APPENDIX C: AIR QUALITY ASSESSMENT.

MCVEHIL-MONNETT ASSOCIATES, INC.
Air Quality ▪ Environmental Management

Memorandum

To: Ms. Cynthia Parnow
Knight Piésold Consulting

From: Ms. Kendall C. Necker, CCM and Mr. William R. Monnett

Date: April 22, 2009

Subject: Air Quality Dispersion Model Impact Assessment
For Exploration Activities on the Paramount Mine Project Area
Bodie Wilderness Study Area, California

On behalf of Knight Piésold Consulting, McVehil-Monnett Associates, Inc (MMA) conducted an air quality modeling analysis in support of the proposed exploration activities at the Paramount Mine Project Area (Paramount Mine), located in the Bodie Wilderness Study Area (BWSA) in east central California. At this time, Knight Piésold has requested that MMA not include modeling discussions in the Environmental Assessment (EA) text. Instead, Knight Piésold requested that MMA generate a memorandum providing a detailed description of the model preparation and analysis. This memorandum responds to that request, and provides details of the Paramount modeling analysis, including the air quality regulatory background; project-area climate; proposed action description that focused on air pollutant emissions and air quality; emission inventory development based on proposed action information; air dispersion modeling methodology and inputs; and modeling results.

Air Quality Regulatory Background

According to information provided to MMA by Knight Piésold, the BWSA and the access to the area are not within any Federal Air Quality Non Attainment/Maintenance Area, under the jurisdiction of the Great Basin Unified Air Pollution Control District (GBUAPCD). Thus, the area meets all ambient standards. Table 1 lists the State of California and National Ambient Air Quality Standards.

Table 1. California and National Ambient Air Quality Standards

Pollutant	Averaging Period	Concentration ($\mu g/m^3$)	
		California Ambient Air Quality Standards (CAAQS)[1]	National Ambient Air Quality Standards (NAAQS)[2]
Ozone (O_3)	1-Hour	180	--
	8-Hour	137	147
Respirable Particulate Matter (PM_{10})	24-Hour	50	150
	Annual	20	--
Fine Particulate Matter ($PM_{2.5}$)	24-Hour	35	35
	Annual	12	15
Carbon Monoxide (CO)	1-Hour	23,000	40,000
	8-Hour	10,000	10,000
	8-Hour (Lake Tahoe Only)	7,000	--
Nitrogen Dioxide (NO_2)	1-Hour	339	--
	Annual	57	100
Sulfur Dioxide (SO_2)	1-Hour	665	--
	3-Hour	--	1300
	24-Hour	105	365
	Annual	--	80
Lead	30-Day Average	1.5	--
	Calendar Quarter	--	1.5
Sulfates	24-Hour	25	--
Hydrogen Sulfide	1-Hour	42	--
Vinyl Chloride	24-Hour	26	--
Visibility Reducing Particulates	8-Hour	Ten miles or more (30 miles for Lake Tahoe) at less than 70% RH	

1. California standards for O_3, CO, SO_2 (1 and 24-hour), NO_2, and particulates (PM_{10} and $PM_{2.5}$) are not to be exceeded. All others are not to be equaled or exceeded.
2. National standards other than for ozone, $PM_{2.5}$ and those with annual averages are not to be exceeded more than once per year. Ozone standard is attained when the fourth highest 8-hour concentration in a year averaged over three years is equal to or less than the standard. For PM2.5, the 24-hour standard is attained when 98th percentile of the daily concentrations for a year averaged over three years are equal to or less than the standard.

Regional Climate for the Project Area

The climate in the Bodie Hills is defined as middle-latitude steppe. This semi-arid climate is characterized by cold winters, warm to sometimes hot summers, and meager annual and monthly precipitation. Diurnal temperature ranges tend to be large. Due to cold temperatures in the fall, winter and spring, a portion of the precipitation falls as snow. Precipitation amounts vary widely from year to year. Weather can vary widely from day to day driven by cyclones and anticyclones moving through the area. Weather tends to vary more in the winter than the summer.

Table 1 presents temperature and precipitation data collected during the period 1964 to 2007 from Bodie, California, which is located about five miles southeast of the Paramount Mine at an elevation of 8,370 feet (Western Regional Climate Center, 2007). The 43-year annual mean temperature is 56.3°F, with the highest average maximum of 76.8°F occurring in July and the lowest average minimum temperature of 5.7°F occurring in January. On average, 12.9 inches of precipitation is received for the year with the majority (8.84 inches) occurring during the coolest part of the year of November through April. The average annual snowfall is 98.1 inches, with snow falling during all months of the year except July and August. Throughout the year the average on-the-ground snow depth is 6 inches, with the deepest occurring in the month February at 20 inches and the lowest being 0 inches from June through October.

Table 1. Monthly Climate Summary for the Period 09/01/1964 to 06/30/2007 for Station 040943, Bodie, California (Western Regional Climate Center, 2007).

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Average Max. Temp. (°F)	39.9	41.1	44.2	49.9	60.3	69.6	76.8	76.1	69.3	60.1	47.8	40.3	56.3
Average Min. Temp. (°F)	5.7	7.5	12.2	17.7	24.6	30.8	35.1	33.3	26.6	19.2	12.6	6.3	19.3
Average Total Precip. (in.)	1.78	1.68	1.43	1.01	0.73	0.74	0.91	0.57	0.52	0.59	1.29	1.66	12.9
Average Total Snowfall (in.)	19.1	17.2	15.8	7.6	3.6	0.8	0	0	0.6	2.9	10.2	20.3	98.1
Average Snow Depth (in.)	15	20	19	10	1	0	0	0	0	0	2	8	6

Paramount Mine Project Overview

Cougar Gold, LLC (Cougar) purchased and established mining claims in the Paramount Mine Project Area in the 2000s. Cougar initiated discussions with the Bureau of Land Management (BLM) to conduct exploration activities in the Paramount Mine. Cougar submitted a Plan of Operations (POO), and in 2007 the BLM issued a drilling authorization on the Paramount Mine Road and areas around the Paramount Mine excluded from the BWSA. Cougar did not drill in the BWSA, and met all authorization and rehabilitation requirements.

Proposed Action Description

In January 2009, Cougar proposed a plan for mineral exploration in the Paramount Mine, occurring in the BWSA. The current proposed action is a downscaled version of the original

plan, which MMA modeled in 2008. Figure 1 shows the general location of the proposed action, which is approximately 14 kilometers east of Bridgeport, California.
Figure 2 shows the proposed drill areas (hexagons), as well as access roads of Aurora Canyon Road, Geiger Grade, and Paramount Mine Road. For this memorandum, the portion of Geiger Grade road west of Paramount Mine Road will be known as "Upper Geiger Grade" and the portion of Geiger Grade road east of Paramount and into the project area will be known as "Lower Geiger Grade". No drilling will occur in the starred areas, and no helicopters will be used.

For the current proposed action, 11 core holes in 8 locations (Figure 2) will be drilled by two coring drill rigs (LF-70 or equivalent) operating simultaneously 24-hours per day. The proposed action is expected to last 45 days, operating from mid-July to early September. Due to weather delays or poor drilling conditions, the program may extend into October or November. Both drill rigs are truck-mounted. One rig will handle drilling activities in the northern group of core holes, and the other rig will handle drilling activities with the southern group of core holes. During active drilling at a core hole, the access route to that location will be temporarily blocked, with signage to re-route the public.

The proposed exploration drilling action at Paramount Mine will require eight support vehicles performing selected duties, as listed in Table 2. All vehicles will be diesel-fired. Support vehicles include one 3,500-gallon water truck; one crew van; three F-450 pickup trucks serving drill sites: two trucks for secondary water supply and one truck for fuel and parts; and three F-250 pickup trucks: two for the geologists and one for the project coordinator. All eight support vehicles will leave from Bridgeport for the 11-mile one-way drive to the Paramount Mine. No employee-owned vehicles will be permitted on-site. Work crew transport will be accomplished by the van. The drive from Bridgeport to the Paramount Mine area will take about 30-minutes. As listed in Table 3, one-way lengths for the various roads along the route are as follows: Aurora Canyon Road 8 miles, Upper Geiger Grade 2 miles, Paramount Mine Road 1.5 miles, and Lower Geiger Grade 1.5 miles. All roads along the route are secondary, unpaved.

Table 2. Support Vehicle Inventory for the Proposed Action at Paramount Mine

Vehicle	Description	Number
3500 gallon water truck	Peterbilt 330 Tank Truck	1
Crew van	Ford E-350, 15-passenger	1
Service truck (fuel, parts)	Ford F-450	1
Secondary water trucks	Ford F-450	2
Geologist trucks	Ford F-250	2
Project Coordinator	Ford F-250	1

Table 3. Road Length along Route to the Proposed Action at Paramount Mine

Road	One-Way Length (Miles)
Aurora Canyon Road	8
Upper Geiger Grade Road	2
Paramount Mine Road	1.5
Lower Geiger Grade Road	1.5

With the exception of the 3500-gallon water truck, vehicles will travel on all four roads. The 3500-gallon water truck will only traverse to the secondary staging area located at the intersection of Upper Geiger Grade and Paramount Mine Road (Figure 2), and will not travel on Paramount Mine Road or the Lower Geiger Grade road. Table 4 catalogs total mileage traveled on each road by vehicle group, as well as overall project totals. In addition, the time of day traveled along each road is indicated. To minimize environmental impacts, traffic along Aurora Canyon Road and Upper Geiger Grade will be spread over a three hour time-block in the morning from 7:00 AM to 10:00 AM, and a three-hour time block in the evening from 7:00 PM to 10:00 PM.

Table 4. Proposed Action Daily Mileage

Vehicle Group	Aurora Canyon Road Miles Traveled Daily	Upper Geiger Grade Miles Traveled Daily	Paramount Mine Road Miles Traveled Daily	Lower Geiger Grade Miles Traveled Daily	Total Miles Traveled Daily
F-250 Pickups, F-450 Pickups and Crew Van	128	32	18	18	196
Service Trucks	48	12	30	33	123
3500-Gallon Water Truck	32	8	None	None	40
Proposed Action Total	208	52	48	51	359
Local Travel Time	7 AM to 10 AM 7 PM to 10 PM	7 AM to 10 AM 7 PM to 10 PM	Anytime	Anytime	

Emission Estimates for the Proposed Action

An emissions inventory is developed from activity or equipment-specific operating parameters combined with applicable emission factors related to that activity or equipment. Emission factors are dependent on a wide variety of parameters associated with the activity or process, such as fuel burned, equipment size, silt content, moisture content, vehicle size, etc. For this analysis, MMA employed emission factors from several references, including EPA's *Compilation of Air Pollutant Emission Factors* (AP-42)*, Volume I Stationary Point and Area Sources*, *5th Edition*, manufacturer information, and MOBILE6.2 emissions model.

The emissions inventory is broken into three main categories: portable point, fugitive gas, and fugitive dust. The portable point sources are the drill rigs and associated light plants; fugitive gas emissions are emitted from vehicle tailpipes; and fugitive dust is generated from vehicle travel along roads. Expected pollutants to be emitted from the activities in the proposed action include volatile organic compounds (VOCs), carbon monoxide (CO), nitrogen oxides (NO_X),

sulfur dioxide (SO_2), ammonia (NH_3), particulate matter less than or equal to 10 microns (PM_{10}), and small amounts of other regulated air pollutants.

Drill Rigs and Light Plants

Emissions from drill rig and light plants consist of NO_X, CO, SO_2, PM_{10}, and VOCs, as well as small amounts of other regulated pollutants of benzene, toluene, xylenes, propylene, 1,3-butadiene, formaldehyde, acetaldehyde, acrolein, and polycyclic aromatic hydrocarbons (PAH). Emission rates for some pollutants were based on manufacturer information, and some were based on AP-42 Volume I, Section 3.3 Gasoline and Diesel Industrial Engines.

For the drill rigs, emission factors from Cummins engine 4BTA3.9-C130 were obtained for VOCs, CO, NO_X and PM_{10}. These emission factors were provided in grams per horse power hour (g/hp-hr) as listed below:

VOCs	CO	NO_X	PM_{10}	Units
0.26	0.46	6.51	0.2	g/hp-hr

Assuming the drill rigs are each 130 horsepower and operate 24 hours per day, daily emissions for VOCs, CO, NO_X and PM_{10} were estimated using the following equation:

$$Q_{Daily} = \left(\frac{E\,g}{hp-hr}\right)\left(\frac{24\,hrs}{day}\right)(130\,hp)\left(\frac{lb}{453.6\,g}\right), \qquad in\ lbs/day \qquad (1)$$

Pollutants from light plants are based on AP-42 Volume I, Section 3.3, Table 3.3-1, listed in pounds per million British thermal unit (lbs/MMBtu) fuel input:

VOCs	CO	NO_X	PM_{10}	Units
0.35	0.95	4.41	0.31	lbs/MMBtu

Assuming a heat value rating for diesel fuel at 19,300 Btu/lb and a fuel density of 6.9 lbs/gallon, the heat rating for diesel fuel in MMBtu per gallon is 0.13317 MMBtu/gal. Assuming fuel consumption at 0.25 gallons per hour (gal/hr), the fuel input is calculated at 0.0333 MMBtu/hr. Applying the above emission factor and fuel input, daily emissions are calculated as follows:

$$Q_{Daily} = \left(\frac{E\,lb}{MMBtu}\right)\left(\frac{0.0333\,MMBtu}{hr}\right)\left(\frac{24\,hrs}{day}\right), \qquad in\ lbs/day \qquad (2)$$

For SO_2 from both the light plant and drill rig combined, the emission factor was based on AP-42 Volume I, Section 3.3, Table 3.3-1, as listed below:

SO_2	Units
0.29	lbs/MMBtu

In addition, emission factors for some other regulated pollutants were obtained from AP-42 Volume I, Section 3.3, Table 3.3-2. These are listed below:

Benzene	Toluene	Xylenes	Propylene	1,3-Butadiene	Formald-ehyde	Acetald-ehyde	Acrolein	Total PAH	Units
9.33E-04	4.09E-04	2.85E-04	2.58E-03	3.91E-05	1.18E-03	7.67E-04	9.25E-04	1.68E-04	Lbs/ MMBtu

Fuel consumption for the drill rig and light plant combined was assumed to be 5.25 gallons per hour, or 0.699 MMBtu/hour. Equation 2 was used to calculate the daily emissions for SO_2 and the other regulated pollutants for each drill rig/light plant combination.

Using the above listed assumptions, emission factors and equations, emissions by pollutant are estimated and totaled for drill rig and light plants. Table 5 provides a summary by pollutant in pounds per day for each rig/light plant as well as the 45-day project total. The criteria pollutant with the largest emissions is NO_X at 4,346 pounds, project total.

Table 5. Emissions from Drill Rigs and Light Plants- Paramount Mine

Pollutant	Emissions Per Each Drill Rig/Light Plant Combination (lbs/day)	Project Totals: Both Rigs and Light Plants for 45 Days (lbs)
VOCs	2.1	186.2
CO	3.9	353.0
NO_X	48.3	4,345.7
SO_2	4.9	437.1
PM_{10}	1.6	146.1
Benzene	1.57E-02	1.4
Toluene	6.86E-03	0.6
Xylenes	4.78E-03	0.4
Propylene	4.33E-02	3.9
1,3-Butadiene	6.56E-04	0.1
Formaldehyde	1.98E-02	1.8
Acetaldehyde	1.29E-02	1.2
Acrolein	1.55E-02	1.4
Total PAH	2.82E-03	0.3

Vehicle Tailpipe Emissions

Vehicle tailpipe emission factors were obtained from the emissions model MOBILE6.2.03 based on model year, fuel burned, and vehicle class. The crew van and F-250 pickups are categorized as heavy duty diesel vehicle 2B (HDDV2B), the F-450 service trucks are categorized as heavy duty diesel vehicle 4B (HDDV4B), and the water truck is categorized as heavy duty diesel vehicle 8A (HDDV8A). Emission factors in grams per mile (g/mi) obtained from MOBILE6.2 are listed in Table 6. Pollutants consist of VOCs, CO, NO_X, SO_2, NH_3, and PM_{10}, as well as other regulated pollutants of benzene, 1,3-butadiene, formaldehyde, acetaldehyde, and acrolein.

Table 6. Emission Factors for Vehicle Tailpipes from MOBILE6.2

Pollutant	F-250 Trucks and Crew Van: HDDV2B (g/mi)	F-450 Service Trucks: HDDV4B (g/mi)	Water Truck: HDDV8A (g/mi)
VOCs	0.267	0.356	1.024
CO	2.056	2.763	5.462
NO_X	2.196	2.935	12.402
SO_2	0.0073	0.0093	0.0144
NH_3	0.027	0.027	0.027
PM_{10}	0.1021	0.1016	0.2535
Benzene	0.00293	0.00392	0.01127
1,3 Butadiene	0.0017	0.00228	0.00655
Formaldehyde	0.02185	0.02919	0.08394
Acetaldehyde	0.00805	0.01075	0.03091
Acrolein	0.00098	0.00131	0.00376

To calculate daily emissions for each pollutant and vehicle class, the emission factor (g/mile) was multiplied by the mileage shown in Table 4, per the following equation:

$$Q_{Daily} = \left(\frac{E\,g}{mi}\right)\left(\frac{miles}{day}\right)\left(\frac{lb}{453.6\,g}\right), \qquad in\ lbs/day$$

Emissions for each pollutant were then summed for the roads traversed, as applicable. Table 7 catalogs the results, listing daily emissions by road, daily road total, and proposed action total for the 45 days. For vehicle tailpipes, NO_X has the largest emissions at 128 pounds project total.

Table 7. Vehicle Tailpipe Emissions by Road and Proposed Action Total

Pollutant	Daily Total Emissions by Road (lbs)				Daily Road Total (lbs)	Proposed Action Total (lbs)
	Aurora Canyon Road	Upper Geiger Grade	Paramount Mine Road	Lower Geiger Grade		
VOCs	0.19	0.05	0.03	0.04	0.30	13.6
CO	1.26	0.31	0.26	0.28	2.12	95.4
NO_X	1.81	0.45	0.28	0.30	2.84	127.7
SO_2	0.004	0.001	0.001	0.001	0.01	0.3
NH_3	0.012	0.003	0.003	0.003	0.02	1.0
PM_{10}	0.06	0.01	0.01	0.01	0.09	4.2
Benzene	2.04E-03	5.09E-04	3.76E-04	4.01E-04	3.32E-03	1.50E-01
1,3 Butadiene	1.18E-03	2.96E-04	2.18E-04	2.33E-04	1.93E-03	8.69E-02
Formaldehyde	1.52E-02	3.79E-03	2.80E-03	2.99E-03	2.48E-02	1.11E+00
Acetaldehyde	5.59E-03	1.40E-03	1.03E-03	1.10E-03	9.12E-03	4.10E-01
Acrolein	6.80E-04	1.70E-04	1.26E-04	1.34E-04	1.11E-03	5.00E-02

Fugitive Dust from Vehicle Travel

Uncontrolled fugitive PM_{10} from vehicle travel was estimated using the emission factor equation in AP-42 Volume I, Section 13.2.2 Unpaved Roads for unpaved public roads. This emission factor equation, in pounds per vehicle mile traveled (VMT), is dependent on silt and moisture content of the road, and vehicle speed. The equation is as follows:

$$E = \frac{k\left(\frac{s}{12}\right)^a \left(\frac{S}{30}\right)^d}{\left(\frac{M}{0.5}\right)^c} - C \quad , \qquad \text{lbs/VMT} \qquad (3)$$

where:

$\mathrm{E} = \text{emission factor}$

$\mathrm{k} = \text{particle size multiplier}\,[1.8 \text{ for } \mathrm{PM}_{10}]$

$\mathrm{s} = \text{silt content (\%)}\,[10.0]$

$\mathrm{S} = \text{mean vehicle speed, mph}\,[20]$

$\mathrm{M} = \text{moisture content (\%)}\,[0.5]$

$\mathrm{a} = \text{dimensionless constant}\,[1]$

$\mathrm{c} = \text{dimensionless constant}\,[0.2]$

$\mathrm{d} = \text{dimensionless constant}\,[0.5]$

$\mathrm{C} = \text{brake and tire wear for 1980's vehicles}$

Road silt content was assumed to be 10%, a typical value for western mines, and road moisture content was assumed to be 0.5%, reflective of the overall dry conditions. The variable C was not used, as the vehicles to be used have model years newer than the 1980's. Plugging these variables into Equation 3, the uncontrolled PM_{10} emission factor is 1.22 lbs/VMT. Chemical suppressants will be applied during the project to achieve 80% control and a PM_{10} emission factor of 0.244 lbs/VMT.

Daily emissions of PM_{10} were calculated by multiplying the mileage traveled by the emission factor using the below equation, with results listed in Table 8.

$$Q_{Daily} = \left(\frac{E\,lbs}{VMT}\right)\left(\frac{VMTs}{day}\right), \qquad in\ lbs/day \qquad (4)$$

Table 8. Fugitive Dust from Vehicle Travel

Pollutant	Daily Emissions (lbs)				Daily Total (lbs)	Proposed Action Total (lbs)
	Aurora Canyon Road	Upper Geiger Grade	Paramount Mine Road	Lower Geiger Road		
PM_{10}	50.752	12.688	11.712	12.444	87.60	3941.8

Proposed Action Summary

Daily and total emissions from the proposed action are summarized in Table 9. The criteria pollutants with the highest emissions are NO_X and PM_{10} at 4,473 pounds and 4,092 pounds, respectively, project total.

Table 9. Proposed Action Emissions Summary

Pollutant	Daily Emissions From Drills and Light Plants (lbs)	Daily Emissions From Vehicle Tailpipes (lbs)	Daily Emissions From Vehicle Travel (lbs)	Daily Total (lbs)	Proposed Action Total (lbs)
VOC	4.1	0.3	NA	4.4	199.8
CO	7.8	2.1	NA	10.0	448.3
NOX	96.6	2.8	NA	99.4	4473.4
SO2	9.7	0.01	NA	9.7	437.5
NH3	NA	0.02	NA	0.02	1.0
PM10	3.2	0.1	87.60	90.9	4092.1
Benzene	3.13E-02	3.32E-03	NA	3.46E-02	1.6
Toluene	1.37E-02	NA	NA	1.37E-02	0.6
Xylenes	9.56E-03	NA	NA	9.56E-03	0.4
Propylene	8.66E-02	NA	NA	8.66E-02	3.9
1,3 Butadiene	1.31E-03	1.93E-03	NA	3.24E-03	0.1
Formaldehyde	3.96E-02	2.48E-02	NA	6.44E-02	2.9
Acetaldehyde	2.57E-02	9.12E-03	NA	3.49E-02	1.6
Acrolein	3.10E-02	1.11E-03	NA	3.21E-02	1.4
Total PAH	5.64E-03	NA	NA	5.64E-03	0.3

Model Methodology

The latest available version of AERMOD (07026) was utilized to assess impacts from the proposed action. Model inputs and control parameter options were selected in accordance with the protocol established in *Guideline on Air Quality Models, Revised* (GAQM) and *User's Guide for the AMS/EPA Regulatory Model - AERMOD*, both EPA documents. AERMOD is the EPA regulatory default model for nearfield impact assessments.

Air Quality Model Description

AERMOD is a modeling system developed by the **A**merican Meteorological Society/**E**PA **R**egulatory **I**mprovement **C**ommittee (AERMIC). The **AER**MIC **mod**el (AERMOD) modeling system consists of two main pre-processors, AERMAP and AERMET, and the AERMOD model itself. The AERMAP pre-processor characterizes terrain by employing electronic terrain maps

and extracting and calculating required data based on a user-generated receptor grid. AERMAP generates a file containing data for each receptor: x- and y- coordinate location, mean sea level elevation, and hill profile parameter. AERMET characterizes the state of atmosphere at the surface and in the mixed layer, as well as the vertical structure of the planetary boundary layer. Input into AERMET consists of meteorological surface and upper air data, as well as land surface characteristics of albedo, Bowen ratio and surface roughness generated by AERSURF. AERMET produces two data files per year: a file that contains hourly surface meteorological data and boundary-layer parameters, and a file that contains hourly meteorological data at various levels.

AERMOD incorporates the receptor file from AERMAP, the two meteorological data files from AERMET, and user-provided project source and site data along with PRIME building downwash parameters (if applicable). The user identifies if the source(s) is located in an urban area (along with population), otherwise the model assumes a rural location. The users specifies how the model is to be run with various options, such as regulatory default mode, concentration or deposition output, dry or wet plume depletion, as well other user-set options. AERMOD produces either ambient air concentration or ground deposition values at each receptor for an individual pollutant over requested averaging periods. Available averaging periods are 1-, 2-, 3-, 4-, 6-, 8-, 12-, and 24-hour, as well as month, period, and annual.

Source Characterization

For AERMOD, the proposed action source data comprise emissions, location and physical characteristics. Emission sources can be described in the model as point, volume, area, open pit (OPENPIT), as well as other source types. Based on the information provided, the proposed action sources consist of two drill/light plants, fugitive gaseous emissions from vehicle tailpipes, and fugitive dust from vehicle movement. The two drill rigs and light plants were entered into AERMOD as point sources with all emissions vented out the drill rig stack; vehicle tailpipe emissions and fugitive dust from vehicle movement were entered into the model as volume sources. Modeling analysis focused on criteria pollutants of PM_{10}, SO_2, NO_X and CO, as these pollutants have ambient standards.

For each point source the data entered into the model consist of the x- and y-location, MSL elevation, pollutant emission rate (g/s), stack height (m), stack diameter (m), plume exit temperature (K), and plume exit velocity (m/s). For each volume source the data entered into the model consist of x- and y-location, MSL elevation, pollutant emission rate (g/s), release height (m), initial lateral dimension (σ_{yo}) (m), and initial vertical dimension (σ_{zo}) (m). The latter two parameters are based on the physical width and height characteristics of the source, and whether they are being emitted near a building and/or if the source itself is elevated.

One dill rig/light plant was placed at one of the core holes to the north (PAX2) and one was placed to the south (PAX16), as shown in Figure 3. Aurora Canyon Road, Upper Geiger Grade, Paramount Mine Road, and Lower Geiger Grade were approximated in the model with volume sources. Table 10A lists the modeled stack parameters, except for the emission rate, for the

drills/light plants, and Table 10B lists the modeled volume source parameters for the roads. Drill stack parameters were approximated from manufacturer data.

Table 10A. Model Input Parameters for Drills/Light Plants

Description	Model ID	UTM Easting (m)	UTM Northing (m)	Elevation (m)	Stack Height (m)	Plume Exit Temperature (K)	Plume Exit Velocity (m/s)	Stack Diameter (m)
North Drill/Light Plant	PAX2	320134.4	4238040.5	2634.6	6	859	45.75	0.1
South Drill/Light Plant	PAX16	319243.8	4237587.5	2768.2	6	859	45.75	0.1

Table 10B. Model Input Parameters for Roads

Description	Model IDs	UTM Easting (m)	UTM Northing (m)	Elevation (m)	Release Height (m)	Sigma-y (m)	Sigma-z (m)
Aurora Canyon Road and Upper Geiger Grade	ACGGR001-ACGGR001390	Various	Various	Various	1.0	18.6	0.93
Paramount Mine Road	PR01-PR45	Various	Various	Various	1.0	18.6	0.93
Lower Geiger Grade	LGR01-LGR45	Various	Various	Various	1.0	18.6	0.93

AERMOD was run in regulatory default mode. Modeled short-term and long-term emission rates for each source were calculated, as applicable, by source operation. The model was run for appropriate averaging periods based on ambient standards. Table 11A lists the modeled emission rates for the drills/light plants. As drills/light plants operate continuously 24 hours per day, modeled short-term emissions were calculated by converting daily emissions into grams per second. Long-term modeled emissions were calculated above by spreading project total emissions (in 45 days) over the year, i.e., dividing the proposed action total emissions by 365, and converting to grams per second. This is conservative because the model is run during poor dispersion periods in the winter, when the proposed action will not be running.

Table 11B presents the modeled emission rates for each volume source on the roads. Modeled emission rates for Paramount Mine Road and Lower Geiger Grade were handled in the same manner as the drills, since vehicles on these routes will operate any time of the day. For Aurora Canyon Road and Upper Geiger Grade, vehicles will traverse to and from the project area from 7 AM to 10 AM in the morning and 7 PM and 10 PM in the evening. To reflect this activity in the model, emissions on these roads were compressed to three hours in the morning and three hours in the evening. Emission rates were apportioned evenly over the volume sources. AERMOD was then set to limit the operation of these volume sources to the six hours listed.

Table 11A. Modeled Emission Rates for Drills/Light Plants

	Short-Term	Long-Term
Pollutant	Modeling Emissions Per Site (g/sec)	Modeling Emissions Per Site (g/sec)
CO	0.02059	NA
NOX	0.2535	0.03125
SOX	0.0255	0.00314
PM10	0.00852	0.00105

Table 11B. Modeled Emission Rates for Road Volume Sources

Gaseous Pollutants	Model ID Number					
	ARGGR001-ARGGR390	PR01-PR45	LGR01-LGR45	ARGGR001-ARGGR390	PR01-PR45	LGR01-LGR45
CO (g/s)	8.467E-05	3.084E-05	3.297E-05	NA	NA	NA
NO_X (g/s)	1.215E-04	3.281E-05	3.508E-05	1.498E-05	4.045E-06	4.325E-06
SO_2 (g/s)	2.733E-07	1.056E-07	1.127E-07	3.369E-08	1.301E-08	1.390E-08
PM_{10} (g/s)	4.800E-03	1.372E-03	1.457E-03	5.918E-04	1.691E-04	1.797E-04

Receptor Grid

The proposed action does not have an ambient air boundary and all areas will remain accessible to the public during proposed action activities. The exception to this will be the drill sites, where the public will be blocked from nearby access for safety reasons.

A receptor grid in a modeling study is designed to capture significant impacts from the project, as well as identifying any nearby sensitive areas. For this modeling analysis, two nested grids were generated. The interior grid was a 5 kilometer by 5 kilometer receptor grid centered on the project area with a spacing of 100 meters. The exterior grid extended 5 kilometers from the interior grid with a spacing of 250 meters. In addition, to the west of the exterior grid, a third receptor grid was placed that covered a 10 kilometer by 10 kilometer area centered on the Aurora Canyon Road, with a spacing of 1,000 meters. See Figure 4 for the receptor grid layout.

A few receptors were excluded from the modeling analysis. These include those that were within 100 meters of the modeled drill sites, reflecting the exclusion listed above. In addition, receptors within 25 meters of the road were excluded, as is a typical buffer with modeling for roads for regulatory purposes.

In addition to the grid above, two other receptor grids were used. The first grid represented the boundary of the Mono Lake non-attainment area to the southeast of the proposed action. This boundary was digitized based maps available from California Air Resources Board (CARB). In addition, receptors used for Yosemite National Park were obtained from the National Park Service (NPS) Web site for the Class I analysis.

Meteorological Data

AERMET processed five years (2003 to 2007) of Mono Lake surface data and Reno NWS upper air data. Surface characteristics were generated using AERSURF for monthly variables, and 12 30-degree sectors. Figure 5 presents a five-year wind rose. The mean wind speed at Mono Lake from 2003 to 2007 was 2.8 meters per second (m/s) (6.3 miles per hour (mph)), with the predominant flow from the south at about 13% of the time and secondary flows from the north-northeast and north at about 12.5% and 12% of the time, respectively.

Ambient Air Quality Impacts

Impacts from the proposed action were assessed for both short-term and long-term averaging periods; the long-term period was converted to an annual equivalent based on the life of the project. No other sources were modeled with the proposed project. Per the request of Knight Piésold, measured background concentrations were not added to model impacts. Knight Piésold specifically requested that only the impacts from the proposed action be compared against ambient standards.

Table 12 presents modeled impact results for criteria pollutants compared to applicable ambient standards. All predicted impacts from the proposed action are below ambient standards, with the closest being the one-hour NO_X, a California standard. Note that this predicted impact considers the Ozone Limiting Method (OLM), which relies on the following relationship between NO, NO_2 and O_3:

$$NO + O_3 \rightarrow NO_2 + O_2$$

In calculating NO_2 impacts for the short-term, only 10% of the NO_X emitted is assumed to be NO_2, the pollutant on which the standard is based, and the remaining balance is mostly NO which requires available ambient ozone for the conversion. Applying OLM to the project uses a measured background ozone concentration of 268.5 $\mu g/m^3$ (obtained from the EPA Air Quality System database) and a modeled highest 1-hour NO_X concentration of 290.1 $\mu g/m^3$, with the resultant NO_2 concentration equaling 297.5 $\mu g/m^3$. Applying OLM to the annual period, the modeled impact is multiplied by 0.75.

Table 12. Comparison of Predicted Model Impacts from Paramount to California and National Ambient Air Quality Standards.

Pollutant	Averaging Period	Modeled Highest First-High Concentration (µg/m^3)	CAAQS[1] (µg/m^3)	Highest Second-High Modeled Concentration Or Maximum Annual (µg/m^3)	NAAQS[2] (µg/m^3)
PM_{10}	24-Hour	25.2	50	22.8	150
	Annual	0.7	20	0.7	NA
CO	1-Hour	23.6	23,000	22.2	40,000
	8-Hour	10.6	10,000	6.2	10,000
NO_2[3]	1-Hour	297.5	339	NA	NA
	Annual	0.4	57	0.4	100
SO_2	1-Hour	29.2	665	NA	NA
	3-Hour	16.0	NA	14.0	1300
	24-Hour	4.9	105	2.9	365
	Annual	0.1	NA	0.1	80

1. CAAQS values are not to be exceeded during the year.
2. NAAQS values are not to be exceed more than once per year for short-term periods, and are not to be exceeded for annual averaging periods.
3. Ozone limiting method applied.

Table 13 lists model impact results for criteria pollutants on the Class I area of Yosemite compared against the Federal Class I significant impact levels (SILs). All pollutant impacts are well below the Federal Class I SILs, and thus no further analysis of Class I impacts would have to be performed for the proposed action.

Table 13. Predicted Modeled Impacts from Paramount in Yosemite National Park (Northern Portion) Compared to Class I Significant Impact Levels (SILs)

Pollutant	Averaging Period	Highest First-High Modeled Concentration, Or Maximum Annual (µg/m^3)	Class I SILs (µg/m^3)
PM_{10}	24-Hour	0.183	0.3
	Annual	0.001	0.2
NO_2	Annual	0.001	0.1
SO_2	3-Hour	0.084	1
	24-Hour	0.017	0.2
	Annual	0.0001	0.1

Table 14 shows predicted impact results on the Mono Basin non-attainment area for PM_{10}, compared against federal Class II SILs. Impacts are well below the significance levels for PM_{10}, thus the project would not significantly contribute to the violation of the NAAQS in Mono Basin.

Table 14. Predicted Modeled Impacts from Paramount along Northern Boundary of Mono Basin Federal Non-Attainment Area Compared to Class II SILs

Pollutant	Averaging Period	Highest First-High Modeled Concentration, Or Maximum Annual (µg/m^3)	Class II Significant Impact Levels (µg/m^3)
PM_{10}	24-Hour	0.8	5
	Annual	0.01	1

Conclusion

MMA performed an air quality impact analysis for the proposed exploration activities at Paramount Mine based on the provided description and equipment list of the proposed action. The impact analysis involved development of an emissions inventory as well as an air quality dispersion model to determine ambient impacts on the surrounding environment.

An emissions inventory was generated for the proposed action for criteria pollutants VOCs, CO, NO_X, SO_2, and PM_{10}, as well as other regulated air pollutants. The emissions inventory was calculated based on data for various activities, equipment, and support vehicles required for the proposed action, as well as emission factors from AP-42, MOBILE6.2 emissions model, and manufacturer information. For the criteria pollutants of CO, NO_X, SO_2, and PM_{10}, short-term and long-term emission rates were calculated based on operational data.

Air quality impact assessment focused on four criteria pollutants PM_{10}, NO_X, SO_2, and CO. The air quality dispersion model utilized to determine ambient concentrations for these four pollutants was AERMOD (07026), which is EPA's regulatory default model for nearfield impact assessments. Inputs into AERMOD included source parameters, receptors, and meteorological data. Source parameters include source characterization, location, short- and long-term emission rates, as well as other required data. To capture impacts, a receptor grid was developed that covered the Paramount Mine and access road, and extended out 10 kilometers. In addition, receptors were placed on two sensitive areas: (1) the Mono Lake PM_{10} non-attainment area boundary to the southeast of the proposed action, and (2) Yosemite National Park, utilizing NPS receptors. Meteorological data entered into the model entailed five years of Mono Lake surface data and Reno upper air data. AERMOD was run in regulatory default mode for the required averaging periods for the four pollutants of concern based on the CAAQS and NAAQS.

Model results show all impacts from the proposed action are predicted to be below ambient standards, with the closest being the one-hour NO_X, a California standard. AERMOD predicted PM_{10} impacts from the proposed action at the boundary of the Mono Lake nonattainment area to be below Class II SILs for both 24-hour and annual averaging periods. Model results also demonstrated impacts at Yosemite National Park from the proposed action to be below Class I SILs for all applicable pollutants and averaging periods.

Based on the description of the proposed action, the emissions inventory, and the modeled impacts, the proposed action discussed in this memorandum will have negligible air quality impacts on the immediate surrounding environment, the Mono Lake nonattainment area, and Yosemite National Park.

Figure 1

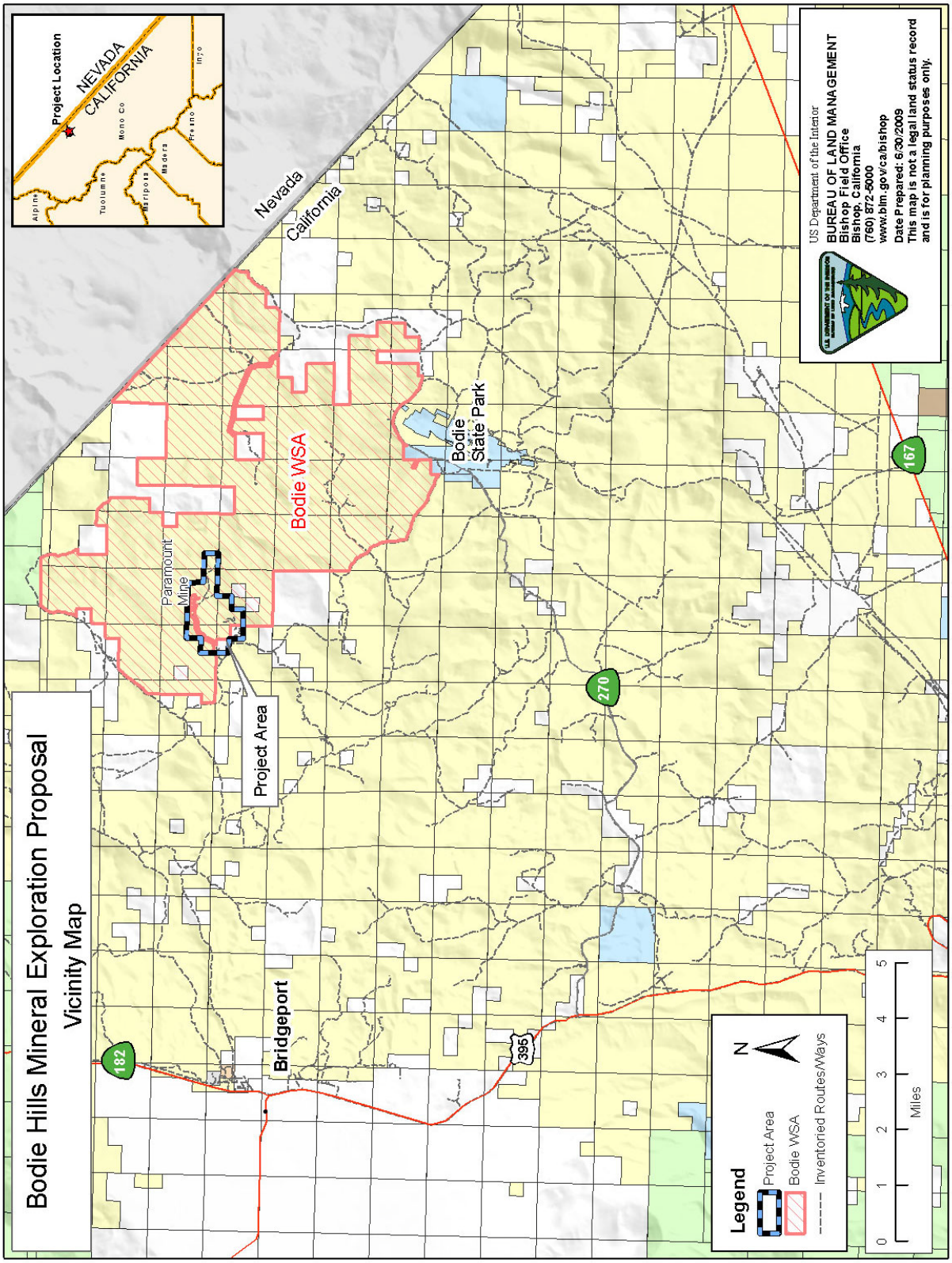

Bodie Hills Mineral Exploration Proposal
Vicinity Map
Project Location
NEVADA
CALIFORNIA
Alpine
Tuolumne
Mono Co
Mariposa
Madera
Fresno
Inyo
Nevada
California
Bodie WSA
Bodie State Park
Paramount Mine
Project Area
Bridgeport
182
270
395
167
Legend
Project Area
Bodie WSA
Inventoried Routes/Ways
N
0 1 2 3 4 5
Miles
US Department of the Interior
BUREAU OF LAND MANAGEMENT
Bishop Field Office
Bishop, California
(760) 872-5000
www.blm.gov/ca/bishop
Date Prepared: 6/30/2009
This map is not a legal land status record
and is for planning purposes only.

Figure 2

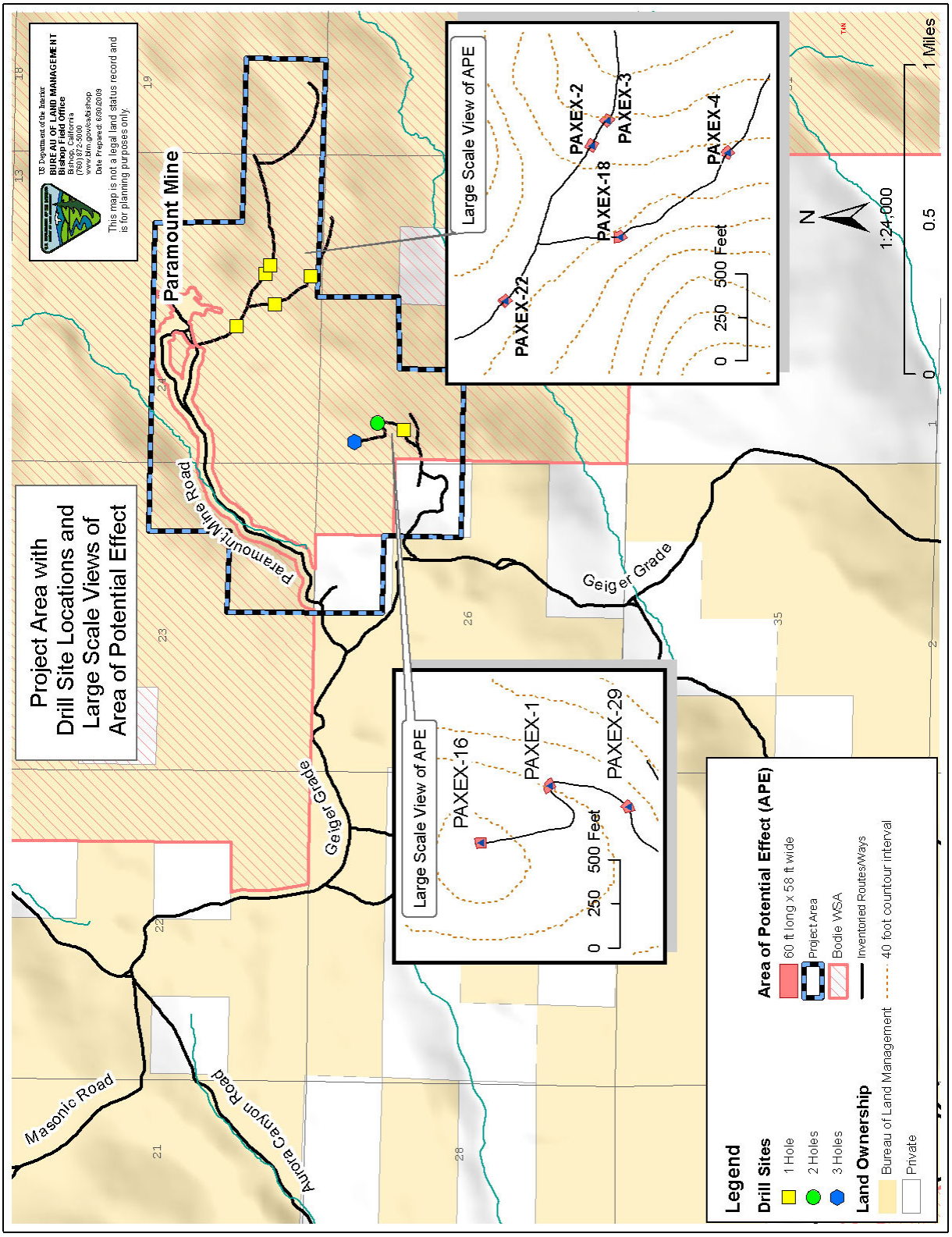

Project Area with
Drill Site Locations and
Large Scale Views of
Area of Potential Effect
U.S. Department of the Interior
BUREAU OF LAND MANAGEMENT
Bishop Field Office
Bishop, California
(760) 872-5000
www.blm.gov/ca/bishop
Date Prepared: 6/30/2009
This map is not a legal land status record and is for planning purposes only.
Paramount Mine
Paramount Mine Road
Geiger Grade
Masonic Road
Aurora Canyon Road
Large Scale View of APE
PAXEX-16
PAXEX-1
PAXEX-29
0 250 500 Feet
Large Scale View of APE
PAXEX-22
PAXEX-18
PAXEX-2
PAXEX-3
PAXEX-4
0 250 500 Feet
N
1:24,000
0 0.5 1 Miles
Legend
Drill Sites
1 Hole
2 Holes
3 Holes
Land Ownership
Bureau of Land Management
Private
Area of Potential Effect (APE)
60 ft long x 58 ft wide
Project Area
Bodie WSA
Inventoried Routes/Ways
40 foot countour interval

Figure 3

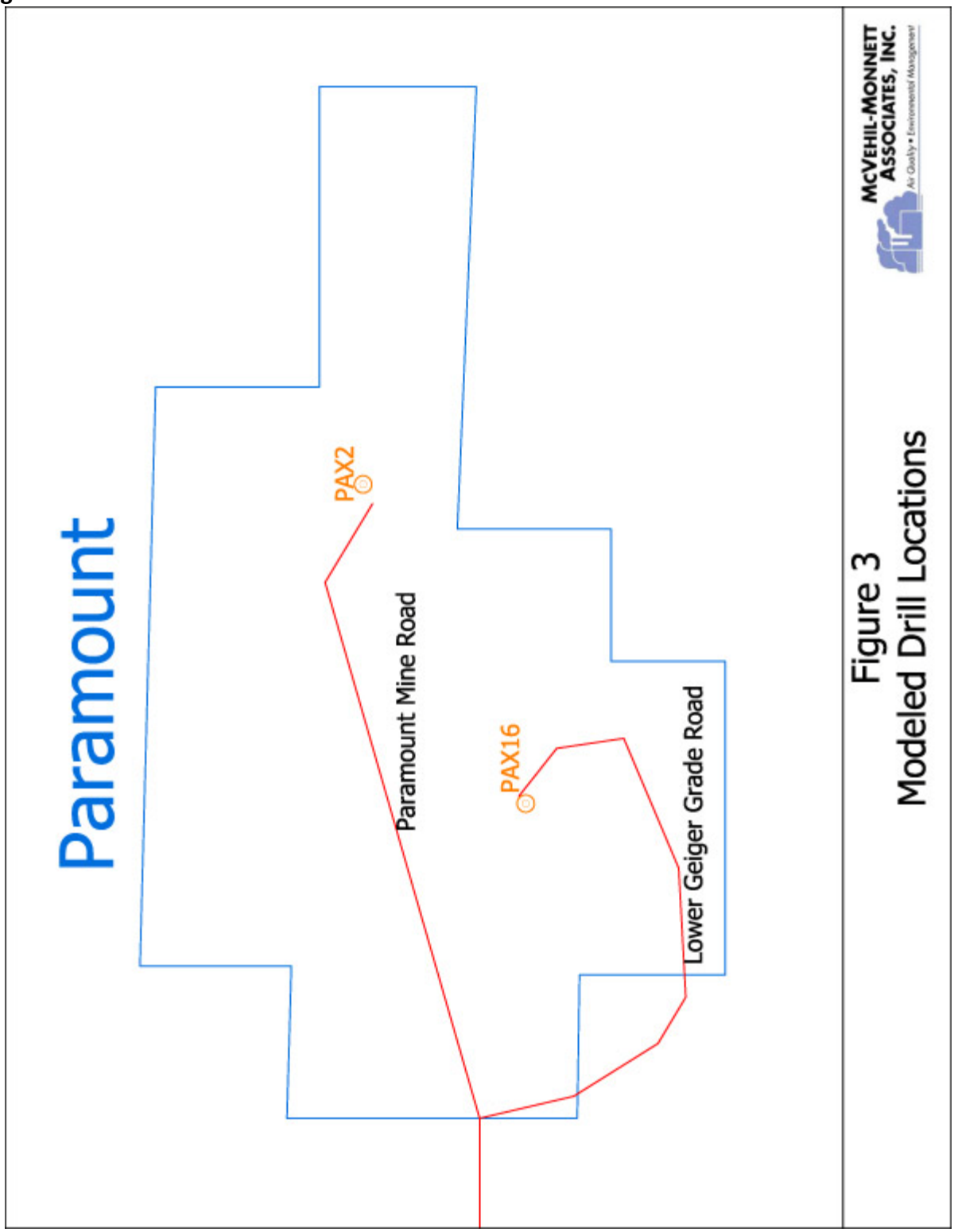

Paramount
PAX2
Paramount Mine Road
PAX16
Lower Geiger Grade Road
Figure 3
Modeled Drill Locations
McVehil-Monnett Associates, Inc.
Air Quality • Environmental Management

Figure 4

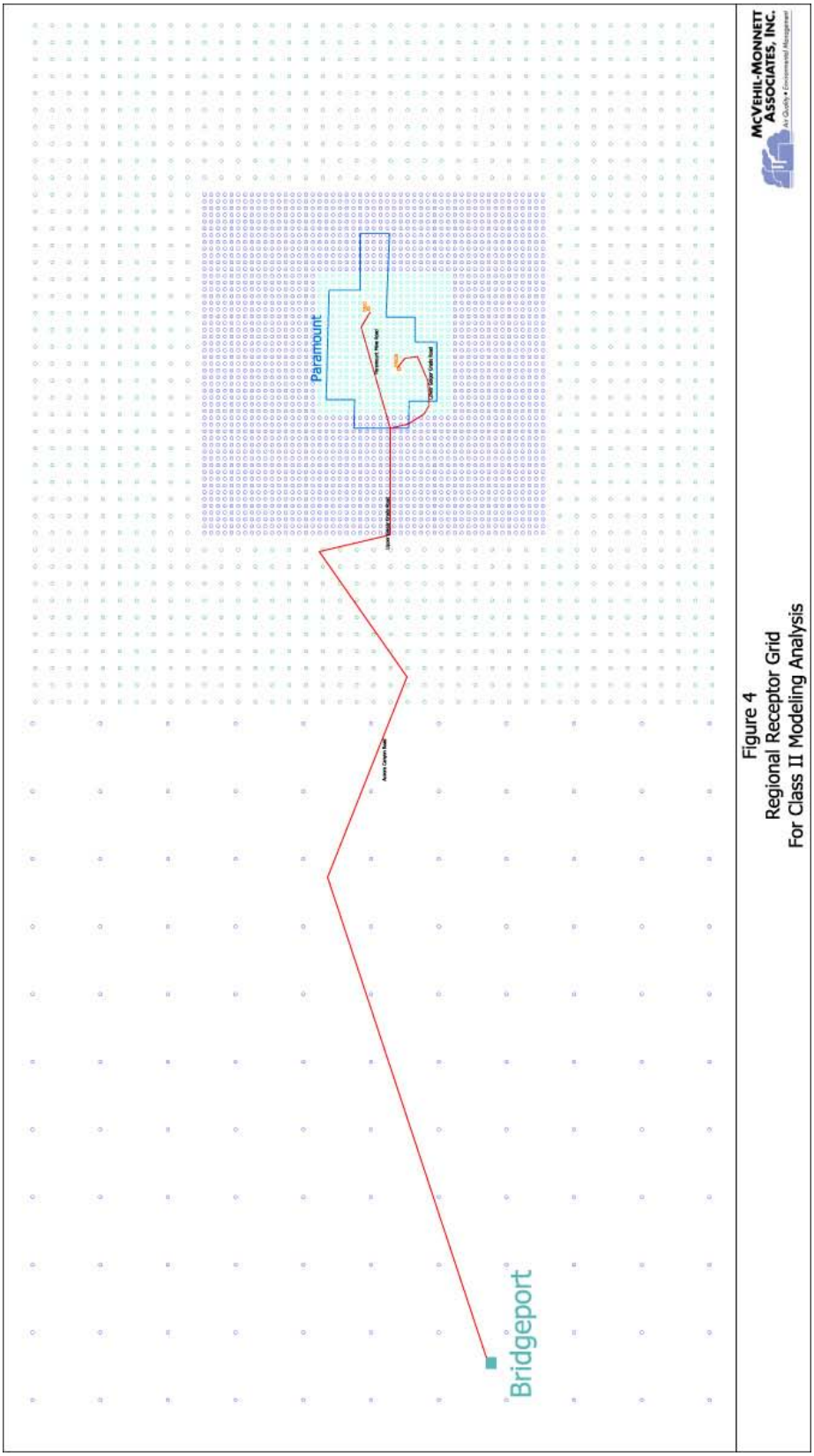
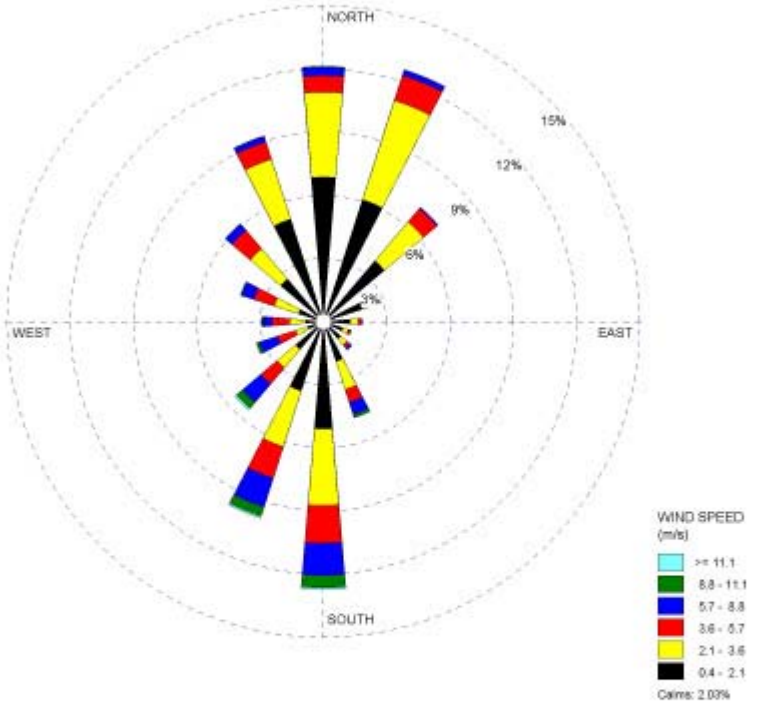


Figure 5

WIND ROSE PLOT:
Mono Lake Meteorological Station

DISPLAY:
Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	2003-2007 **Jan 1 - Dec 31** **00:00 - 23:00**	**Paramount Mine**	
		MODELER: **McVehil-Monnett Associates**	Figure 5
	CALM WINDS: **2.03%**	TOTAL COUNT: **43392 hrs.**	
	AVG. WIND SPEED: **2.85 m/s**	DATE: **4/17/2009**	PROJECT NO.: **2311-09**

WRPLOT View - Lakes Environmental Software