

June 10, 2024

Deborah Bradley
Attn: Hermosa Critical Minerals Project
United States Forest Service
300 W. Congress Street
Tucson, AZ 85701

Re: Hermosa Critical Minerals Project, project 65668
via electronic mail to: Deborah.bradley@usda.gov and

Dear U.S. Forest Service,

As representatives of the undersigned professional observatories in the state of Arizona, we are writing to express our concern about some elements both proposed and missing in South32 Hermosa Inc.'s Critical Minerals Exploration and Mine Plan of Operations currently under consideration for approval by the U.S. Forest Service because the project plan will use light plants that will impede astronomical research.

The South32 Hermosa project plan calls for the use at least an additional 26 light plants on exploratory drill sites. Existing light plants owned by South32 already pose disruptions to clear observations for nearby observatories. Both existing and proposed light plants are unshielded and radiate light more than 20 degrees above horizontal, brightening the sky for miles around the project, and impeding observations for multiple observatories. In the past there have been some agreed upon mitigations by South32, such as turning off light plants or changing their directionality, but these mitigations have been short-lived, and the lights have regularly returned to their original positions and durations of operation. While the South32 Hermosa project plan acknowledges that there may be disruptions and that the company will create a plan to mitigate light pollution, this acknowledgement is only directed at the protection of wildlife and does not mention expected disruptions to research by observatories. There is also no mention of when a lighting plan will be completed or how it will be reviewed, approved, supported, or responsibly maintained. It further does not mention what steps will be taken to minimize disruptions to research and the natural dark environment. To date, there has been no contact with the undersigned observatories regarding these proposed lighting plans.

Artificial lighting can either be of significant or limited detriment to astronomy and the naturally dark environment. Because light pollution lightens and brightens the whole background of the night sky, it not only drowns out the dimmest stars but also makes it more difficult to see brighter ones, thus impeding observations and research. According to published literature and professional lighting engineering guidance, light radiated directly within 20 degrees above horizontal, such as the light that this project plan calls for, is the strongest contributor to anthropogenic sky glow at observatories impacted by urban areas and large infrastructure projects. Limiting light color temperature and shielding luminaires to ensure that light shines downward have been shown to be effective ways to limit skyglow and the impact on the dark

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environment without negatively impacting the use of light. Most notably, luminaire shielding ensures that available light is directed to the ground, where it is of the most use for infrastructure purposes, rather than being scattered into the night sky.

Arizona hosts the world's largest optical telescope and 10% of all the world's largest telescopes. The Department of Energy, the National Science Foundation, the Smithsonian Institution, U.S. Navy, and NASA, along with U.S. universities and foreign institutions, invest tens of millions of dollars annually in operating and upgrading Arizona observatories, which are located in the state due to its persistent naturally dark skies. The area of Southern Arizona— Santa Cruz County and Cochise County— most impacted by the South32 Hermosa project has long been home to multiple member institutions of the astronomical community, including the University of Arizona's Patterson Observatory in Sierra Vista, the Winer Observatory— a private non-profit observatory serving academic and astronomical institutions and educational programs— in Sonoita, the Fairborn Institute's Fairborn Observatory in Washington Camp, the Tenagra Observatory— a private observatory serving academic institutions and the International Asteroid Warning Network— in Rio Rico, and the Smithsonian Institution's Fred Lawrence Whipple Observatory located in the Coronado National Forest on Mt. Hopkins in Amado, with local governments and communities aligning with efforts to protect dark skies.

The City of Tucson and Pima County have shared designated Lighting Areas which extend well into Santa Cruz County and Cochise County. Santa Cruz County has included Whipple Observatory and others in its master planning, tourism plans, and newly designated lighting areas in the ongoing revision of its outdoor lighting policies. Cochise County, too, maintains strong lighting policies— elevated in some towns and cities— to minimize the impacts of artificial light on the naturally dark environment and astronomical research. The amount of artificial lighting requested and suggested by the South32 Hermosa project, which would not be allowed under local policy without a variance, would be of significant detriment to the protections afforded observatories by these local policies.

As a part of the environmental assessment process, we propose to work with the U.S. Forest Service and the applicant on a full outdoor lighting impact study and plan that shows how South32 Hermosa will deploy a strategic approach to prevent the growth of artificial skyglow and to ensure that appropriate lighting and shielding methods are deployed for this project. We also propose that project include an accurate light pollution baseline, input from local professional lighting engineers, and those with local astronomical and environmental protection experience. During initial public scoping in May 2024, the environmental assessment firm for the Hermosa project sent a photographer to Whipple Observatory to procure images of the mine for a light pollution baseline. Despite requests from the Smithsonian Institution, the photographer only captured daytime images, when light plants are not in use and an accurate baseline for the impact of artificial light at night cannot be captured. Further, published literature and studies on light pollution and mitigations suggest the plan be modified to include a provision for replacing and modernizing existing unshielded lighting in already-working South32 mining projects and financial support from South32 for ongoing community monitoring of light pollution from the project.

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The protection of the natural desert sky will greatly benefit astronomical research, education, and outreach activities in Southern Arizona for years to come and ensure that generations of Americans and visitors to the area will continue to enjoy and learn from an increasingly vulnerable and nationally significant natural resource in some of the nation's darkest locations.

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