LIGHT MITIGATION PLAN

NUEVIDA RESOURCES, LLC
ARDOUREL 33081718 PAD

June 15, 2022

Prepared by

SGM

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SGM Project # 2019-244

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1.0 Introduction

NueVida Resources, LLC (NueVida) is providing this Light Mitigation Plan (Plan) to the Colorado Oil and Gas Conservation Commission (COGCC), Colorado Parks and Wildlife (CPW), La Plata County Planning Department, La Plata County Planning Commission, and La Plata County Board of County Commissioners (collectively LPC) in compliance with requirements under COGCC's Rule 304.c.(3) and Rule 424.a, as well as LPC's Land Use Code (LUC) Section 90-123.III.J. related to light mitigation measures for minor oil and gas facilities. The purpose of this Plan is to address these requirements and mitigate impacts from light generated by the proposed project.

1.1 Statement of Qualifications

Persuant to the COGCC Light Mitigation Plan Guidance document, General Requirements, the following is a statement describing the relevant expertise of the lighting professional preparing and signing this Plan. Amber Haymes, PE, LC, is a registered Professional Engineer in the states of Colorado and New Mexico, and a Certified Lighting Designer by the National Council on Qualifications for Lighting Professionals. She holds a bachelor's degree in Architectural Engineering with emphasis in Lighting from the University of Colorado Boulder, has 10 years of professional experience in electrical and lighting design and photometric analysis, and is a member of the International Dark Sky Association.

1.2 Project Description and Phases

NueVida proposes to develop the Ardourel 33081718 Pad (Project), a natural gas exploration and production facility with 34.51 acres of total disturbance. NueVida plans to initially drill two test wells into the Mancos Formation utilizing horizontal drilling technologies on its leasehold within La Plata County, Colorado. Based on results of the initial wells, an additional six wells may be drilled on the well pad for a total of eight wells. To accommodate these wells, NueVida is proposing a multi-well facility (well pad), access roads, pipelines, and Temporary Use Areas (TUA) on private land owned by the Ardourel Trust.

Construction of the well pad, TUAs and installation of the water storage tanks will take approximately 58 days to complete. Drilling operations will take approximately 40 days to complete for the initial two wells. The drilling rig will then be removed, and a two-week period will begin for preparation to complete the wells. Completion operations for both wells will take approximately 30 days. After completion, the tanks on the tank pad TUA will be removed, however, the produced water pad will remain in place while testing of the wells occurs to determine if additional wells may be drilled in subsequent years.

The table below summarizes the proposed phases, their duration, and whether lighting will be used. Lighting for the drilling and completion phases is required due to 24/7 operation and the presence of staff on site after dark. Proposed lighting for drilling and completion phases are detailed and analyzed in the respective sections of this Plan. The construction and production phases will not have lighting, and are therefore not detailed in this Plan.

Table 1 - Project Phases and Proposed Lighting

PHASE	DURATION	LIGHTING PROPOSED	REMARKS
Construction	58 Days	None	Daylight operations only.
Drilling	40 Days	Temporary lighting on well pad only.	Refer to drilling section for detail and analysis.
Completion	30 Days	Temporary lighting on well pad, TUA, and pump pad.	Refer to completion section for detail and analysis.
Production	--	None	No staff present under normal operations. In the event of emergency, temporary mobile lighting would be utilized.

1.3 Site Context

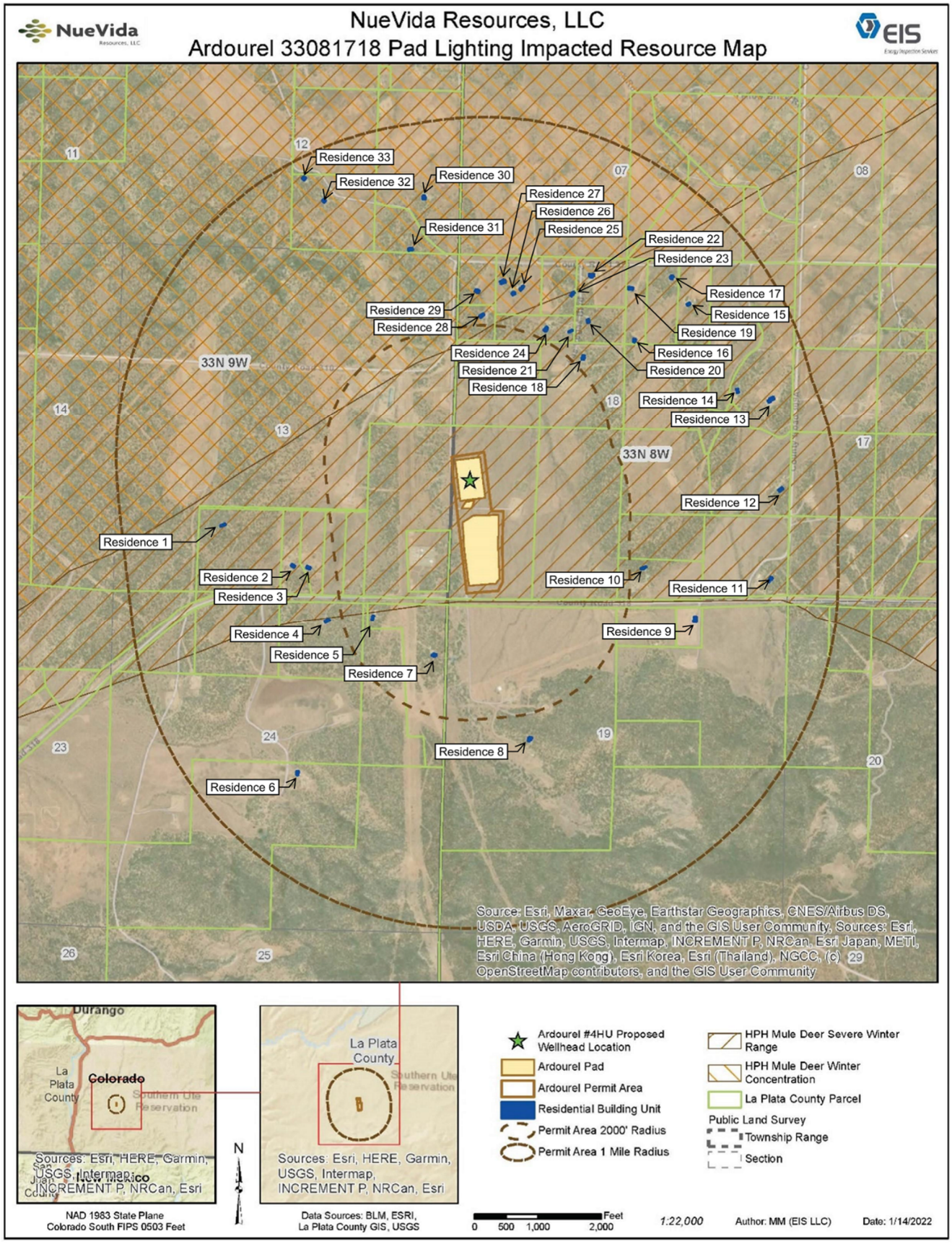
This Project would be located near Ignacio, Colorado on Parcel Number 595318300056 and will be accessed from County Road 318. The legal location for the project is the W/2 SW/4 of Section 18, Township 33 North, Range 8 West, N.M.P.M. This proposed location is currently occupied by sagebrush vegetation with sparse pinion pine and juniper trees scattered throughout. It is zoned for agricultural use. The location abuts other private properties on three sides and County Road 318 on the southern border.

There are 33 separate residential building units within one mile of the area of disturbance. For the purposes of this analysis, unique ID numbers were assigned to the residences (refer to Impacted Resource Map for locations and ID numbers). The cumulative lighting impact on each residence was calculated for each phase and results are in compliance with Rule 424.

Wildlife species, specifically mule deer, have High Priority Habitat (HPH) within the disturbance area of the Project. This HPH is considered Mule Deer Severe Winter Range and typically operators are requested to restrict new construction or development activities during the winter closure period of December 1 through April 30. NueVida would not perform any pre-production operations during the closure period, and as previously stated production operations will not involve any lighting.

There are two residential buildings and one county road (318) within 2000 feet of the area of disturbance. The visibility of project light sources from the county road was considered for each phase, and is not expected to create a safety hazard to motorists. The potential for operational traffic to create headlight glare for residents was considered for each phase, and is not expected to create an undue disturbance. For details of each anlysis, refer to the impact analysis sections for each phase.

Figure 1 - Impacted Resource Map



1.4 Jurisdictional Authority

The jurisdictional authority governing this project is La Plata County. The project location is zoned agricultural by the County. The County's Land Use Code contains the following requirements pertaining to exterior lighting for minor oil and gas facilities.

> *Section 90-123.III*
>
> > *J. Exterior lighting, when required, shall comply with the design standards in this subsection. Facilities do not have to comply with any exterior lighting standard that contradicts required industry safety standards, including drilling and emergency operations.*
> >
> > > *1. All outdoor lighting fixtures with an initial output of more than 2,000 lumens (equivalent to a 26 watt compact fluorescent or 100 watt standard incandescent lamp type) shall have a full cutoff fixture (also known as a fully shielded fixture). The fixture shall be designed to shield the source of illumination from view from above or from adjacent property, and to not cast significant light other than straight down from the source.*

The County requirement for full shielding of permanent fixtures over 2,000 lumens regardless of mounting type is similar to the COGCC Rule 424.b, requiring full shielding for all fixtures mounted on standards. Because this project does not propose any permanent fixtures, or fixtures mounted on standards, neither rule is applicable. The County's Land Use Code does not address any other lighting aspects of the project, therefore COGCC rules will be applied throughout this Plan.

2.0 Applicable Rules

2.1 Maximum Permissible Light Levels

Rule 424.d, Production Phase Lighting, combined with the agricultural zoning of this specific project, gives a maximum of 2.5 lumens per square foot of working pad surface. At the Director's option, the limit could be reduced to 1.25 due to the presence of residential building units within 2,000 feet of the site. This project does not propose any lighting during the production phase, and therefore is in compliance.

Rule 424.c, Pre-Production Phase Lighting, does not limit the lumens per square foot of temporary lighting used. No other applicable regulation addresses total site lumens for pre-production phases, therefore total site lumens are not calculated in this analysis.

2.2 Cumulative Light Impacts

Rule 424.f limits the impact of the project lighting on any residential building unit within 1 mile of the project to 4 lux (measured vertically at 5.5 ft above grade, facing the brightest light source). For the two project phases for which lighting is proposed, the impact on each of the 33 residences is predicted by calculation to be less than 4 lux. For detailed results, refer to the impact analysis sections for each phase.

2.3 Photometric Plan

Rule 424.a requires a photometric plan calculating ground illuminance values on the site extending to 100' beyond the area of disturbance boundary, but only for production phase lighting, and only when there is a building unit within 2,000' of the site. This project does not propose any production phase lighting. However, due to the quantity of residential building units in the vicinity of the site, NueVida is performing this analysis as a best management practice to ensure pre-production phase lighting does not create significant ground illumination more than 100' beyond the area of disturbance.

3.0 Best Management Practices

Best management practices for all phases would include the following:

- No lighting will be used during the High Priority Habitat winter closure period of December 1 through April 30.
- No lighting during the construction or production phases; all project lighting will be temporary with an estimated total duration of 70 days.
- All fixtures will be aimed downward (below horizontal), with the exception of mast lighting necessary to illuminate the stairway for personnel safety.
- Fixtures will be aimed inward (away from adjacent properties) whenever possible while providing adequate safety lighting for personnel.
- Mobile light towers near County Road 318 will be placed such that the tank walls prevent the light source from being visible to drivers coming from either direction.
- The cumulative impact on residences within 1 mile of the site will be less than one quarter of the maximum impact allowed by Rule 424.
- The brightest point on the ground 100' from the area of disturbance will be less bright than the ground under a full moon (illuminance less than 1 lux). Most of the ground area within 100' of the permitted boundary will have an illuminance level generally perceived as fully dark (less than 0.1 lux).

4.0 Impact Analysis Methodology

To analyze the potential impacts of the proposed lighting, a computer photometric model was developed using AGI32 software. Photometric software is a tool commonly used by lighting designers to predict the visual results of proposed designs. The user builds a three dimensional model of the physical environment, inputs lighting fixture performance data supplied by the light fixture manufacturer, and defines the location and orientation of the fixtures to be used. The software then performs complex calculations that "follow" each unit of light (measured in "lumens") from the source as it strikes objects, bounces from one object to another, and is eventually absorbed or exits the model area. The result is a predicted illuminance level (measured in "lux") for each surface in the modeled environment. The illuminance of a surface is defined as the lumens that fall on the surface per unit of area - it can conceptually be thought of as "brightness." In reality, human perception is more complex and is affected by other variables as well, but these other variables are not addressed by COGCC Rule 424, and are therefore excluded from this impact analysis.

For this analysis, the modeled environment consists of major pieces of equipment, the topographic surface defined by the project's proposed grading plan, and a coarser topographic surface derived from USGS data for the area within one mile of the permitted site boundary. Results of the photometric calculation are presented here in the format of "isolines" on a plan view drawing. An "isoline" is a line where the illuminance (lux) on the ground is equal to a given value, very similar to the way topographic lines on a terrain map represent lines of a given elevation. Cumulative impacts are presented in a table format, with a vertical illuminance value for each residence within the mile radius that was modeled.

5.0 Drilling Phase

5.1 Drilling Phase Proposed Layout and Equipment

During the drilling phase, lighting will be present on the well pad, but not the Temporary Use Area. There are no proposed sound walls or other barriers; they are not anticipated to be necessary based on the results of the impact analysis.

Lighting will consist of linear style and flood style fixtures mounted to the drilling rig and the mud pit facility to provide adequate safety lighting for personnel working in the immediate vicinity of the equipment. In addition, ad hoc mobile lighting is proposed to be used as needed elsewhere on the pad, as permitted by COGCC Rule 424.a.(2).A.iii. An aircraft warning strobe will be present at the top of the drill-rig mast, but it is excluded from this analysis because its light output will not contribute meaningfully to any of the metrics being studied. A cutsheet for it is included at the end of Appendix A for reference. No lighting standards (more commonly known as light poles) are proposed to be used.

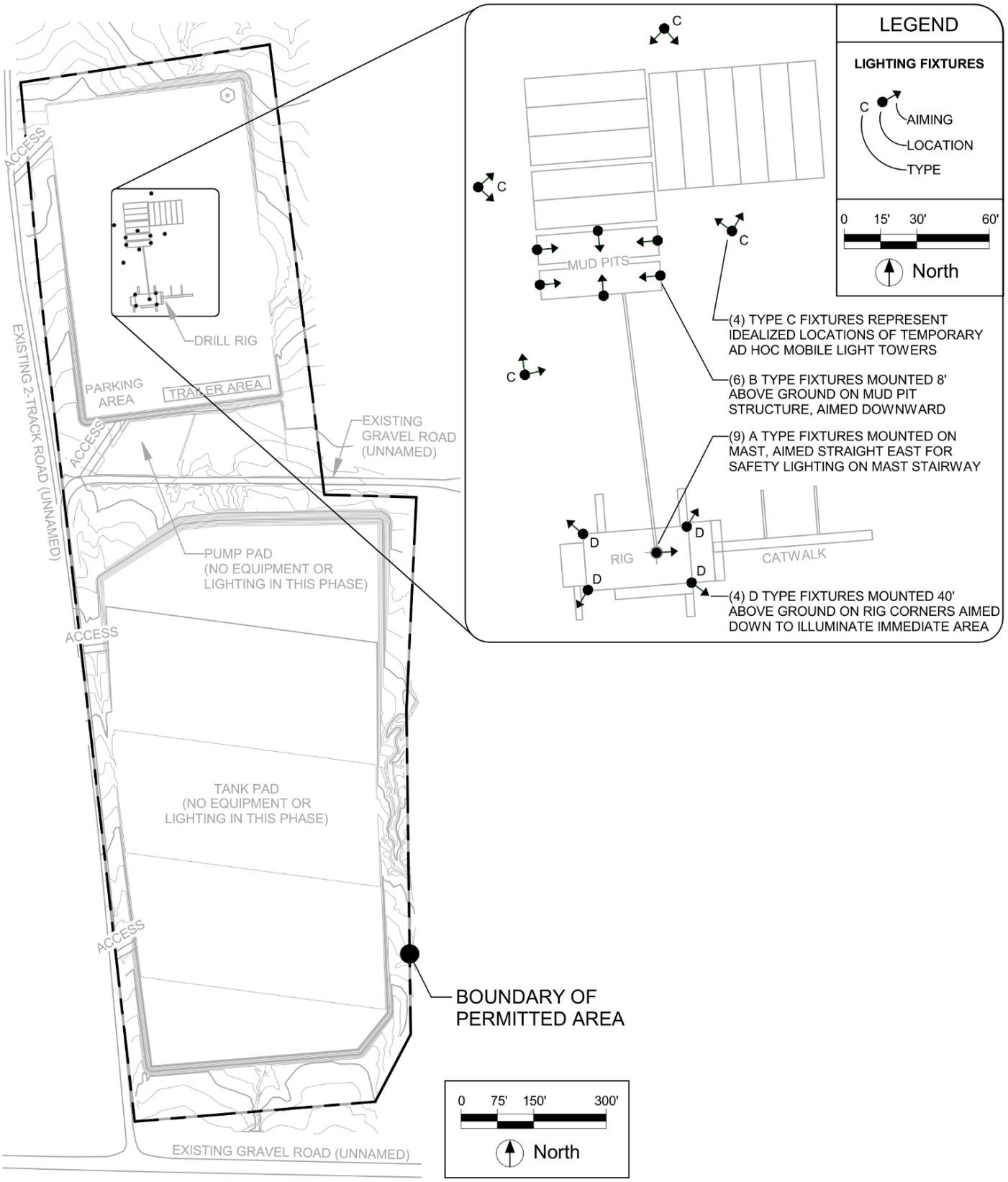
For this impact analysis, the ad hoc mobile lighting is represented by light towers in idealized locations, using a commonly available rental fixture. Depending upon availability at the time of the work, a different but very similar rental fixture may be used.

The table below summarizes the relevant characteristics of the fixtures proposed to be used. For fixtures noted as "downcast," the exact aiming angle will be adjusted in the field according to the needs of the operators, but will never be above the horizontal. For the purposes of photometric calculations, 75 degress from straight down was used as an estimate of the vertical aiming angle.

Table 2 - Drilling Phase Fixture Schedule

TYPE	DESCRIPTION	LIGHT SOURCE	OUTPUT	HEIGHT	AIMING
A	4’ linear fixture mounted vertically along mast	LED retrofit kit 60 Watt	8,000 Lumens	Varies 60' - 138'	Toward stairway
B	4’ linear fixture, mounted horizontally above pits	LED retrofit kit 60 Watt	8,000 Lumens	16'	Downcast and inward
C	Portable light tower with 4 floodlights	Metal Halide (4) 1000 Watt	282,000 Lumens	12'	Downcast and inward
D	HID Floodlight, mounted on corners of rig	Metal Halide (1) 400 Watt	30,000 Lumens	40'	Downcast around rig

Figure 2 - Drilling Phase Lighting Layout



5.2 Drilling Phase Impact Analysis

5.2.1 Photometric Plan

All proposed lighting for the drilling phase was modeled in photometric software as described previously in the Impact Analysis Methodology section. The horizontal illuminance (colloqially, ground brightness) was calculated within the area of disturbance, and extending to 100’ beyond the area of disturbance. The results of that calculation are presented on the following page in the form of illuminance isolines using the unit of “lux.” Generally, the vast majority of the light produced by the project would stay within the area of disturbance. The grading of the pad creates some elevation change at the edges that helps to contain spill light. A small amount of light spills outside the area of disturbance where the topography allows, but very little reaches the 100’ line. The drawing notes the maximum illuminance (brightest point) on the 100’ line as 0.3 lux. For reference, this value is less than half the ground brightness created naturally by a full moon.

5.2.2 Cumulative Light Impacts

The second calculation performed using this model analyzed the vertical illuminance (the brightness of a hypothetical vertical surface) at the front wall of all residential buildings within one mile of the area of disturbance. Specifically, the location analyzed is 5.5’ above the ground level, for an imaginary vertical surface facing directly toward the brightest source of light. This calculation takes into account the topography and distance between the site and the residences. For all 33 residences, the vertical illuminance was 1 lux or less, well below the COGCC Rule 424 limit of 4 lux. Table 3 provides the actual calculated values, with residence ID numbers keyed to the Impacted Resources Map (Figure 1).

5.2.3 Impact to Drivers on County Roads

County Road 318 is located approximately 1800 feet from the nearest light fixtures proposed for this phase. The road would be approximately 45’ higher in elevation compared to the graded well pad, which would effectively hide all fixtures at less than a 45-foot mounting height from view of drivers. The only fixtures visible from the road would be the smaller linear fixtures mounted high on the drill-rig mast (Type A), which are not expected to create safety or visibility problems due to their lower output and the large distance to the road.

5.2.4 Operational Traffic Impact to Residences

There are two residential building units within 2000-feet of the area of disturbance. They are located to the southwest, on the opposite side of County Road 318. From the perspective of these residences, vehicle headlights associated with drilling activity would be both farther away and lower in elevation than the heavier existing traffic on the county road. Therefore, drilling related traffic is not expected to create any significant disturbance to occupants.

Figure 3 - Drilling Phase Photometric Plan

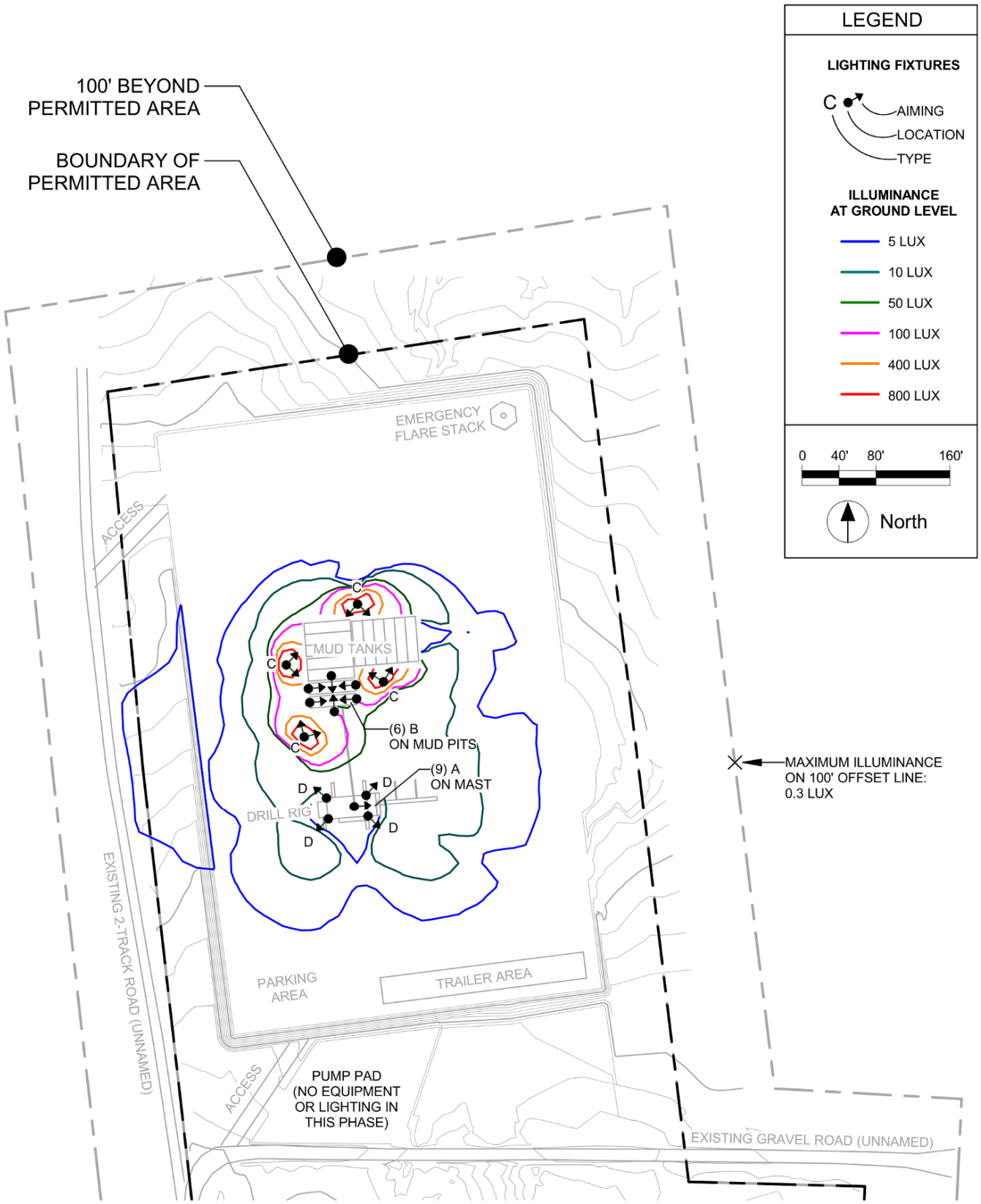


Table 3 - Drilling Phase Cumulative Impact Calculation Results

RESIDENCE ID NUMBER	REGULATORY LIMIT (Lux)	CALCULATED IMPACT (Lux)	COMPLIES
1	< 4.0	0.10	Yes
2	< 4.0	0.10	Yes
3	< 4.0	0.10	Yes
4	< 4.0	0.10	Yes
5	< 4.0	0.20	Yes
6	< 4.0	0.00	Yes
7	< 4.0	0.10	Yes
8	< 4.0	0.00	Yes
9	< 4.0	0.10	Yes
10	< 4.0	0.30	Yes
11	< 4.0	0.10	Yes
12	< 4.0	0.10	Yes
13	< 4.0	0.10	Yes
14	< 4.0	0.10	Yes
15	< 4.0	0.10	Yes
16	< 4.0	0.10	Yes
17	< 4.0	0.10	Yes
18	< 4.0	0.20	Yes
19	< 4.0	0.30	Yes
20	< 4.0	0.10	Yes
21	< 4.0	0.20	Yes
22	< 4.0	0.30	Yes
23	< 4.0	0.20	Yes
24	< 4.0	0.20	Yes
25	< 4.0	0.20	Yes
26	< 4.0	0.20	Yes
27	< 4.0	0.20	Yes
28	< 4.0	0.10	Yes
29	< 4.0	0.10	Yes
30	< 4.0	0.20	Yes
31	< 4.0	0.10	Yes
32	< 4.0	0.00	Yes
33	< 4.0	0.30	Yes

6.0 Completion Phase

6.1 Completion Phase Proposed Layout and Equipment

During the completion phase, lighting will be required on both the well pad and Temporary Use Area. Only ad hoc mobile lighting is propsed on both pads; equipment-mounted lighting is not anticipated to be required. The specific mobile fixtures used will depend on availability at the time of the work, but are expected to consist of portable light towers, each with four independantly aimable light sources at 12-feet above ground. A commonly available rental fixture was used for this analysis.

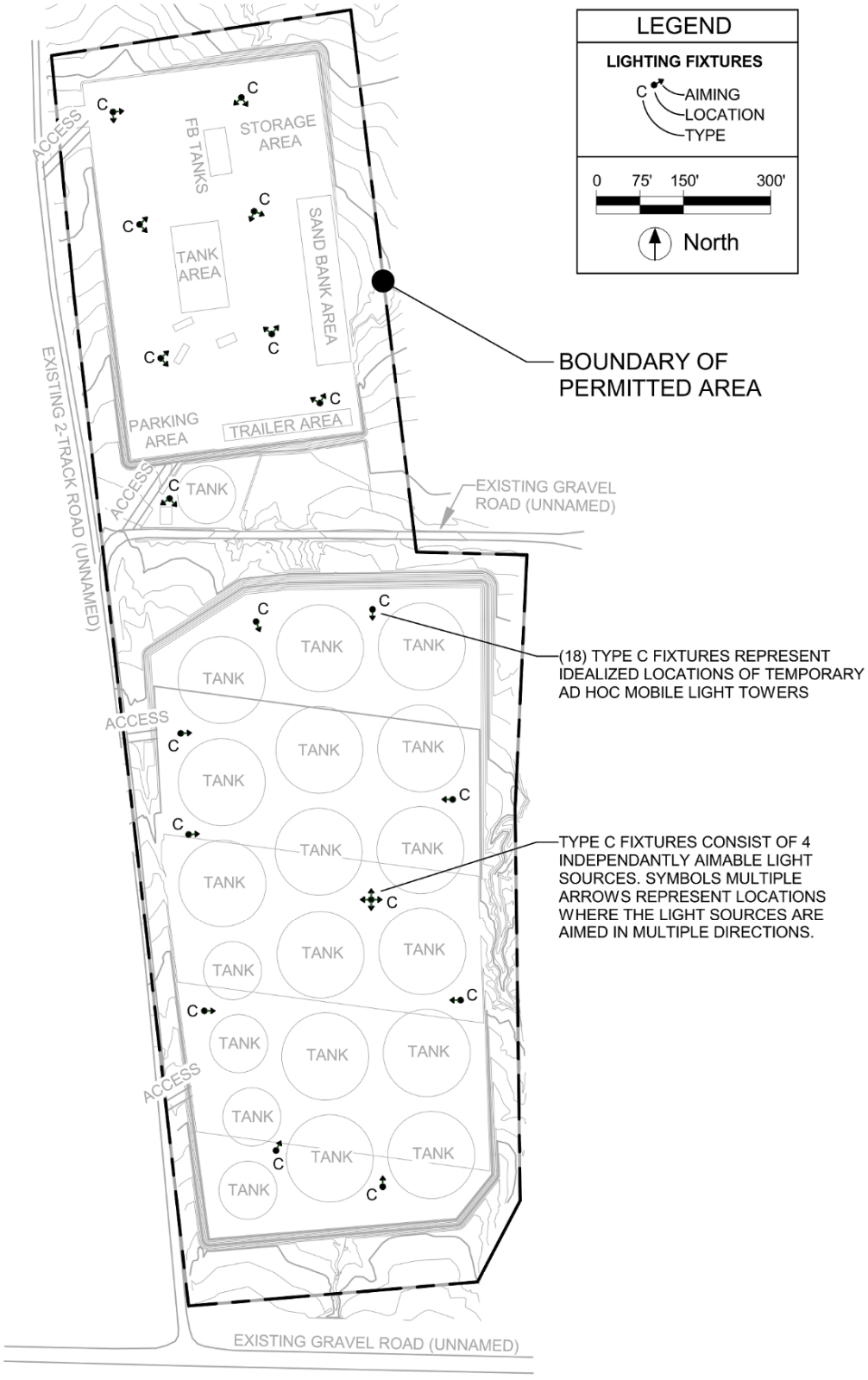
The drawing on the following page illustrates the anticipated quantity, locations, and aiming of the portable light towers on both pads. Fixture symbols with multiple aiming arrows represent locations where the independent light sources on the tower will be aimed in multiple directions. Exact locations and aiming will be adjusted in the field as required for safe operations.

Whenever possible, light sources will be aimed inward away from adjacent properties. At all times, all light sources aimed toward the ground. For calculation purposes, a vertical aiming angle of 75 degrees from straight downward was assumed.

Table 4 - Completion Phase Fixture Schedule

TYPE	DESCRIPTION	LIGHT SOURCE	OUTPUT	HEIGHT	AIMING
C	Portable light tower with 4 floodlights	Metal Halide (4) 1000 Watt	282,000 Lumens	12'	Downcast and inward

Figure 4 - Completion Phase Lighting Layout



6.2 Completion Phase Impact Analysis

6.2.1 Photometric Plan

All proposed lighting for the completion phase was modeled in photometric software as described previously in the Impact Analysis Methodology section. The horizontal illuminance (colloqially, ground brightness) was calculated within the area of disturbance, and extending to 100' beyond the area of disturbance. Generally, the vast majority of the light produced by the project would stay within the area of disturbance. The grading of the pad creates some elevation change at the edges that helps to contain spill light. A small amount of light spills outside the area of disturbance where the topography allows, but very little reaches the line 100' line. The drawing notes the maximum illuminance (brightest point) on the 100' line as 0.6 lux. For reference, this value is about half the ground brightness created naturally by a full moon.

6.2.2 Cumulative Light Impacts

The second calculation performed using this model analyzed the vertical illuminance (colloquially, the brightness of a vertical surface) at all residential buildings within one mile of the area of disturbance. Specifically, the location analyzed is 5.5-feet above the ground level, for an imaginary vertical surface facing directly toward the brightest source of light. This calculation takes into account the topography and distance between the site and the residences. For all 33 residences, the vertical illuminance was 1 lux or less, well below the COGCC Rule 424 limit of 4 lux. Table 5 provides the actual calculated values, with residence ID numbers keyed to the Impacted Resources Map (Figure 1).

6.2.3 Impact to Drivers on County Roads

County Road 318 is located approximately 200 feet from the southern edge of the southernmost graded pad, and some mobile light towers would need to be placed on the southern portion of the pad. The adjacent tanks are the same height as the fixtures (12 feet). The operator would need to take care to place the mobile towers such that the tanks block drivers' view of the light sources. Each time any light tower on the southern half of the TUA is moved, the operator would need to immediately test the new location by driving CR 318 for 1 mile in both directions to verify that all light sources are hidden from view of drivers. If this is not possible due to unforeseen circumstances in the field, the operator would need to install temporary light blocking walls as needed to prevent direct view of light sources.

6.2.4 Operational Traffic Impact to Residences

There are two residential building units within 2000 feet of the area of disturbance They are located to the southwest, on the opposite side of CR 318. From the perspective of these residences, vehicle headlights associated with completion would be both farther away and lower in elevation than the heavier existing traffic on the county road. Therefore, completion related traffic is not expected to create any significant disturbance to occupants.

Figure 5 - Completion Phase Photometric Plan (Well Pad)

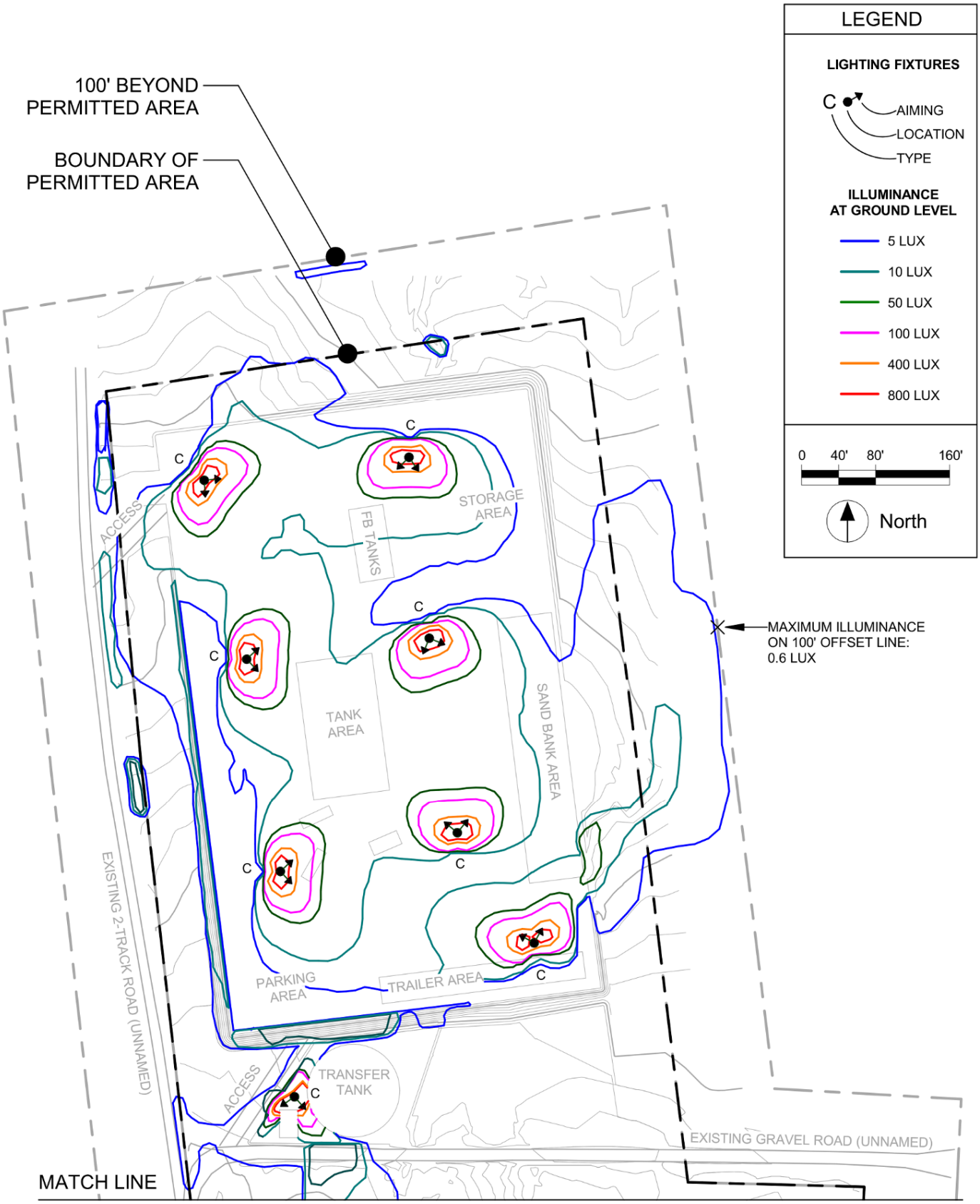


Figure 6 - Completion Phase Photometric Plan (TUA)

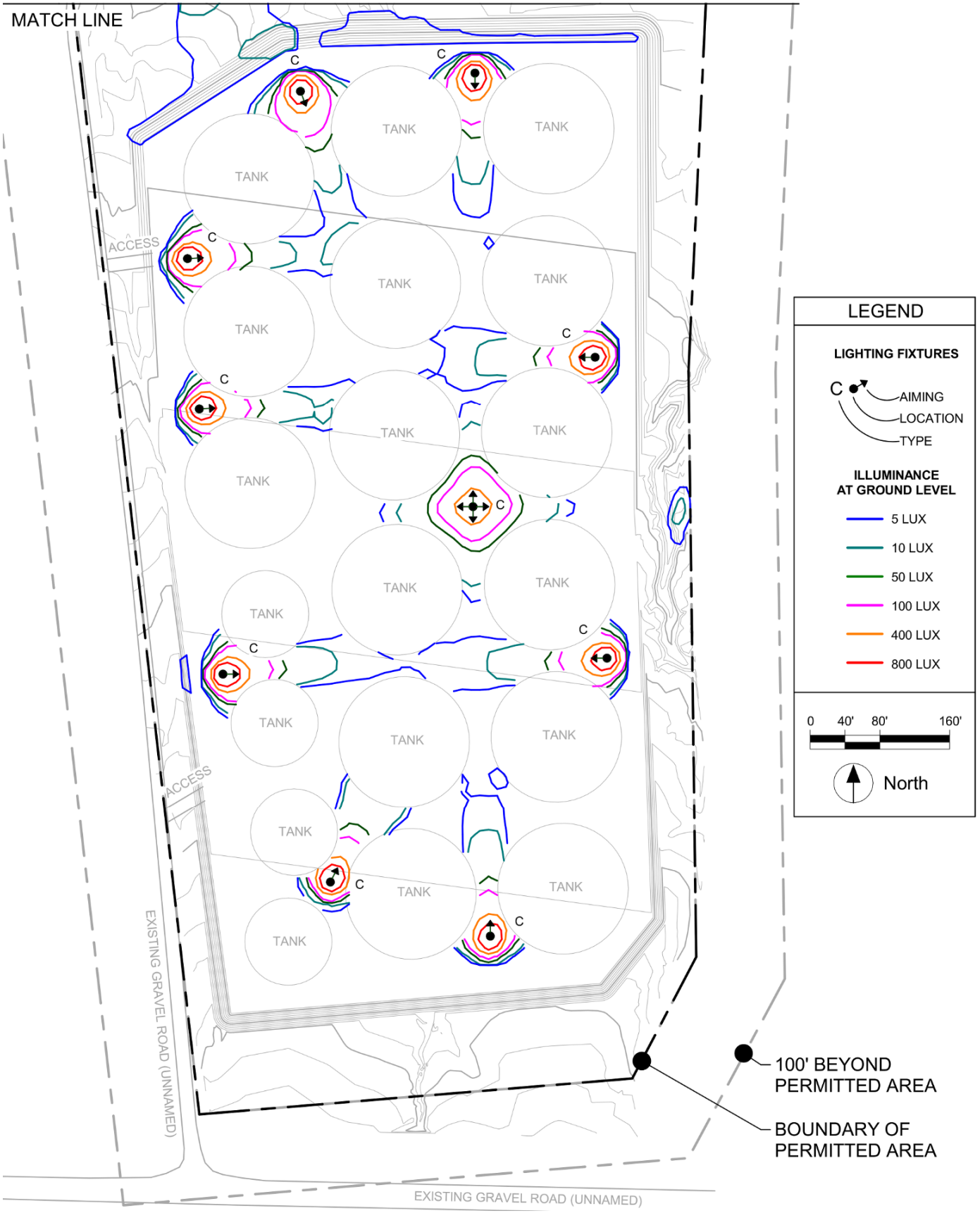


Table 5 - Completion Phase Cumulative Impact Calculation Results

RESIDENCE ID NUMBER	REGULATORY LIMIT (Lux)	CALCULATED IMPACT (Lux)	COMPLIES
1	< 4.0	0.20	Yes
2	< 4.0	0.20	Yes
3	< 4.0	0.30	Yes
4	< 4.0	0.40	Yes
5	< 4.0	0.90	Yes
6	< 4.0	0.10	Yes
7	< 4.0	1.00	Yes
8	< 4.0	0.50	Yes
9	< 4.0	0.40	Yes
10	< 4.0	1.00	Yes
11	< 4.0	0.30	Yes
12	< 4.0	0.20	Yes
13	< 4.0	0.10	Yes
14	< 4.0	0.20	Yes
15	< 4.0	0.20	Yes
16	< 4.0	0.20	Yes
17	< 4.0	0.30	Yes
18	< 4.0	0.40	Yes
19	< 4.0	0.50	Yes
20	< 4.0	0.30	Yes
21	< 4.0	0.30	Yes
22	< 4.0	0.50	Yes
23	< 4.0	0.20	Yes
24	< 4.0	0.20	Yes
25	< 4.0	0.20	Yes
26	< 4.0	0.40	Yes
27	< 4.0	0.20	Yes
28	< 4.0	0.10	Yes
29	< 4.0	0.10	Yes
30	< 4.0	0.30	Yes
31	< 4.0	0.00	Yes
32	< 4.0	0.00	Yes
33	< 4.0	0.70	Yes

Appendix A – Fixture Cutsheets

Pauluhn DuraPro hazardous area linear fluorescent luminaires

FIXTURE TYPES A AND B

Groups A, B, C, D
Cl. I, Zone 2, Groups IIA, IIB, IIC
Cl. II, Div. 2, Groups F, G
Cl. III
Type 4; conforms to IP66

Applications:

- Watertight requirements
- Dusttight requirements
- Oil and gas exploration and production
- Wastewater treatment plants
- Pipeline compressor/pumping and storage
- Maintenance and lubrication pits
- Petrochemical facilities
- High abuse areas

Features:

- Fluorescent system provides energy savings up to 50% when compared to HID
- Multi-voltage electronic ballast resistant to brownouts or voltage and frequency fluctuations
- Field replaceable lens and gasket
- Acrylic lens withstands constant exposure to sunlight and contact with petroleum-based products
- Neoprene gasket resists petroleum
- Permanent safety cable mounting points at each end
- Fixture may be mounted horizontally or vertically and rotated up to 270°
- Tool-less entry via heavy duty twist draw latches
- Lens frame hinged on side for easy lamp replacement
- Spring loaded lamp holders resist shock and vibration
- Optional self-contained emergency battery back-up ballasts
- Optional certified test switch on emergency models

Certifications and compliances:

- Class I, Division 2, Groups A, B, C, D
- Class I, Zone 2, Groups IIA, IIB, IIC
- Class II, Division 2, Groups F, G
- Class III
- UL844 – Hazardous Locations
- UL1598 – Luminaires
- CSA - Class 3428 03
- CSA - Class 3428 83
- Type 4
- Conforms to IP66

Standard materials and finishes:

- Housing – extruded aluminum with cast end caps
- Lens – clear acrylic (standard); polycarbonate (optional)
- Reflector – aluminum parabolic with an electrostatically applied powder coat finish; minimum 90% reflectance
- Gasket – one-piece neoprene
- Latches – plated steel

Technical specifications:

- Entries – ½" NPT through feed outlets (standard); ¾" NPT outlets (optional)
- Lamp holder – double spring loaded
- Latches – twist draw
- Ballast – 120-277V, 50/60 Hz electronic; 347V and 480V (optional)
- Emergency battery back-up ballast – optional, self-contained 90 minute minimum for all lamp types; 120 minute minimum for F32T8 one lamp; starting temperature 32°F (0°C)

Photometrics:

- Complete photometrics can be found at www.crouse-hinds.com/photometrics

Temperature performance data:

Watts	Ballast / socket type	ANSI lamp code	Class I	Class II; Class III	Starting temperature	Maximum ambient °C[A]	Supply wire °C
17	T8 bi-pin G13	F17-T8	T5	T3C	0°F (-18°C)	55	90
32	T8 bi-pin G13	F32-T8	T5	T3C	-20°F (-29°C)	55	90
40	4-pin 2G11	FT40-CF	T5	T3C	0°F (-18°C)	55	90
24/54	T5HO mini bi-pin G5	F24/F54-T5HO	T5	N/A	-20°F (-29°C)	40	90
14/28	T5 mini bi-pin G5	F14/F28-T5	T5	T3C	0°F (-18°C)	40	90
44	T8HO RDC R17d	F48-T8HO	T4A	T3C	-20°F (-29°C)	40	90
35/60	T12HO RDC R17d	F24/F48-T12HO	T4A	T3C	-20°F (-29°C)	40	90

[A] Contact factory for optional higher ambient models.

Pauluhn DuraPro hazardous area linear fluorescent luminaires

FIXTURE TYPES A AND B

ups A, B, C, D
Cl. I, Zone 2, Groups IIA, IIB, IIC
Cl. II, Div. 2, Groups F, G
Cl. III
Type 4; conforms to IP66

Ordering information:

Part number example
DP42871**

DP **4** **2** **8** **7** **1** ******

Model	
DP	

Length (nominal)	
2	2 foot
4	4 foot

Number of lamps	
2	2 lamp
3	3 lamps (lamp types 5 and 6)
4	4 lamps (lamp type 2 only)

Lamp type	
1	2 ft. F17 or 4 ft. F32 (T8 bi-pin)
2	2 ft. FT40 (CF 2G11)
5	2 ft. F24 or 4 ft. F54 (T5HO mini bi-pin)
6	2 ft. F24 or 4 ft. F28 (T5 mini bi-pin)
7	4 ft. F48 (T8HO RDC)
8	2 ft. F24 or 4 ft. F48 (T5HO RDC)

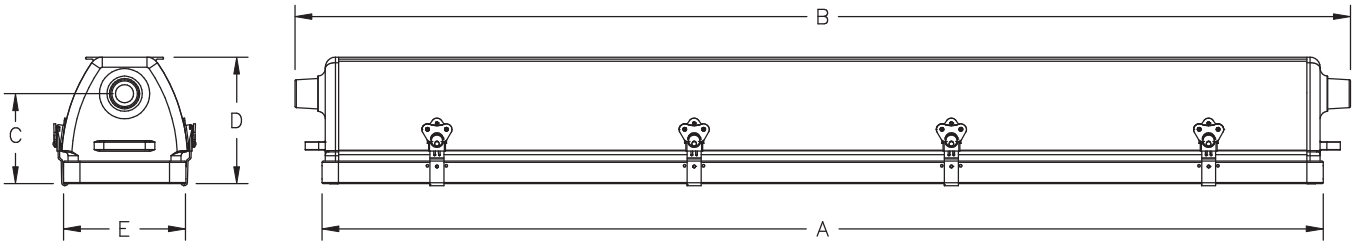
Voltage / frequency	
7	120-277V, 50/60 Hz
6	347V, 60 Hz (contact factory)
9	480V, 60 Hz (contact factory)

Entries	
1	½" through feed NPT hubs
2	¾" through feed NPT hubs

Options	
EM1	Emergency battery back-up ballast, one lamp, 277V max.
EMT	Emergency battery back-up ballast, one lamp, 277V max., test switch
L[B]	Lamps
P	Polycarbonate lens

REFER TO LED RETROFIT KIT SPECIFICATION SHEET ON FOLLOWING PAGES

Dimensions:



Nominal length	Dimensions in inches / centimeters A	B	C	D	E	Carton L x W x D (in.)	Nominal weight lbs. (kg.)
2 foot	26.00 (66.00)	27.60 (70.20)	4.40 (11.10)	6.30 (16.00)	6.50 (16.50)	8¾ x 6¼ x 31⅞	23.00 (10.40)
4 foot	50.00 (127.00)	51.60 (131.10)	4.40 (11.10)	6.30 (16.00)	6.50 (16.50)	10 x 8 x 56	32.00 (14.55)

[B] Lamps are not included unless option 'L' is specified.

Pauluhn DuraPro hazardous area linear fluorescent luminaires

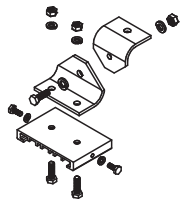
FIXTURE TYPES A AND B

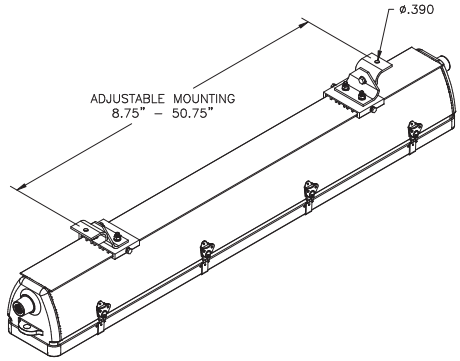
Groups A, B, C, D
Cl. I, Zone 2, Groups IIA, IIB, IIC
Cl. II, Div. 2, Groups F, G
Cl. III
Type 4; conforms to IP66

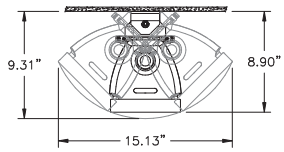
Mounting options:

DP1050MTK©

Back mount swivel kit.
Two aluminum brackets with slide mount.

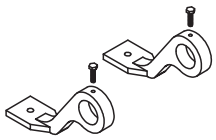


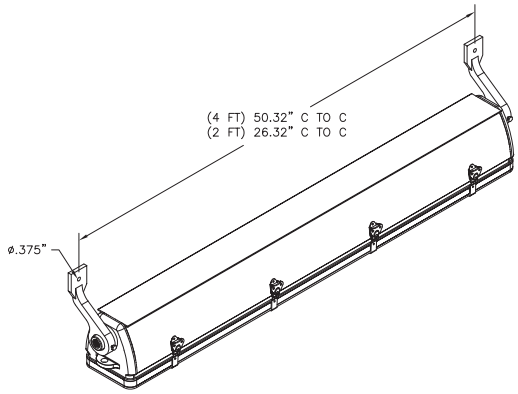


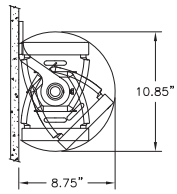


DP1052MTK

Offset wall or ceiling mounting kit.
Two cast aluminum brackets.

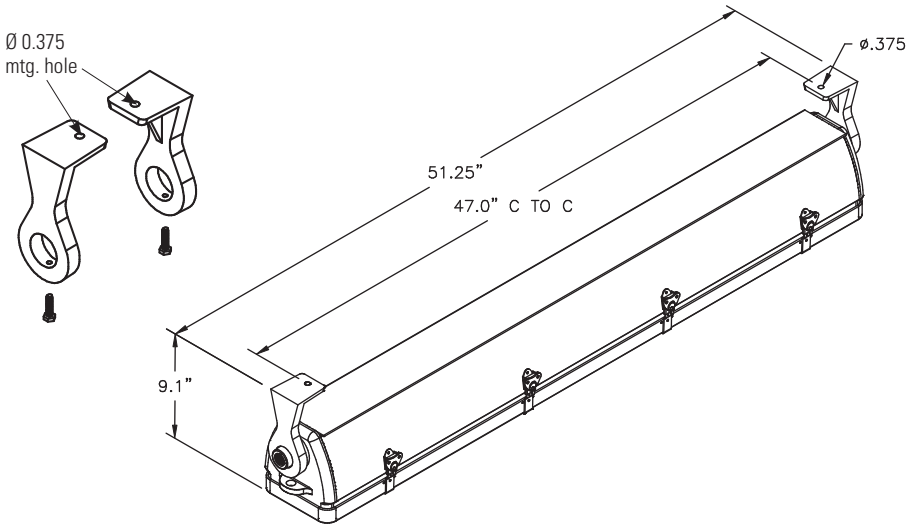


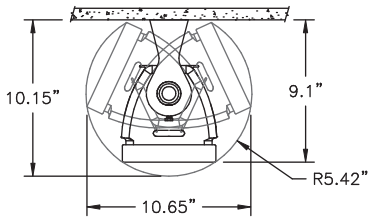




DP1053MTK

Ceiling or wall mounting kit.
Two cast aluminum brackets.





©Add suffix PS for plated steel swivel brackets.

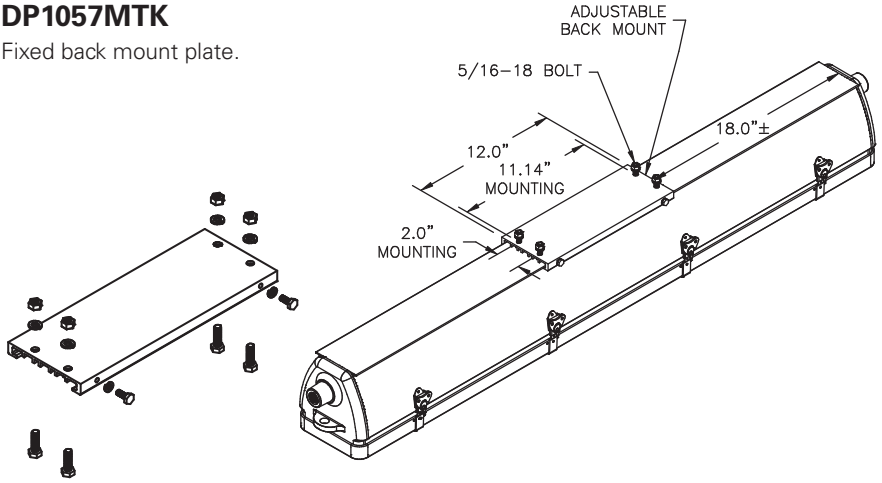
Pauluhn DuraPro hazardous area linear fluorescent luminaires

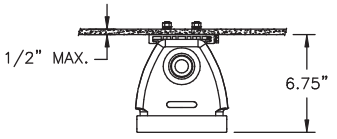
ups A, B, C, D
Cl. I, Zone 2, Groups IIA, IIB, IIC
Cl. II, Div. 2, Groups F, G
Cl. III
Type 4; conforms to IP66

Mounting options (continued) and accessories:

DP1057MTK

Fixed back mount plate.



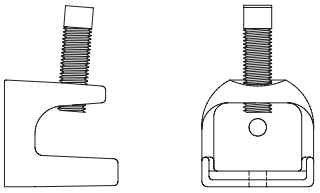


Beam clamp kit

FX7028

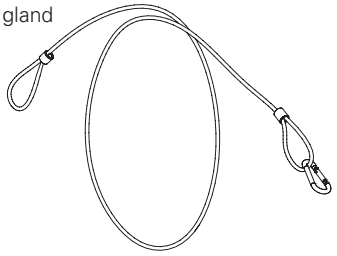
Beam clamp kit includes:

- (2) beam clamps
- (1) safety cable
- (1) cable gland



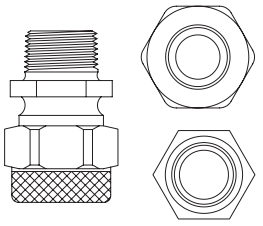
BC2K

(2) beam clamps
(for use with surface mount)



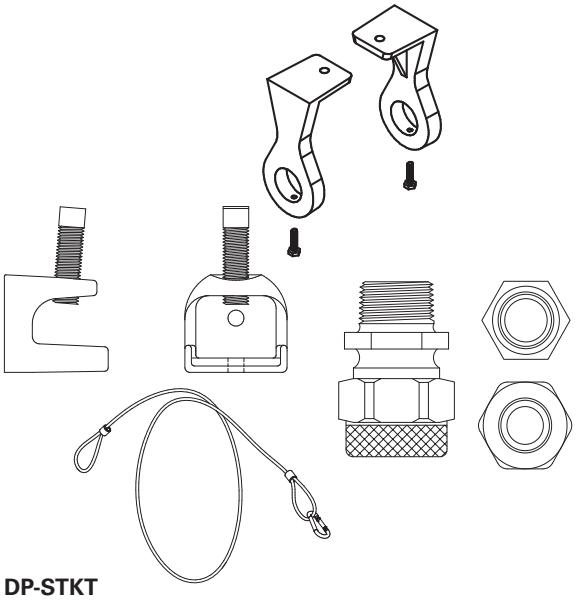
SC30H

48" safety cable with snap hook



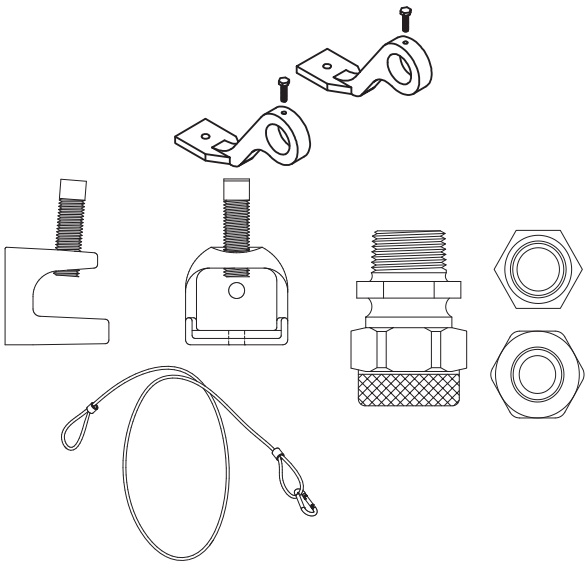
CX1502

¾" aluminum cable gland; cord grip range 0.438 - 0.562



DP-STKT

Includes FX7028 and DP1053MTK.



DP-OFKT

Includes FX7028 and DP1052MTK.

FIXTURE TYPES A AND B

LINEAR LED KITS
2x2 AND 2x4 INDOOR TROFFERS

FUTURE FIT LED KITS

DESCRIPTION

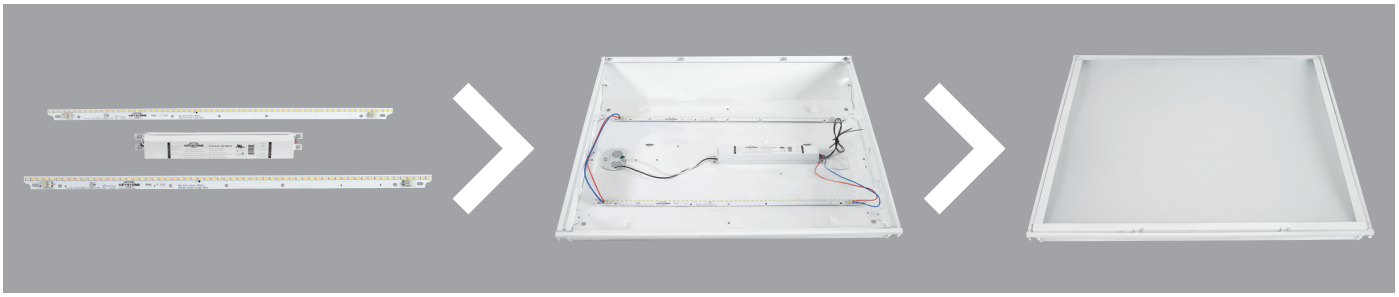
UL 1598C Classified LED retrofit kit. Includes the following components:

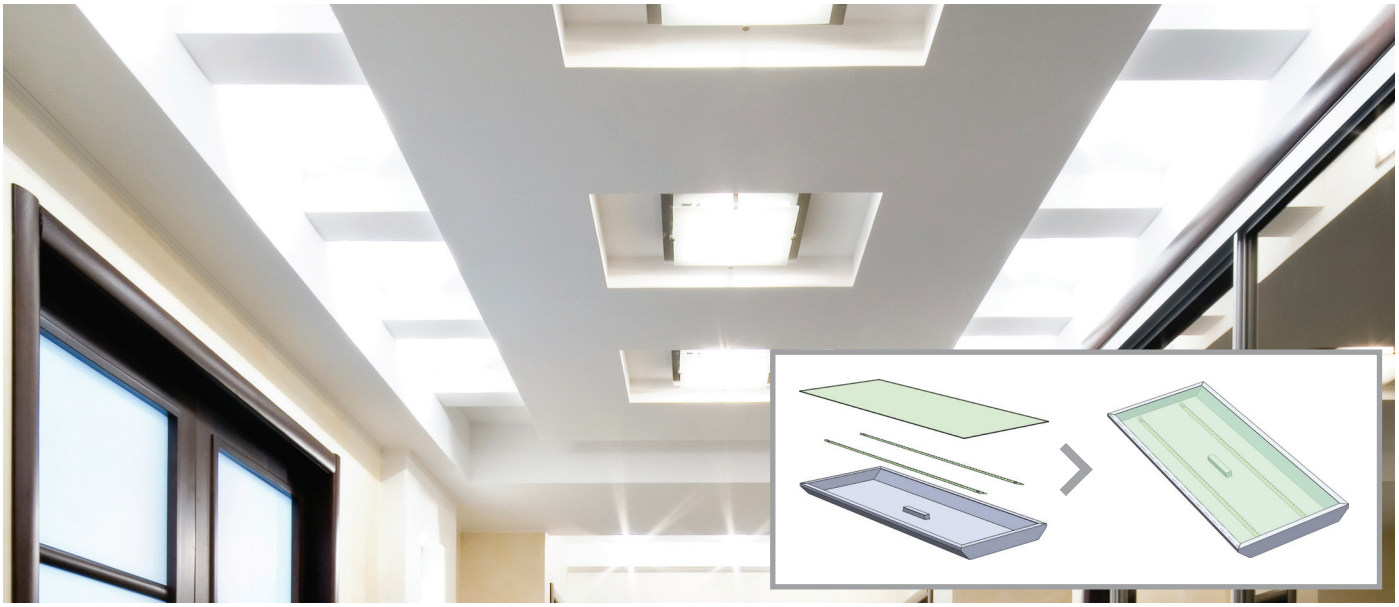
• (1) LED Driver • (2) LED Modules • Mounting Accessories (Jumper Wires, Tek Screws with Rubber Grommets, Power Quick-Disconnect)

APPLICATION

Upgrade indoor troffer fluorescent-style luminaires to an LED solution. Suitable for after-market or OEM installation. (OEM must have UL LED Luminaire General Coverage file.)

TYPICAL FIXTURE APPLICATION





SYSTEM FEATURES

Module Features

- For Use in Class 2 Lighting Systems
- Highly Reflective White Soldermask
- Low Profile WAGO Push Connectors
- UL Recognized Components
- Single-Sided CEM3 Substrate
- 3-Step MacAdam Color Binning
- LM80 Tested LEDs by Samsung
- Beam Angle: 120°
- Reported Life Expectancy: L70 > 36,000 hours at Tc <85°C
- Calculated Life Expectancy: L70 = 93,000 hours at Tc <85°C
- Maximum Board Temperature at Tc Point: 85°C

Driver Features

- 120-277V Input, High Power Factor, 0-IOV Dimming
- UL 8750 Recognized Component LED Power Unit
- Meets FCC Part 15 Class B (Consumer) Limit for EMI
- Over Current, Short Circuit, and Open Circuit Protection
- Class 2 Output
- Type 1 Outdoor, Suitable for Dry and Damp Locations
- Up to 194°F/90°C Maximum Case Temperature
- THO: <20%

Specifications subject to change. Last revised on 2.23.18

FIXTURE TYPES A AND B

LINEAR LED KITS
2x2 AND 2x4 INDOOR TROFFERS

PERFORMANCE SPECIFICATIONS

2x4, 4000 LUMEN LINEAR

Dimming Type: 0-10V

KIT CONTENTS:
Driver: (1) KTLD-40-UV-1100-VDIM-L9
Module: (2) KTLM-1080-L6-8xx-81B
Mounting Hardware and Accessories

Color Temp	Input Voltage	LED Retrofit Kit Catalog Number	No. of Modules	Total System Drive Current	Drive Current per Module	Total System Lumens	Total Module Power	Module Efficacy	Driver Efficiency	Total System Power	Total System Efficacy
3500K	120-277V	KT-RKIT-24-4000-835-VDIM	2	1100mA	550mA	3820	30W	127 lm/W	82%	36.5W	105 lm/W
4000K	120-277V	KT-RKIT-24-4000-840-VDIM	2	1100mA	550mA	3860	30W	129 lm/W	82%	36.5W	106 lm/W
5000K	120-277V	KT-RKIT-24-4000-850-VDIM	2	1100mA	550mA	4000	30W	133 lm/W	82%	36.5W	110 lm/W

2x4, 5000 LUMEN LINEAR

Dimming Type: 0-10V

KIT CONTENTS:
Driver: (1) KTLD-40-UV-1100-VDIM-L9
Module: (2) KTLM-1080-L6-8xx-99B
Mounting Hardware and Accessories

Color Temp	Input Voltage	LED Retrofit Kit Catalog Number	No. of Modules	Total System Drive Current	Drive Current per Module	Total System Lumens	Total Module Power	Module Efficacy	Driver Efficiency	Total System Power	Total System Efficacy
3500K	120-277V	KT-RKIT-24-5000-835-VDIM	2	1100mA	550mA	4680	36W	130 lm/W	82%	44W	106 lm/W
4000K	120-277V	KT-RKIT-24-5000-840-VDIM	2	1100mA	550mA	4800	36W	133 lm/W	82%	44W	109 lm/W
5000K	120-277V	KT-RKIT-24-5000-850-VDIM	2	1100mA	550mA	5000	36W	139 lm/W	82%	44W	114 lm/W

2x2, 4000 LUMEN LINEAR

Dimming Type: 0-10V

KIT CONTENTS:
Driver: (1) KTLD-40-UV-1100-VDIM-L9
Module: (2) KTLM-1080-L2-8xx-81B
Mounting Hardware and Accessories

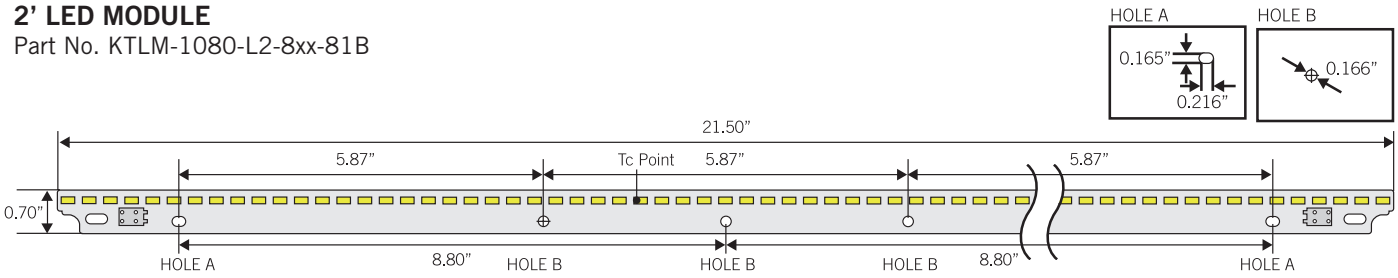
Color Temp	Input Voltage	LED Retrofit Kit Catalog Number	No. of Modules	Total System Drive Current	Drive Current per Module	Total System Lumens	Total Module Power	Module Efficacy	Driver Efficiency	Total System Power	Total System Efficacy
3500K	120-277V	KT-RKIT-22-4000-835-VDIM	2	1100mA	550mA	3820	30W	127 lm/W	82%	36.5W	105 lm/W
4000K	120-277V	KT-RKIT-22-4000-840-VDIM	2	1100mA	550mA	3860	30W	129 lm/W	82%	36.5W	106 lm/W
5000K	120-277V	KT-RKIT-22-4000-850-VDIM	2	1100mA	550mA	4000	30W	133 lm/W	82%	36.5W	110 lm/W

Keystone Technologies • 1390 Welsh Road, North Wales, PA 19454 • Phone (800) 464-2680 • Fax (888) 966-0556 • KeystoneTech.com

LINEAR LED KITS
2x2 AND 2x4 INDOOR TROFFERS

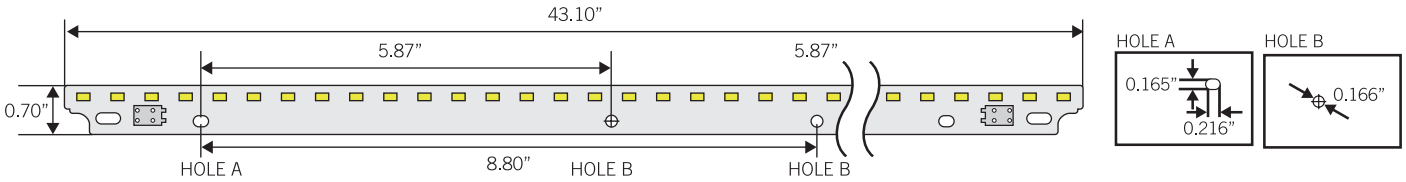
PHYSICAL SPECIFICATIONS

2' LED MODULE
Part No. KTLM-1080-L2-8xx-81B

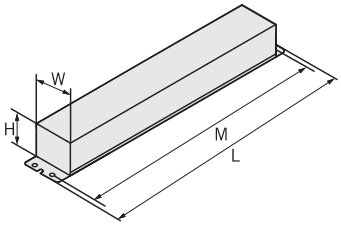


4' LED MODULES
Part No. KTLM-1080-L6-8xx-81B and Part No. KTLM-1080-L6-8xx-99B

Note: LEDs on modules below are to show placement only.



LED DRIVER



LENGTH	9.57"
WIDTH	1.13"
HEIGHT	1.07"
MOUNTING	8.90"

ORDERING INFORMATION

Order Code	Packaging Style	Package Quantity	Item Status
KT-RKIT-24-4000-8xx-VDIM-BP	Bulk Packaged	20	Quick Ship
KT-RKIT-24-4000-8xx-VDIM-IP	Individually Packaged	1	Quick Ship
KT-RKIT-24-5000-8xx-VDIM-BP	Bulk Packaged	20	Quick Ship
KT-RKIT-24-5000-8xx-VDIM-IP	Individually Packaged	1	Quick Ship
KT-RKIT-22-4000-8xx-VDIM-BP	Bulk Packaged	20	Quick Ship
KT-RKIT-22-4000-8xx-VDIM-IP	Individually Packaged	1	Quick Ship

CATALOG NUMBER BREAKDOWN

KT-RKIT-24-4000-840-VDIM

1 2 3 4 5 6 7

1 Keystone Technologies
2 Retrofit Kit
3 Nominal Size: 24 = 2'x 4' Troffer; 22 = 2'x 2' Troffer
4 Nominal Lumens
5 CRI: 8 = 800 Series
6 CCT: 35 = 3500K, 40 = 4000K; 50 = 5000K
7 Dimming Type: VDIM = 0-10V Dimming

Specifications subject to change. Last revised on 2.23.18

FIXTURE TYPE C

Light Towers

8 kW

Overview:

Modular light towers combine a rugged frame with your choice of either a high quality generator or generator/welder. Each power unit delivers the features you've come to expect from Rain for Rent such as brushless design and excellent voltage regulation. Simple mounting requirements provide the ability to exchange power sources with minimal delay. This unique design provides greater versatility than any other light tower on the market. Ballasts and light switches for the Light Tower Series are conveniently located in the tongue area of the trailer.

Features:

- Cold weather, wide body light tower.
- Fully Adjustable Metal Halide Lamps – Four 1,000 watt lamps provide maximum illumination and are controlled by individual circuit breakers for versatility. Lights can be removed and stored separately.
- Engine – Powered by a 15.4 Hp @ 1800 rpms, 1.123 L, 3 cylinder, Tier 4, Kubota D1105, naturally aspirated, liquid cooled, 4-cycle diesel with water separator fuel filter.
- Generator – Meccalte LT3 160/4, 10kVA, single phase, brushless capacitator excited, generator end with class H insulation.
- 60 Gallon Fuel Tank – Provides 94 hours of running time. Contents protected by a fluid containment system which holds 115% of all fluids on board. Drain plug at rear is included.
- Control Panel – Engine controller is sealed digital microprocessor with weather resistant membrane over buttons and LED indicators. Operation is via Simple One Touch, Start/Stop push buttons.
- Trailer Design – Withstands the rigors of the jobsite in addition to providing smooth highway towing. A 3500 lb torsion type, independent wheel suspension system for towing stability and low vibration.

Accessories:

- Nurse Fuel Tank
- Spillguards

Specs:

Power	8 kW
Dry weight	2,500 lbs.
Footprint:	180" x 75" x 74"

Liquid Ingenuity®
800-742-7246
rainforrent.com

Pauluhn DFL HID hazardous area floodlights

FIXTURE TYPE D

Cl. I, Zone 2, AEx nR II
Cl. II, Div. 1, Groups F, G (250W max.)
Ex nR II

Marine & Wet Locations
NEMA 4X
IP66

Applications:

- Onshore drilling and exploration
- Pipeline compressor and storage
- Corrosive environments
- Façade security lighting

Features:

- 150-400W high pressure sodium or 175-400W metal halide
- AEx nR, Ex nR restricted breathing rating is standard – restricted breathing offers cooler T-numbers for increased hazardous locations suitability
- NEMA 7x6 butterfly beam floodlight pattern – wide, uniform and far reaching to provide excellent efficiency and more light where you need it
- NEMA Type 4X and IP66 heavy duty, die cast copper-free aluminum construction is designed for use indoors and outdoors in marine and wet locations with stainless steel external hardware suitable for saltwater and corrosive applications
- 40°C, 55°C and 65°C ambient suitability – addresses high ambient common at industrial facilities
- Low ambient capability to -40°C – perfect for colder climates
- Hinged door frame assembly – has captive cover screws for ease of relamping
- Yoke mount design – standard construction provides the greatest mounting flexibility; can be mounted vertically (wall), horizontally (rooftop or floor) or any angle in between
- 3-axis resonance withstand and UL844 vibration compliant – can stand up to the tough jobs
- Precision formed aluminum reflector – superior beam control, distribution and efficiency
- High light output with a low cost of operation – cost-effectiveness in a high wattage floodlight
- Slipfitter adapter for pole mounting and wall mounting bracket available

Certifications and compliances:

- Class I, Division 2, Groups A, B, C, D
- Class I, Zone 2, AEx nR II
- Class II, Division 1, Groups F, G (250W maximum)
- Ex nR II
- UL/cUL844 – Hazardous Locations
- UL/cUL1598 – Luminaires
- UL/cUL1598A – Supplemental Requirements for Luminaires for Installation on Marine Vessels
- 60079-15
- NEMA Type 4X
- IP66
- Marine and wet locations
- ABS

Standard materials and finishes:

- Housing and lens frame – heavy duty die cast copper-free aluminum with Corro-free epoxy powder coat finish
- Lens – heat- and impact-resistant tempered glass
- Gasket – one-piece silicone
- Mounting brackets – aluminum with Corro-free epoxy powder coat finish
- Reflector – precision formed aluminum
- Lamp holder – porcelain
- Hardware – stainless steel

Technical specifications:

- Entries – one ¾" AEx/Ex gland
- Wind rating – EPA: 2.90 at vertical
- Lamp type – high pressure sodium; probe start metal halide[A]; pulse start metal halide (lamps not provided)
- Lamp holder – mogul base
- Ballast – multi-tap 120/208/240/277V, 60 Hz (standard); 220-240V, 50 Hz (optional); tri-tap 120/277/347V (optional); 480V (optional)

Mounting option:

- Yoke mount

Photometrics:

- Complete photometrics can be found at www.crouse-hinds.com/photometrics

[A]Not available in the U.S.

Pauluhn DFL HID hazardous area floodlights

FIXTURE TYPE D

, D
Cl. I, Zone 2, AEx nR II
Cl. II, Div. 1, Groups F, G (250W max.)
Ex nR II

Marine & Wet Locations
NEMA 4X
IP66

Options:

Description	Suffix
• Lamps included	**L[B]**
• 480V	**480**
Replace /MT in catalog number with /480	
• 230V	**230**
Replace /220 ONLY in catalog number with /230	

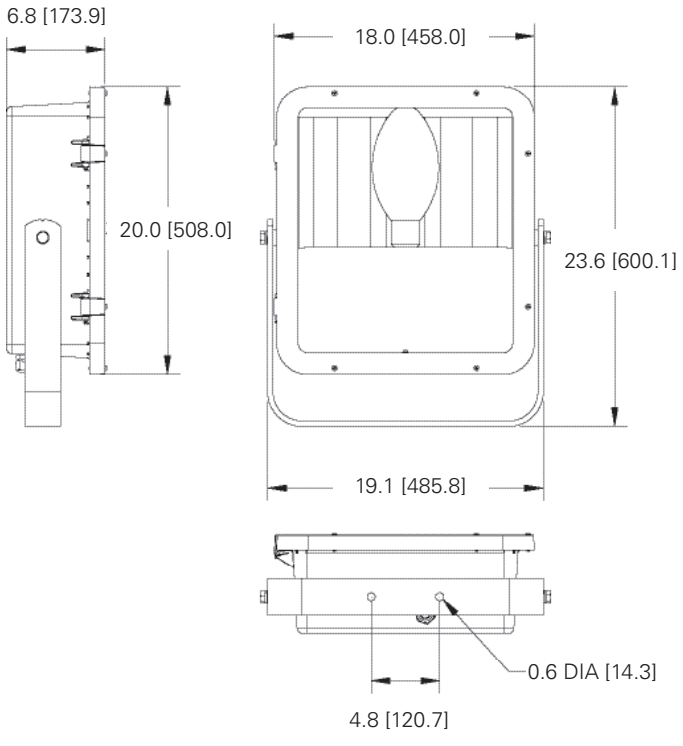
Accessories (ordered separately):

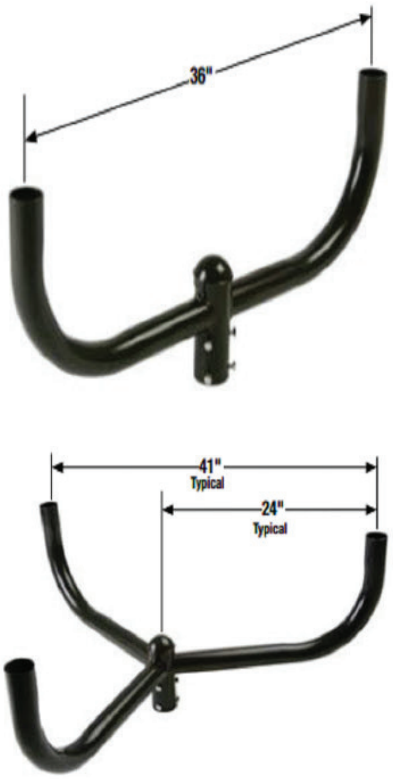
Description	Cat. #
• Pole mount slipfitter adapter	**SFA6**
• Wall mount bracket adapter	**SWB6**
• Bull horn, 2 tenon, gray	**BLHN2**
• Bull horn, 3 tenon, gray	**BLHN3**

Ordering information:

Cat. #	Lamp type	Watts	Weight (lbs.)	ANSI lamp type	Zone T-code	Division T-code	Ambient temperature °C	Supply wire °C
DFLMY250/MT 76 S828	Pulse start metal halide	250	42.0	M153	T3	T1	40/55/65	90/90/105
DFLMY400/MT 76 S828	Pulse start metal halide	400	44.0	M155	T3	T1	40/55	105/105
DFLMY320/MT 76 S828	Pulse start metal halide	320	44.0	M154	T3	T1	40/55	105/105
DFLMY250/TT 76[C]	Probe start metal halide	250	42.0	M58[C]	T3	T1	40/55/65	90/90/105
DFLMY400/TT 76[C]	Probe start metal halide	400	44.0	M59[C]	T3	T1	40/55	90/105
DFLMY250/220 50 76[C]	Probe start metal halide	250	42.0	M58[C]	T3	T1	40/55/65	90/90/105
DFLMY400/220 50 76[C]	Probe start metal halide	400	44.0	M59[C]	T3	T1	40/55	90/105
DFLSY250/MT 76	High pressure sodium	250	40.0	S50	T3	T1	40/55/65	90/90/105
DFLSY400/MT 76	High pressure sodium	400	44.0	S51	T3	T1	40/55	90/105
DFLSY250/TT 76	High pressure sodium	250	40.0	S50	T3	T1	40/55/65	90/90/105
DFLSY400/TT 76	High pressure sodium	400	44.0	S51	T3	T1	40/55	90/105
DFLSY250/220 50 76	High pressure sodium	250	40.0	S50	T3	T1	40/55/65	90/90/105
DFLSY400/220 50 76	High pressure sodium	400	44.0	S51	T3	T1	40/55	90/105

Dimensions (in inches):





Bull horns – provided with 2 3/8" pole tenon

[B] Lamp is not included unless option 'L' is selected.
[C] Not available in the U.S.

FEDERAL SIGNAL

Model 151XST

Hazardous Location Strobe Light

A B C G R

Model 151XST hazardous location strobe light provides 80 high-intensity flashes per minute. This hazardous location warning light has an aluminum base, coated for corrosion resistance, that can be ordered for mounting on a 3/4-inch NPT pipe or a surface. The dome guard (included) fits over the glass lens to protect it against accidental collision with moving equipment, such as forklifts.

Federal Signal's rugged 151XST strobe light is specifically designed for hazardous locations or corrosive environments where a very bright visual signal is required. This warning light can be used for plant evacuation or other communication needs.

FEATURES

- Available in 12-24VDC, 120VAC and 230-240VAC
- Five lens colors: Amber, Blue, Clear, Green and Red
- 10,000-hour high-intensity strobe
- Available in 3/4-inch NPT pipe mount or surface mount
- Dome guard included
- Indoor/outdoor use
- Conformal coated PCBA
- Type 4X, IP66 enclosure
- IP69K compliant
- Marine rated
- UL and cUL Listed for Class I, Division 2, Groups A, B, C and D; Class II, Division 1, Groups E, F, and G; Class III

MODEL	VOLTAGE	OPERATING CURRENT	FLASH RATE/ MINUTE	LIGHT OUTPUT PEAK[1]	ECP[2]
151XST-*012-024**	12-24VDC	1.3-0.60 amps	80	520,000 cd	165 cd
151XST-*120**	120VAC 50/60Hz	0.35 amps	80	520,000 cd	165 cd
151XST-*240**	230-240VAC 50/60Hz	0.18 amps	80	520,000 cd	165 cd

* Include (S) for Surface Mount Option (Example part number: 151XST-S120R for surface mount option, 151XST-120R for pipe mount)

** Indicates color: (A) Amber, (B) Blue, (C) Clear, (G) Green or (R) Red

[1] Peak candela is the maximum light intensity generated by a flashing light during its light pulse

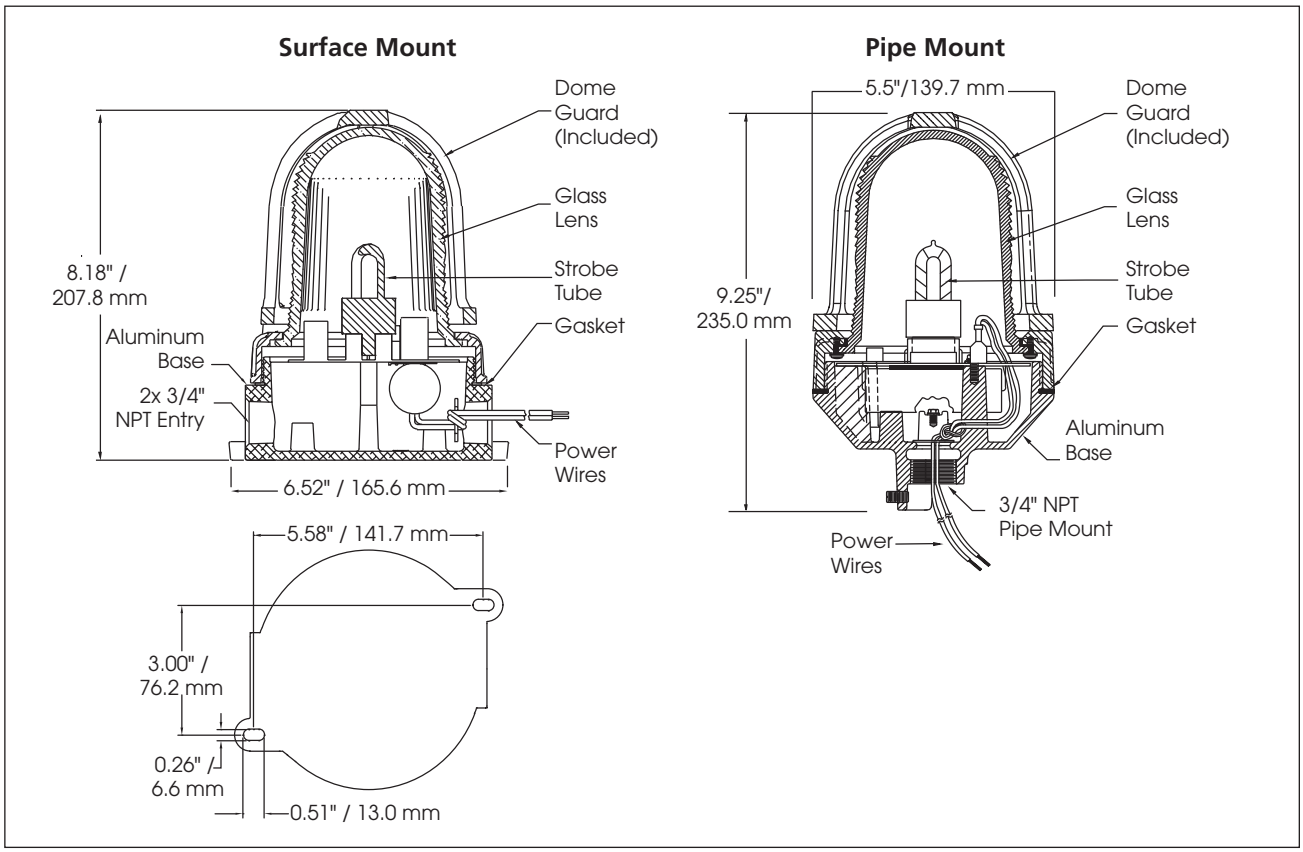
[2] ECP (Effective Candela) is the intensity that would appear to an observer if the light were burning steadily

HAZARDOUS LOCATION RATING: 151XST

T-CODE AT MAXIMUM AMBIENT TEMPERATURE, °C		
Hazardous Location	**40°C**	**66°C**
Class I, Division 2, Groups A, B, C, D	T2	T1
Class II, Division 1, Groups E, F, G	T5	T5
Class III	T5	T5

AIRCRAFT WARNING BEACON

Hazardous Location Strobe Light (151XST)



SPECIFICATIONS

Lamp Life:		10,000 Hours
Light Source:		Strobe tube
Operating Temperature:	-67°F to 150°F	-55°C to 66°C
Net Weight:	3.8 lbs	1.7 kg
Shipping Weight:	4.5 lbs	2.0 kg
Pipe Mount		
Height:	9.25"	235.0 mm
Diameter:	5.5"	139.7 mm
Surface Mount		
Height:	8.18"	207.8 mm
Diameter	6.52"	165.6 mm

REPLACEMENT PARTS

Description	Part Number
Series C Dome and Ring Assembly	
Lens & Ring Assembly, Amber[1]	K8449078C-01
Lens & Ring Assembly, Blue[1]	K8449078C-06
Lens & Ring Assembly, Clear[1]	K8449078C-04
Lens & Ring Assembly, Green[1]	K8449078C-07
Lens & Ring Assembly, Red[1]	K8449078C
PCB Assembly, 12-24VDC	K2001173C
PCB Assembly, 120VAC	K2001071B
PCB Assembly, 240VAC	K2001071B-01
Strobe Tube	K149122B
Dome Guard	K8449090C

[1] Includes dome gasket

HOW TO ORDER

151XST – **S** **12-24** **A**

TYPE
151XST

MOUNTING
Blank - Pipe
S - Surface

VOLTAGE
012-024 (Pipe) (12-24VDC)
12-24 (Surface) (12-24VDC)
120 (120VAC)
240 (230-240VAC)

COLOR
A Amber
B Blue
C Clear
G Green
R Red

OPTIONAL ACCESSORIES

Description	Part Number
Hazardous Location Mounting Bracket	LHWB

Mounting Brackets shown on pages 138-139