Stibnite Gold Project EIS Appendix F

Air Quality and Climate Change

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F-1: Air Emission Inventory – EIS Alternative 1 and Alternative 2

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Note : The parameters and methods used for this emission inventory were developed for purposes of the EIS, prior to submittal of the air quality permit application to IDEQ. Therefore, these methods and parameters (e.g., road silt content and mean vehicle weights) have not been reviewed and approved by IDEQ. While each emission estimate presented here is based on technically valid methods, comments and preferences by IDEQ communicated during review of the Midas Gold air permit application are not incorporated at the time of this DEIS.

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: E. Memon
	PROJECT NO: 335-1-1	PAGE: 1 OF: 3 SHEET: EmSum
AIR EMISSION CALCULATIONS	SUBJECT: Emissions Summary	DATE: October 10, 2018

Emissions Summary

Maximum Annual Emissions

Total Emissions by LOM Year

	LOM	PM	PM10	PM2.5	CO	NOX	SO2	VOC
		ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
	-2	231.0	66.9	17.1	461.7	156.2	0.8	52.3
	-1	364.9	106.4	30.8	531.3	220.8	0.9	**56.8**
	PP	642.7	173.1	33.6	481.0	291.9	1.0	43.0
1-12	1	921.5	270.7	58.6	335.8	218.8	5.8	20.3
1-12	2	1,121.1	328.9	66.3	420.4	323.7	6.1	22.5
1-12	3	1,157.0	345.0	66.6	491.8	330.2	6.1	22.9
1-12	4	**1,229.5**	**365.0**	**68.7**	**537.8**	**351.1**	**6.1**	23.7
1-12	5	1,116.3	333.2	64.9	485.0	341.3	6.1	23.0
1-12	6	1,200.2	356.1	65.1	490.2	348.0	6.1	22.6
1-12	7	1,116.6	335.5	62.7	476.2	299.7	6.0	21.4
1-12	8	1,189.8	356.7	64.6	503.7	310.0	6.0	21.6
1-12	9	1,172.2	348.9	64.2	486.5	310.4	6.0	22.1
1-12	10	1,125.2	334.3	62.7	456.0	280.8	5.9	21.4
1-12	11	774.1	239.4	52.1	329.6	211.7	5.8	18.6
1-12	12	477.4	154.9	42.0	170.8	101.2	5.5	11.6
		PM_tpy	PM10_tpy	PM2.5_tpy	CO_tpy	NOx_tpy	SO2_tpy	VOC_tpy

Maximum Daily Emissions of AQRV Pollutants

Total Emissions by LOM Year

	LOM	Q/D Threshold	PM10	PM2.5	NOX	SO2	H2SO4	AQRV Pollutants (lb/day)				
			lb/day	lb/day	lb/day	lb/day	lb/day	Process	Mining	Construction	Total	
	-2	775	494.0	120.0	1,013.2	4.5	0.0	0	0	1,512	1,512	chk
	-1	775	791.0	223.2	1,498.4	5.6	0.0	0	0	2,295	2,295	chk
	PP	775	1,141.0	217.2	1,813.1	7.9	0.0	0	1,715	1,247	2,962	chk
1-12	1	775	1,595.2	365.7	1,259.5	34.3	48.7	455	2,482	0	2,938	chk
1-12	2	775	1,926.2	413.1	1,846.6	35.7	48.7	455	3,402	0	3,857	chk
1-12	3	775	1,993.1	411.4	1,877.7	35.7	48.7	455	3,500	0	3,955	chk
1-12	4	775	**2,098.2**	**421.1**	**1,995.4**	**36.1**	**48.7**	455	3,723	0	**4,178**	chk
1-12	5	775	1,926.6	402.0	1,940.3	35.8	48.7	455	3,496	0	3,951	chk
1-12	6	775	2,048.3	400.7	1,978.2	35.8	48.7	455	3,656	0	4,111	chk
1-12	7	775	1,932.1	387.1	1,706.0	35.2	48.7	455	3,267	0	3,722	chk
1-12	8	775	2,051.3	397.9	1,763.8	35.3	48.7	455	3,444	0	3,899	chk
1-12	9	775	2,007.8	395.5	1,766.0	35.4	48.7	455	3,403	0	3,858	chk
1-12	10	775	1,925.9	387.2	1,599.5	35.0	48.7	455	3,154	0	3,609	chk
1-12	11	775	1,425.9	329.5	1,221.0	34.0	48.7	455	2,274	0	2,730	chk
1-12	12	775	949.3	272.6	602.2	32.3	48.7	455	1,177	0	1,633	chk
			PM10_ppd	PM2.5_ppd	NOx_ppd	SO2_ppd	VOC_ppd	Sul_ppd				

Conversions

365 day/yr
2,000 lb/ton

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: E. Memon
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Emissions Summary

Ore Processing and Refining	PM_tpy	PM10_tpy	PM2.5_tpy	CO_tpy	NOx_tpy	SO2_tpy	VOC_tpy
LOM	PM	PM10	PM2.5	CO	NOX	SO2	VOC
	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
1-12	53.0	37.2	28.7	13.0	21.8	5.2	4.7

Mining	chk	chk	chk	chk	chk	chk-16	chk
LOM	PM	PM10	PM2.5	CO	NOX	SO2	VOC
	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
PP	418.8	109.8	19.2	210.6	178.3	0.5	14.2
1	868.6	233.4	29.9	322.8	197.0	0.6	15.6
2	1,068.1	291.6	37.6	407.3	301.9	0.8	17.8
3	1,104.1	307.8	37.9	478.8	308.4	0.8	18.2
4	1,176.6	327.8	40.0	524.8	329.3	0.9	19.0
5	1,063.3	295.9	36.2	471.9	319.5	0.9	18.3
6	1,147.2	318.8	36.4	477.2	326.3	0.9	17.9
7	1,063.7	298.2	34.0	463.2	277.9	0.7	16.7
8	1,136.9	319.5	35.9	490.7	288.2	0.8	16.9
9	1,119.3	311.6	35.5	473.5	288.6	0.8	17.4
10	1,072.3	297.0	34.0	443.0	259.0	0.7	16.7
11	721.1	202.1	23.4	316.5	189.9	0.5	13.9
12	424.5	117.7	13.3	157.8	79.5	0.2	6.9

Mine Infrastructure Construction[1]	chk	chk	chk	chk	chk	chk	chk
	197.9	54.2	10.8	200.7	49.0	0.3	24.3
LOM	PM	PM10	PM2.5	CO	NOX	SO2	VOC
	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
-2	205.0	57.8	13.5	392.1	91.6	0.6	47.8
-1	312.9	88.2	23.6	392.1	91.6	0.6	47.8
PP	197.9	54.2	10.8	200.7	49.0	0.3	24.3

[1] *Construction emissions during mine operation are accounted for in the mining emissions*

Power Line Construction	chk	chk	chk	chk	chk	chk	chk
	26.0	9.1	3.6	69.6	64.6	0.1	4.5
LOM	PM	PM10	PM2.5	CO	NOX	SO2	VOC
	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
-2	26.0	9.1	3.6	69.6	64.6	0.1	4.5
-1	52.0	18.2	7.2	139.3	129.2	0.3	9.0
PP	26.0	9.1	3.6	69.6	64.6	0.1	4.5

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Emissions Summary

Ore Processing and Refining	PM_ppd	PM10_ppd	PM2.5_ppd	CO_ppd	NOx_ppd	SO2_ppd	VOC_ppd	Sul_ppd
LOM	PM	PM10	PM2.5	CO	NOX	SO2	VOC	H2SO4
	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day
1-12	n/a	256.0	195.7	72.6	121.4	29.0	n/a	48.7

Mining		chk	chk	chk	chk	chk	
LOM	PM	PM10	PM2.5	CO	NOX	SO2	VOC
	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day
PP	n/a	670.1	113.2	1,788.0	1,039.9	5.0	n/a
1	n/a	1,339.2	170.0	2,153.3	1,138.0	5.3	n/a
2	n/a	1,670.2	217.3	2,480.0	1,725.2	6.6	n/a
3	n/a	1,737.1	215.7	2,679.3	1,756.3	6.7	n/a
4	n/a	1,842.2	225.3	2,933.3	1,874.0	7.0	n/a
5	n/a	1,670.6	206.3	2,641.7	1,818.9	6.8	n/a
6	n/a	1,792.2	205.0	2,669.0	1,856.7	6.8	n/a
7	n/a	1,676.1	191.4	2,589.7	1,584.5	6.1	n/a
8	n/a	1,795.3	202.2	2,741.1	1,642.4	6.3	n/a
9	n/a	1,751.8	199.8	2,648.4	1,644.6	6.4	n/a
10	n/a	1,669.9	191.5	2,479.5	1,478.1	6.0	n/a
11	n/a	1,169.9	133.7	2,180.9	1,099.6	4.9	n/a
12	n/a	693.2	76.8	1,411.0	480.8	3.3	n/a

Infrastructure Construction[1][2]		chk 402.7	chk 76.9	chk 1148.4	chk 288.0	chk 1.8	
LOM	PM	PM10	PM2.5	CO	NOX	SO2	VOC
	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day
-2	n/a	425.7	92.9	2226.5	527.9	3.5	n/a
-1	n/a	654.5	169.0	2226.5	527.9	3.5	n/a
PP	n/a	402.7	76.9	1148.4	288.0	1.8	n/a

[1] *Maximum daily emissions based on: 1000 person crew during peak construction, scaled with an average annual crew of 750 and an annual operating schedule of 355 day/yr*

[2] *Construction daily emissions based on: 1000 construction crew during peak construction, scaled with average annual crew of 750 and an annual operating schedule of 355 day/yr. Daily power generation emissions are not scaled by peak crew.*

Power Line Construction[1]		chk 68.3	chk 27.1	chk-13 523.0	chk 485.2	chk 1.1	
LOM	PM	PM10	PM2.5	CO	NOX	SO2	VOC
	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day
-2	n/a	68.3	27.1	523.0	485.2	1.1	n/a
-1	n/a	136.5	54.2	1046.1	970.5	2.1	n/a
PP	n/a	68.3	27.1	523.0	485.2	1.1	n/a

Construction daily emissions based on: 1000 construction crew during peak construction, scaled with average annual crew of 750 and an annual operating schedule of 355 day/yr.

Conversions

2,000	lb/ton	1,000	person construction crew during peak construction
24	hr/day	750	person average construction crew during the year
355	day/yr Annual operations schedule		

SOURCE DESCRIPTION		OPERATING LIMITS							EMISSION FACTORS									
Model ID	Source Description	Design Throughput unit/hr	unit/day	unit/yr	units	Material	hr/yr	reference	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	H	unit	reference
OC1	Loader Transfer of Ore to Grizzly Screen	1,042	25,000	9,125,000	ton	Ore	8,760	(Midas Gold 2016), Sec. 10.1	0.00014	4.6E-05	1.3E-05						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.
OC2	Grizzly Screen to Apron Feeder	1,042	25,000	9,125,000	ton	Ore	8,760	(Midas Gold 2016), Sec. 10.1	0.00014	4.6E-05	1.3E-05						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.
OC3	Apron Feeder to Dribble Conveyor	1,042	25,000	9,125,000	ton	Ore	8,760	(Midas Gold 2016), Sec. 10.1	0.00014	4.6E-05	1.3E-05						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.
OC4	Apron Feeder to Vibrating Grizzly	1,042	25,000	9,125,000	ton	Ore	8,760	(Midas Gold 2016), Sec. 10.1	0.00014	4.6E-05	1.3E-05						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.
OC5	Dribble Conveyor to Vibrating Grizzly	1,042	25,000	9,125,000	ton	Ore	8,760	(Midas Gold 2016), Sec. 10.1	0.00014	4.6E-05	1.3E-05						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.
OC6	Vibrating Grizzly to Primary Crusher or Coarse Ore Stockpile Feed Conveyor	1,042	25,000	9,125,000	ton	Ore	8,760	(Midas Gold 2016), Sec. 10.1	0.00014	4.6E-05	1.3E-05						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.
OC7	Primary Crusher and Associated Transfers out to Coarse Ore Stockpile Feed Conveyor	1,042	25,000	9,125,000	ton	Ore	8,760	(Midas Gold 2016), Sec. 10.1	0.0012	0.00054	0.0001						lb/ton	AP-42, Table 11.19.2-2 (08/04) Tert. Crushing - ctrl.
OC8	Coarse Ore Stockpile Feed Conveyor Transfer to Stockpile	1,042	25,000	9,125,000	ton	Ore	8,760	(Midas Gold 2016), Sec. 10.1	0.00014	4.6E-05	1.3E-05						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.
OC9	Stockpile Transfers to Reclaim Conveyors	1,150	27,600	10,074,000	ton	Ore	8,760	(M3 2017b)	0.003	0.0011	0.00017						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
OC10	Reclaim Conveyers to SAG Mill Feed Conveyor	1,150	27,600	10,074,000	ton	Ore	8,760	(M3 2017b)	0.003	0.0011	0.00017						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
OC11	SAG Mill Feed Conveyor Transfer to SAG Mill	1,438	34,500	12,592,500	ton	Ore	8,760	(M3 2017b)	0.003	0.0011	0.00017						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
OC12	Pebble Crusher and Associated Transfers in (from SAG Mill) and out (to Pebble Discharge Conveyor)	287.5	6,900	2,518,500	ton	Ore	8,760	(M3 2017b)	0.0012	0.00054	0.0001						lb/ton	AP-42, Table 11.19.2-2 (08/04) Tert. Crushing - ctrl.
OC13	Pebble Discharge Conveyor to SAG Mill Feed Conveyor	287.5	6,900	2,518,500	ton	Ore	8,760	(M3 2017b)	0.00014	4.6E-05	1.3E-05						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.
LS1L	Mill Lime Silo#1 Loading	60	250	4,375	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.00099	0.00034	0.00005						lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.; PM2.5Ch. 13.2.4
LS1U	Mill Lime Silo #1 Unloading to SAG Mill Conveyor	20	250	4,375	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.00042						lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.; PM2.5 Ch. 13.2.4
MillS2L	Mill Lime Silo #2 Loading	60	250	4,375	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.00099	0.00034	0.00005						lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.; PM2.5Ch. 13.2.4
MillS2U	Mill Lime Silo #2 Unloading to SAG Mill Conveyor	20	250	4,375	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.00042						lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.; PM2.5 Ch. 13.2.4
Sb1	Sb Drying (2.72 MMBtu/hr Propane-Fired)	2.72		23,827	MMBtu	Propane	8,760	(M3 2017d)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
Sb2	Sb Bagging	4.5		39,420	ton	Sb Conc	8,760	(M3 2017d)	0.118	0.118	0.118						lb/hr	Based on NDEP-BAPC Permit for Clay Bagging Operation (Hectatone) (NDEP 2015b)
AC	Autoclave	290	6,960	2,540,400	ton	Ore	8,760	(M3 2017b)	5.075	5.075	5.075			0.6525		0.9	lb/hr	Based on NDEP-BAPC Permits/test data for Autoclaves: PM & SO2 - [Goldstrike (NDEP 2019], H2S - (APT 2013). Negligible CO due to no organic carbon in the feed (M3 2017a)
ACB	POX Boiler (17 MMBtu/hr Propane-Fired)	17	17	510	MMBtu	Propane	30	(M3 2017b)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Ind. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
ACS1L	AC Lime Silo #1 Loading	120	1,000	17,500	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.00099	0.00034	0.00005						lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.
ACS1U	AC Lime Silo #1 Unloading to Lime Slaker	20	480	17,500	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004						lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.
ACS2L	AC Lime Silo #2 Loading	120	1,000	17,500	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.00099	0.00034	0.00005						lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.
ACS2U	AC Lime Silo #2 Unloading to Lime Slaker	20	480	17,500	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004						lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.

SOURCE DESCRIPTION		EMISSION CONTROLS			HOURLY EMISSIONS								DAILY EMISSIONS							
Model ID	Source Description	control system	efficiency	reference	PM lb/hr	PM_{10} lb/hr	$PM_{2.5}$ lb/hr	CO lb/hr	NOx lb/hr	SO_2 lb/hr	VOC lb/hr	H2S lb/hr	PM lb/day	PM_{10} lb/day	$PM_{2.5}$ lb/day	CO lb/day	NOx lb/day	SO_2 lb/day	VOC lb/day	H2S lb/day
OC1	Loader Transfer of Ore to Grizzly Screen	Water Sprays		Control efficiency included in emission factor	0.146	0.0479	0.0135						3.50	1.15	0.325					
OC2	Grizzly Screen to Apron Feeder	Moisture Carry-Over		Control efficiency included in emission factor	0.146	0.0479	0.0135						3.50	1.15	0.325					
OC3	Apron Feeder to Dribble Conveyor	Moisture Carry-Over		Control efficiency included in emission factor	0.146	0.0479	0.0135						3.50	1.15	0.325					
OC4	Apron Feeder to Vibrating Grizzly	Moisture Carry-Over		Control efficiency included in emission factor	0.146	0.0479	0.0135						3.50	1.15	0.325					
OC5	Dribble Conveyor to Vibrating Grizzly	Moisture Carry-Over		Control efficiency included in emission factor	0.146	0.0479	0.0135						3.50	1.15	0.325					
OC6	Vibrating Grizzly to Primary Crusher or Coarse Ore Stockpile Feed Conveyor	Moisture Carry-Over		Control efficiency included in emission factor	0.146	0.0479	0.0135						3.50	1.15	0.325					
OC7	Primary Crusher and Associated Transfers out to Coarse Ore Stockpile Feed Conveyor	Water Sprays		Control efficiency included in emission factor	1.25	0.563	0.104						30.0	13.5	2.50					
OC8	Coarse Ore Stockpile Feed Conveyor Transfer to Stockpile	Moisture Carry-Over		Control efficiency included in emission factor	0.146	0.0479	0.0135						3.50	1.15	0.325					
OC9	Stockpile Transfers to Reclaim Conveyors	Undergrnd	80%	Based on AP-42, Chapter 13.2.4, reduction in EF due to wind speed reduction	0.690	0.253	0.0391						16.6	6.07	0.938					
OC10	Reclaim Conveyers to SAG Mill Feed Conveyor	Undergrnd	80%	Based on AP-42, Chapter 13.2.4, reduction in EF due to wind speed reduction	0.690	0.253	0.0391						16.6	6.07	0.938					
OC11	SAG Mill Feed Conveyor Transfer to SAG Mill	Enclosure	80%	Based on AP-42, Chapter 13.2.4, reduction in EF due to wind speed reduction	0.863	0.316	0.0489						20.7	7.59	1.17					
OC12	Pebble Crusher and Associated Transfers in (from SAG Mill) and out (to Pebble Discharge Conveyor)	Water Sprays		Control efficiency included in emission factor	0.345	0.155	0.0288						8.28	3.73	0.690					
OC13	Pebble Discharge Conveyor to SAG Mill Feed Conveyor	Moisture Carry-Over		Control efficiency included in emission factor	0.0403	0.0132	0.00374						0.966	0.317	0.0897					
LS1L	Mill Lime Silo#1 Loading	Bin Vent		Control efficiency included in emission factor	0.0594	0.0204	0.00300						0.248	0.0850	0.0125					
LS1U	Mill Lime Silo #1 Unloading to SAG Mill Conveyor	None	0%		0.0960	0.0560	0.00840						1.20	0.700	0.105					
MillS2L	Mill Lime Silo #2 Loading	Bin Vent		Control efficiency included in emission factor	0.0594	0.0204	0.00300						0.248	0.0850	0.0125					
MillS2U	Mill Lime Silo #2 Unloading to SAG Mill Conveyor	None	0%		0.0960	0.0560	0.00840						1.20	0.700	0.105					
Sb1	Sb Drying (2.72 MMBtu/hr Propane-Fired)	None	NA		0.0208	0.0208	0.0208	0.223	0.386	0.0473	0.0238		0.499	0.499	0.499	5.35	9.27	1.13	0.571	
Sb2	Sb Bagging	Baghouse	NA	Control efficiency included in emission factor	0.118	0.118	0.118						2.83	2.83	2.83					
AC	Autoclave	Wet Scrubber	NA	PM control efficiency included in emission factor	5.08	5.08	5.08			0.653		0.900	122	122	122			15.7		21.6
ACB	POX Boiler (17 MMBtu/hr Propane-Fired)	None	NA	NOX control efficiency included in emission factor	0.130	0.130	0.130	1.39	2.42	0.295	0.149		0.130	0.130	0.130	1.39	2.42	0.295	0.149	
ACS1L	AC Lime Silo #1 Loading	Bin Vent		Control efficiency included in emission factor	0.119	0.0408	0.00600						0.990	0.340	0.0500					
ACS1U	AC Lime Silo #1 Unloading to Lime Slaker	None	0%		0.0960	0.0560	0.00800						2.30	1.34	0.192					
ACS2L	AC Lime Silo #2 Loading	Bin Vent		Control efficiency included in emission factor	0.119	0.0408	0.00600						0.990	0.340	0.0500					
ACS2U	AC Lime Silo #2 Unloading to Lime Slaker	None	0%		0.0960	0.0560	0.00800						2.30	1.34	0.192					

SOURCE DESCRIPTION		ANNUAL EMISSIONS									NAD 83 LOCATION				
Model ID	Source Description	PM ton/yr	PM_{10} ton/yr	$PM_{2.5}$ ton/yr	CO ton/yr	NOx ton/yr	SO_2 ton/yr	VOC ton/yr	H2S ton/yr	Hg2+P ton/yr	UTM E m	UTM N m	reference	elev m	reference
OC1	Loader Transfer of Ore to Grizzly Screen	0.639	0.210	0.0593						3.83E-7	632,045	4,974,583	PC building center	1,968.5	PC building base
OC2	Grizzly Screen to Apron Feeder	0.639	0.210	0.0593						3.83E-7	632,045	4,974,583	PC building center	1,968.5	PC building base
OC3	Apron Feeder to Dribble Conveyor	0.639	0.210	0.0593						3.83E-7	632,045	4,974,583	PC building center	1,968.5	PC building base
OC4	Apron Feeder to Vibrating Grizzly	0.639	0.210	0.0593						3.83E-7	632,045	4,974,583	PC building center	1,968.5	PC building base
OC5	Dribble Conveyor to Vibrating Grizzly	0.639	0.210	0.0593						3.83E-7	632,045	4,974,583	PC building center	1,968.5	PC building base
OC6	Vibrating Grizzly to Primary Crusher or Coarse Ore Stockpile Feed Conveyor	0.639	0.210	0.0593						3.83E-7	632,045	4,974,583	PC building center	1,968.5	PC building base
OC7	Primary Crusher and Associated Transfers out to Coarse Ore Stockpile Feed Conveyor	5.48	2.46	0.456						3.29E-6	632,045	4,974,583	PC building center	1,968.5	PC building base
OC8	Coarse Ore Stockpile Feed Conveyor Transfer to Stockpile	0.639	0.210	0.0593						3.83E-7	631,947	4,974,520	Stockpile center	1,957.0	Stockpile base
OC9	Stockpile Transfers to Reclaim Conveyors	3.02	1.11	0.171						1.81E-6	631,947	4,974,520	Stockpile center	1,957.0	Stockpile base
OC10	Reclaim Conveyers to SAG Mill Feed Conveyor	3.02	1.11	0.171						1.81E-6	631,947	4,974,520	Stockpile center	1,957.0	Stockpile base
OC11	SAG Mill Feed Conveyor Transfer to SAG Mill	3.78	1.39	0.214						2.27E-6	632,113	4,974,243	Mill building wall opening	2,000.6	Mill building base
OC12	Pebble Crusher and Associated Transfers in (from SAG Mill) and out (to Pebble Discharge Conveyor)	1.51	0.680	0.126						9.07E-7	632,028	4,974,187	Pebble crusher building center	1,973.3	Pebble crusher building base
OC13	Pebble Discharge Conveyor to SAG Mill Feed Conveyor	0.176	0.0579	0.0164						1.06E-7	632,028	4,974,187	Pebble crusher building center	1,973.3	Pebble crusher building base
LS1L	Mill Lime Silo#1 Loading	0.00217	7.44E-4	1.09E-4							632,095	4,974,272	Mill Silo #1 center	1,992.0	Mill Silo #1 base
LS1U	Mill Lime Silo #1 Unloading to SAG Mill Conveyor	0.0105	0.00613	9.19E-4							632,095	4,974,272	Mill Silo #1 center	1,992.0	Mill Silo #1 base
MillS2L	Mill Lime Silo #2 Loading	0.00217	7.44E-4	1.09E-4							632,090	4,974,282	Mill Silo #2 center	1,990.0	Mill Silo #2 base
MillS2U	Mill Lime Silo #2 Unloading to SAG Mill Conveyor	0.0105	0.00613	9.19E-4							632,090	4,974,282	Mill Silo #2 center	1,990.0	Mill Silo #2 base
Sb1	Sb Drying (2.72 MMBtu/hr Propane-Fired)	0.0911	0.0911	0.0911	0.977	1.69	0.207	0.104		3.04E-6	632,231	4,974,183	Mill building corner	2,000.6	Mill building base
Sb2	Sb Bagging	0.517	0.517	0.517							632,208	4,974,221	Mill building corner	2,000.6	Mill building base
AC	Autoclave	22.2	22.2	22.2			2.86		3.94	2.21E-4	632,229	4,974,096	POX building corner	2,007.2	POX building base
ACB	POX Boiler (17 MMBtu/hr Propane-Fired)	0.00195	0.00195	0.00195	0.0209	0.0362	0.00443	0.00223		6.50E-8	632,261	4,974,116	POX building corner	2,007.2	POX building base
ACS1L	AC Lime Silo #1 Loading	0.00866	0.00298	4.38E-4							632,267	4,974,124	AC Silo #1 center	2,007.2	AC Silo #1 base
ACS1U	AC Lime Silo #1 Unloading to Lime Slaker	0.0420	0.0245	0.00350							632,267	4,974,124	AC Silo #1 center	2,007.2	AC Silo #1 base
ACS2L	AC Lime Silo #2 Loading	0.00866	0.00298	4.38E-4							632,257	4,974,140	AC Silo #2 center	2,007.2	AC Silo #2 base
ACS2U	AC Lime Silo #2 Unloading to Lime Slaker	0.0420	0.0245	0.00350							632,257	4,974,140	AC Silo #2 center	2,007.2	AC Silo #2 base

SOURCE DESCRIPTION		RELEASE PARAMETERS INPUT						MODEL EMISSION RATES / RELEASE PARAMETERS													
Model ID	Source Description	POINT VOLUME	rel ht (ft) rel ht (ft)	temp (F) width (ft)	flow (dscfm) vert. ln (ft)	flow (acfm) grnd ht (ft)	dia (ft) oz type	PM_{10}-24 gps	$PM_{2.5}$-24 gps	CO-ALL gps	NO_2-1 gps	SO_2-1 gps	SO_2-3 gps	PM_{10}-AN gps	$PM_{2.5}$-AN gps	NO_2-AN gps	SO_2-AN gps	Hg2+P gps	ht (m) ht (m)	temp (K) oy (m)	vel (m/s) oz (m)	dia (m)
OC1	Loader Transfer of Ore to Grizzly Screen	VOLUME	64	52.9	128	128	srf src	6.04E-03	1.71E-03					6.04E-03	1.71E-03			1.10E-08	19.5	3.75	18.1	
OC2	Grizzly Screen to Apron Feeder	VOLUME	64	52.9	128	128	srf src	6.04E-03	1.71E-03					6.04E-03	1.71E-03			1.10E-08	19.5	3.75	18.1	
OC3	Apron Feeder to Dribble Conveyor	VOLUME	64	52.9	128	128	srf src	6.04E-03	1.71E-03					6.04E-03	1.71E-03			1.10E-08	19.5	3.75	18.1	
OC4	Apron Feeder to Vibrating Grizzly	VOLUME	64	52.9	128	128	srf src	6.04E-03	1.71E-03					6.04E-03	1.71E-03			1.10E-08	19.5	3.75	18.1	
OC5	Dribble Conveyor to Vibrating Grizzly	VOLUME	64	52.9	128	128	srf src	6.04E-03	1.71E-03					6.04E-03	1.71E-03			1.10E-08	19.5	3.75	18.1	
OC6	Vibrating Grizzly to Primary Crusher or Coarse Ore Stockpile Feed Conveyor	VOLUME	64	52.9	128	128	srf src	6.04E-03	1.71E-03					6.04E-03	1.71E-03			1.10E-08	19.5	3.75	18.1	
OC7	Primary Crusher and Associated Transfers out to Coarse Ore Stockpile Feed Conveyor	VOLUME	64	52.9	128	128	srf src	7.09E-02	1.31E-02					7.09E-02	1.31E-02			9.45E-08	19.5	3.75	18.1	
OC8	Coarse Ore Stockpile Feed Conveyor Transfer to Stockpile	VOLUME	35.8	3	71.6	71.6	srf src	6.04E-03	1.71E-03					6.04E-03	1.71E-03			1.10E-08	10.9	0.213	10.2	
OC9	Stockpile Transfers to Reclaim Conveyors	VOLUME	4	8	8	8	srf src	3.19E-02	4.93E-03					3.19E-02	4.93E-03			5.22E-08	1.22	0.567	1.13	
OC10	Reclaim Conveyers to SAG Mill Feed Conveyor	VOLUME	4	8	8	8	srf src	3.19E-02	4.93E-03					3.19E-02	4.93E-03			5.22E-08	1.22	0.567	1.13	
OC11	SAG Mill Feed Conveyor Transfer to SAG Mill	VOLUME	68	4	4	70	elev src w/ bldg	3.98E-02	6.16E-03					3.98E-02	6.16E-03			6.52E-08	20.7	0.284	0.567	
OC12	Pebble Crusher and Associated Transfers in (from SAG Mill) and out (to Pebble Discharge Conveyor)	VOLUME	10	32.7	20	20	srf src	1.96E-02	3.62E-03					1.96E-02	3.62E-03			2.61E-08	3.05	2.32	2.84	
OC13	Pebble Discharge Conveyor to SAG Mill Feed Conveyor	VOLUME	10	32.7	20	20	srf src	1.67E-03	4.71E-04					1.67E-03	4.71E-04			3.04E-09	3.05	2.32	2.84	
LS1L	Mill Lime Silo#1 Loading	POINT	43.7	Ambient		0.155	1.0	4.46E-04	6.56E-05					2.14E-05	3.15E-06				13.3	0	0.00100	0.305
LS1U	Mill Lime Silo #1 Unloading to SAG Mill Conveyor	VOLUME	4.5	1	1	5	elev src w/ bldg	3.67E-03	5.51E-04					1.76E-04	2.64E-05				1.37	0.0709	0.142	
MillS2L	Mill Lime Silo #2 Loading	POINT	43.7	Ambient		0.155	1.0	4.46E-04	6.56E-05					2.14E-05	3.15E-06				13.3	0	0.00100	0.305
MillS2U	Mill Lime Silo #2 Unloading to SAG Mill Conveyor	VOLUME	4.5	1	1	5	elev src w/ bldg	3.67E-03	5.51E-04					1.76E-04	2.64E-05				1.37	0.0709	0.142	
Sb1	Sb Drying (2.72 MMBtu/hr Propane-Fired)	POINT	150	360		1,073	1.0	2.62E-03	2.62E-03	2.81E-02	4.87E-02	5.95E-03	5.95E-03	2.62E-03	2.62E-03	4.87E-02	5.95E-03	8.74E-08	45.7	455	6.94	0.305
Sb2	Sb Bagging	POINT	150	Ambient		982	1.0	1.49E-02	1.49E-02					1.49E-02	1.49E-02				45.7	0	6.35	0.305
AC	Autoclave	POINT	77	200	5,000	39,800	5.0	6.39E-01	6.39E-01			8.22E-02	8.22E-02	6.39E-01	6.39E-01		8.22E-02	6.36E-06	23.5	366	10.3	1.52
ACB	POX Boiler (17 MMBtu/hr Propane-Fired)	POINT	77	360		6,703	2.0	6.83E-04	6.83E-04	1.76E-01	3.04E-01	3.72E-02	3.72E-02	5.61E-05	5.61E-05	1.04E-03	1.27E-04	1.87E-09	23.5	455	10.8	0.610
ACS1L	AC Lime Silo #1 Loading	POINT	57.2	Ambient		0.155	1.0	1.78E-03	2.62E-04					8.56E-05	1.26E-05				17.4	0	0.00100	0.305
ACS1U	AC Lime Silo #1 Unloading to Lime Slaker	VOLUME	4.5	1	1	5	elev src w/ bldg	7.06E-03	1.01E-03					7.05E-04	1.01E-04				1.37	0.0709	0.142	
ACS2L	AC Lime Silo #2 Loading	POINT	57.2	Ambient		0.155	1.0	1.78E-03	2.62E-04					8.56E-05	1.26E-05				17.4	0	0.00100	0.305
ACS2U	AC Lime Silo #2 Unloading to Lime Slaker	VOLUME	4.5	1	1	5	elev src w/ bldg	7.06E-03	1.01E-03					7.05E-04	1.01E-04				1.37	0.0709	0.142	

SOURCE DESCRIPTION		OPERATING LIMITS							EMISSION FACTORS									
Model ID	Source Description	Design Throughput unit/hr	unit/day	unit/yr	units	Material	hr/yr	reference	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	H2S	unit	reference
ACS3L	AC Lime Silo #3 Loading	120	1,000	17,500	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.00099	0.00034	0.00005						lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.
ACS3U	AC Lime Silo #3 Unloading to Lime Slaker	20	480	17,500	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004						lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.
ACS4L	AC Lime Silo #4 Loading	120	500	8,750	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.00099	0.00034	0.00005						lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.
ACS42U	AC Lime Silo #4 Unloading to Lime Slaker	20	480	8,750	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004						lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.
CKD	Carbon Regeneration Kiln (Drum)	0.3		2,628	ton	Carbon	8,760	(M3 2017b)	0.42	0.42	0.42	0.12	0.012		0.11		lb/hr	Based on NDEP-BAPC Permit for Carbon Regeneration Kiln [Goldstrike (NDEP 2019)]
CKB	Carbon Regeneration Kiln (Burners)	2.255		19,754	MMBtu	Propane	8,760	(M3 2017b)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
EW	Electrowinning Cells & Pregnant Solution Tank	100 gpm			gal	Au Sol'n	8,760	Typical Ind. Oper.										
MR	Mercury Retort	0.5/batch	24 hr	21	ton	Au Conc	1,248	(M3 2017b) & (M3 2017a)										
MF	Induction Melting Furnace	0.5/batch	12 hr	21	ton	Au Conc	624	(M3 2017b) & (M3 2017a)	3.5	3.5	3.5						lb/hr	Based on NDEP-BAPC Permit for Melting Furnace [Goldstrike (NDEP 2019)]
EDG1	Camp Emergency Generator (Mfr. Yr. >2007; diesel)	1000	0.27 hr	100,000	bkW	Diesel	100	(M3 2017a)	0.2	0.2	0.2	3.5	6.4	0.00657	1.3		g/kW-hr	40 CFR Subpart 60.4202(a)(2); SO2 mass balance (15ppm ULSD) (CFR 2018b)
EDG2	Plant Emergency Generator #1 (Mfr. Yr. >2007; diesel)	1000	0.27 hr	100,000	bkW	Diesel	100	(M3 2017a)	0.2	0.2	0.2	3.5	6.4	0.00657	1.3		g/kW-hr	40 CFR Subpart 60.4202(a)(2); SO2 mass balance (15ppm ULSD) (CFR 2018b)
EDG3	Plant Emergency Generator #2 (Mfr. Yr. >2007; diesel)	1000	0.27 hr	100,000	bkW	Diesel	100	(M3 2017a)	0.2	0.2	0.2	3.5	6.4	0.00657	1.3		g/kW-hr	40 CFR Subpart 60.4202(a)(2); SO2 mass balance (15ppm ULSD) (CFR 2018b)
EDFP	Mill Fire Pump (Mfr. Yr. >2009; diesel)	200	0.27 hr	20,000	bkW	Diesel	100	Typical Ind. Oper.	0.2	0.2	0.2	3.5	4	0.00657	4		g/kW-hr	Table 4 to Subpart IIII of Part 60—130≤KW<225 (175≤HP<300); SO2 - mass balance (15ppm ULSD) (CFR
PV	Propane Vaporizer (0.4 MMBtu/hr Propane-Fired)	0.10		876	MMBtu	Propane	8,760	(M3 2017a)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
HS	Strip Circuit Solution Heater (5 MMBtu, Propane-Fired)	5.00		43,800	MMBtu	Propane	8,760	(M3 2017b)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
H1M	Mine Air Heater #1 (4 MMBtu/hr Propane-Fired)	4.00		35,040	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
H2M	Mine Air Heater #2 (4 MMBtu/hr Propane-Fired)	4.00		35,040	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
HM	Mill HVAC Heaters (4 x 1.0 MMBtu Propane-Fired)	4.00		35,040	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
HAC	Autoclave HVAC Heater (1 x 0.25 MMBtu Propane-Fired)	0.25		2,190	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
HR	Refinery HVAC Heaters (1 x 0.25 MMBtu Propane-Fired)	0.25		2,190	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
HA	Admin HVAC Heaters (1 x 0.25 MMBtu Propane-Fired)	0.25		2,190	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
HMO	Mine Ops. HVAC Heaters (2 x 0.25 MMBtu Propane-Fired)	0.50		4,380	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
HTS	Truck Shop HVAC Heaters (2 x 1.0 MMBtu Propane-Fired)	2.00		17,520	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal

SOURCE DESCRIPTION		EMISSION CONTROLS			HOURLY EMISSIONS								DAILY EMISSIONS							
Model ID	Source Description	control system	efficiency	reference	PM lb/hr	PM_{10} lb/hr	$PM_{2.5}$ lb/hr	CO lb/hr	NOx lb/hr	SO_2 lb/hr	VOC lb/hr	H2S lb/hr	PM lb/day	PM_{10} lb/day	$PM_{2.5}$ lb/day	CO lb/day	NOx lb/day	SO_2 lb/day	VOC lb/day	H2S lb/day
ACS3L	AC Lime Silo #3 Loading	Bin Vent		Control efficiency included in emission factor	0.119	0.0408	0.00600						0.990	0.340	0.0500					
ACS3U	AC Lime Silo #3 Unloading to Lime Slaker	None	0%		0.0960	0.0560	0.00800						2.30	1.34	0.192					
ACS4L	AC Lime Silo #4 Loading	Bin Vent		Control efficiency included in emission factor	0.119	0.0408	0.00600						0.495	0.170	0.0250					
ACS42U	AC Lime Silo #4 Unloading to Lime Slaker	None	0%		0.0960	0.0560	0.00800						2.30	1.34	0.192					
CKD	Carbon Regeneration Kiln (Drum)	Wet Scrubber / Carbon Filter	NA	PM control efficiency included in emission factor	0.420	0.420	0.420	0.120	0.0120		0.110		10.1	10.1	10.1	2.88	0.288	0	2.64	
CKB	Carbon Regeneration Kiln (Burners)	None	NA		0.0173	0.0173	0.0173	0.185	0.320	0.0392	0.0197		0.414	0.414	0.414	4.44	7.69	0.940	0.473	
EW	Electrowinning Cells & Pregnant Solution Tank	Shared Carbon Filter																		
MR	Mercury Retort	Condenser / Carbon Filter																		
MF	Induction Melting Furnace	Baghouse / Carbon Filter	NA	Control efficiency included in emission factor	3.50	3.50	3.50						42.0	42.0	42.0					
EDG1	Camp Emergency Generator (Mfr. Yr. >2007; diesel)	None	NA		0.441	0.441	0.441	7.72	14.1	0.0145	2.87		0.119	0.119	0.119	2.08	3.81	0.00391	0.774	
EDG2	Plant Emergency Generator #1 (Mfr. Yr. >2007; diesel)	None	NA		0.441	0.441	0.441	7.72	14.1	0.0145	2.87		0.119	0.119	0.119	2.08	3.81	0.00391	0.774	
EDG3	Plant Emergency Generator #2 (Mfr. Yr. >2007; diesel)	None	NA		0.441	0.441	0.441	7.72	14.1	0.0145	2.87		0.119	0.119	0.119	2.08	3.81	0.00391	0.774	
EDFP	Mill Fire Pump (Mfr. Yr. >2009; diesel)	None	NA		0.0882	0.0882	0.0882	1.54	1.76	0.00290	1.76		0.0238	0.0238	0.0238	0.417	0.476	7.82E-4	0.476	
PV	Propane Vaporizer (0.4 MMBtu/hr Propane-Fired)	None	NA		7.65E-4	7.65E-4	7.65E-4	0.00820	0.0142	0.00174	8.74E-4		0.0184	0.0184	0.0184	0.197	0.341	0.0417	0.0210	
HS	Strip Circuit Solution Heater (5 MMBtu, Propane-Fired)	None	NA		0.0383	0.0383	0.0383	0.410	0.710	0.0869	0.0437		0.918	0.918	0.918	9.84	17.0	2.09	1.05	
H1M	Mine Air Heater #1 (4 MMBtu/hr Propane-Fired)	None	NA		0.0306	0.0306	0.0306	0.328	0.568	0.0695	0.0350		0.734	0.734	0.734	7.87	13.6	1.67	0.839	
H2M	Mine Air Heater #2 (4 MMBtu/hr Propane-Fired)	None	NA		0.0306	0.0306	0.0306	0.328	0.568	0.0695	0.0350		0.734	0.734	0.734	7.87	13.6	1.67	0.839	
HM	Mill HVAC Heaters (4 x 1.0 MMBtu Propane-Fired)	None	NA		0.0306	0.0306	0.0306	0.328	0.568	0.0695	0.0350		0.734	0.734	0.734	7.87	13.6	1.67	0.839	
HAC	Autoclave HVAC Heater (1 x 0.25 MMBtu Propane-Fired)	None	NA		0.00191	0.00191	0.00191	0.0205	0.0355	0.00434	0.00219		0.0459	0.0459	0.0459	0.492	0.852	0.104	0.0525	
HR	Refinery HVAC Heaters (1 x 0.25 MMBtu Propane-Fired)	None	NA		0.00191	0.00191	0.00191	0.0205	0.0355	0.00434	0.00219		0.0459	0.0459	0.0459	0.492	0.852	0.104	0.0525	
HA	Admin HVAC Heaters (1 x 0.25 MMBtu Propane-Fired)	None	NA		0.00191	0.00191	0.00191	0.0205	0.0355	0.00434	0.00219		0.0459	0.0459	0.0459	0.492	0.852	0.104	0.0525	
HMO	Mine Ops. HVAC Heaters (2 x 0.25 MMBtu Propane-Fired)	None	NA		0.00383	0.00383	0.00383	0.0410	0.0710	0.00869	0.00437		0.0918	0.0918	0.0918	0.984	1.70	0.209	0.105	
HTS	Truck Shop HVAC Heaters (2 x 1.0 MMBtu Propane-Fired)	None	NA		0.0153	0.0153	0.0153	0.164	0.284	0.0348	0.0175		0.367	0.367	0.367	3.93	6.82	0.834	0.420	

SOURCE DESCRIPTION		ANNUAL EMISSIONS									NAD 83 LOCATION				
Model ID	Source Description	PM ton/yr	PM_{10} ton/yr	$PM_{2.5}$ ton/yr	CO ton/yr	NOx ton/yr	SO_2 ton/yr	VOC ton/yr	H2S ton/yr	Hg2+P ton/yr	UTM E m	UTM N m	reference	elev m	reference
ACS3L	AC Lime Silo #3 Loading	0.00866	0.00298	4.38E-4							632,248	4,974,156	AC Silo #3 center	2,007.2	AC Silo #3 base
ACS3U	AC Lime Silo #3 Unloading to Lime Slaker	0.0420	0.0245	0.00350							632,248	4,974,156	AC Silo #3 center	2,007.2	AC Silo #3 base
ACS4L	AC Lime Silo #4 Loading	0.00433	0.00149	2.19E-4							632,238	4,974,171	AC Silo #4 center	2,007.2	AC Silo #4 base
ACS42U	AC Lime Silo #4 Unloading to Lime Slaker	0.0210	0.0123	0.00175							632,238	4,974,171	AC Silo #4 center	2,007.2	AC Silo #4 base
CKD	Carbon Regeneration Kiln (Drum)	1.84	1.84	1.84	0.526	0.0526		0.482		6.51E-6	632,013	4,974,051	Refinery building corner	1,970.3	Refinery building base
CKB	Carbon Regeneration Kiln (Burners)	0.0756	0.0756	0.0756	0.810	1.40	0.172	0.0864		2.52E-6	631,998	4,974,042	Along Refinery building wall	1,970.3	Refinery building base
EW	Electrowinning Cells & Pregnant Solution Tank									6.51E-6	631,983	4,974,033	Refinery building corner	1,970.3	Refinery building base
MR	Mercury Retort									6.51E-6	632,003	4,974,001	Refinery building corner	1,970.3	Refinery building base
MF	Induction Melting Furnace	1.09	1.09	1.09						6.51E-6	632,032	4,974,019	Refinery building corner	1,970.3	Refinery building base
EDG1	Camp Emergency Generator (Mfr. Yr. >2007; diesel)	0.0220	0.0220	0.0220	0.386	0.705	7.24E-4	0.143			634,274	4,972,050	Outside Recreation building	2,114.0	Recreation building base
EDG2	Plant Emergency Generator #1 (Mfr. Yr. >2007; diesel)	0.0220	0.0220	0.0220	0.386	0.705	7.24E-4	0.143			632,105	4,974,154	Outside Mill building	2,001.0	Mill building base
EDG3	Plant Emergency Generator #2 (Mfr. Yr. >2007; diesel)	0.0220	0.0220	0.0220	0.386	0.705	7.24E-4	0.143			632,109	4,974,148	Outside Mill building	2,002.0	Mill building base
EDFP	Mill Fire Pump (Mfr. Yr. >2009; diesel)	0.00441	0.00441	0.00441	0.0772	0.0882	1.45E-4	0.0882			632,113	4,974,141	Outside Mill building	2,003.0	Mill building base
PV	Propane Vaporizer (0.4 MMBtu/hr Propane-Fired)	0.00335	0.00335	0.00335	0.0359	0.0622	0.00761	0.00383		1.12E-7	632,216	4,974,118	POX building corner	2,007.2	POX building base
HS	Strip Circuit Solution Heater (5 MMBtu, Propane-Fired)	0.168	0.168	0.168	1.80	3.11	0.381	0.191		5.58E-6	632,017	4,974,010	Along Refinery building wall	1,970.3	Refinery building base
H1M	Mine Air Heater #1 (4 MMBtu/hr Propane-Fired)	0.134	0.134	0.134	1.44	2.49	0.304	0.153		4.47E-6	632,287	4,974,227	Near underground mine shaft	2,000.0	Mine shaft base
H2M	Mine Air Heater #2 (4 MMBtu/hr Propane-Fired)	0.134	0.134	0.134	1.44	2.49	0.304	0.153		4.47E-6	632,288	4,974,228	Near underground mine shaft	2,000.0	Mine shaft base
HM	Mill HVAC Heaters (4 x 1.0 MMBtu Propane-Fired)	0.134	0.134	0.134	1.44	2.49	0.304	0.153		4.47E-6	632,168	4,974,191	Mill building center	2,000.6	Mill building base
HAC	Autoclave HVAC Heater (1 x 0.25 MMBtu Propane-Fired)	0.00838	0.00838	0.00838	0.0898	0.156	0.0190	0.00957		2.79E-7	632,238	4,974,130	POX building center	2,007.2	POX building base
HR	Refinery HVAC Heaters (1 x 0.25 MMBtu Propane-Fired)	0.00838	0.00838	0.00838	0.0898	0.156	0.0190	0.00957		2.79E-7	632,008	4,974,026	Refinery building center	1,970.3	Refinery building base
HA	Admin HVAC Heaters (1 x 0.25 MMBtu Propane-Fired)	0.00838	0.00838	0.00838	0.0898	0.156	0.0190	0.00957		2.79E-7	632,038	4,973,751	Admin building center	1,979.0	Admin building base
HMO	Mine Ops. HVAC Heaters (2 x 0.25 MMBtu Propane-Fired)	0.0168	0.0168	0.0168	0.180	0.311	0.0381	0.0191		5.58E-7	631,889	4,973,472	Mine Ops building center	1,988.5	Mine Ops building base
HTS	Truck Shop HVAC Heaters (2 x 1.0 MMBtu Propane-Fired)	0.0670	0.0670	0.0670	0.718	1.24	0.152	0.0766		2.23E-6	631,848	4,973,398	Truck Shop building center	1,991.8	Truck Shop building base

SOURCE DESCRIPTION		RELEASE PARAMETERS INPUT						MODEL EMISSION RATES / RELEASE PARAMETERS													
Model ID	Source Description	POINT VOLUME	rel ht (ft) rel ht (ft)	temp (F) width (ft)	flow (dscfm) vert. ln (ft)	flow (acfm) grnd ht (ft)	dia (ft) oz type	PM_{10}-24 gps	$PM_{2.5}$-24 gps	CO-ALL gps	NO_2-1 gps	SO_2-1 gps	SO_2-3 gps	PM_{10}-AN gps	$PM_{2.5}$-AN gps	NO_2-AN gps	SO_2-AN gps	Hg2+P gps	ht (m) ht (m)	temp (K) oy (m)	vel (m/s) oz (m)	dia (m)
ACS3L	AC Lime Silo #3 Loading	POINT	57.2	Ambient		0.155	1.0	1.78E-03	2.62E-04					8.56E-05	1.26E-05				17.4	0	0.00100	0.305
ACS3U	AC Lime Silo #3 Unloading to Lime Slaker	VOLUME	4.5	1	1	5	elev src w/ bldg	7.06E-03	1.01E-03					7.05E-04	1.01E-04				1.37	0.0709	0.142	
ACS4L	AC Lime Silo #4 Loading	POINT	47.5	Ambient		0.155	1.0	8.92E-04	1.31E-04					4.28E-05	6.29E-06				14.5	0	0.00100	0.305
ACS42U	AC Lime Silo #4 Unloading to Lime Slaker	VOLUME	4.5	1	1	5	elev src w/ bldg	7.06E-03	1.01E-03					3.52E-04	5.03E-05				1.37	0.0709	0.142	
CKD	Carbon Regeneration Kiln (Drum)	POINT	55	150	1,500	2,300	1.3	5.29E-02	5.29E-02	1.51E-02	1.51E-03			5.29E-02	5.29E-02	1.51E-03		1.87E-07	16.8	339	9.52	0.381
CKB	Carbon Regeneration Kiln (Burners)	POINT	46	360		889	1.0	2.17E-03	2.17E-03	2.33E-02	4.04E-02	4.94E-03	4.94E-03	2.17E-03	2.17E-03	4.04E-02	4.94E-03	7.24E-08	14.0	455	5.75	0.305
EW	Electrowinning Cells & Pregnant Solution Tank	POINT	55	150	3,000	8,800	2.5											1.87E-07	16.8	339	9.11	0.762
MR	Mercury Retort	POINT	55	85	100	100	0.5											1.87E-07	16.8	303	2.59	0.152
MF	Induction Melting Furnace	POINT	55	150	5,000	7,700	2.3	2.20E-01	2.20E-01					3.14E-02	3.14E-02			1.87E-07	16.8	339	9.84	0.686
EDG1	Camp Emergency Generator (Mfr. Yr. >2007; diesel)	POINT	7	1,100		7,701	0.8	6.25E-04	6.25E-04	9.72E-01	2.03E-02	2.08E-05	1.82E-03	6.34E-04	6.34E-04	2.03E-02	2.08E-05		2.13	866	77.8	0.244
EDG2	Plant Emergency Generator #1 (Mfr. Yr. >2007; diesel)	POINT	7	1,100		7,701	0.8	6.25E-04	6.25E-04	9.72E-01	2.03E-02	2.08E-05	1.82E-03	6.34E-04	6.34E-04	2.03E-02	2.08E-05		2.13	866	77.8	0.244
EDG3	Plant Emergency Generator #2 (Mfr. Yr. >2007; diesel)	POINT	7	1,100		7,701	0.8	6.25E-04	6.25E-04	9.72E-01	2.03E-02	2.08E-05	1.82E-03	6.34E-04	6.34E-04	2.03E-02	2.08E-05		2.13	866	77.8	0.244
EDFP	Mill Fire Pump (Mfr. Yr. >2009; diesel)	POINT	7	1,100		1,540	0.4	1.25E-04	1.25E-04	1.94E-01	2.54E-03	4.16E-06	3.65E-04	1.27E-04	1.27E-04	2.54E-03	4.16E-06		2.13	866	62.3	0.122
PV	Propane Vaporizer (0.4 MMBtu/hr Propane-Fired)	POINT	68	360		39	0.4	9.64E-05	9.64E-05	1.03E-03	1.79E-03	2.19E-04	2.19E-04	9.64E-05	9.64E-05	1.79E-03	2.19E-04	3.21E-09	20.7	455	1.58	0.122
HS	Strip Circuit Solution Heater (5 MMBtu, Propane-Fired)	POINT	46	360		1,972	1.3	4.82E-03	4.82E-03	5.16E-02	8.95E-02	1.09E-02	1.09E-02	4.82E-03	4.82E-03	8.95E-02	1.09E-02	1.61E-07	14.0	455	7.55	0.396
H1M	Mine Air Heater #1 (4 MMBtu/hr Propane-Fired)	POINT	7	360		1,577	1.3	3.86E-03	3.86E-03	4.13E-02	7.16E-02	8.76E-03	8.76E-03	3.86E-03	3.86E-03	7.16E-02	8.76E-03	1.28E-07	2.13	455	6.04	0.396
H2M	Mine Air Heater #2 (4 MMBtu/hr Propane-Fired)	POINT	7	360		1,577	0.7	3.86E-03	3.86E-03	4.13E-02	7.16E-02	8.76E-03	8.76E-03	3.86E-03	3.86E-03	7.16E-02	8.76E-03	1.28E-07	2.13	455	20.8	0.213
HM	Mill HVAC Heaters (4 x 1.0 MMBtu Propane-Fired)	POINT	141	360		394	0.3	3.86E-03	3.86E-03	4.13E-02	7.16E-02	8.76E-03	8.76E-03	3.86E-03	3.86E-03	7.16E-02	8.76E-03	1.28E-07	43.0	455	28.3	0.0914
HAC	Autoclave HVAC Heater (1 x 0.25 MMBtu Propane-Fired)	POINT	68	360		99	0.3	2.41E-04	2.41E-04	2.58E-03	4.48E-03	5.47E-04	5.47E-04	2.41E-04	2.41E-04	4.48E-03	5.47E-04	8.03E-09	20.7	455	7.11	0.0914
HR	Refinery HVAC Heaters (1 x 0.25 MMBtu Propane-Fired)	POINT	46	360		99	0.3	2.41E-04	2.41E-04	2.58E-03	4.48E-03	5.47E-04	5.47E-04	2.41E-04	2.41E-04	4.48E-03	5.47E-04	8.03E-09	14.0	455	7.11	0.0914
HA	Admin HVAC Heaters (1 x 0.25 MMBtu Propane-Fired)	POINT	21	360		99	0.3	2.41E-04	2.41E-04	2.58E-03	4.48E-03	5.47E-04	5.47E-04	2.41E-04	2.41E-04	4.48E-03	5.47E-04	8.03E-09	6.40	455	7.11	0.0914
HMO	Mine Ops. HVAC Heaters (2 x 0.25 MMBtu Propane-Fired)	POINT	41	360		99	0.7	4.82E-04	4.82E-04	5.16E-03	8.95E-03	1.09E-03	1.09E-03	4.82E-04	4.82E-04	8.95E-03	1.09E-03	1.61E-08	12.5	455	1.31	0.213
HTS	Truck Shop HVAC Heaters (2 x 1.0 MMBtu Propane-Fired)	POINT	41	360		394	0.7	1.93E-03	1.93E-03	2.07E-02	3.58E-02	4.38E-03	4.38E-03	1.93E-03	1.93E-03	3.58E-02	4.38E-03	6.42E-08	12.5	455	5.20	0.213

SOURCE DESCRIPTION		OPERATING LIMITS							EMISSION FACTORS									
Model ID	Source Description	Design Throughput unit/hr	unit/day	unit/yr	units	Material	hr/yr	reference	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	H2S	unit	reference
HW	Warehouse HVAC Heaters (3 x 1.0 MMBtu Propane-Fired)	3.00		26,280	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
PSL	Prill Silos Loading (2 x 100 ton)	200	200	7,300	ton	Prill	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.02	0.007	0.00106						lb/ton	AP-42, Table 8.3-2 (7/93), Bulk Loading - unctrl; PM10/PM2.5 Ch. 13.2.4
PSU	Prill Silos Unloading (2 x 100 ton)	200	200	7,300	ton	Prill	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.02	0.007	0.00106						lb/ton	AP-42, Table 8.3-2 (7/93), Bulk Loading - unctrl; PM10/PM2.5 Ch. 13.2.4
CS1L	Cement/Shotcrete Silo#1 Loading	80	80	60,000	ton	Cement	8,760	Typical Ind. Oper.	0.00099	0.00034	0.00005						lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.
CS1U	Cement/Shotcrete Silo#1 Unloading	20	80	60,000	ton	Cement	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004						lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.
CS2L	Cement/Shotcrete Silo#2 Loading	80	80	60,000	ton	Cement	8,760	Typical Ind. Oper.	0.00099	0.00034	0.00005						lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.
CS2U	Cement/Shotcrete Silo#2 Unloading	20	80	60,000	ton	Cement	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004						lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.
CAL	Aggregate Bin Loading	100	2,400	500,000	ton	Aggregate	8,760	Typical Ind. Oper.	0.0069	0.0033	0.0005						lb/ton	AP-42, Table 11.12-2 (6/06), aggregate transfer-unctrl.
CAU	Aggregate Bin Unloading	100	2,400	500,000	ton	Aggregate	8,760	Typical Ind. Oper.	0.0069	0.0033	0.0005						lb/ton	AP-42, Table 11.12-2 (6/06), aggregate transfer-unctrl.
CM	Central Mixer Loading	20 (120)	80 (2,480)	60,000 (560K)	ton-cement	Cement	8,760	Typical Ind. Oper.	0.0184	0.0055	0.0008						lb/ton	AP-42, Table 11.12-2 (6/06), central mixer-ctrl.
HL	Landmark/Stibnite Heaters (3 x 1.0 MMBtu Propane-Fired)	3.00		26,280	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
TG1	Mine Site Gasoline Tank #1			250,000	gal	Gasoline	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide tank capacity)							0.219		lb/hr	EPA Tanks 4.0.9d
TG2	Mine Site Gasoline Tank #2			250,000	gal	Gasoline	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide tank capacity)							0.219		lb/hr	EPA Tanks 4.0.9d
TD3	Mine Site Diesel Tank #3			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018g)							0.002		lb/hr	EPA Tanks 4.0.9d
TD4	Mine Site Diesel Tank #4			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018g)							0.002		lb/hr	EPA Tanks 4.0.9d
TD5	Mine Site Diesel Tank #5			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018g)							0.002		lb/hr	EPA Tanks 4.0.9d
TD6	Mine Site Diesel Tank #6			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018g)							0.002		lb/hr	EPA Tanks 4.0.9d
TD7	Mine Site Diesel Tank #7			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018g)							0.002		lb/hr	EPA Tanks 4.0.9d
TD8	Mine Site Diesel Tank #8			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018g)							0.002		lb/hr	EPA Tanks 4.0.9d
TD9	Mine Site Diesel Tank #9			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018g)							0.002		lb/hr	EPA Tanks 4.0.9d
TD10	Mine Site Diesel Tank #10			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018g)							0.002		lb/hr	EPA Tanks 4.0.9d
TDL1	Landmark Diesel Tank #1			130,000	gal	Diesel	8,760	(Midas Gold 2018d), (Midas Gold 2018g)							0.000		lb/hr	EPA Tanks 4.0.9d
TDL2	Landmark Diesel Tank #2			130,000	gal	Diesel	8,760	(Midas Gold 2018d), (Midas Gold 2018g)							0.000		lb/hr	EPA Tanks 4.0.9d
TGL3	Landmark Gasoline Tank #3			130,000	gal	Gasoline	8,760	(Midas Gold 2018d), (Midas Gold 2018g)							0.118		lb/hr	EPA Tanks 4.0.9d

SOURCE DESCRIPTION		EMISSION CONTROLS			HOURLY EMISSIONS								DAILY EMISSIONS							
Model ID	Source Description	control system	efficiency	reference	PM lb/hr	PM_{10} lb/hr	$PM_{2.5}$ lb/hr	CO lb/hr	NOx lb/hr	SO_2 lb/hr	VOC lb/hr	H2S lb/hr	PM lb/day	PM_{10} lb/day	$PM_{2.5}$ lb/day	CO lb/day	NOx lb/day	SO_2 lb/day	VOC lb/day	H2S lb/day
HW	Warehouse HVAC Heaters (3 x 1.0 MMBtu Propane-Fired)	None	NA		0.0230	0.0230	0.0230	0.246	0.426	0.0521	0.0262		0.551	0.551	0.551	5.90	10.2	1.25	0.630	
PSL	Prill Silos Loading (2 x 100 ton)	None	0%		4.00	1.40	0.212						4.00	1.40	0.212					
PSU	Prill Silos Unloading (2 x 100 ton)	None	0%		4.00	1.40	0.212						4.00	1.40	0.212					
CS1L	Cement/Shotcrete Silo#1 Loading	Bin Vent		Control efficiency included in emission factor	0.0792	0.0272	0.00400						0.0792	0.0272	0.00400					
CS1U	Cement/Shotcrete Silo#1 Unloading	None	0%		0.0960	0.0560	0.00800						0.384	0.224	0.0320					
CS2L	Cement/Shotcrete Silo#2 Loading	Bin Vent		Control efficiency included in emission factor	0.0792	0.0272	0.00400						0.0792	0.0272	0.00400					
CS2U	Cement/Shotcrete Silo#2 Unloading	None	0%		0.0960	0.0560	0.00800						0.384	0.224	0.0320					
CAL	Aggregate Bin Loading	None	0%		0.690	0.330	0.0500						16.6	7.92	1.20					
CAU	Aggregate Bin Unloading	None	0%		0.690	0.330	0.0500						16.6	7.92	1.20					
CM	Central Mixer Loading	Bin Vent OR Enclosure		Control efficiency included in emission factor	0.368	0.110	0.0160						1.47	0.440	0.0640					
HL	Landmark/Stibnite Heaters (3 x 1.0 MMBtu Propane-Fired)	None	NA		0.0230	0.0230	0.0230	0.246	0.426	0.0521	0.0262		0.551	0.551	0.551	5.90	10.2	1.25	0.630	
TG1	Mine Site Gasoline Tank #1	None	NA								0.219								5.25	
TG2	Mine Site Gasoline Tank #2	None	NA								0.219								5.25	
TD3	Mine Site Diesel Tank #3	None	NA								0.00167								0.0400	
TD4	Mine Site Diesel Tank #4	None	NA								0.00167								0.0400	
TD5	Mine Site Diesel Tank #5	None	NA								0.00167								0.0400	
TD6	Mine Site Diesel Tank #6	None	NA								0.00167								0.0400	
TD7	Mine Site Diesel Tank #7	None	NA								0.00167								0.0400	
TD8	Mine Site Diesel Tank #8	None	NA								0.00167								0.0400	
TD9	Mine Site Diesel Tank #9	None	NA								0.00167								0.0400	
TD10	Mine Site Diesel Tank #10	None	NA								0.00167								0.0400	
TDL1	Landmark Diesel Tank #1	None	NA								2.29E-4								0.00551	
TDL2	Landmark Diesel Tank #2	None	NA								2.29E-4								0.00551	
TGL3	Landmark Gasoline Tank #3	None	NA								0.118								2.84	

SOURCE DESCRIPTION		ANNUAL EMISSIONS									NAD 83 LOCATION				
Model ID	Source Description	PM ton/yr	PM_{10} ton/yr	$PM_{2.5}$ ton/yr	CO ton/yr	NOx ton/yr	SO_2 ton/yr	VOC ton/yr	H2S ton/yr	Hg2+P ton/yr	UTM E m	UTM N m	reference	elev m	reference
HW	Warehouse HVAC Heaters (3 x 1.0 MMBtu Propane-Fired)	0.101	0.101	0.101	1.08	1.87	0.228	0.115		3.35E-6	632,060	4,973,664	Warehouse building center	1,983.9	Warehouse building base
PSL	Prill Silos Loading (2 x 100 ton)	0.0730	0.0256	0.00387							632,346	4,973,500	Prill Silo #1 center	2,010.0	Prill Silo #1 base
PSU	Prill Silos Unloading (2 x 100 ton)	0.0730	0.0256	0.00387							632,346	4,973,500	Prill Silo #1 center	2,010.0	Prill Silo #1 base
CS1L	Cement/Shotcrete Silo#1 Loading	0.0297	0.0102	0.00150							632,165	4,973,562	Aggregate stockpile center	1,990.0	Aggregate stockpile base
CS1U	Cement/Shotcrete Silo#1 Unloading	0.144	0.0840	0.0120							632,165	4,973,562	Aggregate stockpile center	1,990.0	Aggregate stockpile base
CS2L	Cement/Shotcrete Silo#2 Loading	0.0297	0.0102	0.00150							632,165	4,973,562	Aggregate stockpile center	1,990.0	Aggregate stockpile base
CS2U	Cement/Shotcrete Silo#2 Unloading	0.144	0.0840	0.0120							632,165	4,973,562	Aggregate stockpile center	1,990.0	Aggregate stockpile base
CAL	Aggregate Bin Loading	1.73	0.825	0.125							632,165	4,973,562	Aggregate stockpile center	1,990.0	Aggregate stockpile base
CAU	Aggregate Bin Unloading	1.73	0.825	0.125							632,165	4,973,562	Aggregate stockpile center	1,990.0	Aggregate stockpile base
CM	Central Mixer Loading	0.552	0.165	0.0240							632,165	4,973,562	Aggregate stockpile center	1,990.0	Aggregate stockpile base
HL	Landmark/Stibnite Heaters (3 x 1.0 MMBtu Propane-Fired)	0.101	0.101	0.101	1.08	1.87	0.228	0.115		3.35E-6	634,332	4,972,082	Dormitory 3 center	2,118.0	Dormitory 3 building base
TG1	Mine Site Gasoline Tank #1							0.957							
TG2	Mine Site Gasoline Tank #2							0.957							
TD3	Mine Site Diesel Tank #3							0.00730							
TD4	Mine Site Diesel Tank #4							0.00730							
TD5	Mine Site Diesel Tank #5							0.00730							
TD6	Mine Site Diesel Tank #6							0.00730							
TD7	Mine Site Diesel Tank #7							0.00730							
TD8	Mine Site Diesel Tank #8							0.00730							
TD9	Mine Site Diesel Tank #9							0.00730							
TD10	Mine Site Diesel Tank #10							0.00730							
TDL1	Landmark Diesel Tank #1							0.00101							
TDL2	Landmark Diesel Tank #2							0.00101							
TGL3	Landmark Gasoline Tank #3							0.518							

SOURCE DESCRIPTION		RELEASE PARAMETERS INPUT						MODEL EMISSION RATES / RELEASE PARAMETERS														
Model ID	Source Description	POINT VOLUME	rel ht (ft) rel ht (ft)	temp (F) width (ft)	flow (dscfm) vert. ln (ft)	flow (acfm) grnd ht (ft)	dia (ft) oz type	PM_{10}-24 gps	$PM_{2.5}$-24 gps	CO-ALL gps	NO_2-1 gps	SO_2-1 gps	SO_2-3 gps	PM_{10}-AN gps	$PM_{2.5}$-AN gps	NO_2-AN gps	SO_2-AN gps	Hg2+P gps	ht (m) ht (m)	temp (K) oy (m)	vel (m/s) oz (m)	dia (m)
HW	Warehouse HVAC Heaters (3 x 1.0 MMBtu Propane-Fired)	POINT	41	360		394	0.7	2.89E-03	2.89E-03	3.10E-02	5.37E-02	6.57E-03	6.57E-03	2.89E-03	2.89E-03	5.37E-02	6.57E-03	9.64E-08	12.5	455	5.20	0.213
PSL	Prill Silos Loading (2 x 100 ton)	POINT	25.5	Ambient		0	1.0	7.35E-03	1.11E-03					7.35E-04	1.11E-04				7.77	0	0.00100	0.305
PSU	Prill Silos Unloading (2 x 100 ton)	VOLUME	4.5	1	1	5	elev src w/ bldg	7.35E-03	1.11E-03					7.35E-04	1.11E-04				1.37	0.0709	0.142	
CS1L	Cement/Shotcrete Silo#1 Loading	VOLUME	5	72.2	10	10	srf src	1.43E-04	2.10E-05					2.93E-04	4.32E-05				1.52	5.12	1.42	
CS1U	Cement/Shotcrete Silo#1 Unloading	VOLUME	5	72.2	10	10	srf src	1.18E-03	1.68E-04					2.42E-03	3.45E-04				1.52	5.12	1.42	
CS2L	Cement/Shotcrete Silo#2 Loading	VOLUME	5	72.2	10	10	srf src	1.43E-04	2.10E-05					2.93E-04	4.32E-05				1.52	5.12	1.42	
CS2U	Cement/Shotcrete Silo#2 Unloading	VOLUME	5	72.2	10	10	srf src	1.18E-03	1.68E-04					2.42E-03	3.45E-04				1.52	5.12	1.42	
CAL	Aggregate Bin Loading	VOLUME	5	72.2	10	10	srf src	4.16E-02	6.30E-03					2.37E-02	3.60E-03				1.52	5.12	1.42	
CAU	Aggregate Bin Unloading	VOLUME	5	72.2	10	10	srf src	4.16E-02	6.30E-03					2.37E-02	3.60E-03				1.52	5.12	1.42	
CM	Central Mixer Loading	VOLUME	5	72.2	10	10	srf src	2.31E-03	3.36E-04					4.75E-03	6.90E-04				1.52	5.12	1.42	
HL	Landmark/Stibnite Heaters (3 x 1.0 MMBtu Propane-Fired)	POINT	36	360		394	0.7	2.89E-03	2.89E-03	3.10E-02	5.37E-02	6.57E-03	6.57E-03	2.89E-03	2.89E-03	5.37E-02	6.57E-03	9.64E-08	11.0	455	5.20	0.213
TG1	Mine Site Gasoline Tank #1																					
TG2	Mine Site Gasoline Tank #2																					
TD3	Mine Site Diesel Tank #3																					
TD4	Mine Site Diesel Tank #4																					
TD5	Mine Site Diesel Tank #5																					
TD6	Mine Site Diesel Tank #6																					
TD7	Mine Site Diesel Tank #7																					
TD8	Mine Site Diesel Tank #8																					
TD9	Mine Site Diesel Tank #9																					
TD10	Mine Site Diesel Tank #10																					
TDL1	Landmark Diesel Tank #1																					
TDL2	Landmark Diesel Tank #2																					
TGL3	Landmark Gasoline Tank #3																					

SOURCE DESCRIPTION		OPERATING LIMITS							EMISSION FACTORS									
Model ID	Source Description	Design Throughput unit/hr	unit/day	unit/yr	units	Material	hr/yr	reference	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	H2S	unit	reference
FALSE	LIME PRODUCTION																	
LS1	Limestone transfer to Primary Crusher Hopper	0.00	0	0	ton	Limestone	8,760	(Midas Gold 2018m)	0.003	0.0011	0.00017						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
LS2	Primary Crushing and Associated Transfers In and Out	0.00	0	0	ton	Limestone	8,760		0.0054	0.0024	0.00036						lb/ton	AP-42, Table 11.19.2-2 (08/04) Tert. Crush - unctrl.; PM2.5 Ch. 13.2.4
LS3	Primary Screening and Associated Transfers In and Out	0.00	0	0	ton	Limestone	8,760		0.025	0.0087	0.00132						lb/ton	AP-42, Table 11.19.2-2 (08/04) Screening - unctrl.; PM2.5 Ch. 13.2.4
LS4	Secondary Crushing and Associated Transfers In and Out	0.00	0	0	ton	Limestone	8,760		0.0054	0.0024	0.00036						lb/ton	AP-42, Table 11.19.2-2 (08/04) Tert. Crush - unctrl.; PM2.5 Ch. 13.2.4
LS5	Secondary Screening and Associated Transfers In and Out	0.00	0	0	ton	Limestone	8,760		0.025	0.0087	0.00132						lb/ton	AP-42, Table 11.19.2-2 (08/04) Screening - unctrl.; PM2.5 Ch. 13.2.4
LS6	Limestone transfer to Ball Mill Feed Bin	0.00	0	0	ton	Limestone	8,760	LS1 minus LK throughts	0.003	0.0011	0.00017						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
LS7	Limestone transfer to Ball Mill Feed Conveyor	0.00	0	0	ton	Limestone	8,760		0.003	0.0011	0.00017						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
LS8	Ball Mill Feed transfer to Ball Mill	0.00	0	0	ton	Limestone	8,760	(Midas Gold 2018m)	0.003	0.0011	0.00017						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
LSBM	Limestone Ball Mill	0.00	0	0	ton	Limestone	8,760		0.0404	0.0339	0.0121						lb/ton	AP-42, Table 11.19.2-4 (08/04) Dry Grind.
LS9	Limestone transfer to Kiln Feed Bin	0.00	0	0	ton	Limestone	8,760		0.003	0.0011	0.00017						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
LS10	Limestone transfer to Lime Kiln Feed Conveyor	0.00	0	0	ton	Limestone	8,760		0.003	0.0011	0.00017						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
LS11	Fines Screening and Associated Transfers In and Out	0.00	0	0	ton	Limestone	8,760		0.025	0.0087	0.00132						lb/ton	AP-42, Table 11.19.2-2 (08/04) Screening - unctrl.; PM2.5 Ch. 13.2.4
LS12	Kiln Feed transfer to PFR Shaft Lime Kiln	0.00	0	0	ton	Limestone	8,760	(Midas Gold 2018m)	0.003	0.0011	0.00017						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
LK	Parallel Flow Regenerative (PFR) Shaft Lime Kiln	0.00	0	0	ton	Lime	8,760	(Midas Gold 2018m)	0.026	0.026	0.026	0.45	0.24	0.0012			lb/ton	AP-42 Tables 11.17-2, 6 : Gas-Fired Parallel Flow Regenetive Kiln with Fabric Filter
LKC	PFR Shaft Lime Kiln Combustion	0.00	0	0	MMBtu	Propane	8,760	Based on 810 kcal/kg (Maerz 2018)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
LCR	Lime Mill Crushing and associated transfers In and Out	0.00	0	0	ton	Lime	8,760		0.00043	0.00043	0.00043						lb/ton	AP-42 Table 11.17-4: Primary Crusher with Fabric Filter
LSL	Pebble Lime Silo Loading via Bucket Elevator	0.00	0	0	ton	Lime	8,760		8.8E-05	8.8E-05	8.8E-05						lb/ton	AP-42 Table 11.17-4: Crushed Material Conveyor Transfer with Fabric Filter
LSU	Pebble Lime Silo discharge to Lime Slaker	0.00	0	0	ton	Lime	8,760		8.8E-05	8.8E-05	8.8E-05						lb/ton	AP-42 Table 11.17-4: Crushed Material Conveyor Transfer with Fabric Filter
Total																		

SOURCE DESCRIPTION		EMISSION CONTROLS			HOURLY EMISSIONS								DAILY EMISSIONS							
Model ID	Source Description	control system	efficiency	reference	PM lb/hr	PM_{10} lb/hr	$PM_{2.5}$ lb/hr	CO lb/hr	NOx lb/hr	SO_2 lb/hr	VOC lb/hr	H2S lb/hr	PM lb/day	PM_{10} lb/day	$PM_{2.5}$ lb/day	CO lb/day	NOx lb/day	SO_2 lb/day	VOC lb/day	H2S lb/day
FALSE	LIME PRODUCTION																			
LS1	Limestone transfer to Primary Crusher Hopper	None	0		0.000	0.0000	0.0000						0.00	0.00	0.000	0	0	0	0	0
LS2	Primary Crushing and Associated Transfers In and Out	None	0		0.000	0.000	0.0000						0.00	0.00	0.000	0	0	0	0	0
LS3	Primary Screening and Associated Transfers In and Out	None	0		0.00	0.000	0.0000						0.0	0.0	0.00	0	0	0	0	0
LS4	Secondary Crushing and Associated Transfers In and Out	None	0		0.000	0.000	0.0000						0.00	0.00	0.000	0	0	0	0	0
LS5	Secondary Screening and Associated Transfers In and Out	None	0		0.00	0.000	0.0000						0.0	0.0	0.00	0	0	0	0	0
LS6	Limestone transfer to Ball Mill Feed Bin	None	0		0.000	0.0000	0.0000						0.00	0.00	0.000	0	0	0	0	0
LS7	Limestone transfer to Ball Mill Feed Conveyor	None	0		0.000	0.0000	0.00000						0.00	0.000	0.000	0	0	0	0	0
LS8	Ball Mill Feed transfer to Ball Mill	None	0		0.000	0.0000	0.00000						0.00	0.000	0.000	0	0	0	0	0
LSBM	Limestone Ball Mill	Fabric Filter	(0)*		0.000	0.0000	0.00000						0.00	0.000	0.000	0	0	0	0	0
LS9	Limestone transfer to Kiln Feed Bin	None	0		0.000	0.0000	0.0000						0.00	0.00	0.000	0	0	0	0	0
LS10	Limestone transfer to Lime Kiln Feed Conveyor	None	0		0.000	0.0000	0.00000						0.00	0.000	0.000	0	0	0	0	0
LS11	Fines Screening and Associated Transfers In and Out	None	0		0.00	0.000	0.0000						0.0	0.0	0.00	0	0	0	0	0
LS12	Kiln Feed transfer to PFR Shaft Lime Kiln	None	0		0.000	0.0000	0.00000						0.00	0.000	0.000	0	0	0	0	0
LK	Parallel Flow Regenerative (PFR) Shaft Lime Kiln	Fabric Filter	(0)*		0.000	0.000	0.000	0.00	0.00	0.0000	0		0.00	0.00	0.00	0	0.0	0.000	0.00	0
LKC	PFR Shaft Lime Kiln Combustion	None	0		0.000	0.000	0.000	0.00	0.00	0.000	0.000		0.00	0.00	0.00	0.0	0.0	0.0	0.00	0
LCR	Lime Mill Crushing and associated transfers In and Out	Fabric Filter	(0)*		0.00000	0.00000	0.00000						0.000	0.000	0.000	0	0	0	0	0
LSL	Pebble Lime Silo Loading via Bucket Elevator	Fabric Filter	(0)*		0.00E+0	0.00E+0	0.00E+0						0.0000	0.0000	0.0000	0	0	0	0	0
LSU	Pebble Lime Silo discharge to Lime Slaker	Wet Scrubber	(0)*		0.00E+0	0.00E+0	0.00E+0						0.0000	0.0000	0.0000	0	0	0	0	0
Total					**27.1**	**17.1**	**11.9**	**28.8**	**51.0**	**1.54**	**11.5**	**0.900**	**360**	**256**	**196**	**73**	**121**	**29.0**	**25.8**	**21.6**

SOURCE DESCRIPTION		ANNUAL EMISSIONS									NAD 83 LOCATION				
Model ID	Source Description	PM ton/yr	PM_{10} ton/yr	$PM_{2.5}$ ton/yr	CO ton/yr	NOx ton/yr	SO_2 ton/yr	VOC ton/yr	H2S ton/yr	Hg2+P ton/yr	UTM E m	UTM N m	reference	elev m	reference
FALSE	LIME PRODUCTION														
LS1	Limestone transfer to Primary Crusher Hopper	0.000	0.000	0.0000						0.00E+00	632,239	4,974,256	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS2	Primary Crushing and Associated Transfers In and Out	0.00	0.000	0.000						0.00E+00	632,239	4,974,256	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS3	Primary Screening and Associated Transfers In and Out	0.00	0.00	0.000						0.00E+00	632,239	4,974,256	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS4	Secondary Crushing and Associated Transfers In and Out	0.00	0.000	0.000						0.00E+00	632,227	4,974,268	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS5	Secondary Screening and Associated Transfers In and Out	0.00	0.00	0.000						0.00E+00	632,227	4,974,268	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS6	Limestone transfer to Ball Mill Feed Bin	0.000	0.000	0.0000						0.00E+00	632,181	4,974,307	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS7	Limestone transfer to Ball Mill Feed Conveyor	0.000	0.000	0.0000						0.00E+00	632,181	4,974,307	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS8	Ball Mill Feed transfer to Ball Mill	0.000	0.000	0.0000						0.00E+00	632,200	4,974,273	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LSBM	Limestone Ball Mill	0.000	0.000	0.0000						0.00E+00	632,215	4,974,248	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS9	Limestone transfer to Kiln Feed Bin	0.000	0.000	0.0000						0.00E+00	632,169	4,974,325	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS10	Limestone transfer to Lime Kiln Feed Conveyor	0.000	0.000	0.0000						0.00E+00	632,169	4,974,325	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS11	Fines Screening and Associated Transfers In and Out	0.00	0.00	0.000						0.00E+00	632,151	4,974,314	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS12	Kiln Feed transfer to PFR Shaft Lime Kiln	0.000	0.000	0.0000						0.00E+00	632,056	4,974,285	Drawing SK-OPTION 3b, 06/06/2018	1,984.0	Google Earth
LK	Parallel Flow Regenerative (PFR) Shaft Lime Kiln	0.00	0.00	0.00	0.0	0.00	0.0000				632,057	4,974,265	Drawing SK-OPTION 3b, 06/06/2018	1,984.0	Google Earth
LKC	PFR Shaft Lime Kiln Combustion	0.000	0.000	0.000	0.00	0.0	0.00	0.00		0.00E+0	632,057	4,974,265	Drawing SK-OPTION 3b, 06/06/2018	1,984.0	Google Earth
LCR	Lime Mill Crushing and associated transfers In and Out	0.0000	0.0000	0.0000							632,073	4,974,233	Drawing SK-OPTION 3b, 06/06/2018	1,990.0	Google Earth
LSL	Pebble Lime Silo Loading via Bucket Elevator	0.00000	0.00000	0.00000							632,069	4,974,206	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LSU	Pebble Lime Silo discharge to Lime Slaker	0.00000	0.00000	0.00000							632,069	4,974,206	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
Total		**53.0**	**37.2**	**28.7**	**13.0**	**21.8**	**5.25**	**4.69**	**3.94**	**2.95E-4**					

SOURCE DESCRIPTION		RELEASE PARAMETERS INPUT						MODEL EMISSION RATES / RELEASE PARAMETERS													
Model ID	Source Description	POINT VOLUME	rel ht (ft) rel ht (ft)	temp (F) width (ft)	flow (dscfm) vert. ln (ft)	flow (acfm) grnd ht (ft)	dia (ft) oz type	PM_{10}-24 gps	$PM_{2.5}$-24 gps	CO-ALL gps	NO_2-1 gps	SO_2-1 gps	SO_2-3 gps	PM_{10}-AN gps	$PM_{2.5}$-AN gps	NO_2-AN gps	SO_2-AN gps	Hg2+P gps	ht (m) ht (m)	temp (K) oy (m)	vel (m/s) oz (m)	dia (m)
FALSE	LIME PRODUCTION																					
LS1	Limestone transfer to Primary Crusher Hopper	VOLUME	11.3	22.6	22.6	22.6	srf src	0	0					0	0			0	3.44	1.60	3.20	
LS2	Primary Crushing and Associated Transfers In and Out	VOLUME	11.3	22.6	22.6	22.6	srf src	0	0					0	0			0	3.44	1.60	3.20	
LS3	Primary Screening and Associated Transfers In and Out	VOLUME	11.3	22.6	22.6	22.6	srf src	0	0					0	0			0	3.44	1.60	3.20	
LS4	Secondary Crushing and Associated Transfers In and Out	VOLUME	11.3	22.6	22.6	22.6	srf src	0	0					0	0			0	3.44	1.60	3.20	
LS5	Secondary Screening and Associated Transfers In and Out	VOLUME	11.3	22.6	22.6	22.6	srf src	0	0					0	0			0	3.44	1.60	3.20	
LS6	Limestone transfer to Ball Mill Feed Bin	POINT	29.0	Ambient		0.155	1.0	0	0					0	0			0	8.84	0	0.00100	0.305
LS7	Limestone transfer to Ball Mill Feed Conveyor	VOLUME	3.5	1	3	5	elev src w/ bldg	0	0					0	0			0	1.07	0.0709	0.425	
LS8	Ball Mill Feed transfer to Ball Mill	VOLUME	28	4	4	30	elev src w/ bldg	0	0					0	0			0	8.53	0.284	0.567	
LSBM	Limestone Ball Mill	POINT	70.0	Ambient		10,000	1.9	0	0					0	0			0	21.3	0	17.9	0.579
LS9	Limestone transfer to Kiln Feed Bin	POINT	29.0	Ambient		0.155	1.0	0	0					0	0			0	8.84	0	0.00100	0.305
LS10	Limestone transfer to Lime Kiln Feed Conveyor	VOLUME	3.5	1	3	5	elev src w/ bldg	0	0					0	0			0	1.07	0.0709	0.425	
LS11	Fines Screening and Associated Transfers In and Out	VOLUME	2.5	8	5	5	srf src	0	0					0	0			0	0.762	0.567	0.709	
LS12	Kiln Feed transfer to PFR Shaft Lime Kiln	VOLUME	68	4	4	70	elev src w/ bldg	0	0					0	0			0	20.7	0.284	0.567	
LK	Parallel Flow Regenerative (PFR) Shaft Lime Kiln	POINT	150	350		18,000	2.5	0	0	0	0	0	0	0	0	0	0		45.7	450	18.6	0.762
LKC	PFR Shaft Lime Kiln Combustion	POINT	150	350		18,000	2.5	0	0	0	0	0	0	0	0	0	0	0	45.7	450	18.6	0.762
LCR	Lime Mill Crushing and associated transfers In and Out	POINT	50	Ambient		10,000	1.9	0	0					0	0				15.2	0	17.9	0.579
LSL	Pebble Lime Silo Loading via Bucket Elevator	POINT	29.0	Ambient		0.155	1.0	0	0					0	0				8.84	0	0.00100	0.305
LSU	Pebble Lime Silo discharge to Lime Slaker	VOLUME	3.5	1	3	5	elev src w/ bldg	0	0					0	0				1.07	0.0709	0.425	
Total								1.34	1.03	3.63	0.93	0.188	0.194	1.07	0.825	0.63	0.151	8.485E-06				

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: S. Pryor
	PROJECT NO: 335-1-1	PAGE: 1 OF: 7 SHEET: ProcHAP
AIR EMISSION CALCULATIONS	SUBJECT: Process HAP and GHG Emissions	DATE: October 10, 2018

Hazardous Air Pollutants and Greenhouse Gas Emissions

HAP Emissions Summary

	Emissions	
Pollutant	lb/yr	ton/yr
1,3-Butadiene	0.01	3.67E-06
Acetaldehyde	0.21	1.07E-04
Acrolein	0.04	1.98E-05
Arsenic	0.05	2.70E-05
Benzene	2.93	1.46E-03
Beryllium	0.00	1.62E-06
Cadmium	0.30	1.48E-04
Chromium	0.38	1.89E-04
Cobalt	0.02	1.13E-05
Dichlorobenzene	0.32	1.62E-04
Formaldehyde	20.66	1.03E-02
Hexane	485.15	2.43E-01
Manganese	0.10	5.12E-05
Mercury	24.77	1.24E-02
Naphthalene	0.16	8.22E-05
Nickel	0.57	2.83E-04
POM	0.65	3.26E-04
Selenium	0.01	3.23E-06
Toluene	1.78	8.92E-04
Xylene	0.60	2.99E-04
Total HAP	**538.71**	**2.69E-01**
		0.2694
		chk

GHG Emissions Summary

Source Category	CO2e *(ton/yr)*
Propane Combustion	19,129
Diesel Combustion	246
Autoclaving	47,316
Lime Kiln	0
Total GHGs	**66,691**

PROPANE COMBUSTION

Source Data

Source ID	Description	MMBtu/yr
Sb1	Sb Drying (2.72 MMBtu/hr Propane-Fired)	23,827
ACB	POX Boiler (17 MMBtu/hr Propane-Fired)	510
CKB	Carbon Regeneration Kiln (Burners)	19,754
PV	Propane Vaporizer (0.4 MMBtu/hr Propane-Fired)	876
HS	Strip Circuit Solution Heater (5 MMBtu, Propane-Fired)	43,800
H1M	Mine Air Heater #1 (4 MMBtu/hr Propane-Fired)	35,040
H2M	Mine Air Heater #2 (4 MMBtu/hr Propane-Fired)	35,040
HM	Mill HVAC Heaters (4 x 1.0 MMBtu Propane-Fired)	35,040
HAC	Autoclave HVAC Heater (1 x 0.25 MMBtu Propane-Fired)	2,190
HR	Refinery HVAC Heaters (1 x 0.25 MMBtu Propane-Fired)	2,190
HA	Admin HVAC Heaters (1 x 0.25 MMBtu Propane-Fired)	2,190
HMO	Mine Ops. HVAC Heaters (2 x 0.25 MMBtu Propane-Fired)	4,380
HTS	Truck Shop HVAC Heaters (2 x 1.0 MMBtu Propane-Fired)	17,520
HW	Warehouse HVAC Heaters (3 x 1.0 MMBtu Propane-Fired)	26,280
HL	Landmark/Stibnite Heaters (3 x 1.0 MMBtu Propane-Fired)	26,280
LKC	PFR Shaft Lime Kiln Combustion	0
Total		274,917

**Propane heating value* 91,500 *Btu/gal*

HAP Emissions - Propane Combustion

Pollutant	Emission Factor* lb/MMScf	Emission Factor* lb/MMBtu**	Emissions ton/yr
Benzene	2.10E-03	2.06E-6	2.8E-4
Dichlorobenzene	1.20E-03	1.18E-6	1.6E-4
Formaldehyde	7.50E-02	7.35E-5	1.0E-2
Hexane	1.80E+00	1.76E-3	0.24
Naphthalene	6.10E-04	5.98E-7	8.2E-5
Toluene	3.40E-03	3.33E-6	4.6E-4
POM	< 8.82E-05	8.65E-8	1.2E-5
Arsenic	2.00E-04	1.96E-7	2.7E-5
Beryllium	< 1.20E-05	1.18E-8	1.6E-6
Cadmium	1.10E-03	1.08E-6	1.5E-4
Chromium	1.40E-03	1.37E-6	1.9E-4
Cobalt	8.40E-05	8.24E-8	1.1E-5
Manganese	3.80E-04	3.73E-7	5.1E-5
Mercury	2.60E-04	2.55E-7	3.5E-5
Nickel	2.10E-03	2.06E-6	2.8E-4
Selenium	< 2.40E-05	2.35E-8	3.2E-6
Total HAP			0.25

**AP-42, Table 1.4-3 & 1.4-4 (7/98) Natural Gas Combustion*

***Natural Gas Higher Heating Value* 1,020 *MMBtu/MMScf*

PROPANE COMBUSTION - CONTINUED

Propane CO_2e Emission Factors:	62.87 *kg CO2/MMBtu*	*40 CFR Part 98, Table C-1 to Subpart C (11/2013) Propane (CFR 2018d)*
	3.0E-03 *kg CH4/MMBtu*	*40 CFR Part 98, Table C-2 to Subpart C (11/2013) Petroleum (CFR 2018d)*
	6.0E-04 *kg N2O/MMBtu*	*40 CFR Part 98, Table C-2 to Subpart C (11/2013) Petroleum (CFR 2018d)*

Total Propane Combustion 274,917 *MMBtu/yr*

Propane CO2e Emissions - Process Sources:

Greenhouse Gas	Emissions ton/yr	Global Warming Potential*	CO2e ton/yr
CO2	19,052	1	19,052
CH4	0.91	25	23
N2O	0.18	298	54
Total GHG			19,129

** 40 CFR 98, Table A-1 (12/2014) (CFR 2018d)*

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: S. Pryor
	PROJECT NO: 335-1-1	PAGE: 4 OF: 7 SHEET: ProcHAP
AIR EMISSION CALCULATIONS	SUBJECT: Process HAP and GHG Emissions	DATE: October 10, 2018

DIESEL COMBUSTION

Source Data

Source ID	Description	Power Rating kW	Power Rating hp	Operatio hr/yr	Fuel Consumption MMBtu/hr*	
	MMBtu/yr EDG1	Camp Emergency Generator (Mfr. Yr. >2007; diesel)				1,000
	1,341	100	9.39		938.7	
EDG2	Plant Emergency Generator #1 (Mfr. Yr. >2007; diesel)	1,000	1,341	100	9.39	938.7
EDG3	Plant Emergency Generator #2 (Mfr. Yr. >2007; diesel)	1,000	1,341	100	9.39	938.7
EDFP	Mill Fire Pump (Mfr. Yr. >2009; diesel)	200	268	100	1.88	187.7
Total						3,003.8

** Based on brake specific fuel consumption for diesel generators* 7,000 *Btu/hp-hr AP-42 Tbl 3.3-1*

*** Heat Content of* 0.137 *MMBtu/gal*

HAP Emissions - Diesel Combustion, Large Engines

Pollutant	Emission Factor* lb/MMBtu	Emissions ton/yr
1,3-Butadiene	0.00E+00	
Acetaldehyde	2.52E-05	3.55E-05
Acrolein	7.88E-06	1.11E-05
Benzene	7.76E-04	1.09E-03
Formaldehyde	7.89E-05	1.11E-04
POM	2.12E-04	2.98E-04
Toluene	2.81E-04	3.96E-04
Xylene	1.93E-04	2.72E-04
Total HAPs		2.22E-03

**AP-42, Tabs. 3.4-3 & 3.4-4, 10/96, large diesel engines (> 600 hp)*

HAP Emissions - Diesel Combustion, Small Engines

Pollutant	Emission Factor* lb/MMBtu	Emissions ton/yr
1,3-Butadiene	3.91E-05	3.67E-06
Acetaldehyde	7.67E-04	7.20E-05
Acrolein	9.25E-05	8.68E-06
Benzene	9.33E-04	8.76E-05
Formaldehyde	1.18E-03	1.11E-04
POM	1.68E-04	1.58E-05
Toluene	4.09E-04	3.84E-05
Xylene	2.85E-04	2.68E-04
Total HAPs		3.64E-04

**AP-42, Tab. 3.3-2, 10/96, diesel engines (≤ 600 hp)*

Diesel CO2e Emission Factors:	73.96 *kg* CO_2*/MMBtu*	*40 CFR Part 98, Table C-1 to Subpart C (11/2013) No.2*
	3.0E-03 *kg* CH_4*/MMBtu*	*40 CFR Part 98, Table C-2 to Subpart C (11/2013) Petroleum*
	6.0E-04 *kg* N_2O*/MMBtu*	*40 CFR Part 98, Table C-2 to Subpart C (11/2013) Petroleum*
Total Diesel Combustion	3,003.8 *MMBtu/yr*	

Diesel CO2e Emissions - Process Sources:

Greenhouse Gas	Emissions ton/yr	Global Warming Potential*	CO2e ton/yr
CO2	244.89	1	244.89

AUTOCLAVE CO_2 EMISSIONS

CO2 Emissions

	Operation	CO2 Emissions	
Description	hr/yr	ton/hr*	ton/yr
Autoclave	8,760	5.40	47,316

**Per M3 Engineering, 10/11/2017; based on ore feed carbonate values and conservatively assuming limestone for neutralization.*
(M3 2017c)

LIME KILN CO_2 EMISSIONS

CO2 Emissions

	Operation	Feed	Product	Mass Loss	CO2
Description	hr/yr	ton/yr	ton/yr	ton/yr	ton/yr
Parallel Flow Regenerative (PFR) Shaft Lime Kiln	8,760	0	0	0	0

40 CFR 63 Subpart 7E MERCURY SOURCES

Mercury Emissions

Description	Subpart 7E Hg Emissions ton/yr	% of Subpart 7E for Controlled Systems* %	Controlled Hg Emissions* lb/yr	ton/yr
Autoclave	0.107	10.0%	21.34	0.011
Refinery Sources (Kiln, EW, Retort, Furnace)	0.008	20.0%	3.36	0.002
Total	0.115		24.70	0.012

Based on Similar Source Hg Reporting Levels provided below

Subpart 7E Limit - Ore Pretreatment Process*(CFR 2018c)*

$$\frac{84\ \text{lb}}{\sout{\text{MMton}}} \times \frac{2{,}540{,}400\ \sout{\text{ton}}}{\text{yr}} \times \frac{\sout{\text{MMton}}}{1.0\text{E+6}\ \sout{\text{ton}}} = \frac{213.39\ \text{lb}}{\text{yr}}$$

Subpart 7E Limit - Carbon Processes with Mercury Retorts

$$\frac{0.8\ \text{lb}}{\sout{\text{ton}}} \times \frac{21\ \sout{\text{ton}}}{\text{yr}} = \frac{16.8\ \text{lb}}{\text{yr}}$$

Similar Source Hg Reporting Levels

Goldstrike Autoclaves 2 & 3 (2015 & 2016 Hg Report (NDEP 2015a) (NDEP 2016)

$$\frac{28.79\ \text{lb}}{\text{yr}} \times \frac{\text{yr}}{3.13\ \text{MMton}} = \frac{9.18\ \text{lb}}{\text{MMton}} \times \frac{\text{MMton}}{84\ \text{lb}} = 10.9\%$$

Twin Creeks Autoclaves 1 & 2 (2015 & 2016 Hg Repo(NDEP 2015a) (NDEP 2016)

$$\frac{1.01\ \text{lb}}{\text{yr}} \times \frac{\text{yr}}{7.63\ \text{MMton}} = \frac{0.13\ \text{lb}}{\text{MMton}} \times \frac{\text{MMton}}{84\ \text{lb}} = 0.2\%$$

Goldstrike Refinery (2015 & 2016 Hg Reports) (NDEP 2015a) (NDEP 2016)

$$\frac{28.79\ \text{lb}}{\text{yr}} \times \frac{\text{yr}}{251.00\ \text{ton}} = \frac{0.11\ \text{lb}}{\text{MMton}} \times \frac{\text{ton}}{0.8\ \text{lb}} = 14.3\%$$

Twin Creeks Refinery (2015 & 2016 Hg Reports) (NDEP 2015a) (NDEP 2016)

$$\frac{31.27\ \text{lb}}{\text{yr}} \times \frac{\text{yr}}{142.77\ \text{ton}} = \frac{0.22\ \text{lb}}{\text{MMton}} \times \frac{\text{ton}}{0.8\ \text{lb}} = 27.4\%$$

OTHER REGULATED POLLUTANTS

H2SO4 Emissions

Description	Throughput ton/hr	Operation hr/yr	lb/ton*	H2SO4 lb/hr	H2SO4 ton/yr
Autoclave	290	8,760	0.007	2.03	8.9

**Based on Acidic Autoclave test data (APT 2010)*

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: E. Huelson/E. Memon
	PROJECT NO: 335-1-1	PAGE: 1 OF: 9 SHEET: Tanks
AIR EMISSION CALCULATIONS	SUBJECT: Fuel Storage Tanks	DATE: October 10, 2018

Fuel Storage Tanks

	Dimensions				VOC Emissions[1]		
	Capacity	Diameter	Length	Throughput			Reference
Storage Tank	gal	ft	ft	gal/yr	lb/yr	ton/yr	
Mine Site Gasoline Tank #1	5,000	8.5	14.33	250,000	1,914.73	0.96	*(Midas Gold 2016)*
Mine Site Gasoline Tank #2	5,000	8.5	14.33	250,000	1,914.73	0.96	*(Midas Gold 2016)*
Mine Site Diesel Tank #3	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018g)*
Mine Site Diesel Tank #4	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018g)*
Mine Site Diesel Tank #5	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018g)*
Mine Site Diesel Tank #6	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018g)*
Mine Site Diesel Tank #7	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018g)*
Mine Site Diesel Tank #8	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018g)*
Mine Site Diesel Tank #9	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018g)*
Mine Site Diesel Tank #10	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018g)*
Landmark Diesel Tank #1	2,500	6	15.00	130,000	2.01	0.001	*(Midas Gold 2018d), (Midas Gold 2018g)*
Landmark Diesel Tank #2	2,500	6	15.00	130,000	2.01	0.001	*(Midas Gold 2018d), (Midas Gold 2018g)*
Landmark Gasoline Tank #3	2,500	6	15.00	130,000	1,036.15	0.518	*(Midas Gold 2018d), (Midas Gold 2018g)*

[1] *Emissions calculated using EPA Tanks 4.0.9d (EPA 1999)*

Conversions

2,000 lb/ton

Mine Site Gasoline Tanks #1, #2

TANKS 4.0 Report

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Midas Gasoline Tank - 5,000 gal
City:	
State:	Idaho
Company:	Midas Gold
Type of Tank:	Horizontal Tank
Description:	

Tank Dimensions

Shell Length (ft):	14.33
Diameter (ft):	8.50
Volume (gallons):	5,000.00
Turnovers:	50.00
Net Throughput(gal/yr):	250,000.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Boise, Idaho (Avg Atmospheric Pressure = 13.28 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

Midas Gasoline Tank - 5,000 gal - Horizontal Tank

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 9)	All	52.81	46.88	58.74	50.94	3.9950	3.5384	4.4980	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Midas Gasoline Tank - 5,000 gal - Horizontal Tank

Annual Emission Calcaulations	
Standing Losses (lb):	693.2361
Vapor Space Volume (cu ft):	517.9338
Vapor Density (lb/cu ft):	0.0487
Vapor Space Expansion Factor:	0.1491
Vented Vapor Saturation Factor:	0.5264
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	517.9338
Tank Diameter (ft):	8.5000
Effective Diameter (ft):	12.4585
Vapor Space Outage (ft):	4.2500
Tank Shell Length (ft):	14.3300
Vapor Density	
Vapor Density (lb/cu ft):	0.0487
Vapor Molecular Weight (lb/lb-mole):	67.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.9950
Daily Avg. Liquid Surface Temp. (deg. R):	512.4830
Daily Average Ambient Temp. (deg. F):	50.9208
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	510.6106
Tank Paint Solar Absorptance (Shell):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,400.5355

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Mine Site Gasoline Tanks #1, #2 - continued

TANKS 4.0 Report

Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.1431
Daily Vapor Temperature Range (deg. R):	23.7125
Daily Vapor Pressure Range (psia):	0.9594
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.9950
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	3.5384
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	4.4990
Daily Avg. Liquid Surface Temp. (deg R):	512.4830
Daily Min. Liquid Surface Temp. (deg R):	506.5648
Daily Max. Liquid Surface Temp. (deg R):	518.4111
Daily Ambient Temp. Range (deg. R):	23.6750
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.5264
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.9950
Vapor Space Outage (ft):	4.2500
Working Losses (lb):	1,221.4895
Vapor Molecular Weight (lb/lb-mole):	67.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.9950
Annual Net Throughput (gal/yr.):	250,000.0000
Annual Turnovers:	50.0000
Turnover Factor:	0.7667
Tank Diameter (ft):	8.5000
Working Loss Product Factor:	1.0000
Total Losses (lb):	1,914.7256

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

Midas Gasoline Tank - 5,000 gal - Horizontal Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 9)	1,221.49	693.24	1,914.73

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Mine Site Diesel Tanks #3 - #10

TANKS 4.0 Report

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	25,000 gallon diesel storage tank
City:	Boise
State:	Idaho
Company:	Midas Gold
Type of Tank:	Vertical Fixed Roof Tank
Description:	Midas Gold Mine Site offroad diesel storage tanks

Tank Dimensions

Shell Height (ft):	29.70
Diameter (ft):	12.00
Liquid Height (ft) :	29.00
Avg. Liquid Height (ft):	14.50
Volume (gallons):	25,000.00
Turnovers:	29.00
Net Throughput(gal/yr):	725,000.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	1.00
Radius (ft) (Dome Roof)	12.00

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Boise, Idaho (Avg Atmospheric Pressure = 13.28 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

25,000 gallon diesel storage tank - Vertical Fixed Roof Tank
Boise, Idaho

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	52.81	46.88	58.74	50.94	0.0051	0.0041	0.0062	130.0000			188.00	Option 1: VP50 = .0045 VP60 = .0065

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

25,000 gallon diesel storage tank - Vertical Fixed Roof Tank
Boise, Idaho

Annual Emission Calcaulations	
Standing Losses (lb):	3.2383
Vapor Space Volume (cu ft):	1,776.1518
Vapor Density (lb/cu ft):	0.0001
Vapor Space Expansion Factor:	0.0419
Vented Vapor Saturation Factor:	0.9958
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,776.1518
Tank Diameter (ft):	12.0000
Vapor Space Outage (ft):	15.7046
Tank Shell Height (ft):	29.7000
Average Liquid Height (ft):	14.5000

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Mine Site Diesel Tanks #3 - #10 - continued

TANKS 4.0 Report

Roof Outage (ft):	0.5046
Roof Outage (Dome Roof)	
Roof Outage (ft):	0.5046
Dome Radius (ft):	12.0000
Shell Radius (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0001
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0051
Daily Avg. Liquid Surface Temp. (deg. R):	512.4830
Daily Average Ambient Temp. (deg. F):	50.9200
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	510.6108
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,400.5355
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0419
Daily Vapor Temperature Range (deg. R):	23.7125
Daily Vapor Pressure Range (psia):	0.0022
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0051
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0041
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0062
Daily Avg. Liquid Surface Temp. (deg R):	512.4920
Daily Min. Liquid Surface Temp. (deg R):	506.5548
Daily Max. Liquid Surface Temp. (deg R):	518.4111
Daily Ambient Temp. Range (deg. R):	23.6750
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9958
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0051
Vapor Space Outage (ft):	15.7046
Working Losses (lb):	11.3607
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0051
Annual Net Throughput (gal/yr.):	725,000.0000
Annual Turnovers:	29.0000
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	25,000.0000
Maximum Liquid Height (ft):	29.0000
Tank Diameter (ft):	12.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	14.5990

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

25,000 gallon diesel storage tank - Vertical Fixed Roof Tank
Boise, Idaho

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	11.36	3.24	14.60

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Landmark Diesel Tanks #1, #2

TANKS 4.0 Report

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	2,500 gallon diesel storage tank
City:	Boise
State:	Idaho
Company:	Midas Gold
Type of Tank:	Horizontal Tank
Description:	Midas Gold Landmark facility diesel tanks

Tank Dimensions

Shell Length (ft):	15.00
Diameter (ft):	6.00
Volume (gallons):	2,500.00
Turnovers:	52.00
Net Throughput(gal/yr):	130,000.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Boise, Idaho (Avg Atmospheric Pressure = 13.28 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

2,500 gallon diesel storage tank - Horizontal Tank
Boise, Idaho

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	52.81	46.88	58.74	50.94	0.0051	0.0041	0.0062	130.0000			188.00	Option 1: VP50 = .0045 VP60 = .0065

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

2,500 gallon diesel storage tank - Horizontal Tank
Boise, Idaho

Annual Emission Calcaulations	
Standing Losses (lb):	0.4942
Vapor Space Volume (cu ft):	270.1369
Vapor Density (lb/cu ft):	0.0001
Vapor Space Expansion Factor:	0.0419
Vented Vapor Saturation Factor:	0.9992
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	270.1369
Tank Diameter (ft):	6.0000
Effective Diameter (ft):	10.7075
Vapor Space Outage (ft):	3.0000
Tank Shell Length (ft):	15.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0001
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0051
Daily Avg. Liquid Surface Temp. (deg. R):	512.4830
Daily Average Ambient Temp. (deg. F):	50.9208
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	510.6108

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Landmark Diesel Tanks #1, #2 - continued

TANKS 4.0 Report

Tank Paint Solar Absorptance (Shell):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,400.5355
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0419
Daily Vapor Temperature Range (deg. R):	23.7125
Daily Vapor Pressure Range (psia):	0.0022
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0051
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0041
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0062
Daily Avg. Liquid Surface Temp. (deg R):	512.4830
Daily Min. Liquid Surface Temp. (deg R):	506.5548
Daily Max. Liquid Surface Temp. (deg R):	518.4111
Daily Ambient Temp. Range (deg. R):	23.6750
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9992
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0051
Vapor Space Outage (ft):	3.0000
Working Losses (lb):	1.5148
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0051
Annual Net Throughput (gal/yr.):	130,000.0000
Annual Turnovers:	52.0000
Turnover Factor:	0.7436
Tank Diameter (ft):	6.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	2.0090

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

2,500 gallon diesel storage tank - Horizontal Tank
Boise, Idaho

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	1.51	0.49	2.01

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Landmark Gasoline Tanks #3

TANKS 4.0 Report

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	2,500 gallon gasoline tank
City:	Boise
State:	Idaho
Company:	Midas Gold
Type of Tank:	Horizontal Tank
Description:	Midas Gold Landmark facility gasoline tank

Tank Dimensions

Shell Length (ft):	15.00
Diameter (ft):	6.00
Volume (gallons):	2,500.00
Turnovers:	52.00
Net Throughput(gal/yr):	130,000.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Boise, Idaho (Avg Atmospheric Pressure = 13.28 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

2,500 gallon gasoline tank - Horizontal Tank
Boise, Idaho

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 9)	All	52.81	46.88	58.74	50.94	3.9950	3.5384	4.4980	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

2,500 gallon gasoline tank - Horizontal Tank
Boise, Idaho

Annual Emission Calcaulations	
Standing Losses (lb):	420.0911
Vapor Space Volume (cu ft):	270.1369
Vapor Density (lb/cu ft):	0.0487
Vapor Space Expansion Factor:	0.1431
Vented Vapor Saturation Factor:	0.6115
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	270.1369
Tank Diameter (ft):	6.0000
Effective Diameter (ft):	10.7075
Vapor Space Outage (ft):	3.0000
Tank Shell Length (ft):	15.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0487
Vapor Molecular Weight (lb/lb-mole):	67.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.9950
Daily Avg. Liquid Surface Temp. (deg. R):	512.4830
Daily Average Ambient Temp. (deg. F):	50.9208
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	510.6109

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Landmark Gasoline Tanks #3 - continued

TANKS 4.0 Report

Tank Paint Solar Absorptance (Shell):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,400.5355
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.1431
Daily Vapor Temperature Range (deg. R):	29.7125
Daily Vapor Pressure Range (psia):	0.9596
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.9950
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	3.5364
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	4.4980
Daily Avg. Liquid Surface Temp. (deg R):	512.4600
Daily Min. Liquid Surface Temp. (deg R):	506.5548
Daily Max. Liquid Surface Temp. (deg R):	518.4111
Daily Ambient Temp. Range (deg. R):	23.6750
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.6115
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.9950
Vapor Space Outage (ft):	3.0000
Working Losses (lb):	616.0556
Vapor Molecular Weight (lb/lb-mole):	67.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.9950
Annual Net Throughput (gal/yr.):	130,000.0000
Annual Turnovers:	52.0000
Turnover Factor:	0.7436
Tank Diameter (ft):	6.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	1,036.1467

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

2,500 gallon gasoline tank - Horizontal Tank
Boise, Idaho

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 9)	616.06	420.09	1,036.15

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Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: E. Memon
	PROJECT NO: 335-	PAGE: 1 OF: 31 SHEET: Mine
AIR EMISSION CALCULATIONS	SUBJECT: Mining Activity and Emissions	DATE: October 10, 2018

Mining Year 4

Mining Activity and Emissions Emissions Summary

By Area/Model ID

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	CO_PPH	CO_TPY	NOX_PPH	NOX_TPY	SO2_PPH	SO2_TPY	VOC_TPY	Hg2+P_TPY
Area/	Location of	PM	PM10		PM2.5		CO		NOX		SO2		VOC	Hg2+P
Model ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr	ton/yr
YPP	Yellow Pine Pit	65.17	192.48	34.17	16.62	2.95	11.31	48.16	17.16	73.10	0.04	0.18	3.17	3.8E-05
HFP	Hangar Flats Pit	3.08	8.88	1.58	0.92	0.16	0.95	4.06	1.21	5.16	0.00	0.01	0.24	1.8E-06
WEP	West End Pit	3.57	10.32	1.83	0.99	0.18	0.93	3.94	1.17	4.98	0.00	0.01	0.24	2.1E-06
BT	Bradley Tailings	0.09	0.30	0.05	0.11	0.02	0.19	0.83	0.30	1.27	0.00	0.00	0.05	4.4E-08
YPPBL	Yellow Pine Pit Blasting	53.26	151.76	27.70	8.76	1.60	64.96	284.52	1.75	7.64	0.00	0.02	--	3.2E-05
HFPBL	Hangar Flats Pit Blasting	2.23	6.36	1.16	0.37	0.07	2.82	12.33	0.08	0.33	0.00	0.00	--	1.3E-06
WEPBL	West End Pit Blasting	2.71	7.72	1.41	0.45	0.08	3.37	14.76	0.09	0.40	0.00	0.00	--	1.6E-06
BTBL	Bradley Tailings Blastin	--	--	--	--	--	--	--	--	--	--	--	--	--
PC	Process PC	--	--	--	--	--	--	--	--	--	--	--	--	--
STKP	PC Stockpile	--	--	--	--	--	--	--	--	--	--	--	--	--
FDRSF	Fiddle DRSF	56.07	68.47	12.15	33.17	5.89	6.63	28.26	0.96	4.10	0.01	0.05	2.47	3.4E-05
HFDRSF	Hangar Flats DRSF	19.35	23.63	4.19	11.45	2.03	2.29	9.75	0.33	1.41	0.00	0.02	0.85	1.2E-05
YPDRSF	Yellow Pine DRSF	--	--	--	--	--	--	--	--	--	--	--	--	--
WEDRSF	West End DRSF	2.16	2.64	0.47	1.28	0.23	0.26	1.09	0.04	0.16	0.00	0.00	0.10	1.3E-06
PROC	Process Area	0.33	0.86	0.15	0.39	0.07	1.90	8.10	1.14	4.88	0.00	0.01	2.80	1.7E-07
HR	Onsite Hauling	813.63	1,146.00	203.42	126.96	22.53	24.21	103.15	51.46	219.21	0.13	0.57	8.33	4.9E-04
ACCRD	Access Roads	154.90	222.57	39.51	23.72	4.21	1.37	5.84	1.57	6.68	0.00	0.02	0.73	9.2E-05
HELI	Heliport	0.00	0.17	0.00	0.17	0.00	1.04	0.02	0.83	0.02	0.08	0.00	0.03	--
Total		1,176.55	1,842.16	327.79	225.35	40.02	122.22	524.82	78.08	329.34	0.29	0.89	19.01	7.0E-04

See worksheet ROADS for haul road (HR) emissions by Model ID.

By Activity

	chk	chk	chk	chk	chk	chk	chk	chk	chk	chk	chk-16	chk	chk
	PM	PM10		PM2.5		CO		NOX		SO2		VOC	Hg2+P
Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr	ton/yr
Open Pit Drilling	65.32	191.36	33.97	11.04	1.96								3.9E-05
Open Pit Blasting	58.20	165.84	30.27	9.57	1.75	71.14	311.61	1.91	8.37	0.00	0.02		3.5E-05
Onsite Hauling	746.19	1,033.05	183.37	103.30	18.34								4.5E-04
Material Load / Unload	8.10	21.59	3.83	3.27	0.58								4.9E-06
Mobile Tailpipes	4.75	26.78	4.75	20.71	3.68	46.77	199.24	71.87	306.16	0.20	0.84	17.82	
Dozing	71.16	76.58	13.59	42.09	7.47								4.3E-05
Grading	17.66	29.86	5.30	3.09	0.55								1.1E-05
Water Truck Travel	46.44	64.29	11.41	6.43	1.14								2.8E-05
Access Roads	154.90	222.57	39.51	23.72	4.21	1.37	5.84	1.57	6.68	0.00	0.02	0.73	9.2E-05
Wind Erosion	2.61	7.35	1.30	1.10	0.20								1.6E-06
Surface Exploration	1.21	2.73	0.48	0.86	0.15	1.90	8.11	1.90	8.11	0.00	0.02	0.44	6.7E-07
Helicopter	0.00	0.17	0.00	0.17	0.00	1.04	0.02	0.83	0.02	0.08	0.00	0.03	
TSF Construction	--	--	--	--	--								--
Total	1,176.55	1,842.16	327.79	225.35	40.02	122.22	524.82	78.08	329.34	0.29	0.89	19.01	0.0007
													0.0007
													chk

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: E. Memon	
	PROJECT NO: 335-1-2	PAGE: 2	OF: 31 SHEET: Mine
AIR EMISSION CALCULATIONS	SUBJECT: Mining Activity and Emissions	DATE: October 10, 2018	

Mining Year 4

Mining Activity and Emissions Source Parameters Summary

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	SIG_Y_M	SIG_Z_M	PITVOL_M3	SXINIT_M	SYINIT_M	ANGL_DEG
Model ID	Location of Activity	Source Type	UTM NAD 83 E m	UTM NAD 83 N m	Elev. m	Rel. Ht. m	S-y m	S-z m	Pit Vol. m^3	Len X m	Len Y m	Angle deg
YPP	Yellow Pine Pit	AREA	631,160	4,975,865	1,832	5.3		4.9		882	882	-8
HFP	Hangar Flats Pit	AREA	630,925	4,972,884	1,993	5.3		4.9		491.0	491.0	-
WEP	West End Pit	AREA	632,398	4,976,290	2,192	5.3		4.9		376.2	376.2	-
BT	Bradley Tailings	AREA	628,496	4,971,000	2,097	5.3		4.9		1,157	1,157	-
YPPBL	Yellow Pine Pit Blasting	VOLUME	631,471	4,976,374	1,717	75.0	20.9	34.9				
HFPBL	Hangar Flats Pit Blasting	VOLUME	631,171	4,973,129	1,891	75.0	20.9	34.9				
WEPBL	West End Pit Blasting	VOLUME	632,586	4,976,478	1,994	75.0	20.9	34.9				
STKP	PC Stockpile	VOLUME	632,087	4,974,600	1,980	5.3	53.3	4.9				
FDRSF	Fiddle DRSF	VOLUME	630,981	4,974,903	2,115	5.3	180.2	4.9				
HFDRSF	Hangar Flats DRSF	VOLUME	630,158	4,972,124	2,080	5.3	174.8	4.9				
YPDRSF	Yellow Pine DRSF	VOLUME	631,491	4,976,383	1,904	5.3	182.2	4.9				
WEDRSF	West End DRSF	VOLUME	633,392	4,976,207	2,376	5.3	124.1	4.9				
PROC	Process Area	AREA	631,880	4,973,910	1,970	2.2		2.1		400	400	0
HR	Onsite Hauling	VOLUME	See worksheet: ROADS			5.3	15.1	4.9	-	-	-	-
ACCRD	Access Roads	VOLUME	See worksheet: HR Grid			3.0	5.6	2.8	-	-	-	-
HELI	Heliport	VOLUME	632,222	4,973,588	1,996	3.4	9.1	3.2				

Updat

Emissions by LOM (ton/yr) Calculated on: 10/10/18

	LOM	PM	PM10		PM2.5		CO		NOX		SO2		VOC
PM10+SO2+NOX	Year	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr
ton/yr	PP	418.8	670.1	109.8	113.2	19.2	74.5	210.6	43.3	178.3	0.2	0.5	14.2
431	1	868.6	1,339.2	233.4	170.0	29.9	89.7	322.8	47.4	197.0	0.2	0.6	15.6
594	2	1,068.1	1,670.2	291.6	217.3	37.6	103.3	407.3	71.9	301.9	0.3	0.8	17.8
617	3	1,104.1	1,737.1	307.8	215.7	37.9	111.6	478.8	73.2	308.4	0.3	0.8	18.2
658	**4**	**1,176.6**	**1,842.2**	**327.8**	**225.3**	**40.0**	**122.2**	**524.8**	**78.1**	**329.3**	**0.3**	**0.9**	**19.0**
616	5	1,063.3	1,670.6	295.9	206.3	36.2	110.1	471.9	75.8	319.5	0.3	0.9	18.3
646	6	1,147.2	1,792.2	318.8	205.0	36.4	111.2	477.2	77.4	326.3	0.3	0.9	17.9
577	7	1,063.7	1,676.1	298.2	191.4	34.0	107.9	463.2	66.0	277.9	0.3	0.7	16.7
608	8	1,136.9	1,795.3	319.5	202.2	35.9	114.2	490.7	68.4	288.2	0.3	0.8	16.9
601	9	1,119.3	1,751.8	311.6	199.8	35.5	110.4	473.5	68.5	288.6	0.3	0.8	17.4
557	10	1,072.3	1,669.9	297.0	191.5	34.0	103.3	443.0	61.6	259.0	0.2	0.7	16.7
393	11	721.1	1,169.9	202.1	133.7	23.4	90.9	316.5	45.8	189.9	0.2	0.5	13.9
197	12	424.5	693.2	117.7	76.8	13.3	58.8	157.8	20.0	79.5	0.1	0.2	6.9
		chk	chk	chk	chk	chk	chk	chk	chk	chk	chk	chk-16	chk

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Mining Year 4

Open Pit Drilling

Activity Information

Operating schedule	355 day/yr	*(M3 2014)*	
Total drill holes per year	100,492 hole/yr	*(Midas Gold 2018l)*	

	Annual LOM-4 rates	Material blasted		Drilling[1]
YPP	Yellow Pine Pit	41,848,916 ton/yr	*(Midas Gold 2017b)*	91,885 hole/yr
HFP	Hangar Flats Pit	1,783,712 ton/yr	*(Midas Gold 2017b)*	3,917 hole/yr
WE	West End Pit	2,136,599 ton/yr	*(Midas Gold 2017b)*	4,692 hole/yr
BT_	Bradley Tailings	0 ton/yr	*(Midas Gold 2017b)*	0 hole/yr
	Total	45,769,227 ton/yr		100,494 hole/yr

(1) *Total drill holes per year scaled based on material blasted; rounded up to the nearest whole number*

Emission Factors

TSP (PM)	1.3 lb/hole	*AP-42, Tab. 11.9-4, 7/98 (overburden)*

PM Scaling Factors

PM	1	
PM10	0.52	*AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)*
PM2.5	0.03	*AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)*

Emissions by Model ID

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	Hg2+P_TPY
	Location of	PM	PM10		PM2.5		Hg2+P
Model ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
YPP	Yellow Pine Pit	59.73	174.97	31.06	10.09	1.79	3.6E-05
HFP	Hangar Flats Pit	2.55	7.46	1.32	0.43	0.08	1.5E-06
WEP	West End Pit	3.05	8.93	1.59	0.52	0.09	1.8E-06
BT	Bradley Tailings	--	--	--	--	--	--
Total	Open Pit Drilling	65.32	191.36	33.97	11.04	1.96	3.9E-05

Source Parameters[1]

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	PITVOL_M3	SXINIT_M	SYINIT_M	SIG_Z_M	ANGL_DEG	Area
		Source	UTM NAD 83		Elev.	Rel. Ht.	Pit Vol.	Len X	Len Y	S-z	Angle	
Model ID	Activity	Type	E m	N m	m	m	m^3	m	m	m	deg	
YPP	Yellow Pine Pit	AREA	631,160	4,975,865	1,832	5.32		882.0	882.0	4.95	-8.0	777906
HFP	Hangar Flats Pit	AREA	630,925	4,972,884	1,993	5.32		491.0	491.0	4.95	0.0	241069
WEP	West End Pit	AREA	632,398	4,976,290	2,192	5.32		376.2	376.2	4.95	0.0	141544

(1) *UTM - (Midas Gold 2017e); Rel. Ht. - (EPA 2012); Len X, Len Y, Angle - best-fit equal area rectangle; Elev. - (Midas Gold 2018n)*

Source Parameters[1]

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M		SXINIT_M	SYINIT_M	SIG_Z_M	ANGL_DEG	
		Source	UTM NAD 83		Elev.	Rel. Ht.	Pit Vol.	Len X	Len Y	S-z	Angle	
Model ID	Activity	Type	E m	N m	m	m	m^3	m	m	m	deg	
BT	Bradley Tailings	AREA	628,496	4,971,000	2,097	5.32		1,157	1,157	4.95	0.0	1338158

(1) *UTM, Elev. - (Midas Gold 2017e); Rel. Ht. - (EPA 2012); Len X, Len Y - best-fit equal area rectangle*

Conversions

2,000 lb/ton

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Mining Year 4

Open Pit Blasting

Activity Information

Operating schedule		365 day/yr	24 hr/day
BLS	Blast area	80,360 ft^2/blast	*(Midas Gold 2017b)*
TOT	Maximum blasts per year	365 blast/yr	*(Midas Gold 2017b)*

	Annual LOM-4 rates	Material blasted	Blasting[1]	ANFO use	
YPP	Yellow Pine Pit	41,848,916 ton/yr	334 blast/yr	8,493 ton ANFO/yr	*(Midas Gold 2017b)*
HFP	Hangar Flats Pit	1,783,712 ton/yr	14 blast/yr	368 ton ANFO/yr	*(Midas Gold 2017b)*
WE	West End Pit	2,136,599 ton/yr	17 blast/yr	440 ton ANFO/yr	*(Midas Gold 2017b)*
BT_	Bradley Tailings	0 ton/yr	0 blast/yr	0 ton ANFO/yr	*(Midas Gold 2017b)*
	Total	45,769,227 ton/yr	365 blast/yr	9,302 ton ANFO/yr	

(1) *Maximum blasts per year scaled based on material blasted; rounded up to the nearest whole number*

Emission Factors

Emission factor equation		TSP (lb/blast) = 0.000014 x A$^{1.5}$	*AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)*
A = Area per blast		80,360 ft^2	
TSP (PM)		318.92 lb/blast	
CO		67 lb/ton-ANFO	*AP-42, Tab. 13.3-1, 2/80 (ANFO)*
NOX		0.9 kg/t-ANFO	*(Attalla et al. 2008)*
		1.8 lb/ton-ANFO	
SO2	3.6E-03 lb/ton-ANFO	*Based on:*	6% *diesel content in ANFO* *(Midas Gold 2017d)*

$$\frac{1.5E\text{-}05\ \cancel{\text{lb S}}}{\cancel{\text{lb FO}}} \times \frac{2\ \text{lb SO2}}{\cancel{\text{lb S}}} \times \frac{6\%\ \cancel{\text{lb FO}}}{\cancel{\text{lb ANFO}}} \times \frac{2{,}000\ \cancel{\text{lb ANF}}}{\text{ton ANFO}} = \frac{3.6E\text{-}03\ \text{lb SO2}}{\text{ton ANFO}}$$

PM Scaling Factors

PM10	0.52	*AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)*
PM2.5	0.03	*AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)*

Emissions by Model ID

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	CO_PPH	CO_TPY	NOX_PPH	NOX_TPY	SO2_PPH	SO2_TPY	Hg2+P_TPY
		PM	PM10		PM2.5		CO		NOX[1]		SO2		Hg2+P
Model ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr
YPPBL	Yellow Pine Pit Blasting	53.26	151.76	27.70	8.76	1.60	64.96	284.52	1.75	7.64	0.0035	0.0153	3.2E-05
HFPBL	Hangar Flats Pit Blasting	2.23	6.36	1.16	0.37	0.07	2.82	12.33	0.08	0.33	0.0002	0.0007	1.3E-06
WEPBL	West End Pit Blasting	2.71	7.72	1.41	0.45	0.08	3.37	14.76	0.09	0.40	0.0002	0.0008	1.6E-06
BTBL	Bradley Tailings Blasting	--	--	--	--	--	--	--	--	--	--	--	0
Total	Open Pit Blasting	58.20	165.84	30.27	9.57	1.75	71.14	311.61	1.91	8.37	0.0038	0.0167	3.5E-05

(1) *NO2 / NOX:* 0.0357 *(Attalla et al. 2008)*

Source Parameters[1]

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	SIG_Y_M	SIG_Z_M
		Source	UTM NAD 83		Elev.	Rel. Ht.	S-y	S-z
Model ID	Activity	Type	E m	N m	m	m	m	m
YPPBL	Yellow Pine Pit Blasting	VOLUME	631,471	4,976,374	1,717	75	20.93	34.88
HFPBL	Hangar Flats Pit Blasting	VOLUME	631,171	4,973,129	1,891	75	20.93	34.88
WEPBL	West End Pit Blasting	VOLUME	632,586	4,976,478	1,994	75	20.93	34.88

(1) *UTM, Elev. - (Midas Gold 2017e); Rel. Ht. - (Attalla et al. 2008); S-y, S-z factors - (EPA 2016a)*

Conversions								
2,000 lb/ton	Blast height (BH)	150 m	*(Attalla et al. 2008)*	Sigma divider				
2.205 lb/kg	Blast width	90 m	*(Attalla et al. 2008)*	Rel. Ht.	2	of BH	*(EPA 2016a)*	
1.102 ton/t	Blast depth	90 m	*(Attalla et al. 2008)*	S-y	4.3	of SL	*(EPA 2016a)*	
	Equal area side length (SL)	90 m		S-z	4.3	of BH	*(EPA 2016a)*	

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Mining Year 4
Onsite Hauling

Ore_Waste
Equipment
MachineSpecs

Activity Information
Operating schedule 355 day/yr

Hauling Routes, Production Rates and Distances

Route Origin		Destination		Material Hauled [1] Material Type	Rate ton/yr	One-Way Hauling [2] mi	Truck Loads [3] load/yr	Total Travel [4] VMT/yr
Unpaved Roads								
YPP- Yellow Pine Pit	YPP	Process PC	PC	Ore	7,230,000	1.84	38,905	143,473
YPP- Yellow Pine Pit	YPP	PC Stockpile	STKP	Ore	--	1.80	--	--
YPP- Yellow Pine Pit	YPP	Fiddle DRSF	FDRSF	Rock	24,536,460	2.81	132,029	741,699
YPP- Yellow Pine Pit	YPP	Hangar Flats DRSF	HFDRSF	Rock	6,920,540	4.76	37,239	354,434
YPP- Yellow Pine Pit	YPP	Yellow Pine DRSF	YPDRSF	Rock	--		--	-- YPP-
Yellow Pine Pit	YPP	West End DRSF	WEDRSF	Rock	--		--	-- HFP-
Hangar Flats Pit	HFP	Process PC	PC	Ore	160,000	3.16	861	5,445
HFP- Hangar Flats Pit	HFP	PC Stockpile	STKP	Ore	--	3.12	--	-- HFP-
Hangar Flats Pit	HFP	Fiddle DRSF	FDRSF	Rock	--	4.83	--	-- HFP-
Hangar Flats Pit	HFP	Hangar Flats DRSF	HFDRSF	Rock	1,547,000	2.83	8,325	47,095
HFP- Hangar Flats Pit	HFP	Yellow Pine DRSF	YPDRSF	Rock	--	3.72	--	-- HFP-
Hangar Flats Pit	HFP	West End DRSF	WEDRSF	Rock	--	7.42	--	-- WEP
West End Pit	WEP	Process PC	PC	Ore	660,000	2.68	3,552	19,024
WEP West End Pit	WEP	PC Stockpile	STKP	Ore	--	2.63	--	-- WEP
West End Pit	WEP	Fiddle DRSF	FDRSF	Rock	--	4.43	--	-- WEP
West End Pit	WEP	Hangar Flats DRSF	HFDRSF	Rock	--	6.49	--	-- WEP
West End Pit	WEP	Yellow Pine DRSF	YPDRSF	Rock	--	2.75	--	-- WEP
West End Pit	WEP	West End DRSF	WEDRSF	Rock	946,000	3.07	5,091	31,249
BT-P Bradley Tailings	BT	Process PC	PC	Ore	692,000	3.87	3,724	28,850
BT-S Bradley Tailings	BT	PC Stockpile	STKP	Ore	--		--	--
BT-F Bradley Tailings	BT	Fiddle DRSF	FDRSF	Rock	--		--	--
BT-H Bradley Tailings	BT	Hangar Flats DRSF	HFDRSF	Rock	--	0.63	--	--
BT-Y Bradley Tailings	BT	Yellow Pine DRSF	YPDRSF	Rock	--		--	--
BT-W Bradley Tailings	BT	West End DRSF	WEDRSF	Rock	--		--	--
Total					42,692,000			1,371,269

(1) *(Midas Gold 2017b)*
(2) *(Midas Gold 2017e)*
(3) *See truck fleet information below.*
(4) *Truck loads × One-way hauling* ×2 *(round-trip)*

Truck Fleet

Truck		Payload Capacity [1] ton	Empty Weight [1] ton	Operation [2] hr/yr	Average Weight ton
Hau	Cat 789G	201.8	155.7	126,582	256.6
AD	Cat 740B	43.5	37.6	14,191	59.4
Weighted Average		185.8			236.7

(1) *(Caterpillar 2016c); Model Specs*
(2) *(Midas Gold 2017b)*

Conversions
2,000 lb/ton

Mining Year 4
Onsite Hauling - continued

Hauling Emissions by Route

Route Origin		Destination		Material Hauled Material Type	PM_TPY PM ton/yr	PM10_PPD PM10 lb/day	PM10_TPY PM10 ton/yr	PM2.5_PPD PM2.5 lb/day	PM2.5_TPY PM2.5 ton/yr	Hg2+P_TPY Hg2+P ton/yr
Unpaved Roads										
YPP-Yellow Pine Pit	YPP	Process PC	PC	Ore	78.07	108.09	19.19	10.81	1.92	4.7E-05
YPP-Yellow Pine Pit	YPP	PC Stockpile	STKP	Ore	--	--	--	--	--	--
YPP-Yellow Pine Pit	YPP	Fiddle DRSF	FDRSF	Rock	403.60	558.76	99.18	55.88	9.92	2.4E-04
YPP-Yellow Pine Pit	YPP	Hangar Flats DRSF	HFDRSF	Rock	192.87	267.01	47.39	26.70	4.74	1.2E-04
YPP-Yellow Pine Pit	YPP	Yellow Pine DRSF	YPDRSF	Rock	--	--	--	--	--	--
YPP-Yellow Pine Pit	YPP	West End DRSF	WEDRSF	Rock	--	--	--	--	--	--
HFP Hangar Flats Pit	HFP	Process PC	PC	Ore	2.96	4.10	0.73	0.41	0.07	1.8E-06
HFP Hangar Flats Pit	HFP	PC Stockpile	STKP	Ore	--	--	--	--	--	--
HFP Hangar Flats Pit	HFP	Fiddle DRSF	FDRSF	Rock	--	--	--	--	--	--
HFP Hangar Flats Pit	HFP	Hangar Flats DRSF	HFDRSF	Rock	25.63	35.48	6.30	3.55	0.63	1.5E-05
HFP Hangar Flats Pit	HFP	Yellow Pine DRSF	YPDRSF	Rock	--	--	--	--	--	--
HFP Hangar Flats Pit	HFP	West End DRSF	WEDRSF	Rock	--	--	--	--	--	--
WEP West End Pit	WEP	Process PC	PC	Ore	10.35	14.33	2.54	1.43	0.25	6.2E-06
WEP West End Pit	WEP	PC Stockpile	STKP	Ore	--	--	--	--	--	--
WEP West End Pit	WEP	Fiddle DRSF	FDRSF	Rock	--	--	--	--	--	--
WEP West End Pit	WEP	Hangar Flats DRSF	HFDRSF	Rock	--	--	--	--	--	--
WEP West End Pit	WEP	Yellow Pine DRSF	YPDRSF	Rock	--	--	--	--	--	--
WEP West End Pit	WEP	West End DRSF	WEDRSF	Rock	17.00	23.54	4.18	2.35	0.42	1.0E-05
BT-P Bradley Tailings	BT	Process PC	PC	Ore	15.70	21.73	3.86	2.17	0.39	9.4E-06
BT-S Bradley Tailings	BT	PC Stockpile	STKP	Ore	--	--	--	--	--	--
BT-F Bradley Tailings	BT	Fiddle DRSF	FDRSF	Rock	--	--	--	--	--	--
BT-H Bradley Tailings	BT	Hangar Flats DRSF	HFDRSF	Rock	--	--	--	--	--	--
BT-Y Bradley Tailings	BT	Yellow Pine DRSF	YPDRSF	Rock	--	--	--	--	--	--
BT-W Bradley Tailings	BT	West End DRSF	WEDRSF	Rock	--	--	--	--	--	--
Pit Subtotal					746.19	1,033.05	183.37	103.30	18.34	4.5E-04

Emission Factors

Unpaved roads

Emission factor equation	$E = k(s/12)^a (W/3)^b [(365-P)/365]$		*AP-42, Sec. 13.2.2, Eq. 1a, 11/06*
s = Surface material silt content	4 %		*(Midas Gold 2015)*
W = Mean vehicle weight	236.7 ton		
P = Days/year with ≥0.01 in preci	120 day/yr		*AP-42 Fig. 13.2.2-1, 11/06*

	PM	PM10	PM2.5		
k = Size-specific empirical constan	4.9	1.5	0.15		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
a = Size-specific empirical constan	0.7	0.9	0.9		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
b = Size-specific empirical constan	0.45	0.45	0.45		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
E = Size-specific emission factor	10.88	2.67	0.27	lb/VMT	

Emission Controls

Unpaved roads - periodic application of water and chemical dust suppressant
Control efficiency 90% *(Air Sciences 2018)*

Mining Year 4
Onsite Hauling - continued

Emissions by Area

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	Hg2+P_TPY
		PM	PM10		PM2.5		Hg2+P
Area ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
HR	Onsite Hauling	746.19	1,033.05	183.37	103.30	18.34	4.5E-04

See worksheet ROADS for haul road (HR) emissions by Model ID.

Source Parameters[1]

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	SIG_Y_M	SIG_Z_M
		Source	UTM NAD 83		Elev.	Rel. Ht.	S-y	S-z
Model ID	Activity	Type	E m	N m	m	m	m	m
HR	Onsite Hauling	VOLUME	*See worksheet: ROADS*			5.32	15.14	4.95

[1] *UTM, Elev. - (Midas Gold 2017e); Rel. Ht., Sy, Sz - (EPA 2012)*

Truck	Height	Reference
Cat 789G	6.5 m	*(Caterpillar 2016c)*
Cat 740B	4.1 m	*Model Specs*
Weighted	6.26 m	
Road width (RW)	26.5 m	*(Midas Gold 2016), Fig. 9-1*

Plume Parameter	Calculation	Value (m)	Const.
Plume top (PT) - unpaved	1.7 x VH	10.63	1.7
Release height - unpaved	0.5 x PT	5.32	0.5
Plume width (PW)	RW + 6 m	32.55	6
Sigma-z - unpaved	PT / 2.15	4.95	2.15
Sigma-y	PW / 2.15	15.14	2.15

(EPA 2012)

Conversions
2,000 lb/ton
3.28 ft/m
12 in/ft

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Mining Year 4

Material Load/Unload

Activity Information

Operating schedule 355 day/yr

Throughput Rates chk

Model ID	Location of Activity	No. of Xfers	Rate ton/yr	Total Rate ton/yr	Xfer Description
YPP	Yellow Pine Pit	1	38,687,000	38,687,000	Load
HFP	Hangar Flats Pit	1	1,707,000	1,707,000	Load
WEP	West End Pit	1	1,606,000	1,606,000	Load
BT	Bradley Tailings	1	692,000	692,000	Load
PC	Process PC (1)	0	8,742,000	0	Unload
STKP	PC Stockpile	2	0	0	Unload & Reload
FDRSF	Fiddle DRSF	1	24,536,460	24,536,460	Unload
HFDRSF	Hangar Flats DRSF	1	8,467,540	8,467,540	Unload
YPDRSF	Yellow Pine DRSF	1	0	0	Unload
WEDRSF	West End DRSF	1	946,000	946,000	Unload

(1) *Ore unloading at primary crusher is accounted for in process sources*

Emission Factors

	PM	PM10	PM2.5		
k = Particle size multiplier	0.74	0.35	0.053		*AP-42, Sec. 13.2.4, Pg. 4, 11/06*
E = Emission facto Load	0.00021	0.0001	0.000015	lb/ton	*AP-42, Tab. 11.19.2-2, 8/04 (truck loading - crshed stone)*
Unload	0.00003	0.000016	0.0000024	lb/ton	*AP-42, Tab. 11.19.2-2, 8/04 (truck unloading - fragmented stone)*

Emissions by Model ID

chk PM_TPY PM10_PPD PM10_TPY PM2.5_PPD PM2.5_TPY Hg2+P_TPY

Model ID	Location of Activity	Total Rate ton/yr	PM ton/yr	PM10 lb/day	PM10 ton/yr	PM2.5 lb/day	PM2.5 ton/yr	Hg2+P ton/yr
YPP	Yellow Pine Pit	38,687,000	4.09	10.90	1.93	1.65	0.29	2.5E-06
HFP	Hangar Flats Pit	1,707,000	0.18	0.48	0.09	0.07	0.01	1.1E-07
WEP	West End Pit	1,606,000	0.17	0.45	0.08	0.07	0.01	1.0E-07
BT	Bradley Tailings	692,000	0.07	0.19	0.03	0.03	0.01	4.4E-08
PC	Process PC	--	--	--	--	--	--	--
STKP	PC Stockpile	--	--	--	--	--	--	--
FDRSF	Fiddle DRSF	24,536,460	2.59	6.91	1.23	1.05	0.19	1.6E-06
HFDRSF	Hangar Flats DRSF	8,467,540	0.90	2.39	0.42	0.36	0.06	5.4E-07
YPDRSF	Yellow Pine DRSF	--	--	--	--	--	--	--
WEDRSF	West End DRSF	946,000	0.10	0.27	0.05	0.04	0.01	6.0E-08
Total	Material Load / Unload	76,642,000	8.10	21.59	3.83	3.27	0.58	4.9E-06

Conversions

2.237 mi/hr per m/s

2,000 lb/ton

Mining Year 4

Material Load / Unload -continued

Source Parameters		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	PITVOL_M3	SXINIT_M	SYINIT_M	SIG_Z_M	NGL_DEG	
	Location of	Source	UTM NAD 83		Elev.	Rel. Ht.	Pit Vol.	Len X	Len Y	S-z	Angle	
Model ID	Activity	Type	E m	N m	m	m	m^3	m	m	m	deg	
YPP	Yellow Pine Pit	AREA	631,160	4,975,865	1,832	5.32		882	882	4.95	-8	Pits
HFP	Hangar Flats Pit	AREA	630,925	4,972,884	1,993	5.32		491	491	4.95	0	Pits
WEP	West End Pit	AREA	632,398	4,976,290	2,192	5.32		376	376	4.95	0	Pits
BT	Bradley Tailings	AREA	628,496	4,971,000	2,097	5.32		1,157	1,157	4.95	0	

Source Parameters[1]		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	SIG_Y_M	SIG_Z_M	Surface		
	Location of	Source	UTM NAD 83		Elev.	Rel. Ht.	S-y	S-z	Area	Length	
Model ID	Activity	Type	E m	N m	m	m	m	m	m^2	m	
STKP	PC Stockpile	VOLUME	632,087	4,974,600	1,980	5.32	53.35	4.95	5.26E+04	229.4	Stockpile
FDRSF	Fiddle DRSF	VOLUME	630,981	4,974,903	2,115	5.32	180.22	4.95	6.01E+05	774.9	DRSF
HFDRSF	Hangar Flats DRSF	VOLUME	630,158	4,972,124	2,080	5.32	174.81	4.95	5.65E+05	751.7	DRSF
YPDRSF	Yellow Pine DRSF	VOLUME	631,491	4,976,383	1,904	5.32	182.21	4.95	6.14E+05	783.5	DRSF
WEDRSF	West End DRSF	VOLUME	633,392	4,976,207	2,376	5.32	124.05	4.95	2.85E+05	533.4	DRSF

[1] *UTM, Elev., Area - (Midas Gold 2017e); Rel. Ht. - (EPA 2012); S-y, S-z factors - (EPA 2016a)*

Vehicle height (VH):
Weighted Average 6.26 m

Plume Parameter	Calculation	Value (m)	Const.
Plume top (PT)	1.7 x VH	10.63	1.7
Release height	0.5 x PT	5.32	0.5
Sigma-z	PT / 2.15	4.95	2.15

(EPA 2012)

Sample calculation for PCStockpile

Plume Parameter	Calculation	Value (m)	Const.
Surface area (SA)	Map	52,623	
Side length (SL)	SA^0.5	229.4	0.5
Sigma-y	SL / 4.3	53.35	4.3

(EPA 2016a)

Mining Year 4

Mobile Equipment (Tailpipes)

Equipment MachineSpecs

Mobile Equipment Specifications and Activity

Equipment	Equipment[1] Model	ID	Rating[2] hp	Rating kW	Oper.[1] hr/yr	Equip.[1] Count	Diesel[1] gal/yr	Output[3] kW-hr/yr	Travel[4] VMT/yr	Equipment Category	On-road[5] Class	gal/hp-hr
Production Drill	Cat MD6420	EQP1	800	597	33,507	5	402,084	5,868,276		Non-road		0.02
Production FEL	Cat 994H	EQP2	1,463	1,091	25,229	4	1,135,296	16,569,250		Non-road		0.03
Haul Truck	Cat 789G	EQP3	2,100	1,566	126,582	20	4,430,370	64,659,709		Non-road		0.02
Large Dozer	Cat D10T2	EQP4	600	447	31,646	5	601,265	8,775,246		Non-road		0.03
Small Dozer	Cat D6T	EQP5	200	149	4,468	1	31,273	456,421		Non-road		0.04
Grader	Cat 16M	EQP6	326	243	12,614	3	69,379	1,012,565		Non-road		0.02
Water Truck	Cat 777D	EQP7	1,000	746	7,446	2	186,150	2,716,795		Non-road		0.03
Support FEL	Cat 988K	EQP8	580	433	3,723	1	42,815	624,863		Non-road		0.02
ADT	Cat 740B	EQP9	484	361	14,191	3	127,721	1,864,041		Non-road		0.02
PreSplit Drill	Cat MD6240	EQP10	800	597	3,942	1	39,420	575,321		Non-road		0.01
Excavator	Cat 349	EQP11	408	304	10,424	2	104,244	1,521,405		Non-road		0.02
Blasthole Stemmer	F-650	EQP12	330	246	4,993	1	34,952	510,118	124,830	On-road	MHD	0.02
Blasters Flatbed Truck	F-650	EQP13	330	246	9,986	2	44,939	655,866	249,660	On-road	MHD	0.01
ANFO/Slurry Truck	Cat CT660	EQP14	476	355	4,993	1	39,946	582,992	99,864	On-road	HHD	0.02
Fuel Truck	CAT 740B	EQP15	484	361	7,490	1	149,796	2,186,221		Non-road		0.04
Lube Truck	CAT 740B	EQP16	484	361	6,658	1	133,152	1,943,307		Non-road		0.04
Flatbed Truck	F-350	EQP17	440	328	7,490	1	33,704	491,900	187,245	On-road	LHD45	0.01
Service Truck with Crane	F-650	EQP18	330	246	3,329	1	23,302	340,079	83,220	On-road	MHD	0.02
Crane Truck	F-650	EQP19	330	246	3,329	1	18,308	267,205	66,576	On-road	MHD	0.02
Cat 988 with Tire Handler	Cat 988K	EQP20	580	433	5,825	1	66,992	977,726		Non-road		0.02
Mechanics Truck	F-650	EQP21	330	246	14,147	2	63,663	929,144	353,685	On-road	MHD	0.01
Welding Truck	F-650	EQP22	330	246	7,074	1	31,832	464,572	176,843	On-road	MHD	0.01
Tractor & Lowboy	F-650	EQP23	330	246	2,497	1	17,476	255,059	37,449	On-road	MHD	0.02
Shop Forklift	CAT DP160N	EQP24	124	92	7,490	1	18,725	273,278		Non-road		0.02
RT Forklift	CAT DP35N	EQP25	47	35	7,490	1	33,704	491,900		Non-road		0.10
Crane - 80 Ton	TMS800E	EQP26	402	300	2,081	1	28,087	409,916		Non-road		0.03
Cat 430E Backhoe	CAT 430E	EQP27	101	75	4,993	1	24,966	364,370		Non-road		0.05
Man Van	F-350 (MV)	EQP28	440	328	19,973	4	29,959	437,244	499,320	On-road	LHD45	0.003
Pickup Truck	F-350	EQP29	440	328	33,288	5	33,288	485,827	832,200	On-road	LHD45	0.002
Light Plants	Terex AL5	EQP30	27	20	33,288	8	18,308	267,205		Non-road		0.02
Compactor	Cat CS76 XT	EQP31	177	132	6,329	1	33,228	484,948		Non-road		0.03

[1] *(Midas Gold 2017b)*

[2] *(Caterpillar 2016c)/Manufacturer specifications*

[3] *Based on:* 137,000 BTU/gal *AP-42, App. A (Diesel)* 7,000 BTU/hp-hr *AP-42, Sec. 3.3, (Diesel)*

[4] *Based on the following average speeds (mph):* *(Midas Gold 2018e)*

Blasthole Stemmer	*F-650*	*25*
Blasters Flatbed Truck	*F-650*	*25*
ANFO/Slurry Truck	*Cat CT660*	*20*
Flatbed Truck	*F-350*	*25*
Service Truck with Crane	*F-650*	*25*
Crane Truck	*F-650*	*20*
Mechanics Truck	*F-650*	*25*
Welding Truck	*F-650*	*25*
Tractor & Lowboy	*F-650*	*15*
Man Van	*F-350 (MV)*	*25*
Pickup Truck	*F-350*	*25*

VMT = Vehicle Miles Travelled

Conversions
1.341 hp/kW

[5] *On-road vehicle codes and descriptions provided in MOVES2014a emission factors table (EPA 2015)*

Mining Year 4

Mobile Equipment (Tailpipes)

Operating schedule 355 day/yr 24 hr/day

Equipment MachineSpecs

EPA Non-Road Standards

ID	Equipment Type	Model[1] Year	Power Category	EPA Tier	Lookup ID	MOVES Class ID	EPA Non-Road Standards (g/kW-hr)[2] PM	CO	NOX	VOC
EQP1	Drill	>2015	kW>560	4	T4-kW>560 2015		0.04	3.5	3.5	0.19
EQP2	Loader	≥2018	kW>560	4	T4-kW>560 2015		0.04	3.5	3.5	0.19
EQP3	Haul Truck	≥2018	kW>560	4	T4-kW>560 2015		0.04	3.5	3.5	0.19
EQP4	Dozer	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015		0.02	3.5	0.4	0.19
EQP5	Dozer	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015		0.02	3.5	0.4	0.19
EQP6	Grader	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015		0.02	3.5	0.4	0.19
EQP7	Water Truck	>2015	kW>560	4	T4-kW>560 2015		0.04	3.5	3.5	0.19
EQP8	Loader	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015		0.02	3.5	0.4	0.19
EQP9	Haul Truck	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015		0.02	3.5	0.4	0.19
EQP10	Drill	>2015	kW>560	4	T4-kW>560 2015		0.04	3.5	3.5	0.19
EQP11	Excavator	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015		0.02	3.5	0.4	0.19
EQP12	Blaster Truck	>2015	EQP13		No Standard	MHD				
Blaster Truck	>2015	EQP14	Blaster		No Standard	MHD				
Truck	>2015	EQP15	Support Truck		No Standard	HHD				
>2015	EQP16	Support Truck	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015		0.02	3.5	0.4	0.19
EQP17	Support Truck	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015		0.02	3.5	0.4	0.19
EQP18	Support Truck	>2015			No Standard	LHD45				
EQP19	Support Truck	>2015			No Standard	MHD				
EQP20	Support Truck	>2015			No Standard	MHD				
EQP21	Support Truck	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015		0.02	3.5	0.4	0.19
EQP22	Support Truck	>2015			No Standard	MHD				
EQP23	Support Truck	>2015			No Standard	MHD				
EQP24	Forklift	>2015			No Standard	MHD				
EQP25	Forklift	>2015	75≤kW<130, Ph-in	4	T4-56≤kW<130 2015		0.02	5	0.4	0.19
EQP26	Crane	>2015	19≤kW<37	4	T4-19≤kW<37 2015		0.03	5.5	4.7	4.7
EQP27	Backhoe	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015		0.02	3.5	0.4	0.19
EQP28	Support Truck	>2015	75≤kW<130, Ph-in	4	T4-56≤kW<130 2015		0.02	5	0.4	0.19
EQP29	Support Truck	>2015			No Standard	LHD45				
EQP30	Light Plant	>2015			No Standard	LHD45				
EQP31	Compactor	>2015	19≤kW<37	4	T4-19≤kW<37 2015		0.03	5.5	4.7	4.7
(Midas Gold 2017h)			130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015		0.02	3.5	0.4	0.19

(1) *(CFR 2018a)*

(2)

Mining Year 4

Mobile Equipment (Tailpipes) -continued

Fuel Sulfur-Content Based SO2 Emission Factor

Fuel Sulfur-Content	0.0015%	*Non-road diesel specification per 40 CFR 80.510*
Diesel Density	7.05 lb/gal	*AP-42, App. A*
Molecular Wt. of SO2	64.064 lb/lb-mol	
Molecular Wt. of S	32.065 lb/lb-mol	
Diesel Heat Content	137,000 BTU/gal	*AP-42, App. A (Diesel)*
Brake-Specific Fuel Use	7,000 BTU/hp-hr	*AP-42, Sec. 3.3, (Diesel)*

SO2 emission factor:

$$0.000011 \frac{\text{lb}}{\text{hp-hr}} = 0.0015\% \times \frac{\text{lb S}}{\text{lb Fuel}} \times 7.05 \frac{\text{lb Fuel}}{\text{gal Fuel}} \times \frac{64.064 \text{ lb SO2}}{32.065 \text{ lb S}} \times \frac{\text{gal Fuel}}{137{,}000 \text{ BTU}} \times 7{,}000 \frac{\text{BTU}}{\text{hp-hr}}$$

$$0.006567 \frac{\text{g}}{\text{kW-hr}} = 0.000011 \frac{\text{lb}}{\text{hp-hr}} \times 1.341 \frac{\text{hp}}{\text{kW}} \times 453.593 \frac{\text{g}}{\text{lb}}$$

EPA MOVES 2014a Emission Factors[1]

Vehicle Class	Description	Emission Factor (g/VMT)[2] PM	PM10	PM2.5	CO	NOX	VOC	SO2
LHD<=10K	Passenger Truck 8.5k-10k lb, Diesel	0.178	0.178	0.086	1.322	2.281	0.241	0.006
LHD45	Single Unit Truck 14k-19.5k lb, Diesel	0.589	0.589	0.291	1.867	4.940	0.685	0.011
MHD	Single Unit Truck 19.5k-33k lb, Diesel	0.797	0.797	0.381	2.170	5.684	0.841	0.011
HHD	Single Unit Truck >33k lb, Diesel	1.169	1.169	0.461	2.313	7.324	0.510	0.011

[1] *MOVES 2014a run dated 2017-09-25*

[2] *PM = PM10*

EPA Engine Certification Data

ID	Lookup ID Engine Description			Emission Factor (g/kW-hr) PM	PM10	PM2.5	CO	NOX	VOC
EQP2	EPA_Cert2 Cat 994H	1,463 hp	[1]	0.02	0.02	0.02	0.8	2.7	0.06
EQP3	EPA_Cert3 Cat 789G	2,100 hp	[1]	0.02	0.02	0.02	0.8	2.7	0.06

[1] *(Caterpillar 2018), Engine family No. JCPXL78.1NVF*

Conversions

1.341 hp/kW

453.593 g/lb

Mining Year 4

Mobile Equipment (Tailpipes) -continued

Final Emission Factors

ID	Lookup	PM	PM10	PM2.5	CO	NOX	VOC	SO2	EF Unit	Final EF	Activity
EQP1	T4-kW>560 2015	0.04	0.04	0.04	3.50	3.50	0.19	0.007	g/kW-hr	*EPA_NRS*	5,868,276 kW-hr/yr
EQP2	EPA_Cert2	0.02	0.02	0.02	0.80	2.70	0.06	0.007	g/kW-hr	*EPA_CERT*	16,569,250 kW-hr/yr
EQP3	EPA_Cert3	0.02	0.02	0.02	0.80	2.70	0.06	0.007	g/kW-hr	*EPA_CERT*	64,659,709 kW-hr/yr
EQP4	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	8,775,246 kW-hr/yr
EQP5	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	456,421 kW-hr/yr
EQP6	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	1,012,565 kW-hr/yr
EQP7	T4-kW>560 2015	0.04	0.04	0.04	3.50	3.50	0.19	0.007	g/kW-hr	*EPA_NRS*	2,716,795 kW-hr/yr
EQP8	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	624,863 kW-hr/yr
EQP9	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	1,864,041 kW-hr/yr
EQP10	T4-kW>560 2015	0.04	0.04	0.04	3.50	3.50	0.19	0.007	g/kW-hr	*EPA_NRS*	575,321 kW-hr/yr
EQP11	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	1,521,405 kW-hr/yr
EQP12	MHD	0.80	0.80	0.38	2.17	5.68	0.84	0.011	g/VMT	*EPA_MOVES2014a*	124,830 VMT/yr
EQP13	MHD	0.80	0.80	0.38	2.17	5.68	0.84	0.011	g/VMT	*EPA_MOVES2014a*	249,660 VMT/yr
EQP14	HHD	1.17	1.17	0.46	2.31	7.32	0.51	0.011	g/VMT	*EPA_MOVES2014a*	99,864 VMT/yr
EQP15	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	2,186,221 kW-hr/yr
EQP16	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	1,943,307 kW-hr/yr
EQP17	LHD45	0.59	0.59	0.29	1.87	4.94	0.68	0.011	g/VMT	*EPA_MOVES2014a*	187,245 VMT/yr
EQP18	MHD	0.80	0.80	0.38	2.17	5.68	0.84	0.011	g/VMT	*EPA_MOVES2014a*	83,220 VMT/yr
EQP19	MHD	0.80	0.80	0.38	2.17	5.68	0.84	0.011	g/VMT	*EPA_MOVES2014a*	66,576 VMT/yr
EQP20	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	977,726 kW-hr/yr
EQP21	MHD	0.80	0.80	0.38	2.17	5.68	0.84	0.011	g/VMT	*EPA_MOVES2014a*	353,685 VMT/yr
EQP22	MHD	0.80	0.80	0.38	2.17	5.68	0.84	0.011	g/VMT	*EPA_MOVES2014a*	176,843 VMT/yr
EQP23	MHD	0.80	0.80	0.38	2.17	5.68	0.84	0.011	g/VMT	*EPA_MOVES2014a*	37,449 VMT/yr
EQP24	T4-56≤kW<130 2015	0.02	0.02	0.02	5.00	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	273,278 kW-hr/yr
EQP25	T4-19≤kW<37 2015	0.03	0.03	0.03	5.50	4.70	4.70	0.007	g/kW-hr	*EPA_NRS*	491,900 kW-hr/yr
EQP26	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	409,916 kW-hr/yr
EQP27	T4-56≤kW<130 2015	0.02	0.02	0.02	5.00	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	364,370 kW-hr/yr
EQP28	LHD45	0.59	0.59	0.29	1.87	4.94	0.68	0.011	g/VMT	*EPA_MOVES2014a*	499,320 VMT/yr
EQP29	LHD45	0.59	0.59	0.29	1.87	4.94	0.68	0.011	g/VMT	*EPA_MOVES2014a*	832,200 VMT/yr
EQP30	T4-19≤kW<37 2015	0.03	0.03	0.03	5.50	4.70	4.70	0.007	g/kW-hr	*EPA_NRS*	267,205 kW-hr/yr
EQP31	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	484,948 kW-hr/yr

Final emission factor options:

Category	EF Unit	Activity Unit	Emission Unit	Multiplier
EPA_CERT	g/kW-hr	kW-hr/yr	ton/yr	1.1E-6
EPA_NRS	g/kW-hr	kW-hr/yr	ton/yr	1.1E-6
EPA_MOVES2014a	g/VMT	VMT/yr	ton/yr	1.1E-6

Conversions

453.6 g/lb 2,000 lb/ton

1.341 hp/kW

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: E. Memon
	PROJECT NO: 335-1-2	PAGE: 14 OF: 31 SHEET: Mine
AIR EMISSION CALCULATIONS	SUBJECT: Mining Activity and Emissions	DATE: October 10, 2018

Mining Year 4

Mobile Equipment (Tailpipes) -continued

Emissions by Area chk-15 chk chk-15 chk chk chk chk chk chk chk chk chk

		Equipment	PM	PM10		PM2.5		CO		NOX		SO2		VOC
Area ID	Equipment	Type	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr
PITS	EQP1	Drill	0.26	1.46	0.26	1.46	0.26	5.31	22.64	5.31	22.64	1.0E-2	0.04	1.23
PITS	EQP2	Loader	0.37	2.06	0.37	2.06	0.37	3.43	14.61	11.58	49.31	0.03	0.12	1.10
HR	EQP3	Haul Truck	1.43	8.03	1.43	8.03	1.43	13.38	57.02	45.17	192.4	0.11	0.47	4.28
All	EQP4	Dozer	0.19	1.09	0.19	1.09	0.19	7.95	33.86	0.91	3.87	0.01	0.06	1.84
All	EQP5	Dozer	0.01	0.06	0.01	0.06	0.01	0.41	1.76	0.05	0.20	7.8E-4	3.3E-3	0.10
HR	EQP6	Grader	0.02	0.13	0.02	0.13	0.02	0.92	3.91	0.10	0.45	1.7E-3	7.3E-3	0.21
HR	EQP7	Water Truck	0.12	0.67	0.12	0.67	0.12	2.46	10.48	2.46	10.48	4.6E-3	0.02	0.57
PITS	EQP8	Loader	0.01	0.08	0.01	0.08	0.01	0.57	2.41	0.06	0.28	1.1E-3	4.5E-3	0.13
HR	EQP9	Haul Truck	0.04	0.23	0.04	0.23	0.04	1.69	7.19	0.19	0.82	3.2E-3	0.01	0.39
PITS	EQP10	Drill	0.03	0.14	0.03	0.14	0.03	0.52	2.22	0.52	2.22	9.8E-4	4.2E-3	0.12
PITS	EQP11	Excavator	0.03	0.19	0.03	0.19	0.03	1.38	5.87	0.16	0.67	2.6E-3	0.01	0.32
PITS	EQP12	Blaster Truck	0.11	0.62	0.11	0.30	0.05	0.07	0.30	0.18	0.78	3.4E-4	1.5E-3	0.12
PITS	EQP13	Blaster Truck	0.22	1.24	0.22	0.59	0.10	0.14	0.60	0.37	1.56	6.8E-4	2.9E-3	0.23
PITS	EQP14	Blaster Truck	0.13	0.72	0.13	0.29	0.05	0.06	0.25	0.19	0.81	2.8E-4	1.2E-3	0.06
HR	EQP15	Support Truck	0.05	0.27	0.05	0.27	0.05	1.98	8.43	0.23	0.96	3.7E-3	0.02	0.46
HR	EQP16	Support Truck	0.04	0.24	0.04	0.24	0.04	1.76	7.50	0.20	0.86	3.3E-3	0.01	0.41
HR	EQP17	Support Truck	0.12	0.68	0.12	0.34	0.06	0.09	0.39	0.24	1.02	5.1E-4	2.2E-3	0.14
HR	EQP18	Support Truck	0.07	0.41	0.07	0.20	0.03	0.05	0.20	0.12	0.52	2.3E-4	9.7E-4	0.08
HR	EQP19	Support Truck	0.06	0.33	0.06	0.16	0.03	0.04	0.16	0.10	0.42	1.8E-4	7.7E-4	0.06
HR	EQP20	Support Truck	0.02	0.12	0.02	0.12	0.02	0.89	3.77	0.10	0.43	1.7E-3	7.1E-3	0.20
HR	EQP21	Support Truck	0.31	1.75	0.31	0.84	0.15	0.20	0.85	0.52	2.22	9.7E-4	4.1E-3	0.33
HR	EQP22	Support Truck	0.16	0.87	0.16	0.42	0.07	0.10	0.42	0.26	1.11	4.8E-4	2.1E-3	0.16
HR	EQP23	Support Truck	0.03	0.19	0.03	0.09	0.02	0.02	0.09	0.06	0.23	1.0E-4	4.4E-4	0.03
PROC	EQP24	Forklift	6.0E-3	0.03	6.0E-3	0.03	6.0E-3	0.35	1.51	0.03	0.12	4.6E-4	2.0E-3	0.06
PROC	EQP25	Forklift	0.02	0.09	0.02	0.09	0.02	0.70	2.98	0.60	2.55	8.4E-4	3.6E-3	2.55
PROC	EQP26	Crane	9.0E-3	0.05	9.0E-3	0.05	9.0E-3	0.37	1.58	0.04	0.18	7.0E-4	3.0E-3	0.09
PITS	EQP27	Backhoe	8.0E-3	0.05	8.0E-3	0.05	8.0E-3	0.47	2.01	0.04	0.16	6.2E-4	2.6E-3	0.08
HR	EQP28	Support Truck	0.32	1.83	0.32	0.90	0.16	0.24	1.03	0.64	2.72	1.4E-3	5.8E-3	0.38
HR	EQP29	Support Truck	0.54	3.04	0.54	1.50	0.27	0.40	1.71	1.06	4.53	2.3E-3	9.6E-3	0.63
All	EQP30	Light Plant	8.8E-3	0.05	8.8E-3	0.05	8.8E-3	0.38	1.62	0.32	1.38	4.5E-4	1.9E-3	1.38
All	EQP31	Compactor	0.01	0.06	0.01	0.06	0.01	0.44	1.87	0.05	0.21	8.2E-4	3.5E-3	0.10
Total			4.75	26.78	4.75	20.71	3.68	46.77	199.24	71.87	306.16	0.20	0.84	17.82

Subtotals	Equipment	PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	CO_PPH	CO_TPY	NOX_PPH	NOX_TPY	SO2_PPH	SO2_TPY	VOC_TPY
HR	Haul Roads	3.3	18.8	3.3	14.1	2.5	24.2	103.1	51.5	219.2	0.1	0.6	8.3
PITS	Pits	1.2	6.5	1.2	5.1	0.9	12.0	50.9	18.4	78.4	0.0	0.2	3.4
ALL	All	0.2	1.3	0.2	1.3	0.2	9.2	39.1	1.3	5.7	0.0	0.1	3.4
PROC	Process Area	0.0	0.2	0.0	0.2	0.0	1.4	6.1	0.7	2.8	0.0	0.0	2.7
STKP	PC Stockpile	--	--	--	--	--	--	--	--	--	--	--	--
PC	Process PC	--	--	--	--	--	--	--	--	--	--	--	--
Total	Mobile Tailpipes	4.75	26.78	4.75	20.71	3.68	46.77	199.24	71.87	306.16	0.20	0.84	17.82

All - All locations except haul roads

Short-term emissions are based on annual emissions divided by 355 day/yr and 24 hr/day.

LT Unit	ST Unit	Multiplier
ton/yr	lb/day	5.634
ton/yr	lb/hr	0.235

Conversions
2,000 lb/ton
453.59 g/lb

Mining Year 4

Mobile Equipment (Tailpipes) -continued

Emission Allocation by Model ID

		Area ID				Location of	Total Rate	chk	chk	chk	chk	chk
Model ID	*PITS*	*ALL*	*PROC*	*STKP*	*PC*	Activity	ton/yr	PITS	ALL	PROC	STKP	PC
YPP	*PITS*					Yellow Pine Pit	38,687,000	90.6%	-	-	-	-
HFP	*PITS*					Hangar Flats Pit	1,707,000	4.0%	-	-	-	-
WEP	*PITS*					West End Pit	1,606,000	3.8%	-	-	-	-
BT	*PITS*					Bradley Tailings	692,000	1.6%	-	-	-	-
PC					*PC*	Process PC	0	-	-	-	-	-
STKP				*STKP*		PC Stockpile	0	-	-	-	-	-
FDRSF		*ALL*				Fiddle DRSF	24,536,460	-	72.3%	-	-	-
HFDRSF		*ALL*				Hangar Flats DRSF	8,467,540	-	24.9%	-	-	-
YPDRSF		*ALL*				Yellow Pine DRSF	0	-	-	-	-	-
WEDRSF		*ALL*				West End DRSF	946,000	-	2.8%	-	-	-
PROC			*PROC*			Process Area				100.0%		

All - All locations except haul roads

Mining Year 4

Mobile Equipment (Tailpipes) -continued

Emissions by Model ID[1]		chk-15 PM_TPY	chk PM10_PPD	chk-15 PM10_TPY	chk PM2.5_PPD	chk PM2.5_TPY	chk CO_PPH	chk CO_TPY	chk-14 NOX_PPH	chk NOX_TPY	chk SO2_PPH	chk SO2_TPY	chk VOC_TPY
		PM	PM10		PM2.5		CO		NOX[2]		SO2		VOC
Model ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr
YPP	Mobile Tailpipes	1.05	5.93	1.05	4.66	0.83	10.83	46.13	16.68	71.08	0.04	0.17	3.06
HFP	Mobile Tailpipes	0.05	0.26	0.05	0.21	0.04	0.48	2.04	0.74	3.14	0.00	0.01	0.13
WEP	Mobile Tailpipes	0.04	0.25	0.04	0.19	0.03	0.45	1.92	0.69	2.95	0.00	0.01	0.13
BT	Mobile Tailpipes	0.02	0.11	0.02	0.08	0.01	0.19	0.83	0.30	1.27	0.00	0.00	0.05
PC	Mobile Tailpipes	--	--	--	--	--	--	--	--	--	--	--	--
STKP	Mobile Tailpipes	--	--	--	--	--	--	--	--	--	--	--	--
FDRSF	Mobile Tailpipes	0.16	0.91	0.16	0.91	0.16	6.63	28.26	0.96	4.10	0.01	0.05	2.47
HFDRSF	Mobile Tailpipes	0.06	0.31	0.06	0.31	0.06	2.29	9.75	0.33	1.41	0.00	0.02	0.85
YPDRSF	Mobile Tailpipes	--	--	--	--	--	--	--	--	--	--	--	--
WEDRSF	Mobile Tailpipes	0.01	0.04	0.01	0.04	0.01	0.26	1.09	0.04	0.16	0.00	0.00	0.10
PROC	Mobile Tailpipes	0.03	0.18	0.03	0.18	0.03	1.42	6.07	0.67	2.85	0.00	0.01	2.69
HR	Truck/Grader	3.34	18.80	3.34	14.14	2.51	24.21	103.15	51.46	219.21	0.13	0.57	8.33

(1) *See worksheet ROADS for haul road (HR) emissions by Model ID.*

(2) *NO2/NOX:* *11%* *(CAPCOA 2011)*

Source Parameters[1]		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	SIG_Z_M	SXINIT_M	SYINIT_M	ANGL_DEG	
		Source	UTM NAD 83		Elev.	Rel. Ht.	S-z	Len X	Len Y	Angle	WCB
Model ID	Activity	Type	E m	N m	m	m	m	m	m	deg	deg
PROC	Process Area	AREA	631,880	4,973,910	1,970	2.22	2.07	400	400	0	

(1) *UTM, Elev. - (Midas Gold 2017e); Rel. Ht., S-z - (EPA 2012); Len X, Len Y, Angle - best-fit equal area rectangle*

Vehicle height (VH):

Average (forklifts) 2.62 m *Model Specs*

Plume Parameter	Calculation	Value (m)	Const.
Plume top (PT)	1.7 x VH	4.45	1.7
Release height	0.5 x PT	2.22	0.5
Sigma-z	PT / 2.15	2.07	2.15

(EPA 2012)

Sample Calculation for Mobile Tailpipes

Plume Parameter	Calculation	Value (m)	Const.
Surface area (SA)	Map	160,000	
Side length (SL)	SA^0.5	400.0	0.5
Sigma-y	SL / 4.3	93.02	4.3

(EPA 2016a)

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: E. Memon
	PROJECT NO: 335-1-2	PAGE: 17 OF: 31 SHEET: Mine
AIR EMISSION CALCULATIONS	SUBJECT: Mining Activity and Emissions	DATE: October 10, 2018

Mining Year 4

Dozing and Grading

Activity Information

Operating schedule 355 day/yr

Dozer and Grader Fleet

Equipment Category	Activity
Dozer	36,113 hr/yr
Grader	12,614 hr/yr
	81,994 VMT/yr

Dozing Emission Factors

Emission Factor Equation	TSP (lb/hr) = 5.7 $(s)^{1.2}/(M)^{1.3}$	*AP-42, Tab. 11.9-1, 07/98, (bulldozing, overburden)*
	PM15 (lb/hr) = 1.0 $(s)^{1.5}/(M)^{1.4}$	*AP-42, Tab. 11.9-1, 07/98, (bulldozing, overburden)*
s = Surface material silt content	6.9 %	*AP-42, Table 11.9-3, 07/98, (bulldozers, overburden)*
M = Material moisture content	7.9 %	*AP-42, Table 11.9-3, 07/98, (bulldozers, overburden)*
TSP(PM)	3.941 lb/hr	
PM15	1.004 lb/hr	

Dozing PM Scaling Factors

PM10	0.75	*AP-42, Tab. 11.9-1, 07/98, (applies to PM15 EF, footnote d)*
PM2.5	0.105	*AP-42, Tab. 11.9-1, 07/98, (applies to TSP EF, footnote e)*

Grading Emission Factors

Emission Factor Equation	TSP (lb/VMT) = 0.04 $(S)^{2.5}$	*AP-42, Tab. 11.9-1, 07/98, (grading)*
	PM15 (lb/VMT) = 0.051 $(S)^{2}$	*AP-42, Tab. 11.9-1, 07/98, (grading)*
S - Grader average speed	6.5 mph	*(Caterpillar 2016c), haul road maintenance*
TSP(PM)	4.309 lb/VMT	
PM15	2.155 lb/VMT	

Grading PM Scaling Factors

PM10	0.6	*AP-42, Tab. 11.9-1, 07/98, (applies to PM15 EF, footnote d)*
PM2.5	0.031	*AP-42, Tab. 11.9-1, 07/98, (applies to TSP EF, footnote e)*

Emission Controls

Grading Periodic application of water and chemical dust suppressant

Control efficiency: 90% *See Onsite Hauling*

Emissions by Area

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	Hg2+P_TPY
		PM	PM10		PM2.5		Hg2+P
Area ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
All	Dozing	71.16	76.58	13.59	42.09	7.47	4.3E-05
HR	Grading	17.66	29.86	5.30	3.09	0.55	1.1E-05

Conversions

2,000 lb/ton

Mining Year 4

Dozing and Grading - continued

		chk	chk	chk	chk	chk	chk
Emissions by Model ID		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	Hg2+P_TPY
		PM	PM10		PM2.5		Hg2+P
Model ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
YPP	Dozing	--	--	--	--	--	--
HFP	Dozing	--	--	--	--	--	--
WEP	Dozing	--	--	--	--	--	--
BT	Dozing	--	--	--	--	--	--
PC	Dozing	--	--	--	--	--	--
STKP	Dozing	--	--	--	--	--	--
FDRSF	Dozing	51.43	55.34	9.82	30.42	5.40	3.1E-05
HFDRSF	Dozing	17.75	19.10	3.39	10.50	1.86	1.1E-05
YPDRSF	Dozing	--	--	--	--	--	--
WEDRSF	Dozing	1.98	2.13	0.38	1.17	0.21	1.2E-06
HR	Grading	17.66	29.86	5.30	3.09	0.55	1.1E-05

See worksheet ROADS for haul road (HR) emissions by Model ID.

Source Parameters

Dozing: See Open Pit Drilling and Material Load / Unload for source parameters.
Grading: See Onsite Hauling for source parameters.

Mining Year 4

Water Truck Travel

Activity Information

Operating schedule 355 day/yr

Truck Fleet

Water Truck	Payload Capacity ton	Empty Weight ton	Gross Weight ton	Units	Oper. hr/yr	Reference	Average Weight ton
Cat 777D	100	80	180	2	7,446	*(Caterpillar 2016c)*	130

Average truck speed 15 mph *(Midas Gold 2018e)*

Total vehicle miles traveled (VMT) 111,690 VMT/yr

Emission Factors

Emission factor equation $E = k(s/12)^a (W/3)^b [(365-P)/365]$ *AP-42, Sec. 13.2.2, Eq. 1a, 11/06*

s = Surface material silt content 4 % *(Midas Gold 2015)*

W = Mean vehicle weight 130.17 ton

P = Days/year with ≥0.01 in precip. 120 day/yr *AP-42 Fig. 13.2.2-1, 11/06*

	PM	PM10	PM2.5		
k = Size-specific empirical constant	4.9	1.5	0.15		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
a = Size-specific empirical constant	0.7	0.9	0.9		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
b = Size-specific empirical constant	0.45	0.45	0.45		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
E = Size-specific emission factor	8.32	2.04	0.20	lb/VMT	

Emission Controls

Periodic application of water and chemical dust suppressant

Control efficiency 90% *See Onsite Hauling*

Emissions by Area

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	Hg2+P_TPY
		PM	PM10		PM2.5		Hg2+P
Area ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
HR	Water Truck Travel	46.44	64.29	11.41	6.43	1.14	2.8E-05

Source Parameters

See Onsite Hauling for source parameters.

Conversions

2,000 lb/ton

Mining Year 4

Access Roads

Operation Schedule 355 day/yr 24 hr/day

Equipment MachineSpecs

Mobile Equipment Specifications and Activity

Equipment[1]	Equipment Model[2]	ID	Rating[3] hp	Rating kW	Oper.[4] hr/yr	Annual[1] trip/yr	Diesel[5] gal/yr	Output[6] kW-hr/yr	Travel[7] VMT/yr	Equipment Category	On-road Class	
Grader	Cat 160H	MNT1	200	149	2,000	92	6,748	98,492	6,903	Non-road		Ca
Plow Truck	Cat CT660	MNT2	476	355	2,000	92	16,000	--	6,903	On-road	HHD	Ca
Snow Blower	TM42R	MNT3	450	336	2,000	92	15,126	--	6,903	On-road	HHD	Ca
Water Truck	Cat 725C	MNT4	320	239	2,000	92	16,000	233,514	6,903	Non-road		Ca
Binding Agent Truck	Cat 725C	MNT5	320	239	2,000	92	16,000	233,514	6,903	Non-road		Ca
Vibratory Compactor	Cat CS76 XT	MNT6	177	132	2,000	92	10,500	153,244	6,903	Non-road		Ca
Fuel Service Truck	CAT 740B	MNT7	484	361	2,000	92	18,000	262,704	6,903	Non-road		CA
Rock Rakes	Cat CT660	MNT8	476	355	2,000	92	16,000	--	6,903	On-road	HHD	Ca
Light Vehicles	F-350	MNT9	440	328		3,156	16,915	--	236,807	On-road	LHD45	F-3
Heavy Trucks	Cat CT660 (8X6)	LDEL	476	355		7,906	91,264	--	593,218	On-road	HHD	Ca

(1) *(Midas Gold 2016), Tables 7-1, 12-2, and 12-4. Maintenance trips distributed equally amongst maintenace equipment.*
Heavy trucks include buses, supply, product shipment and trash trucks. Light vehicles include visitor and employee vehicles.

(2) *Similar models by equipment type from (Midas Gold 2017b)*

(3) *(Caterpillar 2016c)/Manufacturer specifications*

(4) *Combined hours, (Midas Gold 2017f)*

(5) *Maintenance equipment based on brake-specific fuel use scaled for similar equipment from (Midas Gold 2017b)*
Light vehicles based on Ford F-350 fuel economy of: 14.0 *mpg (fuelly.com)* *Heavy trucks based on fuel economy* 6.5 *mpg (ATRI 2016)*

(6) *Based on* 137,000 *BTU/gal* AP-42, App. A (Diesel) 7,000 *BTU/hp-hr* AP-42, Sec. 3.3, (Diesel)

(7) *Based on access road length of:* 37.5 X 2 *mi (roundtrip)* *(Midas Gold 2018c)*

EPA Non-Road Standards

ID	Equipment Type	Model[1] Year	Power Category	EPA Tier	Lookup ID	EPA Non-Road Standards (g/kW-hr)[2] PM	CO	NOX	VOC
MNT1	Grader	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
MNT2	Truck				No Standard				
MNT3	Truck				No Standard				
MNT4	Truck	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
MNT5	Truck	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
MNT6	Compactor	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
MNT7	Truck	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
MNT8	Truck				No Standard				
MNT9	Light Truck				No Standard				
LDEL	Truck				No Standard				

(1) *(Midas Gold 2017h)*

(2) *(CFR 2018a)*

Final Emission Factors

ID	Lookup	PM	PM10	PM2.5	CO	NOX	VOC	SO2	EF Unit	Final EF	Activity
MNT1	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.01	g/kW-hr	*EPA_NRS*	98,492 kW-hr/yr
MNT2	HHD	1.17	1.17	0.46	2.31	7.32	0.51	0.01	g/VMT	*EPA_MOVES2014a*	6,903 VMT/yr
MNT3	HHD	1.17	1.17	0.46	2.31	7.32	0.51	0.01	g/VMT	*EPA_MOVES2014a*	6,903 VMT/yr
MNT4	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.01	g/kW-hr	*EPA_NRS*	233,514 kW-hr/yr
MNT5	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.01	g/kW-hr	*EPA_NRS*	233,514 kW-hr/yr
MNT6	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.01	g/kW-hr	*EPA_NRS*	153,244 kW-hr/yr
MNT7	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.01	g/kW-hr	*EPA_NRS*	262,704 kW-hr/yr
MNT8	HHD	1.17	1.17	0.46	2.31	7.32	0.51	0.01	g/VMT	*EPA_MOVES2014a*	6,903 VMT/yr
MNT9	LHD45	0.59	0.59	0.29	1.87	4.94	0.68	0.01	g/VMT	*EPA_MOVES2014a*	236,807 VMT/yr
LDEL	HHD	1.17	1.17	0.46	2.31	7.32	0.51	0.01	g/VMT	*EPA_MOVES2014a*	593,218 VMT/yr

Mining Year 4

Access Roads - continued

Mobile Equipment Tailpipe Emissions

Emissions by Area chk chk chk chk chk chk chk chk chk chk chk chk

		Equipment	PM	PM10		PM2.5		CO		NOX		SO2		VOC
Area ID	Equipmen	Type	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr
ACCRD	MNT1	Grader	2.2E-3	0.01	2.2E-3	0.01	2.2E-3	0.09	0.38	0.01	0.04	1.7E-4	7.1E-4	0.02
ACCRD	MNT2	Plow Truck	8.9E-3	0.05	8.9E-3	0.02	3.5E-3	4.1E-3	0.02	0.01	0.06	1.9E-5	8.1E-5	3.9E-3
ACCRD	MNT3	Snow Blower	8.9E-3	0.05	8.9E-3	0.02	3.5E-3	4.1E-3	0.02	0.01	0.06	1.9E-5	8.1E-5	3.9E-3
ACCRD	MNT4	Water Truck	5.1E-3	0.03	5.1E-3	0.03	5.1E-3	0.21	0.90	0.02	0.10	4.0E-4	1.7E-3	0.05
ACCRD	MNT5	Binding Agent Truck	5.1E-3	0.03	5.1E-3	0.03	5.1E-3	0.21	0.90	0.02	0.10	4.0E-4	1.7E-3	0.05
ACCRD	MNT6	Vibratory Compactor	3.4E-3	0.02	3.4E-3	0.02	3.4E-3	0.14	0.59	0.02	0.07	2.6E-4	1.1E-3	0.03
ACCRD	MNT7	Fuel Service Truck	5.8E-3	0.03	5.8E-3	0.03	5.8E-3	0.24	1.01	0.03	0.12	4.5E-4	1.9E-3	0.06
ACCRD	MNT8	Rock Rakes	8.9E-3	0.05	8.9E-3	0.02	3.5E-3	4.1E-3	0.02	0.01	0.06	1.9E-5	8.1E-5	3.9E-3
ACCRD	MNT9	Light Vehicles	0.15	0.87	0.15	0.43	0.08	0.11	0.49	0.30	1.29	6.4E-4	2.7E-3	0.18
ACCRD	LDEL	Heavy Trucks	0.76	4.31	0.76	1.70	0.30	0.36	1.51	1.12	4.79	1.6E-3	7.0E-3	0.33
Total			0.97	5.44	0.97	2.31	0.41	1.37	5.84	1.57	6.68	0.00	0.02	0.73
Subtotals	Equipment		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	CO_PPH	CO_TPY	NOX_PPH	NOX_TPY	SO2_PPH	SO2_TPY	VOC_TPY
ACCRD	Access Roads		0.97	5.44	0.97	2.31	0.41	1.37	5.84	1.57	6.68	0.00	0.02	0.73
Total			0.97	5.44	0.97	2.31	0.41	1.37	5.84	1.57	6.68	0.00	0.02	0.73

~~LT Unit~~	~~ST Unit~~	~~Multiplier~~
ton/yr	lb/day	5.634
ton/yr	lb/hr	0.235

Grading

Operation 2,000 hr/yr
13,000 VMT/yr

Grading Emission Factors

Emission Factor Equation	TSP (lb/VMT) = 0.04 (S)$^{2.5}$	*AP-42, Tab. 11.9-1, 07/98, (grading)*
	PM15 (lb/VMT) = 0.051 (S)^{2}	*AP-42, Tab. 11.9-1, 07/98, (grading)*
S - Grader average speed	6.5 mph	*(Caterpillar 2016c), haul road maintenance*
TSP(PM)	4.309 lb/VMT	
PM15	2.155 lb/VMT	

Grading PM Scaling Factors

PM10	0.6	*AP-42, Tab. 11.9-1, 07/98, (applies to PM15 EF, footnote d)*
PM2.5	0.031	*AP-42, Tab. 11.9-1, 07/98, (applies to TSP EF, footnote e)*

Emission Controls Periodic application of water and chemical dust suppressant
Control efficiency: 90% *See Onsite Hauling*

Emissions by Area

		PM	PM10		PM2.5		Hg2+P
Area ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
ACCRD	Grading	2.80	7.89	1.40	0.49	0.09	1.7E-06

Conversions
2,000 lb/ton
453.59 g/lb
1.341 hp/kW

Mining Year 4

Access Roads - continued

Vehicle Travel Dust

Fleet

Equipment Type	Model	Empty Weight[1] ton	Gross Weight[1] ton	Average Weight ton	Travel mi/yr	
Grader	Cat 160H	17.2	17.2	17.2	6,903	*Grader emissions calculated separately*
Plow Truck	Cat CT660	8.2	26.6	17.4	6,903	
Snow Blower	TM42R	14.8	18.0	16.4	6,903	
Water Truck	Cat 725C	25.6	51.6	38.6	6,903	
Binding Agent Truck	Cat 725C	25.6	51.6	38.6	6,903	
Vibratory Compactor	Cat CS76 XT	19.2	20.8	20.0	6,903	
Fuel Service Truck	CAT 740B	37.6	81.1	59.4	6,903	
Rock Rakes	Cat CT660	8.2	26.6	17.4	6,903	
Light Vehicles	F-350	4.0	7.9	6.0	236,807	
Heavy Trucks	Cat CT660 (8X6)	10.1	34.5	22.3	593,218	

[1] *(Caterpillar 2016c)/Manufacturer specifications*

Total vehicle miles traveled (VMT) 878,347 VMT/yr *Excluding grader*

Emission Factors

Emission factor equation	$E = k(s/12)^a (W/3)^b [(365-P)/365]$	*AP-42, Sec. 13.2.2, Eq. 1a, 11/06*
s = Surface material silt content	4 %	*(Midas Gold 2015)*
W = Mean vehicle weight	18 ton	*Weighted average weight, excluding grader*
P = Days/year with ≥0.01 in precip.	120 day/yr	*AP-42 Fig. 13.2.2-1, 11/06*

	PM	PM10	PM2.5		
k = Size-specific empirical constant	4.9	1.5	0.15		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
a = Size-specific empirical constant	0.7	0.9	0.9		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
b = Size-specific empirical constant	0.45	0.45	0.45		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
E = Size-specific emission factor	3.44	0.85	0.08	lb/VMT	

Emission Controls

Periodic application of water and chemical dust suppressant

Control efficiency 90% *See Onsite Hauling*

Emissions by Area

		PM	PM10		PM2.5		Hg2+P
Area ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
ACCRD	Access Roads	151.13	209.23	37.14	20.92	3.71	9.1E-05

Source Parameters

See Onsite Hauling for source parameters.

Conversions

2,000 lb/ton

Mining Year 4

Access Roads - continued

Emissions by Area

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	CO_PPH	CO_TPY	NOX_PPH	NOX_TPY	SO2_PPH	SO2_TPY	VOC_TPY	Hg2+P_TPY
		PM	PM10		PM2.5		CO		NOX		SO2		VOC	Hg2+P
Area ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr	ton/yr
ACCRD	Access Roads	154.90	222.57	39.51	23.72	4.21	1.37	5.84	1.57	6.68	0.004	0.02	0.73	9.2E-05

Source Parameters[1]

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	SIG_Y_M	SIG_Z_M
		Source	UTM NAD 83		Elev.	Rel. Ht.	S-y	S-z
Model ID	Activity	Type	E m	N m	m	m	m	m
ACCRD	Access Roads	VOLUME	*See worksheet: HR Grid*		2.98	5.63	2.77	

[1] *UTM, Elev. - (Midas Gold 2017e); Rel. Ht., Sy, Sz - (EPA 2012)*

Vehicle	Height		
Average	3.5	m	
Grader	3.7	m	
HD Truck	3.6	m	
LD Truck	3.2	m	
Road width (RW)	6.1	m	*(Midas Gold 2016), Fig. 7-2*
Road length	60,378	m	*(Midas Gold 2018c)*

Plume Parameter	Calculation	Value (m)	Const.
Plume top (PT) - unpaved	1.7 x VH	5.95	1.7
Release height - unpaved	0.5 x PT	2.98	0.5
Plume width (PW)	RW + 6 m	12.096	6
Sigma-z - unpaved	PT / 2.15	2.77	2.15
Sigma-y	PW / 2.15	5.63	2.15

(EPA 2012)

Conversions

2,000	lb/ton
3.28	ft/m
12	in/ft

Mining Year 4

Wind Erosion

Activity Information

Operating schedule 355 day/yr

Erodible Area

Model ID	Location of Activity		Surface Type	Total Rate ton/yr	Erodible Area (acre/yr)[3] Flat	Pile	Surface Footprint
STKP	PC Stockpile		Pile	--		--	13
FDRSF	Fiddle DRSF		Pile	24,536,460		2,436	148
HFDRSF	Hangar Flats DRSF		Pile	8,467,540		841	140
YPDRSF	Yellow Pine DRSF		Pile	--		--	152
WEDRSF	West End DRSF		Pile	946,000		94	70
BT	Bradley Tailings		Flat		331		331
HR	Haul Roads	(1)	Flat		663		182
ACCRD	Access Roads	(2)	Flat		91		91

(1) *Based on total haul road length of* 27,700 *m* *(Midas Gold 2017e)* *and width of* 26.5 *m* *(Midas Gold 2016), Fig. 9-1*

(2) *Based on total access road length of* 60,378 *m* *(Midas Gold 2017e)* *and width of* 6.1 *m* *(Midas Gold 2016), Fig. 7-2*

(3) *Pile surface area calculations:*

Truck dump (TD) size	185.8 ton		
Material density	158.7 lb/ft^3		*(Midas Gold 2017b), average*
	0.079 ton/ft^3		
Material specific volume	12.6 ft^3/ton		
TD volume (V)	2,342 ft^3		
Conical surface calculations			
Side slope	38 deg		
	0.7 rad		
Conical surface area (SA)	Π × r × (h^2 + r^2)^0.5		
Conical volume (V)	(Π × h × r^2) ÷ 3		
Conical base radius	r = s × cos(slope)		
Conical height	h = s × sin(slope)		
Sloped side length	s = (h^2 + r^2)^0.5		
Solution of conical volume equation			
Replacing h and r with s × sin(slope) and s × cos(slope), respectively:			
s = [3 × V/(pi × sin(slope) × cos^2(slope)]^(1/3)		18.0 ft	
r		14.2 ft	
h		11.1 ft	
SA		804 ft^2	
		0.018 acre	
		9.9E-5 acre/ton-TD	

Scaling Factors

PM10	0.5	*AP-42, Pg. 13.2.5-3, 11/06*
PM2.5	0.075	*AP-42, Pg. 13.2.5-3, 11/06*

Conversions

4,046.86 m^2/acre

43,560 ft^2/acre

1609.34 m/mi

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: E. Memon
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AIR EMISSION CALCULATIONS	SUBJECT: Mining Activity and Emissions	DATE: October 10, 2018

Mining Year 4

Wind Erosion - continued ***Wind erosion potential calculations based on Aug-2014 through Aug-2015 Midas Gold on site meteorological data***

Stockpile Surface Wind Erosion Event Emission Calculations

Based on 1 acre/yr 8,760 hr/yr 0.00011 acre/hr

Threshold Wind Event	Date / Hour	u10 (m/s) (1)	u10+ (m/s) (2)	u* (m/s) ID-A (3)	u* (m/s) ID-B (3)	u* (m/s) ID-C (3)	Hours Elapsed ID-A (4)	Hours Elapsed ID-B (4)	Hours Elapsed ID-C (4)	Erodible Surface Area (acre) ID-A (5)	Erodible Surface Area (acre) ID-B (5)	Erodible Surface Area (acre) ID-C (5)
0	6/12/2014 13:00											
1	9/25/2014 14:00	9.810	11.772	1.059	0.706	0.235	2,521	2,521	2,521	0.03453	0.1381	0.1151
2	11/29/2014 12:00	10.050	12.060	1.085	0.724	0.241	1,558	4,079	4,079	0.02134	0.2235	0.1863
3	12/11/2014 03:00	10.000	12.000	1.080	0.720	0.240	279	4,358	4,358	0.00382	0.2388	0.1990
4	12/11/2014 14:00	9.470	11.364	1.023	0.682	0.227	11	4,369	4,369	0.00015	0.2394	0.1995
5	2/5/2015 14:00	10.400	12.480	1.123	0.749	0.250	1,344	5,713	5,713	0.01841	0.3130	0.2609
6	2/6/2015 07:00	10.270	12.324	1.109	0.739	0.246	17	5,730	5,730	0.00023	0.3140	0.2616
7	8/21/2015 14:00	9.610	11.532	1.038	0.692	0.231	4,711	10,441	10,441	0.06453	0.5721	0.4768
8	8/21/2015 15:00	9.530	11.436	1.029	0.686	0.229	1	10,442	10,442	0.00001	0.5722	0.4768
Flat Surface Wind Erosion Event Emission Calculations				Flat			Flat			Flat		
N/A	No wind events above 16.04 m/s											

Stockpile Surface Wind Erosion Event Emission Calculations - continued

Threshold Wind Event	Erosion Potential (lb/acre)(1) ID-A (6)	ID-B (6)	ID-C (6)	PM Emissions (lb) ID-A (7)	ID-B (7)	ID-C (7)	Total (8)	PM10 (lb) Total (9)	PM2.5 (lb) Total (10)
1	9.61	--	--	0.332	--	--	0.332	0.166	0.025
2	16.80	--	--	0.359	--	--	0.359	0.179	0.027
3	15.25	--	--	0.058	--	--	0.058	0.029	0.004
4	0.62	--	--	9.34E-5	--	--	9.34E-5	4.67E-5	7.00E-6
5	28.5	--	--	0.525	--	--	0.525	0.263	0.039
6	24.00	--	--	0.006	--	--	0.006	0.003	0.000
7	4.15	--	--	0.268	--	--	0.268	0.134	0.020
8	2.11	--	--	2.88E-5	--	--	2.88E-5	1.44E-5	2.16E-6
Stockpile Subtotal							1.548	0.774	0.116
Flat Surface Wind Erosion Event Emission Calculations - continued									
N/A	No wind events above 16.04 m/s						--	--	--

Zero denotes winds did not exceed the threshold for a surface regime.

Final Emission Factors (lb/acre-yr)

Surface Type	PM	PM10	PM2.5
Pile	1.55	0.77	0.12
Flat	--	--	--

Mining Year 4

Wind Erosion - continued

Stockpile Surface Wind Erosion Event Emission Calculations - Notes

(1) u10 = wind speed at 10 meters reference height, m/s

(2) u10+ = fastest-mile wind speed, m/s
Based on hourly to fastest-mile wind speed conversion factor of 1.2 *(EPA 1994)*

(3) Pile: u* = friction velocity, m/s = (us/ur) × 0.1 × u10+ *AP-42, Sec. 13.2.5, Eqs. 6 & 7, 11/06*

Area ID	A	B	C	
(us/ur)	0.9	0.6	0.2	*AP-42, Page 13.2.5-10, 11/06*

Flat surface:
u* = friction velocity, m/s = 0.053 × u10+ *AP-42, Sec. 13.2.5, Eq. 4, 11/06*

(4) Hours elapsed since previous wind erosion event

(5) Erodible surface area = hours elapsed since previous erosion event × hourly erodible surface area (acre) × surface regime area fraction Surface regime area fractions:

Area ID	A	B	C	
% Surface	0.12	0.48	0.4	*AP-42, Page 13.2.5-10, 11/06*

(6) Erosion potential, g/m^2, = P = 58(u* - ut*)^2 + 25(u* - ut*); P = 0 for u* ≤ ut*
where, ut* = threshold friction velocity = 1.02 m/s *AP-42, Page 13.2.5-5 (overburden), 11/06*
P converted to lb/acre by multiplying with: 0.002205 lb/g and 4,046.86 m^2/acre
Solving u* = (us/ur) × 0.1 × u10+ for u10, when u* = ut* = 1.02 m/s and u10+ = u* × 1.2
yields the following minimum wind speeds to disturb the each stockpile surface regime:

ID-A	9.44 m/s
ID-B	14.17 m/s
ID-C	42.50 m/s

The threshold wind speed to disturbe flat surfaces is 1.02/0.053/1.2
Flat surface 16.04 m/s
The maximum hourly wind speed in the onsite data is 10.4 m/s, which is less than the threshold wind speeds to cause a disturbance of stockpile regimes ID-B and ID-C, and flat surfaces.

(7) PM emissions, lb = P (lb/acre) × erodible surface area (acre)

(8) Total PM emissions, lb = PM (ID-A), lb + PM (ID-B), lb + PM(ID-C), lb

(9) Total PM10 emissions, lb = total PM emissions, lb × PM10 scaling factors of 0.5 *AP-42, Page 13.2.5-3, 11/06*

(10) Total PM2.5 emissions, lb = total PM emissions, lb × PM2.5 scaling factors of 0.075 *AP-42, Page 13.2.5-3, 11/06*

Mining Year 4

Wind Erosion - continued

Emissions by Model ID

chk

				PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	Hg2+P_TPY
	Location of	Control[1]		PM	PM10		PM2.5		Hg2+P
Model ID	Activity		Type	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
STKP	PC Stockpile	--	Pile	--	--	--	--	--	--
FDRSF	Fiddle DRSF	--	Pile	1.886	5.311	0.943	0.797	0.141	1.1E-06
HFDRSF	Hangar Flats DRSF	--	Pile	0.651	1.833	0.325	0.275	0.049	3.9E-07
YPDRSF	Yellow Pine DRSF	--	Pile	--	--	--	--	--	--
WEDRSF	West End DRSF	--	Pile	0.073	0.205	0.036	0.031	0.005	4.4E-08
BT	Bradley Tailings	67%	Flat	--	--	--	--	--	--
HR	Haul Roads	90%	Flat	--	--	--	--	--	--
ACCRD	Access Roads	90%	Flat	--	--	--	--	--	--
Total	Wind Erosion			2.609	7.349	1.304	1.102	0.196	1.6E-06

[1] *Bradley Tailings - maximum one-third of the total surface exposed (Midas Gold 2017g)*
Roads - see note on page 6

Conversions
2,000 lb/ton

Mining Year 4

Surface Exploration

Activity Information

Operating schedule	355	day/yr	24 hr/day	
Duration	14	yr	168 mo	*(Midas Gold 2018b)*
Construction disturbance	13	acres	0.08 acre/mo	*(Midas Gold 2016), p. 13-1*
Total wet drilling (maximum)	700	holes	50 holes/yr	*(Midas Gold 2016), p. 13-1*
Core diameter	2.5	in		*(Midas Gold 2018j)*
Average core length	800	ft		*(Midas Gold 2016), p. 13-2*
Core volume	27.3	ft^3		
Average material density	158.7	lb/ft^3		*(Midas Gold 2017b)*
Average mass	2.16	ton/hole	108.2 ton/yr	

Construction Emission Calculations

Emission Factors

PM	1.2	ton/acre per month of activity	*AP-42, Page 13.2.3-1, 1/95*

PM Scaling Factors

PM10	0.35	*AP-42, Sec. 13.2.4, Pg. 4, 11/06*
PM2.5	0.053	*AP-42, Sec. 13.2.4, Pg. 4, 11/06*

Construction Emissions

Activity	PM	PM10		PM2.5		Hg2+P
	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
Drill Pad and Temporary Road Construction	1.1	2.2	0.4	0.3	0.1	6.7E-07

Wet Drilling Emission Calculations

Emission Factors

PM10	8.0E-5	lb/ton (material blasted)	*AP-42, Table 11.19.2-2 (wet drilling), Rev. 8/04*

PM Scaling Factors

PM	0.74	*AP-42, Sec. 13.2.4-4, 11/06*
PM10	0.35	*AP-42, Sec. 13.2.4-4, 11/06*
PM2.5	0.053	*AP-42, Sec. 13.2.4-4, 11/06*

Blast-to-Drill Volume Ratio[1] 400 blast volume/drilled volume

[1] *Dyno Nobel 2010 "Blasting and Explosives Quick Reference Guide" (Ratio of total of blast volume to drilled hole volume)*

Wet Drilling Emissions

Activity	PM	PM10		PM2.5		Hg2+P
	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
Wet Drilling	0.004	0.010	0.002	0.001	0.0003	2.2E-09

Conversions

12 in/ft	12 mo/yr
2,000 lb/ton	1.341 hp/kW

Mining Year 4

Surface Exploration - continued

Drill Rig Tailpipe Emission Calculations

Other mobile equipment emissions are included in the Mobile Equipment (Tailpipes) calculations provided on page 14 of this sheet (Midas Gold 2018j)

Drill Specifications and Emission Factors

Equipment[1] Model	Rating[1] hp	Rating kW	Oper.[2] hr/yr	Diesel[3] gal/yr	Output[4] kW-hr/yr	EPA Non-Road Standards (g/kW-hr)[5] PM	CO	NOX	VOC	SO2[6]
Cat MD6420	800	596.6	12,000	144,000	2,101,630	0.04	3.5	3.5	0.19	0.0066

[1] *Similar to production drill (Midas Gold 2018j)*

[2] *Based on* 3.3 *ft/hr (Midas Gold 2018j)*

[3] *Scaled from production drill*

[4] *Based on 137,000 BTU/gal AP-42, App. A (Diese 7,000 BTU/hp-hr AP-42, Sec. 3.3, (Diesel)*

[5] *(CFR 2018a)*

[6] *Fuel Sulfur-Content Based SO2 Emission Factor, see page 12 of this sheet*

Drill Tailpipe Emissions

PM		PM10		PM2.5		CO		NOX		SO2		VOC
ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr	
0.09	0.52	0.09	0.52	0.09	1.90	8.11	1.90	8.11	0.00	0.02	0.44	

Surface Exploration Total Emissions

PM		PM10		PM2.5		CO		NOX		SO2		VOC	Hg2+P
ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr	ton/yr	
1.21	2.73	0.48	0.86	0.15	1.90	8.11	1.90	8.11	0.00	0.02	0.44	6.7E-07	

Emissions by Model ID[1]

		chk PM_TPY	chk PM10_PPD	chk PM10_TPY	chk PM2.5_PPD	chk PM2.5_TPY	chk CO_PPH	chk CO_TPY	chk NOX_PPH	chk NOX_TPY	chk SO2_PPH	chk SO2_TPY	chk VOC_TPY	chk Hg2+P_TPY
		PM	PM10		PM2.5		CO		NOX[2]		SO2		VOC	Hg2+P
Model ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr	ton/yr
YPP	Surface Exploration	0.30	0.68	0.12	0.21	0.04	0.48	2.03	0.48	2.03	0.00	0.00	0.11	1.7E-07
HFP	Surface Exploration	0.30	0.68	0.12	0.21	0.04	0.48	2.03	0.48	2.03	0.00	0.00	0.11	1.7E-07
WEP	Surface Exploration	0.30	0.68	0.12	0.21	0.04	0.48	2.03	0.48	2.03	0.00	0.00	0.11	1.7E-07
PROC	Surface Exploration	0.30	0.68	0.12	0.21	0.04	0.48	2.03	0.48	2.03	0.00	0.00	0.11	1.7E-07

[1] *Equally distributed amongst* 4 *locations (Midas Gold 2018j)*

Conversions
g/ton
2,000 lb/ton

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: E. Memon
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Mining Year 4

Helicopter

Activity Information

Operating schedule	355 day/yr	24 hr/day	
Flight frequency	4 flight/mo		*(Midas Gold 2018h)*
	48 flight/yr		
	1 flight/day, daily maximum		
	1 flight/hr, hourly maximum		

Landing and Takeoff (LTO) Component Durations

AP-42, Vol. II, Table II-1-3 (helicopter)
(EPA 1991)

LTO Component	minute	hour
Idle	7.00	0.12
Takeoff	--	--
Climbout	6.50	0.11
Approach	6.50	0.11

LTO Component Emission Factors (lb/hr)

AP-42, Vol. II, Table II-1-7 (TPE 331-3 GA TP)
(EPA 1991)

LTO Component	PM	CO	NOX	SO2	VOC
Idle	0.3	6.89	0.32	0.11	8.86
Takeoff	0.8	0.35	5.66	0.46	0.05
Climbout	0.6	0.4	4.85	0.41	0.06
Approach	0.6	1.74	2.48	0.25	0.16

Total Emissions [1] ***by Model***

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	CO_PPH	CO_TPY	NOX_PPH	NOX_TPY	SO2_PPH	SO2_TPY	VOC_TPY
		PM		PM10		PM2.5		CO		NOX		SO2	VOC
Model ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr
HELI	Heliport	0.004	0.165	0.004	0.165	0.004	1.036	0.025	0.831	0.020	0.084	0.002	0.025

Source Parameters[1]

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	SIG_Y_M	SIG_Z_M	Surface	
		Source	UTM NAD 83		Elev.	Rel. Ht.	S-y	S-z	Area	Length
Model ID	Activity	Type	E m	N m	m	m	m	m	m^2	m
HELI	Heliport	VOLUME	632,222	4,973,588	1,996	3.43	9.15	3.19	387	19.7

[1] *UTM, Elev. - (Midas Gold 2017e); Rel. Ht., Sy, Sz - (EPA 2012)*

Helicopter	Height	Reference
Bell 429	4.0 m	*(Bell 2018)*

Plume Parameter	Calculation	alue (m	Const.
Plume top (PT)	1.7 x VH	6.87	1.7
Release height	0.5 x PT	3.43	0.5
Helipad width		19.67	
Sigma-z	PT / 2.15	3.19	2.15
Sigma-y	PW / 2.15	9.15	2.15

(EPA 2012)

Conversions

60 min/hr
2,000 lb/ton

Mining Year 4

TSF Construction

Activity Information

CO Percent of total activity 0% *(Midas Gold 2018f)*

Operation 355 day/yr

Total Life of Mine Emissions

PM ton	PM10 ton	PM2.5 ton
131.09	37.02	12.32

Detailed emission calculations provided on sheet: Const, page 2

Construction Emissions by Model ID

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	Hg2+P_TPY
		PM	PM10		PM2.5		Hg2+P
Model ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
BT	Tailings Storage Facility Construction	--	--	--	--	--	--

Maximum daily emissions based on: 1,000 person crew during peak construction, scaled with an average annual crew of *750*

Other construction activity during mine operation is accounted for in the mine equipment usage.

Conversions

2,000 lb/ton

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Mining Year **4**

Hazardous Air Pollutants and Greenhouse Gas Emissions

HAP Emissions Summary

CAS No.	Pollutant/Group	Emissions lb/yr	Emissions ton/yr
106990	1,3-Butadiene	10.6	5.3E-3
75070	Acetaldehyde	231	0.115
107028	Acrolein	32.0	1.6E-2
7440360	Antimony	54.8	2.7E-2
7440382	Arsenic	1,590	**0.795**
71432	Benzene	928	0.464
7440417	Beryllium	7.63	3.8E-3
7440439	Cadmium	1.19	6.0E-4
7440473	Chromium	21.5	1.1E-2
7440484	Cobalt	9.54	4.8E-3
50000	Formaldehyde	390	0.195
7439921	Lead	19.1	9.5E-3
7439965	Manganese	713	0.356
7439976	Mercury	8.50	4.3E-3
7440020	Nickel	4.77	2.4E-3
7723140	Phosphorus	1,550	0.775
	POM	229	0.115
108883	Toluene	355	0.178
1330207	Xylene	245	0.123
Total HAP		6,400	3.20
		chk	chk

GHG Emissions Summary

Pollutant	Emissions ton/yr
Total GHGs	93,287

Conversions

2,000 lb/ton

1.10231 ton/t

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Mining Year 4

Hazardous Air Pollutants and Greenhouse Gas Emissions - Combustion Sources

Activity Information

Mining Mobile Equipment				
Large diesel machinery (> 600 hp)	6,337,320	gal/yr	868,213 MMBtu/yr[1]	*See Mine Sheet*
Small diesel machinery (≤ 600 hp)	1,855,023	gal/yr	254,138 MMBtu/yr[1]	*See Mine Sheet*
Access Road Maintenance				
Large diesel machinery (> 600 hp)	--	gal/yr	-- MMBtu/yr[1]	*See Mine Sheet*
Small diesel machinery (≤ 600 hp)	131,289	gal/yr	17,987 MMBtu/yr[1]	*See Mine Sheet*

[1] Based on diesel heating value of 137,000 Btu/gal *AP-42, Appendix A, p. A-5, 9/85*

Combustion HAP Emission Factors and Emissions

No.	Pollutant/Group	Small Engines[1] lb/MMBtu	Large Engines[2] lb/MMBtu	Emissions lb/yr	CAS ton/yr
106990	1,3-Butadiene	3.91E-5		10.6	5.3E-3
75070	Acetaldehyde	7.67E-4	2.52E-5	231	0.115
107028	Acrolein	9.25E-5	7.88E-6	32.0	1.6E-2
71432	Benzene	9.33E-4	7.76E-4	928	0.464
50000	Formaldehyde	1.18E-3	7.89E-5	390	0.195
	POM [3]	1.68E-4	2.12E-4	229	0.115
108883	Toluene	4.09E-4	2.81E-4	355	0.178
1330207	Xylene	2.85E-4	1.93E-4	245	0.123
Combustion HAP Total				2,420	1.21

[1] *AP-42, Tab. 3.3-2, 10/96, diesel engines (≤ 600 hp)*

[2] *AP-42, Tabs. 3.4-3 & 3.4-4, 10/96, large diesel engines (> 600 hp)*

[3] *POM = Polyoxymethylene, includes:*
Benz(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene Fluoranthene, Fluorene, 2-Methylnaphthalene, 3-Methylchloranthrene, 7,12-Dimethylbenz(a)anthracene, Acenaphthene, Acenaphthylene, Anthracene, Indeno(1,2,3-c,d)pyrene, Naphthalene, Phenanthrene, Pyrene.

Greenhouse Gas Emission Factors [1] and Emissions

Fuel	CO2	CH4	N2O	CO2	CH4	N2O	CO2e
	kg/MMBtu			mt/yr	mt/yr	mt/yr	mt/yr
Diesel	73.96	3.0E-3	6.0E-4	84,339	3.4	0.7	84,629
Combustion Total GHG				84,339	3.4	0.7	84,629

[1] *40 CFR 98 Tab. C-1 and C-2 (CFR 2018d)*

Global Warming Potential [1]

CO2	1
CH4	25
N2O	298

[1] *40 CFR 98 Tab. A-1 (CFR 2018d)*

Conversions
2,000 lb/ton
1,000 kg/mt

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Mining Year **4**

Hazardous Air Pollutants and Greenhouse Gas Emissions - Fugitive Dust Sources

Activity Information

Activity	PM ton/yr	
Open Pit Drilling	65.32	*See Mine Sheet*
Open Pit Blasting	58.20	*See Mine Sheet*
Onsite Hauling	746.19	*See Mine Sheet*
Material Load / Unload	8.10	*See Mine Sheet*
Dozing	71.16	*See Mine Sheet*
Grading	17.66	*See Mine Sheet*
Water Truck Travel	46.44	*See Mine Sheet*
Access Roads	153.93	*See Mine Sheet*
Wind Erosion	2.61	*See Mine Sheet*
Surface Exploration	1.12	*See Mine Sheet*
TSF Construction	--	
Ore Process Dust	21.46	*See Proc Sheet*
Limestone Process Dust	0.00	*See Proc Sheet*
Ore/Waste Subtotal	1,192.19	
Limestone Subtotal	--	

Ore, Watse, and Limestone Dust HAP Concentrations [1] ***and Emissions***

CAS No.	Pollutant	Ore & Watse[1] ppm	Limestone[2] ppm	Emissions lb/yr	ton/yr
7440382	Arsenic	667	23	1,590.38	0.80
7440417	Beryllium	3.2	0.8	7.63	3.8E-3
7440439	Cadmium	0.5	0.25	1.19	6.0E-4
7440484	Cobalt	4	4	9.54	4.8E-3
7440473	Chromium	9	15	21.46	1.1E-2
7439976	Mercury	0.6	0.02	1.43	7.2E-4
7439965	Manganese	299	236.5	712.93	0.36
7440020	Nickel	2	5	4.77	2.4E-3
7439921	Lead	8	3	19.08	9.5E-3
7440360	Antimony	23	2.5	54.84	2.7E-2
7723140	Phosphorus	650		1,549.85	0.77
Dust HAP Total				3,973.09	1.99

[1] *(Midas Gold 2017c) for all metals but Hg; Hg value from (Midas Gold 2018i)*

[2] *(Maerz 2018)*

Conversions

2,000 lb/ton

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Mining Year **4**

Hazardous Air Pollutants and Greenhouse Gas Emissions - Mercury

Fugitive Mercury Flux and Emissions

CAS No	Pollutan	Source	Area m^2	Area ha	Hg Flux $\mu g/m^2$-yr	Emissions lb/yr	Emissions ton/yr
		Stockpiles	52,623	5.3	556	6.5E-2	3.2E-5
		Rock Dumps	2,063,990	206.4	76.2	0.35	1.7E-4
		Tailings	1,338,158	133.8	2,144	6.32	3.2E-3
		Pits	1,160,519	116.1	132.3	0.34	1.7E-4
7439976	Mercury					7.07	3.5E-3

Fugitive Mercury Emission Factors

Source	Twin Creeks (TC) Hg Flux [1] $\mu g/m^2$-yr	Twin Creeks (TC) Hg [2] µg/g	Ore Hg Adjusted $\mu g/m^2$/yr TC	Stibnite Hg Flux [3] $\mu g/m^2$-yr	Stibnite Hg [4] µg/g
Stockpiles	5,609	33	556	556	0.96
Rock Dumps	768	3.5	76.2	76.2	0.60
Tailings	21,621	33	2,144	2,144	0.96
Pits	1,334	9.5	132	132.3	0.60

[1] *(Eckley 2010)* *Table 1: Hg flux µg/m²-yr*

[2] *(Eckley 2010)* *Table 1: Average Hg flux mg/g: " Stockpiles - high-grade stockpiles, Rock Dumps - waste rock dumps, Tailings - high-grade stockpilese as a surrogate; Pits - pit"*

[3] *(Eckley 2010)* *Figure 2: log(y) = m*log(x) + b*

y = Hg Flux (ng/m²-d)

x = material Hg concentration (µg/g)]

Slope =	*Solar*	*TC*
	Low	*0.59*
	Medium	*0.6*
	High	*0.77*
	Average	*0.65*

[4] *(Midas Gold 2018i) Stockpiles - Ore, Rock Dumps - Rock, Tailings - Ore as a surrogate, Pits - Ore and Rock combined average*

Sample Calculation: $m = \log(y1/y2) / \log(x1/x2)$

m=	0.65	unit less
y1=	5,609	$\mu g/m^2$-yr
x1=	33	$\mu g/m^2$-yr
x2=	0.96	$\mu g/m^2$-yr
log(x1/x2)=	1.536243	unit less
log(y1/y2)=	1.003679	unit less
y1/y2=	10.08506	unit less
y2=	556.2	$\mu g/m^2$-yr

Conversions

2,000	lb/ton
10,000	m2/ha
453.593	g/lb
1,000	ng/µg
365	day/yr

0.365 $(\mu g/m^2\text{-yr}) / (ng/m^2\text{-d})$ $\dfrac{1 \text{ ng}}{\text{m2-d}} \left| \dfrac{\mu g}{1{,}000 \text{ ng}} \right| \dfrac{365 \text{ d}}{\text{yr}} = \dfrac{0.365 \ \mu g/\text{m2-yr}}{\mu g/g}$

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Mine Construction Emissions Construction Year PP

Annual Emissions Summary

Activity	PM ton/yr	PM10 ton/yr	PM2.5 ton/yr	CO ton/yr	NOX ton/yr	SO2 ton/yr	VOC ton/yr	Total HAP ton/yr	CO2e ton/yr
Facility and Infrastructure Construction	48.2	13.6	4.5					0.08	
Power Generation	2.2	2.2	2.2	191.4	42.6	0.29	23.4	4.6	35,286
Access Road	147.5	38.3	4.0	9.4	6.4	0.02	0.9	0.24	3,571
Construction Total	197.9	54.2	10.8	200.7	49.0	0.32	24.3	4.9	38,857

Maximum Daily Emissions Summary[1]

Activity	PM lb/day	PM10 lb/day	PM2.5 lb/day	CO lb/day	NOX lb/day	SO2 lb/day	VOC lb/day	Total HAP lb/day	CO2e lb/day
Facility and Infrastructure Construction	362	102.2	34.0					0.60	
Power Generation	12.6	12.6	12.6	1,078.1	240.0	1.7	132.0	25.9	198,796
Access Road	1,107.9	287.8	30.2	70.3	48.0	0.2	6.7	1.8	26,823
Construction Total	1,482.4	402.7	76.9	1,148.4	288.0	1.8	138.7	28.3	225,618

[1] *Maximum daily emissions basedon:* 1,000 *person crew during peak construction, scaled with an average annual crew of* 750 *and an annual operating schedule of* 355 *day/yr (M3 2014)*

Daily power generation emissions are not scaled by peak crew.

Facility Infrastructure Construction Emissions by LOM Year[1]

LOM	PM ton/yr	PM10 ton/yr	PM2.5 ton/yr	CO ton/yr	NOX ton/yr	SO2 ton/yr	VOC ton/yr	Total HAP ton/yr	CO2e ton/yr
-2	53.1	15.0	5.0					0.09	
-1	160.9	45.4	15.1					0.27	
PP	48.2	13.6	4.5					0.08	
1	6.1	1.7	0.6					0.01	
2	32.3	9.1	3.0					0.05	
3	13.7	3.9	1.3					0.02	
4	6.4	1.8	0.6					0.01	
5	13.7	3.9	1.3					0.02	
6	6.1	1.7	0.6					0.01	
[1] 7	5.5	1.6	0.5					0.01	
(Midas Gold 2018f)	chk	chk	chk						

Power Generation Emissions by LOM Year

LOM	Capacity[1]	PM ton/yr	PM10 ton/yr	PM2.5 ton/yr	CO ton/yr	NOX ton/yr	SO2 ton/yr	VOC ton/yr	Total HAP ton/yr	CO2e ton/yr
CO -2	100%	4.5	4.5	4.5	382.7	85.2	0.59	46.9	9.2	70,573
CO -1	100%	4.5	4.5	4.5	382.7	85.2	0.59	46.9	9.2	70,573
CO PP	50%	2.2	2.2	2.2	191.4	42.6	0.29	23.4	4.6	35,286
[1] *(Midas Gold 2018f)*		chk	chk	chk	chk	chk	chk	chk		

Access Road Emissions by LOM Year

LOM	PM ton/yr	PM10 ton/yr	PM2.5 ton/yr	CO ton/yr	NOX ton/yr	SO2 ton/yr	VOC ton/yr	Total HAP ton/yr	CO2e ton/yr
-2	147.5	38.3	4.0	9.4	6.4	0.023	0.9	0.24	3,571
-1	147.5	38.3	4.0	9.4	6.4	0.023	0.9	0.24	3,571
PP	147.5	38.3	4.0	9.4	6.4	0.023	0.9	0.24	3,571
	chk	chk	chk	chk	chk	chk	chk		

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Facility and Infrastructure Construction

Activity Information *(Midas Gold 2018d)*

	Construction Activity	acre
CON	Tailings Storage Facility (including water diversions)	425.3
CON	Haul Roads	178.1
CON	Burntlog Road (including borrows, cut/fill)	337
CON	Exploration Decline and Explosives Area	29.9
CON	EFSFSR Tunnel (including water diversions)	5.9
CON	Ore Processing Area	70.6
CON	Truck Shop Area	5.4
CON	Stibnite Lodge	21.8
CON	Landmark Maintenance Facility	4
CON	Logistics Facility	25
CON	Other Disturbance	19.1

Emission Factors (ton/acre)	PM	PM10	PM2.5	
Site Preparation/Construction	0.308	0.087	0.029	ton/acre *See sheet: PwrConst, page 2*

Emissions by Facility ***Total Construction Emissions***

	Facility	PM ton	PM10 ton	PM2.5 ton
CON	Tailings Storage Facility (including water diversions)	131.1	37.0	12.3
CON	Haul Roads	54.9	15.5	5.2
CON	Burntlog Road (including borrows, cut/fill)	103.9	29.3	9.8
CON	Exploration Decline and Explosives Area	9.2	2.6	0.9
CON	EFSFSR Tunnel (including water diversions)	1.8	0.5	0.2
CON	Ore Processing Area	21.8	6.1	2.0
CON	Truck Shop Area	1.7	0.5	0.2
CON	Stibnite Lodge	6.7	1.9	0.6
CON	Landmark Maintenance Facility	1.2	0.3	0.1
CON	Logistics Facility	7.7	2.2	0.7
CON	Other Disturbance	5.9	1.7	0.6
	Total	345.9	97.7	32.5
		PM_total	PM10_total	PM2.5_total

Conversions

2,000 lb/ton	43,560 ft2/acre	3.28084 ft/m
1.1 ton/mt	100 cm/m	5280 ft/mi

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Mine Construction Emissions

Power Generation

Activity Information

Total Requirement		10 MW			*(Midas Gold 2016), pg. ES-14*
Diesel Generators[1]	75%	8.5 MW	72,420 MW-hr/yr		*(Midas Gold 2017f)*
Propane Generators	25%	2.5 MW	21,300 MW-hr/yr		*(Midas Gold 2017f)*

[1] *Includes temporary power supply to Warm Lake and Yellow Pine based on:* 317 *MMBtu per capita (EIA 2018) and* 100 *people (Midas Gold 2018k)*

Temporary Power 1 MW $\frac{317\ \text{MMBtu}}{\text{person-yr}} \times \frac{0.2933\ \text{MW-hr}}{\text{MMBtu}} \times \frac{100\ \text{person}}{8{,}760\ \text{hr}} \times \frac{\text{yr}}{}$

Emission Factors - Diesel Generators (g/kW-hr)

Pollutant	Standard[1]
CO	3.5
NOX	0.67
VOC	0.19
PM	0.03

[1] *40 CFR: 60.4204(b), 60.4201(a), Table 1 of 1039.101*

Fuel Sulfur-Content-Based SO2 Emission Factor

Fuel Sulfur-Content	0.0015%		*non-road diesel, 40 CFR 80.510*
Diesel Density	7.05	lb/gal	*AP-42, App. A*
Molecular Wt. of SO2	64.0638		
Molecular Wt. of S	32.065		
Diesel Heat Content	137,000	BTU/gal	*AP-42, App. A (Diesel)*
Brake-Specific Fuel Use	7,000	BTU/hp-hr	*AP-42, Sec. 3.3, (Diesel)*

SO2 emission factor:

0.000011 lb/hp-hr $\frac{0.0015\%\ \text{lb S}}{\text{lb Fuel}} \times \frac{7.05\ \text{lb Fuel}}{\text{gal Fuel}} \times \frac{64.064\ \text{lb SO2}}{32.065\ \text{lb S}} \times \frac{\text{gal Fuel}}{137{,}000\ \text{BTU}} \times \frac{7{,}000\ \text{BTU}}{\text{hp-hr}}$

0.006567 g/kW-hr $\frac{0.000011\ \text{lb}}{\text{hp-hr}} \times \frac{1.341\ \text{hp}}{\text{kW}} \times \frac{453.593\ \text{g}}{\text{lb}}$

Emission Factors - Propane Generators (g/kW-hr)

Pollutant	Standard[1]
CO	4.4
NOX	1.35
VOC	1.35

[1] *40 CFR: 60.4233(c) (>19 kw), 4231(c), 1048.101(2). ≥2007 model year . NOX + VOC = NOX+HC standard at 50:50 split.*

Other Emission Factors

PM/PM10/PM2.5	0.01941	lb/MMBTU[1,2]	8.89E-02	g/kW-hr[3]
SO2	5.88E-04	lb/MMBTU[1]	2.69E-03	g/kW-hr[3]

[1] *AP-42, Tab. 3.2-3, 07-00 (4-stroke rich-burn engines)*

[2] *Filterable + condensable particulates*

[3] *Based on brake-specific fuel consumption of* 7,527 *BTU/hp-hr (Caterpillar 1997)*

Conversions

355	day/yr
24	hr/day
1.341	hp/kW
453.6	g/lb
1,000,000	BTU/MMBTU

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Mine Construction Emissions

Emissions

Generator Type	PM ton/yr	PM10 ton/yr	PM2.5 ton/yr	CO ton/yr	NOX ton/yr	SO2 ton/yr	VOC ton/yr
Diesel Generators(1)	2.4	2.4	2.4	279.4	53.5	0.5	15.2
Propane Generators	2.1	2.1	2.1	103.3	31.7	0.1	31.7
Total	4.5	4.5	4.5	382.7	85.2	0.6	46.9

Fuel Consumption

Diesel Consumption on Access Roads[1] 43,649 MMBTU/yr *See access road fuel consumption on page 6*
Diesel Generators[2] 679,807 MMBTU/yr
Propane Generators[3] 214,996 MMBTU/yr

[1] *Based on 137,000 BTU/gal AP-42, App. A (Diesel)*
[2] *Based on 7,000 BTU/hp-hr AP-42, Sec. 3.3, (Diesel)*
[3] *Based on 7,527 BTU/hp-hr (Caterpillar 1997)*

Combustion HAP Emission Factors and Emissions

CAS No.	Pollutant/Group	Small Engines[1] lb/MMBtu	Large Engines[2] lb/MMBtu	Propane Engines[3] lb/MMBtu	Emissions[4] lb/yr	ton/yr
78875	1,2-Dichloropropane			2.69E-5	5.78	2.9E-3
106990	1,3-Butadiene	3.91E-5		2.67E-4	85.7	4.3E-2
542756	1,3-Dichloropropene			2.64E-5	5.68	2.8E-3
540841	2,2,4-Trimethylpentane			2.50E-4	53.7	2.7E-2
75070	Acetaldehyde	7.67E-4	2.52E-5	8.36E-3	2,352	1.18
107028	Acrolein	9.25E-5	7.88E-6	5.14E-3	1,172	0.586
71432	Benzene	9.33E-4	7.76E-4	4.40E-4	770	0.385
56235	Carbon Tetrachloride			3.67E-5	7.89	3.9E-3
108907	Chlorobenzene			3.04E-5	6.54	3.3E-3
	Chloroethanes	0.00E+0	0.00E+0	1.21E-4	26.0	1.3E-2
67663	Chloroform			2.85E-5	6.13	3.1E-3
100414	Ethylbenzene			3.97E-5	8.54	4.3E-3
106934	Ethylene Dibromide			4.43E-5	9.52	4.8E-3
50000	Formaldehyde	1.18E-3	7.89E-5	5.28E-2	12,205	6.10
110543	Hexane			1.11E-3	239	0.119
67561	Methanol			2.50E-3	537	0.269
75092	Methylene Chloride			2.00E-5	4.30	2.1E-3
108952	Phenol			2.40E-5	5.16	2.6E-3
	POM [5]	1.68E-4	2.12E-4	3.47E-4	228	0.114
100425	Styrene			2.36E-5	5.07	2.5E-3
108883	Toluene	4.09E-4	2.81E-4	4.08E-4	384	0.192
75014	Vinyl Chloride			1.49E-5	3.20	1.6E-3
1330207	Xylene	2.85E-4	1.93E-4	1.84E-4	246	0.123
Combustion HAP Total					18,360	9.18

[1] *AP-42, Tab. 3.3-2, 10/96, diesel engines (≤ 600 hp)*
[2] *AP-42, Tabs. 3.4-3 & 3.4-4, 10/96, large diesel engines (> 600 hp)*
[3] *AP-42, Tabs. 1.4-2, 1.4-3 & 1.4-4, 07/98, external natural gas combustion, based on 1,020 Btu/Scf*
[4] *Maximum of the two diesel engine emission factors used*
[5] *POM = Polyoxymethylene, includes:*
2-Methylnaphthalene, 3-Methylchloranthrene, 7,12-Dimethylbenz(a)anthracene, Acenaphthene, Acenaphthylene, Anthracene, Benz(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Indeno(1,2,3-c,d)pyrene, Naphthalene, Phenanthrene, Pyrene.

Conversions

1,000,000 BTU/MMBTU 1,000 kW/MW 907,186 g/ton
2,000 lb/ton 1.341 hp/kW

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Mine Construction Emissions

Greenhouse Gas Emission Factors[1] and Emissions

Fuel	CO2	CH4	N2O	CO2	CH4	N2O	CO2e
	kg/MMBtu			mt/yr	mt/yr	mt/yr	mt/yr
Gen Diesel	73.96	3.0E-3	6.0E-4	50,278	2.0	0.4	50,451
Gen Propane	62.87	3.0E-3	6.0E-4	13,517	0.6	0.1	13,571
Access Rd Diesel	73.96	3.0E-3	6.0E-4	3,228	0.13	0.03	3,239
Combustion Total GHG				67,024	3	1	67,262

[1] *40 CFR 98 Tab. C-1 and C-2 (CFR 2018d)*

Global Warming Potential [1]

CO2	1
CH4	25
N2O	298

[1] *40 CFR 98 Tab. A-1 (CFR 2018d)*

Dust HAP Emission Factors and Emissions

HAP Concentrations[1] and Emissions[2]

CAS No.	Pollutant	ppm	Emissions lb/yr	Emissions ton/yr
7440382	Arsenic	667	259.9	0.1
7440417	Beryllium	3.2	1.2	6.2E-4
7440439	Cadmium	0.5	0.2	9.7E-5
7440484	Cobalt	4.0	1.6	7.8E-4
7440473	Chromium	9.0	3.5	1.8E-3
7439976	Mercury	0.6	0.2	1.2E-4
7439965	Manganese	299	116.5	5.8E-2
7440020	Nickel	2.0	0.8	3.9E-4
7439921	Lead	8.0	3.1	1.6E-3
7440360	Antimony	23	9.0	4.5E-3
7723140	Phosphorus	650	253.2	0.1
Dust HAP Total		1,666	649.2	0.3

[1] *(Midas Gold 2017c) for all metals but Hg; Hg value from (Midas Gold 2018i)*

[2] *Based on total PM emissions of* 194.8 *ton/yr* *See construction PM emissions on page 2, and access road PM emissions (excluding tailpipes) on page 8*

Conversions

1,000 kg/mt
2,000 lb/ton

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Mine Construction Emissions

Access Roads Equipment

Operation Schedule 355 day/yr 24 hr/day MachineSpecs

Traffic Specifications and Activity

Equipment[1]	Equipment Model[2]	ID	Rating[3] hp	Rating kW	Oper.[4] hr/yr	Annual[1] trip/yr	Diesel[5] gal/yr	Output[6] kW-hr/yr	Travel[7] VMT/yr	Equipment Category	On-road Class	
Grader	Cat 160H	CT1	200	149	3,978	183	13,424	195,912	13,731	Non-road		Cat 1
Plow Truck	Cat CT660	CT2	476	355	3,978	183	31,826	--	13,731	On-road	HHD	Cat C
Snow Blower	TM42R	CT3	450	336	3,978	183	30,088	--	13,731	On-road	HHD	Cat C
Water Truck	Cat 725C	CT4	320	239	3,978	183	31,826	464,491	13,731	Non-road		Cat 7
Binding Agent Truck	Cat 725C	CT5	320	239	3,978	183	31,826	464,491	13,731	Non-road		Cat 7
Vibratory Compactor	Cat CS76 XT	CT6	177	132	3,978	183	20,886	304,822	13,731	Non-road		Cat C
Fuel Service Truck	CAT 740B	CT7	484	361	3,978	183	35,804	522,552	13,731	Non-road		CAT
Rock Rakes	Cat CT660	CT8	476	355	3,978	183	31,826	--	13,731	On-road	HHD	Cat C
Light Vehicles	F-350	CT9	440	328		3,314	17,762	--	248,662	On-road	LHD45	F-350
Heavy Trucks	Cat CT660 (8	CT10	476	355		6,353	73,337	--	476,691	On-road	HHD	Cat C

[1] *(Midas Gold 2016), Tables 7-1, 12-1. Maintenance trips distributed equally amongst maintenace equipment.*

Heavy trucks include buses, supply and trash trucks. Light vehicles include visitor and employee vehicles.

[2] *Similar models by equipment type from (Midas Gold 2017b)*

[3] *(Caterpillar 2016c)/Manufacturer specifications*

[4] *Combined hours, (Midas Gold 2017f)*

[5] *Maintenance equipment based on brake-specific fuel use scaled for similar equipment from (Midas Gold 2017b)*

Light vehicles based on Ford F-350 fuel economy o 14.0 *mpg (fuelly.com)* *Heavy trucks based on fuel economy of:* 6.5 *mpg (ATRI 2016)*

[6] *Based o* 137,000 *BTU/gal* AP-42, App. A (Diesel) 7,000 *BTU/hp-hr* AP-42, Sec. 3.3, (Diesel)

[7] *Based on access road length of:* 37.5 X 2 *mi (roundtrip)* *(Midas Gold 2018c)*

EPA Non-Road Standards

ID	Equipment Type	Model[1] Year	Power Category	EPA Tier	Lookup ID	EPA Non-Road Standards (g/kW-hr)[2] PM	CO	NOX	VOC
CT1	Grader	>2015	130≤kW<560, Ph-i	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
CT2	Truck				No Standard				
CT3	Truck				No Standard				
CT4	Truck	>2015	130≤kW<560, Ph-i	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
CT5	Truck	>2015	130≤kW<560, Ph-i	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
CT6	Compactor	>2015	130≤kW<560, Ph-i	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
CT7	Truck	>2015	130≤kW<560, Ph-i	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
CT8	Truck				No Standard				
CT9	Light Truck				No Standard				
CT10	Truck				No Standard				

[1] *(Midas Gold 2017h)*

[2] *(CFR 2018a)*

Final Emission Factors

ID	Lookup	PM	PM10	PM2.5	CO	NOX	VOC	SO2	EF Unit	Final EF	Activity	
CT1	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.01	g/kW-hr	*EPA_NRS*	195,912	kW-hr/yr
CT2	HHD	1.17	1.17	0.46	2.31	7.32	0.51	0.01	g/VMT	*EPA_MOVES2014a*	13,731	VMT/yr
CT3	HHD	1.17	1.17	0.46	2.31	7.32	0.51	0.01	g/VMT	*EPA_MOVES2014a*	13,731	VMT/yr
CT4	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.01	g/kW-hr	*EPA_NRS*	464,491	kW-hr/yr
CT5	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.01	g/kW-hr	*EPA_NRS*	464,491	kW-hr/yr
CT6	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.01	g/kW-hr	*EPA_NRS*	304,822	kW-hr/yr
CT7	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.01	g/kW-hr	*EPA_NRS*	522,552	kW-hr/yr
CT8	HHD	1.17	1.17	0.46	2.31	7.32	0.51	0.01	g/VMT	*EPA_MOVES2014a*	13,731	VMT/yr
CT9	LHD45	0.59	0.59	0.29	1.87	4.94	0.68	0.01	g/VMT	*EPA_MOVES2014a*	248,662	VMT/yr
CT10	HHD	1.17	1.17	0.46	2.31	7.32	0.51	0.01	g/VMT	*EPA_MOVES2014a*	476,691	VMT/yr

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Mine Construction Emissions

Access Roads - continued

Final Emission Factor Options:

Category	EF Unit	Activity Unit	Emission Unit	Multiplier
EPA_CERT	g/kW-hr	kW-hr/yr	ton/yr	1.1E-6
EPA_NRS	g/kW-hr	kW-hr/yr	ton/yr	1.1E-6
EPA_MOVES2014a	g/VMT	VMT/yr	ton/yr	1.1E-6

Traffic Tailpipe Emissions

ID	Equipment Type	PM ton/yr	PM10 lb/day	PM10 ton/yr	PM2.5 lb/day	PM2.5 ton/yr	CO lb/day	CO ton/yr	NOX lb/day	NOX ton/yr	SO2 lb/day	SO2 ton/yr	VOC ton/yr
CT1	Grader	4.3E-3	0.02	4.3E-3	0.02	4.3E-3	4.26	0.76	0.49	0.09	8.0E-3	1.4E-3	0.04
CT2	Plow Truck	0.02	0.10	0.02	0.04	7.0E-3	0.20	0.04	0.62	0.11	9.1E-4	1.6E-4	7.7E-3
CT3	Snow Blower	0.02	0.10	0.02	0.04	7.0E-3	0.20	0.04	0.62	0.11	9.1E-4	1.6E-4	7.7E-3
CT4	Water Truck	0.01	0.06	0.01	0.06	0.01	10.10	1.79	1.15	0.20	0.02	3.4E-3	0.10
CT5	Binding Agent Truc	0.01	0.06	0.01	0.06	0.01	10.10	1.79	1.15	0.20	0.02	3.4E-3	0.10
CT6	Vibratory Compacto	6.7E-3	0.04	6.7E-3	0.04	6.7E-3	6.63	1.18	0.76	0.13	0.01	2.2E-3	0.06
CT7	Fuel Service Truck	0.01	0.06	0.01	0.06	0.01	11.36	2.02	1.30	0.23	0.02	3.8E-3	0.11
CT8	Rock Rakes	0.02	0.10	0.02	0.04	7.0E-3	0.20	0.04	0.62	0.11	9.1E-4	1.6E-4	7.7E-3
CT9	Light Vehicles	0.16	0.91	0.16	0.45	0.08	2.88	0.51	7.63	1.35	0.02	2.9E-3	0.19
CT10	Heavy Trucks	0.61	3.46	0.61	1.36	0.24	6.85	1.22	21.68	3.85	0.03	5.6E-3	0.27
		0.87	4.91	0.87	2.17	0.39	52.76	9.36	36.03	6.40	0.13	0.02	0.89

LT Unit	ST Unit	Multiplier
ton/yr	lb/day	5.634
ton/yr	lb/hr	0.235

Access Road Grading

Operation 3,978 hr/yr
25,859 VMT/yr

Grading Emission Factors

Emission Factor Equation
TSP (lb/VMT) = 0.04 $(S)^{2.5}$ *AP-42, Tab. 11.9-1, 07/98, (grading)*
PM15 (lb/VMT) = 0.051 $(S)^{2}$ *AP-42, Tab. 11.9-1, 07/98, (grading)*

S - Grader average speed 6.5 mph *(Caterpillar 2016c), haul road maintenance*
TSP(PM) 4.309 lb/VMT
PM15 2.155 lb/VMT

Grading PM Scaling Factors

PM10 0.6 *AP-42, Tab. 11.9-1, 07/98, (applies to PM15 EF, footnote d)*
PM2.5 0.031 *AP-42, Tab. 11.9-1, 07/98, (applies to TSP EF, footnote e)*

Emission Controls Periodic application of water and chemical dust suppressant
Control efficiency: 90% *See Onsite Hauling*

Grading Emissions

PM ton/yr	PM10 lb/day	PM10 ton/yr	PM2.5 lb/day	PM2.5 ton/yr
5.57	16	2.79	0.97	0.17

Conversions

2,000	lb/ton
453.59	g/lb
1.341	hp/kW

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Mine Construction Emissions

Access Roads - continued

Access Road Vehicle Travel Dust

Vehicle Specifications

Vehicle Type	Model	Empty Weight[1] ton	Gross Weight[1] ton	Average Weight ton	Travel mi/yr	
Grader	Cat 160H	17.2	17.2	17.2	13,731	*Grader emissions calculated separately*
Plow Truck	Cat CT660	8.2	26.6	17.4	13,731	
Snow Blower	TM42R	14.8	18.0	16.4	13,731	
Water Truck	Cat 725C	25.6	51.6	38.6	13,731	
Binding Agent Truck	Cat 725C	25.6	51.6	38.6	13,731	
Vibratory Compactor	Cat CS76 XT	19.2	20.8	20.0	13,731	
Fuel Service Truck	CAT 740B	37.6	81.1	59.4	13,731	
Rock Rakes	Cat CT660	8.2	26.6	17.4	13,731	
Light Vehicles	F-350	4.0	7.9	6.0	248,662	
Heavy Trucks	Cat CT660 (8X6)	10.1	34.5	22.3	476,691	

[1] *(Caterpillar 2016c)/Manufacturer specifications*

Total vehicle miles traveled (VMT) 821,472 VMT/yr *Excluding grader*

Emission Factors

Emission factor equation $E = k(s/12)^a (W/3)^b [(365-P)/365]$

s = Surface material silt content 4 % *(Midas Gold 2015)*

W = Mean vehicle weight 18 ton *Weighted average weight, excluding grader*

P = Days/year with ≥0.01 in precip. 120 day/yr

	PM	PM10	PM2.5		
k = Size-specific empirical constant	4.9	1.5	0.15		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
a = Size-specific empirical constant	0.7	0.9	0.9		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
b = Size-specific empirical constant	0.45	0.45	0.45		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
E = Size-specific emission factor	3.43	0.84	0.08	lb/VMT	

Emission Controls

Periodic application of water and chemical dust suppressant

Control efficiency: 90% *See Onsite Hauling*

Vehicle Travel Dust Emissions

PM	PM10		PM2.5	
ton/yr	lb/day	ton/yr	lb/day	ton/yr
141.05	195.28	34.66	19.53	3.47

Access Road Total Emissions

PM	PM10		PM2.5		CO		NOX		SO2		VOC
ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
147.49	215.88	38.32	22.67	4.02	52.76	9.36	36.03	6.40	0.13	0.02	0.89

Conversions

2,000 lb/ton

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Mine Construction Emissions

Access Roads - continued

Fuel Sulfur-Content Based SO2 Emission Factor

Fuel Sulfur-Content	0.0015%		*Non-road diesel specification per 40 CFR 80.510*
Diesel Density	7.05	lb/gal	*AP-42, App. A*
Molecular Wt. of SO2	64.064	lb/lb-mol	
Molecular Wt. of S	32.065	lb/lb-mol	
Diesel Heat Content	137,000	BTU/gal	*AP-42, App. A (Diesel)*
Brake-Specific Fuel Use	7,000	Btu/hp-hr	*AP-42, Sec. 3.3, (Diesel engine)*

SO2 emission factor:

0.000011 lb/hp-hr = 0.0015% ~~lb S~~ / ~~lb Fuel~~ × 7.05 ~~lb Fuel~~ / ~~gal Fuel~~ × 64.064 lb SO2 / 32.065 ~~lb S~~ × ~~gal Fuel~~ / 137,000 ~~BTU~~ × 7,000 ~~BTU~~ / hp-hr

0.0066 g/kW-hr = 0.000011 ~~lb~~ / ~~hp~~-hr × 1.341 ~~hp~~ / kW × 453.593 g / ~~lb~~

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Power Line Construction **Construction Year** **PP**

Annual Emissions Summary

Activity	PM ton/yr	PM10 ton/yr	PM2.5 ton/yr	CO ton/yr	NOX ton/yr	SO2 ton/yr	VOC ton/yr	Total HAP ton/yr	CO2e ton/yr
Facility and Infrastructure Construction	23.5	6.7	2.2					0.0	
Mobile Equipment Tailpipe	2.4	2.4	1.4	69.6	64.6	0.14	4.5	0.3	18,300
Power Line Construction Total	26.0	9.1	3.6	69.6	64.6	0.14	4.5	0.3	18,300

Maximum Daily Emissions Summary[1]

Activity	PM lb/day	PM10 lb/day	PM2.5 lb/day	CO lb/day	NOX lb/day	SO2 lb/day	VOC lb/day	Total HAP lb/day	CO2e lb/day
Facility and Infrastructure Construction	176.9	50.0	16.6					0.3	
Mobile Equipment Tailpipe	18.3	18.3	10.5	523.0	485.2	1.1	33.9	2.2	137,466
Construction Total	195.2	68.3	27.1	523.0	485.2	1.1	33.9	2.5	137,466

[1] *Maximum daily emissions based on* *1,000* *person crew during peak construction, scaled with an average annual crew of* *750* *and an annual operating schedule* *355* *day/yr* *(M3 2014)*

Facility Infrastructure Construction Emissions by LOM Year[1]

	LOM	Capacity[1]	PM ton/yr	PM10 ton/yr	PM2.5 ton/yr	CO ton/yr	NOX ton/yr	SO2 ton/yr	VOC ton/yr	Total HAP ton/yr	CO2e ton/yr
CON	-2	25%	23.5	6.7	2.2					0.0	
CON	-1	50%	47.1	13.3	4.4					0.1	
CON	PP	25%	23.5	6.7	2.2					0.0	
[1] *(Midas Gold 2018f)*			chk	chk	chk	chk	chk	chk	chk	chk	chk

Mobile Equipment Tailpipe Emissions by LOM Year

	LOM	Capacity[1]	PM ton/yr	PM10 ton/yr	PM2.5 ton/yr	CO ton/yr	NOX ton/yr	SO2 ton/yr	VOC ton/yr	Total HAP ton/yr	CO2e ton/yr
CON	-2	25%	2.4	2.4	1.4	69.6	64.6	0.14	4.5	0.3	18,300
CON	-1	50%	4.9	4.9	2.8	139.3	129.2	0.28	9.0	0.6	36,600
CON	PP	25%	2.4	2.4	1.4	69.6	64.6	0.14	4.5	0.3	18,300
[1] *(Midas Gold 2018f)*			chk	chk	chk	chk	chk	chk	chk	chk	chk

Conversions

365	day/yr
2,000	lb/ton
1.10	ton/t

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Power Line Construction

POD_2017

Activity Information

Construction Activity	acre[1]	yr[2]
Power Line	305.6	3

[1] *(Midas Gold 2018a)*

[2] *(Midas Gold 2018d)*

Emission Factors (ton/acre)	PM	PM10	PM2.5		
Site Preparation/Construction	0.308	0.087	0.029	ton/acre	*See calculations below*

Site Preparation Activity [1]	***Emission Factor***				***Emission Factor Reference***	***Scaling Factor***	
	PM	PM10	PM2.5			PM10	PM2.5
Dozing	3.94	0.753	0.414	lb/hr	*AP-42, Tab. 11.9-1, 07/98, (bulldozing, overburden); See sheet: Mine, page 17*		
Scraper unloading	0.04	0.0189	0.0029	lb/ton	*AP-42, Tab. 11.9-4, 07/98, (scraper unload); scaling factors from AP-42, Sec. 13.2.4, 11/06*	0.47	0.072
Scraper in travel	20.2	3.8586	2.121	lb/VMT	*See scraping topsoil removel below*		
Scraping topsoil removal	20.2	3.8586	2.121	lb/VMT	*AP-42, Tab. 13.2.3-1, 1/95; dozer scaling factors*	0.19	0.11
Material loading	2.11E-4	1.00E-4	1.51E-5	lb/ton	*AP-42, Tab. 11.19.2-2, 8/04 (truck loading - crshed stone); See sheet: Mine, page 8*		
Material dumping	3.38E-5	1.60E-5	2.42E-6	lb/ton	*AP-42, Tab. 11.19.2-2, 8/04 (truck unloading - fragmented stone); See sheet: Mine, page 8*		
Compacting	3.94	0.75	0.41	lb/hr	*AP-42, Tab. 11.9-1, 07/98, (bulldozing, overburden); See sheet: Mine, page 17*		
Grading	4.31	1.29	0.134	lb/VMT	*AP-42, Tab. 11.9-1, 07/98, (grading); See sheet: Mine, page 17*		

[1] *AP-42, Tab. 13.2.3-1, 1/95*

Construction Operation	***Estimated Activity Rate***		***Estimated Emission Factor (ton/acre)***		
			PM	PM10	PM2.5
Dozing[1]	49 hr/ac		9.66E-2	1.84E-2	1.01E-2
Scraper unloading[2]	4,945 ton/ac		9.89E-2	4.68E-2	7.08E-3
Scraper in travel	0.7 VMT/ac	*See scraping topsoil removel below*	7.25E-3	1.38E-3	7.61E-4
Scraping topsoil removal[3]	0.7 VMT/ac		7.25E-3	1.38E-3	7.61E-4
Material loading	4,945 ton/ac	*See scraper unloading above*	5.23E-4	2.47E-4	3.74E-5
Material dumping	4,945 ton/ac	*See scraper unloading above*	8.36E-5	3.96E-5	5.99E-6
Compacting	49 hr/ac	*See dozing above*	9.66E-2	1.84E-2	1.01E-2
Grading[4]	0.5 VMT/ac		1.11E-3	3.33E-4	3.44E-5

[1] *Based on:* 14,976 *hr dozer useage and* 305.6 *acre disturbance Total (3-yr) power line construction activity*

[2] *Based on:* 45 *cm, scraper cut depth (Caterpillar 631K Scraper) (Caterpillar 2016b) & waste material density of:* 153.8 *lb/ft* ^{3} *(Midas Gold 2017b)*

[3] *Based on:* 11.5 *ft blade width (Caterpillar 631K Scraper) (Caterpillar 2016b)*

[4] *Based on:* 16.0 *ft blade width (Caterpillar 16M3 Grader) (Caterpillar 2016a)*

Emissions ***Total Construction Emissions***

Activity	PM	PM10	PM2.5	CO	NOX	SO2	VOC	Total HAP	CO2e
	ton	ton	ton	ton	ton	ton	ton	ton	ton
Power Line	94.2	26.6	8.9					0.2	
Mobile Equipment Tailpipe	9.7	9.7	5.6	278.5	258.4	0.6	18.1	1.2	73,201
Total	103.9	36.4	14.4	278.5	258.4	0.6	18.1	1.3	73,201

Conversions

2,000	lb/ton	43,560	ft2/acre	3.28084	ft/m
1.1	ton/mt	100	cm/m	5280	ft/mi

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Power Line Construction

Mobile Equipment Tailpipe

MachineSpecs

POD_2017

Activity Information

Mobile Equipment Specifications and Activity

ID	Equipment Type[1]		Equipment Model[2]	Rating hp[2]	Rating kW	Oper. hr/yr[1,3]	Diesel gal/hp-hr[2]	Diesel gal/yr	Output kW-hr/yr[4]	Travel VMT/yr[5]	Equipment Category	On-road Class[6]		
	Transmission Line	gal/hr												
TL1	Bulldozer	19	Cat D10T2	600	447	4,992	0.032	94,848	1,384,274		Non-road		30.66	62%
TL2	Motor Grader	5.5	Cat 16M	326	243	4,992	0.017	27,456	400,711		Non-road		16.66	33%
TL3	Auger Truck	8	Cat CT660	476	355	4,992	0.017	39,936	582,852	99,840	On-road	HHD	24.32	33%
TL4	Wire Reel Trailer	8	Cat CT660	476	355	7,488	0.017	59,904	874,278	149,760	On-road	HHD	24.32	33%
TL5	Truck Mounted Crane	8	Cat CT660	476	355	4,992	0.017	39,936	582,852	99,840	On-road	HHD	24.32	33%
TL6	Pickup	1	F-350 (PT)	440	328	12,480	0.002	12,480	182,141	312,000	On-road	LHD45	22.48	4%
TL7	Fork Lift	2.5	CAT DP160N	124	92	4,992	0.020	12,480	182,141		Non-road	--	6.336	39%
TL8	Diesel Tractor	10	Cat 586C	350	261	7,488	0.029	74,880	1,092,848		Non-road		17.88	56%
TL9	Splicing Truck	8	Cat CT660	476	355	1,248	0.017	9,984	145,713	24,960	On-road	HHD	24.32	33%
TL10	Boom Truck	8	Cat CT660	476	355	4,992	0.017	39,936	582,852	99,840	On-road	HHD	24.32	33%
TL11	Three Drum Puller	8	Cat CT660	476	355	3,744	0.017	29,952	437,139	74,880	On-road	HHD	24.32	33%
TL12	Single Drum Puller	8	Cat CT660	476	355	1,872	0.017	14,976	218,570	37,440	On-road	HHD	24.32	33%
TL13	OHGW and Fiber Reel Trailer	8	Cat CT660	476	355	4,992	0.017	39,936	582,852	99,840	On-road	HHD	24.32	33%
TL14	Dump Truck	9	Cat 740B	484	361	2,496	0.019	22,464	327,854		Non-road		24.73	36%
TL15	Loader	12	Cat 988K	580	433	2,496	0.020	28,704	418,925		Non-road		29.64	39%
TL16	Water Truck	25	Cat 777D	1,000	746	42,432	0.025	1,060,800	15,482,007		Non-road		51.09	49%
TL17	Hauling Truck	25	Cat 777D	1,000	746	4,992	0.025	124,800	1,821,413		Non-road		51.09	49%
TL18	Tensioner	8	Cat CT660	476	355	1,248	0.017	9,984	145,713	24,960	On-road	HHD	24.32	33%
	Substation													
SS1	Backhoe	5	CAT 430E	101	75	4,992	0.050	24,960	364,283		Non-road		5.161	97%
SS2	Auger	8	Cat CT660	476	355	19,968	0.017	159,744	2,331,408	399,360	On-road	HHD	24.32	33%
SS3	Concrete Truck	8	Cat CT660	476	355	19,968	0.017	159,744	2,331,408	399,360	On-road	HHD	24.32	33%
SS4	Pickup	1	F-350 (PT)	440	328	9,984	0.002	9,984	145,713	249,600	On-road	LHD45	22.48	4%
SS5	Field Office/Trailer	7	F-650	330	246	2,496	0.021	17,472	254,998	62,400	On-road	MHD	16.86	42%
SS6	Drilling Rig	12	Cat MD6420	800	597	2,496	0.015	29,952	437,139		Non-road		40.88	29%
SS7	Vibratory Roller	5.3	Cat CS76 XT	177	132	2,496	0.030	13,104	191,248		Non-road		9.044	58%
SS8	Fork Lift	2.5	CAT DP160N	124	92	7,488	0.020	18,720	273,212		Non-road	--	6.336	39%

[1] *(HDR 2017)*

[2] *Equipment type specific make and model, rating, and brake-specific fuel consumption (LOM year 4) selected from mine operation fleet (Midas Gold 2017b)*

[3] *Weekly hours (HDR 2017) times 52 weeks per year*

[4] *Based o* 137,000 *BTU/gal* *AP-42, App. A*

7,000 *BTU/hp-hr* *AP-42, Sec. 3.3*

[6] *On-road vehicle codes and descriptions provided in MOVES emission factors table*

VMT = Vehicle Miles Travelled

[4] *Based on the following average speeds (mph):* *(Midas Gold 2018e)*

Cat CT660	*20*
F-350 (PT)	*25*
F-650	*25*

Conversions

1.341	hp/kW
453.6	g/lb
1,000,000	BTU/MMBTU

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Power Line Construction

Mobile Equipment Tailpipe

Operation schedule 365 day/yr 12 hr/day

EPA Non-Road Standards

ID	Equipment Type	Model[1] Year	Power Category	EPA Tier	Lookup ID	EPA Non-Road Standards (g/kW-hr)[2] PM	CO	NOX	VOC
Transmission Line									
TL1	Dozer	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
TL2	Grader	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
TL3	Truck	>2015			No Standard				
TL4	Truck	>2015			No Standard				
TL5	Truck	>2015			No Standard				
TL6	Pickup	>2015			No Standard				
TL7	Fork Lift	>2015	75≤kW<130, Ph-in	4	T4-56≤kW<130 2015	0.02	5	0.4	0.19
TL8	Tractor	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
TL9	Truck	>2015			No Standard				
TL10	Truck	>2015			No Standard				
TL11	Truck	>2015			No Standard				
TL12	Truck	>2015			No Standard				
TL13	Truck	>2015			No Standard				
TL14	Truck	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
TL15	Truck	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
TL16	Truck	>2015	kW>560	4	T4-kW>560 2015	0.04	3.5	3.5	0.19
TL17	Truck	>2015	kW>560	4	T4-kW>560 2015	0.04	3.5	3.5	0.19
TL18	Truck	>2015			No Standard				
Substation									
SS1	Backhoe	>2015	75≤kW<130, Ph-in	4	T4-56≤kW<130 2015	0.02	5	0.4	0.19
SS2	Truck	>2015			No Standard				
SS3	Truck	>2015			No Standard				
SS4	Pickup	>2015			No Standard				
SS5	Pickup	>2015			No Standard				
SS6	Drill	>2015	kW>560	4	T4-kW>560 2015	0.04	3.5	3.5	0.19
SS7	Roller	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
SS8	Fork Lift	>2015	75≤kW<130, Ph-in	4	T4-56≤kW<130 2015	0.02	5	0.4	0.19

[1] *(Midas Gold 2017h)*

[2] *(CFR 2018a)*

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Power Line Construction

Mobile Equipment Tailpipe

Fuel Sulfur-Content-Based SO2 Emission Factor

Fuel Sulfur-Content	0.0015%	*Non-road diesel, 40 CFR 80.510*
Diesel Density	7.05 lb/gal distillate oil	*AP-42 Appendix A "Weights of Selected Substances" (Distillate oil)*
Molecular Wt. of SO2	64.1 lb/lb-mol	
Molecular Wt. of S	32.1 lb/lb-mol	
Diesel Heat Content	137,000 BTU/gal	*AP-42, App. A*
Brake-Specific Fuel Use	7,000 BTU/hp-hr	*AP-42, Sec. 3.3*

SO2 Emission Factor:

1.08E-5 lb/hp-hr = 0.0015% ~~lbS~~ / ~~lb Fuel~~ × 7.05 ~~lb Fuel~~ / ~~gal Fuel~~ × 64.064 lbSO2 / 32.065 ~~lbS~~ × ~~gal Fuel~~ / 137,000 ~~BTU~~ × 7,000 ~~BTU~~ / hp-hr

6.57E-3 g/kW-hr = 0.000011 ~~lb~~ / ~~hp~~-hr × 1.341 ~~hp~~ / kW × 453.593 g / ~~lb~~

EPA MOVES 2014a Emission Factors[1]

Vehicle Class	Description	Emission Factor (g/VMT)[2] PM	PM10	PM2.5	CO	NOX	VOC	SO2
LHD<=10K	Passenger Truck 8.5k-10k lb, Diesel	0.178	0.178	0.086	1.322	2.281	0.241	0.006
LHD45	Single Unit Truck 14k-19.5k lb, Diesel	0.589	0.589	0.291	1.867	4.940	0.685	0.011
MHD	Single Unit Truck 19.5k-33k lb, Diesel	0.797	0.797	0.381	2.170	5.684	0.841	0.011
HHD	Single Unit Truck >33k lb, Diesel	1.169	1.169	0.461	2.313	7.324	0.510	0.011

[1] *MOVES 2014a run dated 2017-09-25*

[2] *PM = PM10*

Power Line Construction

Mobile Equipment Tailpipe

Final Emission Factors

ID	Lookup	PM	PM10	PM2.5	CO	NOX	VOC	SO2	EF Unit	Final EF	Activity	
Transmission Line												
TL1	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	1,384,274	kW-hr/yr
TL2	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	400,711	kW-hr/yr
TL3	HHD	1.17	1.17	0.46	2.31	7.32	0.51	1.07E-2	g/VMT	*EPA_MOVES2014*	99,840	VMT/yr
TL4	HHD	1.17	1.17	0.46	2.31	7.32	0.51	1.07E-2	g/VMT	*EPA_MOVES2014*	149,760	VMT/yr
TL5	HHD	1.17	1.17	0.46	2.31	7.32	0.51	1.07E-2	g/VMT	*EPA_MOVES2014*	99,840	VMT/yr
TL6	LHD45	0.59	0.59	0.29	1.87	4.94	0.68	1.05E-2	g/VMT	*EPA_MOVES2014*	312,000	VMT/yr
TL7	T4-56≤kW<130 2015	0.02	0.02	0.02	5.00	0.40	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	182,141	kW-hr/yr
TL8	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	1,092,848	kW-hr/yr
TL9	HHD	1.17	1.17	0.46	2.31	7.32	0.51	1.07E-2	g/VMT	*EPA_MOVES2014*	24,960	VMT/yr
TL10	HHD	1.17	1.17	0.46	2.31	7.32	0.51	1.07E-2	g/VMT	*EPA_MOVES2014*	99,840	VMT/yr
TL11	HHD	1.17	1.17	0.46	2.31	7.32	0.51	1.07E-2	g/VMT	*EPA_MOVES2014*	74,880	VMT/yr
TL12	HHD	1.17	1.17	0.46	2.31	7.32	0.51	1.07E-2	g/VMT	*EPA_MOVES2014*	37,440	VMT/yr
TL13	HHD	1.17	1.17	0.46	2.31	7.32	0.51	1.07E-2	g/VMT	*EPA_MOVES2014*	99,840	VMT/yr
TL14	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	327,854	kW-hr/yr
TL15	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	418,925	kW-hr/yr
TL16	T4-kW>560 2015	0.04	0.04	0.04	3.50	3.50	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	15,482,007	kW-hr/yr
TL17	T4-kW>560 2015	0.04	0.04	0.04	3.50	3.50	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	1,821,413	kW-hr/yr
TL18	HHD	1.17	1.17	0.46	2.31	7.32	0.51	1.07E-2	g/VMT	*EPA_MOVES2014*	24,960	VMT/yr
Substation												
SS1	T4-56≤kW<130 2015	0.02	0.02	0.02	5.00	0.40	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	364,283	kW-hr/yr
SS2	HHD	1.17	1.17	0.46	2.31	7.32	0.51	1.07E-2	g/VMT	*EPA_MOVES2014*	399,360	VMT/yr
SS3	HHD	1.17	1.17	0.46	2.31	7.32	0.51	1.07E-2	g/VMT	*EPA_MOVES2014*	399,360	VMT/yr
SS4	LHD45	0.59	0.59	0.29	1.87	4.94	0.68	1.05E-2	g/VMT	*EPA_MOVES2014*	249,600	VMT/yr
SS5	MHD	0.80	0.80	0.38	2.17	5.68	0.84	1.05E-2	g/VMT	*EPA_MOVES2014*	62,400	VMT/yr
SS6	T4-kW>560 2015	0.04	0.04	0.04	3.50	3.50	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	437,139	kW-hr/yr
SS7	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	191,248	kW-hr/yr
SS8	T4-56≤kW<130 2015	0.02	0.02	0.02	5.00	0.40	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	273,212	kW-hr/yr

Final emission factor options:

Category	EF Unit	Activity Unit	Emission Unit	Multiplier
EPA_CERT	lb/hp-hr	hp-hr/yr	ton/yr	5.0E-4
EPA_NRS	g/kW-hr	kW-hr/yr	ton/yr	1.1E-6
EPA_AP42	lb/hp-hr	hp-hr/yr	ton/yr	5.0E-4
EPA_MOVES2014a	g/VMT	VMT/yr	ton/yr	1.1E-6

Conversions

453.6 g/lb 2,000 lb/ton

1.341 hp/kW

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Mobile Equipment Tailpipe

	PM	PM10		PM2.5		CO		NOX		SO2		VOC
ID	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr
Transmission Line												
TL1	0.03	0.17	0.03	0.17	0.03	2.44	5.34	0.28	0.61	4.6E-3	0.01	0.29
TL2	8.8E-3	0.05	8.8E-3	0.05	8.8E-3	0.71	1.55	0.08	0.18	1.3E-3	2.9E-3	0.08
TL3	0.13	0.70	0.13	0.28	0.05	0.12	0.25	0.37	0.81	5.4E-4	1.2E-3	0.06
TL4	0.19	1.06	0.19	0.42	0.08	0.17	0.38	0.55	1.21	8.1E-4	1.8E-3	0.08
TL5	0.13	0.70	0.13	0.28	0.05	0.12	0.25	0.37	0.81	5.4E-4	1.2E-3	0.06
TL6	0.20	1.11	0.20	0.55	0.10	0.29	0.64	0.78	1.70	1.7E-3	3.6E-3	0.24
TL7	4.0E-3	0.02	4.0E-3	0.02	4.0E-3	0.46	1.00	0.04	0.08	6.0E-4	1.3E-3	0.04
TL8	0.02	0.13	0.02	0.13	0.02	1.93	4.22	0.22	0.48	3.6E-3	7.9E-3	0.23
TL9	0.03	0.18	0.03	0.07	0.01	0.03	0.06	0.09	0.20	1.3E-4	2.9E-4	0.01
TL10	0.13	0.70	0.13	0.28	0.05	0.12	0.25	0.37	0.81	5.4E-4	1.2E-3	0.06
TL11	0.10	0.53	0.10	0.21	0.04	0.09	0.19	0.28	0.60	4.0E-4	8.8E-4	0.04
TL12	0.05	0.26	0.05	0.10	0.02	0.04	0.10	0.14	0.30	2.0E-4	4.4E-4	0.02
TL13	0.13	0.70	0.13	0.28	0.05	0.12	0.25	0.37	0.81	5.4E-4	1.2E-3	0.06
TL14	7.2E-3	0.04	7.2E-3	0.04	7.2E-3	0.58	1.26	0.07	0.14	1.1E-3	2.4E-3	0.07
TL15	9.2E-3	0.05	9.2E-3	0.05	9.2E-3	0.74	1.62	0.08	0.18	1.4E-3	3.0E-3	0.09
TL16	0.68	3.74	0.68	3.74	0.68	27.27	59.73	27.27	59.73	0.05	0.11	3.24
TL17	0.08	0.44	0.08	0.44	0.08	3.21	7.03	3.21	7.03	6.0E-3	0.01	0.38
TL18	0.03	0.18	0.03	0.07	0.01	0.03	0.06	0.09	0.20	1.3E-4	2.9E-4	0.01
Substation												
SS1	8.0E-3	0.04	8.0E-3	0.04	8.0E-3	0.92	2.01	0.07	0.16	1.2E-3	2.6E-3	0.08
SS2	0.51	2.82	0.51	1.11	0.20	0.46	1.02	1.47	3.22	2.2E-3	4.7E-3	0.22
SS3	0.51	2.82	0.51	1.11	0.20	0.46	1.02	1.47	3.22	2.2E-3	4.7E-3	0.22
SS4	0.16	0.89	0.16	0.44	0.08	0.23	0.51	0.62	1.36	1.3E-3	2.9E-3	0.19
SS5	0.05	0.30	0.05	0.14	0.03	0.07	0.15	0.18	0.39	3.3E-4	7.3E-4	0.06
SS6	0.02	0.11	0.02	0.11	0.02	0.77	1.69	0.77	1.69	1.4E-3	3.2E-3	0.09
SS7	4.2E-3	0.02	4.2E-3	0.02	4.2E-3	0.34	0.74	0.04	0.08	6.3E-4	1.4E-3	0.04
SS8	6.0E-3	0.03	6.0E-3	0.03	6.0E-3	0.69	1.51	0.06	0.12	9.0E-4	2.0E-3	0.06
Total	3.25	17.81	3.25	10.18	1.86	42.39	92.84	39.33	86.13	0.09	0.19	6.02

LT Unit	ST Unit	Multiplier
ton/yr	lb/day	5.479
ton/yr	lb/hr	0.457

Conversions
2,000 lb/ton
453.59 g/lb

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AIR EMISSION CALCULATIONS	SUBJECT: Power Line Construction Emissions	DATE: October 10, 2018

Power Line Construction

Hazardous Air Pollutants (HAP) and Greenhouse Gases (GHG)

Fuel Consumption TRUE

Small Engines	961,584 gal/yr	131,737 MMBTU/yr[1]
Large Engines	1,215,552 gal/yr	166,531 MMBTU/yr[1]

[1] *Based on 137,000 BTU/gal AP-42, Sec. 3.3*

Combustion HAP Emission Factors and Emissions

CAS No.	Pollutant/Group	Small Engines[1] lb/MMBtu	Large Engines[2] lb/MMBtu	Emissions[4] lb/yr	ton/yr
106990	1,3-Butadiene	3.91E-5		5.2	2.6E-3
75070	Acetaldehyde	7.67E-4	2.52E-5	105.2	5.3E-2
107028	Acrolein	9.25E-5	7.88E-6	13.5	6.7E-3
71432	Benzene	9.33E-4	7.76E-4	252.1	0.1
50000	Formaldehyde	1.18E-3	7.89E-5	168.6	8.4E-2
	POM [3]	1.68E-4	2.12E-4	57.4	2.9E-2
108883	Toluene	4.09E-4	2.81E-4	100.7	5.0E-2
1330207	Xylene	2.85E-4	1.93E-4	69.7	3.5E-2
Combustion HAP Total				772.3	0.39

[1] *AP-42, Tab. 3.3-2, 10/96, diesel engines (≤ 600 hp)*

[2] *AP-42, Tabs. 3.4-3 & 3.4-4, 10/96, large diesel engines (> 600 hp)*

[3] *POM = Polyoxymethylene, includes:*
2-Methylnaphthalene, 3-Methylchloranthrene, 7,12-Dimethylbenz(a)anthracene, Acenaphthene, Acenaphthylene, Anthracene, Benz(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Indeno(1,2,3-c,d)pyrene, Naphthalene, Phenanthrene, Pyrene.

Dust HAP Emission Factors and Emissions

HAP Concentrations[1] and Emissions

CAS No.	Pollutant	ppm	Emissions lb/yr	ton/yr
7440382	Arsenic	667	41.9	2.1E-2
7440417	Beryllium	3.2	0.2	1.0E-4
7440439	Cadmium	0.5	3.1E-2	1.6E-5
7440484	Cobalt	4.0	0.3	1.3E-4
7440473	Chromium	9.0	0.6	2.8E-4
7439976	Mercury	0.6	3.8E-2	1.9E-5
7439965	Manganese	299	18.8	9.4E-3
7440020	Nickel	2.0	0.1	6.3E-5
7439921	Lead	8.0	0.5	2.5E-4
7440360	Antimony	23	1.4	7.2E-4
7723140	Phosphoru	650	40.8	2.0E-2
Dust HAP Total			104.6	5.2E-2

[1] *(Midas Gold 2017c) for all metals but Hg; Hg value from (Midas Gold 2018i)*

Applicable Dust Emissions

Activity	PM ton/yr
Facility and Infrastructure Construction	31.4

Conversions

907,186	g/ton
1,000	kW/MW
1.341	hp/kW
1,000,000	BTU/MMBTU
2,000	lb/ton

Air Sciences Inc.	PROJECT TITLE: Midas Gold	BY: E. Memon		
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AIR EMISSION CALCULATIONS	SUBJECT: Power Line Construction Emissions	DATE: October 10, 2018		

Power Line Construction

GHG Emission Factors [1] ***and Emissions***

Fuel	CO2	CH4	N2O	CO2	CH4	N2O	CO2e
	kg/MMBtu			mt/yr	mt/yr	mt/yr	mt/yr
Diesel	73.96	3.0E-3	6.0E-4	22,060	0.9	0.2	22,136
Combustion Total GHG				22,060	0.9	0.2	22,136

[1] *40 CFR 98 Tab. C-1 and C-2 (CFR. 2018d)*

Global Warming Potential[1]

CO2	1
CH4	25
N2O	298

[1] *40 CFR 98 Tab. A-1 (CFR. 2018d)*

Conversions

1,000 kg/mt
2,000 lb/ton

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: K. Lewis	
	PROJECT NO: 335-1-2	PAGE: 1	OF: 1 SHEET: HgSpec
AIR EMISSION CALCULATIONS	SUBJECT: Hg Emission Speciation	DATE: October 10, 2018	

Mining Year **4**

Facility-Wide Hg Emission and Speciation

Emissions

Activity	Total Hg ton/yr	Total Hg lb/yr	Speciation* Hg0	Hg2	HgP	Total	Hg0 ton/yr	Hg2 ton/yr	HgP ton/yr	Hg2+P ton/yr
Process Propane Combustion	0.00004	0.07		100%		100%	--	3.5E-05	--	3.5E-05
Autoclave	0.01067	21.34	97.9%	1.6%	0.5%	100%	1.0E-02	1.7E-04	5.2E-05	2.2E-04
Refinery Sources (Kiln, EW, Retort, Furnace)	0.00168	3.36	98.4%	1.4%	0.1%	100%	1.7E-03	2.4E-05	2.5E-06	2.6E-05
Process Dust	0.00001	0.03			100%	100%	--	--	1.3E-05	1.3E-05
Mine Fugitive Dust	0.00070	1.40			100%	100%	--	--	7.0E-04	7.0E-04
Mine Fugitive Mercury Flux	0.00354	7.07	100%			100%	3.5E-03	--	--	--
Total	0.01664	33.27					1.6E-02	2.3E-04	7.7E-04	1.0E-03
*See tables below:							94%	1.4%	4.6%	6.0%
Process Subtotal	0.0124	0.0124	chk					chk	2.95E-4	2.95E-4
Mine Subtotal	0.0042	0.0042	chk					chk	7.02E-4	7.02E-4

Autoclave Test Data

Source	Date	Method	Hg0 lb/hr	Hg2 lb/hr	HgP lb/hr	HgTotal lb/hr	Hg0 %	Hg2 %	HgP %
Autoclave Phase 1	10/5/20005	FAMS	0.0426	0.000689	0.00021	0.0435	97.93%	1.58%	0.49%

(NDEP 2006)

Refinery Test Data

Source	Date	Method	Hg0 lb/hr	Hg2 lb/hr	HgP lb/hr	HgTotal lb/hr	Hg0 %	Hg2 %	HgP %
Refinery Retort	10/17/2006	OHM	0.00343	0.000055	9E-06	0.0035	98.17%	1.57%	0.26%
AARL Kiln Scrubber	10/14/2006	OHM	0.02799	0.000268	2.3E-05	0.02828	98.97%	0.95%	0.08%
Melt/Pour Furnace	10/12/2006	OHM	0.01041	0.000273	3.1E-05	0.01072	97.16%	2.55%	0.29%
(WES&T 2006)						Wt. Avg.	98.45%	1.40%	0.15%

Estimated Hg emissions split between Refinery Sources for modeling purposes only:

Source	Split
Kiln	25%
EW	25%
Retort	25%
Furnace	25%
	100%

Conversions

2,000 lb/ton

Air Sciences Inc.	PROJECT TITLE: Midas Gold	BY: K. Lewis
	PROJECT NO: 335-1-2.4	PAGE: 1 OF: 1 SHEET: HgStoke's
AIR EMISSION CALCULATIONS	SUBJECT: Hg Deposition Parameters	DATE: October 10, 2018

Stoke's Law

$Vts = gd^2(p - pa) / 18n$ *Engineering Tool Box*

Vts	terminal settling velocity				
g	gravitational acceleration	9.81E+02	cm/s^2		*Engineering Tool Box*
d	diameter of particle (cm)				
pa	density of air	1.212E-03	g/cm^3	18C	*Engineering Tool Box*
p	density of particle (g/cm^3)				
n	coefficient of viscosity of air	1.80E-04	g/cm-s	18C	*Engineering Tool Box*
µ	micron				

Literature values for deposition velocity of Hg2 and HgP

Hg2	0.5-6 cm/s	*(L. Zhang 2009)*	Range Average	3.25 cm/s
HgP	0.02-2 cm/s	*(L. Zhang 2009)*	Range Average	1.01 cm/s
			Average	2.13 cm/s

d	7 µ		*Aerodynamic diameter to achieve a Vts of ~2 cm/s*
p	13.545 g/cm^3	20C	*Engineering Tool Box (liquid Hg)*
Vts	2.01 cm/s		

$$\frac{0.04362\ \text{lb/ft-h} \times \frac{453.592\ \text{g}}{\text{lb}} \times \frac{\text{ft}}{30.48\ \text{cm}} \times \frac{\text{hr}}{3600\ \text{s}}}{} = 1.80\text{E-}04\ \text{g/cm-s} = 1.80\text{E-}02\ \text{g/m-s}$$

$$\frac{9.81\text{E+}02\ \text{cm}}{\text{s}^2} \times \frac{4.9\text{E-}07\ \text{cm}^2}{} \times \frac{13.545\ \text{g}}{\text{cm}^3} - \frac{1.21\text{E-}03\ \text{g}}{\text{cm}^3} \times \frac{}{18} \times \frac{\text{cm-s}}{1.80\text{E-}04\ \text{g}} = \frac{2.006\ \text{cm}}{\text{s}}$$

Conversions

10,000 cm/µ

Engineering Tool Box URLs

https://www.engineeringtoolbox.com/mercury-d_1002.html
https://www.engineeringtoolbox.com/air-density-specific-weight-d_600.html
https://www.engineeringtoolbox.com/air-absolute-kinematic-viscosity-d_601.html
https://www.engineeringtoolbox.com/accelaration-gravity-d_340.html
https://www.ajdesigner.com/phpstokeslaw/stokes_law_terminal_velocity.php

PROJECT TITLE: Stibnite Gold Project
PROJECT NO.: 335-1-2
SUBJECT: HCN Emissions

BY: K. Lewis
PAGE: 1 of 1 SHEET: HCN
DATE: October 10, 2018

MIDAS GOLD HCN EMISSIONS

Wind: m/s = 2.31, Fw = 1.00

Snow Cover: 155 days w/ 0.5+ in 0.424658 snow

Fugitive Emissions

Area	Source	Cat.	Category Description	Acres	Snow Cover Adjustment Acres	Solution Parameters (M32017c) pH	Free CN- g/m3	T C	pKa	a0	H	Overall kG or Flux m/s or g/m2-s	Fa*Fw	g/s	lb/yr
Tails	Tailings Storage Facility	TA	Tails, Aqueous Surface	110.22	110.22	7.75	1.00	3.74	9.803	0.9912	0.00252	1.89E-05	0.42	8.84E-03	614.9
		TW	Tails, Wet Sediment	110.22	63.42 snow							5.31E-08	0.42	5.73E-03	398.4
		TD	Tails, Dry Sediment	110.22	63.42 snow							2.33E-08	1.00	5.97E-03	415.0
			Active Surface Subtotal	***220.44***											
Mill															
	Tailings Pipeline Maintenance Pond	TA	Tails, Aqueous Surface	0.133	0.133	7.75	1.00	3.74	9.803	0.9912	0.00252	1.89E-05	0.63	1.60E-05	1.1
	CN Detoxification Tank 1	TK	Tanks	0.029	0.029	8.50	25.00	25.00	9.250	0.8490	0.00545	3.11E-04	0.69	2.89E-03	201.0
	CN Detoxification Tank 2	TK	Tanks	0.029	0.029	8.50	25.00	25.00	9.250	0.8490	0.00545	3.11E-04	0.69	2.89E-03	201.0
	CIP Leach Tank 1	TK	Tanks	0.049	0.049	10.25	125.00	52.50	8.535	0.0189	0.01479	3.11E-04	0.67	1.43E-03	99.7
	CIP Leach Tank 2	TK	Tanks	0.049	0.049	10.25	125.00	52.50	8.535	0.0189	0.01479	3.11E-04	0.67	1.43E-03	99.7
	CIP Leach Tank 3	TK	Tanks	0.049	0.049	10.25	125.00	30.00	8.535	0.0189	0.01479	3.11E-04	0.67	1.43E-03	99.7
	CIP Leach Tank 4	TK	Tanks	0.049	0.049	10.25	125.00	52.50	8.535	0.0189	0.01479	3.11E-04	0.67	1.43E-03	99.7
	CIL Tank 1	TK	Tanks	0.053	0.053				9.120	0.0690	0.00654	3.11E-04	0.67	2.48E-03	172.7
	CIL Tank 2	TK	Tanks	0.053	0.053	10.25	125.00	30.00	9.120	0.0690	0.00654	3.11E-04	0.67	2.48E-03	172.7
	CIL Tank 3	TK	Tanks	0.053	0.053	10.25	125.00	30.00	9.120	0.0690	0.00654	3.11E-04	0.67	2.48E-03	172.7
	CIL Tank 4	TK	Tanks	0.053	0.053	10.25	125.00	30.00	9.120	0.0690	0.00654	3.11E-04	0.67	2.48E-03	172.7
	CIL Tank 5	TK	Tanks	0.053	0.053	10.25	125.00	52.50	9.120	0.0690	0.00654	3.11E-04	0.67	2.48E-03	172.7
	CIL Tank 6	TK	Tanks	0.053	0.053	10.25	125.00	30.00	9.120	0.0690	0.00654	3.11E-04	0.67	2.48E-03	172.7
	CIP Tank 1	TK	Tanks	0.007	0.007				8.535	0.0189	0.01479	3.11E-04	0.74	2.36E-04	16.4
	CIP Tank 2	TK	Tanks	0.007	0.007	10.25	125.00	52.50	8.535	0.0189	0.01479	3.11E-04	0.74	2.36E-04	16.4
	CIP Tank 3	TK	Tanks	0.007	0.007	10.25	125.00	52.50	8.535	0.0189	0.01479	3.11E-04	0.74	2.36E-04	16.4
	CIP Tank 4	TK	Tanks	0.007	0.007	10.25	125.00	52.50	8.535	0.0189	0.01479	3.11E-04	0.74	2.36E-04	16.4
	CIP Tank 5	TK	Tanks	0.007	0.007	10.25	125.00	52.50	8.535	0.0189	0.01479	3.11E-04	0.74	2.36E-04	16.4
	CIP Tank 6	TK	Tanks	0.007	0.007	10.25	125.00	52.50	8.535	0.0189	0.01479	3.11E-04	0.74	2.36E-04	16.4
												Overall			
	Snow Adjustments	Tsn	Tails, Snow Covered		93.61 snow							1.17E-08	1.00	4.43E-03	308.3
			Snow Covered Surface Subtotal		***93.6***										
			TOTAL AREA	**331.41**	**331.41**									***Fugitive Total (lb/yr)***	**3,673.6**
														Fugitive Total (ton/yr)	**1.84**

Stack Emissions

	lb/hr	hr/yr	lb/yr
EW Cells	0.000567	8,760	**5.0**
Preg/Barren Tanks	0.004	8,760	**35.0**
		Stack Total (lb/yr)	**40.0**
		Stack Total (ton/yr)	**0.02**
		Total (ton/yr)	**1.86**

** Per EPA's request, three gold mines in Nevada conducted fugitive HCN emission measurements in the fourth quarter of 2009 in order to quantify emissions from the various fugitive HCN sources at gold mines. The Quality Assurance Project Plan (QAPP) for this testing, the EPA's approval letter of this QAPP, and the final fugitive HCN test report are provided on the federal docket website athttps://www.regulations.gov/docketBrowser?rpp=25&so=DESC&sb=commentDueDate&po=0&s=EPA-HQ-OAR-2010-0239-0163&dct=SR&D=EPA-HQ-OAR-2010-0239. The IDs for these documents are EPA-HQ-OAR-2010-0239-0102, EPA-HQ-OAR-2010-0239-0103, and EPA-HQ-OAR-2010-0239-0163 (0163.0 through 0163.6), respectively. The above emission factors were taken from the final fugitive HCN test report, "Card and Schmidt. Evaluation of Air Emissions of Hydrogen Cyanide from Fugitive Sources at Nevada Gold Mines Using the USEPA Surface Isolation Flux Chamber Technology. April 2010."*

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Conversions

60	sec/min	
60	min/hr	
24	hr/day	
365	day/yr	
8,760	hr/yr	
3,600	s/hr	
2,000	lb/ton	
453.593	g/lb	
3.28084	ft/m	
35.3147	ft^3/m^3	
7,000	gr/lb	
1.341	hp/kW	
7.05	lb/gal distillate oi	*AP-42 Appendix A "Weights of Selected Substances" (Distillate oil)*
907.1858	kg/ton	
459.67	°R at 0°F	
68	°F, standard	
7,000	BTU/hp-hr	*AP-42, Sec. 3.3, (Diesel)*
2.2369	mi/hr per m/s	
7.48052	gal/ft^3	
1.10231	ton/t	
2.20462	lb/kg	
1609.34	m/mi	
137,000	BTU/gal	*AP-42, App. A (Diesel)*
4046.9	m^2/acre	
43,560	ft^2/acre	
12	in/ft	
1.10231	ton/mt	
1.0E+6	g/mt	
3	ft/yd	
1.0E+6	scf/MMscf	
10,000	m^2/ha	
1,000	kg/mt	
273.15	°K at 0°C	
32	°F at 0°C	
1.8	°F/°C	
1,000	ng/µg	
0.293297	MW-hr/MMBtu	
12	mo/yr	

Fuel Specifications

15	ppm S content	*40 CFR 80.510 (Non-road diesel)*
7.05	lb/gal-fuel	*AP-42, App. A*
32.065	lb/lb-mol S, and	
64.06	lb/lb-mol SO2	
7,000	Btu/hp-hr	*AP-42, Sec. 3.3, (Diesel engine)*
0.00939	MMBtu/kW-hr	*Diesel*
0.137	MMBtu/gal	*AP-42, App. A (Diesel)*
0.0915	MMBtu/gal Propane	

Constants

M.W. SO2	64.0638
M.W. S	32.065
M.W. O	15.9994

Diesel SO2

$$\frac{15 \text{ parts S}}{1.0E+06} \times \frac{7.05 \text{ lb}}{\text{gal diesel}} \times \frac{64.06 \text{ SO2}}{32.065 \text{ S}} \times \frac{\text{gal}}{0.137 \text{ MMBtu}} \times \frac{0.00939 \text{ MMBtu}}{\text{kW-hr}} \times \frac{453.593 \text{ g}}{\text{lb}} = 6.57E\text{-}03 \frac{\text{g SO2}}{\text{kW-hr}}$$

Calculation

$$\frac{185 \text{ lb S}}{1.00E+06 \text{ lb C3H8}} \times \frac{44.08 \text{ lb C3H8}}{\text{lb mol}} \times \frac{\text{lb mol}}{359.05 \text{ SCF (0C)}} \times \frac{7{,}000 \text{ gr}}{\text{lb}} \times \frac{100 \text{ SCF}}{100 \text{SCF}} = 15.90 \frac{\text{gr S}}{100 \text{ SCF}}$$

Propane heating value 91,500 *Btu/gal* *AP-42, Table 1.5-1 (07/08) Footnotea*

AP-42, Chapter 13.2.4 Particle Size Fractions

0.35	PM10
0.053	PM2.5

Fuel Combustion Exhaust Flow (EPA Method 19, Ffactor)

Propane Heater

F-factor	8,710	dscf/MMBtu	Propane, dry
O2%dry	3	%	
Heat input	1	MMBtu/hr	
Standard exhaust flow	10,170	dscf/hr	
	169	dscfm	
Vol % moisture	15.0%	standard for propane boilers	
Temperature	360	°F, Engineering Toolbox* (LPG heating appliances)	
Pressure, site	0.79	atm	
Actual exhaust flow	394	acfm (wet)/MMBtu	

Diesel Engine

F-factor	9,190	dscf/MMBtu	Oil, dry	
O2%dry	9	%		
Heat input	0.007	MMBtu/hp-hr	AP-42, Sec. 3.3, (Diesel engine)	
Standard exhaust flow	113	dscf/hp-hr		
	1.9	dscfm/hp	2.5	dscfm/kW
Vol % moisture	8.0%	standard for diesel engines		
Temperature	1,100	°F, Engineering Toolbox* (diesel exhaust)		
Pressure, site	0.79	atm		
Actual exhaust flow	7.7	acfm (wet)/hp	10.3	acfm (wet)/kW

* *http://www.engineeringtoolbox.com/fuels-exhaust-temperatures-d_168.html*

Refinery and Autoclave Exhaust Flow dscfm acfm temp_F dia_ft

Source	Hourly Design Rate		Water	Exhaust Parameters Flow dscfm	Flow acfm	Temp F	Velocity ft/s	Dia ft
Carbon Regeneration Kiln (Drum)	0.3	ton	5%	1,500	2,300	150	31	1.25
Electrowinning Cells & Pregnant Solution Tan	100	gal	50%	3,000	8,800	150	30	2.5
Mercury Retort	0.5/batch	ton	5%	100	100	85	8	0.5
Induction Melting Furnace	0.5/batch	ton	5%	5,000	7,700	150	32	2.25
Autoclave	290	ton	80%	5,000	39,800	200	34	5

Stack parameters are based on typical industry values for similar size units.

Enclosure Control Efficiency Calculation

Emission factor equation	$E = 0.0032k(U/5)^{1.3}/(M/2)^{1.4}$				*AP-42, Sec. 13.2.4, Eq. 1, 11/06*
U = Mean wind speed	5.167	mph	2.31	m/s	*(Midas Gold 2017f), Fig. 4-3 (2014 onsite meteorological data)*
U = Mean wind speed	1.3	mph			*Lowest wind speed for Eq. 1, AP-42, Sec. 13.2.4, Eq. 1, 11/06*
M = Moisture content	2.5	%			

	PM	PM10	PM2.5		
k = Particle size multiplier	0.74	0.35	0.053		*AP-42, Sec. 13.2.4, Pg. 4, 11/06*
E = Emission factor	0.00181	0.00086	0.00013	lb/ton	U = 5.167
E = Emission factor	0.00030	0.00014	0.00002	lb/ton	U = 1.300
Control Efficiency	83.4%	83.4%	83.4%		

Site Pressure Calculation

http://www.sensorsone.com/altitude-pressure-units-conversion/

6000	23.978	6531.9	
7000	23.088	23.505	
0		29.921	0.78556

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Lime Kiln Specifications

810 *kcal/kg* *(Maerz 2018)*
3.96567 *btu/kcal*

Lime kiln heat requirements

$$\frac{810\ \text{kcal}}{\text{kg}} \left| \frac{907.186\ \text{kg}}{\text{ton}} \right| \frac{3.96567\ \text{Btu}}{\text{kcal}} \left| \frac{\text{MMBtu}}{1.E{+}06\ \text{Btu}} \right. = \frac{2.914\ \text{MMBtu}}{\text{ton}}$$

Dyno Nobel 2010 "Blasting and Explosives Quick Reference Guide"

(B*S*BH*N)/(PI()*D^2/4000*L)

		B - Drilled Burden (m)	=(25 to 40) x D
		S - Drilled Spacing (m)	=1.15 x B
BH	10 m	BH - Bench Height (m)	≥D/15
		N - Number of Holes in a Blast	
N	100	D - Hole Diameter (mm)	
		L - Hole Length	
D	0.15 m		
B	4.9 m		
S	5.6 m		
L	10 m		
V	27,330		
Vb	70.7		
V/Vb	386.6 400		

Alternative 2 - Lime Kiln Alternative: Emissions Inventory and Modeling Parameters

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Note : The parameters and methods used for this emission inventory were developed for purposes of the EIS, prior to submittal of the air quality permit application to IDEQ. Therefore, these methods and parameters (e.g., road silt content and mean vehicle weights) have not been reviewed and approved by IDEQ. While each emission estimate presented here is based on technically valid methods, comments and preferences by IDEQ communicated during review of the Midas Gold air permit application are not incorporated at the time of this DEIS.

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: E. Memon
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AIR EMISSION CALCULATIONS	SUBJECT: Emissions Summary	DATE: October 10, 2018

Emissions Summary

Maximum Annual Emissions

Total Emissions by LOM Year

	LOM	PM	PM10	PM2.5	CO	NOX	SO2	VOC
		ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
	-2	231.0	66.9	17.1	461.7	156.2	0.8	52.3
	-1	364.9	106.4	30.8	531.3	220.8	0.9	**56.8**
	PP	642.7	173.1	33.6	481.0	291.9	1.0	43.0
1-12	1	939.7	280.4	62.0	353.9	235.9	7.2	21.0
1-12	2	1,139.2	338.6	69.7	438.4	340.8	7.4	23.2
1-12	3	1,175.2	354.7	70.0	509.9	347.3	7.4	23.6
1-12	4	**1,247.7**	**374.7**	**72.1**	**555.9**	**368.3**	**7.5**	24.4
1-12	5	1,134.5	342.9	68.3	503.0	358.4	7.5	23.7
1-12	6	1,218.3	365.7	68.5	508.2	365.2	7.5	23.3
1-12	7	1,134.8	345.1	66.1	494.2	316.9	7.3	22.1
1-12	8	1,208.0	366.4	68.0	521.8	327.1	7.4	22.3
1-12	9	1,190.4	358.6	67.5	504.6	327.5	7.4	22.8
1-12	10	1,143.4	343.9	66.1	474.0	298.0	7.3	22.1
1-12	11	792.3	249.1	55.5	347.6	228.8	7.1	19.3
1-12	12	495.6	164.6	45.4	188.8	118.4	6.8	12.3
		PM_tpy	PM10_tpy	PM2.5_tpy	CO_tpy	NOx_tpy	SO2_tpy	VOC_tpy

Maximum Daily Emissions of AQRV Pollutants

Total Emissions by LOM Year

	LOM	Q/D Threshold	PM10	PM2.5	NOX	SO2	H2SO4	AQRV Pollutants (lb/day)				
			lb/day	lb/day	lb/day	lb/day	lb/day	Process	Mining	Construction	Total	
	-2	775	494.0	120.0	1,013.2	4.5	0.0	0	0	1,512	1,512	chk
	-1	775	791.0	223.2	1,498.4	5.6	0.0	0	0	2,295	2,295	chk
	PP	775	1,141.0	217.2	1,813.1	7.9	0.0	0	1,715	1,247	2,962	chk
1-12	1	775	1,663.8	389.1	1,370.0	43.1	48.7	643	2,482	0	3,126	chk
1-12	2	775	1,994.8	436.5	1,957.1	44.4	48.7	643	3,402	0	4,045	chk
1-12	3	775	2,061.7	434.8	1,988.2	44.5	48.7	643	3,500	0	4,143	chk
1-12	4	775	**2,166.8**	**444.5**	**2,106.0**	**44.8**	**48.7**	643	3,723	0	**4,366**	chk
1-12	5	775	1,995.2	425.4	2,050.9	44.6	48.7	643	3,496	0	4,139	chk
1-12	6	775	2,116.8	424.1	2,088.7	44.6	48.7	643	3,656	0	4,299	chk
1-12	7	775	2,000.7	410.5	1,816.5	43.9	48.7	643	3,267	0	3,910	chk
1-12	8	775	2,119.9	421.4	1,874.3	44.1	48.7	643	3,444	0	4,087	chk
1-12	9	775	2,076.4	418.9	1,876.6	44.2	48.7	643	3,403	0	4,046	chk
1-12	10	775	1,994.5	410.6	1,710.1	43.7	48.7	643	3,154	0	3,797	chk
1-12	11	775	1,494.5	352.9	1,331.6	42.7	48.7	643	2,274	0	2,917	chk
1-12	12	775	1,017.8	296.0	712.8	41.1	48.7	643	1,177	0	1,820	chk
			PM10_ppd	PM2.5_ppd	NOx_ppd	SO2_ppd	VOC_ppd	Sul_ppd				

Conversions

365 day/yr
2,000 lb/ton

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Emissions Summary

Ore Processing and Refining	PM_tpy	PM10_tpy	PM2.5_tpy	CO_tpy	NOx_tpy	SO2_tpy	VOC_tpy
LOM	PM	PM10	PM2.5	CO	NOX	SO2	VOC
	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
1-12	71.1	46.9	32.1	31.1	38.9	6.6	5.4

Mining	Error	Error	Error	Error	Error	Error	Error
LOM	PM	PM10	PM2.5	CO	NOX	SO2	VOC
	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
PP	418.8	109.8	19.2	210.6	178.3	0.5	14.2
1	868.6	233.4	29.9	322.8	197.0	0.6	15.6
2	1,068.1	291.6	37.6	407.3	301.9	0.8	17.8
3	1,104.1	307.8	37.9	478.8	308.4	0.8	18.2
4	1,176.6	327.8	40.0	524.8	329.3	0.9	19.0
5	1,063.3	295.9	36.2	471.9	319.5	0.9	18.3
6	1,147.2	318.8	36.4	477.2	326.3	0.9	17.9
7	1,063.7	298.2	34.0	463.2	277.9	0.7	16.7
8	1,136.9	319.5	35.9	490.7	288.2	0.8	16.9
9	1,119.3	311.6	35.5	473.5	288.6	0.8	17.4
10	1,072.3	297.0	34.0	443.0	259.0	0.7	16.7
11	721.1	202.1	23.4	316.5	189.9	0.5	13.9
12	424.5	117.7	13.3	157.8	79.5	0.2	6.9

	chk	chk	chk	chk	chk	chk	chk
Mine Infrastructure Construction[1]	197.9	54.2	10.8	200.7	49.0	0.3	24.3
LOM	PM	PM10	PM2.5	CO	NOX	SO2	VOC
	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
-2	205.0	57.8	13.5	392.1	91.6	0.6	47.8
-1	312.9	88.2	23.6	392.1	91.6	0.6	47.8
PP	197.9	54.2	10.8	200.7	49.0	0.3	24.3

[1] *Construction emissions during mine operation are accounted for in the mining emissions*

	chk	chk	chk	chk	chk	chk	chk
Power Line Construction	26.0	9.1	3.6	69.6	64.6	0.1	4.5
LOM	PM	PM10	PM2.5	CO	NOX	SO2	VOC
	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
-2	26.0	9.1	3.6	69.6	64.6	0.1	4.5
-1	52.0	18.2	7.2	139.3	129.2	0.3	9.0
PP	26.0	9.1	3.6	69.6	64.6	0.1	4.5

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Emissions Summary

Ore Processing and Refining	PM_ppd	PM10_ppd	PM2.5_ppd	CO_ppd	NOx_ppd	SO2_ppd	VOC_ppd	Sul_ppd
LOM	PM	PM10	PM2.5	CO	NOX	SO2	VOC	H2SO4
	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day
1-12	n/a	324.6	219.1	189.0	232.0	37.8	n/a	48.7

Mining		Error	Error	Error	Error	Error	
LOM	PM	PM10	PM2.5	CO	NOX	SO2	VOC
	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day
PP	n/a	670.1	113.2	1,788.0	1,039.9	5.0	n/a
1	n/a	1,339.2	170.0	2,153.3	1,138.0	5.3	n/a
2	n/a	1,670.2	217.3	2,480.0	1,725.2	6.6	n/a
3	n/a	1,737.1	215.7	2,679.3	1,756.3	6.7	n/a
4	n/a	1,842.2	225.3	2,933.3	1,874.0	7.0	n/a
5	n/a	1,670.6	206.3	2,641.7	1,818.9	6.8	n/a
6	n/a	1,792.2	205.0	2,669.0	1,856.7	6.8	n/a
7	n/a	1,676.1	191.4	2,589.7	1,584.5	6.1	n/a
8	n/a	1,795.3	202.2	2,741.1	1,642.4	6.3	n/a
9	n/a	1,751.8	199.8	2,648.4	1,644.6	6.4	n/a
10	n/a	1,669.9	191.5	2,479.5	1,478.1	6.0	n/a
11	n/a	1,169.9	133.7	2,180.9	1,099.6	4.9	n/a
12	n/a	693.2	76.8	1,411.0	480.8	3.3	n/a

Infrastructure Construction[1][2]		chk 402.7	chk 76.9	chk 1148.4	chk 288.0	chk 1.8	
LOM	PM	PM10	PM2.5	CO	NOX	SO2	VOC
	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day
-2	n/a	425.7	92.9	2226.5	527.9	3.5	n/a
-1	n/a	654.5	169.0	2226.5	527.9	3.5	n/a
PP	n/a	402.7	76.9	1148.4	288.0	1.8	n/a

[1] *Maximum daily emissions based on: 1000 person crew during peak construction, scaled with an average annual crew of 750 and an annual operating schedule of 355 day/yr*

[2] *Construction daily emissions based on: 1000 construction crew during peak construction, scaled with average annual crew of 750 and an annual operating schedule of 355 day/yr. Daily power generation emissions are not scaled by peak crew.*

Power Line Construction[1]		chk 68.3	chk 27.1	chk-13 523.0	chk 485.2	chk 1.1	
LOM	PM	PM10	PM2.5	CO	NOX	SO2	VOC
	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day
-2	n/a	68.3	27.1	523.0	485.2	1.1	n/a
-1	n/a	136.5	54.2	1046.1	970.5	2.1	n/a
PP	n/a	68.3	27.1	523.0	485.2	1.1	n/a

Construction daily emissions based on: 1000 construction crew during peak construction, scaled with average annual crew of 750 and an annual operating schedule of 355 day/yr.

Conversions

2,000	lb/ton	1,000	person construction crew during peak construction
24	hr/day	750	person average construction crew during the year
355	day/yr Annual operations schedule		

SOURCE DESCRIPTION		OPERATING LIMITS							EMISSION FACTORS									
Model ID	Source Description	Design Throughput unit/hr	unit/day	unit/yr	units	Material	hr/yr	reference	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	H2S	unit	reference
OC1	Loader Transfer of Ore to Grizzly Screen	1,042	25,000	9,125,000	ton	Ore	8,760	(Midas Gold 2016), Sec. 10.1	0.00014	4.6E-05	1.3E-05						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.
OC2	Grizzly Screen to Apron Feeder	1,042	25,000	9,125,000	ton	Ore	8,760	(Midas Gold 2016), Sec. 10.1	0.00014	4.6E-05	1.3E-05						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.
OC3	Apron Feeder to Dribble Conveyor	1,042	25,000	9,125,000	ton	Ore	8,760	(Midas Gold 2016), Sec. 10.1	0.00014	4.6E-05	1.3E-05						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.
OC4	Apron Feeder to Vibrating Grizzly	1,042	25,000	9,125,000	ton	Ore	8,760	(Midas Gold 2016), Sec. 10.1	0.00014	4.6E-05	1.3E-05						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.
OC5	Dribble Conveyor to Vibrating Grizzly	1,042	25,000	9,125,000	ton	Ore	8,760	(Midas Gold 2016), Sec. 10.1	0.00014	4.6E-05	1.3E-05						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.
OC6	Vibrating Grizzly to Primary Crusher or Coarse Ore Stockpile Feed Conveyor	1,042	25,000	9,125,000	ton	Ore	8,760	(Midas Gold 2016), Sec. 10.1	0.00014	4.6E-05	1.3E-05						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.
OC7	Primary Crusher and Associated Transfers out to Coarse Ore Stockpile Feed Conveyor	1,042	25,000	9,125,000	ton	Ore	8,760	(Midas Gold 2016), Sec. 10.1	0.0012	0.00054	0.0001						lb/ton	AP-42, Table 11.19.2-2 (08/04) Tert. Crushing - ctrl.
OC8	Coarse Ore Stockpile Feed Conveyor Transfer to Stockpile	1,042	25,000	9,125,000	ton	Ore	8,760	(Midas Gold 2016), Sec. 10.1	0.00014	4.6E-05	1.3E-05						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.
OC9	Stockpile Transfers to Reclaim Conveyors	1,150	27,600	10,074,000	ton	Ore	8,760	(M3 2017b)	0.003	0.0011	0.00017						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
OC10	Reclaim Conveyers to SAG Mill Feed Conveyor	1,150	27,600	10,074,000	ton	Ore	8,760	(M3 2017b)	0.003	0.0011	0.00017						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
OC11	SAG Mill Feed Conveyor Transfer to SAG Mill	1,438	34,500	12,592,500	ton	Ore	8,760	(M3 2017b)	0.003	0.0011	0.00017						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
OC12	Pebble Crusher and Associated Transfers in (from SAG Mill) and out (to Pebble Discharge Conveyor)	287.5	6,900	2,518,500	ton	Ore	8,760	(M3 2017b)	0.0012	0.00054	0.0001						lb/ton	AP-42, Table 11.19.2-2 (08/04) Tert. Crushing - ctrl.
OC13	Pebble Discharge Conveyor to SAG Mill Feed Conveyor	287.5	6,900	2,518,500	ton	Ore	8,760	(M3 2017b)	0.00014	4.6E-05	1.3E-05						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.
LS1L	Mill Lime Silo#1 Loading	60	250	4,375	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.00099	0.00034	0.00005						lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.; PM2.5 Ch. 13.2.4
LS1U	Mill Lime Silo #1 Unloading to SAG Mill Conveyor	20	250	4,375	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.00042						lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.; PM2.5 Ch. 13.2.4
MillS2L	Mill Lime Silo #2 Loading	60	250	4,375	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.00099	0.00034	0.00005						lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.; PM2.5 Ch. 13.2.4
MillS2U	Mill Lime Silo #2 Unloading to SAG Mill Conveyor	20	250	4,375	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.00042						lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.; PM2.5 Ch. 13.2.4
Sb1	Sb Drying (2.72 MMBtu/hr Propane-Fired)	2.72		23,827	MMBtu	Propane	8,760	(M3 2017d)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
Sb2	Sb Bagging	4.5		39,420	ton	Sb Conc	8,760	(M3 2017d)	0.118	0.118	0.118						lb/hr	Based on NDEP-BAPC Permit for Clay Bagging Operation (Hectatone) (NDEP 2015b)
AC	Autoclave	290	6,960	2,540,400	ton	Ore	8,760	(M3 2017b)	5.075	5.075	5.075			0.6525		0.9	lb/hr	Based on NDEP-BAPC Permits/test data for Autoclaves: PM & SO2 - [Goldstrike (NDEP 2019)], H2S - (APT 2013). Negligible CO d ue to no organic
ACB	POX Boiler (17 MMBtu/hr Propane-Fired)	17	17	510	MMBtu	Propane	30	(M3 2017b)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Ind. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
ACS1L	AC Lime Silo #1 Loading	120	1,000	17,500	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.00099	0.00034	0.00005						lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.
ACS1U	AC Lime Silo #1 Unloading to Lime Slaker	20	480	17,500	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004						lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.
ACS2L	AC Lime Silo #2 Loading	120	1,000	17,500	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.00099	0.00034	0.00005						lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.
ACS2U	AC Lime Silo #2 Unloading to Lime Slaker	20	480	17,500	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004						lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.

SOURCE DESCRIPTION		EMISSION CONTROLS			HOURLY EMISSIONS								DAILY EMISSIONS							
Model ID	Source Description	control system	efficiency	reference	PM lb/hr	PM_{10} lb/hr	$PM_{2.5}$ lb/hr	CO lb/hr	NOx lb/hr	SO_2 lb/hr	VOC lb/hr	H2S lb/hr	PM lb/day	PM_{10} lb/day	$PM_{2.5}$ lb/day	CO lb/day	NOx lb/day	SO_2 lb/day	VOC lb/day	H2S lb/day
OC1	Loader Transfer of Ore to Grizzly Screen	Water Sprays		Control efficiency included in emission factor	0.146	0.0479	0.0135						3.50	1.15	0.325					
OC2	Grizzly Screen to Apron Feeder	Moisture Carry-Over		Control efficiency included in emission factor	0.146	0.0479	0.0135						3.50	1.15	0.325					
OC3	Apron Feeder to Dribble Conveyor	Moisture Carry-Over		Control efficiency included in emission factor	0.146	0.0479	0.0135						3.50	1.15	0.325					
OC4	Apron Feeder to Vibrating Grizzly	Moisture Carry-Over		Control efficiency included in emission factor	0.146	0.0479	0.0135						3.50	1.15	0.325					
OC5	Dribble Conveyor to Vibrating Grizzly	Moisture Carry-Over		Control efficiency included in emission factor	0.146	0.0479	0.0135						3.50	1.15	0.325					
OC6	Vibrating Grizzly to Primary Crusher or Coarse Ore Stockpile Feed Conveyor	Moisture Carry-Over		Control efficiency included in emission factor	0.146	0.0479	0.0135						3.50	1.15	0.325					
OC7	Primary Crusher and Associated Transfers out to Coarse Ore Stockpile Feed Conveyor	Water Sprays		Control efficiency included in emission factor	1.25	0.563	0.104						30.0	13.5	2.50					
OC8	Coarse Ore Stockpile Feed Conveyor Transfer to Stockpile	Moisture Carry-Over		Control efficiency included in emission factor	0.146	0.0479	0.0135						3.50	1.15	0.325					
OC9	Stockpile Transfers to Reclaim Conveyors	Undergrnd	80%	Based on AP-42, Chapter 13.2.4, reduction in EF due to wind speed reduction	0.690	0.253	0.0391						16.6	6.07	0.938					
OC10	Reclaim Conveyers to SAG Mill Feed Conveyor	Undergrnd	80%	Based on AP-42, Chapter 13.2.4, reduction in EF due to wind speed reduction	0.690	0.253	0.0391						16.6	6.07	0.938					
OC11	SAG Mill Feed Conveyor Transfer to SAG Mill	Enclosure	80%	Based on AP-42, Chapter 13.2.4, reduction in EF due to wind speed reduction	0.863	0.316	0.0489						20.7	7.59	1.17					
OC12	Pebble Crusher and Associated Transfers in (from SAG Mill) and out (to Pebble Discharge Conveyor)	Water Sprays		Control efficiency included in emission factor	0.345	0.155	0.0288						8.28	3.73	0.690					
OC13	Pebble Discharge Conveyor to SAG Mill Feed Conveyor	Moisture Carry-Over		Control efficiency included in emission factor	0.0403	0.0132	0.00374						0.966	0.317	0.0897					
LS1L	Mill Lime Silo#1 Loading	Bin Vent		Control efficiency included in emission factor	0.0594	0.0204	0.00300						0.248	0.0850	0.0125					
LS1U	Mill Lime Silo #1 Unloading to SAG Mill Conveyor	None	0%		0.0960	0.0560	0.00840						1.20	0.700	0.105					
MillS2L	Mill Lime Silo #2 Loading	Bin Vent		Control efficiency included in emission factor	0.0594	0.0204	0.00300						0.248	0.0850	0.0125					
MillS2U	Mill Lime Silo #2 Unloading to SAG Mill Conveyor	None	0%		0.0960	0.0560	0.00840						1.20	0.700	0.105					
Sb1	Sb Drying (2.72 MMBtu/hr Propane-Fired)	None	NA		0.0208	0.0208	0.0208	0.223	0.386	0.0473	0.0238		0.499	0.499	0.499	5.35	9.27	1.13	0.571	
Sb2	Sb Bagging	Baghouse	NA	Control efficiency included in emission factor	0.118	0.118	0.118						2.83	2.83	2.83					
AC	Autoclave	Wet Scrubber	NA	PM control efficiency included in emission factor	5.08	5.08	5.08			0.653		0.900	122	122	122			15.7		21.6
ACB	POX Boiler (17 MMBtu/hr Propane-Fired)	None	NA	NOX control efficiency included in emission factor	0.130	0.130	0.130	1.39	2.42	0.295	0.149		0.130	0.130	0.130	1.39	2.42	0.295	0.149	
ACS1L	AC Lime Silo #1 Loading	Bin Vent		Control efficiency included in emission factor	0.119	0.0408	0.00600						0.990	0.340	0.0500					
ACS1U	AC Lime Silo #1 Unloading to Lime Slaker	None	0%		0.0960	0.0560	0.00800						2.30	1.34	0.192					
ACS2L	AC Lime Silo #2 Loading	Bin Vent		Control efficiency included in emission factor	0.119	0.0408	0.00600						0.990	0.340	0.0500					
ACS2U	AC Lime Silo #2 Unloading to Lime Slaker	None	0%		0.0960	0.0560	0.00800						2.30	1.34	0.192					

SOURCE DESCRIPTION		ANNUAL EMISSIONS									NAD 83 LOCATION				
Model ID	Source Description	PM ton/yr	PM_{10} ton/yr	$PM_{2.5}$ ton/yr	CO ton/yr	NOx ton/yr	SO_2 ton/yr	VOC ton/yr	H2S ton/yr	Hg2+P ton/yr	UTM E m	UTM N m	reference	elev m	reference
OC1	Loader Transfer of Ore to Grizzly Screen	0.639	0.210	0.0593						3.83E-7	632,045	4,974,583	PC building center	1,968.5	PC building base
OC2	Grizzly Screen to Apron Feeder	0.639	0.210	0.0593						3.83E-7	632,045	4,974,583	PC building center	1,968.5	PC building base
OC3	Apron Feeder to Dribble Conveyor	0.639	0.210	0.0593						3.83E-7	632,045	4,974,583	PC building center	1,968.5	PC building base
OC4	Apron Feeder to Vibrating Grizzly	0.639	0.210	0.0593						3.83E-7	632,045	4,974,583	PC building center	1,968.5	PC building base
OC5	Dribble Conveyor to Vibrating Grizzly	0.639	0.210	0.0593						3.83E-7	632,045	4,974,583	PC building center	1,968.5	PC building base
OC6	Vibrating Grizzly to Primary Crusher or Coarse Ore Stockpile Feed Conveyor	0.639	0.210	0.0593						3.83E-7	632,045	4,974,583	PC building center	1,968.5	PC building base
OC7	Primary Crusher and Associated Transfers out to Coarse Ore Stockpile Feed Conveyor	5.48	2.46	0.456						3.29E-6	632,045	4,974,583	PC building center	1,968.5	PC building base
OC8	Coarse Ore Stockpile Feed Conveyor Transfer to Stockpile	0.639	0.210	0.0593						3.83E-7	631,947	4,974,520	Stockpile center	1,957.0	Stockpile base
OC9	Stockpile Transfers to Reclaim Conveyors	3.02	1.11	0.171						1.81E-6	631,947	4,974,520	Stockpile center	1,957.0	Stockpile base
OC10	Reclaim Conveyers to SAG Mill Feed Conveyor	3.02	1.11	0.171						1.81E-6	631,947	4,974,520	Stockpile center	1,957.0	Stockpile base
OC11	SAG Mill Feed Conveyor Transfer to SAG Mill	3.78	1.39	0.214						2.27E-6	632,113	4,974,243	Mill building wall opening	2,000.6	Mill building base
OC12	Pebble Crusher and Associated Transfers in (from SAG Mill) and out (to Pebble Discharge Conveyor)	1.51	0.680	0.126						9.07E-7	632,028	4,974,187	Pebble crusher building center	1,973.3	Pebble crusher building base
OC13	Pebble Discharge Conveyor to SAG Mill Feed Conveyor	0.176	0.0579	0.0164						1.06E-7	632,028	4,974,187	Pebble crusher building center	1,973.3	Pebble crusher building base
LS1L	Mill Lime Silo#1 Loading	0.00217	7.44E-4	1.09E-4							632,095	4,974,272	Mill Silo #1 center	1,992.0	Mill Silo #1 base
LS1U	Mill Lime Silo #1 Unloading to SAG Mill Conveyor	0.0105	0.00613	9.19E-4							632,095	4,974,272	Mill Silo #1 center	1,992.0	Mill Silo #1 base
MillS2L	Mill Lime Silo #2 Loading	0.00217	7.44E-4	1.09E-4							632,090	4,974,282	Mill Silo #2 center	1,990.0	Mill Silo #2 base
MillS2U	Mill Lime Silo #2 Unloading to SAG Mill Conveyor	0.0105	0.00613	9.19E-4							632,090	4,974,282	Mill Silo #2 center	1,990.0	Mill Silo #2 base
Sb1	Sb Drying (2.72 MMBtu/hr Propane-Fired)	0.0911	0.0911	0.0911	0.977	1.69	0.207	0.104		3.04E-6	632,231	4,974,183	Mill building corner	2,000.6	Mill building base
Sb2	Sb Bagging	0.517	0.517	0.517							632,208	4,974,221	Mill building corner	2,000.6	Mill building base
AC	Autoclave	22.2	22.2	22.2			2.86		3.94	2.21E-4	632,229	4,974,096	POX building corner	2,007.2	POX building base
ACB	POX Boiler (17 MMBtu/hr Propane-Fired)	0.00195	0.00195	0.00195	0.0209	0.0362	0.00443	0.00223		6.50E-8	632,261	4,974,116	POX building corner	2,007.2	POX building base
ACS1L	AC Lime Silo #1 Loading	0.00866	0.00298	4.38E-4							632,267	4,974,124	AC Silo #1 center	2,007.2	AC Silo #1 base
ACS1U	AC Lime Silo #1 Unloading to Lime Slaker	0.0420	0.0245	0.00350							632,267	4,974,124	AC Silo #1 center	2,007.2	AC Silo #1 base
ACS2L	AC Lime Silo #2 Loading	0.00866	0.00298	4.38E-4							632,257	4,974,140	AC Silo #2 center	2,007.2	AC Silo #2 base
ACS2U	AC Lime Silo #2 Unloading to Lime Slaker	0.0420	0.0245	0.00350							632,257	4,974,140	AC Silo #2 center	2,007.2	AC Silo #2 base

SOURCE DESCRIPTION		RELEASE PARAMETERS INPUT						MODEL EMISSION RATES / RELEASE PARAMETERS													
Model ID	Source Description	POINT VOLUME	rel ht (ft) rel ht (ft)	temp (F) width (ft)	flow (dscfm) vert. ln (ft)	flow (acfm) grnd ht (ft)	dia (ft) oz type	PM_{10}-24 gps	$PM_{2.5}$-24 gps	CO-ALL gps	NO_2-1 gps	SO_2-1 gps	SO_2-3 gps	PM_{10}-AN gps	$PM_{2.5}$-AN gps	NO_2-AN gps	SO_2-AN gps	Hg2+P gps	ht (m) ht (m)	temp (K) oy (m)	vel (m/s) oz (m)	dia (m)
OC1	Loader Transfer of Ore to Grizzly Screen	VOLUME	64	52.9	128	128	srf src	6.04E-03	1.71E-03					6.04E-03	1.71E-03			1.10E-08	19.5	3.75	18.1	
OC2	Grizzly Screen to Apron Feeder	VOLUME	64	52.9	128	128	srf src	6.04E-03	1.71E-03					6.04E-03	1.71E-03			1.10E-08	19.5	3.75	18.1	
OC3	Apron Feeder to Dribble Conveyor	VOLUME	64	52.9	128	128	srf src	6.04E-03	1.71E-03					6.04E-03	1.71E-03			1.10E-08	19.5	3.75	18.1	
OC4	Apron Feeder to Vibrating Grizzly	VOLUME	64	52.9	128	128	srf src	6.04E-03	1.71E-03					6.04E-03	1.71E-03			1.10E-08	19.5	3.75	18.1	
OC5	Dribble Conveyor to Vibrating Grizzly	VOLUME	64	52.9	128	128	srf src	6.04E-03	1.71E-03					6.04E-03	1.71E-03			1.10E-08	19.5	3.75	18.1	
OC6	Vibrating Grizzly to Primary Crusher or Coarse Ore Stockpile Feed Conveyor	VOLUME	64	52.9	128	128	srf src	6.04E-03	1.71E-03					6.04E-03	1.71E-03			1.10E-08	19.5	3.75	18.1	
OC7	Primary Crusher and Associated Transfers out to Coarse Ore Stockpile Feed Conveyor	VOLUME	64	52.9	128	128	srf src	7.09E-02	1.31E-02					7.09E-02	1.31E-02			9.45E-08	19.5	3.75	18.1	
OC8	Coarse Ore Stockpile Feed Conveyor Transfer to Stockpile	VOLUME	35.8	3	71.6	71.6	srf src	6.04E-03	1.71E-03					6.04E-03	1.71E-03			1.10E-08	10.9	0.213	10.2	
OC9	Stockpile Transfers to Reclaim Conveyors	VOLUME	4	8	8	8	srf src	3.19E-02	4.93E-03					3.19E-02	4.93E-03			5.22E-08	1.22	0.567	1.13	
OC10	Reclaim Conveyers to SAG Mill Feed Conveyor	VOLUME	4	8	8	8	srf src	3.19E-02	4.93E-03					3.19E-02	4.93E-03			5.22E-08	1.22	0.567	1.13	
OC11	SAG Mill Feed Conveyor Transfer to SAG Mill	VOLUME	68	4	4	70	elev src w/ bldg	3.98E-02	6.16E-03					3.98E-02	6.16E-03			6.52E-08	20.7	0.284	0.567	
OC12	Pebble Crusher and Associated Transfers in (from SAG Mill) and out (to Pebble Discharge Conveyor)	VOLUME	10	32.7	20	20	srf src	1.96E-02	3.62E-03					1.96E-02	3.62E-03			2.61E-08	3.05	2.32	2.84	
OC13	Pebble Discharge Conveyor to SAG Mill Feed Conveyor	VOLUME	10	32.7	20	20	srf src	1.67E-03	4.71E-04					1.67E-03	4.71E-04			3.04E-09	3.05	2.32	2.84	
LS1L	Mill Lime Silo#1 Loading	POINT	43.7	Ambient		0.155	1.0	4.46E-04	6.56E-05					2.14E-05	3.15E-06				13.3	0	0.00100	0.305
LS1U	Mill Lime Silo #1 Unloading to SAG Mill Conveyor	VOLUME	4.5	1	1	5	elev src w/ bldg	3.67E-03	5.51E-04					1.76E-04	2.64E-05				1.37	0.0709	0.142	
MillS2L	Mill Lime Silo #2 Loading	POINT	43.7	Ambient		0.155	1.0	4.46E-04	6.56E-05					2.14E-05	3.15E-06				13.3	0	0.00100	0.305
MillS2U	Mill Lime Silo #2 Unloading to SAG Mill Conveyor	VOLUME	4.5	1	1	5	elev src w/ bldg	3.67E-03	5.51E-04					1.76E-04	2.64E-05				1.37	0.0709	0.142	
Sb1	Sb Drying (2.72 MMBtu/hr Propane-Fired)	POINT	150	360		1,073	1.0	2.62E-03	2.62E-03	2.81E-02	4.87E-02	5.95E-03	5.95E-03	2.62E-03	2.62E-03	4.87E-02	5.95E-03	8.74E-08	45.7	455	6.94	0.305
Sb2	Sb Bagging	POINT	150	Ambient		982	1.0	1.49E-02	1.49E-02					1.49E-02	1.49E-02				45.7	0	6.35	0.305
AC	Autoclave	POINT	77	200	5,000	39,800	5.0	6.39E-01	6.39E-01			8.22E-02	8.22E-02	6.39E-01	6.39E-01		8.22E-02	6.36E-06	23.5	366	10.3	1.52
ACB	POX Boiler (17 MMBtu/hr Propane-Fired)	POINT	77	360		6,703	2.0	6.83E-04	6.83E-04	1.76E-01	3.04E-01	3.72E-02	3.72E-02	5.61E-05	5.61E-05	1.04E-03	1.27E-04	1.87E-09	23.5	455	10.8	0.610
ACS1L	AC Lime Silo #1 Loading	POINT	57.2	Ambient		0.155	1.0	1.78E-03	2.62E-04					8.56E-05	1.26E-05				17.4	0	0.00100	0.305
ACS1U	AC Lime Silo #1 Unloading to Lime Slaker	VOLUME	4.5	1	1	5	elev src w/ bldg	7.06E-03	1.01E-03					7.05E-04	1.01E-04				1.37	0.0709	0.142	
ACS2L	AC Lime Silo #2 Loading	POINT	57.2	Ambient		0.155	1.0	1.78E-03	2.62E-04					8.56E-05	1.26E-05				17.4	0	0.00100	0.305
ACS2U	AC Lime Silo #2 Unloading to Lime Slaker	VOLUME	4.5	1	1	5	elev src w/ bldg	7.06E-03	1.01E-03					7.05E-04	1.01E-04				1.37	0.0709	0.142	

SOURCE DESCRIPTION		OPERATING LIMITS							EMISSION FACTORS									
Model ID	Source Description	Design Throughput unit/hr	unit/day	unit/yr	units	Material	hr/yr	reference	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	H2S	unit	reference
ACS3L	AC Lime Silo #3 Loading	120	1,000	17,500	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.00099	0.00034	0.00005						lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.
ACS3U	AC Lime Silo #3 Unloading to Lime Slaker	20	480	17,500	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004						lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.
ACS4L	AC Lime Silo #4 Loading	120	500	8,750	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.00099	0.00034	0.00005						lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.
ACS42U	AC Lime Silo #4 Unloading to Lime Slaker	20	480	8,750	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004						lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.
CKD	Carbon Regeneration Kiln (Drum)	0.3		2,628	ton	Carbon	8,760	(M3 2017b)	0.42	0.42	0.42	0.12	0.012		0.11		lb/hr	Based on NDEP-BAPC Permit for Carbon Regeneration Kiln [Goldstrike (NDEP 2019)]
CKB	Carbon Regeneration Kiln (Burners)	2.255		19,754	MMBtu	Propane	8,760	(M3 2017b)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
EW	Electrowinning Cells & Pregnant Solution Tank	100 gpm			gal	Au Sol'n	8,760	Typical Ind. Oper.										
MR	Mercury Retort	0.5/batch	24 hr	21	ton	Au Conc	1,248	(M3 2017b) & (M3 2017a)										
MF	Induction Melting Furnace	0.5/batch	12 hr	21	ton	Au Conc	624	(M3 2017b) & (M3 2017a)	3.5	3.5	3.5						lb/hr	Based on NDEP-BAPC Permit for Melting Furnace [Goldstrike (NDEP 2019)]
EDG1	Camp Emergency Generator (Mfr. Yr. >2007; diesel)	1000	0.27 hr	100,000	bkW	Diesel	100	(M3 2017a)	0.2	0.2	0.2	3.5	6.4	0.00657	1.3		g/kW-hr	40 CFR Subpart 60.4202(a)(2); SO2 mass balance (15ppm ULSD) (CFR 2018b)
EDG2	Plant Emergency Generator #1 (Mfr. Yr. >2007; diesel)	1000	0.27 hr	100,000	bkW	Diesel	100	(M3 2017a)	0.2	0.2	0.2	3.5	6.4	0.00657	1.3		g/kW-hr	40 CFR Subpart 60.4202(a)(2); SO2 mass balance (15ppm ULSD) (CFR 2018b)
EDG3	Plant Emergency Generator #2 (Mfr. Yr. >2007; diesel)	1000	0.27 hr	100,000	bkW	Diesel	100	(M3 2017a)	0.2	0.2	0.2	3.5	6.4	0.00657	1.3		g/kW-hr	40 CFR Subpart 60.4202(a)(2); SO2 mass balance (15ppm ULSD) (CFR 2018b)
EDFP	Mill Fire Pump (Mfr. Yr. >2009; diesel)	200	0.27 hr	20,000	bkW	Diesel	100	Typical Ind. Oper.	0.2	0.2	0.2	3.5	4	0.00657	4		g/kW-hr	Table 4 to Subpart IIII of Part 60—130≤KW<225 (175≤HP<300); SO2 - mass balance (15ppm ULSD) (CFR 2018b)
PV	Propane Vaporizer (0.4 MMBtu/hr Propane-Fired)	0.10		876	MMBtu	Propane	8,760	(M3 2017a)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
HS	Strip Circuit Solution Heater (5 MMBtu, Propane-Fired)	5.00		43,800	MMBtu	Propane	8,760	(M3 2017b)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
H1M	Mine Air Heater #1 (4 MMBtu/hr Propane-Fired)	4.00		35,040	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
H2M	Mine Air Heater #2 (4 MMBtu/hr Propane-Fired)	4.00		35,040	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
HM	Mill HVAC Heaters (4 x 1.0 MMBtu Propane-Fired)	4.00		35,040	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
HAC	Autoclave HVAC Heater (1 x 0.25 MMBtu Propane-Fired)	0.25		2,190	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
HR	Refinery HVAC Heaters (1 x 0.25 MMBtu Propane-Fired)	0.25		2,190	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
HA	Admin HVAC Heaters (1 x 0.25 MMBtu Propane-Fired)	0.25		2,190	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
HMO	Mine Ops. HVAC Heaters (2 x 0.25 MMBtu Propane-Fired)	0.50		4,380	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
HTS	Truck Shop HVAC Heaters (2 x 1.0 MMBtu Propane-Fired)	2.00		17,520	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal

SOURCE DESCRIPTION		EMISSION CONTROLS			HOURLY EMISSIONS								DAILY EMISSIONS							
Model ID	Source Description	control system	efficiency	reference	PM lb/hr	PM_{10} lb/hr	$PM_{2.5}$ lb/hr	CO lb/hr	NOx lb/hr	SO_2 lb/hr	VOC lb/hr	H2S lb/hr	PM lb/day	PM_{10} lb/day	$PM_{2.5}$ lb/day	CO lb/day	NOx lb/day	SO_2 lb/day	VOC lb/day	H2S lb/day
ACS3L	AC Lime Silo #3 Loading	Bin Vent		Control efficiency included in emission factor	0.119	0.0408	0.00600						0.990	0.340	0.0500					
ACS3U	AC Lime Silo #3 Unloading to Lime Slaker	None	0%		0.0960	0.0560	0.00800						2.30	1.34	0.192					
ACS4L	AC Lime Silo #4 Loading	Bin Vent		Control efficiency included in emission factor	0.119	0.0408	0.00600						0.495	0.170	0.0250					
ACS42U	AC Lime Silo #4 Unloading to Lime Slaker	None	0%		0.0960	0.0560	0.00800						2.30	1.34	0.192					
CKD	Carbon Regeneration Kiln (Drum)	Wet Scrubber / Carbon Filter	NA	PM control efficiency included in emission factor	0.420	0.420	0.420	0.120	0.0120		0.110		10.1	10.1	10.1	2.88	0.288	0	2.64	
CKB	Carbon Regeneration Kiln (Burners)	None	NA		0.0173	0.0173	0.0173	0.185	0.320	0.0392	0.0197		0.414	0.414	0.414	4.44	7.69	0.940	0.473	
EW	Electrowinning Cells & Pregnant Solution Tank	Shared Carbon Filter																		
MR	Mercury Retort	Condenser / Carbon Filter																		
MF	Induction Melting Furnace	Baghouse / Carbon Filter	NA	Control efficiency included in emission factor	3.50	3.50	3.50						42.0	42.0	42.0					
EDG1	Camp Emergency Generator (Mfr. Yr. >2007; diesel)	None	NA		0.441	0.441	0.441	7.72	14.1	0.0145	2.87		0.119	0.119	0.119	2.08	3.81	0.00391	0.774	
EDG2	Plant Emergency Generator #1 (Mfr. Yr. >2007; diesel)	None	NA		0.441	0.441	0.441	7.72	14.1	0.0145	2.87		0.119	0.119	0.119	2.08	3.81	0.00391	0.774	
EDG3	Plant Emergency Generator #2 (Mfr. Yr. >2007; diesel)	None	NA		0.441	0.441	0.441	7.72	14.1	0.0145	2.87		0.119	0.119	0.119	2.08	3.81	0.00391	0.774	
EDFP	Mill Fire Pump (Mfr. Yr. >2009; diesel)	None	NA		0.0882	0.0882	0.0882	1.54	1.76	0.00290	1.76		0.0238	0.0238	0.0238	0.417	0.476	7.82E-4	0.476	
PV	Propane Vaporizer (0.4 MMBtu/hr Propane-Fired)	None	NA		7.65E-4	7.65E-4	7.65E-4	0.00820	0.0142	0.00174	8.74E-4		0.0184	0.0184	0.0184	0.197	0.341	0.0417	0.0210	
HS	Strip Circuit Solution Heater (5 MMBtu, Propane-Fired)	None	NA		0.0383	0.0383	0.0383	0.410	0.710	0.0869	0.0437		0.918	0.918	0.918	9.84	17.0	2.09	1.05	
H1M	Mine Air Heater #1 (4 MMBtu/hr Propane-Fired)	None	NA		0.0306	0.0306	0.0306	0.328	0.568	0.0695	0.0350		0.734	0.734	0.734	7.87	13.6	1.67	0.839	
H2M	Mine Air Heater #2 (4 MMBtu/hr Propane-Fired)	None	NA		0.0306	0.0306	0.0306	0.328	0.568	0.0695	0.0350		0.734	0.734	0.734	7.87	13.6	1.67	0.839	
HM	Mill HVAC Heaters (4 x 1.0 MMBtu Propane-Fired)	None	NA		0.0306	0.0306	0.0306	0.328	0.568	0.0695	0.0350		0.734	0.734	0.734	7.87	13.6	1.67	0.839	
HAC	Autoclave HVAC Heater (1 x 0.25 MMBtu Propane-Fired)	None	NA		0.00191	0.00191	0.00191	0.0205	0.0355	0.00434	0.00219		0.0459	0.0459	0.0459	0.492	0.852	0.104	0.0525	
HR	Refinery HVAC Heaters (1 x 0.25 MMBtu Propane-Fired)	None	NA		0.00191	0.00191	0.00191	0.0205	0.0355	0.00434	0.00219		0.0459	0.0459	0.0459	0.492	0.852	0.104	0.0525	
HA	Admin HVAC Heaters (1 x 0.25 MMBtu Propane-Fired)	None	NA		0.00191	0.00191	0.00191	0.0205	0.0355	0.00434	0.00219		0.0459	0.0459	0.0459	0.492	0.852	0.104	0.0525	
HMO	Mine Ops. HVAC Heaters (2 x 0.25 MMBtu Propane-Fired)	None	NA		0.00383	0.00383	0.00383	0.0410	0.0710	0.00869	0.00437		0.0918	0.0918	0.0918	0.984	1.70	0.209	0.105	
HTS	Truck Shop HVAC Heaters (2 x 1.0 MMBtu Propane-Fired)	None	NA		0.0153	0.0153	0.0153	0.164	0.284	0.0348	0.0175		0.367	0.367	0.367	3.93	6.82	0.834	0.420	

SOURCE DESCRIPTION		ANNUAL EMISSIONS									NAD 83 LOCATION				
Model ID	Source Description	PM ton/yr	PM_{10} ton/yr	$PM_{2.5}$ ton/yr	CO ton/yr	NOx ton/yr	SO_2 ton/yr	VOC ton/yr	H2S ton/yr	Hg2+P ton/yr	UTM E m	UTM N m	reference	elev m	reference
ACS3L	AC Lime Silo #3 Loading	0.00866	0.00298	4.38E-4							632,248	4,974,156	AC Silo #3 center	2,007.2	AC Silo #3 base
ACS3U	AC Lime Silo #3 Unloading to Lime Slaker	0.0420	0.0245	0.00350							632,248	4,974,156	AC Silo #3 center	2,007.2	AC Silo #3 base
ACS4L	AC Lime Silo #4 Loading	0.00433	0.00149	2.19E-4							632,238	4,974,171	AC Silo #4 center	2,007.2	AC Silo #4 base
ACS42U	AC Lime Silo #4 Unloading to Lime Slaker	0.0210	0.0123	0.00175							632,238	4,974,171	AC Silo #4 center	2,007.2	AC Silo #4 base
CKD	Carbon Regeneration Kiln (Drum)	1.84	1.84	1.84	0.526	0.0526		0.482		6.51E-6	632,013	4,974,051	Refinery building corner	1,970.3	Refinery building base
CKB	Carbon Regeneration Kiln (Burners)	0.0756	0.0756	0.0756	0.810	1.40	0.172	0.0864		2.52E-6	631,998	4,974,042	Along Refinery building wall	1,970.3	Refinery building base
EW	Electrowinning Cells & Pregnant Solution Tank									6.51E-6	631,983	4,974,033	Refinery building corner	1,970.3	Refinery building base
MR	Mercury Retort									6.51E-6	632,003	4,974,001	Refinery building corner	1,970.3	Refinery building base
MF	Induction Melting Furnace	1.09	1.09	1.09						6.51E-6	632,032	4,974,019	Refinery building corner	1,970.3	Refinery building base
EDG1	Camp Emergency Generator (Mfr. Yr. >2007; diesel)	0.0220	0.0220	0.0220	0.386	0.705	7.24E-4	0.143			634,274	4,972,050	Outside Recreation building	2,114.0	Recreation building base
EDG2	Plant Emergency Generator #1 (Mfr. Yr. >2007; diesel)	0.0220	0.0220	0.0220	0.386	0.705	7.24E-4	0.143			632,105	4,974,154	Outside Mill building	2,001.0	Mill building base
EDG3	Plant Emergency Generator #2 (Mfr. Yr. >2007; diesel)	0.0220	0.0220	0.0220	0.386	0.705	7.24E-4	0.143			632,109	4,974,148	Outside Mill building	2,002.0	Mill building base
EDFP	Mill Fire Pump (Mfr. Yr. >2009; diesel)	0.00441	0.00441	0.00441	0.0772	0.0882	1.45E-4	0.0882			632,113	4,974,141	Outside Mill building	2,003.0	Mill building base
PV	Propane Vaporizer (0.4 MMBtu/hr Propane-Fired)	0.00335	0.00335	0.00335	0.0359	0.0622	0.00761	0.00383		1.12E-7	632,216	4,974,118	POX building corner	2,007.2	POX building base
HS	Strip Circuit Solution Heater (5 MMBtu, Propane-Fired)	0.168	0.168	0.168	1.80	3.11	0.381	0.191		5.58E-6	632,017	4,974,010	Along Refinery building wall	1,970.3	Refinery building base
H1M	Mine Air Heater #1 (4 MMBtu/hr Propane-Fired)	0.134	0.134	0.134	1.44	2.49	0.304	0.153		4.47E-6	632,287	4,974,227	Near underground mine shaft	2,000.0	Mine shaft base
H2M	Mine Air Heater #2 (4 MMBtu/hr Propane-Fired)	0.134	0.134	0.134	1.44	2.49	0.304	0.153		4.47E-6	632,288	4,974,228	Near underground mine shaft	2,000.0	Mine shaft base
HM	Mill HVAC Heaters (4 x 1.0 MMBtu Propane-Fired)	0.134	0.134	0.134	1.44	2.49	0.304	0.153		4.47E-6	632,168	4,974,191	Mill building center	2,000.6	Mill building base
HAC	Autoclave HVAC Heater (1 x 0.25 MMBtu Propane-Fired)	0.00838	0.00838	0.00838	0.0898	0.156	0.0190	0.00957		2.79E-7	632,238	4,974,130	POX building center	2,007.2	POX building base
HR	Refinery HVAC Heaters (1 x 0.25 MMBtu Propane-Fired)	0.00838	0.00838	0.00838	0.0898	0.156	0.0190	0.00957		2.79E-7	632,008	4,974,026	Refinery building center	1,970.3	Refinery building base
HA	Admin HVAC Heaters (1 x 0.25 MMBtu Propane-Fired)	0.00838	0.00838	0.00838	0.0898	0.156	0.0190	0.00957		2.79E-7	632,038	4,973,751	Admin building center	1,979.0	Admin building base
HMO	Mine Ops. HVAC Heaters (2 x 0.25 MMBtu Propane-Fired)	0.0168	0.0168	0.0168	0.180	0.311	0.0381	0.0191		5.58E-7	631,889	4,973,472	Mine Ops building center	1,988.5	Mine Ops building base
HTS	Truck Shop HVAC Heaters (2 x 1.0 MMBtu Propane-Fired)	0.0670	0.0670	0.0670	0.718	1.24	0.152	0.0766		2.23E-6	631,848	4,973,398	Truck Shop building center	1,991.8	Truck Shop building base

SOURCE DESCRIPTION		RELEASE PARAMETERS INPUT						MODEL EMISSION RATES / RELEASE PARAMETERS													
Model ID	Source Description	POINT VOLUME	rel ht (ft) rel ht (ft)	temp (F) width (ft)	flow (dscfm) vert. ln (ft)	flow (acfm) grnd ht (ft)	dia (ft) oz type	PM_{10}-24 gps	$PM_{2.5}$-24 gps	CO-ALL gps	NO_2-1 gps	SO_2-1 gps	SO_2-3 gps	PM_{10}-AN gps	$PM_{2.5}$-AN gps	NO_2-AN gps	SO_2-AN gps	Hg2+P gps	ht (m) ht (m)	temp (K) oy (m)	vel (m/s) oz (m)	dia (m)
ACS3L	AC Lime Silo #3 Loading	POINT	57.2	Ambient		0.155	1.0	1.78E-03	2.62E-04					8.56E-05	1.26E-05				17.4	0	0.00100	0.305
ACS3U	AC Lime Silo #3 Unloading to Lime Slaker	VOLUME	4.5	1	1	5	elev src w/ bldg	7.06E-03	1.01E-03					7.05E-04	1.01E-04				1.37	0.0709	0.142	
ACS4L	AC Lime Silo #4 Loading	POINT	47.5	Ambient		0.155	1.0	8.92E-04	1.31E-04					4.28E-05	6.29E-06				14.5	0	0.00100	0.305
ACS42U	AC Lime Silo #4 Unloading to Lime Slaker	VOLUME	4.5	1	1	5	elev src w/ bldg	7.06E-03	1.01E-03					3.52E-04	5.03E-05				1.37	0.0709	0.142	
CKD	Carbon Regeneration Kiln (Drum)	POINT	55	150	1,500	2,300	1.3	5.29E-02	5.29E-02	1.51E-02	1.51E-03			5.29E-02	5.29E-02	1.51E-03		1.87E-07	16.8	339	9.52	0.381
CKB	Carbon Regeneration Kiln (Burners)	POINT	46	360		889	1.0	2.17E-03	2.17E-03	2.33E-02	4.04E-02	4.94E-03	4.94E-03	2.17E-03	2.17E-03	4.04E-02	4.94E-03	7.24E-08	14.0	455	5.75	0.305
EW	Electrowinning Cells & Pregnant Solution Tank	POINT	55	150	3,000	8,800	2.5											1.87E-07	16.8	339	9.11	0.762
MR	Mercury Retort	POINT	55	85	100	100	0.5											1.87E-07	16.8	303	2.59	0.152
MF	Induction Melting Furnace	POINT	55	150	5,000	7,700	2.3	2.20E-01	2.20E-01					3.14E-02	3.14E-02			1.87E-07	16.8	339	9.84	0.686
EDG1	Camp Emergency Generator (Mfr. Yr. >2007; diesel)	POINT	7	1,100		7,701	0.8	6.25E-04	6.25E-04	9.72E-01	2.03E-02	2.08E-05	1.82E-03	6.34E-04	6.34E-04	2.03E-02	2.08E-05		2.13	866	77.8	0.244
EDG2	Plant Emergency Generator #1 (Mfr. Yr. >2007; diesel)	POINT	7	1,100		7,701	0.8	6.25E-04	6.25E-04	9.72E-01	2.03E-02	2.08E-05	1.82E-03	6.34E-04	6.34E-04	2.03E-02	2.08E-05		2.13	866	77.8	0.244
EDG3	Plant Emergency Generator #2 (Mfr. Yr. >2007; diesel)	POINT	7	1,100		7,701	0.8	6.25E-04	6.25E-04	9.72E-01	2.03E-02	2.08E-05	1.82E-03	6.34E-04	6.34E-04	2.03E-02	2.08E-05		2.13	866	77.8	0.244
EDFP	Mill Fire Pump (Mfr. Yr. >2009; diesel)	POINT	7	1,100		1,540	0.4	1.25E-04	1.25E-04	1.94E-01	2.54E-03	4.16E-06	3.65E-04	1.27E-04	1.27E-04	2.54E-03	4.16E-06		2.13	866	62.3	0.122
PV	Propane Vaporizer (0.4 MMBtu/hr Propane-Fired)	POINT	68	360		39	0.4	9.64E-05	9.64E-05	1.03E-03	1.79E-03	2.19E-04	2.19E-04	9.64E-05	9.64E-05	1.79E-03	2.19E-04	3.21E-09	20.7	455	1.58	0.122
HS	Strip Circuit Solution Heater (5 MMBtu, Propane-Fired)	POINT	46	360		1,972	1.3	4.82E-03	4.82E-03	5.16E-02	8.95E-02	1.09E-02	1.09E-02	4.82E-03	4.82E-03	8.95E-02	1.09E-02	1.61E-07	14.0	455	7.55	0.396
H1M	Mine Air Heater #1 (4 MMBtu/hr Propane-Fired)	POINT	7	360		1,577	1.3	3.86E-03	3.86E-03	4.13E-02	7.16E-02	8.76E-03	8.76E-03	3.86E-03	3.86E-03	7.16E-02	8.76E-03	1.28E-07	2.13	455	6.04	0.396
H2M	Mine Air Heater #2 (4 MMBtu/hr Propane-Fired)	POINT	7	360		1,577	0.7	3.86E-03	3.86E-03	4.13E-02	7.16E-02	8.76E-03	8.76E-03	3.86E-03	3.86E-03	7.16E-02	8.76E-03	1.28E-07	2.13	455	20.8	0.213
HM	Mill HVAC Heaters (4 x 1.0 MMBtu Propane-Fired)	POINT	141	360		394	0.3	3.86E-03	3.86E-03	4.13E-02	7.16E-02	8.76E-03	8.76E-03	3.86E-03	3.86E-03	7.16E-02	8.76E-03	1.28E-07	43.0	455	28.3	0.0914
HAC	Autoclave HVAC Heater (1 x 0.25 MMBtu Propane-Fired)	POINT	68	360		99	0.3	2.41E-04	2.41E-04	2.58E-03	4.48E-03	5.47E-04	5.47E-04	2.41E-04	2.41E-04	4.48E-03	5.47E-04	8.03E-09	20.7	455	7.11	0.0914
HR	Refinery HVAC Heaters (1 x 0.25 MMBtu Propane-Fired)	POINT	46	360		99	0.3	2.41E-04	2.41E-04	2.58E-03	4.48E-03	5.47E-04	5.47E-04	2.41E-04	2.41E-04	4.48E-03	5.47E-04	8.03E-09	14.0	455	7.11	0.0914
HA	Admin HVAC Heaters (1 x 0.25 MMBtu Propane-Fired)	POINT	21	360		99	0.3	2.41E-04	2.41E-04	2.58E-03	4.48E-03	5.47E-04	5.47E-04	2.41E-04	2.41E-04	4.48E-03	5.47E-04	8.03E-09	6.40	455	7.11	0.0914
HMO	Mine Ops. HVAC Heaters (2 x 0.25 MMBtu Propane-Fired)	POINT	41	360		99	0.7	4.82E-04	4.82E-04	5.16E-03	8.95E-03	1.09E-03	1.09E-03	4.82E-04	4.82E-04	8.95E-03	1.09E-03	1.61E-08	12.5	455	1.31	0.213
HTS	Truck Shop HVAC Heaters (2 x 1.0 MMBtu Propane-Fired)	POINT	41	360		394	0.7	1.93E-03	1.93E-03	2.07E-02	3.58E-02	4.38E-03	4.38E-03	1.93E-03	1.93E-03	3.58E-02	4.38E-03	6.42E-08	12.5	455	5.20	0.213

SOURCE DESCRIPTION		OPERATING LIMITS							EMISSION FACTORS									
Model ID	Source Description	Design Throughput unit/hr	unit/day	unit/yr	units	Material	hr/yr	reference	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	H2S	unit	reference
HW	Warehouse HVAC Heaters (3 x 1.0 MMBtu Propane-Fired)	3.00		26,280	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
PSL	Prill Silos Loading (2 x 100 ton)	200	200	7,300	ton	Prill	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.02	0.007	0.00106						lb/ton	AP-42, Table 8.3-2 (7/93), Bulk Loading - unctrl; PM10/PM2.5 Ch. 13.2.4
PSU	Prill Silos Unloading (2 x 100 ton)	200	200	7,300	ton	Prill	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.02	0.007	0.00106						lb/ton	AP-42, Table 8.3-2 (7/93), Bulk Loading - unctrl; PM10/PM2.5 Ch. 13.2.4
CS1L	Cement/Shotcrete Silo#1 Loading	80	80	60,000	ton	Cement	8,760	Typical Ind. Oper.	0.00099	0.00034	0.00005						lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.
CS1U	Cement/Shotcrete Silo#1 Unloading	20	80	60,000	ton	Cement	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004						lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.
CS2L	Cement/Shotcrete Silo#2 Loading	80	80	60,000	ton	Cement	8,760	Typical Ind. Oper.	0.00099	0.00034	0.00005						lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.
CS2U	Cement/Shotcrete Silo#2 Unloading	20	80	60,000	ton	Cement	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004						lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.
CAL	Aggregate Bin Loading	100	2,400	500,000	ton	Aggregate	8,760	Typical Ind. Oper.	0.0069	0.0033	0.0005						lb/ton	AP-42, Table 11.12-2 (6/06), aggregate transfer-unctrl.
CAU	Aggregate Bin Unloading	100	2,400	500,000	ton	Aggregate	8,760	Typical Ind. Oper.	0.0069	0.0033	0.0005						lb/ton	AP-42, Table 11.12-2 (6/06), aggregate transfer-unctrl.
CM	Central Mixer Loading	20 (120)	80 (2,480)	60,000 (560K)	ton-cement	Cement	8,760	Typical Ind. Oper.	0.0184	0.0055	0.0008						lb/ton	AP-42, Table 11.12-2 (6/06), central mixer-ctrl.
HL	Landmark/Stibnite Heaters (3 x 1.0 MMBtu Propane-Fired)	3.00		26,280	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
TG1	Mine Site Gasoline Tank #1			250,000	gal	Gasoline	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide tank capacity)							0.219		lb/hr	EPA Tanks 4.0.9d
TG2	Mine Site Gasoline Tank #2			250,000	gal	Gasoline	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide tank capacity)							0.219		lb/hr	EPA Tanks 4.0.9d
TD3	Mine Site Diesel Tank #3			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018g)							0.002		lb/hr	EPA Tanks 4.0.9d
TD4	Mine Site Diesel Tank #4			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018g)							0.002		lb/hr	EPA Tanks 4.0.9d
TD5	Mine Site Diesel Tank #5			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018g)							0.002		lb/hr	EPA Tanks 4.0.9d
TD6	Mine Site Diesel Tank #6			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018g)							0.002		lb/hr	EPA Tanks 4.0.9d
TD7	Mine Site Diesel Tank #7			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018g)							0.002		lb/hr	EPA Tanks 4.0.9d
TD8	Mine Site Diesel Tank #8			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018g)							0.002		lb/hr	EPA Tanks 4.0.9d
TD9	Mine Site Diesel Tank #9			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018g)							0.002		lb/hr	EPA Tanks 4.0.9d
TD10	Mine Site Diesel Tank #10			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018g)							0.002		lb/hr	EPA Tanks 4.0.9d
TDL1	Landmark Diesel Tank #1			130,000	gal	Diesel	8,760	(Midas Gold 2018d), (Midas Gold 2018g)							0.000		lb/hr	EPA Tanks 4.0.9d
TDL2	Landmark Diesel Tank #2			130,000	gal	Diesel	8,760	(Midas Gold 2018d), (Midas Gold 2018g)							0.000		lb/hr	EPA Tanks 4.0.9d
TGL3	Landmark Gasoline Tank #3			130,000	gal	Gasoline	8,760	(Midas Gold 2018d), (Midas Gold 2018g)							0.118		lb/hr	EPA Tanks 4.0.9d

SOURCE DESCRIPTION		EMISSION CONTROLS			HOURLY EMISSIONS								DAILY EMISSIONS							
Model ID	Source Description	control system	efficiency	reference	PM lb/hr	PM_{10} lb/hr	$PM_{2.5}$ lb/hr	CO lb/hr	NOx lb/hr	SO_2 lb/hr	VOC lb/hr	H2S lb/hr	PM lb/day	PM_{10} lb/day	$PM_{2.5}$ lb/day	CO lb/day	NOx lb/day	SO_2 lb/day	VOC lb/day	H2S lb/day
HW	Warehouse HVAC Heaters (3 x 1.0 MMBtu Propane-Fired)	None	NA		0.0230	0.0230	0.0230	0.246	0.426	0.0521	0.0262		0.551	0.551	0.551	5.90	10.2	1.25	0.630	
PSL	Prill Silos Loading (2 x 100 ton)	None	0%		4.00	1.40	0.212						4.00	1.40	0.212					
PSU	Prill Silos Unloading (2 x 100 ton)	None	0%		4.00	1.40	0.212						4.00	1.40	0.212					
CS1L	Cement/Shotcrete Silo#1 Loading	Bin Vent		Control efficiency included in emission factor	0.0792	0.0272	0.00400						0.0792	0.0272	0.00400					
CS1U	Cement/Shotcrete Silo#1 Unloading	None	0%		0.0960	0.0560	0.00800						0.384	0.224	0.0320					
CS2L	Cement/Shotcrete Silo#2 Loading	Bin Vent		Control efficiency included in emission factor	0.0792	0.0272	0.00400						0.0792	0.0272	0.00400					
CS2U	Cement/Shotcrete Silo#2 Unloading	None	0%		0.0960	0.0560	0.00800						0.384	0.224	0.0320					
CAL	Aggregate Bin Loading	None	0%		0.690	0.330	0.0500						16.6	7.92	1.20					
CAU	Aggregate Bin Unloading	None	0%		0.690	0.330	0.0500						16.6	7.92	1.20					
CM	Central Mixer Loading	Bin Vent OR Enclosure		Control efficiency included in emission factor	0.368	0.110	0.0160						1.47	0.440	0.0640					
HL	Landmark/Stibnite Heaters (3 x 1.0 MMBtu Propane-Fired)	None	NA		0.0230	0.0230	0.0230	0.246	0.426	0.0521	0.0262		0.551	0.551	0.551	5.90	10.2	1.25	0.630	
TG1	Mine Site Gasoline Tank #1	None	NA								0.219								5.25	
TG2	Mine Site Gasoline Tank #2	None	NA								0.219								5.25	
TD3	Mine Site Diesel Tank #3	None	NA								0.00167								0.0400	
TD4	Mine Site Diesel Tank #4	None	NA								0.00167								0.0400	
TD5	Mine Site Diesel Tank #5	None	NA								0.00167								0.0400	
TD6	Mine Site Diesel Tank #6	None	NA								0.00167								0.0400	
TD7	Mine Site Diesel Tank #7	None	NA								0.00167								0.0400	
TD8	Mine Site Diesel Tank #8	None	NA								0.00167								0.0400	
TD9	Mine Site Diesel Tank #9	None	NA								0.00167								0.0400	
TD10	Mine Site Diesel Tank #10	None	NA								0.00167								0.0400	
TDL1	Landmark Diesel Tank #1	None	NA								2.29E-4								0.00551	
TDL2	Landmark Diesel Tank #2	None	NA								2.29E-4								0.00551	
TGL3	Landmark Gasoline Tank #3	None	NA								0.118								2.84	

SOURCE DESCRIPTION		ANNUAL EMISSIONS									NAD 83 LOCATION				
Model ID	Source Description	PM ton/yr	PM_{10} ton/yr	$PM_{2.5}$ ton/yr	CO ton/yr	NOx ton/yr	SO_2 ton/yr	VOC ton/yr	H2S ton/yr	Hg2+P ton/yr	UTM E m	UTM N m	reference	elev m	reference
HW	Warehouse HVAC Heaters (3 x 1.0 MMBtu Propane-Fired)	0.101	0.101	0.101	1.08	1.87	0.228	0.115		3.35E-6	632,060	4,973,664	Warehouse building center	1,983.9	Warehouse building base
PSL	Prill Silos Loading (2 x 100 ton)	0.0730	0.0256	0.00387							632,346	4,973,500	Prill Silo #1 center	2,010.0	Prill Silo #1 base
PSU	Prill Silos Unloading (2 x 100 ton)	0.0730	0.0256	0.00387							632,346	4,973,500	Prill Silo #1 center	2,010.0	Prill Silo #1 base
CS1L	Cement/Shotcrete Silo#1 Loading	0.0297	0.0102	0.00150							632,165	4,973,562	Aggregate stockpile center	1,990.0	Aggregate stockpile base
CS1U	Cement/Shotcrete Silo#1 Unloading	0.144	0.0840	0.0120							632,165	4,973,562	Aggregate stockpile center	1,990.0	Aggregate stockpile base
CS2L	Cement/Shotcrete Silo#2 Loading	0.0297	0.0102	0.00150							632,165	4,973,562	Aggregate stockpile center	1,990.0	Aggregate stockpile base
CS2U	Cement/Shotcrete Silo#2 Unloading	0.144	0.0840	0.0120							632,165	4,973,562	Aggregate stockpile center	1,990.0	Aggregate stockpile base
CAL	Aggregate Bin Loading	1.73	0.825	0.125							632,165	4,973,562	Aggregate stockpile center	1,990.0	Aggregate stockpile base
CAU	Aggregate Bin Unloading	1.73	0.825	0.125							632,165	4,973,562	Aggregate stockpile center	1,990.0	Aggregate stockpile base
CM	Central Mixer Loading	0.552	0.165	0.0240							632,165	4,973,562	Aggregate stockpile center	1,990.0	Aggregate stockpile base
HL	Landmark/Stibnite Heaters (3 x 1.0 MMBtu Propane-Fired)	0.101	0.101	0.101	1.08	1.87	0.228	0.115		3.35E-6	634,332	4,972,082	Dormitory 3 center	2,118.0	Dormitory 3 building base
TG1	Mine Site Gasoline Tank #1							0.957							
TG2	Mine Site Gasoline Tank #2							0.957							
TD3	Mine Site Diesel Tank #3							0.00730							
TD4	Mine Site Diesel Tank #4							0.00730							
TD5	Mine Site Diesel Tank #5							0.00730							
TD6	Mine Site Diesel Tank #6							0.00730							
TD7	Mine Site Diesel Tank #7							0.00730							
TD8	Mine Site Diesel Tank #8							0.00730							
TD9	Mine Site Diesel Tank #9							0.00730							
TD10	Mine Site Diesel Tank #10							0.00730							
TDL1	Landmark Diesel Tank #1							0.00101							
TDL2	Landmark Diesel Tank #2							0.00101							
TGL3	Landmark Gasoline Tank #3							0.518							

SOURCE DESCRIPTION		RELEASE PARAMETERS INPUT						MODEL EMISSION RATES / RELEASE PARAMETERS														
Model ID	Source Description	POINT VOLUME	rel ht (ft) rel ht (ft)	temp (F) width (ft)	flow (dscfm) vert. ln (ft)	flow (acfm) grnd ht (ft)	dia (ft) oz type	PM_{10}-24 gps	$PM_{2.5}$-24 gps	CO-ALL gps	NO_2-1 gps	SO_2-1 gps	SO_2-3 gps	PM_{10}-AN gps	$PM_{2.5}$-AN gps	NO_2-AN gps	SO_2-AN gps	Hg2+P gps	ht (m) ht (m)	temp (K) oy (m)	vel (m/s) oz (m)	dia (m)
HW	Warehouse HVAC Heaters (3 x 1.0 MMBtu Propane-Fired)	POINT	41	360		394	0.7	2.89E-03	2.89E-03	3.10E-02	5.37E-02	6.57E-03	6.57E-03	2.89E-03	2.89E-03	5.37E-02	6.57E-03	9.64E-08	12.5	455	5.20	0.213
PSL	Prill Silos Loading (2 x 100 ton)	POINT	25.5	Ambient		0	1.0	7.35E-03	1.11E-03					7.35E-04	1.11E-04				7.77	0	0.00100	0.305
PSU	Prill Silos Unloading (2 x 100 ton)	VOLUME	4.5	1	1	5	elev src w/ bldg	7.35E-03	1.11E-03					7.35E-04	1.11E-04				1.37	0.0709	0.142	
CS1L	Cement/Shotcrete Silo#1 Loading	VOLUME	5	72.2	10	10	srf src	1.43E-04	2.10E-05					2.93E-04	4.32E-05				1.52	5.12	1.42	
CS1U	Cement/Shotcrete Silo#1 Unloading	VOLUME	5	72.2	10	10	srf src	1.18E-03	1.68E-04					2.42E-03	3.45E-04				1.52	5.12	1.42	
CS2L	Cement/Shotcrete Silo#2 Loading	VOLUME	5	72.2	10	10	srf src	1.43E-04	2.10E-05					2.93E-04	4.32E-05				1.52	5.12	1.42	
CS2U	Cement/Shotcrete Silo#2 Unloading	VOLUME	5	72.2	10	10	srf src	1.18E-03	1.68E-04					2.42E-03	3.45E-04				1.52	5.12	1.42	
CAL	Aggregate Bin Loading	VOLUME	5	72.2	10	10	srf src	4.16E-02	6.30E-03					2.37E-02	3.60E-03				1.52	5.12	1.42	
CAU	Aggregate Bin Unloading	VOLUME	5	72.2	10	10	srf src	4.16E-02	6.30E-03					2.37E-02	3.60E-03				1.52	5.12	1.42	
CM	Central Mixer Loading	VOLUME	5	72.2	10	10	srf src	2.31E-03	3.36E-04					4.75E-03	6.90E-04				1.52	5.12	1.42	
HL	Landmark/Stibnite Heaters (3 x 1.0 MMBtu Propane-Fired)	POINT	36	360		394	0.7	2.89E-03	2.89E-03	3.10E-02	5.37E-02	6.57E-03	6.57E-03	2.89E-03	2.89E-03	5.37E-02	6.57E-03	9.64E-08	11.0	455	5.20	0.213
TG1	Mine Site Gasoline Tank #1																					
TG2	Mine Site Gasoline Tank #2																					
TD3	Mine Site Diesel Tank #3																					
TD4	Mine Site Diesel Tank #4																					
TD5	Mine Site Diesel Tank #5																					
TD6	Mine Site Diesel Tank #6																					
TD7	Mine Site Diesel Tank #7																					
TD8	Mine Site Diesel Tank #8																					
TD9	Mine Site Diesel Tank #9																					
TD10	Mine Site Diesel Tank #10																					
TDL1	Landmark Diesel Tank #1																					
TDL2	Landmark Diesel Tank #2																					
TGL3	Landmark Gasoline Tank #3																					

SOURCE DESCRIPTION		OPERATING LIMITS							EMISSION FACTORS									
Model ID	Source Description	Design Throughput unit/hr	unit/day	unit/yr	units	Material	hr/yr	reference	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	H2S	unit	reference
TRUE	LIME PRODUCTION																	
LS1	Limestone transfer to Primary Crusher Hopper	47.08	1,130	317,907	ton	Limestone	8,760	(Midas Gold 2018m)	0.003	0.0011	0.00017						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
LS2	Primary Crushing and Associated Transfers In and Out	47.08	1,130	317,907	ton	Limestone	8,760		0.0054	0.0024	0.00036						lb/ton	AP-42, Table 11.19.2-2 (08/04) Tert. Crush - unctrl.; PM2.5 Ch. 13.2.4
LS3	Primary Screening and Associated Transfers In and Out	47.08	1,130	317,907	ton	Limestone	8,760		0.025	0.0087	0.00132						lb/ton	AP-42, Table 11.19.2-2 (08/04) Screening - unctrl.; PM2.5 Ch. 13.2.4
LS4	Secondary Crushing and Associated Transfers In and Out	47.08	1,130	317,907	ton	Limestone	8,760		0.0054	0.0024	0.00036						lb/ton	AP-42, Table 11.19.2-2 (08/04) Tert. Crush - unctrl.; PM2.5 Ch. 13.2.4
LS5	Secondary Screening and Associated Transfers In and Out	47.08	1,130	317,907	ton	Limestone	8,760		0.025	0.0087	0.00132						lb/ton	AP-42, Table 11.19.2-2 (08/04) Screening - unctrl.; PM2.5 Ch. 13.2.4
LS6	Limestone transfer to Ball Mill Feed Bin	35.95	863	235,219	ton	Limestone	8,760	LS1 minus LK throughts	0.003	0.0011	0.00017						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
LS7	Limestone transfer to Ball Mill Feed Conveyor	11.13	267	82,688	ton	Limestone	8,760		0.003	0.0011	0.00017						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
LS8	Ball Mill Feed transfer to Ball Mill	11.13	267	82,688	ton	Limestone	8,760	(Midas Gold 2018m)	0.003	0.0011	0.00017						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
LSBM	Limestone Ball Mill	35.95	863	235,219	ton	Limestone	8,760		0.0404	0.0339	0.0121						lb/ton	AP-42, Table 11.19.2-4 (08/04) Dry Grind.
LS9	Limestone transfer to Kiln Feed Bin	11.13	267	82,688	ton	Limestone	8,760		0.003	0.0011	0.00017						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
LS10	Limestone transfer to Lime Kiln Feed Conveyor	11.13	267	82,688	ton	Limestone	8,760		0.003	0.0011	0.00017						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
LS11	Fines Screening and Associated Transfers In and Out	11.13	267	82,688	ton	Limestone	8,760		0.025	0.0087	0.00132						lb/ton	AP-42, Table 11.19.2-2 (08/04) Screening - unctrl.; PM2.5 Ch. 13.2.4
LS12	Kiln Feed transfer to PFR Shaft Lime Kiln	11.13	267	82,688	ton	Limestone	8,760	(Midas Gold 2018m)	0.003	0.0011	0.00017						lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
LK	Parallel Flow Regenerative (PFR) Shaft Lime Kiln	7.04	169	52,377	ton	Lime	8,760	(Midas Gold 2018m)	0.026	0.026	0.026	0.45	0.24	0.0012			lb/ton	AP-42 Tables 11.17-2, 6 : Gas-Fired Parallel Flow Regenetive Kiln with Fabric Filter
LKC	PFR Shaft Lime Kiln Combustion	20.52	492	152,629	MMBtu	Propane	8,760	Based on 810 kcal/kg (Maerz 2018)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874		lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
LCR	Lime Mill Crushing and associated transfers In and Out	7.04	169	52,377	ton	Lime	8,760		0.00043	0.00043	0.00043						lb/ton	AP-42 Table 11.17-4: Primary Crusher with Fabric Filter
LSL	Pebble Lime Silo Loading via Bucket Elevator	7.04	169	52,377	ton	Lime	8,760		8.8E-05	8.8E-05	8.8E-05						lb/ton	AP-42 Table 11.17-4: Crushed Material Conveyor Transfer with Fabric Filter
LSU	Pebble Lime Silo discharge to Lime Slaker	7.04	169	52,377	ton	Lime	8,760		8.8E-05	8.8E-05	8.8E-05						lb/ton	AP-42 Table 11.17-4: Crushed Material Conveyor Transfer with Fabric Filter
Total																		

SOURCE DESCRIPTION		EMISSION CONTROLS			HOURLY EMISSIONS								DAILY EMISSIONS							
Model ID	Source Description	control system	efficiency	reference	PM lb/hr	PM_{10} lb/hr	$PM_{2.5}$ lb/hr	CO lb/hr	NOx lb/hr	SO_2 lb/hr	VOC lb/hr	H2S lb/hr	PM lb/day	PM_{10} lb/day	$PM_{2.5}$ lb/day	CO lb/day	NOx lb/day	SO_2 lb/day	VOC lb/day	H2S lb/day
TRUE	LIME PRODUCTION																			
LS1	Limestone transfer to Primary Crusher Hopper	None	0		0.141	0.0518	0.0080						3.39	1.24	0.192	0	0	0	0	0
LS2	Primary Crushing and Associated Transfers In and Out	None	0		0.254	0.113	0.0169						6.10	2.71	0.407	0	0	0	0	0
LS3	Primary Screening and Associated Transfers In and Out	None	0		1.18	0.410	0.0621						28.2	9.8	1.49	0	0	0	0	0
LS4	Secondary Crushing and Associated Transfers In and Out	None	0		0.254	0.113	0.0169						6.10	2.71	0.407	0	0	0	0	0
LS5	Secondary Screening and Associated Transfers In and Out	None	0		1.18	0.410	0.0621						28.2	9.8	1.49	0	0	0	0	0
LS6	Limestone transfer to Ball Mill Feed Bin	None	0		0.108	0.0395	0.0061						2.59	0.95	0.147	0	0	0	0	0
LS7	Limestone transfer to Ball Mill Feed Conveyor	None	0		0.033	0.0122	0.00189						0.80	0.294	0.045	0	0	0	0	0
LS8	Ball Mill Feed transfer to Ball Mill	None	0		0.033	0.0122	0.00189						0.80	0.294	0.045	0	0	0	0	0
LSBM	Limestone Ball Mill	Fabric Filter	(0)*		1.452	1.2188	0.43503						34.86	29.251	10.441	0	0	0	0	0
LS9	Limestone transfer to Kiln Feed Bin	None	0		0.033	0.0122	0.0019						0.80	0.29	0.045	0	0	0	0	0
LS10	Limestone transfer to Lime Kiln Feed Conveyor	None	0		0.033	0.0122	0.00189						0.80	0.294	0.045	0	0	0	0	0
LS11	Fines Screening and Associated Transfers In and Out	None	0		0.28	0.097	0.0147						6.7	2.3	0.35	0	0	0	0	0
LS12	Kiln Feed transfer to PFR Shaft Lime Kiln	None	0		0.033	0.0122	0.00189						0.80	0.294	0.045	0	0	0	0	0
LK	Parallel Flow Regenerative (PFR) Shaft Lime Kiln	Fabric Filter	(0)*		0.183	0.183	0.183	3.17	1.69	0.0085	0		4.39	4.39	4.39	76.05	40.6	0.203	0.00	0
LKC	PFR Shaft Lime Kiln Combustion	None	0		0.157	0.157	0.157	1.68	2.92	0.357	0.179		3.77	3.77	3.77	40.4	70.0	8.6	4.31	0
LCR	Lime Mill Crushing and associated transfers In and Out	Fabric Filter	(0)*		0.00303	0.00303	0.00303						0.073	0.073	0.073	0	0	0	0	0
LSL	Pebble Lime Silo Loading via Bucket Elevator	Fabric Filter	(0)*		6.20E-4	6.20E-4	6.20E-4						0.0149	0.0149	0.0149	0	0	0	0	0
LSU	Pebble Lime Silo discharge to Lime Slaker	Wet Scrubber	(0)*		6.20E-4	6.20E-4	6.20E-4						0.0149	0.0149	0.0149	0	0	0	0	0
Total					**32.4**	**19.9**	**12.9**	**33.6**	**55.6**	**1.90**	**11.6**	**0.900**	**488**	**325**	**219**	**189**	**232**	**37.8**	**30.1**	**21.6**

SOURCE DESCRIPTION		ANNUAL EMISSIONS									NAD 83 LOCATION				
Model ID	Source Description	PM ton/yr	PM_{10} ton/yr	$PM_{2.5}$ ton/yr	CO ton/yr	NOx ton/yr	SO_2 ton/yr	VOC ton/yr	H2S ton/yr	Hg2+P ton/yr	UTM E m	UTM N m	reference	elev m	reference
TRUE	LIME PRODUCTION														
LS1	Limestone transfer to Primary Crusher Hopper	0.477	0.175	0.0270						9.54E-09	632,239	4,974,256	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS2	Primary Crushing and Associated Transfers In and Out	0.86	0.381	0.057						1.72E-08	632,239	4,974,256	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS3	Primary Screening and Associated Transfers In and Out	3.97	1.38	0.210						7.95E-08	632,239	4,974,256	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS4	Secondary Crushing and Associated Transfers In and Out	0.86	0.381	0.057						1.72E-08	632,227	4,974,268	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS5	Secondary Screening and Associated Transfers In and Out	3.97	1.38	0.210						7.95E-08	632,227	4,974,268	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS6	Limestone transfer to Ball Mill Feed Bin	0.353	0.129	0.0200						7.06E-09	632,181	4,974,307	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS7	Limestone transfer to Ball Mill Feed Conveyor	0.124	0.045	0.0070						2.48E-09	632,181	4,974,307	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS8	Ball Mill Feed transfer to Ball Mill	0.124	0.045	0.0070						2.48E-09	632,200	4,974,273	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LSBM	Limestone Ball Mill	4.751	3.987	1.4231						9.50E-08	632,215	4,974,248	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS9	Limestone transfer to Kiln Feed Bin	0.124	0.045	0.0070						2.48E-09	632,169	4,974,325	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS10	Limestone transfer to Lime Kiln Feed Conveyor	0.124	0.045	0.0070						2.48E-09	632,169	4,974,325	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS11	Fines Screening and Associated Transfers In and Out	1.03	0.36	0.055						2.07E-08	632,151	4,974,314	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS12	Kiln Feed transfer to PFR Shaft Lime Kiln	0.124	0.045	0.0070						2.48E-09	632,056	4,974,285	Drawing SK-OPTION 3b, 06/06/2018	1,984.0	Google Earth
LK	Parallel Flow Regenerative (PFR) Shaft Lime Kiln	0.68	0.68	0.68	11.8	6.29	0.0314				632,057	4,974,265	Drawing SK-OPTION 3b, 06/06/2018	1,984.0	Google Earth
LKC	PFR Shaft Lime Kiln Combustion	0.584	0.584	0.584	6.26	10.8	1.33	0.67		1.95E-5	632,057	4,974,265	Drawing SK-OPTION 3b, 06/06/2018	1,984.0	Google Earth
LCR	Lime Mill Crushing and associated transfers In and Out	0.0113	0.0113	0.0113							632,073	4,974,233	Drawing SK-OPTION 3b, 06/06/2018	1,990.0	Google Earth
LSL	Pebble Lime Silo Loading via Bucket Elevator	0.00230	0.00230	0.00230							632,069	4,974,206	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LSU	Pebble Lime Silo discharge to Lime Slaker	0.00230	0.00230	0.00230							632,069	4,974,206	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
Total		**71.1**	**46.9**	**32.1**	**31.1**	**38.9**	**6.61**	**5.36**	**3.94**	**3.15E-4**					

SOURCE DESCRIPTION		RELEASE PARAMETERS INPUT						MODEL EMISSION RATES / RELEASE PARAMETERS													
Model ID	Source Description	POINT VOLUME	rel ht (ft) rel ht (ft)	temp (F) width (ft)	flow (dscfm) vert. ln (ft)	flow (acfm) grnd ht (ft)	dia (ft) oz type	PM_{10}-24 gps	$PM_{2.5}$-24 gps	CO-ALL gps	NO_2-1 gps	SO_2-1 gps	SO_2-3 gps	PM_{10}-AN gps	$PM_{2.5}$-AN gps	NO_2-AN gps	SO_2-AN gps	Hg2+P gps	ht (m) ht (m)	temp (K) oy (m)	vel (m/s) oz (m)	dia (m)
TRUE	LIME PRODUCTION																					
LS1	Limestone transfer to Primary Crusher Hopper	VOLUME	11.3	22.6	22.6	22.6	srf src	6.52E-03	1.01E-03					5.03E-03	7.77E-04			2.74E-10	3.44	1.60	3.20	
LS2	Primary Crushing and Associated Transfers In and Out	VOLUME	11.3	22.6	22.6	22.6	srf src	1.42E-02	2.14E-03					1.10E-02	1.65E-03			4.94E-10	3.44	1.60	3.20	
LS3	Primary Screening and Associated Transfers In and Out	VOLUME	11.3	22.6	22.6	22.6	srf src	5.16E-02	7.83E-03					3.98E-02	6.04E-03			2.29E-09	3.44	1.60	3.20	
LS4	Secondary Crushing and Associated Transfers In and Out	VOLUME	11.3	22.6	22.6	22.6	srf src	1.42E-02	2.14E-03					1.10E-02	1.65E-03			4.94E-10	3.44	1.60	3.20	
LS5	Secondary Screening and Associated Transfers In and Out	VOLUME	11.3	22.6	22.6	22.6	srf src	5.16E-02	7.83E-03					3.98E-02	6.04E-03			2.29E-09	3.44	1.60	3.20	
LS6	Limestone transfer to Ball Mill Feed Bin	POINT	29.0	Ambient		0.155	1.0	4.98E-03	7.70E-04					3.72E-03	5.75E-04			2.03E-10	8.84	0	0.00100	0.305
LS7	Limestone transfer to Ball Mill Feed Conveyor	VOLUME	3.5	1	3	5	elev src w/ bldg	1.54E-03	2.38E-04					1.31E-03	2.02E-04			7.14E-11	1.07	0.0709	0.425	
LS8	Ball Mill Feed transfer to Ball Mill	VOLUME	28	4	4	30	elev src w/ bldg	1.54E-03	2.38E-04					1.31E-03	2.02E-04			7.14E-11	8.53	0.284	0.567	
LSBM	Limestone Ball Mill	POINT	70.0	Ambient		10,000	1.9	1.54E-01	5.48E-02					1.15E-01	4.09E-02			2.73E-09	21.3	0	17.9	0.579
LS9	Limestone transfer to Kiln Feed Bin	POINT	29.0	Ambient		0.155	1.0	1.54E-03	2.38E-04					1.31E-03	2.02E-04			7.14E-11	8.84	0	0.00100	0.305
LS10	Limestone transfer to Lime Kiln Feed Conveyor	VOLUME	3.5	1	3	5	elev src w/ bldg	1.54E-03	2.38E-04					1.31E-03	2.02E-04			7.14E-11	1.07	0.0709	0.425	
LS11	Fines Screening and Associated Transfers In and Out	VOLUME	2.5	8	5	5	srf src	1.22E-02	1.85E-03					1.03E-02	1.57E-03			5.95E-10	0.762	0.567	0.709	
LS12	Kiln Feed transfer to PFR Shaft Lime Kiln	VOLUME	68	4	4	70	elev src w/ bldg	1.54E-03	2.38E-04					1.31E-03	2.02E-04			7.14E-11	20.7	0.284	0.567	
LK	Parallel Flow Regenerative (PFR) Shaft Lime Kiln	POINT	150	350		18,000	2.5	2.31E-02	2.31E-02	3.99E-01	2.13E-01	1.06E-03	1.06E-03	1.96E-02	1.96E-02	1.81E-01	9.04E-04		45.7	450	18.6	0.762
LKC	PFR Shaft Lime Kiln Combustion	POINT	150	350		18,000	2.5	1.98E-02	1.98E-02	2.12E-01	3.67E-01	4.49E-02	4.49E-02	1.68E-02	1.68E-02	3.12E-01	3.81E-02	5.60E-07	45.7	450	18.6	0.762
LCR	Lime Mill Crushing and associated transfers In and Out	POINT	50	Ambient		10,000	1.9	3.82E-04	3.82E-04					3.24E-04	3.24E-04				15.2	0	17.9	0.579
LSL	Pebble Lime Silo Loading via Bucket Elevator	POINT	29.0	Ambient		0.155	1.0	7.81E-05	7.81E-05					6.63E-05	6.63E-05				8.84	0	0.00100	0.305
LSU	Pebble Lime Silo discharge to Lime Slaker	VOLUME	3.5	1	3	5	elev src w/ bldg	7.81E-05	7.81E-05					6.63E-05	6.63E-05				1.07	0.0709	0.425	
Total								1.70	1.15	4.24	1.51	0.234	0.240	1.35	0.923	1.12	0.190	9.054E-06				

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: S. Pryor
	PROJECT NO: 335-1-1	PAGE: 1 OF: 7 SHEET: ProcHAP
AIR EMISSION CALCULATIONS	SUBJECT: Process HAP and GHG Emissions	DATE: October 10, 2018

Hazardous Air Pollutants and Greenhouse Gas Emissions

HAP Emissions Summary

	Emissions	
Pollutant	lb/yr	ton/yr
1,3-Butadiene	0.01	3.67E-06
Acetaldehyde	0.21	1.07E-04
Acrolein	0.04	1.98E-05
Arsenic	0.08	4.19E-05
Benzene	3.24	1.62E-03
Beryllium	0.01	2.51E-06
Cadmium	0.46	2.31E-04
Chromium	0.59	2.93E-04
Cobalt	0.04	1.76E-05
Dichlorobenzene	0.50	2.51E-04
Formaldehyde	31.88	1.59E-02
Hexane	754.49	3.77E-01
Manganese	0.16	7.96E-05
Mercury	24.81	1.24E-02
Naphthalene	0.26	1.28E-04
Nickel	0.88	4.40E-04
POM	0.66	3.32E-04
Selenium	0.01	5.03E-06
Toluene	2.29	1.15E-03
Xylene	0.60	2.99E-04
Total HAP	**821.21**	**4.11E-01**
		0.4106
		chk

GHG Emissions Summary

Source Category	CO2e *(ton/yr)*
Propane Combustion	29,750
Diesel Combustion	246
Autoclaving	47,316
Lime Kiln	30,311
Total GHGs	**107,622**

PROPANE COMBUSTION

Source Data

Source ID	Description	MMBtu/yr
Sb1	Sb Drying (2.72 MMBtu/hr Propane-Fired)	23,827
ACB	POX Boiler (17 MMBtu/hr Propane-Fired)	510
CKB	Carbon Regeneration Kiln (Burners)	19,754
PV	Propane Vaporizer (0.4 MMBtu/hr Propane-Fired)	876
HS	Strip Circuit Solution Heater (5 MMBtu, Propane-Fired)	43,800
H1M	Mine Air Heater #1 (4 MMBtu/hr Propane-Fired)	35,040
H2M	Mine Air Heater #2 (4 MMBtu/hr Propane-Fired)	35,040
HM	Mill HVAC Heaters (4 x 1.0 MMBtu Propane-Fired)	35,040
HAC	Autoclave HVAC Heater (1 x 0.25 MMBtu Propane-Fired)	2,190
HR	Refinery HVAC Heaters (1 x 0.25 MMBtu Propane-Fired)	2,190
HA	Admin HVAC Heaters (1 x 0.25 MMBtu Propane-Fired)	2,190
HMO	Mine Ops. HVAC Heaters (2 x 0.25 MMBtu Propane-Fired)	4,380
HTS	Truck Shop HVAC Heaters (2 x 1.0 MMBtu Propane-Fired)	17,520
HW	Warehouse HVAC Heaters (3 x 1.0 MMBtu Propane-Fired)	26,280
HL	Landmark/Stibnite Heaters (3 x 1.0 MMBtu Propane-Fired)	26,280
LKC	PFR Shaft Lime Kiln Combustion	152,629
Total		427,546

**Propane heating value* 91,500 *Btu/gal*

HAP Emissions - Propane Combustion

Pollutant	Emission Factor* lb/MMScf	Emission Factor* lb/MMBtu**	Emissions ton/yr
Benzene	2.10E-03	2.06E-6	4.4E-4
Dichlorobenzene	1.20E-03	1.18E-6	2.5E-4
Formaldehyde	7.50E-02	7.35E-5	1.6E-2
Hexane	1.80E+00	1.76E-3	0.38
Naphthalene	6.10E-04	5.98E-7	1.3E-4
Toluene	3.40E-03	3.33E-6	7.1E-4
POM	< 8.82E-05	8.65E-8	1.8E-5
Arsenic	2.00E-04	1.96E-7	4.2E-5
Beryllium	< 1.20E-05	1.18E-8	2.5E-6
Cadmium	1.10E-03	1.08E-6	2.3E-4
Chromium	1.40E-03	1.37E-6	2.9E-4
Cobalt	8.40E-05	8.24E-8	1.8E-5
Manganese	3.80E-04	3.73E-7	8.0E-5
Mercury	2.60E-04	2.55E-7	5.4E-5
Nickel	2.10E-03	2.06E-6	4.4E-4
Selenium	< 2.40E-05	2.35E-8	5.0E-6
Total HAP			0.40

**AP-42, Table 1.4-3 & 1.4-4 (7/98) Natural Gas Combustion*

***Natural Gas Higher Heating Value* 1,020 *MMBtu/MMScf*

PROPANE COMBUSTION - CONTINUED

Propane CO_2e Emission Factors:	62.87 *kg CO2/MMBtu*	*40 CFR Part 98, Table C-1 to Subpart C (11/2013) Propane (CFR 2018d)*
	3.0E-03 *kg CH4/MMBtu*	*40 CFR Part 98, Table C-2 to Subpart C (11/2013) Petroleum (CFR 2018d)*
	6.0E-04 *kg N2O/MMBtu*	*40 CFR Part 98, Table C-2 to Subpart C (11/2013) Petroleum (CFR 2018d)*

Total Propane Combustion 427,546 *MMBtu/yr*

Propane CO2e Emissions - Process Sources:

Greenhouse Gas	Emissions ton/yr	Global Warming Potential*	CO2e ton/yr
CO2	29,630	1	29,630
CH4	1.41	25	35
N2O	0.28	298	84
Total GHG			29,750

** 40 CFR 98, Table A-1 (12/2014) (CFR 2018d)*

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: S. Pryor
	PROJECT NO: 335-1-1	PAGE: 4 OF: 7 SHEET: ProcHAP
AIR EMISSION CALCULATIONS	SUBJECT: Process HAP and GHG Emissions	DATE: October 10, 2018

DIESEL COMBUSTION

Source Data

Source ID	Description	Power Rating kW	Power Rating hp	Operatio hr/yr	Fuel Consumption MMBtu/hr*	Fuel Consumption MMBtu/yr EDG1
	Camp Emergency Generator (Mfr. Yr. >2007; diesel)	1,000	1,341	100	9.39	938.7
EDG2	Plant Emergency Generator #1 (Mfr. Yr. >2007; diesel)	1,000	1,341	100	9.39	938.7
EDG3	Plant Emergency Generator #2 (Mfr. Yr. >2007; diesel)	1,000	1,341	100	9.39	938.7
EDFP	Mill Fire Pump (Mfr. Yr. >2009; diesel)	200	268	100	1.88	187.7
Total						3,003.8

** Based on brake specific fuel consumption for diesel generators* 7,000 *Btu/hp-hr AP-42 Tbl 3.3-1*

*** Heat Content of* 0.137 *MMBtu/gal*

HAP Emissions - Diesel Combustion, Large Engines

Pollutant	Emission Factor* lb/MMBtu	Emissions ton/yr
1,3-Butadiene	0.00E+00	
Acetaldehyde	2.52E-05	3.55E-05
Acrolein	7.88E-06	1.11E-05
Benzene	7.76E-04	1.09E-03
Formaldehyde	7.89E-05	1.11E-04
POM	2.12E-04	2.98E-04
Toluene	2.81E-04	3.96E-04
Xylene	1.93E-04	2.72E-04
Total HAPs		2.22E-03

**AP-42, Tabs. 3.4-3 & 3.4-4, 10/96, large diesel engines (> 600 hp)*

HAP Emissions - Diesel Combustion, Small Engines

Pollutant	Emission Factor* lb/MMBtu	Emissions ton/yr
1,3-Butadiene	3.91E-05	3.67E-06
Acetaldehyde	7.67E-04	7.20E-05
Acrolein	9.25E-05	8.68E-06
Benzene	9.33E-04	8.76E-05
Formaldehyde	1.18E-03	1.11E-04
POM	1.68E-04	1.58E-05
Toluene	4.09E-04	3.84E-05
Xylene	2.85E-04	2.68E-05
Total HAPs		3.64E-04

**AP-42, Tab. 3.3-2, 10/96, diesel engines (≤ 600 hp)*

Diesel CO2e Emission Factors:	73.96 *kg* CO_2*/MMBtu*	*40 CFR Part 98, Table C-1 to Subpart C (11/2013) No.2*
	3.0E-03 *kg* CH_4*/MMBtu*	*40 CFR Part 98, Table C-2 to Subpart C (11/2013) Petroleum*
	6.0E-04 *kg* N_2O*/MMBtu*	*40 CFR Part 98, Table C-2 to Subpart C (11/2013) Petroleum*
Total Diesel Combustion	3,003.8 *MMBtu/yr*	

Diesel CO2e Emissions - Process Sources:

Greenhouse Gas	Emissions ton/yr	Global Warming Potential*	CO2e ton/yr
CO2	244.89	1	244.89

AUTOCLAVE CO_2 EMISSIONS

CO2 Emissions

	Operation	CO2 Emissions	
Description	hr/yr	ton/hr*	ton/yr
Autoclave	8,760	5.40	47,316

**Per M3 Engineering, 10/11/2017; based on ore feed carbonate values and conservatively assuming limestone for neutralization.*
(M3 2017c)

LIME KILN CO_2 EMISSIONS

CO2 Emissions

	Operation	Feed	Product	Mass Loss	CO2
Description	hr/yr	ton/yr	ton/yr	ton/yr	ton/yr
Parallel Flow Regenerative (PFR) Shaft Lime Kiln	8,760	82,688	52,377	30,311	30,311

40 CFR 63 Subpart 7E MERCURY SOURCES

Mercury Emissions

Description	Subpart 7E Hg Emissions ton/yr	% of Subpart 7E for Controlled Systems* %	Controlled Hg Emissions* lb/yr	ton/yr
Autoclave	0.107	10.0%	21.34	0.011
Refinery Sources (Kiln, EW, Retort, Furnace)	0.008	20.0%	3.36	0.002
Total	0.115		24.70	0.012

Based on Similar Source Hg Reporting Levels provided below

Subpart 7E Limit - Ore Pretreatment Process*(CFR 2018c)*

$$\frac{84\ \text{lb}}{\cancel{\text{MMton}}} \times \frac{2{,}540{,}400\ \cancel{\text{ton}}}{\text{yr}} \times \frac{\cancel{\text{MMton}}}{1.0\text{E+6}\ \cancel{\text{ton}}} = \frac{213.39\ \text{lb}}{\text{yr}}$$

Subpart 7E Limit - Carbon Processes with Mercury Retorts

$$\frac{0.8\ \text{lb}}{\cancel{\text{ton}}} \times \frac{21\ \cancel{\text{ton}}}{\text{yr}} = \frac{16.8\ \text{lb}}{\text{yr}}$$

Similar Source Hg Reporting Levels

Goldstrike Autoclaves 2 & 3 (2015 & 2016 Hg Report (NDEP 2015a) (NDEP 2016)

$$\frac{28.79\ \text{lb}}{\text{yr}} \times \frac{\text{yr}}{3.13\ \text{MMton}} = \frac{9.18\ \text{lb}}{\text{MMton}} \times \frac{\text{MMton}}{84\ \text{lb}} = 10.9\%$$

Twin Creeks Autoclaves 1 & 2 (2015 & 2016 Hg Repo(NDEP 2015a) (NDEP 2016)

$$\frac{1.01\ \text{lb}}{\text{yr}} \times \frac{\text{yr}}{7.63\ \text{MMton}} = \frac{0.13\ \text{lb}}{\text{MMton}} \times \frac{\text{MMton}}{84\ \text{lb}} = 0.2\%$$

Goldstrike Refinery (2015 & 2016 Hg Reports) (NDEP 2015a) (NDEP 2016)

$$\frac{28.79\ \text{lb}}{\text{yr}} \times \frac{\text{yr}}{251.00\ \text{ton}} = \frac{0.11\ \text{lb}}{\text{MMton}} \times \frac{\text{ton}}{0.8\ \text{lb}} = 14.3\%$$

Twin Creeks Refinery (2015 & 2016 Hg Reports) (NDEP 2015a) (NDEP 2016)

$$\frac{31.27\ \text{lb}}{\text{yr}} \times \frac{\text{yr}}{142.77\ \text{ton}} = \frac{0.22\ \text{lb}}{\text{MMton}} \times \frac{\text{ton}}{0.8\ \text{lb}} = 27.4\%$$

OTHER REGULATED POLLUTANTS

H2SO4 Emissions

Description	Throughput ton/hr	Operation hr/yr	lb/ton*	H2SO4 lb/hr	H2SO4 ton/yr
Autoclave	290	8,760	0.007	2.03	8.9

**Based on Acidic Autoclave test data (APT 2010)*

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: E. Huelson/E. Memon
	PROJECT NO: 335-1-1	PAGE: 1 OF: 9 SHEET: Tanks
AIR EMISSION CALCULATIONS	SUBJECT: Fuel Storage Tanks	DATE: October 10, 2018

Fuel Storage Tanks

	Dimensions				VOC		
	Capacity	Diameter	Length	Throughput	Emissions[1]		Reference
Storage Tank	gal	ft	ft	gal/yr	lb/yr	ton/yr	
Mine Site Gasoline Tank #1	5,000	8.5	14.33	250,000	1,914.73	0.96	*(Midas Gold 2016)*
Mine Site Gasoline Tank #2	5,000	8.5	14.33	250,000	1,914.73	0.96	*(Midas Gold 2016)*
Mine Site Diesel Tank #3	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018g)*
Mine Site Diesel Tank #4	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018g)*
Mine Site Diesel Tank #5	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018g)*
Mine Site Diesel Tank #6	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018g)*
Mine Site Diesel Tank #7	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018g)*
Mine Site Diesel Tank #8	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018g)*
Mine Site Diesel Tank #9	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018g)*
Mine Site Diesel Tank #10	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018g)*
Landmark Diesel Tank #1	2,500	6	15.00	130,000	2.01	0.001	*(Midas Gold 2018d), (Midas Gold 2018g)*
Landmark Diesel Tank #2	2,500	6	15.00	130,000	2.01	0.001	*(Midas Gold 2018d), (Midas Gold 2018g)*
Landmark Gasoline Tank #3	2,500	6	15.00	130,000	1,036.15	0.518	*(Midas Gold 2018d), (Midas Gold 2018g)*

[1] *Emissions calculated using EPA Tanks 4.0.9d (EPA 1999)*

Conversions

2,000 lb/ton

Mine Site Gasoline Tanks #1, #2

TANKS 4.0 Report

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Midas Gasoline Tank - 5,000 gal
City:	
State:	Idaho
Company:	Midas Gold
Type of Tank:	Horizontal Tank
Description:	

Tank Dimensions

Shell Length (ft):	14.33
Diameter (ft):	8.50
Volume (gallons):	5,000.00
Turnovers:	50.00
Net Throughput(gal/yr):	250,000.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Boise, Idaho (Avg Atmospheric Pressure = 13.28 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

Midas Gasoline Tank - 5,000 gal - Horizontal Tank

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 9)	All	52.81	46.88	58.74	50.94	3.9950	3.5384	4.4980	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Midas Gasoline Tank - 5,000 gal - Horizontal Tank

Annual Emission Calcaulations	
Standing Losses (lb):	693.2361
Vapor Space Volume (cu ft):	517.9338
Vapor Density (lb/cu ft):	0.0487
Vapor Space Expansion Factor:	0.1491
Vented Vapor Saturation Factor:	0.5264
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	517.9338
Tank Diameter (ft):	8.5000
Effective Diameter (ft):	12.4565
Vapor Space Outage (ft):	4.2500
Tank Shell Length (ft):	14.3300
Vapor Density	
Vapor Density (lb/cu ft):	0.0487
Vapor Molecular Weight (lb/lb-mole):	67.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.9950
Daily Avg. Liquid Surface Temp. (deg. R):	512.4830
Daily Average Ambient Temp. (deg. F):	50.9208
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	510.6106
Tank Paint Solar Absorptance (Shell):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,400.5355

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Mine Site Gasoline Tanks #1, #2 - continued

TANKS 4.0 Report

Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.1431
Daily Vapor Temperature Range (deg. R):	23.7125
Daily Vapor Pressure Range (psia):	0.9594
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.9950
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	3.5384
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	4.4980
Daily Avg. Liquid Surface Temp. (deg R):	512.4830
Daily Min. Liquid Surface Temp. (deg R):	506.5648
Daily Max. Liquid Surface Temp. (deg R):	518.4111
Daily Ambient Temp. Range (deg. R):	23.6750
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.5264
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.9950
Vapor Space Outage (ft):	4.2500
Working Losses (lb):	1,221.4895
Vapor Molecular Weight (lb/lb-mole):	67.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.9950
Annual Net Throughput (gal/yr.):	250,000.0000
Annual Turnovers:	50.0000
Turnover Factor:	0.7667
Tank Diameter (ft):	8.5000
Working Loss Product Factor:	1.0000
Total Losses (lb):	1,914.7256

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

Midas Gasoline Tank - 5,000 gal - Horizontal Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 9)	1,221.49	693.24	1,914.73

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Mine Site Diesel Tanks #3 - #10

TANKS 4.0 Report

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	25,000 gallon diesel storage tank
City:	Boise
State:	Idaho
Company:	Midas Gold
Type of Tank:	Vertical Fixed Roof Tank
Description:	Midas Gold Mine Site offroad diesel storage tanks

Tank Dimensions

Shell Height (ft):	29.70
Diameter (ft):	12.00
Liquid Height (ft) :	29.00
Avg. Liquid Height (ft):	14.50
Volume (gallons):	25,000.00
Turnovers:	29.00
Net Throughput(gal/yr):	725,000.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	1.00
Radius (ft) (Dome Roof)	12.00

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Boise, Idaho (Avg Atmospheric Pressure = 13.28 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

25,000 gallon diesel storage tank - Vertical Fixed Roof Tank
Boise, Idaho

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	52.81	46.88	58.74	50.94	0.0051	0.0041	0.0062	130.0000			188.00	Option 1: VP50 = .0045 VP60 = .0065

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

25,000 gallon diesel storage tank - Vertical Fixed Roof Tank
Boise, Idaho

Annual Emission Calcaulations	
Standing Losses (lb):	3.2383
Vapor Space Volume (cu ft):	1,776.1518
Vapor Density (lb/cu ft):	0.0001
Vapor Space Expansion Factor:	0.0419
Vented Vapor Saturation Factor:	0.9958
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,776.1518
Tank Diameter (ft):	12.0000
Vapor Space Outage (ft):	15.7046
Tank Shell Height (ft):	29.7000
Average Liquid Height (ft):	14.5000

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Mine Site Diesel Tanks #3 - #10 - continued

TANKS 4.0 Report

Roof Outage (ft):	0.5046
Roof Outage (Dome Roof)	
Roof Outage (ft):	0.5046
Dome Radius (ft):	12.0000
Shell Radius (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0001
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0051
Daily Avg. Liquid Surface Temp. (deg. R):	512.4830
Daily Average Ambient Temp. (deg. F):	50.9200
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	510.6108
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,400.5355
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0419
Daily Vapor Temperature Range (deg. R):	23.7125
Daily Vapor Pressure Range (psia):	0.0022
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0051
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0041
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0062
Daily Avg. Liquid Surface Temp. (deg R):	512.4920
Daily Min. Liquid Surface Temp. (deg R):	506.5548
Daily Max. Liquid Surface Temp. (deg R):	518.4111
Daily Ambient Temp. Range (deg. R):	23.6750
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9958
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0051
Vapor Space Outage (ft):	15.7046
Working Losses (lb):	11.3607
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0051
Annual Net Throughput (gal/yr.):	725,000.0000
Annual Turnovers:	29.0000
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	25,000.0000
Maximum Liquid Height (ft):	29.0000
Tank Diameter (ft):	12.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	14.5990

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

25,000 gallon diesel storage tank - Vertical Fixed Roof Tank
Boise, Idaho

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	11.36	3.24	14.60

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Landmark Diesel Tanks #1, #2

TANKS 4.0 Report

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	2,500 gallon diesel storage tank
City:	Boise
State:	Idaho
Company:	Midas Gold
Type of Tank:	Horizontal Tank
Description:	Midas Gold Landmark facility diesel tanks

Tank Dimensions

Shell Length (ft):	15.00
Diameter (ft):	6.00
Volume (gallons):	2,500.00
Turnovers:	52.00
Net Throughput(gal/yr):	130,000.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Boise, Idaho (Avg Atmospheric Pressure = 13.28 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

2,500 gallon diesel storage tank - Horizontal Tank
Boise, Idaho

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	52.81	46.88	58.74	50.94	0.0051	0.0041	0.0062	130.0000			188.00	Option 1: VP50 = .0045 VP60 = .0065

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

2,500 gallon diesel storage tank - Horizontal Tank
Boise, Idaho

Annual Emission Calcaulations	
Standing Losses (lb):	0.4942
Vapor Space Volume (cu ft):	270.1369
Vapor Density (lb/cu ft):	0.0001
Vapor Space Expansion Factor:	0.0419
Vented Vapor Saturation Factor:	0.9992
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	270.1369
Tank Diameter (ft):	6.0000
Effective Diameter (ft):	10.7075
Vapor Space Outage (ft):	3.0000
Tank Shell Length (ft):	15.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0001
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0051
Daily Avg. Liquid Surface Temp. (deg. R):	512.4830
Daily Average Ambient Temp. (deg. F):	50.9208
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	510.6108

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Landmark Diesel Tanks #1, #2 - continued

TANKS 4.0 Report

Tank Paint Solar Absorptance (Shell):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,400.5355
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0419
Daily Vapor Temperature Range (deg. R):	23.7125
Daily Vapor Pressure Range (psia):	0.0022
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0051
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0041
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0062
Daily Avg. Liquid Surface Temp. (deg R):	512.4830
Daily Min. Liquid Surface Temp. (deg R):	506.5548
Daily Max. Liquid Surface Temp. (deg R):	518.4111
Daily Ambient Temp. Range (deg. R):	23.6750
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9992
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0051
Vapor Space Outage (ft):	3.0000
Working Losses (lb):	1.5148
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0051
Annual Net Throughput (gal/yr.):	130,000.0000
Annual Turnovers:	52.0000
Turnover Factor:	0.7436
Tank Diameter (ft):	6.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	2.0090

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

2,500 gallon diesel storage tank - Horizontal Tank
Boise, Idaho

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	1.51	0.49	2.01

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Landmark Gasoline Tanks #3

TANKS 4.0 Report

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	2,500 gallon gasoline tank
City:	Boise
State:	Idaho
Company:	Midas Gold
Type of Tank:	Horizontal Tank
Description:	Midas Gold Landmark facility gasoline tank

Tank Dimensions

Shell Length (ft):		15.00
Diameter (ft):		6.00
Volume (gallons):		2,500.00
Turnovers:		52.00
Net Throughput(gal/yr):		130,000.00
Is Tank Heated (y/n):	N	
Is Tank Underground (y/n):	N	

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Boise, Idaho (Avg Atmospheric Pressure = 13.28 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

2,500 gallon gasoline tank - Horizontal Tank
Boise, Idaho

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 9)	All	52.81	46.88	58.74	50.94	3.9950	3.5384	4.4980	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

2,500 gallon gasoline tank - Horizontal Tank
Boise, Idaho

Annual Emission Calcaulations	
Standing Losses (lb):	420.0911
Vapor Space Volume (cu ft):	270.1369
Vapor Density (lb/cu ft):	0.0487
Vapor Space Expansion Factor:	0.1431
Vented Vapor Saturation Factor:	0.6115
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	270.1369
Tank Diameter (ft):	6.0000
Effective Diameter (ft):	10.7075
Vapor Space Outage (ft):	3.0000
Tank Shell Length (ft):	15.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0487
Vapor Molecular Weight (lb/lb-mole):	67.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.9950
Daily Avg. Liquid Surface Temp. (deg. R):	512.4830
Daily Average Ambient Temp. (deg. F):	50.9208
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	510.6109

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Landmark Gasoline Tanks #3 - continued

TANKS 4.0 Report

Tank Paint Solar Absorptance (Shell):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,400.5355
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.1431
Daily Vapor Temperature Range (deg. R):	23.7125
Daily Vapor Pressure Range (psia):	0.9596
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.9950
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	3.5364
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	4.4980
Daily Avg. Liquid Surface Temp. (deg R):	512.4600
Daily Min. Liquid Surface Temp. (deg R):	506.5548
Daily Max. Liquid Surface Temp. (deg R):	518.4111
Daily Ambient Temp. Range (deg. R):	23.6750
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.6115
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.9950
Vapor Space Outage (ft):	3.0000
Working Losses (lb):	616.0556
Vapor Molecular Weight (lb/lb-mole):	67.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.9950
Annual Net Throughput (gal/yr.):	130,000.0000
Annual Turnovers:	52.0000
Turnover Factor:	0.7436
Tank Diameter (ft):	6.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	1,036.1467

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

2,500 gallon gasoline tank - Horizontal Tank
Boise, Idaho

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 9)	616.06	420.09	1,036.15

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Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: E. Memon
	PROJECT NO: 335-	PAGE: 1 OF: 31 SHEET: Mine
AIR EMISSION CALCULATIONS	SUBJECT: Mining Activity and Emissions	DATE: October 10, 2018

Mining Year 4

Mining Activity and Emissions Emissions Summary

By Area/Model ID

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	CO_PPH	CO_TPY	NOX_PPH	NOX_TPY	SO2_PPH	SO2_TPY	VOC_TPY	Hg2+P_TPY
Area/	Location of	PM	PM10		PM2.5		CO		NOX		SO2		VOC	Hg2+P
Model ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr	ton/yr
YPP	Yellow Pine Pit	65.17	192.48	34.17	16.62	2.95	11.31	48.16	17.16	73.10	0.04	0.18	3.17	3.8E-05
HFP	Hangar Flats Pit	3.08	8.88	1.58	0.92	0.16	0.95	4.06	1.21	5.16	0.00	0.01	0.24	1.8E-06
WEP	West End Pit	3.57	10.32	1.83	0.99	0.18	0.93	3.94	1.17	4.98	0.00	0.01	0.24	2.1E-06
BT	Bradley Tailings	0.09	0.30	0.05	0.11	0.02	0.19	0.83	0.30	1.27	0.00	0.00	0.05	4.4E-08
YPPBL	Yellow Pine Pit Blasting	53.26	151.76	27.70	8.76	1.60	64.96	284.52	1.75	7.64	0.00	0.02	--	3.2E-05
HFPBL	Hangar Flats Pit Blasting	2.23	6.36	1.16	0.37	0.07	2.82	12.33	0.08	0.33	0.00	0.00	--	1.3E-06
WEPBL	West End Pit Blasting	2.71	7.72	1.41	0.45	0.08	3.37	14.76	0.09	0.40	0.00	0.00	--	1.6E-06
BTBL	Bradley Tailings Blastin	--	--	--	--	--	--	--	--	--	--	--	--	--
PC	Process PC	--	--	--	--	--	--	--	--	--	--	--	--	--
STKP	PC Stockpile	--	--	--	--	--	--	--	--	--	--	--	--	--
FDRSF	Fiddle DRSF	56.07	68.47	12.15	33.17	5.89	6.63	28.26	0.96	4.10	0.01	0.05	2.47	3.4E-05
HFDRSF	Hangar Flats DRSF	19.35	23.63	4.19	11.45	2.03	2.29	9.75	0.33	1.41	0.00	0.02	0.85	1.2E-05
YPDRSF	Yellow Pine DRSF	--	--	--	--	--	--	--	--	--	--	--	--	--
WEDRSF	West End DRSF	2.16	2.64	0.47	1.28	0.23	0.26	1.09	0.04	0.16	0.00	0.00	0.10	1.3E-06
PROC	Process Area	0.33	0.86	0.15	0.39	0.07	1.90	8.10	1.14	4.88	0.00	0.01	2.80	1.7E-07
HR	Onsite Hauling	813.63	1,146.00	203.42	126.96	22.53	24.21	103.15	51.46	219.21	0.13	0.57	8.33	4.9E-04
ACCRD	Access Roads	113.18	163.62	29.04	17.36	3.08	1.24	5.28	1.15	4.91	0.00	0.01	0.61	6.7E-05
HELI	Heliport	0.00	0.17	0.00	0.17	0.00	1.04	0.02	0.83	0.02	0.08	0.00	0.03	--
Total		1,134.84	1,783.21	317.32	218.98	38.89	122.09	524.26	77.67	327.58	0.29	0.89	18.89	6.8E-04

See worksheet ROADS for haul road (HR) emissions by Model ID.

By Activity

	chk	chk	chk	chk	chk	chk	chk	chk	chk	chk	chk	chk	chk
	PM	PM10		PM2.5		CO		NOX		SO2		VOC	Hg2+P
Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr	ton/yr
Open Pit Drilling	65.32	191.36	33.97	11.04	1.96								3.9E-05
Open Pit Blasting	58.20	165.84	30.27	9.57	1.75	71.14	311.61	1.91	8.37	0.00	0.02		3.5E-05
Onsite Hauling	746.19	1,033.05	183.37	103.30	18.34								4.5E-04
Material Load / Unload	8.10	21.59	3.83	3.27	0.58								4.9E-06
Mobile Tailpipes	4.75	26.78	4.75	20.71	3.68	46.77	199.24	71.87	306.16	0.20	0.84	17.82	
Dozing	71.16	76.58	13.59	42.09	7.47								4.3E-05
Grading	17.66	29.86	5.30	3.09	0.55								1.1E-05
Water Truck Travel	46.44	64.29	11.41	6.43	1.14								2.8E-05
Access Roads	113.18	163.62	29.04	17.36	3.08	1.24	5.28	1.15	4.91	0.00	0.01	0.61	6.7E-05
Wind Erosion	2.61	7.35	1.30	1.10	0.20								1.6E-06
Surface Exploration	1.21	2.73	0.48	0.86	0.15	1.90	8.11	1.90	8.11	0.00	0.02	0.44	6.7E-07
Helicopter	0.00	0.17	0.00	0.17	0.00	1.04	0.02	0.83	0.02	0.08	0.00	0.03	
TSF Construction	--	--	--	--	--								--
Total	1,134.84	1,783.21	317.32	218.98	38.89	122.09	524.26	77.67	327.58	0.29	0.89	18.89	0.0007
													0.0007
													chk-19

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: E. Memon
	PROJECT NO: 335-1-2	PAGE: 2 OF: 31 SHEET: Mine
AIR EMISSION CALCULATIONS	SUBJECT: Mining Activity and Emissions	DATE: October 10, 2018

Mining Year 4

Mining Activity and Emissions Source Parameters Summary

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	SIG_Y_M	SIG_Z_M	PITVOL_M3	SXINIT_M	SYINIT_M	ANGL_DEG
Model ID	Location of Activity	Source Type	UTM NAD 83 E m	UTM NAD 83 N m	Elev. m	Rel. Ht. m	S-y m	S-z m	Pit Vol. m^3	Len X m	Len Y m	Angle deg
YPP	Yellow Pine Pit	AREA	631,160	4,975,865	1,832	5.3		4.9		882	882	-8
HFP	Hangar Flats Pit	AREA	630,925	4,972,884	1,993	5.3		4.9		491.0	491.0	-
WEP	West End Pit	AREA	632,398	4,976,290	2,192	5.3		4.9		376.2	376.2	-
BT	Bradley Tailings	AREA	628,496	4,971,000	2,097	5.3		4.9		1,157	1,157	-
YPPBL	Yellow Pine Pit Blasting	VOLUME	631,471	4,976,374	1,717	75.0	20.9	34.9				
HFPBL	Hangar Flats Pit Blasting	VOLUME	631,171	4,973,129	1,891	75.0	20.9	34.9				
WEPBL	West End Pit Blasting	VOLUME	632,586	4,976,478	1,994	75.0	20.9	34.9				
STKP	PC Stockpile	VOLUME	632,087	4,974,600	1,980	5.3	53.3	4.9				
FDRSF	Fiddle DRSF	VOLUME	630,981	4,974,903	2,115	5.3	180.2	4.9				
HFDRSF	Hangar Flats DRSF	VOLUME	630,158	4,972,124	2,080	5.3	174.8	4.9				
YPDRSF	Yellow Pine DRSF	VOLUME	631,491	4,976,383	1,904	5.3	182.2	4.9				
WEDRSF	West End DRSF	VOLUME	633,392	4,976,207	2,376	5.3	124.1	4.9				
PROC	Process Area	AREA	631,880	4,973,910	1,970	2.2		2.1		400	400	0
HR	Onsite Hauling	VOLUME	See worksheet: ROADS			5.3	15.1	4.9	-	-	-	-
ACCRD	Access Roads	VOLUME	See worksheet: HR Grid			3.0	5.6	2.8	-	-	-	-
HELI	Heliport	VOLUME	632,222	4,973,588	1,996	3.4	9.1	3.2				

Updat

Emissions by LOM (ton/yr) Calculated on: 10/10/18

	LOM	PM	PM10		PM2.5		CO		NOX		SO2		VOC
PM10+SO2+NOX	Year	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr
ton/yr	PP	418.8	670.1	109.8	113.2	19.2	74.5	210.6	43.3	178.3	0.2	0.5	14.2
419	1	826.9	1,280.2	223.0	163.6	28.8	89.6	322.3	47.0	195.2	0.2	0.6	15.5
582	2	1,026.4	1,611.3	281.2	211.0	36.5	103.2	406.8	71.5	300.2	0.3	0.8	17.7
605	3	1,062.4	1,678.2	297.3	209.4	36.8	111.5	478.3	72.8	306.7	0.3	0.8	18.1
646	**4**	**1,134.8**	**1,783.2**	**317.3**	**219.0**	**38.9**	**122.1**	**524.3**	**77.7**	**327.6**	**0.3**	**0.9**	**18.9**
604	5	1,021.6	1,611.6	285.5	199.9	35.1	109.9	471.4	75.4	317.8	0.3	0.8	18.2
634	6	1,105.5	1,733.3	308.4	198.6	35.3	111.1	476.6	76.9	324.5	0.3	0.9	17.8
565	7	1,022.0	1,617.2	287.8	185.0	32.9	107.8	462.6	65.6	276.2	0.3	0.7	16.6
596	8	1,095.1	1,736.4	309.0	195.9	34.8	114.1	490.1	68.0	286.5	0.3	0.8	16.8
589	9	1,077.5	1,692.8	301.2	193.4	34.3	110.2	473.0	68.1	286.8	0.3	0.8	17.3
545	10	1,030.5	1,610.9	286.6	185.1	32.9	103.2	442.4	61.2	257.3	0.2	0.7	16.6
380	11	679.4	1,110.9	191.7	127.4	22.3	90.7	316.0	45.4	188.1	0.2	0.5	13.8
185	12	382.8	634.3	107.2	70.5	12.2	58.7	157.2	19.6	77.7	0.1	0.2	6.8
		chk	chk	chk	chk	chk	chk	chk	chk	chk	chk	chk	chk

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Mining Year 4

Open Pit Drilling

Activity Information

Operating schedule	355	day/yr	*(M3 2014)*
Total drill holes per year	100,492	hole/yr	*(Midas Gold 2018l)*

	Annual LOM-4 rates	Material blasted			Drilling[1]	
YPP	Yellow Pine Pit	41,848,916	ton/yr	*(Midas Gold 2017b)*	91,885	hole/yr
HFP	Hangar Flats Pit	1,783,712	ton/yr	*(Midas Gold 2017b)*	3,917	hole/yr
WE	West End Pit	2,136,599	ton/yr	*(Midas Gold 2017b)*	4,692	hole/yr
BT_	Bradley Tailings	0	ton/yr	*(Midas Gold 2017b)*	0	hole/yr
	Total	45,769,227	ton/yr		100,494	hole/yr

(1) *Total drill holes per year scaled based on material blasted; rounded up to the nearest whole number*

Emission Factors

TSP (PM)	1.3	lb/hole	*AP-42, Tab. 11.9-4, 7/98 (overburden)*

PM Scaling Factors

PM	1	
PM10	0.52	*AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)*
PM2.5	0.03	*AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)*

Emissions by Model ID

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	Hg2+P_TPY
	Location of	PM	PM10		PM2.5		Hg2+P
Model ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
YPP	Yellow Pine Pit	59.73	174.97	31.06	10.09	1.79	3.6E-05
HFP	Hangar Flats Pit	2.55	7.46	1.32	0.43	0.08	1.5E-06
WEP	West End Pit	3.05	8.93	1.59	0.52	0.09	1.8E-06
BT	Bradley Tailings	--	--	--	--	--	--
Total	Open Pit Drilling	65.32	191.36	33.97	11.04	1.96	3.9E-05

Source Parameters[1]

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	PITVOL_M3	SXINIT_M	SYINIT_M	SIG_Z_M	ANGL_DEG	Area
		Source	UTM NAD 83		Elev.	Rel. Ht.	Pit Vol.	Len X	Len Y	S-z	Angle	
Model ID	Activity	Type	E m	N m	m	m	m^3	m	m	m	deg	
YPP	Yellow Pine Pit	AREA	631,160	4,975,865	1,832	5.32		882.0	882.0	4.95	-8.0	777906
HFP	Hangar Flats Pit	AREA	630,925	4,972,884	1,993	5.32		491.0	491.0	4.95	0.0	241069
WEP	West End Pit	AREA	632,398	4,976,290	2,192	5.32		376.2	376.2	4.95	0.0	141544

(1) *UTM - (Midas Gold 2017e); Rel. Ht. - (EPA 2012); Len X, Len Y, Angle - best-fit equal area rectangle; Elev. - (Midas Gold 2018n)*

Source Parameters[1]

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M		SXINIT_M	SYINIT_M	SIG_Z_M	ANGL_DEG	
		Source	UTM NAD 83		Elev.	Rel. Ht.	Pit Vol.	Len X	Len Y	S-z	Angle	
Model ID	Activity	Type	E m	N m	m	m	m^3	m	m	m	deg	
BT	Bradley Tailings	AREA	628,496	4,971,000	2,097	5.32		1,157	1,157	4.95	0.0	1338158

(1) *UTM, Elev. - (Midas Gold 2017e); Rel. Ht. - (EPA 2012); Len X, Len Y - best-fit equal area rectangle*

Conversions

2,000 lb/ton

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Mining Year 4

Open Pit Blasting

Activity Information

Operating schedule		365 day/yr	24 hr/day
BLS	Blast area	80,360 ft^2/blast	*(Midas Gold 2017b)*
TOT	Maximum blasts per year	365 blast/yr	*(Midas Gold 2017b)*

	Annual LOM-4 rates	Material blasted	Blasting[1]	ANFO use	
YPP	Yellow Pine Pit	41,848,916 ton/yr	334 blast/yr	8,493 ton ANFO/yr	*(Midas Gold 2017b)*
HFP	Hangar Flats Pit	1,783,712 ton/yr	14 blast/yr	368 ton ANFO/yr	*(Midas Gold 2017b)*
WE	West End Pit	2,136,599 ton/yr	17 blast/yr	440 ton ANFO/yr	*(Midas Gold 2017b)*
BT_	Bradley Tailings	0 ton/yr	0 blast/yr	0 ton ANFO/yr	*(Midas Gold 2017b)*
	Total	45,769,227 ton/yr	365 blast/yr	9,302 ton ANFO/yr	

(1) *Maximum blasts per year scaled based on material blasted; rounded up to the nearest whole number*

Emission Factors

Emission factor equation		TSP (lb/blast) = 0.000014 x A$^{1.5}$	*AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)*
A = Area per blast		80,360 ft^2	
TSP (PM)		318.92 lb/blast	
CO		67 lb/ton-ANFO	*AP-42, Tab. 13.3-1, 2/80 (ANFO)*
NOX		0.9 kg/t-ANFO	*(Attalla et al. 2008)*
		1.8 lb/ton-ANFO	
SO2	3.6E-03 lb/ton-ANFO	*Based on:*	6% *diesel content in ANFO* *(Midas Gold 2017d)*

$$\frac{1.5E\text{-}05\ \cancel{\text{lb S}}}{\cancel{\text{lb FO}}} \times \frac{2\ \text{lb SO2}}{\cancel{\text{lb S}}} \times \frac{6\%\ \cancel{\text{lb FO}}}{\cancel{\text{lb ANFO}}} \times \frac{2{,}000\ \cancel{\text{lb ANF}}}{\text{ton ANFO}} = \frac{3.6E\text{-}03\ \text{lb SO2}}{\text{ton ANFO}}$$

PM Scaling Factors

PM10	0.52	*AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)*
PM2.5	0.03	*AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)*

Emissions by Model ID

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	CO_PPH	CO_TPY	NOX_PPH	NOX_TPY	SO2_PPH	SO2_TPY	Hg2+P_TPY
		PM	PM10		PM2.5		CO		NOX[1]		SO2		Hg2+P
Model ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr
YPPBL	Yellow Pine Pit Blasting	53.26	151.76	27.70	8.76	1.60	64.96	284.52	1.75	7.64	0.0035	0.0153	3.2E-05
HFPBL	Hangar Flats Pit Blasting	2.23	6.36	1.16	0.37	0.07	2.82	12.33	0.08	0.33	0.0002	0.0007	1.3E-06
WEPBL	West End Pit Blasting	2.71	7.72	1.41	0.45	0.08	3.37	14.76	0.09	0.40	0.0002	0.0008	1.6E-06
BTBL	Bradley Tailings Blasting	--	--	--	--	--	--	--	--	--	--	--	0
Total	Open Pit Blasting	58.20	165.84	30.27	9.57	1.75	71.14	311.61	1.91	8.37	0.0038	0.0167	3.5E-05

(1) *NO2 / NOX:* 0.0357 *(Attalla et al. 2008)*

Source Parameters[1]

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	SIG_Y_M	SIG_Z_M
		Source	UTM NAD 83		Elev.	Rel. Ht.	S-y	S-z
Model ID	Activity	Type	E m	N m	m	m	m	m
YPPBL	Yellow Pine Pit Blasting	VOLUME	631,471	4,976,374	1,717	75	20.93	34.88
HFPBL	Hangar Flats Pit Blasting	VOLUME	631,171	4,973,129	1,891	75	20.93	34.88
WEPBL	West End Pit Blasting	VOLUME	632,586	4,976,478	1,994	75	20.93	34.88

(1) *UTM, Elev. - (Midas Gold 2017e); Rel. Ht. - (Attalla et al. 2008); S-y, S-z factors - (EPA 2016a)*

Conversions								
2,000 lb/ton	Blast height (BH)	150 m	*(Attalla et al. 2008)*	Sigma divider				
2.205 lb/kg	Blast width	90 m	*(Attalla et al. 2008)*	Rel. Ht.	2	of BH	*(EPA 2016a)*	
1.102 ton/t	Blast depth	90 m	*(Attalla et al. 2008)*	S-y	4.3	of SL	*(EPA 2016a)*	
	Equal area side length (SL)	90 m		S-z	4.3	of BH	*(EPA 2016a)*	

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Mining Year 4
Onsite Hauling

Ore_Waste
Equipment
MachineSpecs

Activity Information
Operating schedule 355 day/yr

Hauling Routes, Production Rates and Distances

Route Origin		Destination		Material Hauled [1] Material Type	Rate ton/yr	One-Way Hauling [2] mi	Truck Loads [3] load/yr	Total Travel [4] VMT/yr
Unpaved Roads								
YPP- Yellow Pine Pit	YPP	Process PC	PC	Ore	7,230,000	1.84	38,905	143,473
YPP- Yellow Pine Pit	YPP	PC Stockpile	STKP	Ore	--	1.80	--	--
YPP- Yellow Pine Pit	YPP	Fiddle DRSF	FDRSF	Rock	24,536,460	2.81	132,029	741,699
YPP- Yellow Pine Pit	YPP	Hangar Flats DRSF	HFDRSF	Rock	6,920,540	4.76	37,239	354,434
YPP- Yellow Pine Pit	YPP	Yellow Pine DRSF	YPDRSF	Rock	--		--	-- YPP-
Yellow Pine Pit	YPP	West End DRSF	WEDRSF	Rock	--		--	-- HFP-
Hangar Flats Pit	HFP	Process PC	PC	Ore	160,000	3.16	861	5,445
HFP- Hangar Flats Pit	HFP	PC Stockpile	STKP	Ore	--	3.12	--	-- HFP-
Hangar Flats Pit	HFP	Fiddle DRSF	FDRSF	Rock	--	4.83	--	-- HFP-
Hangar Flats Pit	HFP	Hangar Flats DRSF	HFDRSF	Rock	1,547,000	2.83	8,325	47,095
HFP- Hangar Flats Pit	HFP	Yellow Pine DRSF	YPDRSF	Rock	--	3.72	--	-- HFP-
Hangar Flats Pit	HFP	West End DRSF	WEDRSF	Rock	--	7.42	--	-- WEP
West End Pit	WEP	Process PC	PC	Ore	660,000	2.68	3,552	19,024
WEP West End Pit	WEP	PC Stockpile	STKP	Ore	--	2.63	--	-- WEP
West End Pit	WEP	Fiddle DRSF	FDRSF	Rock	--	4.43	--	-- WEP
West End Pit	WEP	Hangar Flats DRSF	HFDRSF	Rock	--	6.49	--	-- WEP
West End Pit	WEP	Yellow Pine DRSF	YPDRSF	Rock	--	2.75	--	-- WEP
West End Pit	WEP	West End DRSF	WEDRSF	Rock	946,000	3.07	5,091	31,249
BT-P Bradley Tailings	BT	Process PC	PC	Ore	692,000	3.87	3,724	28,850
BT-S Bradley Tailings	BT	PC Stockpile	STKP	Ore	--		--	--
BT-F Bradley Tailings	BT	Fiddle DRSF	FDRSF	Rock	--		--	--
BT-H Bradley Tailings	BT	Hangar Flats DRSF	HFDRSF	Rock	--	0.63	--	--
BT-Y Bradley Tailings	BT	Yellow Pine DRSF	YPDRSF	Rock	--		--	--
BT-W Bradley Tailings	BT	West End DRSF	WEDRSF	Rock	--		--	--
Total					42,692,000			1,371,269

(1) *(Midas Gold 2017b)*
(2) *(Midas Gold 2017e)*
(3) *See truck fleet information below.*
(4) *Truck loads × One-way hauling* ×2 *(round-trip)*

Truck Fleet

Truck		Payload Capacity [1] ton	Empty Weight [1] ton	Operation [2] hr/yr	Average Weight ton
Hau	Cat 789G	201.8	155.7	126,582	256.6
AD	Cat 740B	43.5	37.6	14,191	59.4
Weighted Average		185.8			236.7

(1) *(Caterpillar 2016c); Model Specs*
(2) *(Midas Gold 2017b)*

Conversions
2,000 lb/ton

Mining Year 4
Onsite Hauling - continued

Hauling Emissions by Route

Route Origin		Destination		Material Hauled Material Type	PM_TPY PM ton/yr	PM10_PPD PM10 lb/day	PM10_TPY PM10 ton/yr	PM2.5_PPD PM2.5 lb/day	PM2.5_TPY PM2.5 ton/yr	Hg2+P_TPY Hg2+P ton/yr
Unpaved Roads										
YPP-Yellow Pine Pit	YPP	Process PC	PC	Ore	78.07	108.09	19.19	10.81	1.92	4.7E-05
YPP-Yellow Pine Pit	YPP	PC Stockpile	STKP	Ore	--	--	--	--	--	--
YPP-Yellow Pine Pit	YPP	Fiddle DRSF	FDRSF	Rock	403.60	558.76	99.18	55.88	9.92	2.4E-04
YPP-Yellow Pine Pit	YPP	Hangar Flats DRSF	HFDRSF	Rock	192.87	267.01	47.39	26.70	4.74	1.2E-04
YPP-Yellow Pine Pit	YPP	Yellow Pine DRSF	YPDRSF	Rock	--	--	--	--	--	--
YPP-Yellow Pine Pit	YPP	West End DRSF	WEDRSF	Rock	--	--	--	--	--	--
HFP Hangar Flats Pit	HFP	Process PC	PC	Ore	2.96	4.10	0.73	0.41	0.07	1.8E-06
HFP Hangar Flats Pit	HFP	PC Stockpile	STKP	Ore	--	--	--	--	--	--
HFP Hangar Flats Pit	HFP	Fiddle DRSF	FDRSF	Rock	--	--	--	--	--	--
HFP Hangar Flats Pit	HFP	Hangar Flats DRSF	HFDRSF	Rock	25.63	35.48	6.30	3.55	0.63	1.5E-05
HFP Hangar Flats Pit	HFP	Yellow Pine DRSF	YPDRSF	Rock	--	--	--	--	--	--
HFP Hangar Flats Pit	HFP	West End DRSF	WEDRSF	Rock	--	--	--	--	--	--
WEP West End Pit	WEP	Process PC	PC	Ore	10.35	14.33	2.54	1.43	0.25	6.2E-06
WEP West End Pit	WEP	PC Stockpile	STKP	Ore	--	--	--	--	--	--
WEP West End Pit	WEP	Fiddle DRSF	FDRSF	Rock	--	--	--	--	--	--
WEP West End Pit	WEP	Hangar Flats DRSF	HFDRSF	Rock	--	--	--	--	--	--
WEP West End Pit	WEP	Yellow Pine DRSF	YPDRSF	Rock	--	--	--	--	--	--
WEP West End Pit	WEP	West End DRSF	WEDRSF	Rock	17.00	23.54	4.18	2.35	0.42	1.0E-05
BT-P Bradley Tailings	BT	Process PC	PC	Ore	15.70	21.73	3.86	2.17	0.39	9.4E-06
BT-S Bradley Tailings	BT	PC Stockpile	STKP	Ore	--	--	--	--	--	--
BT-F Bradley Tailings	BT	Fiddle DRSF	FDRSF	Rock	--	--	--	--	--	--
BT-H Bradley Tailings	BT	Hangar Flats DRSF	HFDRSF	Rock	--	--	--	--	--	--
BT-Y Bradley Tailings	BT	Yellow Pine DRSF	YPDRSF	Rock	--	--	--	--	--	--
BT-W Bradley Tailings	BT	West End DRSF	WEDRSF	Rock	--	--	--	--	--	--
Pit Subtotal					746.19	1,033.05	183.37	103.30	18.34	4.5E-04

Emission Factors

Unpaved roads

Emission factor equation	$E = k(s/12)^a (W/3)^b [(365-P)/365]$		*AP-42, Sec. 13.2.2, Eq. 1a, 11/06*
s = Surface material silt content	4 %		*(Midas Gold 2015)*
W = Mean vehicle weight	236.7 ton		
P = Days/year with ≥0.01 in preci	120 day/yr		*AP-42 Fig. 13.2.2-1, 11/06*

	PM	PM10	PM2.5		
k = Size-specific empirical constan	4.9	1.5	0.15		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
a = Size-specific empirical constan	0.7	0.9	0.9		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
b = Size-specific empirical constan	0.45	0.45	0.45		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
E = Size-specific emission factor	10.88	2.67	0.27	lb/VMT	

Emission Controls

Unpaved roads - periodic application of water and chemical dust suppressant
Control efficiency 90% *(Air Sciences 2018)*

Mining Year 4
Onsite Hauling - continued

Emissions by Area

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	Hg2+P_TPY
		PM	PM10		PM2.5		Hg2+P
Area ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
HR	Onsite Hauling	746.19	1,033.05	183.37	103.30	18.34	4.5E-04

See worksheet ROADS for haul road (HR) emissions by Model ID.

Source Parameters[1]

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	SIG_Y_M	SIG_Z_M
		Source	UTM NAD 83		Elev.	Rel. Ht.	S-y	S-z
Model ID	Activity	Type	E m	N m	m	m	m	m
HR	Onsite Hauling	VOLUME	*See worksheet: ROADS*			5.32	15.14	4.95

[1] *UTM, Elev. - (Midas Gold 2017e); Rel. Ht., Sy, Sz - (EPA 2012)*

Truck	Height	Reference
Cat 789G	6.5 m	*(Caterpillar 2016c)*
Cat 740B	4.1 m	*Model Specs*
Weighted	6.26 m	
Road width (RW)	26.5 m	*(Midas Gold 2016), Fig. 9-1*

Plume Parameter	Calculation	Value (m)	Const.
Plume top (PT) - unpaved	1.7 x VH	10.63	1.7
Release height - unpaved	0.5 x PT	5.32	0.5
Plume width (PW)	RW + 6 m	32.55	6
Sigma-z - unpaved	PT / 2.15	4.95	2.15
Sigma-y	PW / 2.15	15.14	2.15

(EPA 2012)

Conversions
2,000 lb/ton
3.28 ft/m
12 in/ft

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Mining Year 4

Material Load/Unload

Activity Information

Operating schedule 355 day/yr

Throughput Rates chk

Model ID	Location of Activity	No. of Xfers	Rate ton/yr	Total Rate ton/yr	Xfer Description
YPP	Yellow Pine Pit	1	38,687,000	38,687,000	Load
HFP	Hangar Flats Pit	1	1,707,000	1,707,000	Load
WEP	West End Pit	1	1,606,000	1,606,000	Load
BT	Bradley Tailings	1	692,000	692,000	Load
PC	Process PC (1)	0	8,742,000	0	Unload
STKP	PC Stockpile	2	0	0	Unload & Reload
FDRSF	Fiddle DRSF	1	24,536,460	24,536,460	Unload
HFDRSF	Hangar Flats DRSF	1	8,467,540	8,467,540	Unload
YPDRSF	Yellow Pine DRSF	1	0	0	Unload
WEDRSF	West End DRSF	1	946,000	946,000	Unload

(1) *Ore unloading at primary crusher is accounted for in process sources*

Emission Factors

	PM	PM10	PM2.5		
k = Particle size multiplier	0.74	0.35	0.053		*AP-42, Sec. 13.2.4, Pg. 4, 11/06*
E = Emission facto Load	0.00021	0.0001	0.000015	lb/ton	*AP-42, Tab. 11.19.2-2, 8/04 (truck loading - crshed stone)*
Unload	0.00003	0.000016	0.0000024	lb/ton	*AP-42, Tab. 11.19.2-2, 8/04 (truck unloading - fragmented stone)*

Emissions by Model ID

		chk	PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	Hg2+P_TPY
	Location of	Total Rate	PM	PM10		PM2.5		Hg2+P
~~Model ID~~	~~Activity~~	~~ton/yr~~	~~ton/yr~~	~~lb/day~~	~~ton/yr~~	~~lb/day~~	~~ton/yr~~	~~ton/yr~~
YPP	Yellow Pine Pit	38,687,000	4.09	10.90	1.93	1.65	0.29	2.5E-06
HFP	Hangar Flats Pit	1,707,000	0.18	0.48	0.09	0.07	0.01	1.1E-07
WEP	West End Pit	1,606,000	0.17	0.45	0.08	0.07	0.01	1.0E-07
BT	Bradley Tailings	692,000	0.07	0.19	0.03	0.03	0.01	4.4E-08
PC	Process PC	--	--	--	--	--	--	--
STKP	PC Stockpile	--	--	--	--	--	--	--
FDRSF	Fiddle DRSF	24,536,460	2.59	6.91	1.23	1.05	0.19	1.6E-06
HFDRSF	Hangar Flats DRSF	8,467,540	0.90	2.39	0.42	0.36	0.06	5.4E-07
YPDRSF	Yellow Pine DRSF	--	--	--	--	--	--	--
~~WEDRSF~~	~~West End DRSF~~	~~946,000~~	~~0.10~~	~~0.27~~	~~0.05~~	~~0.04~~	~~0.01~~	~~6.0E-08~~
Total	Material Load / Unload	76,642,000	8.10	21.59	3.83	3.27	0.58	4.9E-06

Conversions

2.237 mi/hr per m/s

2,000 lb/ton

Mining Year 4

Material Load / Unload -continued

Source Parameters		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	PITVOL_M3	SXINIT_M	SYINIT_M	SIG_Z_M	NGL_DEG	
	Location of	Source	UTM NAD 83		Elev.	Rel. Ht.	Pit Vol.	Len X	Len Y	S-z	Angle	
Model ID	Activity	Type	E m	N m	m	m	m^3	m	m	m	deg	
YPP	Yellow Pine Pit	AREA	631,160	4,975,865	1,832	5.32		882	882	4.95	-8	Pits
HFP	Hangar Flats Pit	AREA	630,925	4,972,884	1,993	5.32		491	491	4.95	0	Pits
WEP	West End Pit	AREA	632,398	4,976,290	2,192	5.32		376	376	4.95	0	Pits
BT	Bradley Tailings	AREA	628,496	4,971,000	2,097	5.32		1,157	1,157	4.95	0	

Source Parameters[1]		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	SIG_Y_M	SIG_Z_M	Surface		
	Location of	Source	UTM NAD 83		Elev.	Rel. Ht.	S-y	S-z	Area	Length	
Model ID	Activity	Type	E m	N m	m	m	m	m	m^2	m	
STKP	PC Stockpile	VOLUME	632,087	4,974,600	1,980	5.32	53.35	4.95	5.26E+04	229.4	Stockpile
FDRSF	Fiddle DRSF	VOLUME	630,981	4,974,903	2,115	5.32	180.22	4.95	6.01E+05	774.9	DRSF
HFDRSF	Hangar Flats DRSF	VOLUME	630,158	4,972,124	2,080	5.32	174.81	4.95	5.65E+05	751.7	DRSF
YPDRSF	Yellow Pine DRSF	VOLUME	631,491	4,976,383	1,904	5.32	182.21	4.95	6.14E+05	783.5	DRSF
WEDRSF	West End DRSF	VOLUME	633,392	4,976,207	2,376	5.32	124.05	4.95	2.85E+05	533.4	DRSF

[1] *UTM, Elev., Area - (Midas Gold 2017e); Rel. Ht. - (EPA 2012); S-y, S-z factors - (EPA 2016a)*

Vehicle height (VH):
Weighted Average 6.26 m

Plume Parameter	Calculation	Value (m)	Const.
Plume top (PT)	1.7 x VH	10.63	1.7
Release height	0.5 x PT	5.32	0.5
Sigma-z	PT / 2.15	4.95	2.15

(EPA 2012)

Sample calculation for PCStockpile

Plume Parameter	Calculation	Value (m)	Const.
Surface area (SA)	Map	52,623	
Side length (SL)	SA^0.5	229.4	0.5
Sigma-y	SL / 4.3	53.35	4.3

(EPA 2016a)

Mining Year 4

Mobile Equipment (Tailpipes)

Equipment MachineSpecs

Mobile Equipment Specifications and Activity

Equipment	Equipment[1] Model	ID	Rating[2] hp	Rating kW	Oper.[1] hr/yr	Equip.[1] Count	Diesel[1] gal/yr	Output[3] kW-hr/yr	Travel[4] VMT/yr	Equipment Category	On-road Class	gal/hp-hr
Production Drill	Cat MD6420	EQP1	800	597	33,507	5	402,084	5,868,276		Non-road		0.02
Production FEL	Cat 994H	EQP2	1,463	1,091	25,229	4	1,135,296	16,569,250		Non-road		0.03
Haul Truck	Cat 789G	EQP3	2,100	1,566	126,582	20	4,430,370	64,659,709		Non-road		0.02
Large Dozer	Cat D10T2	EQP4	600	447	31,646	5	601,265	8,775,246		Non-road		0.03
Small Dozer	Cat D6T	EQP5	200	149	4,468	1	31,273	456,421		Non-road		0.04
Grader	Cat 16M	EQP6	326	243	12,614	3	69,379	1,012,565		Non-road		0.02
Water Truck	Cat 777D	EQP7	1,000	746	7,446	2	186,150	2,716,795		Non-road		0.03
Support FEL	Cat 988K	EQP8	580	433	3,723	1	42,815	624,863		Non-road		0.02
ADT	Cat 740B	EQP9	484	361	14,191	3	127,721	1,864,041		Non-road		0.02
PreSplit Drill	Cat MD6240	EQP10	800	597	3,942	1	39,420	575,321		Non-road		0.01
Excavator	Cat 349	EQP11	408	304	10,424	2	104,244	1,521,405		Non-road		0.02
Blasthole Stemmer	F-650	EQP12	330	246	4,993	1	34,952	510,118	124,830	On-road	MHD	0.02
Blasters Flatbed Truck	F-650	EQP13	330	246	9,986	2	44,939	655,866	249,660	On-road	MHD	0.01
ANFO/Slurry Truck	Cat CT660	EQP14	476	355	4,993	1	39,946	582,992	99,864	On-road	HHD	0.02
Fuel Truck	CAT 740B	EQP15	484	361	7,490	1	149,796	2,186,221		Non-road		0.04
Lube Truck	CAT 740B	EQP16	484	361	6,658	1	133,152	1,943,307		Non-road		0.04
Flatbed Truck	F-350	EQP17	440	328	7,490	1	33,704	491,900	187,245	On-road	LHD45	0.01
Service Truck with Crane	F-650	EQP18	330	246	3,329	1	23,302	340,079	83,220	On-road	MHD	0.02
Crane Truck	F-650	EQP19	330	246	3,329	1	18,308	267,205	66,576	On-road	MHD	0.02
Cat 988 with Tire Handler	Cat 988K	EQP20	580	433	5,825	1	66,992	977,726		Non-road		0.02
Mechanics Truck	F-650	EQP21	330	246	14,147	2	63,663	929,144	353,685	On-road	MHD	0.01
Welding Truck	F-650	EQP22	330	246	7,074	1	31,832	464,572	176,843	On-road	MHD	0.01
Tractor & Lowboy	F-650	EQP23	330	246	2,497	1	17,476	255,059	37,449	On-road	MHD	0.02
Shop Forklift	CAT DP160N	EQP24	124	92	7,490	1	18,725	273,278		Non-road		0.02
RT Forklift	CAT DP35N	EQP25	47	35	7,490	1	33,704	491,900		Non-road		0.10
Crane - 80 Ton	TMS800E	EQP26	402	300	2,081	1	28,087	409,916		Non-road		0.03
Cat 430E Backhoe	CAT 430E	EQP27	101	75	4,993	1	24,966	364,370		Non-road		0.05
Man Van	F-350 (MV)	EQP28	440	328	19,973	4	29,959	437,244	499,320	On-road	LHD45	0.003
Pickup Truck	F-350	EQP29	440	328	33,288	5	33,288	485,827	832,200	On-road	LHD45	0.002
Light Plants	Terex AL5	EQP30	27	20	33,288	8	18,308	267,205		Non-road		0.02
Compactor	Cat CS76 XT	EQP31	177	132	6,329	1	33,228	484,948		Non-road		0.03

[1] *(Midas Gold 2017b)*

[2] *(Caterpillar 2016c)/Manufacturer specifications*

[3] *Based on:* 137,000 BTU/gal *AP-42, App. A (Diesel)* 7,000 BTU/hp-hr *AP-42, Sec. 3.3, (Diesel)*

[4] *Based on the following average speeds (mph):* *(Midas Gold 2018e)*

Blasthole Stemmer	*F-650*	*25*
Blasters Flatbed Truck	*F-650*	*25*
ANFO/Slurry Truck	*Cat CT660*	*20*
Flatbed Truck	*F-350*	*25*
Service Truck with Crane	*F-650*	*25*
Crane Truck	*F-650*	*20*
Mechanics Truck	*F-650*	*25*
Welding Truck	*F-650*	*25*
Tractor & Lowboy	*F-650*	*15*
Man Van	*F-350 (MV)*	*25*
Pickup Truck	*F-350*	*25*

VMT = Vehicle Miles Travelled

Conversions
1.341 hp/kW

[5] *On-road vehicle codes and descriptions provided in MOVES2014a emission factors table (EPA 2015)*

Mining Year 4

Mobile Equipment (Tailpipes)

Operating schedule 355 day/yr 24 hr/day

Equipment MachineSpecs

EPA Non-Road Standards

ID	Equipment Type	Model[1] Year	Power Category	EPA Tier	Lookup ID	MOVES Class ID	EPA Non-Road Standards (g/kW-hr)[2] PM	CO	NOX	VOC
EQP1	Drill	>2015	kW>560	4	T4-kW>560 2015		0.04	3.5	3.5	0.19
EQP2	Loader	≥2018	kW>560	4	T4-kW>560 2015		0.04	3.5	3.5	0.19
EQP3	Haul Truck	≥2018	kW>560	4	T4-kW>560 2015		0.04	3.5	3.5	0.19
EQP4	Dozer	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015		0.02	3.5	0.4	0.19
EQP5	Dozer	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015		0.02	3.5	0.4	0.19
EQP6	Grader	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015		0.02	3.5	0.4	0.19
EQP7	Water Truck	>2015	kW>560	4	T4-kW>560 2015		0.04	3.5	3.5	0.19
EQP8	Loader	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015		0.02	3.5	0.4	0.19
EQP9	Haul Truck	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015		0.02	3.5	0.4	0.19
EQP10	Drill	>2015	kW>560	4	T4-kW>560 2015		0.04	3.5	3.5	0.19
EQP11	Excavator	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015		0.02	3.5	0.4	0.19
EQP12	Blaster Truck	>2015	EQP13		No Standard	MHD				
Blaster Truck	>2015	EQP14	Blaster		No Standard	MHD				
Truck	>2015	EQP15	Support Truck		No Standard	HHD				
>2015	EQP16	Support Truck	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015		0.02	3.5	0.4	0.19
EQP17	Support Truck	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015		0.02	3.5	0.4	0.19
EQP18	Support Truck	>2015			No Standard	LHD45				
EQP19	Support Truck	>2015			No Standard	MHD				
EQP20	Support Truck	>2015			No Standard	MHD				
EQP21	Support Truck	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015		0.02	3.5	0.4	0.19
EQP22	Support Truck	>2015			No Standard	MHD				
EQP23	Support Truck	>2015			No Standard	MHD				
EQP24	Forklift	>2015			No Standard	MHD				
EQP25	Forklift	>2015	75≤kW<130, Ph-in	4	T4-56≤kW<130 2015		0.02	5	0.4	0.19
EQP26	Crane	>2015	19≤kW<37	4	T4-19≤kW<37 2015		0.03	5.5	4.7	4.7
EQP27	Backhoe	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015		0.02	3.5	0.4	0.19
EQP28	Support Truck	>2015	75≤kW<130, Ph-in	4	T4-56≤kW<130 2015		0.02	5	0.4	0.19
EQP29	Support Truck	>2015			No Standard	LHD45				
EQP30	Light Plant	>2015			No Standard	LHD45				
EQP31	Compactor	>2015	19≤kW<37	4	T4-19≤kW<37 2015		0.03	5.5	4.7	4.7
(Midas Gold 2017h)			130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015		0.02	3.5	0.4	0.19

(1) *(CFR 2018a)*

(2)

Mining Year 4

Mobile Equipment (Tailpipes) -continued

Fuel Sulfur-Content Based SO2 Emission Factor

Fuel Sulfur-Content	0.0015%	*Non-road diesel specification per 40 CFR 80.510*
Diesel Density	7.05 lb/gal	*AP-42, App. A*
Molecular Wt. of SO2	64.064 lb/lb-mol	
Molecular Wt. of S	32.065 lb/lb-mol	
Diesel Heat Content	137,000 BTU/gal	*AP-42, App. A (Diesel)*
Brake-Specific Fuel Use	7,000 BTU/hp-hr	*AP-42, Sec. 3.3, (Diesel)*

SO2 emission factor:

$$0.000011 \frac{\text{lb}}{\text{hp-hr}} = 0.0015\% \frac{\text{lb S}}{\text{lb Fuel}} \times 7.05 \frac{\text{lb Fuel}}{\text{gal Fuel}} \times 64.064 \frac{\text{lb SO2}}{\text{32.065 lb S}} \times \frac{\text{gal Fuel}}{137{,}000 \text{ BTU}} \times 7{,}000 \frac{\text{BTU}}{\text{hp-hr}}$$

$$0.006567 \frac{\text{g}}{\text{kW-hr}} = 0.000011 \frac{\text{lb}}{\text{hp-hr}} \times 1.341 \frac{\text{hp}}{\text{kW}} \times 453.593 \frac{\text{g}}{\text{lb}}$$

EPA MOVES 2014a Emission Factors[1]

Vehicle Class	Description	Emission Factor (g/VMT)[2] PM	PM10	PM2.5	CO	NOX	VOC	SO2
LHD<=10K	Passenger Truck 8.5k-10k lb, Diesel	0.178	0.178	0.086	1.322	2.281	0.241	0.006
LHD45	Single Unit Truck 14k-19.5k lb, Diesel	0.589	0.589	0.291	1.867	4.940	0.685	0.011
MHD	Single Unit Truck 19.5k-33k lb, Diesel	0.797	0.797	0.381	2.170	5.684	0.841	0.011
HHD	Single Unit Truck >33k lb, Diesel	1.169	1.169	0.461	2.313	7.324	0.510	0.011

[1] *MOVES 2014a run dated 2017-09-25*

[2] *PM = PM10*

EPA Engine Certification Data

ID	Lookup ID	Engine Description		Emission Factor (g/kW-hr) PM	PM10	PM2.5	CO	NOX	VOC
EQP2	EPA_Cert2	Cat 994H 1,463 hp	[1]	0.02	0.02	0.02	0.8	2.7	0.06
EQP3	EPA_Cert3	Cat 789G 2,100 hp	[1]	0.02	0.02	0.02	0.8	2.7	0.06

[1] *(Caterpillar 2018), Engine family No. JCPXL78.1NVF*

Conversions

1.341 hp/kW

453.593 g/lb

Mining Year 4

Mobile Equipment (Tailpipes) -continued

Final Emission Factors

ID	Lookup	PM	PM10	PM2.5	CO	NOX	VOC	SO2	EF Unit	Final EF	Activity
EQP1	T4-kW>560 2015	0.04	0.04	0.04	3.50	3.50	0.19	0.007	g/kW-hr	*EPA_NRS*	5,868,276 kW-hr/yr
EQP2	EPA_Cert2	0.02	0.02	0.02	0.80	2.70	0.06	0.007	g/kW-hr	*EPA_CERT*	16,569,250 kW-hr/yr
EQP3	EPA_Cert3	0.02	0.02	0.02	0.80	2.70	0.06	0.007	g/kW-hr	*EPA_CERT*	64,659,709 kW-hr/yr
EQP4	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	8,775,246 kW-hr/yr
EQP5	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	456,421 kW-hr/yr
EQP6	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	1,012,565 kW-hr/yr
EQP7	T4-kW>560 2015	0.04	0.04	0.04	3.50	3.50	0.19	0.007	g/kW-hr	*EPA_NRS*	2,716,795 kW-hr/yr
EQP8	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	624,863 kW-hr/yr
EQP9	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	1,864,041 kW-hr/yr
EQP10	T4-kW>560 2015	0.04	0.04	0.04	3.50	3.50	0.19	0.007	g/kW-hr	*EPA_NRS*	575,321 kW-hr/yr
EQP11	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	1,521,405 kW-hr/yr
EQP12	MHD	0.80	0.80	0.38	2.17	5.68	0.84	0.011	g/VMT	*EPA_MOVES2014a*	124,830 VMT/yr
EQP13	MHD	0.80	0.80	0.38	2.17	5.68	0.84	0.011	g/VMT	*EPA_MOVES2014a*	249,660 VMT/yr
EQP14	HHD	1.17	1.17	0.46	2.31	7.32	0.51	0.011	g/VMT	*EPA_MOVES2014a*	99,864 VMT/yr
EQP15	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	2,186,221 kW-hr/yr
EQP16	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	1,943,307 kW-hr/yr
EQP17	LHD45	0.59	0.59	0.29	1.87	4.94	0.68	0.011	g/VMT	*EPA_MOVES2014a*	187,245 VMT/yr
EQP18	MHD	0.80	0.80	0.38	2.17	5.68	0.84	0.011	g/VMT	*EPA_MOVES2014a*	83,220 VMT/yr
EQP19	MHD	0.80	0.80	0.38	2.17	5.68	0.84	0.011	g/VMT	*EPA_MOVES2014a*	66,576 VMT/yr
EQP20	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	977,726 kW-hr/yr
EQP21	MHD	0.80	0.80	0.38	2.17	5.68	0.84	0.011	g/VMT	*EPA_MOVES2014a*	353,685 VMT/yr
EQP22	MHD	0.80	0.80	0.38	2.17	5.68	0.84	0.011	g/VMT	*EPA_MOVES2014a*	176,843 VMT/yr
EQP23	MHD	0.80	0.80	0.38	2.17	5.68	0.84	0.011	g/VMT	*EPA_MOVES2014a*	37,449 VMT/yr
EQP24	T4-56≤kW<130 2015	0.02	0.02	0.02	5.00	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	273,278 kW-hr/yr
EQP25	T4-19≤kW<37 2015	0.03	0.03	0.03	5.50	4.70	4.70	0.007	g/kW-hr	*EPA_NRS*	491,900 kW-hr/yr
EQP26	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	409,916 kW-hr/yr
EQP27	T4-56≤kW<130 2015	0.02	0.02	0.02	5.00	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	364,370 kW-hr/yr
EQP28	LHD45	0.59	0.59	0.29	1.87	4.94	0.68	0.011	g/VMT	*EPA_MOVES2014a*	499,320 VMT/yr
EQP29	LHD45	0.59	0.59	0.29	1.87	4.94	0.68	0.011	g/VMT	*EPA_MOVES2014a*	832,200 VMT/yr
EQP30	T4-19≤kW<37 2015	0.03	0.03	0.03	5.50	4.70	4.70	0.007	g/kW-hr	*EPA_NRS*	267,205 kW-hr/yr
EQP31	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.007	g/kW-hr	*EPA_NRS*	484,948 kW-hr/yr

Final emission factor options:

Category	EF Unit	Activity Unit	Emission Unit	Multiplier
EPA_CERT	g/kW-hr	kW-hr/yr	ton/yr	1.1E-6
EPA_NRS	g/kW-hr	kW-hr/yr	ton/yr	1.1E-6
EPA_MOVES2014a	g/VMT	VMT/yr	ton/yr	1.1E-6

Conversions

453.6 g/lb 2,000 lb/ton

1.341 hp/kW

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: E. Memon
	PROJECT NO: 335-1-2	PAGE: 14 OF: 31 SHEET: Mine
AIR EMISSION CALCULATIONS	SUBJECT: Mining Activity and Emissions	DATE: October 10, 2018

Mining Year 4

Mobile Equipment (Tailpipes) -continued

Emissions by Area

			chk-15	chk	chk-15	chk	chk	chk	chk	chk	chk	chk	chk	chk
		Equipment	PM	PM10		PM2.5		CO		NOX		SO2		VOC
Area ID	Equipment	Type	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr
PITS	EQP1	Drill	0.26	1.46	0.26	1.46	0.26	5.31	22.64	5.31	22.64	1.0E-2	0.04	1.23
PITS	EQP2	Loader	0.37	2.06	0.37	2.06	0.37	3.43	14.61	11.58	49.31	0.03	0.12	1.10
HR	EQP3	Haul Truck	1.43	8.03	1.43	8.03	1.43	13.38	57.02	45.17	192.4	0.11	0.47	4.28
All	EQP4	Dozer	0.19	1.09	0.19	1.09	0.19	7.95	33.86	0.91	3.87	0.01	0.06	1.84
All	EQP5	Dozer	0.01	0.06	0.01	0.06	0.01	0.41	1.76	0.05	0.20	7.8E-4	3.3E-3	0.10
HR	EQP6	Grader	0.02	0.13	0.02	0.13	0.02	0.92	3.91	0.10	0.45	1.7E-3	7.3E-3	0.21
HR	EQP7	Water Truck	0.12	0.67	0.12	0.67	0.12	2.46	10.48	2.46	10.48	4.6E-3	0.02	0.57
PITS	EQP8	Loader	0.01	0.08	0.01	0.08	0.01	0.57	2.41	0.06	0.28	1.1E-3	4.5E-3	0.13
HR	EQP9	Haul Truck	0.04	0.23	0.04	0.23	0.04	1.69	7.19	0.19	0.82	3.2E-3	0.01	0.39
PITS	EQP10	Drill	0.03	0.14	0.03	0.14	0.03	0.52	2.22	0.52	2.22	9.8E-4	4.2E-3	0.12
PITS	EQP11	Excavator	0.03	0.19	0.03	0.19	0.03	1.38	5.87	0.16	0.67	2.6E-3	0.01	0.32
PITS	EQP12	Blaster Truck	0.11	0.62	0.11	0.30	0.05	0.07	0.30	0.18	0.78	3.4E-4	1.5E-3	0.12
PITS	EQP13	Blaster Truck	0.22	1.24	0.22	0.59	0.10	0.14	0.60	0.37	1.56	6.8E-4	2.9E-3	0.23
PITS	EQP14	Blaster Truck	0.13	0.72	0.13	0.29	0.05	0.06	0.25	0.19	0.81	2.8E-4	1.2E-3	0.06
HR	EQP15	Support Truck	0.05	0.27	0.05	0.27	0.05	1.98	8.43	0.23	0.96	3.7E-3	0.02	0.46
HR	EQP16	Support Truck	0.04	0.24	0.04	0.24	0.04	1.76	7.50	0.20	0.86	3.3E-3	0.01	0.41
HR	EQP17	Support Truck	0.12	0.68	0.12	0.34	0.06	0.09	0.39	0.24	1.02	5.1E-4	2.2E-3	0.14
HR	EQP18	Support Truck	0.07	0.41	0.07	0.20	0.03	0.05	0.20	0.12	0.52	2.3E-4	9.7E-4	0.08
HR	EQP19	Support Truck	0.06	0.33	0.06	0.16	0.03	0.04	0.16	0.10	0.42	1.8E-4	7.7E-4	0.06
HR	EQP20	Support Truck	0.02	0.12	0.02	0.12	0.02	0.89	3.77	0.10	0.43	1.7E-3	7.1E-3	0.20
HR	EQP21	Support Truck	0.31	1.75	0.31	0.84	0.15	0.20	0.85	0.52	2.22	9.7E-4	4.1E-3	0.33
HR	EQP22	Support Truck	0.16	0.87	0.16	0.42	0.07	0.10	0.42	0.26	1.11	4.8E-4	2.1E-3	0.16
HR	EQP23	Support Truck	0.03	0.19	0.03	0.09	0.02	0.02	0.09	0.06	0.23	1.0E-4	4.4E-4	0.03
PROC	EQP24	Forklift	6.0E-3	0.03	6.0E-3	0.03	6.0E-3	0.35	1.51	0.03	0.12	4.6E-4	2.0E-3	0.06
PROC	EQP25	Forklift	0.02	0.09	0.02	0.09	0.02	0.70	2.98	0.60	2.55	8.4E-4	3.6E-3	2.55
PROC	EQP26	Crane	9.0E-3	0.05	9.0E-3	0.05	9.0E-3	0.37	1.58	0.04	0.18	7.0E-4	3.0E-3	0.09
PITS	EQP27	Backhoe	8.0E-3	0.05	8.0E-3	0.05	8.0E-3	0.47	2.01	0.04	0.16	6.2E-4	2.6E-3	0.08
HR	EQP28	Support Truck	0.32	1.83	0.32	0.90	0.16	0.24	1.03	0.64	2.72	1.4E-3	5.8E-3	0.38
HR	EQP29	Support Truck	0.54	3.04	0.54	1.50	0.27	0.40	1.71	1.06	4.53	2.3E-3	9.6E-3	0.63
All	EQP30	Light Plant	8.8E-3	0.05	8.8E-3	0.05	8.8E-3	0.38	1.62	0.32	1.38	4.5E-4	1.9E-3	1.38
All	EQP31	Compactor	0.01	0.06	0.01	0.06	0.01	0.44	1.87	0.05	0.21	8.2E-4	3.5E-3	0.10
Total			4.75	26.78	4.75	20.71	3.68	46.77	199.24	71.87	306.16	0.20	0.84	17.82
Subtotals	Equipment		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	CO_PPH	CO_TPY	NOX_PPH	NOX_TPY	SO2_PPH	SO2_TPY	VOC_TPY
HR	Haul Roads		3.3	18.8	3.3	14.1	2.5	24.2	103.1	51.5	219.2	0.1	0.6	8.3
PITS	Pits		1.2	6.5	1.2	5.1	0.9	12.0	50.9	18.4	78.4	0.0	0.2	3.4
ALL	All		0.2	1.3	0.2	1.3	0.2	9.2	39.1	1.3	5.7	0.0	0.1	3.4
PROC	Process Area		0.0	0.2	0.0	0.2	0.0	1.4	6.1	0.7	2.8	0.0	0.0	2.7
STKP	PC Stockpile		--	--	--	--	--	--	--	--	--	--	--	--
PC	Process PC		--	--	--	--	--	--	--	--	--	--	--	--
Total	Mobile Tailpipes		4.75	26.78	4.75	20.71	3.68	46.77	199.24	71.87	306.16	0.20	0.84	17.82

All - All locations except haul roads

Short-term emissions are based on annual emissions divided by 355 day/yr and 24 hr/day.

LT Unit	ST Unit	Multiplier
ton/yr	lb/day	5.634
ton/yr	lb/hr	0.235

Conversions

2,000 lb/ton

453.59 g/lb

Mining Year 4

Mobile Equipment (Tailpipes) -continued

Emission Allocation by Model ID

		Area ID				Location of	Total Rate	chk	chk	chk	chk	chk
Model ID	*PITS*	*ALL*	*PROC*	*STKP*	*PC*	Activity	ton/yr	PITS	ALL	PROC	STKP	PC
YPP	*PITS*					Yellow Pine Pit	38,687,000	90.6%	-	-	-	-
HFP	*PITS*					Hangar Flats Pit	1,707,000	4.0%	-	-	-	-
WEP	*PITS*					West End Pit	1,606,000	3.8%	-	-	-	-
BT	*PITS*					Bradley Tailings	692,000	1.6%	-	-	-	-
PC					*PC*	Process PC	0	-	-	-	-	-
STKP				*STKP*		PC Stockpile	0	-	-	-	-	-
FDRSF		*ALL*				Fiddle DRSF	24,536,460	-	72.3%	-	-	-
HFDRSF		*ALL*				Hangar Flats DRSF	8,467,540	-	24.9%	-	-	-
YPDRSF		*ALL*				Yellow Pine DRSF	0	-	-	-	-	-
WEDRSF		*ALL*				West End DRSF	946,000	-	2.8%	-	-	-
PROC			*PROC*			Process Area				100.0%		

All - All locations except haul roads

Mining Year 4

Mobile Equipment (Tailpipes) -continued

Emissions by Model ID[1]

		chk-15	chk	chk-15	chk	chk	chk	chk	chk-14	chk	chk	chk	chk
		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	CO_PPH	CO_TPY	NOX_PPH	NOX_TPY	SO2_PPH	SO2_TPY	VOC_TPY
		PM	PM10		PM2.5		CO		NOX[2]		SO2		VOC
Model ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr
YPP	Mobile Tailpipes	1.05	5.93	1.05	4.66	0.83	10.83	46.13	16.68	71.08	0.04	0.17	3.06
HFP	Mobile Tailpipes	0.05	0.26	0.05	0.21	0.04	0.48	2.04	0.74	3.14	0.00	0.01	0.13
WEP	Mobile Tailpipes	0.04	0.25	0.04	0.19	0.03	0.45	1.92	0.69	2.95	0.00	0.01	0.13
BT	Mobile Tailpipes	0.02	0.11	0.02	0.08	0.01	0.19	0.83	0.30	1.27	0.00	0.00	0.05
PC	Mobile Tailpipes	--	--	--	--	--	--	--	--	--	--	--	--
STKP	Mobile Tailpipes	--	--	--	--	--	--	--	--	--	--	--	--
FDRSF	Mobile Tailpipes	0.16	0.91	0.16	0.91	0.16	6.63	28.26	0.96	4.10	0.01	0.05	2.47
HFDRSF	Mobile Tailpipes	0.06	0.31	0.06	0.31	0.06	2.29	9.75	0.33	1.41	0.00	0.02	0.85
YPDRSF	Mobile Tailpipes	--	--	--	--	--	--	--	--	--	--	--	--
WEDRSF	Mobile Tailpipes	0.01	0.04	0.01	0.04	0.01	0.26	1.09	0.04	0.16	0.00	0.00	0.10
PROC	Mobile Tailpipes	0.03	0.18	0.03	0.18	0.03	1.42	6.07	0.67	2.85	0.00	0.01	2.69
HR	Truck/Grader	3.34	18.80	3.34	14.14	2.51	24.21	103.15	51.46	219.21	0.13	0.57	8.33

(1) *See worksheet ROADS for haul road (HR) emissions by Model ID.*

(2) *NO2/NOX:* 11% *(CAPCOA 2011)*

Source Parameters[1]

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	SIG_Z_M	SXINIT_M	SYINIT_M	ANGL_DEG	
		Source	UTM NAD 83		Elev.	Rel. Ht.	S-z	Len X	Len Y	Angle	WCB
Model ID	Activity	Type	E m	N m	m	m	m	m	m	deg	deg
PROC	Process Area	AREA	631,880	4,973,910	1,970	2.22	2.07	400	400	0	

(1) *UTM, Elev. - (Midas Gold 2017e); Rel. Ht., S-z - (EPA 2012); Len X, Len Y, Angle - best-fit equal area rectangle*

Vehicle height (VH):

Average (forklifts) 2.62 m *Model Specs*

Plume Parameter	Calculation	Value (m)	Const.
Plume top (PT)	1.7 x VH	4.45	1.7
Release height	0.5 x PT	2.22	0.5
Sigma-z	PT / 2.15	2.07	2.15

(EPA 2012)

Sample Calculation for Mobile Tailpipes

Plume Parameter	Calculation	Value (m)	Const.
Surface area (SA)	Map	160,000	
Side length (SL)	SA^0.5	400.0	0.5
Sigma-y	SL / 4.3	93.02	4.3

(EPA 2016a)

Mining Year 4

Dozing and Grading

Activity Information

Operating schedule 355 day/yr

Dozer and Grader Fleet

Equipment Category	Activity
Dozer	36,113 hr/yr
Grader	12,614 hr/yr
	81,994 VMT/yr

Dozing Emission Factors

Emission Factor Equation	TSP (lb/hr) = 5.7 $(s)^{1.2}/(M)^{1.3}$	*AP-42, Tab. 11.9-1, 07/98, (bulldozing, overburden)*
	PM15 (lb/hr) = 1.0 $(s)^{1.5}/(M)^{1.4}$	*AP-42, Tab. 11.9-1, 07/98, (bulldozing, overburden)*
s = Surface material silt content	6.9 %	*AP-42, Table 11.9-3, 07/98, (bulldozers, overburden)*
M = Material moisture content	7.9 %	*AP-42, Table 11.9-3, 07/98, (bulldozers, overburden)*
TSP(PM)	3.941 lb/hr	
PM15	1.004 lb/hr	

Dozing PM Scaling Factors

PM10	0.75	*AP-42, Tab. 11.9-1, 07/98, (applies to PM15 EF, footnote d)*
PM2.5	0.105	*AP-42, Tab. 11.9-1, 07/98, (applies to TSP EF, footnote e)*

Grading Emission Factors

Emission Factor Equation	TSP (lb/VMT) = 0.04 $(S)^{2.5}$	*AP-42, Tab. 11.9-1, 07/98, (grading)*
	PM15 (lb/VMT) = 0.051 $(S)^{2}$	*AP-42, Tab. 11.9-1, 07/98, (grading)*
S - Grader average speed	6.5 mph	*(Caterpillar 2016c), haul road maintenance*
TSP(PM)	4.309 lb/VMT	
PM15	2.155 lb/VMT	

Grading PM Scaling Factors

PM10	0.6	*AP-42, Tab. 11.9-1, 07/98, (applies to PM15 EF, footnote d)*
PM2.5	0.031	*AP-42, Tab. 11.9-1, 07/98, (applies to TSP EF, footnote e)*

Emission Controls

Grading Periodic application of water and chemical dust suppressant

Control efficiency: 90% *See Onsite Hauling*

Emissions by Area

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	Hg2+P_TPY
		PM	PM10		PM2.5		Hg2+P
Area ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
All	Dozing	71.16	76.58	13.59	42.09	7.47	4.3E-05
HR	Grading	17.66	29.86	5.30	3.09	0.55	1.1E-05

Conversions

2,000 lb/ton

Mining Year 4

Dozing and Grading - continued

		chk	chk	chk	chk	chk	chk
Emissions by Model ID		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	Hg2+P_TPY
		PM	PM10		PM2.5		Hg2+P
Model ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
YPP	Dozing	--	--	--	--	--	--
HFP	Dozing	--	--	--	--	--	--
WEP	Dozing	--	--	--	--	--	--
BT	Dozing	--	--	--	--	--	--
PC	Dozing	--	--	--	--	--	--
STKP	Dozing	--	--	--	--	--	--
FDRSF	Dozing	51.43	55.34	9.82	30.42	5.40	3.1E-05
HFDRSF	Dozing	17.75	19.10	3.39	10.50	1.86	1.1E-05
YPDRSF	Dozing	--	--	--	--	--	--
WEDRSF	Dozing	1.98	2.13	0.38	1.17	0.21	1.2E-06
HR	Grading	17.66	29.86	5.30	3.09	0.55	1.1E-05

See worksheet ROADS for haul road (HR) emissions by Model ID.

Source Parameters

Dozing: See Open Pit Drilling and Material Load / Unload for source parameters.
Grading: See Onsite Hauling for source parameters.

Mining Year 4

Water Truck Travel

Activity Information

Operating schedule 355 day/yr

Truck Fleet

Water Truck	Payload Capacity ton	Empty Weight ton	Gross Weight ton	Units	Oper. hr/yr	Reference	Average Weight ton
Cat 777D	100	80	180	2	7,446	*(Caterpillar 2016c)*	130

Average truck speed 15 mph *(Midas Gold 2018e)*

Total vehicle miles traveled (VMT) 111,690 VMT/yr

Emission Factors

Emission factor equation $E = k(s/12)^a (W/3)^b [(365-P)/365]$ *AP-42, Sec. 13.2.2, Eq. 1a, 11/06*

s = Surface material silt content 4 % *(Midas Gold 2015)*

W = Mean vehicle weight 130.17 ton

P = Days/year with ≥0.01 in precip. 120 day/yr *AP-42 Fig. 13.2.2-1, 11/06*

	PM	PM10	PM2.5		
k = Size-specific empirical constant	4.9	1.5	0.15		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
a = Size-specific empirical constant	0.7	0.9	0.9		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
b = Size-specific empirical constant	0.45	0.45	0.45		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
E = Size-specific emission factor	8.32	2.04	0.20	lb/VMT	

Emission Controls

Periodic application of water and chemical dust suppressant

Control efficiency 90% *See Onsite Hauling*

Emissions by Area

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	Hg2+P_TPY
		PM	PM10		PM2.5		Hg2+P
Area ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
HR	Water Truck Travel	46.44	64.29	11.41	6.43	1.14	2.8E-05

Source Parameters

See Onsite Hauling for source parameters.

Conversions

2,000 lb/ton

Mining Year 4

Access Roads

Operation Schedule 355 day/yr 24 hr/day

Equipment MachineSpecs

Mobile Equipment Specifications and Activity

Equipment[1]	Equipment Model[2]	ID	Rating[3] hp	Rating kW	Oper.[4] hr/yr	Annual[1] trip/yr	Diesel[5] gal/yr	Output[6] kW-hr/yr	Travel[7] VMT/yr	Equipment Category	On-road Class	
Grader	Cat 160H	MNT1	200	149	2,000	92	6,748	98,492	6,903	Non-road		Ca
Plow Truck	Cat CT660	MNT2	476	355	2,000	92	16,000	--	6,903	On-road	HHD	Ca
Snow Blower	TM42R	MNT3	450	336	2,000	92	15,126	--	6,903	On-road	HHD	Ca
Water Truck	Cat 725C	MNT4	320	239	2,000	92	16,000	233,514	6,903	Non-road		Ca
Binding Agent Truck	Cat 725C	MNT5	320	239	2,000	92	16,000	233,514	6,903	Non-road		Ca
Vibratory Compactor	Cat CS76 XT	MNT6	177	132	2,000	92	10,500	153,244	6,903	Non-road		Ca
Fuel Service Truck	CAT 740B	MNT7	484	361	2,000	92	18,000	262,704	6,903	Non-road		CA
Rock Rakes	Cat CT660	MNT8	476	355	2,000	92	16,000	--	6,903	On-road	HHD	Ca
Light Vehicles	F-350	MNT9	440	328		3,156	16,915	--	236,807	On-road	LHD45	F-3
Heavy Trucks	Cat CT660 (8X6)	LDEL	476	355		4,989	57,591	--	374,344	On-road	HHD	Ca

(1) *(Midas Gold 2016), Tables 7-1, 12-2, and 12-4. Maintenance trips distributed equally amongst maintenace equipment.*
Heavy trucks include buses, supply, product shipment and trash trucks. Light vehicles include visitor and employee vehicles.

(2) *Similar models by equipment type from (Midas Gold 2017b)*

(3) *(Caterpillar 2016c)/Manufacturer specifications*

(4) *Combined hours, (Midas Gold 2017f)*

(5) *Maintenance equipment based on brake-specific fuel use scaled for similar equipment from (Midas Gold 2017b)*
Light vehicles based on Ford F-350 fuel economy of: 14.0 *mpg (fuelly.com)* *Heavy trucks based on fuel economy* 6.5 *mpg (ATRI 2016)*

(6) *Based on* 137,000 *BTU/gal* AP-42, App. A (Diesel) 7,000 *BTU/hp-hr* AP-42, Sec. 3.3, (Diesel)

(7) *Based on access road length of:* 37.5 X 2 *mi (roundtrip)* *(Midas Gold 2018c)*

EPA Non-Road Standards

ID	Equipment Type	Model[1] Year	Power Category	EPA Tier	Lookup ID	EPA Non-Road Standards (g/kW-hr)[2] PM	CO	NOX	VOC
MNT1	Grader	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
MNT2	Truck				No Standard				
MNT3	Truck				No Standard				
MNT4	Truck	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
MNT5	Truck	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
MNT6	Compactor	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
MNT7	Truck	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
MNT8	Truck				No Standard				
MNT9	Light Truck				No Standard				
LDEL	Truck				No Standard				

(1) *(Midas Gold 2017h)*

(2) *(CFR 2018a)*

Final Emission Factors

ID	Lookup	PM	PM10	PM2.5	CO	NOX	VOC	SO2	EF Unit	Final EF	Activity
MNT1	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.01	g/kW-hr	*EPA_NRS*	98,492 kW-hr/yr
MNT2	HHD	1.17	1.17	0.46	2.31	7.32	0.51	0.01	g/VMT	*EPA_MOVES2014a*	6,903 VMT/yr
MNT3	HHD	1.17	1.17	0.46	2.31	7.32	0.51	0.01	g/VMT	*EPA_MOVES2014a*	6,903 VMT/yr
MNT4	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.01	g/kW-hr	*EPA_NRS*	233,514 kW-hr/yr
MNT5	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.01	g/kW-hr	*EPA_NRS*	233,514 kW-hr/yr
MNT6	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.01	g/kW-hr	*EPA_NRS*	153,244 kW-hr/yr
MNT7	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.01	g/kW-hr	*EPA_NRS*	262,704 kW-hr/yr
MNT8	HHD	1.17	1.17	0.46	2.31	7.32	0.51	0.01	g/VMT	*EPA_MOVES2014a*	6,903 VMT/yr
MNT9	LHD45	0.59	0.59	0.29	1.87	4.94	0.68	0.01	g/VMT	*EPA_MOVES2014a*	236,807 VMT/yr
LDEL	HHD	1.17	1.17	0.46	2.31	7.32	0.51	0.01	g/VMT	*EPA_MOVES2014a*	374,344 VMT/yr

Mining Year 4

Access Roads - continued

Mobile Equipment Tailpipe Emissions

Emissions by Area chk chk chk chk chk chk chk chk chk chk chk chk

Area ID	Equipmen	Equipment Type	PM ton/yr	PM10 lb/day	PM10 ton/yr	PM2.5 lb/day	PM2.5 ton/yr	CO lb/hr	CO ton/yr	NOX lb/hr	NOX ton/yr	SO2 lb/hr	SO2 ton/yr	VOC ton/yr
ACCRD	MNT1	Grader	2.2E-3	0.01	2.2E-3	0.01	2.2E-3	0.09	0.38	0.01	0.04	1.7E-4	7.1E-4	0.02
ACCRD	MNT2	Plow Truck	8.9E-3	0.05	8.9E-3	0.02	3.5E-3	4.1E-3	0.02	0.01	0.06	1.9E-5	8.1E-5	3.9E-3
ACCRD	MNT3	Snow Blower	8.9E-3	0.05	8.9E-3	0.02	3.5E-3	4.1E-3	0.02	0.01	0.06	1.9E-5	8.1E-5	3.9E-3
ACCRD	MNT4	Water Truck	5.1E-3	0.03	5.1E-3	0.03	5.1E-3	0.21	0.90	0.02	0.10	4.0E-4	1.7E-3	0.05
ACCRD	MNT5	Binding Agent Truck	5.1E-3	0.03	5.1E-3	0.03	5.1E-3	0.21	0.90	0.02	0.10	4.0E-4	1.7E-3	0.05
ACCRD	MNT6	Vibratory Compactor	3.4E-3	0.02	3.4E-3	0.02	3.4E-3	0.14	0.59	0.02	0.07	2.6E-4	1.1E-3	0.03
ACCRD	MNT7	Fuel Service Truck	5.8E-3	0.03	5.8E-3	0.03	5.8E-3	0.24	1.01	0.03	0.12	4.5E-4	1.9E-3	0.06
ACCRD	MNT8	Rock Rakes	8.9E-3	0.05	8.9E-3	0.02	3.5E-3	4.1E-3	0.02	0.01	0.06	1.9E-5	8.1E-5	3.9E-3
ACCRD	MNT9	Light Vehicles	0.15	0.87	0.15	0.43	0.08	0.11	0.49	0.30	1.29	6.4E-4	2.7E-3	0.18
ACCRD	LDEL	Heavy Trucks	0.48	2.72	0.48	1.07	0.19	0.22	0.95	0.71	3.02	1.0E-3	4.4E-3	0.21
Total			0.68	3.86	0.68	1.68	0.30	1.24	5.28	1.15	4.91	0.00	0.01	0.61
Subtotals	Equipment		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	CO_PPH	CO_TPY	NOX_PPH	NOX_TPY	SO2_PPH	SO2_TPY	VOC_TPY
ACCRD	Access Roads		0.68	3.86	0.68	1.68	0.30	1.24	5.28	1.15	4.91	0.00	0.01	0.61
Total			0.68	3.86	0.68	1.68	0.30	1.24	5.28	1.15	4.91	0.00	0.01	0.61

~~LT Unit~~	~~ST Unit~~	~~Multiplier~~
ton/yr	lb/day	5.634
ton/yr	lb/hr	0.235

Grading

Operation 2,000 hr/yr
13,000 VMT/yr

Grading Emission Factors

Emission Factor Equation	TSP (lb/VMT) = 0.04 (S)$^{2.5}$	*AP-42, Tab. 11.9-1, 07/98, (grading)*
	PM15 (lb/VMT) = 0.051 (S)^{2}	*AP-42, Tab. 11.9-1, 07/98, (grading)*
S - Grader average speed	6.5 mph	*(Caterpillar 2016c), haul road maintenance*
TSP(PM)	4.309 lb/VMT	
PM15	2.155 lb/VMT	

Grading PM Scaling Factors

PM10	0.6	*AP-42, Tab. 11.9-1, 07/98, (applies to PM15 EF, footnote d)*
PM2.5	0.031	*AP-42, Tab. 11.9-1, 07/98, (applies to TSP EF, footnote e)*

Emission Controls Periodic application of water and chemical dust suppressant
Control efficiency: 90% *See Onsite Hauling*

Emissions by Area

Area ID	Activity	PM ton/yr	PM10 lb/day	PM10 ton/yr	PM2.5 lb/day	PM2.5 ton/yr	Hg2+P ton/yr
ACCRD	Grading	2.80	7.89	1.40	0.49	0.09	1.7E-06

Conversions
2,000 lb/ton
453.59 g/lb
1.341 hp/kW

Mining Year 4

Access Roads - continued

Vehicle Travel Dust

Fleet

Equipment Type	Model	Empty Weight[1] ton	Gross Weight[1] ton	Average Weight ton	Travel mi/yr	
Grader	Cat 160H	17.2	17.2	17.2	6,903	*Grader emissions calculated separately*
Plow Truck	Cat CT660	8.2	26.6	17.4	6,903	
Snow Blower	TM42R	14.8	18.0	16.4	6,903	
Water Truck	Cat 725C	25.6	51.6	38.6	6,903	
Binding Agent Truck	Cat 725C	25.6	51.6	38.6	6,903	
Vibratory Compactor	Cat CS76 XT	19.2	20.8	20.0	6,903	
Fuel Service Truck	CAT 740B	37.6	81.1	59.4	6,903	
Rock Rakes	Cat CT660	8.2	26.6	17.4	6,903	
Light Vehicles	F-350	4.0	7.9	6.0	236,807	
Heavy Trucks	Cat CT660 (8X6)	10.1	34.5	22.3	374,344	

[1] *(Caterpillar 2016c)/Manufacturer specifications*

Total vehicle miles traveled (VMT) 659,473 VMT/yr *Excluding grader*

Emission Factors

Emission factor equation	$E = k(s/12)^a (W/3)^b [(365-P)/365]$	*AP-42, Sec. 13.2.2, Eq. 1a, 11/06*
s = Surface material silt content	4 %	*(Midas Gold 2015)*
W = Mean vehicle weight	17 ton	*Weighted average weight, excluding grader*
P = Days/year with ≥0.01 in precip.	120 day/yr	*AP-42 Fig. 13.2.2-1, 11/06*

	PM	PM10	PM2.5		
k = Size-specific empirical constant	4.9	1.5	0.15		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
a = Size-specific empirical constant	0.7	0.9	0.9		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
b = Size-specific empirical constant	0.45	0.45	0.45		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
E = Size-specific emission factor	3.33	0.82	0.08	lb/VMT	

Emission Controls

Periodic application of water and chemical dust suppressant

Control efficiency 90% *See Onsite Hauling*

Emissions by Area

		PM	PM10		PM2.5		Hg2+P
Area ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
ACCRD	Access Roads	109.70	151.87	26.96	15.19	2.70	6.6E-05

Source Parameters

See Onsite Hauling for source parameters.

Conversions

2,000 lb/ton

Mining Year 4

Access Roads - continued

Emissions by Area

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	CO_PPH	CO_TPY	NOX_PPH	NOX_TPY	SO2_PPH	SO2_TPY	VOC_TPY	Hg2+P_TPY
		PM	PM10		PM2.5		CO		NOX		SO2		VOC	Hg2+P
Area ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr	ton/yr
ACCRD	Access Roads	113.18	163.62	29.04	17.36	3.08	1.24	5.28	1.15	4.91	0.003	0.01	0.61	6.7E-05

Source Parameters[1]

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	SIG_Y_M	SIG_Z_M
		Source	UTM NAD 83		Elev.	Rel. Ht.	S-y	S-z
Model ID	Activity	Type	E m	N m	m	m	m	m
ACCRD	Access Roads	VOLUME	*See worksheet: HR Grid*			2.98	5.63	2.77

[1] *UTM, Elev. - (Midas Gold 2017e); Rel. Ht., Sy, Sz - (EPA 2012)*

Vehicle	Height		
Average	3.5	m	
Grader	3.7	m	
HD Truck	3.6	m	
LD Truck	3.2	m	
Road width (RW)	6.1	m	*(Midas Gold 2016), Fig. 7-2*
Road length	60,378	m	*(Midas Gold 2018c)*

Plume Parameter	Calculation	Value (m)	Const.
Plume top (PT) - unpaved	1.7 x VH	5.95	1.7
Release height - unpaved	0.5 x PT	2.98	0.5
Plume width (PW)	RW + 6 m	12.096	6
Sigma-z - unpaved	PT / 2.15	2.77	2.15
Sigma-y	PW / 2.15	5.63	2.15

(EPA 2012)

Conversions

2,000 lb/ton
3.28 ft/m
12 in/ft

Mining Year 4

Wind Erosion

Activity Information

Operating schedule 355 day/yr

Erodible Area

Model ID	Location of Activity		Surface Type	Total Rate ton/yr	Erodible Area (acre/yr)[3] Flat	Pile	Surface Footprint
STKP	PC Stockpile		Pile	--		--	13
FDRSF	Fiddle DRSF		Pile	24,536,460		2,436	148
HFDRSF	Hangar Flats DRSF		Pile	8,467,540		841	140
YPDRSF	Yellow Pine DRSF		Pile	--		--	152
WEDRSF	West End DRSF		Pile	946,000		94	70
BT	Bradley Tailings		Flat		331		331
HR	Haul Roads	(1)	Flat		663		182
ACCRD	Access Roads	(2)	Flat		91		91

(1) *Based on total haul road length of* 27,700 *m* *(Midas Gold 2017e)* *and width of* 26.5 *m* *(Midas Gold 2016), Fig. 9-1*

(2) *Based on total access road length of* 60,378 *m* *(Midas Gold 2017e)* *and width of* 6.1 *m* *(Midas Gold 2016), Fig. 7-2*

(3) *Pile surface area calculations:*

Truck dump (TD) size	185.8 ton		
Material density	158.7 lb/ft^3		*(Midas Gold 2017b), average*
	0.079 ton/ft^3		
Material specific volume	12.6 ft^3/ton		
TD volume (V)	2,342 ft^3		
Conical surface calculations			
Side slope	38 deg		
	0.7 rad		
Conical surface area (SA)	Π × r × (h^2 + r^2)^0.5		
Conical volume (V)	(Π × h × r^2) ÷ 3		
Conical base radius	r = s × cos(slope)		
Conical height	h = s × sin(slope)		
Sloped side length	s = (h^2 + r^2)^0.5		
Solution of conical volume equation			
Replacing h and r with s × sin(slope) and s × cos(slope), respectively:			
s = [3 × V/(pi × sin(slope) × cos^2(slope)]^(1/3)		18.0 ft	
r		14.2 ft	
h		11.1 ft	
SA		804 ft^2	
		0.018 acre	
		9.9E-5 acre/ton-TD	

Scaling Factors

PM10	0.5	*AP-42, Pg. 13.2.5-3, 11/06*
PM2.5	0.075	*AP-42, Pg. 13.2.5-3, 11/06*

Conversions

4,046.86 m^2/acre

43,560 ft^2/acre

1609.34 m/mi

Mining Year 4

Wind Erosion - continued ***Wind erosion potential calculations based on Aug-2014 through Aug-2015 Midas Gold on site meteorological data***

Stockpile Surface Wind Erosion Event Emission Calculations

Based on 1 acre/yr 8,760 hr/yr 0.00011 acre/hr

Threshold Wind Event	Date / Hour	u10 (m/s) (1)	u10+ (m/s) (2)	u* (m/s) ID-A (3)	u* (m/s) ID-B (3)	u* (m/s) ID-C (3)	Hours Elapsed ID-A (4)	Hours Elapsed ID-B (4)	Hours Elapsed ID-C (4)	Erodible Surface Area (acre) ID-A (5)	Erodible Surface Area (acre) ID-B (5)	Erodible Surface Area (acre) ID-C (5)
0	6/12/2014 13:00											
1	9/25/2014 14:00	9.810	11.772	1.059	0.706	0.235	2,521	2,521	2,521	0.03453	0.1381	0.1151
2	11/29/2014 12:00	10.050	12.060	1.085	0.724	0.241	1,558	4,079	4,079	0.02134	0.2235	0.1863
3	12/11/2014 03:00	10.000	12.000	1.080	0.720	0.240	279	4,358	4,358	0.00382	0.2388	0.1990
4	12/11/2014 14:00	9.470	11.364	1.023	0.682	0.227	11	4,369	4,369	0.00015	0.2394	0.1995
5	2/5/2015 14:00	10.400	12.480	1.123	0.749	0.250	1,344	5,713	5,713	0.01841	0.3130	0.2609
6	2/6/2015 07:00	10.270	12.324	1.109	0.739	0.246	17	5,730	5,730	0.00023	0.3140	0.2616
7	8/21/2015 14:00	9.610	11.532	1.038	0.692	0.231	4,711	10,441	10,441	0.06453	0.5721	0.4768
8	8/21/2015 15:00	9.530	11.436	1.029	0.686	0.229	1	10,442	10,442	0.00001	0.5722	0.4768
Flat Surface Wind Erosion Event Emission Calculations				Flat			Flat			Flat		
N/A	No wind events above 16.04 m/s											

Stockpile Surface Wind Erosion Event Emission Calculations - continued

Threshold Wind Event	Erosion Potential (lb/acre)(1) ID-A (6)	ID-B (6)	ID-C (6)	PM Emissions (lb) ID-A (7)	ID-B (7)	ID-C (7)	Total (8)	PM10 (lb) Total (9)	PM2.5 (lb) Total (10)
1	9.61	--	--	0.332	--	--	0.332	0.166	0.025
2	16.80	--	--	0.359	--	--	0.359	0.179	0.027
3	15.25	--	--	0.058	--	--	0.058	0.029	0.004
4	0.62	--	--	9.34E-5	--	--	9.34E-5	4.67E-5	7.00E-6
5	28.5	--	--	0.525	--	--	0.525	0.263	0.039
6	24.00	--	--	0.006	--	--	0.006	0.003	0.000
7	4.15	--	--	0.268	--	--	0.268	0.134	0.020
8	2.11	--	--	2.88E-5	--	--	2.88E-5	1.44E-5	2.16E-6
Stockpile Subtotal							1.548	0.774	0.116
Flat Surface Wind Erosion Event Emission Calculations - continued									
N/A	No wind events above 16.04 m/s						--	--	--

Zero denotes winds did not exceed the threshold for a surface regime.

Final Emission Factors (lb/acre-yr)

Surface Type	PM	PM10	PM2.5
Pile	1.55	0.77	0.12
Flat	--	--	--

Mining Year 4

Wind Erosion - continued

Stockpile Surface Wind Erosion Event Emission Calculations - Notes

(1) u10 = wind speed at 10 meters reference height, m/s

(2) u10+ = fastest-mile wind speed, m/s
Based on hourly to fastest-mile wind speed conversion factor of 1.2 *(EPA 1994)*

(3) Pile: u* = friction velocity, m/s = (us/ur) × 0.1 × u10+ *AP-42, Sec. 13.2.5, Eqs. 6 & 7, 11/06*

Area ID	A	B	C	
(us/ur)	0.9	0.6	0.2	*AP-42, Page 13.2.5-10, 11/06*

Flat surface:
u* = friction velocity, m/s = 0.053 × u10+ *AP-42, Sec. 13.2.5, Eq. 4, 11/06*

(4) Hours elapsed since previous wind erosion event

(5) Erodible surface area = hours elapsed since previous erosion event × hourly erodible surface area (acre) × surface regime area fraction Surface regime area fractions:

Area ID	A	B	C	
% Surface	0.12	0.48	0.4	*AP-42, Page 13.2.5-10, 11/06*

(6) Erosion potential, g/m^2, = P = 58(u* - ut*)^2 + 25(u* - ut*); P = 0 for u* ≤ ut*
where, ut* = threshold friction velocity = 1.02 m/s *AP-42, Page 13.2.5-5 (overburden), 11/06*
P converted to lb/acre by multiplying with: 0.002205 lb/g and 4,046.86 m^2/acre
Solving u* = (us/ur) × 0.1 × u10+ for u10, when u* = ut* = 1.02 m/s and u10+ = u* × 1.2
yields the following minimum wind speeds to disturb the each stockpile surface regime:

ID-A	9.44 m/s
ID-B	14.17 m/s
ID-C	42.50 m/s

The threshold wind speed to disturbe flat surfaces is 1.02/0.053/1.2
Flat surface 16.04 m/s
The maximum hourly wind speed in the onsite data is 10.4 m/s, which is less than the threshold wind speeds to cause a disturbance of stockpile regimes ID-B and ID-C, and flat surfaces.

(7) PM emissions, lb = P (lb/acre) × erodible surface area (acre)

(8) Total PM emissions, lb = PM (ID-A), lb + PM (ID-B), lb + PM(ID-C), lb

(9) Total PM10 emissions, lb = total PM emissions, lb × PM10 scaling factors of 0.5 *AP-42, Page 13.2.5-3, 11/06*

(10) Total PM2.5 emissions, lb = total PM emissions, lb × PM2.5 scaling factors of 0.075 *AP-42, Page 13.2.5-3, 11/06*

Mining Year 4

Wind Erosion - continued

Emissions by Model ID

				chk PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	Hg2+P_TPY
	Location of	Control[1]		PM	PM10		PM2.5		Hg2+P
Model ID	Activity		Type	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
STKP	PC Stockpile	--	Pile	--	--	--	--	--	--
FDRSF	Fiddle DRSF	--	Pile	1.886	5.311	0.943	0.797	0.141	1.1E-06
HFDRSF	Hangar Flats DRSF	--	Pile	0.651	1.833	0.325	0.275	0.049	3.9E-07
YPDRSF	Yellow Pine DRSF	--	Pile	--	--	--	--	--	--
WEDRSF	West End DRSF	--	Pile	0.073	0.205	0.036	0.031	0.005	4.4E-08
BT	Bradley Tailings	67%	Flat	--	--	--	--	--	--
HR	Haul Roads	90%	Flat	--	--	--	--	--	--
ACCRD	Access Roads	90%	Flat	--	--	--	--	--	--
Total	Wind Erosion			2.609	7.349	1.304	1.102	0.196	1.6E-06

[1] *Bradley Tailings - maximum one-third of the total surface exposed (Midas Gold 2017g)*
Roads - see note on page 6

Conversions
2,000 lb/ton

Mining Year 4

Surface Exploration

Activity Information

Operating schedule	355	day/yr	24 hr/day	
Duration	14	yr	168 mo	*(Midas Gold 2018b)*
Construction disturbance	13	acres	0.08 acre/mo	*(Midas Gold 2016), p. 13-1*
Total wet drilling (maximum)	700	holes	50 holes/yr	*(Midas Gold 2016), p. 13-1*
Core diameter	2.5	in		*(Midas Gold 2018j)*
Average core length	800	ft		*(Midas Gold 2016), p. 13-2*
Core volume	27.3	ft^3		
Average material density	158.7	lb/ft^3		*(Midas Gold 2017b)*
Average mass	2.16	ton/hole	108.2 ton/yr	

Construction Emission Calculations

Emission Factors

PM	1.2	ton/acre per month of activity	*AP-42, Page 13.2.3-1, 1/95*

PM Scaling Factors

PM10	0.35	*AP-42, Sec. 13.2.4, Pg. 4, 11/06*
PM2.5	0.053	*AP-42, Sec. 13.2.4, Pg. 4, 11/06*

Construction Emissions

Activity	PM	PM10		PM2.5		Hg2+P
	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
Drill Pad and Temporary Road Construction	1.1	2.2	0.4	0.3	0.1	6.7E-07

Wet Drilling Emission Calculations

Emission Factors

PM10	8.0E-5	lb/ton (material blasted)	*AP-42, Table 11.19.2-2 (wet drilling), Rev. 8/04*

PM Scaling Factors

PM	0.74	*AP-42, Sec. 13.2.4-4, 11/06*
PM10	0.35	*AP-42, Sec. 13.2.4-4, 11/06*
PM2.5	0.053	*AP-42, Sec. 13.2.4-4, 11/06*

Blast-to-Drill Volume Ratio[1] 400 blast volume/drilled volume

[1] *Dyno Nobel 2010 "Blasting and Explosives Quick Reference Guide" (Ratio of total of blast volume to drilled hole volume)*

Wet Drilling Emissions

Activity	PM	PM10		PM2.5		Hg2+P
	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
Wet Drilling	0.004	0.010	0.002	0.001	0.0003	2.2E-09

Conversions

12 in/ft	12 mo/yr
2,000 lb/ton	1.341 hp/kW

Mining Year 4

Surface Exploration - continued

Drill Rig Tailpipe Emission Calculations

Other mobile equipment emissions are included in the Mobile Equipment (Tailpipes) calculations provided on page 14 of this sheet (Midas Gold 2018j)

Drill Specifications and Emission Factors

Equipment[1] Model	Rating[1] hp	Rating kW	Oper.[2] hr/yr	Diesel[3] gal/yr	Output[4] kW-hr/yr	EPA Non-Road Standards (g/kW-hr)[5] PM	CO	NOX	VOC	SO2[6]
Cat MD6420	800	596.6	12,000	144,000	2,101,630	0.04	3.5	3.5	0.19	0.0066

[1] *Similar to production drill (Midas Gold 2018j)*

[2] *Based on* 3.3 *ft/hr (Midas Gold 2018j)*

[3] *Scaled from production drill*

[4] *Based on 137,000 BTU/gal AP-42, App. A (Diese 7,000 BTU/hp-hr AP-42, Sec. 3.3, (Diesel)*

[5] *(CFR 2018a)*

[6] *Fuel Sulfur-Content Based SO2 Emission Factor, see page 12 of this sheet*

Drill Tailpipe Emissions

PM		PM10		PM2.5		CO		NOX		SO2		VOC
ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr	
0.09	0.52	0.09	0.52	0.09	1.90	8.11	1.90	8.11	0.00	0.02	0.44	

Surface Exploration Total Emissions

PM		PM10		PM2.5		CO		NOX		SO2		VOC	Hg2+P
ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr	ton/yr	
1.21	2.73	0.48	0.86	0.15	1.90	8.11	1.90	8.11	0.00	0.02	0.44	6.7E-07	

Emissions by Model ID[1]

		chk PM_TPY	chk PM10_PPD	chk PM10_TPY	chk PM2.5_PPD	chk PM2.5_TPY	chk CO_PPH	chk CO_TPY	chk NOX_PPH	chk NOX_TPY	chk SO2_PPH	chk SO2_TPY	chk VOC_TPY	chk Hg2+P_TPY
		PM	PM10		PM2.5		CO		NOX[2]		SO2		VOC	Hg2+P
Model ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr	ton/yr
YPP	Surface Exploration	0.30	0.68	0.12	0.21	0.04	0.48	2.03	0.48	2.03	0.00	0.00	0.11	1.7E-07
HFP	Surface Exploration	0.30	0.68	0.12	0.21	0.04	0.48	2.03	0.48	2.03	0.00	0.00	0.11	1.7E-07
WEP	Surface Exploration	0.30	0.68	0.12	0.21	0.04	0.48	2.03	0.48	2.03	0.00	0.00	0.11	1.7E-07
PROC	Surface Exploration	0.30	0.68	0.12	0.21	0.04	0.48	2.03	0.48	2.03	0.00	0.00	0.11	1.7E-07

[1] *Equally distributed amongst* 4 *locations (Midas Gold 2018j)*

Conversions
g/ton
2,000 lb/ton

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Mining Year 4

Helicopter

Activity Information

Operating schedule	355 day/yr	24 hr/day	
Flight frequency	4 flight/mo		*(Midas Gold 2018h)*
	48 flight/yr		
	1 flight/day, daily maximum		
	1 flight/hr, hourly maximum		

Landing and Takeoff (LTO) Component Durations *AP-42, Vol. II, Table II-1-3 (helicopter)* *(EPA 1991)*

LTO Component	minute	hour
Idle	7.00	0.12
Takeoff	--	--
Climbout	6.50	0.11
Approach	6.50	0.11

LTO Component Emission Factors (lb/hr) *AP-42, Vol. II, Table II-1-7 (TPE 331-3 GA TP)* *(EPA 1991)*

LTO Component	PM	CO	NOX	SO2	VOC
Idle	0.3	6.89	0.32	0.11	8.86
Takeoff	0.8	0.35	5.66	0.46	0.05
Climbout	0.6	0.4	4.85	0.41	0.06
Approach	0.6	1.74	2.48	0.25	0.16

Total Emissions [1] ***by Model***

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	CO_PPH	CO_TPY	NOX_PPH	NOX_TPY	SO2_PPH	SO2_TPY	VOC_TPY
		PM	PM10		PM2.5		CO		NOX		SO2		VOC
Model ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr
HELI	Heliport	0.004	0.165	0.004	0.165	0.004	1.036	0.025	0.831	0.020	0.084	0.002	0.025

Source Parameters[1]

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	SIG_Y_M	SIG_Z_M	Surface	
		Source	UTM NAD 83		Elev.	Rel. Ht.	S-y	S-z	Area	Length
Model ID	Activity	Type	E m	N m	m	m	m	m	m^2	m
HELI	Heliport	VOLUME	632,222	4,973,588	1,996	3.43	9.15	3.19	387	19.7

[1] *UTM, Elev. - (Midas Gold 2017e); Rel. Ht., Sy, Sz - (EPA 2012)*

Helicopter	Height	Reference
Bell 429	4.0 m	*(Bell 2018)*

Plume Parameter	Calculation	alue (m	Const.
Plume top (PT)	1.7 x VH	6.87	1.7
Release height	0.5 x PT	3.43	0.5
Helipad width		19.67	
Sigma-z	PT / 2.15	3.19	2.15
Sigma-y	PW / 2.15	9.15	2.15

(EPA 2012)

Conversions

60 min/hr
2,000 lb/ton

Mining Year 4

TSF Construction

Activity Information

Percent of total activity 0% *(Midas Gold 2018f)*

Operation 355 day/yr

Total Life of Mine Emissions

PM ton	PM10 ton	PM2.5 ton
131.09	37.02	12.32

Detailed emission calculations provided on sheet: Const, page 2

Construction Emissions by Model ID

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	Hg2+P_TPY
		PM	PM10		PM2.5		Hg2+P
Model ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
BT	Tailings Storage Facility Construction	--	--	--	--	--	--

Maximum daily emissions based on: 1,000 person crew during peak construction, scaled with an average annual crew of *750*

Other construction activity during mine operation is accounted for in the mine equipment usage.

Conversions

2,000 lb/ton

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Mining Year **4**

Hazardous Air Pollutants and Greenhouse Gas Emissions

HAP Emissions Summary

CAS No.	Pollutant/Group	Emissions lb/yr	Emissions ton/yr
106990	1,3-Butadiene	10.6	5.3E-3
75070	Acetaldehyde	231	0.115
107028	Acrolein	32.0	1.6E-2
7440360	Antimony	53.0	2.7E-2
7440382	Arsenic	1,536	**0.768**
71432	Benzene	928	0.464
7440417	Beryllium	7.39	3.7E-3
7440439	Cadmium	1.16	5.8E-4
7440473	Chromium	21.2	1.1E-2
7440484	Cobalt	9.34	4.7E-3
50000	Formaldehyde	390	0.195
7439921	Lead	18.5	9.3E-3
7439965	Manganese	696	0.348
7439976	Mercury	8.46	4.2E-3
7440020	Nickel	4.77	2.4E-3
7723140	Phosphorus	1,496	0.748
	POM	229	0.115
108883	Toluene	355	0.178
1330207	Xylene	245	0.123
Total HAP		6,272	3.14
		chk	chk

GHG Emissions Summary

Pollutant	Emissions ton/yr
Total GHGs	93,287

Conversions

2,000	lb/ton
1.10231	ton/t

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Mining Year 4

Hazardous Air Pollutants and Greenhouse Gas Emissions - Combustion Sources

Activity Information

Mining Mobile Equipment				
Large diesel machinery (> 600 hp)	6,337,320	gal/yr	868,213 MMBtu/yr[1]	*See Mine Sheet*
Small diesel machinery (≤ 600 hp)	1,855,023	gal/yr	254,138 MMBtu/yr[1]	*See Mine Sheet*
Access Road Maintenance				
Large diesel machinery (> 600 hp)	--	gal/yr	-- MMBtu/yr[1]	*See Mine Sheet*
Small diesel machinery (≤ 600 hp)	131,289	gal/yr	17,987 MMBtu/yr[1]	*See Mine Sheet*

[1] Based on diesel heating value of 137,000 Btu/gal *AP-42, Appendix A, p. A-5, 9/85*

Combustion HAP Emission Factors and Emissions

No.	Pollutant/Group	Small Engines[1] lb/MMBtu	Large Engines[2] lb/MMBtu	Emissions CAS lb/yr	ton/yr
106990	1,3-Butadiene	3.91E-5		10.6	5.3E-3
75070	Acetaldehyde	7.67E-4	2.52E-5	231	0.115
107028	Acrolein	9.25E-5	7.88E-6	32.0	1.6E-2
71432	Benzene	9.33E-4	7.76E-4	928	0.464
50000	Formaldehyde	1.18E-3	7.89E-5	390	0.195
	POM [3]	1.68E-4	2.12E-4	229	0.115
108883	Toluene	4.09E-4	2.81E-4	355	0.178
1330207	Xylene	2.85E-4	1.93E-4	245	0.123
Combustion HAP Total				2,420	1.21

[1] *AP-42, Tab. 3.3-2, 10/96, diesel engines (≤ 600 hp)*

[2] *AP-42, Tabs. 3.4-3 & 3.4-4, 10/96, large diesel engines (> 600 hp)*

[3] *POM = Polyoxymethylene, includes:*
Benz(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene Fluoranthene, Fluorene, 2-Methylnaphthalene, 3-Methylchloranthrene, 7,12-Dimethylbenz(a)anthracene, Acenaphthene, Acenaphthylene, Anthracene, Indeno(1,2,3-c,d)pyrene, Naphthalene, Phenanthrene, Pyrene.

Greenhouse Gas Emission Factors [1] and Emissions

Fuel	CO2	CH4	N2O	CO2	CH4	N2O	CO2e
	kg/MMBtu			mt/yr	mt/yr	mt/yr	mt/yr
Diesel	73.96	3.0E-3	6.0E-4	84,339	3.4	0.7	84,629
Combustion Total GHG				84,339	3.4	0.7	84,629

[1] *40 CFR 98 Tab. C-1 and C-2 (CFR 2018d)*

Global Warming Potential [1]

CO2	1
CH4	25
N2O	298

[1] *40 CFR 98 Tab. A-1 (CFR 2018d)*

Conversions
2,000 lb/ton
1,000 kg/mt

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Mining Year **4**

Hazardous Air Pollutants and Greenhouse Gas Emissions - Fugitive Dust Sources

Activity Information

Activity	PM ton/yr	
Open Pit Drilling	65.32	*See Mine Sheet*
Open Pit Blasting	58.20	*See Mine Sheet*
Onsite Hauling	746.19	*See Mine Sheet*
Material Load / Unload	8.10	*See Mine Sheet*
Dozing	71.16	*See Mine Sheet*
Grading	17.66	*See Mine Sheet*
Water Truck Travel	46.44	*See Mine Sheet*
Access Roads	112.50	*See Mine Sheet*
Wind Erosion	2.61	*See Mine Sheet*
Surface Exploration	1.12	*See Mine Sheet*
TSF Construction	--	
Ore Process Dust	21.46	*See Proc Sheet*
Limestone Process Dust	16.90	*See Proc Sheet*
Ore/Waste Subtotal	1,150.76	
Limestone Subtotal	16.90	

Ore, Watse, and Limestone Dust HAP Concentrations [1] ***and Emissions***

CAS No.	Pollutant	Ore & Watse[1] ppm	Limestone[2] ppm	Emissions lb/yr	ton/yr
7440382	Arsenic	667	23	1,535.89	0.77
7440417	Beryllium	3.2	0.8	7.39	3.7E-3
7440439	Cadmium	0.5	0.25	1.16	5.8E-4
7440484	Cobalt	4	4	9.34	4.7E-3
7440473	Chromium	9	15	21.22	1.1E-2
7439976	Mercury	0.6	0.02	1.38	6.9E-4
7439965	Manganese	299	236.5	696.15	0.35
7440020	Nickel	2	5	4.77	2.4E-3
7439921	Lead	8	3	18.51	9.3E-3
7440360	Antimony	23	2.5	53.02	2.7E-2
7723140	Phosphorus	650		1,495.98	0.75
Dust HAP Total				3,844.82	1.92

[1] *(Midas Gold 2017c) for all metals but Hg; Hg value from (Midas Gold 2018i)*

[2] *(Maerz 2018)*

Conversions

2,000 lb/ton

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Mining Year **4**

Hazardous Air Pollutants and Greenhouse Gas Emissions - Mercury

Fugitive Mercury Flux and Emissions

CAS No	Pollutant	Source	Area m^2	Area ha	Hg Flux $\mu g/m^2$-yr	Emissions lb/yr	Emissions ton/yr
		Stockpiles	52,623	5.3	556	6.5E-2	3.2E-5
		Rock Dumps	2,063,990	206.4	76.2	0.35	1.7E-4
		Tailings	1,338,158	133.8	2,144	6.32	3.2E-3
		Pits	1,160,519	116.1	132.3	0.34	1.7E-4
7439976	Mercury					7.07	3.5E-3

Fugitive Mercury Emission Factors

Source	Twin Creeks (TC) Hg Flux [1] $\mu g/m^2$-yr	Twin Creeks (TC) Hg [2] µg/g	Ore Hg Adjusted $\mu g/m^2$/yr TC	Stibnite Hg Flux [3] $\mu g/m^2$-yr	Stibnite Hg [4] µg/g
Stockpiles	5,609	33	556	556	0.96
Rock Dumps	768	3.5	76.2	76.2	0.60
Tailings	21,621	33	2,144	2,144	0.96
Pits	1,334	9.5	132	132.3	0.60

[1] *(Eckley 2010)* *Table 1: Hg flux µg/m^2-yr*

[2] *(Eckley 2010)* *Table 1: Average Hg flux mg/g: " Stockpiles - high-grade stockpiles, Rock Dumps - waste rock dumps, Tailings - high-grade stockpilese as a surrogate; Pits - pit"*

[3] *(Eckley 2010)* *Figure 2: log(y) = m*log(x) + b*

y = Hg Flux (ng/m^2-d)

x = material Hg concentration (µg/g)]

Slope =	*Solar*	*TC*
	Low	*0.59*
	Medium	*0.6*
	High	*0.77*
	Average	*0.65*

[4] *(Midas Gold 2018i) Stockpiles - Ore, Rock Dumps - Rock, Tailings - Ore as a surrogate, Pits - Ore and Rock combined average*

Sample Calculation: $m = \log(y1/y2) / \log(x1/x2)$

m=	0.65	unit less
y1=	5,609	µg/m^2-yr
x1=	33	µg/m^2-yr
x2=	0.96	µg/m^2-yr
log(x1/x2)=	1.536243	unit less
log(y1/y2)=	1.003679	unit less
y1/y2=	10.08506	unit less
y2=	556.2	µg/m^2-yr

Conversions

2,000	lb/ton
10,000	m2/ha
453.593	g/lb
1,000	ng/µg
365	day/yr

0.365 (µg/m^2-yr) / (ng/m^2-d) $\frac{1 \text{ ng}}{\text{m2-d}} \left| \frac{\mu g}{1{,}000 \text{ ng}} \right| \frac{365 \text{ d}}{\text{yr}} = \frac{0.365 \ \mu g/\text{m2-yr}}{\mu g/g}$

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Mine Construction Emissions Construction Year PP

Annual Emissions Summary

Activity	PM ton/yr	PM10 ton/yr	PM2.5 ton/yr	CO ton/yr	NOX ton/yr	SO2 ton/yr	VOC ton/yr	Total HAP ton/yr	CO2e ton/yr
Facility and Infrastructure Construction	48.2	13.6	4.5					0.08	
Power Generation	2.2	2.2	2.2	191.4	42.6	0.29	23.4	4.6	35,286
Access Road	147.5	38.3	4.0	9.4	6.4	0.02	0.9	0.24	3,571
Construction Total	197.9	54.2	10.8	200.7	49.0	0.32	24.3	4.9	38,857

Maximum Daily Emissions Summary[1]

Activity	PM lb/day	PM10 lb/day	PM2.5 lb/day	CO lb/day	NOX lb/day	SO2 lb/day	VOC lb/day	Total HAP lb/day	CO2e lb/day
Facility and Infrastructure Construction	362	102.2	34.0					0.60	
Power Generation	12.6	12.6	12.6	1,078.1	240.0	1.7	132.0	25.9	198,796
Access Road	1,107.9	287.8	30.2	70.3	48.0	0.2	6.7	1.8	26,823
Construction Total	1,482.4	402.7	76.9	1,148.4	288.0	1.8	138.7	28.3	225,618

[1] *Maximum daily emissions basedon:* 1,000 *person crew during peak construction, scaled with an average annual crew of* 750 *and an annual operating schedule of* 355 *day/yr (M3 2014)*

Daily power generation emissions are not scaled by peak crew.

Facility Infrastructure Construction Emissions by LOM Year[1]

LOM	PM ton/yr	PM10 ton/yr	PM2.5 ton/yr	CO ton/yr	NOX ton/yr	SO2 ton/yr	VOC ton/yr	Total HAP ton/yr	CO2e ton/yr
-2	53.1	15.0	5.0					0.09	
-1	160.9	45.4	15.1					0.27	
PP	48.2	13.6	4.5					0.08	
1	6.1	1.7	0.6					0.01	
2	32.3	9.1	3.0					0.05	
3	13.7	3.9	1.3					0.02	
4	6.4	1.8	0.6					0.01	
5	13.7	3.9	1.3					0.02	
6	6.1	1.7	0.6					0.01	
[1] 7	5.5	1.6	0.5					0.01	
(Midas Gold 2018f)	chk	chk	chk						

Power Generation Emissions by LOM Year

LOM	Capacity[1]	PM ton/yr	PM10 ton/yr	PM2.5 ton/yr	CO ton/yr	NOX ton/yr	SO2 ton/yr	VOC ton/yr	Total HAP ton/yr	CO2e ton/yr
CO -2	100%	4.5	4.5	4.5	382.7	85.2	0.59	46.9	9.2	70,573
CO -1	100%	4.5	4.5	4.5	382.7	85.2	0.59	46.9	9.2	70,573
CO PP	50%	2.2	2.2	2.2	191.4	42.6	0.29	23.4	4.6	35,286
[1] *(Midas Gold 2018f)*		chk	chk	chk	chk	chk	chk	chk		

Access Road Emissions by LOM Year

LOM	PM ton/yr	PM10 ton/yr	PM2.5 ton/yr	CO ton/yr	NOX ton/yr	SO2 ton/yr	VOC ton/yr	Total HAP ton/yr	CO2e ton/yr
-2	147.5	38.3	4.0	9.4	6.4	0.023	0.9	0.24	3,571
-1	147.5	38.3	4.0	9.4	6.4	0.023	0.9	0.24	3,571
PP	147.5	38.3	4.0	9.4	6.4	0.023	0.9	0.24	3,571
	chk	chk	chk	chk	chk	chk	chk		

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Facility and Infrastructure Construction

Activity Information *(Midas Gold 2018d)*

	Construction Activity	acre
CON	Tailings Storage Facility (including water diversions)	425.3
CON	Haul Roads	178.1
CON	Burntlog Road (including borrows, cut/fill)	337
CON	Exploration Decline and Explosives Area	29.9
CON	EFSFSR Tunnel (including water diversions)	5.9
CON	Ore Processing Area	70.6
CON	Truck Shop Area	5.4
CON	Stibnite Lodge	21.8
CON	Landmark Maintenance Facility	4
CON	Logistics Facility	25
CON	Other Disturbance	19.1

Emission Factors (ton/acre)	PM	PM10	PM2.5	
Site Preparation/Construction	0.308	0.087	0.029	ton/acre *See sheet: PwrConst, page 2*

Emissions by Facility ***Total Construction Emissions***

	Facility	PM ton	PM10 ton	PM2.5 ton
CON	Tailings Storage Facility (including water diversions)	131.1	37.0	12.3
CON	Haul Roads	54.9	15.5	5.2
CON	Burntlog Road (including borrows, cut/fill)	103.9	29.3	9.8
CON	Exploration Decline and Explosives Area	9.2	2.6	0.9
CON	EFSFSR Tunnel (including water diversions)	1.8	0.5	0.2
CON	Ore Processing Area	21.8	6.1	2.0
CON	Truck Shop Area	1.7	0.5	0.2
CON	Stibnite Lodge	6.7	1.9	0.6
CON	Landmark Maintenance Facility	1.2	0.3	0.1
CON	Logistics Facility	7.7	2.2	0.7
CON	Other Disturbance	5.9	1.7	0.6
	Total	345.9	97.7	32.5
		PM_total	PM10_total	PM2.5_total

Conversions

2,000 lb/ton	43,560 ft2/acre	3.28084 ft/m
1.1 ton/mt	100 cm/m	5280 ft/mi

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Mine Construction Emissions

Power Generation

Activity Information

Total Requirement		10 MW			*(Midas Gold 2016), pg. ES-14*
Diesel Generators[1]	75%	8.5 MW	72,420 MW-hr/yr		*(Midas Gold 2017f)*
Propane Generators	25%	2.5 MW	21,300 MW-hr/yr		*(Midas Gold 2017f)*

[1] *Includes temporary power supply to Warm Lake and Yellow Pine based on:* 317 *MMBtu per capita (EIA 2018) and* 100 *people (Midas Gold 2018k)*

Temporary Power 1 MW $\frac{317\ \text{MMBtu}}{\text{person-yr}} \times \frac{0.2933\ \text{MW-hr}}{\text{MMBtu}} \times \frac{100\ \text{person}}{8{,}760\ \text{hr}} \times \frac{\text{yr}}{\text{hr}}$

Emission Factors - Diesel Generators (g/kW-hr)

Pollutant	Standard[1]
CO	3.5
NOX	0.67
VOC	0.19
PM	0.03

[1] *40 CFR: 60.4204(b), 60.4201(a), Table 1 of 1039.101*

Fuel Sulfur-Content-Based SO2 Emission Factor

Fuel Sulfur-Content	0.0015%		*non-road diesel, 40 CFR 80.510*
Diesel Density	7.05	lb/gal	*AP-42, App. A*
Molecular Wt. of SO2	64.0638		
Molecular Wt. of S	32.065		
Diesel Heat Content	137,000	BTU/gal	*AP-42, App. A (Diesel)*
Brake-Specific Fuel Use	7,000	BTU/hp-hr	*AP-42, Sec. 3.3, (Diesel)*

SO2 emission factor:

0.000011 lb/hp-hr $\frac{0.0015\%\ \text{lb S}}{\text{lb Fuel}} \times \frac{7.05\ \text{lb Fuel}}{\text{gal Fuel}} \times \frac{64.064\ \text{lb SO2}}{32.065\ \text{lb S}} \times \frac{\text{gal Fuel}}{137{,}000\ \text{BTU}} \times \frac{7{,}000\ \text{BTU}}{\text{hp-hr}}$

0.006567 g/kW-hr $\frac{0.000011\ \text{lb}}{\text{hp-hr}} \times \frac{1.341\ \text{hp}}{\text{kW}} \times \frac{453.593\ \text{g}}{\text{lb}}$

Emission Factors - Propane Generators (g/kW-hr)

Pollutant	Standard[1]
CO	4.4
NOX	1.35
VOC	1.35

[1] *40 CFR: 60.4233(c) (>19 kw), 4231(c), 1048.101(2). ≥2007 model year . NOX + VOC = NOX+HC standard at 50:50 split.*

Other Emission Factors

PM/PM10/PM2.5	0.01941	lb/MMBTU[1,2]	8.89E-02	g/kW-hr[3]
SO2	5.88E-04	lb/MMBTU[1]	2.69E-03	g/kW-hr[3]

[1] *AP-42, Tab. 3.2-3, 07-00 (4-stroke rich-burn engines)*

[2] *Filterable + condensable particulates*

[3] *Based on brake-specific fuel consumption of* 7,527 *BTU/hp-hr (Caterpillar 1997)*

Conversions

355	day/yr
24	hr/day
1.341	hp/kW
453.6	g/lb
1,000,000	BTU/MMBTU

Mine Construction Emissions

Emissions

Generator Type	PM ton/yr	PM10 ton/yr	PM2.5 ton/yr	CO ton/yr	NOX ton/yr	SO2 ton/yr	VOC ton/yr
Diesel Generators(1)	2.4	2.4	2.4	279.4	53.5	0.5	15.2
Propane Generators	2.1	2.1	2.1	103.3	31.7	0.1	31.7
Total	4.5	4.5	4.5	382.7	85.2	0.6	46.9

Fuel Consumption

Diesel Consumption on Access Roads[1] 43,649 MMBTU/yr *See access road fuel consumption on page 6*
Diesel Generators[2] 679,807 MMBTU/yr
Propane Generators[3] 214,996 MMBTU/yr

[1] *Based on 137,000 BTU/gal AP-42, App. A (Diesel)*
[2] *Based on 7,000 BTU/hp-hr AP-42, Sec. 3.3, (Diesel)*
[3] *Based on 7,527 BTU/hp-hr (Caterpillar 1997)*

Combustion HAP Emission Factors and Emissions

CAS No.	Pollutant/Group	Small Engines[1] lb/MMBtu	Large Engines[2] lb/MMBtu	Propane Engines[3] lb/MMBtu	Emissions[4] lb/yr	ton/yr
78875	1,2-Dichloropropane			2.69E-5	5.78	2.9E-3
106990	1,3-Butadiene	3.91E-5		2.67E-4	85.7	4.3E-2
542756	1,3-Dichloropropene			2.64E-5	5.68	2.8E-3
540841	2,2,4-Trimethylpentane			2.50E-4	53.7	2.7E-2
75070	Acetaldehyde	7.67E-4	2.52E-5	8.36E-3	2,352	1.18
107028	Acrolein	9.25E-5	7.88E-6	5.14E-3	1,172	0.586
71432	Benzene	9.33E-4	7.76E-4	4.40E-4	770	0.385
56235	Carbon Tetrachloride			3.67E-5	7.89	3.9E-3
108907	Chlorobenzene			3.04E-5	6.54	3.3E-3
	Chloroethanes	0.00E+0	0.00E+0	1.21E-4	26.0	1.3E-2
67663	Chloroform			2.85E-5	6.13	3.1E-3
100414	Ethylbenzene			3.97E-5	8.54	4.3E-3
106934	Ethylene Dibromide			4.43E-5	9.52	4.8E-3
50000	Formaldehyde	1.18E-3	7.89E-5	5.28E-2	12,205	6.10
110543	Hexane			1.11E-3	239	0.119
67561	Methanol			2.50E-3	537	0.269
75092	Methylene Chloride			2.00E-5	4.30	2.1E-3
108952	Phenol			2.40E-5	5.16	2.6E-3
	POM [5]	1.68E-4	2.12E-4	3.47E-4	228	0.114
100425	Styrene			2.36E-5	5.07	2.5E-3
108883	Toluene	4.09E-4	2.81E-4	4.08E-4	384	0.192
75014	Vinyl Chloride			1.49E-5	3.20	1.6E-3
1330207	Xylene	2.85E-4	1.93E-4	1.84E-4	246	0.123
Combustion HAP Total					18,360	9.18

[1] *AP-42, Tab. 3.3-2, 10/96, diesel engines (≤ 600 hp)*
[2] *AP-42, Tabs. 3.4-3 & 3.4-4, 10/96, large diesel engines (> 600 hp)*
[3] *AP-42, Tabs. 1.4-2, 1.4-3 & 1.4-4, 07/98, external natural gas combustion, based on 1,020 Btu/Scf*
[4] *Maximum of the two diesel engine emission factors used*
[5] *POM = Polyoxymethylene, includes:*
2-Methylnaphthalene, 3-Methylchloranthrene, 7,12-Dimethylbenz(a)anthracene, Acenaphthene, Acenaphthylene, Anthracene, Benz(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Indeno(1,2,3-c,d)pyrene, Naphthalene, Phenanthrene, Pyrene.

Conversions

1,000,000 BTU/MMBTU 1,000 kW/MW 907,186 g/ton
2,000 lb/ton 1.341 hp/kW

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Mine Construction Emissions

Greenhouse Gas Emission Factors[1] and Emissions

Fuel	CO2	CH4	N2O	CO2	CH4	N2O	CO2e
	kg/MMBtu			mt/yr	mt/yr	mt/yr	mt/yr
Gen Diesel	73.96	3.0E-3	6.0E-4	50,278	2.0	0.4	50,451
Gen Propane	62.87	3.0E-3	6.0E-4	13,517	0.6	0.1	13,571
Access Rd Diesel	73.96	3.0E-3	6.0E-4	3,228	0.13	0.03	3,239
Combustion Total GHG				67,024	3	1	67,262

[1] *40 CFR 98 Tab. C-1 and C-2 (CFR 2018d)*

Global Warming Potential [1]

CO2	1
CH4	25
N2O	298

[1] *40 CFR 98 Tab. A-1 (CFR 2018d)*

Dust HAP Emission Factors and Emissions

HAP Concentrations[1] and Emissions[2]

CAS No.	Pollutant	ppm	Emissions lb/yr	Emissions ton/yr
7440382	Arsenic	667	259.9	0.1
7440417	Beryllium	3.2	1.2	6.2E-4
7440439	Cadmium	0.5	0.2	9.7E-5
7440484	Cobalt	4.0	1.6	7.8E-4
7440473	Chromium	9.0	3.5	1.8E-3
7439976	Mercury	0.6	0.2	1.2E-4
7439965	Manganese	299	116.5	5.8E-2
7440020	Nickel	2.0	0.8	3.9E-4
7439921	Lead	8.0	3.1	1.6E-3
7440360	Antimony	23	9.0	4.5E-3
7723140	Phosphorus	650	253.2	0.1
Dust HAP Total		1,666	649.2	0.3

[1] *(Midas Gold 2017c) for all metals but Hg; Hg value from (Midas Gold 2018i)*

[2] *Based on total PM emissions of* 194.8 *ton/yr* *See construction PM emissions on page 2, and access road PM emissions (excluding tailpipes) on page 8*

Conversions

1,000 kg/mt
2,000 lb/ton

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Mine Construction Emissions

Access Roads Equipment

Operation Schedule 355 day/yr 24 hr/day MachineSpecs

Traffic Specifications and Activity

Equipment[1]	Equipment Model[2]	ID	Rating[3] hp	Rating kW	Oper.[4] hr/yr	Annual[1] trip/yr	Diesel[5] gal/yr	Output[6] kW-hr/yr	Travel[7] VMT/yr	Equipment Category	On-road Class	
Grader	Cat 160H	CT1	200	149	3,978	183	13,424	195,912	13,731	Non-road		Cat 1
Plow Truck	Cat CT660	CT2	476	355	3,978	183	31,826	--	13,731	On-road	HHD	Cat C
Snow Blower	TM42R	CT3	450	336	3,978	183	30,088	--	13,731	On-road	HHD	Cat C
Water Truck	Cat 725C	CT4	320	239	3,978	183	31,826	464,491	13,731	Non-road		Cat 7
Binding Agent Truck	Cat 725C	CT5	320	239	3,978	183	31,826	464,491	13,731	Non-road		Cat 7
Vibratory Compactor	Cat CS76 XT	CT6	177	132	3,978	183	20,886	304,822	13,731	Non-road		Cat C
Fuel Service Truck	CAT 740B	CT7	484	361	3,978	183	35,804	522,552	13,731	Non-road		CAT
Rock Rakes	Cat CT660	CT8	476	355	3,978	183	31,826	--	13,731	On-road	HHD	Cat C
Light Vehicles	F-350	CT9	440	328		3,314	17,762	--	248,662	On-road	LHD45	F-350
Heavy Trucks	Cat CT660 (8	CT10	476	355		6,353	73,337	--	476,691	On-road	HHD	Cat C

[1] *(Midas Gold 2016), Tables 7-1, 12-1. Maintenance trips distributed equally amongst maintenace equipment.*

Heavy trucks include buses, supply and trash trucks. Light vehicles include visitor and employee vehicles.

[2] *Similar models by equipment type from (Midas Gold 2017b)*

[3] *(Caterpillar 2016c)/Manufacturer specifications*

[4] *Combined hours, (Midas Gold 2017f)*

[5] *Maintenance equipment based on brake-specific fuel use scaled for similar equipment from (Midas Gold 2017b)*

Light vehicles based on Ford F-350 fuel economy o 14.0 *mpg (fuelly.com)* *Heavy trucks based on fuel economy of:* 6.5 *mpg (ATRI 2016)*

[6] *Based o* 137,000 *BTU/gal* AP-42, App. A (Diesel) 7,000 *BTU/hp-hr* AP-42, Sec. 3.3, (Diesel)

[7] *Based on access road length of:* 37.5 X 2 *mi (roundtrip)* *(Midas Gold 2018c)*

EPA Non-Road Standards

ID	Equipment Type	Model[1] Year	Power Category	EPA Tier	Lookup ID	EPA Non-Road Standards (g/kW-hr)[2] PM	CO	NOX	VOC
CT1	Grader	>2015	130≤kW<560, Ph-i	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
CT2	Truck				No Standard				
CT3	Truck				No Standard				
CT4	Truck	>2015	130≤kW<560, Ph-i	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
CT5	Truck	>2015	130≤kW<560, Ph-i	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
CT6	Compactor	>2015	130≤kW<560, Ph-i	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
CT7	Truck	>2015	130≤kW<560, Ph-i	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
CT8	Truck				No Standard				
CT9	Light Truck				No Standard				
CT10	Truck				No Standard				

[1] *(Midas Gold 2017h)*

[2] *(CFR 2018a)*

Final Emission Factors

ID	Lookup	PM	PM10	PM2.5	CO	NOX	VOC	SO2	EF Unit	Final EF	Activity	
CT1	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.01	g/kW-hr	*EPA_NRS*	195,912	kW-hr/yr
CT2	HHD	1.17	1.17	0.46	2.31	7.32	0.51	0.01	g/VMT	*EPA_MOVES2014a*	13,731	VMT/yr
CT3	HHD	1.17	1.17	0.46	2.31	7.32	0.51	0.01	g/VMT	*EPA_MOVES2014a*	13,731	VMT/yr
CT4	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.01	g/kW-hr	*EPA_NRS*	464,491	kW-hr/yr
CT5	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.01	g/kW-hr	*EPA_NRS*	464,491	kW-hr/yr
CT6	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.01	g/kW-hr	*EPA_NRS*	304,822	kW-hr/yr
CT7	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	0.01	g/kW-hr	*EPA_NRS*	522,552	kW-hr/yr
CT8	HHD	1.17	1.17	0.46	2.31	7.32	0.51	0.01	g/VMT	*EPA_MOVES2014a*	13,731	VMT/yr
CT9	LHD45	0.59	0.59	0.29	1.87	4.94	0.68	0.01	g/VMT	*EPA_MOVES2014a*	248,662	VMT/yr
CT10	HHD	1.17	1.17	0.46	2.31	7.32	0.51	0.01	g/VMT	*EPA_MOVES2014a*	476,691	VMT/yr

Mine Construction Emissions

Access Roads - continued

Final Emission Factor Options:

Category	EF Unit	Activity Unit	Emission Unit	Multiplier
EPA_CERT	g/kW-hr	kW-hr/yr	ton/yr	1.1E-6
EPA_NRS	g/kW-hr	kW-hr/yr	ton/yr	1.1E-6
EPA_MOVES2014a	g/VMT	VMT/yr	ton/yr	1.1E-6

Traffic Tailpipe Emissions

ID	Equipment Type	PM ton/yr	PM10 lb/day	PM10 ton/yr	PM2.5 lb/day	PM2.5 ton/yr	CO lb/day	CO ton/yr	NOX lb/day	NOX ton/yr	SO2 lb/day	SO2 ton/yr	VOC ton/yr
CT1	Grader	4.3E-3	0.02	4.3E-3	0.02	4.3E-3	4.26	0.76	0.49	0.09	8.0E-3	1.4E-3	0.04
CT2	Plow Truck	0.02	0.10	0.02	0.04	7.0E-3	0.20	0.04	0.62	0.11	9.1E-4	1.6E-4	7.7E-3
CT3	Snow Blower	0.02	0.10	0.02	0.04	7.0E-3	0.20	0.04	0.62	0.11	9.1E-4	1.6E-4	7.7E-3
CT4	Water Truck	0.01	0.06	0.01	0.06	0.01	10.10	1.79	1.15	0.20	0.02	3.4E-3	0.10
CT5	Binding Agent Truc	0.01	0.06	0.01	0.06	0.01	10.10	1.79	1.15	0.20	0.02	3.4E-3	0.10
CT6	Vibratory Compacto	6.7E-3	0.04	6.7E-3	0.04	6.7E-3	6.63	1.18	0.76	0.13	0.01	2.2E-3	0.06
CT7	Fuel Service Truck	0.01	0.06	0.01	0.06	0.01	11.36	2.02	1.30	0.23	0.02	3.8E-3	0.11
CT8	Rock Rakes	0.02	0.10	0.02	0.04	7.0E-3	0.20	0.04	0.62	0.11	9.1E-4	1.6E-4	7.7E-3
CT9	Light Vehicles	0.16	0.91	0.16	0.45	0.08	2.88	0.51	7.63	1.35	0.02	2.9E-3	0.19
CT10	Heavy Trucks	0.61	3.46	0.61	1.36	0.24	6.85	1.22	21.68	3.85	0.03	5.6E-3	0.27
		0.87	4.91	0.87	2.17	0.39	52.76	9.36	36.03	6.40	0.13	0.02	0.89

LT Unit	ST Unit	Multiplier
ton/yr	lb/day	5.634
ton/yr	lb/hr	0.235

Access Road Grading

Operation 3,978 hr/yr
25,859 VMT/yr

Grading Emission Factors

Emission Factor Equation
TSP (lb/VMT) = 0.04 $(S)^{2.5}$ *AP-42, Tab. 11.9-1, 07/98, (grading)*
PM15 (lb/VMT) = 0.051 $(S)^{2}$ *AP-42, Tab. 11.9-1, 07/98, (grading)*

S - Grader average speed 6.5 mph *(Caterpillar 2016c), haul road maintenance*
TSP(PM) 4.309 lb/VMT
PM15 2.155 lb/VMT

Grading PM Scaling Factors

PM10 0.6 *AP-42, Tab. 11.9-1, 07/98, (applies to PM15 EF, footnote d)*
PM2.5 0.031 *AP-42, Tab. 11.9-1, 07/98, (applies to TSP EF, footnote e)*

Emission Controls Periodic application of water and chemical dust suppressant
Control efficiency: 90% *See Onsite Hauling*

Grading Emissions

PM ton/yr	PM10 lb/day	PM10 ton/yr	PM2.5 lb/day	PM2.5 ton/yr
5.57	16	2.79	0.97	0.17

Conversions

2,000	lb/ton
453.59	g/lb
1.341	hp/kW

Mine Construction Emissions

Access Roads - continued

Access Road Vehicle Travel Dust

Vehicle Specifications

Vehicle Type	Model	Empty Weight[1] ton	Gross Weight[1] ton	Average Weight ton	Travel mi/yr	
Grader	Cat 160H	17.2	17.2	17.2	13,731	*Grader emissions calculated separately*
Plow Truck	Cat CT660	8.2	26.6	17.4	13,731	
Snow Blower	TM42R	14.8	18.0	16.4	13,731	
Water Truck	Cat 725C	25.6	51.6	38.6	13,731	
Binding Agent Truck	Cat 725C	25.6	51.6	38.6	13,731	
Vibratory Compactor	Cat CS76 XT	19.2	20.8	20.0	13,731	
Fuel Service Truck	CAT 740B	37.6	81.1	59.4	13,731	
Rock Rakes	Cat CT660	8.2	26.6	17.4	13,731	
Light Vehicles	F-350	4.0	7.9	6.0	248,662	
Heavy Trucks	Cat CT660 (8X6)	10.1	34.5	22.3	476,691	

[1] *(Caterpillar 2016c)/Manufacturer specifications*

Total vehicle miles traveled (VMT) 821,472 VMT/yr *Excluding grader*

Emission Factors

Emission factor equation $E = k(s/12)^a (W/3)^b [(365-P)/365]$

s = Surface material silt content	4	%			*(Midas Gold 2015)*
W = Mean vehicle weight	18	ton			*Weighted average weight, excluding grader*
P = Days/year with ≥0.01 in precip.	120	day/yr			
	PM	PM10	PM2.5		
k = Size-specific empirical constant	4.9	1.5	0.15		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
a = Size-specific empirical constant	0.7	0.9	0.9		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
b = Size-specific empirical constant	0.45	0.45	0.45		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
E = Size-specific emission factor	3.43	0.84	0.08	lb/VMT	

Emission Controls

Periodic application of water and chemical dust suppressant

Control efficiency: 90% *See Onsite Hauling*

Vehicle Travel Dust Emissions

PM	PM10		PM2.5	
ton/yr	lb/day	ton/yr	lb/day	ton/yr
141.05	195.28	34.66	19.53	3.47

Access Road Total Emissions

PM	PM10		PM2.5		CO		NOX		SO2		VOC
ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/day	ton/yr	ton/yr
147.49	215.88	38.32	22.67	4.02	52.76	9.36	36.03	6.40	0.13	0.02	0.89

Conversions

2,000 lb/ton

Mine Construction Emissions

Access Roads - continued

Fuel Sulfur-Content Based SO2 Emission Factor

Fuel Sulfur-Content	0.0015%		*Non-road diesel specification per 40 CFR 80.510*
Diesel Density	7.05	lb/gal	*AP-42, App. A*
Molecular Wt. of SO2	64.064	lb/lb-mol	
Molecular Wt. of S	32.065	lb/lb-mol	
Diesel Heat Content	137,000	BTU/gal	*AP-42, App. A (Diesel)*
Brake-Specific Fuel Use	7,000	Btu/hp-hr	*AP-42, Sec. 3.3, (Diesel engine)*

SO2 emission factor:

0.000011 lb/hp-hr = 0.0015% ~~lb S~~ / ~~lb Fuel~~ × 7.05 ~~lb Fuel~~ / ~~gal Fuel~~ × 64.064 lb SO2 / 32.065 ~~lb S~~ × ~~gal Fuel~~ / 137,000 ~~BTU~~ × 7,000 ~~BTU~~ / hp-hr

0.0066 g/kW-hr = 0.000011 ~~lb~~ / ~~hp~~-hr × 1.341 ~~hp~~ / kW × 453.593 g / ~~lb~~

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Power Line Construction **Construction Year** **PP**

Annual Emissions Summary

Activity	PM ton/yr	PM10 ton/yr	PM2.5 ton/yr	CO ton/yr	NOX ton/yr	SO2 ton/yr	VOC ton/yr	Total HAP ton/yr	CO2e ton/yr
Facility and Infrastructure Construction	23.5	6.7	2.2					0.0	
Mobile Equipment Tailpipe	2.4	2.4	1.4	69.6	64.6	0.14	4.5	0.3	18,300
Power Line Construction Total	26.0	9.1	3.6	69.6	64.6	0.14	4.5	0.3	18,300

Maximum Daily Emissions Summary[1]

Activity	PM lb/day	PM10 lb/day	PM2.5 lb/day	CO lb/day	NOX lb/day	SO2 lb/day	VOC lb/day	Total HAP lb/day	CO2e lb/day
Facility and Infrastructure Construction	176.9	50.0	16.6					0.3	
Mobile Equipment Tailpipe	18.3	18.3	10.5	523.0	485.2	1.1	33.9	2.2	137,466
Construction Total	195.2	68.3	27.1	523.0	485.2	1.1	33.9	2.5	137,466

[1] *Maximum daily emissions based on 1,000 person crew during peak construction, scaled with an average annual crew of 750 and an annual operating schedule 355 day/yr (M3 2014)*

Facility Infrastructure Construction Emissions by LOM Year[1]

	LOM	Capacity[1]	PM ton/yr	PM10 ton/yr	PM2.5 ton/yr	CO ton/yr	NOX ton/yr	SO2 ton/yr	VOC ton/yr	Total HAP ton/yr	CO2e ton/yr
CON	-2	25%	23.5	6.7	2.2					0.0	
CON	-1	50%	47.1	13.3	4.4					0.1	
CON	PP	25%	23.5	6.7	2.2					0.0	
[1] *(Midas Gold 2018f)*			chk	chk	chk	chk	chk	chk	chk	chk	chk

Mobile Equipment Tailpipe Emissions by LOM Year

	LOM	Capacity[1]	PM ton/yr	PM10 ton/yr	PM2.5 ton/yr	CO ton/yr	NOX ton/yr	SO2 ton/yr	VOC ton/yr	Total HAP ton/yr	CO2e ton/yr
CON	-2	25%	2.4	2.4	1.4	69.6	64.6	0.14	4.5	0.3	18,300
CON	-1	50%	4.9	4.9	2.8	139.3	129.2	0.28	9.0	0.6	36,600
CON	PP	25%	2.4	2.4	1.4	69.6	64.6	0.14	4.5	0.3	18,300
[1] *(Midas Gold 2018f)*			chk	chk	chk	chk	chk	chk	chk	chk	chk

Conversions

365	day/yr
2,000	lb/ton
1.10	ton/t

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Power Line Construction

POD_2017

Activity Information

Construction Activity	acre[1]	yr[2]
Power Line	305.6	3

[1] *(Midas Gold 2018a)*

[2] *(Midas Gold 2018d)*

Emission Factors (ton/acre)	PM	PM10	PM2.5		
Site Preparation/Construction	0.308	0.087	0.029	ton/acre	*See calculations below*

Site Preparation Activity [1]	***Emission Factor***				***Emission Factor Reference***	***Scaling Factor***	
	PM	PM10	PM2.5			PM10	PM2.5
Dozing	3.94	0.753	0.414	lb/hr	*AP-42, Tab. 11.9-1, 07/98, (bulldozing, overburden); See sheet: Mine, page 17*		
Scraper unloading	0.04	0.0189	0.0029	lb/ton	*AP-42, Tab. 11.9-4, 07/98, (scraper unload); scaling factors from AP-42, Sec. 13.2.4, 11/06*	0.47	0.072
Scraper in travel	20.2	3.8586	2.121	lb/VMT	*See scraping topsoil removel below*		
Scraping topsoil removal	20.2	3.8586	2.121	lb/VMT	*AP-42, Tab. 13.2.3-1, 1/95; dozer scaling factors*	0.19	0.11
Material loading	2.11E-4	1.00E-4	1.51E-5	lb/ton	*AP-42, Tab. 11.19.2-2, 8/04 (truck loading - crshed stone); See sheet: Mine, page 8*		
Material dumping	3.38E-5	1.60E-5	2.42E-6	lb/ton	*AP-42, Tab. 11.19.2-2, 8/04 (truck unloading - fragmented stone); See sheet: Mine, page 8*		
Compacting	3.94	0.75	0.41	lb/hr	*AP-42, Tab. 11.9-1, 07/98, (bulldozing, overburden); See sheet: Mine, page 17*		
Grading	4.31	1.29	0.134	lb/VMT	*AP-42, Tab. 11.9-1, 07/98, (grading); See sheet: Mine, page 17*		

[1] *AP-42, Tab. 13.2.3-1, 1/95*

Construction Operation	***Estimated Activity Rate***		***Estimated Emission Factor (ton/acre)***		
			PM	PM10	PM2.5
Dozing[1]	49 hr/ac		9.66E-2	1.84E-2	1.01E-2
Scraper unloading[2]	4,945 ton/ac		9.89E-2	4.68E-2	7.08E-3
Scraper in travel	0.7 VMT/ac	*See scraping topsoil removel below*	7.25E-3	1.38E-3	7.61E-4
Scraping topsoil removal[3]	0.7 VMT/ac		7.25E-3	1.38E-3	7.61E-4
Material loading	4,945 ton/ac	*See scraper unloading above*	5.23E-4	2.47E-4	3.74E-5
Material dumping	4,945 ton/ac	*See scraper unloading above*	8.36E-5	3.96E-5	5.99E-6
Compacting	49 hr/ac	*See dozing above*	9.66E-2	1.84E-2	1.01E-2
Grading[4]	0.5 VMT/ac		1.11E-3	3.33E-4	3.44E-5

[1] *Based on:* 14,976 *hr dozer useage and* 305.6 *acre disturbance Total (3-yr) power line construction activity*

[2] *Based on:* 45 *cm, scraper cut depth (Caterpillar 631K Scraper) (Caterpillar 2016b) & waste material density of:* 153.8 *lb/ft* ^{3} *(Midas Gold 2017b)*

[3] *Based on:* 11.5 *ft blade width (Caterpillar 631K Scraper) (Caterpillar 2016b)*

[4] *Based on:* 16.0 *ft blade width (Caterpillar 16M3 Grader) (Caterpillar 2016a)*

Emissions ***Total Construction Emissions***

Activity	PM	PM10	PM2.5	CO	NOX	SO2	VOC	Total HAP	CO2e
	ton	ton	ton	ton	ton	ton	ton	ton	ton
Power Line	94.2	26.6	8.9					0.2	
Mobile Equipment Tailpipe	9.7	9.7	5.6	278.5	258.4	0.6	18.1	1.2	73,201
Total	103.9	36.4	14.4	278.5	258.4	0.6	18.1	1.3	73,201

Conversions

2,000	lb/ton	43,560 ft2/acre	3.28084 ft/m
1.1	ton/mt	100 cm/m	5280 ft/mi

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Power Line Construction

Mobile Equipment Tailpipe

MachineSpecs

POD_2017

Activity Information

Mobile Equipment Specifications and Activity

ID	Equipment Type[1]		Equipment Model[2]	Rating hp[2]	Rating kW	Oper. hr/yr[1,3]	Diesel gal/hp-hr[2]	Diesel gal/yr	Output kW-hr/yr[4]	Travel VMT/yr[5]	Equipment Category	On-road Class[6]		
	Transmission Line	gal/hr												
TL1	Bulldozer	19	Cat D10T2	600	447	4,992	0.032	94,848	1,384,274		Non-road		30.66	62%
TL2	Motor Grader	5.5	Cat 16M	326	243	4,992	0.017	27,456	400,711		Non-road		16.66	33%
TL3	Auger Truck	8	Cat CT660	476	355	4,992	0.017	39,936	582,852	99,840	On-road	HHD	24.32	33%
TL4	Wire Reel Trailer	8	Cat CT660	476	355	7,488	0.017	59,904	874,278	149,760	On-road	HHD	24.32	33%
TL5	Truck Mounted Crane	8	Cat CT660	476	355	4,992	0.017	39,936	582,852	99,840	On-road	HHD	24.32	33%
TL6	Pickup	1	F-350 (PT)	440	328	12,480	0.002	12,480	182,141	312,000	On-road	LHD45	22.48	4%
TL7	Fork Lift	2.5	CAT DP160N	124	92	4,992	0.020	12,480	182,141		Non-road	--	6.336	39%
TL8	Diesel Tractor	10	Cat 586C	350	261	7,488	0.029	74,880	1,092,848		Non-road		17.88	56%
TL9	Splicing Truck	8	Cat CT660	476	355	1,248	0.017	9,984	145,713	24,960	On-road	HHD	24.32	33%
TL10	Boom Truck	8	Cat CT660	476	355	4,992	0.017	39,936	582,852	99,840	On-road	HHD	24.32	33%
TL11	Three Drum Puller	8	Cat CT660	476	355	3,744	0.017	29,952	437,139	74,880	On-road	HHD	24.32	33%
TL12	Single Drum Puller	8	Cat CT660	476	355	1,872	0.017	14,976	218,570	37,440	On-road	HHD	24.32	33%
TL13	OHGW and Fiber Reel Trailer	8	Cat CT660	476	355	4,992	0.017	39,936	582,852	99,840	On-road	HHD	24.32	33%
TL14	Dump Truck	9	Cat 740B	484	361	2,496	0.019	22,464	327,854		Non-road		24.73	36%
TL15	Loader	12	Cat 988K	580	433	2,496	0.020	28,704	418,925		Non-road		29.64	39%
TL16	Water Truck	25	Cat 777D	1,000	746	42,432	0.025	1,060,800	15,482,007		Non-road		51.09	49%
TL17	Hauling Truck	25	Cat 777D	1,000	746	4,992	0.025	124,800	1,821,413		Non-road		51.09	49%
TL18	Tensioner	8	Cat CT660	476	355	1,248	0.017	9,984	145,713	24,960	On-road	HHD	24.32	33%
	Substation													
SS1	Backhoe	5	CAT 430E	101	75	4,992	0.050	24,960	364,283		Non-road		5.161	97%
SS2	Auger	8	Cat CT660	476	355	19,968	0.017	159,744	2,331,408	399,360	On-road	HHD	24.32	33%
SS3	Concrete Truck	8	Cat CT660	476	355	19,968	0.017	159,744	2,331,408	399,360	On-road	HHD	24.32	33%
SS4	Pickup	1	F-350 (PT)	440	328	9,984	0.002	9,984	145,713	249,600	On-road	LHD45	22.48	4%
SS5	Field Office/Trailer	7	F-650	330	246	2,496	0.021	17,472	254,998	62,400	On-road	MHD	16.86	42%
SS6	Drilling Rig	12	Cat MD6420	800	597	2,496	0.015	29,952	437,139		Non-road		40.88	29%
SS7	Vibratory Roller	5.3	Cat CS76 XT	177	132	2,496	0.030	13,104	191,248		Non-road		9.044	58%
SS8	Fork Lift	2.5	CAT DP160N	124	92	7,488	0.020	18,720	273,212		Non-road	--	6.336	39%

[1] *(HDR 2017)*

[2] *Equipment type specific make and model, rating, and brake-specific fuel consumption (LOM year 4) selected from mine operation fleet (Midas Gold 2017b)*

[3] *Weekly hours (HDR 2017) times 52 weeks per year*

[4] *Based o* 137,000 *BTU/gal* *AP-42, App. A*

7,000 *BTU/hp-hr* *AP-42, Sec. 3.3*

[6] *On-road vehicle codes and descriptions provided in MOVES emission factors table*

VMT = Vehicle Miles Travelled

[4] *Based on the following average speeds (mph):* *(Midas Gold 2018e)*

Cat CT660	*20*
F-350 (PT)	*25*
F-650	*25*

Conversions

1.341	hp/kW
453.6	g/lb
1,000,000	BTU/MMBTU

Power Line Construction

Mobile Equipment Tailpipe

Operation schedule 365 day/yr 12 hr/day

EPA Non-Road Standards

ID	Equipment Type	Model[1] Year	Power Category	EPA Tier	Lookup ID	EPA Non-Road Standards (g/kW-hr)[2] PM	CO	NOX	VOC
Transmission Line									
TL1	Dozer	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
TL2	Grader	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
TL3	Truck	>2015			No Standard				
TL4	Truck	>2015			No Standard				
TL5	Truck	>2015			No Standard				
TL6	Pickup	>2015			No Standard				
TL7	Fork Lift	>2015	75≤kW<130, Ph-in	4	T4-56≤kW<130 2015	0.02	5	0.4	0.19
TL8	Tractor	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
TL9	Truck	>2015			No Standard				
TL10	Truck	>2015			No Standard				
TL11	Truck	>2015			No Standard				
TL12	Truck	>2015			No Standard				
TL13	Truck	>2015			No Standard				
TL14	Truck	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
TL15	Truck	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
TL16	Truck	>2015	kW>560	4	T4-kW>560 2015	0.04	3.5	3.5	0.19
TL17	Truck	>2015	kW>560	4	T4-kW>560 2015	0.04	3.5	3.5	0.19
TL18	Truck	>2015			No Standard				
Substation									
SS1	Backhoe	>2015	75≤kW<130, Ph-in	4	T4-56≤kW<130 2015	0.02	5	0.4	0.19
SS2	Truck	>2015			No Standard				
SS3	Truck	>2015			No Standard				
SS4	Pickup	>2015			No Standard				
SS5	Pickup	>2015			No Standard				
SS6	Drill	>2015	kW>560	4	T4-kW>560 2015	0.04	3.5	3.5	0.19
SS7	Roller	>2015	130≤kW<560, Ph-in	4	T4-130≤kW≤560 2015	0.02	3.5	0.4	0.19
SS8	Fork Lift	>2015	75≤kW<130, Ph-in	4	T4-56≤kW<130 2015	0.02	5	0.4	0.19

[1] *(Midas Gold 2017h)*

[2] *(CFR 2018a)*

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Power Line Construction

Mobile Equipment Tailpipe

Fuel Sulfur-Content-Based SO2 Emission Factor

Fuel Sulfur-Content	0.0015%		*Non-road diesel, 40 CFR 80.510*
Diesel Density	7.05	lb/gal distillate oil	*AP-42 Appendix A "Weights of Selected Substances" (Distillate oil)*
Molecular Wt. of SO2	64.1	lb/lb-mol	
Molecular Wt. of S	32.1	lb/lb-mol	
Diesel Heat Content	137,000	BTU/gal	*AP-42, App. A*
Brake-Specific Fuel Use	7,000	BTU/hp-hr	*AP-42, Sec. 3.3*

SO2 Emission Factor:

1.08E-5 lb/hp-hr = $\frac{0.0015\%\ \text{~~lbS~~}}{\text{~~lb Fuel~~}} \times \frac{7.05\ \text{~~lb Fuel~~}}{\text{~~gal Fuel~~}} \times \frac{64.064\ \text{lbSO2}}{32.065\ \text{~~lbS~~}} \times \frac{\text{~~gal Fuel~~}}{137{,}000\ \text{~~BTU~~}} \times \frac{7{,}000\ \text{~~BTU~~}}{\text{hp-hr}}$

6.57E-3 g/kW-hr = $\frac{0.000011\ \text{~~lb~~}}{\text{~~hp~~-hr}} \times \frac{1.341\ \text{~~hp~~}}{\text{kW}} \times \frac{453.593\ \text{g}}{\text{~~lb~~}}$

EPA MOVES 2014a Emission Factors[1]

Vehicle Clas	Description	Emission Factor (g/VMT)[2] PM	PM10	PM2.5	CO	NOX	VOC	SO2
LHD<=10K	Passenger Truck 8.5k-10k lb, Diesel	0.178	0.178	0.086	1.322	2.281	0.241	0.006
LHD45	Single Unit Truck 14k-19.5k lb, Diesel	0.589	0.589	0.291	1.867	4.940	0.685	0.011
MHD	Single Unit Truck 19.5k-33k lb, Diesel	0.797	0.797	0.381	2.170	5.684	0.841	0.011
HHD	Single Unit Truck >33k lb, Diesel	1.169	1.169	0.461	2.313	7.324	0.510	0.011

[1] *MOVES 2014a run dated 2017-09-25*

[2] *PM = PM10*

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Mobile Equipment Tailpipe

Final Emission Factors

ID	Lookup	PM	PM10	PM2.5	CO	NOX	VOC	SO2	EF Unit	Final EF	Activity	
Transmission Line												
TL1	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	1,384,274	kW-hr/yr
TL2	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	400,711	kW-hr/yr
TL3	HHD	1.17	1.17	0.46	2.31	7.32	0.51	1.07E-2	g/VMT	*EPA_MOVES2014*	99,840	VMT/yr
TL4	HHD	1.17	1.17	0.46	2.31	7.32	0.51	1.07E-2	g/VMT	*EPA_MOVES2014*	149,760	VMT/yr
TL5	HHD	1.17	1.17	0.46	2.31	7.32	0.51	1.07E-2	g/VMT	*EPA_MOVES2014*	99,840	VMT/yr
TL6	LHD45	0.59	0.59	0.29	1.87	4.94	0.68	1.05E-2	g/VMT	*EPA_MOVES2014*	312,000	VMT/yr
TL7	T4-56≤kW<130 2015	0.02	0.02	0.02	5.00	0.40	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	182,141	kW-hr/yr
TL8	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	1,092,848	kW-hr/yr
TL9	HHD	1.17	1.17	0.46	2.31	7.32	0.51	1.07E-2	g/VMT	*EPA_MOVES2014*	24,960	VMT/yr
TL10	HHD	1.17	1.17	0.46	2.31	7.32	0.51	1.07E-2	g/VMT	*EPA_MOVES2014*	99,840	VMT/yr
TL11	HHD	1.17	1.17	0.46	2.31	7.32	0.51	1.07E-2	g/VMT	*EPA_MOVES2014*	74,880	VMT/yr
TL12	HHD	1.17	1.17	0.46	2.31	7.32	0.51	1.07E-2	g/VMT	*EPA_MOVES2014*	37,440	VMT/yr
TL13	HHD	1.17	1.17	0.46	2.31	7.32	0.51	1.07E-2	g/VMT	*EPA_MOVES2014*	99,840	VMT/yr
TL14	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	327,854	kW-hr/yr
TL15	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	418,925	kW-hr/yr
TL16	T4-kW>560 2015	0.04	0.04	0.04	3.50	3.50	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	15,482,007	kW-hr/yr
TL17	T4-kW>560 2015	0.04	0.04	0.04	3.50	3.50	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	1,821,413	kW-hr/yr
TL18	HHD	1.17	1.17	0.46	2.31	7.32	0.51	1.07E-2	g/VMT	*EPA_MOVES2014*	24,960	VMT/yr
Substation												
SS1	T4-56≤kW<130 2015	0.02	0.02	0.02	5.00	0.40	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	364,283	kW-hr/yr
SS2	HHD	1.17	1.17	0.46	2.31	7.32	0.51	1.07E-2	g/VMT	*EPA_MOVES2014*	399,360	VMT/yr
SS3	HHD	1.17	1.17	0.46	2.31	7.32	0.51	1.07E-2	g/VMT	*EPA_MOVES2014*	399,360	VMT/yr
SS4	LHD45	0.59	0.59	0.29	1.87	4.94	0.68	1.05E-2	g/VMT	*EPA_MOVES2014*	249,600	VMT/yr
SS5	MHD	0.80	0.80	0.38	2.17	5.68	0.84	1.05E-2	g/VMT	*EPA_MOVES2014*	62,400	VMT/yr
SS6	T4-kW>560 2015	0.04	0.04	0.04	3.50	3.50	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	437,139	kW-hr/yr
SS7	T4-130≤kW≤560 2015	0.02	0.02	0.02	3.50	0.40	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	191,248	kW-hr/yr
SS8	T4-56≤kW<130 2015	0.02	0.02	0.02	5.00	0.40	0.19	6.57E-3	g/kW-hr	*EPA_NRS*	273,212	kW-hr/yr

Final emission factor options:

Category	EF Unit	Activity Unit	Emission Unit	Multiplier
EPA_CERT	lb/hp-hr	hp-hr/yr	ton/yr	5.0E-4
EPA_NRS	g/kW-hr	kW-hr/yr	ton/yr	1.1E-6
EPA_AP42	lb/hp-hr	hp-hr/yr	ton/yr	5.0E-4
EPA_MOVES2014a	g/VMT	VMT/yr	ton/yr	1.1E-6

Conversions

453.6 g/lb 2,000 lb/ton

1.341 hp/kW

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Mobile Equipment Tailpipe

	PM	PM10		PM2.5		CO		NOX		SO2		VOC
ID	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr
Transmission Line												
TL1	0.03	0.17	0.03	0.17	0.03	2.44	5.34	0.28	0.61	4.6E-3	0.01	0.29
TL2	8.8E-3	0.05	8.8E-3	0.05	8.8E-3	0.71	1.55	0.08	0.18	1.3E-3	2.9E-3	0.08
TL3	0.13	0.70	0.13	0.28	0.05	0.12	0.25	0.37	0.81	5.4E-4	1.2E-3	0.06
TL4	0.19	1.06	0.19	0.42	0.08	0.17	0.38	0.55	1.21	8.1E-4	1.8E-3	0.08
TL5	0.13	0.70	0.13	0.28	0.05	0.12	0.25	0.37	0.81	5.4E-4	1.2E-3	0.06
TL6	0.20	1.11	0.20	0.55	0.10	0.29	0.64	0.78	1.70	1.7E-3	3.6E-3	0.24
TL7	4.0E-3	0.02	4.0E-3	0.02	4.0E-3	0.46	1.00	0.04	0.08	6.0E-4	1.3E-3	0.04
TL8	0.02	0.13	0.02	0.13	0.02	1.93	4.22	0.22	0.48	3.6E-3	7.9E-3	0.23
TL9	0.03	0.18	0.03	0.07	0.01	0.03	0.06	0.09	0.20	1.3E-4	2.9E-4	0.01
TL10	0.13	0.70	0.13	0.28	0.05	0.12	0.25	0.37	0.81	5.4E-4	1.2E-3	0.06
TL11	0.10	0.53	0.10	0.21	0.04	0.09	0.19	0.28	0.60	4.0E-4	8.8E-4	0.04
TL12	0.05	0.26	0.05	0.10	0.02	0.04	0.10	0.14	0.30	2.0E-4	4.4E-4	0.02
TL13	0.13	0.70	0.13	0.28	0.05	0.12	0.25	0.37	0.81	5.4E-4	1.2E-3	0.06
TL14	7.2E-3	0.04	7.2E-3	0.04	7.2E-3	0.58	1.26	0.07	0.14	1.1E-3	2.4E-3	0.07
TL15	9.2E-3	0.05	9.2E-3	0.05	9.2E-3	0.74	1.62	0.08	0.18	1.4E-3	3.0E-3	0.09
TL16	0.68	3.74	0.68	3.74	0.68	27.27	59.73	27.27	59.73	0.05	0.11	3.24
TL17	0.08	0.44	0.08	0.44	0.08	3.21	7.03	3.21	7.03	6.0E-3	0.01	0.38
TL18	0.03	0.18	0.03	0.07	0.01	0.03	0.06	0.09	0.20	1.3E-4	2.9E-4	0.01
Substation												
SS1	8.0E-3	0.04	8.0E-3	0.04	8.0E-3	0.92	2.01	0.07	0.16	1.2E-3	2.6E-3	0.08
SS2	0.51	2.82	0.51	1.11	0.20	0.46	1.02	1.47	3.22	2.2E-3	4.7E-3	0.22
SS3	0.51	2.82	0.51	1.11	0.20	0.46	1.02	1.47	3.22	2.2E-3	4.7E-3	0.22
SS4	0.16	0.89	0.16	0.44	0.08	0.23	0.51	0.62	1.36	1.3E-3	2.9E-3	0.19
SS5	0.05	0.30	0.05	0.14	0.03	0.07	0.15	0.18	0.39	3.3E-4	7.3E-4	0.06
SS6	0.02	0.11	0.02	0.11	0.02	0.77	1.69	0.77	1.69	1.4E-3	3.2E-3	0.09
SS7	4.2E-3	0.02	4.2E-3	0.02	4.2E-3	0.34	0.74	0.04	0.08	6.3E-4	1.4E-3	0.04
SS8	6.0E-3	0.03	6.0E-3	0.03	6.0E-3	0.69	1.51	0.06	0.12	9.0E-4	2.0E-3	0.06
Total	3.25	17.81	3.25	10.18	1.86	42.39	92.84	39.33	86.13	0.09	0.19	6.02

LT Unit	ST Unit	Multiplier
ton/yr	lb/day	5.479
ton/yr	lb/hr	0.457

Conversions
2,000 lb/ton
453.59 g/lb

Air Sciences Inc.	PROJECT TITLE: Midas Gold	BY: E. Memon
	PROJECT NO: 335-1-1	PAGE: 8 OF: 9 SHEET: PwrConst
AIR EMISSION CALCULATIONS	SUBJECT: Power Line Construction Emissions	DATE: October 10, 2018

Power Line Construction

Hazardous Air Pollutants (HAP) and Greenhouse Gases (GHG)

Fuel Consumption TRUE

Small Engines	961,584 gal/yr	131,737 MMBTU/yr[1]
Large Engines	1,215,552 gal/yr	166,531 MMBTU/yr[1]

[1] *Based on 137,000 BTU/gal AP-42, Sec. 3.3*

Combustion HAP Emission Factors and Emissions

CAS No.	Pollutant/Group	Small Engines[1] lb/MMBtu	Large Engines[2] lb/MMBtu	Emissions[4] lb/yr	ton/yr
106990	1,3-Butadiene	3.91E-5		5.2	2.6E-3
75070	Acetaldehyde	7.67E-4	2.52E-5	105.2	5.3E-2
107028	Acrolein	9.25E-5	7.88E-6	13.5	6.7E-3
71432	Benzene	9.33E-4	7.76E-4	252.1	0.1
50000	Formaldehyde	1.18E-3	7.89E-5	168.6	8.4E-2
	POM [3]	1.68E-4	2.12E-4	57.4	2.9E-2
108883	Toluene	4.09E-4	2.81E-4	100.7	5.0E-2
1330207	Xylene	2.85E-4	1.93E-4	69.7	3.5E-2
Combustion HAP Total				772.3	0.39

[1] *AP-42, Tab. 3.3-2, 10/96, diesel engines (≤ 600 hp)*

[2] *AP-42, Tabs. 3.4-3 & 3.4-4, 10/96, large diesel engines (> 600 hp)*

[3] *POM = Polyoxymethylene, includes:*
2-Methylnaphthalene, 3-Methylchloranthrene, 7,12-Dimethylbenz(a)anthracene, Acenaphthene, Acenaphthylene, Anthracene, Benz(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Indeno(1,2,3-c,d)pyrene, Naphthalene, Phenanthrene, Pyrene.

Dust HAP Emission Factors and Emissions

HAP Concentrations[1] and Emissions

CAS No.	Pollutant	ppm	Emissions lb/yr	ton/yr
7440382	Arsenic	667	41.9	2.1E-2
7440417	Beryllium	3.2	0.2	1.0E-4
7440439	Cadmium	0.5	3.1E-2	1.6E-5
7440484	Cobalt	4.0	0.3	1.3E-4
7440473	Chromium	9.0	0.6	2.8E-4
7439976	Mercury	0.6	3.8E-2	1.9E-5
7439965	Manganese	299	18.8	9.4E-3
7440020	Nickel	2.0	0.1	6.3E-5
7439921	Lead	8.0	0.5	2.5E-4
7440360	Antimony	23	1.4	7.2E-4
7723140	Phosphoru	650	40.8	2.0E-2
Dust HAP Total			104.6	5.2E-2

[1] *(Midas Gold 2017c) for all metals but Hg; Hg value from (Midas Gold 2018i)*

Applicable Dust Emissions

Activity	PM ton/yr
Facility and Infrastructure Construction	31.4

Conversions

907,186	g/ton
1,000	kW/MW
1.341	hp/kW
1,000,000	BTU/MMBTU
2,000	lb/ton

Air Sciences Inc.	PROJECT TITLE: Midas Gold	BY: E. Memon		
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AIR EMISSION CALCULATIONS	SUBJECT: Power Line Construction Emissions	DATE: October 10, 2018		

Power Line Construction

GHG Emission Factors [1] ***and Emissions***

Fuel	CO2	CH4	N2O	CO2	CH4	N2O	CO2e
	kg/MMBtu			mt/yr	mt/yr	mt/yr	mt/yr
Diesel	73.96	3.0E-3	6.0E-4	22,060	0.9	0.2	22,136
Combustion Total GHG				22,060	0.9	0.2	22,136

[1] *40 CFR 98 Tab. C-1 and C-2 (CFR. 2018d)*

Global Warming Potential[1]

CO2	1
CH4	25
N2O	298

[1] *40 CFR 98 Tab. A-1 (CFR. 2018d)*

Conversions

1,000 kg/mt
2,000 lb/ton

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: K. Lewis	
	PROJECT NO: 335-1-2	PAGE: 1	OF: 1 SHEET: HgSpec
AIR EMISSION CALCULATIONS	SUBJECT: Hg Emission Speciation	DATE: October 10, 2018	

Mining Year **4**

Facility-Wide Hg Emission and Speciation

Emissions

Activity	Total Hg ton/yr	Total Hg lb/yr	Speciation* Hg0	Hg2	HgP	Total	Hg0 ton/yr	Hg2 ton/yr	HgP ton/yr	Hg2+P ton/yr
Process Propane Combustion	0.00005	0.11		100%		100%	--	5.4E-05	--	5.4E-05
Autoclave	0.01067	21.34	97.9%	1.6%	0.5%	100%	1.0E-02	1.7E-04	5.2E-05	2.2E-04
Refinery Sources (Kiln, EW, Retort, Furnace)	0.00168	3.36	98.4%	1.4%	0.1%	100%	1.7E-03	2.4E-05	2.5E-06	2.6E-05
Process Dust	0.00001	0.03			100%	100%	--	--	1.3E-05	1.3E-05
Mine Fugitive Dust	0.00068	1.36			100%	100%	--	--	6.8E-04	6.8E-04
Mine Fugitive Mercury Flux	0.00354	7.07	100%			100%	3.5E-03	--	--	--
Total	0.01663	33.26					1.6E-02	2.5E-04	7.5E-04	9.9E-04
*See tables below:							94%	1.5%	4.5%	6.0%
Process Subtotal	0.0124	0.0124	chk					chk	3.15E-4	3.15E-4
Mine Subtotal	0.0042	0.0042	chk					chk-19	6.78E-4	6.78E-4

Autoclave Test Data

Source	Date	Method	Hg0 lb/hr	Hg2 lb/hr	HgP lb/hr	HgTotal lb/hr	Hg0 %	Hg2 %	HgP %
Autoclave Phase 1	10/5/20005	FAMS	0.0426	0.000689	0.00021	0.0435	97.93%	1.58%	0.49%

(NDEP 2006)

Refinery Test Data

Source	Date	Method	Hg0 lb/hr	Hg2 lb/hr	HgP lb/hr	HgTotal lb/hr	Hg0 %	Hg2 %	HgP %
Refinery Retort	10/17/2006	OHM	0.00343	0.000055	9E-06	0.0035	98.17%	1.57%	0.26%
AARL Kiln Scrubber	10/14/2006	OHM	0.02799	0.000268	2.3E-05	0.02828	98.97%	0.95%	0.08%
Melt/Pour Furnace	10/12/2006	OHM	0.01041	0.000273	3.1E-05	0.01072	97.16%	2.55%	0.29%
(WES&T 2006)						Wt. Avg.	98.45%	1.40%	0.15%

Estimated Hg emissions split between Refinery Sources for modeling purposes only:

Source	Split
Kiln	25%
EW	25%
Retort	25%
Furnace	25%
	100%

Conversions

2,000 lb/ton

Air Sciences Inc.	PROJECT TITLE: Midas Gold	BY: K. Lewis	
	PROJECT NO: 335-1-2.4	PAGE: 1	OF: 1 SHEET: HgStoke's
AIR EMISSION CALCULATIONS	SUBJECT: Hg Deposition Parameters	DATE: October 10, 2018	

Stoke's Law

$Vts = gd^2(p - pa) / 18n$ *Engineering Tool Box*

Vts	terminal settling velocity				
g	gravitational acceleration	9.81E+02	cm/s^2		*Engineering Tool Box*
d	diameter of particle (cm)				
pa	density of air	1.212E-03	g/cm^3	18C	*Engineering Tool Box*
p	density of particle (g/cm^3)				
n	coefficient of viscosity of air	1.80E-04	g/cm-s	18C	*Engineering Tool Box*
µ	micron				

Literature values for deposition velocity of Hg2 and HgP

Hg2	0.5-6 cm/s	*(L. Zhang 2009)*	Range Average	3.25 cm/s
HgP	0.02-2 cm/s	*(L. Zhang 2009)*	Range Average	1.01 cm/s
			Average	2.13 cm/s

d	7 µ		*Aerodynamic diameter to achieve a Vts of ~2 cm/s*
p	13.545 g/cm^3	20C	*Engineering Tool Box (liquid Hg)*
Vts	2.01 cm/s		

$$\frac{0.04362\ \text{lb/ft-h} \times \frac{453.592\ \text{g}}{\text{lb}} \times \frac{\text{ft}}{30.48\ \text{cm}} \times \frac{\text{hr}}{3600\ \text{s}}}{} = 1.80\text{E-}04\ \text{g/cm-s} = 1.80\text{E-}02\ \text{g/m-s}$$

$$\frac{9.81\text{E+}02\ \text{cm}}{\text{s}^2} \times \frac{4.9\text{E-}07\ \text{cm}^2}{} \times \frac{13.545\ \text{g}}{\text{cm}^3} - \frac{1.21\text{E-}03\ \text{g}}{\text{cm}^3} \times \frac{}{18} \times \frac{\text{cm-s}}{1.80\text{E-}04\ \text{g}} = \frac{2.006\ \text{cm}}{\text{s}}$$

Conversions

10,000 cm/µ

Engineering Tool Box URLs

https://www.engineeringtoolbox.com/mercury-d_1002.html
https://www.engineeringtoolbox.com/air-density-specific-weight-d_600.html
https://www.engineeringtoolbox.com/air-absolute-kinematic-viscosity-d_601.html
https://www.engineeringtoolbox.com/accelaration-gravity-d_340.html
https://www.ajdesigner.com/phpstokeslaw/stokes_law_terminal_velocity.php

MIDAS GOLD HCN EMISSIONS

Wind: m/s = 2.31, Fw = 1.00

Snow Cover: 155 days w/ 0.5+ in 0.424658 snow

Fugitive Emissions

Area	Source	Cat.	Category Description	Acres	Snow Cover Adjustment Acres	Solution Parameters (M32017c) pH	Free CN- g/m3	T C	pKa	a0	H	Overall kG or Flux m/s or g/m2-s	Fa*Fw	g/s	lb/yr
Tails	Tailings Storage Facility	TA	Tails, Aqueous Surface	110.22	110.22	7.75	1.00	3.74	9.803	0.9912	0.00252	1.89E-05	0.42	8.84E-03	614.9
		TW	Tails, Wet Sediment	110.22	63.42 snow							5.31E-08	0.42	5.73E-03	398.4
		TD	Tails, Dry Sediment	110.22	63.42 snow							2.33E-08	1.00	5.97E-03	415.0
			Active Surface Subtotal	***220.44***											
Mill															
	Tailings Pipeline Maintenance Pond	TA	Tails, Aqueous Surface	0.133	0.133	7.75	1.00	3.74	9.803	0.9912	0.00252	1.89E-05	0.63	1.60E-05	1.1
	CN Detoxification Tank 1	TK	Tanks	0.029	0.029	8.50	25.00	25.00	9.250	0.8490	0.00545	3.11E-04	0.69	2.89E-03	201.0
	CN Detoxification Tank 2	TK	Tanks	0.029	0.029	8.50	25.00	25.00	9.250	0.8490	0.00545	3.11E-04	0.69	2.89E-03	201.0
	CIP Leach Tank 1	TK	Tanks	0.049	0.049	10.25	125.00	52.50	8.535	0.0189	0.01479	3.11E-04	0.67	1.43E-03	99.7
	CIP Leach Tank 2	TK	Tanks	0.049	0.049	10.25	125.00	52.50	8.535	0.0189	0.01479	3.11E-04	0.67	1.43E-03	99.7
	CIP Leach Tank 3	TK	Tanks	0.049	0.049	10.25	125.00	30.00	8.535	0.0189	0.01479	3.11E-04	0.67	1.43E-03	99.7
	CIP Leach Tank 4	TK	Tanks	0.049	0.049	10.25	125.00	52.50	8.535	0.0189	0.01479	3.11E-04	0.67	1.43E-03	99.7
	CIL Tank 1	TK	Tanks	0.053	0.053				9.120	0.0690	0.00654	3.11E-04	0.67	2.48E-03	172.7
	CIL Tank 2	TK	Tanks	0.053	0.053	10.25	125.00	30.00	9.120	0.0690	0.00654	3.11E-04	0.67	2.48E-03	172.7
	CIL Tank 3	TK	Tanks	0.053	0.053	10.25	125.00	30.00	9.120	0.0690	0.00654	3.11E-04	0.67	2.48E-03	172.7
	CIL Tank 4	TK	Tanks	0.053	0.053	10.25	125.00	30.00	9.120	0.0690	0.00654	3.11E-04	0.67	2.48E-03	172.7
	CIL Tank 5	TK	Tanks	0.053	0.053	10.25	125.00	52.50	9.120	0.0690	0.00654	3.11E-04	0.67	2.48E-03	172.7
	CIL Tank 6	TK	Tanks	0.053	0.053	10.25	125.00	30.00	9.120	0.0690	0.00654	3.11E-04	0.67	2.48E-03	172.7
	CIP Tank 1	TK	Tanks	0.007	0.007				8.535	0.0189	0.01479	3.11E-04	0.74	2.36E-04	16.4
	CIP Tank 2	TK	Tanks	0.007	0.007	10.25	125.00	52.50	8.535	0.0189	0.01479	3.11E-04	0.74	2.36E-04	16.4
	CIP Tank 3	TK	Tanks	0.007	0.007	10.25	125.00	52.50	8.535	0.0189	0.01479	3.11E-04	0.74	2.36E-04	16.4
	CIP Tank 4	TK	Tanks	0.007	0.007	10.25	125.00	52.50	8.535	0.0189	0.01479	3.11E-04	0.74	2.36E-04	16.4
	CIP Tank 5	TK	Tanks	0.007	0.007	10.25	125.00	52.50	8.535	0.0189	0.01479	3.11E-04	0.74	2.36E-04	16.4
	CIP Tank 6	TK	Tanks	0.007	0.007	10.25	125.00	52.50	8.535	0.0189	0.01479	3.11E-04	0.74	2.36E-04	16.4
												Overall			
	Snow Adjustments	Tsn	Tails, Snow Covered		93.61 snow							1.17E-08	1.00	4.43E-03	308.3
			Snow Covered Surface Subtotal		***93.6***										
			TOTAL AREA	**331.41**	**331.41**									***Fugitive Total (lb/yr)***	**3,673.6**
														Fugitive Total (ton/yr)	**1.84**

Stack Emissions

	lb/hr	hr/yr	lb/yr
EW Cells	0.000567	8,760	**5.0**
Preg/Barren Tanks	0.004	8,760	**35.0**
		Stack Total (lb/yr)	**40.0**
		Stack Total (ton/yr)	**0.02**
		Total (ton/yr)	**1.86**

** Per EPA's request, three gold mines in Nevada conducted fugitive HCN emission measurements in the fourth quarter of 2009 in order to quantify emissions from the various fugitive HCN sources at gold mines. The Quality Assurance Project Plan (QAPP) for this testing, the EPA's approval letter of this QAPP, and the final fugitive HCN test report are provided on the federal docket website athttps://www.regulations.gov/docketBrowser?rpp=25&so=DESC&sb=commentDueDate&po=0&s=EPA-HQ-OAR-2010-0239-0163&dct=SR&D=EPA-HQ-OAR-2010-0239. The IDs for these documents are EPA-HQ-OAR-2010-0239-0102, EPA-HQ-OAR-2010-0239-0103, and EPA-HQ-OAR-2010-0239-0163 (0163.0 through 0163.6), respectively. The above emission factors were taken from the final fugitive HCN test report, "Card and Schmidt. Evaluation of Air Emissions of Hydrogen Cyanide from Fugitive Sources at Nevada Gold Mines Using the USEPA Surface Isolation Flux Chamber Technology. April 2010."*

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Conversions

60	sec/min	
60	min/hr	
24	hr/day	
365	day/yr	
8,760	hr/yr	
3,600	s/hr	
2,000	lb/ton	
453.593	g/lb	
3.28084	ft/m	
35.3147	ft^3/m^3	
7,000	gr/lb	
1.341	hp/kW	
7.05	lb/gal distillate oi	*AP-42 Appendix A "Weights of Selected Substances" (Distillate oil)*
907.1858	kg/ton	
459.67	°R at 0°F	
68	°F, standard	
7,000	BTU/hp-hr	*AP-42, Sec. 3.3, (Diesel)*
2.2369	mi/hr per m/s	
7.48052	gal/ft^3	
1.10231	ton/t	
2.20462	lb/kg	
1609.34	m/mi	
137,000	BTU/gal	*AP-42, App. A (Diesel)*
4046.9	m^2/acre	
43,560	ft^2/acre	
12	in/ft	
1.10231	ton/mt	
1.0E+6	g/mt	
3	ft/yd	
1.0E+6	scf/MMscf	
10,000	m^2/ha	
1,000	kg/mt	
273.15	°K at 0°C	
32	°F at 0°C	
1.8	°F/°C	
1,000	ng/µg	
0.293297	MW-hr/MMBtu	
12	mo/yr	

Fuel Specifications

15	ppm S content	*40 CFR 80.510 (Non-road diesel)*
7.05	lb/gal-fuel	*AP-42, App. A*
32.065	lb/lb-mol S, and	
64.06	lb/lb-mol SO2	
7,000	Btu/hp-hr	*AP-42, Sec. 3.3, (Diesel engine)*
0.00939	MMBtu/kW-hr	*Diesel*
0.137	MMBtu/gal	*AP-42, App. A (Diesel)*
0.0915	MMBtu/gal Propane	

Constants

M.W. SO2	64.0638
M.W. S	32.065
M.W. O	15.9994

Diesel SO2

$$\frac{15 \text{ parts S}}{1.0E+06} \times \frac{7.05 \text{ lb}}{\text{gal diese}} \times \frac{64.06 \text{ SO2}}{32.065 \text{ S}} \times \frac{\text{gal}}{0.137 \text{ MMBtu}} \times \frac{0.00939 \text{ MMBtu}}{\text{kW-hr}} \times \frac{453.593 \text{ g}}{\text{lb}} = 6.57E\text{-}03 \frac{\text{g SO2}}{\text{kW-hr}}$$

Calculation

$$\frac{185 \text{ lb S}}{1.00E+06 \text{ lb C3H8}} \times \frac{44.08 \text{ lb C3H8}}{\text{lb mol}} \times \frac{\text{lb mol}}{359.05 \text{ SCF (0C)}} \times \frac{7{,}000 \text{ gr}}{\text{lb}} \times \frac{100 \text{ SCF}}{100 \text{SCF}} = 15.90 \frac{\text{gr S}}{100 \text{ SCF}}$$

Propane heating value 91,500 *Btu/gal* *AP-42, Table 1.5-1 (07/08) Footnotea*

AP-42, Chapter 13.2.4 Particle Size Fractions

0.35	PM10
0.053	PM2.5

Fuel Combustion Exhaust Flow (EPA Method 19, Ffactor)

Propane Heater

F-factor	8,710	dscf/MMBtu	Propane, dry
O2%dry	3	%	
Heat input	1	MMBtu/hr	
Standard exhaust flow	10,170	dscf/hr	
	169	dscfm	
Vol % moisture	15.0%	standard for propane boilers	
Temperature	360	°F, Engineering Toolbox* (LPG heating appliances)	
Pressure, site	0.79	atm	
Actual exhaust flow	394	acfm (wet)/MMBtu	

Diesel Engine

F-factor	9,190	dscf/MMBtu	Oil, dry	
O2%dry	9	%		
Heat input	0.007	MMBtu/hp-hr	AP-42, Sec. 3.3, (Diesel engine)	
Standard exhaust flow	113	dscf/hp-hr		
	1.9	dscfm/hp	2.5	dscfm/kW
Vol % moisture	8.0%	standard for diesel engines		
Temperature	1,100	°F, Engineering Toolbox* (diesel exhaust)		
Pressure, site	0.79	atm		
Actual exhaust flow	7.7	acfm (wet)/hp	10.3	acfm (wet)/kW

* *http://www.engineeringtoolbox.com/fuels-exhaust-temperatures-d_168.html*

Refinery and Autoclave Exhaust Flow dscfm acfm temp_F dia_ft

Source	Hourly Design Rate		Water	Exhaust Parameters Flow dscfm	Flow acfm	Temp F	Velocity ft/s	Dia ft
Carbon Regeneration Kiln (Drum)	0.3	ton	5%	1,500	2,300	150	31	1.25
Electrowinning Cells & Pregnant Solution Tan	100	gal	50%	3,000	8,800	150	30	2.5
Mercury Retort	0.5/batch	ton	5%	100	100	85	8	0.5
Induction Melting Furnace	0.5/batch	ton	5%	5,000	7,700	150	32	2.25
Autoclave	290	ton	80%	5,000	39,800	200	34	5

Stack parameters are based on typical industry values for similar size units.

Enclosure Control Efficiency Calculation

Emission factor equation	$E = 0.0032k(U/5)^{1.3}/(M/2)^{1.4}$				*AP-42, Sec. 13.2.4, Eq. 1, 11/06*
U = Mean wind speed	5.167	mph	2.31	m/s	*(Midas Gold 2017f), Fig. 4-3 (2014 onsite meteorological data)*
U = Mean wind speed	1.3	mph			*Lowest wind speed for Eq. 1, AP-42, Sec. 13.2.4, Eq. 1, 11/06*
M = Moisture content	2.5	%			

	PM	PM10	PM2.5			
k = Particle size multiplier	0.74	0.35	0.053		*AP-42, Sec. 13.2.4, Pg. 4, 11/06*	
E = Emission factor	0.00181	0.00086	0.00013	lb/ton	U =	5.167
E = Emission factor	0.00030	0.00014	0.00002	lb/ton	U =	1.300
Control Efficiency	83.4%	83.4%	83.4%			

Site Pressure Calculation

http://www.sensorsone.com/altitude-pressure-units-conversion/

6000	23.978	6531.9	
7000	23.088	23.505	
0		29.921	0.78556

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Lime Kiln Specifications

810 *kcal/kg* *(Maerz 2018)*
3.96567 *btu/kcal*

Lime kiln heat requirements

$$\frac{810\ \text{kcal}}{\text{kg}} \left| \frac{907.186\ \text{kg}}{\text{ton}} \right| \frac{3.96567\ \text{Btu}}{\text{kcal}} \left| \frac{\text{MMBtu}}{1.E{+}06\ \text{Btu}} \right. = \frac{2.914\ \text{MMBtu}}{\text{ton}}$$

Dyno Nobel 2010 "Blasting and Explosives Quick Reference Guide"

(B*S*BH*N)/(PI()*D^2/4000*L)

		B - Drilled Burden (m)	=(25 to 40) x D
		S - Drilled Spacing (m)	=1.15 x B
BH	10 m	BH - Bench Height (m)	≥D/15
		N - Number of Holes in a Blast	
N	100	D - Hole Diameter (mm)	
		L - Hole Length	
D	0.15 m		
B	4.9 m		
S	5.6 m		
L	10 m		
V	27,330		
Vb	70.7		
V/Vb	386.6 400		

F-2: Air Emission Inventory – New Source Review for Alternative 2

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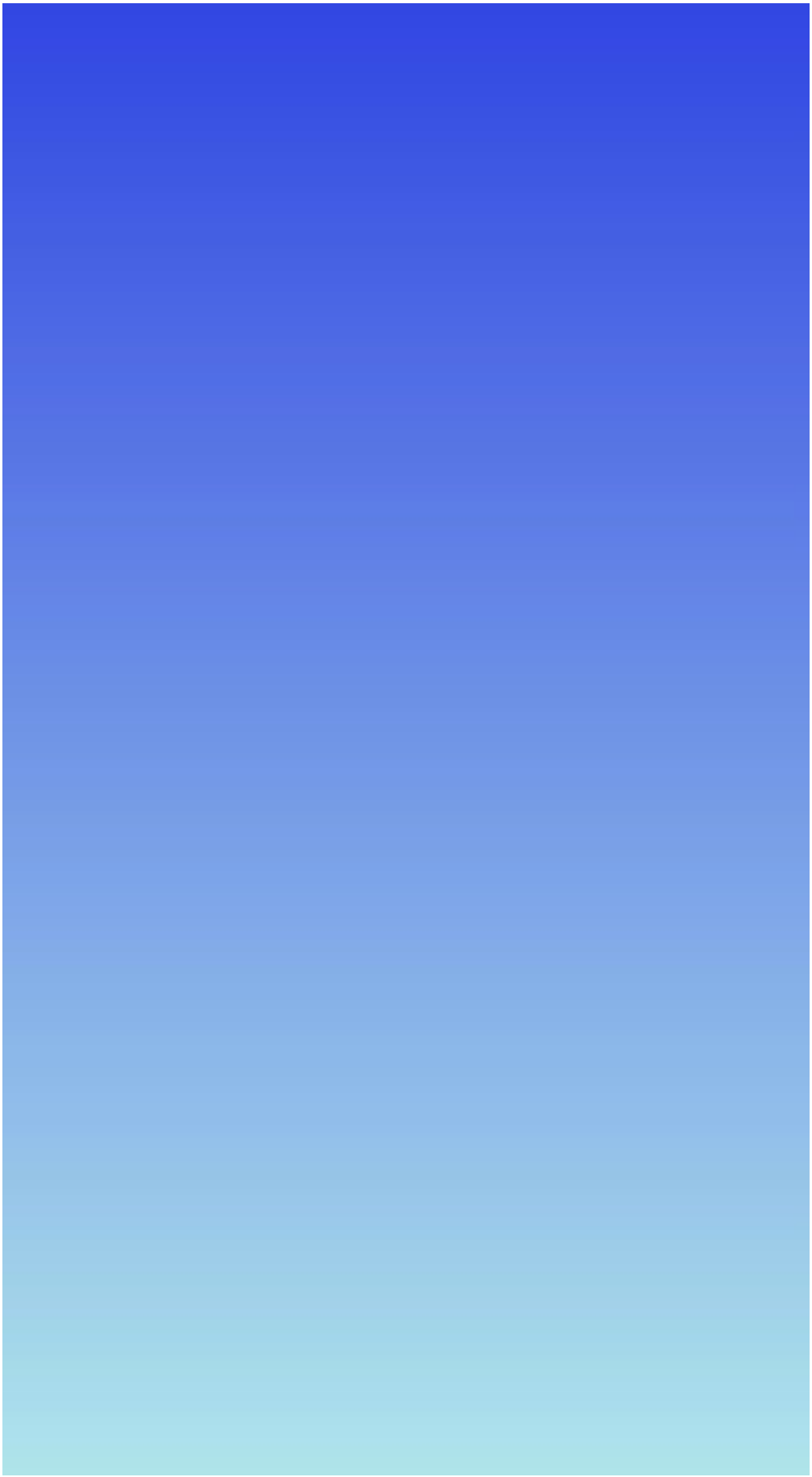

AIR SCIENCES INC.

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Stibnite Gold Project Permit to Construct Application

Appendix B - Emissions Inventory and Modeling Parameters

PREPARED FOR:
MIDAS GOLD IDAHO, INC.

PROJECT NO. 335-1
JUNE 23, 2020

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Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: K. Lewis/E. Memon
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Facility-Wide Criteria Pollutant PTE

Activity	PM	PM10		PM2.5		CO		NOX		SO2		VOC
	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr
Process & Ancillary	87.3	21.7	56.3	13.4	36.4	33.5	30.5	55.4	37.9	1.9	6.5	4.8
Mining Fugitive	3,569	225	986	22.5	98.9	1,742	636	46.8	17.1	9.4E-02	3.4E-02	0.0E+00
Total	3,656	246	1,042	35.9	135	1,776	666	102	54.9	2.0	6.5	4.8

Mining fugitive emissions are for model scenario: W3

Permitting Applicability

	PM	PM10	PM2.5	CO	NOX	SO2
	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
Total Process & Ancillary	87.3	56.3	36.4	30.5	37.9	6.5
Significant Threshold [1]	25	15	10	100	40	40
	Above	Above	Above	Minor	Minor	Minor
Regulatory Concern Threshold (10% of Significant) [2]						
	2.5	1.5	1	10	4	4
	Permit	Permit	Permit	Permit	Permit	Permit
Major Source Determination		100	100	100	100	100
		Minor	Minor	Minor	Minor	Minor

[1] *IDAPA 58.01.01.006.108.a.*

[2] *IDAPA 58.01.01.221.01*

Modeling Applicability

	PM10	PM2.5		CO	NOX		SO2		Pb
	lb/hr	lb/hr	ton/yr	lb/hr	lb/hr	ton/yr	lb/hr	ton/yr	lb/month
Process & Ancillary	21.7	13.4	36.4	33.5	55.4	37.9	1.9	6.5	4.4E-02
Mining Fugitive	225	22.5	98.9	1,742	46.8	17.1	9.4E-02	3.4E-02	0.0E+00
Total	246	35.9	135	1,776	102	54.9	2.0	6.5	4.4E-02
Level I Thresholds [1]	0.22	0.054	0.35	15	0.20	1.20	0.21	1.2	14
Modeling Triggered?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	No

[1] *IDEQ, Guideline for Performing Air Quality Impact Analyses Table 2, September-2013*

Permit to Construct Processing Fee Determination [1]

Regulated Pollutant	ton/yr
PM10	56.3
CO	30.5
NOX	37.9
SO2	6.5
VOC	4.8
Total [2]	136

[1] *Process & Ancillary Sources Only*

[2] *In accordance with 58.01.01.225, the Permit to Construct Processing Fee will be $7,500. This is for a non major new source with an increase of emissions of 100 tpy or more.*

Conversions

2,000 lb/ton

8,760 hr/yr

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total-ton/yr fug-ton/yr

Facility-Wide HAP PTE and Major Source Determination

CAS No.	HAP	Process ton/yr	Mining ton/yr	Total ton/yr
106-99-0	1,3-Butadiene	3.67E-6	--	3.67E-6
91-57-6	2-Methylnaphthalene	4.85E-6	--	4.85E-6
56-49-5	3-Methylchloranthrene	3.64E-7	--	3.64E-7
57-97-6	7,12-Dimethylbenz(a)anthracene	3.24E-6	--	3.24E-6
83-32-9	Acenaphthene	7.09E-6	--	7.09E-6
208-96-8	Acenaphthylene	1.38E-5	--	1.38E-5
75-07-0	Acetaldehyde	1.07E-4	--	1.07E-4
107-02-8	Acrolein	1.98E-5	--	1.98E-5
120-12-7	Anthracene	2.39E-6	--	2.39E-6
7440-36-0	Antimony	3.00E-1	--	3.00E-1
7440-38-2	Arsenic	1.76E-2	--	1.76E-2
56-55-3	Benz(a)anthracene	1.40E-6	--	1.40E-6
71-43-2	Benzene	1.60E-3	--	1.60E-3
50-32-8	Benzo(a)pyrene	6.22E-7	--	6.22E-7
205-99-2	Benzo(b)fluoranthene	1.94E-6	--	1.94E-6
191-24-2	Benzo(g,h,i)perylene	1.07E-6	--	1.07E-6
207-08-9	Benzo(k)fluoranthene	6.86E-7	--	6.86E-7
7440-41-7	Beryllium	8.59E-5	--	8.59E-5
7440-43-9	Cadmium	2.50E-4	--	2.50E-4
75-15-0	Carbon disulfide	6.33E-2	--	6.33E-2
7440-47-3	Chromium	5.73E-4	--	5.73E-4
218-01-9	Chrysene	2.55E-6	--	2.55E-6
7440-48-4	Cobalt	1.20E-4	--	1.20E-4
592-01-8	Cyanide	9.73E-1	--	**9.73E-1**
53-70-3	Dibenz(a,h)anthracene	7.85E-7	--	7.85E-7
106-46-7	Dichlorobenzene	2.43E-4	--	2.43E-4
206-44-0	Fluoranthene	7.00E-6	--	7.00E-6
86-73-7	Fluorene	2.13E-5	--	2.13E-5
50-00-0	Formaldehyde	1.54E-2	--	1.54E-2
110-54-3	Hexane	3.64E-1	--	3.64E-1
193-39-5	Indeno(1,2,3-cd)pyrene	9.82E-7	--	9.82E-7
7439-92-1	Lead	2.62E-4	--	2.62E-4
7439-96-5	Manganese	2.17E-2	--	2.17E-2
7439-97-6	Mercury	1.24E-2	3.54E-3	1.60E-2
91-20-3	Naphthalene	3.14E-4	--	3.14E-4
7440-02-0	Nickel	1.63E-3	--	1.63E-3
85-01-8	Phenanthrene	6.36E-5	--	6.36E-5
7723-14-0	Phosphorus	1.81E-2	--	1.81E-2
129-00-0	Pyrene	6.68E-6	--	6.68E-6
7782-49-2	Selenium	4.85E-6	--	4.85E-6
108-88-3	Toluene	1.12E-3	--	1.12E-3
1330-20-7	Xylene	2.99E-4	--	2.99E-4
Total HAP		1.79	3.54E-3	1.80
Major Source Threshold				25
Major Source of HAP				No

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Maximum Single HAP PTE and Major Source Determination

CAS No.	HAP	ton/yr
592-01-8	Cyanide	0.97
Major Source Threshold		10
Major Source of HAP		No

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Toxic Air Pollutant Analysis prop-lb/hr dies mpro-lb/hr fug-lb/hr

		Emissions (lb/hr)					Screening Level (lb/hr)	Determination
CAS No.	HAP/TAP	(1)	(2)	(3)	(4)	Total	(5)	(6)	
106-99-0	1,3-Butadiene	--		--	--	--	--	2.40E-5	EL not exceeded
91-57-6	2-Methylnaphthalene	1.59E-6		--	--	1.59E-6	--	--	--
56-49-5	3-Methylchloranthrene	1.19E-7		--	--	1.19E-7	--	2.50E-6	EL not exceeded
57-97-6	7,12-Dimethylbenz(a)anthracene	1.06E-6		--	--	1.06E-6	--	--	--
83-32-9	Acenaphthene	1.19E-7		--	--	1.19E-7	--	--	--
208-96-8	Acenaphthylene	1.19E-7		--	--	1.19E-7	--	--	--
75-07-0	Acetaldehyde	--		--	--	--	--	3.00E-3	EL not exceeded
107-02-8	Acrolein	--		--	--	--	1.70E-2	--	EL not exceeded
120-12-7	Anthracene	1.59E-7		--	--	1.59E-7	--	--	--
7440-36-0	Antimony	--		6.86E-2	--	6.86E-2	3.30E-2	--	Non-carcinogenic EL exceeded
7440-38-2	Arsenic	1.32E-5		4.36E-3	--	4.37E-3	--	1.50E-6	Carcinogenic EL exceeded
56-55-3	Benz(a)anthracene	1.19E-7		--	--	1.19E-7	--	--	--
71-43-2	Benzene	1.39E-4		--	--	1.39E-4	--	8.00E-4	EL not exceeded
50-32-8	Benzo(a)pyrene	7.93E-8		--	--	7.93E-8	--	2.00E-6	EL not exceeded
205-99-2	Benzo(b)fluoranthene	1.19E-7		--	--	1.19E-7	--	--	--
191-24-2	Benzo(g,h,i)perylene	7.93E-8		--	--	7.93E-8	--	--	--
207-08-9	Benzo(k)fluoranthene	1.19E-7		--	--	1.19E-7	--	--	--
7440-41-7	Beryllium	7.93E-7		2.17E-5	--	2.25E-5	--	2.80E-5	EL not exceeded
7440-43-9	Cadmium	7.26E-5		4.06E-5	--	1.13E-4	--	3.70E-6	Carcinogenic EL exceeded
75-15-0	Carbon disulfide	--		1.45E-2	--	1.45E-2	2.00E+0	--	EL not exceeded
7440-47-3	Chromium	9.25E-5		1.22E-4	--	2.14E-4	3.30E-2	--	EL not exceeded
218-01-9	Chrysene	1.19E-7		--	--	1.19E-7	--	--	--
7440-48-4	Cobalt	5.55E-6		2.35E-5	--	2.91E-5	3.30E-3	--	EL not exceeded
592-01-8	Cyanide	--		2.22E-1	--	2.22E-1	3.33E-1	--	EL not exceeded
53-70-3	Dibenz(a,h)anthracene	7.93E-8		--	--	7.93E-8	--	--	--
106-46-7	Dichlorobenzene	7.93E-5		--	--	7.93E-5	3.00E+1	--	EL not exceeded
206-44-0	Fluoranthene	1.98E-7		--	--	1.98E-7	--	--	--
86-73-7	Fluorene	1.85E-7		--	--	1.85E-7	--	--	--
50-00-0	Formaldehyde	4.95E-3		--	--	4.95E-3	--	5.10E-4	Carcinogenic EL exceeded
110-54-3	Hexane	1.19E-1		--	--	1.19E-1	1.20E+1	--	EL not exceeded
193-39-5	Indeno(1,2,3-cd)pyrene	1.19E-7		--	--	1.19E-7	--	--	--
7439-92-1	Lead	--		1.72E-4	--	1.72E-4	--	--	--
7439-96-5	Manganese	2.51E-5		3.53E-2	--	3.53E-2	6.70E-2	--	EL not exceeded
7439-97-6	Mercury	1.72E-5		5.13E-3	8.08E-4	5.96E-3	--	--	--
91-20-3	Naphthalene	4.03E-5		--	--	4.03E-5	3.33E+0	--	EL not exceeded
7440-02-0	Nickel	1.39E-4		2.89E-3	--	3.03E-3	--	2.70E-5	Carcinogenic EL exceeded
85-01-8	Phenanthrene	1.12E-6		--	--	1.12E-6	--	--	--
7723-14-0	Phosphorus	--		6.12E-3	--	6.12E-3	7.00E-3	--	EL not exceeded
129-00-0	Pyrene	3.30E-7		--	--	3.30E-7	--	--	--
7782-49-2	Selenium	1.59E-6		--	--	1.59E-6	1.30E-2	--	EL not exceeded
108-88-3	Toluene	2.25E-4		--	--	2.25E-4	2.50E+1	--	EL not exceeded
1330-20-7	Xylene	--		--	--	--	2.90E+1	--	EL not exceeded

(1) *HAP/TAP from propane combustion. Detailed emission calculations are provided in ProcHAP sheet.*

(2) *HAP/TAP from diesel combustion. Detailed emission calculations are provided in ProcHAP sheet.*
Diesel engine HAP are regulated by 40CFR63, Subpart ZZZZ and therefore exempt from TAP analysis per IDAPA 58.01.01 Section 210.20.

(3) *HAP/TAP from material processing. Detailed emission calculations are provided in ProcHAP sheet.*

(4) *Fugitive HAP/TAP from mining activity. Detailed emission calculations are provided in MineHg sheet.*

(5) *Non-carcinogenic emission screening level (EL) from IDAPA 58.01.01 Section 585.*

(6) *Carcinogenic EL from IDAPA 58.01.01 Section 586.*

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Toxic Air Pollutant Analysis prop-lb/hr dies-lb/hr mpro-lb/h fug-lb/hr

CAS No.	Non-HAP TAP	Emissions (lb/hr) (1)	(2)	(3)	(4)	Total	Screening Level (lb/h (5)	(6)	Determination
7440-39-3	Barium	2.91E-4	--	4.71E-3	--	5.00E-3	3.30E-2	--	EL not exceeded
7440-50-8	Copper	5.61E-5	--	2.94E-5	--	8.55E-5	6.70E-2	--	EL not exceeded
7783-06-4	Hydrogen Sulfide	--	--	9.00E-1	--	9.00E-1	9.33E-1	--	EL not exceeded 7439-98-7
	Molybdenum	7.26E-5	--	5.88E-6	--	7.85E-5	3.33E-1	--	EL not exceeded 109-66-0
	Pentane	1.72E-1	--	--	--	1.72E-1	1.18E+2	--	EL not exceeded
7440-22-4	Silver	--	--	2.94E-6	--	2.94E-6	7.00E-3	--	EL not exceeded
7664-93-9	Sulfuric Acid	--	--	2.03E+0	--	2.03E+0	6.70E-2	--	Non-carcinogenic EL exceeded
7440-28-0	Thallium	--	--	5.88E-5	--	5.88E-5	7.00E-3	--	EL not exceeded
7440-61-1	Uranium	--	--	5.88E-5	--	5.88E-5	1.30E-2	--	EL not exceeded
7440-62-2	Vanadium	1.52E-4	--	--	--	1.52E-4	3.00E-3	--	EL not exceeded
7440-66-6	Zinc	1.92E-3	--	--	--	1.92E-3	6.67E-1	--	EL not exceeded

(1) *HAP/TAP from propane combustion. Detailed emission calculations are provided in ProcHAP sheet.*

(2) *HAP/TAP from diesel combustion. Detailed emission calculations are provided in ProcHAP sheet.*

(3) *HAP/TAP from material processing. Detailed emission calculations are provided in ProcHAP sheet.*

(4) *Fugitive HAP/TAP from mining activity. Detailed emission calculations are provided in MineHg sheet.*

(5) *Non-carcinogenic emission screening level (EL) from IDAPA 58.01.01 Section 585.*

(6) *Carcinogenic EL from IDAPA 58.01.01 Section 586.*

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SOURCE DESCRIPTION		OPERATING LIMITS							EMISSION FACTORS									EMISSION CON	
Model	Source Description	Design Throughput						Throughput reference	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	unit	reference	control	efficiency
ID		unit/hr	unit/day	unit/yr	units	Material	hr/yr											system	
OC1	Loader Transfer of Ore to Grizzly	1,042	25,000	9,125,000	ton	Ore	8,760	(Midas Gold 2016), Sec. 10.1	0.00014	4.6E-05	1.3E-05					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.	Water Sprays	
OC2	Grizzly to Apron Feeder	1,042	25,000	9,125,000	ton	Ore	8,760		0.00014	4.6E-05	1.3E-05					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.	Moisture Carry-Over	
OC3	Apron Feeder to Dribble Conveyor	1,042	25,000	9,125,000	ton	Ore	8,760		0.00014	4.6E-05	1.3E-05					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.	Moisture Carry-Over	
OC4	Apron Feeder to Vibrating Grizzly	1,042	25,000	9,125,000	ton	Ore	8,760		0.00014	4.6E-05	1.3E-05					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.	Moisture Carry-Over	
OC5	Dribble Conveyor to Vibrating Grizzly	1,042	25,000	9,125,000	ton	Ore	8,760		0.00014	4.6E-05	1.3E-05					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.	Moisture Carry-Over	
OC6	Vibrating Grizzly to Primary Crusher or Coarse Ore Stockpile Feed Conveyor	1,042	25,000	9,125,000	ton	Ore	8,760		0.00014	4.6E-05	1.3E-05					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.	Moisture Carry-Over	
OC7	Primary Crusher and Associated Transfers out to Coarse Ore Stockpile Feed Conveyor	1,042	25,000	9,125,000	ton	Ore	8,760		0.0012	0.00054	0.0001					lb/ton	AP-42, Table 11.19.2-2 (08/04) Tert. Crushing - ctrl.	Water Sprays	
OC8	Coarse Ore Stockpile Feed Conveyor Transfer to Stockpile	1,042	25,000	9,125,000	ton	Ore	8,760		0.00014	4.6E-05	1.3E-05					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.	Moisture Carry-Over	
OC9	Stockpile Transfers to Reclaim Conveyors	1,150	27,600	10,074,000	ton	Ore	8,760	(M3 2017b)	0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - unctrl.; PM2.5 Ch. 13.2.4	Undergrnd	80%
OC10	Reclaim Conveyors to SAG Mill Feed Conveyor	1,150	27,600	10,074,000	ton	Ore	8,760		0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - unctrl.; PM2.5 Ch. 13.2.4	Undergrnd	80%
OC11	SAG Mill Feed Conveyor Transfer to SAG Mill	1,150	27,600	10,074,000	ton	Ore	8,760		0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - unctrl.; PM2.5 Ch. 13.2.4	Enclosure	80%
OC12	Pebble Crusher and Associated Transfers in (from SAG Mill) and out (to Pebble Discharge Conveyor)	1,150	27,600	10,074,000	ton	Ore	8,760		0.0012	0.00054	0.0001					lb/ton	AP-42, Table 11.19.2-2 (08/04) Tert. Crushing - ctrl.	Water Sprays	
OC13	Pebble Discharge Conveyor to SAG Mill Feed Conveyor	1,150	27,600	10,074,000	ton	Ore	8,760		0.00014	4.6E-05	1.3E-05					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. transfer - ctrl.	Moisture Carry-Over	
LS1L	Mill Lime Silo #1 Loading	60	250	4,375	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.00099	0.00034	0.00005					lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.; PM2.5 Ch. 13.2.4	Bin Vent Filter	
LS1U	Mill Lime Silo #1 Unloading to SAG Mill Conveyor	20	250	4,375	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.00042					lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.; PM2.5 Ch. 13.2.4	None	0%
MilS2L	Mill Lime Silo #2 Loading	60	250	4,375	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.00099	0.00034	0.00005					lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.; PM2.5 Ch. 13.2.4	Bin Vent Filter	
MilS2U	Mill Lime Silo #2 Unloading to SAG Mill Conveyor	20	250	4,375	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.00042					lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.; PM2.5 Ch. 13.2.4	None	0%
Sb1	Sb Dryer (2.72 MMBtu/hr Propane-Fired)	2.72	65.28	23,827	MMBtu	Propane	8,760	(M3 2017d)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal	None	NA
Sb2	Sb Bagging	4.5	108	39,420	ton	Stib. Conc.	8,760	(M3 2017d)	0.118	0.118	0.118					lb/hr	Based on NDEP-BAPC Permit for Clay Bagging Operation (Hectatone) (NDEP 2015b)	Baghouse (BH1)	NA
AC	Autoclave	290	6,960	2,540,400	ton	Float Conc.	8,760	(M3 2017b)	5.075	5.075	5.075			0.6525		lb/hr	Based on NDEP-BAPC Permits/test data for Autoclaves: PM & SO2 - [Goldstrike (NDEP 2019)]. Negligible CO due to no organic carbon in the feed (M3 2017a)	Wet Scrubber (WS1)	NA
ACB	POX Boiler (17 MMBtu/hr Propane-Fired)	17	17	510	MMBtu	Propane	30	(M3 2017b)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Ind. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal	None	NA
ACS1L	AC Lime Silo #1 Loading	120	1,000	17,500	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.00099	0.00034	0.00005					lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.; PM2.5 Ch. 13.2.4	Bin Vent Filter	
ACS1U	AC Lime Silo #1 Unloading to Lime Slaker	20	480	17,500	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004					lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.; PM2.5 Ch. 13.2.4	None	0%
ACS2L	AC Lime Silo #2 Loading	120	1,000	17,500	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.00099	0.00034	0.00005					lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.; PM2.5 Ch. 13.2.4	Bin Vent Filter	
ACS2U	AC Lime Silo #2 Unloading to Lime Slaker	20	480	17,500	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004					lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.; PM2.5 Ch. 13.2.4	None	0%
ACS3L	AC Lime Silo #3 Loading	120	1,000	17,500	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.00099	0.00034	0.00005					lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.; PM2.5 Ch. 13.2.4	Bin Vent Filter	
ACS3U	AC Lime Silo #3 Unloading to Lime Slaker	20	480	17,500	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004					lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.; PM2.5 Ch. 13.2.4	None	0%
ACS4L	AC Lime Silo #4 Loading	120	500	8,750	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.00099	0.00034	0.00005					lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.; PM2.5 Ch. 13.2.4	Bin Vent Filter	
ACS42U	AC Lime Silo #4 Unloading to Lime Slaker	20	480	8,750	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004					lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.; PM2.5 Ch. 13.2.4	None	0%
CKD	Carbon Regeneration Kiln (Drum)	0.3	7.2	2,628	ton	Carbon	8,760	(M3 2017b)	0.42	0.42	0.42	0.12	0.012		0.11	lb/hr	Based on NDEP-BAPC Permit for Carbon Regeneration Kiln [Goldstrike (NDEP 2019)]	Wet Scrubber (WS2) / Carbon Filter (CA1)	NA
CKB	Carbon Regeneration Kiln (Burners)	2.255	54.12	19,754	MMBtu	Propane	8,760	(M3 2017b)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal	None	NA
EW	Electrowinning Cells and Pregnant Solution Tank	100	24 hr		gpm	Au Sol.	8,760	Typical Ind. Oper.	0.07	0.07	0.07					lb/hr	Based on similar source stack test data and 5× safety factor (APT 2016)	Shared Carbon Filter (CA2)	
MR	Mercury Retort	0.5/batch	24 hr	21	ton	Au Conc.	1,248	(M3 2017b) & (M3 2017a)	0.01	0.01	0.01					lb/hr	Based on similar source stack test data and 5× safety factor (APT 2017)	Condenser / Carbon Filter (CA3)	
MF	Induction Melting Furnace	0.5/batch	12 hr	21	ton	Au Conc.	624	(M3 2017b) & (M3 2017a)	2.84	2.84	2.84					lb/hr	Based on IDAPA 58.01.01.701 PM Weight Limit	Baghouse (BH2) / Carbon Filter (CA4)	NA

SOURCE DESCRIPTION		TROLS	HOURLY EMISSIONS							DAILY EMISSIONS							ANNUAL EMISSIONS								
Model	Source Description	reference	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	UTM E	UTM N
ID			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	m	m
OC1	Loader Transfer of Ore to Grizzly	Control efficiency included in emission factor	0.146	0.0479	0.0135					3.50	1.15	0.325					0.639	0.210	0.0593					632,045	4,974,583
OC2	Grizzly to Apron Feeder	Control efficiency included in emission factor	0.146	0.0479	0.0135					3.50	1.15	0.325					0.639	0.210	0.0593					632,045	4,974,583
OC3	Apron Feeder to Dribble Conveyor	Control efficiency included in emission factor	0.146	0.0479	0.0135					3.50	1.15	0.325					0.639	0.210	0.0593					632,045	4,974,583
OC4	Apron Feeder to Vibrating Grizzly	Control efficiency included in emission factor	0.146	0.0479	0.0135					3.50	1.15	0.325					0.639	0.210	0.0593					632,045	4,974,583
OC5	Dribble Conveyor to Vibrating Grizzly	Control efficiency included in emission factor	0.146	0.0479	0.0135					3.50	1.15	0.325					0.639	0.210	0.0593					632,045	4,974,583
OC6	Vibrating Grizzly to Primary Crusher or Coarse Ore Stockpile Feed Conveyor	Control efficiency included in emission factor	0.146	0.0479	0.0135					3.50	1.15	0.325					0.639	0.210	0.0593					632,045	4,974,583
OC7	Primary Crusher and Associated Transfers out to Coarse Ore Stockpile Feed Conveyor	Control efficiency included in emission factor	1.25	0.563	0.104					30.0	13.5	2.50					5.48	2.46	0.456					632,045	4,974,583
OC8	Coarse Ore Stockpile Feed Conveyor Transfer to Stockpile	Control efficiency included in emission factor	0.146	0.0479	0.0135					3.50	1.15	0.325					0.639	0.210	0.0593					631,947	4,974,520
OC9	Stockpile Transfers to Reclaim Conveyors	Based on AP-42, Chapter 13.2.4, reduction in EF due to wind speed reduction	0.690	0.253	0.0391					16.6	6.07	0.938					3.02	1.11	0.171					631,947	4,974,520
OC10	Reclaim Conveyors to SAG Mill Feed Conveyor	Based on AP-42, Chapter 13.2.4, reduction in EF due to wind speed reduction	0.690	0.253	0.0391					16.6	6.07	0.938					3.02	1.11	0.171					631,947	4,974,520
OC11	SAG Mill Feed Conveyor Transfer to SAG Mill	Based on AP-42, Chapter 13.2.4, reduction in EF due to wind speed reduction	0.690	0.253	0.0391					16.6	6.07	0.94					3.02	1.11	0.171					632,113	4,974,243
OC12	Pebble Crusher and Associated Transfers in (from SAG Mill) and out (to Pebble Discharge Conveyor)	Control efficiency included in emission factor	1.380	0.621	0.1150					33.12	14.90	2.760					6.04	2.720	0.504					632,028	4,974,187
OC13	Pebble Discharge Conveyor to SAG Mill Feed Conveyor	Control efficiency included in emission factor	0.1610	0.0529	0.01495					3.864	1.270	0.3588					0.705	0.2317	0.0655					632,028	4,974,187
LS1L	Mill Lime Silo #1 Loading	Control efficiency included in emission factor	0.0594	0.0204	0.00300					0.248	0.0850	0.0125					0.00217	7.44E-4	1.09E-4					632,095	4,974,272
LS1U	Mill Lime Silo #1 Unloading to SAG Mill Conveyor		0.0960	0.0560	0.00840					1.20	0.700	0.105					0.0105	0.00613	9.19E-4					632,095	4,974,272
MilS2L	Mill Lime Silo #2 Loading	Control efficiency included in emission factor	0.0594	0.0204	0.00300					0.248	0.0850	0.0125					0.00217	7.44E-4	1.09E-4					632,090	4,974,282
MilS2U	Mill Lime Silo #2 Unloading to SAG Mill Conveyor		0.0960	0.0560	0.00840					1.20	0.700	0.105					0.0105	0.00613	9.19E-4					632,090	4,974,282
Sb1	Sb Dryer (2.72 MMBtu/hr Propane-Fired)		0.0208	0.0208	0.0208	0.223	0.386	0.0473	0.0238	0.499	0.499	0.499	5.35	9.27	1.13	0.571	0.0911	0.0911	0.0911	0.977	1.69	0.207	0.104	632,231	4,974,183
Sb2	Sb Bagging	Control efficiency included in emission factor	0.118	0.118	0.118					2.83	2.83	2.83					0.517	0.517	0.517					632,208	4,974,221
AC	Autoclave	PM control efficiency included in emission factor	5.08	5.08	5.08			0.653		122	122	122			15.7		22.2	22.2	22.2			2.86		632,229	4,974,096
ACB	POX Boiler (17 MMBtu/hr Propane-Fired)		0.130	0.130	0.130	1.39	2.42	0.295	0.149	0.130	0.130	0.130	1.39	2.42	0.295	0.149	0.00195	0.00195	0.00195	0.0209	0.0362	0.00443	0.00223	632,261	4,974,116
ACS1L	AC Lime Silo #1 Loading	Control efficiency included in emission factor	0.119	0.0408	0.00600					0.990	0.340	0.0500					0.00866	0.00298	4.38E-4					632,267	4,974,124
ACS1U	AC Lime Silo #1 Unloading to Lime Slaker		0.0960	0.0560	0.00800					2.30	1.34	0.192					0.0420	0.0245	0.00350					632,267	4,974,124
ACS2L	AC Lime Silo #2 Loading	Control efficiency included in emission factor	0.119	0.0408	0.00600					0.990	0.340	0.0500					0.00866	0.00298	4.38E-4					632,257	4,974,140
ACS2U	AC Lime Silo #2 Unloading to Lime Slaker		0.0960	0.0560	0.00800					2.30	1.34	0.192					0.0420	0.0245	0.00350					632,257	4,974,140
ACS3L	AC Lime Silo #3 Loading	Control efficiency included in emission factor	0.119	0.0408	0.00600					0.990	0.340	0.0500					0.00866	0.00298	4.38E-4					632,248	4,974,156
ACS3U	AC Lime Silo #3 Unloading to Lime Slaker		0.0960	0.0560	0.00800					2.30	1.34	0.192					0.0420	0.0245	0.00350					632,248	4,974,156
ACS4L	AC Lime Silo #4 Loading	Control efficiency included in emission factor	0.119	0.0408	0.00600					0.495	0.170	0.0250					0.00433	0.00149	2.19E-4					632,238	4,974,171
ACS42U	AC Lime Silo #4 Unloading to Lime Slaker		0.0960	0.0560	0.00800					2.30	1.34	0.192					0.0210	0.0123	0.00175					632,238	4,974,171
CKD	Carbon Regeneration Kiln (Drum)	PM control efficiency included in emission factor	0.420	0.420	0.420	0.120	0.0120		0.110	10.1	10.1	10.1	2.88	0.288	0	2.64	1.84	1.84	1.84	0.526	0.0526		0.482	632,013	4,974,051
CKB	Carbon Regeneration Kiln (Burners)		0.0173	0.0173	0.0173	0.185	0.320	0.0392	0.0197	0.414	0.414	0.414	4.44	7.69	0.940	0.473	0.0756	0.0756	0.0756	0.810	1.40	0.172	0.0864	631,998	4,974,042
EW	Electrowinning Cells and Pregnant Solution Tank		0.07	0.07	0.07					1.68	1.68	1.68					0.31	0.31	0.31					631,983	4,974,033
MR	Mercury Retort		0.01	0.01	0.01					0.24	0.24	0.24					0.006	0.006	0.006					632,003	4,974,001
MF	Induction Melting Furnace	Control efficiency included in emission factor	2.84	2.84	2.84					34.1	34.1	34.1					0.89	0.89	0.89					632,032	4,974,019

SOURCE DESCRIPTION		NAD 83 LOCATION		
Model	Source Description	reference	elev	reference
ID			m	
OC1	Loader Transfer of Ore to Grizzly	PC building center	1,968.5	PC building base
OC2	Grizzly to Apron Feeder	PC building center	1,968.5	PC building base
OC3	Apron Feeder to Dribble Conveyor	PC building center	1,968.5	PC building base
OC4	Apron Feeder to Vibrating Grizzly	PC building center	1,968.5	PC building base
OC5	Dribble Conveyor to Vibrating Grizzly	PC building center	1,968.5	PC building base
OC6	Vibrating Grizzly to Primary Crusher or Coarse Ore Stockpile Feed Conveyor	PC building center	1,968.5	PC building base
OC7	Primary Crusher and Associated Transfers out to Coarse Ore Stockpile Feed Conveyor	PC building center	1,968.5	PC building base
OC8	Coarse Ore Stockpile Feed Conveyor Transfer to Stockpile	Stockpile center	1,957.0	Stockpile base
OC9	Stockpile Transfers to Reclaim Conveyors	Stockpile center	1,957.0	Stockpile base
OC10	Reclaim Conveyors to SAG Mill Feed Conveyor	Stockpile center	1,957.0	Stockpile base
OC11	SAG Mill Feed Conveyor Transfer to SAG Mill	Mill building wall opening	2,000.6	Mill building base
OC12	Pebble Crusher and Associated Transfers in (from SAG Mill) and out (to Pebble Discharge Conveyor)	Pebble crusher building center	1,973.3	Pebble crusher building base
OC13	Pebble Discharge Conveyor to SAG Mill Feed Conveyor	Pebble crusher building center	1,973.3	Pebble crusher building base
LS1L	Mill Lime Silo #1 Loading	Mill Silo #1 center	1,992.0	Mill Silo #1 base
LS1U	Mill Lime Silo #1 Unloading to SAG Mill Conveyor	Mill Silo #1 center	1,992.0	Mill Silo #1 base
MillS2L	Mill Lime Silo #2 Loading	Mill Silo #2 center	1,990.0	Mill Silo #2 base
MillS2U	Mill Lime Silo #2 Unloading to SAG Mill Conveyor	Mill Silo #2 center	1,990.0	Mill Silo #2 base
Sb1	Sb Dryer (2.72 MMBtu/hr Propane-Fired)	Mill building corner	2,000.6	Mill building base
Sb2	Sb Bagging	Mill building corner	2,000.6	Mill building base
AC	Autoclave	POX building corner	2,007.2	POX building base
ACB	POX Boiler (17 MMBtu/hr Propane-Fired)	POX building corner	2,007.2	POX building base
ACS1L	AC Lime Silo #1 Loading	AC Silo #1 center	2,007.2	AC Silo #1 base
ACS1U	AC Lime Silo #1 Unloading to Lime Slaker	AC Silo #1 center	2,007.2	AC Silo #1 base
ACS2L	AC Lime Silo #2 Loading	AC Silo #2 center	2,007.2	AC Silo #2 base
ACS2U	AC Lime Silo #2 Unloading to Lime Slaker	AC Silo #2 center	2,007.2	AC Silo #2 base
ACS3L	AC Lime Silo #3 Loading	AC Silo #3 center	2,007.2	AC Silo #3 base
ACS3U	AC Lime Silo #3 Unloading to Lime Slaker	AC Silo #3 center	2,007.2	AC Silo #3 base
ACS4L	AC Lime Silo #4 Loading	AC Silo #4 center	2,007.2	AC Silo #4 base
ACS42U	AC Lime Silo #4 Unloading to Lime Slaker	AC Silo #4 center	2,007.2	AC Silo #4 base
CKD	Carbon Regeneration Kiln (Drum)	Refinery building corner	1,970.3	Refinery building base
CKB	Carbon Regeneration Kiln (Burners)	Along Refinery building wall	1,970.3	Refinery building base
EW	Electrowinning Cells and Pregnant Solution Tank	Refinery building corner	1,970.3	Refinery building base
MR	Mercury Retort	Refinery building corner	1,970.3	Refinery building base
MF	Induction Melting Furnace	Refinery building corner	1,970.3	Refinery building base

SOURCE DESCRIPTION		RELEASE PARAMETERS INPUT						
Model	Source Description	POINT	rel ht (ft)	temp (F)	flow (dscfm)	flow (acfm)	dia (ft)	reference
ID		VOLUME	rel ht (ft)	width (ft)	vert. ln (ft)	grnd ht (ft)	oz type	
OC1	Loader Transfer of Ore to Grizzly	VOLUME	64	52.9	128	128	srf src	PC bldg height and width
OC2	Grizzly to Apron Feeder	VOLUME	64	52.9	128	128	srf src	PC bldg height and width
OC3	Apron Feeder to Dribble Conveyor	VOLUME	64	52.9	128	128	srf src	PC bldg height and width
OC4	Apron Feeder to Vibrating Grizzly	VOLUME	64	52.9	128	128	srf src	PC bldg height and width
OC5	Dribble Conveyor to Vibrating Grizzly	VOLUME	64	52.9	128	128	srf src	PC bldg height and width
OC6	Vibrating Grizzly to Primary Crusher or Coarse Ore Stockpile Feed Conveyor	VOLUME	64	52.9	128	128	srf src	PC bldg height and width
OC7	Primary Crusher and Associated Transfers out to Coarse Ore Stockpile Feed Conveyor	VOLUME	64	52.9	128	128	srf src	PC bldg height and width
OC8	Coarse Ore Stockpile Feed Conveyor Transfer to Stockpile	VOLUME	35.8	3	71.6	71.6	srf src	36" wide belt; 50,000 ton stockpile height
OC9	Stockpile Transfers to Reclaim Conveyors	VOLUME	4	8	8	8	srf src	8' x 8' tunnel exit
OC10	Reclaim Conveyors to SAG Mill Feed Conveyor	VOLUME	4	8	8	8	srf src	8' x 8' tunnel exit
OC11	SAG Mill Feed Conveyor Transfer to SAG Mill	VOLUME	68	4	4	70	elev src w/ bldg	4' x 4' opening at mid (Mill) bldg height
OC12	Pebble Crusher and Associated Transfers in (from SAG Mill) and out (to Pebble Discharge Conveyor)	VOLUME	10	32.7	20	20	srf src	Pebble Crusher bldg height and width
OC13	Pebble Discharge Conveyor to SAG Mill Feed Conveyor	VOLUME	10	32.7	20	20	srf src	Pebble Crusher bldg height and width
LS1L	Mill Lime Silo #1 Loading	POINT	43.7	Ambient	700	700	0.500	Ht - 3' above silo top; dia & flow from (NDEP 2019)
LS1U	Mill Lime Silo #1 Unloading to SAG Mill Conveyor	VOLUME	4.5	1	1	5	elev src w/ bldg	1' screw discharge; 1' drop to conveyor; 5' above grade
MillS2L	Mill Lime Silo #2 Loading	POINT	43.7	Ambient	700	700	0.500	Ht - 3' above silo top; dia & flow from (NDEP 2019)
MillS2U	Mill Lime Silo #2 Unloading to SAG Mill Conveyor	VOLUME	4.5	1	1	5	elev src w/ bldg	1' screw discharge; 1' drop to conveyor; 5' above grade
Sb1	Sb Dryer (2.72 MMBtu/hr Propane-Fired)	POINT	150	360	461	1,073	1.0	Flow - EPA M19 (3% O2, 15% moist); 10' above bldg top; 12-in dia; T - std propane boiler exhst
Sb2	Sb Bagging	POINT	150	Ambient	800	1,000	1.0	Ht - 10' above bldg top; Flow - (NDEP 2015b)
AC	Autoclave	POINT	77	196	3,101	28,680	5.0	Ht - 10' above bldg top, Flow & Temp. - (APT 2013)
ACB	POX Boiler (17 MMBtu/hr Propane-Fired)	POINT	77	360	2,881	6,703	2.0	Flow - EPA M19 (3% O2, 15% moist); 10' above bldg top; 24-in dia; T - std propane boiler exhst
ACS1L	AC Lime Silo #1 Loading	POINT	57.2	Ambient	1400	1400	0.75	Ht - 3' above silo top; dia & flow from (NDEP 2019)
ACS1U	AC Lime Silo #1 Unloading to Lime Slaker	VOLUME	4.5	1	1	5	elev src w/ bldg	1' screw discharge; 1' drop to conveyor; 5' above grade
ACS2L	AC Lime Silo #2 Loading	POINT	57.2	Ambient	1400	1400	0.75	Ht - 3' above silo top; dia & flow from (NDEP 2019)
ACS2U	AC Lime Silo #2 Unloading to Lime Slaker	VOLUME	4.5	1	1	5	elev src w/ bldg	1' screw discharge; 1' drop to conveyor; 5' above grade
ACS3L	AC Lime Silo #3 Loading	POINT	57.2	Ambient	1400	1400	0.75	Ht - 3' above silo top; dia & flow from (NDEP 2019)
ACS3U	AC Lime Silo #3 Unloading to Lime Slaker	VOLUME	4.5	1	1	5	elev src w/ bldg	1' screw discharge; 1' drop to conveyor; 5' above grade
ACS4L	AC Lime Silo #4 Loading	POINT	47.5	Ambient	1400	1400	0.75	Ht - 3' above silo top; dia & flow from (NDEP 2019)
ACS42U	AC Lime Silo #4 Unloading to Lime Slaker	VOLUME	4.5	1	1	5	elev src w/ bldg	1' screw discharge; 1' drop to conveyor; 5' above grade
CKD	Carbon Regeneration Kiln (Drum)	POINT	55	150	120	180	0.48	Ht - 10' above bldg top; Temp, Flow, Dia - (NDEP 2017)
CKB	Carbon Regeneration Kiln (Burners)	POINT	46	360	382	889	1.0	Flow - EPA M19 (3% O2, 15% moist); 1' above bldg top; 12-in dia; T - std propane boiler exhst
EW	Electrowinning Cells and Pregnant Solution Tank	POINT	55	100	2,660	3,740	1	Ht - 10' above bldg top; Temp, Flow, Dia - (NDEP 2017)
MR	Mercury Retort	POINT	55	150	16	20	0.29	Ht - 10' above bldg top; Temp, Flow, Dia - (NDEP 2017)
MF	Induction Melting Furnace	POINT	55	150	3,500	5,200	1.25	Ht - 10' above bldg top; Temp, Flow, Dia - (NDEP 2017)

SOURCE DESCRIPTION		MODEL EMISSION RATES / RELEASE PARAMETERS														IDAPA 58.01.01.701 PM Weight Limit			
Model	Source Description	PM_{10}-24	$PM_{2.5}$-24	CO-ALL	NO_2-1	SO_2-1	SO_2-3	PM_{10}-AN	$PM_{2.5}$-AN	NO_2-AN	SO_2-AN	ht (m)	temp (K)	vel (m/s)	dia (m)	Process Weight	Allowable PM	Proposed PM	Compliance
ID		gps	gps	gps	gps	gps	gps	gps	gps	gps	gps	ht (m)	oy (m	oz (m		lb/hr	lb/hr	lb/hr	Demonstration
OC1	Loader Transfer of Ore to Grizzly	6.04E-03	1.71E-3					6.04E-3	1.71E-3			19.5	3.75	18.1		2,083,333	41.79	0.146	In Compliance
OC2	Grizzly to Apron Feeder	6.04E-03	1.71E-3					6.04E-3	1.71E-3			19.5	3.75	18.1		2,083,333	41.79	0.146	In Compliance
OC3	Apron Feeder to Dribble Conveyor	6.04E-03	1.71E-3					6.04E-3	1.71E-3			19.5	3.75	18.1		2,083,333	41.79	0.146	In Compliance
OC4	Apron Feeder to Vibrating Grizzly	6.04E-03	1.71E-3					6.04E-3	1.71E-3			19.5	3.75	18.1		2,083,333	41.79	0.146	In Compliance
OC5	Dribble Conveyor to Vibrating Grizzly	6.04E-03	1.71E-3					6.04E-3	1.71E-3			19.5	3.75	18.1		2,083,333	41.79	0.146	In Compliance
OC6	Vibrating Grizzly to Primary Crusher or Coarse Ore Stockpile Feed Conveyor	6.04E-03	1.71E-3					6.04E-3	1.71E-3			19.5	3.75	18.1		2,083,333	41.79	0.146	In Compliance
OC7	Primary Crusher and Associated Transfers out to Coarse Ore Stockpile Feed Conveyor	7.09E-02	1.31E-2					7.09E-2	1.31E-2			19.5	3.75	18.1		2,083,333	41.79	1.25	In Compliance
OC8	Coarse Ore Stockpile Feed Conveyor Transfer to Stockpile	6.04E-03	1.71E-3					6.04E-3	1.71E-3			10.9	0.21	10.2		2,083,333	41.79	0.146	In Compliance
OC9	Stockpile Transfers to Reclaim Conveyors	3.19E-02	4.93E-3					3.19E-2	4.93E-3			1.2	0.57	1.1		2,300,000	42.84	0.690	In Compliance
OC10	Reclaim Conveyors to SAG Mill Feed Conveyor	3.19E-02	4.93E-3					3.19E-2	4.93E-3			1.2	0.57	1.1		2,300,000	42.84	0.690	In Compliance
OC11	SAG Mill Feed Conveyor Transfer to SAG Mill	3.19E-02	4.93E-3					3.19E-2	4.93E-3			20.7	0.28	0.6		2,300,000	42.84	0.690	In Compliance
OC12	Pebble Crusher and Associated Transfers in (from SAG Mill) and out (to Pebble Discharge Conveyor)	7.82E-02	1.45E-2					7.82E-2	1.45E-2			3.0	2.32	2.8		2,300,000	42.84	1.380	In Compliance
OC13	Pebble Discharge Conveyor to SAG Mill Feed Conveyor	6.67E-03	1.88E-3					6.67E-3	1.88E-3			3.0	2.32	2.8		2,300,000	42.84	0.1610	In Compliance
LS1L	Mill Lime Silo #1 Loading	4.46E-04	6.56E-5					2.14E-5	3.15E-6			13.3	0.00	18.1	0.152	120,000	20.47	0.0594	In Compliance
LS1U	Mill Lime Silo #1 Unloading to SAG Mill Conveyor	3.67E-03	5.51E-4					1.76E-4	2.64E-5			1.4	0.07	0.1		40,000	15.56	0.0960	In Compliance
MilS2L	Mill Lime Silo #2 Loading	4.46E-04	6.56E-5					2.14E-5	3.15E-6			13.3	0.00	18.1	0.152	120,000	20.47	0.0594	In Compliance
MilS2U	Mill Lime Silo #2 Unloading to SAG Mill Conveyor	3.67E-03	5.51E-4					1.76E-4	2.64E-5			1.4	0.07	0.1		40,000	15.56	0.0960	In Compliance
Sb1	Sb Dryer (2.72 MMBtu/hr Propane-Fired)	2.62E-03	2.62E-3	2.81E-2	4.87E-2	5.95E-3	5.95E-3	2.62E-3	2.62E-3	4.87E-2	5.95E-3	45.7	455.37	6.9	0.305	-	-	0.0208	N/A
Sb2	Sb Bagging	1.49E-02	1.49E-2					1.49E-2	1.49E-2			45.7	0.00	6.5	0.305	9,000	10.61	0.118	In Compliance
AC	Autoclave	6.39E-01	6.39E-1			8.22E-2	8.22E-2	6.39E-1	6.39E-1		8.22E-2	23.5	364.26	7.4	1.524	580,000	30.36	5.08	In Compliance
ACB	POX Boiler (17 MMBtu/hr Propane-Fired)	6.83E-04	6.83E-4	1.76E-1	3.04E-1	3.72E-2	3.72E-2	5.61E-5	5.61E-5	1.04E-3	1.27E-4	23.5	455.37	10.8	0.610	-	-	0.130	N/A
ACS1L	AC Lime Silo #1 Loading	1.78E-03	2.62E-4					8.56E-5	1.26E-5			17.4	0.00	16.1	0.229	240,000	24.35	0.119	In Compliance
ACS1U	AC Lime Silo #1 Unloading to Lime Slaker	7.06E-03	1.01E-3					7.05E-4	1.01E-4			1.4	0.07	0.1		40,000	15.56	0.0960	In Compliance
ACS2L	AC Lime Silo #2 Loading	1.78E-03	2.62E-4					8.56E-5	1.26E-5			17.4	0.00	16.1	0.229	240,000	24.35	0.119	In Compliance
ACS2U	AC Lime Silo #2 Unloading to Lime Slaker	7.06E-03	1.01E-3					7.05E-4	1.01E-4			1.4	0.07	0.1		40,000	15.56	0.0960	In Compliance
ACS3L	AC Lime Silo #3 Loading	1.78E-03	2.62E-4					8.56E-5	1.26E-5			17.4	0.00	16.1	0.229	240,000	24.35	0.119	In Compliance
ACS3U	AC Lime Silo #3 Unloading to Lime Slaker	7.06E-03	1.01E-3					7.05E-4	1.01E-4			1.4	0.07	0.1		40,000	15.56	0.0960	In Compliance
ACS4L	AC Lime Silo #4 Loading	8.92E-04	1.31E-4					4.28E-5	6.29E-6			14.5	0.00	16.1	0.229	240,000	24.35	0.119	In Compliance
ACS42U	AC Lime Silo #4 Unloading to Lime Slaker	7.06E-03	1.01E-3					3.52E-4	5.03E-5			1.4	0.07	0.1		40,000	15.56	0.0960	In Compliance
CKD	Carbon Regeneration Kiln (Drum)	5.29E-02	5.29E-2	1.51E-2	1.51E-3			5.29E-2	5.29E-2	1.51E-3		16.8	338.71	5.1	0.146	600	2.09	0.420	In Compliance
CKB	Carbon Regeneration Kiln (Burners)	2.17E-03	2.17E-3	2.33E-2	4.04E-2	4.94E-3	4.94E-3	2.17E-3	2.17E-3	4.04E-2	4.94E-3	14.0	455.37	5.8	0.305	-	-	0.0173	N/A
EW	Electrowinning Cells and Pregnant Solution Tank	8.82E-03	8.82E-3					8.82E-3	8.82E-3			16.8	310.93	24.2	0.305	-	-	0.07	N/A
MR	Mercury Retort	1.26E-03	1.26E-3					1.80E-4	1.80E-4			16.8	338.71	1.5	0.088	1,000	2.84	0.01	In Compliance
MF	Induction Melting Furnace	1.79E-01	1.79E-1					2.55E-2	2.55E-2			16.8	338.71	21.5	0.381	1,000	2.84	2.84	In Compliance

SOURCE DESCRIPTION		OPERATING LIMITS							EMISSION FACTORS									EMISSION CON	
Model	Source Description	Design Throughput						Throughput reference	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	unit	reference	control	efficiency
ID		unit/hr	unit/day	unit/yr	units	Material	hr/yr											system	
EDG1	Camp Emergency Generator (Mfr. Yr. >2007; diesel)	1,000	1 hr	100,000	bkW	Diesel	100	(M3 2017a)	0.2	0.2	0.2	3.5	6.4	0.00657	1.3	g/kW-hr	40 CFR Subpart 60.4202(a)(2); SO2 - mass balance (15ppm ULSD) (CFR 2018a)	None	NA
EDG2	Plant Emergency Generator #1 (Mfr. Yr. >2007; diesel)	1,000	1 hr	100,000	bkW	Diesel	100	(M3 2017a)	0.2	0.2	0.2	3.5	6.4	0.00657	1.3	g/kW-hr	40 CFR Subpart 60.4202(a)(2); SO2 - mass balance (15ppm ULSD) (CFR 2018a)	None	NA
EDG3	Plant Emergency Generator #2 (Mfr. Yr. >2007; diesel)	1,000	1 hr	100,000	bkW	Diesel	100	(M3 2017a)	0.2	0.2	0.2	3.5	6.4	0.00657	1.3	g/kW-hr	40 CFR Subpart 60.4202(a)(2); SO2 - mass balance (15ppm ULSD) (CFR 2018a)	None	NA
EDFP	Mill Fire Pump (Mfr. Yr. >2009; diesel)	200	1 hr	20,000	bkW	Diesel	100	Typical Ind. Oper.	0.2	0.2	0.2	3.5	4	0.00657	4	g/kW-hr	Table 4 to ubpart IIII of Part 60- 30::KW<22 :: P<300 D2 l ma bala e ppm (CFR 2018a)	None	NA
PV	Propane Vaporizer (0.1 MMBtu/hr Propane-Fired)	0.10	2.4	876	MMBtu	Propane	8,760	(M3 2017a)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal	None	NA
HS	Strip Circuit Solution Heater (5 MMBtu, Propane-Fired)	5.00	120	43,800	MMBtu	Propane	8,760	(M3 2017b)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal	None	NA
H1M	Mine Air Heater #1 (4 MMBtu/hr Propane-Fired)	4.00	96	35,040	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal	None	NA
H2M	Mine Air Heater #2 (4 MMBtu/hr Propane-Fired)	4.00	96	35,040	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal	None	NA
HM	Mill HVAC Heaters (4 x 1.0 MMBtu Propane-Fired)	4.00	96	35,040	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal	None	NA
HAC	Autoclave HVAC Heater (0.25 MMBtu Propane-Fired)	0.25	6	2,190	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal	None	NA
HR	Refinery HVAC Heater (0.25 MMBtu Propane-Fired)	0.25	6	2,190	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal	None	NA
HA	Admin HVAC Heater (0.25 MMBtu Propane-Fired)	0.25	6	2,190	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal	None	NA
HMO	Mine Ops. HVAC Heaters (2 x 0.25 MMBtu Propane-Fired)	0.50	12	4,380	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal	None	NA
HTS	Truck Shop HVAC Heaters (2 x 1.0 MMBtu Propane-Fired)	2.00	48	17,520	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal	None	NA
HW	Warehouse HVAC Heaters (3 x 1.0 MMBtu Propane-Fired)	3.00	72	26,280	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal	None	NA
PSL	Prill Silos Loading (2 x 100 ton)	200	200	7,300	ton	Prill	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.02	0.007	0.00106					lb/ton	AP-42, Table 8.3-2 (7/93), Bulk Loading - unctrl; PM10/PM2.5 Ch. 13.2.4	None	0%
PSU	Prill Silos Unloading (2 x 100 ton)	200	200	7,300	ton	Prill	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.02	0.007	0.00106					lb/ton	AP-42, Table 8.3-2 (7/93), Bulk Loading - unctrl; PM10/PM2.5 Ch. 13.2.4	None	0%
CS1L	Cement/Shotcrete Silo #1 Loading	80	80	60,000	ton	Cement	8,760	Typical Ind. Oper.	0.00099	0.00034	0.00005					lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.; PM2.5 Ch. 13.2.4.	Bin Vent Filter	
CS1U	Cement/Shotcrete Silo #1 Unloading	20	80	60,000	ton	Cement	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004					lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.; PM2.5 Ch. 13.2.4.	None	0%
CS2L	Cement/Shotcrete Silo #2 Loading	80	80	60,000	ton	Cement	8,760	Typical Ind. Oper.	0.00099	0.00034	0.00005					lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.; PM2.5 Ch. 13.2.4.	Bin Vent Filter	
CS2U	Cement/Shotcrete Silo #2 Unloading	20	80	60,000	ton	Cement	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004					lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.; PM2.5 Ch. 13.2.4.	None	0%
CAL	Aggregate Bin Loading	100	2,400	500,000	ton	Aggregate	8,760	Typical Ind. Oper.	0.0069	0.0033	0.0005					lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.; PM2.5 Ch. 13.2.4.	None	0%
CAU	Aggregate Bin Unloading	100	2,400	500,000	ton	Aggregate	8,760	Typical Ind. Oper.	0.0069	0.0033	0.0005					lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.; PM2.5 Ch. 13.2.4.	None	0%
CM	Central Mixer Loading	20 (120)	80 (2,480)	60,000 (560K)	ton-cement (tot.)	Cement (mix)	8,760	Typical Ind. Oper.	0.0184	0.0055	0.0008					lb/ton	AP-42, Table 11.12-2 (6/06), central mixer-ctrl.; PM2.5 Ch. 13.2.4.	Types of controls used may include water sprays, enclosures, hoods, curtains, shrouds, movable and telescoping chutes, central duct collection systems, and the like.	
TG1	Mine Site Gasoline Tank #1			250,000	gal	Gasoline	8,760	(Midas Gold 2016), Table 12-4, annual use.							0.219	lb/hr	EPA Tanks 4.0.9d	None	NA
TG2	Mine Site Gasoline Tank #2			250,000	gal	Gasoline	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide tank capacity)							0.219	lb/hr	EPA Tanks 4.0.9d	None	NA
TD3	Mine Site Diesel Tank #3			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018c)							0.002	lb/hr	EPA Tanks 4.0.9d	None	NA
TD4	Mine Site Diesel Tank #4			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018c)							0.002	lb/hr	EPA Tanks 4.0.9d	None	NA
TD5	Mine Site Diesel Tank #5			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018c)							0.002	lb/hr	EPA Tanks 4.0.9d	None	NA
TD6	Mine Site Diesel Tank #6			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018c)							0.002	lb/hr	EPA Tanks 4.0.9d	None	NA
TD7	Mine Site Diesel Tank #7			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018c)							0.002	lb/hr	EPA Tanks 4.0.9d	None	NA
TD8	Mine Site Diesel Tank #8			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018c)							0.002	lb/hr	EPA Tanks 4.0.9d	None	NA

SOURCE DESCRIPTION		TROLS	HOURLY EMISSIONS							DAILY EMISSIONS							ANNUAL EMISSIONS								
Model	Source Description	reference	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	UTM E	UTM N
ID			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	m	m
EDG1	Camp Emergency Generator (Mfr. Yr. >2007; diesel)		0.441	0.441	0.441	7.72	14.1	0.0145	2.87	0.441	0.441	0.441	7.72	14.11	0.01448	2.866	0.0220	0.0220	0.0220	0.386	0.705	7.24E-4	0.143	634,274	4,972,050
EDG2	Plant Emergency Generator #1 (Mfr. Yr. >2007; diesel)		0.441	0.441	0.441	7.72	14.1	0.0145	2.87	0.441	0.441	0.441	7.72	14.11	0.01448	2.866	0.0220	0.0220	0.0220	0.386	0.705	7.24E-4	0.143	632,105	4,974,154
EDG3	Plant Emergency Generator #2 (Mfr. Yr. >2007; diesel)		0.441	0.441	0.441	7.72	14.1	0.0145	2.87	0.441	0.441	0.441	7.72	14.11	0.01448	2.866	0.0220	0.0220	0.0220	0.386	0.705	7.24E-4	0.143	632,109	4,974,148
EDFP	Mill Fire Pump (Mfr. Yr. >2009; diesel)		0.0882	0.0882	0.0882	1.54	1.76	0.00290	1.76	0.0882	0.0882	0.0882	1.543	1.764	2.90E-3	1.764	0.00441	0.00441	0.00441	0.0772	0.0882	1.45E-4	0.0882	632,113	4,974,141
PV	Propane Vaporizer (0.1 MMBtu/hr Propane-Fired)		7.65E-4	7.65E-4	7.65E-4	0.00820	0.0142	0.00174	8.74E-4	0.0184	0.0184	0.0184	0.197	0.341	0.0417	0.0210	0.00335	0.00335	0.00335	0.0359	0.0622	0.00761	0.00383	632,216	4,974,118
HS	Strip Circuit Solution Heater (5 MMBtu, Propane-Fired)		0.0383	0.0383	0.0383	0.410	0.710	0.0869	0.0437	0.918	0.918	0.918	9.84	17.0	2.09	1.05	0.168	0.168	0.168	1.80	3.11	0.381	0.191	632,017	4,974,010
H1M	Mine Air Heater #1 (4 MMBtu/hr Propane-Fired)		0.0306	0.0306	0.0306	0.328	0.568	0.0695	0.0350	0.734	0.734	0.734	7.87	13.6	1.67	0.839	0.134	0.134	0.134	1.44	2.49	0.304	0.153	632,287	4,974,227
H2M	Mine Air Heater #2 (4 MMBtu/hr Propane-Fired)		0.0306	0.0306	0.0306	0.328	0.568	0.0695	0.0350	0.734	0.734	0.734	7.87	13.6	1.67	0.839	0.134	0.134	0.134	1.44	2.49	0.304	0.153	632,288	4,974,228
HM	Mill HVAC Heaters (4 x 1.0 MMBtu Propane-Fired)		0.0306	0.0306	0.0306	0.328	0.568	0.0695	0.0350	0.734	0.734	0.734	7.87	13.6	1.67	0.839	0.134	0.134	0.134	1.44	2.49	0.304	0.153	632,168	4,974,191
HAC	Autoclave HVAC Heater (0.25 MMBtu Propane-Fired)		0.00191	0.00191	0.00191	0.0205	0.0355	0.00434	0.00219	0.0459	0.0459	0.0459	0.492	0.852	0.104	0.0525	0.00838	0.00838	0.00838	0.0898	0.156	0.0190	0.00957	632,238	4,974,130
HR	Refinery HVAC Heater (0.25 MMBtu Propane-Fired)		0.00191	0.00191	0.00191	0.0205	0.0355	0.00434	0.00219	0.0459	0.0459	0.0459	0.492	0.852	0.104	0.0525	0.00838	0.00838	0.00838	0.0898	0.156	0.0190	0.00957	632,008	4,974,026
HA	Admin HVAC Heater (0.25 MMBtu Propane-Fired)		0.00191	0.00191	0.00191	0.0205	0.0355	0.00434	0.00219	0.0459	0.0459	0.0459	0.492	0.852	0.104	0.0525	0.00838	0.00838	0.00838	0.0898	0.156	0.0190	0.00957	632,038	4,973,751
HMO	Mine Ops. HVAC Heaters (2 x 0.25 MMBtu Propane-Fired)		0.00383	0.00383	0.00383	0.0410	0.0710	0.00869	0.00437	0.0918	0.0918	0.0918	0.984	1.70	0.209	0.105	0.0168	0.0168	0.0168	0.180	0.311	0.0381	0.0191	631,889	4,973,472
HTS	Truck Shop HVAC Heaters (2 x 1.0 MMBtu Propane-Fired)		0.0153	0.0153	0.0153	0.164	0.284	0.0348	0.0175	0.367	0.367	0.367	3.93	6.82	0.834	0.420	0.0670	0.0670	0.0670	0.718	1.24	0.152	0.0766	631,848	4,973,398
HW	Warehouse HVAC Heaters (3 x 1.0 MMBtu Propane-Fired)		0.0230	0.0230	0.0230	0.246	0.426	0.0521	0.0262	0.551	0.551	0.551	5.90	10.2	1.25	0.630	0.101	0.101	0.101	1.08	1.87	0.228	0.115	632,060	4,973,664
PSL	Prill Silos Loading (2 x 100 ton)		4.00	1.40	0.212					4.00	1.40	0.212					0.0730	0.0256	0.00387					632,346	4,973,500
PSU	Prill Silos Unloading (2 x 100 ton)		4.00	1.40	0.212					4.00	1.40	0.212					0.0730	0.0256	0.00387					632,346	4,973,500
CS1L	Cement/Shotcrete Silo #1 Loading	Control efficiency included in emission factor	0.0792	0.0272	0.00400					0.0792	0.0272	0.00400					0.0297	0.0102	0.00150					632,095	4,974,272
CS1U	Cement/Shotcrete Silo #1 Unloading		0.0960	0.0560	0.00800					0.384	0.224	0.0320					0.144	0.0840	0.0120					632,095	4,974,272
CS2L	Cement/Shotcrete Silo #2 Loading	Control efficiency included in emission factor	0.0792	0.0272	0.00400					0.0792	0.0272	0.00400					0.0297	0.0102	0.00150					632,095	4,974,272
CS2U	Cement/Shotcrete Silo #2 Unloading		0.0960	0.0560	0.00800					0.384	0.224	0.0320					0.144	0.0840	0.0120					632,095	4,974,272
CAL	Aggregate Bin Loading		0.690	0.330	0.0500					16.6	7.92	1.20					1.73	0.825	0.125					632,095	4,974,272
CAU	Aggregate Bin Unloading		0.690	0.330	0.0500					16.6	7.92	1.20					1.73	0.825	0.125					632,095	4,974,272
CM	Central Mixer Loading	Control efficiency included in emission factor	0.368	0.110	0.0160					1.47	0.440	0.0640					0.552	0.165	0.0240					632,095	4,974,272
TG1	Mine Site Gasoline Tank #1								0.219							5.25							0.957		
TG2	Mine Site Gasoline Tank #2								0.219							5.25							0.957		
TD3	Mine Site Diesel Tank #3								0.00167							0.0400							0.00730		
TD4	Mine Site Diesel Tank #4								0.00167							0.0400							0.00730		
TD5	Mine Site Diesel Tank #5								0.00167							0.0400							0.00730		
TD6	Mine Site Diesel Tank #6								0.00167							0.0400							0.00730		
TD7	Mine Site Diesel Tank #7								0.00167							0.0400							0.00730		
TD8	Mine Site Diesel Tank #8								0.00167							0.0400							0.00730		

SOURCE DESCRIPTION		NAD 83 LOCATION		
Model	Source Description	reference	elev	reference
ID			m	
EDG1	Camp Emergency Generator (Mfr. Yr. >2007; diesel)	Outside Recreation building	2,114.0	Recreation building base
EDG2	Plant Emergency Generator #1 (Mfr. Yr. >2007; diesel)	Outside Mill building	2,001.0	Mill building base
EDG3	Plant Emergency Generator #2 (Mfr. Yr. >2007; diesel)	Outside Mill building	2,002.0	Mill building base
EDFP	Mill Fire Pump (Mfr. Yr. >2009; diesel)	Outside Mill building	2,003.0	Mill building base
PV	Propane Vaporizer (0.1 MMBtu/hr Propane-Fired)	POX building corner	2,007.2	POX building base
HS	Strip Circuit Solution Heater (5 MMBtu, Propane-Fired)	Along Refinery building wall	1,970.3	Refinery building base
H1M	Mine Air Heater #1 (4 MMBtu/hr Propane-Fired)	Near underground mine shaft	2,000.0	Mine shaft base
H2M	Mine Air Heater #2 (4 MMBtu/hr Propane-Fired)	Near underground mine shaft	2,000.0	Mine shaft base
HM	Mill HVAC Heaters (4 x 1.0 MMBtu Propane-Fired)	Mill building center	2,000.6	Mill building base
HAC	Autoclave HVAC Heater (0.25 MMBtu Propane-Fired)	POX building center	2,007.2	POX building base
HR	Refinery HVAC Heater (0.25 MMBtu Propane-Fired)	Refinery building center	1,970.3	Refinery building base
HA	Admin HVAC Heater (0.25 MMBtu Propane-Fired)	Admin building center	1,979.0	Admin building base
HMO	Mine Ops. HVAC Heaters (2 x 0.25 MMBtu Propane-Fired)	Mine Ops building center	1,988.5	Mine Ops building base
HTS	Truck Shop HVAC Heaters (2 x 1.0 MMBtu Propane-Fired)	Truck Shop building center	1,991.8	Truck Shop building base
HW	Warehouse HVAC Heaters (3 x 1.0 MMBtu Propane-Fired)	Warehouse building center	1,983.9	Warehouse building base
PSL	Prill Silos Loading (2 x 100 ton)	Prill Silo #1 center	2,010.0	Prill Silo #1 base
PSU	Prill Silos Unloading (2 x 100 ton)	Prill Silo #1 center	2,010.0	Prill Silo #1 base
CS1L	Cement/Shotcrete Silo #1 Loading	Aggregate stockpile center	1,992.0	Aggregate stockpile base
CS1U	Cement/Shotcrete Silo #1 Unloading	Aggregate stockpile center	1,992.0	Aggregate stockpile base
CS2L	Cement/Shotcrete Silo #2 Loading	Aggregate stockpile center	1,992.0	Aggregate stockpile base
CS2U	Cement/Shotcrete Silo #2 Unloading	Aggregate stockpile center	1,992.0	Aggregate stockpile base
CAL	Aggregate Bin Loading	Aggregate stockpile center	1,992.0	Aggregate stockpile base
CAU	Aggregate Bin Unloading	Aggregate stockpile center	1,992.0	Aggregate stockpile base
CM	Central Mixer Loading	Aggregate stockpile center	1,992.0	Aggregate stockpile base
TG1	Mine Site Gasoline Tank #1			
TG2	Mine Site Gasoline Tank #2			
TD3	Mine Site Diesel Tank #3			
TD4	Mine Site Diesel Tank #4			
TD5	Mine Site Diesel Tank #5			
TD6	Mine Site Diesel Tank #6			
TD7	Mine Site Diesel Tank #7			
TD8	Mine Site Diesel Tank #8			

SOURCE DESCRIPTION		RELEASE PARAMETERS INPUT						
Model	Source Description	POINT	rel ht (ft)	temp (F)	flow (dscfm)	flow (acfm)	dia (ft)	reference
ID		VOLUME	rel ht (ft)	width (ft)	vert. ln (ft)	grnd ht (ft)	oz type	
EDG1	Camp Emergency Generator (Mfr. Yr. >2007; diesel)	POINT	7	1,100	1,894	10,328	1.5	Flow - EPA M19 (9% O2, 8% moist; 75% load); 7' high, 18-in dia; T - std diesel engine exhst
EDG2	Plant Emergency Generator #1 (Mfr. Yr. >2007; diesel)	POINT	7	1,100	1,894	10,328	1.5	Flow - EPA M19 (9% O2, 8% moist); 7' high, 18-in dia; T - std diesel engine exhst
EDG3	Plant Emergency Generator #2 (Mfr. Yr. >2007; diesel)	POINT	7	1,100	1,894	10,328	1.5	Flow - EPA M19 (9% O2, 8% moist); 7' high, 18-in dia; T - std diesel engine exhst
EDFP	Mill Fire Pump (Mfr. Yr. >2009; diesel)	POINT	7	1,100	379	2,066	0.75	Flow - EPA M19 (9% O2, 8% moist); 7' high, 9-in dia; T - std diesel engine exhst
PV	Propane Vaporizer (0.1 MMBtu/hr Propane-Fired)	POINT	68	360	17	39	0.4	Flow - EPA M19 (3% O2, 15% moist); 1' above bldg top; 5-in dia; T - std propane boiler exhst
HS	Strip Circuit Solution Heater (5 MMBtu, Propane-Fired)	POINT	46	360	847	1,972	1.3	Flow - EPA M19 (3% O2, 15% moist); 1' above bldg top; 16-in dia; T - std propane boiler exhst
H1M	Mine Air Heater #1 (4 MMBtu/hr Propane-Fired)	POINT	7	360	678	1,577	1.3	Flow - EPA M19 (3% O2, 15% moist); 1' above bldg top; 16-in dia; T - std propane boiler exhst
H2M	Mine Air Heater #2 (4 MMBtu/hr Propane-Fired)	POINT	7	360	678	1,577	0.7	Flow - EPA M19 (3% O2, 15% moist); 1' above bldg top; 8-in dia; T - std propane boiler exhst
HM	Mill HVAC Heaters (4 x 1.0 MMBtu Propane-Fired)	POINT	141	360	678	394	0.3	Flow - EPA M19 (3% O2, 15% moist); 1' above bldg top; 4-in dia; T - std propane boiler exhst - single stack param
HAC	Autoclave HVAC Heater (0.25 MMBtu Propane-Fired)	POINT	68	360	42	99	0.3	Flow - EPA M19 (3% O2, 15% moist); 1' above bldg top; 4-in dia; T - std propane boiler exhst
HR	Refinery HVAC Heater (0.25 MMBtu Propane-Fired)	POINT	46	360	42	99	0.3	Flow - EPA M19 (3% O2, 15% moist); 1' above bldg top; 4-in dia; T - std propane boiler exhst
HA	Admin HVAC Heater (0.25 MMBtu Propane-Fired)	POINT	21	360	42	99	0.3	Flow - EPA M19 (3% O2, 15% moist); 1' above bldg top; 4-in dia; T - std propane boiler exhst
HMO	Mine Ops. HVAC Heaters (2 x 0.25 MMBtu Propane-Fired)	POINT	41	360	85	99	0.7	Flow - EPA M19 (3% O2, 15% moist); 1' above bldg top; 8-in dia; T - std propane boiler exhst - single stack param
HTS	Truck Shop HVAC Heaters (2 x 1.0 MMBtu Propane-Fired)	POINT	41	360	339	394	0.7	Flow - EPA M19 (3% O2, 15% moist); 1' above bldg top; 8-in dia; T - std propane boiler exhst - single stack param
HW	Warehouse HVAC Heaters (3 x 1.0 MMBtu Propane-Fired)	POINT	41	360	508	394	0.7	Flow - EPA M19 (3% O2, 15% moist); 1' above bldg top; 8-in dia; T - std propane boiler exhst - single stack param
PSL	Prill Silos Loading (2 x 100 ton)	POINT	25.5	Ambient		700	0.5	Ht - 3' above silo top; dia & flow from (NDEP 2019)
PSU	Prill Silos Unloading (2 x 100 ton)	VOLUME	4.5	1	1	5	elev src w/ bldg	1' screw discharge; 1' drop to conveyor; 5' above grade
CS1L	Cement/Shotcrete Silo #1 Loading	POINT	43.7	Ambient	930	930	0.5	Ht - 3' above silo top; dia & flow from (NDEP 2019)
CS1U	Cement/Shotcrete Silo #1 Unloading	VOLUME	5	72.2	10	10	srf src	Ht - 3' above silo top; dia & flow from (NDEP 2019)
CS2L	Cement/Shotcrete Silo #2 Loading	POINT	43.7	Ambient	930	930	0.5	Ht - 3' above silo top; dia & flow from (NDEP 2019)
CS2U	Cement/Shotcrete Silo #2 Unloading	VOLUME	5	72.2	10	10	srf src	Ht - 3' above silo top; dia & flow from (NDEP 2019)
CAL	Aggregate Bin Loading	VOLUME	5	72.2	10	10	srf src	Ht - 3' above silo top; dia & flow from (NDEP 2019)
CAU	Aggregate Bin Unloading	VOLUME	5	72.2	10	10	srf src	Ht - 3' above silo top; dia & flow from (NDEP 2019)
CM	Central Mixer Loading	VOLUME	5	72.2	10	10	srf src	Ht - 3' above silo top; dia & flow from (NDEP 2019)
TG1	Mine Site Gasoline Tank #1							
TG2	Mine Site Gasoline Tank #2							
TD3	Mine Site Diesel Tank #3							
TD4	Mine Site Diesel Tank #4							
TD5	Mine Site Diesel Tank #5							
TD6	Mine Site Diesel Tank #6							
TD7	Mine Site Diesel Tank #7							
TD8	Mine Site Diesel Tank #8							

SOURCE DESCRIPTION		MODEL EMISSION RATES / RELEASE PARAMETERS														IDAPA 58.01.01.701 PM Weight Limit			
Model	Source Description	PM_{10}-24	$PM_{2.5}$-24	CO-ALL	NO_2-1	SO_2-1	SO_2-3	PM_{10}-AN	$PM_{2.5}$-AN	NO_2-AN	SO_2-AN	ht (m)	temp (K)	vel (m/s)	dia (m)	Process Weight	Allowable PM	Proposed PM	Compliance
ID		gps	gps	gps	gps	gps	gps	gps	gps	gps	gps	ht (m)	oy (m	oz (m		lb/hr	lb/hr	lb/hr	Demonstration
EDG1	Camp Emergency Generator (Mfr. Yr. >2007; diesel)	2.31E-03	2.31E-3	9.72E-1	2.03E-2	1.82E-3	1.82E-3	6.34E-4	6.34E-4	2.03E-2	2.08E-5	2.1	866.48	29.7	0.457	-	-	0.441	N/A
EDG2	Plant Emergency Generator #1 (Mfr. Yr. >2007; diesel)	2.31E-03	2.31E-3	9.72E-1	2.03E-2	1.82E-3	1.82E-3	6.34E-4	6.34E-4	2.03E-2	2.08E-5	2.1	866.48	29.7	0.457	-	-	0.441	N/A
EDG3	Plant Emergency Generator #2 (Mfr. Yr. >2007; diesel)	2.31E-03	2.31E-3	9.72E-1	2.03E-2	1.82E-3	1.82E-3	6.34E-4	6.34E-4	2.03E-2	2.08E-5	2.1	866.48	29.7	0.457	-	-	0.441	N/A
EDFP	Mill Fire Pump (Mfr. Yr. >2009; diesel)	4.63E-04	4.63E-4	1.94E-1	2.54E-3	3.65E-4	3.65E-4	1.27E-4	1.27E-4	2.54E-3	4.16E-6	2.1	866.48	23.8	0.229	-	-	0.0882	N/A
PV	Propane Vaporizer (0.1 MMBtu/hr Propane-Fired)	9.64E-05	9.64E-5	1.03E-3	1.79E-3	2.19E-4	2.19E-4	9.64E-5	9.64E-5	1.79E-3	2.19E-4	20.7	455.37	1.6	0.122	-	-	7.65E-4	N/A
HS	Strip Circuit Solution Heater (5 MMBtu, Propane-Fired)	4.82E-03	4.82E-3	5.16E-2	8.95E-2	1.09E-2	1.09E-2	4.82E-3	4.82E-3	8.95E-2	1.09E-2	14.0	455.37	7.5	0.396	-	-	0.0383	N/A
H1M	Mine Air Heater #1 (4 MMBtu/hr Propane-Fired)	3.86E-03	3.86E-3	4.13E-2	7.16E-2	8.76E-3	8.76E-3	3.86E-3	3.86E-3	7.16E-2	8.76E-3	2.1	455.37	6.0	0.396	-	-	0.0306	N/A
H2M	Mine Air Heater #2 (4 MMBtu/hr Propane-Fired)	3.86E-03	3.86E-3	4.13E-2	7.16E-2	8.76E-3	8.76E-3	3.86E-3	3.86E-3	7.16E-2	8.76E-3	2.1	455.37	20.8	0.213	-	-	0.0306	N/A
HM	Mill HVAC Heaters (4 x 1.0 MMBtu Propane-Fired)	3.86E-03	3.86E-3	4.13E-2	7.16E-2	8.76E-3	8.76E-3	3.86E-3	3.86E-3	7.16E-2	8.76E-3	43.0	455.37	28.3	0.091	-	-	0.0306	N/A
HAC	Autoclave HVAC Heater (0.25 MMBtu Propane-Fired)	2.41E-04	2.41E-4	2.58E-3	4.48E-3	5.47E-4	5.47E-4	2.41E-4	2.41E-4	4.48E-3	5.47E-4	20.7	455.37	7.1	0.091	-	-	0.00191	N/A
HR	Refinery HVAC Heater (0.25 MMBtu Propane-Fired)	2.41E-04	2.41E-4	2.58E-3	4.48E-3	5.47E-4	5.47E-4	2.41E-4	2.41E-4	4.48E-3	5.47E-4	14.0	455.37	7.1	0.091	-	-	0.00191	N/A
HA	Admin HVAC Heater (0.25 MMBtu Propane-Fired)	2.41E-04	2.41E-4	2.58E-3	4.48E-3	5.47E-4	5.47E-4	2.41E-4	2.41E-4	4.48E-3	5.47E-4	6.4	455.37	7.1	0.091	-	-	0.00191	N/A
HMO	Mine Ops. HVAC Heaters (2 x 0.25 MMBtu Propane-Fired)	4.82E-04	4.82E-4	5.16E-3	8.95E-3	1.09E-3	1.09E-3	4.82E-4	4.82E-4	8.95E-3	1.09E-3	12.5	455.37	1.3	0.213	-	-	0.00383	N/A
HTS	Truck Shop HVAC Heaters (2 x 1.0 MMBtu Propane-Fired)	1.93E-03	1.93E-3	2.07E-2	3.58E-2	4.38E-3	4.38E-3	1.93E-3	1.93E-3	3.58E-2	4.38E-3	12.5	455.37	5.2	0.213	-	-	0.0153	N/A
HW	Warehouse HVAC Heaters (3 x 1.0 MMBtu Propane-Fired)	2.89E-03	2.89E-3	3.10E-2	5.37E-2	6.57E-3	6.57E-3	2.89E-3	2.89E-3	5.37E-2	6.57E-3	12.5	455.37	5.2	0.213	-	-	0.0230	N/A
PSL	Prill Silos Loading (2 x 100 ton)	7.35E-03	1.11E-3					7.35E-4	1.11E-4			7.8	0.00	18.1	0.152	400,000	27.66	4.00	In Compliance
PSU	Prill Silos Unloading (2 x 100 ton)	7.35E-03	1.11E-3					7.35E-4	1.11E-4			1.4	0.07	0.1		400,000	27.66	4.00	In Compliance
CS1L	Cement/Shotcrete Silo #1 Loading	1.43E-04	2.10E-5					2.93E-4	4.32E-5			13.3	0.00	24.1	0.152	160,000	22.00	0.0792	In Compliance
CS1U	Cement/Shotcrete Silo #1 Unloading	1.18E-03	1.68E-4					2.42E-3	3.45E-4			1.5	5.12	1.4		40,000	15.56	0.0960	In Compliance
CS2L	Cement/Shotcrete Silo #2 Loading	1.43E-04	2.10E-5					2.93E-4	4.32E-5			13.3	0.00	24.1	0.152	160,000	22.00	0.0792	In Compliance
CS2U	Cement/Shotcrete Silo #2 Unloading	1.18E-03	1.68E-4					2.42E-3	3.45E-4			1.5	5.12	1.4		40,000	15.56	0.0960	In Compliance
CAL	Aggregate Bin Loading	4.16E-02	6.30E-3					2.37E-2	3.60E-3			1.5	5.12	1.4		200,000	23.26	0.690	In Compliance
CAU	Aggregate Bin Unloading	4.16E-02	6.30E-3					2.37E-2	3.60E-3			1.5	5.12	1.4		200,000	23.26	0.690	In Compliance
CM	Central Mixer Loading	2.31E-03	3.36E-4					4.75E-3	6.90E-4			1.5	5.12	1.4		-	-	0.368	N/A
TG1	Mine Site Gasoline Tank #1															-	-	-	N/A
TG2	Mine Site Gasoline Tank #2															-	-	-	N/A
TD3	Mine Site Diesel Tank #3															-	-	-	N/A
TD4	Mine Site Diesel Tank #4															-	-	-	N/A
TD5	Mine Site Diesel Tank #5															-	-	-	N/A
TD6	Mine Site Diesel Tank #6															-	-	-	N/A
TD7	Mine Site Diesel Tank #7															-	-	-	N/A
TD8	Mine Site Diesel Tank #8															-	-	-	N/A

SOURCE DESCRIPTION		OPERATING LIMITS							EMISSION FACTORS									EMISSION CON	
Model	Source Description	Design Throughput						Throughput reference	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	unit	reference	control	efficiency
ID		unit/hr	unit/day	unit/yr	units	Material	hr/yr											system	
TD9	Mine Site Diesel Tank #9			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018c)							0.002	lb/hr	EPA Tanks 4.0.9d	None	NA
TD10	Mine Site Diesel Tank #10			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018c)							0.002	lb/hr	EPA Tanks 4.0.9d	None	NA
PCSP1	Portable Crushing and Screening Plant 1 (2 crushers (primary and secondary), 2 screens (primary and secondary), and 5 conveyor transfers)	83	2,000	730,000	ton	Aggregate	8,760	(Midas Gold 2019c)	0.0075	0.00279	0.00037					lb/ton	AP-42, Table 11.19.2-2 (08/04): Tert. Crushing - ctrl. × 2 + Screening - ctrl. × 2 + Conv. Transfer - ctrl. × 5	Water Sprays/Moisture Carry-Over	
PCSP2	Portable Crushing and Screening Plant 2 (2 crushers (primary and secondary), 2 screens (primary and secondary), and 5 conveyor transfers)	83	2,000	730,000	ton	Aggregate	8,760	(Midas Gold 2019c)	0.0075	0.00279	0.00037					lb/ton	AP-42, Table 11.19.2-2 (08/04): Tert. Crushing - ctrl. × 2 + Screening - ctrl. × 2 + Conv. Transfer - ctrl. × 5	Water Sprays/Moisture Carry-Over	
TRUE	LIME PRODUCTION																		
LS1	Limestone transfer to Primary Crusher Hopper	47.08	1,130	317,907	ton	Limestone	8,760	(Midas Gold 2018d)	0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4	None	0
LS2	Primary Crushing and Associated Transfers In and Out	47.08	1,130	317,907	ton	Limestone	8,760		0.0054	0.0024	0.00036					lb/ton	AP-42, Table 11.19.2-2 (08/04) Tert. Crush - unctrl.; PM2.5 Ch. 13.2.4	None	0
LS3	Primary Screening and Associated Transfers In and Out	47.08	1,130	317,907	ton	Limestone	8,760		0.025	0.0087	0.00132					lb/ton	AP-42, Table 11.19.2-2 (08/04) Screening - unctrl.; PM2.5 Ch. 13.2.4	None	0
LS4	Secondary Crushing and Associated Transfers In and Out	47.08	1,130	317,907	ton	Limestone	8,760		0.0054	0.0024	0.00036					lb/ton	AP-42, Table 11.19.2-2 (08/04) Tert. Crush - unctrl.; PM2.5 Ch. 13.2.4	None	0
LS5	Secondary Screening and Associated Transfers In and Out	47.08	1,130	317,907	ton	Limestone	8,760		0.025	0.0087	0.00132					lb/ton	AP-42, Table 11.19.2-2 (08/04) Screening - unctrl.; PM2.5 Ch. 13.2.4	None	0
LS6	Limestone transfer to Ball Mill Feed Bin	47.08	1,130	317,907	ton	Limestone	8,760		0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4	None	0
LS7	Limestone transfer to Ball Mill Feed Conveyor	47.08	1,130	317,907	ton	Limestone	8,760		0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4	None	0
LS8	Ball Mill Feed transfer to Ball Mill	47.08	1,130	317,907	ton	Limestone	8,760		0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4	None	0
LSBM	Limestone Ball Mill	47.08	1,130	317,907	ton	Limestone	8,760		0.0404	0.0339	0.0121					lb/ton	AP-42, Table 11.19.2-4 (08/04) Dry Grind. with Fabric Filter	Baghouse (BH3)	NA
LS9	Limestone transfer to Kiln Feed Bin	11.13	267	82,688	ton	Limestone	8,760		0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4	None	0
LS10	Limestone transfer to Lime Kiln Feed Conveyor	11.13	267	82,688	ton	Limestone	8,760		0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4	None	0
LS11	Fines Screening and Associated Transfers In and Out	11.13	267	82,688	ton	Limestone	8,760		0.025	0.0087	0.00132					lb/ton	AP-42, Table 11.19.2-2 (08/04) Screening - unctrl.; PM2.5 Ch. 13.2.4	None	0
LS12	Kiln Feed transfer to PFR Shaft Lime Kiln	11.13	267	82,688	ton	Limestone	8,760	(Midas Gold 2018d)	0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4	None	0
LK	Parallel Flow Regenerative (PFR) Shaft Lime Kiln	7.04	169	52,377	ton	Lime	8,760	(Midas Gold 2018d)	0.13	0.13	0.13	0.45	0.24	0.0012		lb/ton	AP-42 Tables 11.17-2, 6 : Gas-Fired Parallel Flow Regenetive Kiln with Fabric Filter (PM = 5x EF)	Baghouse (BH4)	NA
LKC	PFR Shaft Lime Kiln Combustion	22.04	529	163,935	MMBtu	Propane	8,760	Based on 870 kcal/kg (Maerz 2018)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal	None	0
LCR	Lime Mill Crushing and associated transfers In and Out	7.04	169	52,377	ton	Lime	8,760		0.0404	0.0339	0.0121					lb/ton	AP-42, Table 11.19.2-4 (08/04) Dry Grind. with Fabric Filter	Baghouse (BH5)	NA
LSL	Pebble Lime Silo Loading via Bucket Elevator	7.04	169	52,377	ton	Lime	8,760		0.00088	0.00088	0.00088					lb/ton	AP-42 Table 11.17-4: Crushed Material Conveyor Transfer with Fabric Filter (PM = 10 x EF)	Bin Vent Filter	NA
LSU	Pebble Lime Silo discharge to Lime Slaker	7.04	169	52,377	ton	Lime	8,760		8.8E-05	8.8E-05	8.8E-05					lb/ton	AP-42 Table 11.17-4: Crushed Material Conveyor Transfer with Fabric Filter	Wet Scrubber (WS3)	NA
Total																			

SOURCE DESCRIPTION		TROLS	HOURLY EMISSIONS							DAILY EMISSIONS							ANNUAL EMISSIONS								
Model	Source Description	reference	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	UTM E	UTM N
ID			lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	m	m
TD9	Mine Site Diesel Tank #9								0.00167							0.0400							0.00730		
TD10	Mine Site Diesel Tank #10								0.00167							0.0400							0.00730		
PCSP1	Portable Crushing and Screening Plant 1 (2 crushers (primary and secondary), 2 screens (primary and secondary), and 5 conveyor transfers)	Control efficiency included in emission factor	0.63	0.233	0.030					15.0	5.6	0.73					2.74	1.02	0.133					632,348	4,973,429
PCSP2	Portable Crushing and Screening Plant 2 (2 crushers (primary and secondary), 2 screens (primary and secondary), and 5 conveyor transfers)	Control efficiency included in emission factor	0.625	0.2325	0.0304					15.00	5.58	0.730					2.738	1.018	0.1332					632,348	4,973,369
TRUE	LIME PRODUCTION																								
LS1	Limestone transfer to Primary Crusher Hopper		0.141	0.0518	0.0080					3.39	1.24	0.192	0	0	0	0	0.477	0.175	0.0270					632,239	4,974,256
LS2	Primary Crushing and Associated Transfers In and Out		0.254	0.113	0.0169					6.10	2.71	0.407	0	0	0	0	0.86	0.381	0.057					632,239	4,974,256
LS3	Primary Screening and Associated Transfers In and Out		1.18	0.410	0.0621					28.2	9.8	1.49	0	0	0	0	3.97	1.38	0.210					632,239	4,974,256
LS4	Secondary Crushing and Associated Transfers In and Out		0.254	0.113	0.0169					6.10	2.71	0.407	0	0	0	0	0.86	0.381	0.057					632,227	4,974,268
LS5	Secondary Screening and Associated Transfers In and Out		1.18	0.410	0.0621					28.2	9.8	1.49	0	0	0	0	3.97	1.38	0.210					632,227	4,974,268
LS6	Limestone transfer to Ball Mill Feed Bin		0.141	0.0518	0.0080					3.39	1.24	0.192	0	0	0	0	0.477	0.175	0.0270					632,181	4,974,307
LS7	Limestone transfer to Ball Mill Feed Conveyor		0.141	0.0518	0.00800					3.39	1.243	0.192	0	0	0	0	0.477	0.175	0.0270					632,181	4,974,307
LS8	Ball Mill Feed transfer to Ball Mill		0.141	0.0518	0.00800					3.39	1.243	0.192	0	0	0	0	0.477	0.175	0.0270					632,200	4,974,273
LSBM	Limestone Ball Mill	Control efficiency included in emission factor	1.902	1.5959	0.56964					45.65	38.303	13.671	0	0	0	0	6.422	5.389	1.9233					632,215	4,974,248
LS9	Limestone transfer to Kiln Feed Bin		0.033	0.0122	0.0019					0.80	0.29	0.045	0	0	0	0	0.124	0.045	0.0070					632,169	4,974,325
LS10	Limestone transfer to Lime Kiln Feed Conveyor		0.033	0.0122	0.00189					0.80	0.294	0.045	0	0	0	0	0.124	0.045	0.0070					632,169	4,974,325
LS11	Fines Screening and Associated Transfers In and Out		0.28	0.097	0.0147					6.7	2.3	0.35	0	0	0	0	1.03	0.36	0.055					632,151	4,974,314
LS12	Kiln Feed transfer to PFR Shaft Lime Kiln		0.033	0.0122	0.00189					0.80	0.294	0.045	0	0	0	0	0.124	0.045	0.0070					632,056	4,974,285
LK	Parallel Flow Regenerative (PFR) Shaft Lime Kiln	Control efficiency included in emission factor	0.915	0.915	0.915	3.17	1.69	0.0085		21.97	21.97	21.97	76.05	40.6	0.203	0.00	3.40	3.40	3.40	11.8	6.29	0.0314		632,057	4,974,265
LKC	PFR Shaft Lime Kiln Combustion		0.169	0.169	0.169	1.81	3.13	0.383	0.193	4.05	4.05	4.05	43.4	75.2	9.2	4.62	0.627	0.627	0.627	6.72	11.6	1.42	0.72	632,057	4,974,265
LCR	Lime Mill Crushing and associated transfers In and Out	Control efficiency included in emission factor	0.28448	0.23871	0.08520					6.828	5.729	2.045	0	0	0	0	1.0580	0.8878	0.3169					632,073	4,974,233
LSL	Pebble Lime Silo Loading via Bucket Elevator	Control efficiency included in emission factor	6.20E-3	6.20E-3	6.20E-3					0.1487	0.1487	0.1487	0	0	0	0	0.02305	0.02305	0.02305					632,069	4,974,206
LSU	Pebble Lime Silo discharge to Lime Slaker	Control efficiency included in emission factor	6.20E-4	6.20E-4	6.20E-4					0.0149	0.0149	0.0149	0	0	0	0	0.00230	0.00230	0.00230					632,069	4,974,206
Total			**35.8**	**21.7**	**13.4**	**33.5**	**55.4**	**1.88**	**11.5**	**578**	**376**	**241**	**204**	**259**	**37.2**	**34.5**	**87.3**	**56.3**	**36.4**	**30.5**	**37.9**	**6.48**	**4.78**		

SOURCE DESCRIPTION		NAD 83 LOCATION		
Model	Source Description	reference	elev	reference
ID			m	
TD9	Mine Site Diesel Tank #9			
TD10	Mine Site Diesel Tank #10			
PCSP1	Portable Crushing and Screening Plant 1 (2 crushers (primary and secondary), 2 screens (primary and secondary), and 5 conveyor transfers)	30 m north of access road start point	2,009.0	Google Earth
PCSP2	Portable Crushing and Screening Plant 2 (2 crushers (primary and secondary), 2 screens (primary and secondary), and 5 conveyor transfers)	30 m south of access road start point	2,007.0	Google Earth
TRUE LIME PRODUCTION				
LS1	Limestone transfer to Primary Crusher Hopper	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS2	Primary Crushing and Associated Transfers In and Out	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS3	Primary Screening and Associated Transfers In and Out	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS4	Secondary Crushing and Associated Transfers In and Out	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS5	Secondary Screening and Associated Transfers In and Out	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS6	Limestone transfer to Ball Mill Feed Bin	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS7	Limestone transfer to Ball Mill Feed Conveyor	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS8	Ball Mill Feed transfer to Ball Mill	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LSBM	Limestone Ball Mill	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS9	Limestone transfer to Kiln Feed Bin	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS10	Limestone transfer to Lime Kiln Feed Conveyor	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS11	Fines Screening and Associated Transfers In and Out	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LS12	Kiln Feed transfer to PFR Shaft Lime Kiln	Drawing SK-OPTION 3b, 06/06/2018	1,984.0	Google Earth
LK	Parallel Flow Regenerative (PFR) Shaft Lime Kiln	Drawing SK-OPTION 3b, 06/06/2018	1,984.0	Google Earth
LKC	PFR Shaft Lime Kiln Combustion	Drawing SK-OPTION 3b, 06/06/2018	1,984.0	Google Earth
LCR	Lime Mill Crushing and associated transfers In and Out	Drawing SK-OPTION 3b, 06/06/2018	1,990.0	Google Earth
LSL	Pebble Lime Silo Loading via Bucket Elevator	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
LSU	Pebble Lime Silo discharge to Lime Slaker	Drawing SK-OPTION 3b, 06/06/2018	1,996.0	Google Earth
Total				

SOURCE DESCRIPTION		RELEASE PARAMETERS INPUT						
Model	Source Description	POINT	rel ht (ft)	temp (F)	flow (dscfm)	flow (acfm)	dia (ft)	reference
ID		VOLUME	rel ht (ft)	width (ft)	vert. ln (ft)	grnd ht (ft)	oz type	
TD9	Mine Site Diesel Tank #9							
TD10	Mine Site Diesel Tank #10							
PCSP1	Portable Crushing and Screening Plant 1 (2 crushers (primary and secondary), 2 screens (primary and secondary), and 5 conveyor transfers)	VOLUME	7.0	185.2	14	14	srf src	Typical portable crushing and screening plant parameters
PCSP2	Portable Crushing and Screening Plant 2 (2 crushers (primary and secondary), 2 screens (primary and secondary), and 5 conveyor transfers)	VOLUME	7.0	185.2	14.0	14.0	srf src	Typical portable crushing and screening plant parameters
TRUE	LIME PRODUCTION							
LS1	Limestone transfer to Primary Crusher Hopper	VOLUME	11.3	22.6	22.6	22.6	srf src	PC width. Height equal to width.
LS2	Primary Crushing and Associated Transfers In and Out	VOLUME	11.3	22.6	22.6	22.6	srf src	PC width. Height equal to width.
LS3	Primary Screening and Associated Transfers In and Out	VOLUME	11.3	22.6	22.6	22.6	srf src	PC width. Height equal to width.
LS4	Secondary Crushing and Associated Transfers In and Out	VOLUME	11.3	22.6	22.6	22.6	srf src	PC width. Height equal to width.
LS5	Secondary Screening and Associated Transfers In and Out	VOLUME	11.3	22.6	22.6	22.6	srf src	PC width. Height equal to width.
LS6	Limestone transfer to Ball Mill Feed Bin	POINT	29.0	Ambient		0.155	1.0	Ht - 3' above silo top; dia - 1'; vel - 0.001 m/s for horz
LS7	Limestone transfer to Ball Mill Feed Conveyor	VOLUME	3.5	1	3	5	elev src w/ bldg	1' screw discharge; 3' drop to conveyor; 5' above grade
LS8	Ball Mill Feed transfer to Ball Mill	VOLUME	28	4	4	30	elev src w/ bldg	4' x 4' opening at mid Ball Mill building height
LSBM	Limestone Ball Mill	POINT	70.0	Ambient	13,000	16,500	2.0	Ht - 10' above bldg top; Flow & Temp. - (NDEP 2010)
LS9	Limestone transfer to Kiln Feed Bin	POINT	29.0	Ambient		0.155	1.0	Ht - 3' above silo top; dia - 1'; vel - 0.001 m/s for horz
LS10	Limestone transfer to Lime Kiln Feed Conveyor	VOLUME	3.5	1	3	5	elev src w/ bldg	1' screw discharge; 3' drop to conveyor; 5' above grade
LS11	Fines Screening and Associated Transfers In and Out	VOLUME	2.5	8	5	5	srf src	8' wide screen; 5' drop; 5' above grade
LS12	Kiln Feed transfer to PFR Shaft Lime Kiln	VOLUME	68	4	4	70	elev src w/ bldg	4' x 4' opening at mid Kiln building height
LK	Parallel Flow Regenerative (PFR) Shaft Lime Kiln	POINT	150	350	8,000	16,300	2.0	Ht - 10' above bldg top; typical industry exhaust param
LKC	PFR Shaft Lime Kiln Combustion	POINT	150	350	8,000	16,300	2.0	Common stack with LK
LCR	Lime Mill Crushing and associated transfers In and Out	POINT	50	Ambient	2,000	2,500	0.75	Ht - 10' above bldg top; typical industry exhaust param
LSL	Pebble Lime Silo Loading via Bucket Elevator	POINT	29.0	Ambient	70	70	0.333	Ht - 3' above silo top; dia & flow from (NDEP 2019)
LSU	Pebble Lime Silo discharge to Lime Slaker	VOLUME	3.5	1	3	5	elev src w/ bldg	1' screw discharge; 3' drop to conveyor; 5' above grade
Total								

SOURCE DESCRIPTION		MODEL EMISSION RATES / RELEASE PARAMETERS														IDAPA 58.01.01.701 PM Weight Limit			
Model	Source Description	PM_{10}-24	$PM_{2.5}$-24	CO-ALL	NO_2-1	SO_2-1	SO_2-3	PM_{10}-AN	$PM_{2.5}$-AN	NO_2-AN	SO_2-AN	ht (m)	temp (K)	vel (m/s)	dia (m)	Process Weight	Allowable PM	Proposed PM	Compliance
ID		gps	gps	gps	gps	gps	gps	gps	gps	gps	gps	ht (m)	oy (m	oz (m		lb/hr	lb/hr	lb/hr	Demonstration
TD9	Mine Site Diesel Tank #9															-	-	-	N/A
TD10	Mine Site Diesel Tank #10															-	-	-	N/A
PCSP1	Portable Crushing and Screening Plant 1 (2 crushers (primary and secondary), 2 screens (primary and secondary), and 5 conveyor transfers)	2.93E-02	3.83E-3					2.93E-2	3.83E-3			2.1	13.13	2.0		166,667	22.23	0.63	In Compliance
PCSP2	Portable Crushing and Screening Plant 2 (2 crushers (primary and secondary), 2 screens (primary and secondary), and 5 conveyor transfers)	2.93E-02	3.83E-3					2.93E-2	3.83E-3			2.1	13.13	2.0		166,667	22.23	0.625	In Compliance
TRUE LIME PRODUCTION																			
LS1	Limestone transfer to Primary Crusher Hopper	6.52E-03	1.01E-3					5.03E-3	7.77E-4			3.4	1.60	3.2		94,156	19.27	0.141	In Compliance
LS2	Primary Crushing and Associated Transfers In and Out	1.42E-02	2.14E-3					1.10E-2	1.65E-3			3.4	1.60	3.2		94,156	19.27	0.254	In Compliance
LS3	Primary Screening and Associated Transfers In and Out	5.16E-02	7.83E-3					3.98E-2	6.04E-3			3.4	1.60	3.2		94,156	19.27	1.18	In Compliance
LS4	Secondary Crushing and Associated Transfers In and Out	1.42E-02	2.14E-3					1.10E-2	1.65E-3			3.4	1.60	3.2		94,156	19.27	0.254	In Compliance
LS5	Secondary Screening and Associated Transfers In and Out	5.16E-02	7.83E-3					3.98E-2	6.04E-3			3.4	1.60	3.2		94,156	19.27	1.18	In Compliance
LS6	Limestone transfer to Ball Mill Feed Bin	6.52E-03	1.01E-3					5.03E-3	7.77E-4			8.8	0.00	0.0	0.305	94,156	19.27	0.141	In Compliance
LS7	Limestone transfer to Ball Mill Feed Conveyor	6.52E-03	1.01E-3					5.03E-3	7.77E-4			1.1	0.07	0.4		94,156	19.27	0.141	In Compliance
LS8	Ball Mill Feed transfer to Ball Mill	6.52E-03	1.01E-3					5.03E-3	7.77E-4			8.5	0.28	0.6		94,156	19.27	0.141	In Compliance
LSBM	Limestone Ball Mill	2.01E-01	7.18E-2					1.55E-1	5.53E-2			21.3	0.00	26.7	0.610	94,156	19.27	1.902	In Compliance
LS9	Limestone transfer to Kiln Feed Bin	1.54E-03	2.38E-4					1.31E-3	2.02E-4			8.8	0.00	0.0	0.305	22,250	13.43	0.033	In Compliance
LS10	Limestone transfer to Lime Kiln Feed Conveyor	1.54E-03	2.38E-4					1.31E-3	2.02E-4			1.1	0.07	0.4		22,250	13.43	0.033	In Compliance
LS11	Fines Screening and Associated Transfers In and Out	1.22E-02	1.85E-3					1.03E-2	1.57E-3			0.8	0.57	0.7		22,250	13.43	0.28	In Compliance
LS12	Kiln Feed transfer to PFR Shaft Lime Kiln	1.54E-03	2.38E-4					1.31E-3	2.02E-4			20.7	0.28	0.6		22,250	13.43	0.033	In Compliance
LK	Parallel Flow Regenerative (PFR) Shaft Lime Kiln	1.15E-01	1.15E-1	3.99E-1	2.13E-1	1.06E-3	1.06E-3	9.79E-2	9.79E-2	1.81E-1	9.04E-4	45.7	449.82	26.4	0.610	14,083	11.98	0.915	In Compliance
LKC	PFR Shaft Lime Kiln Combustion	2.12E-02	2.12E-2	2.28E-1	3.95E-1	4.83E-2	4.83E-2	1.80E-2	1.80E-2	3.35E-1	4.10E-2	45.7	449.82	26.4	0.610	-	-	0.169	N/A
LCR	Lime Mill Crushing and associated transfers In and Out	3.01E-02	1.07E-2					2.55E-2	9.12E-3			15.2	0.00	28.7	0.229	14,083	11.98	0.28448	In Compliance
LSL	Pebble Lime Silo Loading via Bucket Elevator	7.81E-04	7.81E-4					6.63E-4	6.63E-4			8.8	0.00	4.1	0.102	14,083	11.98	6.20E-3	In Compliance
LSU	Pebble Lime Silo discharge to Lime Slaker	7.81E-05	7.81E-5					6.63E-5	6.63E-5			1.1	0.07	0.4		14,083	11.98	6.20E-4	In Compliance
Total		1.97	1.26	4.22	1.48	0.237	0.237	1.62	1.046	1.09	0.186								

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: S. Pryor/E. Memon		
	PROJECT NO: 335-1-4	PAGE: 1	OF: 10	SHEET: ProcHAP
AIR EMISSION CALCULATIONS	SUBJECT: Process HAP and GHG Emissions	DATE: June 22, 2020		

prop-lb/hr prop-ton/yr dies-lb/hr dies-ton/yr mpro-lb/hr mpro-ton/yr total-lb/hr total-lb/yr total-ton/yr

Hazardous Air Pollutants (HAP)/Toxic Air Pollutants (TAP) Emissions Summary

		Emissions										
		Propane Combustion		Diesel Combustion		Material Processing		Total[1]				
CAS	HAP/TAP	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	lb/yr	ton/yr	HAP	TAP
106-99-0	1,3-Butadiene	--	--	7.34E-5	3.67E-6	--	--	7.34E-5	7.34E-3	3.67E-6	Y	Y
91-57-6	2-Methylnaphthalene	1.59E-6	4.85E-6	--	--	--	--	1.59E-6	9.71E-3	4.85E-6	Y	N
56-49-5	3-Methylchloranthrene	1.19E-7	3.64E-7	--	--	--	--	1.19E-7	7.28E-4	3.64E-7	Y	Y
57-97-6	7,12-Dimethylbenz(a)anthracene	1.06E-6	3.24E-6	--	--	--	--	1.06E-6	6.47E-3	3.24E-6	Y	N
83-32-9	Acenaphthene	1.19E-7	3.64E-7	1.34E-4	6.72E-6	--	--	1.35E-4	1.42E-2	7.09E-6	Y	N
208-96-8	Acenaphthylene	1.19E-7	3.64E-7	2.69E-4	1.35E-5	--	--	2.70E-4	2.77E-2	1.38E-5	Y	N
75-07-0	Acetaldehyde	--	--	2.15E-3	1.07E-4	--	--	2.15E-3	2.15E-1	1.07E-4	Y	Y
107-02-8	Acrolein	--	--	3.96E-4	1.98E-5	--	--	3.96E-4	3.96E-2	1.98E-5	Y	Y
120-12-7	Anthracene	1.59E-7	4.85E-7	3.81E-5	1.91E-6	--	--	3.83E-5	4.79E-3	2.39E-6	Y	N
7440-36-0	Antimony	--	--	--	--	6.86E-2	3.00E-1	6.86E-2	6.01E+2	3.00E-1	Y	Y
7440-38-2	Arsenic	1.32E-5	4.04E-5	--	--	4.36E-3	1.75E-2	4.37E-3	3.52E+1	1.76E-2	Y	Y
56-55-3	Benz(a)anthracene	1.19E-7	3.64E-7	2.07E-5	1.03E-6	--	--	2.08E-5	2.80E-3	1.40E-6	Y	N
71-43-2	Benzene	1.39E-4	4.25E-4	2.36E-2	1.18E-3	--	--	2.37E-2	3.21E+0	1.60E-3	Y	Y
50-32-8	Benzo(a)pyrene	7.93E-8	2.43E-7	7.59E-6	3.80E-7	--	--	7.67E-6	1.24E-3	6.22E-7	Y	Y
205-99-2	Benzo(b)fluoranthene	1.19E-7	3.64E-7	3.14E-5	1.57E-6	--	--	3.16E-5	3.87E-3	1.94E-6	Y	N
191-24-2	Benzo(g,h,i)perylene	7.93E-8	2.43E-7	1.66E-5	8.29E-7	--	--	1.67E-5	2.14E-3	1.07E-6	Y	N
207-08-9	Benzo(k)fluoranthene	1.19E-7	3.64E-7	6.43E-6	3.22E-7	--	--	6.55E-6	1.37E-3	6.86E-7	Y	N
7440-41-7	Beryllium	7.93E-7	2.43E-6	--	--	2.17E-5	8.35E-5	2.25E-5	1.72E-1	8.59E-5	Y	Y
7440-43-9	Cadmium	7.26E-5	2.22E-4	--	--	4.06E-5	2.73E-5	1.13E-4	4.99E-1	2.50E-4	Y	Y
75-15-0	Carbon disulfide	--	--	--	--	1.45E-2	6.33E-2	1.45E-2	1.27E+2	6.33E-2	Y	Y
7440-47-3	Chromium	9.25E-5	2.83E-4	--	--	1.22E-4	2.90E-4	2.14E-4	1.15E+0	5.73E-4	Y	Y
218-01-9	Chrysene	1.19E-7	3.64E-7	4.37E-5	2.19E-6	--	--	4.39E-5	5.10E-3	2.55E-6	Y	N
7440-48-4	Cobalt	5.55E-6	1.70E-5	--	--	2.35E-5	1.03E-4	2.91E-5	2.40E-1	1.20E-4	Y	Y
592-01-8	Cyanide	--	--	--	--	2.22E-1	9.73E-1	2.22E-1	1.95E+3	**9.73E-1**	Y	Y
53-70-3	Dibenz(a,h)anthracene	7.93E-8	2.43E-7	1.08E-5	5.42E-7	--	--	1.09E-5	1.57E-3	7.85E-7	Y	N
106-46-7	Dichlorobenzene	7.93E-5	2.43E-4	--	--	--	--	7.93E-5	4.85E-1	2.43E-4	Y	Y
206-44-0	Fluoranthene	1.98E-7	6.07E-7	1.28E-4	6.39E-6	--	--	1.28E-4	1.40E-2	7.00E-6	Y	N
86-73-7	Fluorene	1.85E-7	5.66E-7	4.15E-4	2.08E-5	--	--	4.15E-4	4.27E-2	2.13E-5	Y	N
50-00-0	Formaldehyde	4.95E-3	1.52E-2	4.44E-3	2.22E-4	--	--	9.39E-3	3.08E+1	1.54E-2	Y	Y
110-54-3	Hexane	1.19E-1	3.64E-1	--	--	--	--	1.19E-1	7.28E+2	3.64E-1	Y	Y
193-39-5	Indeno(1,2,3-cd)pyrene	1.19E-7	3.64E-7	1.24E-5	6.18E-7	--	--	1.25E-5	1.96E-3	9.82E-7	Y	N
7439-92-1	Lead	--	--	--	--	1.72E-4	2.62E-4	1.72E-4	5.23E-1	2.62E-4	Y	N
7439-96-5	Manganese	2.51E-5	7.69E-5	--	--	3.53E-2	2.17E-2	3.53E-2	4.35E+1	2.17E-2	Y	Y
7439-97-6	Mercury	1.72E-5	5.26E-5	--	--	5.13E-3	1.24E-2	5.15E-3	2.49E+1	1.24E-2	Y	N
91-20-3	Naphthalene	4.03E-5	1.23E-4	3.82E-3	1.91E-4	--	--	3.86E-3	6.29E-1	3.14E-4	Y	Y
7440-02-0	Nickel	1.39E-4	4.25E-4	--	--	2.89E-3	1.21E-3	3.03E-3	3.26E+0	1.63E-3	Y	Y
85-01-8	Phenanthrene	1.12E-6	3.44E-6	1.20E-3	6.02E-5	--	--	1.21E-3	1.27E-1	6.36E-5	Y	N
7723-14-0	Phosphorus	--	--	--	--	6.12E-3	1.81E-2	6.12E-3	3.61E+1	1.81E-2	Y	Y
129-00-0	Pyrene	3.30E-7	1.01E-6	1.13E-4	5.67E-6	--	--	1.14E-4	1.34E-2	6.68E-6	Y	N
7782-49-2	Selenium	1.59E-6	4.85E-6	--	--	--	--	1.59E-6	9.71E-3	4.85E-6	Y	Y
108-88-3	Toluene	2.25E-4	6.88E-4	8.68E-3	4.34E-4	--	--	8.91E-3	2.24E+0	1.12E-3	Y	Y
1330-20-7	Xylene	--	--	5.97E-3	2.99E-4	--	--	5.97E-3	5.97E-1	2.99E-4	Y	Y
Total HAP		1.25E-1	3.82E-1	5.16E-2	2.58E-3	3.59E-1	1.41E+0	5.36E-1	3.59E+3	1.79E+0		

[1] *Includes autoclave and refinery source mercury emissions provided on page 10.*

TRUE

prop-lb/hr prop-ton/yr dies-lb/hr dies-ton/yr mpro-lb/hr mpro-ton/yr total-lb/hr total-lb/yr total-ton/yr

Hazardous Air Pollutants (HAP)/Toxic Air Pollutants (TAP) Emissions Summary - continue

		Emissions									
		Propane Combustion		Diesel Combustion		Material Processing [1]		Total			
CAS	Non-HAP TAP	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	lb/yr	ton/yr	HAP	TAP
7440-39-3	Barium	2.91E-4	8.90E-4	--	--	4.71E-3	2.06E-2	5.00E-3	4.30E+1	2.15E-2	N	Y
7440-50-8	Copper	5.61E-5	1.72E-4	--	--	2.94E-5	1.29E-4	8.55E-5	6.01E-1	3.01E-4	N	Y
7783-06-4	Hydrogen Sulfide	--	--	--	--	0.900	3.942	0.900	7,884	3.942	N	Y
7439-98-7	Molybdenum	7.26E-5	2.22E-4	--	--	5.88E-6	2.58E-5	7.85E-5	4.96E-1	2.48E-4	N	Y
109-66-0	Pentane	1.72E-1	5.26E-1	--	--	--	--	1.72E-1	1.05E+3	5.26E-1	N	Y
7440-22-4	Silver	--	--	--	--	2.94E-6	1.29E-5	2.94E-6	2.58E-2	1.29E-5	N	Y
7664-93-9	Sulfuric Acid	--	--	--	--	2.030	8.891	2.030	17,783	8.891	N	Y
7440-28-0	Thallium	--	--	--	--	5.88E-5	2.58E-4	5.88E-5	5.15E-1	2.58E-4	N	Y
7440-61-1	Uranium	--	--	--	--	5.88E-5	2.58E-4	5.88E-5	5.15E-1	2.58E-4	N	Y
7440-62-2	Vanadium	1.52E-4	4.65E-4	--	--	--	--	1.52E-4	9.30E-1	4.65E-4	N	Y
7440-66-6	Zinc	1.92E-3	5.86E-3	--	--	--	--	1.92E-3	1.17E+1	5.86E-3	N	Y
Total Non-HAP TAP		1.74E-1	5.33E-1	--	--	2.93E+0	1.29E+1	3.11	26,776.27	13.39		

[1] *Material Processing includes Autoclave and Cement Handling and Mixing.*

GHG Emissions Summary

Source Category	CO2e (ton/yr)
Propane Combustion	28,708
Diesel Combustion	246
Autoclaving	47,316
Lime Kiln	30,311
Total GHGs	**106,580**

GHG and Emission Summary by Source

ID Description CO2e_tpy

Source ID	Description	CO2e ton/yr
Sb1	Sb Dryer (2.72 MMBtu/hr Propane-Fired)	1,658
ACB	POX Boiler (17 MMBtu/hr Propane-Fired)	35
CKB	Carbon Regeneration Kiln (Burners)	1,375
PV	Propane Vaporizer (0.1 MMBtu/hr Propane-Fired)	61
HS	Strip Circuit Solution Heater (5 MMBtu, Propane-Fired)	3,048
H1M	Mine Air Heater #1 (4 MMBtu/hr Propane-Fired)	2,438
H2M	Mine Air Heater #2 (4 MMBtu/hr Propane-Fired)	2,438
HM	Mill HVAC Heaters (4 x 1.0 MMBtu Propane-Fired)	2,438
HAC	Autoclave HVAC Heater (0.25 MMBtu Propane-Fired)	152
HR	Refinery HVAC Heater (0.25 MMBtu Propane-Fired)	152
HA	Admin HVAC Heater (0.25 MMBtu Propane-Fired)	152
HMO	Mine Ops. HVAC Heaters (2 x 0.25 MMBtu Propane-Fired)	305
HTS	Truck Shop HVAC Heaters (2 x 1.0 MMBtu Propane-Fired)	1,219
HW	Warehouse HVAC Heaters (3 x 1.0 MMBtu Propane-Fired)	1,829
LKC	PFR Shaft Lime Kiln Combustion	11,407
EDG1	Camp Emergency Generator	77
EDG2	Plant Emergency Generator #1	77
EDG3	Plant Emergency Generator #2	77
EDFP	Mill Fire Pump	15
AC	Autoclave	47,316
LK	Parallel Flow Regenerative (PFR) Shaft Lime Kiln	30,311
Total		106,580

PROPANE COMBUSTION

GHG EMISSIONS

Propane GHG Emission Factors:

		Global Warming Potential*	Reference
CO2	62.87 *kg/MMBtu*	1	*40 CFR Part 98, Table C-1 to Subpart C (11/2013) Propane (CFR 2018c)*
CH4	3.0E-03 *kg/MMBtu*	25	*40 CFR Part 98, Table C-2 to Subpart C (11/2013) Petroleum (CFR 2018c)*
N2O	6.0E-04 *kg/MMBtu*	298	*40 CFR Part 98, Table C-2 to Subpart C (11/2013) Petroleum (CFR 2018c)*

** 40 CFR 98, Table A-1 (12/2014) (CFR 2018c)*

					CO2_tpy	CH4_tpy	N2O_tpy	CO2e_tpy
Source ID	Description	MMBtu/hr	hr/yr	MMBtu/yr	CO2 ton/yr	CH4 ton/yr	N2O ton/yr	CO2e ton/yr
Sb1	Sb Dryer (2.72 MMBtu/hr Propane-Fired)	2.7	8,760	23,827	1,651	7.88E-2	1.58E-2	1,658
ACB	POX Boiler (17 MMBtu/hr Propane-Fired)	17.0	30	510	35	1.69E-3	3.37E-4	35
CKB	Carbon Regeneration Kiln (Burners)	2.3	8,760	19,754	1,369	6.53E-2	1.31E-2	1,375
PV	Propane Vaporizer (0.1 MMBtu/hr Propane-Fired)	0.1	8,760	876	61	2.90E-3	5.79E-4	61
HS	Strip Circuit Solution Heater (5 MMBtu, Propane-Fired)	5.0	8,760	43,800	3,035	1.45E-1	2.90E-2	3,048
H1M	Mine Air Heater #1 (4 MMBtu/hr Propane-Fired)	4.0	8,760	35,040	2,428	1.16E-1	2.32E-2	2,438
H2M	Mine Air Heater #2 (4 MMBtu/hr Propane-Fired)	4.0	8,760	35,040	2,428	1.16E-1	2.32E-2	2,438
HM	Mill HVAC Heaters (4 x 1.0 MMBtu Propane-Fired)	4.0	8,760	35,040	2,428	1.16E-1	2.32E-2	2,438
HAC	Autoclave HVAC Heater (0.25 MMBtu Propane-Fired)	0.3	8,760	2,190	152	7.24E-3	1.45E-3	152
HR	Refinery HVAC Heater (0.25 MMBtu Propane-Fired)	0.3	8,760	2,190	152	7.24E-3	1.45E-3	152
HA	Admin HVAC Heater (0.25 MMBtu Propane-Fired)	0.3	8,760	2,190	152	7.24E-3	1.45E-3	152
HMO	Mine Ops. HVAC Heaters (2 x 0.25 MMBtu Propane-Fired)	0.5	8,760	4,380	304	1.45E-2	2.90E-3	305
HTS	Truck Shop HVAC Heaters (2 x 1.0 MMBtu Propane-Fired)	2.0	8,760	17,520	1,214	5.79E-2	1.16E-2	1,219
HW	Warehouse HVAC Heaters (3 x 1.0 MMBtu Propane-Fired)	3.0	8,760	26,280	1,821	8.69E-2	1.74E-2	1,829
LKC	PFR Shaft Lime Kiln Combustion	22.0	8,760	163,935	11,361	5.42E-1	1.08E-1	11,407
Total		67.4		412,572	28,592	1.36	0.27	28,708

**Propane heating value* 91,500 *Btu/gal*

Conversions

2,000 lb/ton	1.341 hp/kW
907.18582 kg/ton	1E+6 Btu/MMBtu

PROPANE COMBUSTION - CONTINUED

HAP/TAP Emissions - Propane Heaters

		Emission Factor*		Emissions	
CAS	**Pollutant**	lb/MMScf	lb/MMBtu**	lb/hr	ton/yr
91-57-6	2-Methylnaphthalene	2.4E-05	2.35E-8	1.6E-6	4.9E-6
56-49-5	3-Methylchloranthrene	< .8El06	1.76E-9	1.2E-7	3.6E-7
57-97-6	7,12-Dimethylbenz(a)anthracene	< .6El0	1.57E-8	1.1E-6	3.2E-6
83-32-9	Acenaphthene	< .8El06	1.76E-9	1.2E-7	3.6E-7
208-96-8	Acenaphthylene	< .8El06	1.76E-9	1.2E-7	3.6E-7
120-12-7	Anthracene	< 2.4El06	2.35E-9	1.6E-7	4.9E-7
7440-38-2	Arsenic	2.0E-04	1.96E-7	1.3E-5	4.0E-5
56-55-3	Benz(a)anthracene	< .8El06	1.76E-9	1.2E-7	3.6E-7
71-43-2	Benzene	2.1E-03	2.06E-6	1.4E-4	4.2E-4
50-32-8	Benzo(a)pyrene	< .2El06	1.18E-9	7.9E-8	2.4E-7
205-99-2	Benzo(b)fluoranthene	< .8El06	1.76E-9	1.2E-7	3.6E-7
191-24-2	Benzo(g,h,i)perylene	< .2El06	1.18E-9	7.9E-8	2.4E-7
207-08-9	Benzo(k)fluoranthene	< .8El06	1.76E-9	1.2E-7	3.6E-7
7440-41-7	Beryllium	< .2El0	1.18E-8	7.9E-7	2.4E-6
7440-43-9	Cadmium	1.1E-03	1.08E-6	7.3E-5	2.2E-4
7440-47-3	Chromium	1.4E-03	1.37E-6	9.2E-5	2.8E-4
218-01-9	Chrysene	< .8El06	1.76E-9	1.2E-7	3.6E-7
7440-48-4	Cobalt	8.4E-05	8.24E-8	5.5E-6	1.7E-5
53-70-3	Dibenz(a,h)anthracene	< .2El06	1.18E-9	7.9E-8	2.4E-7
106-46-7	Dichlorobenzene	1.2E-03	1.18E-6	7.9E-5	2.4E-4
206-44-0	Fluoranthene	3.0E-06	2.94E-9	2.0E-7	6.1E-7
86-73-7	Fluorene	2.8E-06	2.75E-9	1.8E-7	5.7E-7
50-00-0	Formaldehyde	7.5E-02	7.35E-5	5.0E-3	1.5E-2
110-54-3	Hexane	1.8E+00	1.76E-3	0.12	0.36
193-39-5	Indeno(1,2,3-cd)pyrene	< .8El06	1.76E-9	1.2E-7	3.6E-7
7439-96-5	Manganese	3.8E-04	3.73E-7	2.5E-5	7.7E-5
7439-97-6	Mercury	2.6E-04	2.55E-7	1.7E-5	5.3E-5
91-20-3	Naphthalene	6.1E-04	5.98E-7	4.0E-5	1.2E-4
7440-02-0	Nickel	2.1E-03	2.06E-6	1.4E-4	4.2E-4
85-01-8	Phenanthrene	1.7E-05	1.67E-8	1.1E-6	3.4E-6
129-00-0	Pyrene	5.0E-06	4.90E-9	3.3E-7	1.0E-6
7782-49-2	Selenium	< 2.4El0	2.35E-8	1.6E-6	4.9E-6
108-88-3	Toluene	3.4E-03	3.33E-6	2.2E-4	6.9E-4
Total HAP				0.12	0.38
Non-HAP TAP Emissions - Propane Heaters					
109-66-0	Pentane	2.6E+00	2.55E-3	0.17	0.53
7440-39-3	Barium	4.4E-03	4.31E-6	2.9E-4	8.9E-4
7440-50-8	Copper	8.5E-04	8.33E-7	5.6E-5	1.7E-4
7439-98-7	Molybdenum	1.1E-03	1.08E-6	7.3E-5	2.2E-4
7440-62-2	Vanadium	2.3E-03	2.25E-6	1.5E-4	4.7E-4
7440-66-6	Zinc	2.9E-02	2.84E-5	1.9E-3	5.9E-3
Total Non-HAP TAP				0.17	0.53

**AP-42, Table 1.4-3 & 1.4-4 (7/98) Natural Gas Combustion*

***Natural Gas Higher Heating Value* 1,020 *MMBtu/MMScf*

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: S. Pryor/E. Memon
	PROJECT NO: 335-1-4	PAGE: 5 OF: 10 SHEET: ProcHAP
AIR EMISSION CALCULATIONS	SUBJECT: Process HAP and GHG Emissions	DATE: June 22, 2020

DIESEL COMBUSTION

GHG EMISSIONS

Diesel CO2e Emission Factors:

		Global Warming Potential*	References
CO2	73.96 *kg CO 2/MMBtu*	1	*40 CFR Part 98, Table C-1 to Subpart C (11/2013) No.2* CH4
	3.0E-03 *kg CH 4/MMBtu*	25	*40 CFR Part 98, Table C-2 to Subpart C (11/2013) Petroleum*
N2O	6.0E-04 *kg N 2 O/MMBtu*	298	*40 CFR Part 98, Table C-2 to Subpart C (11/2013) Petroleum*

** 40 CFR 98, Table A-1 (CFR 2018c)*

Source Data

							CO2_tpy	CH4_tpy	N2O_tpy	CO2e_tpy
		Power Rating		Operation	Fuel Consumption		CO2	CH4	N2O	CO2e
Source ID	Description	kW	hp	hr/yr	MMBtu/hr*	MMBtu/yr	ton/yr	ton/yr	ton/yr	ton/yr
EDG1	Camp Emergency Generator	1,000	1,341	100	9.39	938.7	76.53	3.10E-3	6.21E-4	76.79
EDG2	Plant Emergency Generator #1	1,000	1,341	100	9.39	938.7	76.53	3.10E-3	6.21E-4	76.79
EDG3	Plant Emergency Generator #2	1,000	1,341	100	9.39	938.7	76.53	3.10E-3	6.21E-4	76.79
EDFP	Mill Fire Pump	200	268	100	1.88	187.7	15.31	6.21E-4	1.24E-4	15.36
Total					30.0	3,003.8	244.89	9.93E-3	1.99E-3	245.73

** Based on brake specific fuel consumption for diesel generators* 7,000 *Btu/hp-hr* *AP-42 Tbl 3.3-1*

*** Heat Content of* 0.137 *MMBtu/gal*

HAP Emissions - Diesel Engines

								lb/hr	ton/yr
		Emission Factor (lb/MMBtu)		Emissions 600 hp		Emissions >600 hp		Emissions (Total)	
	Pollutant	::600 hp*	>600hp**	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
106-99-0	1,3-Butadiene	3.91E-5		7.34E-5	3.67E-6	0.00E+0	0.00E+0	7.34E-5	3.67E-6
83-32-9	Acenaphthene	1.42E-6	4.68E-6	2.67E-6	1.33E-7	1.32E-4	6.59E-6	1.34E-4	6.72E-6
208-96-8	Acenaphthylene	5.06E-6	9.23E-6	9.50E-6	4.75E-7	2.60E-4	1.30E-5	2.69E-4	1.35E-5
75-07-0	Acetaldehyde	7.67E-4	2.52E-5	1.44E-3	7.20E-5	7.10E-4	3.55E-5	2.15E-3	1.07E-4
107-02-8	Acrolein	9.25E-5	7.88E-6	1.74E-4	8.68E-6	2.22E-4	1.11E-5	3.96E-4	1.98E-5
120-12-7	Anthracene	1.87E-6	1.23E-6	3.51E-6	1.76E-7	3.46E-5	1.73E-6	3.81E-5	1.91E-6
56-55-3	Benz(a)anthracene	1.68E-6	6.22E-7	3.15E-6	1.58E-7	1.75E-5	8.76E-7	2.07E-5	1.03E-6
71-43-2	Benzene	9.33E-4	7.76E-4	1.75E-3	8.76E-5	2.19E-2	1.09E-3	2.36E-2	1.18E-3
50-32-8	Benzo(a)pyrene	1.88E-7	2.57E-7	3.53E-7	1.76E-8	7.24E-6	3.62E-7	7.59E-6	3.80E-7
205-99-2	Benzo(b)fluoranthene	9.91E-8	1.11E-6	1.86E-7	9.30E-9	3.13E-5	1.56E-6	3.14E-5	1.57E-6
191-24-2	Benzo(g,h,i)perylene	4.89E-7	5.56E-7	9.18E-7	4.59E-8	1.57E-5	7.83E-7	1.66E-5	8.29E-7
207-08-9	Benzo(k)fluoranthene	1.55E-7	2.18E-7	2.91E-7	1.45E-8	6.14E-6	3.07E-7	6.43E-6	3.22E-7
218-01-9	Chrysene	3.53E-7	1.53E-6	6.63E-7	3.31E-8	4.31E-5	2.15E-6	4.37E-5	2.19E-6
53-70-3	Dibenz(a,h)anthracene	5.83E-7	3.46E-7	1.09E-6	5.47E-8	9.74E-6	4.87E-7	1.08E-5	5.42E-7
206-44-0	Fluoranthene	7.61E-6	4.03E-6	1.43E-5	7.14E-7	1.13E-4	5.67E-6	1.28E-4	6.39E-6
86-73-7	Fluorene	2.92E-5	1.28E-5	5.48E-5	2.74E-6	3.60E-4	1.80E-5	4.15E-4	2.08E-5
50-00-0	Formaldehyde	1.18E-3	7.89E-5	2.22E-3	1.11E-4	2.22E-3	1.11E-4	4.44E-3	2.22E-4
193-39-5	Indeno(1,2,3-cd)pyrene	3.75E-7	4.14E-7	7.04E-7	3.52E-8	1.17E-5	5.83E-7	1.24E-5	6.18E-7
91-20-3	Naphthalene	8.48E-5	1.30E-4	1.59E-4	7.96E-6	3.66E-3	1.83E-4	3.82E-3	1.91E-4
85-01-8	Phenanthrene	2.94E-5	4.08E-5	5.52E-5	2.76E-6	1.15E-3	5.74E-5	1.20E-3	6.02E-5
129-00-0	Pyrene	4.78E-6	3.71E-6	8.97E-6	4.49E-7	1.04E-4	5.22E-6	1.13E-4	5.67E-6
108-88-3	Toluene	4.09E-4	2.81E-4	7.68E-4	3.84E-5	7.91E-3	3.96E-4	8.68E-3	4.34E-4
1330-20-7	Xylene	2.85E-4	1.93E-4	5.35E-4	2.68E-5	5.44E-3	2.72E-4	5.97E-3	2.99E-4
Total HAP				7.27E-3	3.64E-4	4.43E-2	2.22E-3	5.16E-2	2.58E-3

**AP-42, Tab. 3.3-2, 10/96, diesel engines (600 hp)* TRUE TRUE

***AP-42, Tabs. 3.4-3 & 3.4-4, 10/96, large diesel engines (> 600 hp)*

AUTOCLAVE CO_2 EMISSIONS

CO2 Emissions

Source ID	Description	Operation hr/yr	CO2 Emissions ton/hr*	CO2 Emissions ton/yr
AC	Autoclave	8,760	5.40	47,316

**Per M3 Engineering, 10/11/2017: based on ore feed carbonate values and conservatively assuming limestone for neutralization.*

(M3 2017c)

LIME KILN CO_2 EMISSIONS

CO2 Emissions

Source ID	Description	Operation hr/yr	Feed ton/yr	Product ton/yr	Mass Loss ton/yr	CO2 ton/yr
LK	Parallel Flow Regenerative (PFR) Shaft Lime Kiln	8,760	82,688	52,377	30,311	30,311

MATERIAL PROCESSING HAP/TAP EMISSIONS

Cement Handling

Source ID	Description	Throughput ton/hr	ton/yr	Activity
CS1L	Cement/Shotcrete Silo #1 Loading	80	60,000	Cement Handling
CS2L	Cement/Shotcrete Silo #2 Loading	80	60,000	Cement Handling
CM	Central Mixer Loading	20	60,000.00	Cement Mixer

Activity Information

Activity	Material Processed	Throughput ton/hr	ton/yr
Cement Handling	Cement	160	120,000
Cement Mixer	Cement	20	60,000

Cement Handlin Cement Mixer

HAP/TAP Emission Factors and Emissions

lb/hr ton/yr

CAS No.	HAP/TAP	(1) lb/ton	(2) lb/ton	Cement Handling lb/hr	Cement Handling ton/yr	Cement Mixer lb/hr	Cement Mixer ton/yr	Total lb/hr	Total ton/yr
7440-38-2	Arsenic	1.68E-06	8.38E-06	2.69E-4	1.01E-4	1.68E-4	2.51E-4	4.36E-4	3.52E-4
7440-41-7	Beryllium	1.79E-08		2.86E-6	1.07E-6	--	--	2.86E-6	1.07E-6
7440-43-9	Cadmium	2.34E-07	1.18E-08	3.74E-5	1.40E-5	2.36E-7	3.54E-7	3.77E-5	1.44E-5
7440-47-3	Chromium	2.52E-07	1.42E-06	4.03E-5	1.51E-5	2.84E-5	4.26E-5	6.87E-5	5.77E-5
7439-92-1	Lead	7.36E-07	3.82E-07	1.18E-4	4.42E-5	7.64E-6	1.15E-5	1.25E-4	5.56E-5
7439-96-5	Manganese	2.02E-04	6.12E-05	3.23E-2	1.21E-2	1.22E-3	1.84E-3	3.35E-2	1.40E-2
7440-02-0	Nickel	1.76E-05	3.28E-06	2.82E-3	1.06E-3	6.56E-5	9.84E-5	2.88E-3	1.15E-3
7723-14-0	Phosphorus	1.18E-05	2.02E-05	1.89E-3	7.08E-4	4.04E-4	6.06E-4	2.29E-3	1.31E-3
Total HAP								3.94E-2	1.69E-2

(1) *Cement Handling - AP-42, Table 11.12-8, (06/06) Cement Silo Filing, Uncontrolled.*

(2) *Cement Mixer - AP-42, Table 11.12-8, (06/06) Central Mix Batching, Uncontrolled.*

Autoclave Non-HAP TAP Emissions

CAS No.	Pollutant	Throughput Operation ton/hr	hr/yr	Emission Factor		Emissions lb/hr	Emissions ton/yr
7664-93-9	Sulfuric Acid	290	8,760	0.007	lb/ton(1)	2.03	8.9
7783-06-4	Hydrogen Sulfide		8,760	0.9	lb/hr(2)	0.9	3.9

(1) *H2SO4 is based on Acidic Autoclave test data (APT 2010)*

(2) *H2S is based on Acidic Autoclave test data (APT 2013)*

Conversions

2,000 lb/ton

MATERIAL PROCESSING HAP/TAP EMISSIONS

Ore Processing PM Emissions 5.9 lb/hr
25.8 ton/yr

Ore Dust HAP Concentrations[1] and Emissions

		Concentration	Emissions	
CAS No.	Pollutant	ppm	lb/hr	ton/yr
7440-38-2	Arsenic	667	0.003923	0.0172
7440-41-7	Beryllium	3.2	0.000019	0.0001
7440-43-9	Cadmium	0.5	0.000003	0.00001
7440-48-4	Cobalt	4	0.000024	0.0001
7440-47-3	Chromium	9	0.000053	0.0002
7439-97-6	Mercury	0.96	0.000006	0.00002
7439-96-5	Manganese	299	0.001759	0.0077
7440-02-0	Nickel	2	0.000012	0.0001
7439-92-1	Lead	8	0.000047	0.0002
7440-36-0	Antimony	23	0.000135	0.0006
7723-14-0	Phosphorus	650	0.003823	0.0167
Dust HAP Total			0.009803	0.0429

[1] *(Midas Gold 2017c)*

Ore Dust Non-HAP TAP Concentrations[1] and Emissions

		Concentration	Emissions	
CAS No.	Pollutant	ppm	lb/hr	ton/yr
7440-22-4	Silver	0.5	0.000003	0.00001
7440-39-3	Barium	800	0.004705	0.0206
7440-50-8	Copper	5	0.000029	0.0001
7439-98-7	Molybdenum	1	0.000006	0.00003
7440-28-0	Thallium	10	0.000059	0.00026
7440-61-1	Uranium	10	0.000059	0.0003
Dust HAP Total			0.004861	0.0213

[1] *(Midas Gold 2017c)*

Sb Concentrate Processing PM Emissions 0.12 lb/hr
0.52 ton/yr

Stib. Conc

Sb Concentrate Dust Non-HAP TAP Concentrations[1] and Emissions

		Concentration	Emissions	
CAS No.	Pollutant	ppm	lb/hr	ton/yr
7440-36-0	Antimony	580,000	0.0684	0.2998

[1] *(Midas Gold 2019d)*

Carbon Disulfide Emissions from Xanthate Decomposition

		Xanthate[1]	Molar	CS_2 MW	Temperature	Emissions	
CAS No.	Pollutant	ton/yr	Decomp.[2]	Ratio	Adj. Factor[3]	lb/hr	ton/yr
75-15-0	Carbon Disulfide	1,700	0.99%	0.376	0.01	0.0145	0.063

[1] *(Midas Gold 2016) p. 12-11*

[2] *(Air Sciences 2020) molar decomposition of of xanthate in solution to CS2 gas*

[3] *(Air Sciences 2020) based on the comparison of CS2 generation at 50C and 70C*

Conversions			MW	
2,000	lb/ton	Xanthate (PAX)	202.37	$C_6H_{11}KOS_2$
8,760	hr/yr	Carbon difulfide	76.139	CS_2

MATERIAL PROCESSING HAP/TAP EMISSIONS

Lead Emission by Source

Source ID	Description	TRUE Pb_tpy Pb ton/yr
CS1L	Cement/Shotcrete Silo #1 Loading	2.21E-5
CS2L	Cement/Shotcrete Silo #2 Loading	2.21E-5
CM	Central Mixer Loading	1.15E-5
[1] OC1	Loader Transfer of Ore to Grizzly	5.11E-6
[1] OC2	Grizzly to Apron Feeder	5.11E-6
[1] OC3	Apron Feeder to Dribble Conveyor	5.11E-6
[1] OC4	Apron Feeder to Vibrating Grizzly	5.11E-6
[1] OC5	Dribble Conveyor to Vibrating Grizzly	5.11E-6
[1] OC6	Vibrating Grizzly to Primary Crusher or Coarse Ore Stockpile Feed Conveyor	5.11E-6
[5] OC7	Primary Crusher and Associated Transfers out to Coarse Ore Stockpile Feed Conveyor	4.38E-5
[1] OC8	Coarse Ore Stockpile Feed Conveyor Transfer to Stockpile	5.11E-6
[3] OC9	Stockpile Transfers to Reclaim Conveyors	2.42E-5
[3] OC10	Reclaim Conveyors to SAG Mill Feed Conveyor	2.42E-5
[3] OC11	SAG Mill Feed Conveyor Transfer to SAG Mill	2.42E-5
[6] OC12	Pebble Crusher and Associated Transfers in (from SAG Mill) and out (to Pebble Discharge Conveyor)	4.84E-5
[1] OC13	Pebble Discharge Conveyor to SAG Mill Feed Conveyor	5.64E-6
Total		2.62E-4

Cyanide Emissions from Mill Process Tanks, Carbon Stripping and Electrowinning Process

CAS No.	Source	Dia. ft	pH	Free CN- g/m3	T C	pKa	a0	H	kG m/s	Fa*Fw	g/s	lb/hr	ton/yr
592-01-8	CN Detox Tank 1	40	8.5	25	25	9.250	0.8490	0.0055	0.000311	0.688	0.00289	0.0229	0.101
592-01-8	CN Detox Tank 2	40	8.5	25	25	9.250	0.8490	0.0055	0.000311	0.688	0.00289	0.0229	0.101
592-01-8	CIP Leach Tank 1	52	10.25	125	52.5	8.535	0.0189	0.0148	0.000311	0.668	0.00143	0.0114	0.050
592-01-8	CIP Leach Tank 2	52	10.25	125	52.5	8.535	0.0189	0.0148	0.000311	0.668	0.00143	0.0114	0.050
592-01-8	CIP Leach Tank 3	52	10.25	125	52.5	8.535	0.0189	0.0148	0.000311	0.668	0.00143	0.0114	0.050
592-01-8	CIP Leach Tank 4	52	10.25	125	52.5	8.535	0.0189	0.0148	0.000311	0.668	0.00143	0.0114	0.050
592-01-8	CIL Tank 1	54	10.25	125	30	9.120	0.0690	0.0065	0.000311	0.666	0.00248	0.0197	0.086
592-01-8	CIL Tank 2	54	10.25	125	30	9.120	0.0690	0.0065	0.000311	0.666	0.00248	0.0197	0.086
592-01-8	CIL Tank 3	54	10.25	125	30	9.120	0.0690	0.0065	0.000311	0.666	0.00248	0.0197	0.086
592-01-8	CIL Tank 4	54	10.25	125	30	9.120	0.0690	0.0065	0.000311	0.666	0.00248	0.0197	0.086
592-01-8	CIL Tank 5	54	10.25	125	30	9.120	0.0690	0.0065	0.000311	0.666	0.00248	0.0197	0.086
592-01-8	CIL Tank 6	54	10.25	125	30	9.120	0.0690	0.0065	0.000311	0.666	0.00248	0.0197	0.086
592-01-8	CIP Tank 1	20	10.25	125	52.5	8.535	0.0189	0.0148	0.000311	0.742	0.00024	0.0019	0.008
592-01-8	CIP Tank 2	20	10.25	125	52.5	8.535	0.0189	0.0148	0.000311	0.742	0.00024	0.0019	0.008
592-01-8	CIP Tank 3	20	10.25	125	52.5	8.535	0.0189	0.0148	0.000311	0.742	0.00024	0.0019	0.008
592-01-8	CIP Tank 4	20	10.25	125	52.5	8.535	0.0189	0.0148	0.000311	0.742	0.00024	0.0019	0.008
592-01-8	CIP Tank 5	20	10.25	125	52.5	8.535	0.0189	0.0148	0.000311	0.742	0.00024	0.0019	0.008
592-01-8	CIP Tank 6	20	10.25	125	52.5	8.535	0.0189	0.0148	0.000311	0.742	0.00024	0.0019	0.008
592-01-8	EW Cells											0.0006	0.003
592-01-8	Preg/Barren Tanks											0.0006	0.003
												0.222	0.973

References for Open Leach and Detox Tanks emission calculations: (Card, T. 2009)(EPA 2009)(Schmidt 2010)

Reference for EW Cells and Preg/Barren Tanks emission factor: (APT 2009)

Conversions

8,760 hr/yr	453.5929 g/lb	Wind adjustment factor Fw	1
2,000 lb/ton	3.28084 ft/m		
	3,600 s/hr		

40 CFR 63 Subpart 7E MERCURY SOURCES

Mercury Emissions

Description	Subpart 7E Hg Emissions ton/yr	Oper. hr/yr	% of Subpart 7E for Controlled Systems* %	Controlled Hg Emissions* lb/hr	lb/yr	ton/yr
Autoclave **	0.107	8,760	10.0%	0.002	21.34	0.011
Refinery Sources (Kiln, EW, Retort, Furnace)	0.008	1,248	20.0%	0.003	3.36	0.002
Total 7439-97-6	0.115			0.005	24.70	0.012

**Based on Similar Source Hg Reporting Levels provided below*

***Expected actual emissions from Autoclave:* 0.0105 g/hr 2.3E-05 lb/hr 0.20 lb/yr *(M3 2019)*

Subpart 7E Limit - Ore Pretreatment Processes *(CFR 2018b)*

$$\frac{84\ \text{lb}}{\sout{\text{MMton}}} \times \frac{2{,}540{,}400\ \sout{\text{ton}}}{\text{yr}} \times \frac{\sout{\text{MMton}}}{1.0\text{E+6}\ \sout{\text{ton}}} = \frac{213.39\ \text{lb}}{\text{yr}}$$

Subpart 7E Limit - Carbon Processes with Mercury Retorts

$$\frac{0.8\ \text{lb}}{\sout{\text{ton}}} \times \frac{21\ \sout{\text{ton}}}{\text{yr}} = \frac{16.8\ \text{lb}}{\text{yr}}$$

Similar Source Hg Reporting Levels

Goldstrike Autoclaves 2 & 3 (2015 & 2016 Hg Reports) *(NDEP 2015a) (NDEP 2016)*

$$\frac{28.79\ \text{lb}}{\text{yr}} \times \frac{\text{yr}}{3.13\ \text{MMton}} = \frac{9.18\ \text{lb}}{\text{MMton}} \times \frac{\text{MMton}}{84\ \text{lb}} = 10.9\%$$

Twin Creeks Autoclaves 1 & 2 (2015 & 2016 Hg Reports) *(NDEP 2015a) (NDEP 2016)*

$$\frac{1.01\ \text{lb}}{\text{yr}} \times \frac{\text{yr}}{7.63\ \text{MMton}} = \frac{0.13\ \text{lb}}{\text{MMton}} \times \frac{\text{MMton}}{84\ \text{lb}} = 0.2\%$$

Goldstrike Refinery (2015 & 2016 Hg Reports) *(NDEP 2015a) (NDEP 2016)*

$$\frac{28.79\ \text{lb}}{\text{yr}} \times \frac{\text{yr}}{251.00\ \text{ton}} = \frac{0.11\ \text{lb}}{\text{MMton}} \times \frac{\text{MMton}}{0.8\ \text{lb}} = 14.3\%$$

Twin Creeks Refinery (2015 & 2016 Hg Reports) *(NDEP 2015a) (NDEP 2016)*

$$\frac{31.27\ \text{lb}}{\text{yr}} \times \frac{\text{yr}}{142.77\ \text{ton}} = \frac{0.22\ \text{lb}}{\text{MMton}} \times \frac{\text{MMton}}{0.8\ \text{lb}} = 27.4\%$$

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: E. Huelson/E. Memon
	PROJECT NO: 335-1-4	PAGE: 1 OF: 5 SHEET: Tanks
AIR EMISSION CALCULATIONS	SUBJECT: Fuel Storage Tanks	DATE: June 22, 2020

Fuel Storage Tanks

	Dimensions				VOC Emissions[1]		
	Capacity	Diameter	Length	Throughput			Reference
Storage Tank	gal	ft	ft	gal/yr	lb/yr	ton/yr	
Mine Site Gasoline Tank #1	5,000	8.5	14.33	~~250,000~~	~~1,914.73~~	~~0.96~~	~~*(Midas Gold 2016), Table 12-4, annual use*~~
Mine Site Gasoline Tank #2	5,000	8.5	14.33	250,000	1,914.73	0.96	*(Midas Gold 2016), Table 12-4, annual use*
Mine Site Diesel Tank #3	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018c)*
Mine Site Diesel Tank #4	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018c)*
Mine Site Diesel Tank #5	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018c)*
Mine Site Diesel Tank #6	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018c)*
Mine Site Diesel Tank #7	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018c)*
Mine Site Diesel Tank #8	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018c)*
Mine Site Diesel Tank #9	25,000	12	29.70	725,000	14.60	0.007	*(Midas Gold 2016), (Midas Gold 2018c)*
Mine Site Diesel Tank #10	25,000	12	29.70				

[1] *Emissions calculated using EPA Tanks 4.0.9d (EPA 1999)*

Conversions

2,000 lb/ton

Mine Site Gasoline Tanks #1, #2

TANKS 4.0 Report

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Midas Gasoline Tank - 5,000 gal
City:	
State:	Idaho
Company:	Midas Gold
Type of Tank:	Horizontal Tank
Description:	

Tank Dimensions

Shell Length (ft):	14.33
Diameter (ft):	8.50
Volume (gallons):	5,000.00
Turnovers:	50.00
Net Throughput(gal/yr):	250,000.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Boise, Idaho (Avg Atmospheric Pressure = 13.28 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

Midas Gasoline Tank - 5,000 gal - Horizontal Tank

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 9)	All	52.81	46.88	58.74	50.94	3.9950	3.5384	4.4980	67.0000			92.00	Option 4: RVP=9, ASTM Slope=3

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Midas Gasoline Tank - 5,000 gal - Horizontal Tank

Annual Emission Calcaulations	
Standing Losses (lb):	693.2361
Vapor Space Volume (cu ft):	517.9338
Vapor Density (lb/cu ft):	0.0487
Vapor Space Expansion Factor:	0.1431
Vented Vapor Saturation Factor:	0.5264
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	517.9338
Tank Diameter (ft):	8.5000
Effective Diameter (ft):	12.4565
Vapor Space Outage (ft):	4.2500
Tank Shell Length (ft):	14.3300
Vapor Density	
Vapor Density (lb/cu ft):	0.0487
Vapor Molecular Weight (lb/lb-mole):	67.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.9950
Daily Avg. Liquid Surface Temp. (deg. R):	512.4830
Daily Average Ambient Temp. (deg. F):	50.9208
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	510.6108
Tank Paint Solar Absorptance (Shell):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,400.5355

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Mine Site Gasoline Tanks #1, #2 - continued

TANKS 4.0 Report

Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.1431
Daily Vapor Temperature Range (deg. R):	23.7125
Daily Vapor Pressure Range (psia):	0.9596
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.9950
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	3.5384
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	4.4980
Daily Avg. Liquid Surface Temp. (deg R):	512.4830
Daily Min. Liquid Surface Temp. (deg R):	506.5548
Daily Max. Liquid Surface Temp. (deg R):	518.4111
Daily Ambient Temp. Range (deg. R):	23.6750
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.5264
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	3.9950
Vapor Space Outage (ft):	4.2500
Working Losses (lb):	1,221.4895
Vapor Molecular Weight (lb/lb-mole):	67.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.9950
Annual Net Throughput (gal/yr.):	250,000.0000
Annual Turnovers:	50.0000
Turnover Factor:	0.7667
Tank Diameter (ft):	8.5000
Working Loss Product Factor:	1.0000
Total Losses (lb):	1,914.7256

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

Midas Gasoline Tank - 5,000 gal - Horizontal Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 9)	1,221.49	693.24	1,914.73

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Mine Site Diesel Tanks #3 - #10

TANKS 4.0 Report

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	25,000 gallon diesel storage tank
City:	Boise
State:	Idaho
Company:	Midas Gold
Type of Tank:	Vertical Fixed Roof Tank
Description:	Midas Gold Mine Site offroad diesel storage tanks

Tank Dimensions

Shell Height (ft):	29.70
Diameter (ft):	12.00
Liquid Height (ft) :	29.00
Avg. Liquid Height (ft):	14.50
Volume (gallons):	25,000.00
Turnovers:	29.00
Net Throughput(gal/yr):	725,000.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	1.00
Radius (ft) (Dome Roof)	12.00

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Boise, Idaho (Avg Atmospheric Pressure = 13.28 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

25,000 gallon diesel storage tank - Vertical Fixed Roof Tank
Boise, Idaho

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	52.81	46.88	58.74	50.94	0.0051	0.0041	0.0062	130.0000			188.00	Option 1: VP50 = .0045 VP60 = .0065

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

25,000 gallon diesel storage tank - Vertical Fixed Roof Tank
Boise, Idaho

Annual Emission Calcaulations	
Standing Losses (lb):	3.2383
Vapor Space Volume (cu ft):	1,776.1518
Vapor Density (lb/cu ft):	0.0001
Vapor Space Expansion Factor:	0.0419
Vented Vapor Saturation Factor:	0.9958
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,776.1518
Tank Diameter (ft):	12.0000
Vapor Space Outage (ft):	15.7046
Tank Shell Height (ft):	29.7000
Average Liquid Height (ft):	14.5000

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Mine Site Diesel Tanks #3 - #10 - continued

TANKS 4.0 Report

Roof Outage (ft):	0.5046
Roof Outage (Dome Roof)	
Roof Outage (ft):	0.5046
Dome Radius (ft):	12.0000
Shell Radius (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0001
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0051
Daily Avg. Liquid Surface Temp. (deg. R):	512.4830
Daily Average Ambient Temp. (deg. F):	50.9208
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	510.6108
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,400.5355
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0419
Daily Vapor Temperature Range (deg. R):	23.7125
Daily Vapor Pressure Range (psia):	0.0022
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0051
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0041
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0062
Daily Avg. Liquid Surface Temp. (deg R):	512.4830
Daily Min. Liquid Surface Temp. (deg R):	506.5548
Daily Max. Liquid Surface Temp. (deg R):	518.4111
Daily Ambient Temp. Range (deg. R):	23.6750
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9958
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0051
Vapor Space Outage (ft):	15.7046
Working Losses (lb):	11.3607
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0051
Annual Net Throughput (gal/yr.):	725,000.0000
Annual Turnovers:	29.0000
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	25,000.0000
Maximum Liquid Height (ft):	29.0000
Tank Diameter (ft):	12.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	14.5990

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

25,000 gallon diesel storage tank - Vertical Fixed Roof Tank
Boise, Idaho

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	11.36	3.24	14.60

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AIR EMISSION CALCULATIONS	PROJECT TITLE: Stibnite Gold Project	BY: K. Lewis
	PROJECT NO: 335-1-4	PAGE: 1 OF: 2 SHEET: MineLimits
	SUBJECT: Max Case Operation	DATE: June 22, 2020

Maximum Mining Activity Rate

Maximum Operating Schedule

24 hr/day
365 day/yr

Maximum Production

180,000 ton/day, ore and rock *(Midas Gold 2019b)*
180,000 ton/day, ore *(Midas Gold 2019b)*
180,000 ton/day, rock *(Midas Gold 2019b)*

2 blasts per day *(Midas Gold 2019b)*
600 holes per blast *(Midas Gold 2019a)*

Modeling Scenarios

	Model Scenario	Pit				Ore Destination		Development Rock Destination			
		YPP ton/day	HFP ton/day	WEP ton/day	BT ton/day	PC ton/day	STKP ton/day	FDRSF ton/day	HFDRSF ton/day	YPDRSF ton/day	WEDRSF ton/day
YP	Y1	180,000	--	--	--	--	180,000	--	--	--	--
YP	Y2	180,000	--	--	--	--	--	180,000	--	--	--
YP	Y3	180,000	--	--	--	--	--	--	180,000	--	--
H	H1	--	180,000	--	--	--	180,000	--	--	--	--
H	H2	--	180,000	--	--	--	--	180,000	--	--	--
H	H3	--	180,000	--	--	--	--	--	180,000	--	--
H	H4	--	180,000	--	--	--	--	--	--	180,000	--
W	W1	--	--	180,000	--	--	180,000	--	--	--	--
W	W2	--	--	180,000	--	--	--	180,000	--	--	--
W	W3	--	--	180,000	--	--	--	--	180,000	--	--
W	W4	--	--	180,000	--	--	--	--	--	180,000	--
W	W5	--	--	180,000	--	--	--	--	--	--	180,000
BT	B1	--	--	--	180,000	--	180,000	--	--	--	--
BT	B2	--	--	--	180,000	--	--	--	180,000	--	--

Daily maximum mining equipment

Equipment		Units	
Truck Fleet	Cat 789D	20	*(Midas Gold 2017b)*
Truck Fleet	Cat 740B	12	*(Midas Gold 2019b)*
Water truck	Cat 777D	2	*(Midas Gold 2017b)*
Dozer		6	*(Midas Gold 2017b)*
Grader		3	*(Midas Gold 2017b)*

Daily maximum access road traffic

	One-Way Trips per Day	
Road maintenance equipment	4	*(Midas Gold 2016); Table 12-2*
Light vehicles	19	*(Midas Gold 2016); Table 12-2*
Heavy vehicles	45	*(Midas Gold 2016); Table 12-2*
Total	68	

Acronyms

YPP Yellow Pine Pit
HFP Hangar Flats Pit
WEP West End Pit
BT Bradley Tailings
FDRSF Fiddle DRSF
HFDRSF Hangar Flats DRSF
YPDRSF Yellow Pine DRSF
WEDRSF West End DRSF
PC Primary Crusher
STKP Primary Crusher Stockpile

Dozer Location Percentages

	Pit				Ore Destination		Waste Destination			
Model Run	*YPP*	*HFP*	*WEP*	*BT*	*PC*	*STKP*	*FDRSF*	*HFDRSF*	*YPDRSF*	*WEDRSF*
Y1	50%	--	--	--	--	50%	--	--	--	--
Y2	50%	--	--	--	--	--	50%	--	--	--
Y3	50%	--	--	--	--	--	--	50%	--	--
H1	--	50%	--	--	--	50%	--	--	--	--
H2	--	50%	--	--	--	--	50%	--	--	--
H3	--	50%	--	--	--	--	--	50%	--	--
H4	--	50%	--	--	--	--	--	--	50%	--
W1	--	--	50%	--	--	50%	--	--	--	--
W2	--	--	50%	--	--	--	50%	--	--	--
W3	--	--	50%	--	--	--	--	50%	--	--
W4	--	--	50%	--	--	--	--	--	50%	--
W5	--	--	50%	--	--	--	--	--	--	50%
B1	--	--	--	50%	--	50%	--	--	--	--
B2	--	--	--	50%	--	--	--	50%	--	--

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: K. Lewis/E. Memon
	PROJECT NO: 335-1-4	PAGE: 1 OF: 20 SHEET: Mine
AIR EMISSION CALCULATIONS	SUBJECT: Mining Activity and Emissions	DATE: June 22, 2020

Model Scenario W3

Mining Activity and Emissions Emissions Summary

By Area/Model ID

	PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	CO_PPH	CO_TPY	NOX_PPH	NOX_TPY	SO2_PPH	SO2_TPY	VOC_TPY
Area/	Location of	PM	PM10		PM2.5		CO		NOX		SO2	VOC
Model ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr
YPP	Yellow Pine Pit	--	--	--	--	--	--	--	--	--	--	--	--
HFP	Hangar Flats Pit	--	--	--	--	--	--	--	--	--	--	--	--
WEP	West End Pit	344.54	885.54	161.61	79.64	14.53	--	--	--	--	--	--	--
BT	Bradley Tailings	--	--	--	--	--	--	--	--	--	--	--	--
YPPBL	Yellow Pine Pit Blasting	--	--	--	--	--	--	--	--	--	--	--	--
HFPBL	Hangar Flats Pit Blasting	--	--	--	--	--	--	--	--	--	--	--	--
WEPBL	West End Pit Blasting	117.35	334.38	61.02	19.29	3.52	1,742.00	635.83	46.80	17.08	0.09	0.03	--
BTBL	Bradley Tailings Blasting	--	--	--	--	--	--	--	--	--	--	--	--
STKP	PC Stockpile	--	--	--	--	--	--	--	--	--	--	--	--
FDRSF	Fiddle DRSF	--	--	--	--	--	--	--	--	--	--	--	--
HFDRSF	Hangar Flats DRSF	52.91	57.12	10.42	30.23	5.52	--	--	--	--	--	--	--
YPDRSF	Yellow Pine DRSF	--	--	--	--	--	--	--	--	--	--	--	--
WEDRSF	West End DRSF	--	--	--	--	--	--	--	--	--	--	--	--
TSF	Tailing Storage Facility	--	--	--	--	--	--	--	--	--	--	--	--
HR	Haul Roads	3,047.34	4,106.76	750.84	410.88	75.12	--	--	--	--	--	--	--
ACCRD	Access Roads	6.95	9.38	1.72	0.94	0.17	--	--	--	--	--	--	--
UGEXP	Scout Portal	0.002	0.004	0.001	0.001	0.0001	--	--	--	--	--	--	--
Total		3,569.10	5,393.19	985.62	540.98	98.87	1,742.00	635.83	46.80	17.08	0.09	0.03	--

See worksheet ROADS for haul road (HR) emissions by Model ID.

By Activity

	chk	chk-12	chk	chk	chk	chk	chk	chk	chk	chk	chk	chk
	PM	PM10		PM2.5		CO		NOX		SO2		VOC
Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr
Open Pit Drilling	284.70	811.20	148.04	46.80	8.54							
Open Pit Blasting	117.35	334.38	61.02	19.29	3.52	1,742.00	635.83	46.80	17.08	0.09	0.03	
Onsite Hauling	2,901.27	3,899.39	712.95	389.94	71.29							
Material Load / Unload	8.06	20.88	3.81	3.16	0.58							
Dozing	103.56	108.40	19.78	59.58	10.87							
Grading	36.80	60.51	11.04	6.25	1.14							
Water Truck Travel	109.27	146.86	26.85	14.69	2.69							
Access Road	6.95	9.38	1.72	0.94	0.17							
Wind Erosion	0.02	0.04	0.01	0.01	0.00							
Surface Exploration	1.12	2.14	0.39	0.32	0.06							
Underground Exploration	0.002	0.004	0.0007	0.0006	0.0001							
Total	3,569.10	5,393.19	985.62	540.98	98.87	1,742.00	635.83	46.80	17.08	0.09	0.03	--

W3 Model Input Emission Rates (g/s)

By Area/Model ID

	CO_PPH	NOX_TPY	NOX_PPH	PM2.5_TPY	PM2.5_PPD	PM10_PPD	SO2_PPH
Area/	Location of	CO	NO_X		$PM_{2.5}$		PM_{10}	SO_2
Model ID	Activity	8, 1-hr	Annual	1-hr	Annual	24-hr	24-hr	3, 1-hr
YPP	Yellow Pine Pit	--	--	--	--	--	--	--
HFP	Hangar Flats Pit	--	--	--	--	--	--	--
WEP	West End Pit	--	--	--	0.42	0.42	4.65	--
BT	Bradley Tailings	--	--	--	--	--	--	--
YPPBL	Yellow Pine Pit Blasting	--	--	--	--	--	--	--
HFPBL	Hangar Flats Pit Blasting	--	--	--	--	--	--	--
WEPBL	West End Pit Blasting	219.49	0.49	5.90	0.10	0.10	1.76	0.01
BTBL	Bradley Tailings Blasting	--	--	--	--	--	--	--
STKP	PC Stockpile	--	--	--	--	--	--	--
FDRSF	Fiddle DRSF	--	--	--	--	--	--	--
HFDRSF	Hangar Flats DRSF	--	--	--	0.16	0.16	0.30	--
YPDRSF	Yellow Pine DRSF	--	--	--	--	--	--	--
WEDRSF	West End DRSF	--	--	--	--	--	--	--
TSF	Tailing Storage Facility	--	--	--	--	--	--	--
HR	Haul Roads	--	--	--	2.16	2.16	21.56	--
ACCRD	Access Roads	--	--	--	0.00	0.00	0.05	--
UGEXP	Scout Portal	--	--	--	0.000003	0.000003	0.000021	--
Total		219.49	0.49	5.90	2.844043237	2.84	28.31	0.01
		TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: K. Lewis/E. Memon
	PROJECT NO: 335-1-4	PAGE: 2 OF: 20 SHEET: Mine
AIR EMISSION CALCULATIONS	SUBJECT: Mining Activity and Emissions	DATE: June 22, 2020

Model Scenario W3

Mining Activity and Emissions Source Parameters Summary

ID	description	TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	SIG_Y_M	SIG_Z_M	PITVOL_M3	SXINIT_M	SYINIT_M	ANGL_DEG
Model ID	Location of Activity	Source Type	UTM NAD 83 E m	UTM NAD 83 N m	Elev. m	Rel. Ht. m	S-y/Width m	S-z m	Pit Vol. m^3	Len X m	Len Y m	Angle deg
YPP	Yellow Pine Pit	AREA	631,160	4,975,865	1,832	4.7		4.4		882	882	-8
HFP	Hangar Flats Pit	AREA	630,925	4,972,884	1,993	4.7		4.4		491.0	491.0	-
WEP	West End Pit	AREA	632,398	4,976,290	2,192	4.7		4.4		376.2	376.2	-
BT	Bradley Tailings	AREA	630,110	4,972,105	2,012	4.7		4.4		820	420	-
YPPBL	Yellow Pine Pit Blasting	VOLUME	631,471	4,976,374	1,717	15.0	20.2	7.0				
HFPBL	Hangar Flats Pit Blasting	VOLUME	631,171	4,973,129	1,891	15.0	20.2	7.0				
WEPBL	West End Pit Blasting	VOLUME	632,586	4,976,478	1,994	15.0	20.2	7.0				
BTBL	Bradley Tailings Blasting	VOLUME	630,520	4,972,315	2,012	15.0	20.2	7.0				
STKP	PC Stockpile	VOLUME	632,112	4,974,616	1,980	4.7	53.3	4.4				
FDRSF	Fiddle DRSF	VOLUME	630,981	4,974,903	2,115	4.7	180.2	4.4				
HFDRSF	Hangar Flats DRSF	VOLUME	630,158	4,972,124	2,080	4.7	174.8	4.4				
YPDRSF	Yellow Pine DRSF	VOLUME	631,491	4,976,383	1,904	4.7	182.2	4.4				
WEDRSF	West End DRSF	VOLUME	633,392	4,976,207	2,376	4.7	124.1	4.4				
TSF	Tailing Storage Facility	AREA	628,496	4,971,000	2,097	0				1,157	1,157	-
HR	Onsite Hauling	VOLUME	See worksheet: ROADS			4.7	15.1	4.4				
ACCRD	Access Roads	LINE	Variable			3.0	6.1	2.8				
UGEXP	Scout Portal	AREA	632,362	4,973,690	2,018	0.0		0.0		4.9	4.9	

Updat

Emissions by Model Scenario (ton/yr) Calculated on: 06/22/20

	PM	PM10		PM2.5		CO		NOX		SO2		VOC
Scenario	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	ton/yr
Y1	1,484.1	2,607.5	476.3	264.1	48.2	1,742.0	635.8	46.8	17.1	0.1	0.0	-
Y2	1,922.8	3,180.5	581.1	319.7	58.4	1,742.0	635.8	46.8	17.1	0.1	0.0	-
Y3	2,794.1	4,351.6	795.2	436.8	79.8	1,742.0	635.8	46.8	17.1	0.1	0.0	-
H1	2,073.0	3,399.0	621.0	343.3	62.7	1,742.0	635.8	46.8	17.1	0.1	0.0	-
H2	2,824.9	4,393.0	802.7	441.0	80.6	1,742.0	635.8	46.8	17.1	0.1	0.0	-
H3	1,931.6	3,192.3	583.2	320.9	58.6	1,742.0	635.8	46.8	17.1	0.1	0.0	-
H4	2,327.9	3,724.9	680.6	374.2	68.4	1,742.0	635.8	46.8	17.1	0.1	0.0	-
W1	1,856.7	3,108.4	567.9	314.2	57.4	1,742.0	635.8	46.8	17.1	0.1	0.0	-
W2	2,649.1	4,156.7	759.5	417.3	76.3	1,742.0	635.8	46.8	17.1	0.1	0.0	-
W3	**3,569.1**	**5,393.2**	**985.6**	**541.0**	**98.9**	1,742.0	635.8	46.8	17.1	0.1	0.0	-
W4	1,896.3	3,144.9	574.5	316.2	57.8	1,742.0	635.8	46.8	17.1	0.1	0.0	-
W5	2,039.1	3,336.8	609.6	335.3	61.3	1,742.0	635.8	46.8	17.1	0.1	0.0	-
B1	2,284.9	3,683.2	673.0	371.6	67.9	1,742.0	635.8	46.8	17.1	0.1	0.0	-
B2	934.8	1,852.0	338.2	186.8	34.1	1,742.0	635.8	46.8	17.1	0.1	0.0	-

Highest emissions are highlighted in red .

Model Scenario W3

Open Pit Drilling

Activity Information

Operating schedule 365 day/yr

Total drill holes per year 1,200 hole/day 2 blast/day 600 hole/blast

Annual LOM-W3 rates		Material blasted	Drilling
YPP	Yellow Pine Pit	0 ton/day	0 hole/day
HFP	Hangar Flats Pit	0 ton/day	0 hole/day
WEP	West End Pit	180,000 ton/day	1,200 hole/day
BT	Bradley Tailings	0 ton/day	0 hole/day
	Total	180,000 ton/day	1,200 hole/day

Emission Factors

TSP (PM) 1.3 lb/hole *AP-42, Tab. 11.9-4, 7/98 (overburden)*

PM Scaling Factors

PM 1

PM10 0.52 *AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)*

PM2.5 0.03 *AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)*

Emissions by Model ID

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY
	Location of	PM	PM10		PM2.5	
Model ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr
YPP	Yellow Pine Pit	--	--	--	--	--
HFP	Hangar Flats Pit	--	--	--	--	--
WEP	West End Pit	284.70	811.20	148.04	46.80	8.54
BT	Bradley Tailings	--	--	--	--	--
Total	Open Pit Drilling	284.70	811.20	148.04	46.80	8.54

Source Parameters [1]

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	PITVOL_M3	SXINIT_M	SYINIT_M	SIG_Z_M	ANGL_DEG	Area
		Source	UTM NAD 83		Elev.	Rel. Ht.	Pit Vol.	Len X	Len Y	S-z	Angle	
Model ID	Activity	Type	E m	N m	m	m	m^3	m	m	m	deg	m2
YPP	Yellow Pine Pit	AREA	631,160	4,975,865	1,832	4.75		882.0	882.0	4.42	-8.0	777906
HFP	Hangar Flats Pit	AREA	630,925	4,972,884	1,993	4.75		491.0	491.0	4.42	0.0	241069
WEP	West End Pit	AREA	632,398	4,976,290	2,192	4.75		376.2	376.2	4.42	0.0	141544

[1] *UTM - (Midas Gold 2017d); Rel. Ht. - (EPA 2012); Len X, Len Y, Angle - best-fit equal area rectangle; Elev. - (Midas Gold 2018g)*

Source Parameters [1]

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M		SXINIT_M	SYINIT_M	SIG_Z_M	ANGL_DEG	
		Source	UTM NAD 83		Elev.	Rel. Ht.	Pit Vol.	Len X	Len Y	S-z	Angle	
Model ID	Activity	Type	E m	N m	m	m	m^3	m	m	m	deg	
BT	Bradley Tailings	AREA	630,110	4,972,105	2,012	4.75		820	420	4.42	0.0	344400

[1] *UTM, Elev. - (Midas Gold 2017d); Rel. Ht. - (EPA 2012); Len X, Len Y - best-fit equal area rectangle*

Conversions

2,000 lb/ton

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: K. Lewis/E. Memon
	PROJECT NO: 335-1-4	PAGE: 4 OF: 20 SHEET: Mine
AIR EMISSION CALCULATIONS	SUBJECT: Mining Activity and Emissions	DATE: June 22, 2020

Model Scenario W3

Open Pit Blasting

Activity Information

Operating schedule	365 day/yr	24 hr/day		
Blast area	80,795 ft²/blast	*(Midas Gold 2017b)*		
Blast frequency	1 blast/hr	2 blast/day	730 blast/yr	
ANFO use	26 ton/blast	*(Midas Gold 2017b)*	18,980 ton/yr	

Annual LOM-W3 rates	Material blasted	Blasting	ANFO use	
Yellow Pine Pit	0 ton/day	0 blast/day	0 ton ANFO/hr	*(Midas Gold 2017b)*
Hangar Flats Pit	0 ton/day	0 blast/day	0 ton ANFO/hr	*(Midas Gold 2017b)*
West End Pit	180,000 ton/day	2 blast/day	26 ton ANFO/hr	*(Midas Gold 2017b)*
Bradley Tailings	0 ton/day	0 blast/day	0 ton ANFO/hr	
Total	180,000 ton/day	2 blast/day	26 ton ANFO/hr	

Emission Factors

Emission factor equation	TSP (lb/blast) = 0.000014 x $A^{1.5}$	*AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)*	
A = Area per blast	80,795 ft²		
TSP (PM)	321.52 lb/blast		
CO	67 lb/ton-ANFO	*AP-42, Tab. 13.3-1, 2/80 (ANFO)*	
NOX	0.9 kg/t-ANFO	*(Attalla et al. 2008)*	
	1.8 lb/ton-ANFO		
SO2	3.6E-03 lb/ton-ANFO	*Based on:* 6% *diesel content in ANFO*	*(Midas Gold 2017e)*

$$\frac{1.5E\text{-}05\ \frac{\text{lb S}}{\text{lb FO}} \times 2\ \frac{\text{lb SO2}}{\text{lb S}} \times 6\%\ \frac{\text{lb FO}}{\text{lb ANFO}} \times 2{,}000\ \frac{\text{lb ANFO}}{\text{ton ANFO}}}{} = 3.6E\text{-}03\ \frac{\text{lb SO2}}{\text{ton ANFO}}$$

PM Scaling Factors

PM10	0.52	*AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)*
PM2.5	0.03	*AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)*

Emissions by Model ID

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY	CO_PPH	CO_TPY	NOX_PPH	NOX_TPY	SO2_PPH	SO2_TPY
		PM	PM10		PM2.5		CO		NOX[1]		SO2	
Model ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
YPPBL	Yellow Pine Pit Blasting	--	--	--	--	--	--	--	--	--	--	--
HFPBL	Hangar Flats Pit Blasting	--	--	--	--	--	--	--	--	--	--	--
WEPBL	West End Pit Blasting	117.35	334.38	61.02	19.29	3.52	1,742.00	635.83	46.80	17.08	0.0936	0.0342
BTBL	Bradley Tailings Blasting	--	--	--	--	--	--	--	--	--	--	--
Total	Open Pit Blasting	117.35	334.38	61.02	19.29	3.52	1,742	635.83	46.80	17.08	0.0936	0.0342

[1] *NO2/NOX:* 0.0357 *(Attalla et al. 2008)*

Source Parameters [1]

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	SIG_Y_M	SIG_Z_M
		Source	UTM NAD 83		Elev.	Rel. Ht.	S-y	S-z
~~Model ID~~	~~Activity~~	~~Type~~	~~E m~~	~~N m~~	~~m~~	~~m~~	~~m~~	~~m~~
YPPBL	Yellow Pine Pit Blasting	VOLUME	631,471	4,976,374	1,717	15	20.23	6.98
HFPBL	Hangar Flats Pit Blasting	VOLUME	631,171	4,973,129	1,891	15	20.23	6.98
WEPBL	West End Pit Blasting	VOLUME	632,586	4,976,478	1,994	15	20.23	6.98
BTBL	Bradley Tailings Blasting	VOLUME	630,520	4,972,315	2,012	15	20.23	6.98

[1] *UTM, Elev. - (Midas Gold 2017d); Rel. Ht. - (Attalla et al. 2008); S-y, S-z factors - (EPA 2016)*

Blast height (BH)	30 m	*(Attalla et al. 2008)/5 for conservatism*	Sigma divider			
Blast width	87 m	*sqrt(blast area)*	Rel. Ht.	2	of BH	*(EPA 2016)*
Blast depth	87 m	*sqrt(blast area)*	S-y	4.3	of SL	*(EPA 2016)*
Equal area side length (SL)	87 m		S-z	4.3	of BH	*(EPA 2016)*

Conversions

2,000 lb/ton
2.205 lb/kg
1.102 ton/t
3.281 ft/m

Model Scenario W3
Onsite Hauling

Activity Information
Operating schedule 365 day/yr 24 hr/day

Hauling Routes, Production Rates and Distances

Route Origin		Destination		Material Hauled [1] Material Type	Rate ton/day	One-Way Hauling [2] mi	Truck Loads [3] load/day	Total Travel [4] VMT/day
Unpaved Roads								
YPP- Yellow Pine Pit	YPP	Process PC	PC	Ore	--	1.84	--	--
YPP- Yellow Pine Pit	YPP	PC Stockpile	STKP	Ore	--	1.80	--	--
YPP- Yellow Pine Pit	YPP	Fiddle DRSF	FDRSF	Rock	--	2.81	--	--
YPP- Yellow Pine Pit	YPP	Hangar Flats DRSF	HFDRSF	Rock	--	4.76	--	--
YPP- Yellow Pine Pit	YPP	Yellow Pine DRSF	YPDRSF	Rock	--		--	--
YPP- Yellow Pine Pit	YPP	West End DRSF	WEDRSF	Rock	--		--	--
HFP- Hangar Flats Pit	HFP	Process PC	PC	Ore	--	3.16	--	--
HFP- Hangar Flats Pit	HFP	PC Stockpile	STKP	Ore	--	3.12	--	--
HFP- Hangar Flats Pit	HFP	Fiddle DRSF	FDRSF	Rock	--	4.83	--	--
HFP- Hangar Flats Pit	HFP	Hangar Flats DRSF	HFDRSF	Rock	--	2.83	--	--
HFP- Hangar Flats Pit	HFP	Yellow Pine DRSF	YPDRSF	Rock	--	3.72	--	--
HFP- Hangar Flats Pit	HFP	West End DRSF	WEDRSF	Rock	--		--	--
WEP West End Pit	WEP	Process PC	PC	Ore	--	2.68	--	--
WEP West End Pit	WEP	PC Stockpile	STKP	Ore	--	2.63	--	--
WEP West End Pit	WEP	Fiddle DRSF	FDRSF	Rock	--	4.43	--	--
WEP West End Pit	WEP	Hangar Flats DRSF	HFDRSF	Rock	180,000	6.49	1,264	16,415
WEP West End Pit	WEP	Yellow Pine DRSF	YPDRSF	Rock	--	2.75	--	--
WEP West End Pit	WEP	West End DRSF	WEDRSF	Rock	--	3.07	--	--
BT-P Bradley Tailings	BT	Process PC	PC	Ore	--		--	--
BT-S Bradley Tailings	BT	PC Stockpile	STKP	Ore	--	3.59	--	--
BT-F Bradley Tailings	BT	Fiddle DRSF	FDRSF	Rock	--		--	--
BT-H Bradley Tailings	BT	Hangar Flats DRSF	HFDRSF	Rock	--	0.60	--	--
BT-Y Bradley Tailings	BT	Yellow Pine DRSF	YPDRSF	Rock	--		--	--
BT-W Bradley Tailings	BT	West End DRSF	WEDRSF	Rock	--		--	--
Total					180,000			16,415

(1) *(Midas Gold 2019b)*
(2) *(Midas Gold 2017d)*
(3) *See truck fleet information below.*
(4) *Truck loads* × *One-way hauling* × 2 *(round-trip)*

Truck Fleet

Truck	Payload Capacity [1] ton	Empty Weight [1] ton	Units [2]	Average Weight ton
Cat 789D	201.8	155.7	20	256.6
Cat 740B	43.5	37.6	12	59.4
Weighted Average	142.4		32	182.6

(1) *789D: (Caterpillar 2016), page 10-14*
740B: (Caterpillar 2011), page 13
(2) *(Midas Gold 2017b)* *(Midas Gold 2019b)*

Conversions
2,000 lb/ton

Model Scenario W3
Onsite Hauling - continued

Hauling Emissions by Route

Route		Destination		Material Hauled Material Type	PM_TPY PM ton/yr	PM10_PPD PM10 lb/day	PM10_TPY PM10 ton/yr	PM2.5_PPD PM2.5 Origin lb/day	PM2.5_TPY PM2.5 Origin ton/yr
Unpaved Roads									
YPP- Yellow Pine Pit	YPP	Process PC	PC	Ore	--	--	--	--	--
YPP- Yellow Pine Pit	YPP	PC Stockpile	STKP	Ore	--	--	--	--	--
YPP- Yellow Pine Pit	YPP	Fiddle DRSF	FDRSF	Rock	--	--	--	--	--
YPP- Yellow Pine Pit	YPP	Hangar Flats DRSF	HFDRSF	Rock	--	--	--	--	--
YPP- Yellow Pine Pit	YPP	Yellow Pine DRSF	YPDRSF	Rock	--	--	--	--	--
YPP- Yellow Pine Pit	YPP	West End DRSF	WEDRSF	Rock	--	--	--	--	--
HFP Hangar Flats Pit	HFP	Process PC	PC	Ore	--	--	--	--	--
HFP Hangar Flats Pit	HFP	PC Stockpile	STKP	Ore	--	--	--	--	--
HFP Hangar Flats Pit	HFP	Fiddle DRSF	FDRSF	Rock	--	--	--	--	--
HFP Hangar Flats Pit	HFP	Hangar Flats DRSF	HFDRSF	Rock	--	--	--	--	--
HFP Hangar Flats Pit	HFP	Yellow Pine DRSF	YPDRSF	Rock	--	--	--	--	--
HFP Hangar Flats Pit	HFP	West End DRSF	WEDRSF	Rock	--	--	--	--	--
WEP West End Pit	WEP	Process PC	PC	Ore	--	--	--	--	--
WEP West End Pit	WEP	PC Stockpile	STKP	Ore	--	--	--	--	--
WEP West End Pit	WEP	Fiddle DRSF	FDRSF	Rock	--	--	--	--	--
WEP West End Pit	WEP	Hangar Flats DRSF	HFDRSF	Rock	2,901.27	3,906.57	712.95	390.66	71.29
WEP West End Pit	WEP	Yellow Pine DRSF	YPDRSF	Rock	--	--	--	--	--
WEP West End Pit	WEP	West End DRSF	WEDRSF	Rock	--	--	--	--	--
BT-P Bradley Tailings	BT	Process PC	PC	Ore	--	--	--	--	--
BT-S Bradley Tailings	BT	PC Stockpile	STKP	Ore	--	--	--	--	--
BT-F Bradley Tailings	BT	Fiddle DRSF	FDRSF	Rock	--	--	--	--	--
BT-H Bradley Tailings	BT	Hangar Flats DRSF	HFDRSF	Rock	--	--	--	--	--
BT-Y Bradley Tailings	BT	Yellow Pine DRSF	YPDRSF	Rock	--	--	--	--	--
BT-W Bradley Tailings	BT	West End DRSF	WEDRSF	Rock	--	--	--	--	--
Pit Subtotal					2,901.27	3,906.57	712.95	390.66	71.29

Emission Factors
Unpaved roads

Annual emission factor equation	$E = k(s/12)^a (W/3)^b [(365-P)/365]$		*AP-42, Sec. 13.2.2, Eq. 1a, 11/06*
Daily emission factor equation	$E = k(s/12)^a (W/3)^b$		*AP-42, Sec. 13.2.2, Eq. 1a, 11/06*
s = Surface material silt content	4	%	*(Midas Gold 2015)*
W = Mean vehicle weight	182.6	ton	
P = ay /year with ;:0.0 i pre ip	120	day/yr	*AP-42 Fig. 13.2.2-1, 11/06*

	PM	PM10	PM2.5		
k = Size-specific empirical constant	4.9	1.5	0.15		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
a = Size-specific empirical constant	0.7	0.9	0.9		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
b = Size-specific empirical constant	0.45	0.45	0.45		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
E = Size-specific emission factor					
Annual	9.68	2.38	0.24	lb/VMT	
Daily	14.43	3.55	0.35	lb/VMT	

Emission Controls
Unpaved roads - periodic application of water and chemical dust suppressant
Control efficiency 90% *(Air Sciences 2018)* for chemical suppressant; annual and daily
33% *Conservative estimate* for watering; daily only

Model Scenario W3
Onsite Hauling - continued

Emissions by Area

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY
		PM	PM10		PM2.5	
Area ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr
HR	Onsite Hauling	2,901.27	3,899.39	712.95	389.94	71.29

See worksheet ROADS for haul road (HR) emissions by Model ID.

Source Parameters [1]

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	SIG_Y_M	SIG_Z_M
		Source	UTM NAD 83		Elev.	Rel. Ht.	S-y	S-z
Model ID	Activity	Type	E m	N m	m	m	m	m
HR	Onsite Hauling	VOLUME	*See worksheet: ROADS*			4.75	15.14	442

[1] *UTM, Elev. - (Midas Gold 2017d); Rel. Ht., Sy, Sz - (EPA 2012)*

Truck	Height	Reference
789D	6.5 m	*(Caterpillar 2016), page 10-14*
Cat 740B	4.1 m	*(Caterpillar 2011), page 14*
Weighted	5.58 m	
Road width (RW)	26.5 m	*(Midas Gold 2016), Fig. 9-1*

Plume Parameter	Calculation	Value (m)	Const. Cat
Plume top (PT) - unpaved	1.7 x VH	9.49	1.7
Release height - unpaved	0.5 x PT	4.75	0.5
Plume width (PW)	RW + 6 m	32.55	6
Sigma-z - unpaved	PT / 2.15	4.42	2.15
Sigma-y	PW / 2.15	15.14	2.15

(EPA 2012)

Conversions
2,000 lb/ton
3.28 ft/m
12 in/ft

Model Scenario W3

Material Load / Unload

Activity Information

Operating schedule 365 day/yr

Throughput Rates chk

Model ID	Location of Activity	No. of Xfers	Rate ton/day	Total Rate ton/day	Xfer Description
YPP	Yellow Pine Pit	1	0	0	Load
HFP	Hangar Flats Pit	1	0	0	Load
WEP	West End Pit	1	180,000	180,000	Load
BT	Bradley Tailings	1	0	0	Load
PC	Process PC [1]	0	0	0	Unload
STKP	PC Stockpile	2	0	0	Unload & Reload
FDRSF	Fiddle DRSF	1	0	0	Unload
HFDRSF	Hangar Flats DRSF	1	180,000	180,000	Unload
YPDRSF	Yellow Pine DRSF	1	0	0	Unload
WEDRSF	West End DRSF	1	0	0	Unload

[1] *Ore unloading at primary crusher is accounted for in process sources*

Emission Factors

		PM	PM10	PM2.5		
k = Particle size multiplier		0.74	0.35	0.053		*AP-42, Sec. 13.2.4, Pg. 4, 11/06*
E = Emission facto	Load	0.00021	0.0001	0.000015	lb/ton	*AP-42, Tab. 11.19.2-2, 8/04 (truck loading - crushed stone)*
	Unload	0.00003	0.000016	0.0000024	lb/ton	*AP-42, Tab. 11.19.2-2, 8/04 (truck unloading - fragmented stone)*
	Unload	0.00012	0.00006	0.00001	lb/ton	*Average of loading and unloading EF*

Emissions by Model ID chk PM_TPY PM10_PPD PM10_TPY PM2.5_PPD PM2.5_TPY

~~ID~~	~~Activity~~ Location of	~~Total Rate ton/day~~	~~PM ton/yr~~	~~PM10 lb/day~~	~~PM10 ton/yr~~	~~PM2.5 lb/day~~	~~PM2.5 ton/yr~~ Model
YPP	Yellow Pine Pit	--	--	--	--	--	--
HFP	Hangar Flats Pit	--	--	--	--	--	--
WEP	West End Pit	180,000	6.95	18.00	3.29	2.73	0.50
BT	Bradley Tailings	--	--	--	--	--	--
PC	Process PC	--	--	--	--	--	--
STKP	PC Stockpile	--	--	--	--	--	--
FDRSF	Fiddle DRSF	--	--	--	--	--	--
HFDRSF	Hangar Flats DRSF	180,000	1.11	2.88	0.53	0.44	0.08
YPDRSF	Yellow Pine DRSF	--	--	--	--	--	--
~~WEDRSF~~	~~West End DRSF~~	~~--~~	~~--~~	~~--~~	~~--~~	~~--~~	~~--~~
Total	Material Load / Unload	360,000	8.06	20.88	3.81	3.16	0.58

Conversions

2.237 mi/hr per m/s

2,000 lb/ton

Model Scenario W3

Material Load / Unload - continued

Source Parameters

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	PITVOL_M3	SXINIT_M	SYINIT_M	SIG_Z_M	NGL_DEG	
	Location of	Source	UTM NAD 83		Elev.	Rel. Ht.	Pit Vol.	Len X	Len Y	S-z	Angle	
Model ID	Activity	Type	E m	N m	m	m	m^3	m	m	m	deg	
YPP	Yellow Pine Pit	AREA	631,160	4,975,865	1,832	4.75		882	882	4.42	-8	Pits
HFP	Hangar Flats Pit	AREA	630,925	4,972,884	1,993	4.75		491	491	4.42	0	Pits
WEP	West End Pit	AREA	632,398	4,976,290	2,192	4.75		376	376	4.42	0	Pits
BT	Bradley Tailings	AREA	630,110	4,972,105	2,012	4.75		820	420	4.42	0	

Source Parameters [1]

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	SIG_Y_M	SIG_Z_M	Surface		
	Location of	Source	UTM NAD 83		Elev.	Rel. Ht.	S-y	S-z	Area	Length	
Model ID	Activity	Type	E m	N m	m	m	m	m	m^2	m	
STKP	PC Stockpile	VOLUME	632,112	4,974,616	1,980	4.75	53.35	4.42	5.26E+04	229.4	Stockpile
FDRSF	Fiddle DRSF	VOLUME	630,981	4,974,903	2,115	4.75	180.22	4.42	6.01E+05	774.9	DRSF
HFDRSF	Hangar Flats DRSF	VOLUME	630,158	4,972,124	2,080	4.75	174.81	4.42	5.65E+05	751.7	DRSF
YPDRSF	Yellow Pine DRSF	VOLUME	631,491	4,976,383	1,904	4.75	182.21	4.42	6.14E+05	783.5	DRSF
WEDRSF	West End DRSF	VOLUME	633,392	4,976,207	2,376	4.75	124.05	4.42	2.85E+05	533.4	DRSF

[1] *UTM, Elev., Area - (Midas Gold 2017d); Rel. Ht. - (EPA 2012); S-y, S-z factors - (EPA 2016)*

Vehicle height (VH):
Weighted Average 5.58 m

Reference
(Caterpillar 2016), page 10-14, (Caterpillar 2

Plume Parameter	Calculation	Value (m)	Const.
Plume top (PT)	1.7 x VH	9.49	1.7
Release height	0.5 x PT	4.75	0.5
Sigma-z	PT / 2.15	4.42	2.15

(EPA 2012)

Sample calculation for PC Stockpile

Plume Parameter	Calculation	Value (m)	Const.
Surface area (SA)	Map	52,623	
Side length (SL)	SA^0.5	229.4	0.5
Sigma-y	SL / 4.3	53.35	4.3

(EPA 2016)

Model Scenario W3

Dozing and Grading

Activity Information

Operating schedule 365 day/yr 24 hr/day

Dozer and Grader Fleet

Equipment Category	Units	Activity	
Dozer	6	144 hr/day	*(Midas Gold 2017b)*
Grader	3	72 hr/day	*(Midas Gold 2017b)*
		468 VMT/day	

Dozing Emission Factors

Emission Factor Equation	TSP (lb/hr) = $5.7 (s)^{1.2}/(M)^{1.3}$	*AP-42, Tab. 11.9-1, 07/98, (bulldozing, overburden)*
	PM15 (lb/hr) = $1.0 (s)^{1.5}/(M)^{1.4}$	*AP-42, Tab. 11.9-1, 07/98, (bulldozing, overburden)* s
= Surface material silt content	6.9 %	*AP-42, Table 11.9-3, 07/98, (bulldozers, overburden)*
M = Material moisture content	7.9 %	*AP-42, Table 11.9-3, 07/98, (bulldozers, overburden)*
TSP(PM)	3.941 lb/hr	
PM15	1.004 lb/hr	

Dozing PM Scaling Factors

PM10	0.75	*AP-42, Tab. 11.9-1, 07/98, (applies to PM15 EF, footnote d)*
PM2.5	0.105	*AP-42, Tab. 11.9-1, 07/98, (applies to TSP EF, footnote e)*

Grading Emission Factors

Emission Factor Equation	TSP (lb/VMT) = $0.04 (S)^{2.5}$	*AP-42, Tab. 11.9-1, 07/98, (grading)*
	PM15 (lb/VMT) = $0.051 (S)^{2}$	*AP-42, Tab. 11.9-1, 07/98, (grading)*
S - Grader average speed	6.5 mph	*(Caterpillar 2016), Road Maintenance, page 11-6, Average*
TSP(PM)	4.309 lb/VMT	
PM15	2.155 lb/VMT	

Grading PM Scaling Factors

PM10	0.6	*AP-42, Tab. 11.9-1, 07/98, (applies to PM15 EF, footnote d)*
PM2.5	0.031	*AP-42, Tab. 11.9-1, 07/98, (applies to TSP EF, footnote e)*

Emission Controls

Grading Periodic application of water and chemical dust suppressant

Control efficiency: 90% *See Onsite Hauling*

Emissions by Area

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY
		PM	PM10		PM2.5	
Area ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr
ALL	Dozing	103.56	108.40	19.78	59.58	10.87
HR	Grading	36.80	60.51	11.04	6.25	1.14

Conversions

2,000 lb/ton

Model Scenario W3

Dozing and Grading - continued

		chk	chk	chk	chk	chk
Emissions by Model ID		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY
		PM		PM10		PM2.5
Model ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr
YPP	Dozing	--	--	--	--	--
HFP	Dozing	--	--	--	--	--
WEP	Dozing	51.78	54.20	9.89	29.79	5.44
BT	Dozing	--	--	--	--	--
PC	Dozing	--	--	--	--	--
STKP	Dozing	--	--	--	--	--
FDRSF	Dozing	--	--	--	--	--
HFDRSF	Dozing	51.78	54.20	9.89	29.79	5.44
YPDRSF	Dozing	--	--	--	--	--
WEDRSF	Dozing	--	--	--	--	--
HR	Grading	36.80	60.51	11.04	6.25	1.14

See worksheet ROADS for haul road (HR) emissions by Model ID.

Source Parameters

Dozing: See Open Pit Drilling and Material Load / Unload for source parameters.
Grading: See Onsite Hauling for source parameters.

Model Scenario W3

Water Truck Travel

Activity Information

Operating schedule 365 day/yr 24 hr/day

Truck Fleet

Water Truck	Payload Capacity ton	Empty Weight ton	Gross Weight ton	Units	Oper. hr/day	Reference	Average Weight ton
Cat 777D	100	80	180	2	48	*(Caterpillar 2016), page 10-12*	130

Average truck speed 15 mph *(Midas Gold 2018b)*

Total vehicle miles traveled (VMT) 720 VMT/day

Emission Factors

Annual emission factor equation	$E = k(s/12)^a (W/3)^b [(365-P)/365]$	*AP-42, Sec. 13.2.2, Eq. 1a, 11/06*
Daily emission factor equation	$E = k(s/12)^a (W/3)^b$	*AP-42, Sec. 13.2.2, Eq. 1a, 11/06*
s = Surface material silt content	4 %	*(Midas Gold 2015)*
W = Mean vehicle weight	130.17 ton	
P = ay /year with ;:0.0 i pre ip.	120 day/yr	*AP-42 Fig. 13.2.2-1, 11/06*

	PM	PM10	PM2.5		
k = Size-specific empirical constant	4.9	1.5	0.15		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
a = Size-specific empirical constant	0.7	0.9	0.9		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
b = Size-specific empirical constant	0.45	0.45	0.45		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
E = Size-specific emission factor					
Annual	8.32	2.04	0.20	lb/VMT	
Daily	12.39	3.04	0.30	lb/VMT	

Emission Controls

Periodic application of water and chemical dust suppressant

Control efficiency: 90% *for chemical suppressant; annual and daily* *See Onsite Hauling*

33% *for watering; daily only*

Emissions by Area

		PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY
		PM	PM10		PM2.5	
Area ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr
HR	Water Truck Travel	109.27	146.86	26.85	14.69	2.69

Source Parameters

See Onsite Hauling for source parameters.

Conversions

2,000 lb/ton

Model Scenario W3

Access Road

Activity Information

Operating schedule 365 day/yr 24 hr/day

Maintenance Equipment, Light and Heavy Truck Specifications and Traffic

Equipment	Equipment Model[1]	Notes	AADT[2]	Annual Traffic	Travel[3] VMT/yr	Vehicle Weight[4] Empty ton	Gross ton	Average Weight ton
Maintenance Equipment	Caterpillar 725C		3	1,095	1,772	25.6	51.6	38.6
Light Vehicles	Ford F-350	5	19	6,935	11,223	4.0	7.9	6.0
Heavy Trucks	Caterpillar CT660 (8X6)	6	45	16,425	26,581	10.1	34.5	22.3
Weighted Average Vehicle Weight								18.4

[1] *Appropriate equipment model from (Midas Gold 2017b)*

[2] *AADT = annual average daily traffic (Midas Gold 2016) Tab. 12-2;*
75% of total maintanance AADT (4) assigned to non-grader maintenance equipment and 25% assigned to grader

[3] *Based on access road length of:* 1.6 *mi (within project boundary)* *(Midas Gold 2017d)*

[4] *(Caterpillar 2016)/manufacturer specifications*

[5] *Light vehicles include visitor and employee vehicles.*

[6] *Heavy trucks include buses, supply, product shipment and trash trucks . 2917 lime delivery trips ((Midas Gold 2017a) Tab. 12-4) are excluded.*

Emission Factors

Annual emission factor equation $E = k(s/12)^a (W/3)^b [(365-P)/365]$ *AP-42, Sec. 13.2.2, Eq. 1a, 11/06*

Daily emission factor equation $E = k(s/12)^a (W/3)^b$ *AP-42, Sec. 13.2.2, Eq. 1a, 11/06*

s = Surface material silt content 4 % *(Midas Gold 2015)*

W = Mean vehicle weight 18.42 ton

P = ay /year with ;:0.0 i pre ip. 120 day/yr *AP-42 Fig. 13.2.2-1, 11/06*

	PM	PM10	PM2.5		
k = Size-specific empirical constant	4.9	1.5	0.15		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
a = Size-specific empirical constant	0.7	0.9	0.9		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
b = Size-specific empirical constant	0.45	0.45	0.45		*AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06*
E = Size-specific emission factor					
Annual	3.45	0.85	0.08	lb/VMT	
Daily	5.14	1.26	0.13	lb/VMT	

Emission Controls

Periodic application of water and chemical dust suppressant

Control efficiency: 90% *for chemical suppressant; annual and daily* *See Onsite Hauling*
33% *for watering; daily only*

Emissions by Area

				PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY
				PM	PM10		PM2.5	
Area ID	Activity	VMT/day	VMT/yr	ton/yr	lb/day	ton/yr	lb/day	ton/yr
ACCRD	Vehicle Travel	108.4	39,576	6.83	9.17	1.68	0.92	0.17

Conversions
2,000 lb/ton
1,609 m/mi

Model Scenario W3

Access Road

Grading Traffic

Equipment	AADT	Annual Traffic	VMT/day	VMT/yr
Grader	1	365	1.6	591

Emission Factors *Detailed emission factor calculations are provided on page 10*

PM	4.3	lb/VMT
PM10	1.3	lb/VMT
PM2.5	0.1	lb/VMT

Emission Controls

Periodic application of water and chemical dust suppressant

Control efficiency: 90% *See Onsite Hauling*

Emissions by Area

				PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY
				PM	PM10		PM2.5	
Area ID	Activity	VMT/day	VMT/yr	ton/yr	lb/day	ton/yr	lb/day	ton/yr
ACCRD	Grading	1.6	591	0.13	0.21	0.04	0.02	0.004

Source Parameters [1]

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	SIG_Y_M	SIG_Z_M
		Source	UTM NAD 83		Elev.	Rel. Ht.	Width	S-z
Model ID	Activity	Type	E m	N m	m	m	m	m
ACCRD	*Access Roads*	LINE		*Variable*		2.98	6.10	2.77

[1] *UTM, Elev. - (Midas Gold 2017d); Rel. Ht., Sz - (EPA 2012)*

Vehicle	Height		
Average	3.5	m	
Grader	3.7	m	
HD Truck	3.6	m	
LD Truck	3.2	m	
Road width (RW)	6.1	m	*(Midas Gold 2016), Fig. 7-2*
Road length	2,590	m	

Plume Parameter	Calculation	Value (m)	Const.
Plume top (PT) - unpaved	1.7 x VH	5.95	1.7
Release height - unpaved	0.5 x PT	2.98	0.5
Plume width (PW)	RW + 6 m	12.096	6
Sigma-z - unpaved	PT / 2.15	2.77	2.15

(EPA 2012)

Source Parameters

See Onsite Hauling for source parameters.

Conversions

3.28084 ft/m

Model Scenario W3

Wind Erosion

Activity Information

Operating schedule 365 day/yr

Erodible Area

Model ID	Location of Activity	Surface Type	Total Rate ton/yr	Erodible Area [3] Flat acre/yr	Erodible Area [3] Pile acre/yr	Surface Footprint
STKP	PC Stockpile	Pile	--		--	13
FDRSF	Fiddle DRSF	Pile	--		--	148
HFDRSF	Hangar Flats DRSF	Pile	180,000		20	140
YPDRSF	Yellow Pine DRSF	Pile	--		--	152
WEDRSF	West End DRSF	Pile	--		--	70
BT	Bradley Tailings	Flat		85		85
TSF	Tailing Storage Facility	Flat		331		331
HR	Haul Roads [1]	Flat		582		582
ACCRD	Access Roads [2]	Flat		4		4

[1] *Based on scenario haul road length of 55 mi and width of 26.5 m (Midas Gold 2016), Fig. 9-1*

[2] *Based on access road (within boundary) length of 1.6 mi and width of 6.1 m (Midas Gold 2016), Fig. 7-2*

[3] *Pile surface area calculations:*

Truck dump (TD) size 142.4 ton

Material density 150.2 lb/ft³ *(Midas Gold 2017b), Average Ore & Waste (YP, HF, WE, BT)*

0.075 ton/ft³

Material specific volume 13.3 ft³/ton

TD volume (V) 1,896 ft³

Conical surface calculations

Side slope 38 deg *Typical*

0.7 rad

Conical surface area (SA) r h 2 r 2 ..... 0.

Conical volume (V) h r 2 3

Conical base radius r = s × cos(slope)

Conical height h = s × sin(slope)

Sloped side length s = (h^2 + r^2)^0.5

Solution of conical volume equation

Replacing h and r with s × sin(slope) and s × cos(slope), respectively:

s = [3 × V/(pi × sin(slope) × cos^2(slope)]^(1/3) 16.8 ft

r 13.2 ft

h 10.3 ft

SA 698 ft²

0.016 acre

1.1E-4 acre/ton-TD

Scaling Factors

PM10 0.5 *AP-42, Pg. 13.2.5-3, 11/06*

PM2.5 0.075 *AP-42, Pg. 13.2.5-3, 11/06*

Conversions

4,046.86 m²/acre 2,000 lb/ton

43,560 ft²/acre 12 in/ft

1,609.34 m/mi

3.28 ft/m

Model Scenario W3

Wind Erosion - continued ***Wind erosion potential calculations based on Aug-2014 through Aug-2015 Midas Gold on site meteorological data***

Stockpile Surface Wind Erosion Event Emission Calculations

Based on 1 acre/yr 8,760 hr/yr 0.00011 acre/hr

Threshold Wind Event	Date / Hour	u10 (m/s) (1)	u10+ (m/s) (2)	u* (m/s) ID-A (3)	u* (m/s) ID-B (3)	u* (m/s) ID-C (3)	Hours Elapsed ID-A (4)	Hours Elapsed ID-B (4)	Hours Elapsed ID-C (4)	Erodible Surface Area (acre) ID-A (5)	Erodible Surface Area (acre) ID-B (5)	Erodible Surface Area (acre) ID-C (5)
0	6/12/2014 13:00											
1	9/25/2014 14:00	9.810	11.772	1.059	0.706	0.235	2,521	2,521	2,521	0.03453	0.1381	0.1151
2	11/29/2014 12:00	10.050	12.060	1.085	0.724	0.241	1,558	4,079	4,079	0.02134	0.2235	0.1863
3	12/11/2014 03:00	10.000	12.000	1.080	0.720	0.240	279	4,358	4,358	0.00382	0.2388	0.1990
4	12/11/2014 14:00	9.470	11.364	1.023	0.682	0.227	11	4,369	4,369	0.00015	0.2394	0.1995
5	2/5/2015 14:00	10.400	12.480	1.123	0.749	0.250	1,344	5,713	5,713	0.01841	0.3130	0.2609
6	2/6/2015 07:00	10.270	12.324	1.109	0.739	0.246	17	5,730	5,730	0.00023	0.3140	0.2616
7	8/21/2015 14:00	9.610	11.532	1.038	0.692	0.231	4,711	10,441	10,441	0.06453	0.5721	0.4768
8	8/21/2015 15:00	9.530	11.436	1.029	0.686	0.229	1	10,442	10,442	0.00001	0.5722	0.4768
Flat Surface Wind Erosion Event Emission Calculations												
				Flat			Flat			Flat		
N/A	No wind events above 16.04 m/s											

Stockpile Surface Wind Erosion Event Emission Calculations - continued

Threshold Wind Event	Erosion Potential (lb/acre)(1) ID-A (6)	ID-B (6)	ID-C (6)	PM Emissions (lb) ID-A (7)	ID-B (7)	ID-C (7)	Total (8)	PM10 (lb) Total (9)	PM2.5 (lb) Total (10)
1	9.61	--	--	0.332	--	--	0.332	0.166	0.025
2	16.80	--	--	0.359	--	--	0.359	0.179	0.027
3	15.25	--	--	0.058	--	--	0.058	0.029	0.004
4	0.62	--	--	9.34E-5	--	--	9.34E-5	4.67E-5	7.00E-6
5	28.5	--	--	0.525	--	--	0.525	0.263	0.039
6	24.00	--	--	0.006	--	--	0.006	0.003	0.000
7	4.15	--	--	0.268	--	--	0.268	0.134	0.020
8	2.11	--	--	2.88E-5	--	--	2.88E-5	1.44E-5	2.16E-6
Stockpile Subtotal							1.548	0.774	0.116
Flat Surface Wind Erosion Event Emission Calculations - continued									
N/A	No wind events above 16.04 m/s						--	--	--

Zero denotes winds did not exceed the threshold for a surface regime.

Final Emission Factors (lb/acre-yr)

Surface Type	PM	PM10	PM2.5
Pile	1.55	0.77	0.12
Flat	--	--	--

Model Scenario W3

Wind Erosion - continued

Stockpile Surface Wind Erosion Event Emission Calculations - Notes

(1) u10 = wind speed at 10 meters reference height, m/s

(2) u10+ = fastest-mile wind speed, m/s
Based on hourly to fastest-mile wind speed conversion factor of 1.2 *(EPA 1994)*

(3) Pile: u* = friction velocity, m/s = (us/ur) × 0.1 × u10+ *AP-42, Sec. 13.2.5, Eqs. 6 & 7, 11/06*

Area ID	A	B	C
(us/ur)	0.9	0.6	0.2

AP-42, Page 13.2.5-10, 11/06

Flat surface:
u* = friction velocity, m/s = 0.053 × u10+ *AP-42, Sec. 13.2.5, Eq. 4, 11/06*

(4) Hours elapsed since previous wind erosion event

(5) Erodible surface area = hours elapsed since previous erosion event × hourly erodible surface area (acre) × surface regime area fraction Surface regime area fractions:

Area ID	A	B	C
% Surface	0.12	0.48	0.4

AP-42, Page 13.2.5-10, 11/06

(6) Erosion potential, g/m^2, = P = 8 u* l ut 2 2 u* l ut P = 0 for u* :: ut
where, ut* = threshold friction velocity = 1.02 m/s *AP-42, Page 13.2.5-5 (overburden), 11/06*
P converted to lb/acre by multiplying with: 0.002205 lb/g and 4,046.86 m^2/acre
Solving u* = (us/ur) × 0.1 × u10+ for u10, when u* = ut* = 1.02 m/s and u10+ = u* × 1.2
yields the following minimum wind speeds to disturb the each stockpile surface regime:
ID-A 9.44 m/s
ID-B 14.17 m/s
ID-C 42.50 m/s
The threshold wind speed to disturbe flat surfaces is 1.02/0.053/1.2
Flat surface 16.04 m/s
The maximum hourly wind speed in the onsite data is 10.4 m/s, which is less than the threshold wind speeds to cause a disturbance of stockpile regimes ID-B and ID-C, and flat surfaces.

(7) PM emissions, lb = P (lb/acre) × erodible surface area (acre)

(8) Total PM emissions, lb = PM (ID-A), lb + PM (ID-B), lb + PM(ID-C), lb

(9) Total PM10 emissions, lb = total PM emissions, lb × PM10 scaling factors of 0.5 *AP-42, Page 13.2.5-3, 11/06*

(10) Total PM2.5 emissions, lb = total PM emissions, lb × PM2.5 scaling factors of 0.075 *AP-42, Page 13.2.5-3, 11/06*

Model Scenario W3

Wind Erosion - continued

Emissions by Model ID

				chk PM_TPY	PM10_PPD	PM10_TPY	PM2.5_PPD	PM2.5_TPY
	Location of	Control[1]		PM	PM10		PM2.5	
Model ID	Activity		Type	ton/yr	lb/day	ton/yr	lb/day	ton/yr
STKP	PC Stockpile	--	Pile	--	--	--	--	--
FDRSF	Fiddle DRSF	--	Pile	--	--	--	--	--
HFDRSF	Hangar Flats DRSF	--	Pile	0.016	0.043	0.008	0.006	0.001
YPDRSF	Yellow Pine DRSF	--	Pile	--	--	--	--	--
WEDRSF	West End DRSF	--	Pile	--	--	--	--	--
BT	Bradley Tailings	--	Flat	--	--	--	--	--
TSF	Tailing Storage Facility	67%	Flat	--	--	--	--	--
HR	Haul Roads	90%	Flat	--	--	--	--	--
ACCRD	Access Roads	90%	Flat	--	--	--	--	--
Total	Wind Erosion			0.016	0.043	0.008	0.006	0.001

(1) *Bradley Tailings - maximum one-third of the total surface exposed (Midas Gold 2017f)*

Roads - see note on page 6

Conversions

2,000 lb/ton

Model Scenario W3

Surface Exploration

Activity Information

Operating schedule	365 day/yr	24 hr/day		
Duration	14 yr	168 mo		*(Midas Gold 2018a) (Midas*
Construction disturbance	13 acres	0.08 acre/mo		*Gold 2016), p. 13-1*
Total wet drilling (maximum)	700 holes	50 holes/yr		*(Midas Gold 2016), p. 13-1*
Material blasted	724.9 ton/hole			

Construction Emission Calculations

Emission Factors

PM 1.2 ton/acre per month of activity *AP-42, Page 13.2.3-1, 1/95*

PM Scaling Factors

PM10 0.35 *AP-42, Sec. 13.2.4, Pg. 4, 11/06*

PM2.5 0.053 *AP-42, Sec. 13.2.4, Pg. 4, 11/06*

Construction Emissions

Activity	PM	PM10		PM2.5	
	ton/yr	lb/day	ton/yr	lb/day	ton/yr
Drill Pad and Temporary Road Construction	1.1	2.1	0.4	0.3	0.1

Wet Drilling Emission Calculations

Emission Factors

PM10 8.0E-5 lb/ton (material blasted) *AP-42, Table 11.19.2-2 (wet drilling), Rev. 8/04*

0.058 lb/hole

PM Scaling Factors

PM 0.74 *AP-42, Sec. 13.2.4-4, 11/06*

PM10 0.35 *AP-42, Sec. 13.2.4-4, 11/06*

PM2.5 0.053 *AP-42, Sec. 13.2.4-4, 11/06*

Wet Drilling Emissions

Activity	PM	PM10		PM2.5	
	ton/yr	lb/day	ton/yr	lb/day	ton/yr
Wet Drilling	0.0031	0.0079	0.0015	0.0012	0.00022

Surface Exploration Total Emissions

PM	PM10		PM2.5	
ton/yr	lb/day	ton/yr	lb/day	ton/yr
1.12	2.14	0.39	0.32	0.06

Emissions by Model ID [1]

		chk PM_TPY	chk PM10_PPD	chk PM10_TPY	chk PM2.5_PPD	chk PM2.5_TPY
		PM	PM10		PM2.5	
Model ID	Activity	ton/yr	lb/day	ton/yr	lb/day	ton/yr
WEP	Surface Exploration	1.12	2.14	0.39	0.32	0.06

Conversions

12 in/ft
2,000 lb/ton
12 mo/yr
1.341 hp/kW

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: K. Lewis/E. Memon
	PROJECT NO: 335-1-4	PAGE: 20 OF: 20 SHEET: Mine
AIR EMISSION CALCULATIONS	SUBJECT: Mining Activity and Emissions	DATE: June 22, 2020

Model Scenario W3

Underground Exploration

Activity Information

Operating schedule 365 day/yr

Wet drilling 25 holes/yr *(Midas Gold 2020)*

Wet Drilling Emission Calculations

Emission Factors

PM10 8.0E-5 lb/ton (material blasted) *AP-42, Table 11.19.2-2 (wet drilling), Rev. 8/04*

0.058 lb/hole

PM Scaling Factors

PM 0.74 *AP-42, Sec. 13.2.4-4, 11/06*

PM10 0.35 *AP-42, Sec. 13.2.4-4, 11/06*

PM2.5 0.053 *AP-42, Sec. 13.2.4-4, 11/06*

Wet Drilling Emissions

Activity	PM	PM10		PM2.5	
	ton/yr	lb/day	ton/yr	lb/day	ton/yr
Wet Drilling	0.0015	0.0040	0.0007	0.0006	0.00011

Source Parameters [1]

		TYPE	UTM_E_M	UTM_N_M	ELEV_M	RELHT_M	SIG_Y_M	SIG_Z_M	SXINIT_M	SYINIT_M
		Source	UTM NAD 83		Elev.	Rel. Ht.	S-y	S-z	Length	Width
~~Model ID~~	~~Activity~~	~~Type~~	~~E m~~	~~N m~~	~~m~~	~~m~~	~~m~~	~~m~~	~~m~~	~~m~~
UGEXP	*Scout Portal*	AREA	632,362	4,973,690	2018	0	0	0	4.88	4.88

UTM, Elev. - (Midas Gold 2017d)

Conversions

907,186 g/ton

2,000 lb/ton

3.28084 ft/m

Air Sciences Inc.	PROJECT TITLE: Stibnite Gold Project	BY: S. Pryor/E. Memon
	PROJECT NO: 335-1-4	PAGE: 1 OF: 2 SHEET: MineHg
AIR EMISSION CALCULATIONS	SUBJECT: Mining Fugitive Hg Emissions	DATE: June 22, 2020

Model Scenario W3

fug-lb/hr PPH | fug-lb/day PPD | fug-lb/yr PPY | fug-ton/yr TPY

Mining Fugitive Mercury Emissions Summary

		Emissions			
CAS No.	Pollutant/Group	lb/hr	lb/day	lb/yr	ton/yr
7439-97-6	Mercury	8.1E-4	1.9E-2	7.1E+0	3.5E-3
Total HAP		8.1E-4	1.9E-2	7.1E+0	3.5E-3

Conversions

2,000 lb/ton

1.10231 ton/t

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Model Scenario W3

Fugitive Mercury Emissions

Fugitive Mercury Flux and Emissions

CAS No.	Pollutant	Source	Area m²	Area ha	Hg Flux µg/m²-yr	Emissions[1] lb/hr	Emissions[1] lb/yr	Emissions[1] ton/yr
		Stockpiles	52,623	5.3	556	7.37E-6	6.5E-2	3.2E-5
		Rock Dumps	2,063,990	206.4	76.2	3.96E-5	0.35	1.7E-4
		Tailings	1,338,158	133.8	2,144	7.22E-4	6.32	3.2E-3
		Pits	1,160,519	116.1	132.3	3.86E-5	0.34	1.7E-4
7439-97-6	Mercury					8.1E-4	7.07	3.5E-3

[1] *Hourly emissions based o 8,760 hours per year of operation*

Fugitive Mercury Emission Factors

Source	Twin Creeks (TC) Hg Flux [1] µg/m²-yr	Twin Creeks (TC) Hg [2] µg/g	Ore Hg Adjusted µg/m²/yr TC	Stibnite Hg Flux [3] µg/m²-yr	Stibnite Hg [4] µg/g
Stockpiles	5,609	33	556	556	0.96
Rock Dumps	768	3.5	76.2	76.2	0.60
Tailings	21,621	33	2,144	2,144	0.96
Pits	1,334	9.5	132	132.3	0.60

[1] *(Eckley 2010) Table 1: Hg flux µg/m²-yr*

[2] *(Eckley 2010) Table 1: Average Hg flux mg/g: " Stockpiles - high-grade stockpiles, Rock Dumps - waste rock dumps, Tailings - high-grade stockpiles as a surrogate; Pits - pit"*

[3] *(Eckley 2010) Figure 2: log(y) = m*log(x) + b*

y = Hg Flux (ng/m²-d)

x = material Hg concentration (µg/g)]

Slope =	*Solar*	*TC*
	Low	*0.59*
	Medium	*0.6*
	High	~~*0.77*~~
	Average	*0.65*

[4] *(Midas Gold 2018e) Stockpiles - Ore, Rock Dumps - Rock, Tailings - Ore as a surrogate, Pits - Ore and Rock combined average*

Sample Calculation: $m = \log(y1/y2) / \log(x1/x2)$

m= 0.65 unit less
y1= 5,609 µg/m²-yr
x1= 33 µg/m²-yr
x2= 0.96 µg/m²-yr
log(x1/x2)= 1.5362427 unit less
log(y1/y2)= 1.0036786 unit less
y1/y2= 10.085062 unit less
y2= 556.2 µg/m²-yr

$$\frac{1\ \text{ng}}{\text{m2-d}} \left| \frac{\mu\text{g}}{1{,}000\ \text{ng}} \right| \frac{365\ \text{d}}{\text{yr}} = \frac{0.37\ \mu\text{g/m2-yr}}{\mu\text{g/g}}$$

Conversions

2,000 lb/ton
10,000 m2/ha
453.593 g/lb
1,000 ng/µg
365 day/yr

0.365 (µg/m²-yr) / (ng/m²-d)

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Conversions

60	sec/min				
60	min/hr				
24	hr/day				
365	day/yr				
8,760	hr/yr				
3,600	s/hr				
2,000	lb/ton				
453.593	g/lb				
3.28084	ft/m				
35.3147	ft^3/m^3				
7,000	gr/lb				
1.341	hp/kW				
7.05	lb/gal distillate oi	*AP-42 Appendix A "Weights of Selected Substances" (Distillate oil)*			
907.1858189	kg/ton				
459.67	°R at 0°F				
68	°F, standard				
7,000	BTU/hp-hr	*AP-42, Sec. 3.3, (Diesel)*			
2.2369	mi/hr per m/s				
7.48052	gal/ft^3				
1.10231	ton/t				
2.20462	lb/kg				
1609.34	m/mi				
137,000	BTU/gal	*AP-42, App. A (Diesel)*			
4046.9	m^2/acre				
43,560	ft^2/acre				
12	in/ft				
1.10231	ton/mt				
1.0E+6	g/mt				
3	ft/yd				
1.0E+6	scf/MMscf				
10,000	m^2/ha				
1,000	kg/mt				
273.15	°K at 0°C				
32	°F at 0°C				
1.8	°F/°C				
1,000	ng/µg				
0.293297222	MW-hr/MMBtu				
12	mo/yr				

Fuel Specifications

15	ppm S content	*40 CFR 80.510 (Non-road diesel)*	0.0015%	by weight
7.05	lb/gal-fuel	*AP-42, App. A*		
32.065	lb/lb-mol S, and			
64.06	lb/lb-mol SO2			
7,000	Btu/hp-hr	*AP-42, Sec. 3.3, (Diesel engine)*		
0.00939	MMBtu/kW-hr	*Diesel*		
0.137	MMBtu/gal	*AP-42, App. A (Diesel)*		
0.0915	MMBtu/gal Propane			

Constants

M.W. SO2	64.06
M.W. S	32.07
M.W. O	16

Diesel SO2

$$\frac{15\ \text{parts S}}{1.0E{+}06} \left| \frac{7.05\ \text{lb}}{\text{gal diesel}} \right| \frac{64.06\ \text{SO2}}{32.065\ \text{S}} \left| \frac{\text{gal}}{0.137\ \text{MMBtu}} \right| \frac{0.00939\ \text{MMBtu}}{\text{kW-hr}} \left| \frac{453.593\ \text{g}}{\text{lb}} \right. = 6.57E{-}03\ \frac{\text{g SO2}}{\text{kW-hr}}$$

Propane SO2 Calculation

$$\frac{185\ \text{lb S}}{1.00E{+}06\ \text{lb C3H8}} \left| \frac{44.08\ \text{lb C3H8}}{\text{lb mol}} \right| \frac{\text{lb mol}}{359.05\ \text{SCF (0C)}} \left| \frac{7{,}000\ \text{gr}}{\text{lb}} \right| \frac{100\ \text{SCF}}{100\text{SCF}} = 15.90\ \frac{\text{gr S}}{100\ \text{SCF}}$$

Propane heating value 91,500 *Btu/gal AP-42, Table 1.5-1 (07/08) Footnote a*

AP-42, Chapter 13.2.4 Particle Size Fractions

0.35	PM10
0.053	PM2.5

Fuel Combustion Exhaust Flow (EPA Method 19, Ffactor

Propane Heater

F-factor	8,710	dscf/MMBtu	Propane, dry
O2%dry	3	%	
Heat input	1	MMBtu/hr	
Standard exhaust flow	10,170	dscf/hr	
	169	dscfm	
Vol % moisture	15.0%	standard for propane boilers	
Temperature	360	°F, Engineering Toolbox* (LPG heating appliances)	
Pressure, site	0.79	atm	
Actual exhaust flow	394	acfm (wet)/MMBtu	

Diesel Engine

F-factor	9,190	dscf/MMBtu	Oil, dry
O2%dry	9	%	
Heat input	0.007	MMBtu/hp-hr	AP-42, Sec. 3.3, (Diesel engine)
Standard exhaust flow	113	dscf/hp-hr	
	1.9	dscfm/hp	2.5 dscfm/kW
Vol % moisture	8.0%	standard for diesel engines	
Temperature	1,100	°F, Engineering Toolbox* (diesel exhaust)	
Pressure, site	0.79	atm	
Actual exhaust flow	7.7	acfm (wet)/hp	10.3 acfm (wet)/kW

* *http://www.engineeringtoolbox.com/fuels-exhaust-temperatures-d_168.html*

Exhaust Parameters

dscfm acfm temp_F dia_ft

Source	Hourly Design Rate	Ref.	Water	Exhaust Parameters Flow dscfm	Flow acfm	Temp F	Velocity ft/s	Dia ft
Carbon Regeneration Kiln (Drum)	0.3 ton	*(NDEP 2017)*	1%	120	180	150	17	0.48
Electrowinning Cells and Pregnant Solution Ta	100 gpm	*(NDEP 2017)*	4%	2,660	3,740	100	79	1
Mercury Retort	0.5/batch	*(NDEP 2017)*	1%	16	20	150	5	0.29
Induction Melting Furnace	0.5/batch	*(NDEP 2017)*	1%	3,500	5,200	150	71	1.25
Autoclave	290 ton	*(APT 2013)*	83%	3,101	28,680	196	24	5
Sb Bagging		*(NDEP 2015b)*	0%	800	1,000	68	21	1
Limestone Ball Mill		*(NDEP 2010)*	0%	13,000	16,500	68	88	2
Parallel Flow Regenerative (PFR) Shaft Lime Kiln		*(NDEP 2010)*	4%	8,000	16,300	350	86	2
Lime Mill Crushing and associated transfers In and Out		*(NDEP 2010)*	0%	2,000	2,500	68	119	0.6667

Site Pressure Calculation

http://www.sensorsone.com/altitude-pressure-units-conversion/

6000	23.978	6531.9
7000	23.088	23.505
0	29.921	0.78556

Lime Kiln Specifications

810 *kcal/kg*	100 ton/day	*(Maerz 2018)*	3.96567 *btu/kcal*	
870 *kcal/kg*	400 ton/day	*(Maerz 2018)*		
870 *kcal/kg*	169 ton/day	*Midas Gold Kiln Throughput, maximum-case fuel assumption*		

Lime kiln heat requirements

870 kcal / kg	907.186 kg / ton	3.96567 Btu / kcal	MMBtu / 1.E+06 Btu	=	3.13 MMBtu / ton	

Dyno Nobel 2010 "Blasting and Explosives Quick Reference Guide"

Dyno Nobel 2010 "Blasting and Explosives Quick Reference Guide" (Ratio of total of blast volume to drilled hole volume)

(B*S*BH*N)/(PI()*D^2/4000*L)

		B - Drilled Burden (m)	=(25 to 40) x D
		S - Drilled Spacing (m)	=1.15 x B
BH	10 m	BH - Bench Height (m)	D/15
		N - Number of Holes in a Blast	
N	100	D - Hole Diameter (mm)	
		L - Hole Length	
D	0.15 m		
B	4.9 m		
S	5.6 m		
L	10 m		
V	27,330 m3		
Material density	150.2 lb/ft^3		*(Midas Gold 2017b), Average Ore & Waste (YP, HF, WE, BT)*
M	72,493 ton	724.9 ton/hole	

Enclosure Control Efficiency Calculation

Emission factor equation	$E = 0.0032k(U/5)^{1.3}/(M/2)^{1.4}$				*AP-42, Sec. 13.2.4, Eq. 1, 11/06*
U = Mean wind speed	5.167 mph	2.31 m/s			*(Midas Gold 2017f), Fig. 4-3 (2014 onsite meteorological data)*
U = Mean wind speed	1.3 mph				*Lowest wind speed for Eq. 1, AP-42, Sec. 13.2.4, Eq. 1, 11/06* M
= Moisture content	2.5 %				
	PM	PM10	PM2.5		
k = Particle size multiplier	0.74	0.35	0.053		*AP-42, Sec. 13.2.4, Pg. 4, 11/06*
E = Emission factor	0.00181	0.00086	0.00013	lb/ton	U = 5.167
E = Emission factor	0.00030	0.00014	0.00002	lb/ton	U = 1.300
Control Efficiency	83.4%	83.4%	83.4%		

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Fuel Burning Equipment Emissions

	Source	MMBtu/hr	Flow Rate dscfm	PM lb/hr	PM gr/dscf	PM Limit [1] gr/dscf	
Sb1	Sb Dryer (2.72 MMBtu/hr Propane-Fired)	2.72	461	0.021	0.005	0.015	In Compliance
ACB	POX Boiler (17 MMBtu/hr Propane-Fired)	17	2,881	0.130	0.005	0.015	In Compliance
CKB	Carbon Regeneration Kiln (Burners)	2.255	382	0.017	0.005	0.015	In Compliance
PV	Propane Vaporizer (0.1 MMBtu/hr Propane-Fired)	0.1	17	0.001	0.005	0.015	In Compliance
HS	Strip Circuit Solution Heater (5 MMBtu, Propane-Fired)	5	847	0.038	0.005	0.015	In Compliance
H1M	Mine Air Heater #1 (4 MMBtu/hr Propane-Fired)	4	678	0.031	0.005	0.015	In Compliance
H2M	Mine Air Heater #2 (4 MMBtu/hr Propane-Fired)	4	678	0.031	0.005	0.015	In Compliance
HM	Mill HVAC Heaters (4 x 1.0 MMBtu Propane-Fired)	4	678	0.031	0.005	0.015	In Compliance
HAC	Autoclave HVAC Heater (0.25 MMBtu Propane-Fired)	0.25	42	0.002	0.005	0.015	In Compliance
HR	Refinery HVAC Heater (0.25 MMBtu Propane-Fired)	0.25	42	0.002	0.005	0.015	In Compliance
HA	Admin HVAC Heater (0.25 MMBtu Propane-Fired)	0.25	42	0.002	0.005	0.015	In Compliance
HMO	Mine Ops. HVAC Heaters (2 x 0.25 MMBtu Propane-Fired)	0.5	85	0.004	0.005	0.015	In Compliance
HTS	Truck Shop HVAC Heaters (2 x 1.0 MMBtu Propane-Fired)	2	339	0.015	0.005	0.015	In Compliance
HW	Warehouse HVAC Heaters (3 x 1.0 MMBtu Propane-Fired)	3	508	0.023	0.005	0.015	In Compliance
LKC	PFR Shaft Lime Kiln Combustion	22.0	8,000	0.169	0.002	0.015	In Compliance
EDG1	Camp Emergency Generator (Mfr. Yr. >2007; diesel)	9.39	1,259	0.441	0.041	0.05	In Compliance
EDG2	Plant Emergency Generator #1 (Mfr. Yr. >2007; diesel)	9.39	1,259	0.441	0.041	0.05	In Compliance
EDG3	Plant Emergency Generator #2 (Mfr. Yr. >2007; diesel)	9.39	1,259	0.441	0.041	0.05	In Compliance
EDFP	Mill Fire Pump (Mfr. Yr. >2009; diesel)	1.88	252	0.088	0.041	0.05	In Compliance

[1] *58.01.01.676, Fuel Type: Gas, Emission Oxygen 3%*

Baghouse/Bin Vent Filter PM Emission Concentration

	Source	Control	Flow Rate dscfm	PM lb/hr	PM gr/dscf	PM10 lb/hr	PM10 gr/dscf
Sb2	Sb Bagging	Baghouse (BH1)	800	0.118	0.017	0.118	0.017
MF	Induction Melting Furnace	Baghouse (BH2)	3,500	2.839	0.095	2.839	0.095
LSBM	Limestone Ball Mill	Baghouse (BH3)	13,000	1.902	0.017	1.596	0.014
LK	Parallel Flow Regenerative (PFR) Shaft Lime Kiln	Baghouse (BH4)	8,000	0.915	0.013	0.915	0.013
LCR	Lime Mill Crushing and associated transfers In and Out	Baghouse (BH5)	2,000	0.284	0.017	0.239	0.014
LS1L	Mill Lime Silo #1 Loading	Bin Vent Filter	700	0.059	0.010	0.020	0.003
MillS2L	Mill Lime Silo #2 Loading	Bin Vent Filter	700	0.059	0.010	0.020	0.003
ACS1L	AC Lime Silo #1 Loading	Bin Vent Filter	1,400	0.119	0.010	0.041	0.003
ACS2L	AC Lime Silo #2 Loading	Bin Vent Filter	1,400	0.119	0.010	0.041	0.003
ACS3L	AC Lime Silo #3 Loading	Bin Vent Filter	1,400	0.119	0.010	0.041	0.003
ACS4L	AC Lime Silo #4 Loading	Bin Vent Filter	1,400	0.119	0.010	0.041	0.003
CS1L	Cement/Shotcrete Silo #1 Loading	Bin Vent Filter	930	0.079	0.010	0.027	0.003
CS2L	Cement/Shotcrete Silo #2 Loading	Bin Vent Filter	930	0.079	0.010	0.027	0.003
LSL	Pebble Lime Silo Loading via Bucket Elevator	Bin Vent Filter	70	0.006	0.010	0.006	0.010

Process Activity Uncontrolled Emissions

SOURCE DESCRIPTION		OPERATING LIMITS							EMISSION FACTORS								
Model	Source Description	Design Throughput						reference	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	unit	reference
ID		unit/hr	unit/day	unit/yr	units	Material	hr/yr										
OC1	Loader Transfer of Ore to Grizzly	1,042	25,000	9,125,000	ton	Ore	8,760	(Midas Gold 2016), Sec. 10.1	0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
OC2	Grizzly to Apron Feeder	1,042	25,000	9,125,000	ton	Ore	8,760	0	0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
OC3	Apron Feeder to Dribble Conveyor	1,042	25,000	9,125,000	ton	Ore	8,760	0	0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
OC4	Apron Feeder to Vibrating Grizzly	1,042	25,000	9,125,000	ton	Ore	8,760	0	0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
OC5	Dribble Conveyor to Vibrating Grizzly	1,042	25,000	9,125,000	ton	Ore	8,760	0	0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
OC6	Vibrating Grizzly to Primary Crusher or Coarse Ore Stockpile Feed Conveyor	1,042	25,000	9,125,000	ton	Ore	8,760	0	0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
OC7	Primary Crusher and Associated Transfers out to Coarse Ore Stockpile Feed Conveyor	1,042	25,000	9,125,000	ton	Ore	8,760	0	0.0054	0.0024	0.00036					lb/ton	AP-42, Table 11.19.2-2 (08/04) Tert. Crush - unctrl.; PM2.5 Ch. 13.2.4
OC8	Coarse Ore Stockpile Feed Conveyor Transfer to Stockpile	1,042	25,000	9,125,000	ton	Ore	8,760	0	0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
OC9	Stockpile Transfers to Reclaim Conveyors	1,150	27,600	10,074,000	ton	Ore	8,760	(M3 2017b)	0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
OC10	Reclaim Conveyors to SAG Mill Feed Conveyor	1,150	27,600	10,074,000	ton	Ore	8,760	0	0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
OC11	SAG Mill Feed Conveyor Transfer to SAG Mill	1,150	27,600	10,074,000	ton	Ore	8,760	0	0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
OC12	Pebble Crusher and Associated Transfers in (from SAG Mill) and out (to Pebble Discharge Conveyor)	1150.0	27,600	10,074,000	ton	Ore	8,760	0	0.0054	0.0024	0.00036					lb/ton	AP-42, Table 11.19.2-2 (08/04) Tert. Crush - unctrl.; PM2.5 Ch. 13.2.4
OC13	Pebble Discharge Conveyor to SAG Mill Feed Conveyor	1150.0	27,600	10,074,000	ton	Ore	8,760	0	0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
LS1L	Mill Lime Silo #1 Loading	60	250	4,375	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.73	0.47	0.07117					lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading; PM2.5 Ch. 13.2.4
LS1U	Mill Lime Silo #1 Unloading to SAG Mill Conveyor	20	250	4,375	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.00042					lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.; PM2.5 Ch. 13.2.4
MillS2L	Mill Lime Silo #2 Loading	60	250	4,375	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.73	0.47	0.07117					lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading; PM2.5 Ch. 13.2.4
MillS2U	Mill Lime Silo #2 Unloading to SAG Mill Conveyor	20	250	4,375	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.00042					lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.; PM2.5 Ch. 13.2.4
Sb1	Sb Dryer (2.72 MMBtu/hr Propane-Fired)	2.72	65.28	23,827	MMBtu	Propane	8,760	(M3 2017d)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
Sb2	Sb Bagging	4.5	108	39,420	ton	Stib. Conc.	8,760	(M3 2017d)	1.178	1.178	1.178					lb/hr	Based on NDEP-BAPC Permit for Clay Bagging Operation (Hectatone) (NDEP 2015b), Assumed 90% BH ctrl.
AC	Autoclave	290	6,960	2,540,400	ton	Float Conc.	8,760	(M3 2017b)	16.916667	16.91667	16.91667			0.6525		lb/hr	Based on NDEP-BAPC Permits/test data for Autoclaves: PM & SO2 - [Goldstrike (NDEP 2019)], Assumed 70% PM ctrl. Negligible CO due to no organic carbon in the feed (M3 2017a)
ACB	POX Boiler (17 MMBtu/hr Propane-Fired)	17	17	510	MMBtu	Propane	30	(M3 2017b)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Ind. Boilers; SO2 - 15.9 gr/100ft^3 & 91,500 Btu/gal
ACS1L	AC Lime Silo #1 Loading	120	1,000	17,500	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.73	0.47	0.07117					lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading; PM2.5 Ch. 13.2.4
ACS1U	AC Lime Silo #1 Unloading to Lime Slaker	20	480	17,500	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004					lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.; PM2.5 Ch. 13.2.4
ACS2L	AC Lime Silo #2 Loading	120	1,000	17,500	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.73	0.47	0.07117					lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading; PM2.5 Ch. 13.2.4
ACS2U	AC Lime Silo #2 Unloading to Lime Slaker	20	480	17,500	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004					lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.; PM2.5 Ch. 13.2.4
ACS3L	AC Lime Silo #3 Loading	120	1,000	17,500	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.73	0.47	0.07117					lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading; PM2.5 Ch. 13.2.4

SOURCE DESCRIPTION		HOURLY EMISSIONS							DAILY EMISSIONS							ANNUAL EMISSIONS						
Model ID	Source Description	PM lb/hr	PM_{10} lb/hr	$PM_{2.5}$ lb/hr	CO lb/hr	NOx lb/hr	SO_2 lb/hr	VOC lb/hr	PM lb/day	PM_{10} lb/day	$PM_{2.5}$ lb/day	CO lb/day	NOx lb/day	SO_2 lb/day	VOC lb/day	PM ton/yr	PM_{10} ton/yr	$PM_{2.5}$ ton/yr	CO ton/yr	NOx ton/yr	SO_2 ton/yr	VOC ton/yr
OC1	Loader Transfer of Ore to Grizzly	3.13	1.15	0.18					75.00	27.50	4.25					13.69	5.02	0.78				
OC2	Grizzly to Apron Feeder	3.13	1.15	0.18					75.00	27.50	4.25					13.69	5.02	0.78				
OC3	Apron Feeder to Dribble Conveyor	3.13	1.15	0.18					75.00	27.50	4.25					13.69	5.02	0.78				
OC4	Apron Feeder to Vibrating Grizzly	3.13	1.15	0.18					75.00	27.50	4.25					13.69	5.02	0.78				
OC5	Dribble Conveyor to Vibrating Grizzly	3.13	1.15	0.18					75.00	27.50	4.25					13.69	5.02	0.78				
OC6	Vibrating Grizzly to Primary Crusher or Coarse Ore Stockpile Feed Conveyor	3.13	1.15	0.18					75.00	27.50	4.25					13.69	5.02	0.78				
OC7	Primary Crusher and Associated Transfers out to Coarse Ore Stockpile Feed Conveyor	5.63	2.50	0.38					135	60.00	9.00					24.64	10.95	1.64				
OC8	Coarse Ore Stockpile Feed Conveyor Transfer to Stockpile	3.13	1.15	0.18					75.00	27.50	4.25					13.69	5.02	0.78				
OC9	Stockpile Transfers to Reclaim Conveyors	3.45	1.27	0.20					82.80	30.36	4.69					15.11	5.54	0.86				
OC10	Reclaim Conveyors to SAG Mill Feed Conveyor	3.45	1.27	0.20					82.80	30.36	4.69					15.11	5.54	0.86				
OC11	SAG Mill Feed Conveyor Transfer to SAG Mill	3.45	1.27	0.20					82.80	30.36	4.69					15.11	5.54	0.86				
OC12	Pebble Crusher and Associated Transfers in (from SAG Mill) and out (to Pebble Discharge Conveyor)	6.21	2.76	0.41					149	66.24	9.94					27.20	12.09	1.81				
OC13	Pebble Discharge Conveyor to SAG Mill Feed Conveyor	3.45	1.27	0.20					82.80	30.36	4.69					15.11	5.54	0.86				
LS1L	Mill Lime Silo #1 Loading	43.80	28.20	4.27					183	118	17.79					1.60	1.03	0.16				
LS1U	Mill Lime Silo #1 Unloading to SAG Mill Conveyor	9.60E-2	5.60E-2	8.40E-3					1.20	0.70	0.11					1.05E-2	6.13E-3	9.19E-4				
MillS2L	Mill Lime Silo #2 Loading	43.80	28.20	4.27					183	118	17.79					1.60	1.03	0.16				
MillS2U	Mill Lime Silo #2 Unloading to SAG Mill Conveyor	9.60E-2	5.60E-2	8.40E-3					1.20	0.70	0.11					1.05E-2	6.13E-3	9.19E-4				
Sb1	Sb Dryer (2.72 MMBtu/hr Propane-Fired)	2.08E-2	2.08E-2	2.08E-2	0.22	0.39	4.73E-2	2.38E-2	0.50	0.50	0.50	5.35	9.27	1.13	0.57	9.11E-2	9.11E-2	9.11E-2	0.98	1.69	0.21	0.10
Sb2	Sb Bagging	1.18	1.18	1.18					28.27	28.27	28.27					5.16	5.16	5.16				
AC	Autoclave	16.92	16.92	16.92			0.65		406	406	406			15.66		74.10	74.10	74.10			2.86	
ACB	POX Boiler (17 MMBtu/hr Propane-Fired)	0.13	0.13	0.13	1.39	2.42	0.30	0.15	0.13	0.13	0.13	1.39	2.42	0.30	0.15	1.95E-3	1.95E-3	1.95E-3	2.09E-2	3.62E-2	4.43E-3	2.23E-3
ACS1L	AC Lime Silo #1 Loading	87.60	56.40	8.54					730	470	71.17					6.39	4.11	0.62				
ACS1U	AC Lime Silo #1 Unloading to Lime Slaker	9.60E-2	5.60E-2	8.00E-3					2.30	1.34	0.19					4.20E-2	2.45E-2	3.50E-3				
ACS2L	AC Lime Silo #2 Loading	87.60	56.40	8.54					730	470	71.17					6.39	4.11	0.62				
ACS2U	AC Lime Silo #2 Unloading to Lime Slaker	9.60E-2	5.60E-2	8.00E-3					2.30	1.34	0.19					4.20E-2	2.45E-2	3.50E-3				
ACS3L	AC Lime Silo #3 Loading	87.60	56.40	8.54					730	470	71.17					6.39	4.11	0.62				

SOURCE DESCRIPTION		OPERATING LIMITS							EMISSION FACTORS								
Model	Source Description	Design Throughput						reference	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	unit	reference
ID		unit/hr	unit/day	unit/yr	units	Material	hr/yr										
ACS3U	AC Lime Silo #3 Unloading to Lime Slaker	20	480	17,500	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004					lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.; PM2.5 Ch. 13.2.4
ACS4L	AC Lime Silo #4 Loading	120	500	8,750	ton	Lime	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.73	0.47	0.07117					lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading; PM2.5 Ch. 13.2.4
ACS42U	AC Lime Silo #4 Unloading to Lime Slaker	20	480	8,750	ton	Lime	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004					lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.; PM2.5 Ch. 13.2.4
CKD	Carbon Regeneration Kiln (Drum)	0.3	7.2	2,628	ton	Carbon	8,760	(M3 2017b)	1.4	1.4	1.4	0.12	0.012		0.11	lb/hr	Based on NDEP-BAPC Permit for Carbon Regeneration Kiln [Goldstrike (NDEP 2019)], Assumed 70% PM ctrl
CKB	Carbon Regeneration Kiln (Burners)	2.255	54.12	19,754	MMBtu	Propane	8,760	(M3 2017b)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft³ & 91,500 Btu/gal
EW	Electrowinning Cells and Pregnant Solution Tank	100 gpm	24		gpm	Au Sol.	8,760	Typical Ind. Oper.	0.07	0.07	0.07					lb/hr	Based on similar source stack test data and 5× safety factor (APT 2016)
MR	Mercury Retort	0.5/batch	24 hr	21	ton	Au Conc.	1,248	(M3 2017b) & (M3 2017a)	0.01	0.01	0.01					lb/hr	Based on similar source stack test data and 5× safety factor (APT 2017)
MF	Induction Melting Furnace	0.5/batch	12 hr	21	ton	Au Conc.	624	(M3 2017b) & (M3 2017a)	5.68	5.68	5.68					lb/hr	Based on IDAPA 58.01.01.701 PM Weight Limit. Assumed unctrl = 2 x ctrl
EDG1	Camp Emergency Generator (Mfr. Yr. >2007; diesel)	1000	1 hr	100,000	bkW	Diesel	100	(M3 2017a)	0.2	0.2	0.2	3.5	6.4	0.00657	1.3	g/kW-hr	40 CFR Subpart 60.4202(a)(2); SO2 - mass balance (15ppm ULSD) (CFR 2018a)
EDG2	Plant Emergency Generator #1 (Mfr. Yr. >2007; diesel)	1000	1 hr	100,000	bkW	Diesel	100	(M3 2017a)	0.2	0.2	0.2	3.5	6.4	0.00657	1.3	g/kW-hr	40 CFR Subpart 60.4202(a)(2); SO2 - mass balance (15ppm ULSD) (CFR 2018a)
EDG3	Plant Emergency Generator #2 (Mfr. Yr. >2007; diesel)	1000	1 hr	100,000	bkW	Diesel	100	(M3 2017a)	0.2	0.2	0.2	3.5	6.4	0.00657	1.3	g/kW-hr	40 CFR Subpart 60.4202(a)(2); SO2 - mass balance (15ppm ULSD) (CFR 2018a)
EDFP	Mill Fire Pump (Mfr. Yr. >2009; diesel)	200	1 hr	20,000	bkW	Diesel	100	Typical Ind. Oper.	0.2	0.2	0.2	3.5	4	0.00657	4	g/kW-hr	Table 4 to ubpart IIII of Part 60- 30::KW<22 (:: P<300 D2 l ma bala e (ppm 2018a)
PV	Propane Vaporizer (0.1 MMBtu/hr Propane-Fired)	0.10	2.4	876	MMBtu	Propane	8,760	(M3 2017a)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft³ & 91,500 Btu/gal
HS	Strip Circuit Solution Heater (5 MMBtu, Propane-Fired)	5.00	120	43,800	MMBtu	Propane	8,760	(M3 2017b)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft³ & 91,500 Btu/gal
H1M	Mine Air Heater #1 (4 MMBtu/hr Propane-Fired)	4.00	96	35,040	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft³ & 91,500 Btu/gal
H2M	Mine Air Heater #2 (4 MMBtu/hr Propane-Fired)	4.00	96	35,040	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft³ & 91,500 Btu/gal
HM	Mill HVAC Heaters (4 x 1.0 MMBtu Propane-Fired)	4.00	96	35,040	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft³ & 91,500 Btu/gal
HAC	Autoclave HVAC Heater (0.25 MMBtu Propane-Fired)	0.25	6	2,190	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft³ & 91,500 Btu/gal
HR	Refinery HVAC Heater (0.25 MMBtu Propane-Fired)	0.25	6	2,190	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft³ & 91,500 Btu/gal
HA	Admin HVAC Heater (0.25 MMBtu Propane-Fired)	0.25	6	2,190	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft³ & 91,500 Btu/gal
HMO	Mine Ops. HVAC Heaters (2 x 0.25 MMBtu Propane-Fired)	0.50	12	4,380	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft³ & 91,500 Btu/gal
HTS	Truck Shop HVAC Heaters (2 x 1.0 MMBtu Propane-Fired)	2.00	48	17,520	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft³ & 91,500 Btu/gal
HW	Warehouse HVAC Heaters (3 x 1.0 MMBtu Propane-Fired)	3.00	72	26,280	MMBtu	Propane	8,760	Typical Ind. Oper.	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft³ & 91,500 Btu/gal
PSL	Prill Silos Loading (2 x 100 ton)	200	200	7,300	ton	Prill	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.02	0.007	0.00106					lb/ton	AP-42, Table 8.3-2 (7/93), Bulk Loading - unctrl; PM10/PM2.5 Ch. 13.2.4
PSU	Prill Silos Unloading (2 x 100 ton)	200	200	7,300	ton	Prill	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide silo capacity)	0.02	0.007	0.00106					lb/ton	AP-42, Table 8.3-2 (7/93), Bulk Loading - unctrl; PM10/PM2.5 Ch. 13.2.4
CS1L	Cement/Shotcrete Silo #1 Loading	80	80	60,000	ton	Cement	8,760	Typical Ind. Oper.	0.73	0.47	0.07117					lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading; PM2.5 Ch. 13.2.4
CS1U	Cement/Shotcrete Silo #1 Unloading	20	80	60,000	ton	Cement	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004					lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.; PM2.5 Ch. 13.2.4.
CS2L	Cement/Shotcrete Silo #2 Loading	80	80	60,000	ton	Cement	8,760	Typical Ind. Oper.	0.73	0.47	0.07117					lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading; PM2.5 Ch. 13.2.4
CS2U	Cement/Shotcrete Silo #2 Unloading	20	80	60,000	ton	Cement	8,760	Typical Ind. Oper.	0.0048	0.0028	0.0004					lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.; PM2.5 Ch. 13.2.4.
CAL	Aggregate Bin Loading	100	2,400	500,000	ton	Aggregate	8,760	Typical Ind. Oper.	0.0069	0.0033	0.0005					lb/ton	AP-42, Table 11.12-2 (6/06), pneumatic loading-ctrl.; PM2.5 Ch. 13.2.4.
CAU	Aggregate Bin Unloading	100	2,400	500,000	ton	Aggregate	8,760	Typical Ind. Oper.	0.0069	0.0033	0.0005					lb/ton	AP-42, Table 11.12-2 (6/06), weigh hopper loading-unctrl.; PM2.5 Ch. 13.2.4.
CM	Central Mixer Loading	20 (120)	80 (2,480)	60,000 (560K)	ton-cement (tot)	Cement (mix)	8,760	Typical Ind. Oper.	0.572	0.156	0.0236					lb/ton	AP-42, Table 11.12-2 (6/06), central mixer

SOURCE DESCRIPTION		HOURLY EMISSIONS							DAILY EMISSIONS							ANNUAL EMISSIONS						
Model	Source Description	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC
ID		lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
ACS3U	AC Lime Silo #3 Unloading to Lime Slaker	9.60E-2	5.60E-2	8.00E-3					2.30	1.34	0.19					4.20E-2	2.45E-2	3.50E-3				
ACS4L	AC Lime Silo #4 Loading	87.60	56.40	8.54					365	235	35.59					3.19	2.06	0.31				
ACS42U	AC Lime Silo #4 Unloading to Lime Slaker	9.60E-2	5.60E-2	8.00E-3					2.30	1.34	0.19					2.10E-2	1.23E-2	1.75E-3				
CKD	Carbon Regeneration Kiln (Drum)	1.40	1.40	1.40	0.12	1.20E-2		0.11	33.60	33.60	33.60	2.88	0.29	0.00E+0	2.64	6.13	6.13	6.13	0.53	5.26E-2		0.48
CKB	Carbon Regeneration Kiln (Burners)	1.73E-2	1.73E-2	1.73E-2	0.18	0.32	3.92E-2	1.97E-2	0.41	0.41	0.41	4.44	7.69	0.94	0.47	7.56E-2	7.56E-2	7.56E-2	0.81	1.40	0.17	8.64E-2
EW	Electrowinning Cells and Pregnant Solution Tank																					
MR	Mercury Retort																					
MF	Induction Melting Furnace	5.68	5.68	5.68					68.14	68.14	68.14					1.77	1.77	1.77				
EDG1	Camp Emergency Generator (Mfr. Yr. >2007; diesel)	0.44	0.44	0.44	7.72	14.11	1.45E-2	2.87	0.44	0.44	0.44	7.72	14.11	1.45E-2	2.87	2.20E-2	2.20E-2	2.20E-2	0.39	0.71	7.24E-4	0.14
EDG2	Plant Emergency Generator #1 (Mfr. Yr. >2007; diesel)	0.44	0.44	0.44	7.72	14.11	1.45E-2	2.87	0.44	0.44	0.44	7.72	14.11	1.45E-2	2.87	2.20E-2	2.20E-2	2.20E-2	0.39	0.71	7.24E-4	0.14
EDG3	Plant Emergency Generator #2 (Mfr. Yr. >2007; diesel)	0.44	0.44	0.44	7.72	14.11	1.45E-2	2.87	0.44	0.44	0.44	7.72	14.11	1.45E-2	2.87	2.20E-2	2.20E-2	2.20E-2	0.39	0.71	7.24E-4	0.14
EDFP	Mill Fire Pump (Mfr. Yr. >2009; diesel)	8.82E-2	8.82E-2	8.82E-2	1.54	1.76	2.90E-3	1.76	8.82E-2	8.82E-2	8.82E-2	1.54	1.76	2.90E-3	1.76	4.41E-3	4.41E-3	4.41E-3	7.72E-2	8.82E-2	1.45E-4	8.82E-2
PV	Propane Vaporizer (0.1 MMBtu/hr Propane-Fired)	7.65E-4	7.65E-4	7.65E-4	8.20E-3	1.42E-2	1.74E-3	8.74E-4	1.84E-2	1.84E-2	1.84E-2	0.20	0.34	4.17E-2	2.10E-2	3.35E-3	3.35E-3	3.35E-3	3.59E-2	6.22E-2	7.61E-3	3.83E-3
HS	Strip Circuit Solution Heater (5 MMBtu, Propane-Fired)	3.83E-2	3.83E-2	3.83E-2	0.41	0.71	8.69E-2	4.37E-2	0.92	0.92	0.92	9.84	17.05	2.09	1.05	0.17	0.17	0.17	1.80	3.11	0.38	0.19
H1M	Mine Air Heater #1 (4 MMBtu/hr Propane-Fired)	3.06E-2	3.06E-2	3.06E-2	0.33	0.57	6.95E-2	3.50E-2	0.73	0.73	0.73	7.87	13.64	1.67	0.84	0.13	0.13	0.13	1.44	2.49	0.30	0.15
H2M	Mine Air Heater #2 (4 MMBtu/hr Propane-Fired)	3.06E-2	3.06E-2	3.06E-2	0.33	0.57	6.95E-2	3.50E-2	0.73	0.73	0.73	7.87	13.64	1.67	0.84	0.13	0.13	0.13	1.44	2.49	0.30	0.15
HM	Mill HVAC Heaters (4 x 1.0 MMBtu Propane-Fired)	3.06E-2	3.06E-2	3.06E-2	0.33	0.57	6.95E-2	3.50E-2	0.73	0.73	0.73	7.87	13.64	1.67	0.84	0.13	0.13	0.13	1.44	2.49	0.30	0.15
HAC	Autoclave HVAC Heater (0.25 MMBtu Propane-Fired)	1.91E-3	1.91E-3	1.91E-3	2.05E-2	3.55E-2	4.34E-3	2.19E-3	4.59E-2	4.59E-2	4.59E-2	0.49	0.85	0.10	5.25E-2	8.38E-3	8.38E-3	8.38E-3	8.98E-2	0.16	1.90E-2	9.57E-3
HR	Refinery HVAC Heater (0.25 MMBtu Propane-Fired)	1.91E-3	1.91E-3	1.91E-3	2.05E-2	3.55E-2	4.34E-3	2.19E-3	4.59E-2	4.59E-2	4.59E-2	0.49	0.85	0.10	5.25E-2	8.38E-3	8.38E-3	8.38E-3	8.98E-2	0.16	1.90E-2	9.57E-3
HA	Admin HVAC Heater (0.25 MMBtu Propane-Fired)	1.91E-3	1.91E-3	1.91E-3	2.05E-2	3.55E-2	4.34E-3	2.19E-3	4.59E-2	4.59E-2	4.59E-2	0.49	0.85	0.10	5.25E-2	8.38E-3	8.38E-3	8.38E-3	8.98E-2	0.16	1.90E-2	9.57E-3
HMO	Mine Ops. HVAC Heaters (2 x 0.25 MMBtu Propane-Fired)	3.83E-3	3.83E-3	3.83E-3	4.10E-2	7.10E-2	8.69E-3	4.37E-3	9.18E-2	9.18E-2	9.18E-2	0.98	1.70	0.21	0.10	1.68E-2	1.68E-2	1.68E-2	0.18	0.31	3.81E-2	1.91E-2
HTS	Truck Shop HVAC Heaters (2 x 1.0 MMBtu Propane-Fired)	1.53E-2	1.53E-2	1.53E-2	0.16	0.28	3.48E-2	1.75E-2	0.37	0.37	0.37	3.93	6.82	0.83	0.42	6.70E-2	6.70E-2	6.70E-2	0.72	1.24	0.15	7.66E-2
HW	Warehouse HVAC Heaters (3 x 1.0 MMBtu Propane-Fired)	2.30E-2	2.30E-2	2.30E-2	0.25	0.43	5.21E-2	2.62E-2	0.55	0.55	0.55	5.90	10.23	1.25	0.63	0.10	0.10	0.10	1.08	1.87	0.23	0.11
PSL	Prill Silos Loading (2 x 100 ton)	4.00	1.40	0.21					4.00	1.40	0.21					7.30E-2	2.56E-2	3.87E-3				
PSU	Prill Silos Unloading (2 x 100 ton)	4.00	1.40	0.21					4.00	1.40	0.21					7.30E-2	2.56E-2	3.87E-3				
CS1L	Cement/Shotcrete Silo #1 Loading	58.40	37.60	5.69					58.40	37.60	5.69					21.90	14.10	2.14				
CS1U	Cement/Shotcrete Silo #1 Unloading	9.60E-2	5.60E-2	8.00E-3					0.38	0.22	3.20E-2					0.14	8.40E-2	1.20E-2				
CS2L	Cement/Shotcrete Silo #2 Loading	58.40	37.60	5.69					58.40	37.60	5.69					21.90	14.10	2.14				
CS2U	Cement/Shotcrete Silo #2 Unloading	9.60E-2	5.60E-2	8.00E-3					0.38	0.22	3.20E-2					0.14	8.40E-2	1.20E-2				
CAL	Aggregate Bin Loading	0.69	0.33	5.00E-2					16.56	7.92	1.20					1.73	0.83	0.13				
CAU	Aggregate Bin Unloading	0.69	0.33	5.00E-2					16.56	7.92	1.20					1.73	0.83	0.13				
CM	Central Mixer Loading	11.44	3.12	0.47					45.76	12.48	1.89					17.16	4.68	0.71				

SOURCE DESCRIPTION		OPERATING LIMITS							EMISSION FACTORS								
Model	Source Description	Design Throughput						reference	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	unit	reference
ID		unit/hr	unit/day	unit/yr	units	Material	hr/yr										
TG1	Mine Site Gasoline Tank #1			250,000	gal	Gasoline	8,760	(Midas Gold 2016), Table 12-4, annual use.							0.219	lb/hr	EPA Tanks 4.0.9d
TG2	Mine Site Gasoline Tank #2			250,000	gal	Gasoline	8,760	(Midas Gold 2016), Sec. 12.3 (facility-wide tank capacity)							0.219	lb/hr	EPA Tanks 4.0.9d
TD3	Mine Site Diesel Tank #3			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018c)							0.002	lb/hr	EPA Tanks 4.0.9d
TD4	Mine Site Diesel Tank #4			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018c)							0.002	lb/hr	EPA Tanks 4.0.9d
TD5	Mine Site Diesel Tank #5			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018c)							0.002	lb/hr	EPA Tanks 4.0.9d
TD6	Mine Site Diesel Tank #6			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018c)							0.002	lb/hr	EPA Tanks 4.0.9d
TD7	Mine Site Diesel Tank #7			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018c)							0.002	lb/hr	EPA Tanks 4.0.9d
TD8	Mine Site Diesel Tank #8			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018c)							0.002	lb/hr	EPA Tanks 4.0.9d
TD9	Mine Site Diesel Tank #9			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018c)							0.002	lb/hr	EPA Tanks 4.0.9d
TD10	Mine Site Diesel Tank #10			725,000	gal	Diesel	8,760	(Midas Gold 2016), (Midas Gold 2018c)							0.002	lb/hr	EPA Tanks 4.0.9d
PCSP1	Portable Crushing and Screening Plant 1 (2 crushers (primary and secondary), 2 screens (primary and secondary), and 5 conveyor transfers)	83	2,000	730,000	ton	Aggregate	8,760	(Midas Gold 2019c)	0.0758	0.0277	0.00421					lb/ton	AP-42, Table 11.19.2-2 (08/04): Tert. Crushing - ctrl. × 2 + Screening - ctrl. × 2 + Conv. Transfer - ctrl. × 5
PCSP2	Portable Crushing and Screening Plant 2 (2 crushers (primary and secondary), 2 screens (primary and secondary), and 5 conveyor transfers)	83	2,000	730,000	ton	Aggregate	8,760	(Midas Gold 2019c)	0.0758	0.0277	0.00421					lb/ton	AP-42, Table 11.19.2-2 (08/04): Tert. Crushing - ctrl. × 2 + Screening - ctrl. × 2 + Conv. Transfer - ctrl. × 5
TRUE LIME PRODUCTION																	
LS1	Limestone transfer to Primary Crusher Hopper	47.08	1,130	317,907	ton	Limestone	8,760	(Midas Gold 2018d)	0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
LS2	Primary Crushing and Associated Transfers In and Out	47.08	1,130	317,907	ton	Limestone	8,760		0.0054	0.0024	0.00036					lb/ton	AP-42, Table 11.19.2-2 (08/04) Tert. Crush - unctrl.; PM2.5 Ch. 13.2.4
LS3	Primary Screening and Associated Transfers In and Out	47.08	1,130	317,907	ton	Limestone	8,760		0.025	0.0087	0.00132					lb/ton	AP-42, Table 11.19.2-2 (08/04) Screening - unctrl.; PM2.5 Ch. 13.2.4
LS4	Secondary Crushing and Associated Transfers In and Out	47.08	1,130	317,907	ton	Limestone	8,760		0.0054	0.0024	0.00036					lb/ton	AP-42, Table 11.19.2-2 (08/04) Tert. Crush - unctrl.; PM2.5 Ch. 13.2.4
LS5	Secondary Screening and Associated Transfers In and Out	47.08	1,130	317,907	ton	Limestone	8,760		0.025	0.0087	0.00132					lb/ton	AP-42, Table 11.19.2-2 (08/04) Screening - unctrl.; PM2.5 Ch. 13.2.4
LS6	Limestone transfer to Ball Mill Feed Bin	47.08	1,130	317,907	ton	Limestone	8,760	0	0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
LS7	Limestone transfer to Ball Mill Feed Conveyor	47.08	1,130	317,907	ton	Limestone	8,760		0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
LS8	Ball Mill Feed transfer to Ball Mill	47.08	1,130	317,907	ton	Limestone	8,760	0	0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
LSBM	Limestone Ball Mill	47.08	1,130	317,907	ton	Limestone	8,760		0.404	0.339	0.121					lb/ton	AP-42, Table 11.19.2-4 (08/04) Dry Grind. with Fabric Filter, Assumed 90% BH ctrl
LS9	Limestone transfer to Kiln Feed Bin	11.13	267	82,688	ton	Limestone	8,760		0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
LS10	Limestone transfer to Lime Kiln Feed Conveyor	11.13	267	82,688	ton	Limestone	8,760		0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
LS11	Fines Screening and Associated Transfers In and Out	11.13	267	82,688	ton	Limestone	8,760		0.025	0.0087	0.00132					lb/ton	AP-42, Table 11.19.2-2 (08/04) Screening - unctrl.; PM2.5 Ch. 13.2.4
LS12	Kiln Feed transfer to PFR Shaft Lime Kiln	11.13	267	82,688	ton	Limestone	8,760	(Midas Gold 2018d)	0.003	0.0011	0.00017					lb/ton	AP-42, Table 11.19.2-2 (08/04) Conv. Xfer - unctrl.; PM2.5 Ch. 13.2.4
LK	Parallel Flow Regenerative (PFR) Shaft Lime Kiln	7.04	169	52,377	ton	Lime	8,760	(Midas Gold 2018d)	1.3	1.3	1.3	0.45	0.24	0.0012		lb/ton	AP-42 Tables 11.17-2, 6 : Gas-Fired Parallel Flow Regenetive Kiln with Fabric Filter (PM = 5x EF), Assumed 90% BH ctrl.
LKC	PFR Shaft Lime Kiln Combustion	22.04	529	163,935	MMBtu	Propane	8,760	Based on 870 kcal/kg (Maerz 2018)	0.00765	0.00765	0.00765	0.0820	0.142	0.01738	0.00874	lb/MMBtu	AP-42, Table 1.5-1 (07/08) Com. Boilers; SO2 - 15.9 gr/100ft³ & 91,500 Btu/gal
LCR	Lime Mill Crushing and associated transfers In and Out	7.04	169	52,377	ton	Lime	8,760		0.404	0.339	0.121					lb/ton	AP-42, Table 11.19.2-4 (08/04) Dry Grind. with Fabric Filter, Assumed 90% BH ctrl.
LSL	Pebble Lime Silo Loading via Bucket Elevator	7.04	169	52,377	ton	Lime	8,760		0.0088	0.0088	0.0088					lb/ton	AP-42 Table 11.17-4: Crushed Material Conveyor Transfer with Fabric Filter (PM = 10 x EF), Assumed 90% BHctrl.
LSU	Pebble Lime Silo discharge to Lime Slaker	7.04	169	52,377	ton	Lime	8,760		0.00088	0.00088	0.00088					lb/ton	AP-42 Table 11.17-4: Crushed Material Conveyor Transfer with Fabric Filter, Assumed 90% BH ctrl.
Total																	

SOURCE DESCRIPTION		HOURLY EMISSIONS							DAILY EMISSIONS							ANNUAL EMISSIONS						
Model	Source Description	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC	PM	PM_{10}	$PM_{2.5}$	CO	NOx	SO_2	VOC
ID		lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
TG1	Mine Site Gasoline Tank #1							0.22							5.25							0.96
TG2	Mine Site Gasoline Tank #2							0.22							5.25							0.96
TD3	Mine Site Diesel Tank #3							1.67E-3							4.00E-2							7.30E-3
TD4	Mine Site Diesel Tank #4							1.67E-3							4.00E-2							7.30E-3
TD5	Mine Site Diesel Tank #5							1.67E-3							4.00E-2							7.30E-3
TD6	Mine Site Diesel Tank #6							1.67E-3							4.00E-2							7.30E-3
TD7	Mine Site Diesel Tank #7							1.67E-3							4.00E-2							7.30E-3
TD8	Mine Site Diesel Tank #8							1.67E-3							4.00E-2							7.30E-3
TD9	Mine Site Diesel Tank #9							1.67E-3							4.00E-2							7.30E-3
TD10	Mine Site Diesel Tank #10							1.67E-3							4.00E-2							7.30E-3
PCSP1	Portable Crushing and Screening Plant 1 (2 crushers (primary and secondary), 2 screens (primary and secondary), and 5 conveyor transfers)	6.32	2.31	0.35					152	55.40	8.42					27.67	10.11	1.54				
PCSP2	Portable Crushing and Screening Plant 2 (2 crushers (primary and secondary), 2 screens (primary and secondary), and 5 conveyor transfers)	6.32	2.31	0.35					152	55.40	8.42					27.67	10.11	1.54				
TRUE LIME PRODUCTION																						
LS1	Limestone transfer to Primary Crusher Hopper	0.14	5.18E-2	8.00E-3					3.39	1.24	0.19					0.48	0.17	2.70E-2				
LS2	Primary Crushing and Associated Transfers In and Out	0.25	0.11	1.69E-2					6.10	2.71	0.41					0.86	0.38	5.72E-2				
LS3	Primary Screening and Associated Transfers In and Out	1.18	0.41	6.21E-2					28.25	9.83	1.49					3.97	1.38	0.21				
LS4	Secondary Crushing and Associated Transfers In and Out	0.25	0.11	1.69E-2					6.10	2.71	0.41					0.86	0.38	5.72E-2				
LS5	Secondary Screening and Associated Transfers In and Out	1.18	0.41	6.21E-2					28.25	9.83	1.49					3.97	1.38	0.21				
LS6	Limestone transfer to Ball Mill Feed Bin	0.14	5.18E-2	8.00E-3					3.39	1.24	0.19					0.48	0.17	2.70E-2				
LS7	Limestone transfer to Ball Mill Feed Conveyor	0.14	5.18E-2	8.00E-3					3.39	1.24	0.19					0.48	0.17	2.70E-2				
LS8	Ball Mill Feed transfer to Ball Mill	0.14	5.18E-2	8.00E-3					3.39	1.24	0.19					0.48	0.17	2.70E-2				
LSBM	Limestone Ball Mill	19.02	15.96	5.70					456	383	137					64.22	53.89	19.23				
LS9	Limestone transfer to Kiln Feed Bin	3.34E-2	1.22E-2	1.89E-3					0.80	0.29	4.54E-2					0.12	4.55E-2	7.03E-3				
LS10	Limestone transfer to Lime Kiln Feed Conveyor	3.34E-2	1.22E-2	1.89E-3					0.80	0.29	4.54E-2					0.12	4.55E-2	7.03E-3				
LS11	Fines Screening and Associated Transfers In and Out	0.28	9.68E-2	1.47E-2					6.68	2.32	0.35					1.03	0.36	5.46E-2				
LS12	Kiln Feed transfer to PFR Shaft Lime Kiln	3.34E-2	1.22E-2	1.89E-3					0.80	0.29	4.54E-2					0.12	4.55E-2	7.03E-3				
LK	Parallel Flow Regenerative (PFR) Shaft Lime Kiln	9.15	9.15	9.15	3.17	1.69	8.45E-3		220	220	220	76.05	40.56	0.20		34.05	34.05	34.05	11.78	6.29	3.14E-2	
LKC	PFR Shaft Lime Kiln Combustion	0.17	0.17	0.17	1.81	3.13	0.38	0.19	4.05	4.05	4.05	43.36	75.15	9.19	4.62	0.63	0.63	0.63	6.72	11.65	1.42	0.72
LCR	Lime Mill Crushing and associated transfers In and Out	2.84	2.39	0.85					68.28	57.29	20.45					10.58	8.88	3.17				
LSL	Pebble Lime Silo Loading via Bucket Elevator	6.20E-2	6.20E-2	6.20E-2					1.49	1.49	1.49					0.23	0.23	0.23				
LSU	Pebble Lime Silo discharge to Lime Slaker	6.20E-3	6.20E-3	6.20E-3					0.15	0.15	0.15					2.30E-2	2.30E-2	2.30E-2				
Total		**699**	**443**	**102**	**33.50**	**55.37**	**1.88**	**11.51**	**5,964**	**3,786**	**1,316**	**204**	**259**	**37.21**	**34.53**	**565**	**342**	**169**	**30.45**	**37.85**	**6.48**	**4.78**

F-3: Review and Rationale for Selected Air Emission Factors

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Appendix F-3

Review and Rationale for Selected Air Emission Factors

Stibnite Gold Project

In the report *Air Quality Analysis*, prepared by Air Sciences Incorporated for Midas Gold Idaho, Inc. (Air Sciences 2018) and in the modeling report provided to support the Permit to Construct application to IDEQ (Air Sciences 2020) a variety of published air emission factors were used to quantify pollutant emissions from the Project sources. This discussion will review the selection of emission factors, as tabulated in Tables 4 through 9 in *Air Quality Analysis*, which are excerpted from that report and provided in **Appendix F-1**.

The estimation of air pollutant emissions for the action alternatives considered a number of factors to derive an inventory to support the analysis of impacts:

- Construction and operation methods (e.g., earthmoving, material loading, open-pit mining, gold extraction processes);
- Design criteria (e.g., equipment type and size, hauling distances);
- Emission abatement techniques (e.g., watering, baghouse, carbon filter);
- Material characteristics (e.g., moisture content, silt content, density); and
- Site characteristics (e.g., wind, precipitation).

Activity-specific (e.g., drilling, blasting, material crushing and conveying, refining, and other ancillary sources) emissions were estimated based on the maximum activity rates during each life-of-mine year, coupled with applicable emission estimation techniques. Maximum emissions were calculated on a short-term (hourly and daily) and a long-term (annual) basis for ore processing, mining operations, and construction activities. The full inventory of emissions for Alternative 1 and Alternative 2 (lime kiln operation) are provided in **Appendices A** and **B**, respectively, in the report Air Quality Analysis prepared for the Project (Air Sciences Inc. 2018), and reproduced in this document as **Appendix F-1**. The alternative emission inventory used for the IDEQ air permit application (Air Sciences 2020) is provided in **Appendix F-2**.

Emission Factor Use and Uncertainty

An emission factor is usually a well-supported, representative value that reasonably relates the quantity of a pollutant released from some activity or process to a quantitative measure of the intensity or rate of the activity. Examples of the measure of activity rate are acres disturbed, tons processed, gallons of fuel combusted, or thermal content of fuel utilized. The units of the corresponding emission factor would be the weight of pollutant released per unit of activity (e.g., pounds CO/1000-gallon fuel combusted, pounds PM per acre of soil disturbed). If the activity rate is quantified for a specific period of time, then the emission rate per that unit of time can be calculated:

$$E = A \times EF \times (1 - ER/100)$$

where:

E = emission rate (e.g., weight pollutant emitted per unit of time)

A = activity rate (e.g., a quantity of a particular activity per unit of time)

EF = emission factor (e.g., weight pollutant released per unit of activity)

ER = overall emission reduction efficiency (a percent of emission abated) for a control device or mitigation measure.

The estimation of the activity rates "A" for a future operation is subject to uncertainty for several reasons. It is not possible to predict with certitude the specific level of an activity, e.g., fuel combusted, area disturbed, or tons of material processed, for an operation during the early planning stages. As construction and operational parameters are more closely defined during detail design and actual construction, the activity rate estimates would be more certain. For pre-construction licensing and permitting, the values of "A" are selected to conservatively high-biased, to avoid under-estimating of emissions and impacts.

In general, emission factors are representative of a broad average of emissions data available for a specific source category. So, a single emission factor encompasses data from many actual operations that cover a relatively large range of actual emission rates per unit of activity. One should consider the AP-42 emission factors as representing an average of the range of measured or calculated emission rates. Approximately half of the sources in this population would have emission factors higher than the published average, and the remainder would have lower factors (EPA 2003).

In EPA Document AP-42, the level of uncertainty in a given factor is indicated by an "emission factor rating" with values ranging from "A" for best accuracy, and "E" for greater uncertainty. To illustrate the level of confidence in judging emission estimates, it can be noted that nearly all the emission factor values in Section 11.19.2 in Document AP-42, which is relied upon for many Project sources, have emission factor ratings of "D" or "E" (EPA 2003). To compensate for this uncertainty, the accepted practice is to over-estimate the activity rates for a given operation to avoid under-reporting the final estimates. It is also noteworthy the guidance from the State of Nevada, which is the home of numerous surface gold mines, supports the use of factors from this AP-42 section for surface mining operations (NDEP 2017).

Rationale for Emission Factor Selections Used for the Project

Mining operations, such as those described for the Stibnite Gold Project (the Project) involve a large number of emission source categories characterized by the type of process, material processed, and equipment used. For the Project air pollutant emission sources, activity-specific

emission factors and techniques provided in industry-standard technical documents. The remainder of this section provides the rationale for emission factor selection, organized by the tables reproduced in this Appendix. These factors were used for the emission inventory and air impact modeling study prepared for the Project. While alternative emission factor choices are available in the literature, the discussion below describes the reasoning why the selected factors were used. Most emission factor selections followed guidance from the Nevada Division of Environmental Protection (NDEP 2017).

Table 4. Process Source EF from AP-42.

Material Transfer, Crushing, Screening, AP-42 Table 11.19.2-2: For these operations involving transfer and processing of gold or and waste rock, the emission factors in Table 11.19.2-2 are based on data from processes and materials with close physical similarity to the Project. These factors have ratings of C or D, which indicates moderate uncertainty in using these values for a specific process source. As described in Section 11.19.2:

> Major rock types processed by the crushed stone industry include limestone, granite, dolomite, traprock, sandstone, quartz, and quartzite. Minor types include calcareous marl, marble, shell, and slate. Rock and crushed stone products generally are loosened by drilling and blasting and then are loaded by power shovel or front-end loader into large haul trucks that transport the material to the processing operations. Techniques used for extraction vary with the nature and location of the deposit. Processing operations may include crushing, screening, size classification, material handling and storage operations.

Ball Mill, AP-42 Table 11.19.2-4: The ball mill for the project will be handling minerals of the same nature as that used to derive the emission factors in Table 11.19.2-4. This is a broadly representative value for this type of source. Based on the references cited in AP-42, this factor was derived by the EPA using data obtained from the Pulverized Mineral Division of the National Stone, Sand, and Gravel Association.

Lime Kiln Crushing and Transfer, AP-42 Table 11.17-4: One alternative that will be addressed in the EIS is the implementation of an on-site limestone recovery and lime kiln operation. For this alternative, the emission factors cited in Air Quality Analysis are specifically for the lime production process, using limestone as the raw materials, which would differ from the run of mine ore and waste rock otherwise used in the Project.

Lime/Cement/Shotcrete Silo Storage, Aggregate Bin, Central Mixer, AP-42 Table 11.12-2: The material involved in these steps for the Project most closely resemble the physical materials and processes of the concrete batching industry. The size distribution and moisture content would be comparable to the raw materials used for blending concrete. The silos, transfer equipment, and the cement mixer (stationary or mobile) would be essentially identical to the industry sources in this AP-42 section.

Prill Silo Loading/Unloading, AP-42 Table 8.3-2: This operation refers to the silo loading and unloading of ammonium nitrate “prill”, which is a solid form of the chemical produced for

blending of ANFO explosive. This matches the actual material and physical handling operations for prill that are describe in this section of AP-42:

> Ammonium nitrate is marketed in several forms, depending upon its use. . . .Solid ammonium nitrate may be produced in the form of prills, grains, granules, or crystals. Prills can be produced in either high or low density form, depending on the concentration of the melt. High density prills, granules, and crystals are used as fertilizer, grains are used solely in explosives, and low density prills can be used as either.

Propane-fired Heaters and Boilers, AP-42 Table 1.5-1: This table provides the accepted factors for external combustion equipment using liquefied petroleum gas (LPG), which is the commercial form of propane that would be used by the process sources. Although this table and the individual average values are based on a substantial data set, the emission factors have a rating of "E". This is the ranking with most uncertainty, due to the wide variation in the emissions data, fuel characteristics, and combustion conditions for the equipment in this source category.

Table 5. Process Source EF from Similar Source Test Data or Permit Limits

In this table, the selected emission factors are derived from similar gold ore refining and related processes in Nevada. There are numerous gold mines and processing facilities in Nevada, and these are regulated by the Nevada Division of Environmental Protection (NDEP) that demonstrates compliance with permit conditions through reference method testing. The physical similarity of the listed processes at gold mines in Nevada to those planned for the Project, and the level of data quality underlying these emission rates, supports the use of the Nevada mine emission rate data for these sources that are specific to gold ore processing. The processes and materials processed (low-moisture, gold-bearing ores) for the sources described in the NDEP information are closely resemble these same point sources that would be included in the Project. The individual steps in refining are well-established by industrial practice, and do not differ significantly between facilities.

The primary consideration for acceptance of an emission factor or emission rate data for a given source is whether the source characteristics underlying the selected factor are more representative of the activity than for other alternative emission factors that could be adopted. There is limited literature on published emission factors for the gold ore refining and concentrate bagging processes listed in Table 5, and those published factors represent operations that are not specific to gold extraction, or bagging of powdered metal concentrates. In such cases, emission factors or rates can be developed from alternative information, that has been accepted by another state agency, and that more closely aligns with the processes of interest. This can include stack test results and other engineering analyses provided by air quality agencies that support permit compliance.

The sources listed in Table 5 are process point sources. For these specific sources, the emission characteristics rely on fuel combustion, nature of the material being bagged, and the physical treatment of the material involved (e.g., ore heating in the autoclave, stripping of

carbon by heating in a kiln, melting of precipitated gold sludge in a furnace). The processes and materials processed (low-moisture, gold-bearing ores) for the northern Nevada sources described in the NDEP information are comparable to these same point sources included in the Project. Gold mines in Nevada are regulated by NDEP, so the supporting emission information is also viewed as technically credible.

For several processes that are specific to gold ore processing, Midas Gold elected to use NDEP information for gold refining emission rates, rather than EPA Document AP-42. However, at the time of this report it is not confirmed by IDEQ that NDEP emission factors will be acceptable for permitting of the Project. The IDEQ will review and have final approval of the use of these Nevada gold refining process factors as part of the air permit development for the Project. However, the physical similarity of the listed processes at gold mines in Nevada to those for the Plan supports the use by Midas Gold of the Nevada emission factors for these sources that are specific to gold ore refining.

Table 6. EF Used to Calculate Mining Activity Emissions

Drilling, AP-42, Table 11.9-4, Blasting (PM), Dozing and Grading, AP-42 Table 11.9-1: This section of AP-42 addresses surface coal mining sources. However, in AP-42 this is the sole industry for which emission factors for drilling, blasting, bulldozing and surface grading are provided for a extractive mining facility, versus a more generic construction environment. The Project inventory follows accepted practice in using these mining emission factors for the general operations that involve surface overburden and waste rock, which it has in common with surface coal mining.

Blasting (CO), AP-42 Table 13.3-1: There is limited published information on the nature of pollutant emissions due to the ANFO as a blasting agent. The references for this table in AP-42 are dated 1974, and 1976, when measurement techniques were not as sophisticated or accurate as later analytical instruments. The factor rankings are “D” which infers relatively high uncertainty. Normal practice is to use the values in this AP-42 table as a default, unless more recent and accurate information is available.

Blasting (NO_X) Atalla et al. 2008, and (SO_2) material balance: More recent data than that in AP-42 was obtained for NO_X emissions due to blasting at surface mines, and was preferred for NO_X for this source (Atalla et al. 2008). A material balance for SO_2 uses the actual sulfur content of the blasting agent for the Project, which is preferable to an industry-wide average value.

Truck Hauling, Water Trucking, Vehicle Travel on Burntlog Route and Warm Lake Route, EF Equations in AP-42 Section 13.2.2: These equations are the accepted correlations for a wide variety of vehicle travel on unpaved ground, for road travel, construction, and mining operations. The selection of parameters for the correlation 1a (silt, and mean vehicle weight) were vetted by the agencies during initial development of this Project inventory.

Truck Loading, Unloading and Wet Drilling, AP-42 Table 11.19.2-2. See the discussion of the AP-42 table in under Table 4, above. These calculations also use the ratio of $PM_{2.5}$ to PM_{10} that

is used to characterize emission from “batch drop” of bulk materials, which are correlated to the prevailing wind speed and material moisture.

Helicopter, AP-42, Volume II, Table II-1-3-7: This is the set of engine tailpipe emission factors that are published by EPA that are specific to this category of aviation engine.

Table 7. MOVES 2014a EF Used to Calculate On-Road Vehicle Tailpipe Emissions

The MOVES program 2014a version is the most recent tool for the estimation of on-road vehicle tailpipe emissions. The key parameter is the selection of vehicle categories and weight classes for use of the model. The categories used in this case match well with the roster of vehicles planned for the Project (EPA 2015).

Table 8. EF Used to Calculate Construction Activity Emissions

Dozing, Compacting, Grading, Table 11.9-1, Scraper Unloading, AP-42 Table 11.9-4: Refer to the discussion of these AP-42 tables under Table 6, above.

Scraper in Travel, Topsoil Removal, Overall General Construction, AP-42 Table 13.2.3-1: For construction operations that are not directly associated with mining, such as scraper travel, topsoil handling, and generic site grading, the emission factors in Section 13.2.3 are normally used. These types of operations are characterized by a need to estimate site-wide construction emissions that encompass the typical range of diverse activities, without regard to the actual plans of any individual construction project. For these reasons, this section offers accepted methods by which site-specific emissions may be estimated.

Material Loading, Material Dumping, AP-42 Section 11.19.2-2: Refer to the discussion of this AP-42 table under Table 4, above. For these construction operations at the Project, the material handled is of the same nature as that involved in crushed stone extraction and handling operations.

Table 9. Control Techniques and Efficiencies in Emission Calculations

For this table, it should be noted that with two exceptions, the emission factors that are identified in the preceeding tables include the effect of controls in the published factors. The categories of unpaved road and underground belt material transfers have control efficiencies that are calculated using correlations in AP-42, Section 13.2. The parameters used in these correlations and the resulting efficiency values have been vetted by the reviewing agencies.

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