

Appendix U. Technical Support Document for Air Resources

U.1. Introduction

This air resources technical support document describes the data and methodology used to conduct and serve as the basis for the air quality impact analysis included in Chapter 4 of the Lander Resource Management Plan (RMP) and Environmental Impact Statement (EIS).

U.1.1. Study Area

The study area for this analysis is focused on the Lander Field Office planning area and includes cumulative emission sources and potential impacts to Class I areas within 100 kilometers of the planning area. Federal Prevention of Significant Deterioration (PSD) Class I areas are afforded special protection under the 1970 Clean Air Act (CAA). This study includes the following Class I areas, which were selected due to their close proximity to the Lander Field Office.

- Bridger Wilderness Area
- Fitzpatrick Wilderness Area
- Washakie Wilderness Area
- Yellowstone National Park
- Teton Wilderness Area
- Grand Teton National Park

U.1.2. Pollutants Addressed in the Analysis

The basic framework for controlling air pollutants in the United States is mandated by the CAA and its amendments and the 1999 Regional Haze Regulations. The CAA addresses criteria air pollutants, National Ambient Air Quality Standards (NAAQS) for criteria air pollutants, the PSD program, and emission standards for hazardous air pollutants (HAPs). The Regional Haze Regulations address visibility impairment.

Criteria pollutants are those for which NAAQS have been established. Ambient air concentrations of these constituents greater than the national standards represent a risk to human health. Criteria pollutants include carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), ozone (O₃), particulate matter (PM₁₀, PM_{2.5}), and lead. Volatile organic compounds (VOCs) are a group of pollutants for which there is no established ambient air quality standard but which are regulated under the CAA. VOCs are organic compounds that participate in photochemical reactions in the atmosphere and are critical to O₃ formation. HAPs are those pollutants that cause or may cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental and ecological impacts. The United States Environmental Protection Agency (EPA) has issued reference concentrations for evaluating the inhalation risk for cancerous and noncancerous health impacts for chronic inhalation. Pollutants that are responsible for degradation of visibility and atmospheric deposition include sulfur and nitrogen compounds and fine particulate matter (PM_{2.5}). Nitric acid and nitrate are not emitted directly into the air, but form in the atmosphere from industrial and automotive emissions of nitrogen oxides (NO_x). Sulfate is formed in the atmosphere from industrial emissions of SO₂. Deposition

of these compounds can adversely impact terrestrial and aquatic vegetation, soil chemistry, and aquatic chemistry. Ambient concentrations of these pollutants can cause reduced visibility (haze). Greenhouse gases (GHGs) are those pollutants that are effective at trapping heat in the earth's atmosphere and have been attributed to climate change. These pollutants include carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O).

The air pollutants addressed in this analysis included criteria pollutants (NO_x, PM₁₀, PM_{2.5}, CO, SO₂, and O₃), VOCs, HAPs, and GHGs (specifically CO₂, CH₄, and N₂O). These pollutants were included in this analysis because: 1) they were identified as compounds that had potential to be emitted by management actions and activities within the planning area; 2) sufficient production and operational data was available to estimate emissions; and, 3) scientifically defensible or actual emission factors were available to quantify emissions. Lead, a criteria pollutant, was primarily a concern before the widespread use of unleaded gasoline and emissions from fuel combustion were a concern. Lead was not included in this analysis as emissions from projected activities would be negligible. Hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride were not included in the analysis of GHGs because the proposed management activities and actions are not typically sources of these pollutants and emissions would be negligible or zero.

U.1.3. Thresholds of Significance

Criteria Pollutants

In order to protect and enhance the quality of the nation's air resources, EPA established NAAQS. Wyoming Department of Environmental Quality (DEQ) has established Wyoming Ambient Air Quality Standards (WAAQS). Primary standards are set at the level required to protect human health with an "adequate margin of safety" and must safeguard the public as a whole. Secondary standards are set at the level that protects public welfare, which is defined to include all forms of environmental damage, including but not limited to impacts on visibility, water, soil, and climate. Table U.1, "National and Wyoming Ambient Air Quality Standards" (p. 1652) shows the current NAAQS and WAAQS. The Bureau of Land Management (BLM) cannot authorize any activity that would not conform to all applicable local, state, tribal, and federal air quality laws, regulations, standards.

Table U.1. National and Wyoming Ambient Air Quality Standards

Pollutant	Averaging Time	National Ambient Air Quality Standards						Wyoming Ambient Air Quality Standards		
		Primary			Secondary			Primary		
		(ppm)	(ppb)	(µg/m ³)	(ppm)	(ppb)	(µg/m ³)	(ppm)	(ppb)	(µg/m ³)
Carbon Monoxide	1 hour	35 (a)	35,000	40,000	None			35	35,000	40 (mg/m ³)
	8 hour	9 (a)	9,000	10,000	None			9	9,000	10 (mg/m ³)
Lead	Rolling 3-month	---	---	0.15	Same as Primary			---	---	0.15
Nitrogen Dioxide	1 hour	0.1	100 (b)	189	None			---	---	---
	Annual (Arithmetic Mean)	0.053	53	100	Same as Primary			0.05	50	100

Pollutant	Averaging Time	National Ambient Air Quality Standards						Wyoming Ambient Air Quality Standards		
		Primary			Secondary			Primary		
		(ppm)	(ppb)	($\mu\text{g}/\text{m}^3$)	(ppm)	(ppb)	($\mu\text{g}/\text{m}^3$)	(ppm)	(ppb)	($\mu\text{g}/\text{m}^3$)
PM ₁₀	24 hour	---	---	150 (c)	Same as Primary			---	---	150 (c)
	Annual (Arithmetic Mean)	None			None			---	---	50
PM _{2.5}	24 hour	---	---	35 (d)	Same as Primary			---	---	35 (d)
	Annual (Arithmetic Mean)	---	---	15.0 (e)	Same as Primary			---	---	15.0 (e)
Ozone	8 hour	0.075 (f)	75	147	Same as Primary			0.08	80	157
Sulfur Dioxide	1 hour	0.075	75 (g)	197	None			---	---	---
	3 hour	None			0.5 (a)	500	1,300	0.50	500	1,300
	24 hour	None			None			0.10	100	260
	Annual (Arithmetic Mean)	None			None			0.02	20	60
Hydrogen Sulfide	1/2 hour average	---	---	---	---	---	---	0.05	50	70 (h)
	1/2 hour average	---	---	---	---	---	---	0.03	30	40 (i)

Note: **Bold** indicates the standard as written in the corresponding regulation. Other values are conversions.

(a) Not to be exceeded more than once per year. (b) To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010). (c) Not to be exceeded more than once per year on average over 3 years. (d) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 $\mu\text{g}/\text{m}^3$ (effective December 17, 2006). (e) To attain this standard, the 3-year average of the weighted annual mean PM_{2.5} concentrations from single or multiple community-oriented monitors must not exceed 15.0 $\mu\text{g}/\text{m}^3$. (f) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm (effective March 27, 2008). (g) To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb (effective June 22, 2010). (h) Not to be exceeded more than two times per year. (i) Not to be exceeded more than two times in any five consecutive days.

PM_{2.5} particulate matter less than 2.5 microns in diameter

ppb parts per billion

ppm parts per million

$\mu\text{g}/\text{m}^3$ micrograms per cubic meter

mg/m^3 milligrams per cubic meter

The CAA includes provisions for the PSD in designated areas. The goal of the PSD program is “to preserve, protect and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores and other areas of special national or regional natural, recreation, scenic or historic value.” A classification system was established identifying allowable amounts of additional air quality degradation (increments) which would be allowed above legally established baseline levels (Table U.2, “Prevention of Significant Deterioration Increments” (p. 1654)). PSD Class I areas have the greatest limitations, with a very limited amount of additional degradation allowed, primarily national parks and wilderness areas. The remainder of the nation (outside non-attainment and maintenance areas) was designated as PSD Class II areas, where moderate deterioration and controlled growth is allowed. In its project specific EISs, BLM may compare cumulative concentrations of air pollutants to the PSD increments as an indication of a level of concern.

Table U.2. Prevention of Significant Deterioration Increments

Pollutant	Averaging Period	PSD Increment – Class I ($\mu\text{g}/\text{m}^3$)	PSD Increment – Class II ($\mu\text{g}/\text{m}^3$)
Sulfur Dioxide (SO_2)	3 hour	25	512
	24 hour	5	91
	Annual	21	20
Particulate Matter (PM_{10})	24 hour	8	30
	Annual	4	17
Nitrogen Dioxide (NO_2)	Annual	2.5	25
Carbon Monoxide (CO)	1 hour	None	None
	8 hour	None	None
Lead 3 months	3 months	None	None
Source: 40 CFR 51.166(c)			
PSD Prevention of Significant Deterioration $\mu\text{g}/\text{m}^3$ micrograms per cubic meter			

Hazardous Air Pollutants

Section 112 of the CAA lists more than 180 chemicals as HAPs. In addition, Sections 112(d) and 112(g) require regulatory agencies to establish Maximum Achievable Control Technology (MACT) Standards for sources that emit HAPs. Any source that emits or has the potential to emit 10 tons per year or more of any HAP or 25 tons per year or more of any combination of HAPs is considered a major source and will require a Title V, Part 70, operating permit review and permit. In addition to MACT standards, EPA has listed (on its Air Toxics Database) Reference Exposure Levels (RELs) for many of the HAPs. RELs are defined as concentrations at or below which no adverse health effects are expected.

Visibility

Changes in visibility or regional haze are caused by fine particles and gases scattering and absorbing light. A 1.0 deciview (dv) change in light extinction is considered potentially significant in mandatory Federal PSD Class I areas as described in the EPA Regional Haze Regulations (40 Code of Federal Regulations [CFR] §51.300 et seq.). A 1.0-dv change is defined as approximately a 10 percent change in the extinction coefficient (corresponding to a 2 to 5 percent change in contrast, for a black target against a clear sky, at the most optically sensitive distance from an observer), which is a small but noticeable change in haziness under most circumstances when viewing scenes in mandatory Federal Class I areas. For multi-source projects located within range of a Class I area, changes in extinction of less than 5 percent (0.5 dv) are generally considered unlikely to result in adverse impacts to visibility. Changes in extinction greater than 10 percent (1.0 dv) are generally considered unacceptable and will likely require additional more refined impact analysis typically including an evaluation of mitigation measures.

Atmospheric Deposition

The National Park Service (NPS) and United States Fish and Wildlife Service (USFWS) have established thresholds to evaluate nitrogen and sulfur deposition within Class I areas. These deposition analysis thresholds are defined as 0.005 kilogram per hectare per year (kg/ha/yr) in the western United States for both nitrogen and sulfur. These thresholds are typically used to analyze project alone impacts. Cumulative impacts are typically compared to the level of concern, which is defined by the NPS and USFWS as 3 kg/ha/yr for N and 5 kg/ha/yr for sulfur (Fox et al.1989)

in Rocky Mountain regions. Deposition rates that are below the level of concern are believed to cause no adverse impacts.

Lake Chemistry

The USFWS considers lake chemistry changes to be potentially significant if the screening methodology predicts decreases in acid neutralizing capacity (ANC) of more than defined limits of acceptable change (LAC). A lake's LAC depends on its background ANC value. The LAC is defined as a 10 percent change for lakes with ANC background values greater than 25 microequivalents per liter (meq/l) and is defined as a change of 1 meq/l for lakes with ANC background values less than 25 meq/l. If a lake's ANC is predicted to decrease by more than the applicable LAC then potential changes to lake chemistry may cause adverse effects and a more detailed analysis of lake chemistry impacts would be required.

U.1.4. Emissions Generating Activities Included in Analysis

Air pollutant emissions were estimated for 11 different types of management actions or activities that were identified as having the potential to generate emissions of the specified pollutants. The following is a list summarizing the 11 sectors and the specific activities under each sector for which potential emissions were quantified.

Leasable Minerals – Conventional Oil and Gas Development

- Well pad and compressor station pad construction
- Road construction and maintenance
- Well drilling, completion, and testing
- Well completion flares
- Well workovers
- Construction vehicle exhaust and fugitive dust
- Maintenance vehicle exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Natural gas fired compressors
- Dehydrator, separator, and water tank heaters
- Dehydrator vents
- Tank venting, flashing, and loadout
- Wellhead equipment leaks
- Pneumatic pumps and devices
- Well pad and road reclamation
- Wind erosion

Leasable Minerals – Coalbed Natural Gas Development

- Well pad, compressor station pad, and water disposal well pad construction
- Road construction and maintenance
- Well drilling, completion, and testing
- Well workovers
- Construction vehicle exhaust and fugitive dust
- Maintenance vehicle exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Natural gas fired compressors

- Dehydrator and tank heaters
- Dehydrator vents
- Wellhead equipment leaks
- Pneumatic pumps and devices
- Well pad and road reclamation
- Wind erosion

Locatable Minerals – Bentonite Mining

- Construction vehicle exhaust and fugitive dust
- Maintenance vehicle exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Exploratory drilling
- Exploratory excavation and reclamation
- Mine development excavation and reclamation
- Product handling, transfer, and storage

Locatable Minerals – Gold Mining

- Construction vehicle exhaust and fugitive dust
- Maintenance vehicle exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Exploratory drilling
- Exploratory excavation and reclamation
- Mine development excavation and reclamation
- Product handling, transfer, and storage

Locatable Minerals – Uranium Mining

- Construction vehicle exhaust and fugitive dust
- Maintenance vehicle exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Injection well, production well, and monitoring well construction
- Well drilling and workovers
- Road and pipeline construction
- Road and well pad maintenance and reclamation
- Transport of resin

Salable Minerals – Sand, Gravel, and other Mineral Development

- Construction vehicle exhaust and fugitive dust
- Maintenance vehicle exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Product handling, transfer, and storage
- Wind erosion

Fire Management and Ecology – Planned and Prescribed Fire

- Heavy equipment exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Mechanical equipment (chainsaws, etc.) exhaust
- Smoke from prescribed fire

Vegetation – Forests, Woodlands, and Aspen Communities Management

- Heavy equipment and mechanical equipment exhaust and fugitive dust associated with tree harvesting, pole and post harvesting, firewood collection, tree salvaging, and weed control
- Commuting vehicle exhaust and fugitive dust

Land Resources – Renewable Energy, Rights-of-Way, and Corridor Projects

- Heavy equipment and mechanical equipment exhaust and fugitive dust associated with the construction of wind energy projects, telephone and fiber optics sites, pipelines, roads, powerlines, and communication sites.
- Commuting vehicle exhaust and fugitive dust

Land Resources – Comprehensive Trails and Travel Management

- Recreation trail and road maintenance
- Off-highway vehicles (OHVs)

Land Resources – Livestock Grazing

- Heavy equipment exhaust and fugitive dust associated with construction of springs, reservoirs, wells, pipelines, fences, and reservoir maintenance
- Commuting vehicle exhaust and fugitive dust
- Enteric fermentation and manure

There were some management activities that emissions were not estimated for because development potential was low, emissions were considered to be minor, or insufficient data was available to calculate emissions. Emissions from the following management actions were not estimated because the potential for development was considered low: coal mining, phosphate mining, oil shale development, geothermal development, gemstones and lapidary materials development. Emissions from the following management actions were not estimated because: (1) the level of activity is not expected to change between alternatives, (2) the magnitude of emissions from the activity is considered to be very small in comparison to other management activities, or (3) sufficient operational or production data was not available to quantify emissions: wildfires, invasive species and pest management, grassland and shrub land management, wild horse management and activities related to heritage and visual resources, socioeconomic resources, and fish and wildlife resources.

U.2. Methodology

The air quality impact analysis included compiling an emissions inventory for existing conditions within the planning area as well as for projected future development. Emissions were estimated for each alternative and a comparative analysis was conducted. Emissions were based on reasonable future actions that were identified as having the potential to result in increased emissions of air pollutants. Emission estimates calculated for this analysis should not be assumed to be a definitive representation of future emissions. Depending on future economic conditions, mining and drilling methods, air pollution control technologies, and other factors that influence the pace of development, actual future emissions could be considerably different than presented. In addition, the size, location, and pace of development for future projects are not well known at this planning stage. For these reasons, it was determined that air quality modeling would not be included in this analysis. The input data required to conduct a modeling analysis was not available

and although “surrogate” input data could be used to force model results, those results would not be valuable to the decision maker or the public. As part of the National Environmental Policy Act (NEPA) analysis for actual development projects, the BLM will conduct an air quality analysis that will include air dispersion modeling of both project and cumulative impacts for those projects that may have a significant impact on air quality within the planning area.

For this analysis, air pollutant emissions were estimated over the 20 year life of project (LOP) for three specific years. The base year selected was 2008 because actual production, operational, and development data was most recently available for this year. The year 2018 was selected for the short-term year as development and construction projections for this year were the greatest across all resources. The year 2027 was selected as being representative of operational emissions over the long term. This section gives specific details on how emissions were estimated for the air resources analysis. The tables located in Section U.4, “Summary of Emissions” (p. 1665), at the end of this appendix summarize the projected total annual emissions by resource for 2008, 2018, and 2027.

U.2.1. Emission Calculations by Category

Leasable Minerals – Conventional Oil and Gas Development and Coalbed Natural Gas Development

The basis for emission calculations for conventional oil and gas development was the Reasonable Foreseeable Development (RFD) Scenario for Oil and Gas, Lander Field Office (BLM 2009c). According to the RFD up to 2,517 new conventional oil and natural gas wells and 827 coalbed natural gas (CBNG) wells may be drilled within the Lander Field Office planning area during the next 20 years. These numbers reflect the maximum level of development that can be expected during this time period. Table U.3, “Number of Existing and Proposed Wells by Alternative” (p. 1658) shows the number and types of wells for each alternative for both BLM wells and for non-BLM (private, state, or other federal) wells.

Table U.3. Number of Existing and Proposed Wells by Alternative

	Conventional Wells (Non-BLM)	Conventional Wells (BLM)	CBNG Wells (Non-BLM)	CBNG Wells (BLM)
Existing	2,236	882	28	5
Year – 2018				
Alternative A	2,511	1,794	823	480
Alternative B	2,152	1,435	436	93
Alternative C	2,517	1,800	827	484
Alternative D	2,436	1,719	749	406
Year – 2027				
Alternative A	1,942	1,388	741	432
Alternative B	1,665	1,110	392	84
Alternative C	1,948	1,392	744	436
Alternative D	1,885	1,330	674	365
Source: BLM 2009c				
BLM Bureau of Land Management CBNG coalbed natural gas				

The following list identifies the assumptions and sources of information used in the calculations of emissions for this category:

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- Emission factors for drill rig engines, diesel powered heavy (construction) equipment, generator engines, and other oil field equipment were obtained from EPA NONROADS 2008a Emissions Model (EPA 2009c).
- Emission factors for natural gas fired compressor engines were based on NSPS Emission Standards for Spark Ignition Engines 40 CFR Part 60 JJJJ, recent Best Available Control Technology (BACT) determinations by Wyoming DEQ, EPA's AP-42 Compilation of Air Pollutant Emission Factors (EPA 1995a), and American Petroleum Institute's (API) Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Natural Gas Industry (American Petroleum Institute 2009).
- Emission factors for on-road vehicles were obtained from EPA's MOBILE6.2 Motor Vehicle Emission Factor Model (EPA 2006).
- Emission factors for VOC and HAPs emissions oil and gas sources were based on EPA's AP-42, EPA's Protocol for Equipment Leak Emissions Estimates (EPA 1995b), Gas Technology Institute GRI-GLYCalc 4.0 emissions estimating software (GTI 2000), EPA's Natural Gas STAR Program (EPA No Date), Wyoming DEQ's Oil and Gas Production Facilities Permitting Guidance, Chapter 6, Section 2 revised March 2010 (Wyoming DEQ 2010b), and field gas analyses from the planning area.
- Activity and equipment data were obtained from resource specialists in the Lander Field Office, existing operator experience from producing fields in the planning area, and professional judgment.
- It was assumed that (1) natural gas fired engines would be equipped with non-selective catalytic reduction technology, (2) VOC and HAP emissions from dehydrators, tank flashing, pneumatic pumps, and produced water tanks would be controlled to 98 percent efficiency per Wyoming DEQ BACT, (3) and drill rig engines would comply with Tier II or better emission standards.
- It was assumed that water application as a best management practice (BMP) would reduce fugitive dust emissions from ground-disturbing activities during construction and reclamation activities and maintenance of roads by 50 percent from uncontrolled levels.

Locatable Minerals – Bentonite Mining

Emissions estimates for future bentonite mining were based on operating data from the one existing bentonite mine in the planning area and development potential estimated in the Final Mineral Occurrence and Development Potential Report (BLM 2009b). Because alternatives A and C would include the fewest restrictions on potential bentonite mining, it was assumed that in addition to the existing mine, two additional mines with similar operational characteristics would be operational in 2018 and 2027. Because of the additional restrictions on mineral development and the location of designated Areas of Critical Environmental Concern under Alternative B, it was assumed that only the existing mine would operate in the future. For Alternative D it was assumed that the existing mine and one additional mine would be operational in 2018 and 2027. Emission factors for this category were obtained from EPA's AP-42 (EPA 1995a), EPA's NONROADS 2008a Emissions model (EPA 2009c), EPA's MOBILE6.2 motor vehicle emission factor model (EPA 2006), and API's Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Natural Gas Industry (American Petroleum Institute 2009).

Locatable Minerals – Gold Mining

Emissions estimates for future gold mining were based on the Decision Record and Environmental Assessment for the Rattlesnake Hills Gold Exploration Drilling Project, (BLM 2010l) located in the planning area, development potential estimated in the Final Mineral Occurrence and

Development Potential Report (BLM 2009b), and existing exploratory operations. It was assumed that the gold mining operations in the planning area consist of typical surface mining techniques and all processing is done offsite outside of the planning area. It was assumed that gold mining operations would be similar for all alternatives. Future emissions were based on the assumption that exploratory operations would continue and one mine similar to the proposed Rattlesnake Hills Project would be operational in 2018 and 2027. Emission factors for this category were obtained from EPA's AP-42, EPA's NONROADS 2008a Emissions model, and EPA's MOBILE6.2 motor vehicle emission factor model.

Locatable Minerals – Uranium Mining

Emission estimates for future uranium mining were based on the Plan of Operations for the proposed Gas Hills project, development potential estimated in the Final Mineral Occurrence and Development Potential Report (BLM 2009b), and existing exploratory operations. The assumptions for uranium mining were predicated on in-situ recovery mining. It is likely that open pit and underground conventional mines will be proposed and approved. However, the air emissions associated with those future projects will be analyzed on a site-specific basis. As of 2011, the BLM had begun preparing an EIS for a Plan of Operations for a conventional mine. Air emissions, including those associated with the Heap Leach Mill operation, are being analyzed. Those data are not yet available for inclusion in this document. Future emissions were based on the assumption that exploratory operations would continue and two mines similar to the proposed Gas Hills Project would be operational in 2018 and 2027 for alternatives. Emission factors for this category were obtained from EPA's AP-42, EPA's NONROADS 2008a Emissions model, EPA's MOBILE6.2 motor vehicle emission factor model, and API Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Natural Gas Industry.

Salable Minerals – Sand, Gravel, and other Mineral Development

Emissions were estimated for this category primarily for sand and gravel sales and free use permits but also included moss rock, limestone, and soil and fill permits and sales. Existing emission calculations were based on the average of permit and sales records from 1989 – 2009. Future emission calculations were based on the permit and sales records and the Final Mineral Occurrence and Development Potential Report (BLM 2009b). Future emissions were calculated using estimated tons of material to be processed for each alternative. Emission factors for this category were obtained from EPA's AP-42, EPA's NONROADS 2008a Emissions model, and EPA's MOBILE6.2 motor vehicle emission factor model.

Fire Management and Ecology – Planned and Prescribed Fire

Emission estimates for fire management were based on the number of acres of disturbance projected for each alternative for mechanical treatments and for prescribed burning. Emissions factors for mechanical treatments (heavy equipment, all terrain vehicles, and chain saws) were obtained from EPA's NONROADS 2008a Emissions model and emission factors for commuting vehicles were obtained from EPA's MOBILE6.2 motor vehicle emission factor model. Emission factors for PM₁₀, PM_{2.5}, NO_x, SO₂, CO, VOCs, CH₄, and N₂O from smoke were obtained from Western Governors Association/Western Regional Air Partnership (WRAP) 2002 Fire Emission Inventory for the WRAP Region-Phase II (WRAP 2005).

Vegetation – Forests, Woodlands, and Aspen Communities Management

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Emission Calculations by Category

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Emissions were estimated for this category for activities related to forest management (silviculture, insect control, and forest products harvesting) and were based on the numbers of acres of surface disturbance projected for each alternative. Emission factors for heavy equipment and logging equipment used in these activities were obtained from EPA's NONROADS 2008a Emissions model and emission factors for commuting vehicles were obtained from EPA's MOBILE6.2 motor vehicle emission factor model.

Land Resources – Renewable Energy, Rights-of-Way, and Corridor Projects

Emissions were estimated for this category for several surface-disturbing projects under Land Resources. Table U.4, "Basis for Emissions Calculations for Land Resources Projects" (p. 1661) shows the key criteria projected under each alternative that were used to as the basis for emissions calculations. Emission factors for surface-disturbing activities were obtained from EPA's AP-42. Emission factors for heavy equipment used in these activities were obtained from EPA's NONROADS 2008a Emissions model and emission factors for commuting vehicles were obtained from EPA's MOBILE6.2 motor vehicle emission factor model.

Table U.4. Basis for Emissions Calculations for Land Resources Projects

Type of Project	Alternative A	Alternative B	Alternative C	Alternative D
Wind energy projects - acres of disturbance for life of project (20 years)	2,250	0	108,000	2,250
Wind energy projects - number of turbines	50	0	2,400	50
Telephone and fiber optics projects - acres of disturbance per year	13.43	2.68	13.83	7.22
Pipelines projects - acres of disturbance per year	447	351	460	427
Roads (non-mineral) projects - acres of disturbance per year	231.8	46.36	237.93	115.5
Powerline projects - acres of disturbance per year	98.46	19.69	101.41	49.23
Communication sites - acres of disturbance per year	20.64	9.64	21.46	9.64
Other - acres of disturbance per year	39	30.61	40	37.32

Land Resources – Comprehensive Trails and Travel Management

Emission sources under this category included road maintenance within the planning area (recreational roads only, mineral development roads were included in those categories), trail maintenance (including cross-country ski trail grooming), and OHV use within the planning area. Road and trail maintenance emissions were estimated using historical data on miles maintained per year and equipment use. Future emissions were based on the number of miles to be maintained for each alternative. Emission factors for heavy equipment used in these activities were obtained from EPA's NONROADS 2008a Emissions model and emission factors for commuting vehicles were

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obtained from EPA's MOBILE6.2 motor vehicle emission factor model. OHV emissions were estimated using EPA's NONROADS 2008a Emissions model which calculated annual emissions based on EPA's National Emissions Inventory and county population for 2005. Emissions were then projected for 2008, 2018, and 2027. It was assumed that OHV use would not change by alternative. Emission factors for surface-disturbing activities were obtained from EPA's AP-42.

Land Resources – Livestock Grazing

Emissions were estimated for six construction activities related to livestock grazing: springs, wells, fence, reservoir, and pipeline construction and reservoir maintenance. Emission estimates for these activities were based on the number of acres of disturbance projected for each activity under each alternative. In addition, CH₄ emissions related to animal enteric fermentation and manure deposits were calculated for estimated head of cattle, sheep, and horses projected for each alternative based on current livestock grazing permits. Emission factors for heavy equipment used in these activities were obtained from EPA's NONROADS 2008a Emissions model and emission factors for commuting vehicles were obtained from EPA's MOBILE6.2 motor vehicle emission factor model. Emission factors for enteric fermentation and manure management were obtained from the Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories (IPCC 2006).

U.3. Mitigation and BMPs

The following table (Table U.5, "Emission Reduction Strategies for Oil and Gas Development" (p. 1662)) outlines emission reduction strategies for oil and gas development in the planning area.

Table U.5. Emission Reduction Strategies for Oil and Gas Development

Mitigation Measure	Environmental Benefits	Environmental Liabilities	Feasibility
Control Strategies for Drilling and Compression			
Directional Drilling	Reduces construction related emissions (dust and vehicle and construction equipment emissions). Decreases surface disturbance and vegetation impacts (dust and CO ₂ and nitrogen flux). Reduces habitat fragmentation	Could result in higher air impacts in one area with longer sustained drilling times.	Depends on geological strata
Improved engine technology (Tier 2 or better) for diesel drill rig engines	Reduced NO _x , PM, CO, and VOC emissions		Dependent on availability of technology from engine manufacturers
SCR for drill rig engines and/or compressors	NO _x emissions reduction and decreased formation of visibility impairing compounds. NO _x control efficiency of 95% achieved on drill rig engines. NO _x emission rate of 0.1 g/hp-hr achieved for compressors	Potential NH ₃ emissions and formation of visibility impairing ammonium sulfate. Regeneration/disposal of catalyst can produce hazardous waste	Not applicable to 2-stroke engines

Mitigation Measure	Environmental Benefits	Environmental Liabilities	Feasibility
NSCR for drill rig engines and/or compressors	NO _x emissions reduction and decreased formation of visibility impairing compounds. NO _x control efficiency of 80-90% achieved for drill rig engines. NO _x emission rate of 0.7 g/hp-hr achieved for compressor engines greater than 100 hp.	Regeneration/disposal of catalysts can produce hazardous waste	Not applicable to lean burn or 2-stroke engines
Natural gas fired drill rig engines	NO _x emissions reduction and decreased formation of visibility impairing compounds		Requires onsite processing of field gas.
Electrification of drill rig engines and/or compressors	Decreased emissions at the source. Transfers emissions to more efficiently controlled source	Displaces emissions to EGU	Depends on availability of power and transmission lines
Improved engine technology (Tier 2 or better) for all mobile and non-road diesel engines	Reduced NO _x , PM, CO, and VOC emissions		Dependent on availability of technology from engine manufacturers
Green (a.k.a. closed loop or flareless) completions	Reduction in VOC and CH ₄ emissions. Reduces or eliminates flaring and venting and associated emissions. Reduces or eliminates open pits and associated evaporative emissions. Increased recovery of gas to pipeline rather than atmosphere.	Temporary increase in truck traffic and associated emissions	Need adequate pressure and flow. Need onsite infrastructure (tanks/dehydrator). Availability of sales line. Green completion permits required by Wyoming BACT in some areas
Green workovers	Same as above	Same as above	Same as above
Minimize or eliminate venting and/or use closed loop process where possible during "blow downs"	Same as above		Best Management Practices required by Wyoming BACT
Eliminate open pits	Reduces VOC and GHG emissions. Reduces potential for soil and water contamination. Reduces odors.	May increase truck traffic and associated emissions.	Requires tank and/or pipeline infrastructure.
Electrification of wellhead compression/pumping	Reduces local emissions of fossil fuel combustion and transfers to more easily controlled source.	Displaces emissions to EGU	Depends on availability of power and transmission lines
Wind (or other renewable) generated power for compressors	Low or no emissions.	May require construction of infrastructure. Visual impacts. Potential wildlife impacts.	Depends on availability of power and transmission lines
Control Strategies Utilizing Centralized Systems			
Centralization (or consolidation) of gas processing facilities (separation, dehydration, sweetening, etc.)	Reduced long-term truck traffic and associated emissions. Reduced VOC and GHG emissions from individual dehydrator/separator units.	Temporary increase in construction associated emissions.	Requires pipeline infrastructure.

Mitigation Measure	Environmental Benefits	Environmental Liabilities	Feasibility
Liquids Gathering systems (for condensate and produced water)	Reduced long-term truck traffic and associated emissions. Reduced VOC and GHG emissions from tanks.	Temporary increase in construction associated emissions.	Requires pipeline infrastructure.
Water and/or fracturing liquids delivery system	Reduced long-term truck traffic and associated emissions.	Temporary increase in construction associated emissions unless place above ground.	Requires pipeline infrastructure. Not feasible for some terrain.
Control Strategies for Tanks, Separators, and Dehydrators			
Eliminate use of open top tanks	Reduced VOC and GHG emissions		Required by Wyoming BACT for produced water tanks in some areas.
Capture and control of flashing emissions from all storage tanks and separation vessels with vapor recovery and/or thermal combustion units.	Reduces VOC and GHG emissions.		98% VOC control if ≥ 10 TPY required statewide by Wyoming BACT
Capture and control of produced water tank emissions.	Reduces VOC and GHG emissions.		98% VOC control and no open top tanks required by Wyoming DEQ in some areas
Capture and control of dehydration equipment emissions with condensers, vapor recovery, and/or thermal combustion	Reduces VOC, HAP, and GHG emissions		Still vent condensers required and 98% VOC control if ≥ 8 TPY required statewide and in CDA by Wyoming BACT. All dehydration emissions controlled at 98% in JPAD (no 8 TPY threshold)
Control Strategies for Misc. Fugitive VOC Emissions			
Install and maintain low VOC emitting seals, valves, hatches on production equipment	Reduces VOC and GHG emissions.		
Initiate an equipment leak detection and repair program (including use of FLIR cameras, grab samples, organic vapor detection devices, visual inspection, etc.)	Reduction in VOC and GHG emissions		
Install or convert gas operated pneumatic devices to electric, solar, or instrument (or compressed) air driven devices/controllers	Reduces VOC and GHG emissions.	Electric or compressed air driven operations can displace or increase combustion emissions.	
Use "low" or "no bleed" gas operated pneumatic devices/controllers	Reduces VOC and GHG emissions.		Or closed loop required statewide by Wyoming BACT
Use closed loop system or thermal combustion for gas operated pneumatic pumps.	Reduces VOC and GHG emissions.		Required statewide by Wyoming BACT (98% VOC control or closed loop)

Mitigation Measure	Environmental Benefits	Environmental Liabilities	Feasibility
Install or convert gas operated pneumatic pumps to electric, solar, or instrument (or compressed) air driven pumps	Reduces VOC and GHG emissions.	Electric or compressed air driven operations can displace or increase combustion emissions.	Required statewide by Wyoming BACT if no thermal combustion used.
Install vapor recovery on truck loading/unloading operations at tanks	Reduces emissions of VOC and GHG emissions.		Wyoming BACT analysis required if VOC ≥ 8 TPY or HAP ≥ 5 TPY.
Control Strategies for Fugitive Dust and Vehicle Emissions			
Unpaved surface treatments including watering, chemical suppressants, and gravel.	20% - 80% control of fugitive dust (particulates) from vehicle traffic.	Potential impacts to water and vegetation from runoff of suppressants.	
Use remote telemetry and automation of wellhead equipment	Reduces vehicle traffic and associated emissions.		
Speed limit control and enforcement on unpaved roads	Reduction of fugitive dust emissions		
Reduce commuter vehicle trips through car pools, commuter vans or buses, innovative work schedules, or work camps	Reduced combustion emissions, reduced fugitive dust emissions, reduced ozone formation, reduced impacts to visibility		
Miscellaneous Control Strategies			
Use of ultra-low sulfur diesel in engines, compressors, construction equipment, etc.	Reduces emissions of particulates and sulfates		Fuel not readily available in some areas.
Reduce unnecessary vehicle idling	Reduced combustion emissions, reduced ozone formation, reduced impacts to visibility, reduced fuel consumption		
Reduced pace of (phased) development	Peak emissions of all pollutants reduced	Emissions generated at a lower rate but for a longer period	May not be economically viable.
BACT Best Available Control Technology CH ₄ methane CO Carbon Monoxide CO ₂ Carbon Dioxide DEQ Department of Environmental Quality EGU electric generating unit FLIR Forward Looking Infrared Radiometer g/hp-hr gallons per horsepower hour GHG greenhouse gas HAP Hazardous Air Pollutant		JPAD Joint Precision Airdrop System Misc. Miscellaneous NH ₃ Ammonia NO _x Nitrogen Oxides PM particulate matter SCR Selective Catalytic Reduction TPY tons per year VOC Volatile Organic Compound	

U.4. Summary of Emissions

The following tables summarize the projected total annual emissions for each alternative by resource for years 2008, 2018, and 2027.

Table U.6. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Base Year – 2008)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	17	2	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	7	7	134	3	36	10	1	15,524	0	0	15,576	14,090
Well Completion Flaring	0	0	2	0	11	63	6	2	0	0	2	2
Commuting Vehicles - Construction	28	3	1	0	1	0	0	280	0		281	255
Wind Erosion	6	1	---	---	---	---	---	---	---		---	---
Sub-total: Construction	59	13	137	3	49	73	7	15,806	0	0	15,859	14,347
Natural Gas Compression - Operations a	11	11	308	1	154	154	46	123,032	257	1	128,778	117,047
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	172	0	0	172	156
Dehy Venting and Flashing	---	---	---	---	---	241	91	2,623	160		5,981	5,738
Station Visits - Operations	23	2	0	0	1	1	0	81	0		81	73
Well Workover - Operations	0	0	2	0	1	0	0	317	0	0	318	287
Well & Pipeline Visits for Inspection & Repair - Operations	29	3	0	0	1	0	0	49	0		49	45
Tanks Condensate and Loadout	---	---	---	---	---	282	28	20	47		1,005	1,003
Wellhead Fugitives	---	---	---	---	---	430	43	254	3,947		83,149	83,125
Pneumatic Devices	---	---	---	---	---	316	32	186	2,899		61,066	61,049
Sub-total: Operations	63	16	311	1	157	1,425	240	126,733	7,311	1	280,599	268,524
Road Maintenance	2	0	0	0	0	0	0	60	0		60	54
Sub-total: Maintenance	2	0	0	0	0	0	0	60	0	0	60	54
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	38	0		38	34

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	1	0	0	0	0	0	0	39	0	0	39	35
Total Emissions	125	29	449	4	206	1,498	247	142,638	7,311	1	296,557	282,961
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.7. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative A – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq metric tonnes
Well Pad & Station Construction - Fugitive Dust	50	5	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	22	22	402	9	109	30	3	46,562	0	0	46,718	42,261
Well Completion Flaring	1	1	6	0	34	189	19	7	0	0	7	6
Commuting Vehicles - Construction	84	9	3	0	3	1	0	839	0		840	762
Wind Erosion	19	3	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	176	39	411	9	146	220	22	47,407	0	0	47,564	43,030
Natural Gas Compression - Operations a	31	31	904	2	452	452	136	361,003	755	3	377,862	343,440
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	505	0	0	506	458
Dehy Venting and Flashing	---	---	---	---	---	709	266	7,696	469		17,549	16,836
Station Visits - Operations	69	7	1	0	4	2	0	237	0		237	215
Well Workover - Operations	1	0	6	0	2	0	0	950	0	0	953	862
Well & Pipeline Visits for Inspection & Repair - Operations	84	8	1	0	2	1	0	145	0		145	132
Tanks Condensate and Loadout	---	---	---	---	---	826	83	57	138		2,950	2,944
Wellhead Fugitives	---	---	---	---	---	1,263	126	744	11,582		243,975	243,907
Pneumatic Devices	---	---	---	---	---	928	93	546	8,506		179,182	179,131
Sub-total: Operations	185	47	913	2	460	4,181	703	371,883	21,451	3	823,358	787,926
Road Maintenance	5	1	1	0	0	0	0	176	0		176	159
Sub-total: Maintenance	5	1	1	0	0	0	0	176	0	0	176	159
Road Reclamation	0	0	0	0	0	0	0	4	0		4	3
Well Reclamation	4	0	0	0	0	0	0	110	0		110	100

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	4	0	0	0	0	0	0	114	0	0	114	103
Total Emissions	371	87	1,325	11	607	4,401	725	419,580	21,451	4	871,212	831,219

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately

Table U.8. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative A – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	50	5	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	22	22	402	9	109	30	3	46,562	0	0	46,718	42,261
Well Completion Flaring	1	1	6	0	34	189	19	7	0	0	7	6
Commuting Vehicles - Construction	84	9	3	0	3	1	0	839	0		840	762
Wind Erosion	19	3	---	---	---	---	---	---	---		---	---
Sub-total: Construction	176	39	411	9	146	220	22	47,407	0	0	47,564	43,030
Natural Gas Compression - Operations a	24	24	696	1	348	348	104	277,632	581	2	290,598	264,126
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	388	0	0	389	353
Dehy Venting and Flashing	---	---	---	---	---	545	204	5,918	361		13,496	12,948
Station Visits - Operations	53	5	1	0	3	1	0	183	0		183	166
Well Workover - Operations	1	0	6	0	2	0	0	950	0	0	953	862
Well & Pipeline Visits for Inspection & Repair - Operations	65	6	1	0	2	1	0	111	0		111	101
Tanks Condensate and Loadout	---	---	---	---	---	636	64	44	106		2,269	2,264
Wellhead Fugitives	---	---	---	---	---	971	97	572	8,908		187,631	187,578
Pneumatic Devices	---	---	---	---	---	713	71	420	6,542		137,801	137,762
Sub-total: Operations	143	36	704	2	354	3,215	541	286,219	16,497	3	633,431	606,160
Road Maintenance	4	0	0	0	0	0	0	135	0		135	123
Sub-total: Maintenance	4	0	0	0	0	0	0	135	0	0	135	123
Road Reclamation	0	0	0	0	0	0	0	3	0		3	3
Well Reclamation	3	0	0	0	0	0	0	84	0		84	76

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	3	0	0	0	0	0	0	87	0	0	87	79
Total Emissions	326	76	1,115	11	501	3,435	563	333,848	16,497	3	681,217	649,391
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.9. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative B – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric Tonnes
Well Pad & Station Construction - Fugitive Dust	42	4	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	18	17	322	7	87	24	2	37,272	0	0	37,397	33,830
Well Completion Flaring	1	0	5	0	27	151	15	5	0	0	5	5
Commuting Vehicles - Construction	68	7	3	0	3	1	0	676	0		676	614
Wind Erosion	16	2	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	143	31	329	7	117	176	18	37,953	0	0	38,078	34,448
Natural Gas Compression - Operations a	27	27	783	2	392	392	117	312,573	654	3	327,169	297,366
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	437	0	0	438	397
Dehy Venting and Flashing	---	---	---	---	---	613	230	6,663	406		15,194	14,578
Station Visits - Operations	60	6	1	0	3	1	0	206	0		206	187
Well Workover - Operations	1	0	5	0	2	0	0	760	0	0	762	690
Well & Pipeline Visits for Inspection & Repair - Operations	73	7	1	0	2	1	0	126	0		126	114
Tanks Condensate and Loadout	---	---	---	---	---	716	72	50	119		2,554	2,549
Wellhead Fugitives	---	---	---	---	---	1,094	109	644	10,029		211,245	211,185
Pneumatic Devices	---	---	---	---	---	803	80	473	7,365		155,143	155,100
Sub-total: Operations	160	41	790	2	398	3,620	609	321,931	18,573	3	712,838	682,165
Road Maintenance	4	0	1	0	0	0	0	152	0		152	138
Sub-total: Maintenance	4	0	1	0	0	0	0	152	0	0	152	138
Road Reclamation	0	0	0	0	0	0	0	3	0		3	3
Well Reclamation	3	0	0	0	0	0	0	95	0		95	86

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric Tonnes
Sub-total: Reclamation	3	0	0	0	0	0	0	98	0	0	98	89
Total Emissions	312	73	1,120	9	516	3,796	627	360,134	18,573	3	751,166	716,840

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately

Table U.10. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative B – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	42	4	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	18	17	322	7	87	24	2	37,272	0	0	37,397	33,830
Well Completion Flaring	1	0	5	0	27	151	15	5	0	0	5	5
Commuting Vehicles - Construction	68	7	3	0	3	1	0	676	0		676	614
Wind Erosion	16	2	---	---	---	---	---	---	---		---	---
Sub-total: Construction	143	31	329	7	117	176	18	37,953	0	0	38,078	34,448
Natural Gas Compression - Operations a	21	21	602	1	301	301	90	240,129	502	2	251,343	228,447
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	336	0	0	337	305
Dehy Venting and Flashing	---	---	---	---	---	471	177	5,119	312		11,673	11,199
Station Visits - Operations	46	5	1	0	2	1	0	158	0		158	143
Well Workover - Operations	1	0	5	0	2	0	0	760	0	0	762	690
Well & Pipeline Visits for Inspection & Repair - Operations	56	6	1	0	1	1	0	96	0		96	88
Tanks Condensate and Loadout	---	---	---	---	---	550	55	38	92		1,962	1,959
Wellhead Fugitives	---	---	---	---	---	840	84	495	7,704		162,286	162,240
Pneumatic Devices	---	---	---	---	---	617	62	363	5,658		119,187	119,153
Sub-total: Operations	123	31	608	1	306	2,781	468	247,494	14,268	2	547,803	524,222
Road Maintenance	3	0	0	0	0	0	0	117	0		117	106
Sub-total: Maintenance	3	0	0	0	0	0	0	117	0	0	117	106
Road Reclamation	0	0	0	0	0	0	0	2	0		2	2
Well Reclamation	3	0	0	0	0	0	0	73	0		73	66

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	3	0	0	0	0	0	0	75	0	0	75	68
Total Emissions	273	63	938	9	424	2,957	485	285,639	14,269	3	586,074	558,845

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately

Table U.11. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative C – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq metric tonnes
Well Pad & Station Construction - Fugitive Dust	50	5	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	22	22	402	9	109	30	3	46,562	0	0	46,718	42,261
Well Completion Flaring	1	1	6	0	34	189	19	7	0	0	7	6
Commuting Vehicles - Construction	84	9	3	0	3	1	0	839	0		840	762
Wind Erosion	19	3	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	176	39	411	9	146	220	22	47,407	0	0	47,564	43,030
Natural Gas Compression - Operations a	31	31	906	2	453	453	136	361,813	757	3	378,709	344,210
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	506	0	0	507	459
Dehy Venting and Flashing	---	---	---	---	---	710	266	7,713	470		17,588	16,874
Station Visits - Operations	69	7	1	0	4	2	0	238	0		238	216
Well Workover - Operations	1	0	6	0	2	0	0	950	0	0	953	862
Well & Pipeline Visits for Inspection & Repair - Operations	84	8	1	0	2	1	0	145	0		145	132
Tanks Condensate and Loadout	---	---	---	---	---	828	83	58	138		2,956	2,951
Wellhead Fugitives	---	---	---	---	---	1,266	127	746	11,608		244,522	244,453
Pneumatic Devices	---	---	---	---	---	930	93	548	8,526		179,583	179,533
Sub-total: Operations	186	47	915	2	461	4,190	705	372,715	21,499	3	825,202	789,691
Road Maintenance	5	1	1	0	0	0	0	176	0		176	160
Sub-total: Maintenance	5	1	1	0	0	0	0	176	0	0	176	160
Road Reclamation	0	0	0	0	0	0	0	4	0		4	3
Well Reclamation	4	0	0	0	0	0	0	110	0		110	100

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	4	0	0	0	0	0	0	114	0	0	114	103
Total Emissions	371	87	1,328	11	608	4,410	727	420,412	21,499	4	873,057	832,984

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately

Table U.12. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative C – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq metric tonnes
Well Pad & Station Construction - Fugitive Dust	50	5	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	22	22	402	9	109	30	3	46,562	0	0	46,718	42,261
Well Completion Flaring	1	1	6	0	34	189	19	7	0	0	7	6
Commuting Vehicles - Construction	84	9	3	0	3	1	0	839	0		840	762
Wind Erosion	19	3	---	---	---	---	---	---	---		---	---
Sub-total: Construction	176	39	411	9	146	220	22	47,407	0	0	47,564	43,030
Natural Gas Compression - Operations a	24	24	697	1	348	348	105	278,172	582	3	291,162	264,639
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	389	0	0	390	353
Dehy Venting and Flashing	---	---	---	---	---	546	205	5,930	362		13,522	12,973
Station Visits - Operations	53	5	1	0	3	1	0	183	0		183	166
Well Workover - Operations	1	0	6	0	2	0	0	950	0	0	953	862
Well & Pipeline Visits for Inspection & Repair - Operations	65	6	1	0	2	1	0	112	0		112	101
Tanks Condensate and Loadout	---	---	---	---	---	637	64	44	106		2,273	2,269
Wellhead Fugitives	---	---	---	---	---	973	97	573	8,925		187,996	187,943
Pneumatic Devices	---	---	---	---	---	715	71	421	6,555		138,069	138,030
Sub-total: Operations	143	36	705	2	355	3,222	542	286,774	16,529	3	634,660	607,337
Road Maintenance	4	0	0	0	0	0	0	135	0		135	123
Sub-total: Maintenance	4	0	0	0	0	0	0	135	0	0	135	123
Road Reclamation	0	0	0	0	0	0	0	3	0		3	3
Well Reclamation	3	0	0	0	0	0	0	84	0		84	76

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	3	0	0	0	0	0	0	87	0	0	87	79
Total Emissions	327	76	1,117	11	501	3,442	564	334,403	16,529	3	682,447	650,568

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately

Table U.13. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative D – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	48	5	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	21	21	384	9	104	29	3	44,498	0	0	44,647	40,389
Well Completion Flaring	1	1	6	0	32	180	18	6	0	0	6	6
Commuting Vehicles - Construction	81	8	3	0	3	1	0	803	0		804	730
Wind Erosion	19	3	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	169	37	393	9	140	210	21	45,308	0	0	45,458	41,124
Natural Gas Compression - Operations a	30	30	879	2	440	440	132	350,885	734	3	367,271	333,815
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	491	0	0	492	446
Dehy Venting and Flashing	---	---	---	---	---	689	258	7,480	456		17,057	16,364
Station Visits - Operations	67	7	1	0	4	2	0	231	0		231	209
Well Workover - Operations	1	0	6	0	2	0	0	907	0	0	911	824
Well & Pipeline Visits for Inspection & Repair - Operations	82	8	1	0	2	1	0	141	0		141	128
Tanks Condensate and Loadout	---	---	---	---	---	803	80	56	134		2,867	2,862
Wellhead Fugitives	---	---	---	---	---	1,228	123	723	11,258		237,138	237,071
Pneumatic Devices	---	---	---	---	---	902	90	531	8,268		174,160	174,110
Sub-total: Operations	180	46	888	2	447	4,064	684	361,445	20,849	3	800,267	765,829
Road Maintenance	5	1	1	0	0	0	0	171	0		171	155
Sub-total: Maintenance	5	1	1	0	0	0	0	171	0	0	171	155
Road Reclamation	0	0	0	0	0	0	0	4	0		4	3
Well Reclamation	4	0	0	0	0	0	0	107	0		107	97

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	4	0	0	0	0	0	0	111	0	0	111	100
Total Emissions	358	84	1,282	11	588	4,274	705	407,034	20,850	4	846,006	807,208

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately

Table U.14. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative D – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	CO ₂ eq metric tonnes
Well Pad & Station Construction - Fugitive Dust	48	5	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	21	21	384	9	104	29	3	44,498	0	0	44,647	40,389
Well Completion Flaring	1	1	6	0	32	180	18	6	0	0	6	6
Commuting Vehicles - Construction	81	8	3	0	3	1	0	803	0		804	730
Wind Erosion	19	3	---	---	---	---	---	---	---		---	---
Sub-total: Construction	169	37	393	9	140	210	21	45,308	0	0	45,458	41,124
Natural Gas Compression - Operations a	23	23	676	1	338	338	101	269,808	564	2	282,408	256,682
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	377	0	0	378	343
Dehy Venting and Flashing	---	---	---	---	---	530	199	5,752	351		13,116	12,583
Station Visits - Operations	51	5	1	0	3	1	0	177	0		177	161
Well Workover - Operations	1	0	6	0	2	0	0	907	0	0	911	824
Well & Pipeline Visits for Inspection & Repair - Operations	63	6	1	0	2	1	0	108	0		108	98
Tanks Condensate and Loadout	---	---	---	---	---	618	62	43	103		2,205	2,201
Wellhead Fugitives	---	---	---	---	---	944	94	556	8,657		182,343	182,292
Pneumatic Devices	---	---	---	---	---	693	69	408	6,358		133,917	133,880
Sub-total: Operations	139	35	684	2	344	3,125	526	278,137	16,032	2	615,563	589,063
Road Maintenance	4	0	0	0	0	0	0	131	0		131	119
Sub-total: Maintenance	4	0	0	0	0	0	0	131	0	0	131	119
Road Reclamation	0	0	0	0	0	0	0	3	0		3	2
Well Reclamation	3	0	0	0	0	0	0	82	0		82	74

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	3	0	0	0	0	0	0	84	0	0	84	76
Total Emissions	315	73	1,077	10	484	3,335	547	323,661	16,032	3	661,237	630,382

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately

Table U.15. Leasable Minerals – CBNG Development – Federal Wells (Base Year – 2008)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	1	0	---	---	---	---	---	---	---	---	---	---
Wind Erosion	0	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	0	0	1	0	0	0	0	116	0	0	117	106
Commuting Vehicles - Construction	0	0	0	0	0	0	0	7	0		7	6
Sub-total: Construction	1	0	1	0	0	0	0	123	0	0	123	112
Natural Gas Compression - Operations a	0	0	2	0	1	1	0	964	2	0	1,009	915
Dehydrators	0	0	0	0	0	0	0	132	0	0	132	120
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	0	0	0	12		244	221
Pneumatics	---	---	---	---	---	0	0	6	91		1,907	1,730
Station Visits - Operations	2	0	0	0	0	0	0	3	0		3	3
Well Workover - Operations	0	0	0	0	0	0	0	8	0	0	8	8
Well & Pipeline Visits for Inspection & Repair - Operations	0	0	0	0	0	0	0	0	0		0	0
Sub-total: Operations	2	0	3	0	2	2	0	2,104	104	0	4,296	3,898
Road Maintenance	0	0	0	0	0	0	0	0	0		0	0
Sub-total: Maintenance	0	0	0	0	0	0	0	0	0	0	0	0
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	0	0		0	0
Sub-total: Reclamation	0	0	0	0	0	0	0	0	0	0	0	0

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	4	1	4	0	2	2	0	2,228	104	0	4,420	4,011

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression

Table U.16. Leasable Minerals – CBNG Development – Federal Wells (Alternative A – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	10	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	5	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	1	1	20	1	7	2	0	2,718	0	0	2,726	2,474
Commuting Vehicles - Construction	10	1	1	0	1	0	0	149	0		149	135
Sub-total: Construction	26	4	21	1	8	2	0	2,866	0	0	2,875	2,609
Natural Gas Compression - Operations a	8	8	232	0	116	116	35	92,506	194	1	96,828	87,866
Dehydrators	0	0	1	0	1	9	4	924	0	0	926	841
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	41	1,112		23,401	21,235
Pneumatics	---	---	---	---	---	43	4	556	8,689		183,032	166,091
Station Visits - Operations	11	1	0	0	1	0	0	40	0		40	36
Well Workover - Operations	0	0	1	0	0	0	0	203	0	0	204	185
Well & Pipeline Visits for Inspection & Repair - Operations	12	1	0	0	0	0	0	22	0		22	20
Sub-total: Operations	32	10	235	1	119	172	44	95,282	9,995	1	305,445	277,174
Road Maintenance	1	0	0	0	0	0	0	31	0		31	28
Sub-total: Maintenance	1	0	0	0	0	0	0	31	0	0	31	28
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	19	0		19	17
Sub-total: Reclamation	1	0	0	0	0	0	0	20	0	0	20	18

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	60	15	256	1	126	173	44	98,200	9,995	1	308,372	279,829

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression

Table U.17. Leasable Minerals – CBNG Development – Federal Wells (Alternative A – 2027)

Activity	Annual Emissions (Tons)											CO ₂ eq metric tonnes
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	
Well Pad & Station Construction - Fugitive Dust	10	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	5	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	1	1	20	1	7	2	0	2,718	0	0	2,726	2,474
Commuting Vehicles - Construction	10	1	1	0	1	0	0	149	0		149	135
Sub-total: Construction	26	4	21	1	8	2	0	2,866	0	0	2,875	2,609
Natural Gas Compression - Operations a	7	7	209	0	104	104	31	83,255	174	1	87,145	79,079
Dehydrators	0	0	1	0	1	8	4	792	0	0	794	720
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	37	1,001		21,061	19,112
Pneumatics	---	---	---	---	---	39	4	500	7,820		164,729	149,482
Station Visits - Operations	11	1	0	0	0	0	0	18	0		18	16
Well Workover - Operations	0	0	1	0	0	0	0	203	0	0	204	185
Well & Pipeline Visits for Inspection & Repair - Operations	11	1	0	0	0	0	0	19	0		19	18
Sub-total: Operations	29	9	212	0	107	154	39	85,817	8,996	1	274,963	249,513
Road Maintenance	1	0	0	0	0	0	0	28	0		28	26
Sub-total: Maintenance	1	0	0	0	0	0	0	28	0	0	28	26
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	17	0		17	16
Sub-total: Reclamation	1	0	0	0	0	0	0	18	0	0	18	16

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	57	14	233	1	114	156	40	88,729	8,996	1	277,884	252,164

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression

Table U.18. Leasable Minerals – CBNG Development – Federal Wells (Alternative B – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	2	0	---	---	---	---	---	---	---	---	---	---
Wind Erosion	1	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	0	0	4	0	1	0	0	569	0	0	571	518
Commuting Vehicles - Construction	2	0	0	0	0	0	0	31	0		31	29
Sub-total: Construction	6	1	4	0	2	0	0	601	0	0	603	547
Natural Gas Compression - Operations	2	2	45	0	22	22	7	17,923	37	0	18,760	17,024
Dehydrators	0	0	0	0	0	2	1	264	0	0	265	240
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	1	0	8	216		4,534	4,114
Pneumatics	---	---	---	---	---	8	1	108	1,684		35,463	32,180
Station Visits - Operations	3	0	0	0	0	0	0	10	0		10	9
Well Workover - Operations	0	0	0	0	0	0	0	42	0	0	42	39
Well & Pipeline Visits for Inspection & Repair - Operations	2	0	0	0	0	0	0	4	0		4	4
Sub-total: Operations	7	2	46	0	24	33	9	19,350	1,937	0	60,071	54,511
Road Maintenance	0	0	0	0	0	0	0	6	0		6	6
Sub-total: Maintenance	0	0	0	0	0	0	0	6	0	0	6	6
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	4	0		4	3
Sub-total: Reclamation	0	0	0	0	0	0	0	4	0	0	4	3
Total Emissions	13	3	51	0	25	34	9	19,960	1,937	0	60,683	55,066

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression

Table U.19. Leasable Minerals – CBNG Development – Federal Wells (Alternative B – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	2	0	---	---	---	---	---	---	---	---	---	---
Wind Erosion	1	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	0	0	4	0	1	0	0	569	0	0	571	518
Commuting Vehicles - Construction	2	0	0	0	0	0	0	31	0		31	29
Sub-total: Construction	6	1	4	0	2	0	0	601	0	0	603	547
Natural Gas Compression - Operations a	1	1	41	0	20	20	6	16,189	34	0	16,945	15,376
Dehydrators	0	0	0	0	0	2	1	264	0	0	265	240
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	1	0	7	195		4,095	3,716
Pneumatics	---	---	---	---	---	8	1	97	1,521		32,031	29,066
Station Visits - Operations	3	0	0	0	0	0	0	5	0		5	4
Well Workover - Operations	0	0	0	0	0	0	0	42	0	0	42	39
Well & Pipeline Visits for Inspection & Repair - Operations	2	0	0	0	0	0	0	4	0		4	3
Sub-total: Operations	7	2	42	0	21	30	8	17,599	1,749	0	54,379	49,346
Road Maintenance	0	0	0	0	0	0	0	5	0		5	5
Sub-total: Maintenance	0	0	0	0	0	0	0	5	0	0	5	5
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	3	0		3	3
Sub-total: Reclamation	0	0	0	0	0	0	0	3	0	0	3	3

Activity	Annual Emissions (Tons)											CO ₂ eq metric tonnes
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	
Total Emissions	13	3	46	0	23	30	8	18,208	1,749	0	54,991	49,901
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression												

Table U.20. Leasable Minerals – CBNG Development – Federal Wells (Alternative C – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	10	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	5	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	1	1	20	1	7	2	0	2,724	0	0	2,732	2,479
Commuting Vehicles - Construction	10	1	1	0	1	0	0	150	0		150	136
Sub-total: Construction	27	4	21	1	8	2	0	2,874	0	0	2,882	2,615
Natural Gas Compression - Operations	8	8	234	0	117	117	35	93,277	195	1	97,635	88,598
Dehydrators	0	0	1	0	1	9	4	924	0	0	926	841
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	42	1,122		23,596	21,412
Pneumatics	---	---	---	---	---	43	4	561	8,762		184,558	167,475
Station Visits - Operations	12	1	0	0	1	0	0	43	0		43	39
Well Workover - Operations	0	0	1	0	0	0	0	203	0	0	204	185
Well & Pipeline Visits for Inspection & Repair - Operations	13	1	0	0	0	0	0	22	0		22	20
Sub-total: Operations	33	11	237	1	120	173	44	96,062	10,079	1	307,976	279,470
Road Maintenance	1	0	0	0	0	0	0	32	0		32	29
Sub-total: Maintenance	1	0	0	0	0	0	0	32	0	0	32	29
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	19	0		19	18
Sub-total: Reclamation	1	0	0	0	0	0	0	20	0	0	20	18
Total Emissions	61	15	258	1	127	175	44	98,987	10,079	1	310,910	282,132

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression

Table U.21. Leasable Minerals – CBNG Development – Federal Wells (Alternative C – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	10	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	5	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	1	1	20	1	7	2	0	2,724	0	0	2,732	2,479
Commuting Vehicles - Construction	10	1	1	0	1	0	0	150	0		150	136
Sub-total: Construction	27	4	21	1	8	2	0	2,874	0	0	2,882	2,615
Natural Gas Compression - Operations a	7	7	211	0	105	105	32	84,026	176	1	87,952	79,811
Dehydrators	0	0	1	0	1	8	4	792	0	0	794	720
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	38	1,010		21,256	19,289
Pneumatics	---	---	---	---	---	39	4	505	7,893		166,254	150,866
Station Visits - Operations	11	1	0	0	0	0	0	18	0		18	16
Well Workover - Operations	0	0	1	0	0	0	0	203	0	0	204	185
Well & Pipeline Visits for Inspection & Repair - Operations	11	1	0	0	0	0	0	20	0		20	18
Sub-total: Operations	29	9	214	0	107	156	40	86,593	9,079	1	277,491	251,806
Road Maintenance	1	0	0	0	0	0	0	29	0		29	26
Sub-total: Maintenance	1	0	0	0	0	0	0	29	0	0	29	26
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	17	0		17	16
Sub-total: Reclamation	1	0	0	0	0	0	0	18	0	0	18	16

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	57	14	235	1	115	158	40	89,513	9,079	1	280,419	254,464

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression

Table U.22. Leasable Minerals – CBNG Development – Federal Wells (Alternative D – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	8	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	4	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	1	1	17	0	6	1	0	2,271	0	0	2,278	2,067
Commuting Vehicles - Construction	9	1	0	0	1	0	0	125	0		125	113
Sub-total: Construction	22	3	18	0	6	2	0	2,396	0	0	2,403	2,181
Natural Gas Compression - Operations	7	7	196	0	98	98	29	78,245	164	1	81,900	74,320
Dehydrators	0	0	1	0	1	7	4	792	0	0	794	720
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	35	941		19,794	17,962
Pneumatics	---	---	---	---	---	36	4	470	7,350		154,815	140,485
Station Visits - Operations	11	1	0	0	1	0	0	36	0		36	33
Well Workover - Operations	0	0	1	0	0	0	0	169	0	0	170	154
Well & Pipeline Visits for Inspection & Repair - Operations	11	1	0	0	0	0	0	18	0		18	17
Sub-total: Operations	28	9	199	0	100	145	37	80,756	8,454	1	258,520	234,591
Road Maintenance	1	0	0	0	0	0	0	27	0		27	24
Sub-total: Maintenance	1	0	0	0	0	0	0	27	0	0	27	24
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	16	0		16	15
Sub-total: Reclamation	1	0	0	0	0	0	0	17	0	0	17	15
Total Emissions	52	12	217	1	107	147	37	83,196	8,454	1	260,966	236,811

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression

Table U.23. Leasable Minerals – CBNG Development – Federal Wells (Alternative D – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	8	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	4	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	1	1	17	0	6	1	0	2,271	0	0	2,278	2,067
Commuting Vehicles - Construction	9	1	0	0	1	0	0	125	0		125	113
Sub-total: Construction	22	3	18	0	6	2	0	2,396	0	0	2,403	2,181
Natural Gas Compression - Operations a	6	6	176	0	88	88	26	70,343	147	1	73,629	66,814
Dehydrators	0	0	1	0	0	7	3	660	0	0	662	600
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	2	0	31	846		17,795	16,148
Pneumatics	---	---	---	---	---	33	3	423	6,608		139,181	126,298
Station Visits - Operations	10	1	0	0	0	0	0	17	0		17	15
Well Workover - Operations	0	0	1	0	0	0	0	169	0	0	170	154
Well & Pipeline Visits for Inspection & Repair - Operations	9	1	0	0	0	0	0	16	0		16	15
Sub-total: Operations	25	8	179	0	90	130	33	72,650	7,601	1	232,462	210,946
Road Maintenance	1	0	0	0	0	0	0	24	0		24	22
Sub-total: Maintenance	1	0	0	0	0	0	0	24	0	0	24	22
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	15	0		15	13
Sub-total: Reclamation	1	0	0	0	0	0	0	15	0	0	15	14

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	49	12	196	1	96	132	33	75,085	7,601	1	234,904	213,162

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression

Table U.24. Locatable Minerals – Bentonite Mining (Base Year – 2008)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	101	11	0	0	0	0	0	61	0	0	61	56
Product Handling, Transfer, and Storage	0	0	---	---	---	---	---	---	---		---	---
Unpaved Roads	0	0	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	0	0	0	0	0	0	0		0	0
Heavy Equipment - Dust	0	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	0	0	0	0	0	0	0	0	0		0	0
Total	101	11	0	0	0	0	0	61	0	0	61	56

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.25. Locatable Minerals – Bentonite Mining (Alternative A – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	101	11	0	0	0	0	0	61	0	0	61	56
Product Handling, Transfer, and Storage	374	40	---	---	---	---	---	---	---		---	---
Unpaved Roads	65	6	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	2	0	9	1	0	689	0		690	626
Heavy Equipment - Dust	1	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	1	1	8	0	3	1	0	2,391	0		2,392	2,170
Total	542	59	10	0	12	2	0	3,141	0	0	3,143	2,852

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.26. Locatable Minerals – Bentonite Mining (Alternative A – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	101	11	0	0	0	0	0	61	0	0	61	56
Product Handling, Transfer, and Storage	374	40	---	---	---	---	---	---	---		---	---
Unpaved Roads	65	6	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	2	0	9	1	0	689	0		690	626
Heavy Equipment - Dust	1	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	1	1	2	0	1	1	0	2,392	0		2,392	2,170
Total	542	59	5	0	10	1	0	3,142	0	0	3,143	2,852

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.27. Locatable Minerals – Bentonite Mining (Alternative B – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	0	0	0	0	0	0	0	0	0	0	0	0
Product Handling, Transfer, and Storage	125	13	---	---	---	---	---	---	---		---	---
Unpaved Roads	22	2	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	1	0	3	0	0	230	0		230	209
Heavy Equipment - Dust	0	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	0	0	3	0	1	0	0	797	0		797	723
Total	147	16	3	0	4	1	0	1,027	0	0	1,027	932

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.28. Locatable Minerals – Bentonite Mining (Alternative B – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	0	0	0	0	0	0	0	0	0	0	0	0
Product Handling, Transfer, and Storage	125	13	---	---	---	---	---	---	---		---	---
Unpaved Roads	22	2	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	1	0	3	0	0	230	0		230	209
Heavy Equipment - Dust	0	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	0	0	1	0	0	0	0	797	0		797	723
Total	147	16	1	0	3	0	0	1,027	0	0	1,027	932

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.29. Locatable Minerals – Bentonite Mining (Alternative C – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	101	11	0	0	0	0	0	61	0	0	61	56
Product Handling, Transfer, and Storage	374	40	---	---	---	---	---	---	---		---	---
Unpaved Roads	65	6	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	2	0	9	1	0	689	0		690	626
Heavy Equipment - Dust	1	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	1	1	8	0	3	1	0	2,391	0		2,392	2,170
Total	542	59	10	0	12	2	0	3,141	0	0	3,143	2,852

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.30. Locatable Minerals – Bentonite Mining (Alternative C – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	101	11	0	0	0	0	0	61	0	0	61	56
Product Handling, Transfer, and Storage	374	40	---	---	---	---	---	---	---		---	---
Unpaved Roads	65	6	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	2	0	9	1	0	689	0		690	626
Heavy Equipment - Dust	1	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	1	1	2	0	1	1	0	2,392	0		2,392	2,170
Total	542	59	5	0	10	1	0	3,142	0	0	3,143	2,852

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.31. Locatable Minerals – Bentonite Mining (Alternative D – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	101	11	0	0	0	0	0	61	0	0	61	56
Product Handling, Transfer, and Storage	249	27	---	---	---	---	---	---	---		---	---
Unpaved Roads	43	4	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	1	0	6	0	0	459	0		460	417
Heavy Equipment - Dust	0	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	1	1	5	0	2	1	0	1,594	0		1,594	1,447
Total	395	43	7	0	8	1	0	2,115	0	0	2,116	1,920

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.32. Locatable Minerals – Bentonite Mining (Alternative D – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	101	11	0	0	0	0	0	61	0	0	61	56
Product Handling, Transfer, and Storage	249	27	---	---	---	---	---	---	---		---	---
Unpaved Roads	43	4	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	1	0	6	0	0	459	0		460	417
Heavy Equipment - Dust	0	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	0	0	1	0	1	0	0	1,594	0		1,595	1,447
Total	395	43	3	0	7	1	0	2,115	0	0	2,116	1,920
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.33. Locatable Minerals – Gold Mining (Base Year – 2008)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5} a	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	1	0	0	0	0	0	0	37	0	0	37	34
Mine Development	0	0	---	---	---	---	---	---	---	---	---	---
Unpaved Roads	0	0	---	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	0	0	0	0	0	0	0		0	0
Heavy Equipment - Combustive	0	0	0	0	0	0	0	0	0		0	0
Total	1	0	0	0	0	0	0	37	0	0	37	34

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.34. Locatable Minerals – Gold Mining (All Alternatives – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5} a	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	5	1	1	0	1	0	0	149	0	0	150	137
Mine Development	220	67	---	---	---	---	---	---	---	---	---	---
Unpaved Roads	88	9	---	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	1	0	2	1	0	396	0		396	359
Heavy Equipment - Combustive	1	1	6	0	2	1	0	1,865	0		1,865	1,693
Total	314	77	8	0	5	1	0	2,410	0	0	2,412	2,188

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.35. Locatable Minerals – Gold Mining (All Alternatives – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5} a	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Exploratory Operations	5	1	1	0	1	0	0	149	0	0	150	136
Mine Development	216	66	---	---	---	---	---	---	---	---	---	---
Unpaved Roads	88	9	---	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	1	0	2	1	0	396	0		396	359
Heavy Equipment - Combustive	1	1	6	0	2	1	0	1,865	0		1,865	1,693
Total	310	76	8	0	5	1	0	2,410	0	0	2,411	2,188

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.36. Locatable Minerals – Uranium Mining (Base Year – 2008)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	1	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	2	2	28	1	11	3	0	634	0	0	637	578
Wind Erosion	1	0	---	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Construction	12	1	0	0	1	0	0	0	0	---	---	---
Sub-total: Construction	15	3	28	1	12	3	0	634	0	0	637	578
Transport of Ion Exchange Resin	7	1	0	0	0	0	0	0	0		0	0
Well Workover - Operations	2	0	1	0	0	0	0	114	0	0	114	103
Well & Pipeline Visits for Inspection & Repair - Operations	0	0	0	0	0	0	0	0	0		0	0
Sub-total: Operations	10	1	1	0	0	0	0	114	0	0	114	104
Road Maintenance	0	0	0	0	0	0	0	0	0		0	0
Sub-total: Maintenance	0	0	0	0	0	0	0	0	0	0	0	0
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Pad Reclamation	0	0	0	0	0	0	0	4	0		4	4
Sub-total: Reclamation	0	0	0	0	0	0	0	4	0	0	4	4
Total Emissions	25	4	30	1	13	3	0	752	0	0	755	685

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1

Table U.37. Locatable Minerals – Uranium Mining (All Alternatives – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad Construction - Fugitive Dust	2	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	9	9	117	3	45	10	1	2,620	0	0	2,626	2,383
Wind Erosion	2	0	---	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Construction	50	5	1	0	6	0	0	0	0	---	---	---
Sub-total: Construction	64	14	118	3	51	11	1	2,620	0	0	2,626	2,383
Transport of Ion Exchange Resin	142	14	2	0	1	1	0	2,370	0		2,372	2,152
Well Workover - Operations	43	5	8	0	2	1	0	2,198	0	0	2,205	2,001
Well & Pipeline Visits for Inspection & Repair - Operations	2	0	0	0	0	0	0	5	0		5	4
Sub-total: Operations	187	19	10	0	4	1	0	4,573	0	0	4,582	4,158
Road Maintenance	0	0	0	0	0	0	0	5	0		5	5
Sub-total: Maintenance	0	0	0	0	0	0	0	5	0	0	5	5
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Pad Reclamation	3	0	0	0	0	0	0	80	0		80	72
Sub-total: Reclamation	3	0	0	0	0	0	0	80	0	0	80	72
Total Emissions	254	34	128	3	55	12	1	7,278	1	0	7,293	6,618

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1

Table U.38. Locatable Minerals – Uranium Mining (All Alternatives – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	2	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	9	9	117	3	45	10	1	2,620	0	0	2,626	2,383
Wind Erosion	2	0	---	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Construction	50	5	1	0	6	0	0	0	0	---	---	---
Sub-total: Construction	64	14	118	3	51	11	1	2,620	0	0	2,626	2,383
Transport of Ion Exchange Resin	85	9	1	0	1	1	0	2,371	0		2,373	2,153
Well Workover - Operations	25	3	1	0	0	0	0	1,310	0	0	1,315	1,193
Well & Pipeline Visits for Inspection & Repair - Operations	1	0	0	0	0	0	0	3	0		3	3
Sub-total: Operations	112	11	2	0	1	1	0	3,685	0	0	3,691	3,349
Road Maintenance	0	0	0	0	0	0	0	3	0		3	3
Sub-total: Maintenance	0	0	0	0	0	0	0	3	0	0	3	3
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Pad Reclamation	2	0	0	0	0	0	0	47	0		47	43
Sub-total: Reclamation	2	0	0	0	0	0	0	47	0	0	47	43
Total Emissions	177	26	120	3	52	12	1	6,355	0	0	6,367	5,777

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1

Table U.39. Salable Minerals – Sand & Gravel (Base Year – 2008)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5a}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} - metric tonnes
Product Handling, Transfer, and Storage	2	0	---	---	---	---	---	---	---	---	---
Unpaved Roads	234	23	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	4	0	5	2	0	1,028	0	1,029	934
Heavy Equipment - Dust	10	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	11	10	170	4	76	11	1	17,704	0	17,707	16,068
Wind Erosion	24	4	---	---	---	---	---	---	---	---	---
Total	282	39	174	4	81	13	1	18,732	0	18,736	17,002

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.40. Salable Minerals – Sand & Gravel (Alternative A – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Product Handling, Transfer, and Storage	3	0	---	---	---	---	---	---	---	---	---
Unpaved Roads	276	28	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	5	0	6	2	0	1,210	0	1,211	1,099
Heavy Equipment - Dust	13	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	7	7	74	4	33	7	1	21,151	0	21,153	19,195
Wind Erosion	31	5	---	---	---	---	---	---	---	---	---
Total	330	41	79	4	39	9	1	22,361	0	22,364	20,294
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.41. Salable Minerals – Sand & Gravel (Alternative A – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Product Handling, Transfer, and Storage	3	0	---	---	---	---	---	---	---	---	---
Unpaved Roads	276	28	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	5	0	6	2	0	1,210	0	1,211	1,099
Heavy Equipment - Dust	13	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	6	5	23	3	11	6	1	21,155	0	21,157	19,199
Wind Erosion	15	2	---	---	---	---	---	---	---	---	---
Total	313	37	27	3	17	8	1	22,365	0	22,368	20,298

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.42. Salable Minerals – Sand & Gravel (Alternative B – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Product Handling, Transfer, and Storage	3	0	---	---	---	---	---	---	---	---	---
Unpaved Roads	265	26	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	5	0	6	2	0	1,162	0	1,163	1,055
Heavy Equipment - Dust	13	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	7	7	72	4	32	7	1	20,304	0	20,307	18,427
Wind Erosion	31	5	---	---	---	---	---	---	---	---	---
Total	319	40	76	4	38	9	1	21,466	0	21,469	19,482
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.43. Salable Minerals – Sand & Gravel (Alternative B – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Product Handling, Transfer, and Storage	3	0	---	---	---	---	---	---	---	---	---
Unpaved Roads	265	26	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	5	0	6	2	0	1,162	0	1,163	1,055
Heavy Equipment - Dust	13	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	5	5	22	3	11	6	1	20,309	0	20,311	18,431
Wind Erosion	15	2	---	---	---	---	---	---	---	---	---
Total	301	36	26	3	16	8	1	21,471	0	21,473	19,486

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.44. Salable Minerals – Sand & Gravel (Alternative C – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} met- ric tonnes
Product Handling, Transfer, and Storage	4	1	---	---	---	---	---	---	---	---	---
Unpaved Roads	331	33	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	6	0	7	3	0	1,452	0	1,453	1,319
Heavy Equipment - Dust	13	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	9	9	89	5	40	9	1	25,381	0	25,383	23,034
Wind Erosion	31	5	---	---	---	---	---	---	---	---	---
Total	387	49	95	5	47	11	1	26,833	0	26,837	24,353

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.45. Salable Minerals – Sand & Gravel (Alternative C – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Product Handling, Transfer, and Storage	3	1	---	---	---	---	---	---	---	---	---
Unpaved Roads	331	33	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	6	0	7	3	0	1,452	0	1,453	1,319
Heavy Equipment - Dust	13	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	7	6	27	4	14	7	1	25,386	0	25,388	23,038
Wind Erosion	15	2	---	---	---	---	---	---	---	---	---
Total	370	44	33	4	21	9	1	26,838	0	26,842	24,357

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.46. Salable Minerals – Sand & Gravel (Alternative D – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Product Handling, Transfer, and Storage	3	0	---	---	---	---	---	---	---	---	---
Unpaved Roads	276	28	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	5	0	6	2	0	1,210	0	1,211	1,099
Heavy Equipment - Dust	13	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	7	7	74	4	33	7	1	21,151	0	21,153	19,195
Wind Erosion	31	5	---	---	---	---	---	---	---	---	---
Total	330	41	79	4	39	9	1	22,361	0	22,364	20,294

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.47. Salable Minerals – Sand & Gravel (Alternative D – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Product Handling, Transfer, and Storage	3	0	---	---	---	---	---	---	---	---	---
Unpaved Roads	276	28	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	5	0	6	2	0	1,210	0	1,211	1,099
Heavy Equipment - Dust	13	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	6	5	23	3	11	6	1	21,155	0	21,157	19,199
Wind Erosion	15	2	---	---	---	---	---	---	---	---	---
Total	313	37	27	3	17	8	1	22,365	0	22,368	20,298

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.48. Fire Management and Ecology (Base Year – 2008)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust and Smoke	65	29	8	2	270	14	1	0	14	2	942	855
Heavy Equipment Exhaust	0	0	0	0	1	0	0	23	0		23	21
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0		20	18
Total	71	30	8	2	271	14	1	44	14	2	985	894

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.49. Fire Management and Ecology (Alternative A – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust and Smoke	50	27	8	2	270	14	1	0	14	2	942	855
Heavy Equipment Exhaust	0	0	0	0	1	0	0	19	0		19	17
Commuting Vehicles - Fugitive Dust	5	0	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	18	0		18	16
Total	55	27	8	2	271	14	1	37	14	2	978	888

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.50. Fire Management and Ecology (Alternative A – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust and Smoke	50	27	8	2	270	14	1	0	14	2	942	855
Heavy Equipment Exhaust	0	0	0	0	1	0	0	19	0		19	17
Commuting Vehicles - Fugitive Dust	5	0	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	18	0		18	16
Total	55	27	8	2	271	14	1	37	14	2	978	888

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.51. Fire Management and Ecology (Alternative B – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust and Smoke	161	88	25	7	899	46	5	0	48	7	3,139	2,849
Heavy Equipment Exhaust	0	0	0	0	3	1	0	67	0		68	61
Commuting Vehicles - Fugitive Dust	17	2	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	61	0		62	56
Total	178	90	25	7	902	47	5	129	48	7	3,268	2,966

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.52. Fire Management and Ecology (Alternative B – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust and Smoke	161	88	25	7	899	46	5	0	48	7	3,139	2,849
Heavy Equipment Exhaust	0	0	0	0	3	1	0	67	0		68	61
Commuting Vehicles - Fugitive Dust	17	2	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	61	0		62	56
Total	178	90	25	7	902	47	5	129	48	7	3,268	2,966

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.53. Fire Management and Ecology (Alternative C – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust and Smoke	50	27	8	2	270	14	1	0	14	2	942	855
Heavy Equipment Exhaust	0	0	0	0	1	0	0	32	0		32	29
Commuting Vehicles - Fugitive Dust	7	1	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	25	0		25	22
Total	58	28	8	2	271	14	1	57	14	2	999	906

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.54. Fire Management and Ecology (Alternative C – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust and Smoke	50	27	8	2	270	14	1	0	14	2	942	855
Heavy Equipment Exhaust	0	0	0	0	1	0	0	32	0		32	29
Commuting Vehicles - Fugitive Dust	7	1	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	25	0		25	22
Total	58	28	8	2	271	14	1	57	14	2	999	906

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.55. Fire Management and Ecology (Alternative D – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust and Smoke	70	43	13	3	450	23	2	0	24	3	1,570	1,424
Heavy Equipment Exhaust	0	0	0	0	1	0	0	19	0		19	17
Commuting Vehicles - Fugitive Dust	5	0	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	18	0		18	16
Total	75	43	13	3	450	23	2	37	24	3	1,606	1,458

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.56. Fire Management and Ecology (Alternative D – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust and Smoke	70	43	13	3	450	23	2	0	24	3	1,570	1,424
Heavy Equipment Exhaust	0	0	0	0	1	0	0	19	0		19	17
Commuting Vehicles - Fugitive Dust	5	0	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	18	0		18	16
Total	75	43	13	3	450	23	2	37	24	3	1,606	1,458

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.57. Vegetation – Forest and Woodlands (Base Year – 2008)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq} tons	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	32	3	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	32	3	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	38	4	0	0	5	1	0	47	0	47	42

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.58. Vegetation – Forest and Woodlands (Alternative A – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq} tons	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	131	13	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	131	13	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	138	14	0	0	5	1	0	47	0	47	42
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.59. Vegetation – Forest and Woodlands (Alternative A – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq} tons	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	131	13	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	131	13	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	138	14	0	0	5	1	0	47	0	47	42

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.60. Vegetation – Forest and Woodlands (Alternative B – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq} tons	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	193	19	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	193	19	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	199	20	0	0	5	1	0	47	0	47	42

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.61. Vegetation – Forest and Woodlands (Alternative B – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq} tons	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	193	19	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	193	19	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	199	20	0	0	5	1	0	47	0	47	42

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.62. Vegetation – Forest and Woodlands (Alternative C – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq} tons	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	263	26	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	263	26	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	269	27	0	0	5	1	0	47	0	47	42

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.63. Vegetation – Forest and Woodlands (Alternative C – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq} tons	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	263	26	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	263	26	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	269	27	0	0	5	1	0	47	0	47	42

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.64. Vegetation – Forest and Woodlands (Alternative D – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq} tons	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	210	21	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	210	21	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	217	22	0	0	5	1	0	47	0	47	42
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.65. Vegetation – Forest and Woodlands (Alternative D – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq} tons	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	210	21	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	210	21	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	217	22	0	0	5	1	0	47	0	47	42

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.66. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Base Year – 2008)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust	10	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	2	0	1	0	0	189	0	189	171
Sub-total: Heavy Equipment	10	1	2	0	1	0	0	189	0	189	171
Commuting Vehicles - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	13	0	13	12
Sub-total: Commuting Vehicles	3	0	0	0	0	0	0	13	0	13	12
Total	13	1	2	0	1	0	0	202	0	202	183
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.67. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative A – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	37	4	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	2	0	1	0	0	504	0	504	457
Sub-total: Heavy Equipment	37	4	2	0	1	0	0	504	0	504	457
Commuting Vehicles - Fugitive Dust	8	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	39	0	39	36
Sub-total: Commuting Vehicles	8	1	0	0	0	0	0	39	0	39	36
Total	45	5	2	0	1	0	0	543	0	543	493

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.68. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative A – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust	37	4	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	1	0	0	0	0	514	0	514	466
Sub-total: Heavy Equipment	37	4	1	0	0	0	0	514	0	514	466
Commuting Vehicles - Fugitive Dust	8	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	39	0	39	36
Sub-total: Commuting Vehicles	8	1	0	0	0	0	0	39	0	39	36
Total	45	5	1	0	1	0	0	553	0	553	502
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.69. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative B – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	16	2	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	1	0	0	0	0	218	0	218	198
Sub-total: Heavy Equipment	16	2	1	0	0	0	0	218	0	218	198
Commuting Vehicles - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	13	0	13	12
Sub-total: Commuting Vehicles	3	0	0	0	0	0	0	13	0	13	12
Total	19	2	1	0	1	0	0	231	0	231	210

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.70. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative B – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust	16	2	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	220	0	220	200
Sub-total: Heavy Equipment	16	2	0	0	0	0	0	220	0	220	200
Commuting Vehicles - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	13	0	13	12
Sub-total: Commuting Vehicles	3	0	0	0	0	0	0	13	0	13	12
Total	19	2	0	0	0	0	0	233	0	233	212
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.71. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative C – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	408	41	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	2	2	25	1	11	2	0	6195	0	6196	5623
Sub-total: Heavy Equipment	411	43	25	1	11	2	0	6195	0	6196	5623
Commuting Vehicles - Fugitive Dust	129	13	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	1	0	3	1	0	779	0	779	707
Sub-total: Commuting Vehicles	129	13	1	0	3	1	0	779	0	779	707
Total	539	56	26	1	14	4	0	6974	0	6976	6330

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.72. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative C – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust	408	41	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	2	2	7	1	3	2	0	6203	0	6204	5629
Sub-total: Heavy Equipment	410	42	7	1	3	2	0	6203	0	6204	5629
Commuting Vehicles - Fugitive Dust	129	13	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	1	0	3	1	0	779	0	779	707
Sub-total: Commuting Vehicles	129	13	1	0	3	1	0	779	0	779	707
Total	539	55	9	1	6	3	0	6982	0	6983	6337
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Table U.73. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative D – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	30	3	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	2	0	1	0	0	418	0	418	379
Sub-total: Heavy Equipment	31	3	2	0	1	0	0	418	0	418	379
Commuting Vehicles - Fugitive Dust	7	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	34	0	34	31
Sub-total: Commuting Vehicles	7	1	0	0	0	0	0	34	0	34	31
Total	37	4	2	0	1	0	0	452	0	452	410

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.74. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative D – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Fugitive Dust	30	3	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	423	0	423	384
Sub-total: Heavy Equipment	30	3	0	0	0	0	0	423	0	423	384
Commuting Vehicles - Fugitive Dust	7	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	34	0	34	31
Sub-total: Commuting Vehicles	7	1	0	0	0	0	0	34	0	34	31
Total	37	4	1	0	0	0	0	456	0	456	414

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.75. Land Resources – Comprehensive Trails and Travel Management (Base Year – 2008)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Road Maintenance	2	0	1	0	0	0	0	101	0	101	92
Motorized Recreation	7	6	5	1	472	191	19	2,607	3	2,668	2,421
Total	9	6	6	1	472	191	19	2,708	3	2,769	2,513

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.76. Land Resources – Comprehensive Trails and Travel Management (Alternative A – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Road Maintenance	2	0	0	0	0	0	0	103	0	103	93
Motorized Recreation	4	4	7	1	526	119	12	3,558	2	3,608	3,274
Total	7	4	7	1	526	119	12	3,661	2	3,710	3,367

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.77. Land Resources – Comprehensive Trails and Travel Management (Alternative A – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Road Maintenance	2	0	0	0	0	0	0	103	0	103	93
Motorized Recreation	3	3	8	1	522	88	9	3,796	4	3,876	3,517
Total	6	3	8	1	522	88	9	3,898	4	3,978	3,610

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.78. Land Resources – Comprehensive Trails and Travel Management (Alternative B – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Road Maintenance	2	0	0	0	0	0	0	90	0	90	82
Motorized Recreation	4	4	7	1	526	119	12	3,558	2	3,608	3,274
Total	6	4	7	1	526	119	12	3,649	2	3,698	3,356

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.79. Land Resources – Comprehensive Trails and Travel Management (Alternative B – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Road Maintenance	2	0	0	0	0	0	0	90	0	90	82
Motorized Recreation	3	3	8	1	522	88	9	3,796	4	3,876	3,517
Total	5	3	8	1	522	88	9	3,886	4	3,966	3,599

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.80. Land Resources – Comprehensive Trails and Travel Management (Alternative C – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Road Maintenance	3	0	0	0	0	0	0	127	0	127	115
Motorized Recreation	4	4	7	1	526	119	12	3,558	2	3,608	3,274
Total	7	4	7	1	526	119	12	3,685	2	3,735	3,389

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.81. Land Resources – Comprehensive Trails and Travel Management (Alternative C – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Road Maintenance	3	0	0	0	0	0	0	127	0	127	115
Motorized Recreation	3	3	8	1	522	88	9	3,796	4	3,876	3,517
Total	6	3	8	1	522	88	9	3,923	4	4,003	3,632

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.82. Land Resources – Comprehensive Trails and Travel Management (Alternative D – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Road Maintenance	2	0	0	0	0	0	0	103	0	103	93
Motorized Recreation	4	4	7	1	526	119	12	3,558	2	3,608	3,274
Total	7	4	7	1	526	119	12	3,661	2	3,710	3,367

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.83. Land Resources – Comprehensive Trails and Travel Management (Alternative D – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Road Maintenance	2	0	0	0	0	0	0	103	0	103	93
Motorized Recreation	3	3	8	1	522	88	9	3,796	4	3,876	3,517
Total	6	3	8	1	522	88	9	3,898	4	3,978	3,610

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.84. Land Resources – Livestock Grazing (Base Year – 2008)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	1	0	0	0	0	60	0	60	54
Sub-total: Construction	3	0	1	0	0	0	0	60	0	60	54
Commuting Vehicles - Fugitive Dust	77	7	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	4	0	86	4	0	1,756	0	1,761	1,598
Enteric Fermentation and Manure	---	---	---	---	---	---	---	---	1,187	24,919	22,613
Sub-total: Operations and Maintenance	77	8	4	0	86	4	0	1,756	1,187	26,680	24,211
Total	80	8	5	0	86	4	0	1,816	1,187	26,740	24,265

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.85. Land Resources – Livestock Grazing (Alternative A – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	62	0	62	56
Sub-total: Construction	3	0	0	0	0	0	0	62	0	62	56
Commuting Vehicles - Fugitive Dust	77	7	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	4	0	86	4	0	1,756	0	1,761	1,598
Enteric Fermentation and Manure	---	---	---	---	---	---	---	---	1,187	24,919	22,613
Sub-total: Operations and Maintenance	77	8	4	0	86	4	0	1,756	1,187	26,680	24,211
Total	80	8	4	0	86	4	0	1,818	1,187	26,742	24,267

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.86. Land Resources – Livestock Grazing (Alternative A – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	62	0	62	56
Sub-total: Construction	3	0	0	0	0	0	0	62	0	62	56
Commuting Vehicles - Fugitive Dust	77	7	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	4	0	86	4	0	1,756	0	1,761	1,598
Enteric Fermentation and Manure	---	---	---	---	---	---	---	---	1,187	24,919	22,613
Sub-total: Operations and Maintenance	77	8	4	0	86	4	0	1,756	1,187	26,680	24,211
Total	80	8	4	0	86	4	0	1,818	1,187	26,742	24,267

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.87. Land Resources – Livestock Grazing (Alternative B – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	0	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	0	0	0	0
Sub-total: Construction	0	0	0	0	0	0	0	0	0	0	0
Commuting Vehicles - Fugitive Dust	0	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	0	0	0	0
Enteric Fermentation and Manure	---	---	---	---	---	---	---		0	0	0
Sub-total: Operations and Maintenance	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.88. Land Resources – Livestock Grazing (Alternative B – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	0	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	0	0	0	0
Sub-total: Construction	0	0	0	0	0	0	0	0	0	0	0
Commuting Vehicles - Fugitive Dust	0	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	0	0	0	0
Enteric Fermentation and Manure	---	---	---	---	---	---	---		0	0	0
Sub-total: Operations and Maintenance	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.89. Land Resources – Livestock Grazing (Alternative C – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	144	0	144	131
Sub-total: Construction	6	1	0	0	0	0	0	144	0	144	131
Commuting Vehicles - Fugitive Dust	78	8	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	4	0	87	4	0	1,808	0	1,813	1,645
Enteric Fermentation and Manure	---	---	---	---	---	---	---	---	1,614	33,894	30,757
Sub-total: Operations and Maintenance	78	8	4	0	87	4	0	1,808	1,614	35,707	32,402
Total	84	8	5	0	87	4	0	1,952	1,614	35,852	32,533

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.90. Land Resources – Livestock Grazing (Alternative C – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	144	0	144	131
Sub-total: Construction	6	1	0	0	0	0	0	144	0	144	131
Commuting Vehicles - Fugitive Dust	78	8	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	4	0	87	4	0	1,808	0	1,813	1,645
Enteric Fermentation and Manure	---	---	---	---	---	---	---	---	1,614	33,894	30,757
Sub-total: Operations and Maintenance	78	8	4	0	87	4	0	1,808	1,614	35,707	32,402
Total	84	8	5	0	87	4	0	1,952	1,614	35,852	32,533

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.91. Land Resources – Livestock Grazing (Alternative D – 2018)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	144	0	144	131
Sub-total: Construction	6	1	0	0	0	0	0	144	0	144	131
Commuting Vehicles - Fugitive Dust	78	8	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	4	0	87	4	0	1,808	0	1,813	1,645
Enteric Fermentation and Manure	---	---	---	---	---	---	---	---	1,614	33,894	30,757
Sub-total: Operations and Maintenance	78	8	4	0	87	4	0	1,808	1,614	35,707	32,402
Total	84	8	5	0	87	4	0	1,952	1,614	35,852	32,533

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.92. Land Resources – Livestock Grazing (Alternative D – 2027)

Activity	Annual Emissions (Tons)										
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	CO _{2eq}	CO _{2eq} metric tonnes
Heavy Equipment - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	144	0	144	131
Sub-total: Construction	6	1	0	0	0	0	0	144	0	144	131
Commuting Vehicles - Fugitive Dust	78	8	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	4	0	87	4	0	1,808	0	1,813	1,645
Enteric Fermentation and Manure	---	---	---	---	---	---	---	---	1,614	33,894	30,757
Sub-total: Operations and Maintenance	78	8	4	0	87	4	0	1,808	1,614	35,707	32,402
Total	84	8	5	0	87	4	0	1,952	1,614	35,852	32,533

a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1

Table U.93. Leasable Minerals – Conventional Oil and Gas Development – Total (BLM and Non-BLM) Wells (Base Year – 2008)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	32	3	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	8	7	136	3	37	10	1	15,705	0	0	15,757	14,254
Well Completion Flaring	0	0	2	0	11	63	6	2	0	0	2	2
Commuting Vehicles - Construction	30	3	1	0	1	0	0	315	0		315	286
Wind Erosion	6	1	---	---	---	---	---	---	---		---	---
Sub-total: Construction	77	15	139	3	50	73	7	16,022	0	0	16,074	14,542
Natural Gas Compression - Operations a	26	26	766	2	383	383	115	305,692	639	3	319,968	290,821
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	428	0	0	428	388
Dehy Venting and Flashing	---	---	---	---	---	600	225	6,516	397		14,860	14,257
Station Visits - Operations	58	6	1	0	3	1	0	201	0		201	182
Well Workover - Operations	0	0	2	0	1	0	0	317	0	0	318	287
Well & Pipeline visits for Inspection & Repair - Operations	71	7	1	0	2	1	0	123	0		123	111
Tanks Condensate and Loadout	---	---	---	---	---	700	70	49	117		2,498	2,493
Wellhead Fugitives	---	---	---	---	---	1,070	107	630	9,808		206,595	206,537
Pneumatic Devices	---	---	---	---	---	785	79	463	7,203		151,728	151,686
Sub-total: Operations	156	40	770	2	389	3,540	596	314,418	18,164	3	696,719	666,762
Road Maintenance	4	0	1	0	0	0	0	149	0		149	135
Sub-total: Maintenance	4	0	1	0	0	0	0	149	0	0	149	135
Road Reclamation	0	0	0	0	0	0	0	3	0		3	3
Well Reclamation	3	0	0	0	0	0	0	93	0		93	85

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	3	0	0	0	0	0	0	96	0	0	96	87
Total Emissions	240	55	910	5	439	3,614	603	330,685	18,164	3	713,038	681,527

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately

Table U.94. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative A – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	80	8	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	32	31	564	13	153	42	4	65,312	1	1	65,531	59,281
Well Completion Flaring	1	1	9	0	47	264	26	9	0	0	9	8
Commuting Vehicles - Construction	119	12	4	0	5	2	0	1,199	0		1,200	1,089
Wind Erosion	27	4	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	259	56	577	13	205	308	31	66,521	1	1	66,740	60,378
Natural Gas Compression - Operations a	55	55	1,604	3	802	802	241	640,389	1,339	6	670,295	609,234
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	1	0	0	896	0	0	898	813
Dehy Venting and Flashing	---	---	---	---	---	1,257	471	13,651	832		31,130	29,866
Station Visits - Operations	122	12	2	0	6	3	0	421	0		421	382
Well Workover - Operations	2	1	9	0	3	1	0	1,330	0	0	1,334	1,207
Well & Pipeline Visits for Inspection & Repair - Operations	149	15	1	0	4	2	0	257	0		257	233
Tanks Condensate and Loadout	---	---	---	---	---	1,466	147	102	244		5,233	5,223
Wellhead Fugitives	---	---	---	---	---	2,241	224	1,320	20,546		432,792	432,670
Pneumatic Devices	---	---	---	---	---	1,646	165	969	15,090		317,853	317,763
Sub-total: Operations	328	83	1,618	4	816	7,416	1,248	659,335	38,052	6	1,460,212	1,397,393
Road Maintenance	9	1	1	0	1	0	0	312	0		312	283
Sub-total: Maintenance	9	1	1	0	1	0	0	312	0	0	312	283
Road Reclamation	0	0	0	0	0	0	0	7	0		7	6
Well Reclamation	7	1	1	0	1	0	0	195	0		195	177

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	7	1	1	0	1	0	0	202	0	0	202	183
Total Emissions	604	141	2,196	17	1,022	7,725	1,279	726,368	38,052	6	1,527,466	1,458,236

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately

Table U.95. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative A – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	80	8	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	32	31	564	13	153	42	4	65,312	1	1	65,531	59,281
Well Completion Flaring	1	1	9	0	47	264	26	9	0	0	9	8
Commuting Vehicles - Construction	119	12	4	0	5	2	0	1,199	0		1,200	1,089
Wind Erosion	27	4	---	---	---	---	---	---	---		---	---
Sub-total: Construction	259	56	577	13	205	308	31	66,521	1	1	66,740	60,378
Natural Gas Compression - Operations a	43	43	1,251	3	626	626	188	499,550	1,045	4	522,878	475,246
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	0	0	0	699	0	0	700	634
Dehy Venting and Flashing	---	---	---	---	---	980	368	10,649	649		24,284	23,298
Station Visits - Operations	95	10	2	0	5	2	0	329	0		329	298
Well Workover - Operations	2	0	9	0	3	1	0	1,330	0	0	1,334	1,207
Well & Pipeline Visits for Inspection & Repair - Operations	116	12	1	0	3	1	0	201	0		201	182
Tanks Condensate and Loadout	---	---	---	---	---	1,144	114	79	191		4,082	4,074
Wellhead Fugitives	---	---	---	---	---	1,748	175	1,029	16,028		337,609	337,513
Pneumatic Devices	---	---	---	---	---	1,284	128	756	11,771		247,948	247,878
Sub-total: Operations	257	65	1,264	3	637	5,785	973	514,621	29,683	5	1,139,364	1,090,332
Road Maintenance	7	1	0	0	0	0	0	243	0		243	221
Sub-total: Maintenance	7	1	0	0	0	0	0	243	0	0	243	221
Road Reclamation	0	0	0	0	0	0	0	5	0		5	5
Well Reclamation	5	1	0	0	0	0	0	151	0		151	137

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	5	1	0	0	0	0	0	156	0	0	156	142
Total Emissions	528	122	1,841	16	843	6,094	1,004	581,540	29,684	5	1,206,503	1,151,072

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately

Table U.96. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative B – 2018)

Activity	Annual Emissions (Tons)											CO ₂ eq metric tonnes
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO ₂ eq	
Well Pad & Station Construction - Fugitive Dust	73	7	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	27	26	483	11	132	36	4	56,027	1	1	56,215	50,853
Well Completion Flaring	1	1	7	0	40	227	23	8	0	0	8	7
Commuting Vehicles - Construction	103	11	4	0	4	1	0	1,036	0		1,037	941
Wind erosion	23	4	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	227	48	495	11	176	264	26	57,072	1	1	57,260	51,802
Natural Gas Compression - Operations a	51	51	1,483	3	741	741	222	591,959	1,238	5	619,603	563,160
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	1	0	0	828	0	0	830	752
Dehy Venting and Flashing	---	---	---	---	---	1,162	436	12,619	769		28,776	27,608
Station Visits - Operations	113	11	2	0	6	3	0	389	0		389	353
Well Workover - Operations	2	1	8	0	2	1	0	1,140	0	0	1,144	1,034
Well & Pipeline Visits for Inspection & Repair - Operations	138	14	1	0	4	2	0	238	0		238	216
Tanks Condensate and Loadout	---	---	---	---	---	1,355	136	94	226		4,837	4,828
Wellhead Fugitives	---	---	---	---	---	2,071	207	1,220	18,992		400,061	399,948
Pneumatic Devices	---	---	---	---	---	1,521	152	896	13,949		293,815	293,732
Sub-total: Operations	303	77	1,495	3	754	6,855	1,153	609,382	35,174	5	1,349,692	1,291,631
Road Maintenance	8	1	1	0	0	0	0	288	0		288	261
Sub-total: Maintenance	8	1	1	0	0	0	0	288	0	0	288	261
Road Reclamation	0	0	0	0	0	0	0	6	0		6	5
Well Reclamation	6	1	1	0	1	0	0	180	0		181	164

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	7	1	1	0	1	0	0	186	0	0	187	169
Total Emissions	545	127	1,991	14	931	7,120	1,180	666,928	35,175	6	1,407,426	1,343,864

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately

Table U.97. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative B – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	73	7	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	27	26	483	11	132	36	4	56,027	1	1	56,215	50,853
Well Completion Flaring	1	1	7	0	40	227	23	8	0	0	8	7
Commuting Vehicles - Construction	103	11	4	0	4	1	0	1,036	0		1,037	941
Wind Erosion	23	4	---	---	---	---	---	---	---		---	---
Sub-total: Construction	227	48	495	11	176	264	26	57,072	1	1	57,260	51,802
Natural Gas Compression - Operations a	40	40	1,158	2	579	579	174	462,181	966	4	483,765	439,696
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	0	0	0	646	0	0	648	587
Dehy Venting and Flashing	---	---	---	---	---	907	340	9,852	601		22,467	21,555
Station Visits - Operations	88	9	2	0	5	2	0	304	0		304	276
Well Workover - Operations	2	0	8	0	2	1	0	1,140	0	0	1,144	1,034
Well & Pipeline Visits for Inspection & Repair - Operations	107	11	1	0	3	1	0	186	0		186	168
Tanks Condensate and Loadout	---	---	---	---	---	1,058	106	73	176		3,776	3,770
Wellhead Fugitives	---	---	---	---	---	1,617	162	952	14,829		312,354	312,266
Pneumatic Devices	---	---	---	---	---	1,188	119	699	10,891		229,401	229,336
Sub-total: Operations	237	60	1,169	3	589	5,353	900	476,034	27,463	4	1,054,044	1,008,688
Road Maintenance	6	1	0	0	0	0	0	225	0		225	204
Sub-total: Maintenance	6	1	0	0	0	0	0	225	0	0	225	204
Road Reclamation	0	0	0	0	0	0	0	5	0		5	4
Well Reclamation	5	0	0	0	0	0	0	140	0		140	127

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	5	1	0	0	0	0	0	144	0	0	144	131
Total Emissions	475	109	1,664	14	766	5,617	927	533,475	27,463	5	1,111,673	1,060,825

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately

Table U.98. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative C – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	80	8	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	32	31	564	13	153	42	4	65,312	1	1	65,531	59,281
Well Completion Flaring	1	1	9	0	47	264	26	9	0	0	9	8
Commuting Vehicles - Construction	119	12	4	0	5	2	0	1,199	0		1,200	1,089
Wind Erosion	27	4	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	259	56	577	13	205	308	31	66,521	1	1	66,740	60,378
Natural Gas Compression - Operations a	55	55	1,606	3	803	803	241	641,199	1,341	6	671,142	610,004
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	1	0	0	897	0	0	899	814
Dehy Venting and Flashing	---	---	---	---	---	1,258	472	13,669	833		31,169	29,904
Station Visits - Operations	122	12	2	0	6	3	0	422	0		422	383
Well Workover - Operations	2	1	9	0	3	1	0	1,330	0	0	1,334	1,207
Well & Pipeline Visits for Inspection & Repair - Operations	149	15	1	0	4	2	0	257	0		257	234
Tanks Condensate and Loadout	---	---	---	---	---	1,468	147	102	245		5,239	5,230
Wellhead Fugitives	---	---	---	---	---	2,243	224	1,321	20,572		433,339	433,217
Pneumatic Devices	---	---	---	---	---	1,648	165	970	15,109		318,255	318,165
Sub-total: Operations	329	83	1,620	4	817	7,426	1,249	660,166	38,100	6	1,462,056	1,399,157
Road Maintenance	9	1	1	0	1	0	0	312	0		312	283
Sub-total: Maintenance	9	1	1	0	1	0	0	312	0	0	312	283
Road Reclamation	0	0	0	0	0	0	0	7	0		7	6
Well Reclamation	7	1	1	0	1	0	0	195	0		196	177

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	7	1	1	0	1	0	0	202	0	0	202	183
Total Emissions	604	141	2,199	17	1,023	7,734	1,280	727,201	38,100	6	1,529,311	1,460,002

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately

Table U.99. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative C – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	80	8	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	32	31	564	13	153	42	4	65,312	1	1	65,531	59,281
Well Completion Flaring	1	1	9	0	47	264	26	9	0	0	9	8
Commuting Vehicles - Construction	119	12	4	0	5	2	0	1,199	0		1,200	1,089
Wind Erosion	27	4	---	---	---	---	---	---	---		---	---
Sub-total: Construction	259	56	577	13	205	308	31	66,521	1	1	66,740	60,378
Natural Gas Compression - Operations a	43	43	1,254	3	627	627	188	500,359	1,046	5	523,725	476,017
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	0	0	0	700	0	0	701	635
Dehy Venting and Flashing	---	---	---	---	---	982	368	10,666	650		24,323	23,336
Station Visits - Operations	95	10	2	0	5	2	0	329	0		329	299
Well Workover - Operations	2	0	9	0	3	1	0	1,330	0	0	1,334	1,207
Well & Pipeline Visits for Inspection & Repair - Operations	116	12	1	0	3	1	0	201	0		201	182
Tanks Condensate and Loadout	---	---	---	---	---	1,145	115	80	191		4,088	4,081
Wellhead Fugitives	---	---	---	---	---	1,751	175	1,031	16,054		338,156	338,060
Pneumatic Devices	---	---	---	---	---	1,286	129	757	11,790		248,350	248,280
Sub-total: Operations	257	65	1,266	3	638	5,795	975	515,452	29,731	5	1,141,208	1,092,096
Road Maintenance	7	1	0	0	0	0	0	243	0		243	221
Sub-total: Maintenance	7	1	0	0	0	0	0	243	0	0	243	221
Road Reclamation	0	0	0	0	0	0	0	5	0		5	5
Well Reclamation	5	1	0	0	0	0	0	151	0		151	137

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	5	1	0	0	0	0	0	156	0	0	156	142
Total Emissions	529	122	1,843	16	844	6,103	1,006	582,373	29,732	5	1,208,348	1,152,837

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately

Table U.100. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative D – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	79	8	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	31	30	546	12	148	41	4	63,249	1	1	63,461	57,408
Well Completion Flaring	1	1	8	0	46	256	26	9	0	0	9	8
Commuting Vehicles - Construction	115	12	4	0	5	2	0	1,163	0		1,164	1,056
Wind Erosion	26	4	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	252	54	559	12	199	298	30	64,421	1	1	64,634	58,472
Natural Gas Compression - Operations a	54	54	1,579	3	789	789	237	630,271	1,318	6	659,705	599,609
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	1	0	0	882	0	0	883	800
Dehy Venting and Flashing	---	---	---	---	---	1,237	464	13,436	819		30,638	29,394
Station Visits - Operations	120	12	2	0	6	3	0	414	0		415	376
Well Workover - Operations	2	1	9	0	3	1	0	1,287	0	0	1,292	1,168
Well & Pipeline Visits for Inspection & Repair - Operations	146	15	1	0	4	2	0	253	0		253	230
Tanks Condensate and Loadout	---	---	---	---	---	1,443	144	100	240		5,150	5,141
Wellhead Fugitives	---	---	---	---	---	2,205	221	1,299	20,222		425,954	425,834
Pneumatic Devices	---	---	---	---	---	1,620	162	954	14,851		312,831	312,743
Sub-total: Operations	323	82	1,592	4	803	7,299	1,228	648,896	37,450	6	1,437,121	1,375,295
Road Maintenance	9	1	1	0	0	0	0	307	0		307	278
Sub-total: Maintenance	9	1	1	0	0	0	0	307	0	0	307	278
Road Reclamation	0	0	0	0	0	0	0	6	0		6	6
Well Reclamation	7	1	1	0	1	0	0	192	0		192	174

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	7	1	1	0	1	0	0	199	0	0	199	180
Total Emissions	591	138	2,153	16	1,003	7,598	1,258	713,822	37,451	6	1,502,260	1,434,226

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately

Table U.101. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative D – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	79	8	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	31	30	546	12	148	41	4	63,249	1	1	63,461	57,408
Well Completion Flaring	1	1	8	0	46	256	26	9	0	0	9	8
Commuting Vehicles - Construction	115	12	4	0	5	2	0	1,163	0		1,164	1,056
Wind Erosion	26	4	---	---	---	---	---	---	---		---	---
Sub-total: Construction	252	54	559	12	199	298	30	64,421	1	1	64,634	58,472
Natural Gas Compression - Operations a	42	42	1,232	3	616	616	185	491,860	1,028	4	514,829	467,931
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	0	0	0	688	0	0	689	625
Dehy Venting and Flashing	---	---	---	---	---	965	362	10,485	639		23,910	22,939
Station Visits - Operations	94	9	2	0	5	2	0	323	0		323	294
Well Workover - Operations	2	0	9	0	3	1	0	1,287	0	0	1,292	1,168
Well & Pipeline Visits for Inspection & Repair - Operations	114	11	1	0	3	1	0	197	0		198	179
Tanks Condensate and Loadout	---	---	---	---	---	1,126	113	78	188		4,019	4,012
Wellhead Fugitives	---	---	---	---	---	1,721	172	1,014	15,781		332,412	332,318
Pneumatic Devices	---	---	---	---	---	1,264	126	744	11,590		244,131	244,063
Sub-total: Operations	253	64	1,244	3	627	5,696	958	506,677	29,226	4	1,121,804	1,073,529
Road Maintenance	7	1	0	0	0	0	0	239	0		239	217
Sub-total: Maintenance	7	1	0	0	0	0	0	239	0	0	239	217
Road Reclamation	0	0	0	0	0	0	0	5	0		5	5
Well Reclamation	5	1	0	0	0	0	0	149	0		149	135

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Sub-total: Reclamation	5	1	0	0	0	0	0	154	0	0	154	139
Total Emissions	517	119	1,803	15	826	5,995	988	571,491	29,227	5	1,186,830	1,132,357

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately

Table U.102. Leasable Minerals – CBNG Development – Total (BLM and Non-BLM) Wells (Base Year – 2008)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	1	0	---	---	---	---	---	---	---	---	---	---
Wind Erosion	0	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	0	0	1	0	0	0	0	129	0	0	129	117
Commuting Vehicles - Construction	1	0	0	0	0	0	0	9	0		9	8
Sub-total: Construction	2	0	1	0	0	0	0	137	0	0		125
Natural Gas Compression - Operations a	0	0	14	0	7	7	2	5,396	11	0	5,648	5,125
Dehydrators	0	0	0	0	0	1	0	132	0	0	132	120
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	0	0	2	65		1,365	1,239
Pneumatics	---	---	---	---	---	3	0	32	507		10,677	9,689
Station Visits - Operations	6	1	0	0	0	0	0	10	0		10	9
Well Workover - Operations	0	0	0	0	0	0	0	8	0	0	8	8
Well & Pipeline Visits for Inspection & Repair - Operations	1	0	0	0	0	0	0	1	0		1	1
Sub-total: Operations	7	1	15	0	8	10	3	6,573	583	0	18,835	17,091
Road Maintenance	0	0	0	0	0	0	0	2	0		2	2
Sub-total: Maintenance	0	0	0	0	0	0	0	2	0	0	2	2
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	1	0		1	1
Sub-total: Reclamation	0	0	0	0	0	0	0	1	0	0	1	1

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	9	1	16	0	8	10	3	6,713	583	0	18,838	17,219

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression

Table U.103. Leasable Minerals – CBNG Development – Total Wells (Alternative A – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	17	2	---	---	---	---	---	---	---	---	---	---
Wind Erosion	8	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	2	2	35	1	12	3	0	4,646	0	0	4,660	4,229
Commuting Vehicles - Construction	18	2	1	0	1	0	0	255	0		255	231
Sub-total: Construction	45	7	36	1	13	3	0	4,900	0	0	4,915	4,460
Natural Gas Compression - Operations	14	14	397	1	199	199	60	158,609	332	1	166,019	150,653
Dehydrators	0	0	1	0	1	15	8	1,453	0	0	1,456	1,321
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	5	1	71	1,907		40,124	36,410
Pneumatics	---	---	---	---	---	74	7	953	14,899		313,824	284,777
Station Visits - Operations	20	2	0	0	1	0	0	69	0		69	63
Well Workover - Operations	1	0	2	0	1	0	0	347	0	0	348	316
Well & Pipeline Visits for Inspection & Repair - Operations	21	2	0	0	1	0	0	37	0		37	34
Sub-total: Operations	56	18	402	1	203	294	75	162,530	17,138	1	522,870	474,473
Road Maintenance	1	0	0	0	0	0	0	54	0		54	49
Sub-total: Maintenance	1	0	0	0	0	0	0	54	0	0	54	49
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	33	0		33	30
Sub-total: Reclamation	1	0	0	0	0	0	0	34	0	0	34	31

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	103	25	438	2	216	297	75	167,518	17,138	1	527,873	479,013

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression

Table U.104. Leasable Minerals – CBNG Development – Total Wells (Alternative A – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	17	2	---	---	---	---	---	---	---	---	---	---
Wind Erosion	8	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	2	2	35	1	12	3	0	4,646	0	0	4,660	4,229
Commuting Vehicles - Construction	18	2	1	0	1	0	0	255	0		255	231
Sub-total: Construction	45	7	36	1	13	3	0	4,900	0	0	4,915	4,460
Natural Gas Compression - Operations a	12	12	358	1	179	179	54	142,806	299	1	149,478	135,642
Dehydrators	0	0	1	0	1	14	7	1,321	0	0	1,323	1,201
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	5	0	64	1,717		36,126	32,782
Pneumatics	---	---	---	---	---	67	7	858	13,414		282,556	256,403
Station Visits - Operations	18	2	0	0	0	0	0	31	0		31	28
Well Workover - Operations	1	0	2	0	1	0	0	347	0	0	348	316
Well & Pipeline Visits for Inspection & Repair - Operations	19	2	0	0	1	0	0	33	0		33	30
Sub-total: Operations	50	16	362	1	182	265	68	146,451	15,430	1	470,889	427,304
Road Maintenance	1	0	0	0	0	0	0	48	0		48	44
Sub-total: Maintenance	1	0	0	0	0	0	0	48	0	0	48	44
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	30	0		30	27
Sub-total: Reclamation	1	0	0	0	0	0	0	31	0	0	31	28

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	97	23	398	2	195	268	68	151,431	15,430	1	475,883	431,836

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression

Table U.105. Leasable Minerals – CBNG Development – Total Wells (Alternative B – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	9	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	4	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	1	1	19	0	6	1	0	2,491	0	0	2,499	2,268
Commuting Vehicles - Construction	10	1	1	0	1	0	0	136	0		137	124
Sub-total: Construction	24	4	19	0	7	2	0	2,628	0	0	2,635	2,392
Natural Gas Compression - Operations	7	7	211	0	105	105	32	84,026	176	1	87,952	79,811
Dehydrators	0	0	1	0	1	8	4	792	0	0	794	720
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	38	1,010		21,256	19,289
Pneumatics	---	---	---	---	---	39	4	505	7,893		166,254	150,866
Station Visits - Operations	11	1	0	0	1	0	0	36	0		36	33
Well Workover - Operations	0	0	1	0	0	0	0	186	0	0	187	169
Well & Pipeline Visits for Inspection & Repair - Operations	11	1	0	0	0	0	0	20	0		20	18
Sub-total: Operations	29	9	214	0	108	156	40	86,594	9,079	1	277,492	251,807
Road Maintenance	1	0	0	0	0	0	0	29	0		29	26
Sub-total: Maintenance	1	0	0	0	0	0	0	29	0	0	29	26
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	17	0		17	16
Sub-total: Reclamation	1	0	0	0	0	0	0	18	0	0	18	16

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	55	13	233	1	115	158	40	89,268	9,079	1	280,174	254,241

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression

Table U.106. Leasable Minerals – CBNG Development – Total Wells (Alternative B – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	9	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	4	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	1	1	19	0	6	1	0	2,491	0	0	2,499	2,268
Commuting Vehicles - Construction	10	1	1	0	1	0	0	136	0		137	124
Sub-total: Construction	24	4	19	0	7	2	0	2,628	0	0	2,635	2,392
Natural Gas Compression - Operations a	6	6	189	0	95	95	28	75,547	158	1	79,076	71,757
Dehydrators	0	0	1	0	1	7	4	792	0	0	794	720
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	34	908		19,111	17,342
Pneumatics	---	---	---	---	---	35	4	454	7,096		149,477	135,641
Station Visits - Operations	10	1	0	0	0	0	0	17	0		17	15
Well Workover - Operations	0	0	1	0	0	0	0	186	0	0	187	169
Well & Pipeline Visits for Inspection & Repair - Operations	10	1	0	0	0	0	0	18	0		18	16
Sub-total: Operations	27	9	192	0	97	140	36	78,038	8,163	1	249,671	226,562
Road Maintenance	1	0	0	0	0	0	0	26	0		26	23
Sub-total: Maintenance	1	0	0	0	0	0	0	26	0	0	26	23
Road Reclamation	0	0	0	0	0	0	0	1	0		1	0
Well Reclamation	1	0	0	0	0	0	0	16	0		16	14
Sub-total: Reclamation	1	0	0	0	0	0	0	16	0	0	16	15

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	52	12	211	1	104	142	36	80,707	8,163	1	252,348	228,991

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression

Table U.107. Leasable Minerals – CBNG Development – Total Wells (Alternative C – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	13	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	8	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	2	2	34	1	12	3	0	4,596	0	0	4,610	4,183
Commuting Vehicles - Construction	17	2	1	0	1	0	0	247	0		247	225
Sub-total: Construction	41	7	35	1	13	3	0	4,843	0	0	4,858	4,408
Natural Gas Compression - Operations	8	8	234	0	117	117	35	93,277	195	1	97,635	88,598
Dehydrators	0	0	1	0	1	9	4	924	0	0	926	841
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	42	1,122		23,596	21,412
Pneumatics	---	---	---	---	---	43	4	561	8,762		184,558	167,475
Station Visits - Operations	12	1	0	0	1	0	0	43	0		43	39
Well Workover - Operations	1	0	2	0	1	0	0	347	0	0	348	316
Well & Pipeline Visits for Inspection & Repair - Operations	13	1	0	0	0	0	0	22	0		22	20
Sub-total: Operations	34	11	238	1	120	173	44	96,206	10,079	1	308,120	279,601
Road Maintenance	1	0	0	0	0	0	0	32	0		32	29
Sub-total: Maintenance	1	0	0	0	0	0	0	32	0	0	32	29
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	19	0		19	18
Sub-total: Reclamation	1	0	0	0	0	0	0	20	0	0	20	18

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	76	17	274	1	133	176	45	101,100	10,079	1	313,030	284,056

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression

Table U.108. Leasable Minerals – CBNG Development – Total Wells (Alternative C – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	13	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	8	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	2	2	34	1	12	3	0	4,596	0	0	4,610	4,183
Commuting Vehicles - Construction	17	2	1	0	1	0	0	247	0		247	225
Sub-total: Construction	41	7	35	1	13	3	0	4,843	0	0	4,858	4,408
Natural Gas Compression - Operations a	12	12	359	1	180	180	54	143,384	300	1	150,083	136,192
Dehydrators	0	0	1	0	1	14	7	1,321	0	0	1,323	1,201
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	5	0	64	1,724		36,272	32,915
Pneumatics	---	---	---	---	---	67	7	862	13,469		283,700	257,441
Station Visits - Operations	18	2	0	0	0	0	0	31	0		31	28
Well Workover - Operations	1	0	2	0	1	0	0	347	0	0	348	316
Well & Pipeline Visits for Inspection & Repair - Operations	19	2	0	0	1	0	0	33	0		33	30
Sub-total: Operations	50	16	364	1	183	266	68	147,033	15,493	1	472,784	429,024
Road Maintenance	1	0	0	0	0	0	0	49	0		49	44
Sub-total: Maintenance	1	0	0	0	0	0	0	49	0	0	49	44
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	30	0		30	27
Sub-total: Reclamation	1	0	0	0	0	0	0	31	0	0	31	28

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	94	23	399	2	196	269	68	151,955	15,493	1	477,721	433,504

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression

Table U.109. Leasable Minerals – CBNG Development – Total Wells (Alternative D – 2018)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	12	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	7	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	2	2	32	1	11	2	0	4,253	0	0	4,266	3,871
Commuting Vehicles - Construction	16	2	1	0	1	0	0	228	0		228	207
Sub-total: Construction	37	6	33	1	12	3	0	4,481	0	0	4,495	4,079
Natural Gas Compression - Operations	7	7	196	0	98	98	29	78,245	164	1	81,900	74,320
Dehydrators	0	0	1	0	1	7	4	792	0	0	794	720
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	35	941		19,794	17,962
Pneumatics	---	---	---	---	---	36	4	470	7,350		154,815	140,485
Station Visits - Operations	11	1	0	0	1	0	0	36	0		36	33
Well Workover - Operations	1	0	2	0	1	0	0	321	0	0	323	293
Well & Pipeline Visits for Inspection & Repair - Operations	11	1	0	0	0	0	0	18	0		18	17
Sub-total: Operations	28	9	200	0	101	145	37	80,909	8,454	1	258,672	234,730
Road Maintenance	1	0	0	0	0	0	0	27	0		27	24
Sub-total: Maintenance	1	0	0	0	0	0	0	27	0	0	27	24
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	16	0		16	15
Sub-total: Reclamation	1	0	0	0	0	0	0	17	0	0	17	15

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	67	15	233	1	113	148	37	85,433	8,454	1	263,210	238,848

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression

Table U.110. Leasable Minerals – CBNG Development – Total Wells (Alternative D – 2027)

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Well Pad & Station Construction - Fugitive Dust	12	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	7	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	2	2	32	1	11	2	0	4,253	0	0	4,266	3,871
Commuting Vehicles - Construction	16	2	1	0	1	0	0	228	0		228	207
Sub-total: Construction	37	6	33	1	12	3	0	4,481	0	0	4,495	4,079
Natural Gas Compression - Operations a	11	11	325	1	163	163	49	129,894	272	1	135,962	123,378
Dehydrators	0	0	1	0	1	12	6	1,189	0	0	1,191	1,081
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	5	0	58	1,562		32,859	29,818
Pneumatics	---	---	---	---	---	61	6	781	12,201		257,008	233,220
Station Visits - Operations	16	2	0	0	0	0	0	28	0		28	25
Well Workover - Operations	1	0	2	0	1	0	0	321	0	0	323	293
Well & Pipeline Visits for Inspection & Repair - Operations	18	2	0	0	0	0	0	30	0		30	28
Sub-total: Operations	46	15	330	1	166	241	62	133,292	14,035	1	428,394	388,743
Road Maintenance	1	0	0	0	0	0	0	44	0		44	40
Sub-total: Maintenance	1	0	0	0	0	0	0	44	0	0	44	40
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	27	0		27	24
Sub-total: Reclamation	1	0	0	0	0	0	0	28	0	0	28	25

Activity	Annual Emissions (Tons)											
	PM ₁₀	PM _{2.5}	NO _x	SO ₂	CO	VOC	HAPs a	CO ₂	CH ₄	N ₂ O	CO _{2eq}	CO _{2eq} metric tonnes
Total Emissions	85	21	363	2	178	244	62	137,845	14,035	1	432,961	392,887

a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1, and formaldehyde HAP added for gas compression