

Sky Brightness Monitoring Oversight Committee Plan

As Required By: Mitigation Measure FS-DS-02

June 2018

Prepared by:

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HUDBAY

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Monitoring and Reporting Schedule

<i>Task Schedule</i>	<i>Purpose/Description/Timing</i>	<i>Baseline Period/ Pre-Mining Period/ Construction Phase</i>			<i>Operations Phase</i>		<i>Closure Phase</i>	
		<i>AN</i>	<i>Q</i>	<i>A</i>	<i>Q</i>	<i>A</i>	<i>Q</i>	<i>A</i>
*Initial funding	Provide \$218,069 to SAO within 3 month of issuance of ROD	RC						
*Oversight Committee development	Finalize members the Oversight Committee	FS						
*Monitoring Plan development	Finalize components of monitoring plan	OC						
Ongoing funding	Provide \$100,000 to SAO to defray monitoring costs			RC		RC		RC
Oversight Committee meetings	Review and analyze light monitoring data		OC		OC		OC	
Reporting	To Forest Service			OC		OC		OC

AN = As Needed; Q = Quarterly; A= Annually; * = within 3 months following issuance of Final ROD (assumed in Baseline Period); SAO = Smithsonian Astronomical Observatory, RC = Rosemont Copper, FS = Forest Service, OC = Oversight Committee

Revision Log

<i>Revision Number</i>	<i>Revision Lead</i>	<i>Purpose of Revision</i>	<i>Revision Date</i>
1	Rosemont	Based on Forest Service review of June 2017 MPO submittal.	March 2018
2	Rosemont	Based on Forest Service review of March 2018 MPO submittal.	June 2018

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1.0 PLAN OBJECTIVE AND DESCRIPTION

This *Sky Brightness Monitoring Oversight Committee Plan* (Plan) was developed as a mitigation and monitoring measure (Mitigation Measure) requirement of the U.S. Forest Service's (USFS: Forest Service) Coronado National Forest (Coronado) Final Environmental Impact Statement (FEIS: USFS, 2013) for the Rosemont Copper Project (Project). The Mitigation Measure requirement is specified as "FS-DS-02: Funding of additional ground-based sky brightness monitoring" on pages B-58 through B-60 in Appendix B of the FEIS. Corrections to any of the mitigation measures listed in Appendix B are provided in an Errata to the FEIS (USFS, 2017a). The Record of Decision (ROD; USFS, 2017b) for the Rosemont Project also lists the required mitigation measures.

Mitigation Measure FS-DS-02 includes funding, monitoring, and the establishment of an Oversight Committee.

This Plan provides the Forest Service with a possible template to consider when developing monitoring activities, metrics and mitigation thresholds, and the structure of the Oversight Committee associated with this Mitigation Measure. Suggestions for the details of this Oversight Committee, such as the composition of the group, are included for the Forest Service to consider.

Funding associated with this Plan will be provided by Rosemont Copper Company (Rosemont) and will be initiated in the Baseline Period (prior to ground disturbance). Initial funding is timed to occur within three months following issuance of the final Record of Decision (ROD) by the Forest Service. Monitoring specific to this Plan will occur, by others, at the Fred Lawrence Whipple Observatory on Mount Hopkins (aka Smithsonian Astronomical Observatory [SAO]). Monitoring is anticipated to begin in the Pre-Mining Period, continue through the Active Mining Phase, and continue, as needed, into the Final Reclamation and Closure Phase (Closure Phase).

1.1 PLAN OBJECTIVE

The objective of Mitigation Measure FS-DS-02 is to:

- Fund ground-based sky brightness monitoring equipment and its operation at the Fred Lawrence Whipple Observatory on Mount Hopkins and provide parameters for participation in a Sky Brightness Monitoring Plan Oversight Committee. The monitoring is designed to complement the aerial based light monitoring being undertaken in Mitigation Measure FS-DS-01.

Other Forest Service mitigation measures associated with light monitoring include:

- FS-DS-01: Outdoor lighting plan implementation designed to reduce potential impacts from artificial night lighting. This includes management and inspection of light fixtures as well as aerial and mobile/static ground-based measurements of light at night.

1.2 PLAN DESCRIPTION

The remainder of this Plan includes the following sections:

- Section 2.0: Plan Details;
- Section 3.0: Monitoring and Reporting;
- Section 4.0: Closure and Bond Release;
- Section 5.0: Data Management; and
- Section 6.0: References.

2.0 PLAN DETAILS

The details associated with this Plan are listed below.

2.1 PURPOSE OF OVERSIGHT COMMITTEE

The purpose of the Sky Brightness Monitoring Plan Oversight Committee is to review and monitor all pertinent data from mine operations under Mitigation Measures FS-DS-01 and FS-DS-02. This includes establishing both pre-mine and post-mine baseline measurements of sky brightness, monitoring ongoing changes, and reviewing data and reports submitted by the SAO. The data will be evaluated for the quality of the information and determining whether or not the triggers are exceeded. Although yet to be agreed upon, an exceedance trigger of 10 percent above the post-mine baseline measurement has been proposed by the SAO.

This Oversight Committee will be formed by the Forest Service to allow access to professionals and local experts in the lighting and astronomical industries. According to Mitigation Measure FS-DS-02, within three months of final Record of Decision (ROD) issuance, representatives from Rosemont Copper, the USFS, and the SAO will meet to finalize the key components of the SAO monitoring plan. It is assumed the Oversight Committee will also work to evaluate the SAO monitoring plan and triggers and that they would participate in these early meetings. The topics to be covered at this meeting include:

- Appropriate triggers and specific trigger methodology;
- Analysis considerations when reviewing regional sky brightness;
- Locations and aiming of sensors; and
- Identification of the metrics to be used and how they will be calculated.

If measurements exceed established triggers, additional meetings may be held. Any substantial changes, or exceedances identified by the monitoring, would be reviewed by the Oversight Committee and recommendations for action would be developed. These recommendations will be provided for consideration to the Forest Supervisor. Additionally, the Oversight Committee will review the proposed adaptive management actions from Rosemont to ensure those actions meet the intent of the light mitigation proposed for the site.

This Oversight Committee will be formed by the Forest Service to allow access to professionals and local experts in the lighting and astronomical industries. This is not an advisory committee therefore no consensus advice or recommendations resulting from group deliberation or interaction is expected or will be solicited.

The current approved monitoring plan presented by the SAO is included in Appendix C of the *Outdoor Light Monitoring Plan* (MPO Volume II-q).

2.2 PARTICIPATION AND COMPOSITION OF OVERSIGHT COMMITTEE

The Oversight Committee will meet quarterly with additional meetings held when necessary. Meetings will be held at a location of the committees choosing; however, Rosemont believes it is important that these meetings be held on the Rosemont site or close to the site location. This will allow for better dialogue and allow committee members to see the site conditions, fixtures and lighting design elements, and other issues that may arise. Rosemont will be happy to host these meetings on-site.

The Mitigation Measure specifies that the committee consists of five members. The Forest Service will serve as the chair with other individuals representing Rosemont, the Fred Lawrence Whipple Observatory, an independent astronomer, and any other necessary subcontractors. Through preliminary discussions, the following individuals have been identified as possible members:

- Chair - Forest Service: Representative

- Rosemont Copper: Technical Representative
- Fred Lawrence Whipple Observatory: Charles Alcott, or Grant Williams/Emilio Falco/Pascal Fortin as alternates
- Independent Astronomer: Richard Green, Associate Director of the Steward Observatory
- Subcontractor: Christian Monrad, of Monrad Engineering, Tucson AZ.

Further, additional information or discussion might be useful from those who understand the process and the science. These groups and individuals may include but also may not be limited to:

- Tucson Amateur Astronomy Club
- Huachuca Amateur Astronomy Club
- Pete Strasser, Technical Director, International Dark-Sky Association
- David Levy
- BLM Staff
- National Park Service
- Pima County Outdoor Lighting Committee member
- Western Research Labs – Dr. Eric Craine

Rosemont recommends that an outside contractor help develop the rules, structure, and bylaws of the committee and facilitate the initial meeting. Terry Chute from SWCA would appear to be the best fit to serve in this role due to his knowledge and expertise of the Project and topic.

After the preliminary meeting, regular meetings with agendas should be set and managed to ensure the intent of Mitigation Measure FS-DS-02 is met. These meetings should provide an opportunity to discuss general sky brightness trends as well as specific concerns relating to the Project; however, Rosemont also would suggest that the attendees be limited to those with specific topical information so that discussions can be managed around the intent of the Oversight Committee.

2.3 FUNDING FOR EQUIPMENT AND MONITORING

Within three (3) months issuance of the final ROD, Rosemont would provide \$218,069 in funding to the SAO for:

- Purchase of monitoring equipment; and
- Initiation of monitoring.

In addition to the \$218,069, Rosemont would provide annual funding to the SAO in the amount of \$100,000 to defray costs associated with the program.

3.0 MONITORING AND REPORTING

Monitoring and reporting components for Mitigation Measure FS-DS-02 are listed below.

3.1 MONITORING

There is no required monitoring by Rosemont with regard to this Mitigation Measure.

Designs, reports, and monitoring identified in Mitigation Measure FS-DS-01 will be made available to the Oversight Committee to ensure there is complete understanding of the lighting picture at the Project. Depending upon the plans developed by the SAO, Rosemont may alter the currently planned monitoring to take advantage of new technology and compliment the work performed by SAO. These plans will be presented to the Oversight Committee for discussion and concurrence.

3.2 REPORTING

Reporting on Mitigation Measure FS-DS-02 by the Oversight Committee designee to the Forest Service will include the following information:

- Funds distributed to the Smithsonian and date of distribution;
- Equipment purchased, date of purchase and date of installation;
- Equipment calibration and maintenance activities including dates and work performed and whether such work effects the operation or calibration of equipment;
- Summary of participation in the Sky Brightness Monitoring Plan Oversight Committee, including dates of participation;
- Regional sky brightness measurements and analysis of impacts;
- Recommendations and any actions taken as a result of those recommendations; and
- A copy of the report or minutes produced following each meeting describing what was discussed, any issues presented, and topics for the next meeting will be included in the annual report.

Rosemont is not responsible for reporting results obtained by the SAO. Additionally, some of the information stated above will need to be provided to Rosemont by the SAO. However, data, to the extent it is available to Rosemont, will be managed and submitted to the Forest Service as agreed and recommended by the Committee.

4.0 CLOSURE AND BOND RELEASE

This section addresses closure activities associated with this Plan as well as the approach for funding of those activities and bond release of those funds. If bonding is set for one year or less (i.e., simply completing testwork or finalizing reporting) no bond release is proposed. For longer periods, the bonding terms and application for bond release, as well as the mechanism for that release, are included.

4.1 INTERIM CLOSURE

There are no interim closure activities associated with this measure.

4.2 FINAL CLOSURE

There are no final closure activities associated with this measure.

4.3 BOND RELEASE

There is no bonding associated with this measure.

5.0 DATA MANAGEMENT

As chair of the Sky Brightness Monitoring Oversight Committee, the Forest Service is responsible for the data management elements of this Mitigation Measure. Should the Forest Service require any data from Rosemont to incorporate into the management record for the Committee, Rosemont will provide information related to this Plan upon Forest Service request, and in a format consistent with established data transfer convention for the Project.

6.0 REFERENCES

USFS, 2013. *Final Environmental Impact Statement for Rosemont Copper Project, Appendix B Mitigation and Monitoring Plan*. December 2013.

2017a. *Errata – Rosemont Copper Project Final Environmental Impact Statement*. April 26, 2017.

2017b. *Record of Decision – Rosemont Copper Project and Amendment of the Coronado Land and Resource Management Plan*. June 2017.