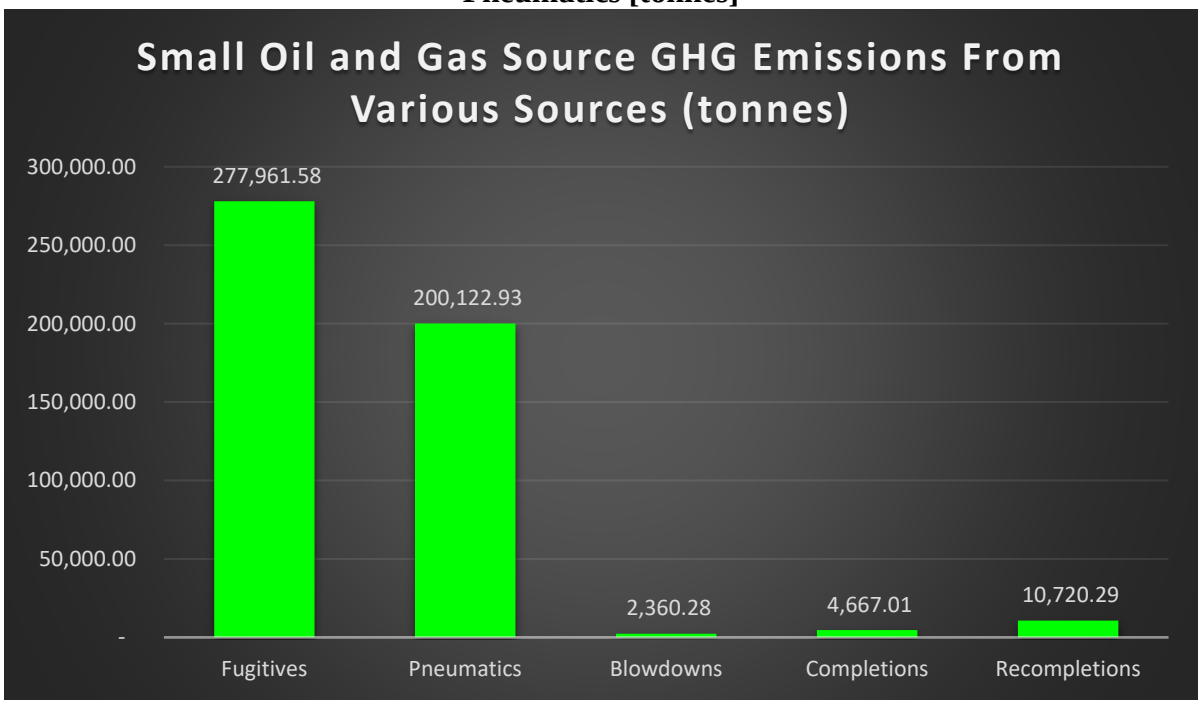


Figure 28: GHG emissions from Fugitives, Blowdowns, Completions, Recompletions, and Pneumatics [tonnes]



J. Typical Well-Site Configuration

Description

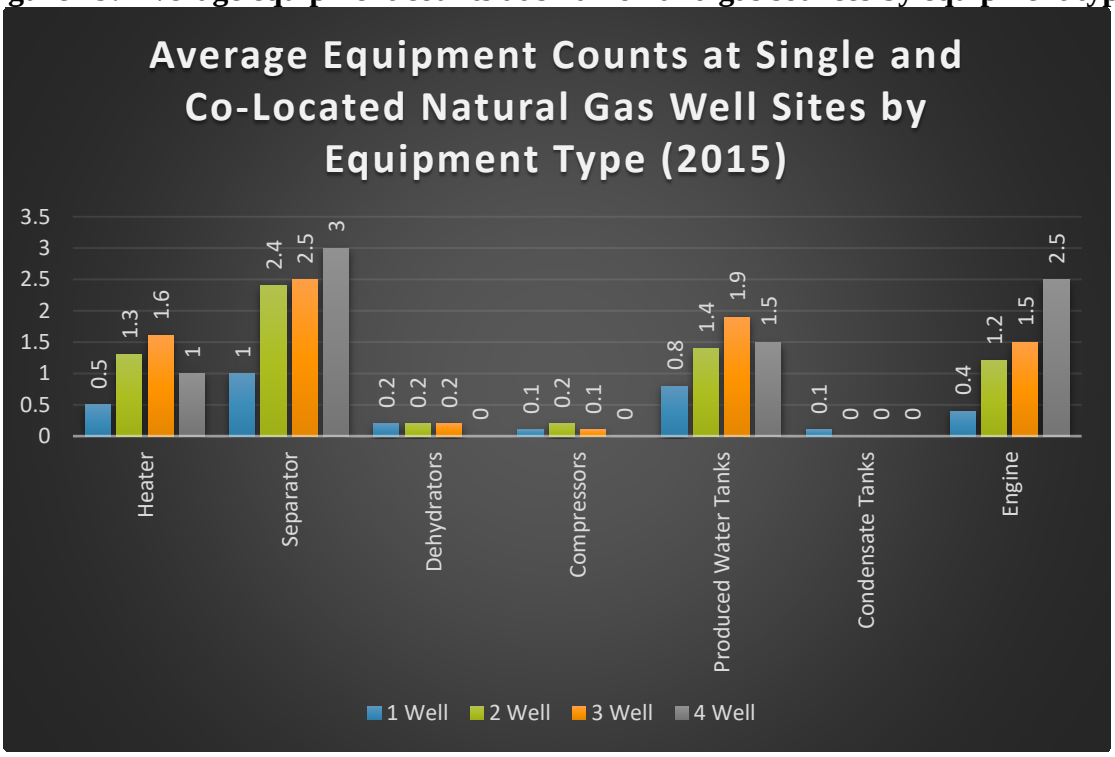
The AQP compiled equipment count information collected in the previous comprehensive emission inventory ICRs in CY 2015 to prepare average equipment type counts based on the number of natural gas wells located on a single well-pad. This information can be used to gain a better understanding of typical well-site configurations on the Reservation and to assist with estimating emissions from any proposed natural gas development schedules.

Average equipment counts at small oil and gas sources on the Reservation are displayed below in Table 31 and Figure 29.

Table 31: Average equipment counts at single and co-located well-sites at small oil and gas sources

Number of Wells per Pad	Heater	Separator	Dehydrators	Compressors	Produced Water Tanks	Condensate Tanks	Engine
1	0.5	1.0	0.2	0.1	0.8	0.1	0.4
2	1.3	2.4	0.2	0.2	1.4	0.0	1.2
3	1.6	2.5	0.2	0.1	1.9	0.0	1.5
4	1.0	3.0	0.0	0.0	1.5	0.0	2.5

Figure 29: Average equipment counts at small oil and gas sources by equipment type



2. Fruitland Formation Outcrop Natural Gas Seeps

Description of Sources

Naturally occurring methane and CO_2 seepage from outcrops of the Cretaceous Fruitland Formation (Fruitland Outcrop) contribute a significant quantity of the GHG emissions on the Reservation.

Data Collection

The data used to quantify emissions from the Fruitland Outcrop were provided to the AQP from the SUIT Department of Energy (SUIT DOE). SUIT DOE has collected outcrop seepage data on an annual basis since 2007 using an independent contractor between 2007 and 2018. The goal of the study is identification, mapping, and quantification of methane seeps on the Fruitland Outcrop. A backpack mounted, hand-held gas flux meter manufactured by WEST Systems is used to measure methane and CO_2 soil gas flux concentrations in moles per meters squared per day [mol/m² day] at thirty-five seep areas, totaling 53,352,338 square feet (1.9 miles) of ground. The flux concentrations were then used by the contractor to calculate volumetric methane and CO_2 concentrations for 2017 in MCFD.

Emission Calculation Methodology

The AQP calculated ton per year emission rates for methane and CO_2 by converting the volumetric methane and CO_2 flux concentrations from MSCF to SCFD and then dividing the flux concentrations by the ideal gas law constant and multiplying the constants by the molecular weight of each gas. GHG emissions in CO_2 equivalence (CO_2e) were calculated by multiplying methane emissions by the EPA's global warming potential factor of 25 for methane.

Example Calculations

Calculation to Convert Flux Rate in SCFD to lb/day

*lb/day = Flux/Ideal Gas Law Conversion Factor*molar mass*

Where:

Flux = Volumetric gas flux in SCFD
Ideal Gas Law Conversion Factor = 379.3 SCF/mol
*Molar Mass = g*Mol^{-1} (CH4 = 16.04; CO2 = 44.01)*

*lb/day Methane = 3,097,000/379.3*16.04 = 1,053,658 lb/day Methane*

Calculation to convert lb/day to tpy:

*tpy = lb/day/2000(lb/ton)*365 (days/year)*

Emissions

Emission calculations for methane, CO_2, and total GHG in CO_2e are displayed below in Table 32:

Table 32: Emissions of methane, CO_2, and total GHG in CO_2 Equivalent [tonnes]

Methane	2,055,414.05
CO_2	71,979.85
Total GHG (CO_2e)	2,127,393.90

3. Gas Stations

Description of Sources

There are five road and one marina gasoline service station that operated on the Reservation during calendar year 2017.

Data Collection

2017 gasoline throughput values were provided to the AQP by representatives of each gas station, and the total throughput is displayed below in Table 33.

Table 33: Annual gasoline throughput at gasoline stations located on the Southern Ute Indian Reservation [gal/yr]*

Total Gasoline Throughput:	**2,022,603.65**

*Reported throughput totals for one gasoline station included both diesel and gasoline and were corrected to include only gasoline. The method used for correcting this value is explained below in the Assumptions section.

Assumptions

AQP assumed that gasoline throughput values reported by gas station representatives are valid. One gasoline station provided an aggregate throughput value for diesel and gasoline fuel. The AQP corrected this throughput value to only include gasoline based on gasoline to diesel fuel dispensing rates published in the Statistics Portal[23].

[23] Statista: The Statistics Portal. (2018). *U.S. motor gasoline and distillate fuel oil consumption by the transportation sector from 1992 to 2017 (in 1,000 barrels per day)*. Retrieved from: https://www.statista.com/statistics/189410/us-gasoline-and-diesel-consumption-for-highway-vehicles-since-1992/

Due to the absence of emission factors for diesel fuel dispensing in EPA AP-42 Section 5.22, the AQP assumed emissions from diesel fuel dispensing to be negligible and did not calculate emissions for this activity. EPA AP-42 Section 5.2.2, also assumes a negligible methane content from gasoline evaporative emissions; therefore, AQP did not calculate GHG emissions for gas stations.

Emission Calculation Methodology

Gas station emissions were calculated using the Tribal Emissions Inventory Software Solutions (TEISS) emissions calculator for gasoline service stations.[24] The calculator employs emission factors from EPA AP-42 Section 5.2.2. Total reported fuel throughputs were input into the TEISS emissions calculator for two stages of gasoline service station emissions. Stage 1 includes underground tank filling and submerged filling. Stage 2 includes underground tank breathing and emptying, vehicle refueling displacement losses (uncontrolled), and spillage.

Emissions

Total VOC emissions from gas stations on the Reservation during 2017 are displayed below in Table 34.

Table 34: VOC emissions from gasoline dispensing stations [tons]

Pollutant	Emissions
VOC	21.34

4. Aviation Gasoline

Description of Sources

Emission estimates for aviation gasoline and the amount of lead in the leaded gasoline for counties were last developed by EPA for calendar year 2014. Lead is an additive in aviation gasoline used for piston-engine aircrafts (either general aviation or air taxi) to increase the fuel octane and prevent valve seat decline, which is a safety concern.

Data Collection

[24] Institute for Tribal Environmental Professionals. (2016). Tribal Emissions Inventory Software Solution Version 3.6.26. Retrieved from http://www7.nau.edu/itep/main/air/air_aqt_teiss.

Data was obtained from the EPA NEI for calendar year 2014. EPA's data collection methodology is described in EPA's 2008 Technical Support Document titled *Lead Emissions from the Use of Leaded Aviation Gasoline in the United States*.[25]

Assumptions

The AQP assumed EPA's calendar year 2014 EPA's aviation gasoline emission estimates for La Plata County and Animas Air Parks would be the most representative emission estimates available for calendar year 2017.

Emissions

VOC and HAP emissions from aviation gasoline usage on the Reservation in 2017 is displayed below in Table 35.

Table 35: VOC and HAP emissions from aviation gasoline [tons]*

Total VOC Emissions	**13.66**
Total HAP Emissions	**0.72**

*Emissions for aviation gasoline fueling are estimated from data sourced from the 2014 EPA National Emission Inventory Database and assumed to be realistic estimations of aviation gasoline fueling emissions for 2017.

5. Gravel Pits

Description of Sources

Twenty-one sand and gravel pits operated within the exterior boundaries of the Reservation during calendar year 2017. Data was collected from the Colorado Division of Reclamation Mining and Safety (DRMS) database[26]. The emissions from pits on the Reservation were estimated by scaling down the emissions estimates reported to the 2014 EPA NEI for La Plata and Archuleta counties for calendar year 2014.

Data Collection

The AQP identified active gravel pits located within the exterior boundaries of the Reservation through the DRMS ArcGIS data set. AQP identified the gravel, sand, and combined sand and gravel permits located within the exterior boundaries of the Reservation in La Plata and Archuleta counties. Permits with an active status for 2017

[25] U.S. EPA. (2008, October). Lead Emissions from the use of Leaded Aviation Gasoline in the United States. Retrieved from: https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1004MXJ.TXT.

[26] Colorado Division of Reclamation Mining and Safety. (2018). *Active Hardrock Permits.* Department of Natural Resources. Retrieved from http://mining.state.co.us/Reports/Pages/GISData.aspx.

were then cross-referenced with the DRMS Imaged Document data to determine if there was production in 2017. This methodology determined nineteen active gravel pits in La Plata County and two active gravel pits in Archuleta County during 2017.

Emissions

Gravel pit emissions for La Plata County were obtained from the EPA's calendar year 2014 Nonpoint Emission Inventory for gravel pits. Emission totals were reported to NEI for La Plata and Archuleta counties and not for individual gravel pits. To derive emission estimates for the Reservation, the reported emission totals for La Plata County were downscaled by the percentage of the affected acreage of active gravel pits that are located within the exterior boundaries of the Reservation. For example, 24.02% of the affected acreage of active gravel pits in La Plata County are within the Reservation boundaries, therefore, gravel pits on the Reservation account for 24.02% percent of emissions in La Plata County. Emission totals for 2017 are displayed below in Table 36.

Table 36: Emissions of PM_{10} and $PM_{2.5}$ from active gravel pits

County	Pollutant	County emissions [tpy]	Percent of active permitted pits within SUIR	Reservation Emissions [tpy]
La Plata	**PM_{10}**	175.30	24%	42.11
La Plata	**$PM_{2.5}$**	21.91	24%	5.26
Archuleta	**PM_{10}**	29.22	57%	16.62
Archuleta	**$PM_{2.5}$**	3.65	57%	2.08

6. Residential Heating

A. Description of Sources: Fireplaces and Wood Burning Stoves

Fireplaces and wood burning stoves are a significant source of residential heating within the exterior boundaries of the Reservation. The predominant types of solid fuel available are pinyon-juniper, pine, and aspen.

Data Collection

The U.S. Census 2012-2016 American Community Survey 5-Year Estimate (survey) was used to determine the number of households on the Reservation that use fireplaces or wood burning stoves for residential heating.[27] The survey estimates the total number of

[27] U.S. Census Bureau. (2018). 2012-2016 American Community Survey 5-Year Estimates. Retrieved from https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml.

households on the Reservation that used wood as a heating source during the five-year survey period.

The U.S. Energy Information Administration, Office of Energy Consumption and Efficiency Statistics' 2005 Residential Energy Consumption Survey (EIA) was used to obtain the average number of cords used within a year at an average household.[28] Table US8 of the EIA lists that an average household uses an average of 1.6 cords per year. The U.S. Census reported 925 households on the Reservation use fireplaces or woodstoves as the primary heating source.

Fireplace and wood burning residential heating data for the Southern Ute Indian Reservation in 2017 is displayed below in Table 37.

Table 37: Fireplace and wood burning residential heating data

Homes heated with wood	Average fuel use per household/year	Unit of measurement	Total number of cords used in 2017
925	1.6	Cords	1,480

Emission Calculation Methodology

Emissions for residential fireplace and wood burning stoves were calculated using the Tribal Emissions Inventory Software Solutions (TEISS) emission calculator. The calculator employed emission factors from EPA AP-42 Section 1.10.2, which may be adjusted based on the units of data input.

Example Calculation

$$\frac{925 \text{ households} \times 1.6 \text{ cord}}{\text{household}} = 1{,}480 \text{ cords (input into TEISS)}$$

Assumptions

The U.S. Census surveyed 5,156 households. 925 households with an estimated uncertainty of ± 78 use fireplaces or woodstoves for home heating. The TEISS variables chosen were conventional pre-phase I wood stove, Rocky Mountain and Pacific Coast region with Ponderosa Pine Hardwood Forest.

Emissions

[28] U.S. Energy Information Administration. (2005) Table US8 Average Consumption by Fuels Used, 2005 Physical Units per Household. Retrieved from: http://www.eia.gov/consumption/residential/data/2005/c&e/summary/pdf/tableus8.pdf.

Total criteria pollutant and GHG emissions from residential fireplace and wood-burning stoves on the Reservation in 2017 are displayed below in Table 38.

Table 38: Criteria pollutant and GHG emissions from fireplaces and wood burning stoves [tons]*

Pollutant	NOx	SO_2	PM_{10}	CO	VOC	GHG (CO_2e)
Total	2.13	0.30	23.26	175.40	40.28	6,393.54

*GHG reported in metric tonnes.

B. Description of Sources: Propane Heating

Liquid propane (LP) is the dominant source of residential heating on the Reservation and in Southwest Colorado.

Data Collection

The U.S. Census 2012 -2016 American Community Survey 5-Year Estimate was used to determine the number of households on the Reservation that use LP gas as a source of heating.

The U.S. Energy Information Administration, Office of Energy Consumption and Efficiency Statistics' 2015 Residential Energy Consumption Survey (EIA) was used to obtain the average of LP used per household. The survey estimated the average number of gallons of LP used within a year for an average household.[29] The U.S. Census reported 2,444 or 47.4% of households on the Reservation use LP gas as the primary heat source and the EIA estimated 278 gallons of LP gas are burned per year in households in Colorado.

Liquid Propane residential heating data for the Southern Ute Indian Reservation in 2017 is displayed below in Table 39.

Table 39: Liquid propane residential heating data

Homes Heated with Liquid Propane	Average Fuel Use per Household/Year	Unit of Measurement	Total Gallons used in 2017
2,444	278	Gallons	679,432

Emission Calculation Methodology

[29] U.S. Energy Information Administration. (2015). Table CE2.5 Household Site Fuel Consumption in the West Region, Totals and Average, 2015 Physical Units. Retrieved from https://www.eia.gov/consumption/.

Emissions for residential LP gas heating were calculated using the TEISS emission calculator. The calculator employed emission factors from EPA AP-42 Section 1.5.

Example Calculation

$$\frac{\text{2,444 households} \times \text{278 gallons}}{\text{household}} = \text{679,432 gallons *(input into TEISS)}$$

Assumptions

The U.S. Census surveyed 5,156 households with an estimated uncertainty of ± 147 households that use LP gas for home heating. The actual sulfur content of LP gas on the Reservation is unknown and the default sulfur content of 0.54 grains/100 ft^3 was used in the TEISS emission calculator.

Emissions

Total criteria pollutant and GHG emissions from residential LP gas usage on the Reservation in 2017 is displayed below in Table 40.

Table 40: Criteria pollutant and GHG emissions from liquid propane gas heating at residential sources [tons]*

Pollutant	NOx	SO_2	PM_{10}	CO	VOC	GHG (CO_2e)
Total	4.55	0.02	0.01	1.29	0.18	3,902.84

*GHG reported in metric tonnes.

C. Description of Sources: Natural Gas Heating

Natural gas is a prevalent residential heating fuel on the Reservation.

Data Collection

The U.S. Census 2012-2016 American Community Survey 5-Year Estimate (survey) was used to determine the number of households on the Reservation that use natural gas for residential heating. The survey estimates the total number of households on the Reservation that used natural gas as a heating source during the five-year survey period.

The U.S. Energy Information Administration, Office of Energy Consumption and Efficiency Statistics' 2015 Residential Energy Consumption Survey (EIA) was used to obtain the average of natural gas used per household. The survey estimated the average cubic feet of natural gas used within a year for an average household. The U.S. Census reported 976 or 20% of households on the Reservation use natural gas as the primary heat source and the EIA estimated 48.3 thousand cubic feet (48.3 Mcf) of natural gas are burned per year in households in Colorado.

Natural Gas residential heating data for the Southern Ute Indian Reservation in 2017 is displayed below in Table 41.

Table 41: Natural gas residential heating data

Homes Heated with Natural Gas	Average Fuel Use per Household/Year	Unit of Measurement	Total MMcf used in 2017
976	0.0483	MMcf	47.14

Emission Calculation Methodology

Emissions for residential natural gas heating were calculated using the TEISS emission calculator. The calculator employed emission factors from EPA AP-42.

Example Calculation

$$\frac{976 \text{ household} \times 0.0483 \text{ MMcf gas}}{\text{household}} = 47.14 \text{ MMcf gas (input into TEISS)}$$

Assumptions

The U.S. Census surveyed 5,156 households with an estimated uncertainty of ± 88 households that use natural gas for home heating. TEISS input variables were the EPA AP-42 default heating value of 1020 Btu/ft^3 and sulfur content of 2000 grains/ $MMft^3$.

Emissions

Total criteria pollutant and GHG emissions from residential natural gas heating sources on the Reservation in 2017 are displayed below in Table 42.

Table 42: Criteria pollutant and GHG emissions from natural gas heating at residential sources [tons]*

Pollutant	NOx	SO_2	PM_{10}	CO	VOC	GHG (CO_2e)
Total	2.27	0.01	0.18	0.97	0.13	2,568.97

*GHG reported in metric tonnes.

7. Agricultural Burning

Description of Activity

Agricultural burning is performed on the Reservation to clear irrigation ditches of vegetation and to clear pastures of weeds and vegetation prior to crop cultivation.

Data Collection

Emissions from agricultural burning on the Reservation were obtained from the 2014 NEI for La Plata County and Archuleta County. EPA reported two types of agricultural burning: Agricultural Burning Grasses, and Agricultural Burning Unspecified Crop Type. EPA did not report emissions for Agricultural Burning Unspecified Crop Type for Archuleta County. Emissions were not included in this emissions inventory for Montezuma County due to only 0.2% of the county falling within the Reservation boundaries.

Emission Calculation Methodology

Emissions obtained from the NEI for La Plata and Archuleta County were scaled down proportionally to the percentage of land in La Plata and Archuleta counties that fall within the exterior boundaries of the Reservation. 38.9% and 29.5 % respectively.

Assumptions

AQP assumes the methods and calculations used to develop emissions from agricultural burning are valid and acknowledges that the process used to reduce emissions for the Reservation could result in a slight under or overestimation of emissions. It is also assumed that emissions from agricultural burning from the 2014 NEI are realistic estimations that occurred in 2017.

Emissions

Criteria pollutants, NH_3, and HAP emission estimates from agricultural burning that occurred within the exterior boundaries of the Reservation in 2017 are displayed below in Table 43.

Table 43: Criteria pollutant, NH_3, and HAP emissions from agricultural burning [tons]*

Pollutant	PM_{10}	$PM_{2.5}$	CO	NOx	NH_3	SO_2	VOC
TOTAL	2.19	1.61	12.61	0.30	0.87	0.09	0.74

*Emissions for agricultural burning were estimated from data retrieved from the 2014 EPA National Emission Inventory Database and are assumed to be realistic estimations of agricultural burning emissions that occurred in 2017.

VI. Mobile Sources

Description of Sources

Mobile source emissions are generated from on-road vehicles and non-road engines including lawn equipment, recreational vehicles, agricultural equipment, construction equipment, etc.

1. On-Road Mobile Sources

AQP estimated emissions from gasoline, diesel, compressed natural gas (CNG), and ethanol fueled on-road mobile sources, such as motorcycles, passenger cars, passenger trucks, light commercial trucks, transit buses, school buses, refuse trucks, single unit land and short-haul trucks, motorhomes, and combination short-haul trucks.

Data Collection

Hourly humidity and temperature data were obtained from the two SUIT Ambient Air Monitoring stations, Ute 1 and Ute 3. The humidity and temperature data were used to calculate hourly averages for each month of the year. The hourly average values for each month were then used as meteorology data inputs into the EPA MOVES2014a (MOVES) emission modeling software. [30]

Vehicle miles traveled (VMT) data (by vehicle type) were obtained from the 2014 NEI County Database (CDB). Fuel type data for on-road vehicles was obtained from the 2014 NEI National Database (NDB) and no adjustments to the data set were necessary, since fuel type usage was assumed to be the same across the Reservation.

Emission Calculation Methodology

Data values were input into the MOVES model to calculate mobile source emissions individually for both La Plata and Archuleta counties. Data adjustments were made to the emission totals for each county based on the percentage of road miles in La Plata and Archuleta County that fall within the exterior boundaries of the Reservation, as determined from GIS shapefiles obtained from the La Plata and Archuleta County GIS departments.[31,32] The data adjustment resulted in a reduction of the emissions to 34.65% and 17.24% for La Plata and Archuleta Counties, respectively. No significant roads on the Reservation are located in Montezuma County, and therefore AQP assumed on-road emissions for Montezuma County to be negligible. The AQP determined that 947.3

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[30] U.S. EPA Moves 2014a. (2018). Retrieved from https://www.epa.gov/catc/clean-air-technology-center-products#software.

[31] La Plata County. (2018). *Roads.* GIS/Mapping. Retrieved from ftp://ftp.laplata.co.us/shapefiles/.

[32] Archuleta County. (2018). *Roads - Archuleta County.* GIS. Retrieved from http://www.archuletacounty.org/504/Download-GIS-Data.

miles of roads are within the Reservation boundaries. The AQP later combined the two model output data sets to obtain Reservation emission totals. MOVES calculated emissions for running exhaust, engine start exhaust, brake wear and tire wear from mobile sources fueled by gasoline, diesel, CNG and ethanol. Data outputs were organized by road type and pollutant.

Assumptions

AQP assumed data from the 2014 NEI to be the best available data for 2017 and the emissions estimations from MOVES to be correctly calculated and realistic.

Emissions

Criteria pollutant emissions from on-road mobile sources on the Reservation in 2017 are displayed below in Table 44.

Table 44: Criteria pollutant emissions from on-road mobile sources [tons]

Pollutant	CO	NOx	VOC	PM_{10}	$PM_{2.5}$
Emissions	2,627.19	394.23	277.89	20.38	18.24

2. Non-Road Mobile Sources

Non-road mobile sources contribute a significant portion of the NOx and CO emissions from mobile sources. Non-road mobile sources on the Reservation include agricultural equipment, construction and mining equipment, lawn and garden equipment, and recreational equipment.

Data Collection

Hourly humidity and temperature data were obtained from the two SUIT Ambient Air Monitoring stations, Ute 1 and Ute 3. The humidity and temperature data were used to calculate hourly averages for each month of the year. The hourly average values for each month were then used as data inputs into MOVES emission modeling software.

Fuel type data for non-road sources were obtained from the 2014 NEI NDB and used as the fuel data inputs in MOVES.

Assumptions

AQP assumed data from the 2014 NEI to be the best available data and the emissions estimations from MOVES to be correctly calculated and realistic.

Emission Calculation Methodology

AQP performed one MOVES model run for non-road sources for La Plata and Archuleta County each. MOVES outputs emissions for weekdays and weekend days for each month. Emissions were multiplied by the amount of weekday and weekend days per month. AQP reduced emissions totals for La Plata and Archuleta County to 38.9 % and 29.5% respectively, based on the portion of the counties that are within the exterior boundaries of the Reservation.

Emissions

Criteria pollutant emissions from non-road mobile sources on the Reservation in 2017 are displayed below in Table 45.

Table 45: Criteria pollutant emissions from non-road mobile sources [tons]

Pollutant	CO	NOx	VOC	PM_{10}	$PM_{2.5}$
Emissions	1,215.65	145.03	206.79	16.46	15.62

VII. Events

1. Wildland Fires and Prescribed Burns

Description of Activity

The forest on the Reservation is predominantly comprised of pinyon-juniper woodlands with ponderosa, gambel oak, aspen and sub-alpine forest at higher elevation areas. The forest is prone to wildfire and prescribed burns are utilized as a forest management strategy to help prevent catastrophic fires, improve wildlife habitat, and improve overall forest health. Wildfires and prescribed burns can be significant sources of air pollution on the Reservation and the Four Corners area.

Data Collection

Wildland and prescribed burn fire (forest fire) data for calendar year 2017 were obtained from the Bureau of Indian Affairs (BIA) and the Southern Ute Agency Fire Management Division.[33] The initial data identified 35 fires (31 wildfires and 4 prescribed fires). Data sets included type of fire, latitude and longitude of fire perimeter, and acres burned.

Emission Calculation Methodology

[33] Bureau of Indian Affairs Fire Management. (2017). *Southern Ute 2017 Fire Occurrence*

Forest fire emission estimates were calculated using the USFS BlueSky Playground web tool (BlueSky).[34] BlueSky is comprised of several internal USFS datasets and modeling programs, including the Fuels Characteristic Classification System fuel information dataset (FCCS), the CONSUME3 fuel consumption model, and the FEPS emission factors model.

Forest fire data including latitude and longitude and acres burned are input into BlueSky and BlueSky selects the correct default model input values based on the fire location. Input values include available fuel load, fuel consumed, emission factors, and meteorological forecast data. "Dry" was selected for the fuel moisture value. Forest fire event by FCCS fuel bed type are displayed below in Table 46.

Table 46: Forest fire occurrence by fuels characteristic classification system, fuel bed type, and acres burned

FCCS Fuel Bed Description	Number of Fires	Acres Burned
Ponderosa Pine Savanna	5	200.1
Interior Douglas-Fir-Interior Ponderosa Pine/Gamble Oak Forest	1	0.3
Pinyon-Utah Juniper Woodland	28	19.7
Sagebrush Shrubland	1	0.1
Totals	**35**	**220.2**

Emission Equations

Emissions = (Area burned) x (Fuel Load Available) x (Fuel Consumed (Burn Efficiency)) x (Emission Factors)

Mass of Emissions =
Area burned (input from AQP datasets)
Fuel Load Available (updated FCCS map)
Fuel Consumed (CONSUME3)
Emission Factors (FEPS plus HAPs)
Bluesky Playground Framework

Assumptions

Collected and reported fire related data is assumed to be accurate and to be the best data available. BlueSky is assumed to function as intended and to select the proper fuel characteristics from the USFS FCCS map when latitude and longitude coordinates are input into the model.

[34] U.S. Forest Service AirFire Research Team. (2016). *BlueSky Playground (Version 2.0 beta)*. Retrieved from http://playground.airfire.org/home.php.

Emissions

Total criteria pollutant, NH_3 and GHG from prescribed burns and wildland fires that occurred within the exterior boundaries of Reservation boundaries in 2017 are displayed below in Table 47.

Table 47: Criteria pollutant, NH_3, and GHG emissions from prescribed burns and wildland fires [tons]*

Pollutant	PM_{10}	$PM_{2.5}$	CO	NOx	NH_3	SO_2	VOC	GHG (CO_2e)
Total	13.86	13.01	50.99	0.30	0.60	0.14	17.25	728.76

*GHG reported in metric tonnes.

VIII. Biogenic

Biogenic processes of trees, vegetation, soil, and microbial activities generate VOC, NOx, CO, and HAP emissions. EPA estimates biogenic emissions for triennial inventory years, with the last estimation performed for calendar year 2014.

Assumptions

The AQP assumed the emission estimations prepared by EPA to be performed correctly and to be the best available emissions estimates for 2017.

Emission Calculation Methodology

Biogenic emissions estimated for La Plata and Archuleta County were prepared by EPA using the EPA's Biogenic Emission Inventory System and Biogenic Emissions Landuse Database.[35] AQP obtained the 2014 emission estimates for La Plata and Archuleta counties from the 2014 NEI. Emissions estimates for Montezuma County were not included in this emissions inventory due to only 0.2% of the county falling within the Reservation boundaries.

County wide emissions were reduced for La Plata and Archuleta County to 38.9% and 29.5% respectively, based on the area of each county that is located within the exterior boundaries of the Reservation.

Emissions

[35] U.S. Environmental Protection Agency. (2009). Biogenic Emission Inventory System. Retrieved from https://www.epa.gov/air-emissions-modeling/biogenic-emission-inventory-system-beis.

Criteria pollutant and HAP emissions from biogenic sources on the Reservation in 2017 are displayed below in Table 48.

Table 48: Criteria pollutant and HAP emissions from biogenic sources [tons]*

Pollutant	CO	NOx	VOC	HAP
Emissions	2,018.41	146.05	11,932.16	1,532.26

*Emissions for biogenic sources were estimated from data retrieved from the 2014 EPA National Emission Inventory data and are assumed to be realistic estimations of biogenic source emissions for 2017.

IX. Summary

1. Emissions Sources

Reservation emissions presented in this inventory are distributed between point, non-point, mobile, and biogenic sources.

A. Point Sources

There are four categories of point sources including:

1) Title V permitted oil and gas sources,
2) TMNSR permitted and true minor oil and gas sources,
3) Municipal solid waste landfills, and
4) Airports.

B. Non-Point Sources

There are eight categories of non-point sources including:

1) Small oil and natural gas sources,
2) Fruitland Formation Outcrop natural gas seeps
3) Gasoline stations,
4) Aviation gasoline dispensing,
5) Gravel pits,
6) Residential heating,
7) Fire events (wildland fires and prescribed burns), and
8) Agricultural burning.

C. Mobile Sources

Mobile sources are divided into two categories:

1) On-road, and

2) Non-road.

D. Biogenic Emissions

Biogenic emissions encompass all non-man-made emission sources.

2. Emission Inventory Findings

Oil and natural gas production and mid-stream transmission are the predominant industries on the Reservation. Of all the quantified emission categories, oil and gas contributed the most significant quantities of NOx, CO, SO_2 and PM_{10} to the airshed during 2017. Oil and gas related activities accounted for 18,695.68 tons, or 96% of the total NOx emissions quantified in the emission inventory, 15,464.33 tons, or 71% of the total quantified CO emissions, 63.98 tons, or 60% of the total quantified SO_2 emissions, and 229.68 tons, or 60% of the total quantified PM_{10} emissions. GHG emissions from the oil and gas sector were calculated to be 4,139,484.44 metric tons, or 66% of total Reservation emissions. A summary of 2017 criteria pollutant, HAP, and GHG emissions by source category is displayed below in Table 49.

Table 49: Criteria pollutant, HAP, and GHG emissions on the Southern Ute Indian Reservation [tons]*

Source Category	NOx	VOC	SO_2	PM_{10}	CO	Total HAP	$PM_{2.5}$	GHG (CO_2e)
Point Sources								
Title V oil and gas	2,381.89	947.55	28.62	75.97	2,388.07	298.40	-	1,453,124.10
Synthetic minor oil and gas	315.97	165.94	5.84	3.78	206.10	35.61	-	98,310.54
True minor oil and gas	4,609.43	897.09	25.56	52.36	3,507.64	298.65	-	1,365,890.40
Municipal Solid Waste Landfills	-	6.46	-	2.30	0.21	2.49	1.38	14,379.88
Airports	34.87	17.50	4.28	4.51	198.43	5.02	3.82	-
Permitted Point Sources	23.79	0.81	37.17	13.03	6.97	0.05	1.94	29.21
Total Point Source Emissions	**7,365.96**	**2,035.36**	**101.48**	**151.95**	**6,307.43**	**640.22**	**7.13**	**2,931,734.13**
Non- Point Sources								
Small oil and gas sources	11,388.39	1,091.58	3.95	97.57	9,362.51	256.12	78.80	1,222,159.41
Fruitland Formation Outcrop Natural Gas Seeps	-	-	-	-	-	-	-	2,127,393.90
Gas Stations	-	21.34	-	-	-	-	-	-
Aviation Gasoline	-	13.66	-	-	-	-	-	-
Gravel Pits	-	-	-	58.73	-	-	7.34	-
Residential Heating	8.95	40.59	0.34	23.45	177.66	-	23.26	12,865.35
Fire Events	0.30	17.25	0.14	13.86	50.99	-	13.01	728.76
Agricultural Burning	0.30	0.74	0.09	2.19	12.61	-	1.61	-
Total Non-Point Source Emissions	**11,397.94**	**1,185.17**	**4.52**	**195.80**	**9,603.77**	**256.12**	**124.02**	**3,363,147.42**
Mobile Sources								
Mobile Sources	539.26	484.68	-	36.84	3,842.84	-	33.86	-
Biogenic								
Biogenic	146.06	11,932.16	-	-	2,018.41	1,532.26	-	-
Reservation-Wide Emissions Totals								
Total:	**19,449.22**	**15,637.36**	**106.00**	**384.58**	**21,772.45**	**2,428.60**	**165.02**	**6,294,881.55**

*GHG gas emissions reported in metric tonnes.

NOx, CO, and VOC emissions by source category on the Reservation in 2017 are displayed below in Figures 30 and 31.

Figure 30: NOx and CO emissions by source category [tons]

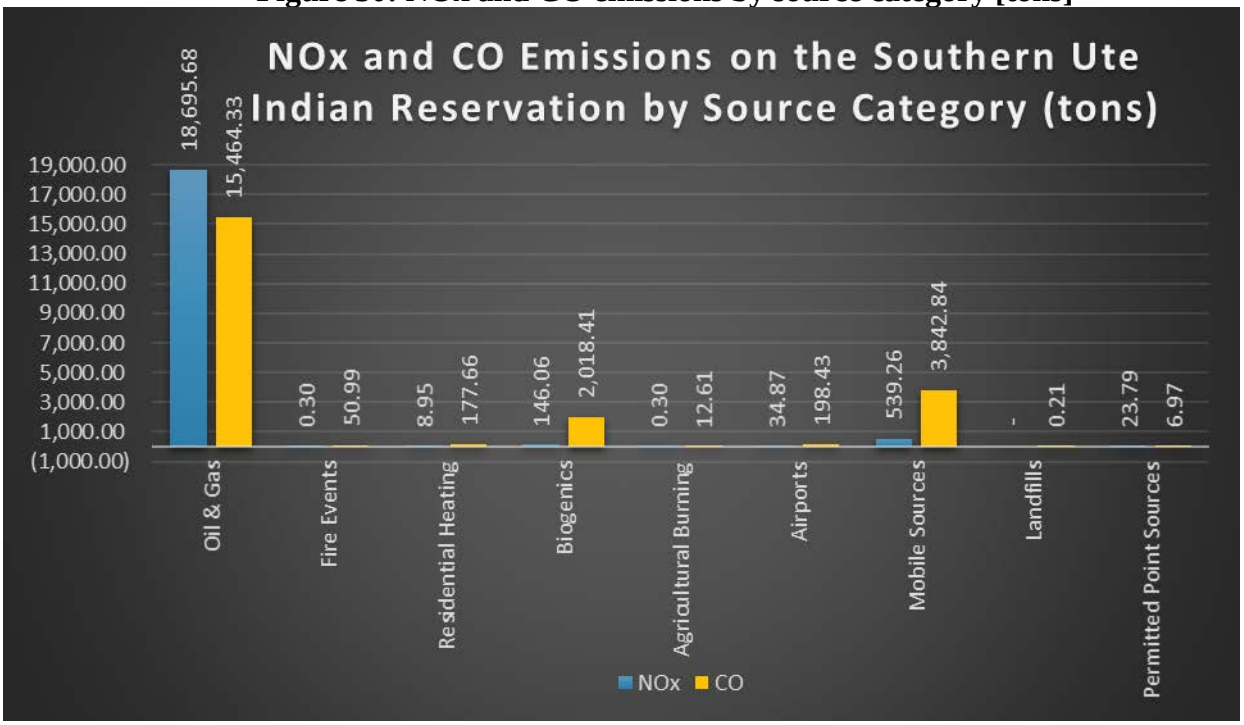
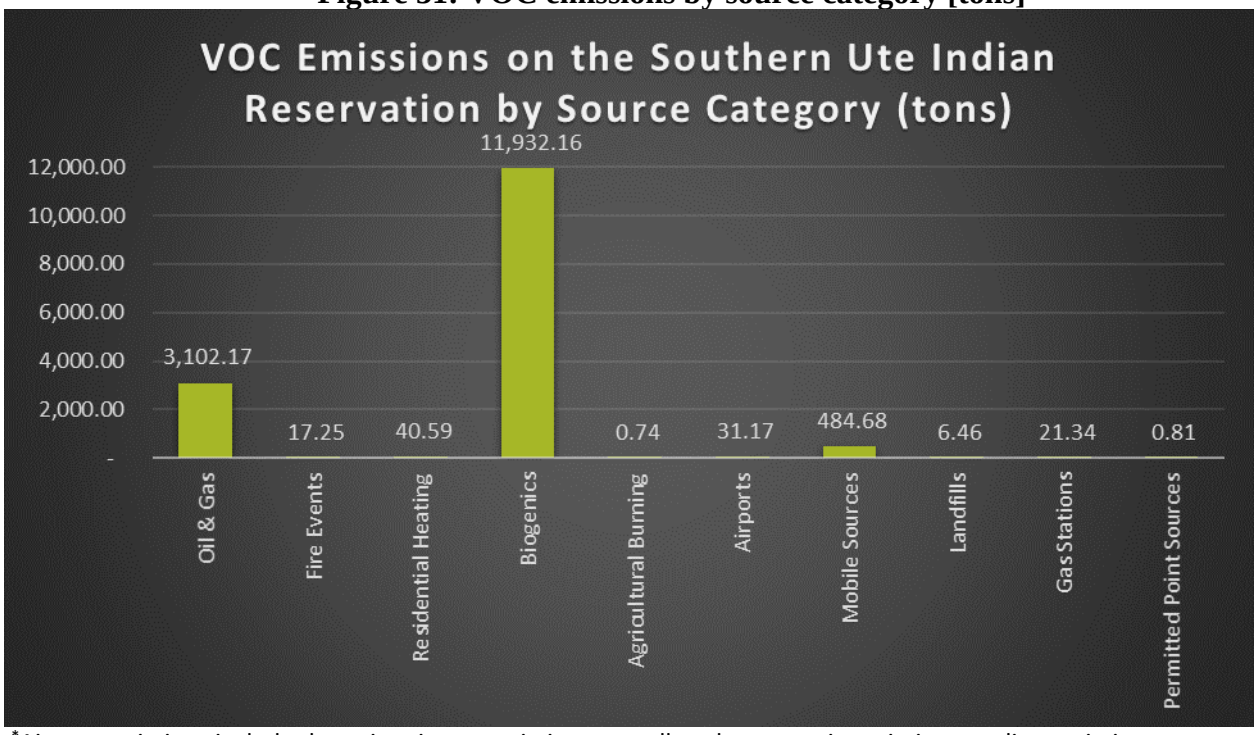


Figure 31: VOC emissions by source category [tons]*



*Airport emissions include the point airport emissions as well as the non-point aviation gasoline emissions.

Biogenic sources are the most significant source of VOCs and HAPs emissions to the airshed. VOC emissions from this category account for 76% of the total VOC emissions to the airshed at 11,932.16 tons. HAP emissions were 63% of emissions to the airshed at 1,532.26 tons.

Due to the lack of accurate emission factors and reliable data, GHG emissions were not estimated for every category presented in this inventory. Several categories that were not evaluated or quantified, such as mobile sources and biogenic sources, would be expected to contribute significant emissions of GHG. However, of the total GHG quantified, oil and natural gas activities account for 66% of the total GHG at 4,139,484.44 metric tons in CO_2e. Natural gas seeps from the Fruitland Formation Outcrop account for 34% of the total GHG at 2,127,393.90 metric tons in CO_2e.

3. Oil and Gas Emissions Summary

The bulk of the emission sources within the point source category are larger emission sources such as natural gas compressor stations, central delivery points, treating plants, and processing plants. Combined, the Title V, permitted TMNSR, and true minor sources represent the bulk of non-biogenic VOC and HAP emissions. VOC emissions from oil and gas point sources account for 54% of the total airshed, non-biogenic VOC emissions at 2,010.58 tons and 71% of the total non-biogenic HAP at 632.66 tons. These source categories also contribute 57% of the total SO_2 emissions to the airshed at 60.03 tons.

Within the oil and gas sector, non-point source, small oil and gas sources such as production well sites, contribute the most NOx, CO, and PM_{10} emissions to the airshed in contrast to the larger Title V, permitted TMNSR, and true minor sources. This is due to the large number of non-registered oil and gas sources, 2,760 sites, operating within the exterior boundaries of the Reservation. This category alone accounts for 59% of the total airshed NOx emissions at 11,388.39 tons and 43% of the total CO emissions at 9,362.51 tons. Emissions of particulate matter 10 micrometers or less in diameter were 97.57 tons, or about 25% of the total airshed emissions. Emissions totals from oil and gas sector sources are displayed below in Table 50 and Figures 32 through Figures 34.

Table 50: Emissions from oil and gas sector sources [tons]*

Category	NOx	VOC	SO_2	PM_{10}	CO	HAP	$PM_{2.5}$	GHG (CO_2e)
Title V	2,381.89	947.55	28.62	75.97	2,388.07	298.40	-	1,453,124.10
Synthetic minor	315.97	165.94	5.84	3.78	206.10	35.61	-	98,310.54
True Minor	4,609.43	897.09	25.56	52.36	3,507.64	298.65	-	1,365,890.40
Small oil and gas sources	11,388.39	1,091.58	3.95	97.57	9,362.51	256.12	78.80	1,222,159.41
Total	**18,695.68**	**3,102.17**	**63.98**	**229.68**	**15,464.33**	**888.78**	**78.80**	**4,139,484.44**

*GHG emissions reported in metric tonnes.

Figure 32: NOx and CO emissions from oil and gas sources [tons]

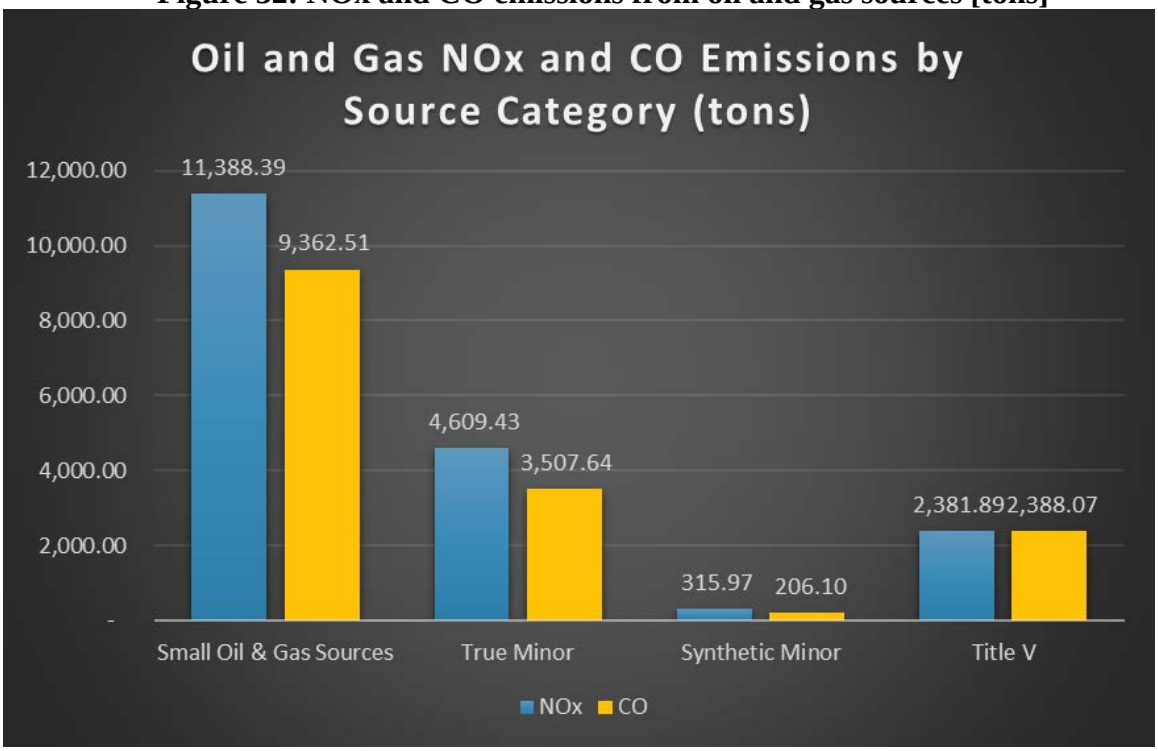


Figure 33: VOC and HAP emissions from oil and gas sources [tons]

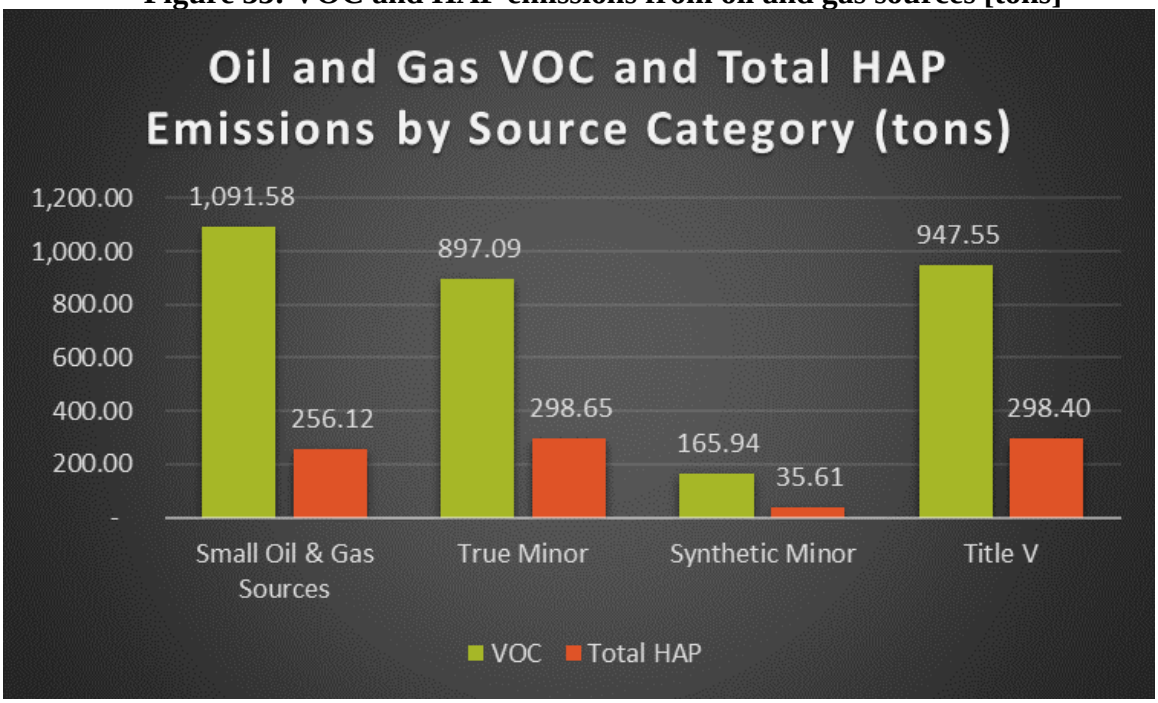
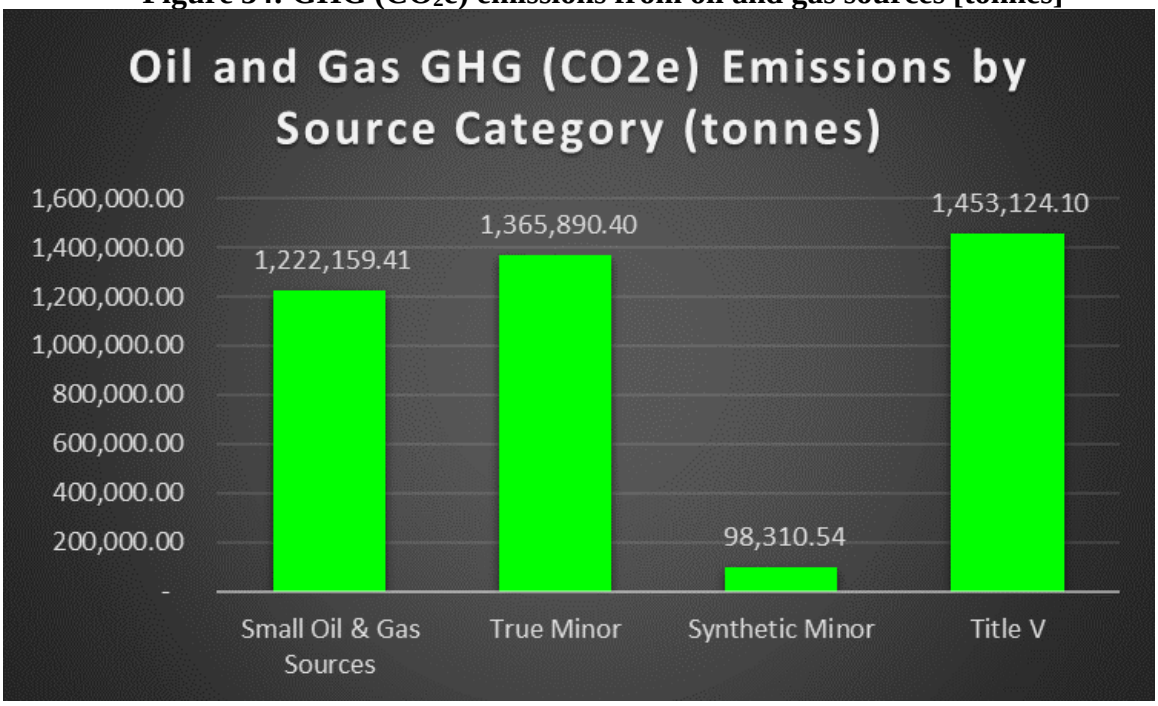


Figure 34: GHG (CO_2e) emissions from oil and gas sources [tonnes]



Within the small oil and gas sources, the emission unit type that contributed the most NOx emissions were natural gas-fired reciprocating internal combustion engines (RICE). Two-stroke lean burn (2SLB) RICE between 301-400 hp and four-stroke rich burn (4SRB) engines between 0-50 hp were the largest emitting subcategories. The largest contributor of CO emissions from small oil and gas sources were 4SRB engines between 0-50 hp and 4SRB engines between 51-100 hp.

4. Comparison of the 2017 SUIT EI, the CY2015 SUIT EI, and the WRAP CY2014 EI

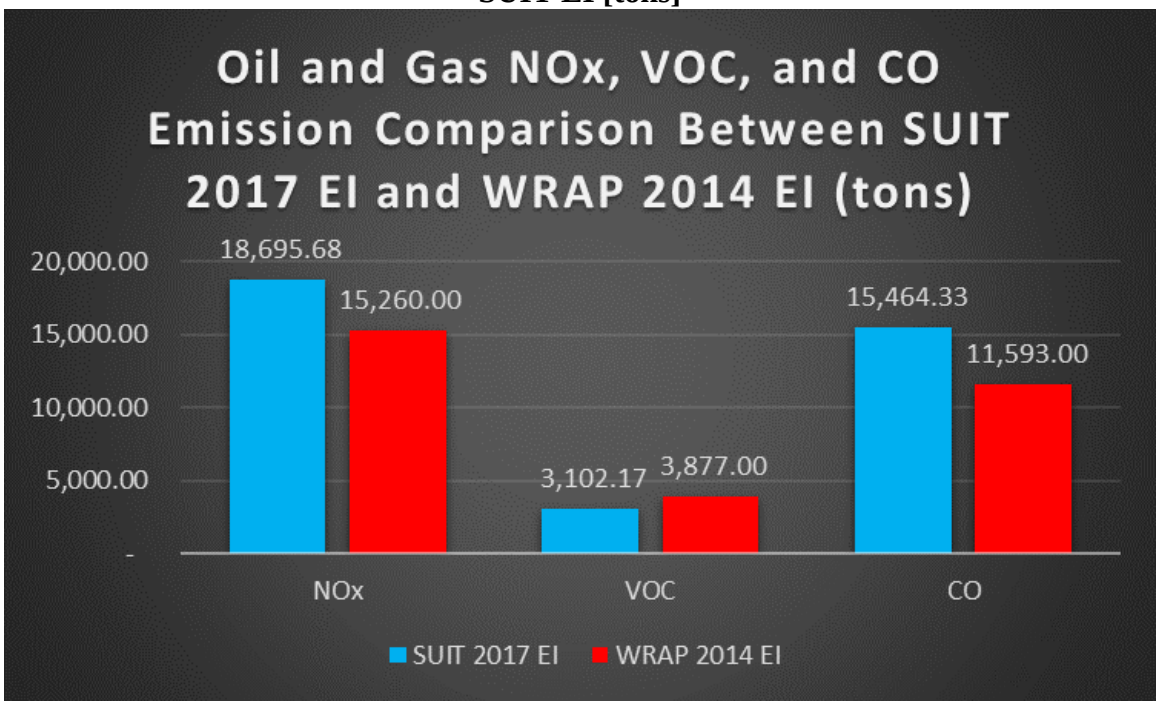
To evaluate the representativeness of oil and gas emission estimations from this 2017 SUIT emissions inventory, the AQP has compared the results with oil and gas emission estimates for the Reservation from the *2015 Southern Ute Indian Reservation Emission Inventory* (2015 SUIT EI) and the Western Regional Air Partnership (WRAP) emissions inventory titled *Development of Baseline 2014 Emissions from Oil and Gas Activity in Greater San Juan Basin and Permian Basin* (2014 WRAP EI).[36] The AQP considers the 2014 WRAP EI and 2015 SUIT EI emissions inventories to be the most accurate and representative oil and gas emission inventories previously prepared for the Reservation.

The WRAP EI obtained data for point sources on the Reservation from data submitted by the Tribe to the EPA National Emission Inventory database for 2014. To quantify emissions from

[36] Bar-Ilan A., J. G. (2009, September 1). Development of Baseline 2014 Emisions from Oil and Gas Activity in the Greater San Juan Basin and Permian Basin. Prepared by Ramboll Environ for Western Regional Air Partnership. Retrieved from http://www.wrapair2.org/pdf/2014_SanJuan_Permian_Baseyear_EI_Final_Report_10Nov2017.pdf

non-point oil and gas sources located on the Reservation, the WRAP EI used data from the 2015 SUIT EI. The State of Colorado, in cooperation with the Tribe's AQP, scaled this data back to 2014 values by developing a "growth factor" based on reported production on the Reservation in 2015 versus 2014. In addition to SUIT EI data, the 2014 WRAP EI included San Juan Basin emissions data provided by the State of Colorado for sources outside of the Reservation boundaries in La Plata and Archuleta counties. The 2017 SUIT EI does not include emissions from non-Reservation sources and therefore does not provide a direct comparison of all emission sources included in the 2014 WRAP EI. A comparison of NOx, CO, and VOC emissions from this 2017 SUIT EI and the La Plata and Archuleta counties section of the 2014 WRAP EI are displayed in Figure 35 below.

Figure 35: Comparison of NOx, CO, and VOC emissions from the 2014 WRAP EI with 2017 SUIT EI [tons]

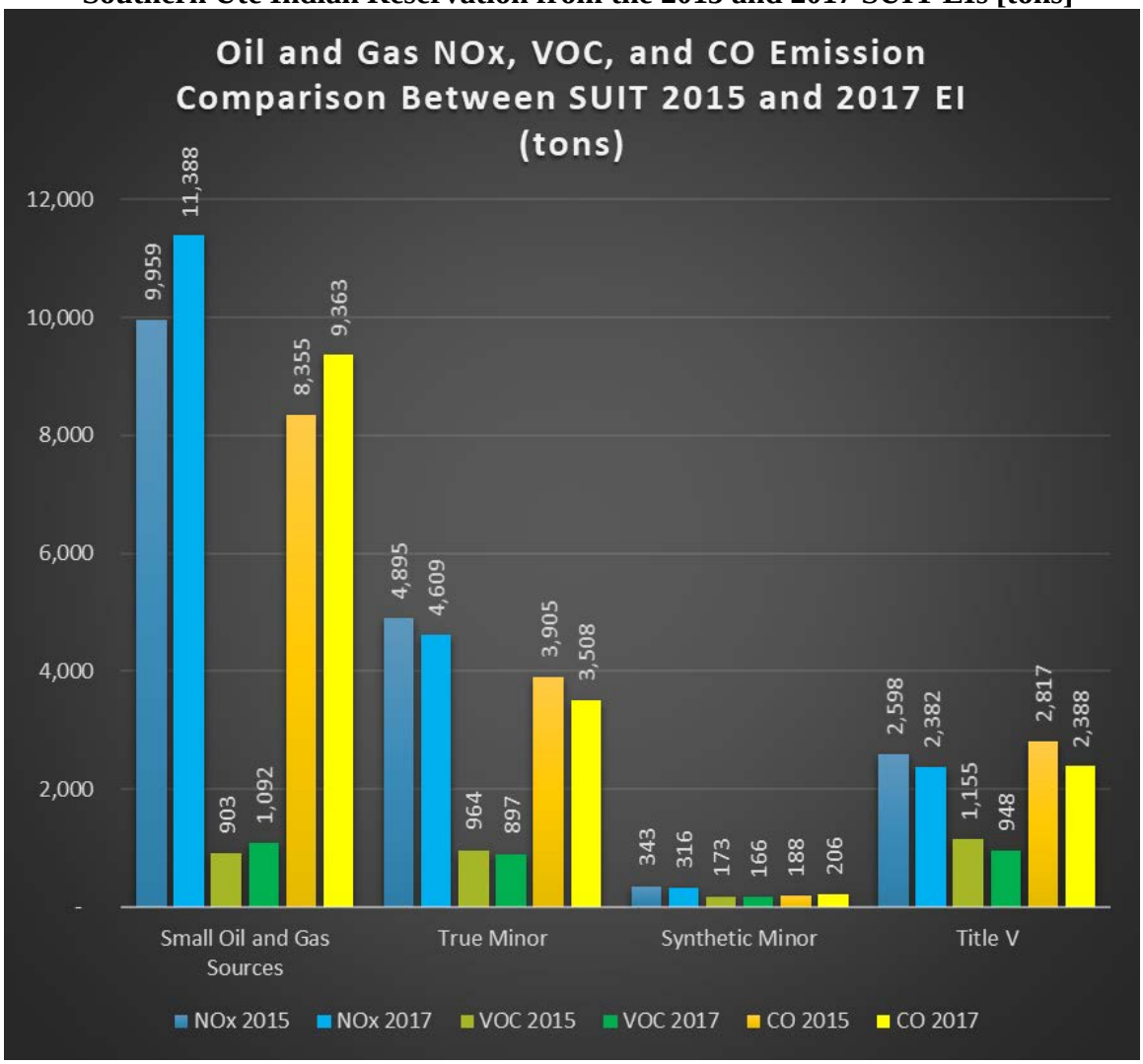


A comparison of the 2015 SUIT EI and 2017 SUIT EI shows a 900.57 ton increase in NOx emissions, a 199.84 ton increase in CO emissions and a 92.72 ton decrease in VOC emissions between 2015 and 2017 at oil and gas point sources and non-point sources. AQP attributes the increased NOx and CO emissions to 113 more engines being reported in 2017 than in 2015 at the non-point oil and gas sources.

Between the 2015 and 2017 SUIT EIs, emissions decrease trends were observed at oil and gas point sources. True minor sources and Title V sources showed a decrease in NOx, CO, and VOC emissions. Synthetic minor sources also showed a decrease of NOx and VOC emissions but show a slight increase in CO emissions. AQP attributes the decreases in NOx and VOC emissions to decreased oil and gas production on the Reservation between 2015 and 2017.

A comparison of NOx, CO and VOC emissions at oil and gas sources on the Reservation from the 2017 SUIT EI and the 2015 SUIT EI is displayed below in Figure 36.

Figure 36: Comparison of oil and gas NOx, CO, and VOC emission estimations for the Southern Ute Indian Reservation from the 2015 and 2017 SUIT EIs [tons]



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40 CFR Part 98 - Mandatory Greenhouse Gas Reporting. (2016). U.S. Government Publishing Office. Retrieved from http://www.ecfr.gov/cgi-bin/text-idx?SID=32c4baa0d0aff54fa651d1cdb1cd7934&mc=true&tpl=/ecfrbrowse/Title40/40cfr98_main_02.tpl

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XI. Appendix – Quality Assurance Review

Description of Quality Assurance Review

To meet the EPA emissions inventory level II data quality objective of conducting a third party quality assurance (QA) review, the AQP contracted with Montrose Air Quality Services. The QA review included the review of the data collection methodology, data, assumptions, emission factors, calculation methodologies, and emission totals. An abridged version of the final QA report is attached as an Appendix. A full version of the QA report, which contains all of the QA review forms can be requested from the AQP.

QUALITY ASSURANCE REPORT

SOUTHERN UTE INDIAN TRIBE
2017 EMISSION INVENTORY

PREPARED FOR:

Southern Ute Indian Tribe
Environmental Programs Division
Air Quality Program
P.O. Box 737, MS #4
Ignacio, Colorado 81137

PREPARED BY:

1631 E. Saint Andrew Place
Santa Ana, California 92705

November 2018

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SECTION 1.0

INTRODUCTION

1.1 Project Summary

Southern Ute Indian Tribe (SUIT) Air Quality Program (AQP) is developing the 2017 emission inventory (EI) to obtain baseline emission data for all quantifiable air emission sources located within exterior boundaries of the SUIT. The baseline emission will be used to support air quality plans and regulations targeted at ozone precursors for maintaining attainment with National Ambient Air Quality Standards, emission modeling, and Title V permitting fee analysis.

The EI includes criteria pollutants, such as oxides of nitrogen (NOx), carbon monoxide (CO), particulate matter ten micrometers in diameter or smaller (PM10), volatile organic compounds (VOC), hazardous air pollutants (HAP), and greenhouse gases (GHGs). The inventory includes emissions from point, non-point, mobile, and biogenic emission sources.

SUIT AQP has requested Montrose Air Quality Services (MAQS) to perform a quality assurance (QA) review of the EI. The QA review includes emission calculation method verification, emission factors validation, and the assessment of the supporting text.

1.2 Technical Project Contacts

For the purpose of this QA review, the MAQS contact are as follow:

A. Edward Krisnadi
Senior Project Manager

Montrose Air Quality Services
Regulatory Compliance Services
1631 E. St. Andrew Place
Santa Ana, CA 92705

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SECTION 2.0

QUALITY ASSURANCE PLAN

In accordance with the guidance described in EPA Emission Inventory Improvement Program (EIIP) Volume VI Chapter 2: Planning and Documentation dated January 1997, a Quality Assurance Plan (QAP) was prepared to provide written instructions for the technical and quality aspects associated with the development of the 2017 SUIT EI. The main purpose of QAP is to ensure the developed EI is complete, accurate, comparable, and representative of the emissions occur on the SUIT Reservation during the calendar year of 2017. The quality review was conducted in accordance with the QAP. The complete QAP is included in Appendix A.

SECTION 3.0

SUMMARY OF FINDINGS

The 2017 SUIT EI includes criteria air pollutant, HAP, and GHGs emissions from the following sources:

- 35 oil and gas sources permitted under Title V program
- 6 oil and gas sources permitted as synthetic minor permitted facilities
- 299 registered tribal minor new source review (TMNSR) oil and gas facilities
- 2 municipal solid waste landfills
- 3 airports and the usage of aviation gasoline
- 2,428 non registered TMNSR oil and gas facilities
- 6 gasoline service stations
- 13 sand and gravel pits
- Fruitland formation outcrop natural gas seeps
- Residential heating from wood burning, propane, and natural gas combustions
- Wildfires and prescribed burns
- Agricultural burning
- Mobile sources
- Biogenic sources

Each emission source type was reviewed in accordance with the QAP. Table 3-1 summarizes the type of review activities, the findings, and recommended corrective mechanisms. The detail of these findings are included in QA/QC forms provided in Appendix B of this report.

TABLE 3-1
SUMMARY OF FINDINGS

Type of Emission Sources	Type of Review Activities	Findings & Recommended Corrective Mechanisms
Title V Oil and Gas Facilities	Data Entry	The accuracy of data transferred from the submitted annual emission reports to the emission summary spreadsheet was reviewed. Some incorrect data entries were found, and some incorrect formulas to calculate GHG emissions were also found.
Synthetic Minor Oil and Gas Facilities	Data Entry	The accuracy of data transferred from the submitted annual emission reports to the emission summary spreadsheet was reviewed. No data entry mistake was found.

Type of Emission Sources	Type of Review Activities	Findings & Recommended Corrective Mechanisms
Registered TMNSR Oil and Gas Facilities	Data Entry	The accuracy of data transferred from the information collection request (ICR) provided by the facility owners or operators to the emission summary spreadsheet was reviewed. No incorrect data entry was found.
Landfill	Data Entry, Data Input and Output Associated with Emission Software	The accuracy of data transferred from the landgem output and submitted annual emission report to the emission summary spreadsheet was reviewed. Few incorrect data entries were found and revisions on these mistakes were recommended. GHG emissions were reported; however, these emissions were not included in the emission summary spreadsheet. MAQS recommended to add the GHG emissions to the summary spreadsheet.
Airport and the usage of aviation gasoline	Data Entry	The accuracy of data transferred from the EPA National Emission Inventory Database (NEI) to the emission summary spreadsheet was reviewed. No incorrect data entry was found.
Non Registered TMNSR Oil and Gas Facilities	Data Entry, Calculation Methods, Emission Factors, Data Input and Output Associated with Emission Software	ICR was created to collect data from non-registered TMNSR oil and gas facilities. Prior to distribute to the facilities, the ICR template was reviewed. Mistakes, such as incorrect formulas, typos, incorrect formatting and engineering assumptions, and missing data, were found and recommended to be corrected. Once facilities submit their data, each facility ICR and the accuracy of data transferred from ICR to the emission summary spreadsheet were reviewed. Incorrect formula on some facility ICRs were found. When the facilities indicate zero value for compressor blowdowns, well completion and recompletion, pneumatic devices, and venting wells, the spreadsheet incorrectly refer to the assumed value instead of zero value. Additionally, several mistakes on the data transfer to the summary spreadsheet were found in this review.

Type of Emission Sources	Type of Review Activities	Findings & Recommended Corrective Mechanisms
Gas Stations	Data Entry	Few incorrect data transferred from 2016 EPA NEI database to the emission summary spreadsheet were found. Additionally, controlled emission from vehicle refueling was not included in the emission summary spreadsheet.
Sand and Gravel Pits	Data Entry	The accuracy of data transferred from EPA National Emission Inventory database (NEI) to the emission summary spreadsheet was reviewed. No mistakes were found in this review.
Residential Heating	Data Entry, Calculation Methods, Emission Factors, Data Input and Output Associated with Emission Software	The accuracy of data transferred from the Tribal Emissions Inventory Software Solutions (TEISS) to the emission summary spreadsheet, the used of AP-42 emission factors, and the calculation methodology were reviewed. A minor mistake of labelling the cell header was found.
Wildfires and Prescribed Burns	Data Entry, Data Input and Output Associated with Emission Software	The accuracy of data transferred from the data output of BlueSky emission software to the emission summary spreadsheet was reviewed. Incorrect data entry of total acres was found in this review. Incorrect formula for GHG emissions were also found for Sandoval Piles RX, Sundance Pile RX, and Beardance Pile RX.
Agricultural Burning	Data Entry	The accuracy of data transferred from EPA National Emission Inventory database (NEI) to the emission summary spreadsheet was reviewed. No mistakes were found in this review.
Mobile Source	Data Entry	The accuracy of data transferred from the data output of EPA Moves2014a emission software to the emission summary spreadsheet was reviewed. Incorrect data transferred for La Plata Nonroad emissions were found.
Biogenic Source	Data Entry	The accuracy of data transferred from EPA National Emission Inventory database (NEI) to the emission summary spreadsheet was reviewed. One incorrect data transferred was found.

Type of Emission Sources	Type of Review Activities	Findings & Recommended Corrective Mechanisms
Fruitland Outcrop	Data Entry	The accuracy of data transferred from 2017 Fruitland Outcrop Soil Gas Flux Monitoring report to the emission summary spreadsheet was reviewed. No mistakes were found in this review.
Permitted Point Sources	Data Entry	The accuracy of data transferred from permit application of Crossfire Bonds Gravel Pit facility to the emission summary spreadsheet was reviewed. Several incorrect data entries were found in this review.
All Sources (2017 Comprehensive Emission Inventory)	Formula	The summary of 2017 emission inventory was created to summarize the 2017 emissions from all sources. The accuracy of the formula in this summary was reviewed. Few incorrect and missing formula were found in this table.

All the corrective actions recommended by MAQS to revise the findings are being accepted and implemented by SUIT AQP. The letter of project completion included in the Appendix C contains a more detailed discussion on this matter.

APPENDIX A

QUALITY ASSURANCE PLAN

QUALITY ASSURANCE PLAN

SOUTHERN UTE INDIAN TRIBE
2017 EMISSION INVENTORY

PREPARED FOR:

Southern Ute Indian Tribe
Environmental Programs Division
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P.O. Box 737, MS #4
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SECTION 1.0

INTRODUCTION

1.1 Emission Inventory Purpose

The 2017 emission inventory (EI) for the Southern Ute Indian Tribe (SUIT) Reservation is being developed to obtain baseline emissions data for the 2017 calendar year for all quantifiable air emission sources located within exterior boundaries of the SUIT. Using this baseline emission data, SUIT will develop air quality plans and air quality regulations targeted at ozone precursors for maintaining attainment with the Ozone National Ambient Air Quality Standards, emission modeling, and Title V permitting fee analysis.

The EI addresses air pollutants, such as oxides of nitrogen (NO_X), carbon monoxide (CO), particulate matter ten micrometers in diameter or smaller (PM10), volatile organic compounds (VOC), hazardous air pollutants (HAP), and greenhouse gases (GHGs), from point, non-point, mobile, and biogenic emission sources.

The SUIT Reservation is located in southwestern Colorado, covers 1,066 square miles in three counties (La Plata, Archuleta, and Montezuma), and borders New Mexico to the south. The total area covered by the EI is approximately 682,590 acres, which encompasses all land within the external boundaries of the SUIT Reservation. The primary land use is agricultural, and the predominant industry is oil and gas production. As of January 2018, oil and gas production facilities include 35 Title V sources, 6 permitted Tribal Minor New Source Review (TMNSR) sources, 299 registered TMNSR, and 2,428 non-registered sources.

1.2 Data Quality Objectives and Indicators

Because the EI will provide supportive data for strategic decision making, it is considered a Level II inventory, based on guidance provided by the USEPA Emission Inventory Improvement Program (EIIP) dated January 1997. The end use of this inventory will drive the minimum QA and work plan requirements.

Table 1-1 shows the established data quality objectives (DQOs) to ensure the accuracy, completeness, representativeness, and comparability of the inventory, in keeping with the EIIP's guidance for Level II inventories.

Table 1-2 presents the data quality indicators (DQIs) that will be used to measure the progress of each DQO.

Table 1-1
Data Quality Objectives (DQOs)

DQO	Procedure for Achieving Objective
Accuracy	For the purpose of this inventory, emissions from certain sources, such as Title V facilities, TMSNR facilities, etc., were obtained and transmitted directly from existing inventory reports that were provided by facility operators. Therefore, only the accuracy of data entry will be reviewed by a third-party contractor, Montrose Air Quality Services (MAQS). For all other emission sources, such as non-point sources, mobile sources, etc., a comprehensive review, which includes emission factors, engineering assumptions, and other parameters, will be conducted by MAQS to ensure accuracy. A QA/QC report will be developed by MAQS to record the findings and the corrective actions taken. The report will also include this Quality Assurance Plan (QAP) and will be available to be included in the overall inventory report.
Completeness	For Title V and permitted TMNSR oil and gas facilities, and landfills, the collection data was based on the required 2017 annual emission fee report. SUIT AQP issued Clean Air Act (CAA) Section 114 information collection requests (ICR) in June 2018 to collect data from registered TMNSR oil and gas facilities and non-registered oil and gas sources. Various reputable sources, such as EPA, the Colorado Oil and Gas Conservation Commission (COGCC), and professional organizations were used to collect data from mobile sources, biogenic sources, and non-point sources other than oil and gas facilities.
Representativeness	The data will be reviewed and compared to emission inventories from comparable regions to determine the reasonableness of the emissions estimates and representativeness of the data.
Comparability	To ensure the data are comparable, standard procedures will be followed, and results will be presented in the same units that were used in the 2015 SUIT EI and 2014 Western Regional Air Partnership (WRAP) Greater San Juan Basin (GSJB) oil and gas emission inventories. Emission factors and assumptions will be compared with methodologies used in similar emission calculation applications.

Table 1-2
Data Quality Indicators (DQIs)

DQO	Inventory DQI Target Values
Accuracy	Sources of all data used, including emission factors, assumptions, and calculation methodologies will be thoroughly documented to allow an outside reviewer to replicate all calculations. Emission calculation models, such as GRI-GLY Calc 4.0, Tanks 4.09d, etc., were utilized to calculate emissions whenever it was applicable.
Completeness	Capture 100% of point source emissions reported in annual emission fee report for 2017 calendar year. Capture 95% of non-point oil and gas source emissions data, which was collected through CAA Section 114 ICR issued by SUIT AQP in June 2016. Capture 80% of non-point sources other than oil and gas, mobile sources, and biogenic sources. Data for these sources were collected from various reputable sources, such as facility surveys, US census, and etc.
Representativeness	100% of emission estimates will be within an order of magnitude of the value of estimates from emission inventories from comparable regions. If this DQI can't be met, an explanation will be provided.
Comparability	Results to be compared with 2015 SUIT EI and 2014 WRAP GSJB oil and gas emission inventories Emission factors and assumptions will be compared with methodologies used in similar emission calculation applications.

1.3 Summary of Quality Assurance Plan Organization

The remaining of this QAP is organized as follows:

Section 2.0	Contains the programs summary that describes the major components of the inventory development and QA/QC program
Section 3.0	Presents the purpose and policy statement
Section 4.0	Contains the emission inventory preparation plan, which includes details the organizational structure, roles, and training of inventory development, and QA/QC team members
Section 5.0	Discusses QA/QC procedures that will be implemented throughout this project
Section 6.0	Describes the corrective action mechanism that will be implemented as needed
Section 7.0 through 10.0	Discuss the methods used to prepare the point, non-point, mobile, and biogenic source inventories, as well as planned QA/QC activities for each source category.
Section 11.0	Presents the data reporting procedures that will be followed
Section 12.0	Presents reference citations for all data sources discussed in this QAP

SECTION 2.0

PROGRAM SUMMARY

This QAP provides written instructions for the technical and quality aspects associated with development of the 2017 SUIT Reservation EI. It is designed so that QA/QC procedures are implemented throughout the entire inventory development process. This will ensure that the inventory is complete, accurate, comparable, and representative of the SUIT Reservation.

2.1 Program Components

Inventory tasks and QC procedures will include data checking by the SUIT AQP staff and MAQS throughout the development of the inventory and the final EI report. These procedures include, but are not limited to, the following:

- The development and implementation of written procedures for data gathering, data assessment, data handling, calculation of emissions, and reporting;
- Adequate management and supervision of work;
- Review of all calculations for technical soundness and accuracy, including verification that the appropriate emission factors were used and impact of controls were correctly addressed;
- Documentation of data in a manner that will allow reconstruction of all inventory development activities; and
- Maintenance of an orderly master file of all the data gathered and a copy-ready version of the final inventory submitted to the USEPA National Emission Inventory database.

QA activities are distinguished from QC activities in that they provide a more objective assessment of data quality because QA personnel are not directly involved in the development of the inventory. QA activities are usually more comprehensive because they include assessments of the effectiveness and appropriateness of the systems established by management to control data quality

For this inventory, the review on the data collection will be conducted by SUIT AQP staff. The QA review of data entry to the final EI spreadsheet, emission totals, assumptions, emission factors, and calculation methodologies will be conducted by MAQS.

MAQS will develop a QA/QC report which includes all the review activities and corrective actions taken to finalize the 2017 SUIT Reservation EI.

2.2 Inventory Constraints

Several constraints may impact the inventory development process. The intent of this inventory is to develop emissions estimates for various emission sources on the reservation that are accurate and representative of reservation emissions. To fulfill that intention, data specific to the reservation will be collected for as many sources as possible.

It is expected that for some sources, measured data will not be available due to unreturned or insufficient information collection request responses. There may also be time and funding limitations on how much measured data can be collected.

The effects of these constrains will be minimized by:

- Prioritization of categories so that resources will be allocated preferentially to critical data and sources;
- In measured data are not available, data from reputable sources, such as federal, state, and local government agencies and professional organizations, will be used; and
- Any engineering assumptions made to develop this EI will be validated by a third party contractor, which is MAQS.

SECTION 3.0

PURPOSE AND POLICY STATEMENT FOR THE 2017 SOUTHERN UTE INDIAN TRIBE FOR CRITERIA POLLUTANTS, HAP, AND GREENHOUSE GASES EMISSIONS INVENTORY

The point, non-point, mobile, and biogenic EI is being developed to provide general assessment of air pollutant sources within the exterior boundaries of the SUIT Reservation. The EI will be used to determine baseline emissions data that will help the SUIT AQP to develop future air quality planning, such as development of air quality regulations, emissions modeling, and Title V permitting fee analysis.

In order to provide data of sufficient quality, SUIT AQP with MAQS assistance has developed this QAP. It includes all of the critical elements recommended in the EPA EIIP guidance documents (EIIP, 1997).

Implementation of the QA and QC procedures described in this QAP is fully supported by the SUIT AQP Manager, the AQP Technical Manager, the AQP Scientist, and the AQP Air Quality Analyst who were involved in the development of this 2017 EI. This support is evidenced by their commitment to implement the procedures as described in this QAP and to generate data of known quality.

QC procedures described in this document were developed by MAQS with the approval of SUIT AQP staff. These procedures were developed to provide a comprehensive program that includes QC measures that are implemented by MAQS.

It is the responsibility of MAQS to report any deviations on the inventory immediately to the SUIT AQP technical manager and program manager. The impact of deviations on the inventory will be evaluated and the appropriate corrective actions will be taken to ensure that the technical and DQOs are met.

Danny Powers, Air Quality Program Manager, SUIT AQP — 11/26/2018 Date

Oakley Hayes, Air Quality Technical Manager, SUIT AQP — 11-26-2018 Date

Karl Lany, District Manager, MAQS — 11/26/2018 Date

A. Edward Krisnadi, Senior Project Manager, MAQS — 11/26/2018 Date

SECTION 4.0

EMISSION INVENTORY PREPARATION PLAN

All the inventory development activities will be managed by SUIT AQP staff. The oil and gas facilities, which consist of Title V, permitted TMNSR, registered TMSNR, and non-registered TMSNR, will be prepared by the SUIT AQP Air Quality Scientist, Matt Wampler. The non-oil and gas facilities, which consist of non-point, mobile, and biogenic sources, will be prepared by SUIT AQP Air Quality Analyst, Christina Schweipert. The comprehensive EI report will be prepared by SUIT AQP Air Quality Technical Manager, Oakley Hayes. The overall management of this EI development will be supervised by SUIT AQP Manager, Danny Powers.

Before ICR was distributed to registered TMNSR and non-registered oil and gas facilities, MAQS will review the workbook. Once the ICRs are completed by the facilities, MAQS will conduct the QA/QC activities on the workbooks, which also include emissions from other sources, such as mobile source, biogenic source, etc. MAQS will also review the text of the final EI report developed by SUIT AQP staff.

SECTION 5.0

GENERAL QA/QC PROCEDURE

QA/QC procedures described in this QAP were developed to help ensure data accuracy, completeness, representativeness, and comparability. These procedures will be implemented by SUIT AQP staff throughout the planning, data collection, emission estimation, and reporting phases of the inventory development program.

5.1 QC Activities

QC procedures will be implemented during inventory development to meet technical and DQOs. These activities will be conducted at critical steps in the inventory development process where the successful outcome of inventory development could be compromised. These critical steps are presented below and discussed in the following subsections of this QAP:

- Data collection;
- Data documentation;
- Calculating emissions;
- Data checking;
- Reporting; and
- Maintenance of the master files.

5.1.1 Data Collection

Data for this EI will be collected according to EPA level II EI guidelines utilizing measured data when available and reputable sources when measured data is not available. The approach and supporting documents or references will be thoroughly documented and included in the emission report. Table 5-1 shows guidance documents and suggested data sources in collecting the data:

Table 5-1
Data Collection Guidance Documents

Source Type	Guidance Document	Suggested Data Sources
Point Source	USEPA AP-42 – Compilation of Air Emission Factors USEPA EIIP Volume II 40 CFR Part 98	Existing emission inventories, state permit files, ICR, facility surveys, engineering documentation.
Non-point Source	USEPA AP-42 – Compilation of Air Emission Factors Emission estimation software	Existing emission inventories, state permit files, ICR, facility surveys, US Census, engineering documentation, case study.
Mobile Source (On-Road and Non-Road Mobile Source)	Guidance and emission factors used in USEPA emission models (MOVES2014a) EIIP Volume IV	Existing emission inventories.
Biogenic	EIIP Volume V	Existing emission inventories.

5.1.2 Data Documentation

Good data documentation procedures are essential when developing an emissions inventory. Therefore, the following data documentation requirements have been developed to facilitate the validation of the final emission results.

- Data sources will be included as references in the final inventory report. Units of measurement will be provided with each data value;
- Calculation methodologies with example calculations will be provided in the final inventory report;
- The approach used to determine completeness for each source type will be described;
- Documents from which emission factors are taken will be identified and referenced; and
- The source, agency group, or company providing information via telephone will be identified (include contact information and the date information was provided).

In developing the EI, the master files will be saved and maintained in electronic formats. These electronic documents including reports and spreadsheets shall be saved in the electronic folder, established for the 2017 SUIT Reservation EI.

5.1.3 Calculating Emissions

Information on how point, area, mobile, and biogenic emissions will be calculated is provided in Sections 7.0 through 10.0.

5.1.4 Data Checking

Data checking will be conducted by MAQS, which was not involved in the development of the EI. The following review activities will be performed by MAQS:

- Validate data transmission from existing emission inventories to the EI spreadsheets.
- Validate the cell functions and formulas in the EI spreadsheets.
- Validate the emission factors, calculation methodologies, and engineering assumptions for calculating the emissions.
- Validate the data input values and results generated from emission estimation software, such as EPA MOVES2014a, EPA TANKs 4.09d, GRI-GLYCalc, EPA LandGEM, etc.
- Validate the text of the emission inventory report including emission factors, assumptions, citations, and emission estimations.

Throughout the review process, MAQS will advise the SUIT AQP of deficiencies and recommended corrective mechanisms to improve the accuracy of the inventory. These findings and corrective actions will be recorded on the QA/QC form included in Appendix A of this QAP.

Additionally, MAQS will prepare a QA/QC report, which summarizes the results from all review activities conducted to validate the accuracy of this EI.

5.1.5 Reporting

Prior to finalizing the report, all of actions taken in response to the recommendations for corrective actions will be evaluated to determine whether the report accurately reflects the corrections made. The final emission report will be reviewed for technical soundness, completeness, accuracy, comparability, and representatives by SUIT AQP technical manager and program manager, and MAQS.

It is the responsibility of SUIT AQP program manager to ensure that the report accurately reflects the data and that the master file provides sufficient data to verify the results reported. A copy-ready master of the report will be retained in the master file and made available to all project personnel.

5.1.6 Maintenance of the Master File

The master file is a compilation of all data gathered and produced during development of the inventory. It should include sufficient supporting data to verify the accuracy of the emission results reported. Indexing procedures must facilitate data retrieval.

Maintenance of the master file will begin with retention of this QAP. All correspondence data and data received concerning development of the inventory will be filed by source. References will be maintained along with applicable data contained within each reference.

The master file will be maintained in an electronic project file. Access to these electronic files will be limited to SUIT AQP staff and controlled so that the master file is maintained in an orderly manner and is complete.

5.2 QA Activities

QA activities are distinguished from QC activities in that they provide a more objective assessment of data quality because QA personnel are not directly involved in development of the inventory. QA activities are usually more comprehensive because they include assessments of the effectiveness and appropriateness of the systems established by management to control data quality.

QA activities of the EI will be conducted by a third party contractor, MAQS. These activities will provide assessments on the quality of calculation methodologies, emission factors, and engineering assumptions in developing the EI. Findings will be recorded on the QA/QC form included in Appendix A and be included in the final QA/QC report.

SECTION 6.0

CORRECTIVE ACTION MECHANISMS

Recommendations for corrective actions will be made and undertaken as soon as quality concerns are identified. All changes or corrections made to the EI will be documented in the QA/QC form and summarized in the final QA/QC report prepared by the third party contractor, MAQS.

SECTION 7.0

POINT SOURCE INVENTORY PREPARATION AND QA/QC ACTIVITIES

For the purposes of this emission inventory, SUIT AQP identifies the following category of point sources located within the exterior boundary of the reservation:

- Title V Oil and Gas Sources
- TMNSR Oil and Gas Sources
- Municipal Solid Waste (MSW) Landfills
- Airports

Each of these sources will be assessed for inclusion in the 2017 EI.

7.1 Title V Oil and Gas Sources

A Title V emission source is a source that emits or has the potential to emit (PTE) 100 tons per year or more of any criteria pollutants, 10 tons per year or more of any one hazardous air pollutants (HAP), or 25 tons per year or more of any combination of HAP. In 2017, there were 35 Title V oil and gas sources operated on the SUIT Reservation.

Title V sources are required to report emissions annually and pay emission fees based on the type and quantity of pollutants emitted. For this EI, the data will be collected directly from the most recent annual emission fee report. If there are no data available from the annual emission fee report, Title V permit applications will be utilized as the data source to complete the EI.

7.2 Minor Point Sources

7.2.1 Permitted Tribal Minor New Source Review Oil and Gas Sources

If a source has the PTE equal to or greater than the thresholds that require a permit under the Title V operating permit program or prevention of significant deterioration (PSD) program, a source can obtain TMNSR permits to create enforceable emission limitations to reduce PTE to below the Title V or PSD emission thresholds. These permits are often referred to as “synthetic minor permits”.

For the TMNSR portion of this inventory, emissions from six TMNSR oil and gas facilities, which are not subject to Title V, will be included. Similar to Title V sources, permitted TMNSR sources are required to submit annual emission inventories to EPA. For this EI, the data will be collected directly from the most recent submitted annual emission inventories. PTE data from the permit applications will also be used in completing this EI.

7.2.2 Registered Tribal Minor New Source Review Oil and Gas Sources

TMSNR sources with PTE equal or greater than the thresholds described in Table 7-1, but below the thresholds that require a Title V operating permit are required to register with EPA Region 8 by no later than March 1, 2013. As of January 2018, EPA Region 8 currently has received 299 registrations for oil and gas sources located within the exterior boundary of SUIT Reservation.

Table 7-1
TMNSR Permitting Threshold

Regulated Air Pollutant	Permitting Threshold (TPY)
Carbon monoxide	10
Oxides of nitrogen	10
Sulfur dioxide	10
Volatile Organic Compounds	5
PM-10	5
PM-2.5	3
Lead	0.1
Fluorides	1
Sulfuric Acid Mist	2
Hydrogen Sulfide (H2S)	2
Total Reduced Sulfur (including H2S)	2
Reduced Sulfur Compounds	2
Waste Combustor Emissions	10
Solid Waste Landfills Emissions (measured as Non Methane Organic Compounds)	10

SUIT AQP issued a mandatory Clean Air Act Section 114 information collection request (ICR) in June 2018 to reconcile emission data from each of the registered TMNSR oil and gas sources. The ICR specifically requested reconciliation of the operational status of each registered source, equipment located at each source, and the actual emissions for the 2017 calendar year. Additionally, the ICR included emissions and emission sources exempted under the registrations, such as engines less than 50 hp, HAP and GHG emissions.

7.3 Landfills

There are two Class II MSW landfills within the SUIT Reservation boundaries. These landfills are Bondad Landfill and Archuleta County Landfill. The emissions from Bondad Landfill were obtained directly from the 2017 Title V emission fee form package submitted to SUIT AQP.

SUIT AQP worked with Archuleta Solid Waste Department to obtain documentation, such as 2017 greenhouse gas report, air pollution emission notice, permit applications and design capacity report, in compiling the emissions from the Archuleta County Landfill. These reports were submitted by Archuleta County to the Colorado Department of Public Health and Environment (CDPHE). SUIT AQP utilized EPA MSW landfill emission model, LandGEM version 3.02 (LandGEM) to calculate emissions from Archuleta County Landfill. Engineering assumptions and climatic parameters contained in Bondad Landfill Title V emission fee report were used as input values for LandGEM in calculating Archuleta County Landfill emissions.

7.4 Airports

There are three airports located within the SUIT Reservation, the Durango-La Plata County airport, the Animas Air Park, and Animas Air Park Helipark. Emissions from these airports were calculated and submitted to the EPA National Emission Inventory (NEI) database for calendar year 2016. SUIT AQP used these reported values for the 2017 EI.

7.5 New Permitted Facility

The 2017 EI includes emission from a new permitted Bonds Gravel Pit facility owned and operated by Crossfire Aggregate Services, LLC. The emission at this facility mainly comes from mining operations, which include of rock crushing, and concrete batch operations, which include material handling and loading. Additional emission sources at the facility are a diesel-fired engine generator and a water heater. Emissions from the facility were calculated and reported to SUIT AQP on August 18, 2015 as part of the air permit application.

7.6 QA/QC Activities for Point Sources

All data received from the data sources will be stored and maintained in the project master files. All data sources will be clearly documented in the EI spreadsheets. For Title V oil and gas sources, minor sources consisting of permitted and registered TMNSR oil and gas sources, Bondad landfill, and airports, SUIT AQP did not perform any calculations, since 2017 emissions data from these sources had been calculated and reported directly to SUIT AQP or EPA. Therefore, MAQS will only review the data entries from the data sources to the EI spreadsheets.

SUIT AQP estimated emissions from Archuleta County Landfill by using LandGEM software. MAQS will review the input values and data results generated from the software.

SECTION 8.0

NON-POINT SOURCE INVENTORY PREPARATION AND QA/QC ACTIVITIES

For the purposes of this emission inventory, SUIT AQP identified the following categories of non-point sources located within the exterior boundary of the reservation:

- Non-registered Oil and Gas Sources
- Fruitland Formation Outcrop Natural Gas Seeps
- Gas Stations
- Aviation Gasoline
- Gravel Pits
- Residential Heating
- Wildland Fires and Prescribed Burns
- Agricultural Burning

Each of these sources will be assessed for inclusion in the 2017 EI.

8.1 Non-registered Oil and Gas Sources

For the purpose of this emission inventory, non-registered oil and gas sources are defined as oil and gas sources with emissions below the emission thresholds described in Table 7-1.

The list of non-registered oil and gas sources was obtained from the Colorado Oil and Gas Conservation Commission (COGCC) and Drilling Edge database. Each operator of a non-registered source received a Clean Air Act Section 114 ICR issued by SUIT AQP in June 2018. The ICR required each recipient to provide actual equipment counts, production information, and equipment configuration. One hundred percent of the companies that reported production on the Reservation in 2017 to the COGCC or Drilling Edge database submitted completed ICRs. Ground surveys were utilized to estimate equipment counts from the remaining unreported sources.

Table 8-1 shows the type of emission sources, required data, and calculation methodologies needed to develop the EI for non-registered oil and gas facilities.

Table 8-1
Non-Registered Oil and Gas Sources Calculation Method and Required Data

Emission Source	Calculation Method and Required Data
Natural Gas-Fired Reciprocating Internal Combustion Engines	**Method:** EPA AP-42 3.2 – Natural Gas-Fired Reciprocating Engines (August, 2000), 40 CFR Part 98, Subpart C, Table C-1 and C-2 – Mandatory Greenhouse Gas Reporting. **Data:** Engine horsepower rating, engine configurations, operating hours, and brake specific fuel consumption (BSFC).
Natural Gas-Fired Turbines	**Method:** EPA AP-42 3.1 – Stationary Gas Turbines (April, 2000), 40 CFR Part 98, Subpart C, Table C-1 and C-2 – Mandatory Greenhouse Gas Reporting. **Data:** Turbine horsepower rating, turbine configurations, operating hours, and brake specific fuel consumption (BSFC).
Tri-Ethylene Glycol Dehydration Unit	**Method:** GRI-GLYCalc emission estimation software. **Data:** Natural gas analysis, wet gas temperature, pressure, dry gas flowrate/throughput, lean glycol water content, glycol pump type, pipeline water content specification.
Liquid Storage Tanks	**Method:** EPA TANKS 4.09d (TANKS), Engineering calculation for flash gas emissions, EPA AP-42 5.2 – Transportation and Marketing Petroleum Liquids (July 2008), American Petroleum Institute Compendium of Greenhouse Gas Emissions for the Oil and Gas Industry, 40 CFR Part 98 Subpart W. **Data:** Tank throughput, tank characteristics, Reid vapor pressure, field sampling data for flash gas composition and gas to water ratio values, truck tank capacity, liquid saturation factor, liquid molecular weight, true vapor pressure, and temperature.
Heaters and Boilers	**Method:** EPA AP-42 1.4 – Natural Gas Combustion (July 1998), 40 CFR Part 98, Subpart C, Table C-1 and C-2 – Mandatory Greenhouse Gas Reporting. **Data:** Equipment heat rating, operating hours, natural gas heating value
Equipment Leaks and Fugitive Emissions	**Method:** Canadian Association of Petroleum Producers Guide for Calculating Greenhouse Emissions, publication number 2003-0003 (April 2003), EPA Protocol for Equipment Leak Emission Estimates Chapter 2.3 (November 1995), 40 CFR Part 98, Subpart W – Mandatory Greenhouse Gas Reporting. **Data:** Fugitive component counts (valves, connectors, open ended lines).

Natural Gas Driven Pneumatic Devices	**Method:** EPA Report for Oil and Natural Gas Sector Pneumatic Devices (April 2014). **Data:** Number of devices per well, equipment bleed rate, and operating hours.
Natural Gas Blowdown and Purges	**Method:** Facility Surveys **Data:** Number and time duration of annual compressor and pipeline blowdowns, the amount of natural gas vented.
Well Completion and Recompletions	**Method:** Facility Surveys **Data:** Number of well completions and recompletions.

8.2 Fruitland Formation Outcrop Natural Gas Seeps

Naturally occurring methane and CO2 seepage from outcrops of the Cretaceous Fruitland Formation (Fruitland Outcrop) contribute a significant quantity of the GHG emissions on the Reservation. SUIT AQP hired an independent contractor to measure methane and CO_2 soil gas flux concentrations at thirty-five seep areas. These field measurements were used to calculate the emission of GHG from Fruitland Outcrop.

8.3 Gasoline Service Stations

Six gasoline service stations were operated on the SUIT Reservation during calendar year 2017. 2017 fuel throughput was provided by each gas station representative, except for one gas station. 2015 fuel throughput of this one gas station was used for 2017 EI Emission factors from EPA AP-42 Chapter 5.2, Table 5.2-7 – Evaporative Emissions from Gasoline Service Station Operations were utilized to estimate the emissions. SUIT AQP did not calculate emissions from diesel service stations since diesel fuel dispensing emissions are assumed to be negligible. SUIT AQP also did not calculate GHG emissions from gas stations because methane content from gasoline evaporative emissions is negligible.

8.4 Aviation Gasoline

Emission estimates for aviation gasoline and the amount of lead (Pb) in the leaded gasoline were developed by EPA for calendar year 2014. This data was obtained from the EPA National Emission Inventory (NEI). SUIT AQP utilized the 2014 data for the 2017 EI.

8.5 Gravel Pits

Thirteen sand and gravel pits operated in SUIT Reservation during the 2017 calendar year. The number of active pits within the exterior boundaries of SUIT Reservation was determined based on the data from the Colorado Division of Reclamation Mining and Safety (DRMS) database and the current active permits. Emissions of sand and gravel pits in SUIT Reservation were estimated based on total reported 2014 emissions from all gravel pits located in La Plata and Archuleta counties.

8.6 Residential Heating

There are three types of fuel used for residential heating: wood used in fireplaces and wood burning stoves, propane, and natural gas. The amount of households using these fuels was determined using the U.S. Census 2012-2016 American Community Survey 5-Year Estimate. The U.S. Energy Information Administration, Office of Energy Consumption and Efficiency Statistics Residential Energy Consumption Survey was used to obtain the average number of cords, propane, and natural gas used within a year at an average household.

Calculation methodologies and emission factors described in EPA AP-42 Section 1.10, 1.5, and 1.4 were used to estimate the emissions from residential heating using wood, propane, and natural gas respectively.

8.7 Wildland Fires and Prescribed Burns

The forest on SUIT Reservation is predominantly comprised of pinyon-juniper woodlands with ponderosa, gambel, oak, aspen, and sub-alpine forest. The forest is prone to wildfire and prescribed burns are utilized as a forest management strategy to help prevent catastrophic fires, improve wildlife habitat, and improve overall forest health. Wildfires and prescribed burns can be significant sources of air pollution.

The acres of wildfires and prescribed burns was obtained from the Bureau of Indian Affairs (BIA) and the Southern Ute Agency Fire Management Division, and Federal Fire Occurrence Website. The data indicates 35 fires (31 wildfires and 4 prescribed fires) occurred in 2017. Emission estimation software called BlueSky was utilized to calculate the emissions from wildland fires and prescribed burns.

8.8 Agricultural Burning

The emissions from agricultural burning activities occurred within the SUIT Reservation were estimated based on the total agricultural burning emissions in La Plata County reported in The 2014 EPA National Emission Inventory (NEI) database. It is assumed the reported emissions in 2014 NEI reflect the emissions occurred in 2017.

8.9 QA/QC Activities for Non-point Sources

All data received from the data sources will be stored and maintained in the project master files. All data sources will be clearly documented in the EI spreadsheets. In addition to data entries from the data sources to the EI spreadsheets, MAQS will also review emission factors, calculation methodologies, engineering assumptions, data input values and results generated from various emission estimation softwares, and the text of the report referencing the data sources. Any findings and corrective actions taken during the review process will be recorded in the QA/QC form and compiled in the final QA/QC report.

SECTION 9.0

MOBILE SOURCES INVENTORY PREPARATION AND QA/QC ACTIVITIES

Mobile source emissions are generated from on-road vehicles and non-road engines, such as lawn equipment, recreational vehicles, agricultural equipment, construction equipment, etc.

9.1 On-Road Mobile Sources

Emissions from on-road mobile sources include emissions from motorcycles, passenger cars and trucks, light commercial trucks, transit buses, school buses, refuse trucks, single unit land and short-haul trucks, motorhomes, and combination short-haul trucks. To calculate the emissions from on-road mobile sources, SUIT AQP utilized emission estimation software, Moves2014a. The data input values for Moves2014a were mainly obtained from the 2014 County Database (CDB) and 2014 National Database (NDB). The hourly humidity and temperature data were obtained from SUIT Ambient Air Monitoring stations, Ute 1 and Ute 3.

9.2 Non-Road Mobile Sources

Emission from non-road mobiles sources include emissions from mobile source operating off-road, such as agricultural, construction, and recreational equipment. To calculate the emissions from non-road mobile sources, SUIT AQP utilized emission estimation software, Moves2014a. The data input values for Moves2014a were collected from 2014 NDB for La Plata and Archuleta County. The hourly humidity and temperature data for 2017 were obtained from SUIT Ambient Air Monitoring stations, Ute 1 and Ute 3.

9.3 QA/QC Activities for Mobile Sources

Since emissions from mobile sources (on-road and non-road mobile sources) were calculated using emission software, Moves2014a, MAQS will review the data input values and data results generated from the software.

SECTION 10.0

BIOGENIC INVENTORY PREPARATION AND QA/QC ACTIVITIES

Biogenic emissions are generated from trees, vegetation, oil and gas seeps, soil and microbial activities. VOC and NO_X emissions are typical biogenic emissions. EPA estimated biogenic emissions from La Plata and Archuleta County for the 2014 calendar year using the Biogenic Emission Inventory System (BEIS 3.61) with Biogenic Emission Landuse Database (BELD 4.1). The EPA biogenic emissions were scaled down by 38.9% for La Plata County and 29.5% for Archuleta County to represent the area within the exterior boundaries of SUIT Reservation.

Since the biogenic emissions were directly from EPA database, MAQS will review the data entries from the data source to the EI spreadsheet.

SECTION 11.0

DATA REPORTING

The 2017 EI will be provided to U.S. EPA through an emission reporting software called Tribe Emission Inventory Software Solution (TEISS). The procedures, assumptions, sample calculations, and summary table of emissions will be thoroughly documented in the 2017 EI report. The final QA/QC report, which includes this QAP, will also be incorporated to the 2017 EI report. These reports will be maintained and made available upon request.

SECTION 12.0

REFERENCES

The list of references will be provided in the final 2017 EI report.

APPENDIX A

SOUTHERN UTE INDIAN TRIBE
2017 EMISSION INVENTORY QA/QC NOTES

PROVIDED IN APPENDIX B OF THE QA REPORT

APPENDIX B

QA/QC FORMS

QA/QC FORMS – ICR SPREADSHEETS

NON-REGISTERED OIL AND GAS FACILITIES
(TEMPLATE)

SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Not Applicable
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
18028 DRAFT 2017 Minor Source EI IR Template.xls			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	5/31/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1	Misc.	Cover Page	A11	Typo Error on "Tab 1. Coverpage."	Revise to "Tab 1. Cover Page."
2	Misc.	EI Survey (Non-Registered)	G89, G118, G146, C216	The text on "red cell indicates …" does not match with the conditional formatting. The text refers to the equipment count table in cells C19-C31.	Revise the text to refer the right table or revise the conditional formatting in referencing the equipment count table in cells C19-C31.
3	Formula	EI Survey (Non-Registered)	C140	The cell is supposed to sum the values input into C128:C139, but it calls to sum L128:L139.	Correct the cell to read "Sum(C128:C139)"
4	Formula	EI Survey (Non-Registered)	D140	The cell is supposed to sum the values input into D128:D139, but it calls to sum M128:M139.	Correct the cell to read "Sum(D128:D139)"
5	Formula	EI Survey (Non-Registered)	E140	The cell is supposed to sum the values input into E128:E139, but it calls to sum N128:N139.	Correct the cell to read "Sum(E128:E139)"
6	Formula	EI Survey (Non-Registered)	E233	The cell is suposed to calculate the sum of the Oil Tanks in F225:F228 and E231, but it calls out for the sum of E225:E228.	Correct the cell to read "Sum(F225:F228, E231)"
7	Formula	EI Survey (Non-Registered)	I233	The cell is suposed to calculate the sum of the Oil Tanks in J225:J228 and I231, but it calls out for the sum of I225:I228.	Correct the cell to read "Sum(J225:J228, I231)"
8	Format	EI Survey (Non-Registered)	C219-C220	The conditional formatting to fade out the cells when values entered in cell C219-220 should be used.	Apply the conditional format.
9	Engineering Assumption	EI Survey (Non-Registered)	J257, J261-J297	There is no assumed data for the "Mole %" column of the Gas Evolved From Oil Table.	Add the assumed Values. If there are no assumed values, add "None" or "0" in the cells.

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
10	Engineering Assumption	EI Survey (Non-Registered)	B372, B373, B376	There are no assumptions listed for the total volume sent to the combustor, the combustor heat rate and the hours of operation.	Add the assumed Values. If there are no assumed values, add "None" or "0" in the cells.
11	Format	EI Survey (Non-Registered)	C376	When an entry is placed in to this cell, the value is automatically formated as a percentage.	Since this cell is there to account for the hours of operations, the cell needs to be formated as a number.
12	Format	EI Survey (Non-Registered)	D381 - D424	Maintain the same significant digits on the molecular weight for consistency.	Reformat the cells to have the same significant digits.
13	Engineering Assumption	EI Survey (Non-Registered)	B430 - B473	There are no assumed values for the Assumed Mol% for the Incoming Gas Stream Analysis #1 Table.	Add the assumed Values. If there are no assumed values, add "None" or "0" in the cells.
14	Format	EI Survey (Non-Registered)	D430 - D473	Maintain the same significant digits on the molecular weight for consistency.	Reformat the cells to have the same significant digits.
15	Formula	EI Survey (Non-Registered)	B474, B475	There are no formulas in these cells. These cells should have formulas, which sum the mol% and VOC.	Insert formulas that sum the mol% and VOC.
16	Engineering Assumption	EI Survey (Non-Registered)	B479, B480, B483	There are no assumptions values on these cells.	Add the assumed Values. If there are no assumed values, add "None" or "0" in the cells.
17	Format	EI Survey (Non-Registered)	C483	When an entry is placed into this cell the value is automatically formated as a percentage.	Since this cell is there to account for the hours of operations, the cell needs to be formated as a number.
18	Engineering Assumption	EI Survey (Non-Registered)	B488- B531	There are no assumed values for the Assumed Mol% for the Fuel Gas Analysis #2 Table.	Add the assumed Values. If there are no assumed values, add "None" or "0" in the cells.
19	Format	EI Survey (Non-Registered)	D488 - D531	Maintain the same significant digits on the molecular weight for consistency.	Reformat the cells to have the same significant digits.
20	Formula	EI Survey (Non-Registered)	B425, B426, B532, B533	Incorrect formulas in the cells.	Revise the formulas to sum the mol% and VOC.
21	Engineering Assumption	EI Survey (Non-Registered)	B537- B580	There are no assumed values for the Assumed Mol% for the Incoming Gas Stream Analysis #2 Table.	Add the assumed Values. If there are no assumed values, add "None" or "0" in the cells.

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
22	Format	EI Survey (Non-Registered)	D537 - D580	Maintain the same significant digits on the molecular weight for consistency.	Reformat the cells to have the same significant digits.
23	Formula	EI Survey (Non-Registered)	B581, B582	There are no formulas in these cells. These cells should have formulas, which sum the mol% and VOC.	Insert formulas that sum the mol% and VOC.
24	Engineering Assumption	EI Survey (Non-Registered)	B591	There is no assumed data for the Total Venting Volume.	Add the assumed Values. If there are no assumed values, add "None" or "0" in the cells.
25	Data Entry	EI Survey (Non-Registered)	B606 - B638	Blank cells for the assumed mol%.	Add 0.0000% for these cells.
26	Format	EI Survey (Non-Registered)	D595 - D638	Maintain the same significant digits on the molecular weight for consistency.	Reformat the cells to have the same significant digits.
27	Format	Emissions	Multiple	Maintain the same significant digits on the mole% and Wt % for consistency and displaying more accurate number.	Reformat the cells to have the same significant digits (0.0000%).
28	Formula	Emissions	D1539	Missing value of GOR on oil.	Add GOR value on oil (scf/bbl).
29	Misc.	Emissions	B1558 - B1560, B1610 - B1612, B1663 - B1665	These cells are input cells; considering having these cells in "EI Survey (Non-Registered)" tab. Then, insert formula refers to the input cells.	Create input cells in "EI Survery (Non-Registered)" tab.
30	Formula	Emissions	A1557, A1609, A1662	All the loading losses were assumed to be uncontrolled.	The formula should be revised to have controlled efficiency input.
31	Misc.	Emissions	A1614, A1615	Mislabel on the annual throughput and loading losses.	Revise the label to "Condensate Annual Throughput" and "Condensate Loading Losses".
32	Misc.	Emissions	A1667, A1668	Mislabel on the annual throughput and loading losses.	Revise the label to "Oil Annual Throughput" and "Oil Loading Losses".

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
33	Formula	Emissions	Multiple	GHG is typically reported in metric tons not tonnes; Therefore, the formula in coverting lbs to metric tons is incorrect. These errors occur in Tanks + Loading, Fugitive Components, Compressor Blowdown, Well Completion Venting, Well Recompletion Venting, Pneumatic Devices, Other Combustion Devices, Venting Wells calculations.	Revise the formula to multiply 2.2405 kg/lbs then divide by 1,000 kg/metric tons.
34	Misc.	Emissions	D1755, D1834, D1913, D2465	Incorrect unit on the ideal gas constant.	Revise the unit to scf.atm/^{o}R.lb-mol.
35	Formula	Emissions	B1996	Incorrect formula for total emissions of GHG.	Revise the formula to summation of cells E2007 and E2015.
36	Emission Factor	Emissions	NA	In combustion control devices calculation, the potential emissions from pilot combustion should be calculated as fuel combustion similar to boiler or heater.	Revise the emission factors and formula similar to boiler and heater emission factors and formula.

QA/QC FORMS – ICR SPREADSHEETS

NON-REGISTERED OIL AND GAS FACILITIES

SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Alan Howard Karchmer Living Trust
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
108614 Alan Howard Karchmer Living Trust 2017 ICR(4)-AQP Edits			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/9/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1				No findings	No Findings
2					
3					
4					
5					
6					
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	American Petroleum Energy Co.
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 American Petroleum Energy Co. 2017.xls			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/3/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1	Calculation	Emissions	C2431	The formula calls out to "2. EI Survey (Non-Registered)'!C591" the cell; however, is not acessible.	Verify with the operator that there is no venting wells in 2017.
2	Formula	Emissions	C1909	The operator indicates zero well recompletion event in 2017. However, the emission is calculated based on the assumption value of one.	Revise the formula to "IF('2EI Survey (Non-Registered'!D352<0…"
3	Formula	Emissions	C1910	The operator indicates zero for the volume of gas vented. However, the emission is calculated based on the assumtion value of 1,000 mscf/Recompletion.	Revise the formula to "IF('2EI Survey (Non-Registered'!D351<0…"
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Beeman Oil & Gas LLC
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 Beeman_SUIT ICR Workbook_2017-AQP Edits.xls			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/4/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1	Formula	Emissions	C1752: C1753	The operator indicates zero compressor blowdowns events in 2017. However, the emission is calculated based on the assumption values of two, ten and one.	Revise the formula to "IF('2EI Survey (Non-Registered'!E323<0…", "IF('2EI Survey (Non-Registered'!E324<0…".
2	Formula	Emissions	C1830: C1831	The operator indicates zero well completion event in 2017. However, the emission is calculated based on the assumption value of 50%, zero, 1000, and zero.	Revise the formula to "IF('2EI Survey (Non-Registered'!C341<0…", "IF('2EI Survey (Non-Registered'!C342<0…".
3	Formula	Emissions	C1909: C1910	The operator indicates zero well recompletions event in 2017. However, the emission is calculated based on the assumption value of 50%, zero, zero, and 1000.	Revise the formula to "IF('2EI Survey (Non-Registered'!D351<0…", "IF('2EI Survey (Non-Registered'!D352<0…".
4	Formula	Emissions	C1999: C2001	The operator indicates zero Pneumatic controllers event in 2017. However, the emission is calculated based on the assumption value of 2.7, 5.5, and 8760.	Revise the formula to "IF('2EI Survey (Non-Registered'!C363<0…", "IF('2EI Survey (Non-Registered'!E363<0…", "IF('2EI Survey (Non-Registered'!G363<0…".
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Benson Montin Greer Drilling Corp
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 Benson-Montin-Greer Drilling Corp 2017 ICR.xls			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/9/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Big Run Production Co
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180906 Big Run Production FINAL Minor Source IR Template			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/15/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1	Formula	Emissions	M30: M269	The operator indicates zero Average Operating Hours. However, the emission is calculated based on the assumed value of 8760.	Revise the formula to "IF('2EI Survey (Non-Registered'!$C$93<0…"
2	Formula	Emissions	M276: M515	The operator indicates zero Average Operating Hours. However, the emission is calculated based on the assumed value of 8760.	Revise the formula to "IF('2EI Survey (Non-Registered'!$C$93<0…"
3	Formula	Emissions	M522: M761	The operator indicates zero Average Operating Hours. However, the emission is calculated based on the assumed value of 8760.	Revise the formula to "IF('2EI Survey (Non-Registered'!$C$93<0…"
4	Formula	Emissions	M790: M1029	The operator indicates zero Average Operating Hours. However, the emission is calculated based on the assumed value of 8760.	Revise the formula to "IF('2EI Survey (Non-Registered'!$C$93<0…"
5	Formula	Emissions	C1752	The operator indicates zero Natural Gas Lost per Blowdown Event. However, the emission is calculated based on the assumed value of 2.	Revise the formula to "IF('2EI Survey (Non-Registered'!D324<0…"
6	Formula	Emissions	C1753	The operator indicates zero Annual Compressor Blowdowns. However, the emission is calculated based on the assumed value of 2.	Revise the formula to "IF('2EI Survey (Non-Registered'!D323<0…"
7	Formula	Emissions	C1909	The operator indicates zero Well Recompletion in 2017. However, the emission is calculated based on the assumed value of 1.	Revise the formula to "IF('2EI Survey (Non-Registered'!D352<0…"
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Black Hills Exploration and Production Inc
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180906 ATG Enterprises 2017 ICR 2018-09-06			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/15/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1	Data Entry	EI Survey (Non-Registered)	H239: H246	There are operator inputs for tank sized 301-400 but there are no tanks reported in that size.	Verify the Operator input data.
2	Formula	Emissions	C1909:	The operator indicates zero Well Recompletion in 2017. However, the emission is calculated based on the assumed value of 1.	Revise the formula to "IF('2EI Survey (Non-Registered'!D352<0..."
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	BP America Production Company
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 BP America Production Company 2017 ICR - Sumitted 9-6-2018			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/10/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Catamount Energy Partners LLC
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 Catamount Energy Partners 2017 ICR-AQP Edits			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/10/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1	Formula	EI Survey (Non-Registered)	C1830	The operator indicates zero well completion event in 2017. However, the emission is calculated based on the assumption value of 50%.	Revise the formula to "IF('2EI Survey (Non-Registered'!D341<0…".
2	Formula	EI Survey (Non-Registered)	C1910	The operator indicates zero well recompletions event in 2017. However, the emission is calculated based on the assumption value of 1000.	Revise the formula to "IF('2EI Survey (Non-Registered'!D351<0…".
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Coleman Oil & Gas Inc.
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 Coleman Oil Gas inc 2017 ICR			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/10/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1	Formula	Emissions	C1753	The operator indicates zero average Compressor Blowdowns in 2017. However, the emission is calculated based on the assumption value of 2.	Revise the formula to "IF('2EI Survey (Non-Registered'!D323<0…".
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Dugan production Corp
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 Dugan Production Corp 2017 ICR			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/10/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1	Formula	Emissions	C1909	The operator indicates zero average Well Recompletion event in 2017. However, the emission is calculated based on the assumption value of 1.	Revise the formula to "IF('2EI Survey (Non-Registered'!D352<0...".
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Enduring Resources LLC
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 Enduring Resources LLC 2017 ICR (003)			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/12/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Enervest Operating LLC
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 Enervest Operating LLC 2017 ICR			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/12/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Enterprise Products Operating LLC
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 Enterprise Products Operating LLC 2017 ICR			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/12/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Faulconer Inc.
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 Faulconer Inc Vernon E 2017 ICR			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/12/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1				No Findings	No Findings
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information
Emission Category: Multiple Sources
Emission Source Details: Oil and Gas Production

Facility Information
Owner/Operator: Fritz & Digman
Name: Not Applicable

File Name:
180614 Fritz Digman 2017 ICR

QA/QC Completed by: Marcos Padilla; Project Scientist; Montrose Air Quality Services.
Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
Date: 10/12/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1	Formula	Emissions	L1539	The operator indicates zero Gas Oil Ratio. However, the emission is calculated based on the assumed value of 16.4996.	Revise the formula to "IF('2EI Survey (Non-Registered'!C257<0…"
2	Formula	Emissions	P1539	The operator indicates zero Gas Oil Ratio. However, the emission is calculated based on the assumed value of 16.4996.	Revise the formula to "IF('2EI Survey (Non-Registered'!C257<0…"
3	Formula	Emissions	P1540	The operator indicates zero Gas Water Ratio. However, the emission is calculated based on the assumed value of 3.3167.	Revise the formula to "IF('2EI Survey (Non-Registered'!G257<0…"
4	Formula	Emissions	C1752	The operator indicates zero Natural Gas Lost per Blowdown Event. However, the emission is calculated based on the assumed value of 2.	Revise the formula to "IF('2EI Survey (Non-Registered'!D324<0…"
5	Formula	Emissions	C1753	The operator indicates zero Annual Compressor Blowdowns. However, the emission is calculated based on the assumed value of 2.	Revise the formula to "IF('2EI Survey (Non-Registered'!D323<0…"
6	Formula	Emissions	C1831	The operator indicates zero Gas vented to the atmoshepre. However, the emission is calculated based on the assumed value of 1000.	Revise the formula to "IF('2EI Survey (Non-Registered'!C342<0…"
7	Formula	Emissions	C1909:	The operator indicates zero Well Recompletion in 2017. However, the emission is calculated based on the assumed value of 1.	Revise the formula to "IF('2EI Survey (Non-Registered'!D352<0…"
8	Formula	Emissions	C1910	The operator indicates zero Gas lost per Well Recompletion event. However, the emission is calculated based on the assumed value of 1000.	Revise the formula to "IF('2EI Survey (Non-Registered'!D351<0…"
9	Formula	Emissions	C1998	The operator indicates zero Devices per well. However, the emission is calculated based on the assumed value of 2.7.	Revise the formula to "IF('2EI Survey (Non-Registered'!C363<0…"
10	Formula	Emissions	C1999	The operator indicates zero Gas emission rate. However, the emission is calculated based on the assumed value of 5.5.	Revise the formula to "IF('2EI Survey (Non-Registered'!E363<0…"
11	Formula	Emissions	C2001	The operator indicates zero Hours of operations. However, the emission is calculated based on the assumed value of 8760.	Revise the formula to "IF('2EI Survey (Non-Registered'!G363<0…"
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Gosney and Sons Inc
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 Gosney Sons Inc 2017 ICR			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/14/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1	Formula	Emissions	C1909	The operator indicates zero well recompletion event in 2017. However, the emission is calculated based on the assumption value of one.	Revise the formula to "IF('2EI Survey (Non-Registered'!D352<0…"
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Hilcorp Energy Company
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 Hilcorp Energy Company 2017 ICR			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/15/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1	Formula	Emissions	C1909	The operator indicates zero Well Recompletion in 2017. However, the emission is calculated based on the assumed value of 1.	Revise the formula to "IF('2EI Survey (Non-Registered'!D352<0…"
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Hubbs III LLC
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 Hubbs III LLC 2017 ICR			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/14/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Logos Operating LLC
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 Logos Operating LLC 2017 ICR (Autosaved) FINAL			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/15/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1	Formula	Emissions	C1909	The operator indicates zero well recompletion event in 2017. However, the emission is calculated based on the assumption value of two.	Revise the formula to "IF('2EI Survey (Non-Registered'!D352<0..."
2	Formula	Emissions	C1910	The operator indicates zero for the volume of gas vented. However, the emission is calculated based on the assumtion value of 1,000 mscf/Recompletion.	Revise the formula to "IF('2EI Survey (Non-Registered'!D351<0..."
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Maralex Resources Inc.
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 Maralex Resources Inc 2017 ICR - AQP Edits			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/15/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1	Formula	Emissions	C1909	The operator indicates zero well recompletion event in 2017. However, the emission is calculated based on the assumption value of one.	Revise the formula to "IF('2EI Survey (Non-Registered'!D352<0..."
2	Formula	Emissions	C1910	The operator indicates zero for the volume of gas vented. However, the emission is calculated based on the assumtion value of 1,000 mscf/Recompletion.	Revise the formula to "IF('2EI Survey (Non-Registered'!D351<0..."
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	McLane Trust
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 McLane Trust - Dixie 2017 ICR - AQP Edits			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/15/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1				No Findings	No Findings
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Merrion Oil & Gas Corp.
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 Merrion Oil Gas Corp 2017 ICR			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/15/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1	Data Entry	EI Survey (Non-Registered)	C165: C175	There is one boiler listed on the equipment list but there is no entry in the listed cells.	Enter the data for the listed boiler.
2	Formula	Emissions	C1998	The operator indicates zero Devices per well. However, the emission is calculated based on the assumed value of 2.7.	Revise the formula to "IF('2EI Survey (Non-Registered'!C363<0..."
3	Formula	Emissions	C1999	The operator indicates zero Gas emission rate. However, the emission is calculated based on the assumed value of 5.5.	Revise the formula to "IF('2EI Survey (Non-Registered'!E363<0..."
4	Formula	Emissions	C2001	The operator indicates zero Hours of operations. However, the emission is calculated based on the assumed value of 8760.	Revise the formula to "IF('2EI Survey (Non-Registered'!G363<0..."
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Murchison Oil & Gas
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 Murchison oil Gas 2017 ICR - AQP			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/15/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1	Formula	EI Survey (Non-Registered)	F307	The operator indicates zero Open-Ended Lines. However, the emission is calculated based on the assumed value of 192.	Revise the formula to "IF(G307>=…"
2	Formula	Emissions	C1753	The operator indicates zero Annual Compressor Blowdowns. However, the emission is calculated based on the assumed value of 2.	Revise the formula to "IF('2EI Survey (Non-Registered'!D323<0…"
3	Formula	Emissions	C1831	The operator indicates zero Gas vented to the atmoshepre. However, the emission is calculated based on the assumed value of 1000.	Revise the formula to "IF('2EI Survey (Non-Registered'!C342<0…"
4	Formula	Emissions	C1909:	The operator indicates zero Well Recompletion in 2017. However, the emission is calculated based on the assumed value of 1.	Revise the formula to "IF('2EI Survey (Non-Registered'!D352<0…"
5	Formula	Emissions	C1998	The operator indicates zero Devices per well. However, the emission is calculated based on the assumed value of 2.7.	Revise the formula to "IF('2EI Survey (Non-Registered'!C363<0…"
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Petrox Resources Inc
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180906 PETROX_AirRequest-AQP Edit			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/15/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1	Formula	Emissions	C1752	The operator indicates zero Natural Gas Lost per Blowdown Event. However, the emission is calculated based on the assumed value of 2.	Revise the formula to "IF('2EI Survey (Non-Registered'!D324<0…"
2	Formula	Emissions	C1753	The operator indicates zero Annual Compressor Blowdowns. However, the emission is calculated based on the assumed value of 2.	Revise the formula to "IF('2EI Survey (Non-Registered'!D323<0…"
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Red Cedar Gathering Company
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 Red Cedar Gathering Company 2017 ICR_2-AQP Edits			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/15/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Red Willow Production Company
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180830 Red Willow Production Company 2017 ICR-AQP Edits			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/15/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Rim Operating Inc.
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 Rim Operating Inc 2017 ICR-AQP Edits			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/15/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1	Formula	Emissions	C1909:	The operator indicates zero Well Recompletion in 2017. However, the emission is calculated based on the assumed value of 1.	Revise the formula to "IF('2EI Survey (Non-Registered'!D352<0..."
2	Formula	Emissions	C1910	The operator indicates zero Gas lost per Well Recompletion event. However, the emission is calculated based on the assumed value of 1000.	Revise the formula to "IF('2EI Survey (Non-Registered'!D351<0..."
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Southern Ute Growth Fund - Department of Energy
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 Southern Ute Growth Fund - Department of Energy			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Southland Royalty Company LLC
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 Southland Royalty Company LLC 2017 ICR			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/15/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1	Formula	Emissions	C1753	The operator indicates zero Annual Compressor Blowdowns. However, the emission is calculated based on the assumed value of 2.	Revise the formula to "IF('2EI Survey (Non-Registered'!D323<0…"
2	Formula	Emissions	C1752	The operator indicates zero Natural Gas Lost per Blowdown Event. However, the emission is calculated based on the assumed value of 2.	Revise the formula to "IF('2EI Survey (Non-Registered'!D324<0…"
3	Formula	Emissions	C1909	The operator indicates zero Well Recompletion in 2017. However, the emission is calculated based on the assumed value of 1.	Revise the formula to "IF('2EI Survey (Non-Registered'!D352<0…"
4	Formula	Emissions	C1910	The operator indicates zero Gas lost per Well Recompletion event. However, the emission is calculated based on the assumed value of 1000.	Revise the formula to "IF('2EI Survey (Non-Registered'!D351<0…"
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Thompson Engineering and Production
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 Thompson Engineering and Production 2017 ICR			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/15/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1				No Findings	No Findings
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Williams Four Corners LLC
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 williams Four Corners LLC 2017 ICR			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/15/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1				No Findings	No Findings
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SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information		**Facility Information**	
Emission Category:	Multiple Sources	Owner/Operator:	Williford Resources LLC
Emission Source Details:	Oil and Gas Production	Name:	Not Applicable
File Name:		QA/QC Completed by:	Marcos Padilla; Project Scientist; Montrose Air Quality Services.
180614 Williford Resources LLC 2017 ICR-AQP Edits			Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
		Date:	10/15/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1				No Findings	No Findings
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QA/QC FORMS – SUMMARY SPREADSHEET

OIL AND GAS FACLITIES

MODIFIED BASED ON SUIT AQP FEEDBACK ON 11/14/2018

SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information
Emission Category: Multiple Sources
Emission Source Details: Oil and Gas Production

Facility Information
Owner/Operator: Not Applicable
Name: Not Applicable

File Name:
180924 Emissions Inventory Data Summary Template

QA/QC Completed by: Marcos Padilla; Project Scientist; Montrose Air Quality Services.
Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.
Date: 11/3/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1	Formula	1. Oil & Gas - Title V Facility and Non-Registered Minor Facility	V16: V2136	The CO_2e is calculated by multiplying the mass of a GHG's by the Global Warming Potential (GWP) factor of the GHG. The formula just adds the mass of CO2, CH4, and N2O without converting CH4 and N2O to CO2eq.	Please include the GWP factors for CH4 (25) and N2O (298) in the calculation
2	Data Entry	1. Oil & Gas - Title V Facility	P259	No Data Input.	180323_RC ARK-SIM_FEE 2017 pdf file has data for the NOx value.
3	Data Entry	1. Oil & Gas - Title V Facility	Q259	No Data Input.	180323_RC ARK-SIM_FEE 2017 pdf file has data for the VOC.
4	Data Entry	1. Oil & Gas - Title V Facility	S259	No Data Input.	180323_RC ARK-SIM_FEE 2017 pdf file has data for the $PM_{10.}$
5	Data Entry	1. Oil & Gas - Title V Facility	T259	No Data Input.	180323_RC ARK-SIM_FEE 2017 pdf file has data for the CO.
~~6~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~AB304~~	~~Data input is incorrect.~~	~~The cell should be 0.18 instead of 0.200.~~
~~7~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~AG304~~	~~No Data Input.~~	~~The cell value should be 0.02.~~
~~8~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~AH304~~	~~No Data Input.~~	~~The cell value should be 0.02.~~
~~9~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~AI304~~	~~No Data Input.~~	~~The cell value should be 0.04.~~
~~10~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~P305~~	~~Data input is incorrect.~~	~~The cell value should be 19.2 instead of 8.7.~~
~~11~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~Q305~~	~~Data input is incorrect.~~	~~The cell value should be 12.8 instead of 5.8.~~
~~12~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~S305~~	~~Data input is incorrect.~~	~~The cell value should be 0.4 instead of 0.200.~~
~~13~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~T305~~	~~Data input is incorrect.~~	~~The cell value should be 33.9 instead of 15.5.~~
~~14~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~AB305~~	~~Data input is incorrect.~~	~~The cell value should be 3.71 instead of 0.800.~~
~~15~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~AG305~~	~~Data input is incorrect.~~	~~The cell value should be 0.35 instead of 0.100.~~
~~16~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~AH305~~	~~No Data Input.~~	~~The cell value should be 0.22.~~
~~17~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~AI305~~	~~No Data Input.~~	~~The cell value should be 0.11.~~
~~18~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~P308~~	~~Data input is incorrect.~~	~~The cell value should be 19.2 instead of 13.4.~~
~~19~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~Q308~~	~~Data input is incorrect.~~	~~The cell value should be 12.8 instead of 8.9.~~
~~20~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~S308~~	~~Data input is incorrect.~~	~~The cell value should be 0.4 instead of 0.300.~~
~~21~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~T308~~	~~Data input is incorrect.~~	~~The cell value should be 34.0 instead of 23.6.~~
~~22~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~AB308~~	~~Data input is incorrect.~~	~~The cell value should be 3.72 instead of 1.800.~~
~~23~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~AG308~~	~~Data input is incorrect.~~	~~The cell value should be 0.35 instead of 0.200.~~
~~24~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~P309~~	~~Data input is incorrect.~~	~~The cell value should be 18.5 instead of 18.00.~~
~~25~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~Q309~~	~~Data input is incorrect.~~	~~The cell value should be 12.3 instead of 12.00.~~
~~26~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~T309~~	~~Data input is incorrect.~~	~~The cell value should be 32.7 instead of 31.7.~~
~~27~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~AB309~~	~~Data input is incorrect.~~	~~The cell value should be 3.57 instead of 3.2.~~
~~28~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~AH309~~	~~Data input is incorrect.~~	~~The cell value should be 0.21 instead of 0.20.~~
~~29~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~U311~~	~~No Formula.~~	~~The cell needds to have the same "Sum" formula as the rest of that column~~
~~30~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~AD311~~	~~No Data Input.~~	~~The cell value should be 0.04.~~
31	Data Entry	1. Oil & Gas - Title V Facility	W316:W321	The input values for these cells are not located in 183029_BP Dry Creek_FEE 2017 pdf file.	Confirm these values are correct.
32	Data Entry	1. Oil & Gas - Title V Facility	V316: V328	The sum of all CO_2e 27,063.386 tpy; however, the Dry Creek Fee 2017 Fee report states that the facility emitted 45,506.3 tpy of CO2e.	Verify the method of CO_2e calculation for the facility.
33	Data Entry	1. Oil & Gas - Title V Facility	P321	Data input is incorrect.	The cell value should be 18.931 instead of 18.311.
34	Data Entry	1. Oil & Gas - Title V Facility	V322, V323, V328	The input values for these cells are not located in 183029_BP Dry Creek_FEE 2017 pdf file.	Confirm these values are correct.
35	Data Entry	1. Oil & Gas - Title V Facility	V338, V344, V352, V396, V1026	The input values for these cells are not located in 183029_BP Florida_FEE 2017 pdf file.	Confirm these values are correct.
36	Data Entry	1. Oil & Gas - Title V Facility	AB879: AM879	No Data Input.	Enter the data from 180319_CE IGTP_FEE 2017 pdf file for these HAP's.
37	Data Entry	1. Oil & Gas - Title V Facility	AB838: AM838	No Data Input.	Enter the data from 180319_CE IGTP_FEE 2017 pdf file for these HAP's.

Cell AD305, AD308, and AD309 values should be 0.1, 0.2, and 0.3

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
38	Data Entry	1. Oil & Gas - Title V Facility	S838, T838 S879, T879 S1075,T1075 S1076,T1076 S1078,T1078 S1094,T1094 S1095,T1095 S1109,T1109	No Data Input.	CE IGTP_FEE 2017 pdf file has data for these PM & CO.
39	Data Entry	1. Oil & Gas - Title V Facility	AN1113, AO1113	No Data Input.	Enter the Latitude (37.1216) and Longitude (-107.6589).
40	Data Entry	1. Oil & Gas - Title V Facility	S1657	No Data Input.	The cell value should be 0.3.
41	Data Entry	1. Oil & Gas - Title V Facility	S1661	No Data Input.	The cell value should be ~~0.3.~~ 0.4
42	Data Entry	1. Oil & Gas - Title V Facility	S1666	No Data Input.	The cell value should be ~~0.04.~~ 0.3
43	Data Entry	1. Oil & Gas - Title V Facility	S1674	No Data Input.	The cell value should be 0.3.
44	Data Entry	1. Oil & Gas - Title V Facility	S1679	No Data Input.	The cell value should be 0.04.
45	Data Entry	1. Oil & Gas - Title V Facility	P1956: AM1956	No Data Input.	Page 13 of 180329_BP TS6_FEE 2017 pdf file has data for these heaters.
46	Formula	1. Oil & Gas - Title V Facility	U1980	Missing Formula (there are reported HAPS values)	Enter formula that sums the total HAPs of the emission source (SUM(AB1973:AM1973).
47	Data Entry	1. Oil & Gas - Title V Facility	S1984	No Data Input.	The cell value should be ~~0.04.~~ 0
48	Data Entry	1. Oil & Gas - Title V Facility	S1987	No Data Input.	The cell value should be ~~0.04.~~ 0.4
49	Data Entry	1. Oil & Gas - Title V Facility	S1988	No Data Input.	The cell value should be ~~0.04.~~ 0.4
50	Data Entry	1. Oil & Gas - Title V Facility	S1993	No Data Input.	The cell value should be ~~0.04.~~ 0.4
51	Data Entry	1. Oil & Gas - Title V Facility	S1999	No Data Input.	The cell value should be ~~0.04.~~ 0.4
~~52~~	~~Data Entry~~	~~1. Oil & Gas - Title V Facility~~	~~AF1999~~	~~Data input is incorrect.~~	~~There should not be any data here.~~
53	Misc.	1. Oil & Gas - Title V Facility	None	No mistake on the summary spreadsheet. The emission fee calculations of RC Ponderosa CS_FEE Sheet seems to have been done with the potential to emit numbers instead of the actual emissions.	No changes on the summary spreadsheet
54	Data Entry	1. Oil & Gas - Non Registered Minor	W124	Data input is incorrect.	The cell value should be 4.850723139 instead of 27.566.
55	Data Entry	1. Oil & Gas - Non Registered Minor	Q128	Data input is incorrect.	The cell value should be 0.008828947 instead of 0.135.
56	Data Entry	1. Oil & Gas - Non Registered Minor	X133	Data input is incorrect.	The cell value should be 256.6646061 instead of 258.471.
57	Data Entry	1. Oil & Gas - Non Registered Minor	Y166	No Data Input.	The cell value should be 0.48275956.
58	Data Entry	1. Oil & Gas - Non Registered Minor	W350	Data input is incorrect.	The cell should be 16.97753098.
59	Data Entry	1. Oil & Gas - Non Registered Minor	X492	Data input is incorrect.	The cell value should be ~~1.314~~ 1.263 instead of 1314.0.
60	Data Entry	1. Oil & Gas - Non Registered Minor	AJ645	No Data Input	The cell value should be ~~0.308210526.~~ 0.022
61	Data Entry	1. Oil & Gas - Non Registered Minor	AJ680	No Data Input	The cell value should be ~~0.044305263.~~ 0.00
62	Data Entry	1. Oil & Gas - Non Registered Minor	W682	Data input is incorrect.	The cell value should be ~~153.6184915~~ 0.024 instead of 8.471.
63	Data Entry	1. Oil & Gas - Non Registered Minor	X682	Data input is incorrect.	The cell value should be ~~23535.44709~~ 4.482 instead of 1297.850.
64	Data Entry	1. Oil & Gas - Non Registered Minor	W689	Data input is incorrect.	The cell value should be 0.100023128 instead of 1.945.
65	Data Entry	1. Oil & Gas - Non Registered Minor	W716	No Data Input.	The cell value should be 0.303035514.
66	Data Entry	1. Oil & Gas - Non Registered Minor	X716	No Data Input.	The cell value should be 147.3281615.
67	Formula	1. Oil & Gas - Non Registered Minor	V716	The cell has data instead of the sum formula.	Insert Formula, "Sum(W716:Y716)" to be consistent with other cells.
68	Data Entry	1. Oil & Gas - Non Registered Minor	X948	Data input is incorrect.	The cell value should be 61.08499224 instead of 61.515.
69	Data Entry	1. Oil & Gas - Non Registered Minor	W949	Data input is incorrect.	The cell value should be 0.404226928 instead of 2.297.
70	Data Entry	1. Oil & Gas - Non Registered Minor	X951	Data input is incorrect.	The cell value should be 648.9370761 instead of 652.361.
71	Data Entry	1. Oil & Gas - Non Registered Minor	AB2022	No Data Input.	The cell value should be 0.0.003788743.
72	Data Entry	1. Oil & Gas - Non Registered Minor	AC2022	No Data Input.	The cell value should be 0.000106085.
73	Data Entry	1. Oil & Gas - Non Registered Minor	AD2022	No Data Input.	The cell value should be 0.000171756.
74	Data Entry	1. Oil & Gas - Non Registered Minor	AJ2022	No Data Input.	The cell value should be 0.090929825.
75	Data Entry	1. Oil & Gas - Non Registered Minor	X2023	Data input is incorrect.	The cell value should be 7352.408531 instead of 7404.160617.

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
76	Data Entry	1. Oil & Gas - Non Registered Minor	AE2103	No Data Input.	The cell value should be 0.0026.
77	Data Entry	1. Oil & Gas - Non Registered Minor	X2133	Data input is incorrect.	The cell value should be 49.60992503 instead of 49.878.
78	Data Entry	1. Oil & Gas - Non Registered Minor	N/A	No data input for emission from tanks at Hubbs III LLC facility.	Add VOC, benzene, toluene, ethylbenzene, xylenes, and GHG(CO2e) emissions from oil tank at Hubbs III LLC facility.
79					
80					

Cell P1984, T1984, AF 1984, and V1984 should be zero or no values based on the reported actual emissions of Red Cedar Worford Ridge Compressor Station.

QA/QC FORMS – SUMMARY SPREADSHEET

SOLID WASTE LANDFILLS
AIRPORTS
GASOLINE SERVICE STATIONS
SAND AND GRAVEL PITS
FRUITLAND OUTCROP EMISSIONS
RESIDENTIAL HEATING
FIRE EVENTS
AGRICULTURAL BURNING
NEW PERMITTED POINT SOURCE
MOBILE SOURCE
BIOGENIC SOURCE

SOUTHERN UTE INDIAN TRIBE (SUIT)
2017 EMISSION INVENTORY (EI) QA/QC FORM

Emission Source Information

Emission Category: Multiple Sources

Emission Source Details: Non Oil and Gas Production Sources

File Name:

180924 Emissions Inventory Data Summary Template

Facility Information

Owner/Operator: Not Applicable

Name: Not Applicable

QA/QC Completed by: Edward Krisnadi; Senior Project Manager; Montrose Air Quality Services.

Date: 11/3/2018

QA/QC ACTIVITIES - FINDINGS

No.	Type of Findings (Error)	Tab Title	Cell	QA/QC Notes	Corrective Mechanism
1	Data Entry	2. Fire Events	B51, B52	Incorrect data transfer from the bluesky 2.0 beta output file.	Revise the cell B51 from 185 to 12; Revise the cell B52 from 12 to 185.
2	Formula	2. Fire Events	P18:P20	This cell should have formula which convert CO2 and CH4 into CO2e in metric tons. The cell values transferred from blue sky output data seem to overestimate the GHG (CO2e) emissions.	Add formula to convert CO2 and CH4 into CO2e in metric tons.
3	Data Entry	3. Residential Heating	K17	Incorrect unit in the cell.	Revise the unit from lb/tons to lb/cords.
4	Data Entry	4. Biogenics	E21	Incorrect data transfer from the NEI biogenics_laplata spreadsheet	Revise the cell value from 17151.4 into 254.657.
5		5. Ag. Burning	None	No Findings.	No Findings.
6		6. Gravel Pits	None	No Findings.	No Findings.
7		7. Airports	None	No Findings.	No Findings.
8	Misc.	8. Mobile Sources	E30:E34	The value of these cells (La Plata Nonroad Emission) can't be matched with the values of the provided	Verify with the output of MOVES software for La Plata Nonroad Emission.
9	Data Entry	9. Landfills	F39:F41	Incorrect data tranfer from 180326_TR Bondad Landfill_FEE 2017.pdf file	Revise the cell F39 to 0.126, cell F40 to 0.0124, F41 to 0.0328.
10	Misc.	9. Landfills	None	GHG emissions from both landfills were reported in the annual emission inventory for Bondad landfill and Weaver Consultants Group's email for Archuleta Landfill. However, these emissions were not reported in summary emission spreadsheet.	Add GHG emissions from both landfills to the summary emission spreadsheet.
11	Data Entry	10. Gas Stations	D16; D17	Incorrect data transfer from 2017 Gas Stations Total Emissions	Revise the cell D16 to 0.71 tons per year, and cell D17 to 11.13 tons per year.
12	Data Entry	10. Gas Stations	B18:D18	Missing emissions from vehicle refueling, displacement losses (controlled)	Enter the emission data of 1.11 tons per year for emissions from vehicle refueling, displacement losses (controlled).
13	Data Entry	11. Permitted Point Sources	G14, G15	Incorrect data tranfer from 181029 Crossfire-Bonds spreadsheet.	The value entered in these cells should be for cells F14, F15 (PM10 emissions not PM2.5 emission).
14	Data Entry	11. Permitted Point Sources	E16:G43	Incorrect data tranfer from 181029 Crossfire-Bonds spreadsheet.	The value entered in these cells were not based on the updated report.
15	Data Entry	11. Permitted Point Sources	F44	Incorrect data tranfer from 181029 Crossfire-Bonds spreadsheet.	Enter cell value of 0.022.
16	Misc.	11. Permitted Point Sources	None	Missing emission data from emission unit ID HO-03	Enter emission data of HO-03 from 181029 Crossfire-Bonds spreadsheet.
17		12. Outcrop Emissions	None	No Findings.	No Findings.
18	Data Entry	13. EI Summary	F14:G14	Missing formula in the cells.	The cell should contain the following formula: F14 = SUM(V29,V81) and G14 = SUM(V30,V82) from 3.Residential Heating tab.
19	Data Entry	13. EI Summary	N21	Incorrect formula in the cell.	The cell should have the formula of SUM(L18,L25,L47) from 7.Airports tab.
20	Data Entry	13. EI Summary	K27	Incorrect formula in the cell.	The cell should have the formula of SUM(J25,J52) from 9.Landfills tab.
21	Data Entry	13. EI Summary	D28	Missing formula in the cells.	The cell should have the formula "=H14" from the 10.Gas Stations tab.

APPENDIX C

LETTER OF PROJECT COMPLETION

Montrose Air Quality Services, LLC.
1631 East Saint Andrew Place
Santa Ana, California 92705

November 26, 2018

Danny Powers
Air Quality Program Manager

Southern Ute Indian Tribe
Environmental Program Division
Air Quality Program
P.O. Box 737, MS# 84
Ignacio, Colorado 81137

Subject: Project Completion for Quality Assurance Review on 2017 Emission Inventory

Dear Mr. Powers,

This letter is to inform you that the Quality Assurance (QA) review of the 2017 Emission Inventory (EI) project has been completed on November 26, 2018. Montrose Air Quality Services (MAQS) has completed the review of the emission calculation worksheets and draft emission inventory report. All the corrective actions recommended by MAQS have been discussed with Southern Ute Indian Tribe Air Quality Program (SUIT AQP) staffs. During the review, any unclear recommendations were discussed, reviewed, and confirmed by SUIT AQP and MAQS through conference calls. All final recommendations have been or will be incorporated by SUIT AQP staff into the inventory. With these recommended changes, MAQS believes the EI is complete, accurate and representative pursuant to US EPA inventory

On behalf of MAQS, I would like to thank the SUIT AQP for the opportunity to participate in this project. Should you or other SUIT AQP staff have any questions or concerns related to this project, please contact me at (714)919-6557 or ekrisnadi@montrose-env.com

Sincerely,
Montrose Air Quality Services, LLC.

A. Edward Krisnadi
Senior Project Manager
Regulatory Compliance Services

Enclosure(s)
029RC2-441834.ltr1