



## ECMC LIGHT MITIGATION PLAN OPERATOR GUIDANCE

### FORM 2A

### Rule 304.c.(3). - Light Mitigation Plan

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#### Document Control

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#### Rule Citation

##### 304.c.(3). Light Mitigation Plan

A light mitigation plan consistent with the requirements of Rule 424.a.

Associated rules (including all sections of Rule 424) are included in Appendix A.

#### Purpose of Light Mitigation Plan

The Light Mitigation Plan is intended to describe how Operators will comply with the light mitigation requirements of Rule 424. This also aids Staff in assessing cumulative light impacts from an Oil and Gas Location. The Light Mitigation Plan is expected to address all practices and procedures that are specified in Rule 424. The Light Mitigation Plan shall also differentiate between pre-production and production plans.

#### Guidance/Requirements

##### General Requirements

1. The Light Mitigation Plan will be signed by a person with relevant expertise in light mitigation techniques and design. This may include lighting engineers,

architects, landscape architects, or other relevant professionals with demonstrated expertise. The plan will include a statement describing the relevant experience and expertise of the person signing the plan.

2. The plan will contain all required elements specified in Rule 424.a.(2) or will contain substantially equivalent information if developed through a local government or federal process. (If a plan is developed through a local government or federal process, provide contact information and a description of the process.)
  - a. A pre-production facility lighting plan demonstrating one or more proposed methods of ensuring compliance with Rule 424.c, and:
    - i. That provides adequate lighting to ensure safety during active operations involving personnel; and
    - ii. The proposed anticipated location, mounting, height, and orientation of all outdoor lighting fixtures on the site during pre-production activities.
    - iii. Nothing in this Rule 424.a.(2).A prevents an Operator from using ad hoc temporary portable lighting when necessary for safety reasons during pre-production activities, provided that the Operator otherwise complies with the standards in Rules 424.b-f.
  - b. A Production Facility lighting plan demonstrating one or more proposed methods of ensuring compliance with Rule 424.d & e, and:
    - i. The location, mounting, height, and orientation of all outdoor lighting fixtures on the site;
    - ii. A table that calculates the total lumen output of all fixtures combined; and

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- iii. Cut sheets of light fixtures that demonstrate Backlight, Uplight, and Glare (“BUG”) rating, lumen output, and fully shielded design; and
  - iv. For any location with a Building Unit within 2,000 feet, a photometric plan estimating or calculating the illuminance, measured in lux, 100 feet outside the facility boundary;
- c. The Operator’s capability of meeting all requirements of this Rule 424 through one or more proposed methods;
  - d. The location of the resources and receptors listed in Rules 424.c & d; and
  - e. Square footage of the Working Pad Surface for purposes of demonstrating compliance with Rule 424.d.(2).
- 3. The plan will contain the necessary maps, diagrams and drawings to thoroughly describe the planned lighting layout and equipment.
  - 4. The plan will specify the zoning of the location and the surrounding lands and the maximum permissible light levels. If the local government maximum lighting level is lower than ECMC’s maximum permissible light level, the Director may use the local government lighting level in place of ECMC’s lighting level for this plan.
  - 5. The plan will include a description of the lighting standards that are planned, including a description of how light will be blocked or diffused to reduce impacts beyond the Oil and Gas Location.
  - 6. Lighting fixture output units will be listed in lumens. The estimated illuminance to surrounding receptors such as Residential Building Units will be shown in lux. Calculation results will be shown in these units. Diagrams such as the photometric plan may use conversion factors from foot-candles to lumens to demonstrate compliance.

7. The plan will identify the nearby population and wildlife habitat that may be impacted by lighting and describe the potential impacts and the site-specific mitigation measures to minimize impacts.
8. The plan will include a description of how site lighting will manage cumulative nighttime light intensity at Residential Building Units and High Occupancy Building Units, as specified in Rule 424.f.
9. The plan will contain site-specific Best Management Practices (BMPs) to mitigate light pollution and obtrusive lighting. Provide the BMPs in a list that facilitates copying them onto the Oil and Gas Location Assessment ("Form 2A").
10. Rule 424.b.(3).C. addresses the use of BMPs to minimize light pollution and obtrusive lighting by adjusting lighting colors to reduce intensity. Warmer color scales are encouraged and although the Commission views 3,000 degrees Kelvin as a reasonable maximum lighting color, the appropriate maximum temperatures may be determined on a case-by-case basis.
11. The plan will demonstrate how the location will be sufficiently lit for safety during all phases of operations.
12. Lighting fixture output units will be listed in lumens.
13. The estimated illuminance to surrounding receptors such as Residential Building Units will be shown in lux.
14. Calculation results will be shown in these units. Diagrams such as the photometric plan may use conversion factors from foot-candles to lux to demonstrate compliance.

### **Pre-Production Phases Plan Guidance**

1. The pre-production light plan will include the planned temporary or mobile lighting, as well as a default or idealized location of the lighting. The operator

is allowed to make adjustments based on conditions in the field with ad hoc temporary lighting, which will not require updates to the Light Mitigation Plan.

2. The pre-production phase of the plan will include figures showing major pieces of operational equipment (for orientation), the anticipated location, height, and orientation of outdoor lighting fixtures as well as the location of BMPs or other objects that block light from leaving the location, such as sound walls.
  - a. The figures will cover the phases of pre-production with outdoor light fixtures. This may include the pad construction phase, the drilling phase, completions, and flowback (if different from production). For clarity, a figure for each phase is usually preferable. If there is no pad lighting at any individual phase, the plan should state that, and then no figure is required for that phase. These figures may be based on the location's layout drawings.
3. If a noise barrier is being used on the location and impacts the amount of light that leaves the location, the operator will state when it will be removed, with consideration being given to any outdoor lights that remain at the location.
4. The operator will show how the likely light impacts out to 2,000 feet were considered or managed in regards to Building Unit occupants, motorists on roads, and wildlife in High Priority Habitats (HPH).

## **Production Phase Plan Guidance**

1. The production phase will include a figure(s) showing major pieces of operational equipment (for orientation), the anticipated location, height, and orientation of outdoor lighting fixtures, as well as the location of BMPs or other objects that block light from leaving the location, such as sound walls. The detail level for the non-lighting production equipment does not need to meet the level of a Layout Drawing, as the non-lighting production equipment is on this figure largely for orientation.

2. Include a table that calculates the total lumen output of all fixtures combined, the total square footage of the Working Pad Surface, and the lumens per square foot of Working Pad Surface. If a smaller area contained within the Working Pad Surface is used for a Relevant Local Government's plan, that smaller area's square footage may be used in place of the Working Pad Surface.
3. Include cut sheets of light fixtures that demonstrate Backlight, Uplight, and Glare (BUG) rating, lumen output, and fully shielded design.
4. If a Building Unit is located within 2,000 feet of the Working Pad Surface, include a photometric plan estimating the illuminance, measured in lux, 100 feet outside of the facility boundary. The facility boundary may be determined by the area planned for production operations after interim reclamation.

## **Additional Information**

### **Common Errors and Issues Encountered by ECMC Staff**

1. Sound walls or all noise barriers not accounted for.
2. If minor changes to the layout drawings occur, ECMC Staff will evaluate whether the change affects the light escaping from the location. If the change does not significantly impact how much light escapes the location, then updates to the Light Mitigation Plan may not be needed.

### **General Notes**

1. If plans developed through a local government land use process are substantially equivalent to what is required for this Light Mitigation Plan, the plans for the local government land use process may be submitted in place of the Light Mitigation Plan. The Director and/or Commission will determine whether the information or plan provided is substantially equivalent.
2. If the facility has a noise barrier, its ability to block light should be considered when designing the lighting plan for the location.

3. The cumulative nighttime light intensity requirement specified in Rule 424.f for the Production Phase will be considered satisfied if the light intensity measurement from the location at one mile is estimated at 0.1 lux or less. Intensities over 0.1 lux will be evaluated by staff.
4. Graphic representations of Rule 423.a.(2).B.iii. backlight, uplight, and glare information are preferred.\
5. Lighting fixture output units will be listed in lumens.
6. The estimated illuminance to surrounding receptors such as Residential Building Units will be shown in lux.
7. Calculation results will be shown in these units. Diagrams such as the photometric plan may use conversion factors from foot-candles to lux to demonstrate compliance.

## Frequently Asked Questions

1. N/A

## Document Change Log

Change Date	Description of Changes
5/15/2025	Updated to reflect Dec 2025 Rules, updated cumulative nighttime light intensity, updated diagram description
June 4, 2025	Reviewed, ADA accessibility verified, prepared for publication

## **Appendix A - Rule Citation**

### **424. LIGHTING**

- a. Operators will submit a light mitigation plan as an attachment to their Form 2As, pursuant to Rule 304.c.(3). An Operator may submit substantially equivalent information or plans developed through a local government land use process in lieu of the information required by this Rule 424.a unless the Director or Commission determines that the information or plan developed through the Local Government land use process is not equivalent.

(1) All light mitigation plans will be signed by a person with relevant expertise in light mitigation techniques and design.

(2) All light mitigation plans will address:

A. A pre-production facility lighting plan demonstrating one or more proposed methods of ensuring compliance with Rule 424.c, and:

- i. That provides adequate lighting to ensure safety during active operations involving personnel; and

- ii. The proposed anticipated location, mounting, height, and orientation of all outdoor lighting fixtures on the site during pre-production activities.

- iii. Nothing in this Rule 424.a.(2).A prevents an Operator from using ad hoc temporary portable lighting when necessary for safety reasons during pre-production activities, provided that the Operator otherwise complies with the standards in Rules 424.b-f.

B. A Production Facility lighting plan demonstrating one or more proposed methods of ensuring compliance with Rule 424.d & e, and:



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- i. The location, mounting, height, and orientation of all outdoor lighting fixtures on the site;
  - ii. A table that calculates the total lumen output of all fixtures combined; and
  - iii. Cut sheets of light fixtures that demonstrate Backlight, Uplight, and Glare (“BUG”) rating, lumen output, and fully shielded design; and
  - iv. For any location with a Building Unit within 2,000 feet, a photometric estimating or calculating the illuminance, measured in lux, 100 feet outside the facility boundary;
- C. The Operator’s capability of meeting all requirements of this Rule 424 through one or more proposed methods;
- D. The location of the resources and receptors listed in Rules 424.c & d; and
- E. Square footage of the Working Pad Surface for purposes of demonstrating compliance with Rule 424.d.(2).

**b. Lighting Standards.**

- (1) Operators will direct site lighting downward and inward, such that no light shines above a horizontal plane passing through the center point light source.
- (2) Operators will use appropriate technology within fixtures that obscures, blocks, or diffuses the light to reduce light intensity outside the boundaries of the Oil and Gas Facility.
- (3) Operators will use Best Management Practices to minimize light pollution and obtrusive lighting, which may include, but are not limited to:

- A. Minimizing lighting when not needed using timers or motion sensors;
- B. Using full cut-off lighting;
- C. Using lighting colors that reduce light intensity; and
- D. Using low-glare or no-glare lighting.

**c. Pre-Production Facility Lighting.**

- (1) At all Oil and Gas Facilities with active operations involving personnel, Operators will provide sufficient on-site lighting to ensure the safety of all persons on or near the site.
- (2) If the facility has a noise barrier, Operators will locate the facility lighting beneath the noise barrier, except for drilling rig lights, which will be shielded and pursuant to Federal Aviation Administration permit requirements if applicable. Operators will take precautions to ensure that lights do not shine out of openings in the noise barrier.
- (3) Prior to the Commencement of Production Operations, Operators will take all necessary and reasonable precautions to ensure that lighting from Oil and Gas Facilities does not unnecessarily impact the health, safety, and welfare of any of the following:
  - A. Persons occupying Building Units within 2,000 feet of the Oil and Gas Facility;
  - B. Motorists on roads within 2,000 feet of the Oil and Gas Facility; and
  - C. Wildlife occupying any High Priority Habitat within 2,000 feet of the Oil and Gas Facility.

**d. Production Phase Facility Lighting When Personnel Are On-Site.**

- (1) After the Commencement of Production Operations, at all Oil and Gas Facilities with active operations involving personnel, Operators will provide sufficient on-site lighting to ensure the safety of all persons on or near the site.
- (2) After the Commencement of Production Operations, when active operations involving personnel are occurring, Oil and Gas Facilities will not exceed the following maximum permissible light levels.

LAND USE	Lumens per square foot of Working Pad Surface
Residential /Rural/State Parks/State Wildlife Areas/High Priority Habitat/Wilderness Areas/National Park/National Monument	1.25
Commercial/Agricultural	2.5
Light Industrial	5.0
Industrial	7.5

- (3) The basis for determining land use designation pursuant to be Rule 424.d.(2) will be the Relevant Local Government's land use or zoning designation. The Director may consult with a Relevant or Proximate Local Government to identify the type of land use of the Oil and Gas Location and its surrounding area, taking into consideration any applicable zoning or other local land use designation.
- A. To protect public safety and welfare, the Director may require Operators to comply with a lower maximum permissible light level in areas zoned industrial, light industrial, or commercial, if the

Oil and Gas Facility will be within 2,000 feet of a residential Building Unit or High Occupancy Building Unit.

- B. The Director may require Operators to comply with a lower maximum permissible light level based on the consultation process with Relevant and Proximate Local Governments, CDPHE, or CPW required by Rules 302.g, 309.e, & 309.f.
  - C. In a light mitigation plan submitted pursuant to Rule 424.a, an Operator may request a higher maximum permissible light level than would otherwise be allowed by Rule 424.d.(2), if the Operator demonstrates that both the Relevant and any Proximate Local Governments agree to the higher maximum permissible light level. The Director may apply that higher maximum permissible light level as long as the requested level is protective of public safety, public welfare, and wildlife.
- e. **Production Phase Facility Lighting When Personnel Are Not On-Site.** After the Commencement of Production Operations, Operators will minimize continuous on-site lighting when personnel are not present.
  - f. **Cumulative Light Impacts.** Operators will develop site lighting to reduce cumulative nighttime light intensity from all Oil and Gas Facilities to 4 lux at any Residential Building Unit or High Occupancy Building Unit within 1 mile of any Oil and Gas Facility, measured at 5.5 feet above grade in a direct line of sight to the brightest light fixture onsite.