CCSM Project Infrastructure Components

Environmental Assessment

Appendix D

Air Quality Emissions Calculations

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APPENDIX D

AIR QUALITY EMISSIONS CALCULATIONS

Table D-1. Total Construction Emissions

Pollutant	Emissions (tons per year)				
	2014	2015	2016	2017	2018
Criteria Pollutants					
CO	88.70	n/a	n/a	n/a	n/a
NO_x	411.64	n/a	n/a	n/a	n/a
PM_{10}		n/a	n/a	n/a	n/a
Fugitive	n/a	n/a	n/a	n/a	n/a
Exhaust	29.21	n/a	n/a	n/a	n/a
Total:	**29.21**	**n/a**	**n/a**	**n/a**	**n/a**
$PM_{2.5}$		n/a	n/a	n/a	n/a
Fugitive	n/a	n/a	n/a	n/a	n/a
Exhaust	29.21	n/a	n/a	n/a	n/a
Total:	**29.21**	**n/a**	**n/a**	**n/a**	**n/a**
SO_2	27.22	n/a	n/a	n/a	n/a
VOC	32.80	n/a	n/a	n/a	n/a
Hazardous Air Pollutants					
Benzene	0.09	n/a	n/a	n/a	n/a
Toluene	0.04	n/a	n/a	n/a	n/a
Xylenes	0.03	n/a	n/a	n/a	n/a
Acetaldehyde	0.07	n/a	n/a	n/a	n/a
Formaldehyde	0.11	n/a	n/a	n/a	n/a
Propylene	0.24	n/a	n/a	n/a	n/a
Greenhouse Gases					
CO_2	15,270.50	n/a	n/a	n/a	n/a
CH_4	0.61	n/a	n/a	n/a	n/a
N_2O	0.12	n/a	n/a	n/a	n/a
CO_2e	15,322.51	n/a	n/a	n/a	n/a

n/a Not applicable. Construction will only occur during 2014.

Table D-2. All Operations and Construction Emissions (Including Decommissioning)

Pollutant	Emissions (tons per year)				
	2014	2015	2016	2017	2018
Criteria Pollutants					
CO	106.96	211.38	202.57	110.36	105.87
NO_x	469.37	980.97	940.08	512.16	491.31
PM_{10}					
Fugitive	0.94	228.30	215.33	66.20	11.88
Exhaust	35.23	69.62	66.72	30.64	34.87
Total:	**36.16**	**297.91**	**282.04**	**96.84**	**46.75**
$PM_{2.5}$					
Fugitive	0.14	72.09	67.98	20.75	9.61
Exhaust	35.23	69.62	66.72	30.64	34.87
Total:	**35.37**	**141.70**	**134.69**	**51.39**	**41.99**
SO_2	32.82	64.87	62.17	33.87	32.49
VOC	39.55	78.16	74.90	40.81	39.15
Hazardous Air Pollutants					
Benzene	0.10	0.21	0.20	0.11	0.10
Toluene	0.05	0.09	0.09	0.05	0.05
Xylenes	0.03	0.06	0.06	0.03	0.03
Acetaldehyde	0.09	0.17	0.16	0.09	0.09
Formaldehyde	0.13	0.26	0.25	0.14	0.13
Propylene	0.29	0.57	0.55	0.30	0.29
Greenhouse Gases					
CO_2	18,420.21	36,390.88	34,873.76	18,999.66	19,304.62
CH_4	0.74	1.47	1.40	0.76	0.78
N_2O	0.15	0.29	0.28	0.15	0.16
CO_2e	18,482.95	36,514.82	34,992.54	19,064.37	19,370.37

Table D-3. Summary of Construction Emissions by Phase

Construction Phase	Criteria Pollutants - Emissions (tons/year)						Hazardous Pollutants - Emissions (tons/year)						GHG Emissions (tons/year)			
	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOCs	Benzene	Toluene	Xylenes	Acetaldehyde	Formaldehyde	Propylene	CO_2	CH_4	N_2O	CO_2e
Mobilization																
1_Onsite Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2_Onroad Vehicles	18.30	84.91	6.03	6.03	5.61	6.77	0.02	0.008	0.005	0.015	0.02	0.05	3,149.71	0.13	0.03	3,160.44
Total:	**18.30**	**84.91**	**6.03**	**6.03**	**5.61**	**6.77**	**0.02**	**0.01**	**0.01**	**0.01**	**0.02**	**0.05**	**3,149.71**	**0.13**	**0.03**	**3,160.44**
Site Prep																
1_Onsite Equipment	5.26	24.40	1.73	1.73	1.61	1.94	0.01	0.002	0.002	0.004	0.01	0.01	904.98	0.04	0.01	908.06
2_Onroad Vehicles	18.26	84.73	6.01	6.01	5.60	6.75	0.02	0.008	0.005	0.015	0.02	0.05	3,143.09	0.13	0.03	3,153.79
Total:	**23.51**	**109.12**	**7.74**	**7.74**	**7.22**	**8.69**	**0.02**	**0.01**	**0.01**	**0.02**	**0.03**	**0.06**	**4,048.07**	**0.16**	**0.03**	**4,061.86**
Quarry Road Construction																
1_Onsite Equipment	6.22	28.88	2.05	2.05	1.91	2.30	0.01	0.003	0.002	0.005	0.01	0.02	1,071.37	0.04	0.01	1,075.02
2_Onroad Vehicles	18.26	84.73	6.01	6.01	5.60	6.75	0.02	0.008	0.005	0.015	0.02	0.05	3,143.09	0.13	0.03	3,153.79
Total:	**24.48**	**113.61**	**8.06**	**8.06**	**7.51**	**9.05**	**0.02**	**0.01**	**0.01**	**0.02**	**0.03**	**0.07**	**4,214.45**	**0.17**	**0.03**	**4,228.81**
Operations Area Construction																
1_Onsite Equipment	4.15	19.28	1.37	1.37	1.27	1.54	0.004	0.002	0.001	0.003	0.01	0.01	715.18	0.03	0.01	717.61
2_Onroad Vehicles	18.26	84.73	6.01	6.01	5.60	6.75	0.02	0.01	0.01	0.01	0.02	0.05	3,143.09	0.13	0.03	3,153.79
Total:	**22.41**	**104.01**	**7.38**	**7.38**	**6.88**	**8.29**	**0.02**	**0.01**	**0.01**	**0.02**	**0.03**	**0.06**	**3,858.27**	**0.16**	**0.03**	**3,871.41**

n/a Not applicable.

Table D-4. Summary of Operations Emissions by Phase

Operation Phase	Criteria Pollutants - Emissions (tons/year)						Hazardous Pollutants - Emissions (tons/year)						GHG Emission (tons/year)			
	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOCs	Benzene	Toluene	Xylenes	Acetaldehyde	Formaldehyde	Propylene	CO_2	CH_4	N_2O	CO_2e
2014																
Equipment	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fugitive Dust	--	--	0.94	0.14	--	--	--	--	--	--	--	--	--	--	--	--
Onroad Vehicles	18.26	84.73	6.01	6.01	5.60	6.75	0.02	0.01	0.01	0.01	0.02	0.05	3,149.71	0.13	0.03	3,160.44
Total:	**18.26**	**84.73**	**6.95**	**6.15**	**5.60**	**6.75**	**0.02**	**0.01**	**0.01**	**0.01**	**0.02**	**0.05**	**3,149.71**	**0.13**	**0.03**	**3,160.44**
2015																
Equipment	52.26	242.53	17.21	17.21	16.04	19.32	0.05	0.02	0.02	0.04	0.06	0.14	8,997.06	0.36	0.07	9,027.71
Fugitive Dust	--	--	228.30	72.09	--	--	--	--	--	--	--	--	--	--	--	--
Onroad Vehicles	159.12	738.44	52.41	52.41	48.83	58.84	0.16	0.07	0.05	0.13	0.20	0.43	27,393.81	1.10	0.22	27,487.11
Total:	**211.38**	**980.97**	**297.91**	**141.70**	**64.87**	**78.16**	**0.21**	**0.09**	**0.06**	**0.17**	**0.26**	**0.57**	**36,390.88**	**1.47**	**0.29**	**36,514.82**
2016																
Equipment	52.26	242.53	17.21	17.21	16.04	19.32	0.05	0.02	0.02	0.04	0.06	0.14	8,997.06	0.36	0.07	9,027.71
Fugitive Dust	--	--	215.33	67.98	--	--	--	--	--	--	--	--	--	--	--	--
Onroad Vehicles	150.31	697.55	49.50	49.50	46.13	55.58	0.15	0.06	0.05	0.12	0.19	0.41	25,876.70	1.04	0.21	25,964.83
Total:	**202.57**	**940.08**	**282.04**	**134.69**	**62.17**	**74.90**	**0.20**	**0.09**	**0.06**	**0.16**	**0.25**	**0.55**	**34,873.76**	**1.40**	**0.28**	**34,992.54**
2017																
Equipment	52.26	242.53	17.21	17.21	16.04	19.32	0.05	0.02	0.02	0.04	0.06	0.14	8,997.04	0.36	0.07	9,027.68
Fugitive Dust	--	--	66.20	20.75	--	--	--	--	--	--	--	--	--	--	--	--
Onroad Vehicles	58.10	269.64	13.43	13.43	17.83	21.48	0.06	0.02	0.02	0.05	0.07	0.16	10,002.62	0.40	0.08	10,036.69
Total:	**110.36**	**512.16**	**96.84**	**51.39**	**33.87**	**40.81**	**0.11**	**0.05**	**0.03**	**0.09**	**0.14**	**0.30**	**18,999.66**	**0.76**	**0.15**	**19,064.37**
2018																
Equipment	32.66	151.58	10.76	10.76	10.02	12.08	0.03	0.01	0.01	0.03	0.04	0.09	6,701.61	0.27	0.05	6,724.43
Fugitive Dust	--	--	11.49	9.57	--	--	--	--	--	--	--	--	--	--	--	--
Onroad Vehicles	38.98	180.87	12.84	12.84	11.96	14.41	0.04	0.02	0.01	0.03	0.05	0.11	6,709.86	0.27	0.05	6,732.71
Total:	**71.64**	**332.46**	**35.08**	**33.16**	**21.98**	**26.49**	**0.07**	**0.03**	**0.02**	**0.06**	**0.09**	**0.19**	**13,411.47**	**0.54**	**0.11**	**13,457.14**
Site Decommissioning (2018)																
Equipment	14.95	69.40	4.93	4.93	4.59	5.53	0.01	0.01	0.00	0.01	0.02	0.04	2,574.45	0.10	0.02	2,583.21
Fugitive Dust	--	--	0.19	0.02	--	--	--	--	--	--	--	--	--	--	--	--
Onroad Vehicles	5.96	27.66	1.96	1.96	1.83	2.20	0.0058	0.0026	0.0018	0.0048	0.0074	0.0162	1,026.12	0.04	0.01	1,029.62
Total:	**20.91**	**97.06**	**7.08**	**6.91**	**6.42**	**7.73**	**0.02**	**0.01**	**0.01**	**0.02**	**0.03**	**0.06**	**3,600.57**	**0.14**	**0.03**	**3,612.83**
Road Decommissioning (2018)																
Equipment	7.48	34.73	2.47	2.47	2.30	2.77	0.01	0.00	0.00	0.01	0.01	0.02	1,288.54	0.05	0.01	1,292.93
Fugitive Dust	--	--	0.19	0.02	--	--	--	--	--	--	--	--	--	--	--	--
Onroad Vehicles	5.83	27.07	1.92	1.92	1.79	2.16	0.0057	0.0025	0.0017	0.0047	0.0072	0.0158	1,004.04	0.04	0.01	1,007.46
Total:	**13.32**	**61.80**	**4.58**	**4.41**	**4.09**	**4.92**	**0.01**	**0.01**	**0.00**	**0.01**	**0.02**	**0.04**	**2,292.58**	**0.09**	**0.02**	**2,300.39**

EMISSIONS CALCULATIONS -- GENERAL INPUTS

Table D-5. Onsite Equipment Conversion Factors

Conversion Factors		
1 ton =	2,000	lbs
1 metric ton =	2,204.62	lbs
1 lb =	453.6	g
1 kg =	2.204	lbs
BSFCa	7,000	Btu/hp-hr
1 MMBtua =	1,000,000	Btu

[a]USEPA. 1996. AP-42. Background Document for Section 3.3: Gasoline and Diesel Industrial Engines. Available at: http://www.epa.gov/ttn/chief/ap42/ch03/bgdocs/b03s03.pdf.
Equation: Source Activity*Emission Rate*Operating Hours=Emissions (tons/per year)

Table D-6. Onsite Equipment Emission Factors

Pollutant	Emission Factor[a]	Unit
CO	0.00668	(lb/hp-hr)
NO_x	0.0310	(lb/hp-hr)
$PM_{2.5}$	*Assumed to be the same as PM_{10}	
PM_{10}	0.0022	(lb/hp-hr)
SO_2	0.00205	(lb/hp-hr)
VOCs	0.00247	(lb/hp-hr)
CO_2	1.15	(lb/hp-hr)
Benzene	0.00000653	(lb/hp-hr)
Toluene	0.00000286	(lb/hp-hr)
Xylenes	0.000002	(lb/hp-hr)
Acetaldehyde	0.00000537	(lb/hp-hr)
Formaldehyde	0.00000826	(lb/hp-hr)
Propylene	0.0000181	(lb/hp-hr)
CH4[b]	0.00005	(lb/hp-hr)[c]
N2O[b]	0.00001	(lb/hp-hr)[d]

[a]All emission factors from AP-42. Section 3.3 Gasoline And Diesel Industrial Engines. Available at: http://www.epa.gov/ttn/chief/ap42/ch03/final/c03s03.pdf.
[b]USEPA. 2014. Emission Factors for Greenhouse Gas Inventories. Available at: http://www.epa.gov/climateleadership/documents/emission-factors.pdf.
[c]3 g/MMBtu
[d]0.6 g/MMBtu
Annual emissions = horsepower * hours * factor/2000
*Assuming PM_{10} and $PM_{2.5}$ to be 100% of total PM
PM_{10}/Total PM fraction – 1.0
$PM_{2.5}$/Total PM fraction – 1.0

Table D-7. Equipment Horsepower Assumptions

Equipment	Horsepower (hp)
Dozer	580
Scraper	500
Excavator	330
Grader	259
Crusher (electric, incl. in generator)	325
Screener (electric, incl. in generator)	325
Generator (diesel) - 25Amp/240V	325
Loader	262
Roller - vibratory	250
Compactor	250
Forklift	9.5
Reclaimer	500
Rough terrain crane	500
Water truck (calc. as if nonroad)	285
Pickup Truck	325
Tractor-Trailer	400
Dump Truck	330
Cement Distrib. Truck	400

Source: CCSM FEIS, Appendix H Air Quality.
Available at: http://www.blm.gov/wy/st/en/info/NEPA/documents/rfo/Chokecherry.html.

Table D-8. Global Warming Potentials

CO_2	CH_4	N_2O
1	25	298

Table D-9. Various Input Assumptions and References for Assumptions

Description	Value/Assumption		Unit	Reference (SPOD page unless noted otherwise)
No. of work days/wk	Given for decommissioning but apply to all	6	days/wk	7-1
No. of work hr/day	Given for decommissioning but apply to all	12	hr/day	7-1
No. of work days/month		26.07	days	calculated
Downtime (engine off) for equipment	For lunch, breaks, maintenance, etc.	1.0	hr/day	Assumed
No. of work hours/month for equipment	(hr/day - downtime) x days/mo	287	hr/mo	calculated
Quarry output (for estimating # truck trips carrying aggregate out to wind farm)	year 2014	0	cy	Tbl 5-5
	year 2015	1,066,400	cy	Tbl 5-5
	year 2016	1,005,500	cy	Tbl 5-5
	year 2017	305,200	cy	Tbl 5-5
	year 2018	180,700	cy	Tbl 5-5
Capacity of belly-dump truck		24	cy	Att. B Traffic Study, p.B-11
No. of belly-dump truck round trips	year 2014	0	rnd trips/yr	calculated
	year 2015	44,433	rnd trips/yr	calculated
	year 2016	41,896	rnd trips/yr	calculated
	year 2017	12,717	rnd trips/yr	calculated
	year 2018	7,529	rnd trips/yr	calculated
Vehicle speed on Quarry Road		25	mph	CCSM FEIS ROD, Appendix D, Measure A-3-05
Worker vehicle occupancy		1.5	persons/ vehicle	Att. B Traffic Study, p.B-12
Vehicle trip distances	Tractor-Trailer Belly-Dump	60	mi/rnd trip	Assumed (avg. from quarry to WTG sites)
	Tractor-Trailer/Flatbed	200	mi/rnd trip	Assumed (Laramie or equiv.)
	Dump Truck	200	mi/rnd trip	Assumed (Laramie or equiv.)
	Smaller trucks (mat'ls & supplies)	200	mi/rnd trip	Assumed (Laramie or equiv.)
	Cement Distrib. Truck	200	mi/rnd trip	Assumed (Laramie or equiv.)
	Worker commuting	112	mi/rnd trip	see tab
Water Truck (On-site loads)	year 2014	0	rnd trips/yr	N.A. for oper. - only construction in 2014
	year 2015	2,715	rnd trips/yr	Att. B Traffic Study, p.B-11
	year 2016	2,715	rnd trips/yr	Att. B Traffic Study, p.B-11
	year 2017	2,715	rnd trips/yr	Att. B Traffic Study, p.B-11
	year 2018	2,715	rnd trips/yr	Att. B Traffic Study, p.B-12

Table D-9. Various Input Assumptions and References for Assumptions

Description	Value/Assumption		Unit	Reference (SPOD page unless noted otherwise)
Other		2	year 2017 is split between decommissioning and operations	
		2	decommissioning phase is split between road and site	

Based on 11/13/13 SPOD for Quarry

Operation Vehicles

Fugitive Dust from Onroad Vehicles on Unpaved Roads
Emission Factors for Publicly Accessible Unpaved Roads

$$E\ (lb/VMT) = \frac{k\ (s/12)^a\ (S/30)^d}{(M/0.5)^c} - C$$

$$E_{ext} = E\ (1 - P/365)$$

Constants	Parameter	PM_{10}	$PM_{2.5}$
12	k	1.8	0.18
30	a	1	1
0.5	d	0.5	0.5
	c	0.2	0.2

Function/Variable Description	Assumed Value	Reference
E = size-specific emission factor (lb/VMT)	N/A	
E_{ext} = size-specific emission factor extrapolated for	N/A	
s = surface material silt content (%)	varies	EPA AP-42 Section 13.2.2, Table 13.2.2-1
S = mean vehicle speed (mph)	25	CCSM FEIS.
C = emission factor for 1980's vehicle fleet exhaust, N/A		
$PM_{2.5\ (lb/VMT)}$	0.00036	EPA AP-42 Section 13.2.2, Table 13.2.2-4
$PM_{10\ (lb/VMT)}$	0.00047	EPA AP-42 Section 13.2.2, Table 13.2.2-4
M = surface material moisture content (%)	2.0	EPA AP-42 Section 13.2.2
P = Number of days precip per year	30	EPA AP-42 Section 13.2.2, Figure 13.2.2-1
CE = control efficiency of watering	50%	

Sources: EPA, AP-42 Volume I, Section 13.2.2 Unpaved Roads, Table 13.2.2-2, Nov. 2006
Fitzpatrick, M. 1990. *User's Guide: Emission Control Technologies and Emission Factors for Unpaved Road Fugitive Emissions* , EPA/625/5-87/022. http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=20008SFC.

Production Sequence Fugitive Dust

Sequence Event	PM10	PM2.5	Units	Controlled/ Uncontrolled Rate	Control Efficiency (%)	Source	Description in Ref. of Factor Used
Excavation*,**	5.80E-02	5.80E-02	lb/U.S. ton	Uncontrolled	50	MI DEQ 2005	Highest emission factor of activities potentially
Transfer Excavate to Screener*,**	4.00E-02	4.00E-02	lb/U.S. ton	Uncontrolled	50	MI DEQ 2005	Highest emission factor of activities potentially
Screening	3.70E-04	2.50E-05	kg/metric tonne	Controlled	50	Env. Canada	Screening, SCC 3-05-020-02/03
Truck Unloading*,**	1.60E-05	1.60E-05	lb/U.S. ton	Uncontrolled	50	MI DEQ 2005	Truck unloading, SCC 3-05-020-31
Primary Crushing	2.70E-04	5.00E-05	kg/metric tonne	Controlled	50	Env. Canada	Pri/Sec/Ter crushing, SCC 3-05-020-01/02/03
Secondary Crushing	2.70E-04	5.00E-05	kg/metric tonne	Controlled	50	Env. Canada	Pri/Sec/Ter crushing, SCC 3-05-020-01/02/03
Conveyor Transfer to Stockpile	2.30E-05	6.50E-06	kg/metric tonne	Controlled	50	Env. Canada	Conveyor transfer point, SCC 3-05-020-06
Truck Loading (Front end Loader)*,**	1.00E-04	1.00E-04	lb/U.S. ton	Uncontrolled	50	MI DEQ 2005	Truck Loading - Front end Loader, SCC 3-05-020-33

* Assuming uncontrolled emisison factor, then emissions controlled at 50% efficiency.
** Assuming conservatively that PM2.5 emission factor = PM10 emission factor.
PM Released (metric tonnes/yr) = PM Emission Factor (kg /metric tonne) x Annual throughput (metric tonne/yr) x (1 metric tonne/1 000 kg)
PM Released (U.S. tons/yr) = PM Emission Factor (lb /U.S. ton) x Annual throughput (U.S. ton/yr) x (1 U.S. ton/2 000 lb)

Sources for Production Sequence Emissions

Environment Canada. Undated, post-2007. Pit Quarries Air Guidance Document. Available at: http://www.ec.gc.ca/inrp-npri/default.asp?lang=en&n=A9C1EE34-1#s8_8. Accessed: January 15, 2014
Michigan Department of Environmental Quality (MI DEQ). 2005. Emission Calculations Fact Sheet. Available at: http://www.michigan.gov/documents/deq/deq-aqd-air-eval-era-EmissionCalculation-mineralproductprocesses_324070_7.pdf.

Conversion from cubic yards to tons

27	cubic yards to cubic feet
155	lb per cubic feet - Quarry rock
110	lb per cubic feet - Topsoil
2000	tons per lb

Stockpile Wind Erosion:

EF (kg/ton) = k x 0.0016 *((U/2.2)^1.3)/(M/2)^1.4)

EF: Emission factor
U: Mean wind speed (m/s)
M: material moisture content (%)
k: particle size multiplier

k (PM10) =	0.35
k (PM2.5) =	0.053
Constants:	0.0016
	2.2
	1.3
	2
	1.4

Source: Environment Canada. Undated, post-2007. Pit Quarries Air Guidance Document. Available at: http://www.ec.gc.ca/inrp-npri/default.asp?lang=en&n=A9C1EE34-1#s8_8. Accessed: January 15, 2014

U (Avg. daily wind speed from 2010-2014) =	4.83	m/s	NOAA. Climate Center Data. Available at: http://www1.ncdc.noaa.gov/pub/orders/cdo/268444.csv.
M =	2.4	%	CCSM FEIS. *Assumed moisture content of all materials was the same.

PM10 EF:	7.52E-04	kg/metric tonne
PM2.5 EF:	1.14E-04	kg/metric tonne

Storage area quantities for wind erosion calculations

Description	Value	Unit
Overburden stockpile maximum	500,000	cubic yards
Finished product stockpile maximum	250,000	cubic yards
Reclamation stockpile maximum	100,000	cubic yards
2014 topsoil stockpile (subtract this from finished product pile)	0	cubic yards
2015 topsoil stockpile (subtract this from finished product pile)	51,400	cubic yards
2016 topsoil stockpile (subtract this from finished product pile)	20,500	cubic yards
2017 topsoil stockpile (subtract this from finished product pile)	6,200	cubic yards
2018 topsoil stockpile (subtract this from finished product pile)	3,700	cubic yards

Source: PCW 2014c. Text and Table 5-5.

Table D-10. Road Rock Quarry Equipment Inputs

Equipment	No. Units by Construction Phases (2014)				No. Units by Oper. Phases (2015-2018, per year)				No. Units by Decomm/Reclam. Phases (2018)		Total Equipment Unit-Months, All Phases, by Year					Total Equipment Unit-Hours Operating, All Phases, by Year				
	Mobili-zation	*Site Prep*	*Quarry Rd. Constr.*	*Ops Area Constr.*	*All Ops 2015*	*All Ops 2016*	*All Ops 2017.*	*All Ops 2018 w/o Decom.*	*Site Decom*	*Road Decom*	*2014*	*2015*	*2016*	*2017*	*2018*	*2014*	*2015*	*2016*	*2017*	*2018*
Phase Duration (mo) per Tbl 6-1	1	1	2	1	8	8	8	5	2	2										
Dozer		4	4	4	3	3	3	3	4	2	16	24	24	24	27	4,589	6,883	6,883	6,883	7,743
Scraper		4			3	3	3	3	4	2	4	24	24	24	27	1,147	6,883	6,883	6,883	7,743
Excavator			2		3	3	3	3	3	2	4	24	24	24	25	1,147	6,883	6,883	6,883	7,170
Grader		2	1	2	1	1	1	1	2	1	6	8	8	8	11	1,721	2,294	2,294	2,294	3,155
Crusher (electric, incl. in generator)											0	0	0	0	0	0	0	0	0	0
Screener (electric, incl. in generator)											0	0	0	0	0	0	0	0	0	0
Generator (diesel)		2	0	3	3	3	3	3	2	0	5	24	24	24	19	1,434	6,883	6,883	6,883	5,449
Loader				2	3	3	3	3	2	2	2	24	24	24	23	574	6,883	6,883	6,596	6596
Roller - vibratory		2		2							4	0	0	0	0	1,147	0	0	0	0
Compactor											0	0	0	0	0	0	0	0	0	0
Forklift			2						2	2	4	0	0	0	8	1,147	0	0	0	2,294
Reclaimer			1								2	0	0	0	0	574	0	0	0	0
Rough terrain crane									1		0	0	0	0	2	0	0	0	0	574
Water truck (calc. as if nonroad)		1	1	1	2	2	2	2	1	1	4	16	16	16	14	1,147	4,589	4,589	4,589	4,015
Vehicles	***Trucks: Total No. of Round Trips for Phase except as noted***										***No. of Vehicle Round Trips/year***					***Total Vehicle VMT/year***				
Tractor-Trailer Belly-Dump (all phases in year)				434,200	44,443	41,896	12,717	7,529	Incl. in oper. Phases		434,200	44,433	41,896	12,717	7,529	26,052,000	2,666,000	2,513,750	763,000	11,294
Tractor-Trailer/Flatbed	12								12		12	0	0	0	12	2,400	0	0	0	2,400
Dump Truck											0	0	0	0	0	0	0	0	0	0
Smaller trucks (mat'ls & supplies)											0	0	0	0	0	0	0	0	0	0
Cement Distrib. Truck											0	0	0	0	0	0	0	0	0	0
Worker Commuting																				
Avg. no. of workers (all ops)				8	16.4	15.8	17.1	14.6		23.0										
No. of worker personal veh. (all ops)				5.3	10.9	10.5	11.4	9.8		15.3										
No. of months in period (all phases)				5	12	12	12	8		3										
No. of work days in period				130.4	312.9	312.9	312.9	208.6		78.2										
No. of commuting trips in period				695	3,424	3,285	3,563	2,034		1,199	695	3,424	3,285	3,563	3,233	77,867	383,493	367,920	399,067	362,080

Source: PCW 2014c

Build-up of Construction Equipment Ops based on SPOD Tables 6-1, 6-2, 6-3 and pp.6-6 - 7-3.

Notes:
Presence of equipment/vehicles: as described in text.
Number of equipment/vehicles: estimated from SPOD Table 6-3.
Phase durations: estimated from SPOD Table 6-1.
Equipment-hours: estimated from work days/hours and no. of months of use
No. of workers: SPOD Table 6-2

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Table D-11. Road Rock Quarry Workforce by Phase

Month	2014		2015		2016		2017		2018	
	Activity	*Workers*	*Activity*	*Workers*	*Activity*	*Workers*	*Activity*	*Workers*	*Activity*	*Workers*
January	--	0	Off-season	4	Off-season	4	Off-season	4	Off-season	4
February	--	0	Off-season	4	Off-season	4	Off-season	4	Off-season	4
March	--	0	Off-season	4	Off-season	4	Off-season	4	Off-season	4
April	--	0	Mobilize, operate	5	Mobilize, operate	5	Mobilize, operate	5	Mobilize, operate	5
May	--	0	Operate	9	Operate	6	Operate	9	Operate	7
June	--	0	Operate	33	Operate	31	Operate	33	Operate	31
July	--	0	Operate	33	Operate	31	Operate	33	Operate	31
August	Off-season	5	Operate	31	Operate	31	Operate	33	Operate	31
September	Mobilize, site prep., construct	22	Operate	31	Operate	31	Operate	33	Decommission	31
October	Construct	5	Operate	31	Operate	31	Operate	33	Decommission	31
November	Demobilize	4	Demobilize	7	Demobilize	6	Demobilize	9	Reclaim	7
December	Off-season	4	Off-season	5	Off-season	5	Off-season	5	--	0
No. of months staffed	**5**		**12**		**12**		**12**		**11**	
Avg. workforce while staffed		**8.0**		**16.4**		**15.8**		**17.1**		**16.9**

Table D-12. Worker Commute Distance

Worker Residence Location	% of Workers	Approx. Distance (mi)		
		Residence to I-80 Exit 221	Exit 221 to Quarry site	Total 1-way Distance
Rawlins area	50%	9	12	21
East of Rawlins (Laramie area)	40%	90	12	102
South of Rawlins (Saratoga area)	10%	35	12	47
Weighted average commute distance (mi)			**1-way**	**56**
			Round trip	**112**

Source: PCW 21014c (Appendix D Transportation Management Plan, Attachment B Traffic Study, pp.B-12 - B-13, for "Construction" Labor Force)

*Driving distance measured using Microsoft Streets & Trips (rounded)

Table D-13. Mobilization Onsite Heavy Equipment Exhaust Emissions

Heavy Equipment	Engine Horsepower	Number Required	Usage	Criteria Pollutants Emissions (Tons/year)						Hazardous Pollutants Emissions (grams/hour) - all units						GHG Emissions (tons/year)			
	(hp)		*(hrs/ year)*	*CO*	*NO_x*	*SO_2*	*VOC*	*PM_{10}*	*$PM_{2.5}$*	*Benzene*	*Toluene*	*Xylenes*	*Acetaldehyde*	*Formaldehyde*	*Propylene*	CO_2	CH_4	N_2O	CO_2e
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

N/A Not Applicable

Table D-14. Mobilization Construction and Workforce Emissions

Equipment Type	Number of Vehicles	Engine Horsepower	Average Vehicle Speed	VMT/ round trip	Criteria Pollutants - Emissions (tons/year)						Hazardous Pollutants - Emissions (tons/year)						GHG Emissions (tons/year)			
		(hp)	*(miles per hour)*		*CO*	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*SO_2*	*VOCs*	*Benzene*	*Toluene*	*Xylenes*	*Acetaldehyde*	*Formaldehyde*	*Propylene*	CO_2	CH_4	N_2O	CO_2e
Tractor-Trailer Belly-Dump	12	400	25	60	0.04	0.18	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	6.62	0.0003	0.0001	6.65
Tractor-Trailer/Flatbed	0	400	25	200	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	No Data	330	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Smaller trucks (mat'ls & supplies)	No Data	325	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cement Distrib. Truck	No Data	400	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Worker commuting	3	325	25	112	18.26	84.73	6.01	6.01	5.60	6.75	0.02	0.008	0.005	0.015	0.02	0.05	3,143.09	0.13	0.03	3,153.79
Totals																				
					18.30	**84.91**	**6.03**	**6.03**	**5.61**	**6.77**	**0.02**	**0.01**	**0.01**	**0.01**	**0.02**	**0.05**	**3,149.71**	**0.13**	**0.03**	**3,160.44**

N/A Not applicable due to no data

Table D-15. Site Preparation Onsite Heavy Equipment Exhaust Emissions

Heavy Equipment	Engine Horsepower	Number Required	Usage	Criteria Pollutants Emissions (tons/year)						Hazardous Pollutants Emissions (tons/year)						GHG Emissions (tons/year)			
	(hp)		*(hrs/year)*	*CO*	*NO_x*	CO_2	CO_2	CO_2	CO_2	*Benzene*	*Toluene*	*Xylenes*	*Acetaldehyde*	*Formaldehyde*	*Propylene*	*CO_2*	*CH_4*	*N_2O*	*CO_2e*
Dozer	580	4	1,147	2.22	10.31	6.62	6.62	6.62	6.62	0.0022	0.0010	0.0007	0.0018	0.0027	0.0060	382.57	0.02	0.00	383.88
Scraper	500	4	1,147	1.92	8.89	0.00	0.00	0.00	0.00	0.0019	0.0008	0.0006	0.0015	0.0024	0.0052	329.80	0.01	0.00	330.93
Grader	259	2	574	0.50	2.30	N/A	N/A	N/A	N/A	0.0005	0.0002	0.0001	0.0004	0.0006	0.0013	85.42	0.00	0.00	85.71
Generator (diesel)	325	2	574	0.62	2.89	N/A	N/A	N/A	N/A	0.0006	0.0003	0.0002	0.0005	0.0008	0.0017	107.19	0.00	0.00	107.55
Roller - vibratory	250	0	0	0.00	0.00	N/A	N/A	N/A	N/A	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.00	0.00
Water truck	285	0	0	0.00	0.00	3,143.09	3,143.09	3,143.09	3,143.09	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.00	0.00
Totals																			
				5.26	**24.40**	**1.61**	**1.94**	**1.73**	**3,149.71**	**3,149.71**	**3,149.71**	**3,149.71**	**0.00**	**0.01**	**0.01**	**904.98**	**0.04**	**0.01**	**908.06**

Table D-16. Site Preparation Construction and Workforce Emissions

Equipment Type	Number of Vehicles	Engine Horsepower	Average Vehicle Speed	VMT/ round trip	Criteria Pollutants - Emissions (tons/year)						Hazardous Pollutants - Emissions (tons/year)						GHG Emissions (tons/year)			
		(hp)	*(miles per hour)*		*CO*	*NO_x*	*CO2*	*CO2*	*CO2*	*CO2*	*Benzene*	*Toluene*	*Xylenes*	*Acetaldehyde*	*Formaldehyde*	*Propylene*	*CO_2*	*CH_4*	*N_2O*	*CO_2e*
Tractor-Trailer Belly-Dump[1]	0	400	25	60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor-Trailer/Flatbed	0	400	25	200	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	No Data	330	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Smaller trucks (mat'ls & supplies)	No Data	325	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cement Distrib. Truck	No Data	400	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Worker commuting	3	325	25	112	18.26	84.73	6.01	6.01	5.60	6.75	0.02	0.008	0.005	0.015	0.02	0.05	3,143.09	0.13	0.03	3,153.79
Totals																				
					18.26	**84.73**	**6.01**	**6.01**	**5.60**	**6.75**	**0.02**	**0.01**	**0.01**	**0.01**	**0.02**	**0.05**	**3,143.09**	**0.13**	**0.03**	**3,153.79**

N/A Not Applicable due to no data.

[1]Tractor Trailer Belly Dump Trucks are on a round trip/year basis

Table D-17. Quarry Road Onsite Heavy Equipment Exhaust Emissions

Heavy Equipment	Engine Horsepower	Number Required	Usage	Criteria Pollutants Emissions (tons/year)						Hazardous Pollutants Emissions (tons/year)						GHG Emissions (tons/year)			
	(hp)		*(hrs/year)*	*CO*	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*SO_2*	*VOCs*	*Benzene*	*Toluene*	*Xylenes*	*Acetaldehyde*	*Formaldehyde*	*Propylene*	*CO_2*	*CH_4*	*N_2O*	*CO_2e*
Dozer	580	4	2,294	4.44	20.63	1.36	1.64	1.46	1.46	0.0043	0.0019	0.0013	0.0036	0.0055	0.0120	765.14	0.03	0.01	767.75
Excavator	330	2	1,147	1.26	5.87	0.39	0.47	0.42	0.42	0.0012	0.0005	0.0004	0.0010	0.0016	0.0034	217.67	0.01	0.00	218.41
Grader	259	1	574	0.50	2.30	0.15	0.18	0.16	0.16	0.0005	0.0002	0.0001	0.0004	0.0006	0.0013	85.42	0.00	0.00	85.71
Forklift	9.5	1	574	0.02	0.08	0.01	0.01	0.01	0.01	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.13	0.00	0.00	3.14
Reclaimer	500	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.00	0.00
Water truck	285	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.00	0.00
Totals																			
				6.22	**28.88**	**1.91**	**2.30**	**2.05**	**2.05**	**0.01**	**0.00**	**0.00**	**0.01**	**0.01**	**0.02**	**1,071.37**	**0.04**	**0.01**	**1,075.02**

Table D-18. Quarry Road Construction and Workforce Emissions

Equipment Type	Number of Vehicles	Engine Horsepower	Average Vehicle Speed	VMT/ round trip	Criteria Pollutants - Emissions (tons/year)						Hazardous Pollutants - Emissions (tons/year)						GHG Emissions (tons/year)			
		(hp)	*(miles per hour)*		*CO*	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*SO_2*	*VOCs*	*Benzene*	*Toluene*	*Xylenes*	*Acetaldehyde*	*Formaldehyde*	*Propylene*	*CO_2*	*CH_4*	*N_2O*	*CO_2e*
Tractor-Trailer Belly-Dump[1]	0	400	25	60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor-Trailer/Flatbed	0	400	25	200	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	No Data	330	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Smaller trucks (mat'ls & supplies)	No Data	325	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cement Distribution Truck	No Data	400	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Worker commuting	3	325	25	112	18.26	84.73	6.01	6.01	5.60	6.75	0.02	0.008	0.005	0.015	0.02	0.05	3,143.09	0.13	0.03	3,153.79
Totals																				
					18.26	**84.73**	**6.01**	**6.01**	**5.60**	**6.75**	**0.02**	**0.01**	**0.01**	**0.01**	**0.02**	**0.05**	**3,143.09**	**0.13**	**0.03**	**3,153.79**

N/A Not Applicable due to no data.

[1]Tractor Trailer Belly Dump Trucks are on a round trip/year basis

Table D-19. Operations Area Onsite Heavy Equipment Exhaust Emissions

Heavy Equipment	Engine Horsepower	Number Required	Usage	Criteria Pollutants Emissions (tons/year)						Hazardous Pollutants Emissions (tons/year)						GHG Emissions (tons/year)			
	(hp)		*(hrs/year)*	*CO*	*NO_x*	*CO_2*	*CO_2*	*CO_2*	*CO_2*	*(hrs/year)*	*CO*	*NO_x*	*SO_2*	*VOC*	*PM_{10}*	*CO_2*	*CH_4*	*N_2O*	*CO_2e*
Dozer	580	4	1,147	2.22	10.31	0.68	0.82	0.73	0.73	0.0022	0.0010	0.0007	0.0018	0.0027	0.0060	382.57	0.02	0.00	383.88
Grader	259	2	574	0.50	2.30	0.15	0.18	0.16	0.16	0.0005	0.0002	0.0001	0.0004	0.0006	0.0013	85.42	0.00	0.00	85.71
Generator (diesel)	325	3	860	0.93	4.33	0.29	0.35	0.31	0.31	0.0009	0.0004	0.0003	0.0008	0.0012	0.0025	160.78	0.01	0.00	161.33
Loader	262	2	574	0.50	2.33	0.15	0.19	0.17	0.17	0.0005	0.0002	0.0002	0.0004	0.0006	0.0014	86.41	0.00	0.00	86.70
Roller - vibratory	250	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.00	0.00
Water truck	285	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.00	0.00
Totals																			
				4.15	**19.28**	**1.27**	**1.54**	**1.37**	**1.37**	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**	**0.01**	**715.18**	**0.03**	**0.01**	**717.61**

Table D-20. Operations Area Construction and Workforce Emissions

Equipment Type	Number of Vehicles	Engine Horsepower	Average Vehicle Speed	VMT/ round trip	Criteria Pollutants - Emissions (tons/year)						Hazardous Pollutants - Emissions (tons/year)						GHG Emissions (tons/year)			
		(hp)	*(miles per hour)*		*CO*	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*SO_2*	*VOCs*	*Benzene*	*Toluene*	*Xylenes*	*Acetaldehyde*	*Formaldehyde*	*Propylene*	*CO_2*	*CH_4*	*N_2O*	*CO_2e*
Tractor-Trailer Belly-Dump[1]	0	400	25	60	60.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor-Trailer/Flatbed	0	400	25	200	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	No Data	330	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Smaller trucks (mat'ls & supplies)	No Data	325	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cement Distrib. Truck	No Data	400	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Worker commuting	3	325	25	112	18.26	84.73	6.01	6.01	5.60	6.75	0.02	0.008	0.005	0.015	0.02	0.05	3,143.09	0.13	0.03	3,153.79
Totals																				
					18.26	**84.73**	**6.01**	**6.01**	**5.60**	**6.75**	**0.02**	**0.01**	**0.01**	**0.01**	**0.02**	**0.05**	**3,143.09**	**0.13**	**0.03**	**3,153.79**

N/A Not Applicable due to no data.

[1]Tractor Trailer Belly Dump Trucks are on a round trip/year basis

Table D-21. Operations Equipment Emissions

Equipment	Horsepower (hp)	Number of Units	Annual operating hours (hrs/year)	Criteria Pollutants - Emissions (tons/year)						Hazardous Pollutants - Emissions (tons/year)						GHG Emissions (tons/year)			
				CO	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*SO_2*	*VOCs*	*Benzene*	*Toluene*	*Xylenes*	*Acetaldehyde*	*Formaldehyde*	*Propylene*	*CO_2*	*CH_4*	*N_2O*	*Total CO_2e*
2015																			
Dozer	580	3	6,883	13.33	61.88	4.39	4.39	4.09	4.93	0.01	0.01	0.004	0.01	0.02	0.04	2,295.43	0.09	0.02	2,303.25
Scraper	500	3	6,883	11.49	53.34	3.79	3.79	3.53	4.25	0.01	0.005	0.003	0.01	0.01	0.03	1,978.82	0.08	0.02	1,985.56
Excavator	330	3	6,883	7.59	35.21	2.50	2.50	2.33	2.81	0.01	0.003	0.002	0.01	0.01	0.02	1,306.02	0.05	0.01	1,310.47
Grader	259	1	2,294	1.98	9.21	0.65	0.65	0.61	0.73	0.002	0.001	0.001	0.002	0.002	0.01	341.68	0.01	0.00	342.84
Generator (diesel)	325	3	6,883	7.47	34.67	2.46	2.46	2.29	2.76	0.01	0.003	0.002	0.01	0.01	0.02	1,286.23	0.05	0.01	1,290.61
Loader	262	3	6,883	6.02	27.95	1.98	1.98	1.85	2.23	0.01	0.003	0.002	0.005	0.01	0.02	1,036.92	0.04	0.01	1,040.46
Water truck	285	2	4,589	4.37	20.27	1.44	1.44	1.34	1.62	0.004	0.002	0.001	0.004	0.01	0.01	751.95	0.03	0.01	754.51
2016																			
Dozer	580	3	6,883	13.33	61.88	4.39	4.39	4.09	4.93	0.01	0.01	0.004	0.01	0.02	0.04	2,295.43	0.09	0.02	2,303.25
Scraper	500	3	6,883	11.49	53.34	3.79	3.79	3.53	4.25	0.01	0.005	0.003	0.01	0.01	0.03	1,978.82	0.08	0.02	1,985.56
Excavator	330	3	6,883	7.59	35.21	2.50	2.50	2.33	2.81	0.01	0.003	0.002	0.01	0.01	0.02	1,306.02	0.05	0.01	1,310.47
Grader	259	1	2,294	1.98	9.21	0.65	0.65	0.61	0.73	0.00	0.001	0.001	0.002	0.002	0.01	341.68	0.01	0.00	342.84
Generator (diesel)	325	3	6,883	7.47	34.67	2.46	2.46	2.29	2.76	0.01	0.003	0.002	0.01	0.01	0.02	1,286.23	0.05	0.01	1,290.61
Loader	262	3	6,883	6.02	27.95	1.98	1.98	1.85	2.23	0.01	0.003	0.002	0.005	0.01	0.02	1,036.92	0.04	0.01	1,040.46
Water truck	285	2	4,589	4.37	20.27	1.44	1.44	1.34	1.62	0.004	0.002	0.001	0.004	0.01	0.01	751.95	0.03	0.01	754.51
2017																			
Dozer	580	3	6,883	13.33	61.88	4.39	4.39	4.09	4.93	0.01	0.01	0.004	0.01	0.02	0.04	2,295.43	0.09	0.02	2,303.25
Scraper	500	3	6,883	11.49	53.34	3.79	3.79	3.53	4.25	0.01	0.005	0.003	0.01	0.01	0.03	1,978.82	0.08	0.02	1,985.56
Excavator	330	3	6,883	7.59	35.21	2.50	2.50	2.33	2.81	0.01	0.003	0.002	0.01	0.01	0.02	1,306.02	0.05	0.01	1,310.47
Grader	259	1	2,294	1.98	9.21	0.65	0.65	0.61	0.73	0.00	0.001	0.001	0.002	0.002	0.01	341.68	0.01	0.00	342.84
Generator (diesel)	325	3	6,883	7.47	34.67	2.46	2.46	2.29	2.76	0.01	0.003	0.002	0.01	0.01	0.02	1,286.23	0.05	0.01	1,290.61
Loader	262	3	6,883	6.02	27.95	1.98	1.98	1.85	2.23	0.01	0.003	0.002	0.005	0.01	0.02	1,036.90	0.04	0.01	1,040.43
Water truck	285	2	4,589	4.37	20.27	1.44	1.44	1.34	1.62	0.004	0.002	0.001	0.004	0.01	0.01	751.95	0.03	0.01	754.51
2018																			
Dozer	580	3	4,302	8.33	38.67	2.74	2.74	2.56	3.08	0.01	0.004	0.002	0.01	0.01	0.02	1,434.65	0.06	0.01	1,439.53
Scraper	500	3	4,302	7.18	33.34	2.37	2.37	2.20	2.66	0.01	0.003	0.002	0.01	0.01	0.02	1,236.76	0.05	0.01	1,240.98
Excavator	330	3	4,302	4.74	22.00	1.56	1.56	1.46	1.75	0.005	0.002	0.001	0.004	0.006	0.013	816.26	0.03	0.01	819.04
Grader	259	1	1,434	1.24	5.76	0.41	0.41	0.38	0.46	0.001	0.001	0.000	0.001	0.002	0.003	213.55	0.01	0.00	214.28
Generator (diesel)	325	3	4,302	4.67	21.67	1.54	1.54	1.43	1.73	0.005	0.002	0.001	0.004	0.006	0.013	803.90	0.03	0.01	806.63
Loader	262	3	4,302	3.76	17.47	1.24	1.24	1.16	1.39	0.004	0.002	0.001	0.003	0.005	0.010	648.06	0.03	0.01	650.27
Water truck	285	2	2,868	2.73	12.67	0.90	0.90	0.84	1.01	0.003	0.001	0.001	0.002	0.003	0.007	469.97	0.02	0.00	471.57
Emission Total																			
2015				**52.26**	**242.53**	**17.21**	**17.21**	**16.04**	**19.32**	**0.05**	**0.02**	**0.02**	**0.04**	**0.06**	**0.14**	**8,997.06**	**0.36**	**0.07**	**9,027.71**
2016				**52.26**	**242.53**	**17.21**	**17.21**	**16.04**	**19.32**	**0.05**	**0.02**	**0.02**	**0.04**	**0.06**	**0.14**	**8,997.06**	**0.36**	**0.07**	**9,027.71**
2017				**52.26**	**242.53**	**17.21**	**17.21**	**16.04**	**19.32**	**0.05**	**0.02**	**0.02**	**0.04**	**0.06**	**0.14**	**8,997.04**	**0.36**	**0.07**	**9,027.68**
2018				**32.66**	**151.58**	**10.76**	**10.76**	**10.02**	**12.08**	**0.03**	**0.01**	**0.01**	**0.03**	**0.04**	**0.09**	**6,701.61**	**0.27**	**0.05**	**6,724.43**

N/A Not Applicable

Table D-22. Site Decommissioning Equipment Emissions

Equipment	Horsepower (hp)	Number of Units	Annual operating hours (hrs/year)	Criteria Pollutants - Emissions (tons/year)						Hazardous Pollutants - Emissions (tons/year)						GHG Emissions (tons/year)			
				CO	*NO_x*	*CO_2*	*CO_2*	*CO_2*	*CO_2*	*Benzene*	*Toluene*	*Xylenes*	*Acetaldehyde*	*Formaldehyde*	*Propylene*	*CO_2*	*CH_4*	*N_2O*	*Total CO_2e*
2018																			
Dozer	580	4	2,294	4.44	20.63	1.46	1.46	1.36	1.64	4.34E-03	1.90E-03	1.33E-03	3.57E-03	5.50E-03	1.20E-02	765.14	0.031	0.006	767.75
Scraper	500	4	2,294	3.83	17.78	1.26	1.26	1.18	1.42	3.75E-03	1.64E-03	1.15E-03	3.08E-03	4.74E-03	1.04E-02	659.61	0.027	0.005	661.85
Excavator	330	3	1,721	1.90	8.80	0.62	0.62	0.58	0.70	1.85E-03	8.12E-04	5.68E-04	1.52E-03	2.35E-03	5.14E-03	326.51	0.013	0.003	327.62
Grader	259	2	1,147	0.99	4.61	0.33	0.33	0.30	0.37	9.70E-04	4.25E-04	2.97E-04	7.98E-04	1.23E-03	2.69E-03	170.84	0.007	0.001	171.42
Generator (diesel)	325	2	1147	1.25	5.78	0.41	0.41	0.38	0.46	1.22E-03	5.33E-04	3.73E-04	1.00E-03	1.54E-03	3.37E-03	214.37	0.009	0.002	215.10
Loader	262	2	1147	1.00	4.66	0.33	0.33	0.31	0.37	9.81E-04	4.30E-04	3.01E-04	8.07E-04	1.24E-03	2.72E-03	172.82	0.007	0.001	173.41
Forklift	9.5	2	1147	0.04	0.17	0.01	0.01	0.01	0.01	3.56E-05	1.56E-05	1.09E-05	2.93E-05	4.50E-05	9.86E-05	6.27	0.000	0.000	6.29
Rough terrain crane	500	1	574	0.96	4.45	0.32	0.32	0.29	0.35	9.36E-04	4.10E-04	2.87E-04	7.70E-04	1.18E-03	2.60E-03	164.90	0.007	0.001	165.46
Water truck	285	1	574	0.55	2.53	0.18	0.18	0.17	0.20	5.34E-04	2.34E-04	1.63E-04	4.39E-04	6.75E-04	1.48E-03	93.99	0.004	0.001	94.31
Emission Total																			
				14.95	**69.40**	**4.93**	**4.93**	**4.59**	**5.53**	**0.01**	**0.01**	**0.00**	**0.01**	**0.02**	**0.04**	**2,574.45**	**0.10**	**0.02**	**2,583.21**

N/A Not Applicable

Table D-23. Road Decommissioning Equipment Emissions

Equipment	Horsepower (hp)	Number of Units	Annual operating hours (hrs/year)	Criteria Pollutants - Emissions (tons/year)						Hazardous Pollutants - Emissions (tons/year)						GHG Emissions (tons/year)			
				CO	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*SO_2*	*VOCs*	*Benzene*	*Toluene*	*Xylenes*	*Acetaldehyde*	*Formaldehyde*	*Propylene*	*CO_2*	*CH_4*	*N_2O*	*Total CO_2e*
2018																			
Dozer	580	2	1147	2.22	10.31	0.73	0.73	0.68	0.82	2.17E-03	9.51E-04	6.65E-04	1.79E-03	2.75E-03	6.02E-03	382.57	0.015	0.003	383.88
Scraper	500	2	1147	1.92	8.89	0.63	0.63	0.59	0.71	1.87E-03	8.20E-04	5.74E-04	1.54E-03	2.37E-03	5.19E-03	329.80	0.013	0.003	330.93
Excavator	330	2	1147	1.26	5.87	0.42	0.42	0.39	0.47	1.24E-03	5.41E-04	3.79E-04	1.02E-03	1.56E-03	3.43E-03	217.67	0.009	0.002	218.41
Grader	259	1	574	0.50	2.30	0.16	0.16	0.15	0.18	4.85E-04	2.12E-04	1.49E-04	3.99E-04	6.14E-04	1.34E-03	85.42	0.003	0.001	85.71
Loader	262	2	1147	1.00	4.66	0.33	0.33	0.31	0.37	9.81E-04	4.30E-04	3.01E-04	8.07E-04	1.24E-03	2.72E-03	172.82	0.007	0.001	173.41
Forklift	9.5	2	1147	0.04	0.17	0.01	0.01	0.01	0.01	3.56E-05	1.56E-05	1.09E-05	2.93E-05	4.50E-05	9.86E-05	6.27	0.000	0.000	6.29
Water truck	285	1	574	0.55	2.53	0.18	0.18	0.17	0.20	5.34E-04	2.34E-04	1.63E-04	4.39E-04	6.75E-04	1.48E-03	93.99	0.004	0.001	94.31
Emission Total																			
				7.48	**34.73**	**2.47**	**2.47**	**2.30**	**2.77**	**0.01**	**0.00**	**0.00**	**0.01**	**0.01**	**0.02**	**1,288.54**	**0.05**	**0.01**	**1,292.93**

N/A Not Applicable

Table D-24. 2014 Operation Vehicle Dust Emission

Equipment Type	Road Type	Dust Control Method[1]	Average Vehicle Weight	Average Vehicle Speed	Silt Content	Moisture Content[2]	Vehicle Count	Round Trips (RTs)	RT Distance	Vehicle Miles Traveled (VMT)[3]	Emission Control Efficiency[4]	PM_{10} Emission Factor[5]	$PM_{2.5}$ Emission Factor[5]	PM_{10} Emissions[6] (controlled)	$PM_{2.5}$ Emissions[6] (controlled)
			(lb)	*(mph)*	*(%)*	*(%)*		*(RT/site)*	*(miles)*	*(VMT/site)*	*(%)*	*(lb/VMT)*	*(lb/VMT)*	*(lb/yr)*	*(lb/yr)*
Worker Commuter Vehicles	Local	Water	5,000	25	5.1	2.4	5.33	0	112	597.33	50	0.25	0.02	75.52	7.46
Smaller trucks (mat'ls & supplies)	Local	Water	7,000	25	5.1	2.4	No Data	0	0	0	50	0.25	0.02	0.00	0.00
Dump Truck	Local	Water	10,000	25	5.1	2.4	No Data	0	0	0	50	0.25	0.02	0.00	0.00
Tractor-Trailer Belly-Dump[7]	Local	Water	70,000	25	5.1	2.4	1	0	0	0	50	0.25	0.02	0.00	0.00
Tractor Trailer-Flatbed	Local	Water	35,000	25	5.1	2.4	0	0	0	0	50	0.25	0.02	0.00	0.00
Cement Distribution Truck	Local	Water	42,000	25	5.1	2.4	No Data	0	0	0	50	0.25	0.02	0.00	0.00
Heavy Truck (Water)	Local	Water	35,000	25	5.1	2.4	0	6	1	0	50	0.25	0.02	0.00	0.00
Totals (tons/year)															
														0.04	**0.00**

Source: CCSM Project FEIS (BLM 2012b), Appendix H Air Quality.

[1]Dust control methods include using water (resource road) or chemical (local road) as a dust suppressant along with vehicle restriction speed limit of 25 mph.
[2]AP-42 (EPA 2004), Table 11.9-3, "Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations."
[3]Calculated as Round Trips per Vehicle Type x Round Trip Distance.
[4]CCSM Project FEIS (BLM 2012b), Appendix H Air Quality.
[5]AP-42 (EPA 2004), Section 13.2.2 "Unpaved Roads", equations 1a and 1b.
[6]Calculated as lb/VMT x VMT/site x control efficiency.
[7]Tractor Trailer Belly Dump Trucks are on a round trip/year basis

Table D-25. 2015 Operation Vehicle Dust Emission

Equipment Type	Road Type	Dust Control Method[1]	Average Vehicle Weight	Average Vehicle Speed	Silt Content	Moisture Content[2]	Vehicle Count	Round Trips (RTs)	RT Distance	Vehicle Miles Traveled (VMT)[3]	Emission Control Efficiency[4]	PM_{10} Emission Factor[5]	$PM_{2.5}$ Emission Factor[5]	PM_{10} Emissions[6] (controlled)	$PM_{2.5}$ Emissions[6] (controlled)
			(lb)	*(mph)*	*(%)*	*(%)*		*(RT/site)*	*(miles)*	*(VMT/site)*	*(%)*	*(lb/VMT)*	*(lb/VMT)*	*(lb/VMT)*	*(lb/VMT)*
Worker Commuter Vehicles	Local	Water	5,000	25	5.1	2.4	10.94	0	112	1,225.78	50	0.25	0.02	154.96	15.30
Smaller trucks (mat'ls & supplies)	Local	Water	7,000	25	5.1	2.4	No Data	0	0	0	50	0.25	0.02	0.00	0.00
Dump Truck	Local	Water	10,000	25	5.1	2.4	No Data	0	0	0	50	0.25	0.02	0.00	0.00
Tractor-Trailer Belly-Dump[7]	Local	Water	70,000	25	5.1	2.4	1	44,433	60	2,666,000	50	0.25	0.02	337,036.68	33,286,44
Tractor Trailer-Flatbed	Local	Water	35,000	25	5.1	2.4	0	0	0	0	50	0.25	0.02	0.00	0.00
Cement Distribution Truck	Local	Water	42,000	25	5.1	2.4	No Data	0	0	0	50	0.25	0.02	0.00	0.00
Heavy Truck (Water)	Local	Water	35,000	25	5.1	2.4	2	2,715	1	5,430	50	0.25	0.02	686.46	67.80
Totals (tons/year)															
														168.94	**16.68**

Source: CCSM Project FEIS (BLM 2012b), Appendix H Air Quality.

[1]Dust control methods include using water (resource road) or chemical (local road) as a dust suppressant along with vehicle restriction speed limit of 25 mph.
[2]AP-42 (EPA 2004), Table 11.9-3, "Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations."
[3]Calculated as Round Trips per Vehicle Type x Round Trip Distance.
[4]CCSM Project FEIS (BLM 2012b), Appendix H Air Quality.
[5]AP-42 (EPA 2004), Section 13.2.2 "Unpaved Roads", equations 1a and 1b.
[6]Calculated as lb/VMT x VMT/site x control efficiency.
[7]Tractor Trailer Belly Dump Trucks are on a round trip/year basis

Table D-26. 2016 Operation Vehicle Dust Emission

Equipment Type	Road Type	Dust Control Method[1]	Average Vehicle Weight	Average Vehicle Speed	Silt Content	Moisture Content[2]	Vehicle Count	Round Trips (RTs)	RT Distance	Vehicle Miles Traveled (VMT)[3]	Emission Control Efficiency[4]	PM_{10} Emission Factor[5]	$PM_{2.5}$ Emission Factor[5]	PM_{10} Emissions[6] (controlled)	$PM_{2.5}$ Emissions[6] (controlled)
			(lb)	*(mph)*	*(%)*	*(%)*		*(RT/site)*	*(miles)*	*(VMT/site)*	*(%)*	*(lb/VMT)*	*(lb/VMT)*	*(lb/VMT)*	*(lb/VMT)*
Worker Commuter Vehicles	Local	Water	5,000	25	5.1	2.4	10.5	0	112	1,176	50	0.25	0.02	148.67	14.68
Smaller trucks (mat'ls & supplies)	Local	Water	7,000	25	5.1	2.4	No Data	0	0	0	50	0.25	0.02	0.00	0.00
Dump Truck	Local	Water	10,000	25	5.1	2.4	No Data	0	0	0	50	0.25	0.02	0.00	0.00
Tractor-Trailer Belly-Dump[7]	Local	Water	70,000	25	5.1	2.4	1	41,896	60	2,513,750	50	0.25	0.02	317,789.13	31,385.52
Tractor Trailer-Flatbed	Local	Water	35,000	25	5.1	2.4	0	0	0	0	50	0.25	0.02	0.00	0.00
Cement Distribution Truck	Local	Water	42,000	25	5.1	2.4	No Data	0	0	0	50	0.25	0.02	0.00	0.00
Heavy Truck (Water)	Local	Water	35,000	25	5.1	2.4	2	2,715	0	5430	50	0.25	0.02	686.46	67.80
Totals (tons/year)															
														159.31	**15.73**

Source: CCSM Project FEIS (BLM 2012b), Appendix H Air Quality.

[1]Dust control methods include using water (resource road) or chemical (local road) as a dust suppressant along with vehicle restriction speed limit of 25 mph.
[2]AP-42 (EPA 2004), Table 11.9-3, "Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations."
[3]Calculated as Round Trips per Vehicle Type x Round Trip Distance.
[4]CCSM Project FEIS (BLM 2012b), Appendix H Air Quality.
[5]AP-42 (EPA 2004), Section 13.2.2 "Unpaved Roads", equations 1a and 1b.
[6]Calculated as lb/VMT x VMT/site x control efficiency.
[7]Tractor Trailer Belly Dump Trucks are on a round trip/year basis

Table D-27. 2017 Operation Vehicle Dust Emission

Equipment Type	Road Type	Dust Control Method[1]	Average Vehicle Weight	Average Vehicle Speed	Silt Content	Moisture Content[2]	Vehicle Count	Round Trips (RTs)	RT Distance	Vehicle Miles Traveled (VMT)[3]	Emission Control Efficiency[4]	PM_{10} Emission Factor[5]	$PM_{2.5}$ Emission Factor[5]	PM_{10} Emissions[6] (controlled)	$PM_{2.5}$ Emissions[6] (controlled)
			(lb)	*(mph)*	*(%)*	*(%)*		*(RT/site)*	*(miles)*	*(VMT/site)*	*(%)*	*(lb/yr)*	*(lb/yr)*	*(lb/yr)*	*(lb/yr)*
Worker Commuter Vehicles	Local	Water	5,000	25	5.1	2.4	11.39	0	112	0	50	0.25	0.02	0.00	0.00
Smaller trucks (mat'ls & supplies)	Local	Water	7,000	25	5.1	2.4	No Data	0	0	0	50	0.25	0.02	0.00	0.00
Dump Truck	Local	Water	10,000	25	5.1	2.4	No Data	0	0	0	50	0.25	0.02	0.00	0.00
Tractor-Trailer Belly-Dump[7]	Local	Water	70,000	25	5.1	2.4	1	12,717	60	763,000	50	0.25	0.02	96,458.74	9,526.46
Tractor Trailer-Flatbed	Local	Water	35,000	25	5.1	2.4	0	0	0	0	50	0.25	0.02	0.00	0.00
Cement Distribution Truck	Local	Water	42,000	25	5.1	2.4	No Data	0	0	0	50	0.25	0.02	0.00	0.00
Heavy Truck (Water)	Local	Water	35,000	25	5.1	2.4	2	2,715	0	5,430	50	0.25	0.02	686.46	67.80
Totals (tons/year)															
														48.57	**4.80**

Source: CCSM Project FEIS (BLM 2012b), Appendix H Air Quality.

[1]Dust control methods include using water (resource road) or chemical (local road) as a dust suppressant along with vehicle restriction speed limit of 25 mph.
[2]AP-42 (EPA 2004), Table 11.9-3, "Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations."
[3]Calculated as Round Trips per Vehicle Type x Round Trip Distance.
[4]CCSM Project FEIS (BLM 2012b), Appendix H Air Quality.
[5]AP-42 (EPA 2004), Section 13.2.2 "Unpaved Roads", equations 1a and 1b.
[6]Calculated as lb/VMT x VMT/site x control efficiency.
[7]Tractor Trailer Belly Dump Trucks are on a round trip/year basis

Table D-28 2018 Operation Vehicle Dust Emission

Equipment Type	Road Type	Dust Control Method[1]	Average Vehicle Weight	Average Vehicle Speed	Silt Content	Moisture Content[2]	Vehicle Count	Round Trips (RTs)	RT Distance	Vehicle Miles Traveled (VMT)[3]	Emission Control Efficiency[4]	PM_{10} Emission Factor[5]	$PM_{2.5}$ Emission Factor[5]	PM_{10} Emissions[6] (controlled)	$PM_{2.5}$ Emissions[6] (controlled)
			(lb)	*(mph)*	*(%)*	*(%)*		*(RT/site)*	*(miles)*	*(VMT/site)*	*(%)*	*(lb/yr)*	*(lb/yr)*	*(lb/yr)*	*(lb/yr)*
Worker Commuter Vehicles	Local	Water	5,000	25	5.1	2.4	9.75	0	0	0	50	0.25	0.02	0.00	0.00
Smaller trucks (mat'ls & supplies)	Local	Water	7,000	25	5.1	2.4	No Data	0	0	0	50	0.25	0.02	0.00	0.00
Dump Truck	Local	Water	10,000	25	5.1	2.4	No Data	0	0	0	50	0.25	0.02	0.00	0.00
Tractor-Trailer Belly-Dump[7]	Local	Water	70,000	25	5.1	2.4	1	0	60	0	50	0.25	0.02	0.00	0.00
Tractor Trailer-Flatbed	Local	Water	35,000	25	5.1	2.4	0	0	0	0	50	0.25	0.02	0.00	0.00
Cement Distribution Truck	Local	Water	42,000	25	5.1	2.4	No Data	0	0	0	50	0.25	0.02	0.00	0.00
Heavy Truck (Water)	Local	Water	35,000	25	5.1	2.4	2	1,358	0	2,715	50	0.25	0.02	343.23	33.90
Totals (tons/year)															
														0.69	**0.07**

Source: CCSM Project FEIS (BLM 2012b), Appendix H Air Quality.

[1]Dust control methods include using water (resource road) or chemical (local road) as a dust suppressant along with vehicle restriction speed limit of 25 mph.
[2]AP-42 (EPA 2004), Table 11.9-3, "Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations."
[3]Calculated as Round Trips per Vehicle Type x Round Trip Distance.
[4]CCSM Project FEIS (BLM 2012b), Appendix H Air Quality.
[5]AP-42 (EPA 2004), Section 13.2.2 "Unpaved Roads", equations 1a and 1b.
[6]Calculated as lb/VMT x VMT/site x control efficiency.
[7]Tractor Trailer Belly Dump Trucks are on a round trip/year basis

Table D-29. 2018 Site Decommissioning Vehicle Dust Emission

Vehicle Type	Road Type	Dust Control Method[1]	Average Vehicle Weight	Average Vehicle Speed	Silt Content	Moisture Content[2]	Vehicle Count	Round Trips (RTs)	RT Distance	Vehicle Miles Traveled (VMT)[3]	Emission Control Efficiency[4]	PM_{10} Emission Factor[5]	$PM_{2.5}$ Emission Factor[5]	PM_{10} Emissions[6] (controlled)	$PM_{2.5}$ Emissions[6] (controlled)
			(lb)	*(mph)*	*(%)*	*(%)*		*(RT/site)*	*(miles)*	*(VMT/site)*	*(%)*	*(lb/VMT)*	*(lb/VMT)*	*(lb/VMT)*	*(lb/VMT)*
Worker Commuter Vehicles	Local	Water	5,000	25	5.1	2.4	15,333	0	112	1,717.333	50	0.25	0.02	217.11	21.44
Smaller trucks (mat'ls & supplies)	Local	Water	7,000	25	5.1	2.4	No Data	0	0	0	50	0.25	0.02	0.00	0.00
Dump Truck	Local	Water	10,000	25	5.1	2.4	No Data	0	0	0	50	0.25	0.02	0.00	0.00
Tractor-Trailer Belly-Dump[7]	Local	Water	70,000	25	5.1	2.4	0	0	0	0	50	0.25	0.02	0.00	0.00
Tractor Trailer-Flatbed	Local	Water	35,000	25	5.1	2.4	0	0	0	0	50	0.25	0.02	0.00	0.00
Cement Distribution Truck	Local	Water	42,000	25	5.1	2.4	No Data	0	0	0	50	0.25	0.02	0.00	0.00
Heavy Truck (Water)	Local	Water	35,000	25	5.1	2.4	1	1,357.5	0	1,357.5	50	0.25	0.02	171.62	16.95
Totals (tons/year)															
														0.19	**0.02**

Source: CCSM Project FEIS (BLM 2012b), Appendix H Air Quality.

[1]Dust control methods include using water (resource road) or chemical (local road) as a dust suppressant along with vehicle restriction speed limit of 25 mph.
[2]AP-42 (EPA 2004), Table 11.9-3, "Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations."
[3]Calculated as Round Trips per Vehicle Type x Round Trip Distance.
[4]CCSM Project FEIS (BLM 2012b), Appendix H Air Quality.
[5]AP-42 (EPA 2004), Section 13.2.2 "Unpaved Roads", equations 1a and 1b.
[6]Calculated as lb/VMT x VMT/site x control efficiency.
[7]Tractor Trailer Belly Dump Trucks are on a round trip/year basis

Table D-30. 2018 Road Decommissioning Vehicle Dust Emission

Vehicle Type	Road Type	Dust Control Method[1]	Average Vehicle Weight	Average Vehicle Speed	Silt Content	Moisture Content[2]	Vehicle Count	Round Trips (RTs)	RT Distance	Vehicle Miles Traveled (VMT)[3]	Emission Control Efficiency[4]	PM_{10} Emission Factor[5]	$PM_{2.5}$ Emission Factor[5]	PM_{10} Emissions[6] (controlled)	$PM_{2.5}$ Emissions[6] (controlled)
			(lb)	*(mph)*	*(%)*	*(%)*		*(RT/site)*	*(miles)*	*(VMT/site)*	*(%)*	*(lb/VMT)*	*(lb/VMT)*	*(lb/yr)*	*(lb/yr)*
Worker Commuter Vehicles	Local	Water	5,000	25	5.1	2.4	15.333	0	112	1,717.333	50	0.25	0.02	217.11	21.44
Smaller trucks (mat'ls & supplies)	Local	Water	7,000	25	5.1	2.4	No Data	0	0	0	50	0.25	0.02	0.00	0.00
Dump Truck	Local	Water	10,000	25	5.1	2.4	No Data	0	0	0	50	0.25	0.02	0.00	0.00
Tractor-Trailer Belly-Dump[7]	Local	Water	70,000	25	5.1	2.4	0	0	0	0	50	0.25	0.02	0.00	0.00
Tractor Trailer-Flatbed	Local	Water	35,000	25	5.1	2.4	0	0	0	0	50	0.25	0.02	0.00	0.00
Cement Distribution Truck	Local	Water	42,000	25	5.1	2.4	No Data	0	0	0	50	0.25	0.02	0.00	0.00
Heavy Truck (Water)	Local	Water	35,000	25	5.1	2.4	1	1,357.5	0	1,357.5	50	0.25	0.02	171.62	16.95
Totals (tons/year)															
														0.19	**0.02**

Source: CCSM Project FEIS (BLM 2012b), Appendix H Air Quality.

[1]Dust control methods include using water (resource road) or chemical (local road) as a dust suppressant along with vehicle restriction speed limit of 25 mph.
[2]AP-42 (EPA 2004), Table 11.9-3, "Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations."
[3]Calculated as Round Trips per Vehicle Type x Round Trip Distance.
[4]CCSM Project FEIS (BLM 2012b), Appendix H Air Quality.
[5]AP-42 (EPA 2004), Section 13.2.2 "Unpaved Roads", equations 1a and 1b.
[6]Calculated as lb/VMT x VMT/site x control efficiency.
[7]Tractor Trailer Belly Dump Trucks are on a round trip/year basis

Table D-31. Operations Fugitive Dust Emissions for Excavation

Year	Aggregate (cu yd)	Total Aggregate (tons)	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)
2014	0	0	0.000	0.000
2015	1,066,400	2,231,442	32.356	32.356
2016	1,005,500	2,104,009	30.508	30.508
2017	305,200	638,631	9.260	9.260
2018	180,700	378,115	5.483	5.483

Table D-32. Operations Fugitive Dust Emissions for Transfer Excavate to Screener

Year	Aggregate (cu yd)	Total Aggregate (tons)	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)
2014	0	0	0.000	0.000
2015	1,066,400	2,231,442	22.314	22.314
2016	1,005,500	2,104,009	21.040	21.040
2017	305,200	638,631	6.386	6.386
2018	180,700	378,115	3.781	3.781

Table D-33. Operations Fugitive Dust Emissions for Screening

Year	Aggregate (cu yd)	Total Aggregate (tons)	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)
2014	0	0	0.000	0.000
2015	1,066,400	2,231,442	0.826	0.056
2016	1,005,500	2,104,009	0.778	0.053
2017	305,200	638,631	0.236	0.016
2018	180,700	378,115	0.140	0.009

Table D-34. Operations Fugitive Dust Emissions for Primary Crushing

Year	Aggregate (cu yd)	Total Aggregate (tons)	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)
2014	0	0	0.000	0.000
2015	1,066,400	2,231,442	0.602	0.112
2016	1,005,500	2,104,009	0.568	0.105
2017	305,200	638,631	0.172	0.032
2018	180,700	378,115	0.102	0.019

Table D-35. Operations Fugitive Dust Emissions for Secondary Crushing

Year	Aggregate (cu yd)	Total Aggregate (tons)	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)
2014	0	0	0.000	0.000
2015	1,066,400	2,231,442	0.602	0.112
2016	1,005,500	2,104,009	0.568	0.105
2017	305,200	638,631	0.172	0.032
2018	180,700	378,115	0.102	0.019

Table D-36. Operations Fugitive Dust Emissions for Conveyor Transfer to Stockpile

Year	Aggregate (cu yd)	Total Aggregate (tons)	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)
2014	0	0	0.000	0.000
2015	1,066,400	2,231,442	0.023	0.007
2016	1,005,500	2,104,009	0.022	0.006
2017	305,200	638,631	0.007	0.002
2018	180,700	378,115	0.004	0.001

Table D-37. Operations Fugitive Dust Emissions for Truck Loading from Stockpile (via Front end Loader)

Year	Aggregate (cu yd)	Total Aggregate (tons)	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)
2014	0	0	0.000	0.000
2015	1,066,400	2,231,442	0.056	0.056
2016	1,005,500	2,104,009	0.053	0.053
2017	305,200	638,631	0.016	0.016
2018	180,700	378,115	0.009	0.009

Table D-38. Operations Fugitive Dust Emissions for Total Production Sequence Emissions

Year	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)
2014	0.000	0.000
2015	56.780	55.012
2016	53.537	51.870
2017	16.250	15.744
2018	9.621	9.322

Table D-39. Operations Fugitive Dust Emissions for Conveyor Transfer to Stockpile Emissions

Year	Aggregate (cu yd)	Total Aggregate (tons)	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)
2014	0	0	0.000	0.000
2015	1,066,400	2,231,442	0.023	0.007
2016	1,005,500	2,104,009	0.022	0.006
2017	305,200	638,631	0.007	0.002
2018	180,700	378,115	0.004	0.001

Table D-40. Operations Fugitive Dust Emissions for Finished Product Stockpile

Year	Aggregate (cu yd)	Aggregate (tons)	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)
2014	0	0	0.000000	0.000000
2015	1,066,400	2,155,113	1.620324	0.245363
2016	1,005,500	2,073,566	1.559013	0.236079
2017	305,200	629,424	0.473233	0.071661
2018	180,700	372,620	0.280155	0.042423

Source: PCW 2014c

Table D-41. Operations Fugitive Dust Emissions for Overburden Soil Storage Area

Year	Soil (cu yd)	Soil (tons)	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)
2014	500,000	1,046,250	0.786624	0.119117
2015	500,000	1,046,250	0.786624	0.119117
2016	500,000	1,046,250	0.786624	0.119117
2017	500,000	1,046,250	0.786624	0.119117
2018	500,000	1,046,250	0.786624	0.119117

Source: PCW 2014c

Table D-42. Operations Fugitive Dust Emissions for Topsoil Storage Area

Year	Soil (cu yd)	Soil (tons)	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)
2014	0	0	0.000000	0.0000000
2015	51,400	76,329	0.057388	0.0086902
2016	20,500	30,443	0.022888	0.0034659
2017	6,200	9,207	0.006922	0.0010482
2018	3,700	5,495	0.004131	0.000626

Source: PCW 2014c

Table D-43. Operations Fugitive Dust Emissions for Reclamation Subsoil Storage Area

Year	Soil (cu yd)	Soil (tons)	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)
2014	100,000	148,500	0.111650	0.0169070
2015	100,000	148,500	0.111650	0.0169070
2016	100,000	148,500	0.111650	0.0169070
2017	100,000	148,500	0.111650	0.0169070
2018	100,000	148,500	0.111650	0.016907

Source: PCW 2014c

Table D-44. Operations Fugitive Dust Emissions Total Emissions

Year	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)
2014	0.898274	0.136024
2015	2.575987	0.390078
2016	2.480176	0.375569
2017	1.378430	0.208734
2018	1.182560	0.179073

Table D-45. 2015 Operational Onroad Vehicle Emissions

Equipment Type	Number of Vehicles	Engine Horsepower	Average Vehicle Speed	Usage Rates (miles/round trip)	Criteria Pollutants - Emissions (tons/year)						Hazardous Pollutants - Emissions (tons/year)						GHG Emissions (tons/year)			
		(hp)	*(miles per hour)*		*CO*	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*SO_2*	*VOCs*	*Benzene*	*Toluene*	*Xylenes*	*Acetaldehyde*	*Formaldehyde*	*Propylene*	*CO_2*	*CH_4*	*N_2O*	*CO_2e*
Tractor-Trailer Belly-Dump[1]	44.433	400	25	60	142.47	661.17	46.92	46.92	43.72	52.68	0.14	0.06	0.04	0.11	0.18	0.39	24,527.20	0.99	0.20	24,610.73
Tractor-Trailer/Flatbed	0	400	25	200	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	No Data	330	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Smaller trucks (mat'ls & supplies)	No Data	325	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cement Distrib. Truck	No Data	400	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Worker commuting	10.944	325	25	112	16.65	77.27	5.48	5.48	5.11	6.16	0.02	0.01	0.005	0.01	0.02	0.05	2,866.61	0.12	0.02	2,876.38
Totals - 2015																				
					159.12	**738.44**	**52.41**	**52.41**	**48.83**	**58.84**	**0.16**	**0.07**	**0.05**	**0.13**	**0.20**	**0.43**	**27,393.81**	**1.10**	**0.22**	**27,487.11**

[1]Tractor Trailer Belly Dump Trucks are on a round trip/year basis

N/A Not Applicable due to no data.

Table D-46. 2016 Operational Onroad Vehicle Emissions

Equipment Type	Number of Vehicles	Engine Horsepower	Average Vehicle Speed	Usage Rates (miles/round trip)	Criteria Pollutants - Emissions (tons/year)						Hazardous Pollutants - Emissions (tons/year)						GHG Emissions (tons/year)			
		(hp)	*(miles per hour)*		*CO*	*NO_x*	*CO_2*	*CO_2*	*CO_2*	*CO_2*	*Benzene*	*Toluene*	*Xylenes*	*Acetaldehyde*	*Formaldehyde*	*Propylene*	*CO_2*	*CH_4*	*N_2O*	*CO_2e*
Tractor-Trailer Belly-Dump[1]	41,896	400	25	60	134.33	623.41	44.24	44.24	41.23	49.67	0.13	0.06	0.04	0.11	0.17	0.36	23,126.50	0.93	0.19	23,205.26
Tractor-Trailer/Flatbed	0	400	25	200	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	No Data	330	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Smaller trucks (mat'ls & supplies)	No Data	325	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cement Distrib. Truck	No Data	400	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Worker commuting	10.5	325	25	112	15.98	74.14	5.26	5.26	4.90	5.91	0.02	0.01	0.005	0.01	0.02	0.04	2,750.20	0.11	0.02	2,759.57
Totals - 2016																				
					150.31	**697.55**	**49.50**	**49.50**	**46.13**	**55.58**	**0.15**	**0.06**	**0.05**	**0.12**	**0.19**	**0.41**	**25,876.70**	**1.04**	**0.21**	**25,964.83**

[1]Tractor Trailer Belly Dump Trucks are on a round trip/year basis

N/A Not Applicable due to no data.

Table D-47. 2017 Operational Onroad Vehicle Emissions

Equipment Type	Number of Vehicles	Engine Horsepower	Average Vehicle Speed	Usage Rates (miles/round trip)	Criteria Pollutants - Emissions (tons/year)						Hazardous Pollutants - Emissions (tons/year)						GHG Emissions (tons/year)			
		(hp)	*(miles per hour)*		*CO*	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*SO_2*	*VOCs*	*Benzene*	*Toluene*	*Xylenes*	*Acetaldehyde*	*Formaldehyde*	*Propylene*	*CO_2*	*CH_4*	*N_2O*	*CO_2e*
Tractor-Trailer Belly-Dump[1]	12,717	400	25	60	40.77	189.22	13.43	13.43	12.51	15.08	0.04	0.02	0.01	0.03	0.05	0.11	7,019.60	0.28	0.06	7,043.51
Tractor-Trailer/Flatbed	0	400	25	200	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	No Data	330	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Smaller trucks (mat'ls & supplies)	No Data	325	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cement Distrib. Truck	No Data	400	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Worker commuting	11.39	325	25	112	17.33	80.41	0.00	0.00	5.32	6.41	0.02	0.01	0.005	0.01	0.02	0.05	2,983.02	0.12	0.02	2,993.18
Totals - 2017																				
					58.10	**269.64**	**13.43**	**13.43**	**17.83**	**21.48**	**0.06**	**0.02**	**0.02**	**0.05**	**0.07**	**0.16**	**10,002.62**	**0.40**	**0.08**	**10,036.69**

[1]Tractor Trailer Belly Dump Trucks are on a round trip/year basis

N/A Not Applicable due to no data.

Table D-48. 2018 Operational Onroad Vehicle Emissions

Equipment Type	Number of Vehicles	Engine Horsepower	Average Vehicle Speed	Usage Rates (miles/round trip)	Criteria Pollutants - Emissions (tons/year)						Hazardous Pollutants - Emissions (tons/year)						GHG Emissions (tons/year)			
		(hp)	*(miles per hour)*		*CO*	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*SO_2*	*VOCs*	*Benzene*	*Toluene*	*Xylenes*	*Acetaldehyde*	*Formaldehyde*	*Propylene*	*CO_2*	*CH_4*	*N_2O*	*CO_2e*
Tractor-Trailer Belly-Dump[1]	7,529	400	25	60	24.14	112.03	7.95	7.95	7.41	8.93	0.02	0.01	0.01	0.02	0.03	0.07	4,156.10	0.17	0.03	4,170.25
Tractor-Trailer/Flatbed	0	400	25	200	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	No Data	330	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Smaller trucks (mat'ls & supplies)	No Data	325	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cement Distrib. Truck	No Data	400	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Worker commuting	9.75	325	25	112	14.83	68.84	4.89	4.89	4.55	5.49	0.01	0.01	0.004	0.01	0.02	0.05	2,553.76	0.10	0.02	2,562.46
Totals - 2017																				
					38.98	**180.87**	**12.84**	**12.84**	**11.96**	**14.41**	**0.04**	**0.02**	**0.01**	**0.03**	**0.05**	**0.11**	**6,709.86**	**0.27**	**0.05**	**6,732.71**

[1]Tractor Trailer Belly Dump Trucks are on a round trip/year basis

N/A Not Applicable due to no data.

Table D-49. 2018 Site Decommissioning Onroad Vehicle Emissions

Equipment Type	Number of Vehicles	Engine Horsepower	Average Vehicle Speed	Usage Rates (miles/round trip)	Criteria Pollutants - Emissions (tons/year)						Hazardous Pollutants - Emissions (tons/year)						GHG Emissions (tons/year)			
		(hp)	*(miles per hour)*		*CO*	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*SO_2*	*VOCs*	*Benzene*	*Toluene*	*Xylenes*	*Acetaldehyde*	*Formaldehyde*	*Propylene*	*CO_2*	*CH_4*	*N_2O*	*CO_2e*
Tractor-Trailer Belly-Dump[1]	0	400	25	60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor-Trailer/Flatbed	12	400	25	200	0.13	0.60	0.04	0.04	0.04	0.05	0.00013	0.00005	0.00004	0.00010	0.00016	0.00035	22.08	0.00	0.00	22.16
Dump Truck	No Data	330	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Smaller trucks (mat'ls & supplies)	No Data	325	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cement Distrib. Truck	No Data	400	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Worker commuting	15.33	325	25	112	5.83	27.07	1.92	1.92	1.79	2.16	0.0057	0.0025	0.0017	0.0047	0.0072	0.0158	1,004.04	0.04	0.01	1,007.46
Totals																				
					5.96	**27.66**	**1.96**	**1.96**	**1.83**	**2.20**	**5.83E-03**	**2.55E-03**	**1.78E-03**	**4.79E-03**	**7.37E-03**	**1.62E-02**	**1,026.12**	**0.04**	**0.01**	**1,029.62**

[1]Tractor Trailer Belly Dump Trucks are on a round trip/year basis

N/A Not Applicable due to no data.

Table D-50. 2018 Road Decommissioning Onroad Vehicle Emissions

Equipment Type	Number of Vehicles	Engine Horsepower	Average Vehicle Speed	Usage Rates (miles/round trip)	Criteria Pollutants - Emissions (tons/year)						Hazardous Pollutants - Emissions (tons/year)						GHG Emissions (tons/year)			
		(hp)	*(miles per hour)*		*CO*	*NO_x*	*PM_{10}*	*$PM_{2.5}$*	*SO_2*	*VOCs*	*Benzene*	*Toluene*	*Xylenes*	*Acetaldehyde*	*Formaldehyde*	*Propylene*	*CO_2*	*CH_4*	*N_2O*	*CO_2e*
Tractor-Trailer Belly-Dump[1]	0	400	25	60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor-Trailer/Flatbed	0	400	25	200	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck	No Data	330	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Smaller trucks (mat'ls & supplies)	No Data	325	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cement Distrib. Truck	No Data	400	25	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Worker commuting	15.33	325	25	112	5.83	27.07	1.92	1.92	1.79	2.16	0.0057	0.0025	0.0017	0.0047	0.0072	0.0158	1,004.04	0.04	0.01	1,007.46
Totals																				
					5.83	**27.07**	**1.92**	**1.92**	**1.79**	**2.16**	**5.70E-03**	**2.5E-03**	**1.75E-03**	**4.69E-03**	**7.21E-03**	**1.58E-02**	**1,004.04**	**0.04**	**0.01**	**1,007.46**

[1]Tractor Trailer Belly Dump Trucks are on a round trip/year basis

N/A Not Applicable due to no data.