

DOWNTOWN DERBY DISTRICT LIGHTING MASTER PLAN - DELIVER



Downtown Lighting Plan



Commerce
CITY



Derby Lighting Plan

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01

Project Context & Background

PROJECT CONTEXT & BACKGROUND

The Derby District is the historic heart of Commerce City and it is due for a redevelopment of its dated lighting systems. A revitalization of the lighting systems would help to celebrate the District's original railroad town history and enhance the sense of community while meeting Goal Five: Revitalize Derby of the Derby Sub Area Plan. Updating the lighting systems would also add much needed vibrancy to the District, highlighting the area as a retail, dining and public use space that should attract people as a destination. This would help meet Goal Two: Re-establish Derby as a Destination of the Derby Sub Area Plan. The lighting systems can be upgraded in conjunction with updates to the signage and way-finding elements of the District which would help to provide a visual identity to the Derby area and meet Goal Three: To give Derby greater visibility and identity of the Derby Sub Area Plan.

A cultural mural of the past, present and future located in the Derby District on the north facade of the Save-A-Lot at 7290 Monaco Street.

Mural of the Derby logo located on the west facade of the Tasty Donuts building at 6441 E 72nd Place as seen from Joe Reilly Park.

Lighting can be utilized to create and support a visual identity for the Derby District, embracing the small town feel while creating a friendlier and safer environment for pedestrians, patrons and vehicular traffic. In coordination with the 1950's-1970's dominated architecture, a dynamic and interconnected lighting scheme will help to bring the back the area's desirability and vitality as a destination and help satisfy Goal Four: Use the 1950s Era as a unifying architectural foundation of the Derby Sub Area Plan. Derby was developed in a time when cities were built for the automobile. Small sidewalks and inadequate lighting create unwelcoming and unsafe pedestrian spaces. Tailoring aspects of the lighting to the human scale will promote healthy, positive and vibrant activities for both day and night, as well as create a much safer environment.

Lighting can also embrace the strong connection between way-finding, enhancing the identity and culture which embodies the Derby District. Dated systems will be evaluated for replacement with new technologies such as LED luminaires and advanced controls which would allow for more energy efficient and easily operable solutions as well as meet Goal 6: Become an Environmental Model of the Derby Sub Area Plan.

The renewed lighting plan for Derby will be directed towards the diverse groups of residents, promote safe and active pedestrian activity, and make Derby a desirable destination for community members.

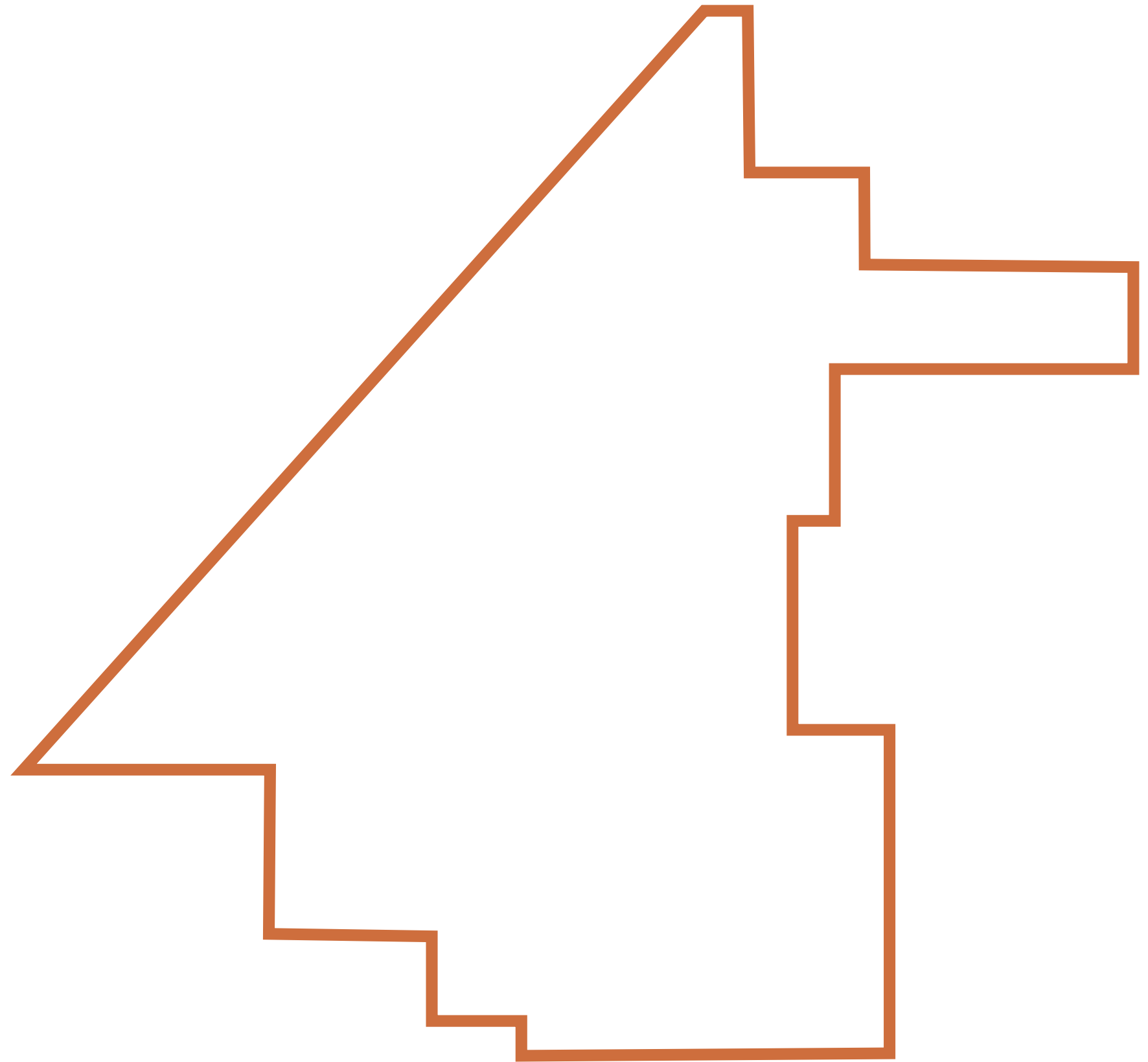
PROJECT APPROACH

The project is broken into three distinct phases in order to effectively evaluate the existing lighting systems and make proper recommendations for revitalization. The phases are as follows:

1. **Discover** - The Discovery phase included a detailed assessment of the existing state of the lighting systems in order to determine if the lighting systems were in need of upgrading. Evaluation of the current conditions included in depth analysis of the existing lighting systems found within the district.
2. **Create** - Following evaluation of the existing conditions as part of the Discovery phase, the project then proceeded into the Create phase where potential solutions were evaluated to determine the most prudent design solution for new lighting systems.
3. **Delivery** - The Delivery phase is the development of a detailed master-plan type document which will outline the design solution in detail for future implementation.

The Discovery phase was initiated by conducting field studies to understand the existing conditions, assess the community needs and ascertain background on the history and future plans for the Derby District. Several community outreach programs and surveys were implemented to allow the community the opportunity to be heard on what issues were most important to them. All of this gathered information was taken into account as the project was being evaluated and a set of metrics were created, tailored specifically to the needs of the Derby District. These metrics were derived from the current industry standards to create a framework against which both the existing and proposed lighting conditions within the Derby District can be measured.

The following pages outline and define the metrics for which the lighting systems can be evaluated.



Map outlining the scope boundary for the Derby Downtown District Lighting Plan.

02

Project Goals

REQUIREMENTS

Based on our experience, lighting installations are most successful when they meet or exceed standard levels of illumination as outlined by the Illuminating Engineering Society of North America (IESNA), utilize quality luminaires that adhere to industry standard codes and design guidelines, and when they create an identity for the area in which they are installed.

A successful lighting redevelopment project for the Derby District should satisfy these same design criteria by meeting the following goals:

- 1. Levels of Illumination:** Provide lighting solutions with appropriate levels of illumination that are also within acceptable ratios of uniformity.
- 2. Lighting Quality:** Provide lighting solutions of suitable color quality with vertical illumination for safety of pedestrians in the nighttime environment.
- 3. Optical Performance:** Provide lighting that is respectful of the night skies and of neighboring properties by utilizing luminaires with high quality optical performance.
- 4. Energy and Maintenance:** Provide energy efficient lighting solutions that are within current energy code standards and that provide easily maintainable solutions.
- 5. Private Property:** Provide a means for addressing private property lighting to support the initiatives within the Derby District.
- 6. Visual Identity:** Provide lighting systems that have a visual identity and connection to the District and additional Way-finding / Signage efforts for a cohesive solution.

The following pages outline the importance of each goal in more detail.

CODES AND INDUSTRY STANDARDS

Project recommendations shall comply with local and state jurisdictional code authorities. Applicable codes include, but are not limited to, the following:

- a. Illuminating Engineering Society of North America (IESNA) 10th Edition Handbook,
- b. International Building Code (IBC) 2012 series of codes including 2012 IECC (International Energy Conservation Code) and 2014 NEC (National Electric Code),
- c. International Dark-Sky Association,
- d. Commerce City Land Development Code,
- e. And the Derby Sub Area Plan and Design Guidelines.

Pedestrian lighting scheme with strong vertical illumination and visual theme.

1. LEVELS OF ILLUMINATION

The recommended lighting solutions shall provide adequate levels of illumination for safety and visual acuity along all roadways, sidewalks and pedestrian areas. A focus on both vertical and horizontal illumination at sidewalks will enhance the safety of the space at night. Horizontal lighting is necessary for adequately seeing and traversing pathway and roadway surfaces. Vertical illumination is essential for spacial context and the ability to see objects within the area. Vertical illumination is also what gives us the ability to see things like people's faces, the color of vehicles and other details that we rely on to give us a sense of safety and security within the night environment.

The recommended light levels for the designated space zones are as follows based on IESNA standards:

ROADWAYS		Avg. Concrete	Avg. Asphalt	Uniformity Ratio
1	LOCAL ROAD RESIDENTIAL	0.3 fc	0.4 fc	6:1
2	LOCAL ROAD INTERMEDIATE	0.5 fc	0.6 fc	6:1
3	LOCAL ROAD COMMERCIAL	0.6 fc	0.8 fc	6:1
4	COLLECTOR ROAD COMMERCIAL	0.8 fc	1.2 fc	4:1
5	MAJOR ROAD COMMERCIAL	1.2 fc	1.7 fc	3:1

SIDEWALKS

	COMMERCIAL	INTERMEDIATE	RESIDENTIAL	ON ROADWAY
Minimum Horizontal Illuminance	1.0 fc	0.6 fc	0.2 fc	0.5 fc
Vertical Average 6' AFG	2.2 fc	1.1 fc	0.5 fc	0.5 fc



Map of the five indicated roadway illumination classifications as required have been identified for the Derby District. The yellow shown above gets increasingly brighter as light level requirements increase.

*Refer to graphics on page 12 for comparison of existing light level conditions.

2. LIGHTING QUALITY

Having good lighting quality in a space is about more than just having high levels of illumination, it's about using the right amount of light, when and where it's needed. The following categories are important aspects that lend to good light quality in exterior spaces :

Visual Acuity & Adaptation

Visual acuity and adaptation are important concepts related to roadway lighting for vehicular and pedestrian safety. Visual acuity refers to the effectiveness of an individual's visual system. The visual system takes time to adjust from light to dark settings, known as light adaptation. Therefore, for optimal safety and visual acuity, lighting systems need to be design to maintain a reasonable spread between light and dark, known as the ratio of uniformity. This is particularly concerning in the exterior nighttime environment in areas where there is potential for vehicular and pedestrian conflict. Both drivers and pedestrians need to maintain good visual acuity, particularly around areas such as intersections with crosswalks, so that everyone stays safe. This relates to the uniformity ratios provided as part of the IESNA recommendations from the previous page.

"Before" image of high glare lighting with unsafe perimeter. "After" image of lower light levels, less glare, and a wider perimeter perceived as safer.

Left image of low CCT with low CRI where it's hard to tell the color of cars. Right image of desirable CCT and high CRI where colors are easily identifiable.

Color Quality

Correlated color temperature (CCT) is a metric that quantifies the color or perceived "whiteness" of a light source. Meanwhile, the color rendering index (CRI) is a metric indicating how accurately a light source renders color. These are separate, but often related metrics for evaluating dated light source technologies. An example would be high pressure sodium light sources with a CCT of approximately 2000K and a CRI of 20- 60, this type of lighting is perceived as creating an uncomfortable environment with a very yellow or orange colored light where colors are not easily identifiable. It's more desirable to have what is perceived as a "whiter" color source with a CCT in the range of 3000-5000K and with a CRI of greater than 80 for what is perceived as true rendition of colors.

Color quality is an important metric for exterior environments as it gives people a perceived sense of safety and security when they can easily identify color characteristics such as the color of vehicles, people's clothing and faces.

Additionally, there are some spectral distributions of light which tend to be in the cooler color temperature range, greater than 4000K, that can be disruptive to sleep patterns and should be used with caution in areas including or neighboring residential properties.

Vertical Illumination

Vertical illumination can create visual boundaries and a sense of space. It is the amount of light that is falling on vertical planes in a space. These visual boundaries can help to differentiate private versus public spaces, designate vehicular versus pedestrian zones and define the Derby District from the neighboring community areas. Additionally, quality vertical illumination, as opposed to simply focusing on light falling on the horizontal plane at the ground, is essential for pedestrian safety as it allows for facial recognition and the ability to identify safe or potentially unsafe situations.

Modern technology light sources, such as LED, have high performance optics designed to put the light where it is needed, which includes vertical planes in addition to the horizontal ground plane. Utilizing modern lighting technologies will help illuminate vertical planes, making spaces feel safer and more welcoming at night. The color temperature of the light will also be more consistent across the various luminaires, which allows for an over all better lighting quality and a safer feeling space.

A depiction of vertical illumination on faces. Her face is well illuminated which is perceived as welcoming and safe, whereas his face is in the dark without visibility of facial features which is more mysterious and likely to be perceived as unsafe.

3. OPTICAL PERFORMANCE

The International Dark-sky Association (IDA) works to protect the night skies for present and future generations. As such, the IESNA has developed BUG Ratings, for quantifying the optical performance of luminaires into categories of Backlight, Uplight, and Glare. Many jurisdictions enforce the use of appropriate BUG rated luminaires depending on the development zone characteristics. For example, uplight and glare may be perceived as more acceptable in an urban environment but can be a detriment to residential and more suburban or rural communities. This means that the type of lighting matters and that appropriate luminaire and optical configurations shall be utilized appropriately to illuminate various zones within a development plan.

Luminaires shall be full cut-off where appropriate to limit spill light onto neighboring properties. High performing luminaires shall be considered which have highly controlled optics for efficiency and control of spill light. Glare shall be shielded and controlled such that the light source is shielded and appropriately aimed such that the lighting is not a nuisance to neighboring properties or passersby.

Rigorous lighting standards require that installed lighting systems comply with performance standards, currently the Derby District does not include this in the Municipal Code, but it is a prudent metric for design and evaluation of existing installations.

Graphic of BUG (backlight, uplight, and glare) rating classifications for luminaire performance. Classifications are determined based on where the light is coming out of the fixture [back (B), forward (F), up (U)] and the angle at which the light is coming out of the fixture [low (L), medium (M), high (H), very high (VH)].

4. ENERGY & MAINTENANCE

It's important for lighting systems to have long life systems and easily available parts for maintenance over their lifetime. Lighting technologies have made great advancements in recent years, moving from incandescent, fluorescent and high intensity discharge (high and low pressure sodium and metal halide) to predominantly long life LED sources. LED luminaires are able to provide more light in a more controlled manner for less energy and with less maintenance than previously utilized sources.

All new installations should comply with current energy usage allowances per IECC 2012 (currently adopted code for the City of Commerce City at the time of writing this document), section C405.6.2. Adhering to these codes will allow the Derby District to have more energy efficient lighting and a significant reduction in energy bills and associated recurring maintenance needs and outages.

XCEL Energy

Generally roadway lighting within various municipalities and districts are furnished and maintained by XCEL Energy, as appears to be the case with the vast majority of existing luminaires within the public realm of the Derby District. However, XCEL has moved towards increased performance and energy efficiency by providing a limited selection of LED luminaires. Albeit, those solutions may or may not be suitable for the future direction of the lighting systems within Derby.

If that happens to be the case, Xcel will often work with private developers or municipalities to allow special districts with luminaires that differ from the Xcel standards. Xcel generally powers and maintains those roadway systems which comply with their standards. In the case of special districts where the luminaires differ from their standards, Xcel has been known to power them at their standard rates and pass the maintenance on to the district, development or municipality. Even if the lighting system is more efficient, using less power than the traditional Xcel standards, they generally will not negotiate the rate down to reflect the reduced power consumption. However, this provision would allow the Derby District to utilize luminaire systems that differ from the Xcel standards in order to support a district standard lighting scheme which visually supports the identity of the District.

Public roadway, walkway and ambient lighting blend with private property.

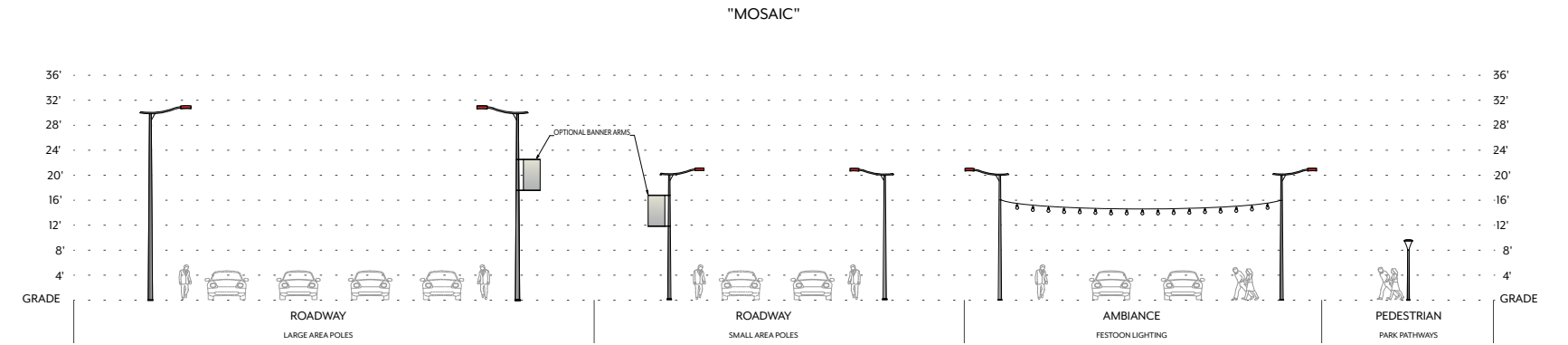
Example of strong design concept that blends from public to private realm.

5. PRIVATE PROPERTY

In an effort to make the entire Derby District feel cohesive, the lighting on private property should also be addressed. It is important to ensure that all exterior luminaires are conforming to current codes and design standards. This is difficult given that there is limited new construction and a large number of existing installations which are grandfathered under older and outdated standards. However, property owners with existing installations should be encouraged to maintain and update their lighting accordingly to aid in the cohesiveness of the District. Maintaining the private property lighting would also assist in making the retail area feel more vibrant, welcoming and safe at night. Light level requirements for private properties are not as high or as rigorous as the requirements for public spaces, yet it is still equally as important in affecting the overall feel and perception of an area at night where public and private blend together. Curtailing current issues such as lamps that are out, varying color temperatures and glare will be a beneficial step forward in making the Derby District a vibrant and welcoming destination.

6. VISUAL IDENTITY

Exterior lighting is often something that people do not notice during the day. However, that does not have to be the case. Lighting systems can be a great mechanism for creating or supporting a visual identity for a space, development or district. Rather than simply providing high overhead lighting from street lights, use of lower height pedestrian level lighting with a design character can help to visually unify an area. Utilizing a variety of luminaire solutions together as a family is a great way to add visual interest and identity while also being an efficient option that tailors various light outputs to meet the needs of the specific areas where they are used. The following categories are examples of different types of luminaires that can be utilized together to create a layered family approach with a strong and cohesive visual identity.



Sample of a contemporary lighting family that creates a strong visual identity.

Gateway, Entry Roadway

Major monument type lighting and way-finding elements combine to highlight an arrival element denoting the entry into a district or region.

Pedestrian Area

Common lighting often seen around 30 feet in height, providing general horizontal illumination for pedestrian and vehicular circulation.

Decorative Pedestrian

Often decorative in character or of a uniquely identifying character, pedestrian level lighting elements are often in the range of 10-16 feet in height, providing high levels of vertical illumination at a loer and more intimate height, for the safety of pedestrians.

Low-Level

Light columns, bollards, landscape accent lighting, and in-ground path marker lights create an intimate level of illumination near the ground at a pedestrian scale for aiding in way-finding and creating atmosphere.

Ambiance

Elements such as string or festoon lighting can be utilized to create a sense of space within the outdoor environment, almost like a room outdoors, with a festive, vibrant feel.

Accessories

Elements such as banner arms, signage, security cameras, flower baskets, and marker lights can all be integrated into lighting schemes for added effect and design flair in support of a central theme.

An example of a lighting installation with a strong visual identity.

03

Existing Conditions

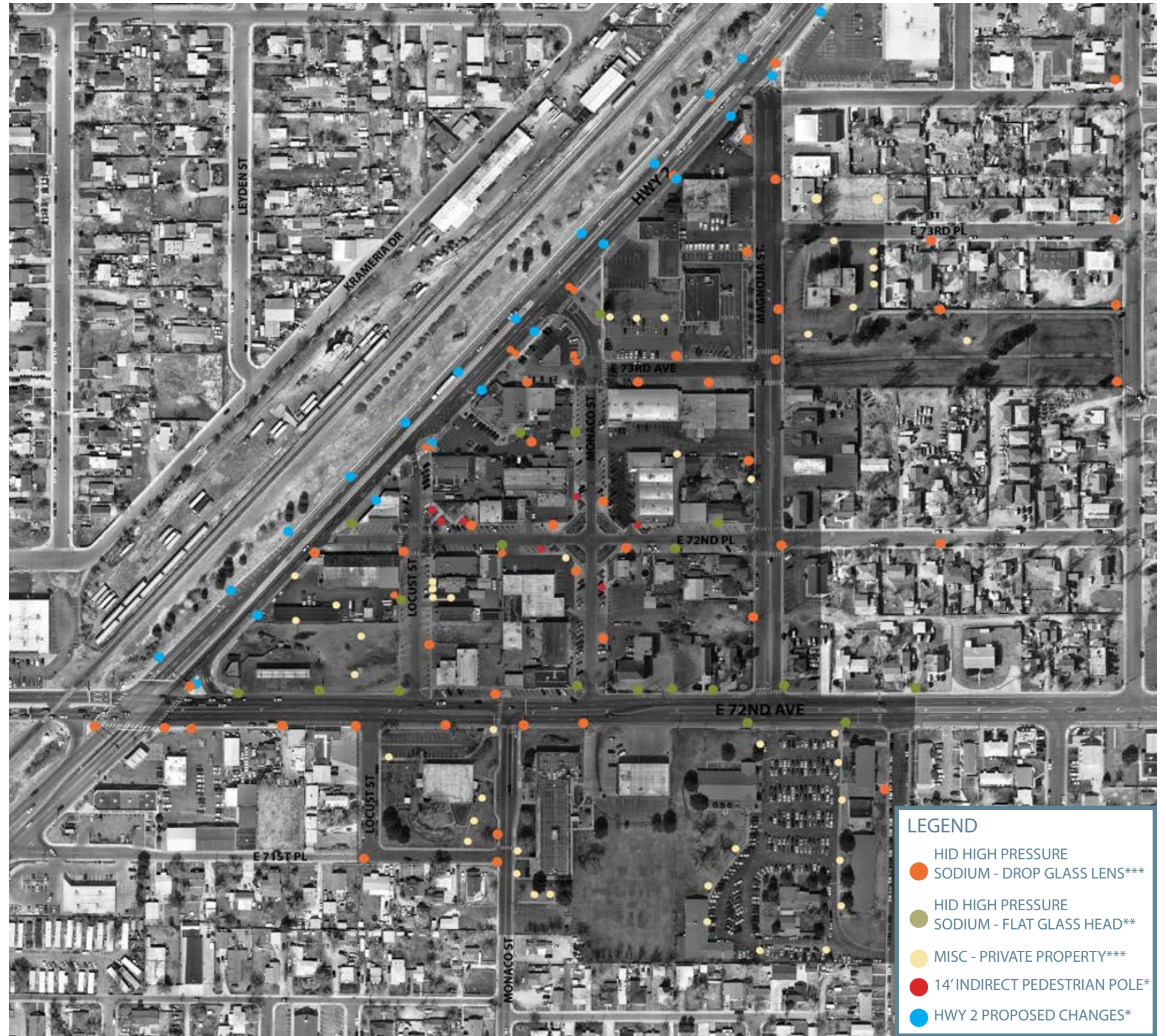
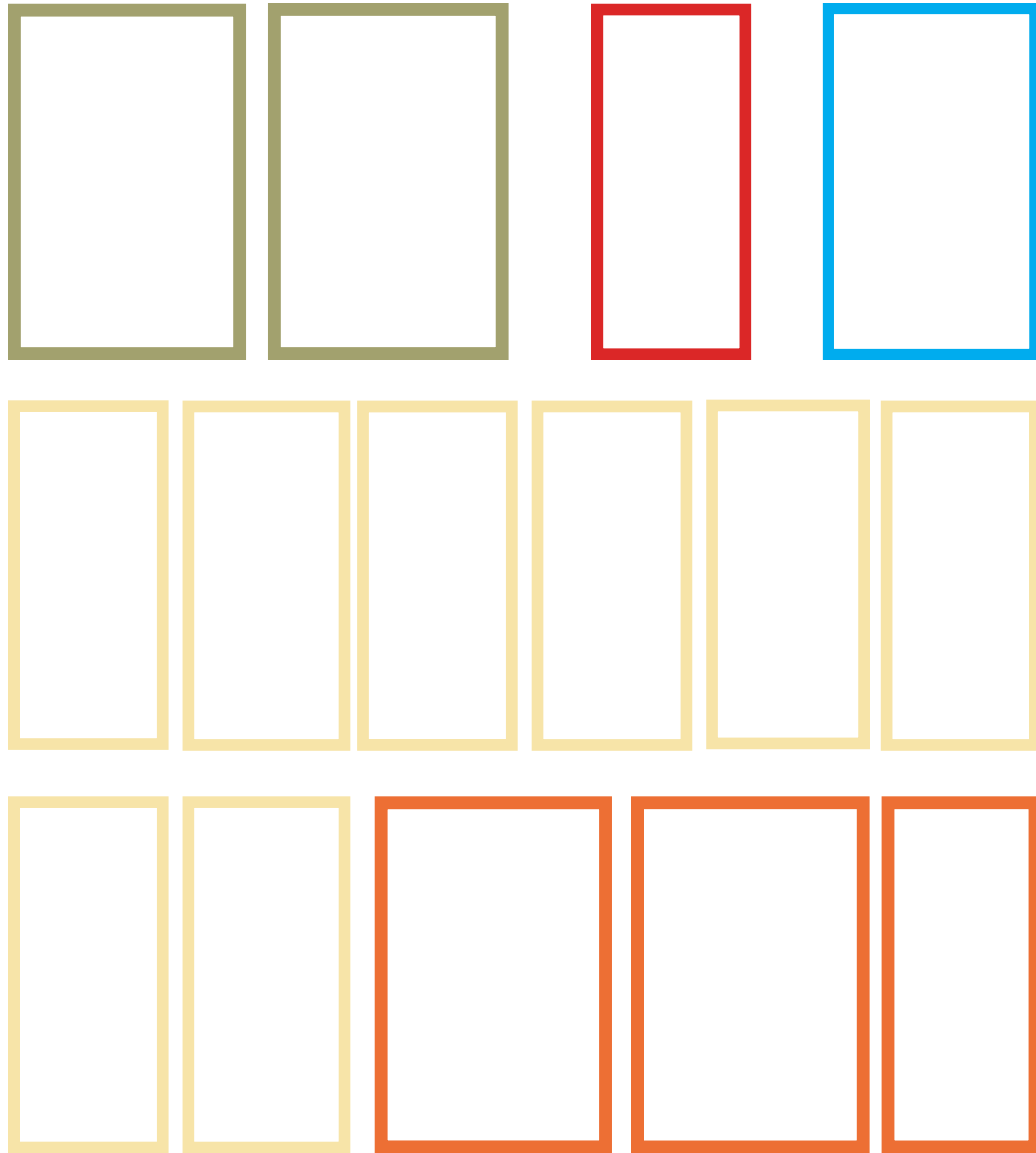
EXISTING CONDITIONS

A successful lighting revitalization project for the Derby District would need to satisfy the following criteria, as outlined in the prior section on Project Goals. The first step is to evaluate the existing conditions based on these metrics.

1. **Levels of Illumination:** Provide lighting solutions with appropriate levels of illumination that are also within acceptable ratios of uniformity.
2. **Lighting Quality:** Provide lighting solutions of suitable color quality with vertical illumination for safety of pedestrians in the nighttime environment.
3. **Optical Performance:** Provide lighting that is respectful of the night skies and of neighboring properties by utilizing luminaires with high quality optical performance.
4. **Energy and Maintenance:** Provide energy efficient lighting solutions that are within current energy code standards and that provide easily maintainable solutions.
5. **Private Property:** Provide a means for addressing private property lighting to support the initiatives within the Derby District.
6. **Visual Identity:** Provide a lighting systems that have a visual identity and connection to the District and additional Way-finding / Signage efforts for a cohesive solution.

Day time photos of some of the various types of lighting found throughout public and private properties within the Derby District.

Prior to evaluating the detailed criteria, an inventory of existing lighting types and locations was created. The map to the right is color coded to the below images of luminaire types by category. Note that the blue colored luminaires for Highway 2 are currently being installed in the indicated locations as part of the reconstruction project. Refer to the appendix for additional plan views at a more detailed scale.



Map of the Derby District with existing luminaire locations indicated by color keyed dot as coordinated with the legend and luminaire images to the left.

* Powered from underground.

** Powered from overhead power lines.

*** Powered from a mixture of underground and overhead power lines.

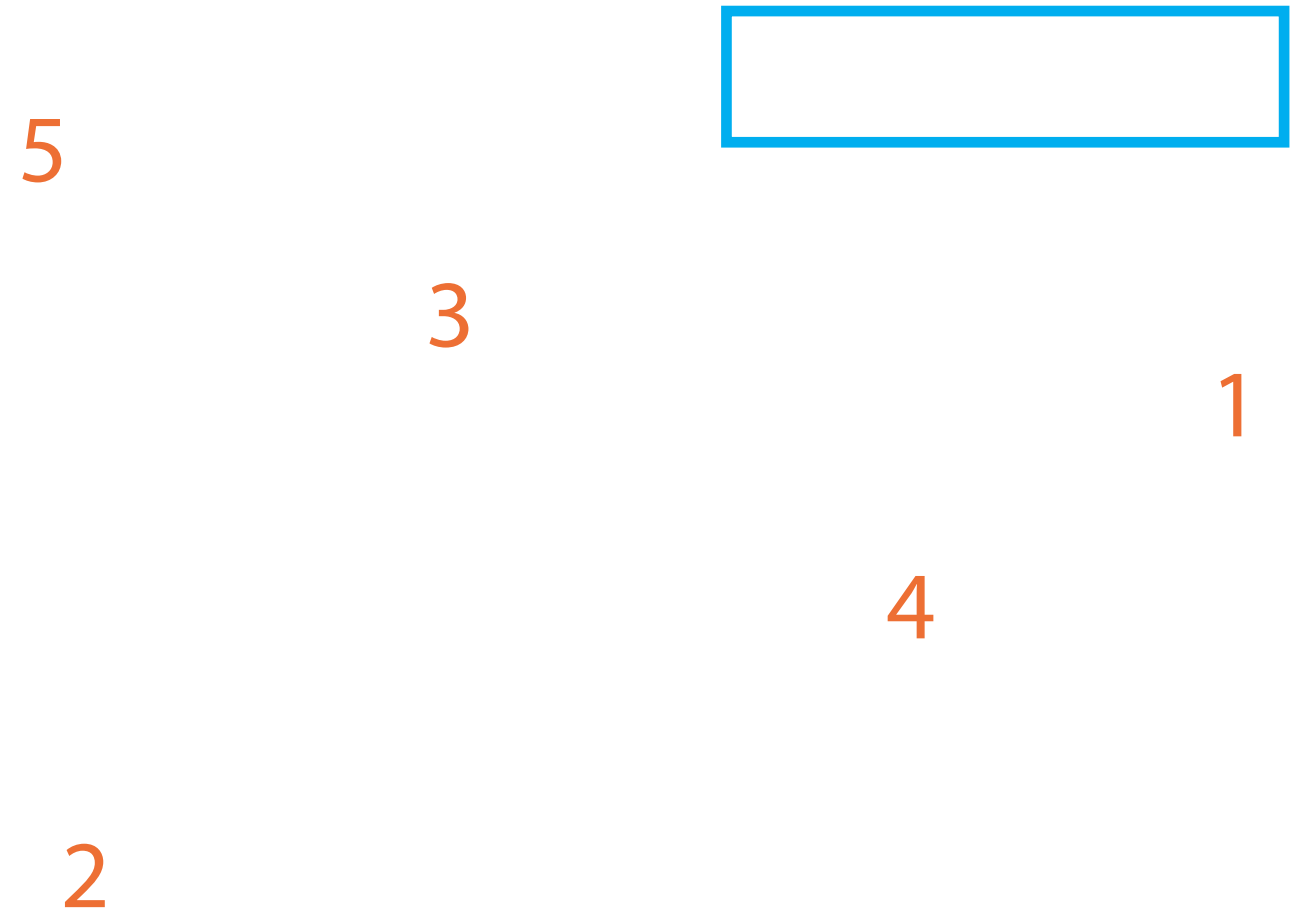
1. LEVELS OF ILLUMINATION

The current levels of illumination are very inconsistent throughout the District. This is due to outdated lamp sources and luminaires that are installed at inconsistent spacing, resulting in variable horizontal light levels on the ground plane. The inconsistent light levels are not conducive to a feeling of safety and vibrancy throughout the District. Additionally, there is a lack of vertical illumination causing spaces to feel as though the perimeter area bleeds into nothingness, with no security from a visual boundary of space. The limited vertical illumination also makes it difficult to see people, enhancing the discomfort of the area.

Lighting in the retail areas, while ample in some areas, is completely lacking in others. This lack of quality illumination can cause patrons to wonder if the area is open for business after the sun sets. Los Valientes Park is an area that has significantly insufficient light levels with only two luminaires located within the entire park (the park area is shown in **blue** on map to the right).

The map to the right depicts areas that are not compliant with IESNA recommendations in **red** and areas with light levels that are compliant in **green**.

	RECOMMENDED			ACTUAL	
	Avg. Illuminance	Uniformity Ratio		Range of Illuminance	Uniformity Ratio
1 LOCAL ROAD RESIDENTIAL	0.4 fc	6:1	0.1 - 1.5 fc	15:1	
2 LOCAL ROAD INTERMEDIATE	0.6 fc	6:1	0.1 - 0.5 fc	5:1	
3 LOCAL ROAD COMMERCIAL	0.8 fc	6:1	0.1 - 4.5 fc	45:1	
4 COLLECTOR ROAD COMMERCIAL	1.2 fc	4:1	0.1 - 0.5 fc	5:1	
5 MAJOR ROAD COMMERCIAL	1.7 fc	3:1	0.1 - 2.0 fc	20:1	



Map of existing light levels found within the Derby District where red indicates below standard levels of illumination and green indicates that the light levels are within standard recommended levels.

2. LIGHTING QUALITY

The existing luminaires in the Derby District are anything but consistent in their quality of illumination. The inconsistencies in lamp type, color quality and distribution lead to significant inconsistencies in the light levels found throughout the district. These disparities make Derby feel like an uncomfortable and unsafe place to be at night.

The majority of the existing luminaires appear to utilize high pressure sodium sources, which are often very yellow in appearance and have poor color rendering characteristics. The yellow color and low color rendering index (CRI) make it difficult to discern colors. The poor color rendition can be problematic in public and retail areas where its important to be able to identify people, their clothing and the color of vehicles. Additionally, due to the poor performance of the existing lighting systems, the light levels are not uniform which creates areas where it is difficult to maintain visual acuity. Vertical light levels are lacking given the inconsistent spacing and locations of luminaires limiting the ability to see and visually define spaces and people. All of these elements factor into people's perception of safety, or rather the lack there of, within the District at night.

Night time photo of existing luminaires with warm color temperature in the Derby District.

Night time photo of existing luminaires with cool color temperature in the Derby District

Examples of existing luminaires of various types in the Derby District that utilize dated sag glass or dropped lens technology which is not compliant with current Dark-Sky standards.

3. OPTICAL PERFORMANCE

The existing luminaires within the Derby District appear to have been installed at various times over the past several decades. Given the advances in light sources and luminaire technology, most of the optical components on the existing luminaires are outdated and do not comply with current design standards. Examples would be the high pressure sodium cobra head type luminaires which utilize outdated sag glass or dropped lens technology. These types of luminaires do not have good optical control of the light distribution, resulting in high angels of glare, poor uniformity and trespass issues with spill light falling in unintended locations. As such, these luminaires do not comply with today's full cut-off BUG type ratings or the International Dark-sky Association (IDA) efforts.

4. ENERGY AND MAINTENANCE

There is very little consistency to the existing lighting systems that are installed within the Derby District. The majority of the luminaires are cobra head type roadway luminaires of various types with high pressure sodium lamping while there are a few pedestrian scaled metal halide luminaires and a handful of LED luminaires at Los Valientes Park. The high pressure sodium roadway luminaires have various optics, lenses and pole components, many of which are wood, all of which makes for difficult maintenance. Meanwhile, the metal halide pedestrian luminaires are silver in finish and newer, although many were not operational during our visits to the area to assess luminaire performance. The LED luminaires in the park are of yet another type and of black finish.

Maintenance could be simplified by standardizing the lighting with the District to be of consistent types and finish. This would streamline maintenance by utilizing fewer components and parts while also minimizing the variety with fewer luminaire types. Implementing newer technology LED systems would also reduce maintenance due to the long life of the systems which would require maintenance in 10-15 year cycles rather than 2-5 year cycles. These newer LED systems are also notably more efficient which would result in considerably less energy use to run the systems.

Examples of the variety of light sources, poles and finishes found within the Derby District ranging from high pressure sodium on wood poles, metal halide indirect luminaires with silver metal poles and LED luminaires with black finishes.

5. PRIVATE PROPERTY

Lighting of private properties within the Derby District varies greatly, which is not surprising and is not particularly problematic as that is common and to be expected of private properties. However, given the age of many of the properties there are many lighting elements that are very outdated and not being maintained for proper working order. This results in poor vertical illumination around the buildings making it difficult to see the perimeter of the spatial environment which makes the area feel unsafe. Outages also deter people from retail and dining establishments as it can make it difficult to discern if a property is open for business. Additionally, many of the luminaire types are non-cut off meaning that they are directional in nature and often create glare. Glare can overwhelm the visual system by introducing too much light at one time to the eye while it is 'tuned' to dark, night-time light, causing an unsafe condition.

Private property flood lights that cause disability glare.

Rope lights in Joe Reilly Park that were not functional during our visits to the park.

Example of private property with light outages causing people to question if the establishment is open for business.

6. VISUAL IDENTITY

As mentioned in previous sections, the existing lighting systems are very inconsistent in appearance and performance. Both of these factors affect the visual character of the Derby District. The lighting systems currently appear chaotic and dis-similar. In order to provide a more uniform and cohesive feel to the District, it would be advisable to streamline the lighting systems to be of consistent type and character that relate to other elements found within the District. Relating the lighting poles and systems to the poles and design character of the way-finding and signage elements, a strong design element can be introduced into the Derby District. This design element should support the history and future growth of the area by instilling a vibrancy and a visually interesting design element to the area both during the day and night.

04

Community Feedback

WHAT DO THE PEOPLE HAVE TO SAY?

Community outreach programs, city meetings, on-line surveys and public workshops were all used to gather the community's input and opinion on the current state of the existing lighting systems within the Derby District. The following events were held for gathering input and information from the public:

Community Workshop - June 7, 2017

Held at the Commerce City Small Business Resource Center

Community Workshop - June 12, 2017

Held at The Yellow Rose Event Center

Community Open House - August 17, 2017

Held at the Anythink Library

The objectives for the community outreach was to inform and educate community members by providing information about the project and to get feedback that would drive the direction of the project. Each of the community meetings were attended by a small group of stakeholders, ranging from 6-15 participants. Following these public events, posters and materials were positioned at the Recreation Center and the Civic Center, each for a minimum duration of one week, for additional feedback from the community.

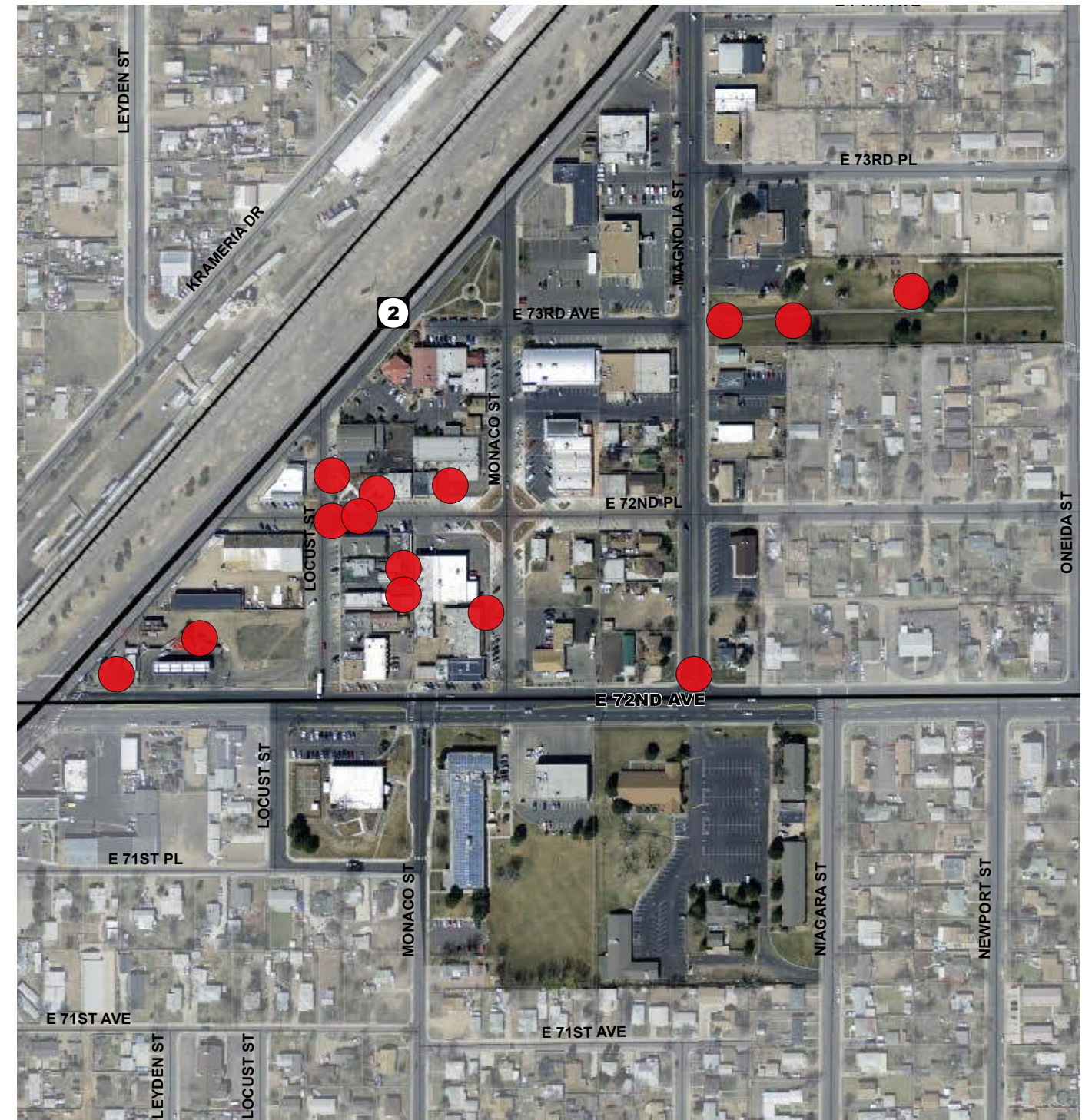
Photos from the various community workshop sessions. These photos depict graphics that were shown to community members and workshop activities that were conducted to engage attendees.

AREAS OF CONCERN

The following bullets have been distilled from these events and responses.

- The Derby District could be made more walkable if there were better lighting.
- Lighting could help to make the District more safe and appealing at night.
- Transient people are a concern, to which better lighting would help to deter.
- The visibility of the District could be enhanced, which better lighting could help support.
- It's dark, not uniformly illuminated and doesn't feel safe or "open" for business.
- Property addresses are hard to see, particularly at night as there isn't enough vertical illumination.
- The bus stop near the Library is not well illuminated and frequently has people loitering.
- The Los Valientes Park is not well illuminated, with loitering, transients and party goers causing disturbances.
- Pedestrian cross-walks could be better illuminated and highlighted for the safety of pedestrians.

The graphic to the right utilizes red dots to indicate areas where people have specific concerns for the quality of lighting, saying that it's too dark and unsafe in these areas.



A graphic map where red dots indicate areas where people within the District have specific concerns for the quality and level of illumination, making these areas feel unsafe. This map was obtained from prior planning efforts.

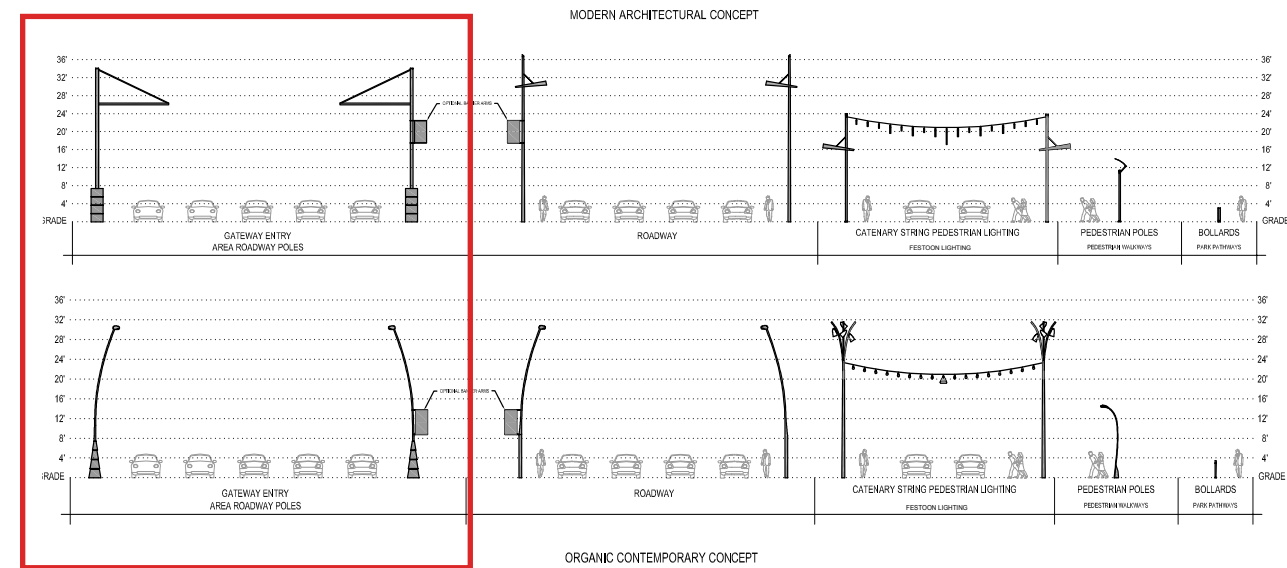
05 Design Development

STEP 1

The first step in the 'Create' process was to identify and provide examples of different types of luminaires that can be utilized together, in a community setting, to create a strong and cohesive visual identity.

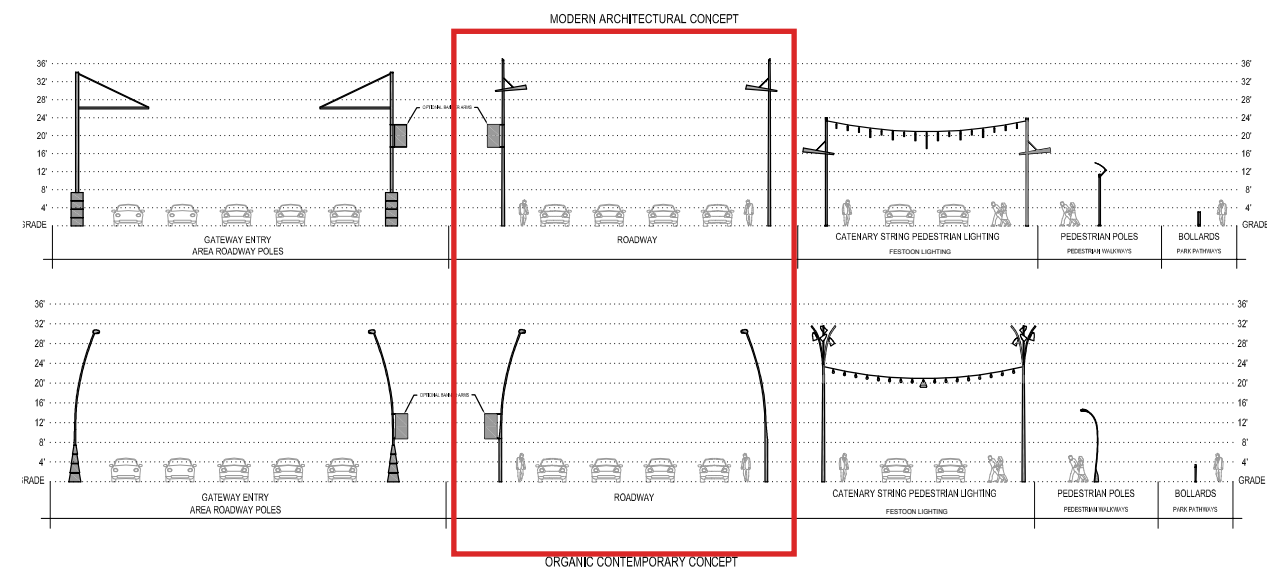
Gateway, Entry Roadway

Major monument type lighting and way-finding elements combine to highlight an arrival element denoting the entry into a district or region.



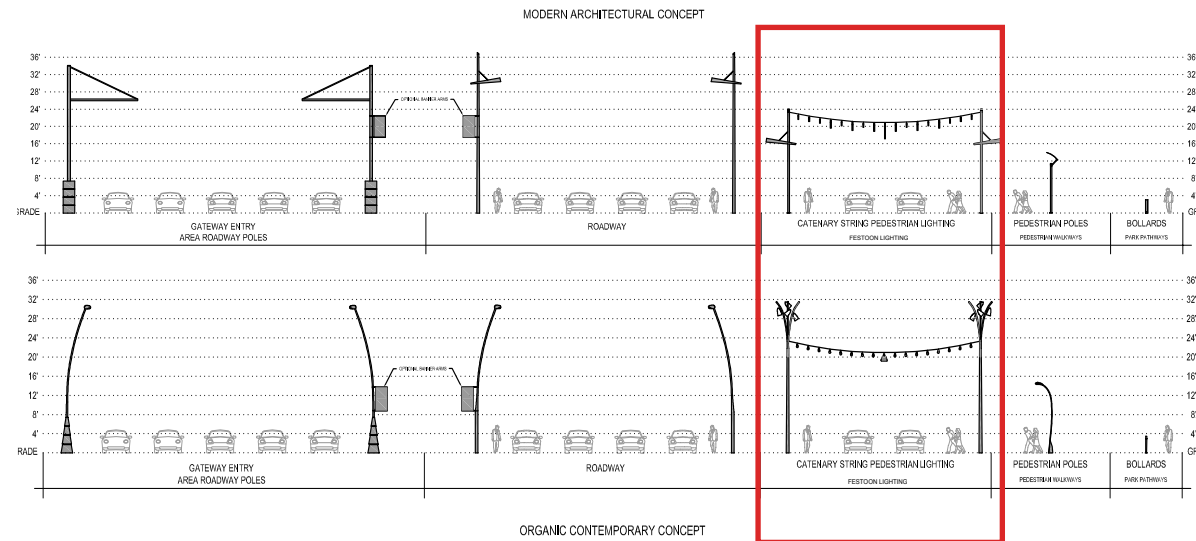
Pedestrian Area

Common lighting often seen around 30 feet in height, providing general horizontal illumination for pedestrian and vehicular circulation.



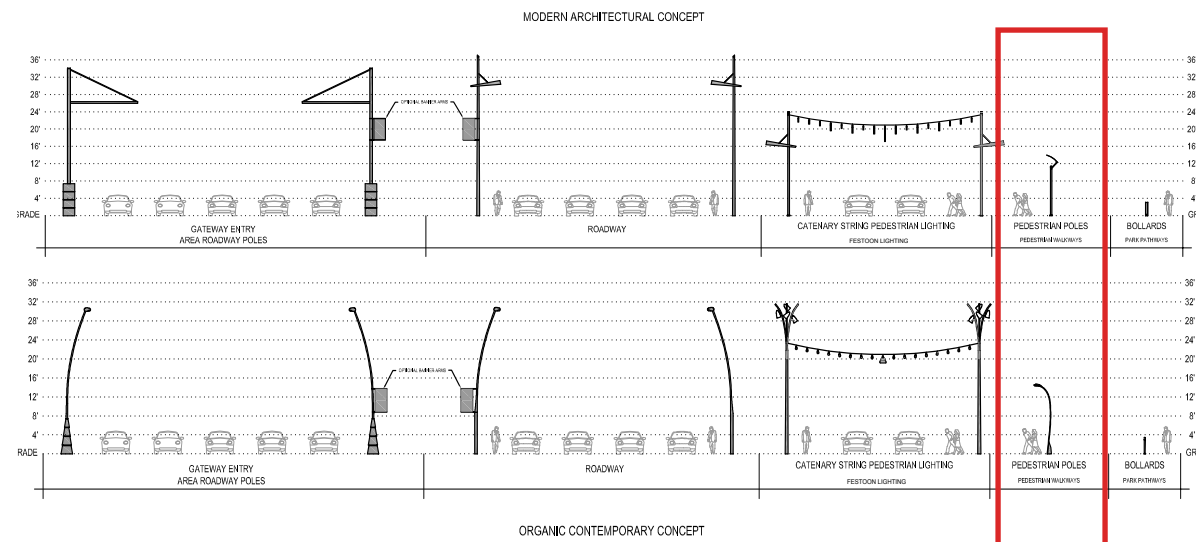
Ambiance

Elements such as string or festoon lighting can be utilized to create a sense of space within the outdoor environment, almost like a room outdoors, with a festive, vibrant feel.



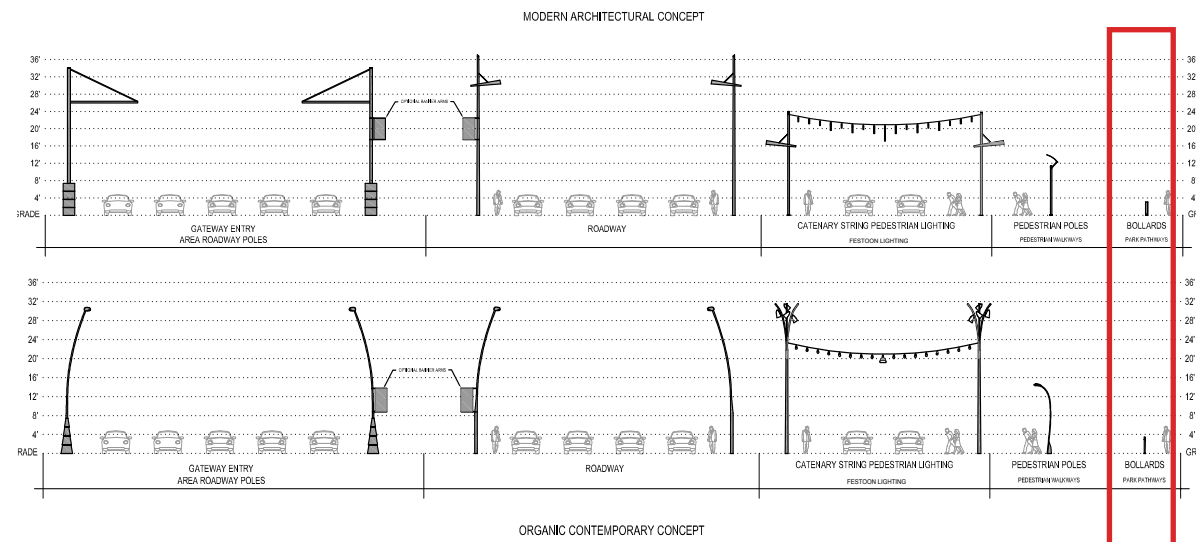
Decorative Pedestrian

Often decorative in character or of a uniquely identifying character, pedestrian level lighting elements are often in the range of 10-16 feet in height, providing high levels of vertical illumination at a lower and more intimate height, for the safety of pedestrians.



Low-Level

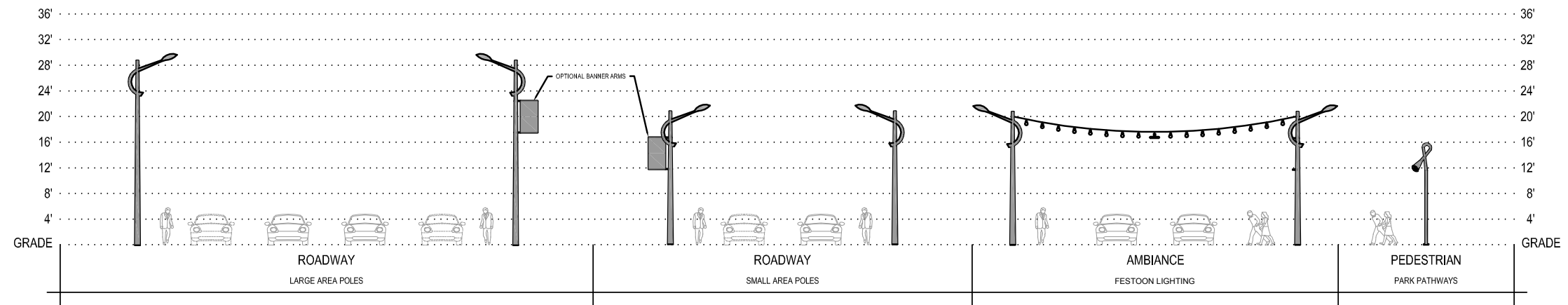
Light columns, bollards, landscape accent lighting, and in-ground path marker lights create an intimate level of illumination near the ground at a pedestrian scale for aiding in way-finding and creating atmosphere.



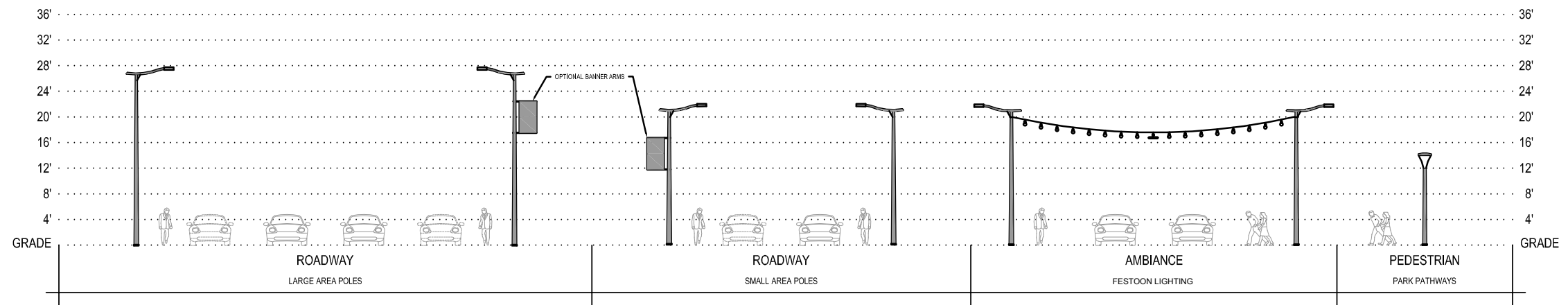
STEP 2

The next step in the 'Create' process was to develop three design schemes, in coordination with signage, that were tailored to the Derby district. Each scheme incorporated both large and small roadway luminaires, ambiance luminaires, and pedestrian scale luminaires which produced various layered family options.

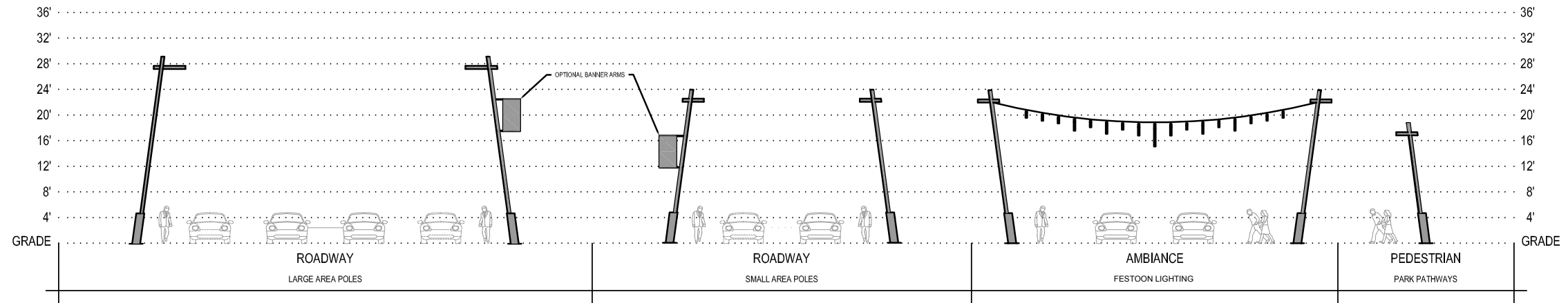
DESIGN OPTION A - "GOOGIE DERBY"



DESIGN OPTION B - "COMMUNITY MOSAIC"



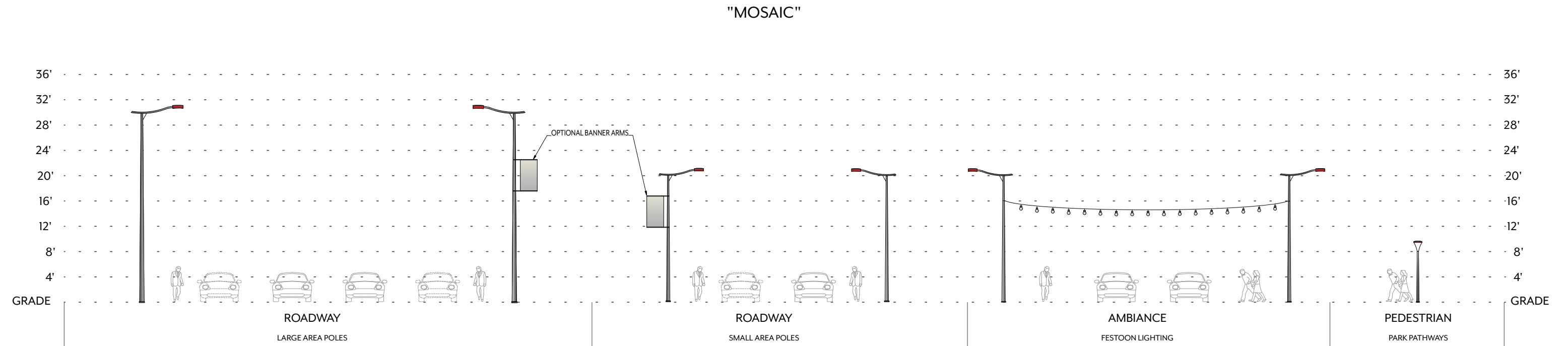
DESIGN OPTION C - "BUILDING ON HISTORY"



STEP 3

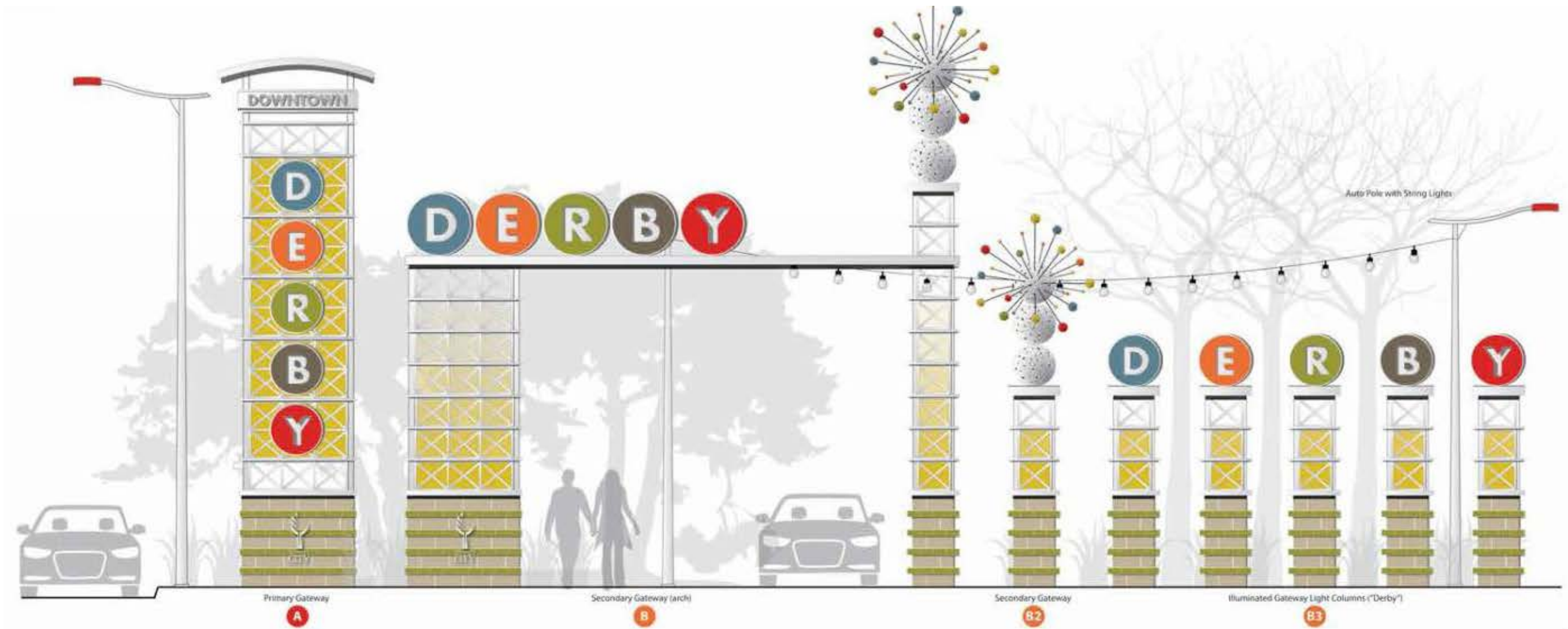
The final step in the 'Create' process was to address community feedback and adjust both the signage and lighting design schemes to reflect what community members responded to. In regards to the lighting schemes, the Derby community felt that the 'Cultural Mosaic' option fit the needs and aesthetic of the district best.

FINAL LIGHTING FAMILY SCHEME



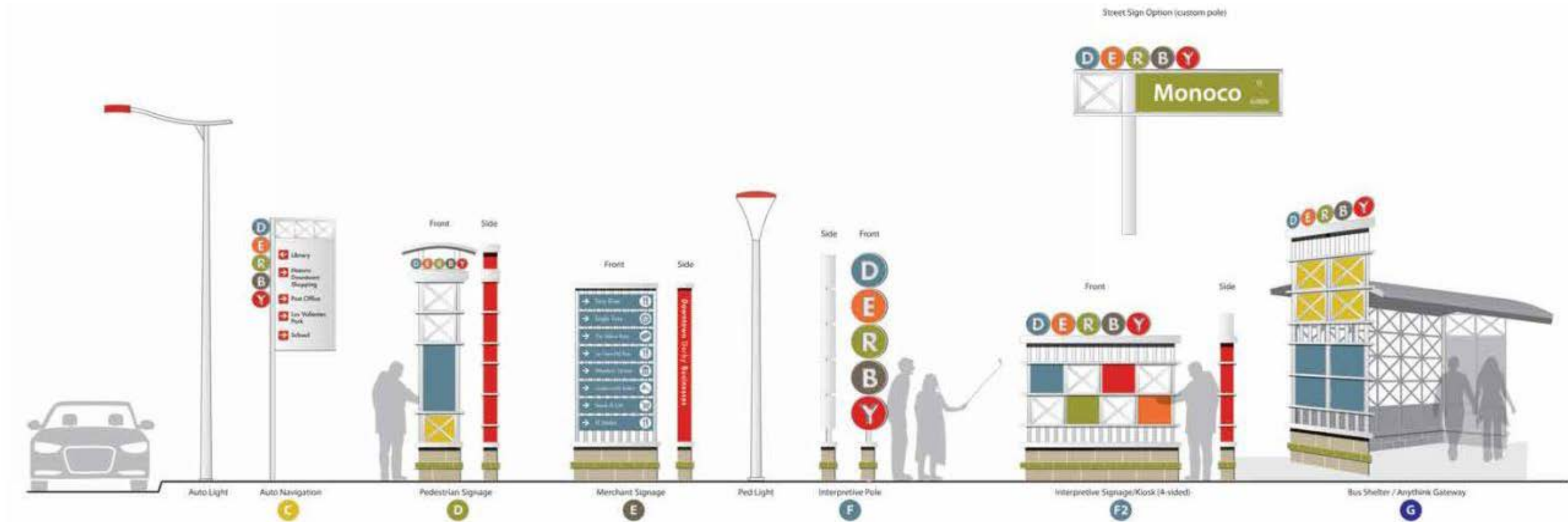
FINAL LIGHTING AND SIGNAGE SCHEME

The overall design of the final lighting scheme is meant to reinforce the intent of the signage. Primary gateways, which denote major arrival points to the district, are coordinated with the tallest, most prominent roadway poles. Similarly, secondary gateways, which are meant to be welcoming and establish a character for the district, are coordinated with the smaller roadway poles as well as festoon lighting which can also act as defining elements of the district.



FINAL LIGHTING AND SIGNAGE SCHEME

Automobile navigation signs (type C below) and street signage (shown above type F2 below) can be easily integrated with the proposed lighting poles. The lighting poles will match the major structural elements of the signage in color and the fixture heads will be painted red to match the signage elements, as shown below, to give the entire lighting and signage scheme continuity.



06

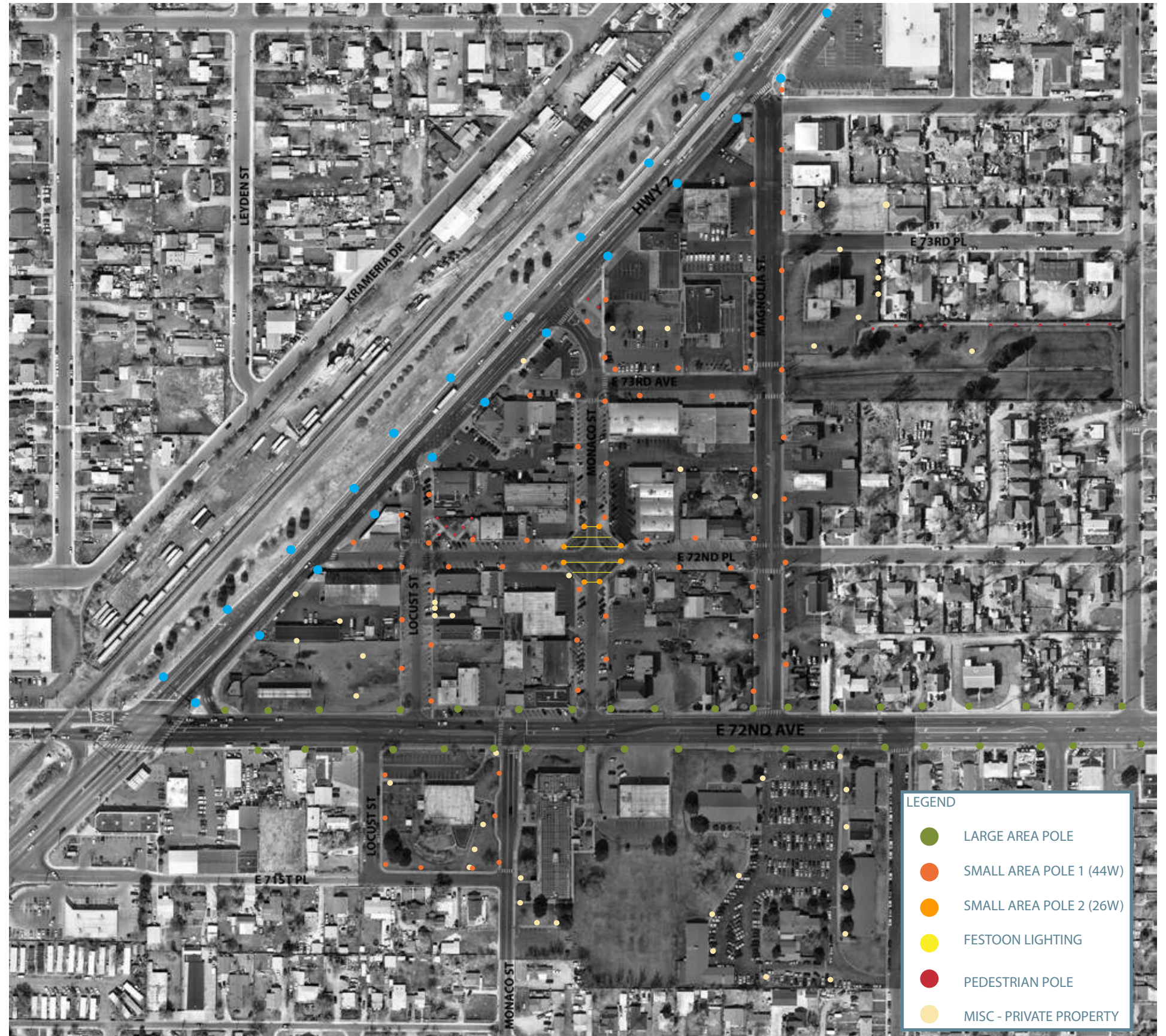
Design

Recommendations

The following design recommendations are guidelines and should be treated as such; These are not final designs. Prior to final implementation, fixture locations, power, and controls should be coordinated with existing and/or planned structures, curbs, landscaping, and power. These recommendations are meant to provide a framework for future development decisions and present a representative design of a potential lighting solution for the Downtown Derby district.

PROJECT GOAL SATISFACTION

- 1. LEVELS OF ILLUMINATION:** To provide adequate levels of illumination and uniformity, as defined by IESNA, we have provided a range of spacing guidelines that will satisfy the necessary requirements.
- 2. LIGHTING QUALITY:** To provide a suitable color of light and vertical illumination for safety, we recommend that all fixtures have a correlated color temperature of 3000K which will provide a soft, yellow color that will be visually pleasing both during the day and at night.
- 3. OPTICAL PERFORMANCE:** To provide a considerate design that is respectful of the night skies and neighboring properties we have recommended optics that are tailored to each block of the district and do not throw light too far beyond the targeted areas.
- 4. ENERGY AND MAINTENANCE:** To provide energy efficient lighting solutions that are within current energy code standards, we have recommended all LED solutions and a control system that is responsive to daylight.
- 5. PRIVATE PROPERTY:** To improve private property lighting, we recommend all fixtures located on such properties be updated to comply with current design standards. While it is not addressed in detail in this document, private property fixtures should also be coordinated with the proposed fixtures to match levels of illumination, color temperature, color rendering, optics, and energy codes in order to ensure operability and to limit trespass.
- 6. VISUAL IDENTITY:** To provide lighting solutions with a visual identity, we recommend lighting the district with the YOA luminaire family, manufactured by Schreder which can provide a singular, cohesive lighting scheme while providing options for all the various parts of the downtown district.

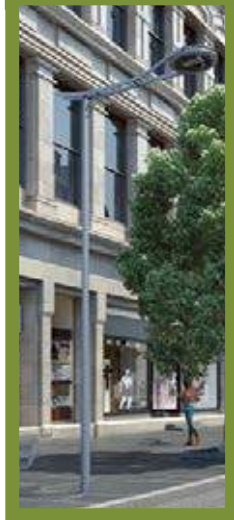
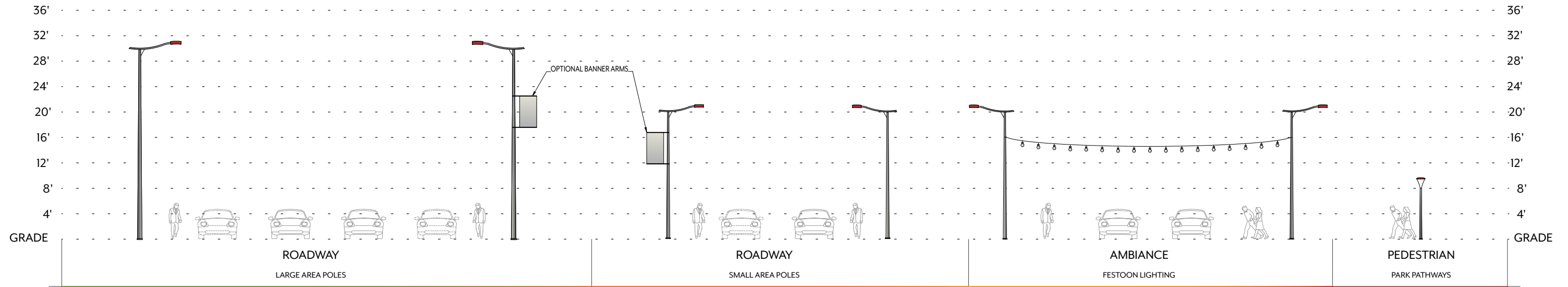


Map of the Derby District with potential new luminaire locations indicated by color keyed dot as coordinated with the luminaire images on page 22. *Refer to Appendix A for larger scale views

LUMINAIRE RECOMMENDATION OVERVIEW

Refer to Appendix B for exact recommendations.

"MOSAIC"



Schreder - YOA Midi

Lucia Single Arm Mounting @ 30'-0"
LED, 3000K, 80+ CRI, 7200 Lumens, 64W
Type II, Medium Distribution



Schreder - YOA Midi

Lucia Single Arm Mounting @ 20'-0"
LED, 3000K, 80+ CRI, 5400 Lumens, 44W
Type II, Medium Distribution



Schreder - YOA Midi

Lucia Single Arm Mounting @ 20'-0"
LED, 3000K, 80+ CRI, 2900 Lumens, 26W
Type IV, Short Distribution



Tivoli - Lightsphere
Festoon Lighting @ 16'-0", Spaced 1'-6" OC
LED, 3000K, 3 Lumens/Foot (Standard), 0.08W/Foot



Schreder - YOA Midi

Yoke Mounting @ 8'-0"
LED, 3000K, 80+ CRI, 2200 Lumens, 19W
Type II, Short Distribution

INFRASTRUCTURE RE-USE PLAN

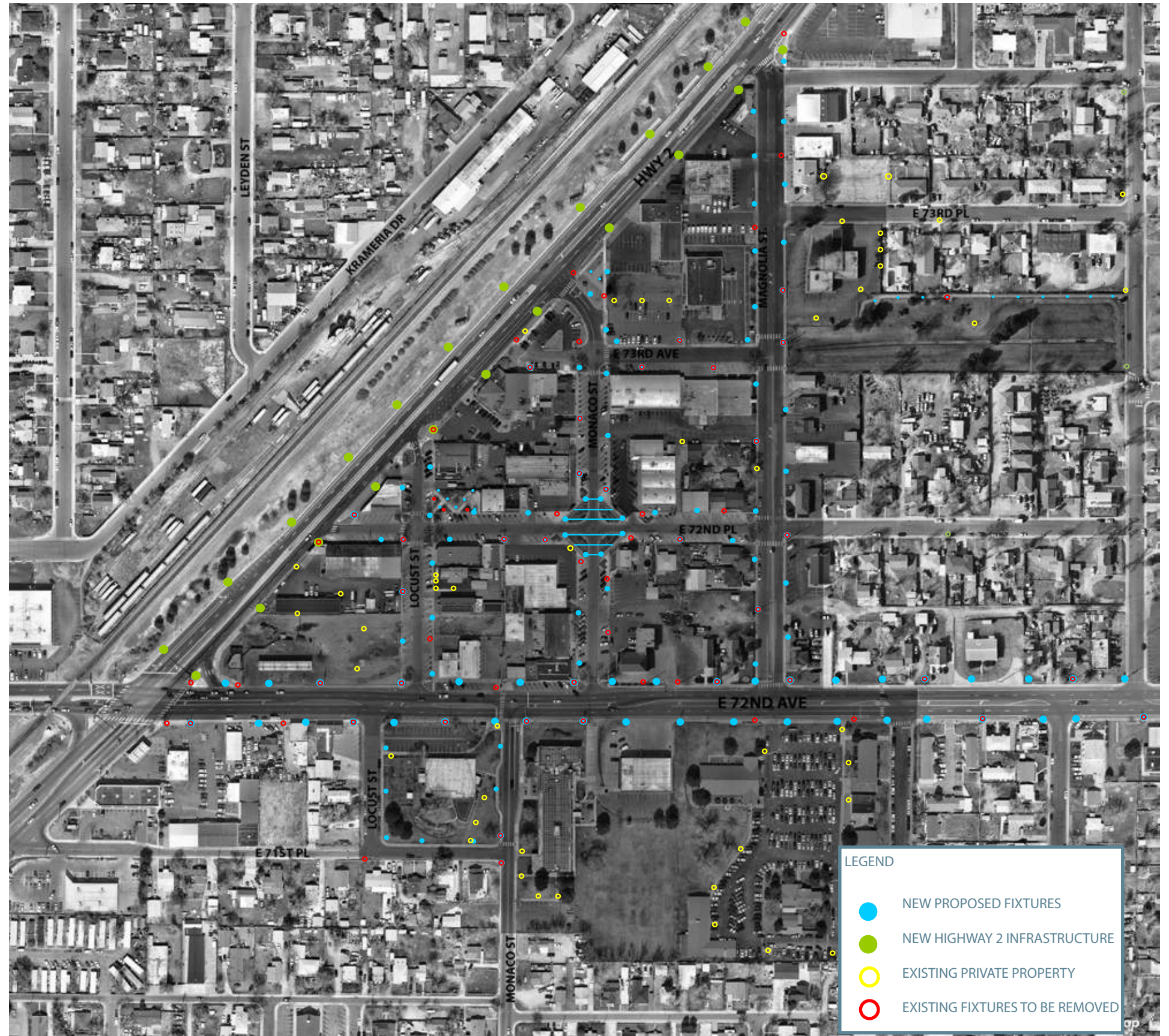
These design recommendations have taken existing luminaire locations into consideration and have re-used as many locations as possible while still maintaining adequate light levels.

The map to the right indicates the proposed demolition and re-use plan for the Derby District.

- Blue, filled circles indicate new fixtures in their proposed locations.
- Red, open circles denote existing fixtures that can be removed.
- Yellow, open circles denote existing private property fixtures that will stay.

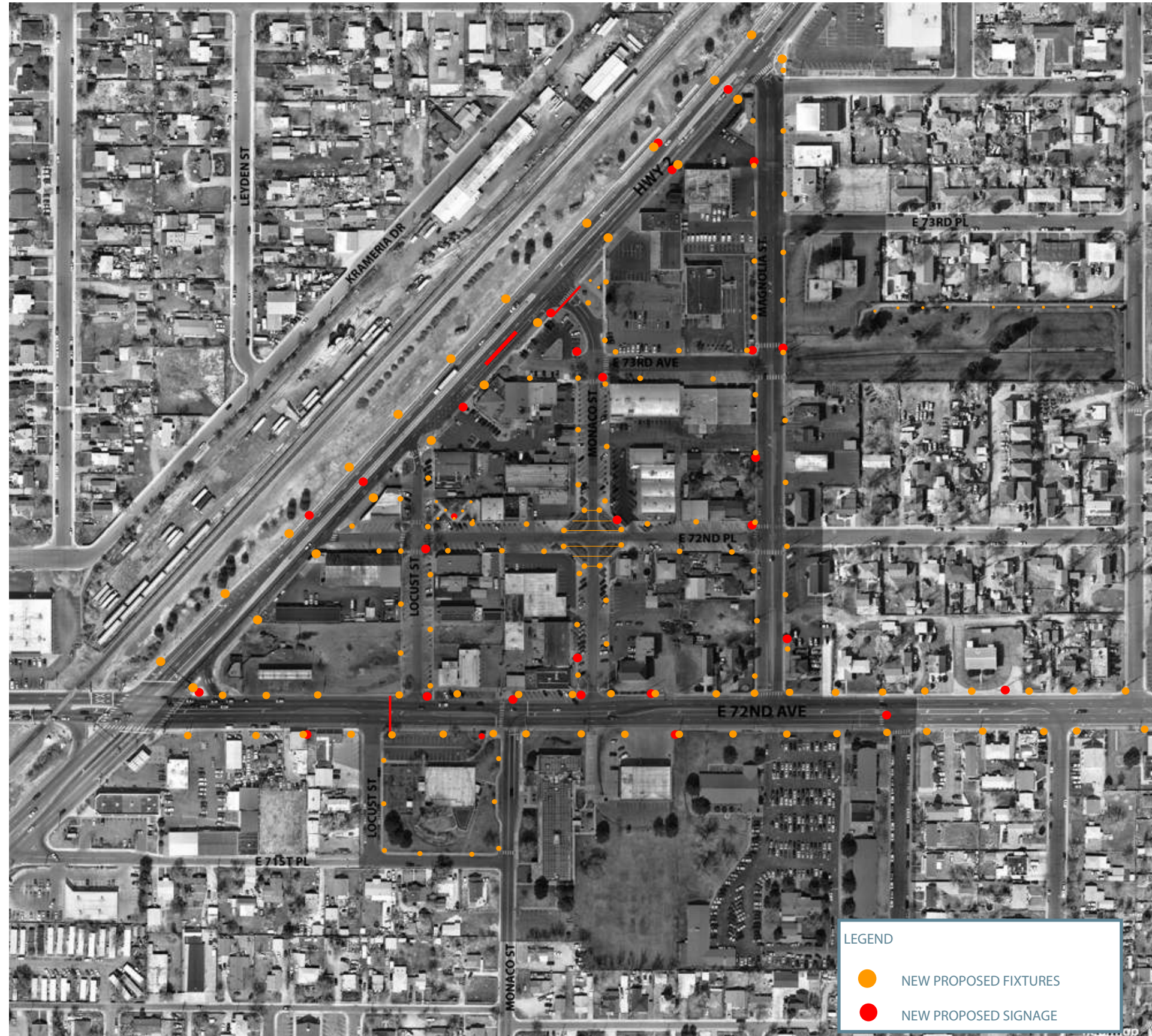
Where blue (new fixtures) and red (existing fixtures to be removed) dots overlap indicate locations where infrastructure and power can potentially be re-used.

Infrastructure and power should be evaluated on a case-by-case basis prior to installation to determine whether re-use is a feasible and practical option.



Map of the Derby District with potential new luminaire locations and existing luminaire locations. Where red and blue dots coincide indicates a location where power and other infrastructure can potentially be re-used. *Refer to Appendix A for larger scale views

OVERALL RECOMMENDATION WITH SIGNAGE & WAYFINDING



Map of the Derby District with potential new luminaire locations and potential new signage and wayfinding locations.

DESIGN DETAILS AND CALCULATIONS

The following pages contain detailed views and photometric calculations of sample areas throughout the Derby District. These views are representative of the different road and pedestrian conditions that exist in the district. Photometric calculations are meant to demonstrate how the recommended spacing was determined and how it has been used to achieve IESNA standard light levels.

RECOMMENDED COLLECTOR ROAD (COMMERCIAL) DESIGN

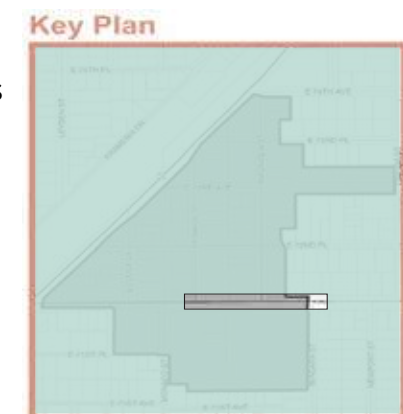


Map of the recommended light fixture spacing for large collector roadways.

- **Guidelines**

In order to illuminate large collector roads, such as E 72nd Ave, to IESNA specified standards, it is our recommendation that fixtures be mounted 30 feet above the finished grade and be spaced 80-120 feet apart, with 100 foot spacing being ideal.

We also recommend that the fixtures be placed on both sides of the road and alternate their spacing where possible as shown in the above graphic in order to illuminate both sides of the road evenly.



COLLECTOR ROAD (COMMERCIAL) PHOTOMETRIC CALCULATIONS



Depiction of photometric calculations that represent achievable light levels when fixtures are spaced according to the specified design guidelines.

COLLECTOR ROAD

IESNA STANDARD		PER GUIDELINES	
Avg. Illuminance	Uniformity Ratio	Avg. Illuminance	Uniformity Ratio
1.2 fc	4:1	13 fc	2:1

Photometric calculations assume a fixture spacing of 100 feet on center, with fixtures on either side of the roadway as shown.



RECOMMENDED LOCAL ROAD (COMMERCIAL) DESIGN



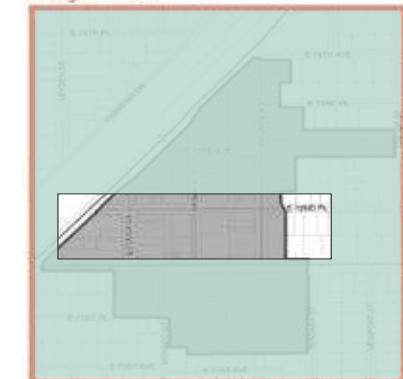
Map of the recommended light fixture spacing for local, commercial roadways.

- **Guidelines**

In order to illuminate local commercial roads, such as the northern portions of Locust St and Monaco St, to IESNA specified standards, it is our recommendation that fixtures be mounted 20 feet above the finished grade and be spaced 100-140 feet apart, with 120 foot spacing being ideal.

We also recommend that the fixtures be placed on both sides of the road and alternate their spacing as shown in the above graphic in order to illuminate both sides of the road and parking areas evenly.

Key Plan



LOCAL ROAD (COMMERCIAL) PHOTOMETRIC CALCULATIONS



Depiction of photometric calculations that represent achievable light levels when fixtures are spaced according to the specified design guidelines.

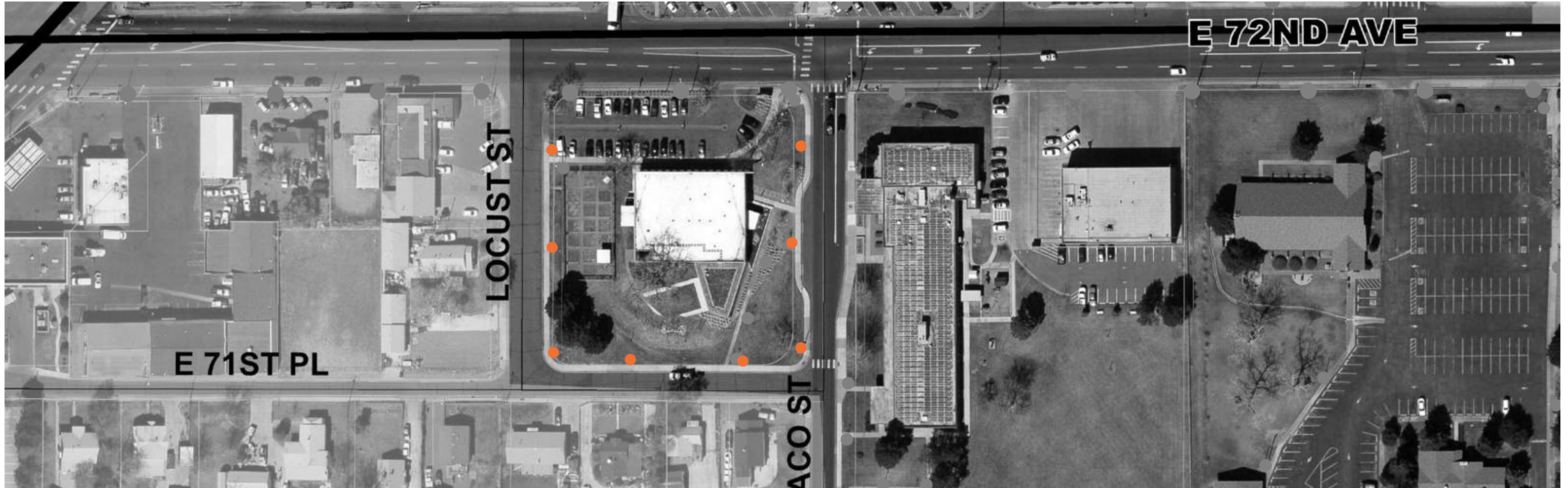
LOCAL ROAD COMMERCIAL

IESNA STANDARD		◇◇◇◇◇◇◇◇◇◇	PER GUIDELINES	
Avg. Illuminance	Uniformity Ratio		Avg. Illuminance	Uniformity Ratio
0.8 fc	6:1		1.1fc	5.6:1

Photometric calculations assume a fixture spacing of 120 feet on center, with fixtures on either side of the roadway as shown.



RECOMMENDED LOCAL ROAD (INTERMEDIATE) DESIGN



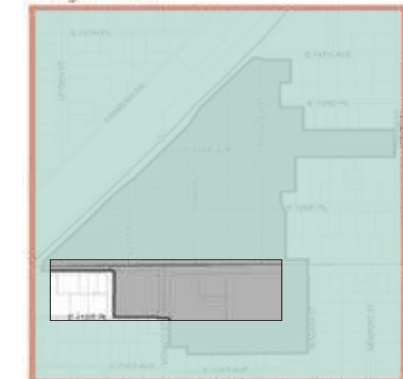
Map of the recommended light fixture spacing for local, intermediate roadways.

- **Guidelines**

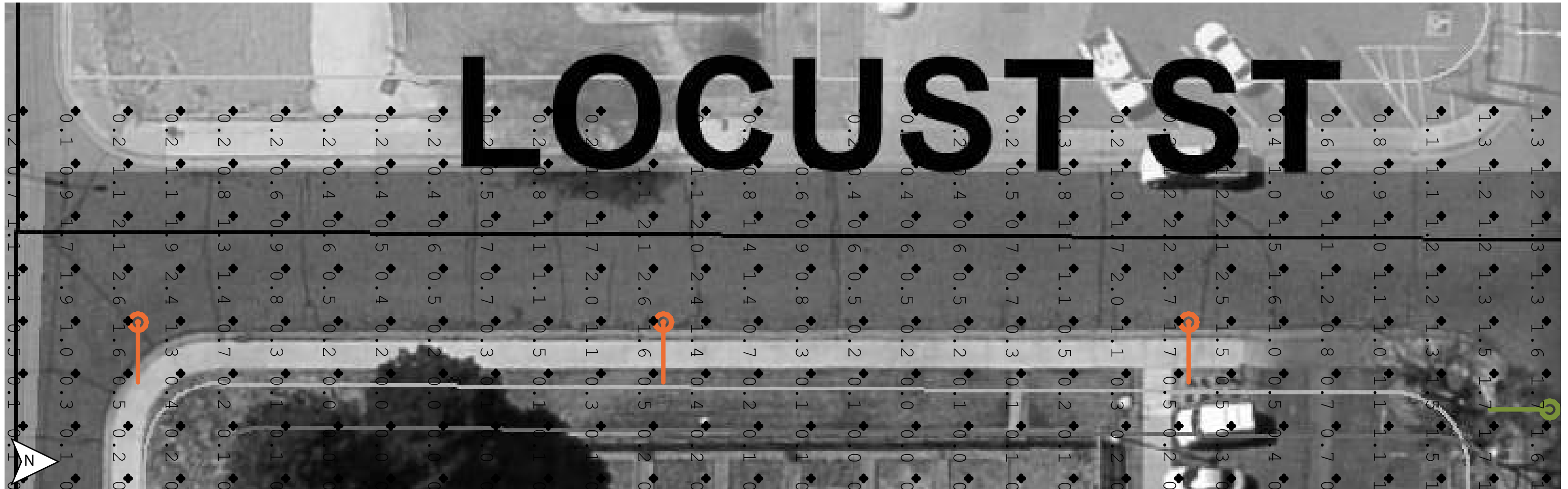
In order to illuminate local intermediate roads, such as the southern portions of Locust St and Monaco St, to IESNA specified standards, it is our recommendation that fixtures be mounted 20 feet above the finished grade and be spaced 80-120 feet apart, with 100 foot spacing being ideal.

We also recommend that the fixtures be placed on one side of the road as shown in the above graphic in order to keep poles out of residential properties.

Key Plan



LOCAL ROAD (INTERMEDIATE) PHOTOMETRIC CALCULATIONS



Depiction of photometric calculations that represent achievable light levels when fixtures are spaced according to the specified design recommendations.

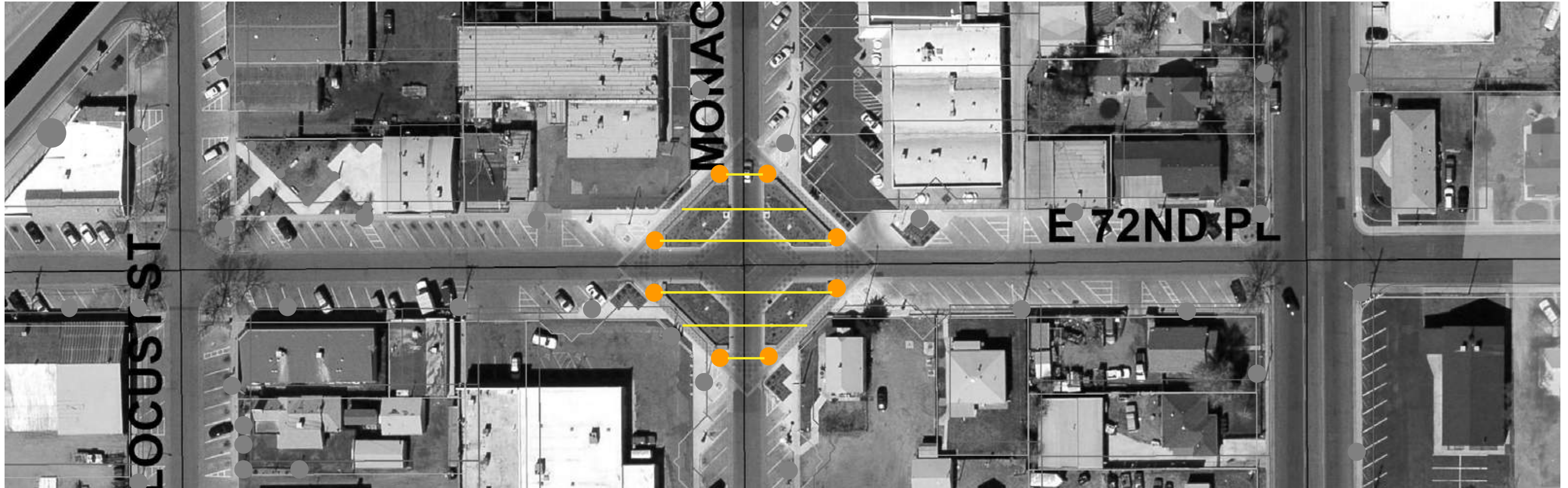
LOCAL ROAD INTERMEDIATE

IESNA STANDARD		PER GUIDELINES	
Avg. Illuminance	Uniformity Ratio	Avg. Illuminance	Uniformity Ratio
0.6 fc	6:1	1.0 fc	5:1

Photometric calculations assume a fixture spacing of 100 feet on center, with fixtures on one side of the roadway as shown.



RECOMMENDED AMBIANCE LIGHTING DESIGN



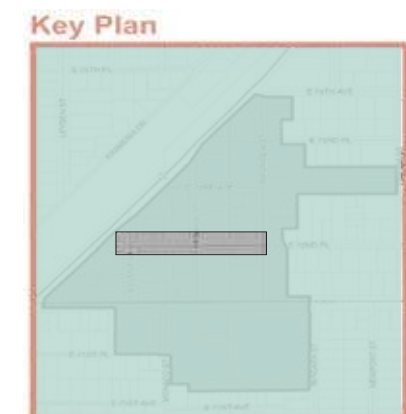
Map of the recommended light fixture spacing for ambiance lighting in the feature intersection of the town.

- **Guidelines**

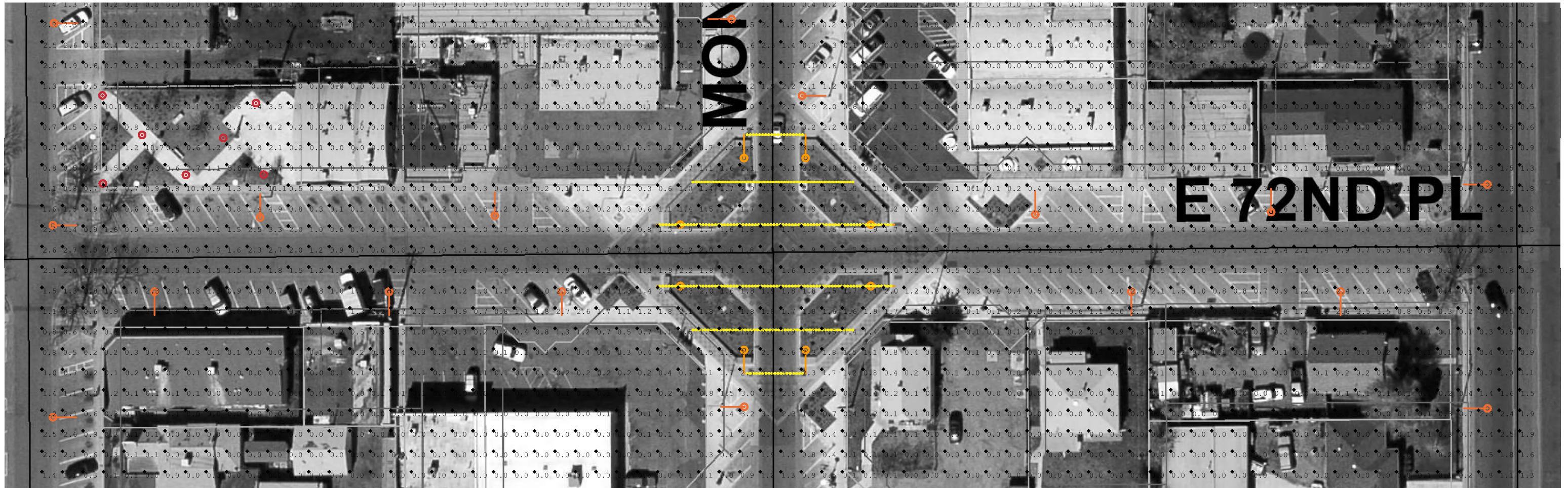
In order to illuminate the feature intersection of the town to IESNA specified standards, it is our recommendation that pole mounted fixtures be mounted 20 feet above the finished grade and that festoon fixtures be mounted 15 to 16 feet above the finished grade.

We also recommend that two area fixtures be placed at each entrance to the intersection with the festival lights suspended between them as shown in the above graphic.

Four (4) additional decorative poles must be provided in order to hang festoon lights in this design



AMBIANCE PHOTOMETRIC CALCULATIONS



Depiction of photometric calculations that represent achievable light levels when fixtures are spaced according to the specified design guidelines.

SIDEWALKS				
IESNA STANDARD			PER GUIDELINES	
Min. Illuminance			Min. Illuminance	
0.6 fc			0.6 fc	

Photometric calculations assume two area fixtures will be placed at each entrance to the plaza and festoon lighting will be spaced 18 inches on center as shown.

LOCAL ROAD COMMERCIAL				
IESNA STANDARD			PER GUIDELINES	
Avg. Illuminance	Uniformity Ratio		Avg. Illuminance	Uniformity Ratio
0.8 fc	6:1		2.0 fc	3.3:1

Photometric calculations assume two area fixtures will be placed at each entrance to the plaza and festoon lighting will be spaced 18 inches on center as shown.



RECOMMENDED PEDESTRIAN LIGHTING DESIGN



Map of the recommended light fixture spacing for pedestrian walkways and/or parks.

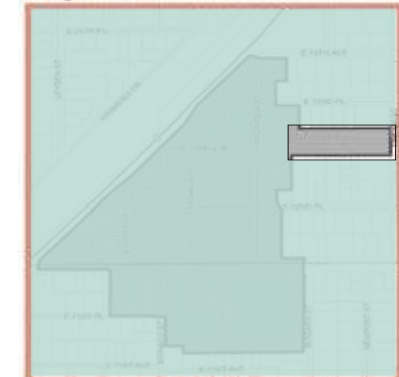
- **Guidelines**

In order to illuminate pedestrian walkways, such as those in Los Valientes Park, to IESNA specified standards, it is our recommendation that fixtures be mounted 10.5 feet above the finished grade and be spaced approximately 50 feet apart.

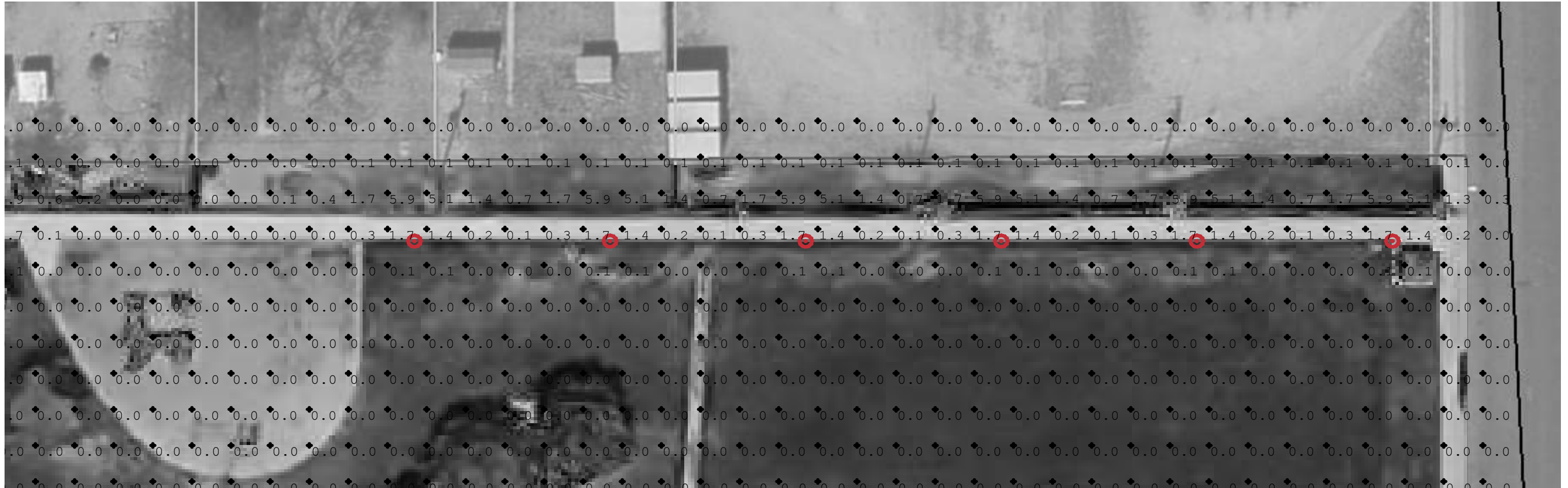
We also recommend that the fixtures be placed on one side of the walkway as shown in the above graphic in order to maintain safe levels of illumination along the pathways.

*Although this park does have some existing lighting, new lighting should be a high priority based on observed high levels of pedestrian activity during the evening hours and based on the inadequacy of the currently provided light levels.

Key Plan



PEDESTRIAN PHOTOMETRIC CALCULATIONS



Depiction of photometric calculations that represent achievable light levels when fixtures are spaced according to the specified design guidelines.

SIDEWALKS

IESNA STANDARD

Min.
Illuminance

0.6 fc



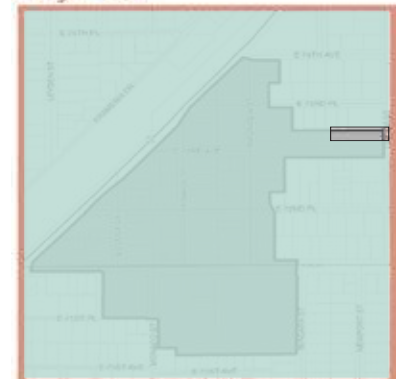
PER GUIDELINES

Min.
Illuminance

0.7 fc

Photometric calculations assume a fixture spacing of 50 feet on center, with fixtures on one side of the roadway as shown.

Key Plan

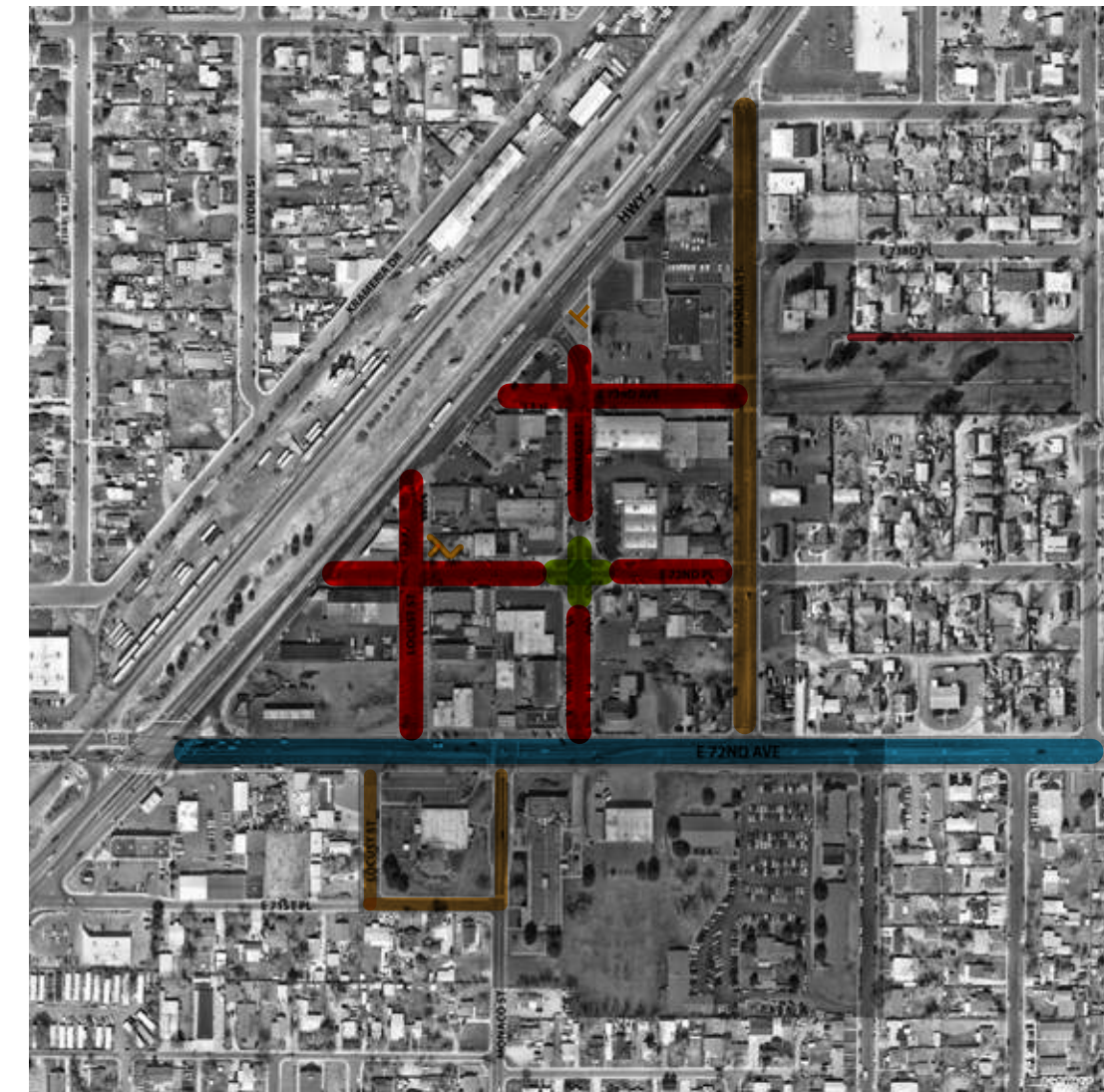


PRIORITIZATION RECOMMENDATION

Based on our findings, the light levels at E 72nd Avenue are compliant with IESNA standards (as reported on page 12) and, therefore, should not be considered a priority. Similarly, the intersection of Monaco Street and E 72nd Place is intended to be more festive and communal than necessary for meeting light levels. So, as indicated in the table below, it is our recommendation that the Derby district prioritize upgrading some small area poles and pedestrian poles first, followed by festoon lighting second, and finally large area poles.

Making upgrades in this order will prioritize the replacement of lighting on streets that do not currently meet IESNA standards as well as in parks that are heavily traveled at night, but do not maintain safe light levels. This will begin to provide a visual identity to the Derby district while increasing safety in as many areas as possible.

FIXTURE TYPE	PRIORITY LEVEL (1 - MOST IMPORTANT, 4 - LEAST IMPORTANT)	NOTES
LARGE AREA POLE	4	
SMALL AREA POLE 1 <i>44w, 5400 lumen version</i>	1 & 2	
SMALL AREA POLE 2 <i>26w, 2900 lumen version</i>	1	
PEDESTRIAN POLE	1 & 2	
CUSTOM PAINT COLOR FOR POLES	N/A	\$1,000 CHARGE PER ORDER OF FIXTURES FOR CUSTOM PAINT COLOR
BANNER ARM <i>Optional</i>	Optional	
FESTOON LIGHTING	3	
DRIVER FOR FESTOON LIGHTING	3	
DECORATIVE POLES	3	
CONTROL PACKAGE (STANDALONE PHOTOCELLS) or CONTROL PACKAGE (WIRELESS 'SMART' SYSTEM WITH MONITORING CAPABILITIES)	1	REQUIRED FOR ANY UPGRADES, REGARDLESS OF FIXTURE TYPE OR LOCATION



Map of prioritization for the Derby District where red indicates #1 priority areas, orange indicates #2 priority areas, green indicates #3 priority areas, and blue indicates #4 priority areas.

COST ESTIMATE - MATERIALS

The pricing provided below should be used for budgeting purposes only. In order to approximate final costs, this pricing does include a 10% + 10% markup. However, pricing is subject to change based on the actual ordering date, actual fixture quantities, and actual fixture specifications. Updated pricing should be obtained prior to ordering any fixtures for installment.

	PRICE PER UNIT	ESTIMATED QUANTITY	TOTAL ESTIMATED COST <i>(including markup)</i>
LARGE AREA POLE	\$3,100.00	40	\$150,040.00
SMALL AREA POLE 1 <i>44w, 5400 lumen version</i>	\$2,100.00	69	\$175,329.00
SMALL AREA POLE 2 <i>26w, 2900 lumen version</i>	\$2,050.00	8	\$19,844.00
PEDESTRIAN POLE	\$1,550.00	19	\$35,634.50
CUSTOM PAINT COLOR FOR POLES	\$1,000.00	SINGULAR PRICE PER ORDER <i>Independent of quantity ordered</i>	\$1,210.00
BANNER ARM <i>Optional</i>	\$90.00	50	\$5,445.00
FESTOON LIGHTING	\$10.00 PER FOOT	460 FEET	\$5,566.00
DRIVER FOR FESTOON LIGHTING	\$245.00	6	\$1,778.70
DECORATIVE POLES <i>Additonal poles required to hang festoon lighting</i>	\$712.00	4	\$3,446.08
CONTROL PACKAGE (STANDALONE PHOTOCELLS)	\$75.00	144	\$13,068.00
or CONTROL PACKAGE (WIRELESS 'SMART' SYSTEM WITH MONITORING CAPABILITIES) <i>Refer to Appendix B for descriptions of each control system.</i>	\$245.00	144	\$42,688.80
TOTAL ESTIMATED QUANTITY & COST <i>Calculated with 'smart' control system and banner arms.</i>		154	\$440,982.08

COST ESTIMATE - LABOR

	COST
LIGHTING CONTROL INSTALLATION	\$33,964.00
LOW VOLTAGE GEAR	\$56,794.00
SITE LIGHTING INSTALLATION	\$1,436,113.00
DEMOLITION	\$13,128.00
ESTIMATE ADJUSTMENTS*	\$59,731.00
DJE	\$196,915.00
LANDSCAPING**	\$52,511.00
TOTAL ESTIMATED LABOR COST	\$1,849,156.00
SITE LIGHTING MATERIALS	\$440,982.08
TOTAL ESTIMATED PROJECT COST	\$2,290,138.08

* - Includes traffic control, porta potties and other expenses normally covered by a general contractor.
 ** - Includes landscape, asphalt and concrete repair that is needed as a result of the construction.

Estimates for labor costs have been provided by Jim Dent, VP of Preconstruction with Weifield Group, an electrical contractor based in Colorado and Wyoming.

6950 South Jordan Road, Centennial, CO 80112
 Phone: 303.428.2011
 Fax: 303.202.0466

Jim Dent, VP of Preconstruction
 Phone: 303-407-6645

In order to accurately estimate costs, the following considerations were made:

CLARIFICATIONS

1. Our proposal is based on the following contract documents listed below:
 - a. Derby Lighting Overview
2. Proposal is based on a mutually agreeable lump sum contract and schedule to be determined.
3. Our proposal is based on a 40-hour work week.
4. We have not included premium costs in our proposal.
5. Temporary construction lighting and power is included.
6. We have not included provisions for differing site conditions.
7. We have included dust control, surveying, utility locates, and traffic control.
8. We have not included any re-remediation of decontaminated soils.
9. We did not include any provisions for replacing the fixtures on private property.
10. We assume the City of Commerce City will not charge permit, road or sidewalk closure fees.
11. We assume PVC schedule 40 for underground installations.
12. We assume the poles along Highway 2 are not part of the scope of this project.

INCLUSIONS

1. Sales tax.
2. One year warranty.
3. Electrical permits are included.
4. All safety equipment and tools will be provided.
5. Mobilization of electrical equipment and supplies is provided.
6. We will provide clean-up of our own identifiable debris to an on-site dumpster.
7. Excavation, trenching, backfill, and compaction associated with the electrical installations are included. We anticipate that this excavation can be accomplished with traditional excavation equipment and we presume that spoils can be dispersed on site. We have not included costs for rock excavation, blasting or haul-off and disposal of spoils.
8. We included 5% for electrical engineering fees.
9. We included directional boring under roads in lieu of cutting and patching the roads for the installation of the branch wiring.

10. We included all new underground branch wiring to every fixture.
11. We included new pole bases for every pole.
12. We included an allowance for demolition of the existing poles.
13. We included all equipment necessary to install all of the fixtures.
14. We included porta-potties and dumpsters.
15. We included landscape repair.
16. We included some curb, sidewalk and asphalt repair.
17. We included six "Power Centers" which include a weatherproof enclosure, meter housing, disconnect and a 100 amp three phase 120/208 volt panel. (We assume the utility will provide 120/208 volt power to the power centers.)

EXCLUSIONS

1. Builders Risk Insurance.
2. Asbestos abatement or toxic waste removal.

FUTURE COMPLIANCE

The Derby District is bound to continually change in years to come. In order to maintain consistency in the lighting plan for the district, it will be important to come back to the original design criteria, metrics, and project goals defined in this document. Any future upgrades to lighting should satisfy the following requirements:

1. **Levels of Illumination:** Provide lighting solutions with appropriate levels of illumination that are also within acceptable ratios of uniformity.
2. **Lighting Quality:** Provide lighting solutions of suitable color quality with vertical illumination for safety of pedestrians in the nighttime environment.
3. **Optical Performance:** Provide lighting that is respectful of the night skies and of neighboring properties by utilizing luminaires with high quality optical performance.
4. **Energy and Maintenance:** Provide energy efficient lighting solutions that are within current energy code standards and that provide easily maintainable solutions.
5. **Private Property:** Provide a means for addressing private property lighting to support the initiatives within the Derby District.
6. **Visual Identity:** Provide lighting systems that have a visual identity and connection to the District and proposed lighting for a cohesive solution.

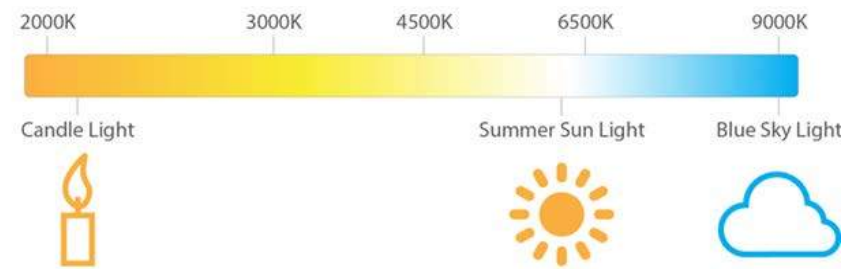
Additionally, the outlined light levels, per IESNA standards, should be maintained. Over the life of the LED systems, the output will eventually degrade to a point where maintenance and replacement of components will be necessary. The provided light levels as outlined will be a gage of continued performance in the future. Outputs can be measured by utilizing an illuminance meter and compared to the outlined design light level targets. If the measured light levels drop below 30% (based on industry L70 standards) from the design target, then the system will need maintenance attention in the form of fixture replacement or replacement of fixture components.

07

Glossary

DEFINITIONS

- BUG Rating - A rating system that classifies luminaire performance based on how much light comes out of the back, top (uplight), and front (glare) of the fixture. Additionally, the angle at which this light comes out of the fixture is measured in order to further classify the luminaires.
- Color Rendering Index - A metric indicating how accurately a light source renders color.
- Color Temperature - A metric that quantifies the color or perceived 'whiteness' of a light source. Color temperature is measured in degrees Kelvin (K).



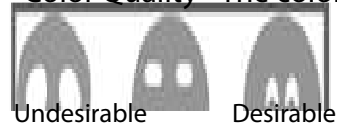
- Footcandle - A unit which measures the illuminance cast on a surface by a one-candela source one foot away.
- Illuminance - The amount of light striking a surface.
- Luminaire - A complete electric light fixture.
- Uniformity Ratio - The ratio of the maximum to minimum illuminance on a surface. Low uniformity ratios indicate the surface is receiving a very even amount of light.
- Vertical Illumination - Light that falls on the vertical planes of a room or building.

ACRONYMS & ABBREVIATIONS

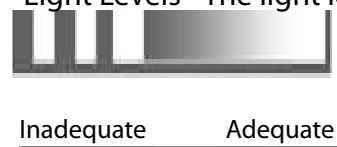
- AFG - At Finished Grade
- B.U.G. - Backlight. Uplight. Glare.
- CCT - Correlated Color Temperature
- CRI - Color Rendering Index
- FC - Foot-candle
- IBC - International Building Code
- IESNA - Illuminating Engineering Society of North America

VISUAL AIDES

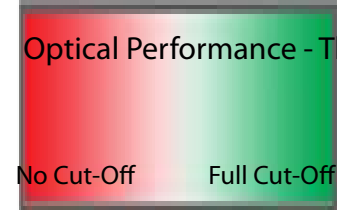
- **Color Quality** - The color quality is determined by how well a person can visually recognize objects in their environment.



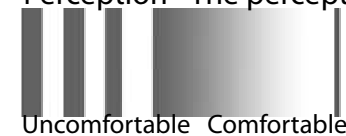
- **Light Levels** - The light levels were measured and this slider is in reference for how well they compare to the IESNA recommendations.



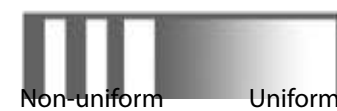
- **Optical Performance** - The optical performance sliders is in reference to how well a luminaire controls the light as it exits.



- **Perception** - The perception of spaces is largely a personal feeling, however, the ranking of perception was based up feelings of unease in locations at night due to the lack of lighting in on the vertical surfaces.



- **Uniformity** - The uniformity of a space is determined based on how often there are luminaires and how well they are providing an even amount of light.



- **Visual Identity** - The visual identity of a space is determined by how well all the luminaires in the space tell the same 'story'.



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APPENDIX A

The following graphics provide larger scale views of the maps found throughout the document.

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Existing Condition Maps

47 Existing Luminaire Locations

52 Existing Light Levels

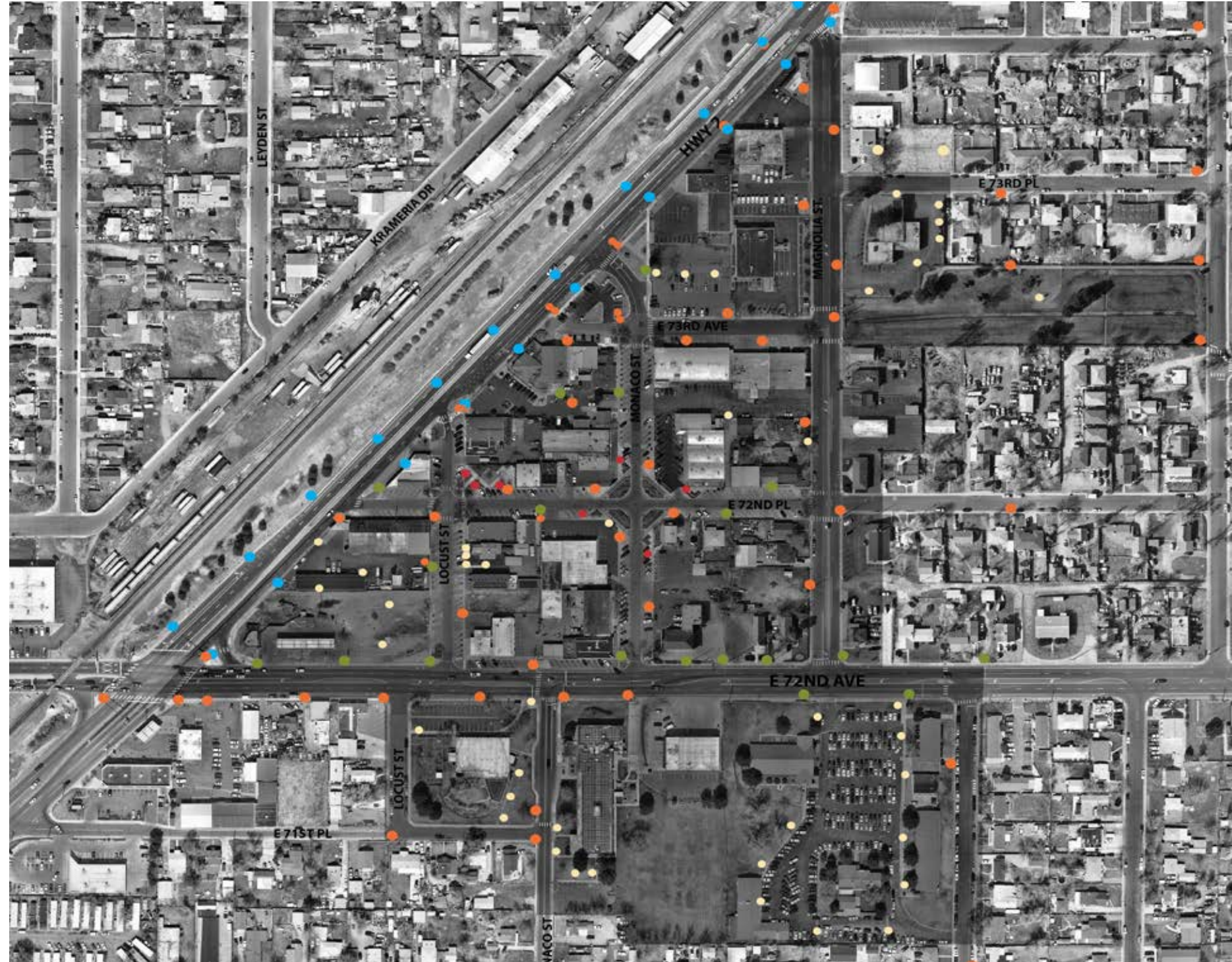
Recommendation Maps

56 Recommendation Overview

61 Infrastructure Re-Use

APPENDIX A - EXISTING LUMINAIRE LOCATIONS

- LEGEND
- HID HIGH PRESSURE SODIUM - DROP GLASS LENS
 - HID HIGH PRESSURE SODIUM - FLAT GLASS HEAD
 - MISC - PRIVATE PROPERTY
 - 14' INDIRECT PEDESTRIAN POLE
 - HWY 2 PROPOSED CHANGES



APPENDIX A - EXISTING LUMINAIRES



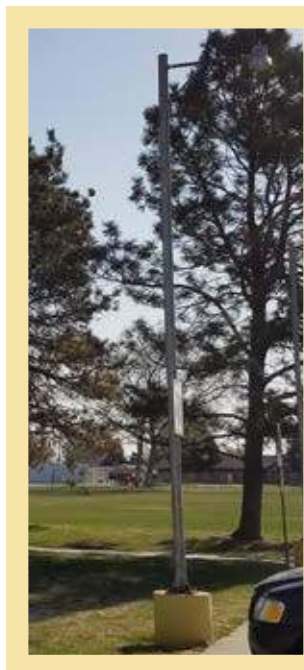
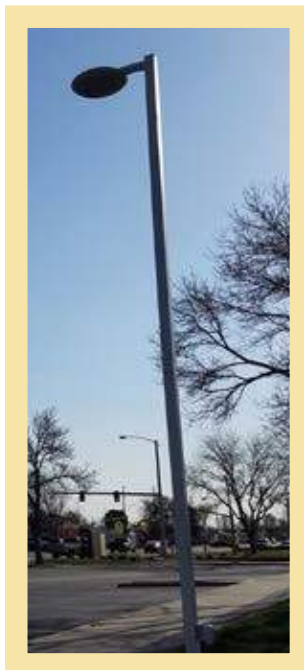
HID HIGH PRESSURE SODIUM - DROP GLASS LENS



HID HIGH PRESSURE SODIUM - FLAT GLASS HEAD



HWY 2 PROPOSED



MISCELLANEOUS PRIVATE PROPERTY, REFER TO APPENDIX FOR LOCATIONS



14' INDIRECT POLE

APPENDIX A - LUMINAIRE LOCATIONS








- LEGEND
- HID HIGH PRESSURE SODIUM - DROP GLASS LENS
 - HID HIGH PRESSURE SODIUM - FLAT GLASS HEAD
 - MISC - PRIVATE PROPERTY
 - 14' INDIRECT PEDESTRIAN POLE
 - HWY 2 PROPOSED CHANGES



APPENDIX A - EXISTING LUMINAIRE LOCATIONS



LEGEND

-  HID HIGH PRESSURE SODIUM - DROP GLASS LENS
-  HID HIGH PRESSURE SODIUM - FLAT GLASS HEAD
-  MISC - PRIVATE PROPERTY
-  14' INDIRECT PEDESTRIAN POLE
-  HWY 2 PROPOSED CHANGES



APPENDIX A - EXISTING LUMINAIRE LOCATIONS

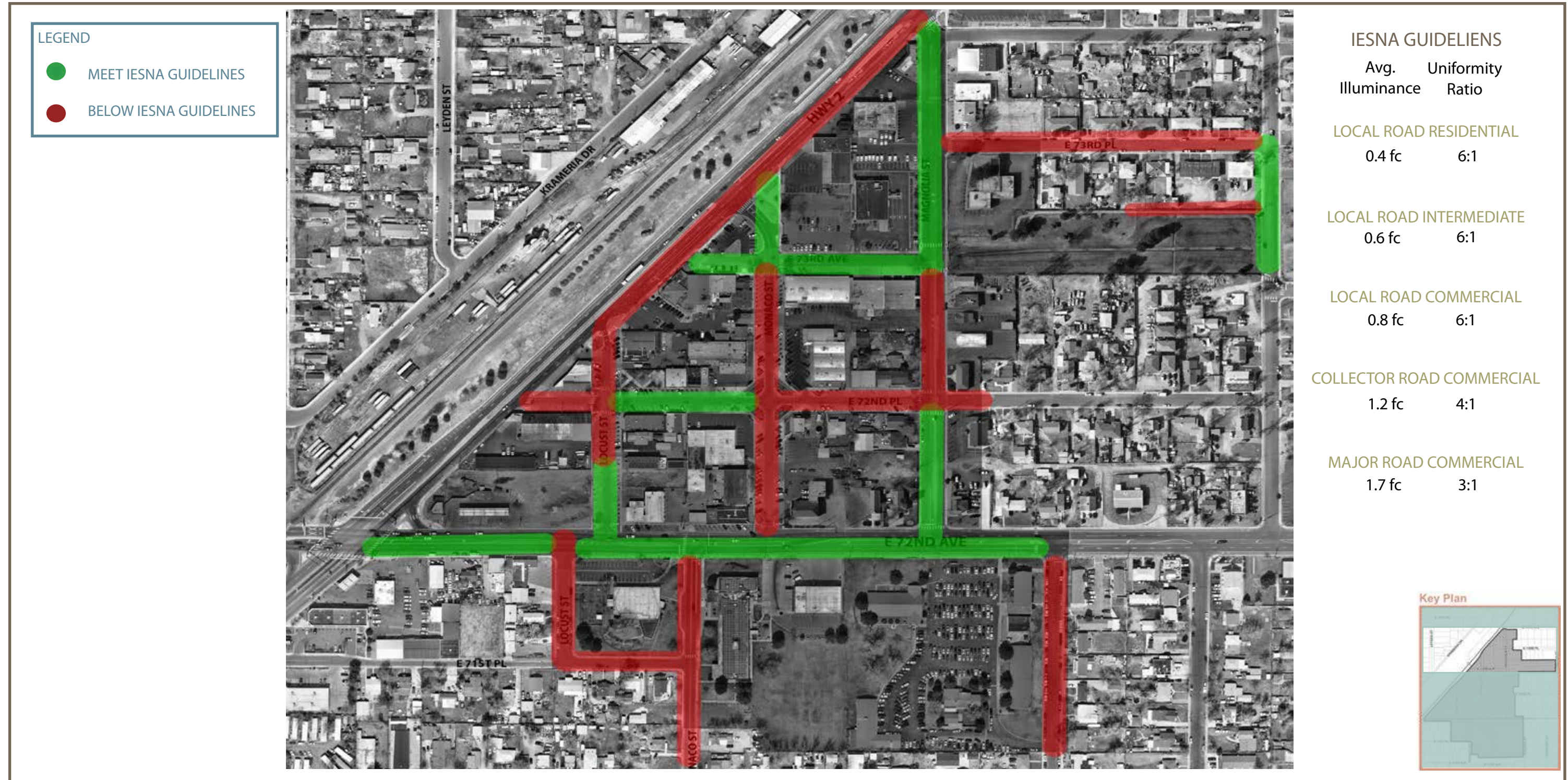


LEGEND

- HID HIGH PRESSURE SODIUM
- DROP GLASS LENS
- HID HIGH PRESSURE SODIUM
- FLAT GLASS HEAD
- MISC - PRIVATE PROPERTY
- 14' INDIRECT PEDESTRIAN
POLE
- HWY 2 PROPOSED CHANGES



APPENDIX A - EXISTING LIGHT LEVELS



APPENDIX A - EXISTING LIGHT LEVELS



LEGEND

- MEET IESNA GUIDELINES
- BELOW IESNA GUIDELINES



APPENDIX A - EXISTING LIGHT LEVELS

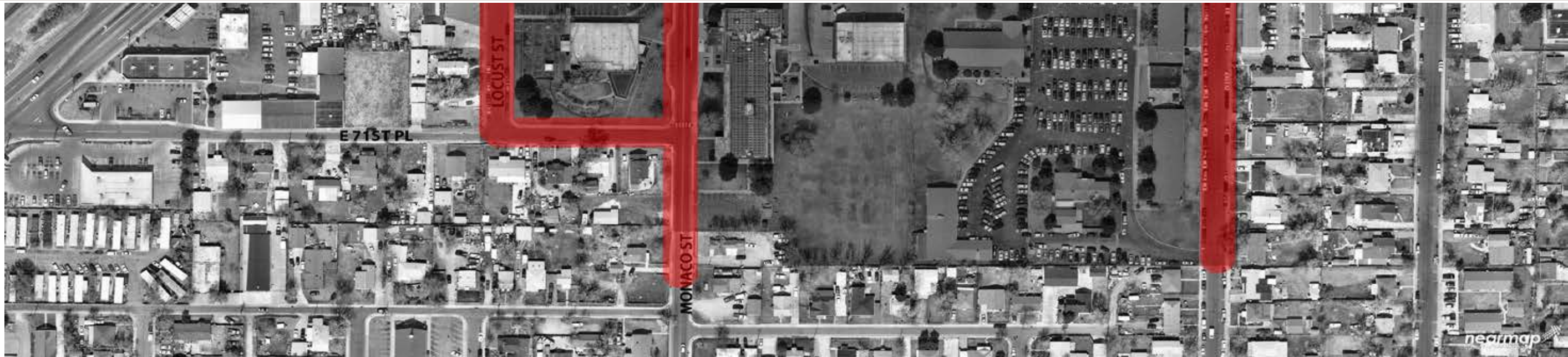


LEGEND

- MEET IESNA GUIDELINES
- BELOW IESNA GUIDELINES



APPENDIX A - EXISTING LIGHT LEVELS




LEGEND

- MEET IESNA GUIDELINES
- BELOW IESNA GUIDELINES



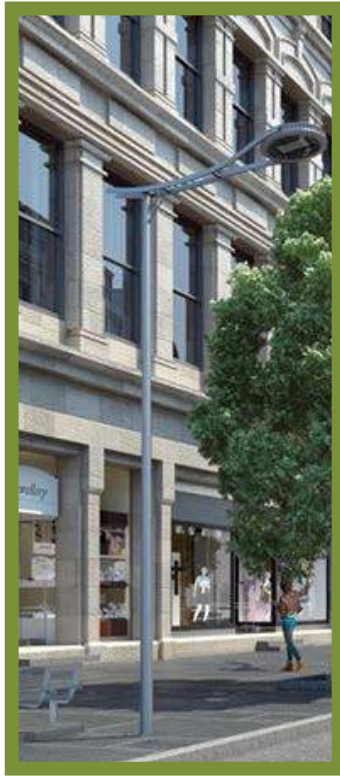
APPENDIX A - RECOMMENDATION OVERVIEW

LEGEND

-  LARGE AREA POLE
-  SMALL AREA POLE 1 (44W)
-  SMALL AREA POLE 2 (26W)
-  FESTOON LIGHTING
-  PEDESTRIAN POLE
-  MISC - PRIVATE PROPERTY



APPENDIX A - RECOMMENDATION OVERVIEW



LARGE AREA POLE



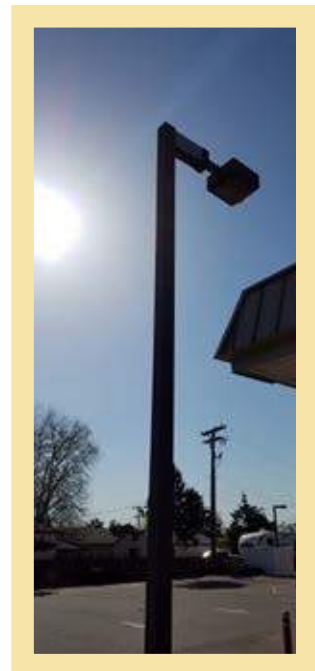
SMALL AREA POLES 1&2



FESTOON LIGHTING



PEDESTRIAN POLE



MISCELLANEOUS PRIVATE PROPERTY, REFER TO APPENDIX FOR LOCATIONS

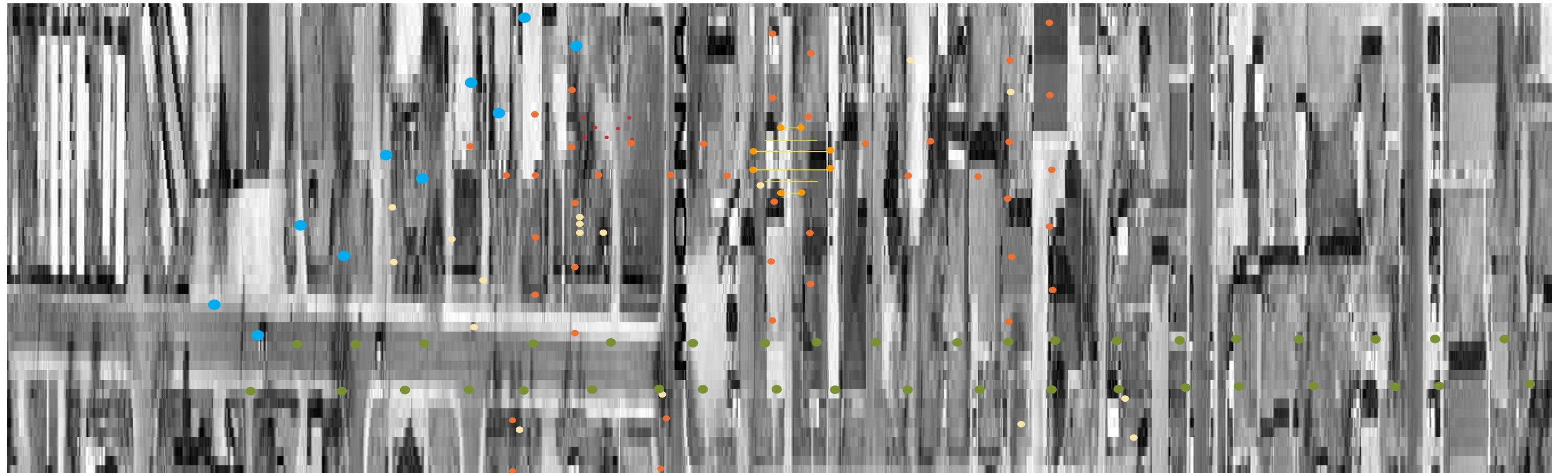
APPENDIX A - RECOMMENDATION OVERVIEW



LEGEND

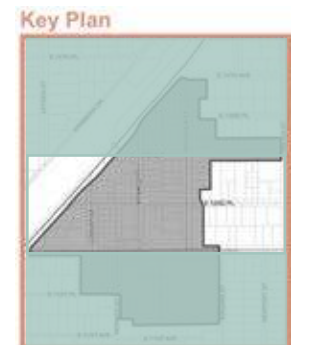
-  LARGE AREA POLE
-  SMALL AREA POLE 1 (44W)
-  SMALL AREA POLE 2 (26W)
-  FESTOON LIGHTING
-  PEDESTRIAN POLE
-  MISC - PRIVATE PROPERTY

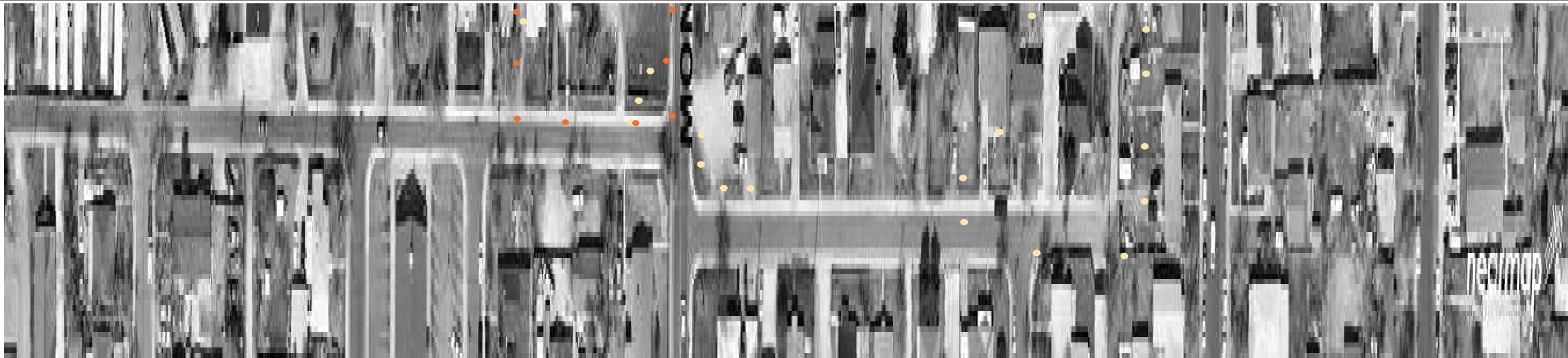




LEGEND

-  LARGE AREA POLE
-  SMALL AREA POLE 1 (44W)
-  SMALL AREA POLE 2 (26W)
-  FESTOON LIGHTING
-  PEDESTRIAN POLE
-  MISC - PRIVATE PROPERTY





LEGEND

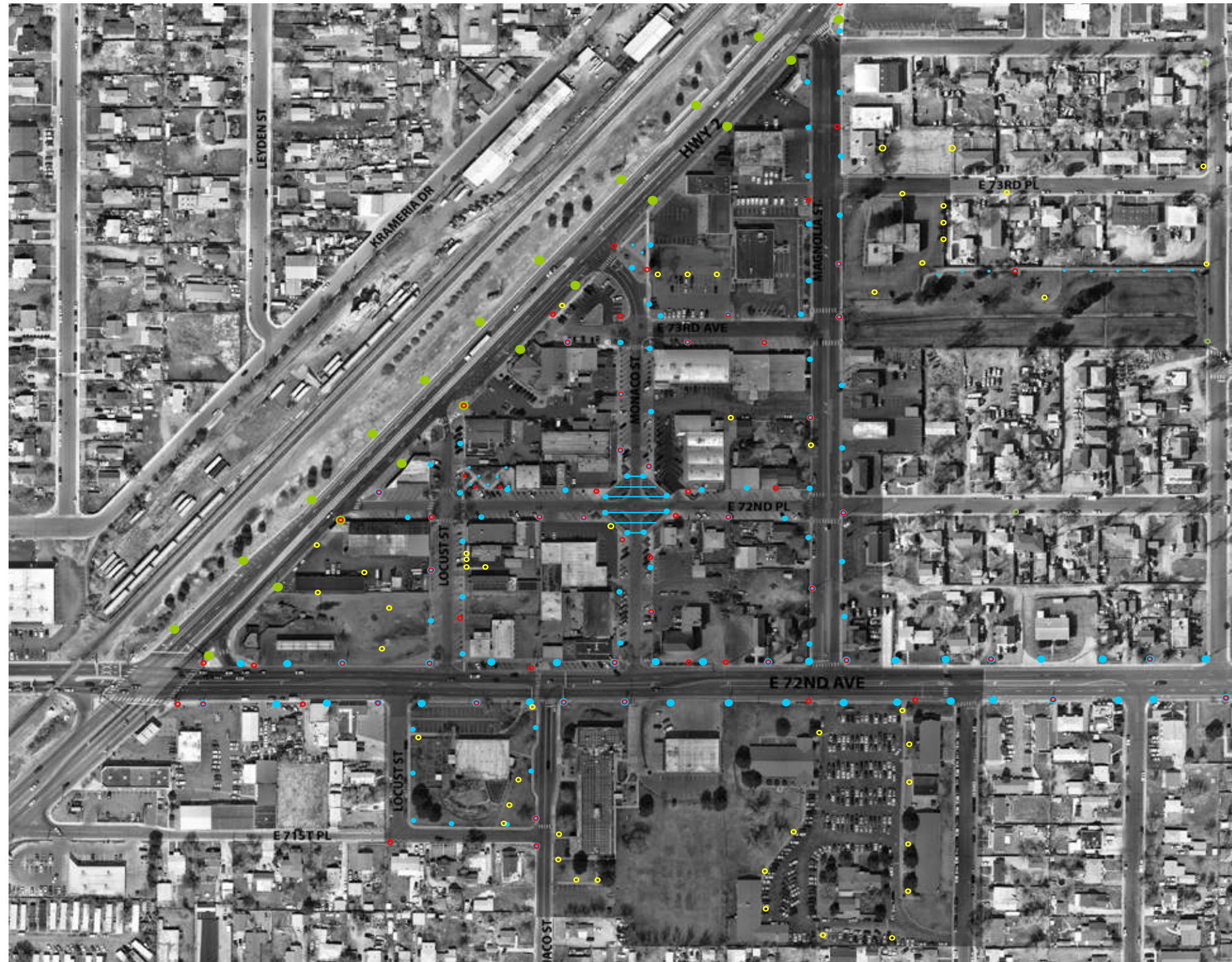
-  LARGE AREA POLE
-  SMALL AREA POLE 1 (44W)
-  SMALL AREA POLE 2 (26W)
-  FESTOON LIGHTING
-  PEDESTRIAN POLE
-  MISC - PRIVATE PROPERTY

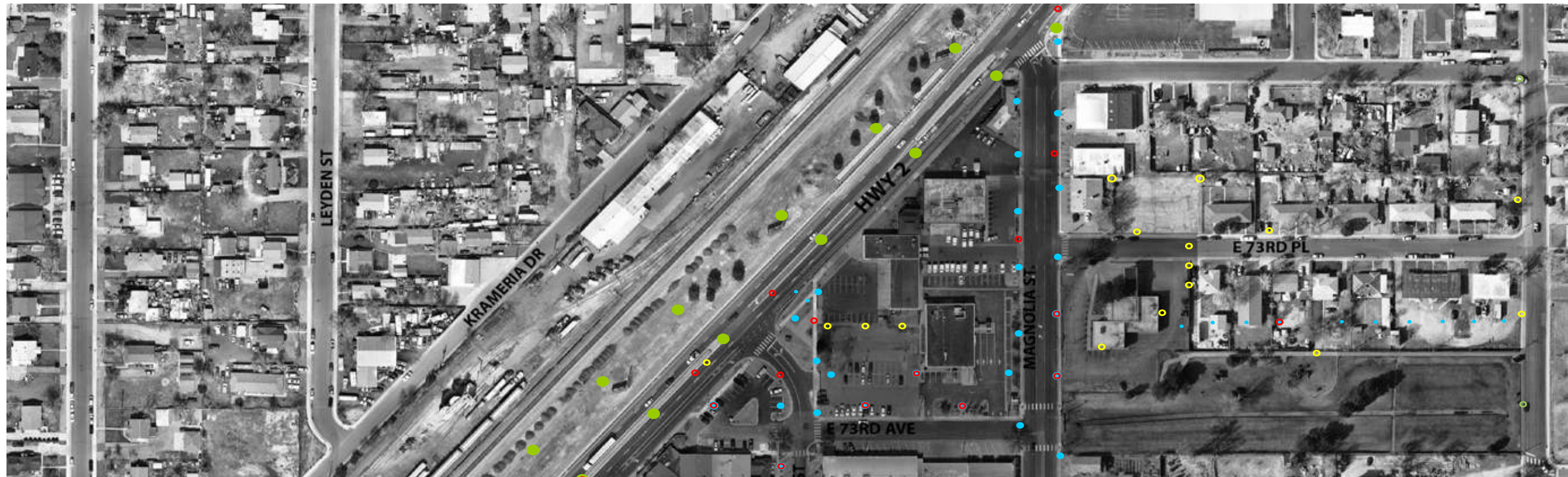


APPENDIX A - INFRASTRUCTURE RE-USE

- LEGEND
- NEW PROPOSED FIXTURES
 - NEW HIGHWAY 2 INFRASTRUCTURE
 - EXISTING PRIVATE PROPERTY
 - EXISTING FIXTURES TO BE REMOVED

Locations where red and blue dots coincide indicate locations where power and other infrastructure can potentially be re-used.



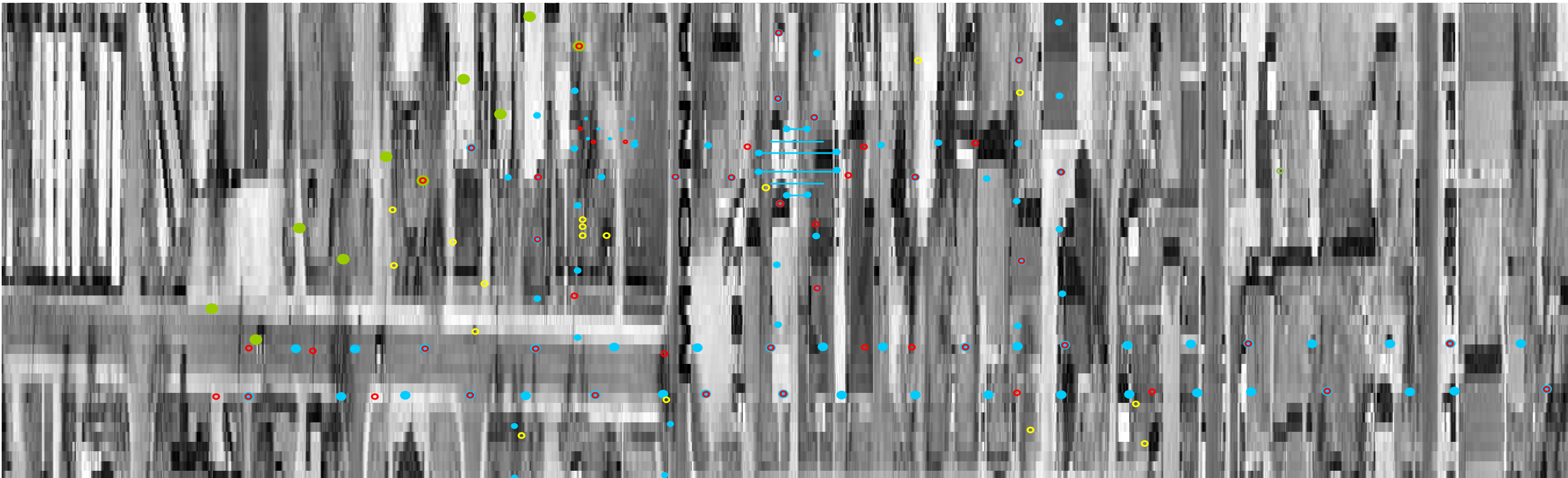


Locations where red and blue dots coincide indicate locations where power and other infrastructure can potentially be re-used.

LEGEND

- NEW PROPOSED FIXTURES
- NEW HIGHWAY 2 INFRASTRUCTURE
- EXISTING PRIVATE PROPERTY
- EXISTING FIXTURES TO BE REMOVED



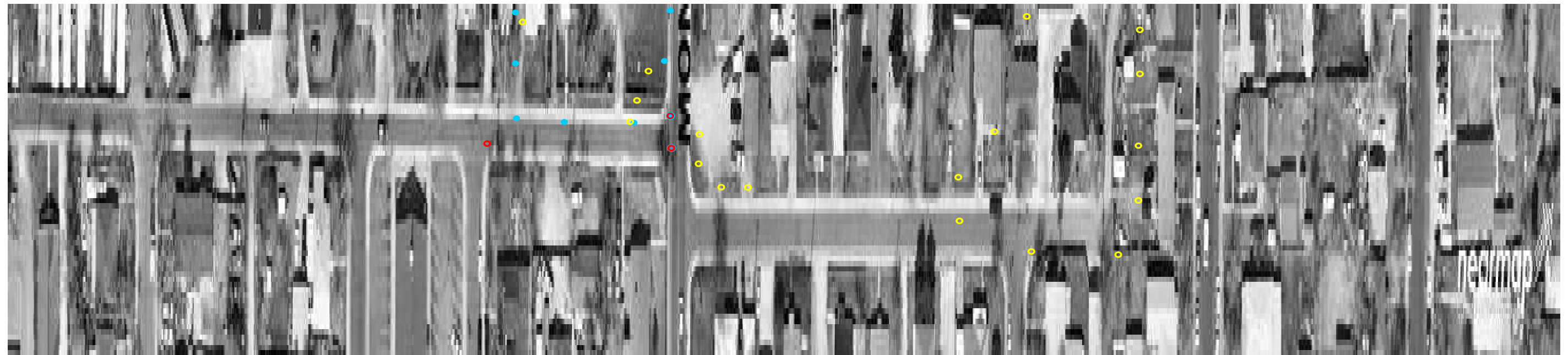


Locations where red and blue dots coincide indicate locations where power and other infrastructure can potentially be re-used.

LEGEND

- NEW PROPOSED FIXTURES
- NEW HIGHWAY 2 INFRASTRUCTURE
- EXISTING PRIVATE PROPERTY
- EXISTING FIXTURES TO BE REMOVED

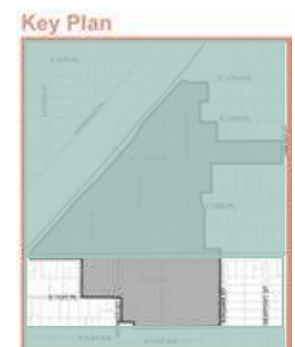




Locations where red and blue dots coincide indicate locations where power and other infrastructure can potentially be re-used.

LEGEND

- NEW PROPOSED FIXTURES
- NEW HIGHWAY 2 INFRASTRUCTURE
- EXISTING PRIVATE PROPERTY
- EXISTING FIXTURES TO BE REMOVED



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APPENDIX B

The following pages contain detailed specification information for the recommended luminaires and control systems.

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66	Large Area Pole Specification
69	Small Area Pole 1 Specification
72	Small Area Pole 2 Specifcaiton
75	Pedestrian Pole Specification
78	Ambiance String Light Specification
83	Controls Overview

APPENDIX B - LARGE AREA POLE



ORDERING INFORMATION

All YOA fixtures ship with the following items standard:

- XP-G2 standard output LEDs
- IK08 rated impact-resistant flat glass protector
- IP66 rated integral driver and optical unit
- Single fixture with slip-fitter mounts to standard 2 3/8" (60mm) tenon
- 10kV surge protection
- 5 year warranty

Sample Configuration: **YOAD-26W-T2SH-AS-NW-L5-SV-DG** _ _ _ _ _

1. Specify **BASE LUMINAIRE**
2. Select **OPTIONS**

Job Name / Location

Fixture Type

Configuration



BASE LUMINAIRE

YOA	Watts (lumens) ^	Optic and Distribution + (Specify both)	Color Temperature ^	Mounting -	Voltage/Class	Finish *
<input type="text"/>	<input type="text"/>	<input type="text"/> <input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
YOAD (Yoa Midi)	16 LEDs 19W (2,200 lm) 26W (2,900 lm) 38W (3,600 lm)	Optic T2VS (Type II very short, 5120) T2SH (Type II short, 5102) T2MD (Type II medium, 5117) T3SH (Type III short, 5121) T3MD (Type III medium, 5112) T4SH (Type IV short, 5119)	CW (5700K, 70+CRI) NW (4000K, 70+CRI) WW (3000K, 80+CRI)	Standard L5 (2 3/8", 60mm slip fit tenon) E2 (Lyre/Yoke post-top - YOAD only) S8 (Catenary suspended - YOAD only)	SV (120-277V)	Standard - AKZO DG (AKZO900 dark grey) AKZO* MG (AKZO150 mid grey) BK (AKZO200 black) Other AKZO* specify AKZO code AK ____
YOAX (Yoa Maxi)	24 LEDs 28W (3,300 lm) 39W (4,300 lm) 55W (5,400 lm)	Distribution AS (Asymmetric) SY (Symmetric)		- Additional mounting options available; see page 5 of this guide		Other RAL* specify RAL code RAL ____ M (matte) RAL ____ B (semi gloss) RAL ____ T (textured)
	40 LEDs 44W (5,400 lm) 64W (7,200 lm) 93W (9,100 lm)					Fixture head to match red signage elements.
	64 LEDs 72W (8,600 lm) 101W (11,500 lm) 140W (14,800 lm)	Optic T2VS (Type II very short, 5120) T2SH (Type II short, 5102) T2MD (Type II medium, 5117) T3SH (Type III short, 5121) T3MD (Type III medium, 5112) T4SH (Type IV short, 5119)				
	80 LEDs 87W (10,700 lm) 123W (14,300 lm) 185W (18,500 lm)	Distribution AS (Asymmetric) SY (Symmetric)				

OPTIONS (add codes below to end of part number above) *

Control Options *

- N7P** - NEMA 7-pin receptacle
- IOT** - Owllet IOT Control (dimming enabled, requires NEMA 7-pin receptacle)
- P7** - LuCo Owllet Control (dimming enabled, requires NEMA 7-pin receptacle)
- SXXX** - Custom control/sensor
- TXXX** - Custom photocell
- SC** - Shorting Cap (requires NEMA 7-pin receptacle)

Dimming Options *

- D01** - 0-10V
- DXXX** - Custom dimming

Other Fixture Options *

- A6** - Marine grade (3000 hour salt spray tested)
- BS** - Backlight shield (optic integrated)
- CT** - Power cable - specify type
- CT** - Power cable - specify length in feet to 26' (8m)
- AB** - Bird Spikes

NOTES:

- ^ Lumen output for **NW** (4000K) LEDs. Lumen output for **WW** (3000K) LEDs is up to 15% less than **NW** and total Lumen output may vary +/- 7%. Additional output configurations available. Please consult factory.
- + Additional photometry available. Please consult factory for details.
- * Additional cost may apply.



ANSI/UL 1598/CAN/CSA C22.2 No.250.0-08, 3rd Ed.

Preliminary data, date of revision: 11/30/2017

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Schröder Lighting LLC
1415 West 22nd Street, T Floor Oak Brook, IL 60523 USA
T 847-621-5130
www.schroeder.com



Yoa offers a complete lighting solution with state-of-the-art LED technology and astonishing elegance.

OPTICS DESIGNED FOR SAFETY

Yoa is equipped with second-generation LensoFlex®2 photometric engines that were specifically designed for lighting spaces where well-being and safety is essential. Both sizes offer flexible combinations of LED modules, driving currents and dimming options to provide the most cost-effective solution while improving comfort and safety.

APPLICATIONS

- Urban streets and roads
- Squares and pedestrian areas
- Residential areas
- Parks
- School or business campuses
- Parking lots

MOUNTING OPTIONS

- Slip-fit mounting onto a tenon with 2 3/8" (60mm) outside diameter
- Catenary suspension
- Post-top mounting
- Lyre/Yoke mounting
- Additional mounting options available – see page 5 of this guide

ECONOMIC BENEFITS

Cutting edge LED technology, in conjunction with a constant flux system and a smart dimming system, makes it possible to achieve over 70% energy savings compared to traditional technology. Yoa enables responsible use of energy and resources, an accelerated ROI, and decreased maintenance.

KEY SPECIFICATIONS - LUMINAIRE

- Optical compartment tightness level: IP 66 (*)
- Electrical compartment tightness level: IP 66 (**)
- Impact resistance: IK 08 (***)
- Nominal voltage: 120-277V - 50/60Hz
- L70: 100,000+ hours
- EPA:
- Yoa Midi: 0.227ft²
- Yoa Maxi: 0.226ft²
- Electrical safety class: US Class I (***)
- Materials:
- Housing: Die-cast aluminum
- Protector: Glass
- Color: Dark grey AKZO 900 sanded (any other RAL or AKZO color upon request)

KEY ADVANTAGES

- LensoFlex®2 engine with adaptable photometry for various applications
- FutureProof: easy access to the photometric engine and electronic assembly for future replacements or upgrades
- Compatible with IoT controls, including our Owllet range
- ULOR 0%
- Low energy consumption
- Maximized savings in energy and maintenance costs
- Durable yet recyclable materials
- Perfect match between design and performance
- Surge protection: 10kV

(*) according to IEC - EN 60529

(**) according to IEC - EN 62262

(***) according to NFPA 70 (NEC)

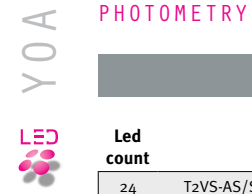


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Preliminary data, date of revision: 11/30/2017

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APPENDIX B - LARGE AREA POLE



PHOTOMETRY

Nominal Photometry Detail - Neutral White (4000K) 70+ CRI

Led count	Optics	Luminaire output flux (lm)	Current (mA)	Luminaire total power (W)	Luminaire efficiency (lm/W)	BUG Rating*
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	3431	350	28	123	B1 Uo G0
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	4632	500	39	119	B1 Uo G1
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	6004	700	55	109	B2 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	3354	350	28	120	B1 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	4528	500	39	116	B1 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	5869	700	55	107	B2 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	3190	350	28	114	B1 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	4306	500	39	110	B2 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	5582	700	55	101	B2 Uo G2
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	3306	350	28	118	B1 Uo G1
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	4463	500	39	114	B1 Uo G1
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	5786	700	55	105	B2 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	3202	350	28	114	B1 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	4323	500	39	111	B1 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	5603	700	55	102	B2 Uo G1

Nominal Photometry Detail - Warm White (3000K) 80+ CRI

Led count	Optics	Luminaire output flux (lm)	Current (mA)	Luminaire total power (W)	Luminaire efficiency (lm/W)	BUG Rating*
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	3100	350	28	111	B1 Uo G0
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	4185	500	39	107	B1 Uo G1
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	5426	700	55	99	B2 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	3030	350	28	108	B1 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	4091	500	39	105	B1 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	5303	700	55	96	B2 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	2882	350	28	103	B1 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	3891	500	39	100	B1 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	5044	700	55	92	B2 Uo G2
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	2987	350	28	107	B1 Uo G1
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	4033	500	39	103	B1 Uo G1
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	5228	700	55	95	B1 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	2893	350	28	103	B1 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	3906	500	39	100	B1 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	5063	700	55	92	B1 Uo G1

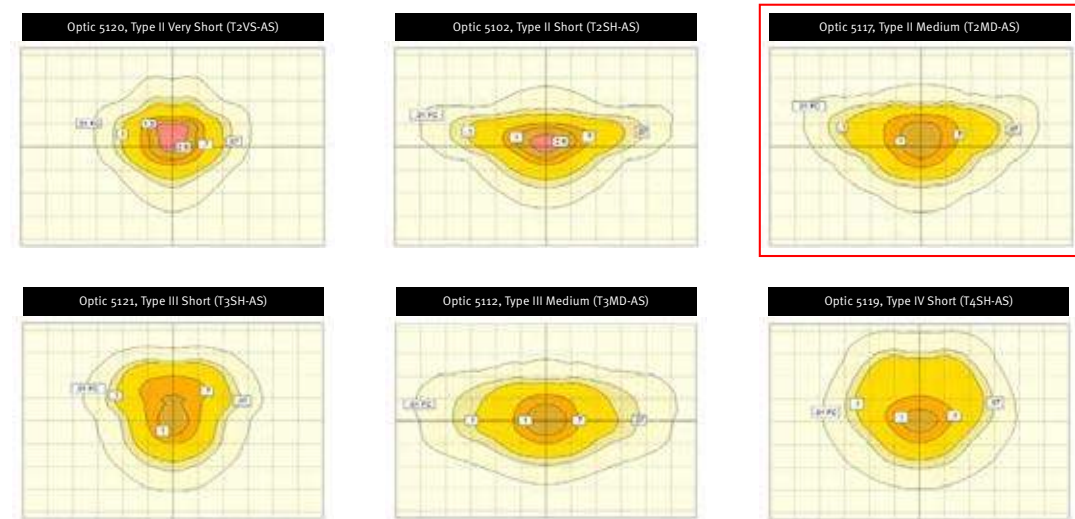
* "B" in BUG Rating applies to Asymmetric distributions only.

Preliminary data, date of revision: 11/30/2017



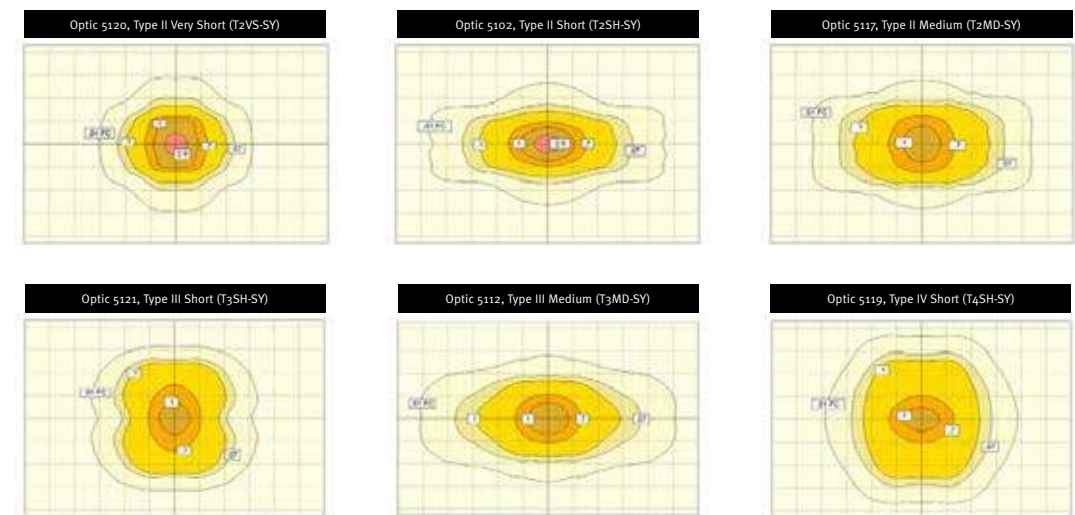
LIGHT DISTRIBUTIONS

ASYMMETRIC DISTRIBUTIONS*: Ideal for urban streets and roads, transit facilities, walkways



*Photometry Tables and Light Distribution curves shown above are specific to AS (Asymmetric) Distributions with 24 LEDs, standard extra clear smooth glass lens. Illuminance diagrams use a mounting height of 25ft (7.6m). Photometry for other configurations including symmetric distributions and other LED models are available upon request. Please contact us for more information.

SYMMETRIC DISTRIBUTIONS**: Ideal for parks, public squares and pedestrian malls, business or education campuses, parking areas



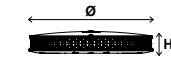
**Photometry Tables and Light Distribution curves shown above are specific to SY (Symmetric) Distributions with 24 LEDs, standard extra clear smooth glass lens. Illuminance diagrams use a mounting height of 25ft (7.6m). Photometry for other configurations including asymmetric distributions and other LED models are available upon request. Please contact us for more information.



APPENDIX B - LARGE AREA POLE

YOA
LED

DIMENSIONS



	Yoa Midi	Yoa Maxi
Ø	500mm / 19.7"	650mm / 25.6"
H	90mm / 3.5"	90mm / 3.5"

MOUNTING

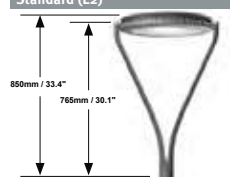
Side Tenon (LS)



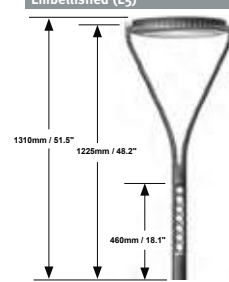
Catenary (S8)



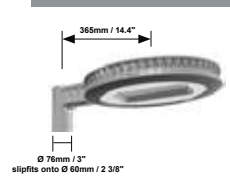
LYRE Standard (E2)



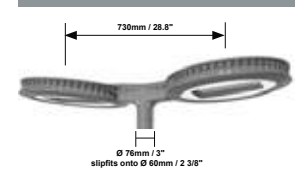
LYRE Embellished (E3)



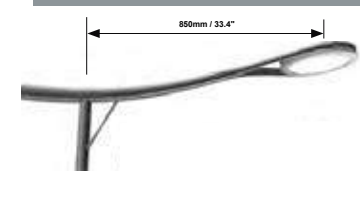
Post-Top - Single (P1)



Post-Top - Double (P2)



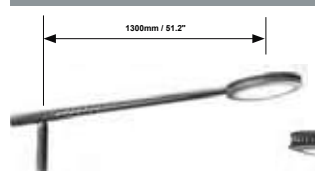
LUCEA Single Arm (L1)



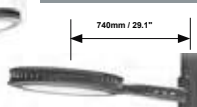
LUCEA Pole Mount (L3)



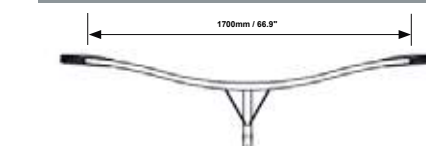
TRESSA Single Arm (T1)



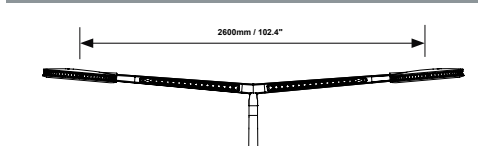
TRESSA Pole Mount (T3)



LUCEA Double Arm (L2)



TRESSA Double Arm (T2)



	TENON	CATENARY	LYRE		POST-TOP		LUCEA			TRESSA		
	Side Tenon (LS)	Catenary (S8)	Standard (E2)	Embellished (E3)	Post-Top Single (P1)	Post-Top Double (P2)	Single Arm (L1)	Double Arm (L2)	Pole Mount (L3)	Single Arm (T1)	Double Arm (T2)	Pole Mount (T3)
Yoa Midi	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Yoa Maxi	✓	n/a	n/a	n/a	✓	✓	✓	✓	n/a	✓	✓	n/a



APPENDIX B - SMALL AREA POLE 1



ORDERING INFORMATION

All YOA fixtures ship with the following items standard:

- XP-G2 standard output LEDs
- IK08 rated impact-resistant flat glass protector
- IP66 rated integral driver and optical unit
- Single fixture with slip-fitter mounts to standard 2 3/8" (60mm) tenon
- 10kV surge protection
- 5 year warranty

Sample Configuration: **YOAD-26W-T2SH-AS-NW-L5-SV-DG** - - - -

1. Specify **BASE LUMINAIRE**
2. Select **OPTIONS**

Job Name / Location

Fixture Type

Configuration



BASE LUMINAIRE

YOA	Watts (lumens) ^	Optic and Distribution + (Specify both)	Color Temperature ^	Mounting -	Voltage/Class	Finish *
YOAD (Yoa Midi)	16 LEDs 19W (2,200 lm) 26W (2,900 lm) 38W (3,600 lm) 24 LEDs 28W (3,300 lm) 39W (4,300 lm) 55W (5,400 lm) 40 LEDs 44W (5,400 lm) 64W (7,200 lm) 93W (9,100 lm)	Optic T2VS (Type II very short, 5120) T2SH (Type II short, 5102) T2MD (Type II medium, 5117) T3SH (Type III short, 5121) T3MD (Type III medium, 5112) T4SH (Type IV short, 5119) Distribution AS (Asymmetric) SY (Symmetric)	CW (5700K, 70+CRI) NW (4000K, 70+CRI) WW (3000K, 80+CRI)	Standard L5 (2 3/8", 60mm slip fit tenon) E2 (Lyre/Yoke post-top - YOAD only) S8 (Catenary suspended - YOAD only)	SV (120-277V)	Standard - AKZO DG (AKZO900 dark grey) AKZO* MG (AKZO150 mid grey) BK (AKZO200 black) Other AKZO* specify AKZO code AK____ Other RAL* specify RAL code RAL____M (matte) RAL____B (semi gloss) RAL____T (textured) Fixture head to match red signage elements.
YOAX (Yoa Maxi)	64 LEDs 72W (8,600 lm) 101W (11,500 lm) 140W (14,800 lm) 80 LEDs 87W (10,700 lm) 123W (14,300 lm) 185W (18,500 lm)	Optic T2VS (Type II very short, 5120) T2SH (Type II short, 5102) T2MD (Type II medium, 5117) T3SH (Type III short, 5121) T3MD (Type III medium, 5112) T4SH (Type IV short, 5119) Distribution AS (Asymmetric) SY (Symmetric)				

OPTIONS (add codes below to end of part number above) *

Control Options *

- N7P** - NEMA 7-pin receptacle
- IOT** - Owllet IOT Control (dimming enabled, requires NEMA 7-pin receptacle)
- P7** - LuCo Owllet Control (dimming enabled, requires NEMA 7-pin receptacle)
- SXXX** - Custom control/sensor
- TXXX** - Custom photocell
- SC** - Shorting Cap (requires NEMA 7-pin receptacle)

Dimming Options *

- D01** - 0-10V
- DXXX** - Custom dimming

Other Fixture Options *

- A6** - Marine grade (3000 hour salt spray tested)
- BS** - Backlight shield (optic integrated)
- CT** - Power cable - specify type
- CT** - Power cable - specify length in feet to 26' (8m)
- AB** - Bird Spikes

NOTES:

- ^ Lumen output for **NW** (4000K) LEDs. Lumen output for **WW** (3000K) LEDs is up to 15% less than **NW** and total Lumen output may vary +/- 7%. Additional output configurations available. Please consult factory.
- * Additional photometry available. Please consult factory for details.
- * Additional cost may apply.



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Preliminary data, date of revision: 11/30/2017

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Yoa offers a complete lighting solution with state-of-the-art LED technology and astonishing elegance.

OPTICS DESIGNED FOR SAFETY

Yoa is equipped with second-generation LensoFlex®2 photometric engines that were specifically designed for lighting spaces where well-being and safety is essential. Both sizes offer flexible combinations of LED modules, driving currents and dimming options to provide the most cost-effective solution while improving comfort and safety.

APPLICATIONS

- Urban streets and roads
- Squares and pedestrian areas
- Residential areas
- Parks
- School or business campuses
- Parking lots

MOUNTING OPTIONS

- Slip-fit mounting onto a tenon with 2 3/8" (60mm) outside diameter
- Catenary suspension
- Post-top mounting
- Lyre/Yoke mounting
- Additional mounting options available – see page 5 of this guide

ECONOMIC BENEFITS

Cutting edge LED technology, in conjunction with a constant flux system and a smart dimming system, makes it possible to achieve over 70% energy savings compared to traditional technology. Yoa enables responsible use of energy and resources, an accelerated ROI, and decreased maintenance.



KEY SPECIFICATIONS - LUMINAIRE

- Optical compartment tightness level: IP 66 (*)
- Electrical compartment tightness level: IP 66 (**)
- Impact resistance: IK 08 (***)
- Nominal voltage: 120-277V - 50/60Hz
- L70: 100,000+ hours
- EPA:
 - Yoa Midi: 0.227ft²
 - Yoa Maxi: 0.226ft²
- Electrical safety class: US Class I (***)
- Materials:
 - Housing: Die-cast aluminum
 - Protector: Glass
 - Color: Dark grey AKZO 900 sanded (any other RAL or AKZO color upon request)

KEY ADVANTAGES

- LensoFlex®2 engine with adaptable photometry for various applications
- FutureProof: easy access to the photometric engine and electronic assembly for future replacements or upgrades
- Compatible with IoT controls, including our Owllet range
- ULOR 0%
- Low energy consumption
- Maximized savings in energy and maintenance costs
- Durable yet recyclable materials
- Perfect match between design and performance
- Surge protection: 10kV

(*) according to IEC - EN 60529

(**) according to IEC - EN 62262

(***) according to NFPA 70 (NEC)

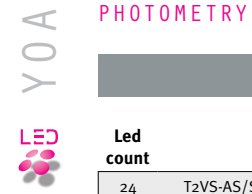


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APPENDIX B - SMALL AREA POLE 1



PHOTOMETRY

Nominal Photometry Detail - Neutral White (4000K) 70+ CRI

Led count	Optics	Luminaire output flux (lm)	Current (mA)	Luminaire total power (W)	Luminaire efficiency (lm/W)	BUG Rating*
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	3431	350	28	123	B1 Uo G0
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	4632	500	39	119	B1 Uo G1
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	6004	700	55	109	B2 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	3354	350	28	120	B1 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	4528	500	39	116	B1 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	5869	700	55	107	B2 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	3190	350	28	114	B1 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	4306	500	39	110	B2 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	5582	700	55	101	B2 Uo G2
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	3306	350	28	118	B1 Uo G1
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	4463	500	39	114	B1 Uo G1
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	5786	700	55	105	B2 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	3202	350	28	114	B1 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	4323	500	39	111	B1 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	5603	700	55	102	B2 Uo G1

Nominal Photometry Detail - Warm White (3000K) 80+ CRI

Led count	Optics	Luminaire output flux (lm)	Current (mA)	Luminaire total power (W)	Luminaire efficiency (lm/W)	BUG Rating*
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	3100	350	28	111	B1 Uo G0
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	4185	500	39	107	B1 Uo G1
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	5426	700	55	99	B2 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	3030	350	28	108	B1 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	4091	500	39	105	B1 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	5303	700	55	96	B2 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	2882	350	28	103	B1 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	3891	500	39	100	B1 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	5044	700	55	92	B2 Uo G2
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	2987	350	28	107	B1 Uo G1
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	4033	500	39	103	B1 Uo G1
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	5228	700	55	95	B1 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	2893	350	28	103	B1 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	3906	500	39	100	B1 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	5063	700	55	92	B1 Uo G1

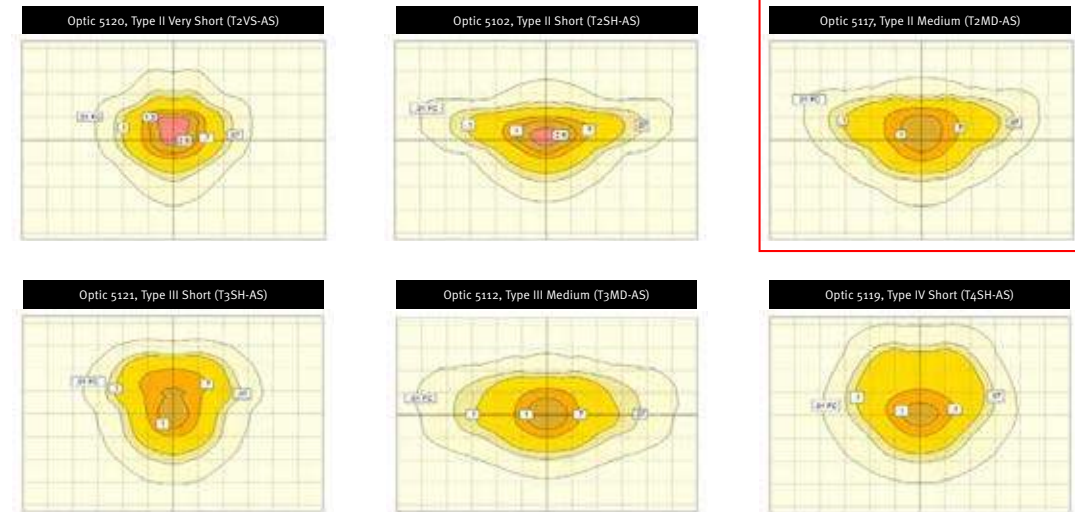
* "B" in BUG Rating applies to Asymmetric distributions only.

Preliminary data, date of revision: 11/30/2017



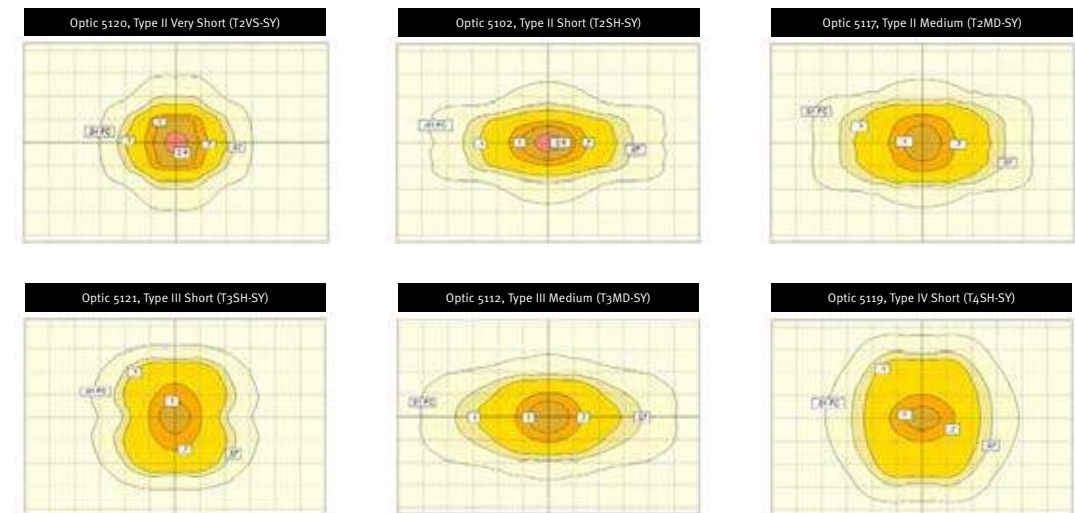
LIGHT DISTRIBUTIONS

ASYMMETRIC DISTRIBUTIONS*: Ideal for urban streets and roads, transit facilities, walkways



*Photometry Tables and Light Distribution curves shown above are specific to AS (Asymmetric) Distributions with 24 LEDs, standard extra clear smooth glass lens. Illuminance diagrams use a mounting height of 25ft (7.6m). Photometry for other configurations including symmetric distributions and other LED models are available upon request. Please contact us for more information.

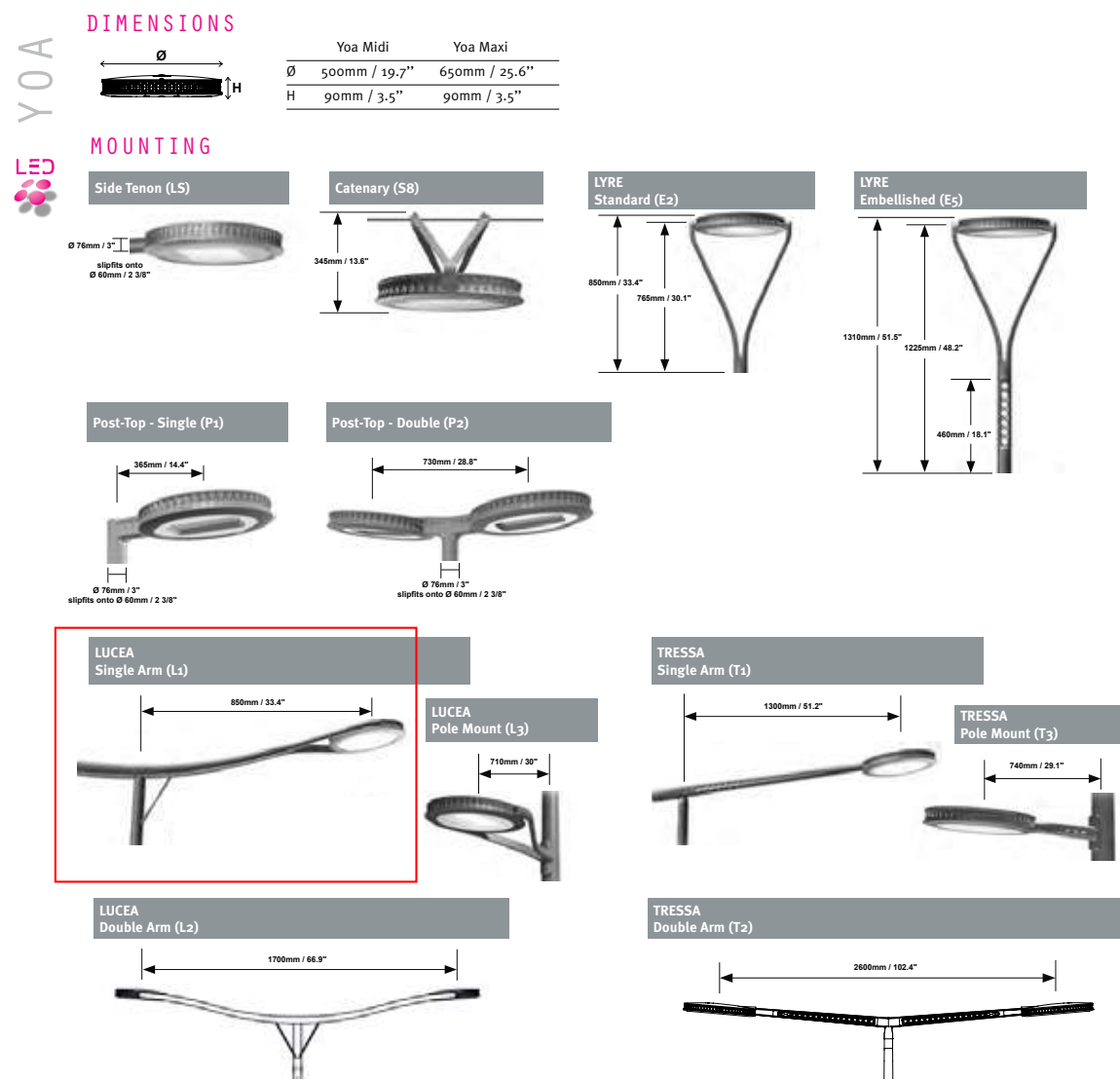
SYMMETRIC DISTRIBUTIONS**: Ideal for parks, public squares and pedestrian malls, business or education campuses, parking areas



**Photometry Tables and Light Distribution curves shown above are specific to SY (Symmetric) Distributions with 24 LEDs, standard extra clear smooth glass lens. Illuminance diagrams use a mounting height of 25ft (7.6m). Photometry for other configurations including asymmetric distributions and other LED models are available upon request. Please contact us for more information.



APPENDIX B - SMALL AREA POLE 1



	TENON	CATENARY	LYRE		POST-TOP		LUCEA			TRESSA		
	Side Tenon (LS)	Catenary (S8)	Standard (E2)	Embellished (E3)	Post-Top Single (P1)	Post-Top Double (P2)	Single Arm (L1)	Double Arm (L2)	Pole Mount (L3)	Single Arm (T1)	Double Arm (T2)	Pole Mount (T3)
Yoa Midi	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Yoa Maxi	✓	n/a	n/a	n/a	✓	✓	✓	✓	n/a	✓	✓	n/a



APPENDIX B - SMALL AREA POLE 2



ORDERING INFORMATION

All YOA fixtures ship with the following items standard:

- XP-G2 standard output LEDs
- IK08 rated impact-resistant flat glass protector
- IP66 rated integral driver and optical unit
- Single fixture with slip-fitter mounts to standard 2 3/8" (60mm) tenon
- 10kV surge protection
- 5 year warranty

Sample Configuration: **YOAD-26W-T2SH-AS-NW-L5-SV-DG** _ _ _ _ _

1. Specify **BASE LUMINAIRE**
2. Select **OPTIONS**

Job Name / Location

Fixture Type

Configuration



BASE LUMINAIRE

YOA	Watts (lumens) ^	Optic and Distribution + (Specify both)	Color Temperature ^	Mounting -	Voltage/Class	Finish *
YOAD (Yoa Midi)	16 LEDs 19W (2,200 lm) 26W (2,900 lm) 38W (3,600 lm)	Optic T2VS (Type II very short, 5120) T2SH (Type II short, 5102) T2MD (Type II medium, 5117) T3SH (Type III short, 5121) T3MD (Type III medium, 5112) T4SH (Type IV short, 5119)	CW (5700K, 70+CRI) NW (4000K, 70+CRI) WW (3000K, 80+CRI)	Standard L5 (2 3/8", 60mm slip fit tenon) E2 (Lyre/Yoke post-top - YOAD only) S8 (Catenary suspended - YOAD only)	SV (120-277V)	Standard - AKZO DG (AKZO900 dark grey) AKZO* MG (AKZO150 mid grey) BK (AKZO200 black) Other AKZO* specify AKZO code AK ____
YOAX (Yoa Maxi)	24 LEDs 28W (3,300 lm) 39W (4,300 lm) 55W (5,400 lm)	Distribution AS (Asymmetric) SY (Symmetric)				Other RAL* specify RAL code RAL ____ M (matte) RAL ____ B (semi gloss) RAL ____ T (textured)
	40 LEDs 44W (5,400 lm) 64W (7,200 lm) 93W (9,100 lm)			- Additional mounting options available; see page 5 of this guide		Fixtue head to match red signage elements.
	64 LEDs 72W (8,600 lm) 101W (11,500 lm) 140W (14,800 lm)	Optic T2VS (Type II very short, 5120) T2SH (Type II short, 5102) T2MD (Type II medium, 5117) T3SH (Type III short, 5121) T3MD (Type III medium, 5112) T4SH (Type IV short, 5119)				
	80 LEDs 87W (10,700 lm) 123W (14,300 lm) 185W (18,500 lm)	Distribution AS (Asymmetric) SY (Symmetric)				

OPTIONS (add codes below to end of part number above) *

Control Options *

- N7P** - NEMA 7-pin receptacle
- IOT** - Owllet IOT Control (dimming enabled, requires NEMA 7-pin receptacle)
- P7** - LuCo Owllet Control (dimming enabled, requires NEMA 7-pin receptacle)
- SXXX** - Custom control/sensor
- TXXX** - Custom photocell
- SC** - Shorting Cap (requires NEMA 7-pin receptacle)

Dimming Options *

- D01** - 0-10V
- DXXX** - Custom dimming

Other Fixture Options *

- A6** - Marine grade (3000 hour salt spray tested)
- BS** - Backlight shield (optic integrated)
- CT** - Power cable - specify type
- CT** - Power cable - specify length in feet to 26' (8m)
- AB** - Bird Spikes

NOTES:

- ^ Lumen output for **NW** (4000K) LEDs. Lumen output for **WW** (3000K) LEDs is up to 15% less than **NW** and total Lumen output may vary +/- 7%. Additional output configurations available. Please consult factory.
- + Additional photometry available. Please consult factory for details.
- * Additional cost may apply.



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OPTICS DESIGNED FOR SAFETY

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APPLICATIONS

- Urban streets and roads
- Squares and pedestrian areas
- Residential areas
- Parks
- School or business campuses
- Parking lots

MOUNTING OPTIONS

- Slip-fit mounting onto a tenon with 2 3/8" (60mm) outside diameter
- Catenary suspension
- Post-top mounting
- Lyre/Yoke mounting
- Additional mounting options available – see page 5 of this guide

ECONOMIC BENEFITS

Cutting edge LED technology, in conjunction with a constant flux system and a smart dimming system, makes it possible to achieve over 70% energy savings compared to traditional technology. Yoa enables responsible use of energy and resources, an accelerated ROI, and decreased maintenance.

KEY SPECIFICATIONS - LUMINAIRE

- Optical compartment tightness level: IP 66 (*)
- Electrical compartment tightness level: IP 66 (*)
- Impact resistance: IK 08 (**)
- Nominal voltage: 120-277V - 50/60Hz
- L70: 100,000+ hours
- EPA:
- Yoa Midi: 0.227ft²
- Yoa Maxi: 0.226ft²
- Electrical safety class: US Class I (***)
- Materials:
- Housing: Die-cast aluminum
- Protector: Glass
- Color: Dark grey AKZO 900 sanded (any other RAL or AKZO color upon request)

KEY ADVANTAGES

- LensoFlex®2 engine with adaptable photometry for various applications
- FutureProof: easy access to the photometric engine and electronic assembly for future replacements or upgrades
- Compatible with IoT controls, including our Owllet range
- ULOR 0%
- Low energy consumption
- Maximized savings in energy and maintenance costs
- Durable yet recyclable materials
- Perfect match between design and performance
- Surge protection: 10kV

(*) according to IEC - EN 60529

(**) according to IEC - EN 62262

(***) according to NFPA 70 (NEC)

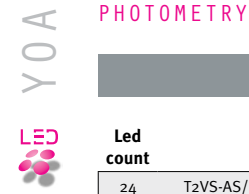


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APPENDIX B - SMALL AREA POLE 2



PHOTOMETRY

Nominal Photometry Detail - Neutral White (4000K) 70+ CRI

Led count	Optics	Luminaire output flux (lm)	Current (mA)	Luminaire total power (W)	Luminaire efficiency (lm/W)	BUG Rating*
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	3431	350	28	123	B1 Uo G0
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	4632	500	39	119	B1 Uo G1
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	6004	700	55	109	B2 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	3354	350	28	120	B1 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	4528	500	39	116	B1 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	5869	700	55	107	B2 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	3190	350	28	114	B1 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	4306	500	39	110	B2 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	5582	700	55	101	B2 Uo G2
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	3306	350	28	118	B1 Uo G1
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	4463	500	39	114	B1 Uo G1
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	5786	700	55	105	B2 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	3202	350	28	114	B1 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	4323	500	39	111	B1 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	5603	700	55	102	B2 Uo G1

Nominal Photometry Detail - Warm White (3000K) 80+ CRI

Led count	Optics	Luminaire output flux (lm)	Current (mA)	Luminaire total power (W)	Luminaire efficiency (lm/W)	BUG Rating*
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	3100	350	28	111	B1 Uo G0
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	4185	500	39	107	B1 Uo G1
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	5426	700	55	99	B2 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	3030	350	28	108	B1 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	4091	500	39	105	B1 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	5303	700	55	96	B2 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	2882	350	28	103	B1 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	3891	500	39	100	B1 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	5044	700	55	92	B2 Uo G2
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	2987	350	28	107	B1 Uo G1
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	4033	500	39	103	B1 Uo G1
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	5228	700	55	95	B1 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	2893	350	28	103	B1 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	3906	500	39	100	B1 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	5063	700	55	92	B1 Uo G1

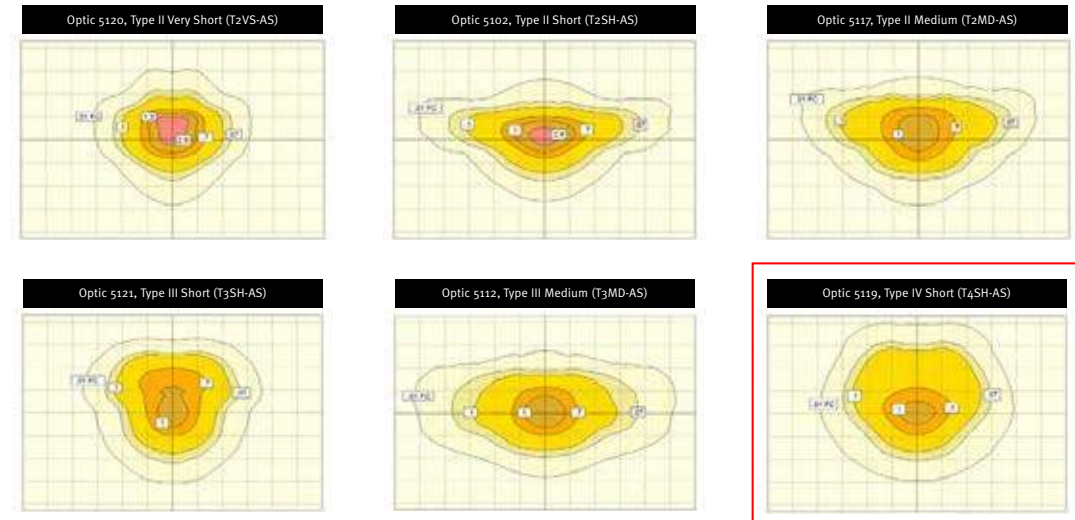
* "B" in BUG Rating applies to Asymmetric distributions only.

Preliminary data, date of revision: 11/30/2017



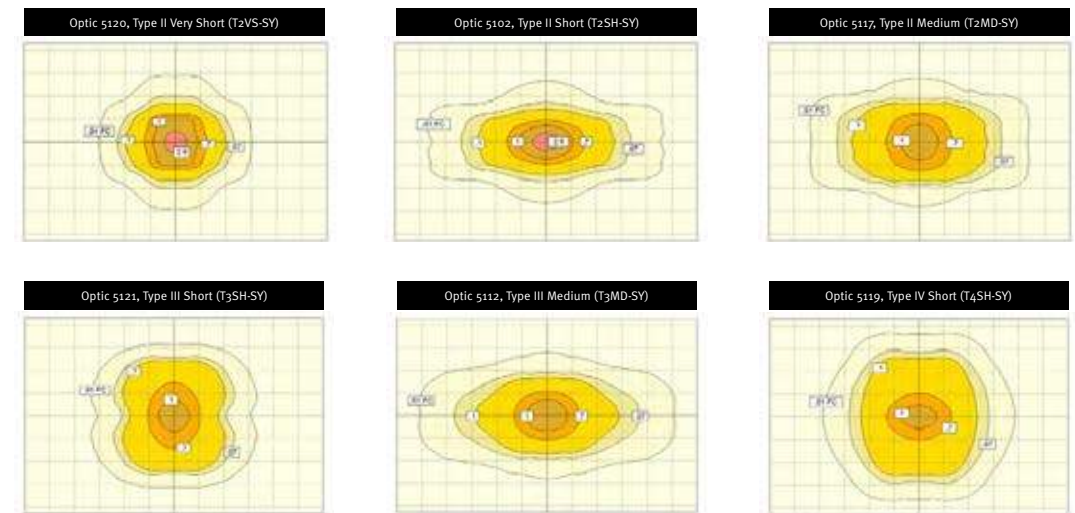
LIGHT DISTRIBUTIONS

ASYMMETRIC DISTRIBUTIONS*: Ideal for urban streets and roads, transit facilities, walkways



*Photometry Tables and Light Distribution curves shown above are specific to AS (Asymmetric) Distributions with 24 LEDs, standard extra clear smooth glass lens. Illuminance diagrams use a mounting height of 25ft (7.6m). Photometry for other configurations including symmetric distributions and other LED models are available upon request. Please contact us for more information.

SYMMETRIC DISTRIBUTIONS**: Ideal for parks, public squares and pedestrian malls, business or education campuses, parking areas



**Photometry Tables and Light Distribution curves shown above are specific to SY (Symmetric) Distributions with 24 LEDs, standard extra clear smooth glass lens. Illuminance diagrams use a mounting height of 25ft (7.6m). Photometry for other configurations including asymmetric distributions and other LED models are available upon request. Please contact us for more information.



APPENDIX B - SMALL AREA POLE 2

YOA
LED

DIMENSIONS

	Yoa Midi	Yoa Maxi
Ø	500mm / 19.7"	650mm / 25.6"
H	90mm / 3.5"	90mm / 3.5"

MOUNTING

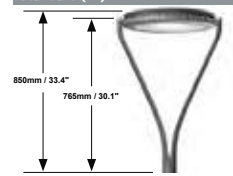
Side Tenon (LS)



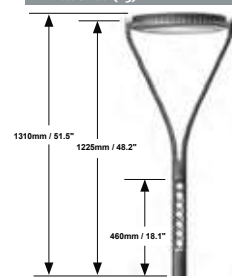
Catenary (S8)



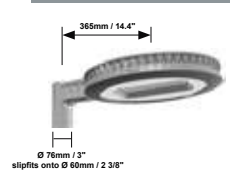
LYRE Standard (E2)



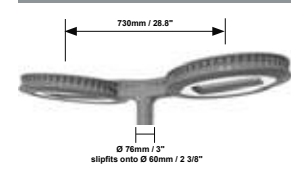
LYRE Embellished (E3)



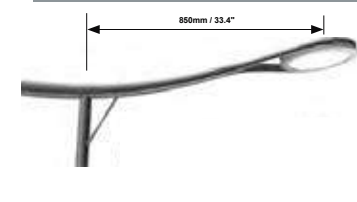
Post-Top - Single (P1)



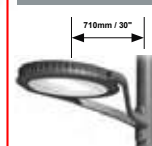
Post-Top - Double (P2)



LUCEA Single Arm (L1)



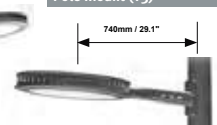
LUCEA Pole Mount (L3)



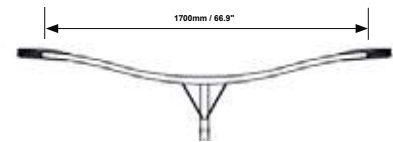
TRESSA Single Arm (T1)



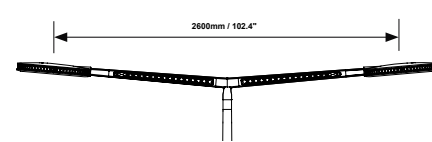
TRESSA Pole Mount (T3)



LUCEA Double Arm (L2)



TRESSA Double Arm (T2)



	TENON	CATENARY	LYRE		POST-TOP		LUCEA			TRESSA		
	Side Tenon (LS)	Catenary (S8)	Standard (E2)	Embellished (E3)	Post-Top Single (P1)	Post-Top Double (P2)	Single Arm (L1)	Double Arm (L2)	Pole Mount (L3)	Single Arm (T1)	Double Arm (T2)	Pole Mount (T3)
Yoa Midi	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Yoa Maxi	✓	n/a	n/a	n/a	✓	✓	✓	✓	n/a	✓	✓	n/a



APPENDIX B - PEDESTRIAN POLE



ORDERING INFORMATION

All YOA fixtures ship with the following items standard:

- XP-G2 standard output LEDs
- IK08 rated impact-resistant flat glass protector
- IP66 rated integral driver and optical unit
- Single fixture with slip-fitter mounts to standard 2 3/8" (60mm) tenon
- 10kV surge protection
- 5 year warranty

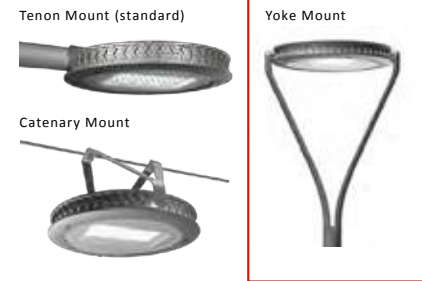
Sample Configuration: **YOAD-26W-T2SH-AS-NW-L5-SV-DG** - - - -

1. Specify **BASE LUMINAIRE**
2. Select **OPTIONS**

Job Name / Location

Fixture Type

Configuration



BASE LUMINAIRE

YOA	Watts (lumens) ^	Optic and Distribution + (Specify both)	Color Temperature ^	Mounting -	Voltage/Class	Finish *
YOAD (Yoa Midi)	16 LEDs 19W (2,200 lm) 26W (2,900 lm) 38W (3,600 lm) 24 LEDs 28W (3,300 lm) 39W (4,300 lm) 55W (5,400 lm) 40 LEDs 44W (5,400 lm) 64W (7,200 lm) 93W (9,100 lm)	Optic T2VS (Type II very short, 5120) T2SH (Type II short, 5102) T2MD (Type II medium, 5117) T3SH (Type III short, 5121) T3MD (Type III medium, 5112) T4SH (Type IV short, 5119) Distribution AS (Asymmetric) SY (Symmetric)	CW (5700K, 70+CRI) NW (4000K, 70+CRI) WW (3000K, 80+CRI)	Standard L5 (2 3/8", 60mm slip fit tenon) E2 (Lyre/Yoke post-top - YOAD only) S8 (Catenary suspended - YOAD only) + Additional mounting options available; see page 5 of this guide	SV (120-277V)	Standard - AKZO DG (AKZO900 dark grey) AKZO* MG (AKZO150 mid grey) BK (AKZO200 black) Other AKZO* specify AKZO code AK _____ Other RAL* specify RAL code RAL _____ M (matte) RAL _____ B (semi gloss) RAL _____ T (textured) Fixture head to match red signage elements.
YOAX (Yoa Maxi)	64 LEDs 72W (8,600 lm) 101W (11,500 lm) 140W (14,800 lm) 80 LEDs 87W (10,700 lm) 123W (14,300 lm) 185W (18,500 lm)	Optic T2VS (Type II very short, 5120) T2SH (Type II short, 5102) T2MD (Type II medium, 5117) T3SH (Type III short, 5121) T3MD (Type III medium, 5112) T4SH (Type IV short, 5119) Distribution AS (Asymmetric) SY (Symmetric)				

OPTIONS (add codes below to end of part number above) *

Control Options *

- N7P** - NEMA 7-pin receptacle
- IOT** - Owllet IOT Control (dimming enabled, requires NEMA 7-pin receptacle)
- P7** - LuCo Owllet Control (dimming enabled, requires NEMA 7-pin receptacle)
- SXXX** - Custom control/sensor
- TXXX** - Custom photocell
- SC** - Shorting Cap (requires NEMA 7-pin receptacle)

Dimming Options *

- D01** - 0-10V
- DXXX** - Custom dimming

Other Fixture Options *

- A6** - Marine grade (3000 hour salt spray tested)
- BS** - Backlight shield (optic integrated)
- CT** - Power cable - specify type
- CT** - Power cable - specify length in feet to 26' (8m)
- AB** - Bird Spikes

NOTES:

- ^ Lumen output for **NW** (4000K) LEDs. Lumen output for **WW** (3000K) LEDs is up to 15% less than **NW** and total Lumen output may vary +/- 7%. Additional output configurations available. Please consult factory.
- + Additional photometry available. Please consult factory for details.
- * Additional cost may apply.



ANSI/UL 1598/CAN/CSA C22.2 No.250.0-08, 3rd Ed.

Preliminary data, date of revision: 11/30/2017

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Schröder Lighting LLC
1415 West 22nd Street, T Floor Oak Brook, IL 60523 USA
T 847-621-5130
www.schroeder.com



Yoa offers a complete lighting solution with state-of-the-art LED technology and astonishing elegance.

OPTICS DESIGNED FOR SAFETY

Yoa is equipped with second-generation LensoFlex®2 photometric engines that were specifically designed for lighting spaces where well-being and safety is essential. Both sizes offer flexible combinations of LED modules, driving currents and dimming options to provide the most cost-effective solution while improving comfort and safety.

APPLICATIONS

- Urban streets and roads
- Squares and pedestrian areas
- Residential areas
- Parks
- School or business campuses
- Parking lots

MOUNTING OPTIONS

- Slip-fit mounting onto a tenon with 2 3/8" (60mm) outside diameter
- Catenary suspension
- Post-top mounting
- Lyre/Yoke mounting
- Additional mounting options available – see page 5 of this guide

ECONOMIC BENEFITS

Cutting edge LED technology, in conjunction with a constant flux system and a smart dimming system, makes it possible to achieve over 70% energy savings compared to traditional technology. Yoa enables responsible use of energy and resources, an accelerated ROI, and decreased maintenance.

KEY SPECIFICATIONS - LUMINAIRE

- Optical compartment tightness level: IP 66 (*)
- Electrical compartment tightness level: IP 66 (*)
- Impact resistance: IK 08 (**)
- Nominal voltage: 120-277V - 50/60Hz
- L70: 100,000+ hours
- EPA:
 - Yoa Midi: 0.227ft²
 - Yoa Maxi: 0.226ft²
- Electrical safety class: US Class I (***)
- Materials:
 - Housing: Die-cast aluminum
 - Protector: Glass
 - Color: Dark grey AKZO 900 sanded (any other RAL or AKZO color upon request)

KEY ADVANTAGES

- LensoFlex®2 engine with adaptable photometry for various applications
- FutureProof: easy access to the photometric engine and electronic assembly for future replacements or upgrades
- Compatible with IoT controls, including our Owllet range
- ULOR 0%
- Low energy consumption
- Maximized savings in energy and maintenance costs
- Durable yet recyclable materials
- Perfect match between design and performance
- Surge protection: 10kV

(*) according to IEC - EN 60529

(**) according to IEC - EN 62262

(***) according to NFPA 70 (NEC)

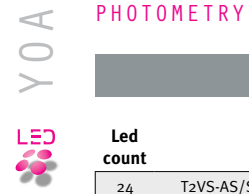


ANSI/UL 1598/CAN/CSA C22.2 No.250.0-08, 3rd Ed.
Preliminary data, date of revision: 11/30/2017

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APPENDIX B - PEDESTRIAN POLE



PHOTOMETRY

Nominal Photometry Detail - Neutral White (4000K) 70+ CRI

Led count	Optics	Luminaire output flux (lm)	Current (mA)	Luminaire total power (W)	Luminaire efficiency (lm/W)	BUG Rating*
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	3431	350	28	123	B1 Uo G0
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	4632	500	39	119	B1 Uo G1
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	6004	700	55	109	B2 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	3354	350	28	120	B1 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	4528	500	39	116	B1 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	5869	700	55	107	B2 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	3190	350	28	114	B1 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	4306	500	39	110	B2 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	5582	700	55	101	B2 Uo G2
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	3306	350	28	118	B1 Uo G1
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	4463	500	39	114	B1 Uo G1
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	5786	700	55	105	B2 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	3202	350	28	114	B1 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	4323	500	39	111	B1 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	5603	700	55	102	B2 Uo G1

Nominal Photometry Detail - Warm White (3000K) 80+ CRI

Led count	Optics	Luminaire output flux (lm)	Current (mA)	Luminaire total power (W)	Luminaire efficiency (lm/W)	BUG Rating*
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	3100	350	28	111	B1 Uo G0
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	4185	500	39	107	B1 Uo G1
24	T2VS-AS/SY, 5120, Asymmetric/Symmetric	5426	700	55	99	B2 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	3030	350	28	108	B1 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	4091	500	39	105	B1 Uo G1
24	T2SH-AS/SY, 5102, Asymmetric/Symmetric	5303	700	55	96	B2 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	2882	350	28	103	B1 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	3891	500	39	100	B1 Uo G1
24	T3MD-AS/SY, 5112, Asymmetric/Symmetric	5044	700	55	92	B2 Uo G2
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	2987	350	28	107	B1 Uo G1
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	4033	500	39	103	B1 Uo G1
24	T2MD-AS/SY, 5117, Asymmetric/Symmetric	5228	700	55	95	B1 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	2893	350	28	103	B1 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	3906	500	39	100	B1 Uo G1
24	T4SH-AS/SY, 5119, Asymmetric/Symmetric	5063	700	55	92	B1 Uo G1

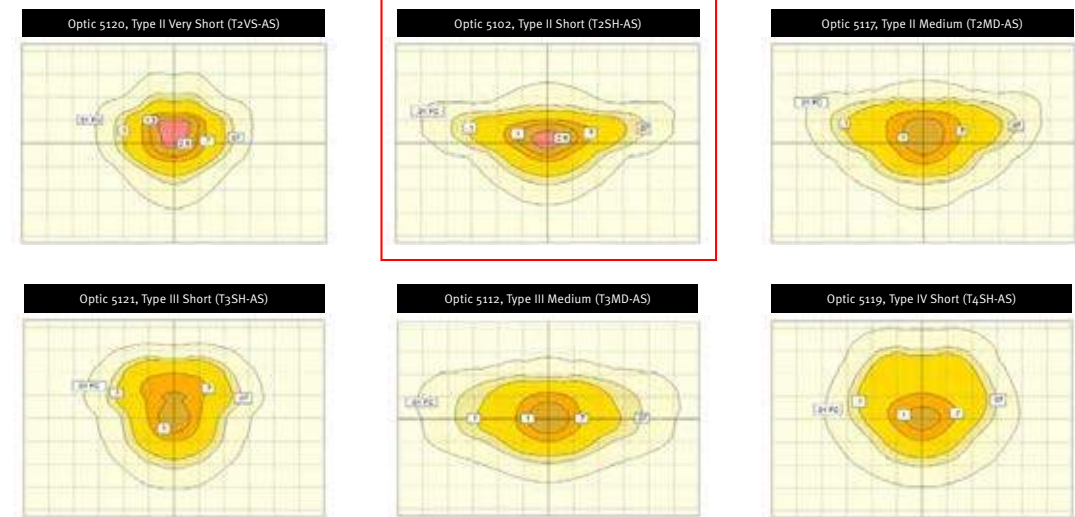
* "B" in BUG Rating applies to Asymmetric distributions only.

Preliminary data, date of revision: 11/30/2017



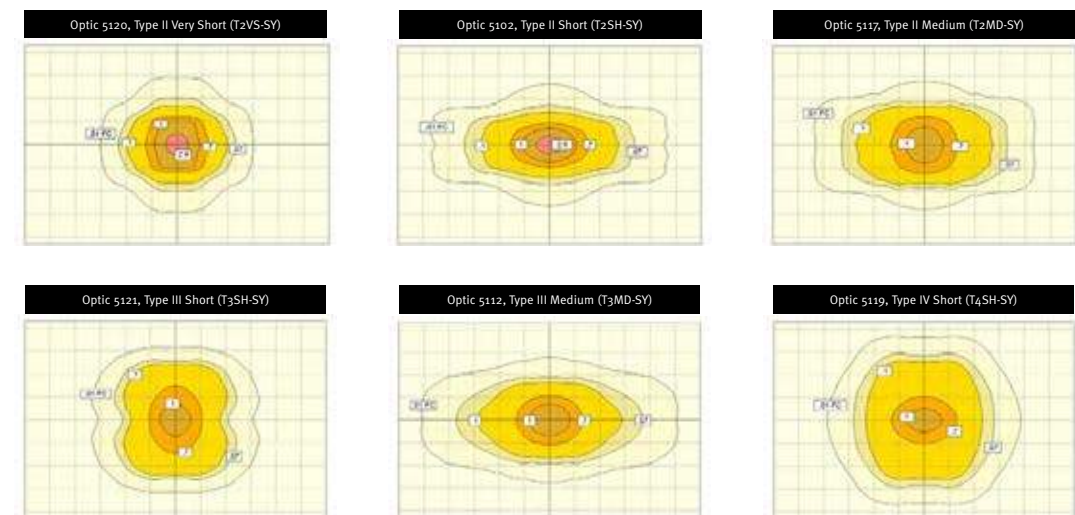
LIGHT DISTRIBUTIONS

ASYMMETRIC DISTRIBUTIONS*: Ideal for urban streets and roads, transit facilities, walkways



*Photometry Tables and Light Distribution curves shown above are specific to AS (Asymmetric) Distributions with 24 LEDs, standard extra clear smooth glass lens. Illuminance diagrams use a mounting height of 25ft (7.6m). Photometry for other configurations including symmetric distributions and other LED models are available upon request. Please contact us for more information.

SYMMETRIC DISTRIBUTIONS**: Ideal for parks, public squares and pedestrian malls, business or education campuses, parking areas



**Photometry Tables and Light Distribution curves shown above are specific to SY (Symmetric) Distributions with 24 LEDs, standard extra clear smooth glass lens. Illuminance diagrams use a mounting height of 25ft (7.6m). Photometry for other configurations including asymmetric distributions and other LED models are available upon request. Please contact us for more information.



APPENDIX B - PEDESTRIAN POLE

YOA
LED

DIMENSIONS

	Yoa Midi	Yoa Maxi
Ø	500mm / 19.7"	650mm / 25.6"
H	90mm / 3.5"	90mm / 3.5"

MOUNTING

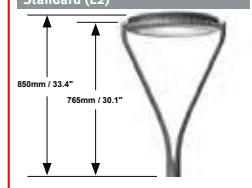
Side Tenon (LS)



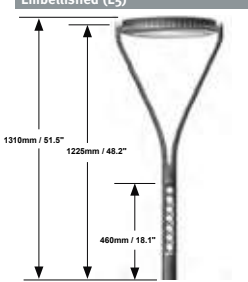
Catenary (S8)



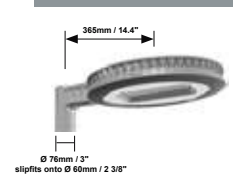
LYRE Standard (E2)



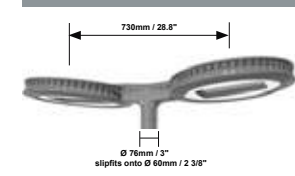
LYRE Embellished (E3)



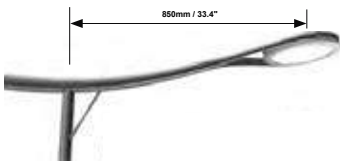
Post-Top - Single (P1)



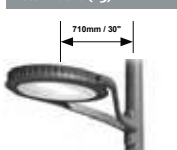
Post-Top - Double (P2)



LUCEA Single Arm (L1)



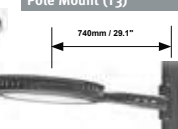
LUCEA Pole Mount (L3)



TRESSA Single Arm (T1)



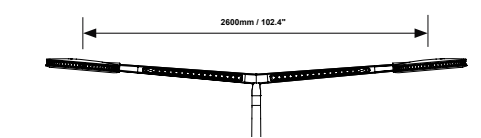
TRESSA Pole Mount (T3)



LUCEA Double Arm (L2)



TRESSA Double Arm (T2)




	TENON	CATENARY	LYRE		POST-TOP		LUCEA			TRESSA		
	Side Tenon (LS)	Catenary (S8)	Standard (E2)	Embellished (E3)	Post-Top Single (P1)	Post-Top Double (P2)	Single Arm (L1)	Double Arm (L2)	Pole Mount (L3)	Single Arm (T1)	Double Arm (T2)	Pole Mount (T3)
Yoa Midi	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Yoa Maxi	✓	n/a	n/a	n/a	✓	✓	✓	✓	n/a	✓	✓	n/a






LITESPHERE
The Original Spec Grade Strand Light

New Very High Output (VHO) LED Module



23 times brighter than our standard output
0.96 Watts
91 Lumens
Nichia SMD LEDs
Thermal plastic base for optimal heat dissipation
12V DC (Low voltage safe)



Dimmable 1900K 2700K 3000K 3500K 4000K 5000K



APPLICATIONS | Litesphere



Community Decoration - Fairs and Festivals - Restaurants - Street Scapes - Shopping Centers

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www.tivollighting.com tel: 714-957-6101 fax: 714-427-3458



GUIDE | Litesphere



Strand



12V DC



Shatterproof



LISTED



IP65



Made in USA

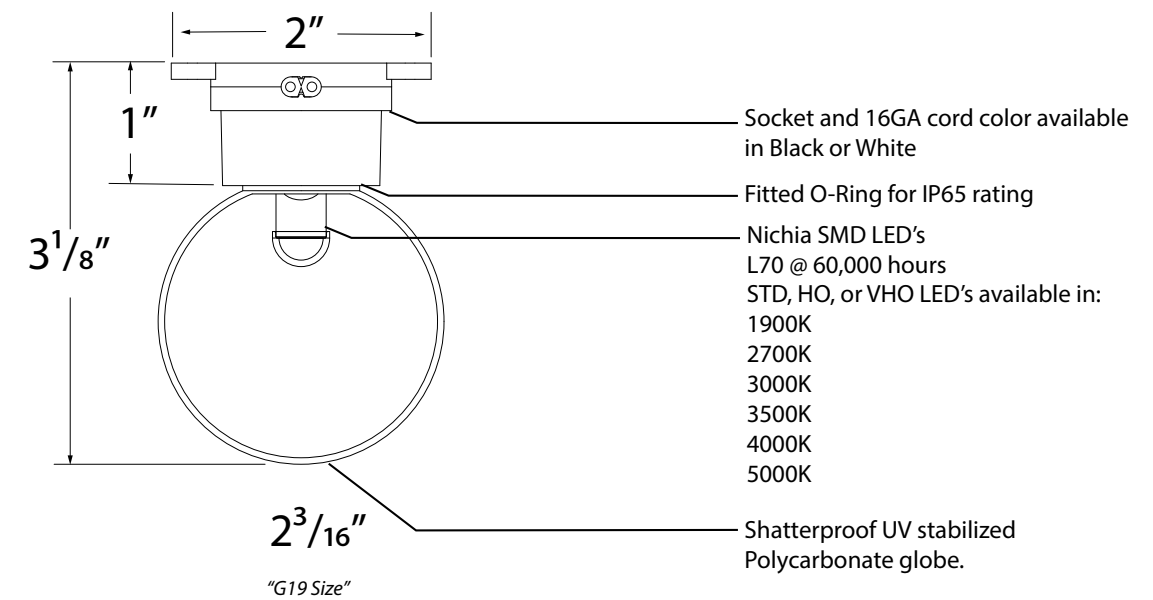


Dimmable

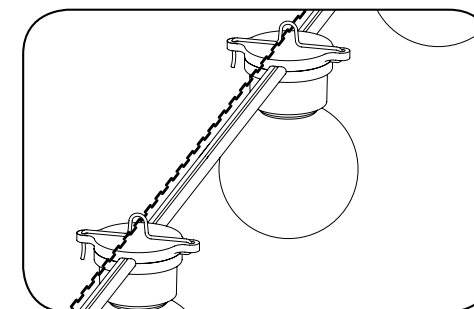


Warranty

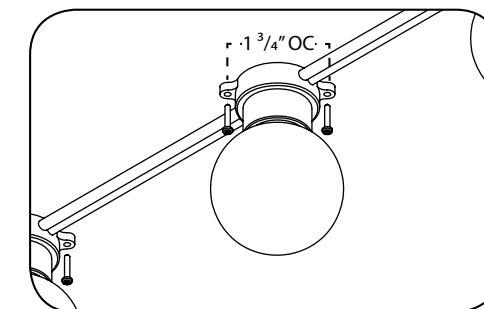
Features



Mounting



Catenary cable hangers
(Hanger clips included, cable available)



Direct/Surface

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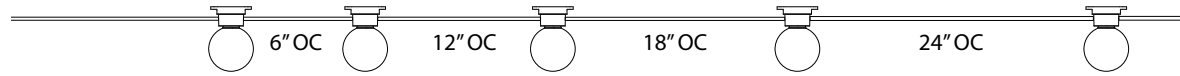
APPENDIX B - AMBIANCE STRING LIGHT



PHOTOMETRY | Litesphere

Standard Spacing Options & Max Run Chart

(Custom spacing available, please consult factory)

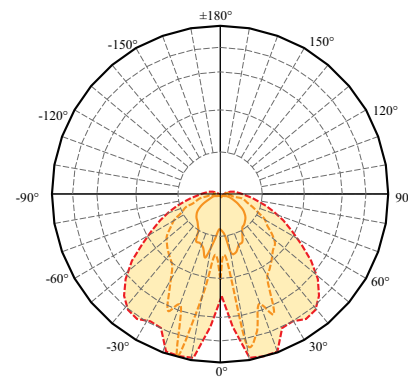


	6" OC			12" OC			18" OC			24" OC		
	STANDARD (S)	HIGH (H)	VERY HIGH (V)	(S)	(H)	(V)	(S)	(H)	(V)	(S)	(H)	(V)
Lumens Per Foot	8	24	182	4	12	91	3	9	68	2	6	45
Watts Per Foot	.2	.52	1.92	.1	.26	.96	.08	.20	.64	.05	.13	.48
*Max Single Run	100'	60'	30'	150'	90'	45'	180'	110'	55'	200'	130'	60'

Lumens Per Watt **STD 40** **HO 46** **VHO 94**

Tested @ 3000K w/ clear globe

*Max run lengths based on Tivoli's recommended lumen drop.



— Standard Output
 - - High Output
 - - - Very High Output



LITESPHERE
STANDARD BRIGHTNESS
3000K

[Download IES](#)

LITESPHERE
HIGH OUTPUT
3000K

[Download IES](#)

LITESPHERE
VERY HIGH OUTPUT
2700K

[Download IES](#)

LITESPHERE
VERY HIGH OUTPUT
3000K

[Download IES](#)

Colored Globes Available



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SPEC | Litesphere



Project: _____

Type: _____ Length: _____

Notes:

Ordering Information



Product	Wire	Spacing	LED Type	CCT	Globe	Voltage
LSL						12
Litesphere	B Black W White	06 6" OC 12 12" OC 18 18" OC 24 24" OC CU custom	V Very High Output H High Output S Standard Output	19 1900K 27 2700K 30 3000K 35 3500K 40 4000K 50 5000K	C Clear F Frosted Y Yellow R Red O Orange G Green B Blue P Purple Z Varied Colors	12 12V DC

custom spacing designed and fabricated in our Tustin, CA location.

(5000K available in Very High Output only)

3500K recommended for color globes

! Tivoli factory cuts and prepares all lengths to your specification. Individual lengths and runs must be specified at time of ordering or product will be shipped in max run lengths (see chart on page 5 for max run lengths)

Lengths and Runs

*see page 7 for ordering examples

L _____	Length in feet	Quantity
R _____	Max Run	

Extra Feed Cable

*24" lead included, specify if extra length is required

LS-XEP _____	Extra Lead Wire	B Black	Length in feet
		W White	

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APPENDIX B - AMBIANCE STRING LIGHT



Mounting Accessories



LS-CABLE-60 Catenary Cable Kit - 60'
LS-CABLE-110 Catenary Cable Kit - 110'
LS-CABLE-500 Catenary Cable Kit - 500'
 (1/8th inch, includes 2 cables locks for use with loads up to 200lbs)



LS-LOCK-4 Cable Lock 1/8th Cable
 Cable Lock for 1/8th inch cable, Heavy-duty lockable fasteners support loads up to 330 lbs.

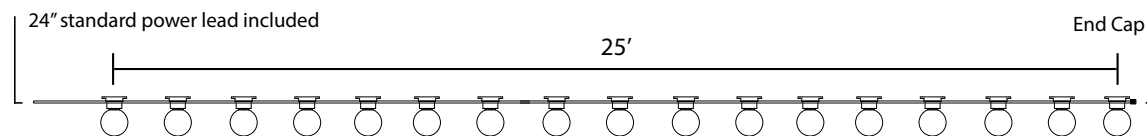
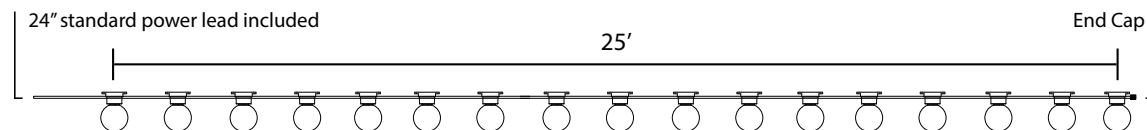
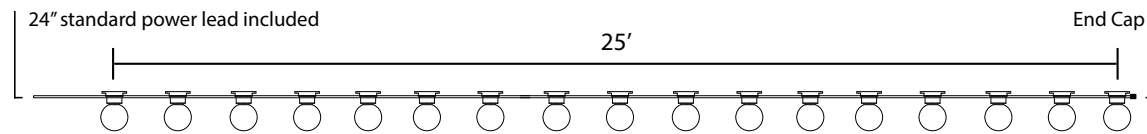


LS-TT Catenary Tensioning Tool
 Catenary Cable Tensioning Tool

Lengths and Run Ordering Examples

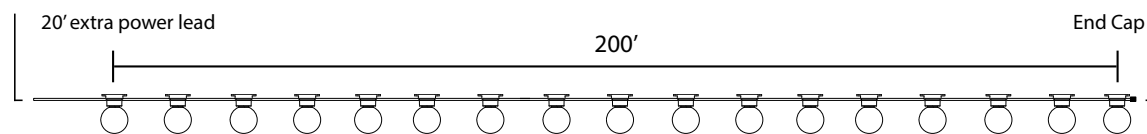
LSL-B-06-V-30-F-12

L25	-	3
Length in feet		Number of Runs



LSL-B-24-S-30-F-12

R	-	1	LS-XEP	-	B	-	20
Max Run		Quantity	Extra Lead Wire		B Black		Length in feet
					W White		

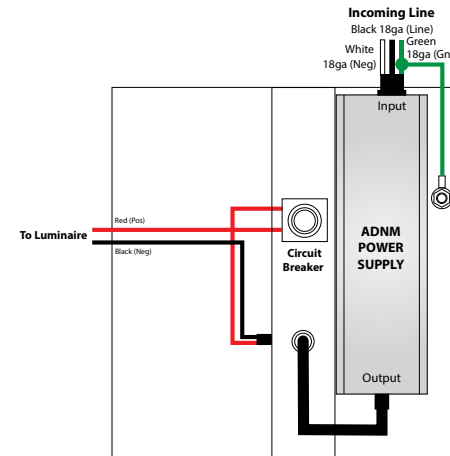


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Power Supplies

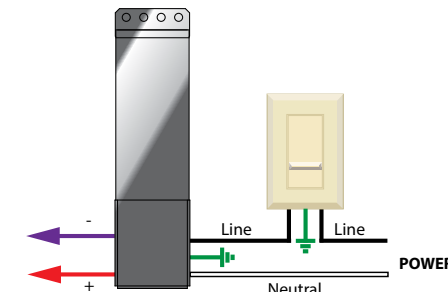


NON DIMMING

CAT NO	PRIMARY AND SECONDARY	TOTAL WATTAGE / AMPS PER BREAKER	MAX RUN LENGTHS				DIMENSIONS	LISTING	
			LED TYPE	6" OC	12" OC	18" OC			24" OC
ADNM-60-1-5-12-D	120-277V AC / 12V DC	60W / 1X5A	SB	100'	150'	180'	200'	6.00" W X 6.00" L X 4.00" D	NEMA3R/ UL listed
			HO	60'	90'	110'	130'		
			VHO	30'	45'	55'	60'		
ADNM-150-2-5-12-D	120-277V AC / 12V DC	120W / 2X5A	SB	2x100'	2x150'	2x180'	2x200'	12.00" W X 12.00" L X 4.25" D	NEMA3R/ UL listed
			HO	2x60'	2x90'	2x110'	2x130'		
			VHO	2x30'	2x45'	2x55'	2x60'		
ADNM-240-3-5-12-D	120-277V AC / 12V DC	180W / 3X5A	SB	3x100'	3x150'	3x180'	3x200'	12.00" W X 12.00" L X 4.25" D	NEMA3R/ UL listed
			HO	3x60'	3x90'	3x110'	3x130'		
			VHO	3x30'	3x45'	3x55'	3x60'		
ADNM-320-4-5-12-D	120-277V AC / 12V DC	240W / 4X5A	SB	4x100'	4x150'	4x180'	4x200'	12.00" W X 12.00" L X 4.25" D	NEMA3R/ UL listed
			HO	4x60'	4x90'	4x110'	4x130'		
			VHO	4x30'	4x45'	4x55'	4x60'		

MLV DIMMING

CAT NO	PRIMARY AND SECONDARY	TOTAL WATTAGE / AMPS PER BREAKER	MAX RUN LENGTHS				DIMENSIONS	LISTING	
			LED TYPE	6" OC	12" OC	18" OC			24" OC
JT-60-1-5-12-D	120V AC / 12V DC	60W / 1X5A	SB	100'	150'	180'	200'	4.25" W X 8.5" L X 3.25" D	NEMA3R/ cETLus
			HO	60'	90'	110'	130'		
			VHO	30'	45'	55'	60'		
JTH-60-1-5-12-D	277V AC / 12V DC	60W / 1X5A	SB	100'	150'	180'	200'	4.25" W X 8.5" L X 3.25" D	NEMA3R/ cETLus
			HO	60'	90'	110'	130'		
			VHO	30'	45'	55'	60'		
JT-240-4-5-12-D	120V AC / 12V DC	240W / 4X5A	SB	4x100'	4x150'	4x180'	4x200'	8.5" W X 16" L X 4.5" D	NEMA3R/ cETLus
			HO	4x60'	4x90'	4x110'	4x130'		
			VHO	4x30'	4x45'	4x55'	4x60'		
JTH-240-4-5-12-D	277V AC / 12V DC	240W / 4X5A	SB	4x100'	4x150'	4x180'	4x200'	8.5" W X 16" L X 4.5" D	NEMA3R/ cETLus
			HO	4x60'	4x90'	4x110'	4x130'		
			VHO	4x30'	4x45'	4x55'	4x60'		
EMEC601512	120V AC / 12V DC	60W / 5A	SB	100'	150'	180'	200'	3.03" W X 14.3" L X 2.24" D	IP67/ cETLus
			HO	60'	90'	110'	130'		
			VHO	30'	45'	55'	60'		
EM-ML601512B	120V AC / 12V DC	60W / 5A	SB	100'	150'	180'	200'	3.93" W X 8.13" L X 1.59" D	NEMA3R/ cETLus
			HO	60'	90'	110'	130'		
			VHO	30'	45'	55'	60'		
EMML-H601512B	277V AC / 12V DC	60W / 5A	SB	100'	150'	180'	200'	3.93" W X 8.13" L X 1.59" D	NEMA3R/ cETLus
			HO	60'	90'	110'	130'		
			VHO	30'	45'	55'	60'		



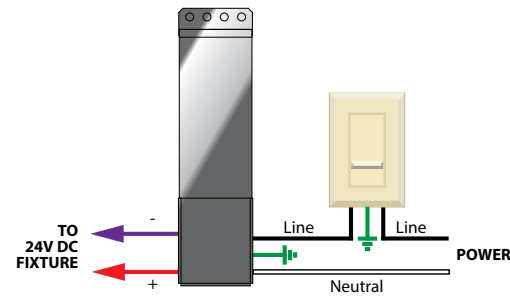
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APPENDIX B - AMBIANCE STRING LIGHT

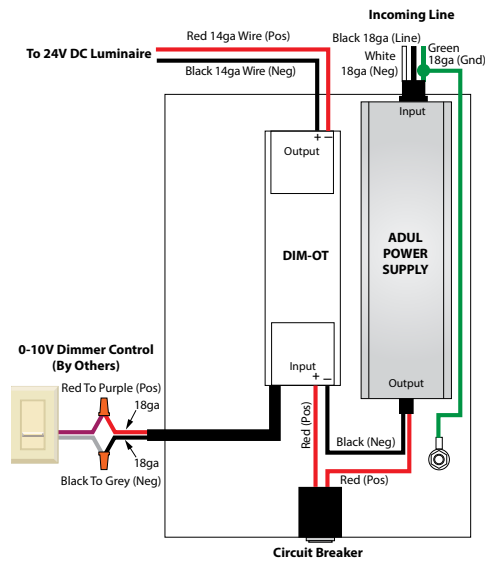


POWER | Litesphere



ELV DIMMING

CAT NO	PRIMARY AND SECONDARY	TOTAL WATTAGE / AMPS PER BREAKER	MAX RUN LENGTHS					DIMENSIONS	LISTING
			LED TYPE	6" OC	12" OC	18" OC	24" OC		
EMEC601512	120V AC / 12V DC	60W / 5A	SB	100'	150'	180'	200'	3.03" W X 14.3" L X 2.24" D	cETLus
			HO	60'	90'	110'	130'		
			VHO	30'	45'	55'	60'		
EM-ML601512B	120V AC / 12V DC	60W / 5A	SB	100'	150'	180'	200'	3.93" W X 8.13" L X 1.59" D	cETLus
			HO	60'	90'	110'	130'		
			VHO	30'	45'	55'	60'		
EMML-H601512B	277V AC / 12V DC	60W / 5A	SB	100'	150'	180'	200'	3.93" W X 8.13" L X 1.59" D	cETLus
			HO	60'	90'	110'	130'		
			VHO	30'	45'	55'	60'		



0-10V DIMMING

CAT NO	PRIMARY AND SECONDARY	TOTAL WATTAGE / AMPS PER BREAKER	MAX RUN LENGTHS					DIMENSIONS	LISTING
			LED TYPE	6" OC	12" OC	18" OC	24" OC		
ADNM-60-1-5-12-DOT	120-277V AC / 12V DC	60W / 1X5A	SB	100'	150'	180'	200'	6.00" W X 6.00" L X 4.00" D	NEMA3R/ UL listed
			HO	60'	90'	110'	130'		
			VHO	30'	45'	55'	60'		
ADNM-150-2-5-12-DOT	120-277V AC / 12V DC	120W / 2X5A	SB	2x100'	2x150'	2x180'	2x200'	12.00" W X 12.00" L X 4.25" D	NEMA3R/ UL listed
			HO	2x60'	2x90'	2x110'	2x130'		
			VHO	2x30'	2x45'	2x55'	2x60'		
ADNM-240-3-5-12-DOT	120-277V AC / 12V DC	180W / 3X5A	SB	3x100'	3x150'	3x180'	3x200'	12.00" W X 12.00" L X 4.25" D	NEMA3R/ UL listed
			HO	3x60'	3x90'	3x110'	3x130'		
			VHO	3x30'	3x45'	3x55'	3x60'		
ADNM-320-4-5-12-DOT	120-277V AC / 12V DC	240W / 4X5A	SB	4x100'	4x150'	4x180'	4x200'	12.00" W X 12.00" L X 4.25" D	NEMA3R/ UL listed
			HO	4x60'	4x90'	4x110'	4x130'		
			VHO	4x30'	4x45'	4x55'	4x60'		

APPENDIX B - CONTROLS

A standalone photocell system would be compliant with current building and energy codes and should be sufficient for the needs of the project and the Derby District.

However, a networked smart wireless control system with more advanced technology could be provided. The network system would be advantageous for future implementation of smart city, wi-fi or digital monitoring systems such as temperature, traffic and roadway conditions. Additionally, the more advanced control features could provide feedback regarding usage. This would be informative for monitoring the system as it ages for management of component replacement due to reduced performance as the system nears end of life at L70, providing less 70% of the originally installed output. Likewise, energy usage could be monitored and the lighting systems could be managed to reduce output at certain times based on traffic levels or peak demand load shedding. Although not necessary to meet requirements of the District today, these features could be advantageous in the future and are worth consideration.

STANDALONE PHOTOCELL SYSTEM

One pole, one control

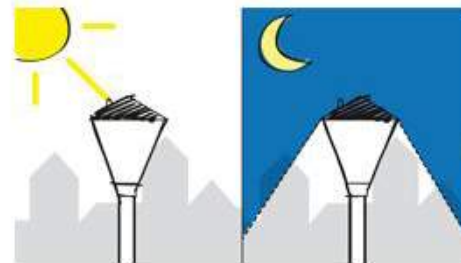
Each luminaire is fitted with a control unit and can be managed independently.

This type of control system is ideal for areas with little activity at night such as pedestrian areas, parks, car parks and warehouses.

Schröder Owlet offers several solutions.

Photocell

Placed on top of the luminaire, an integrated photocell switches it ON or OFF depending on the level of natural light. Each light point behaves independently. A photocell enables an out of the box installation without commissioning. Thus it is very easy to install in existing lighting schemes.



KEY BENEFITS

- Low investment
- Fast payback
- Energy savings of up to 30%
- Easy installation
- Reliable dimming profiles

WIRELESS 'SMART' SYSTEM WITH MONITORING CAPABILITIES

Connected lighting to transform your environment

The Owlet IoT City Management System is not only a performing remote lighting management system that enables you to:

- increase safety
- improve operations and
- reduce energy and operating costs by up to 85%.

Based on Open Standards, it can interact with larger smart city platforms to exchange data or interoperate with neighbouring systems so that you can gain important data to:

- rethink services
- create new opportunities and
- enrich citizen experiences.

KEY BENEFITS

- Smart hybrid architecture
- Easy set-up
- Efficient asset management
- Instant GPS location
- Precise energy consumption measurement
- Savings of up to 85%
- Compliance with norms
- Reliable network
- Intuitive web-based interface
- Smart City enabler

Why choose Owlet IoT?



Smart Hybrid Architecture

A strong local mesh network between the luminaires and the sensors guarantees an instant reaction to events which is key for a **real-time adaptive lighting scheme** while a remote control system using the cloud ensures an **efficient set-up** and **communication** between the local network and the servers.



Easy set-up

Thanks to a built-in GPS antenna and an intelligent auto-commissioning process, it is a **real Plug + Play solution** that does not require any intervention from the installer or contractor, nor any segment controllers or gateways.



Efficient asset management

The Owlet luminaire controller incorporates a **unique feature** to capture the **characteristics of the lighting scheme**. This data and the precise luminaire position provided by the GPS feature determines the luminaire light profile for the given location.



Instant GPS location

A built-in GPS accurately locates the luminaire position. There is **no need for field recording, scanning or manual mapping**. It also detects changes e.g. following maintenance.



Precise energy consumption measurement

The nodes or luminaire controllers incorporate a built-in utility grade energy meter that offers the **highest metering accuracy** (<1% for the complete dimming range) so you **only pay for the energy consumed**.



Safe fall back scenarios

Multiple technologies (e.g. AES encryption) ensure that the system is **switched on and off in complete security**. Switching and dimming commands as well as the astronomical clock and built-in photocell **prevent a complete blackout at night**.



Intuitive web based application

With an intuitive web application, users can **monitor and manage a network from any device connected to the Internet**. A easy-to-use dashboard helps to organise and customise reports and statistics. Strict security measures protect the system from any kind of intrusion.



Operational benefits

This dynamic management system has the capacity to **implement, adapt and reproduce lighting profiles** and driver settings, which are typical for public lighting networks so you can gain valuable data to **optimise operational efficiency**.