OPERATING PERMIT APPLICATION

MONTANA LIMESTONE RESOURCES

APPENDIX A-1

BASELINE AIR QUALITY REPORT

October, 2014

AIR QUALITY STUDY

MONTANA LIMESTONE RESOURCES PROJECT,

GRANITE COUNTY, MONTANA

Prepared for:

Montana Limestone Resources, LLC
P.O. Box 16630
Missoula, Montana 59808-6630

Prepared by:

Bison Engineering, Inc.
1400 11th Avenue
Helena, MT 59601

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1.0 Introduction

Baseline air quality and meteorological monitoring is being conducted by Bison Engineering, Inc. in the vicinity of the proposed MLR facility near Drummond, Montana. The first four quarterly audit reports (2013Q3 – 2014Q2) have been submitted to the Montana Department of Environmental Quality - Air Resources Management Bureau (ARMB) and will not be resubmitted with this application. Additional quarterly reports will be submitted to ARMB until a full year of data is collected for each monitor; therefore, the baseline air quality evaluation is incomplete as of the submittal of this mine permit application.

Table A-1-1 lists the parameters being monitored, including start and end dates when applicable. The locations of the monitoring sites in relation to the community of Drummond are shown in Figure 2.1-1. Results of monitoring performed to date are summarized in Sections 2.1.1 and 2.1.2.

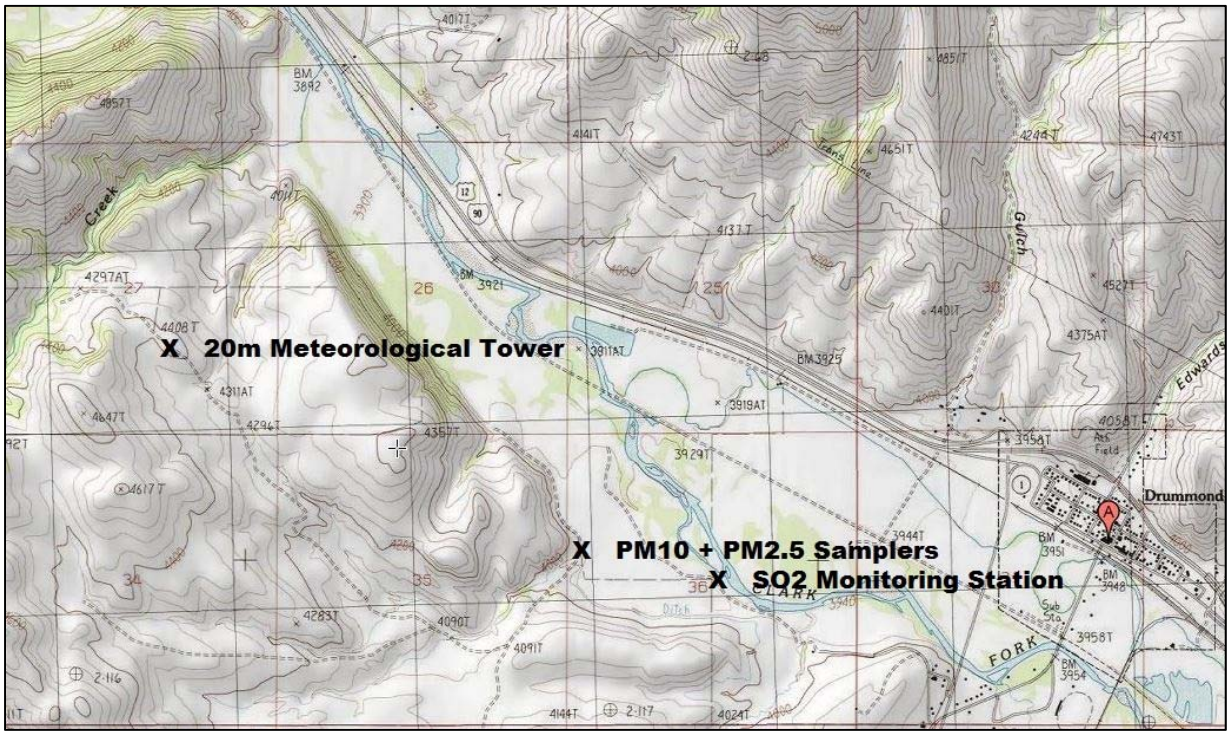
Table A-1-1 MLR Baseline Air Quality / Meteorology Monitoring Parameters

Site Location	Parameter(s)	Start Date	End Date
MLR Meteorological Tower	Wind direction, 19 meters Wind direction sigma, 19 meters Wind speed, 19 meters Temperature, 2 meters and 19 meters Delta temperature (19 meters – 2 meters) Solar radiation, 3 meters	09/24/2013	Ongoing
	Relative humidity, 2 meters	04/10/2014	Ongoing
Particulate Monitors[1]	$PM_{2.5}$ and PM_{10}	08/17/2013	08/30/2014
Sulfur Dioxide Shelter	Sulfur dioxide	01/09/2014	Ongoing
	Barometric pressure	02/03/2014	Ongoing
	Precipitation	05/22/2014	Ongoing
$PM_{2.5}$ denotes particulate matter smaller than 2.5 microns in diameter PM_{10} denotes particulate matter smaller than 10 microns in diameter			

2.0 Air Quality Data Summary

Monitoring for both fine particulates ($PM_{2.5}$) and inhalable particulates (PM_{10}) began in August 2013, and ended in August 2014. The data have been quality-assured and reported through June 2014. For the August 2013 - June 2014 data period, the average $PM_{2.5}$ concentration was 4.0 micrograms per cubic meter (µg/m^3), and the maximum 24-hour concentration was 20 µg/m^3. These values are well below the respective annual standard of 12 µg/m^3, and the (98th-percentile) 24-hour standard of 35 µg/m^3. From August 2013 - June 2014, the average PM_{10} concentration was 7 micrograms per cubic meter (µg/m^3), and the maximum 24-hour concentration was 31 µg/m^3. These values are well below the respective annual standard of 50 µg/m^3, and the 24-hour standard of 150 µg/m^3.

Figure A-1-1 MLR Monitoring Locations



Sulfur dioxide monitoring began in January 2014, and will continue until one full year of data has been collected. The data have been quality-assured and reported through June 2014. During this period the average sulfur dioxide concentration was 0 parts per billion (ppb). The 99th-percentile of the one-hour daily maximum concentrations was 1 ppb. The maximum 3-hour concentration was 9 ppb, compared to the Federal standard of 500 ppb.

The baseline air quality data is summarized and compared against applicable Federal and Montana standards in Table 2.1-2.

3.0 Meteorological Data Summary

As shown in Table 2.1-1, most of the meteorological monitoring began in September 2013; barometric pressure, relative humidity and precipitation monitoring was added during 2014. The objective of that monitoring is to provide a meteorological dataset suitable for dispersion modeling. Because the purpose of this narrative is to describe the climatology of the MLR site, Table 1-3 presents the long-term (1971-2000) data record from the Drummond Aviation site located approximately 2.5 miles south-southwest of Drummond. The climate can be described as “modified continental,” and is characterized by semi-arid conditions and large daily and seasonal temperature ranges. Annual average precipitation is 12.61 inches, with approximately half occurring between May and August. Precipitation during the winter months is comparatively light, with much of it occurring as snow. There is generally a snow cover from December through February.

Table A-1-2: Summary of MLR Baseline Air Quality Data

Pollutant	Averaging Period	Measured Background Concentration	NAAQS	MAAQS	Units
SO_2	1-hr	1[a]	75 [a]	---	ppb
		0.028	---	0.5 [b]	ppm
	3-hr	0.009	0.5 [c]	---	ppm
	24-hr	0.001	---	0.1 [c]	ppm
	Annual	0.000	---	0.02	ppm
PM_{10}	24-hr	31	150 [d]	150 [e]	$\mu g/m^3$
	Annual	7	---	50 [f]	$\mu g/m^3$
$PM_{2.5}$	24-hr	20	35 [g]	---	$\mu g/m^3$
	Annual	4	12	---	$\mu g/m^3$

[a] Based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations. Reported background value is 2nd highest daily one-hour maximum.
[b] Not more than 18 exceedances in 12 months.
[c] Not more than one exceedance per year.
[d] Not to be exceeded more than once per year on average over 3 years.
[e] Not to be exceeded more than once per year, as determined in accordance with 40 CFR 50 Appendix K.
[f] Not to be exceeded in a calendar year, as determined in accordance with 40 CFR 50 Appendix K.
[g] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m3 (effective December 17, 2006).

Table A-1-3 Climatological Data for Drummond Aviation Site[1]

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Avg. Max (°C)[2]	-0.8	3.2	9.0	14.7	19.3	24.0	28.7	28.4	22.3	14.6	4.2	-1.1	13.9
Avg. Min (°C)[2]	-11.3	-9.1	-5.3	-2.1	1.9	5.7	7.1	6.6	2.3	-2.2	-6.8	-11.0	-2.0
Avg. Precip. (inches)	0.79	0.61	0.75	0.98	1.96	1.66	1.15	1.29	1.06	0.77	0.79	0.80	12.61
Avg. Snowfall (inches)[3]	8.3	5.3	6.1	4.2	1.9	0.4	0.0	0.1	0.7	1.2	5.5	8.1	41.7
Avg. Snow Depth (inches)[3]	4	3	1	0	0	0	0	0	0	0	1	2	1

[1]Source: Western Regional Climate Center
[2]Values converted from original degrees F values to facilitate comparison with Table 1-4.
[3]Snowfall data based on 1963-2005 period

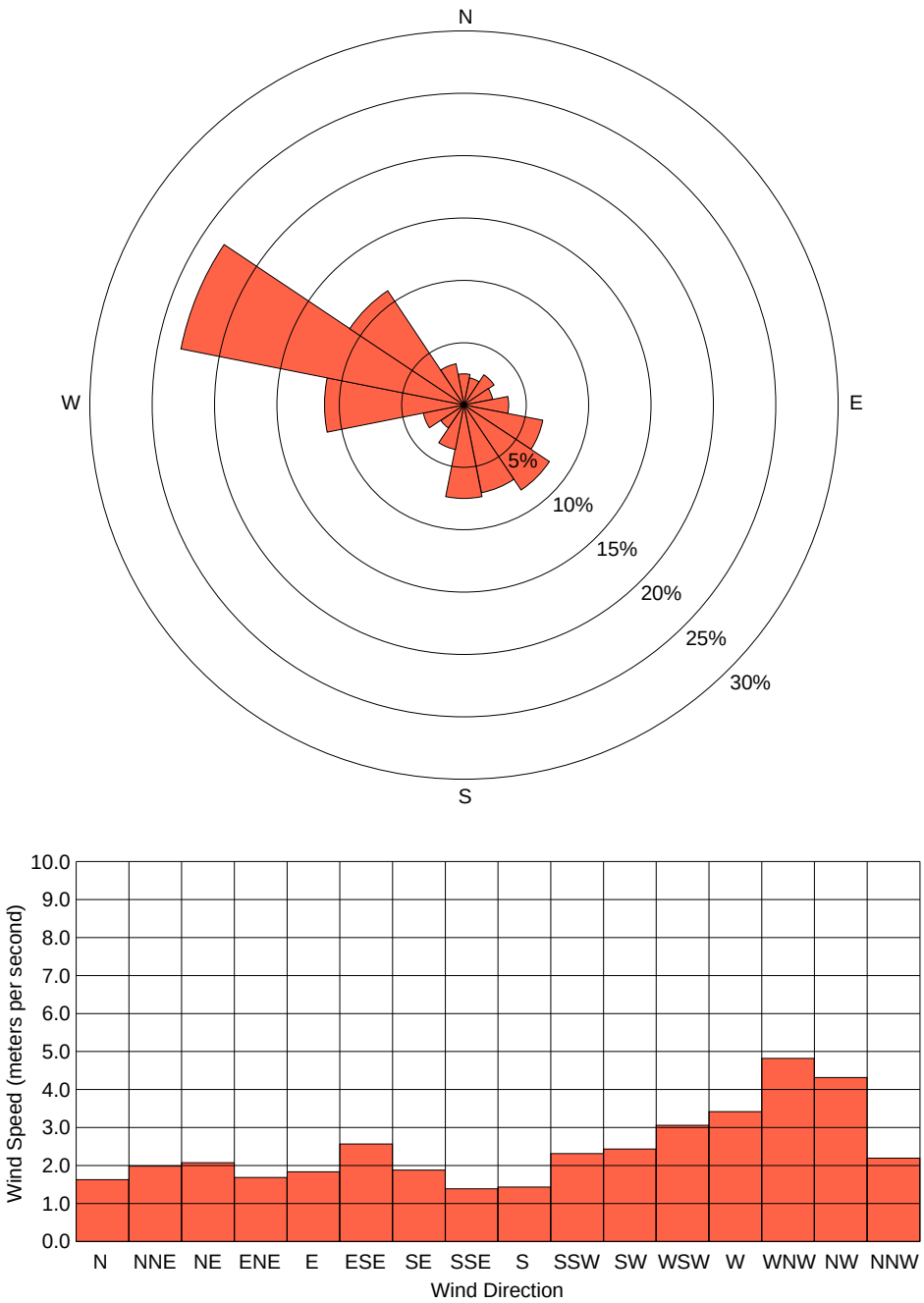
Approximately nine months of quality-assured data have been collected at the MLR meteorological tower, and they are summarized in Table 2.1-4. It should be emphasized that those data are based on conditions during a single nine-month period, and do not necessarily represent long-term climatology. For example, February of 2014 was drastically colder than both December 2013 and January 2014; climatologically, February is warmer than both December and January, as shown in Table 2.1-3. Also, note that the 9-month average temperature values for the MLR site are skewed downward since no data from the warmest months of July and August are included.

By contrast, the nine-month data period is sufficient to evaluate the general wind conditions at the MLR site, which one would expect to be reasonably consistent from year to year since they are strongly influenced by localized terrain effects. Figure 1-2 presents a graphical wind rose, wherein each "petal" in the wind rose represents the percentage of the time that the wind blew from a particular direction. It is evident that the site is dominated by winds from the west through northwest, occurring over half of the time. A slight secondary maximum occurs for winds from the southeast quadrant. Winds are generally light; the average wind speed to date has been 3.1 meters per second (6.9 miles per hour). West-northwest winds tend to be the strongest, with an average speed of 4.9 meters per second (11.0 miles per hour).

Table A-1-4 Summary of MLR Meteorological Data

Month	Wind Speed (m/s) Avg	Wind Direction (degrees from) Avg	Standard Deviation of Horiz. WD (degrees) Avg	Temp 19m (deg C) Avg	Temp 2m (deg C) Avg	Delta Temp 19m-2m (deg C) Avg	Relative Humidity (%) Avg
Sep 2013	3.1	247	32	6.8	6.8	-0.04	---
Oct 2013	2.7	241	36	4.5	4.4	0.11	---
Nov 2013	2.4	247	36	0.3	0.1	0.20	---
Dec 2013	3.1	274	30	-4.8	-5.1	0.25	---
Jan 2014	2.8	245	36	-2.1	-2.4	0.24	---
Feb 2014	2.7	181	33	-9.4	-9.6	0.21	---
Mar 2014	3.2	267	33	0.8	0.6	0.15	---
Apr 2014	3.8	295	33	5.2	5.3	-0.15	55.5
May 2014	3.3	313	38	10.7	10.9	-0.21	53.9
Jun 2014	3.6	299	34	13.2	13.5	-0.27	56.0
9 month period[1]	3.1	261	34	2.5	2.5	0.05	55.1

[1]Calculated as arithmetic average of monthly means

Figure A-1-2 Wind Rose for MLR Drummond Site

September 24, 2013 to June 30, 2014