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ARCHITECTURE
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Resolution Copper Mining

Outdoor Lighting & Pinal County Outdoor Lighting Code

Technical Memo

Prepared for

RESOLUTION COPPER

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RESOLUTION COPPER OUTDOOR LIGHTING & PINAL COUNTY OUTDOOR LIGHTING CODE
TECHNICAL MEMO

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1 BACKGROUND

The 2016 Pinal County Development Services Code is the code in effect regulating the amount of light permitted outdoors within Pinal County. The 2016 Town of Superior, Article XV Outdoor Lighting Provisions, governs outdoor lighting requirements within Superior area specifies that either this code or a more restrictive code in place at the time shall be adhered to. The Pinal County Code has been determined more restrictive and will be used as the regulating document.

Based on lighting source, fixture type, mounting type, and illumination level, the Pinal County Code identifies three lighting zones for commercial and industrial installations. The Resolution Copper Mine is governed by the most restrictive of these zones, namely Lighting Zone 3. The maximum lumen density (LD) or amount of light within 'Lighting Zone 3' area is 19 lumens per square foot from all light sources. It is worth noting that in Lighting Zone 3 new mercury vapor light sources shall not be allowed. Also the Town of Superior Outdoor Lighting Provisions address lighting sources consistent with Pinal County Code Lighting Area 3 in prohibiting mercury vapor, but also prohibit the use of quartz halogen sources.

Although the mine is exempt from the Pinal County Outdoor Lighting Code, Resolution Copper Mining plans to operate within the intent of the Pinal County Outdoor Lighting Code as long as mine safety and operations are not compromised and there are no conflicts with Mine Safety and Health Administration (MSHA) regulations or site specific standards. As such, the mine outdoor lighting design was prepared in accordance with Lighting Zone 3 and the results are discussed below.

2 2016 PINAL COUNTY DEVELOPMENT SERVICES CODE

The 2016 Pinal County Development Services Code, ("the Code"), `Definition,' "General Illumination" is outdoor lighting used for, but not limited to, illumination for walkways, roadways, equipment yards, parking lots, and outdoor security where safety of the grounds is the primary concern. Of particular importance in development of a lighting plan per the Pinal County Code is the following:

a. The "Lumen Density (LD)" is defined as initial lumens of the lamps/light sources utilized by the exterior lighting per square foot of area (lumens/ft^2) for the project site.

b. The calculated "observation point" shall be oriented perpendicular into the project site, and angled at 90 degrees above nadir (perfectly horizontal). The light loss factor (LLF) utilized for the calculations shall be 1.00.

Both of these elements of the code were used to develop the plan.

3 DESIGN APPROACH AND RESULTS

The entire mine site is regulated by the Mine Safety and Health Act (MSHA). Similar to the Occupational Safety and Health Act, MSHA establishes requirements for providing mine workers with a safe and healthy working environment. As such it includes requirements for lighting within the mine property to offer a well lit and safe working area. Incorporation of MSHA regulations into the plan are described later in this memo.

The Pinal County Code for Lighting Zone 3 also allows the use of Low Pressure Sodium (LPS) type outdoor lighting. Although this type of lamp is a very efficient light source, it has not been recommended for use in the Resolution Copper lighting plan.

LPS lamps comprise a very harsh and narrow color range light source of 1600K – 1700K color temperature. As a result, LPS light masks all colors, and in particular all red colors. All colors appear gray under LPS lighting. This is a major safety concern in the event of an incident where personnel are injured, are bleeding, and the first responders cannot differentiate or see the color of any bodily liquids, particularly blood. To address that issue, sources with a lower Kelvin color value light source similar to high pressure sodium (HPS) lamps have been incorporated into the plan.

Light Emitting Diode ("LED") lamps were considered for the entire mine site. The color temperature spectrum emitted by LED's at (2000K - 2700K) is within the acceptable range defined in the 'Lighting Zone 3' area as defined by the Pinal County Outdoor Lighting Code. The LED`s lamp source would be comparable to HPS (1900K - 2300K) color temperature in degrees Kelvin.

The design and lighting installations outlined here are based on the current mine plan of operations and represent a preliminary assessment of the lighting requirements to meet site safety and security design requirements. The specific lighting fixtures described in the design and used in modeling incorporate the general type of light, color temperature, and shielding which are proposed to be employed; however, the specific model used may be different upon final implementation.

3.1 ROADWAY AND PARKING LOTS

The use of outdoor lighting is primarily for safety at a mine site. On roadways and in parking lots, lighting provides better visibility allowing earlier driving decisions by enabling the operators to understand the driving challenge facing them at the immediate moment. This lighting also allows pedestrians to better avoid hazards on the ground in their path of travel while they are close to roads. As a result, the roadway lighting on mine access and circulation roads was designed for an average illumination of 0.5 foot candle (fc).

All roadway and designated parking lot lighting was designed using LED fixtures and a maximum of 6:1 ratio between the average illumination and the minimum illumination on the surface of the road or parking lot. Visual Lighting Roadway Tool outdoor lighting software (example provided as attachments) was utilized to establish parameters of lamp lumens, mounting height of the light fixture above the road, position of the light fixture with respect to the road edge ("Set-back") and distance between lights ("Light Span"). To achieve 0.5 fc, light fixtures were found to require a mounting span of 123 feet on alternating sides of the road for mine / heavy mobile equipment. For roads designated for light duty truck traffic, spans of

approximately 225 feet were calculated to be appropriate with lights on one side of the roadway. Fixture spacing in parking lots varied based on the geometry of each individual lot.

3.2 PROCESS AND MINE SHAFT AREAS

The primary purpose of area lighting, especially around process buildings and mine shaft headframe structures, is for safety. These areas tend to have pedestrian traffic intermingled with mobile equipment and other operational activities and as such visibility within these areas is critical for worker safety.

The total acreage of the Resolution Copper Mine Sites requiring coverage with night time lighting is approximately 280 acres. Lighting distribution within these area is detailed on table 1 and table 2 (Option).

It is worth noting that lighting assessments for the primary access to the operational site areas lighting is included in each respective site operational area lumens.

Drawings 20100-EL-001, 40340-EL-001, 40340-EL-003, 40240-EL-004, 40390-EL-001, 40390-EL-002 and 70110-EL-001 are provided in Appendix A as a guide to the Mine Areas discussed.

Drawings 40340-EL-003.1 West Plant Site, 40390-EL-002.1 Silver King Site, 40390-EL-002.2 Peg Leg Site and 40340-EL-002.3 Skunk Camp Site are provided in appendix A as Optional Facilities Site Areas.

Site	Area	Square Footage:	Total lumens allowed @ 19 lumens/Sq. Ft.	Current Total Lumens proposed:	Latitude	Longitude	Elevation
CAP Canal Pump Station	Pump Station	3,767	71,580	17,985	33°9'27.10"N	111°27'56.04"W	1574.80'
Queen Valley Booster Station	Pump Station	45,900	872,101	88,425	33°16'38.38"N	111°16'32.77"W	2099.74'
CAP Distribution	Pumps/Water Tanks	216,374	4,111,106	244,251	33°11'33.77"N	111°24'34.55"W	1679.79'
Concentrate Loadout Facilities	Pumps/Water Tanks	709,900	13,488,100	1,081,674	33°11'33.77"N	111°24'34.55"W	1679.79'
Concentrate Loadout Facilities	Filter Plant/Loadout Building	-	-	-	33°12'8.89"N	111°24'52.06"W	1687.0'
West Plant Facilities:	Flotation/Grinding/Thickener Tanks	6,310,423	119,898,037	11,083,339	33°18'38.43"N	111°6'21.34"W	3100.39'
West Plant Facilities:	SRP Substation	-	-	-	33°18'35.57"N	111°6'40.90"W	3038.06'
West Plant Facilities:	Admin./Vehicle Maint.	-	-	-	33°18'5.15"N	111°6'29.61"W	3046.26'
West Plant Facilities:	Guard house/Truck Staging	-	-	-	33°17'46.82"N	111°6'32.82"W	2841.21'
West Plant Facilities:	Ancilitary Facilities Parking	-	-	-	33°17'31.28"N	111°6'28.54"W	2775.60'
Near West Tailing Facilities	Maintenance/Adminstration	673,260	12,791,940	291,106	33°19'.24.00"N	111°9'30.53"W	2680.45'
East Plant Facilities:	Shaft Area	4,422,156	84,020,964	4,145,795	33°18'17.55"N	111°4'6.35"W	4173.23'
Site Roadways (Lumens Included In Site Current Total Lumens Proposed)							
Concentrate Loadout Facilities	Skyline Access Road	111,944	2,126,936	162,288	-	-	-
West Plant Facilities:	Lone Tree	735,417	13,972,923	1,825,740	-	-	-
West Plant Facilities:	Silver King Mine Road	16,945	321,955	273,861	-	-	-
West Plant Facilities:	Water Services Access Road	60,278	1,145,282	111,573	-	-	-
West Plant Facilities:	Concentrator Access Road	227,412	4,320,828	1,896,741	-	-	-
Near West Tailing Facilities	Tailings Acess Road	71,041	1,349,779	202,858	-	-	-
East Plant Facilities:	Access Road	185,277	3,520,263	486,546	-	-	-

Table 1
Area Lighting Specifics

Site	Area	Square Footage:	Total lumens allowed @ 19 lumens/Sq. Ft.	Current Total Lumens proposed:	Latitude	Longitude	Elevation
West Plant Facilities - Option:	Concentrate Loadout Facilities Filter Plant/Loadout Building	250,185	4,753,515	1,322,086	33°17'28.74"N	111°7'6.2"W	2735.0'
Silver King Facilities - Option:	Maintenance/Adminstration	277,676	5,275,844	270,820	33°21'.24.10"N	111°6'52.27"W	4006.00
Peg Leg Facilities - Option:	Maintenance/Adminstration	277,676	5,275,844	270,820	33°02'.37.49"N	111°2'24.76"W	3134.00'
Skunk Camp Facilities - Option:	Maintenance/Adminstration	277,676	5,275,844	270,820	33°13'.20.10"N	110°54'47.39"W	3803.00'
Site Roadways (Lumens Included In Site Current Total Lumens Proposed)							
West Plant Facilities - Option:	Concentrate Loadout Facilities Alternate Access Road "A"	46,952	892,088	182,574	-	-	-
West Plant Facilities - Option:	Concentrate Loadout Facilities Raw Water / Concentrate Alignment	53,530	1,017,070	192,717	-	-	-
West Plant Facilities - Option:	Concentrate Loadout Facilities Truck Route "A"	17,270	328,130	243,432	-	-	-
West Plant Facilities - Option:	Concentrate Loadout Facilities Truck Route "B"	13,920	264,480	81,144	-	-	-

Table 2 - Option
Area Lighting Specifics

4 CONCLUSIONS

The total lumens as presented in this memo are based on the current mine plan of operations and the lighting plan has been designed to be in compliance with the Pinal County Outdoor Lighting Code.

Of importance, the amount of lumens proposed per the plan for each operational area is far below the Pinal County Code for Lighting Zone 3.

5 APPENDIX A

2016 Town of Superior, Article XV - Outdoor Lighting Provisions - Pages 15-1, 15-2, 15-3, & 15-4 of 15-5

2016 Pinal County Development Services Codes

1. Chapter 2.15.040 - Zoning Districts, Maps & Boundaries - Pages 2 & 3 of 4
2. Chapter 2.195 - Outdoor Lighting - Pages 6, 7, 8, 9 & 10 of 13

Visual Lighting Roadway Tool, SK 1 & SK 2

Drawing 20100-EL-001 - East Plant Facilities Site, Electrical, Lighting, Designation

Drawing 40340-EL-001 - West Marrco Line, Electrical, CAP Canal & Queen Valley Pump Stations, Lighting, Designation

Drawing 40340-EL-003 - West Marrco Line, Electrical, Concentrate Loadout Lighting Sheet 1, Designation

Drawing 40340-EL-003.1 - West Plant Site, Electrical, Concentrate Loadout Lighting Sheet 1, Designation (Option)

Drawing 40340-EL-004 - West Marrco Line, Electrical, CAP Distribution Lighting Sheet 1, Designation

Drawing 40390-EL-001 - West Plant Site, Electrical, Lighting Sheet 1, Designation

Drawing 40390-EL-002 - West Plant Site, Electrical, Near West Tailings Lighting, Designation

Drawing 40390-EL-002.1 - Silver King Site, Electical, Silver King Site Lighting, Designation (Option)

Drawing 40390-EL-002.2 - Peg Leg Site, Electical, Peg Leg Site Lighting, Designation (Option)

Drawing 40390-EL-002.3 - Skunk Camp Site, Electical, Skunk Camp Site Lighting, Designation (Option)

Drawing 70110-EL-001 - West Plant Site, Electrical, Lighting Sheet 1, Designation

ARTICLE XV – OUTDOOR LIGHTING PROVISIONS

§15.0 PURPOSE

The purpose of this Article is to control artificial illuminating devices emitting rays into the night sky which have a detrimental effect on the rural atmosphere, astronomical observations, or which would otherwise be offensive to neighboring and nearby properties.

§15.1 CONFORMANCE WITH APPLICABLE CODES

A. All outdoor artificial illuminating devices shall be installed and utilized in conformance with the provisions of this Section, and all other ordinances or building codes of the Town of Superior.

B. Where any provisions of the Arizona State Statutes, or any federal law, or any companion ordinance conflicts with the requirements of these outdoor lighting provisions the most restrictive shall govern.

C. The provisions of this Article are not intended to prevent the use of any material or method of installation not specifically prescribed by this Article, provided any such alternate has been approved in writing by the Town of Superior Zoning Administrator. The Zoning Administrator shall consider any state of the art technology which is consistent with the intent of the Ordinance as new lighting technology develops which is useful in reducing light above the horizontal plane.

§15.2 DEFINITIONS

For the purpose of this Article the following terms shall have the following definitions:

A. **Filtered:** Outdoor light fixtures whose transmission is less than five (5) percent total emergent flux at wavelengths less than thirty-nine hundred (3900) angstroms. Total emergent flux is defined as that between three-thousand (3000) and seven-thousand (7000) angstrom units.

B. **Fossil Fuel Light:** Light produced directly or indirectly by the combustion of natural gas or other utility-type fossil fuels.

C. **Fully Shielded:** Fixtures shall be shielded so that light rays emitted by the fixture, either directly from the lamp or indirectly from the fixture, are projected below a horizontal plane running through the lowest point on the fixture where light is emitted.

D. **Individual:** Any private individual, tenant, lessee, owner, or any commercial entity including, but not limited to, companies, partnerships, joint ventures or corporations.

E. **Installed:** The initial installation of outdoor light fixtures, defined herein, on or after the effective date of this Article.

F. **Luminary:** A body that gives light.

G. **Outdoor Light Fixtures:** Outdoor artificial illuminating devices, outdoor fixtures, lamps

and other devices permanent or portable, used for illumination or advertisement purposes. Such devices shall include, but are not limited to search, spot, or floodlights for:

1. Buildings and structures.

2. Recreational areas.

3. Parking lot lighting.

4. Landscape lighting.

5. Billboards and other signage (advertising or others).

6. Street lighting.

7. Building overhangs and open canopies.

8. Product display area lighting.

H. **Partially Shielded:** Means the fixture shall be shielded so that the bottom edge of the shield is below the plane centerline of the light source (lamp), minimizing the emission of light above the horizontal plane.

§15.3 GENERAL REQUIREMENTS

A. **Shielding:** All outdoor light fixtures, except those exempt from this Article, shall be fully or partially shielded as required in the following Table 9 of this Section. Light sources that must be shielded shall be shielded in a manner that the bulb or light source from the fixture is not visible from an adjoining property or from the street view.

B. **Filtration:** All outdoor light fixtures, except those exempt from this Article, shall be filtered as required in the following Table 9 of this Section.

C. **Building and Structures:** Overhead lighting used to light building overhangs and open canopies shall be fully recessed within the overhang or canopy. The architectural use of light bars shall be minimized and the light directed downward. Within a fifteen (15) foot radius of the entry door there shall be lighting. Security lighting mounted on the building shall be shielded in accordance with Table 9 and shall not exceed a height of fifteen (15) feet.

TABLE 9 - REQUIREMENTS FOR SHIELDING AND FILTERING

FIXTURE LAMP TYPE	SHIELDING	FILTERING [1]
Low Pressure Sodium [2]	Fully	None
High Pressure Sodium	Fully	None
Metal Halide	Fully	Yes
Fluorescent	Fully [3]	Yes[4]
Incandescent greater than 75W	Fully	None
Incandescent less than 75W	Partially	None
Fossil Fuel	None	None
Glass Tubes filled with Neon, Argon, Krypton	None	None
Other Lamp Types	As approved by the Zoning Administrator	

FOOTNOTES:

1. Glass, acrylic, or translucent enclosures satisfy these filter requirements except that quartz glass does not meet this requirement.

2. This is the preferred lamp type to minimize undesirable light into the night sky affecting astronomical observations.

3. Outdoor advertising signs of the type constructed of translucent materials and wholly illuminated by fluorescent light from within do not require shielding. For such signs, total lamp wattage per sign shall be less than seventy-five (75) watts except for signs using dark backgrounds with light lettering or symbols.

4. Warm White and Natural Lamps are preferred to minimize detrimental effects.

5. For the purpose of this Article, quartz lamps shall not be considered an incandescent light source.

D. **Parking Lot Lighting:** The use of fixtures with excessive candle power shall be avoided.

1. The minimum lighting intensity in parking areas should be 1.0 foot-candle with the level of illumination as measured at the property line not to exceed 0.25 foot-candle.

2. The maximum height of parking lot lighting standards (poles) shall be fifteen (15) feet. Lighting standards located near buildings and adjacent to sidewalks shall not exceed twelve (12) feet in height. This provision does not apply to lighting on buildings or to lighting along Hwy U.S. 60.

3. High activity areas such as near building entrances and pedestrian corridors may provide greater lighting intensity as may be approved by the Town.

E. **Outdoor Advertising Signs:** All exterior lighting fixtures used to illuminate an outdoor advertising sign or billboard shall be mounted on the top of the sign structure and directed downward.

F. All outdoor or exterior lighting shall be directed down. No intermittent, flickering or flashing lights shall be permitted.

G. Low pressure sodium lamps are the preferred light source for minimizing adverse effects on astronomical observations.

§15.4 PROHIBITIONS

A. **Searchlights:** The operation of searchlights for advertising purposes is prohibited.

B. **Recreational Facilities:** No outdoor recreational facility, public or private, shall be illuminated by non-conforming means after 11:00 P.M. except to conclude a specific recreational, sporting or other activity that began prior to 10:00 P.M.

C. **Exterior Lighting:** All lighting for off-street parking or loading areas, external illumination of the building or signs, or any product display lighting shall be directed away from and shielded from any residential property and shall not detract from driver visibility on adjacent streets.

D. **Mercury Vapor and Quartz-Halogen:** The installation of mercury vapor or quartz halogen fixtures is prohibited. Existing mercury vapor and quartz halogen fixtures shall either be replaced or equipped with a filter and fully shielded.

E. **Signage:** Bottom mounted outdoor light sources for any advertising sign lighting.

§15.5 EXEMPTIONS

A. **Nonconforming Fixtures**: All outdoor light fixtures existing and fully installed prior to the effective date of this Ordinance may remain "nonconforming" indefinitely, provided however, that no change in use, replacement, structural alteration, or restoration (after abandonment of outdoor light fixtures) shall be made unless it thereafter conforms to the provisions of this Article.

B. **Fossil Fuel Light:** Lighting produced by the combustion of natural gas or other utility-type fossil fuels is exempt. (This does not exempt lighting produced indirectly from combustion of natural gas or other utility-type fossil fuels, such as through the use of electricity to produce lighting.)

MH	Manufactured Home Zoning District
RV	Recreational Vehicle Homesite Zoning District
MHP	Manufactured Home Park Zoning District
PM/RVP	Park Model/Recreational Vehicle Park Zoning District
TR	Transitional Zoning District
Business zoning districts:	
CB-1	Local Business Zoning District
CB-2	General Business Zoning District
Industrial zoning districts:	
CI-B	Industrial Buffer Zoning District
CI-I	Light Industry and Warehouse Zoning District
CI-2	Industrial Zoning District
Overlay zoning districts:	
PAD	Planned Area Development Overlay Zoning District, pursuant to the regulations set forth in Chapter 2.175 PCDSC.
DR	Design Review

[Ord. 011812-ZO-PZ-C-007-10 § 6; Ord. 61862 § 501. Formerly 2.15.010].

2.15.040 Zoning districts on and after February 18, 2012.

For the purpose of this title, the following classifications of zoning districts are hereby established for use on and after February 18, 2012. Any rezoning application or PAD overlay district application filed on or after February 18, 2012, must be to one of the following established zoning district classifications, except as described in PCDSC 2.175.090(D):

Rural zoning districts:	
RU-10	Rural Zoning District
RU-5	Rural Zoning District
RU-3.3	Rural Zoning District
RU-2	Rural Zoning District
RU-1.25	Rural Zoning District
RU-C	Rural Commercial Zoning District
Residential zoning districts:	
R-43	Single Residence Zoning District
R-35	Single Residence Zoning District
R-20	Single Residence Zoning District

R-12	Single Residence Zoning District
R-9	Single Residence Zoning District
R-7	Single Residence Zoning District
MD	Mixed Dwelling Zoning District
MR	Multiple Residence Zoning District
Activity center zoning districts:	
AC-1	Activity Center Zoning District
AC-2	Activity Center Zoning District
AC-3	Activity Center Zoning District
Office zoning districts:	
O-1	Minor Office Zoning District
O-2	General Office Zoning District
Commercial zoning districts:	
C-1	Neighborhood Commercial Zoning District
C-2	Community Commercial Zoning District
C-3	General Commercial Zoning District
Industrial zoning districts:	
I-1	Industrial Buffer Zoning District
I-2	Light Industrial and Warehouse Zoning District
I-3	Industrial Zoning District
Other zoning districts:	
MH-8	Manufactured Home Zoning District
MH-435	Manufactured Home Park Zoning District
PM/RV-435	Park Model/Recreational Vehicle Park Zoning District
Overlay zoning districts:	
PAD	Planned Area Development Overlay Zoning District, pursuant to the regulations set forth in Chapter 2.176 PCDSC.
DR	Design Review

[Ord. 011812-ZO-PZ-C-007-10 § 6].

2.15.050 Official zoning map.

The boundaries of zoning districts shall be as shown on a geographic coverage layer entitled "zoning" that is maintained as part of the county's geographic information system (GIS) under the certification of the planning

Note: In the event that a new lighting zone 3 site, or an existing lighting zone 3 site that is undergoing a renovation (as per PCDSC 2.195.010(B)), is to be located within 150 feet of an existing lighting zone 1 site, then the lighting zone 3 site shall be considered a lighting zone 2 site for the purpose of conformance to this chapter.

B. Operating Hours. Every project in all lighting zones shall be encouraged to reduce as much as possible the amount of outdoor lighting that operates after 10:00 p.m., except as permitted in PCDSC 2.195.040. All nonsecurity lighting (except for the illumination of roadways and state and federal flags) shall be turned off by 10:00 p.m. or within one hour after close-of-business, whichever is later. A nighttime reduction of at least 50 percent in overall LD or LPD is required. All non-full cutoff luminaires in lighting zones 1 and 2 shall be included in the fixtures being turned off.

Non-full-cutoff and nonfully shielded incandescent luminaires of greater than 150 watts, and all other luminaire types of greater than 70 watts, that were installed prior to the adoption of the chapter are considered to be nonconforming, and shall possess an automatic control device that turns the luminaires off between midnight and sunrise.

In addition to turning off these nonconforming luminaires, multifamily housing is only required to reduce the lighting located at common areas such as clubhouses, pool areas and playgrounds.

C. Light Sources and Fixture Shielding. New mercury vapor light sources shall not be allowed. Existing installations must be removed or replaced with a conforming light source and luminaire by no later than January 1, 2011.

Searchlights and strobe/flashing lights are not allowed in any lighting zone without a separate permit as required in PCDSC 2.195.090, and the duration of the allowed use may be limited by planning staff.

Lasers, exposed neon, and other intense linear light sources are not allowed in lighting zone 1, but are allowed in lighting zones 2 and 3 and subject to approval and stipulations by planning staff during the review process. Lasers must be aimed at-or-below the horizontal plane and terminated on an opaque surface within the site.

All site perimeter luminaires located within 50 feet of a single-family residential property line, excluding bollards or other luminaires of less than six feet in height, shall possess house-side shielding (HSS) to the satisfaction of planning staff. All such luminaires that will also be operating after 10:00 p.m. shall possess external house-side shielding.

The total amount of outdoor lighting that is not full-cutoff, including uplighting, shall not exceed five percent of the outdoor lighting LPD or LD, whichever is less. Uplighting that is covered by solid roof or solid building overhang will not be subject to this chapter if it is:

1. Permanently set at 90 degrees; and

2. Is pulled back from any edge of the solid roof or solid building overhang by a distance equal to the distance between the top of the uplight (X) and the distance between the outside edge of the uplight and the outside edge of the solid roof or solid building overhang (Y).

Lighting Zone 1: Pole- or wall-mounted luminaires shall be full-cutoff luminaires only. Bollards shall be full-cutoff, or louvered with coated lamps (see PCDSC 2.195.020, "Bollard, louvered"). All light sources shall have a maintained color temperature of less than or equal to 3,000 Kelvin.

Wall-mounted luminaires of greater than 800 initial lumens shall possess a bottom-diffusing lens or an internal house-side shield (HSS), to the satisfaction of planning staff, in order to minimize the illuminance "hot spot" on the wall. Uplighting luminaires shall not exceed 800 initial lumens each.

Lighting Zone 2: Pole- or wall-mounted luminaires of less than or equal to 1,800 initial lumens may be semi-cutoff, cutoff, or full-cutoff. All other pole or wall-mounted luminaires shall be full-cutoff. Bollards shall be full-cutoff, or louvered with coated lamps, or of a type where the lamp is recessed and not directly visible.

Wall-mounted full-cutoff luminaires of greater than 3,500 initial lumens shall possess a bottom-diffusing lens or an internal house-side shield to the satisfaction of planning staff. Uplighting luminaires shall not exceed 1,200 initial lumens each.

Lighting Zone 3: Pole- or wall-mounted luminaires of less than or equal to 3,500 initial lumens may be semi-cutoff, cutoff, or full-cutoff. All other pole or wall-mounted luminaires shall be full-cutoff. Bollards shall be full-cutoff, or louvered with coated lamps, or of a type where the lamp is shielded and not directly visible.

Wall-mounted fixtures of greater than 6,500 initial lumens shall possess a bottom-diffusing lens or an internal house-side shield to the satisfaction of planning staff. Uplighting fixtures shall not exceed 1,200 initial lumens each.

D. Luminaire Mounting Height and Equipment Finish. The mounting height of a luminaire is to be measured from finished grade to the fixture lens or luminous opening. The exposed portion of concrete pole bases shall be finished in a fashion other than exposed concrete (brushed finish, painted, etc.). No portion of any luminaire that is attached to a wall that is common with another property shall be allowed to protrude above the top of the wall. In lighting zones 1 and 2, bollards shall not be more than 48 inches in height.

Lighting Zone 1: Luminaires located at or within 30 feet of a residential property line shall not exceed eight feet in height. All others shall not exceed 15 feet in height, and the pole color shall be dark and nonreflective (such as dark bronze or black).

Lighting Zone 2: Luminaires located at or within 30 feet of a residential property line shall not exceed eight feet in height. Luminaires located greater than 30 feet and less than or equal to 150 feet from a residential property line, and not blocked from direct view by a structure, shall not exceed 15 feet in height. All others shall not exceed 25 feet. Pole color shall be dark and nonreflective (such as dark bronze or black).

Lighting Zone 3: Luminaires located at or within 30 feet of a residential property line shall not exceed eight feet in height. Luminaires located greater than 30 feet and less than or equal to 150 feet from a residential property line, and not blocked from direct view by a structure, shall not exceed 15 feet in height. All others shall not exceed 30 feet in height. Pole color shall be approved by planning staff.

E. Perimeter (Spill Light) Illuminance Levels. This chapter establishes limits for the amount of light trespass/spill light that is allowed to cross a project site's property line(s) when there is a residential property line located within 150 feet of any of the project site's property line(s). These limits are based upon initial maximum vertical illuminance values along the appropriate property lines, calculated at no more than 10-foot horizontal increments, and at an elevation of six feet above finished grade. The calculated "observation point" shall be oriented perpendicular into the project site, and angled at 90 degrees above nadir (perfectly horizontal). The light loss factor (LLF) utilized for the calculations shall be 1.00. The following limits shall not be applied to the permanently exempted uses, or the specific uses in this chapter where alternate spill light limits are expressly defined.

Lighting Zone 1: The maximum initial vertical illuminance at any calculation point shall not exceed 0.30 footcandles during normal business evening hours, and 0.10 footcandles after the facility enters security lighting-only operating mode (in compliance with subsection B of this section).

Lighting Zone 2: The maximum initial vertical illuminance at any calculation point shall not exceed 0.80 footcandles during normal business evening hours, and 0.30 footcandles after the facility enters security-lighting-only operating mode.

Lighting Zone 3: The maximum initial vertical illuminance at any calculation point shall not exceed 1.50 footcandles during normal business evening hours, and 0.80 footcandles after the facility enters security-lighting-only operating mode.

F. Lighting Chapter Matrix (Commercial Uses Only).

Lighting zone	Operating Hours, LPD Limit and LD Limit	Light Sources and Fixture Shielding	Mounting Height and Pole Color	Perimeter Illuminance Levels	Uplighting
1 Low Ambient Light Areas	Security lighting only after 10:00 p.m. or 1 hour after close of business LPD = 50% of IECC limit LD = 9 lumens/ft²	Light sources L.T.E. 3,000K color temperature Full-cutoff fixtures only HSS on perimeter fixtures adjacent to residential	8' height when L.T.E. 30' from residential property line 15' height when G.T. 30' Dark and nonreflective colors	0.30 VFC maximum normal business and 0.10 VFC security only, at a residential property line	L.T.E. 800 initial lumens Turn off at 10:00 p.m. or 1 hour after close of business
2 Medium Ambient Light Areas	Security lighting only after 10:00 p.m. or 1 hour after close of business LPD = 75% of IECC limit LD = 14 lumens/ft²	All light sources Semi-cutoff and cutoff fixtures when L.T.E. 1,800 initial lumens Full-cutoff when G.T. 1,800 initial lumens HSS on perimeter fixtures adjacent to residential	8' height when L.T.E. 30' from residential property line 15' ht. when G.T. 30' and when L.T.E. 150' 25' ht. when G.T. 150' Dark and nonreflective colors	0.80 VFC maximum normal business and 0.30 VFC security only, at a residential property line	L.T.E. 1,200 initial lumens Turn off at 10:00 p.m. or 1 hour after close of business
3 High Ambient Light Areas	Security lighting only after 10:00 p.m. or 1 hour after close of business LPD = 100% of IECC limit LD = 19 lumens/ft²	All light sources Semi-cutoff and cutoff fixtures when L.T.E. 3,500 initial lumens Full-cutoff when G.T. 3,500 initial lumens HSS on perimeter fixtures adjacent to residential External HSS adjacent to residential after 10:00 p.m.	15' height when L.T.E. 150' from residential property line 30' ht. when G.T. 150' Dark and nonreflective colors	1.50 VFC maximum normal business and 0.80 VFC security only, at a residential property line	L.T.E. 1,200 initial lumens Turn off at 10:00 p.m. or 1 hour after close of business

Explanation of Terms Used in the Lighting Chapter Matrix

***	To be determined by planning staff.
1,800, 3,500 and 6,500 Lumens	1,800 lumens is equivalent to the initial lumen output of a 100-watt incandescent, or a 26-watt compact fluorescent lamp. 3,500 lumens is equivalent to the initial lumen output of a 42-watt compact fluorescent, or a 50-watt metal halide lamp. 6,500 lumens is equivalent to the initial lumen output of a 70-watt high pressure sodium lamp.
G.T.	Greater than.
L.T.E.	Less than or equal to.
L.T.E. 1,800	A light source that produces less than or equal to 1,800 lumens of light when the lamp is new.
Kelvin (K)	The Kelvin temperature scale is utilized to describe the color/hue of a light source.
L.T.E. 3,000K	A light source with a color temperature of less than or equal to 3,000 degrees Kelvin ("warm" color/hue light).
Light Source	A type of lamp, such as an incandescent or metal halide lamp.
H.S.S.	House-side shields reduce the amount of rearward illumination produced by a luminaire. Shields on pole-mounted luminaires reduce the amount of spill light/light trespass from the site, while shields on wall-mounted fixtures reduce the intense illumination "hot spots" that can be produced underneath the luminaire.
Height (Ht.)	The mounting height of a luminaire, as measured from the fixture lens to the finished grade of the parking lot. 15' HT. L.T.E. 150' means that luminaires located less than or equal to 150 feet from a residential property line cannot exceed 15 feet in mounting height.
Dark Color	The required color/finish of a light pole.
Perimeter Illuminance Levels	The highest allowed initial vertical illuminance at any point around the perimeter of a site.

[Ord. 011812-ZO-PZ-C-007-10 § 22; Ord. PZ-C-003-09 § 1].

2.195.040 Specific uses.

A. Parking Canopies. All light fixtures shall be full-cutoff, or the fixtures shall be located and all sides of the canopy fascia extended so that no portion of the lamp or lens is visible from beyond any of the property lines. Light fixtures in multifamily housing shall be located at no less than every other parking space, and shall utilize polycarbonate lenses and tamper-proof hardware. This illumination and associated wattage shall be included in the outdoor lighting submittal, and shall not exceed an LPD of 1.08 watts/ft^2.

B. Multilevel Parking Structures.

Lighting Zones 1 and 2: Interior fixtures and rooftop fixtures shall be full-cutoff. The interior fixtures shall be attached to the ceiling or mounted no lower than the bottom of the support beams. Rooftop fixtures shall be set back a minimum of 25 feet from the perimeter, and shall not exceed 14 feet in height.

Lighting Zone 3: Interior fixtures visible from any residential property shall be full-cutoff. All others may be semi-cutoff or cutoff, but shall possess diffusing lenses or shielding so the lamp is not directly visible from off site. Roof fixtures shall be full-cutoff, set back a minimum of 25 feet from the edge, and shall not exceed 16 feet in height.

C. Gas Stations/Convenience Stores. Fuel canopy luminaires shall be recessed into the canopy ceiling, with a lens that is flat and flush to the ceiling (the fixture access door can protrude below the ceiling). Metal halide canopy lighting is allowed in all lighting zones. In the event that the canopy is located within 150 feet of a property line that is zoned as residential, the canopy fascia shall be extended to a minimum depth of 12 inches below the canopy ceiling. Exposed light sources (such as neon or fluorescent) on the canopy are not allowed. Areas of fascia that are internally illuminated are not allowed in lighting zones 1 and 2. This does not include any internally or back-lighted signage, which shall continue to be regulated by the county's sign ordinance. The amount of spill light shall not exceed two times the limits in PCDSC 2.195.030(E).

D. Drive-Throughs. All fixtures are to be full-cutoff and either recessed into the canopy ceiling, or mounted so that the lowest portion of the fixture is higher than the bottom edge of the canopy fascia. All nonsecurity lighting is to be turned off by 10:00 p.m. or within one hour after close of business, whichever is later.

E. Banks/ATMs. All fixtures for the ATM or teller areas shall be full-cutoff. The fixtures at drive-up canopies shall either be recessed into the canopy ceiling, or mounted so that the lowest portion of the fixture is higher than the bottom edge of the canopy fascia.

F. Religious Facilities. Metal halide and other light sources with color temperatures cooler than 3,000 Kelvin are not allowed in lighting zones 1 and 2, and for all facilities in lighting zone 3 that are at or within 300 feet of a residential property line. All nonsecurity lighting shall be turned off within two hours after the completion of the last service/event. Any fixtures located within 30 feet of a residential property line shall be included in those being turned off. In the event that the parking lot is sized for peak usage (holidays, etc.), control of the lighting is to be divided into "tiers," so that the parking lot lighting in the peak-usage areas only operates during those peak times of the year. Uplighting for the illumination of steeples or other towers for religious facilities are not subject to the provisions of this chapter.

G. Automotive Dealerships. A minimum of 50 percent of the outdoor illumination shall be turned off within one hour after the close of business. All non-full-cutoff fixtures shall be automatically turned off at this time. All perimeter fixtures shall possess house-side shields. Under-canopy lighting shall be full-cutoff, or the canopy fascia shall be extended on all sides so that is lower than any portion of the fixture lens. This use is subject to all other applicable sections in this chapter except for the vertical footcandle (VFC) limits in PCDSC 2.195.030(E).

H. Equestrian Arenas. All new luminaires mounted at a height of 40 feet or less shall be full-cutoff, and others mounted higher than 40 feet may be sports-style floodlights with exceptional internal and external shielding, to the satisfaction of planning staff. All luminaires are to be located, aimed, and/or externally shielded so that none of the light sources are directly visible at any of the property lines. All arena lighting shall be turned off when not in use, and all non-arena lighting shall be reduced at nighttime as per PCDSC 2.195.030(B) when not in use.

Lighting Zone 1: If the arena is located within 150 feet of a residential property line, then the calculated spill light at the property line facing the residential property shall not exceed 0.80 initial vertical footcandles at any point, or 2.00 initial vertical footcandles at any point along the other property lines.

Lighting Zone 2: If the arena is located within 150 feet of a residential property line, the calculated spill light shall not exceed 1.00 initial vertical footcandles (VFC) at any point, or 2.50 initial VFC at any point along the other property lines.

Lighting Zone 3: If the arena is located within 150 feet of a residential property line, the calculated spill light shall not exceed 1.50 initial vertical footcandles (VFC) at any point, or 3.00 initial VFC at any point along the other property lines.

I. Flagpole Lighting. Flagpole uplighting is restricted to state and federal flags, and shall be shielded so that the light source is not directly visible from any of the property lines. Uplighting in all lighting zones shall not exceed the equivalent of two fixtures of 3,500 initial lumens each per flagpole. Flagpole lighting may operate all night, but is to be turned off at dusk if the flag is lowered.

J. Park and Sportslighting for All Private and Public Nonresidential Facilities. All sports, path, parking lot, and playground lighting are to be illuminated in conformance with this chapter, and the most current recommended practices issued by the IESNA. All sports field luminaires shall utilize superior shielding and aiming angles to the satisfaction of planning staff. All sports field luminaires shall possess a gray painted finish, and all poles shall have a painted or "dull" galvanized finish. Sports field poles are to be set back a minimum of 50 feet from any residential property line or right-of-way.

All sport courts shall be lighted with full-cutoff luminaires, and are to utilize "on" and "off" user-accessible push-buttons so that the lighting does not operate unless the courts are in actual use. Automatic time-clocks or other programmable controllers are to be used, and shall turn off all nonsecurity lighting at a time in accordance with the applicable lighting zone, except for sports field lighting, which may stay on to as late as 11:00 p.m. when a formal game is in progress, except as permitted under PCDSC 2.195.090.

All park luminaires, such as those located in ramadas, shall be shielded and/or located so that the light source is not directly visible from beyond any of the property lines. Initial vertical illuminance (spill light) shall be calculated in conformance with PCDSC 2.195.030(E), except that the spacing distance between the calculation points may match the spacing used for the sports lighting calculations.

Lighting Zone 1: Sports field lighting shall not exceed 80 feet in height. Path, and parking lot lighting shall not exceed 16 feet in height. Playground lighting shall not exceed 20 feet in height. Sport court lighting shall not exceed 25 feet in height, and all fixtures shall possess four-sided shielding/skirting. Sports lighting shall not operate after 10:30 p.m. Perimeter spill light shall not exceed 0.80 footcandles at any point along an adjacent residential property line, or 1.60 footcandles at any point along any property line not adjacent to a residential property.

Lighting Zone 2: Sports field lighting shall not exceed 80 feet in height. Path, parking lot, and playground lighting shall not exceed 25 feet in height. Sport court lighting shall not exceed 30 feet in height. Sports lighting shall not operate after 10:30 p.m. Perimeter spill light shall not exceed 1.20 footcandles at any point along an adjacent residential property line, or 2.40 footcandles at any point along any property line not adjacent to a residential property.

Lighting Zone 3: Sports field lighting shall not exceed 90 feet in height. Path, parking lot, and playground lighting shall not exceed 30 feet in height. Sport court lighting shall not exceed 50 feet in height. Sports lighting shall not operate after 11:00 p.m. Perimeter spill light shall not exceed 1.50 footcandles at any point along an adjacent residential property line, or 3.00 footcandles at any point along any property line not adjacent to a residential property.

K. Signage Lighting. This chapter shall apply to externally illuminated signs only. All such lighting shall comply with the lumen and LPD limits and shielding requirements established in PCDSC 2.195.030(C).

L. Single-Family Residences, Attached and Detached.

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Project No. 140023.605
Project RESOLUTION COPPER - DARK SKY
Sheet No. 1 of 2 By LO
Drawing No. SK 1

SUBJECT: VISUAL LIGHTING TOOL - TYPICAL ROADWAY SCREEN SHOT DATE: 26 JUN 17

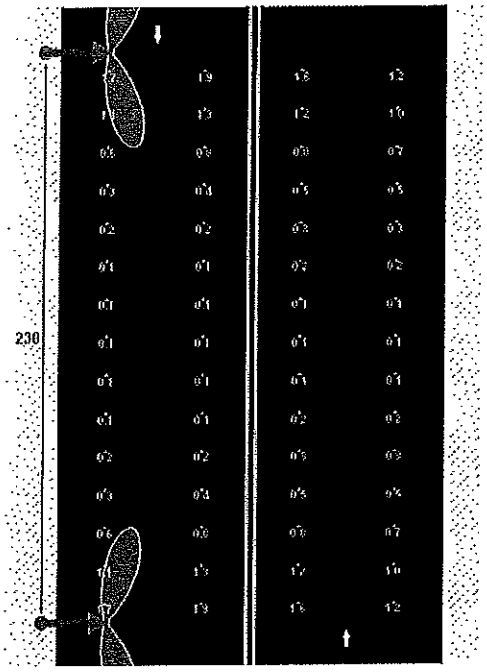
Visual Roadway Tool™

AcuityBrands.

File Help Tools

Criteria

Recommendations	Illuminance
Auto Calculate	☑
Luminaire Spacing	230
Road Length	
Luminance	
Average	
Average / Minimum	
Maximum / Minimum	
Illuminance	
Average	0.4
Minimum	
Average / Minimum	6
Other Metrics	
Veiling Luminance	0.4



Display Illuminance

Spacing		230 feet		
Quantity		0		
		Left	Right	
Roadway Luminance				
Average	[-]	0.5	0.4	cd/m²
Max		1	0.8	cd/m²
Min		0.2	0.1	cd/m²
Ave/Min	[-]	3.5	3.5	
Max/Min	[-]	6.5	6.8	
Lv Ratio	[0.4]	0.3	0.3	
STV		4.5	4.5	
Roadway Illuminance				
Average	[0.4]	0.6	0.6	fc
Max		1.9	1.6	fc
Min	[-]	0.1	0.1	fc
Ave/Min	[6]	10	8.1	
Max/Min		31.3	23.1	
Sidewalk Illuminance				
Average		--	--	fc
Ave/Min		--	--	
Ev Min		--	--	fc
Bikelane Illuminance				
Average		--	--	fc
Ave/Min		--	--	
Ev Min		--	--	fc

Project Information

A

PHILIPS LUMEC

No Photo Available

[A] - RX132-G2-2NA7-N

Configuration: Single

Light Loss Factor	0.91	Lamp Quantity	1
Support Length	4	Lumens Per Lamp	6899
Tilt	0	Wattage	69.7

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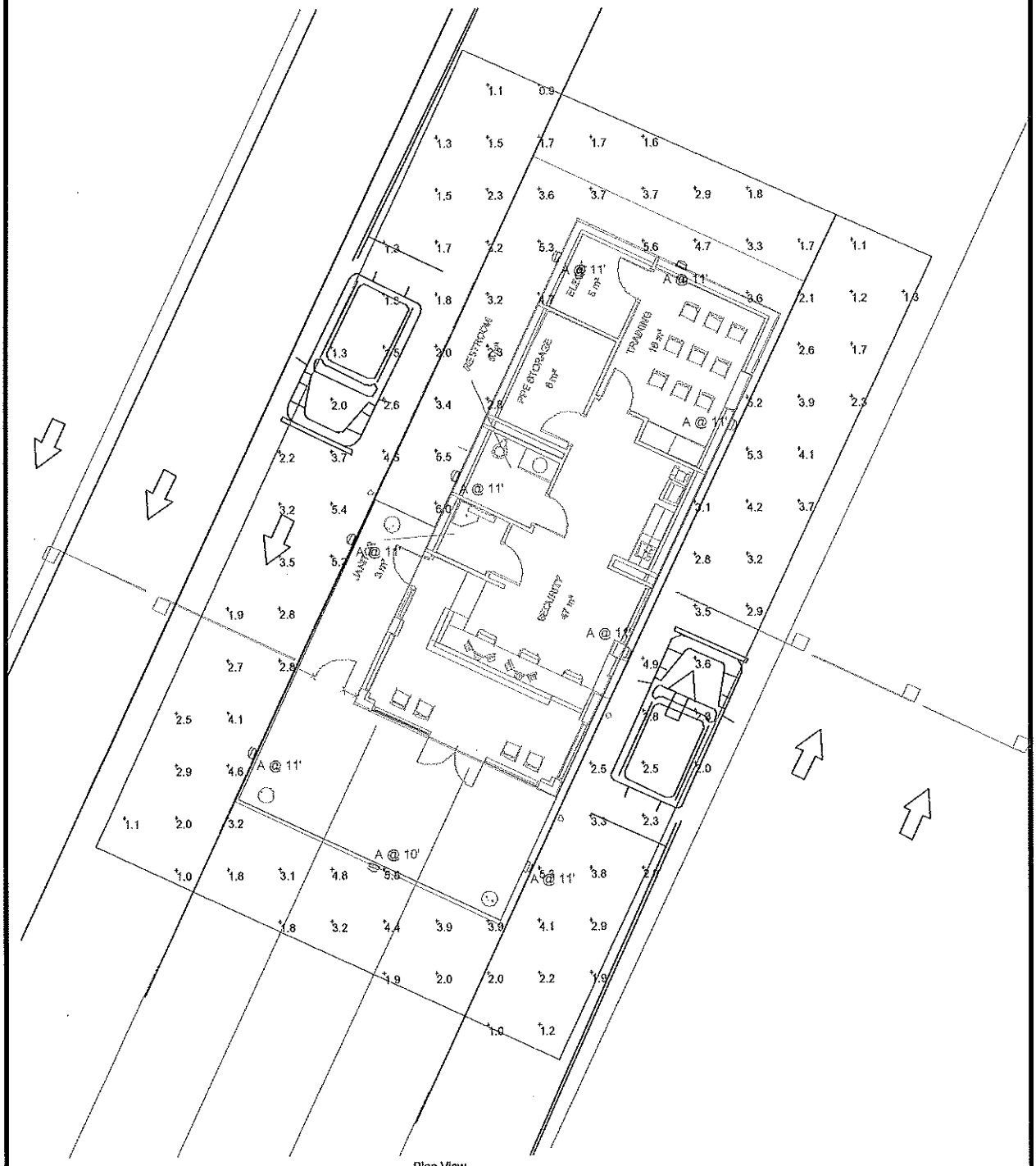
Project No. 140023.605
Project RESOLUTION COPPER - DARK SKY
Sheet No. 2 of 2 By LO
Drawing No. SK 2

SUBJECT: VISUAL LIGHTING TOOL - TYPICAL BUILDING SCREEN SHOT DATE: 26 JUN 17



Plan View

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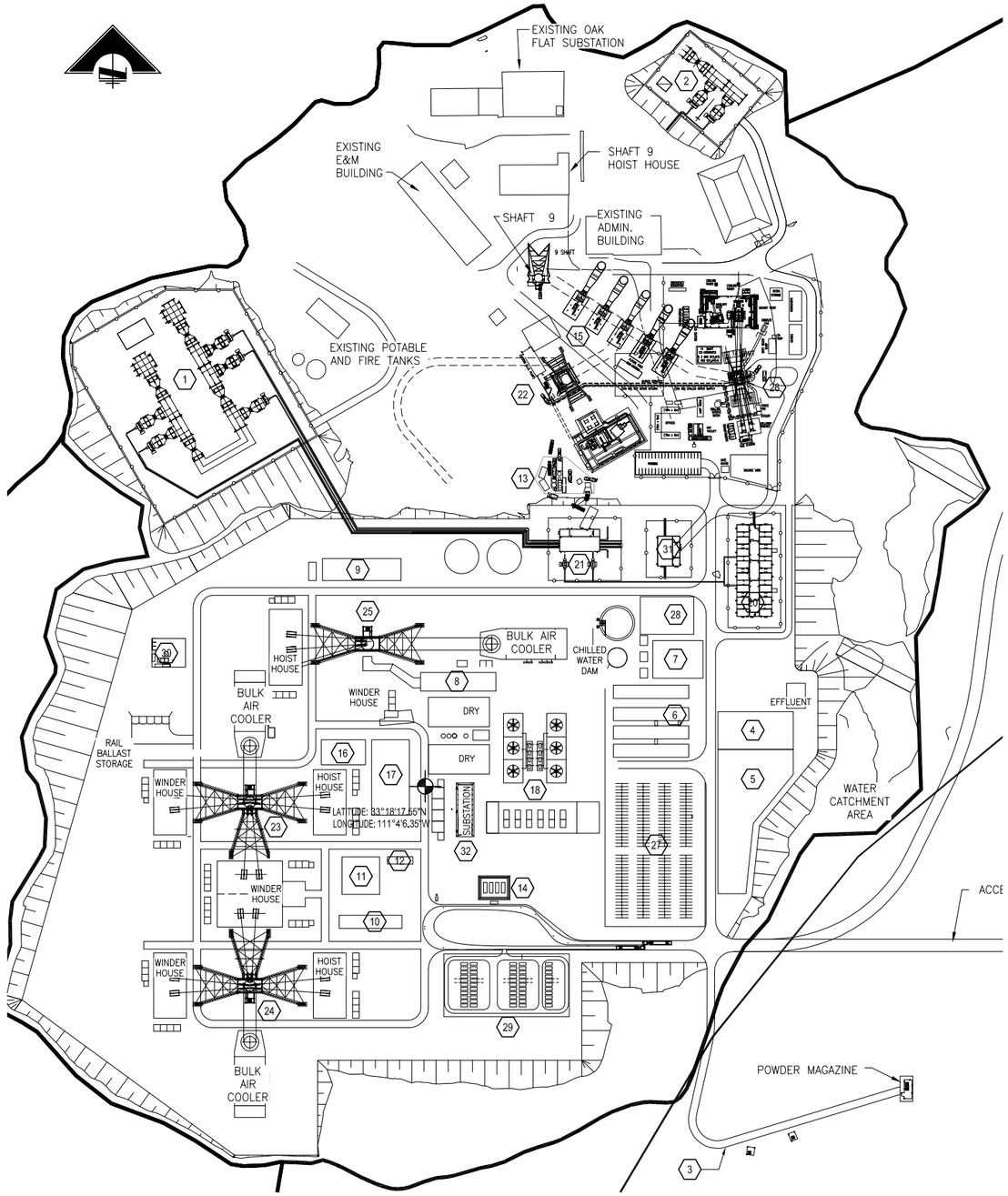

	Building/Area	Fixture Type	Manufacture/Model No.	Fixture Lumens	Fixture Quantity	Total Lumens
1	230kv Substation	R7	PHILIPS #RX1-64-G2-4-A7-RCD-PH8	12,995	13	168,935
		R8	PHILIPS #RX1-64-G2-4-A7-RCD-PH8	25,990	3	77,970
2	North Substation	R7	PHILIPS #RX1-64-G2-4-A7-RCD-PH8	12,995	6	77,970
3	Site Access Road	R3	Philips Lumec #RX1-48-G2-4-A-7-RCD-PH8	9,825	3	29,475
4	General Store	B	LSI Industries #SWM-2-LED-UE	4,080	8	32,640
5	General Store Yard	R2	Philips Lumec #RX1-48-G2-3-A7-RCD-PH8	9,833	7	68,831
6	Offices/Canteen	A	LSI Industries #SWS-2-LED-UE	1,322	44	58,168
7	Cable Storage	A	LSI Industries #SWS-2-LED-UE	1,322	14	18,508
8	Lamp Room	A	LSI Industries #SWS-2-LED-UE	1,322	14	18,508
9	Compressors	R2	Philips Lumec #RX1-48-G2-3-A7-RCD-PH8	9,833	3	29,499
10	Training	A	LSI Industries #SWS-2-LED-UE	1,322	10	13,220
11	Hoist Workshops	B	LSI Industries #SWM-2-LED-UE	4,080	8	32,640
12	First Aid	A	LSI Industries #SWS-2-LED-UE	1,322	4	5,288
13	Batch Plant	R2	Philips Lumec #RX1-48-G2-3-A7-RCD-PH8	9,833	5	49,165
14	Diesel Storage	R2	Philips Lumec #RX1-48-G2-3-A7-RCD-PH8	9,833	2	19,666
15	Fan Station Area	R2	Philips Lumec #RX1-48-G2-3-A7-RCD-PH8	9,833	5	49,165
16	Wash Bay	B	LSI Industries #SWM-2-LED-UE	4,080	8	32,640
17	Trackless Workshop	B	LSI Industries #SWM-2-LED-UE	4,080	12	48,960
18	Condenser Cooling Towers & Refrigeration	B	LSI Industries #SWM-2-LED-UE	4,080	26	106,080
19	Access Road inside plant	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	47	476,721
		R3	Philips Lumec #RX1-48-G2-4-A-7-RCD-PH8	9,825	1	9,825
20	Backup diesel Generator	A	LSI Industries #SWS-2-LED-UE	1,322	18	23,796
21	Production Power Station	A	LSI Industries #SWS-2-LED-UE	1,322	16	21,152
22	Shaft#10, Headframe					
	Stairs	I2	Crouse-Hinds #PMV-3L-P-R1-G-UNV1	3,531	20	70,620
	Platforms	I3	Cooper Crouse-Hinds #PMV-5L-P-R3-G-UNV1	5,335	14	74,690
	Shaft & Hoist	I8	Crouse-Hinds #PMV-11L-3A-R-UNV1	9,567	8	76,536
		R2	Philips Lumec #RX1-48-G2-3-A7-RCD-PH8	9,833	4	39,332
23	Shaft#11, Headframe					
	Stairs	I2	Crouse-Hinds #PMV-3L-P-R1-G-UNV1	3,531	34	120,054
	Platforms	I3	Cooper Crouse-Hinds #PMV-5L-P-R3-G-UNV1	5,335	26	138,710
	Shaft & Hoist	I8	Crouse-Hinds #PMV-11L-3A-R-UNV1	9,567	8	76,536
		R2	Philips Lumec #RX1-48-G2-3-A7-RCD-PH8	9,833	4	39,332
	Shaft#11, Winder/Hoist Houses	A	LSI Industries #SWS-2-LED-UE	1,322	6	7,932
	Shaft#11, Winder/Hoist Houses	E	LSI Industries #SWM3-WT-LED-48-450-UE	5,563	27	150,201
	Shaft#11, Bulk Air cooler	I7	Crouse-Hinds #PMV-7L-3TW-R3-G-UNV1	7,195	3	21,585

	Building/Area	Fixture Type	Manufacture/Model No.	Fixture Lumens	Fixture Quantity	Total Lumens
24	Shaft #12, Headframe					
	Stairs	I2	Crouse-Hinds #PMV-3L-P-R1-G-UNV1	3,531	34	120,054
	Platforms	I3	Cooper Crouse-Hinds #PMV-5L-P-R3-G-UNV1	5,335	26	138,710
	Shaft & Hoist	I8	Crouse-Hinds #PMV-11L-3A-R-UNV1	9,567	8	76,536
		R2	Philips Lumec #RX1-48-G2-3-A7-RCD-PH8	9,833	4	39,332
	Shaft #12, Winder/Hoist Houses	A	LSI Industries #SWS-2-LED-UE	1,322	6	7,932
	Shaft #12, Winder/Hoist Houses	E	LSI Industries #SWM3-WT-LED-48-450-UE	5,563	27	150,201
	Shaft #12, Bulk Air cooler	I7	Crouse-Hinds #PMV-7L-3TW-R3-G-UNV1	7,195	3	21,585
25	Shaft #13, Headframe					
	Stairs	I2	Crouse-Hinds #PMV-3L-P-R1-G-UNV1	3,531	34	120,054
	Platforms	I3	Cooper Crouse-Hinds #PMV-5L-P-R3-G-UNV1	5,335	26	138,710
	Shaft & Hoist	I8	Crouse-Hinds #PMV-11L-3A-R-UNV1	9,567	8	76,536
		R2	Philips Lumec #RX1-48-G2-3-A7-RCD-PH8	9,833	4	39,332
	Shaft #13, Hoist House	A	LSI Industries #SWS-2-LED-UE	1,322	2	2,644
	Shaft #13, Hoist House	E	LSI Industries #SWM3-WT-LED-48-450-UE	5,563	10	55,630
	Shaft #13, Bulk Air cooler	I7	Crouse-Hinds #PMV-7L-3TW-R3-G-UNV1	7,195	3	21,585
26	Shaft #14, Headframe					
	Stairs	I2	Crouse-Hinds #PMV-3L-P-R1-G-UNV1	3,531	18	63,558
	Platforms	I3	Cooper Crouse-Hinds #PMV-5L-P-R3-G-UNV1	5,335	14	74,690
	Shaft & Hoist	I8	Crouse-Hinds #PMV-11L-3A-R-UNV1	9,567	8	76,536
		R2	Philips Lumec #RX1-48-G2-3-A7-RCD-PH8	9,833	4	39,332
	Shaft #14, Auxiliary Hoist	I3	Cooper Crouse-Hinds #PMV-5L-P-R3-G-UNV1	5,335	12	64,020
		R2	Philips Lumec #RX1-48-G2-3-A7-RCD-PH8	9,833	4	39,332
27	General Parking Area	P1	LSI Industries #XLCS-3-LED-HO-UE	13,400	5	67,000
		P2	LSI Industries #XLCS-3-LED-HO-UE	26,800	10	268,000
28	Laydown Area	R2	Philips Lumec #RX1-48-G2-3-A7-RCD-PH8	9,833	4	39,332
29	Marshall Yard	R2	Philips Lumec #RX1-48-G2-3-A7-RCD-PH8	9,833	8	78,664
30	Batch Plant (#2)	R2	Philips Lumec #RX1-48-G2-3-A7-RCD-PH8	9,833	2	19,666
31	Alternate Power Station	A	LSI Industries #SWS-2-LED-UE	1,322	7	9,254
32	Substation	A	LSI Industries #SWS-2-LED-UE	1,322	10	13,220
	Total Area Lumens					**4,145,795**

NOTE:
1. COLOR TEMPERATURE (2100K).

50 25 0 50 100
SCALE IN METERS
DO NOT SCALE 11x17 DRAWINGS

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STAGE 2

REFERENCES DWG. NO.	REFERENCES TITLE	REFERENCES DWG. NO.	REFERENCES TITLE

REVISIONS NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT

REVISIONS NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT

		DATE
SCALE:	AS NOTED	
DESIGNED BY	LO	FEB 17
DRAWN BY	LO	FEB 17
CHECKED BY	AM	JUL 18
PROJECT MGR	AF	JUL 18
CLIENT APPR.		

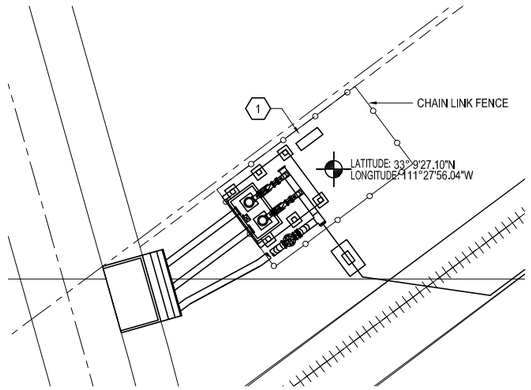
m3 ARCHITECTURE ENGINEERING CONSTRUCTION MANAGEMENT
Tucson, Arizona
Chandler, Arizona
Hermosillo, Sonora Mexico
www. m3eng.com

Resolution Copper Mining, LLC

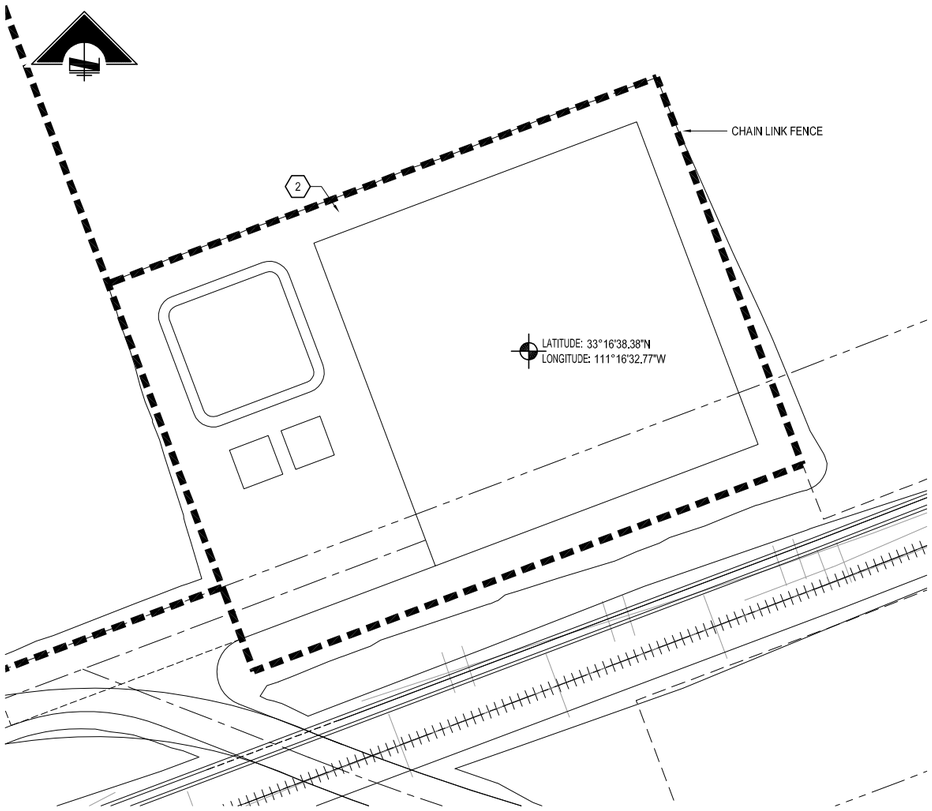
LIGHTING PLAN
EAST PLANT FACILITIES SITE
ELECTRICAL
LIGHTING

PROJECT NO. M3-PN140023.605
DWG NO. **20100-EL-001**
REV NO. 3
DATE 23 JUL 18

File: P:\2014\140023.605\EEC (540)\140023.605 Combine Site Option\20100-EL-001 – East Plant.dwg LAST UPDATE: 7/18/2018 8:19 AM BY: LO455



CAP CANAL PUMP STATION AREA PLAN



QUEEN VALLEY BOOSTER STATION AREA PLAN

	Building/Area	Fixture Type	Manufacture/Model No.	Fixture Lumens	Fixture Quantity	Total Lumens
1	Cap & Booster Pump	R3	Philips Lumec #RX1-48-G2-4-A-7-RCD-PH8	9,825	1	9,825
		B	LSI Industries #SWM-2-LED-UE	4,080	2	8,160
	Total Area Lumers					17,985
2	Queen Valley Pump	R3	Philips Lumec #RX1-48-G2-4-A-7-RCD-PH8	9,825	7	68,775
		R6	Philips Lumec #RX1-48-G2-4-A-7-RCD-PH8	19,650	1	19,650
	Total Area Lumers					88,425

NOTE:
1. COLOR TEMPERATURE (2100K).

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STAGE 2

REFERENCES		REFERENCES		REVISIONS						REVISIONS					
DWG. NO.	TITLE	DWG. NO.	TITLE	NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT	NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT

		DATE
SCALE:	AS NOTED	
DESIGNED BY	LO	FEB 17
DRAWN BY	LO	FEB 17
CHECKED BY	AM	JUL 18
PROJECT MGR	AF	JUL 18
CLIENT APPR.		

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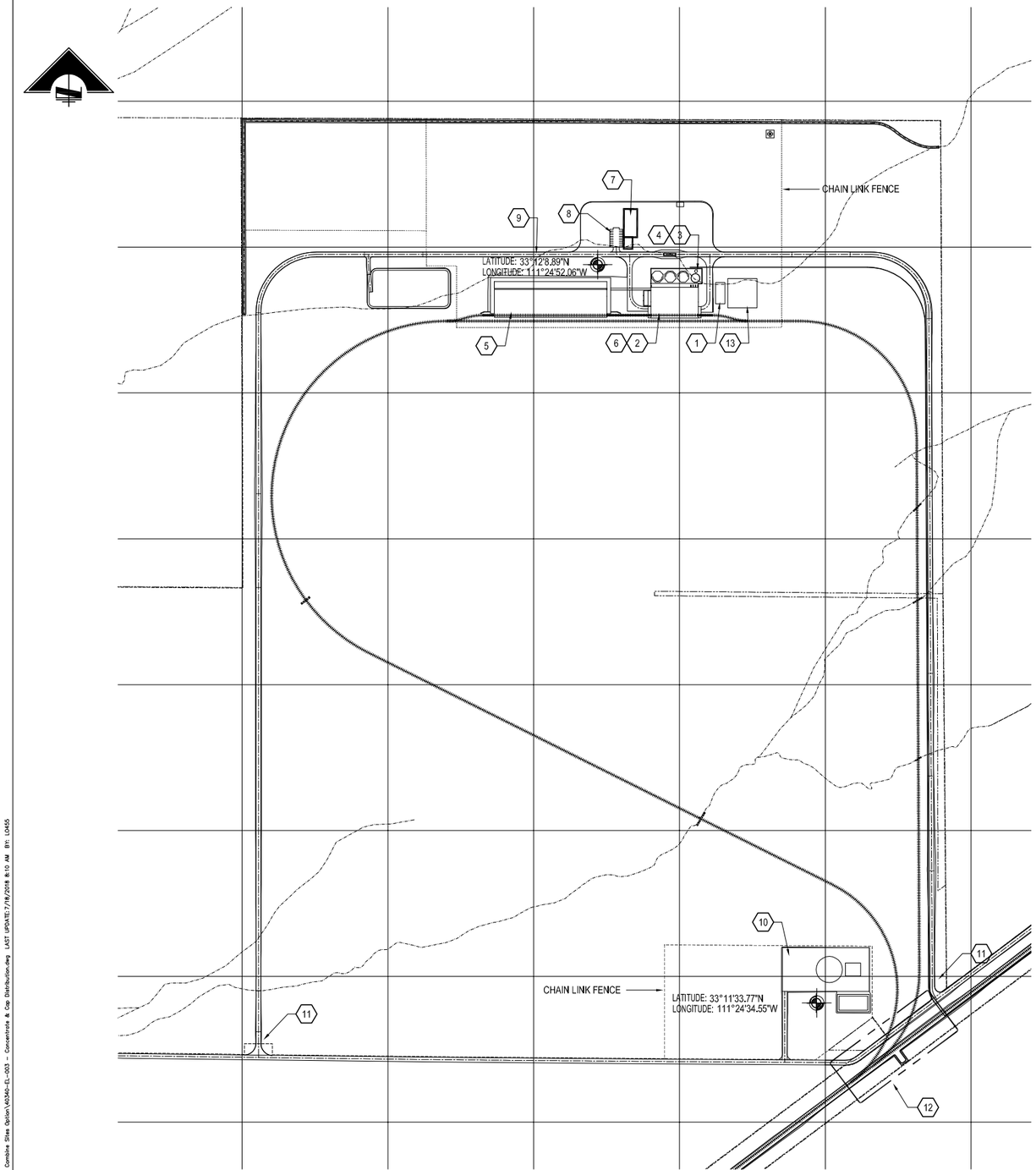
LIGHTING PLAN
WEST MARRCO LINE
ELECTRICAL
CAP CANAL & QUEEN VALLEY PUMP STA.

PROJECT NO. M3-PN140023.605
DWG NO. **40340-EL-001**
REV NO. 3
DATE 23 JUL 18

File: P:\2014\140023.605\CLEC (548)\140023.605 Combine Sites Option\40340-EL-001 - CAP & Queen.dwg LAST UPDATE:7/18/2018 8:13 AM BY: LO455



	Building/Area	Fixture Type	Manufacture/Model No.	Fixture Lumens	Fixture Quantity	Total Lumens
1	Electrical Building	B	LSI Industries #SWM-2-LED-UE	4,080	10	40,800
2	Concentrate Filter Plant	A	LSI Industries #SWS-2-LED-UE	1,322	6	7,932
		E	LSI Industries #SWM3-WT-LED-48-450-UE	5,563	16	89,008
3	Tank Area	I1	Crouse-Hinds #PMV-7L-P-R1-G-UNV1	7,195	15	107,925
4	Tank Area Stairs	I2	Crouse-Hinds #PMV-3L-P-R1-G-UNV1	3,531	12	42,372
5	Concentrate Loadout Building	A	LSI Industries #SWS-2-LED-UE	1,322	5	6,610
		B	LSI Industries #SWM-2-LED-UE	4,080	4	16,320
		E	LSI Industries #SWM3-WT-LED-48-450-UE	5,563	28	155,764
6	Concentrate Filter Plant Stairs	I2	Crouse-Hinds #PMV-3L-P-R1-G-UNV1	3,531	13	45,903
7	Ancillary Facilities	B	LSI Industries #SWM-2-LED-UE	4,080	16	65,280
8	General Parking	P3	LSI Industries #XLCS-FT-LED-HO	14,700	2	29,400
9	Marrco Access Road - North	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	12	121,716
10	Pump & Water Tank	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	3	30,429
		R3	Philips Lumec #RX1-48-G2-4-A-7-RCD-PH8	9,825	11	108,075
		R5	Philips Lumec #RX1-48-G2-3-A-7-RCD-PH8	19,666	3	58,998
		B	LSI Industries #SWM-2-LED-UE	4,080	4	16,320
11	Sky Line Access Road - @ Entrance	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	2	20,286
12	Sky Line Access Road - @ Train Tracks	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	2	20,286
13	SRP Substation	R3	Philips Lumec #RX1-48-G2-4-A-7-RCD-PH8	9,825	10	98,250
	Total Area Lumens					**1,081,674**

NOTE:
1. COLOR TEMPERATURE (2100K).

25 50 0 100 200
SCALE IN METERS
DO NOT SCALE 11x17 DRAWINGS

RESOLUTION COPPER

PRELIMINARY
NOT FOR CONSTRUCTION

STAGE 2

REFERENCES DWG. NO.	REFERENCES TITLE	REFERENCES DWG. NO.	REFERENCES TITLE

REVISIONS NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT

REVISIONS NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT

		DATE
SCALE:	AS NOTED	
DESIGNED BY	LO	FEB 17
DRAWN BY	LO	FEB 17
CHECKED BY	AM	MAY 17
PROJECT MGR	AF	MAY 17
CLIENT APPR.		

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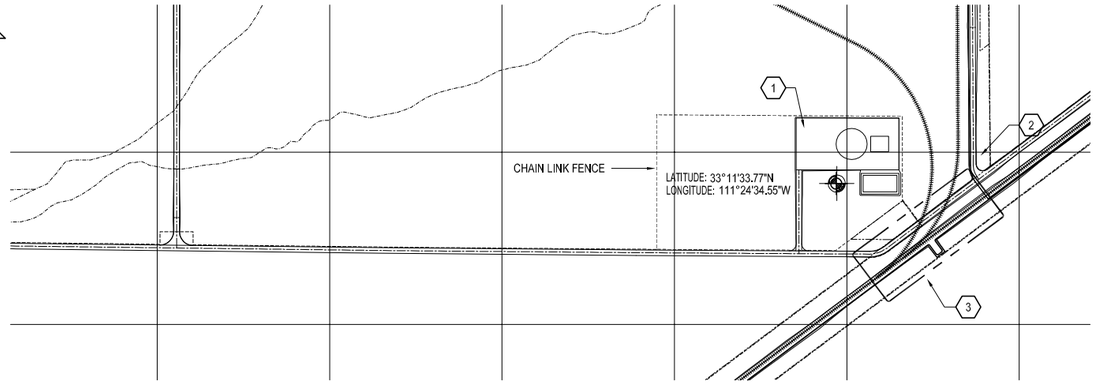
LIGHTING PLAN
WEST MARRCO LINE
ELECTRICAL
CONCENTRATE LOADOUT LIGHTING SHT. 1

PROJECT NO. M3-PN140023.605
DWG NO. **40340-EL-003**
REV NO. 3
DATE 23 JUL 18



	Building/Area	Fixture Type	Manufacture/Model No.	Fixture Lumens	Fixture Quantity	Total Lumens
1	Pump & Water Tank	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	3	30,429
		R3	Philips Lumec #RX1-48-G2-4-A-7-RCD-PH8	9,825	11	108,075
		R5	Philips Lumec #RX1-48-G2-3-A-7-RCD-PH8	19,666	3	58,998
		B	LSI Industries #SWM-2-LED-UE	4,080	4	16,320
2	Sky Line Access Road - @ Entrances	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	1	10,143
3	Sky Line Access Road - @ Train Tracks	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	2	20,286
	Total Area Lumens					**244,251**

NOTE:
1. COLOR TEMPERATURE (2100K).

25 50 0 100 200
SCALE IN METERS
DO NOT SCALE 11x17 DRAWINGS

RESOLUTION COPPER

PRELIMINARY
NOT FOR CONSTRUCTION

STAGE 2

REFERENCES		REFERENCES		REVISIONS						REVISIONS					
DWG. NO.	TITLE	DWG. NO.	TITLE	NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT	NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT

		DATE
SCALE:	AS NOTED	
DESIGNED BY	LO	APR 18
DRAWN BY	LO	APR 18
CHECKED BY	AM	JUL 18
PROJECT MGR	AF	JUL 18
CLIENT APPR.		

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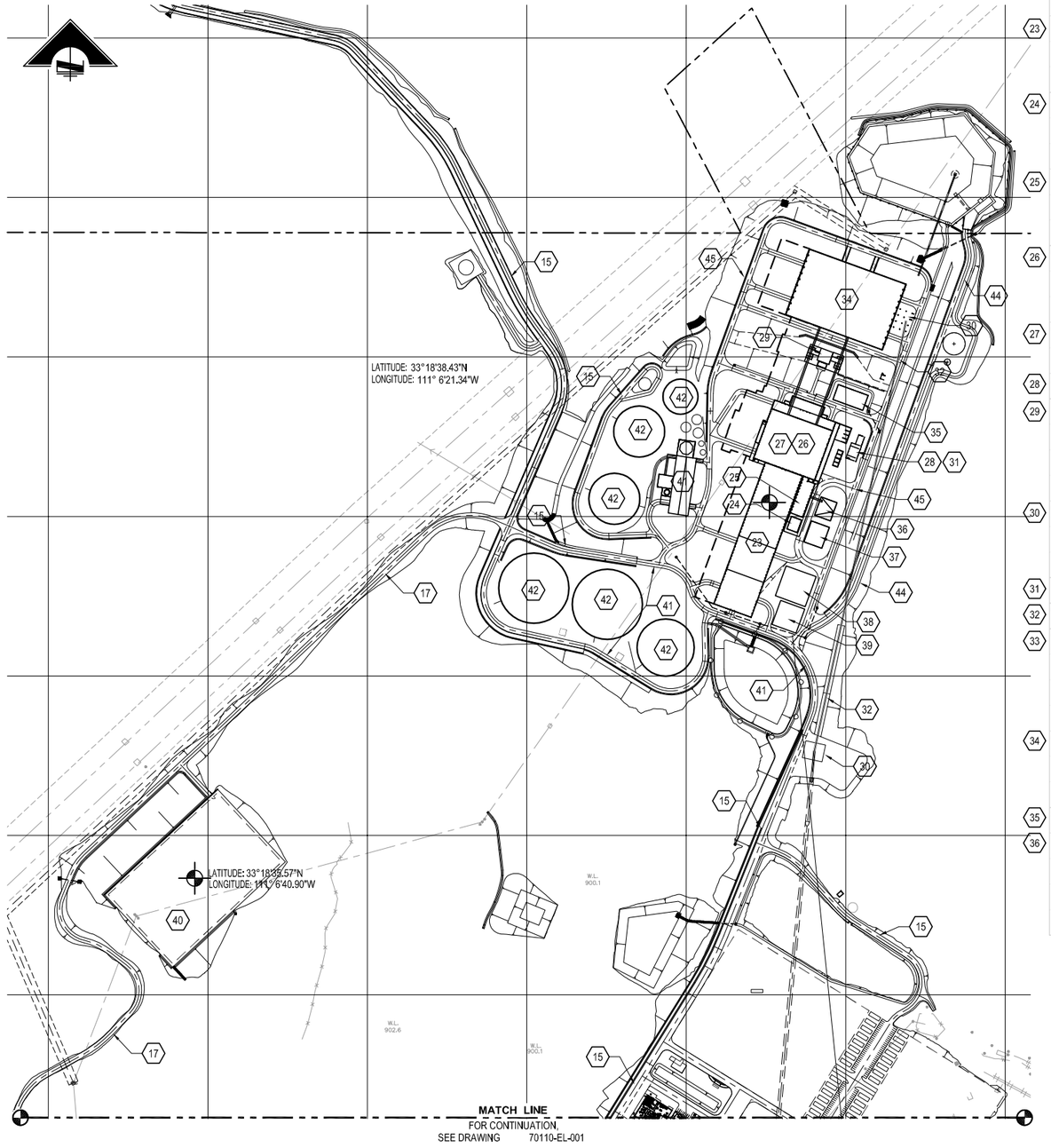
Resolution Copper Mining, LLC

LIGHTING PLAN
WEST MARRCO LINE
ELECTRICAL
CAP DISTRIBUTION LIGHTING SHT. 1

PROJECT NO. M3-PN140023.605
DWG NO. **40340-EL-004**
REV NO. 0
DATE 23 JUL 18



	Building/Area	Fixture Type	Manufacture/Model No.	Fixture Lumens	Fixture Quantity	Total Lumens
23	Flotation Building	A	LSI Industries #SWS-2-LED-UE	1,322	4	5,288
		B	LSI Industries #SWM-2-LED-UE	4,080	4	16,320
		E	LSI Industries #SWM3-WT-LED-48-450-UE	5,563	23	127,949
24	Flotation Electrical Building	A	LSI Industries #SWS-2-LED-UE	1,322	2	2,644
		B	LSI Industries #SWM-2-LED-UE	4,080	4	16,320
		E	LSI Industries #SWM3-WT-LED-48-450-UE	5,563	1	5,563
25	Reagents Area	A	LSI Industries #SWS-2-LED-UE	1,322	6	7,932
		B	LSI Industries #SWM-2-LED-UE	4,080	2	8,160
		E	LSI Industries #SWM3-WT-LED-48-450-UE	5,563	3	16,689
26	Grinding Area	A	LSI Industries #SWS-2-LED-UE	1,322	10	13,220
		B	LSI Industries #SWM-2-LED-UE	4,080	4	16,320
		E	LSI Industries #SWM3-WT-LED-48-450-UE	5,563	13	72,319
27	Grinding Area Stairs	I2	Crouse-Hinds #PMV-3L-P-R1-G-UNV1	3,531	24	84,744
		I3	Cooper Crouse-Hinds #PMV-5L-P-R3-G-UNV1	5,335	8	42,680
28	Screen Tower	I3	Cooper Crouse-Hinds #PMV-5L-P-R3-G-UNV1	5,335	23	122,705
29	Pebble Crushing	I2	Crouse-Hinds #PMV-3L-P-R1-G-UNV1	3,531	20	70,620
		I3	Cooper Crouse-Hinds #PMV-5L-P-R3-G-UNV1	5,335	34	181,390
		B	LSI Industries #SWM-2-LED-UE	4,080	5	20,400
		I7	Crouse-Hinds #PMV-7L-3TW-R3-G-UNV1	7,195	6	43,170
30	Coarse Ore Transfer Tower	I2	Crouse-Hinds #PMV-3L-P-R1-G-UNV1	3,531	13	45,903
		I3	Cooper Crouse-Hinds #PMV-5L-P-R3-G-UNV1	5,335	12	64,020
		I7	Crouse-Hinds #PMV-7L-3TW-R3-G-UNV1	7,195	4	28,780
31	Platform Conveyors	I1	Crouse-Hinds #PMV-7L-P-R1-G-UNV1	7,195	22	158,290
32	Coarse Ore Conveyors	I1	Crouse-Hinds #PMV-7L-P-R1-G-UNV1	7,195	80	575,600
33	Coarse Ore Conveyor Platform	I1	Crouse-Hinds #PMV-7L-P-R1-G-UNV1	7,195	4	28,780
		I2	Crouse-Hinds #PMV-3L-P-R1-G-UNV1	3,531	13	45,903
		I3	Cooper Crouse-Hinds #PMV-5L-P-R3-G-UNV1	5,335	5	26,675
		I7	Crouse-Hinds #PMV-7L-3TW-R3-G-UNV1	7,195	5	35,975
34	Coarse Ore Stockpile	B	LSI Industries #SWM-2-LED-UE	4,080	2	8,160
		E	LSI Industries #SWM3-WT-LED-48-450-UE	5,563	14	77,882
		R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	5	50,715
35	Stockpile Electric Building	B	LSI Industries #SWM-2-LED-UE	4,080	14	57,120
36	Lime Area	I1	Crouse-Hinds #PMV-7L-P-R1-G-UNV1	7,195	5	35,975
		I2	Crouse-Hinds #PMV-3L-P-R1-G-UNV1	3,531	4	14,124
		I3	Cooper Crouse-Hinds #PMV-5L-P-R3-G-UNV1	5,335	6	32,010
		R2	Philips Lumec #RX1-48-G2-3-A7-RCD-PH8	9,833	3	29,499

	Building/Area	Fixture Type	Manufacture/Model No.	Fixture Lumens	Fixture Quantity	Total Lumens
37	Compressor Building	B	LSI Industries #SWM-2-LED-UE	4,080	6	24,480
38	Concentrator Substation	B	LSI Industries #SWM-2-LED-UE	4,080	12	48,960
39	Blowers Area	B	LSI Industries #SWM-2-LED-UE	4,080	6	24,480
40	SRP Substation	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	18	182,574
		B	LSI Industries #SWM-2-LED-UE	4,080	48	195,840
41	Moly Filter Plant	A	LSI Industries #SWS-2-LED-UE	1,322	3	3,966
		B	LSI Industries #SWM-2-LED-UE	4,080	3	12,240
		E	LSI Industries #SWM3-WT-LED-48-450-UE	5,563	14	77,882
		R3	Philips Lumec #RX1-48-G2-4-A-7-RCD-PH8	9,825	2	19,650
42	Thickener Tanks	I1	Crouse-Hinds #PMV-7L-P-R1-G-UNV1	7,195	22	158,290
44	Water Services access Road	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	11	111,573
45	Concentractor Access Road	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	187	1,896,741
	Mill Site Sub Total Area Lumens					4,946,520

NOTE:
1. COLOR TEMPERATURE (2100K).

25 50 0 100 200
SCALE IN METERS
DO NOT SCALE 11x17 DRAWINGS

RESOLUTION COPPER

PRELIMINARY
NOT FOR CONSTRUCTION

STAGE 2

REFERENCES DWG. NO.	REFERENCES TITLE
70110-EL-001	ANCILLIARY SITE LIGHTING - SHEET 1

REVISIONS NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT

SCALE: AS NOTED	DATE
DESIGNED BY LO	FEB 17
DRAWN BY LO	FEB 17
CHECKED BY AM	JUL 18
PROJECT MGR AF	JUL 18
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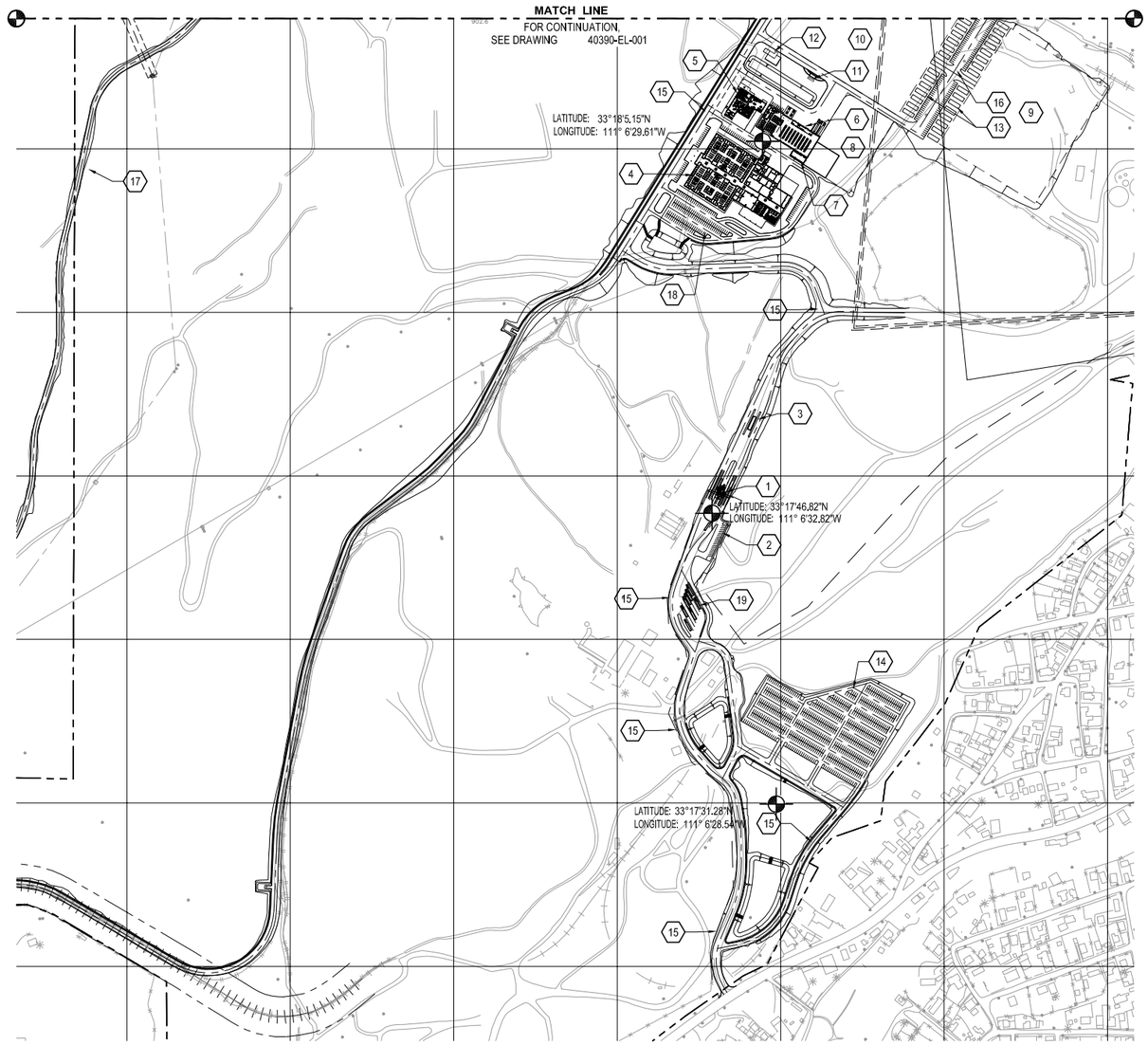
LIGHTING PLAN
WEST PLANT SITE
ELECTRICAL
MILL SITE LIGHTING - SHEET 1

PROJECT NO. M3-PN140023.605
DWG NO. **40390-EL-001**
REV NO. 3
DATE 23 JUL 18

File: P:\2014\140023.605\LEC (345)\140023.605 Combine Site Option\40390-EL-001 - West Plant North.dwg LAST UPDATE: 7/18/2018 8:07 AM BY: LO455



	Building/Area	Fixture Type	Manufacture/Model No.	Fixture Lumens	Fixture Quantity	Total Lumens
1	Guard House	A	LSI Industries #SWS-2-LED-UE	1,322	9	11,898
2	Guard House Parking	P1	LSI Industries #XLCS-3-LED-HO-UE	13,400	5	67,000
3	Truck Scale	R3	Philips Lumec #RX1-48-G2-4-A-7-RCD-PH8	9,825	2	19,650
4	Administration Building	A	LSI Industries #SWS-2-LED-UE	1,322	67	88,574
		B	LSI Industries #SWM-2-LED-UE	4,080	9	36,720
5	Mill/Vehicle Maintenance	A	LSI Industries #SWS-2-LED-UE	1,322	11	14,542
		B	LSI Industries #SWM-2-LED-UE	4,080	13	53,040
		C	LSI Industries #SFCM-WB-LED-PL1-UE	3,533	2	7,066
6	Warehouse	A	LSI Industries #SWS-2-LED-UE	1,322	4	5,288
		B	LSI Industries #SWM-2-LED-UE	4,080	22	89,760
7	Electrcal Building @ Warehouse	A	LSI Industries #SWS-2-LED-UE	1,322	2	2,644
		B	LSI Industries #SWM-2-LED-UE	4,080	4	16,320
8	Warehouse Lay down Yard - 1	R2	Philips Lumec #RX1-48-G2-3-A7-RCD-PH8	9,833	17	167,161
9	Warehouse Lay down Yard -2	R2	Philips Lumec #RX1-48-G2-3-A7-RCD-PH8	9,833	46	452,318
10	Construction Lay down Yard	R2	Philips Lumec #RX1-48-G2-3-A7-RCD-PH8	9,833	60	589,980
11	Fueling Station	R3	Philips Lumec #RX1-48-G2-4-A-7-RCD-PH8	9,825	1	9,825
12	Truck Wash	B	LSI Industries #SWM-2-LED-UE	4,080	5	20,400
13	Construction Trailers	A	LSI Industries #SWS-2-LED-UE	1,322	30	39,660
14	Parking - Ancillary Facilities	P1	LSI Industries #XLCS-3-LED-HO-UE	13,400	26	348,400
		P2	LSI Industries #XLCS-3-LED-HO-UE	26,800	45	1,206,000
15	Lone Tree Access Road	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	180	1,825,740
16	Construction Trailers Parking	P1	LSI Industries #XLCS-3-LED-HO-UE	13,400	16	214,400
17	Sliver King Mine Road	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	27	273,861
18	Parking - Administration	P1	LSI Industries #XLCS-3-LED-HO-UE	13,400	22	294,800
		P2	LSI Industries #XLCS-3-LED-HO-UE	26,800	9	241,200
19	Truck Staging Parking	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	4	40,572
	Ancilliary Site Sub Total Area Lumens					6,136,819
	Mill site Sub Total Area Lumens					4,946,520
	Total Area Lumens					11,083,339

NOTE:
1. COLOR TEMPERATURE (2100K).

25 50 0 100 200
SCALE IN METERS
DO NOT SCALE 11x17 DRAWINGS

RESOLUTION COPPER

PRELIMINARY
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STAGE 2

REFERENCES DWG. NO.	REFERENCES TITLE	REFERENCES DWG. NO.	REFERENCES TITLE
40390-EL-001	MILL SITE LIGHTING - SHEET 1		

REVISIONS NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT

REVISIONS NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT

		DATE
SCALE:	AS NOTED	
DESIGNED BY	LO	FEB 17
DRAWN BY	LO	FEB 17
CHECKED BY	AM	JUL 18
PROJECT MGR	AF	JUL 18
CLIENT APPR.		

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LIGHTING PLAN
WEST PLANT SITE
ELECTRICAL
ANCILLIARY SITE LIGHTING - SHEET 1

PROJECT NO. M3-PN140023.605
DWG NO. **70110-EL-001**
REV NO. 3
DATE 23 JUL 18

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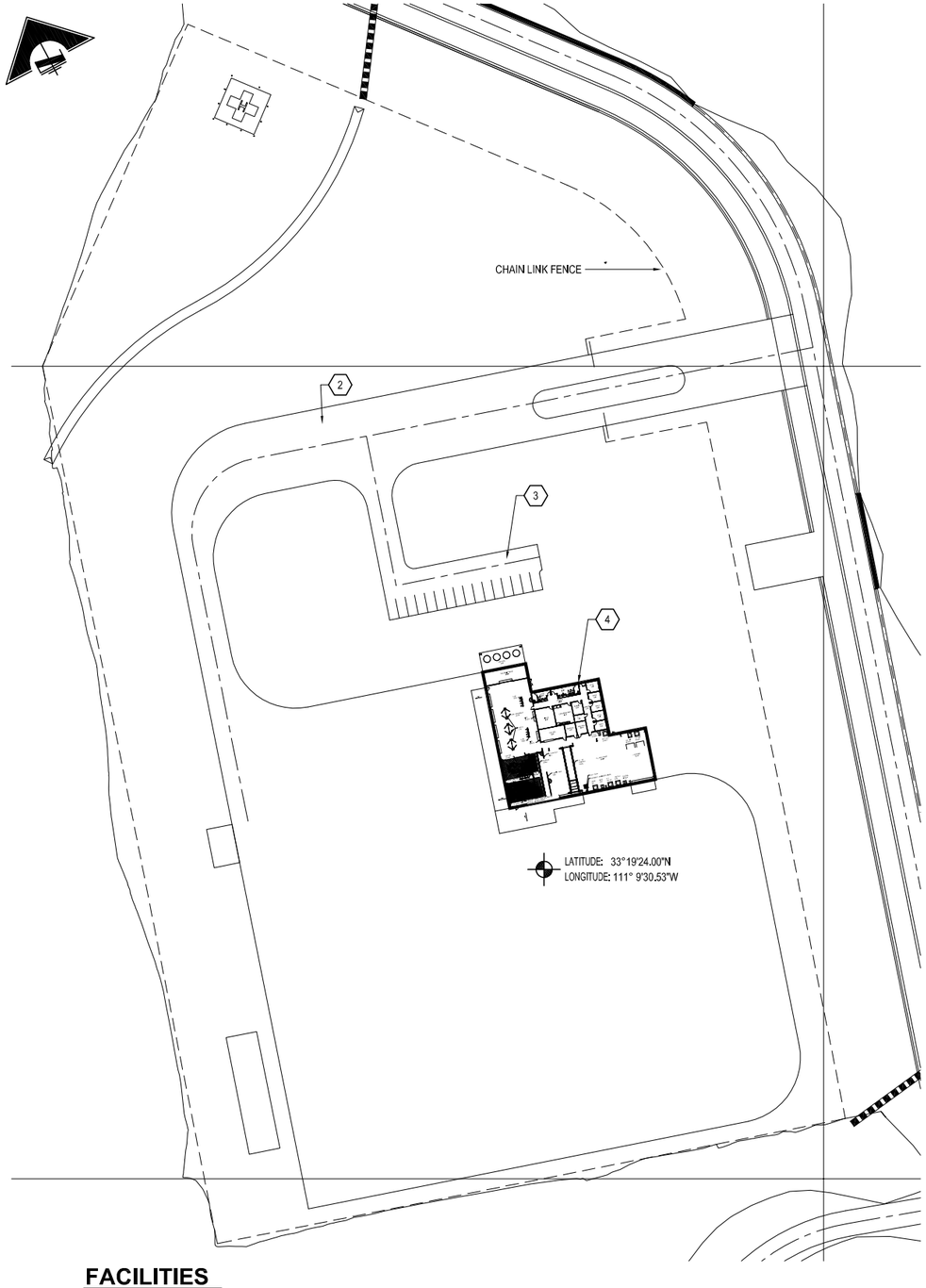

FACILITIES
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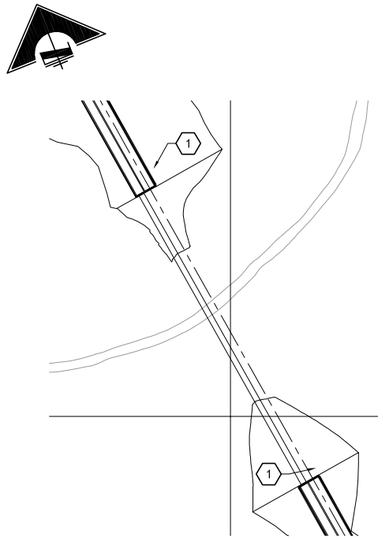

BRIDGE
SCALE: 1"=60'-0"

	Building/Area	Fixture Type	Manufacture/Model No.	Fixture Lumens	Fixture Quantity	Total Lumens
1	Tailings Access Road @ Bridge	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	2	20,286
2	Drive	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	16	162,288
		R4	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	20,284	1	20,284
3	General Parking	P1	LSI Industries #XLCS-3-LED-HO-UE	13,400	3	40,200
4	Maintenance/Administration	A	LSI Industries #SWS-2-LED-UE	1,322	24	31,728
		B	LSI Industries #SWM-2-LED-UE	4,080	4	16,320
	Total Area Lumens					291,106

NOTE:
1. COLOR TEMPERATURE (2100K).

20 10 0 20 40
SCALE IN METERS
DO NOT SCALE 11x17 DRAWINGS

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STAGE 2

REFERENCES		REFERENCES		REVISIONS						REVISIONS					
DWG. NO.	TITLE	DWG. NO.	TITLE	NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT	NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT

		DATE
SCALE:	AS NOTED	
DESIGNED BY	LO	FEB 17
DRAWN BY	LO	FEB 17
CHECKED BY	AM	JUL 18
PROJECT MGR	AF	JUL 18
CLIENT APPR.		

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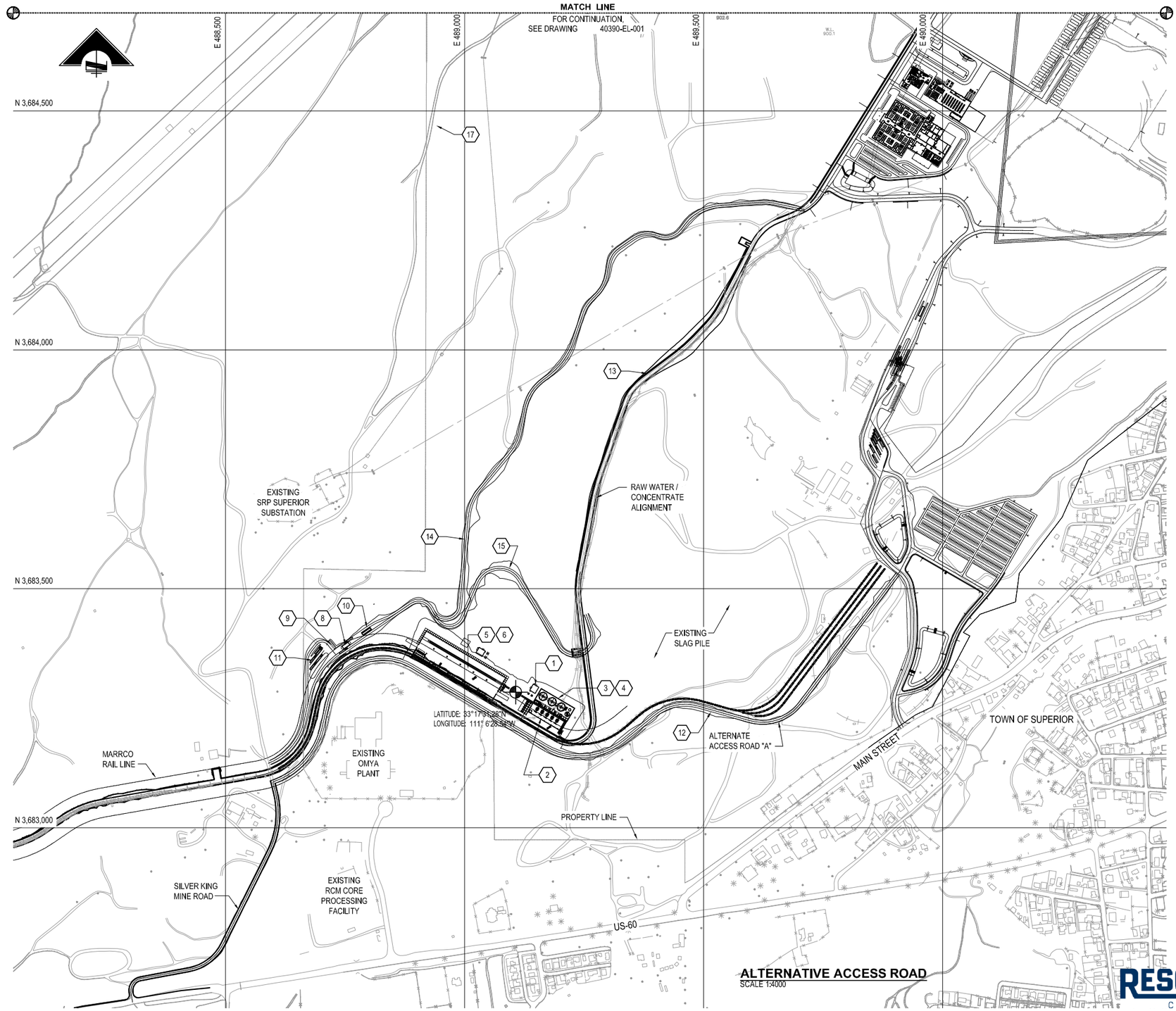
Resolution Copper Mining, LLC

LIGHTING PLAN
WEST PLANT SITE
ELECTRICAL
NEAR WEST TAILINGS LIGHTING

PROJECT NO. M3-PN140023.605
DWG NO. **40390-EL-002**
REV NO. 3 | DATE 23 JUL 18

File: P:\2014\140023.605\ELEC (34B)\140023.605 Combine Site Option\40390-EL-002 - Near West Tailings.dwg LAST UPDATE:7/18/2018 8:05 AM BY: LO455



ALTERNATIVE ACCESS ROAD
SCALE 1:4000

	Building/Area	Fixture Type	Manufacture/Model No.	Fixture Lumens	Fixture Quantity	Total Lumens
1	Electrical Building	B	LSI Industries #SWM-2-LED-UE	4,080	5	20,400
2	Concentrate Filter Plant	A	LSI Industries #SWS-2-LED-UE	1,322	6	7,932
		E	LSI Industries #SWM3-WT-LED-48-450-UE	5,563	16	89,008
3	Tank Area	I1	Crouse-Hinds #PMV-7L-P-R1-G-UNV1	7,195	15	107,925
4	Tank Area Stairs	I2	Crouse-Hinds #PMV-3L-P-R1-G-UNV1	3,531	12	42,372
5	Concentrate Loadout Building	A	LSI Industries #SWS-2-LED-UE	1,322	5	6,610
		B	LSI Industries #SWM-2-LED-UE	4,080	4	16,320
		E	LSI Industries #SWM3-WT-LED-48-450-UE	5,563	28	155,764
6	Concentrate Loadout Building Stairs	I2	Crouse-Hinds #PMV-3L-P-R1-G-UNV1	3,531	13	45,903
8	Guard House	A	LSI Industries #SWS-2-LED-UE	1,322	9	11,898
9	Guard House Parking	P1	LSI Industries #XLCS-3-LED-HO-UE	13,400	2	26,800
10	Truck Scale	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	2	20,286
11	Truck Staging Parking	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	7	71,001
12	Alternative Access Road "A"	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	18	182,574
13	Raw Water/Concentrate Pipeline Alignment	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	19	192,717
14	Truck Route "A"	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	24	243,432
15	Truck Route "B"	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	8	81,144
	Total Area Lumens					**1,322,086**

NOTE:
1. COLOR TEMPERATURE (2100K).

OPTION - WEST PLANT SITE

120 60 0 120 240
SCALE IN METERS
DO NOT SCALE 11x17 DRAWINGS

PRELIMINARY
NOT FOR CONSTRUCTION

RESOLUTION COPPER

STAGE 2

REFERENCES DWG. NO.	REFERENCES TITLE	REFERENCES DWG. NO.	REFERENCES TITLE
-	-	-	-
-	-	--	-
-	-	-	-
-	-	-	-
-	-	-	-

REVISIONS NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT
	-				

REVISIONS NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT

		DATE
SCALE:	1:4000	
DESIGNED BY	LO	APR 18
DRAWN BY	LO	APR 18
CHECKED BY	AM	JUL 18
PROJECT MGR	AF	JUL 18
CLIENT APPR.		

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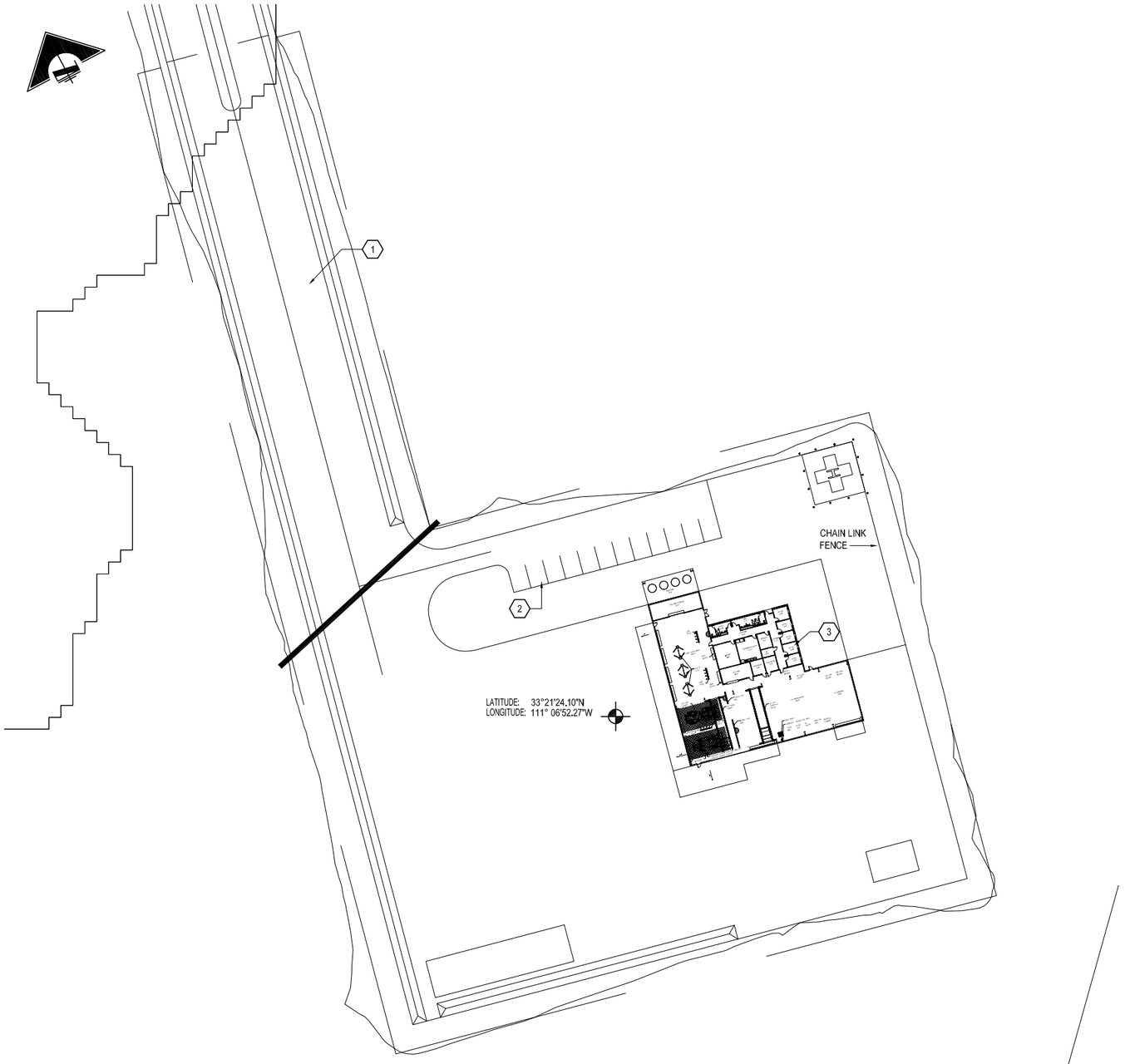
Resolution Copper Mining, LLC

LIGHTING PLAN
WEST PLANT SITE
ELECTRICAL
CONCENTRATE LOADOUT LIGHTING - SHT. 1

PROJECT NO. M3-PN140023.605
DWG NO. **40340-EL-003.1**
REV NO. 3
DATE 23 JUL 18



FACILITIES

SCALE: 1/4" = 1'-0"

KEY PLAN

NO SCALE:

	Building/Area	Fixture Type	Manufacture/Model No.	Fixture Lumens	Fixture Quantity	Total Lumens
1	Drive	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	16	162,288
		R4	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	20,284	1	20,284
2	General Parking	P1	LSI Industries #XLCS-3-LED-HO-UE	13,400	3	40,200
3	Maintenance/Administration	A	LSI Industries #SWS-2-LED-UE	1,322	24	31,728
		B	LSI Industries #SWM-2-LED-UE	4,080	4	16,320
	Total Area Lumens					270,820

NOTE:

1. COLOR TEMPERATURE (2100K).

OPTION - SILVER KING SITE

4' 2' 0' 4' 8'

1/4"=1'-0"

DO NOT SCALE 11x17 DRAWINGS

RESOLUTION COPPER

PRELIMINARY
NOT FOR CONSTRUCTION

STAGE 2

REFERENCES		REFERENCES		REVISIONS						REVISIONS					
DWG. NO.	TITLE	DWG. NO.	TITLE	NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT	NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT

SCALE:	AS NOTED	
DESIGNED BY	LO	FEB 17
DRAWN BY	LO	FEB 17
CHECKED BY	AM	JUL 18
PROJECT MGR	AF	JUL 18
CLIENT APPR.		

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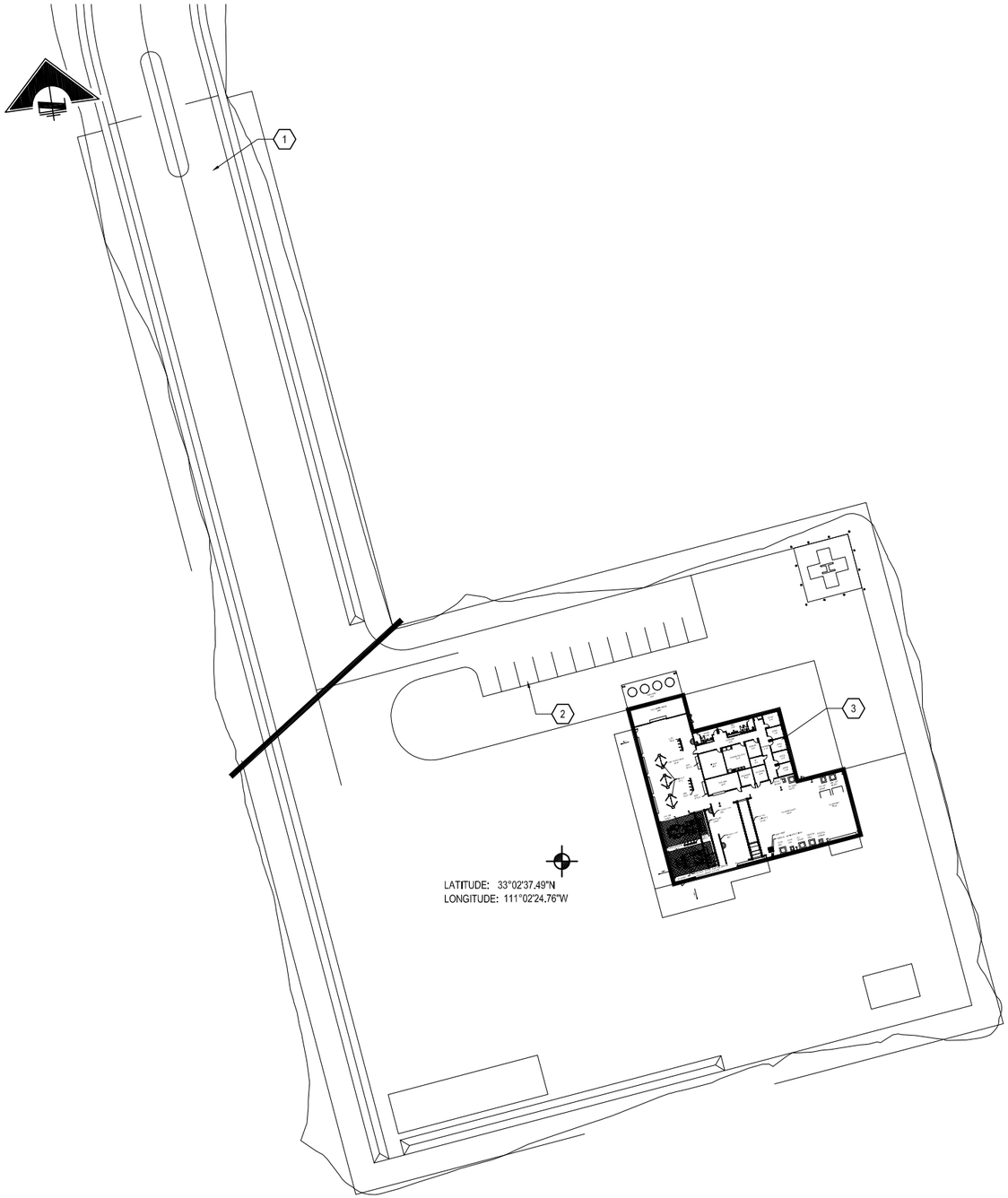
LIGHTING PLAN
SILVER KING SITE
ELECTRICAL
SILVER KING SITE LIGHTING

PROJECT NO. M3-PN140023.605

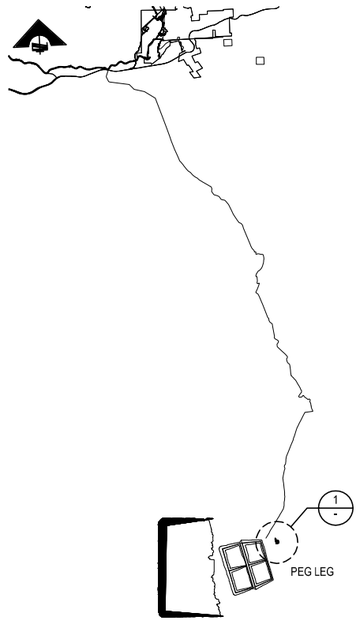
DWG NO. **40390-EL-002.1**

REV NO. 3 | DATE 23 JUL 18



FACILITIES

SCALE: 1/4" = 1'-0"



KEY PLAN

NO SCALE:

	Building/Area	Fixture Type	Manufacture/Model No.	Fixture Lumens	Fixture Quantity	Total Lumens
1	Drive	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	16	162,288
		R4	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	20,284	1	20,284
2	General Parking	P1	LSI Industries #XLCS-3-LED-HO-UE	13,400	3	40,200
3	Maintenance/Administration	A	LSI Industries #SWS-2-LED-UE	1,322	24	31,728
		B	LSI Industries #SWM-2-LED-UE	4,080	4	16,320
	Total Area Lumens					270,820

NOTE:

1. COLOR TEMPERATURE (2100K).

OPTION - PEG LEG SITE

4' 2' 0' 4' 8'

1/4"=1'-0"

DO NOT SCALE 11x17 DRAWINGS

PRELIMINARY
NOT FOR CONSTRUCTION

STAGE 2

REFERENCES		REFERENCES		REVISIONS						REVISIONS					
DWG. NO.	TITLE	DWG. NO.	TITLE	NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT	NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT

SCALE:	AS NOTED	
DESIGNED BY	LO	FEB 17
DRAWN BY	LO	FEB 17
CHECKED BY	AM	JUL 18
PROJECT MGR	AF	JUL 18
CLIENT APPR.		

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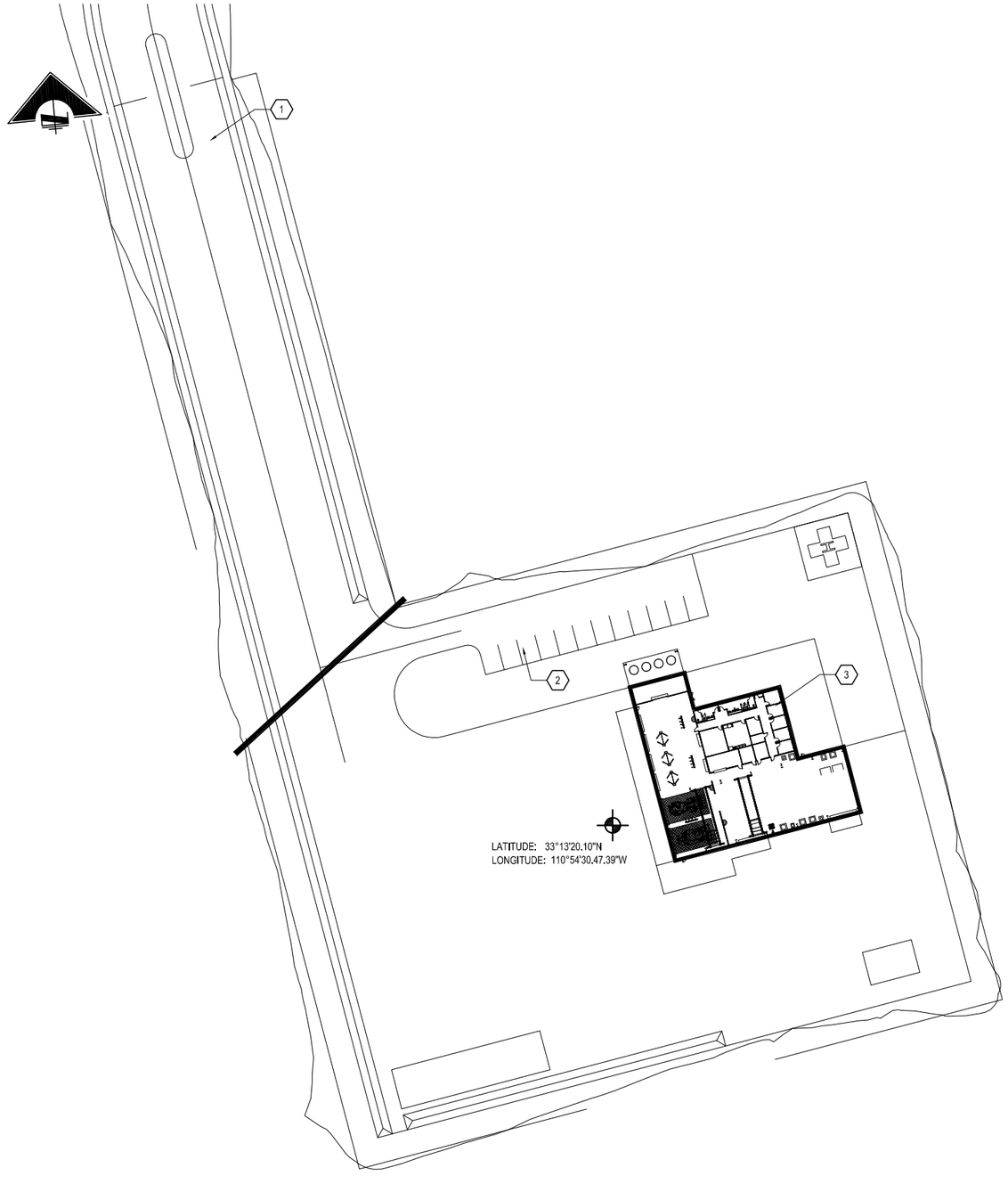
LIGHTING PLAN
PEG LEG SITE
ELECTRICAL
PEG LEG SITE LIGHTING

PROJECT NO. M3-PN140023

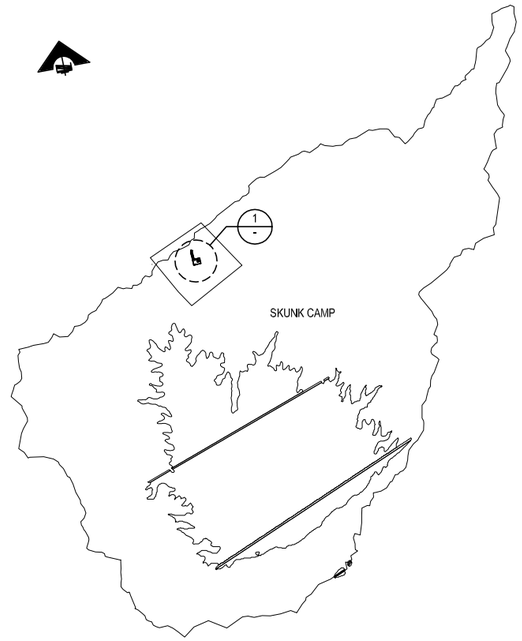
DWG NO. **40390-EL-002.2**

REV NO. 0 | DATE 23 JUL 18

File: P:\2014\140023.600\EEC (346)\140023.600 Combine Site Option\40390-EL-002.2 – Peg Leg.dwg LAST UPDATE:7/23/2018 11:11 AM BY: LO455



FACILITIES
SCALE: 1/4" = 1'-0"



KEY PLAN
NO SCALE:

	Building/Area	Fixture Type	Manufacture/Model No.	Fixture Lumens	Fixture Quantity	Total Lumens
1	Drive	R1	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	10,143	16	162,288
		R4	Philips Lumec #RX1-48-G2-2-A-7-RCD-PH8	20,284	1	20,284
2	General Parking	P1	LSI Industries #XLCS-3-LED-HO-UE	13,400	3	40,200
3	Maintenance/Administration	A	LSI Industries #SWS-2-LED-UE	1,322	24	31,728
		B	LSI Industries #SWM-2-LED-UE	4,080	4	16,320
	Total Area Lumens					270,820

NOTE:
1. COLOR TEMPERATURE (2100K).

OPTION - SKUNK CAMP SITE

4' 2' 0' 4' 8'
1/4"=1'-0"

DO NOT SCALE 11x17 DRAWINGS

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STAGE 2

REFERENCES DWG. NO.	REFERENCES TITLE	REFERENCES DWG. NO.	REFERENCES TITLE

REVISIONS NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT

REVISIONS NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT

		DATE
SCALE:	AS NOTED	
DESIGNED BY	LO	FEB 17
DRAWN BY	LO	FEB 17
CHECKED BY	AM	JUL 18
PROJECT MGR	AF	JUL 18
CLIENT APPR.		

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Resolution Copper Mining, LLC

LIGHTING PLAN
SKUNK CAMP SITE
ELECTRICAL
SKUNK CAMP SITE LIGHTING

PROJECT NO. M3-PN140023
DWG NO. **40390-EL-002.3**
REV NO. 3
DATE 23 JUL 18

File: P:\2014\140023.605\[140023.605 Combine Sites Option\40390-EL-002.3 - Skunk Camp.dwg LAST UPDATE: 7/23/2018 11:13 AM BY: LO455

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RESOLUTION COPPER

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07/30/2018

Mary Rasmussen
US Forest Service
Supervisor's Office
2324 East McDowell Road
Phoenix, AZ 85006-2496

Subject: Resolution Copper Mining, LLC – Mine Plan of Operations and Land Exchange – Outdoor Lighting & Pinal County Outdoor Lighting Code Technical Memo including Alternatives (Rev. 3)

Dear Ms. Rasmussen,

Enclosed for your review and consideration, please find attached a copy of the Outdoor Lighting & Pinal County Outdoor Lighting Code Technical Memo including Alternatives (Rev. 3).

Should you have any questions or require further information please do not hesitate to contact me.

Sincerely,

Vicky Peacey,
Senior Manager, Permitting and Approvals; Resolution Copper Company, as Manager of Resolution Copper Mining, LLC

Cc: Ms. Mary Morissette; Senior Environmental Specialist; Resolution Copper Company
Ms. Kami Ballard; Environmental and Permitting Advisor; Resolution Copper Company

Enclosure(s): *Outdoor Lighting & Pinal County Outdoor Lighting Code Technical Memo including Alternatives (Rev. 3)*