



# **LIGHTING MITIGATION PLAN**

**Submitted with Form 2A Application for the**

**Sky Ranch 4-65 10-9 South  
(Sky Ranch)**

**Date of Plan: July 13, 2021**

**Date of Submittal: August 4, 2021**

**Crestone Peak Resources' Lighting Mitigation Plan is being submitted**

**consistent with the requirements of**

**Rule 424.a. as described herein.**

Crestone Peak Resources' ("Crestone") comprehensive Lighting Mitigation Plan is attached.

Crestone's development of the Sky Ranch Form 2A (the "Site") necessitates work activities to be performed 24 hours a day during drilling and completion phases, requiring the use of temporary and transient lighting to conform with nationally recognized industry and federally mandated safety standards.

The Site is planned for 12 wells on approximately 8.27-acre working pad surface. The parcel the Site is located on is zoned agricultural.

#### Site Specific BMPs

- During construction, no night work and no permanent lighting will be installed on the Site. Daylight operations only are performed during this phase of operation.
- Crestone's development of the Sky Ranch Form 2A (the "Site") necessitates work activities to be performed 24 hours a day during drilling and completion phases, requiring the use of temporary and transient lighting to conform with nationally recognized industry and federally mandated safety standards.
- A proposed 32-foot-high sound/visual wall (32-foot wall) will be installed on the south side of the site.
- There will be 3-Fixture LED Telescoping Mobile Temporary Lighting Towers and 2-Fixture LED Flood Wall Mounted Lights that may be affixed to the 32-foot wall and lights permanently affixed to equipment. All lighting capable of adjustment will be directed inward, downward and shielded to avoid glare on public roads and to prevent light shining beyond the boundary of the Site, while at the same time providing a safe workplace that is free from recognizable hazards and complies with OSHA, ANSI and IESNA standards.
- Drilling rig lights shall be angled and shielded to avoid direct light shining beyond the boundary of the site.
- The lights will be inward, pointing away from residents and none of the lights are directed outward.
- Concurrent to the commencement of any operational changes (e.g., at the end of drilling operations and at the start of hydraulic stimulation operations), a lighting self-audit of the site will be performed to ensure that there is not any rogue light coming from the site that may become a nuisance.
- Once wells are in the production phase, no night work is anticipated, and no permanent lighting will be installed on the site.
- Will use automation, timers, or motion sensors to control and minimize lighting when not needed.
- Will use full cut-off lighting to better direct light, lighting colors that reduce lighting intensity and low-glare or no-glare lighting when possible.
- As the photometric plan depicts, lighting does not go beyond the borders of the oil and gas operating area.

Please see the attached Lighting Mitigation Plan for the location of the resources and receptors.

This Plan is intended to facilitate compliance with:

- Colorado Oil and Gas Conservation Commission (COGCC) Rule 424
- The Occupational Safety and Health Administration (OSHA) Standard 1926.56(b)
- The Occupational Safety and Health Administration (OSHA) OSH Act of 1970, Section 5
- The American National Standard (ANSI) A11.1-1965, R1970, Practice for Industrial Lighting
- The Illuminating Engineering Society of North America (IESNA) RP-7-17, Petroleum, Chemical and Petrochemical Industry Lighting Standards

## PROJECT OVERVIEW

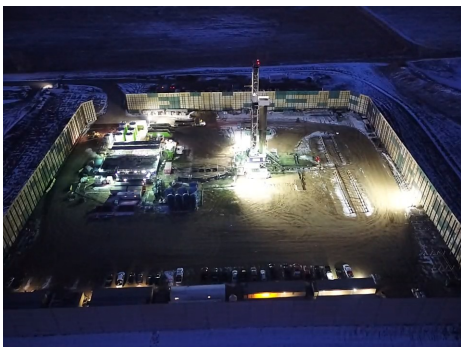
The Company's development of the Project necessitates work activities to be performed 24 hours a day during drilling and completion phases, requiring the use of temporary and transient lighting in order to conform with nationally recognized industry and federally mandated safety standards (referenced above). During night work activities, there may be circumstances when lighting required for safe operations may be **observed** from locations beyond the boundaries of the Site. However, light will not **shine** beyond the boundaries of the well site.

Construction Phase – No night work and no permanent lighting will be installed on the Site. Daylight operations only are performed during this phase of operation.

Drilling Phase and Completion Phase – Night work is anticipated due to the requirement for continuous operations. Lighting for safe night work will be provided by transient and temporary light plants and lights permanently affixed to equipment (pictures attached). All lighting capable of adjustment will be directed inward; downward and shielded to avoid glare on public roads and to prevent light shining beyond the boundary of the Site while at the same time providing a safe workplace that is free from recognizable hazards and complies with OSHA Reg. 1910, ANSI and IESNA standards. A photometric plan is attached to the Site Plan and is representative of the anticipated placement of lighting required for safe night work during these phases of operation.

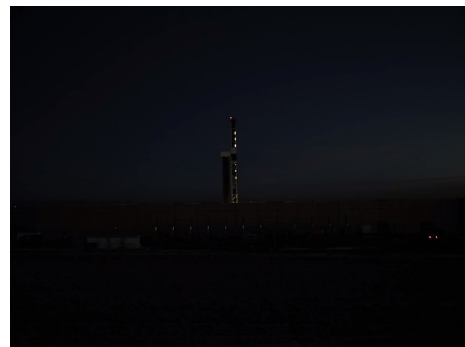
Production Phase — Once wells are in the production phase, no night work is anticipated, and no permanent lighting will be installed on the Site.

## REPRESENTATIVE PHOTOS



*Drilling Night Work*

3



*Drilling Night Work*  
picture is taken 350' from drill site

**COLORADO OIL & GAS CONSERVATION COMMISSION**

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Light Mitigation Plan

**CRESTONE PEAK RESOURCES, LLC  
SKY RANCH 4-65 10-9 PAD PROJECT**

**LIGHT MITIGATION PLAN**

**SECTION 10, TOWNSHIP 4 SOUTH, RANGE 65 WEST, 6TH P.M.  
ARAPAHOE COUNTY, COLORADO**

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8-4-2021



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## **I. INTRODUCTION**

The purpose of this Light Mitigation Plan is to facilitate compliance with Colorado Oil and Gas Conservation Commission (COGCC) Rules and Regulations (Rule 424) for the Sky Ranch 4-65 10-9 Pad Project. The project consists of the development of infrastructure to support the drilling and production of 12 oil and gas wells located in the East 1/2 of Section 10, Township 4 South, Range 65 West, 6th P.M. This plan examines the light mitigation measures that will be implemented by Crestone Peak Resources, LLC to ensure that the project's Pre-Production and Production Facility Lighting demonstrate compliance with Rule 424.

## **II. GENERAL LOCATION AND DESCRIPTION**

### **A. LOCATION AND EXISTING CONDITIONS**

The Sky Ranch 4-65 10-9 Pad is located in Arapahoe County on a 311-acre parcel of land owned by PCY Holdings LLC. The site is on the west side of North Hayesmount Road approximately 1.4 miles south from the intersection of North Hayesmount Road and I-70 Frontage Road. This parcel is zoned Agricultural and the existing land use is agricultural land.

### **B. PROPOSED DEVELOPMENT**

The proposed development will include construction of infrastructure consisting of a well pad (approximately 8.27-acre working pad surface) and utilities to support drilling and production of new oil and gas wells. The Pre-Production Phase will be the initial phase of the project beginning with pad construction and will remain until all the wells have been drilled and hydraulically stimulated. The Production Phase will be the final phase of the project and will include drill-out, flowback, and production activities. Due to the continuous nature of oil & gas operations, many of the activities mentioned above must be performed during nighttime hours.

### **C. PROPOSED LIGHTING**

Light pollution Best Management Practices (Lighting BMPs) will be used to minimize light pollution during all phases of the project's proposed operations. Oil and gas facilities and equipment shall be operated in such a manner that lighting does not constitute a nuisance or hazard to public welfare and will be minimized throughout all phases to the maximum extent practicable. The development of the project will require work operations to be performed 24-hours a day during drilling, completion, drill-out, and flowback stages, requiring the use of temporary lighting and lights permanently affixed to development equipment (e.g. drill rig). All lighting shall conform to nationally recognized industry and federally mandated safety standards. During nighttime work activities, there may be circumstances when lighting required for safe operations may be observed from locations beyond the boundaries of the site. Concurrent to the commencement of any operational changes (e.g., at the end of drilling operations and at the start of hydraulic stimulation operations), a lighting self-audit of the site will be performed to ensure that there is not any rogue light coming from the site that may become a nuisance. Care will be taken to minimize the amount of light observed from locations beyond the boundaries of the site.

### III. PRE-PRODUCTION PHASE FACILITY LIGHTING PLAN – 424.a.(2).A.

During several operations utilizing the pre-production facility site, continuous work (7-days a week & 24-hour a day) will be required to complete the operations as quickly and as safely as possible. During nighttime work, temporary lighting will be required to provide a safe adequately lit workplace that complies with OSHA, ANSI and IESNA standards. A proposed 32-foot high sound/visual wall (32-foot wall) will be placed around portions of the southeast corner of the working pad surface. Lighting will be temporary and be provided by portable light towers and lights permanently affixed to equipment (e.g., the drilling rig). Concurrent to the commencement of any operational changes (e.g., at the end of drilling operations and at the start of hydraulic stimulation operations), a lighting self-audit of the site will be performed to ensure that there is not any rogue light coming from the site that may become a hazard or a nuisance. All measures will be taken to avoid direct light shining beyond the boundary of the site and onto public roads and adjacent property. Lights capable of adjustment will be directed toward working areas on the pad surface inward and angled approximately 45-65° downward and/or shielded to prevent direct light leaving the site.

#### A. PAD CONSTRUCTION OPERATIONS

Pad construction operations consist of building a well pad and access road to facilitate the wells. Pad construction operations also includes placing necessary utilities to support the wells. Typically pad construction operations will only occur during daylight hours. No lighting, permanent or temporary is anticipated on the site during pad construction operations.

#### B. DRILLING OPERATIONS

Drilling operations consist of bringing a drill rig on to the site and drilling the proposed wells. Drilling operations will take place continuously. Current plans of the Sky Ranch 4-65 10-9 Pad project include utilizing a single drilling rig development scenario during drilling operations. A 32-foot wall will be placed around portions of the southeast corner of the working pad surface. Lighting will be temporary and be provided by portable light towers and lights permanently affixed to the drilling rig. A Drilling Operations Photometric Plan and a Drilling Rig Photometric Plan are attached as Appendix A. All proposed lighting during the drilling operations is listed below:

*Table 1 – Drilling Operations Lighting.*

<b>Light Type</b>	<b>Number of Units</b>	<b>Approximate Height (above GE)</b>	<b>Wattage per Unit</b>	<b>Lumens per Unit</b>	<b>Total Lumens</b>
LED Flood Light Tower	4	25'	1,400	154,000	616,000
Lights Permanently Affixed to Drill Rig	1	Varying		See Plan	See Plan
<b>Total Lumens</b>					<b>616,000*</b>

*\*Plus, additional lighting permanently affixed to the drill rig.*

The LED Flood Light Tower is a portable 4-fixture LED telescoping light tower mounted on a single-axle trailer, BUG Rating is B3-U3-G5 (fixture specification sheet is included in Appendix E). These lights will be directed toward working areas on the pad surface inward and angled approximately 45-65° downward and/or shielded to prevent direct light from leaving the site. All lights, except those permanently affixed to the drilling rig, will be mounted or positioned at a height below the 32-foot wall. If deemed necessary, additional light units the same as described above may be utilized to address safety concerns during drilling operations.

## C. HYDRAULIC STIMULATION OPERATIONS

Hydraulic stimulation operations consist of hydraulically fracturing the proposed wells. Hydraulic stimulation operations will take place continuously. Current plans of the project include utilizing a single frac crew development scenario during hydraulic stimulation operations. The 32-foot wall will remain in place around portions of the southeast corner of the working pad surface. Lighting will be temporary and be provided by portable light towers. A Hydraulic Stimulation Operation Lighting Plan is attached as Appendix B. All proposed lighting during the hydraulic stimulation operations is listed below:

Table 2 – Hydraulic Stimulation Operations Lighting.

<i>Light Type</i>	<b>Number of Units</b>	<b>Approximate Height (above GE)</b>	<b>Wattage per Unit</b>	<b>Lumens per Unit</b>	<b>Total Lumens</b>
LED Flood Light Tower	5	25'	1,400	154,000	770,000
<b>Total Lumens</b>					<b>770,000</b>

The LED Flood Light Tower is a portable 4-fixture LED telescoping light tower mounted on a single-axle trailer, BUG Rating is B3-U3-G5 (fixture specification sheet is included in Appendix E). These lights will be directed toward working areas on the pad surface inward and angled approximately 45-65° downward and/or shielded to prevent direct light from leaving the site. All lights, except those permanently affixed to the drilling rig, will be mounted or positioned at a height below the 32-foot wall. If deemed necessary, additional light units the same as described above may be utilized to address safety concerns during drilling operations.

## IV. PRODUCTION PHASE FACILITY LIGHTING PLAN – 424.a.(2).B.

During several operations utilizing the production facility site, continuous work (7-days a week & 24-hour a day) will be required to complete the operations as quickly and as safely as possible. During nighttime work, temporary lighting will be required to provide a safe, adequately lit workplace that complies with OSHA, ANSI, and IESNA standards. Only during drill-out operations will the 32-foot wall remain in place. For the remainder of the production phase of the project, the 32-foot wall will be removed. Lighting will be temporary and be provided by portable light towers, and lights permanently affixed to equipment. Concurrent to the commencement of any operational changes (e.g., at the end of drill-out operations and the start of flowback operations), a lighting self-audit of the site will be performed to ensure that there is not any rogue light coming from the site that may become a hazard or a nuisance. All measures will be taken to avoid direct light shining beyond the boundary of the site and onto public roads and adjacent property. Lights will be directed toward working areas on the pad surface inward and angled approximately 45-65° downward and/or shielded to prevent direct light from leaving the site.

### A. DRILL-OUT & FLOWBACK OPERATIONS

Drill-out and flowback operations consist of recovering fluids following hydraulic stimulation operations. Flowback operations also consist of equipment and material mobilization from the site. The mobilization activities may continue approximately 120 days following drill-out. Drill-out & flowback operations will take place continuously and simultaneously. As noted above, the 32-foot wall will remain in place during drill-out operations and will be removed during flowback operations. Lighting will be temporary and be provided by portable light towers. The



Drill-Out Operations Photometric Plan and Flowback Operations Photometric Plan are attached as Appendix C & D, respectfully. All proposed lighting during drill-out & flowback operations are listed below:

Table 3 – Drill-Out Operations Lighting Fixture Schedule.

<i>Light Type</i>	<b>Number of Units</b>	<b>Approximate Height (above GE)</b>	<b>Wattage per Unit</b>	<b>Lumens per Unit</b>	<b>Total Lumens</b>
LED Flood Light Tower	5	25'	1,400	154,000	770,000
<b>Total Lumens</b>					<b>770,000</b>

Table 4 – Flowback Operations Lighting Fixture Schedule.

<i>Light Type</i>	<b>Number of Units</b>	<b>Approximate Height (above GE)</b>	<b>Wattage per Unit</b>	<b>Lumens per Unit</b>	<b>Total Lumens</b>
LED Flood Light Tower	2	25'	1,400	154,000	308,000
<b>Total Lumens</b>					<b>308,000</b>

The LED Flood Light Tower is a portable 4-fixture LED telescoping light tower mounted on a single-axle trailer, BUG Rating is B3-U3-G5 (fixture specification sheet is included in Appendix E). These lights will be directed toward working areas on the pad surface inward and angled approximately 45-65° downward and/or shielded to prevent direct light from leaving the site. All lights, except those permanently affixed to the drilling rig, will be mounted or positioned at a height below the 32-foot wall. If deemed necessary, additional light units the same as described above may be utilized to address safety concerns during drilling operations.

## B. PRODUCTION OPERATIONS

Production operations consist of the daily gathering of the resources from the wells and maintenance of the permanent production equipment. Typically, productions operations will only occur during daylight hours. No lighting, permanent or temporary is anticipated on the site during production operations.

## C. LOCATION OF RESOURCES & RECEPTORS

This project is not located within 2,000 feet of a "Building Unit" (as defined by COGCC). As stated above, all lighting levels will be contained within the boundary of the site during all operations of Production Phase. As required by COGCC rule 424.a.(2).B.iv., photometric plans of the drill-out & flowback operations have been prepared, and are included as Appendix C & D, respectively. The following outlines and tabulates the location of resources and receptors as identified in COGCC Rule 424.c. & d.:

1. Building Unit(s) within 2,000 feet of the Oil & Gas Facility:
  - a. No Building Units within 2,000 feet
2. Motorists on roads within 2,000 feet of the Oil & Gas Facility:
  - a. N. Hayesmount Road is approximately 150 feet easterly
3. High Priority Habitat within 2,000 feet of the Oil & Gas Facility:
  - a. No High Priority Habitat within 2,000 feet

## V. LIGHTING STANDARDS – 424.b.

No permanent lighting is proposed for this project. All temporary Lights will be directed toward working areas on the pad surface inward and angled approximately 45-65° downward and/or shielded to prevent direct light from leaving the site. As stated above, lighting BMPs will be used to minimize light pollution, which may include but is not limited to:

- Using a 32-foot high sound/visual wall surrounding the working pad surface
- Using automation, timers, or motion sensors to control and minimize lighting when not needed
- Turning off or shielding redundant or un-needed light
- Using full cut-off lighting to better direct light
- Using lighting colors that reduce light intensity
- Using low-glare or no-glare lighting
- Watching for and removing glare points

During nighttime work, lighting shall be adequately lit to provide a safe workplace that complies with OSHA, ANSI, and IESNA standards. Additionally, measures shall be taken to avoid direct light shining beyond the boundary of the site and onto public roads and adjacent property. Concurrent to the commencement of Operational Changes (at the start of drilling activities and at the start of completion activities), a lighting self-audit of the site will be performed to ensure that there is not any rogue light coming from the site that may become a nuisance.

## VI. PRE-PRODUCTION PHASE FACILITY LIGHTING – 424.c.

To ensure the safety of all persons on or near the site during the Pre-Production Phase of this project, it is expected that adequate on-site temporary lighting will be provided. The lighting discussed above (424.a.(2).A.) will be mounted or positioned at a height below the 32-foot wall, except for drilling rig lights which are permanently affixed to the drill rig. All lighting will be angled inward and down to avoid direct light from leaving the site pursuant to municipal, state, and federal requirements. Precautions will be taken to ensure that the lighting does not shine directly outside of the boundary of the site and become a nuisance or a hazard to the existing environment.

Prior to the commencement of production operations, all necessary and reasonable precautions will be taken to ensure that direct lighting from Oil and Gas Facilities does not unnecessarily impact the health, safety, and welfare of any of the following:

1. Building Unit(s) within 2,000 feet of the Oil & Gas Facility:
  - a. No Building Units within 2,000 feet
2. Motorists on roads within 2,000 feet of the Oil & Gas Facility:
  - a. N. Hayesmount Road approximately 182 feet easterly
    - i. It is anticipated that only indirect ambient light (no direct light) from the site will be seen by motorists on the road. If proper lighting BMPs are followed, the proposed lighting should not interfere with motorists.
3. High Priority Habitat within 2,000 feet of the Oil & Gas Facility:
  - i. No High Priority Habitat within 2,000 feet

## VII. PRODUCTION PHASE FACILITY LIGHTING WHEN PERSONNEL ARE ON-SITE – 424.d.

### A. DRILL-OUT OPERATIONS

It is expected that the temporary lighting utilized during drill-out operations (as described above) will not exceed the maximum permissible light level for agricultural land use of 2.5 lumens per square foot of working pad surface. The following are the calculated light levels for the drill-out operations:

Table 5 – Calculated Drill-Out Operations Lumens per Square Foot of Working Pad Surface.

<i>Description</i>	<b>Number of Units</b>	<b>Working Pad Surface (sq. ft.)</b>	<b>Total Lumen Output</b>	<b>Lumens per Square Foot</b>
<i>Drill-Out Temporary Lighting</i>	5	360,070	770,000	2.1
<b>TOTAL</b>				<b>2.1</b>

Appendix C – Drill-Out Operations Photometric Plan shows the calculated light distribution at the site during flowback operations. No direct light is anticipated to leave the working pad surface, and no direct light will be within the 100-foot offset from the working pad surface.

### B. FLOWBACK OPERATIONS

Temporary lighting utilized during flowback operations (as described in above) does not exceed the maximum permissible light level for agricultural land use of 2.5 lumens per square foot of working pad surface. The following are the calculated light levels for the flowback operations:

Table 6 – Calculated Flowback Operations Lumens per Square Foot of Working Pad Surface.

<i>Description</i>	<b>Number of Units</b>	<b>Working Pad Surface (sq. ft.)</b>	<b>Total Lumen Output</b>	<b>Lumens per Square Foot</b>
<i>Flowback Temporary Lighting</i>	2	360,070	308,000	0.9
<b>TOTAL</b>				<b>0.9</b>

Appendix D – Flowback Operations Photometric Plan shows the calculated light distribution at the site during flowback operations. No direct light is anticipated to leave the working pad surface, and no direct light will be within the 100-foot offset from the working pad surface.

### C. PRODUCTION OPERATIONS

Following the commencement of the flowback operations, it is anticipated that no further nighttime activities will occur at the site. No permanent lighting fixtures are planned for the remainder of the production operations and Production Phase of this project. In the event that temporary lighting is required for maintenance of production operations beyond flowback operations, temporary portable light fixtures adequate and sufficient to ensure the safety of all persons on or near the site shall be provided. Lighting BMPs, as discussed above, shall be used to minimize light pollution for temporary nighttime activities necessary to support maintenance for production operations.

## VIII. PRODUCTION PHASE FACILITY LIGHTING WHEN PERSONNEL ARE NOT ON-SITE – 424.e.

As discussed above, after the flowback operations, no further nighttime work is anticipated and no temporary or permanent lighting is anticipated for this project. In the event that permanent lighting is required for production operations beyond flowback operations, a production operations lighting plan shall be created and this report shall be amended.

## IX. CUMULATIVE IMPACTS – 424.f.

This lighting plan was developed so that the cumulative impact of the proposed lighting will conform to the required 4 lux at any Residential Building Unit or High Occupancy Building Unit within 1-mile of the site, measured at 5.5 feet above grade in a direct line of sight to the nearest light fixture on site.

### A. DRILL-OUT OPERATIONS

Based upon the light intensity calculations shown in Appendix C – Drill-out Operations Photometric Plan, the maximum foot-candle (Fc) observed within the working pad area during drill-out operations will be directly beneath the temporary portable light tower located on the middle-east side of the proposed row of wells, calculated as 28.1 Fc. The maximum foot-candle at the working pad entrance is calculated at 0.0 Fc. The maximum foot-candle at the edge of the working pad will be 3.7 Fc (due to the proximity and reflection of the light from the equipment). The maximum foot-candle at a point extended 100 feet from the working pad will be 0.0 Fc. Foot-candle can be converted to lux by using the following conversion: 1 Fc = 10.8 lux.

*Table 7 – Drill-Out Operations Calculated Maximum Light Intensity.*

<b><i>Location of Maximum Light Intensity</i></b>	<b><i>Foot-Candle</i></b>	<b><i>Lux</i></b>
<i>Within the Working Pad Area</i>	28.1	303.5
<i>At the Working Pad Entrance</i>	0.0	0.0
<i>At the Edge of Working Pad</i>	3.7	40.0
<i>100' Beyond the Working Pad</i>	0.0	0.0

Building Units and roads within a 1-mile radius of the project site will experience light intensity levels below the maximum allowable level of 4.0 lux (Rule 424.f) during drill-out operations.

### B. FLOWBACK OPERATIONS

Based upon the light intensity calculations shown as Appendix D – Flowback Operations Photometric Plan, the maximum foot-candle (Fc) observed within the working pad area during flowback operations will be beneath the temporary portable light tower located on the southwest side of the proposed row of wells, calculated as 23.4 Fc. The maximum foot-candle at the working pad entrance is calculated at 0.0 Fc. The maximum foot-candle at the edge of the working pad will be 0.1 Fc. The maximum foot-candle at a point extended 100 feet from the working pad will be 0.0 Fc. Foot-candle can be converted to lux by using the following conversion: 1 Fc = 10.8 lux.

*Table 8 – Flowback Operations Calculated Maximum Light Intensity.*

<b><i>Location of Maximum Light Intensity</i></b>	<b>Foot-Candle</b>	<b>Lux</b>
<i>Within the Working Pad Area</i>	23.4	252.7
<i>At the Working Pad Entrance</i>	0.0	0.0
<i>At the Edge of Working Pad</i>	0.1	1.1
<i>100' Beyond the Working Pad</i>	0.0	0.0

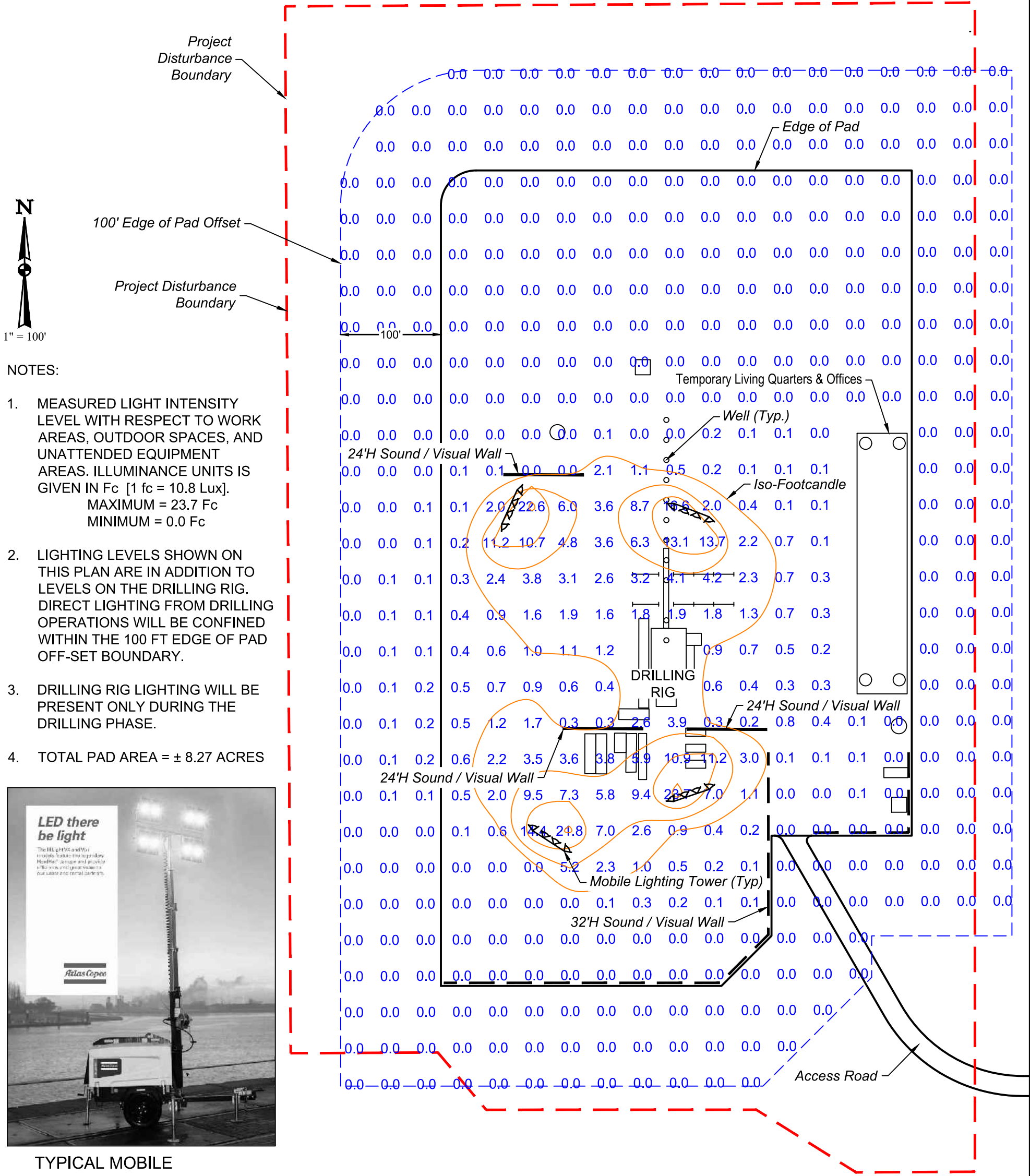
Building Units and roads within a 1-mile radius of the project site will experience light intensity levels below the maximum allowable level of 4.0 lux (Rule 424.f) during flowback operations.

### **C. PRODUCTION OPERATIONS**

As discussed above, once flowback operations are complete, there will be no temporary or permanent lights, so no cumulative light impacts are anticipated for the production operations of this project.

## **X. APPENDIX**

## APPENDIX A – DRILLING RIG PHOTOMETRIC PLAN

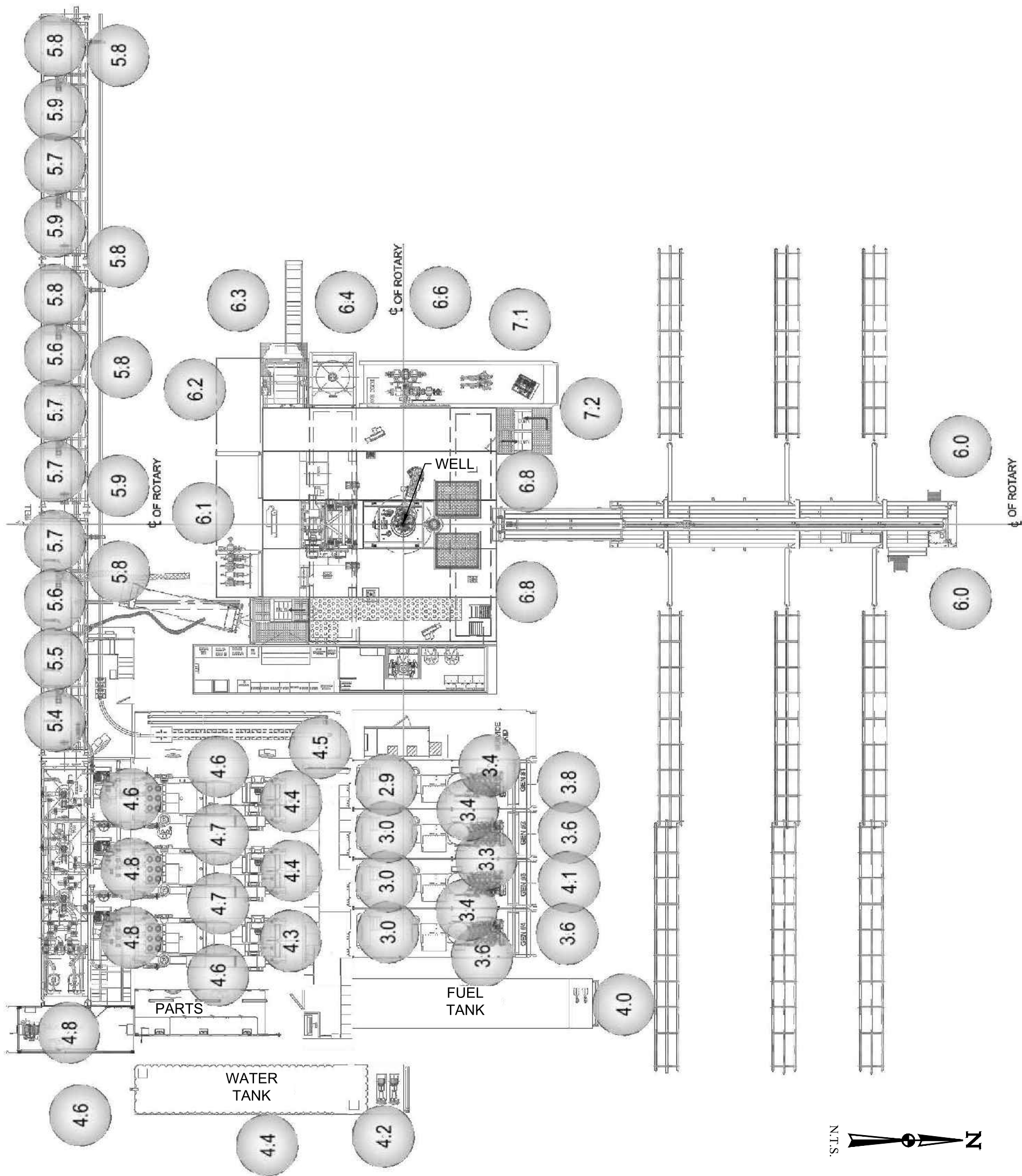


TYPICAL MOBILE  
TOWER LIGHTING

1 DRILLING PAD SITE LIGHTING PHOTOMETRIC PLAN  
SCALE: 1" = 100'

LIGHTING FIXTURE SCHEDULE									
SYMBOL	LIGHT UNIT DESCRIPTION	BUG RATING	MOUNTING INFO	VOLTS	LAMP QUANTITY	LUMENS / LAMP	UNITS QUANTITY	LUMENS / UNIT	TOTAL LUMENS
	4 HEAD FLOOD LIGHT LED MOBILE TEMPORARY LIGHTING TOWER	B3-U3-G5	25' TOWER	120	4	38,500	4	154,000	616,000





## 2 DRILLING RIG SITE LIGHTING PHOTOMETRIC PLAN

SCALE: NO SCALE

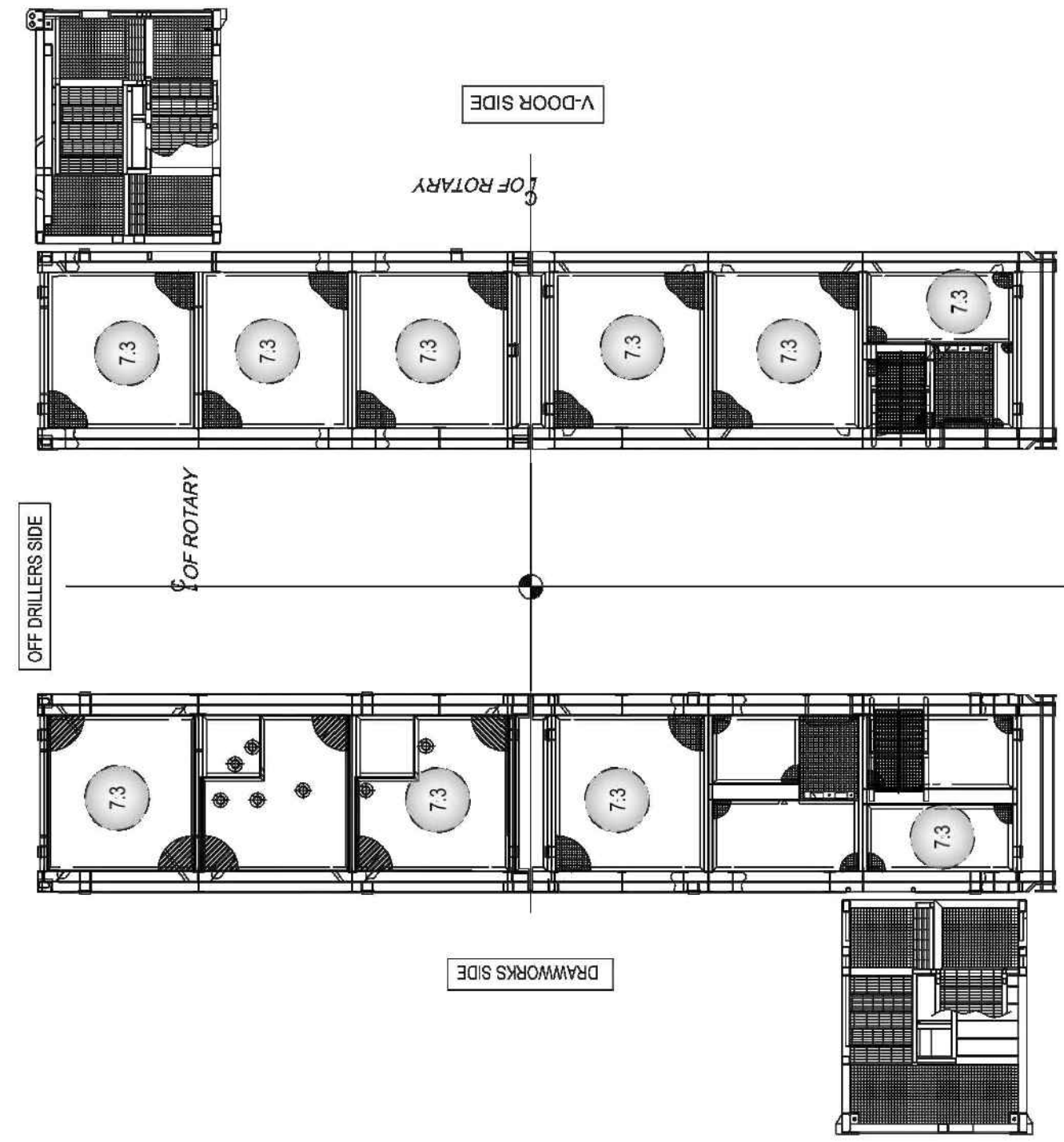
### NOTES:

- MEASURED LIGHT INTENSITY LEVEL WITH RESPECT TO WORK AREAS, OUTDOOR SPACES, AND UNATTENDED EQUIPMENT AREAS. ILLUMINANCE UNITS IS GIVEN IN Fc [1 fc = 10.8 Lux].  
MAXIMUM = 9.1  
MINIMUM = 2.9
- LIGHTING LEVELS SHOWN ON THIS PLAN ARE IN ADDITION TO LEVELS ON THE DRILLING PAD SITE. DIRECT LIGHTING FROM DRILLING OPERATIONS WILL BE CONFINED WITHIN THE 100 FT EDGE OF PAD OFF-SET BOUNDARY.
- DRILLING RIG LIGHTING WILL BE PRESENT ONLY DURING THE DRILLING PHASE.

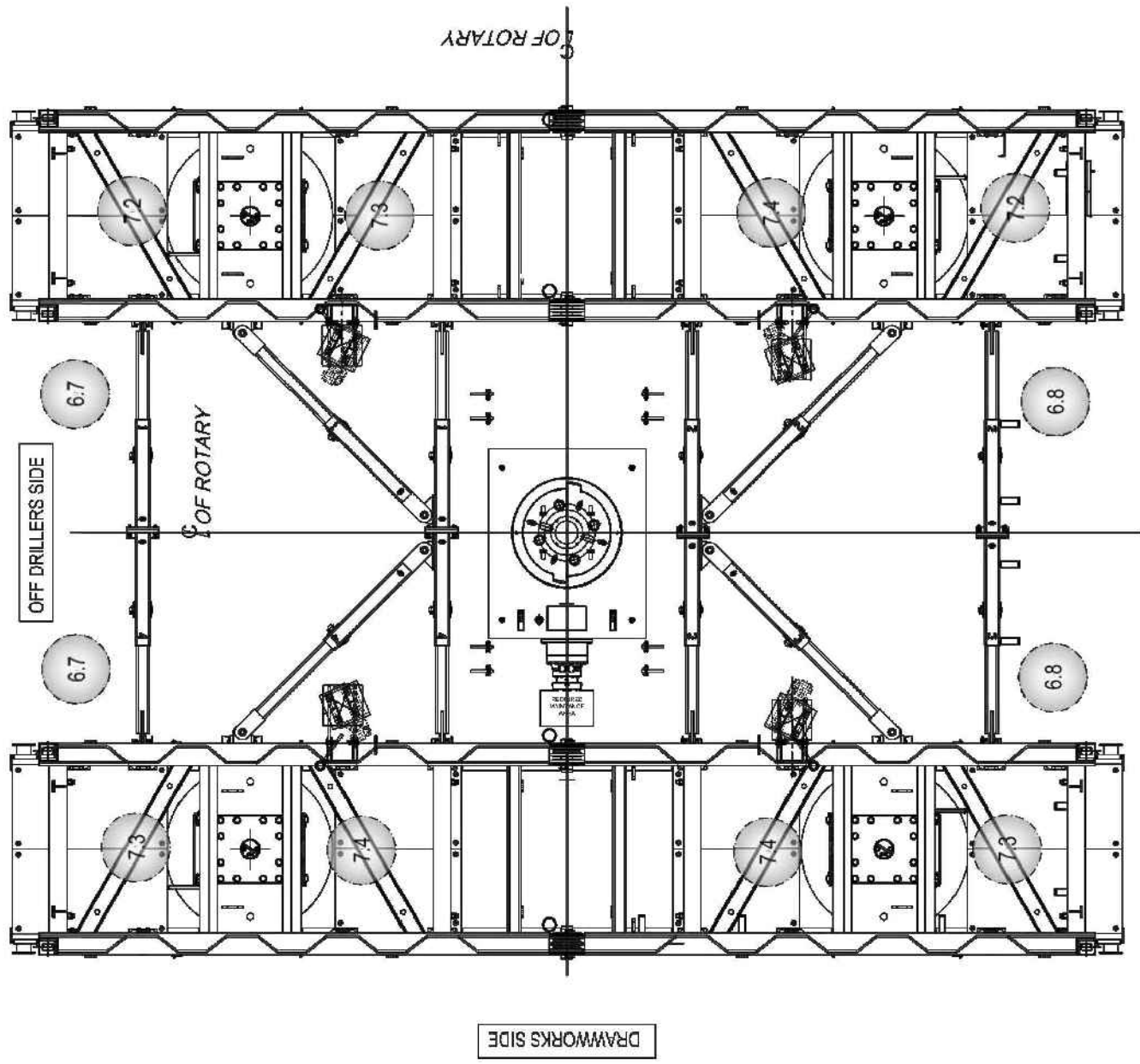








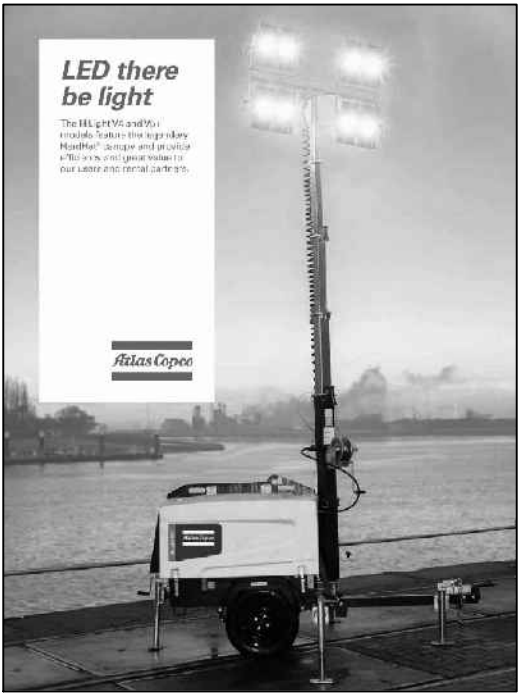
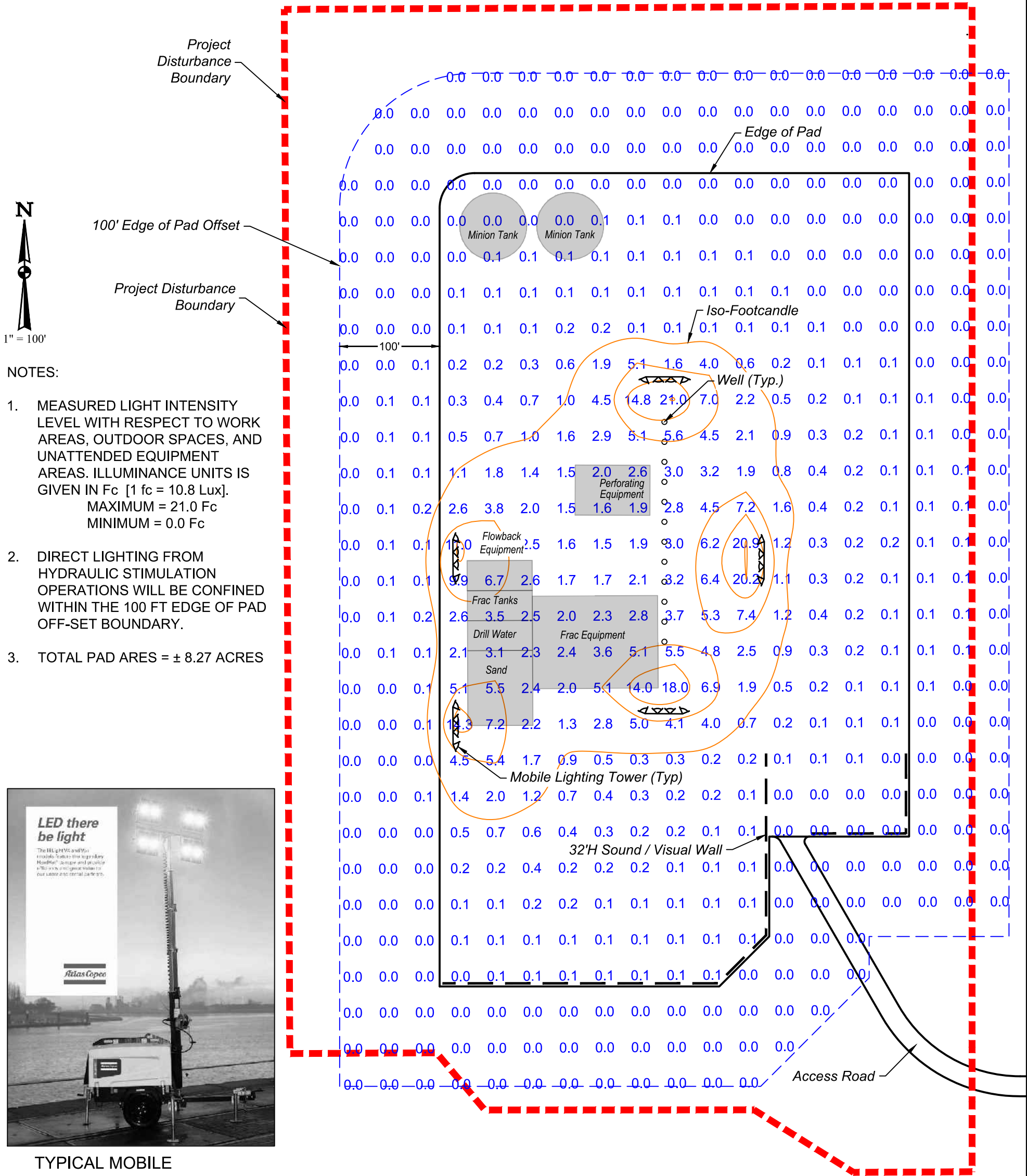
PLAN VIEW @ TOP  
SUBSTRUCTURE BOX



PLAN VIEW @ BOTTOM  
SUBSTRUCTURE BOX

4 DRILLING RIG LIGHTING PHOTOMETRIC PLAN  
SCALE: NO SCALE

## APPENDIX B – HYDRAULIC STIMULATION OPERATIONS LIGHTING PLAN



TYPICAL MOBILE  
TOWER LIGHTING

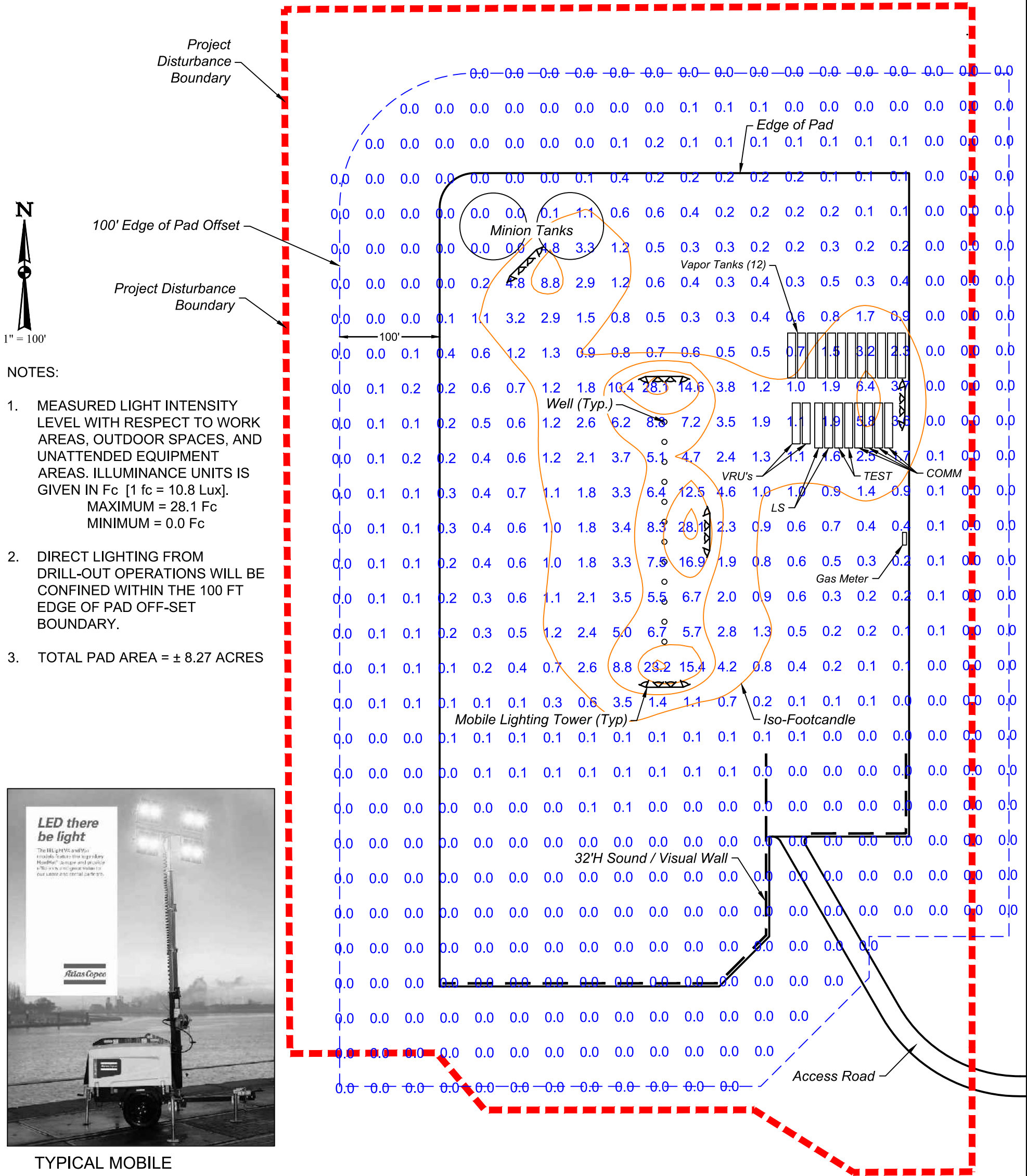
# 1 HYDRAULIC STIMULATION PAD SITE LIGHTING PHOTOMETRIC PLAN

SCALE: 1" = 100'

LIGHTING FIXTURE SCHEDULE									
SYMBOL	LIGHT UNIT DESCRIPTION	BUG RATING	MOUNTING INFO	VOLTS	LAMP QUANTITY	LUMENS / LAMP	UNITS QUANTITY	LUMENS / UNIT	TOTAL LUMENS
	4 HEAD FLOOD LIGHT LED MOBILE TEMPORARY LIGHTING TOWER	B3-U3-G5	25' TOWER	120	4	38,500	5	154,000	770,000

## APPENDIX C – DRILL-OUT OPERATIONS PHOTOMETRIC PLAN





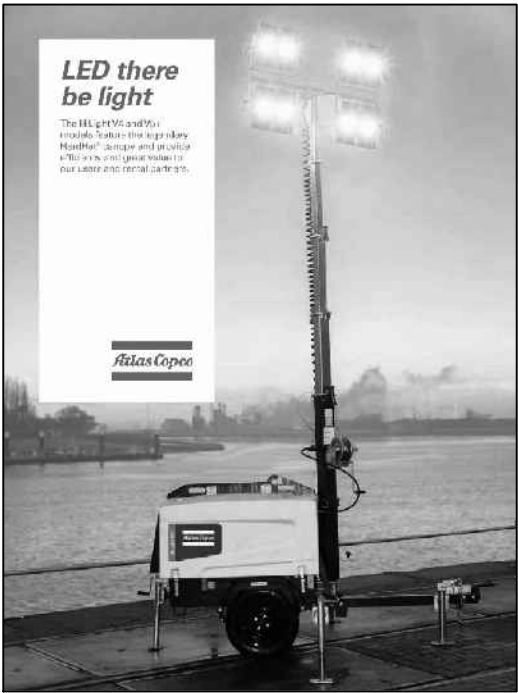
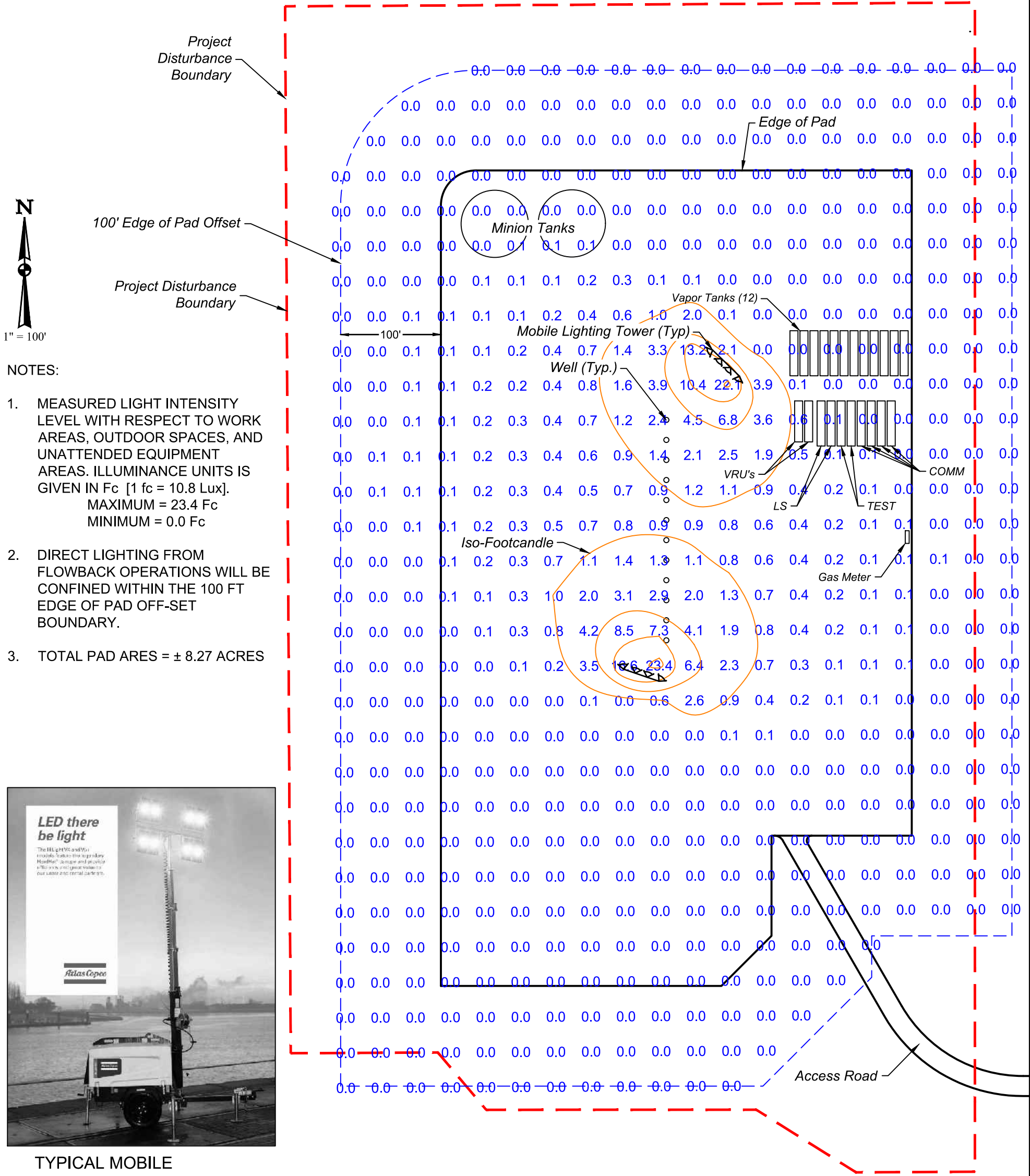
# 1 DRILL-OUT PAD SITE LIGHTING PHOTOMETRIC PLAN

SCALE: 1" = 100'

LIGHTING FIXTURE SCHEDULE									
SYMBOL	LIGHT UNIT DESCRIPTION	BUG RATING	MOUNTING INFO	VOLTS	LAMP QUANTITY	LUMENS / LAMP	UNITS QUANTITY	LUMENS / UNIT	TOTAL LUMENS
	4 HEAD FLOOD LIGHT LED MOBILE TEMPORARY LIGHTING TOWER	B3-U3-G5	25' TOWER	120	4	38,500	5	154,000	770,000

## APPENDIX D – FLOWBACK OPERATIONS PHOTOMETRIC PLAN





TYPICAL MOBILE  
TOWER LIGHTING

# 1 FLOWBACK PAD SITE LIGHTING PHOTOMETRIC PLAN

SCALE: 1" = 100'

LIGHTING FIXTURE SCHEDULE									
SYMBOL	LIGHT UNIT DESCRIPTION	BUG RATING	MOUNTING INFO	VOLTS	LAMP QUANTITY	LUMENS / LAMP	UNITS QUANTITY	LUMENS / UNIT	TOTAL LUMENS
	4 HEAD FLOOD LIGHT LED MOBILE TEMPORARY LIGHTING TOWER	B3-U3-G5	25' TOWER	120	4	38,500	2	154,000	308,000

## APPENDIX E – LIGHT SPECIFICATION SHEET



# HiLight V4 S

# HiLight V5+ S

The HiLight V4 S and V5+ S light towers are perfect for multiple applications. For the ultimate in fuel economy and reliability, the LED HiLight V5+ is our premium offering. Its LED lighting technology provides a wide range of benefits and represents outstanding lifetime value for our customers. The second model, the HiLight V4 is the leading solution within the 4000W metal halide light tower segment. Both models offer assured robustness and extended safety features.



LIGHT  
COVERAGE  
**43,055 ft<sup>2</sup>**  
AVG. 20LUXES

LIFE SPAN  
**6,000**  
Hrs



**0.56**  
g/h



Manual  
vertical mast



HardHat<sup>®</sup>  
technology



Spillage free  
frame


















LED  
**4 x 350 W**

LIGHT  
COVERAGE  
**53,819 ft<sup>2</sup>**  
AVG. 20LUXES

LIFE SPAN  
**50,000**  
Hrs



**0.185**  
g/h

									
									
		HiLight Z3+	HiLight B5+	HiLight V5+ S	Hilight V4 S	HiLight V4W	HiLight E3+	HiLight P2+	HiLight V2+   V3+
 Light coverage ft2		32,292 (average 10 luxes)	53,819 (average 20 luxes)	53,819 (average 20 luxes)	43,055 (average 20 luxes)	43,055 (average 20 luxes)	32,292 (average 10 luxes)	21,527 (average 10 luxes)	21,527 (average 10 luxes)
 Lamps		LED	LED	LED	Metal halide	Metal halide	LED	LED	LED
 Mast		Vertical Hydraulic Battery Powered Noise & CO2 free	Vertical Hydraulic	Vertical manual	Vertical manual	Vertical manual	Vertical manual	Vertical manual	Vertical manual
 Features			Compact box	HardHat® canopy	HardHat® canopy	HardHat® canopy	Electric	Electric	Electric
Performance data									
Rated frequency	Hz	60	60	60	60	60	60	60	60
Rated voltage	VAC	120	120	120	120	120-240	120	120	120
Rated power (PRP)	kW	-	2.7	2.7	6.8	8	-	-	-
Operating temperature (min/max)	°F (°C)	-4/ 122 (-20/ 50)	-4/ 104 (-20/ 40)	-13 / 122 (-25 / 50)	-13 / 122 (-25 / 50)	-13 / 122 (-25 / 50)	-	-	-
Sound power level (LwA)	dB(A)	-	82	86	94	89	-	-	-
Sound pressure level (LpA) at 7m	dB(A)	-	55	63	73	64	-	-	-
Engine									
Model		-	Kubota Z481	Kubota Z482	Kubota Z482	Kubta D1105	-	-	-
Speed	rpm	-	1800	1800	3600	1800	-	-	-
Rated net output (PRP)	kW	-	3	3	8.1	10	-	-	-
Coolant		-	Water	Water	Water	Water	-	-	-
Number of cylinders		-	1	2	2	3	-	-	-
Alternator									
Model		-	Meccalte LT3/74	Meccalte LT3/75	Sincro EK 2 MCT	DP06/AG164	-	-	-
Rated output	kVA	-	3.5	4.5	7.5	8	-	-	-
Insulation / Enclosure protection	class / IP	-	H / 20	H / 21	H / 23	H / 23	-	-	-
Fuel consumption									
Fuel tank capacity	gallon (l)	-	34.3 (230)	28 (105)	28 (105)	42 (160)	-	-	-
Autonomy	h	18-32	220	150	50	90	-	-	-
Power output									
Auxiliary Power	W	-	1,200	1,200	2,400	7,200	-	-	-
Outlets		-	120 VAC, 10A, GFCI Duplex (NEMA 5-20R)	120 VAC, 10A, GFCI Duplex (NEMA 5-20R)	120 VAC, 20A, GFCI Duplex (NEMA 5-20R)	121 VAC, 20A, GFCI Duplex (NEMA 5-20R) 240VAC, 30A, TL (NEMA L5-30R)	-	-	-
Lights									
Floodlights		LED	LED	LED	Metal halide	Metal halide	LED	LED	LED
Wattage	W	4x 160	4 x 350	4 x 350	4 x 1,000	4 x 1,000	4 x 160	320	320   4 x 120
Luminous Flux	Lumen	4 x 16,000	4 x 38,500	4 x 38,500	4 x 110,000	4 x 110,000	4 x 16,000	28,000	28,000   4 x 12,000
Mast									
Type		Hydraulic, vertical, 5 section	Hydraulic, vertical, 5 section	Manual vertical, 5 section	Manual vertical, 5 section	Manual vertical, 5 section	Manual	Manual	Manual
Rotation	degrees	340	340	360	360	360	0	0	0
Maximum height	ft (m)	26 (7.9)	26 (7.9)	25 (7.5)	25 (7.5)	25 (7.5)	23 (7)	11 (3.4)	17 (5)
Maximum speed wind	mph (kph)	50 (80)	50 (80)	51 (80)	51 (80)	59 (95)	52 (80)	32(50)	32 (50)
Enclosure and trailer									
Type		Box type Forklift pockets	Box type Forklift pockets	DOT US Compliant Unibody trailer with 4 point leveling system	DOT US Compliant Unibody trailer with 4 point leveling system	DOT US Compliant Unibody trailer with 4 point leveling system	-	-	Trailer with Bumpers in PE
Base Frame		-	Spillage free frame	Spillage free frame	Spillage free frame	Spillage free frame	-	-	-
Enclosure		Galvanneal Steel Canopy & Powder coating painting	Galvanneal Steel Canopy & Powder coating painting	Gull-wing Hard Hat Doors	Gull-wing Hard Hat Doors	Gull-wing Hard Hat Doors	Hard Hat Canopy	-	-
Dimensions and weigth									
Dimensions in transport Up-right Towbar (L x W x H)	in (m)	-	-	77 x 48 x 102 (1.95 x 1.22 x 2.59)	77 x 48 x 102 (1.95 x 1.22 x 2.59)	74 x 53 x 98 (1.88 x 1.34 x 2.49)	-	-	-
Dimensions in transport - Towed (L x W x H)	in (m)	46 x 46 x 97 (1.16x 1.16x 2.46)	46 x 46 x 97 (1.16x 1.16x 2.46)	110 x 48 x 102 (2.79 x 1.22 x 2.59)	110 x 48 x 102 (2.79 x 1.22 x 2.59)	110 x 53 x 98 (2.79 x 1.34 x 2.49)	48 x 32 x 84 (1.2 x 0.8 x 2.14)	19.7 x 19.7 x 87 (0.5 x 0.5 x 2.2)	45 x 335 x 79 (1.1 x 0.85 x 2)
Weight	lb (kg)	2160 (980)	2160 (980)	1,768 (802)	1,970 (894)	2,041 (926)	608 (276)	99 (45)	243 (110)



## IES ROAD REPORT

PHOTOMETRIC FILENAME : 350W 38500 LUMEN LED\_30D.IES

### DESCRIPTIVE INFORMATION (From Photometric File)

IESNA:LM-63-2002

[TEST]

[TESTLAB]

[TESTDATE]

[ISSUEDATE]

[OTHER]

[MANUFAC]

[LUMCAT] fl-350-85x135

[LUMINAIRE] fl-350-85x135

[LAMPCAT] LED

[LAMP] LED

[\_CONVERT] Luminaire test position and photometric web converted from original test data

### CHARACTERISTICS

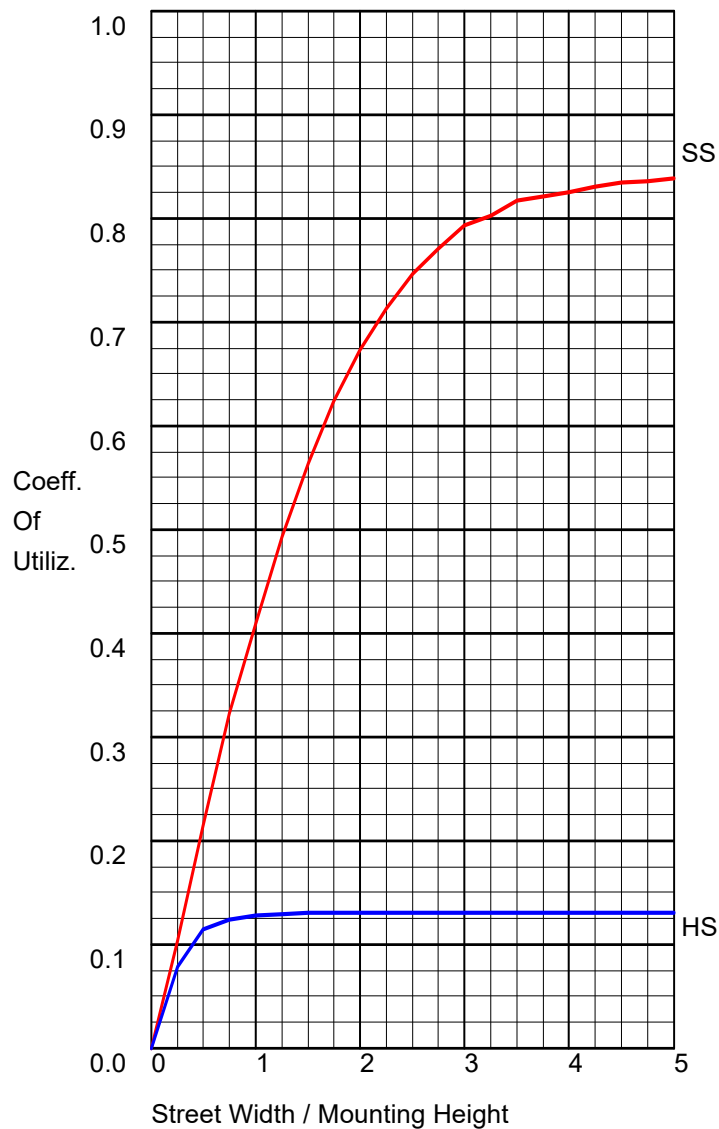
IES Classification	Type IV
Longitudinal Classification	Medium
Lumens Per Lamp	37338 (1 lamp)
Total Lamp Lumens	37338
Luminaire Lumens	37345
Downward Total Efficiency	99 %
Total Luminaire Efficiency	100 %
Luminaire Efficacy Rating (LER)	97
Total Luminaire Watts	386
Ballast Factor	1.00
Upward Waste Light Ratio	0.01
Maximum Candela	26112.25
Maximum Candela Angle	67.5H 70V
Maximum Candela (<90 Degrees Vertical)	26112.25
Maximum Candela Angle (<90 Degrees Vertical)	67.5H 70V
Maximum Candela At 90 Degrees Vertical	1300.775 (3.5% Lamp Lumens)
Maximum Candela from 80 to <90 Degrees Vertical	12466.58 (33.4% Lamp Lumens)
Cutoff Classification (deprecated)	Non-Cutoff

**IES ROAD REPORT**  
**PHOTOMETRIC FILENAME : 350W 38500 LUMEN LED\_30D.IES**

**LUMINAIRE CLASSIFICATION SYSTEM (LCS)**

	Lumens	% Lamp	% Luminaire
FL - Front-Low (0-30)	2894.2	7.8	7.8
FM - Front-Medium (30-60)	13146.5	35.2	35.2
FH - Front-High (60-80)	15017.0	40.2	40.2
FVH - Front-Very High (80-90)	866.9	2.3	2.3
BL - Back-Low (0-30)	1604.2	4.3	4.3
BM - Back-Medium (30-60)	2657.2	7.1	7.1
BH - Back-High (60-80)	606.9	1.6	1.6
BVH - Back-Very High (80-90)	18.3	0.0	0.0
UL - Uplight-Low (90-100)	353.2	0.9	0.9
UH - Uplight-High (100-180)	180.1	0.5	0.5
Total	37344.5	99.9	100.0
BUG Rating	B3-U3-G5		

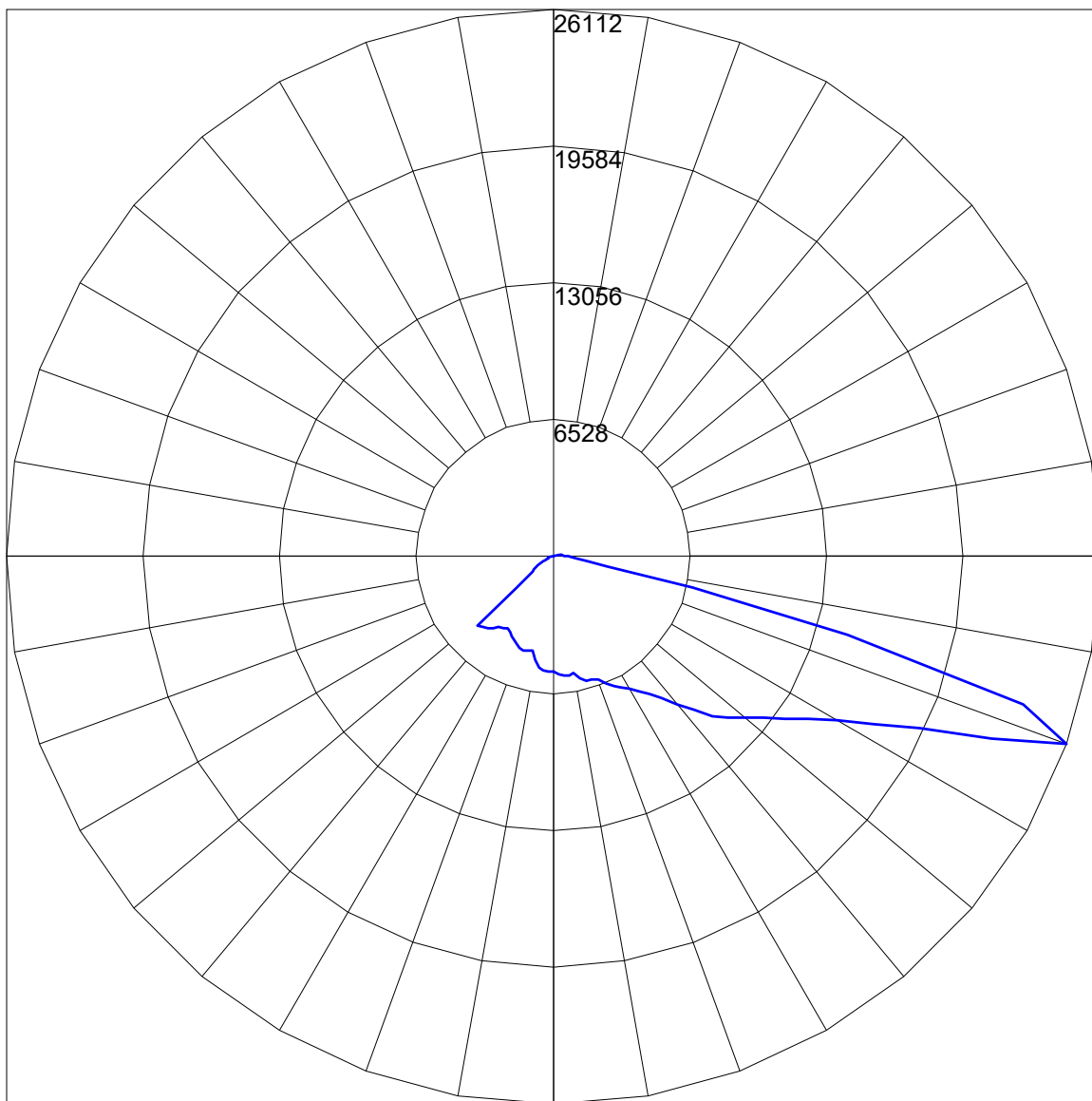
COEFFICIENTS OF UTILIZATION



FLUX DISTRIBUTION

	Lumens	Percent Of Lamp
Downward Street Side	31924.7	85.5
Downward House Side	4886.6	13.1
Downward Total	36811.3	98.6
Upward Street Side	533.0	1.4
Upward House Side	0.3	0.0
Upward Total	533.3	1.4
Total Flux	37344.6	100.0

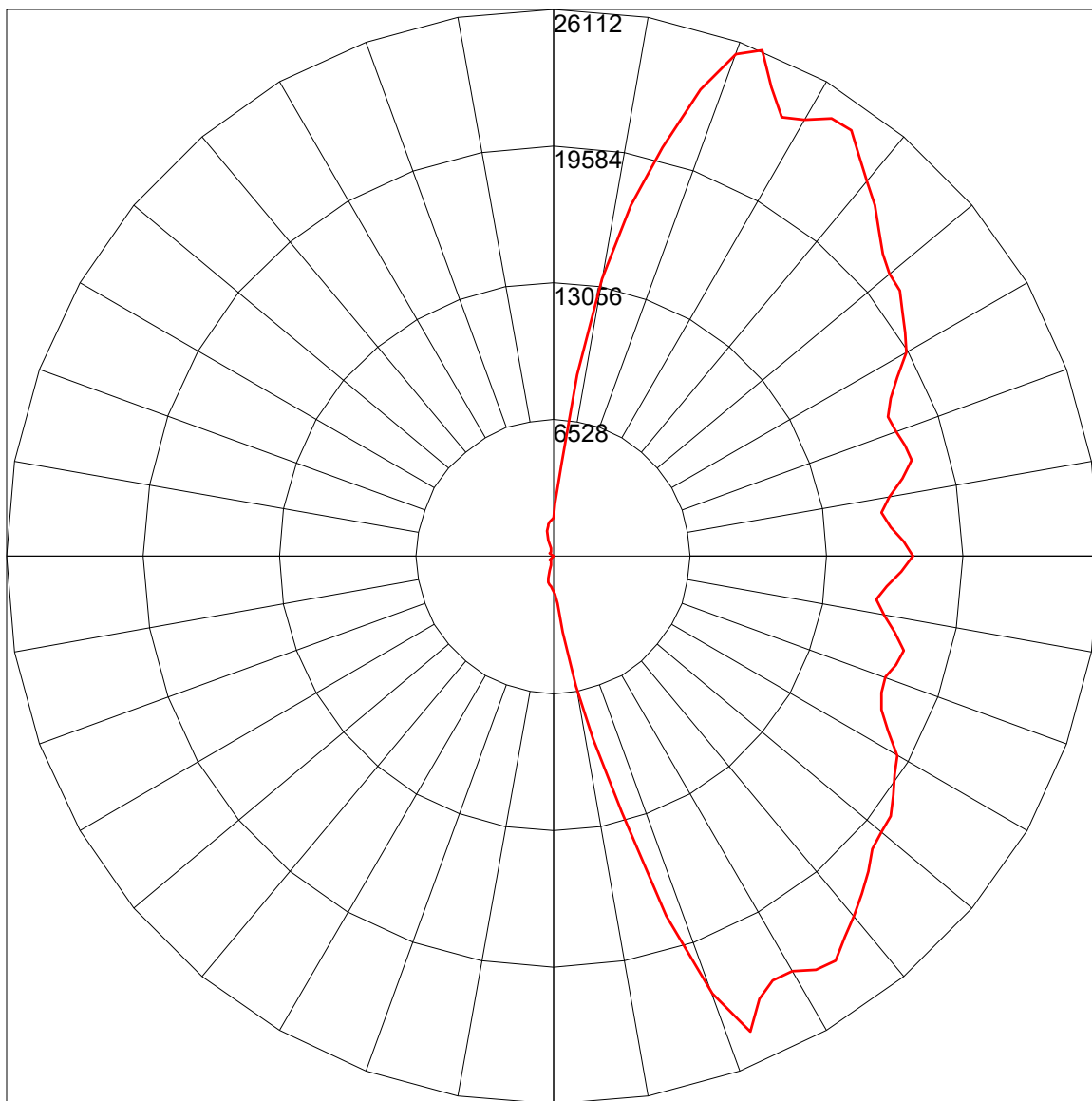
POLAR GRAPH



Maximum Candela = 26112.25 Located At Horizontal Angle = 67.5, Vertical Angle = 70  
Vertical Plane Through Horizontal Angles (67.5 - 247.5) (Through Max. Cd.)

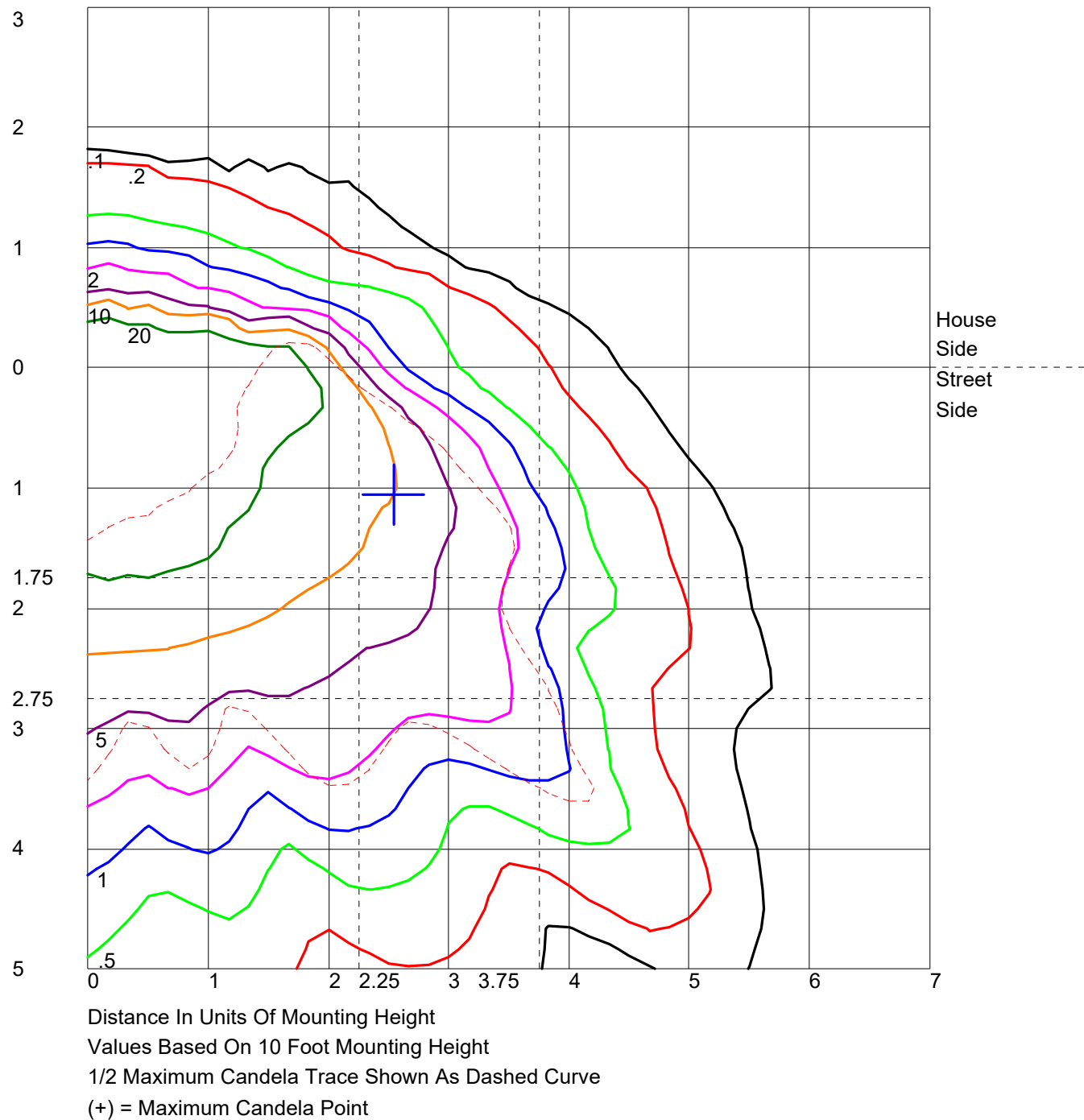


POLAR GRAPH

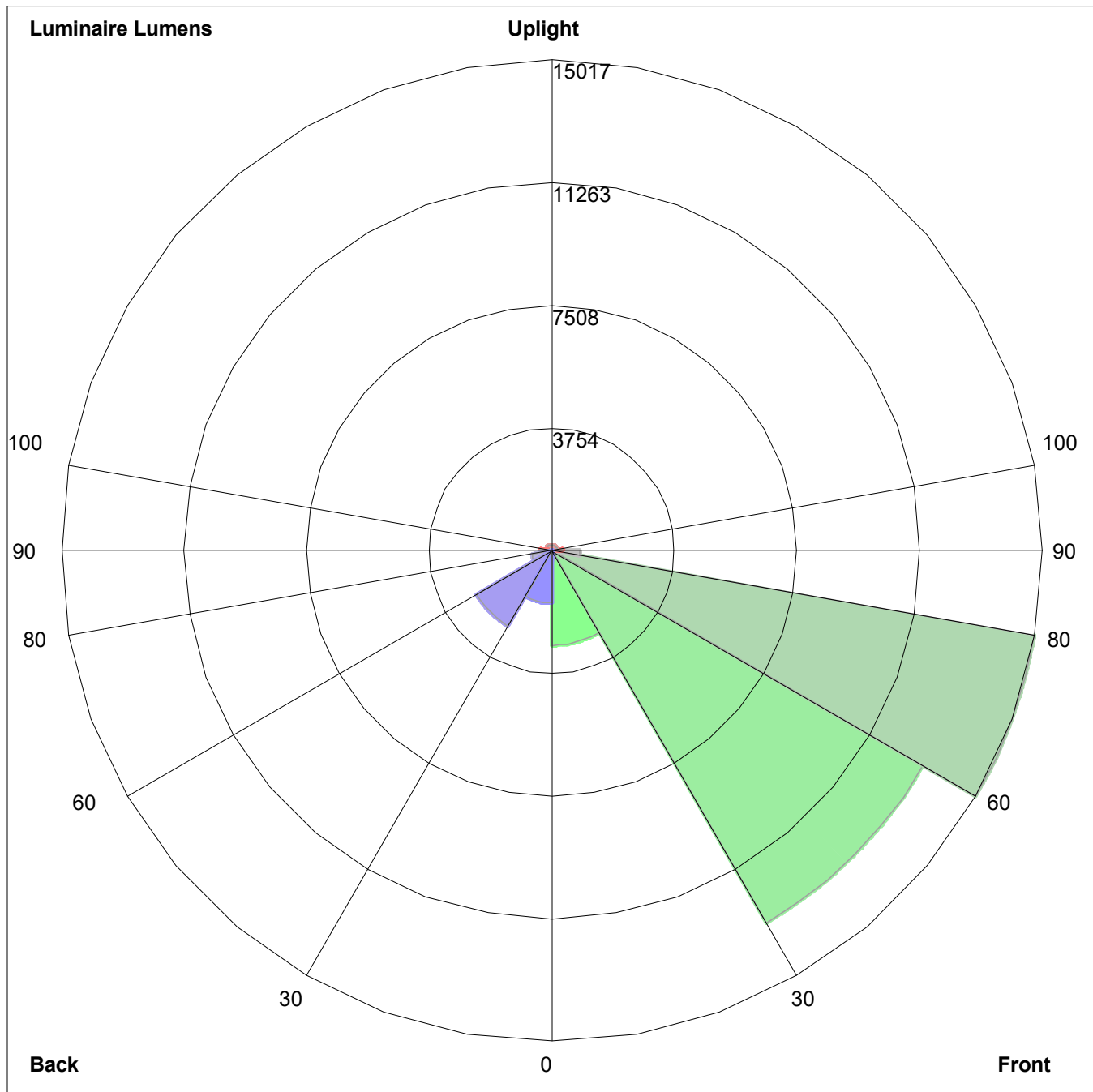


Maximum Candela = 26112.25 Located At Horizontal Angle = 67.5, Vertical Angle = 70  
Horizontal Cone Through Vertical Angle (70) (Through Max. Cd.)

## ISOFOOTCANDLE LINES OF HORIZONTAL ILLUMINANCE



LUMINAIRE CLASSIFICATION SYSTEM (LCS) GRAPH



Luminaire Lumens:  
Front: Low=2894.2, Medium=13146.5, High= 15017.0, Very High=866.9  
Back: Low=1604.2, Medium=2657.2, High=606.9, Very High=18.3  
Uplight: Low=353.2, High=180.1

BUG Rating : B3-U3-G5