Streetlight Conversion Study

Lyons, Colorado

Final Report

Prepared by:

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TOWN OF LYONS

THE TOWN OF LYONS

APPROVAL SHEET

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Greenwood Village, Colorado 80111
(303) 228-2300

_____
Heather H. Bo, P.E., PTOE

Recommended for Approval

_____	_____
Aaron Caplan	Justin Doles
Director of Utilities	Town Engineer/Project Manager

APPROVED by the Town Board of Trustees of the Town of Lyons this _____day of _____ _____, 2025

ATTEST:

_____	_____
City Clerk	Mayor

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1.0 Purpose

The Town of Lyons ("Town") has identified the following primary goals of the study:

- To map the locations and types of existing streetlights in Town. The Town has a GIS file with many of the streetlight locations that are on utility poles, but it is outdated and incomplete with no standalone street light locations. *The original purpose included lumens of existing lights, however, after discussions with Town staff, that information was not available so that was excluded from the existing data.*
- To identify ways of reducing energy consumption and maintenance of street lighting where possible. This also includes recommendations on programmable photocells, dimming, etc. The Town currently uses the Sensus Flexnet communication system for our Advanced Metering Infrastructure of electric and water meters.
- To identify ways to promote DarkSky lighting with specifications such as glare reduction, full cut-off, minimum luminosity, and warmer temperature colors and determine if Lyons might qualify for DarkSky Provisional Status.
- To identify areas where unnecessary street lighting can be removed.
- To identify areas where public lights trespass onto either private property or beyond a specified area (onto the structure, beyond 10 feet from sidewalk, etc.).
- To identify areas of insufficient lighting and provide a recommended lighting solution for each of those areas.
- To recommend design guidelines and details for street lighting. All roadways within Town limits have a posted speed of 20mph or less except for portions of US36
- To identify luminaires to remain that are not currently LED and provide them with a recommendation for LED retrofit type and model.
- To obtain public input with an online survey.

2.0 Background

The Town of Lyons was a recipient of a Boulder County 2024 Sustainability Matching Grant to hire a consultant to explore the conversion of town-controlled inefficient streetlights to LED streetlights. The project would include analysis of the type and placement of lights, and mitigating measures needed to minimize the effects of light pollution. Once complete, the town will utilize the study to apply for funding to implement components of the plan.

Grant details can be found here: https://bouldercounty.gov/news/boulder-county-awards-620k-for-local-sustainability-projects/

3.0 Executive Summary

3.1 Summary

The Town of Lyons identified goals including reducing cost, conserving energy, and reducing light pollution. To accomplish these goals, this project first took an inventory of all existing streetlights within the Town Right-of-Way to help evaluate a LED conversion and current light pollution levels. This inventory was then used to evaluate how many lights were LED versus non-LED, and replacement LED fixtures for the different types of non-LED existing fixtures are recommended in this report. From the public input, DarkSky was identified as a priority of the Town. This influenced the selection of recommended LED fixtures to be DarkSky Approved, which ensures that the light fixture's Backlight, Uplight, and Glare (BUG) are all within the DarkSky.

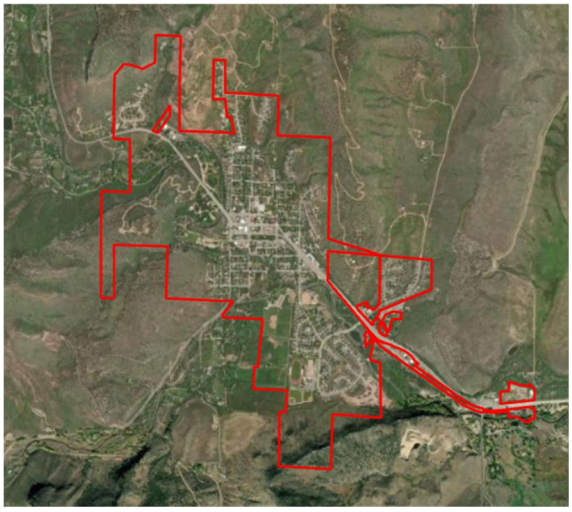

Figure 1: Project Area

3.2 Summary of Cost Estimates

Kimley-Horn has prepared multiple Opinions of Probable Construction Cost (OPCCs) to display the different options the Town of Lyons can achieve depending on budget. The cost estimates are summarized in the table below.

Table 1: Summary of Cost Estimates

Option	Estimated Construction Cost	Notes
Option 1: Replace Only Functioning, Non-LED Fixtures	**$80,500**	Replace only functioning, non-LED fixtures
Option 2: Replace Only Non-LED Fixtures	**$199,200**	Replaces 147 existing non-LED fixtures
Option 3: Replace All Existing Fixtures (Non-LED and LED)	**$323,400**	Replaces 231 existing non-LED and LED fixtures and one missing fixture
Option 4: Replace All Existing Fixtures (Non-LED and LED) and Add Ubicquia Controls	**$358,200**	Replaces 231 existing non-LED and LED fixtures, one missing fixture, and includes the highest level of controls (Ubicquia)

3.3 Recommendation

Table 2 below highlights the existing quantities discovered during the field work. It also notes decorative fixtures, and pole types the fixtures are mounted on, as this is important information for selecting appropriate mounting brackets and arms.

Table 2: Existing Lighting Equipment Inventory	
Equipment	**Total Existing Quantity**
Non-LED Fixtures	147*
Non-LED, Functioning Fixtures	93
Non-LED, Nonfunctioning Fixtures	54
LED Fixtures	84**
LED, Functioning Fixtures	54
LED, Nonfunctioning Fixtures	30
Steel Poles	107***
Timber Poles	106****

*Quantity includes 47 decorative non-LED fixtures
**Quantity includes 48 decorative LED fixtures
***Quantity includes 68 non-LED fixtures on steel poles
****Quantity includes 79 non-LED fixtures on timber poles

By converting the 93 functioning non-LED fixtures to LED, an estimated $4,300 would be saved every year in electricity costs alone. This is based on a 200W HPS light fixture vs an 84W LED, $0.09156KWH electricity cost, and average operating time of 12 hours/day for 365 days/year (4,380 hours). With energy and maintenance costs accounted for, the return on investment of converting the 93 functioning, non-LED fixtures to LED equates to 8.7 years.

Based on the results of the inventory, public survey, photometric analysis, discussions with the Town of Lyons, and DarkSky, the following recommendations are made to address the town's goals and optimize street lighting:

1. **Install DarkSky Approved LED Light Fixtures**: To align with public sentiment and environmental goals, it is recommended to replace all functioning, non-LED fixtures with DarkSky Approved LED fixtures. This includes minimizing SKU variety to streamline maintenance and reduce costs.

2. **Reduce Light Pollution:** Throughout the Town, in locations where the Town decides to keep lighting, it is recommended to reduce light pollution by utilizing DarkSky Approved fixtures with lower lumens, warmer color temperatures, and shielding to minimize light intrusion. The public survey highlighted specific locations where residents are requesting to completely remove lighting which would reduce light pollution more (Section 7.0).

3. **Establish a Lighting Code:** Reference the lighting codes of cities such as Flagstaff and Boulder and the DarkSky code template to establish a comprehensive and effective lighting code for the Town of Lyons (Section 8.5).

4. **Improve Lighting in High Pedestrian Areas:** Increase lighting in identified dark areas, particularly in high pedestrian activity areas, to improve safety. This includes areas such as the vicinity of Lyons Senior/Middle School and along Broadway between 3rd Avenue and 5th Avenue. Additional lighting in these areas will enhance visibility and safety for pedestrians (Section 8.4). In areas where minimal pedestrian activity is expected at night, motion sensors and/or programming the lights to dim during certain hours would alleviate excessive brightness overnight.

5. **Implement Advanced Lighting Controls:** Consider adopting advanced lighting control systems such as Ubicquia, which offers features like dimming, motion sensing, and fixture health reporting. These controls will provide the town with greater flexibility in managing the lighting infrastructure, optimizing energy usage, and implementing DarkSky principles (Section 8.3).

By implementing these recommendations, the Town of Lyons can achieve significant improvements in energy efficiency, operational cost savings, and reduced light pollution while meeting the community's needs for safer and more consistent street lighting.

4.0 Project Scope

The scope for this project included a preliminary analysis, preliminary design report, and preliminary cost estimate. The following objectives were achieved by this study:

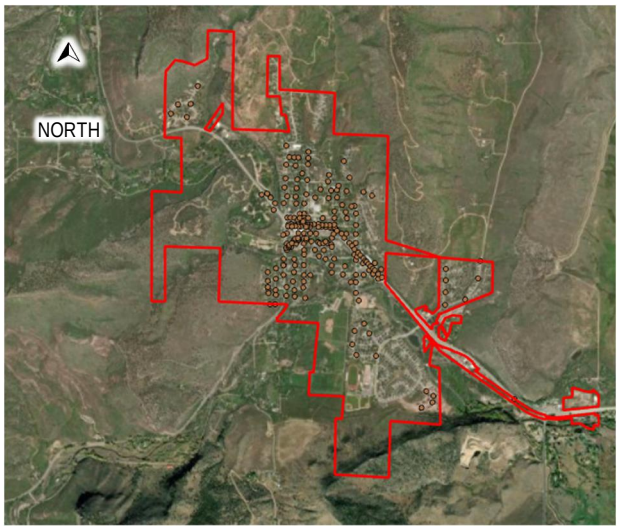

Figure 2: Project Area Existing Lighting

- Performed existing light fixture inventory in Town ROW using GIS
- Completed benefit/cost analysis to compare the current maintenance and operating costs to the cost of upgraded fixtures and operating costs
- Made fixture selection
- Completed photometric analysis to determine if current pole spacing is sufficient for retrofitting LED fixtures
- Summarized the existing lighting infrastructure and LED vs non-LED distribution
- Recommended LED fixture options with DarkSky in mind to replace existing non-LEDs
- Recommended a lighting control system
- Assisted town in establishing lighting standards
- Prepared a preliminary cost estimate for the LED conversion
- Obtained public input on lighting in the Town

A field review was performed over two weeks from December 9th through December 18th, 2024. The field review consisted of inventorying the existing streetlights within Town ROW, taking height measurements, and taking photos of each existing streetlight. This field work served as the basis for analysis, design, and planning-level construction cost estimates. During field work, multiple varieties of fixtures were identified. Appendix E displays various visual observations made during the December field review.

5.0 DarkSky and Light Pollution

DarkSky International is a United States-based non-profit organization that has a mission to preserve and protect the nighttime environment and the heritage of darks skies through quality outdoor lighting. The DarkSky program encourages the protection and restoration of dark, star-filled night skies through education about the problems and solutions of outdoor lighting practices, and how to best mitigate light pollution. Light pollution is the result of outdoor lighting that is not properly shielded, allowing light to shine into eyes and the night skies.

Figure 3: DarkSky Lighting Principles

(https://darksky.org/resources/guides-and-how-tos/lighting-principles/)

Additionally, “DarkSky Approved” provides objective, third-party certification for lighting products. To be DarkSky Approved, lights must restrict the amount of upward-directed light, avoid glare, avoid over-lighting, utilize dimming and other appropriate lighting controls, and minimize short-wavelength (blueish) light in the nighttime environment. Controls such as timers, motion sensors, or photocells are encouraged in addition to dimming controls. The fixtures themselves should be fully shielded with no sag or drop lenses. Further, the light source should be low voltage LED or a solar powered light. The light temperature of a DarkSky Approved light uses a warm-colored light source typically around 3,000 Kelvin. Lights should be angled so that they do not spill into neighboring yards. Finally, lights should only be used when and where they are needed. The fixtures recommended in this report are DarkSky Approved.

However, if the Town were to explore different fixtures in the future, DarkSky has a resource to search for Approved fixtures here: https://darksky.org/what-we-do/darksky-approved/darksky-approved-luminaires-program/luminaires/

If the Town found a fixture they liked and wanted to see if it could be approved to be DarkSky Approved, DarkSky has an application here: https://darksky.org/what-we-do/darksky-approved/darksky-approved-luminaires-program/darksky-approved-luminaires-application/

Based on the information received from the public survey, DarkSky compliance is important to the Town of Lyons in order to limit its contributions to light pollution. DarkSky has many resources available to agencies that are interested in creating DarkSky codes and statutes. Templates are

available from DarkSky for agencies to use as a starting point in creating a new code or statute that follows DarkSky criteria.

The templates can be accessed here: https://darksky.org/darksky-policy-templates/

These goals of DarkSky are incorporated throughout the fixture and control recommendations in this report.

6.0 Existing Conditions and Inventory Listing

From field work, the condition of every light pole and fixture was assessed. The table below outlines the existing light poles and fixtures inventoried.

Table 3: Existing Lighting Equipment Inventory

Equipment	Total Existing Quantity
Non-LED Fixtures	147*
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The Town of Lyons staff provided the electricity and maintenance costs of the lighting system. Town of Lyons currently pays $0.09156 per KWH of electricity. Exact lighting maintenance expenditures are unknown; however, it is assumed that every lighting repair costs the Town a minimum of $500 for the maintenance crew and an estimated $500 for the equipment repair. Based on that information, over a 12-month period, it is assumed that maintenance costs of the lighting system are estimated to be $8,000-$10,000 per year. With the recommendations made in this report for the LED conversion, maintenance costs are anticipated to be reduced. This study does not account for any existing wiring/conduit deficiencies, light pole knockdowns, or light pole foundation repair costs.

The benefit of LED fixtures is the reduced maintenance and longer life span. Depending on the schedule of the lights, LED fixtures can last over 15 years with limited maintenance costs. With the Town of Lyons currently operating 231 light fixtures (147 non-LED fixtures), switching to all LED fixtures will have significant savings on electricity and maintenance. There are currently various LED fixtures in town that were installed under different projects. The information summarized in this report will be used by the Town to determine which light fixtures will be replaced and which ones may be removed altogether. The table below summarizes the different LED and non-LED fixture mounting scenarios found in Town.

Table 4: Light Pole Fixtures Inventory			
Fixture Count	**Total Existing Pole Quantity**	**Total Existing LED Fixture Quantity**	**Total Existing Non-LED Fixture Quantity**
Poles with One Fixture Mounted	194	68	126
Poles with Two Fixtures Mounted	19	16	22
Totals	**213**	**84**	**148**

6.1 Existing Light Poles and Arms

Light poles serving streets, sidewalks, and parking lots were assessed across Town. A total of 212 light poles were evaluated. This count identified 15 different light pole styles by shape and color. Individual pole heights among styles differed throughout. Poles were assessed for type, based on visual observation. For this project of retrofitting existing poles with LED fixtures, it was important to understand the different pole types that currently exist. The height of poles and whether luminaires were mounted to arms were documented in the GIS database. Photos from field work, displaying the assortment of the existing light poles and arms can be found in Appendix E. It is recommended to replace existing arms in poor condition before installing new LED fixtures, and poles and arms with noticeable visible rust or deficiencies should be replaced.

Based on the GIS data collected, the following two maps were made to display

- Existing LED vs non-LED fixtures
- Functioning fixtures vs nonfunctioning fixtures

Some corridors like Main Street had a consistent stretch of LEDs while other areas of Town showed varying fixture and pole types. One goal of this project will be to have consistency in fixture types throughout Town, which will result in multiple benefits, as described in the next section.

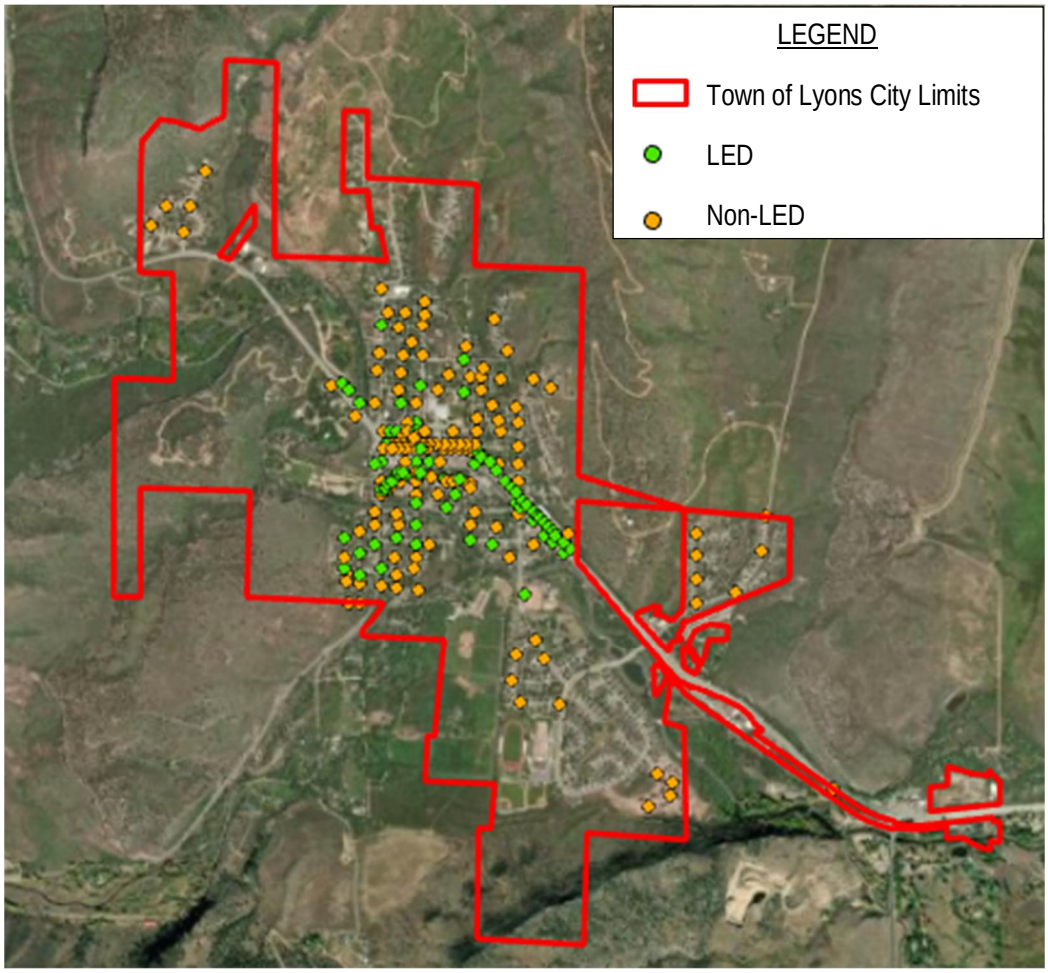

Figure 4: Existing LED and Non-LED Light Fixtures

Based on the field conditions observed by the Town, the following map was created to display all existing light fixtures that were functioning (“on”) and nonfunctioning (“out”). Some corridors like Main Street had a consistent stretch of functional lights while other areas of Town showed varying levels of functionality.

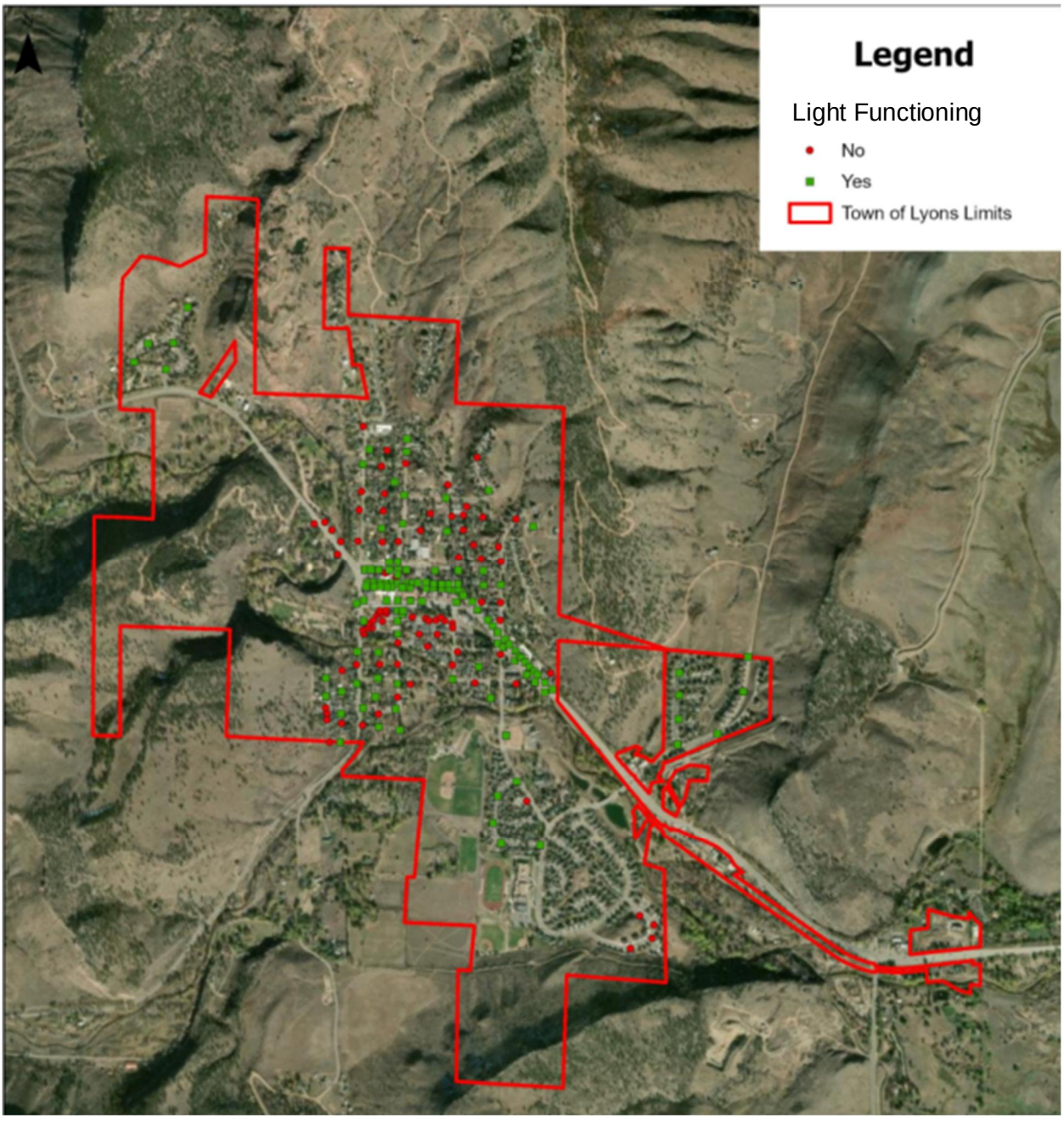

Figure 5: Functioning and Nonfunctioning Existing Light Fixtures

6.2 Existing Fixtures

About 21 different light fixture types were identified across Town. These many different fixtures can make maintenance more difficult because of the multiplicity of different replacement parts the Town must stock and catalogue. Standardizing fixtures would make it easier for maintenance to be familiar with the 3-4 fixtures throughout Town, and easier for the Town to keep spare parts in stock in case of failures.

Appendix E displays the different types of fixtures found throughout Town. Through discussions with the Town, all functioning, non-LED fixtures will be replaced, and the existing LED fixtures could be replaced at a future date.

7.0 Public Survey Input

7.1 Public Survey Methodology

This study included gathering information from the members of the town on lighting. Beyond tracking comments from people in the town during field work, a public survey was also conducted using Social Pinpoint. The survey has two key components. The first portion of the survey is an interactive streetlight map that allows users to place a marker on the map of the town that shows existing streetlights and make a comment. Users can categorize their comment based on how it applies to a light. There are instructions on how to use the map provided. Further, the map updates as people add their notes to show where others have commented. The second portion of the survey is a questionnaire that allows users to answer questions about their priorities for lights, their preferred color temperature, and when they most notice streetlights.

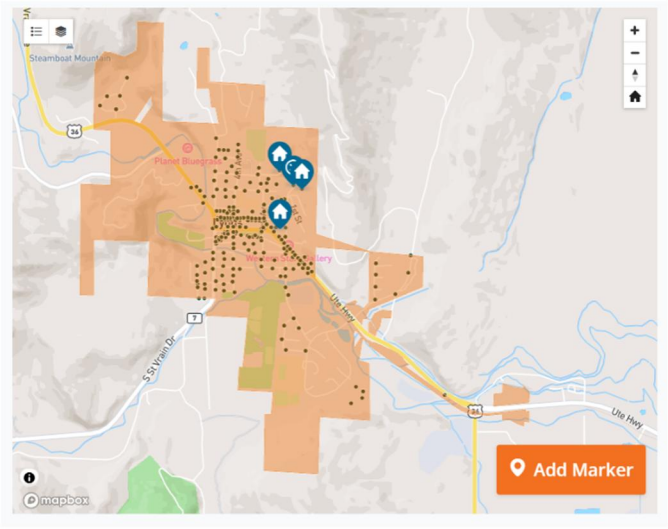

Figure 6: Social Pinpoint Interactive Map

Figure 7: Social Pinpoint Questionnaire

This survey will gather information and perspectives from the people who interact with the lights daily. This information is critical to understanding the lighting and its use in the town and will provide a blueprint for how best to proceed.

7.2 Public Survey Results

The public survey remained open for approximately three months to allow sufficient responses from the Town of Lyons. During the open period, 83 people contributed with 48 people submitting to the interactive map and 81 people completing the questionnaire.

The interactive streetlight map resulted in 27 responses that either wanted a light removed or commented that a light shines into their home. Five (5) responses requested to add a light, and 4 responses showed a light was either missing a bulb or broken. A summary of the responses can be found in Appendix G. The final map is shown in Figure 9: .

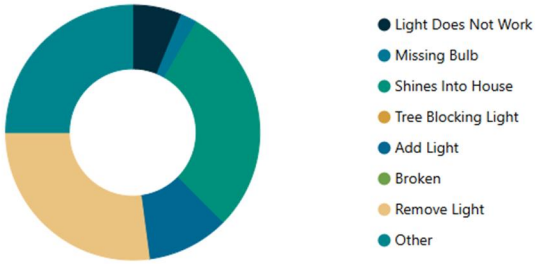

Figure 8: Social Pinpoint Interactive Map Results Summary

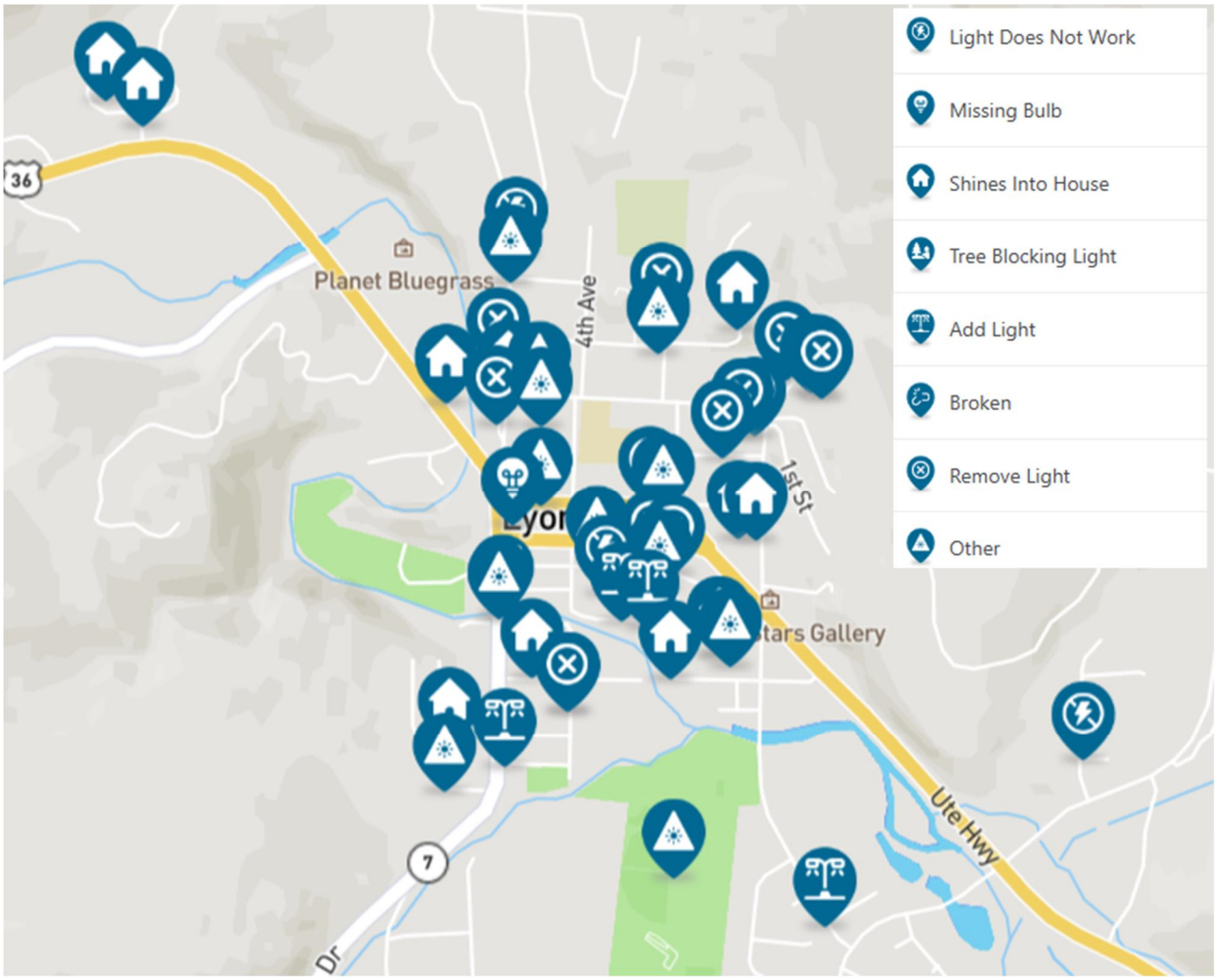

Figure 9: Social Pinpoint Interactive Map Results

Based on the feedback collected from the public survey map, the following points outline various common and repeated requests and concerns from neighborhood residents regarding street lighting in multiple areas of the community. These include preferences for reducing brightness, removing lights, adding shields, and addressing broken lights, reflecting a range of perspectives and agreements among neighbors.

- Eagle Canyon Circle: Neighbors requested lights be made less bright.
- Mountain View Drive: Neighbors noted the lights are too bright and would like them removed, one suggested a shield.
- Intersection of Stickney Alley & 2nd Avenue: Nine neighbors agreed the light should be removed.
- Midblock High St between 2nd Ave and 3rd Ave: A request with 4 agreements was made to remove this light.
- Near Post Office & Visitors Center: 6 people believe the lights are too bright here, one person disagreed and thought more lighting is necessary.

- Evans St: Over the St. Vrain Bridge, four asked that there be no lighting while 2 requested lights for safety walking.
- Midblock Evans St between 3rd Ave and 4th Ave: Two people requested streetlights for safety and walking while 3 people disagreed with this sentiment.
- 4th Avenue midblock between Prospect St and Park St: Light is off, and community wants it to stay that way with 4 agreeing and one mentioning that when on it shines into their house. Sentiment is to keep the light off.
- Intersection of Meily St & Ewald Ave: Three neighbors agreed that they like the lights off. They have been off for 20 years and they would not like them to be turned on.
- Intersection of McCall Alley & 5th Ave: Light is off and broken, community member requested to the city 9/18/23 that it be fixed, worried about elderly neighbors who felt unsafe.
- 503 2nd Ave, west of Main St: A comment requested shields with 6 neighbors in agreement.

The survey had 73 total contributors with 81 total contributions. The majority of respondents said that their priority is to control light pollution over safety or something else. Of the 81 responses, 66 prefer a Dark-Sky approved color temperature of 3,000 Kelvin or less. Respondents primarily notice streetlights in a variety of ways with 36 answering walking, 14 answering driving or biking, and 29 answering at their residence. Figure 10:, Figure 11, and Figure 12 display the survey results.

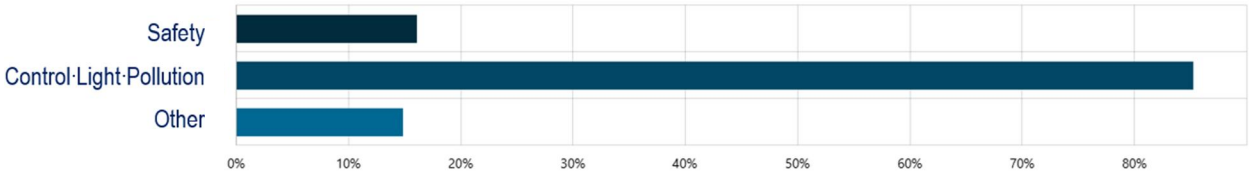

Figure 10: Lighting Priority Results

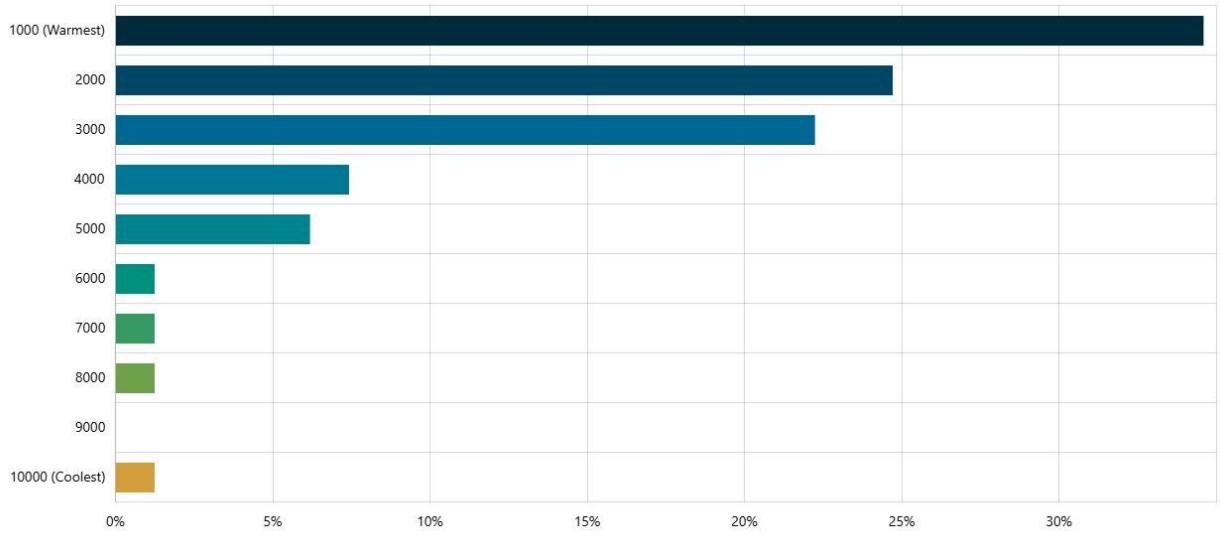

Figure 11: Color Temperature Preference Results

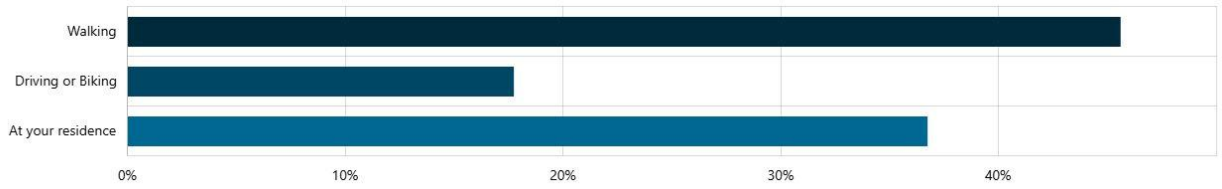

Figure 12: Mode of Primary Notice Results

The complete results from the public survey are included in Appendix G.

8.0 Recommendations and Cost Estimate

8.1 Light Fixture Selection

The goal of the fixture selection was to find an LED fixture that is DarkSky Approved and would be applicable across the Town of Lyons. The Town also indicated that Buy America Standards would form an important consideration for the selected fixtures. Kimley-Horn evaluated many options and recommends the following four (4) fixture options to the Town of Lyons staff.

The Buy America Standards are a set of requirements derived from federal legislation aimed at promoting the purchase and use of domestically produced materials and products in federally funded projects. For lighting fixtures, these standards ensure that the materials used in manufacturing the fixtures, as well as the fixtures themselves, are predominantly sourced and produced within the United States. Specifically, the Buy America Standards typically mandate that at least 55% of the final product's components must be manufactured in the U.S.

All of the fixtures below meet DarkSky and Buy America requirements and have the ability have shields added. The fixture shown in Figure 13 is a decorative LED option to match the existing downtown aesthetic. The fixture shown in Figures 14 and 16 are LED cobra head options that would replace the majority of existing non-LED, non-decorative fixtures around Town. They both have similar functionality; the two differences to note on these two fixtures is the aesthetic appeal, and the option to place an integrated photocell in the rounded cobra head (Figure 14). Figure 15 is a decorative LED fixture that may be used to replace a few of the existing neighborhood fixtures on square poles.

Figure 13: Pendant Decorative LED Fixture

Figure 14: Round Cobra Head LED Fixture

Figure 15: Square Decorative LED Fixture

Figure 16: Square Cobra Head LED Fixture

8.2 Cost Estimate

Kimley-Horn has prepared multiple Opinions of Probable Construction Cost (OPCC) to display the different options the Town of Lyons can achieve depending on the budget. The cost estimates are summarized in the table below.

Table 5: Summary of Cost Estimates

Option	Estimated Construction Cost	Notes
Option 1: Replace Only Functioning, Non-LED Fixtures	**$80,500**	Replace only functioning, non-LED fixtures
Option 2: Replace Only Non-LED Fixtures	**$199,200**	Replaces 147 existing non-LED fixtures
Option 3: Replace All Existing Fixtures (Non-LED and LED)	**$323,400**	Replaces 231 existing non-LED and LED fixtures and one missing fixture
Option 4: Replace All Existing Fixtures (Non-LED and LED) and Add Ubicquia Controls	**$358,200**	Replaces 231 existing non-LED and LED fixtures, one missing fixture, and includes the highest level of controls (Ubicquia)

The estimated construction costs in the table above include installation and 15% contingencies to account for any additional costs that may be found during construction, such as additional mounting brackets, different arms, or economic inflation.

Detailed OPCCs can be found in Appendix A.

8.3 Lighting Controls

The Town of Lyons originally planned to use the Street Light Vantage Point Control System. This system was quoted at $5,000 plus $110 per light fixture module. At 232 existing fixtures, the total cost of this system would have been at least $30,740. This assumes each existing fixture could be retrofitted to fit the module. This quote also assumes installation in December of 2020, and prices have increased significantly since then. This system is no longer available, so other control options have been identified and described below.

Multiple different lighting control options were evaluated in this study with varying capabilities and costs. Photocells have a warranty and lifespan of twenty years. Below is a summary and cost

estimate of each recommended control option. More detail and photos can be found in Appendix F.

Table 6: Summary of Control Systems					
Control System	**Unit Cost**	**Description**	**Capabilities**	**Limitations**	**Remote Access (Yes/No)**
AO Turndown Module	**$10**	Embedded node inside fixture	Manual dimming	No other capability besides dimming	No
AC Twist Lock Photocell	**$20**	Embedded AO Turndown Module inside fixture + upgraded photocell	Manual dimming	No other capability besides dimming	No
DC Connect Photocell	**$20**	Embedded photocell wired on the DC side of driver	Manual dimming, Elongates the life of photocell by eliminating the on/off rush current	No other capability besides dimming	No
Local Connect	**$25**	Upgraded photocell (P7 connector)	Dimming, Motion sensing add on options, report fixture health	No remote access, must be within 250' of fixture	No
nLight Air	**$80**	Upgraded photocell (P7 connector)	Dimming, motion sensing	Requires separate app to create the mesh network from the nodes using Bluetooth; no report generation for knockdowns/outages/voltage spikes, etc)	Yes
Ubicquia (Cellular Control)	**$150**	Upgraded photocell (P7 connector)	Full control (dimming, motion sensing, fixture health reporting, generates automatic reports for knock downs/issues)	Requires $45 for 10 year contract for the cellular service through Ubicquia	Yes

8.4 Photometric Analysis

A photometric analysis was conducted based on all the existing pole locations throughout Town with the proposed fixtures mounted in those existing locations. Based on the photometric analysis, the following observations were made:

Residential Areas:

- The Eagle Canyon neighborhood has lighting installed typically at intersections, cul de sac, and along some curves
- The residential area north of Stickney Street has lighting installed typically at intersections and mid-block
- The residential area south of Railroad Ave has lighting installed typically at intersections and mid-block
- The residential neighborhood adjacent to Lyons Senior Middle/High School has lighting:
    - At curves and intersections along Welch Dr
    - No lighting along the McConnell Drive loop (aside from the intersection with Welch Dr) or any cul de sacs spurring off the McConnell Drive loop
    - Along Carter Drive at intersections and curves where the new construction homes are being built
- The Stone Canyon neighborhood has lighting at intersections and curves

Overall, the residential areas generally have consistent lighting at intersections, cul de sacs, and some midblock areas. Based on the public survey, the majority of the residents are not in favor of the lighting in their neighborhoods. With DarkSky and IES criteria considered, lighting on local, residential streets is not required. The Town could ultimately decide to remove residential lighting in areas that have low speeds, minimal pedestrian activity, and no sight distance issues like steep roadway sections, tight curves, etc.

Downtown/High Pedestrian Activity Level Area:

- Lighting along Main Street was installed relatively consistent spacing with few dark spots
- The intersection of Broadway and 5th has two light fixtures, one mounted on each signal pole/mast arm assembly
- On Broadway from mid-block to 3rd Avenue is a stretch of road with no lighting. This area has wide sidewalks and is adjacent to a park
- High Street between 3rd Avenue and 4th Avenue has two lights with several dark areas. Most of the parking lot for the school is unlit and the sidewalk on the east side of High Street towards 3rd Avenue
- The intersection of US 36, Evans, and 2nd Avenue has several existing lights. With the high pedestrian activity here and crosswalks, all of these light pole locations should remain.

Overall, Main Street is well lit and with the existing pole placements, this area has sufficient lighting. High Street and 4th Avenue around the school, have very little lighting. With the number of crosswalks and pedestrian activity from the school, more lighting could improve the safety of pedestrians in this area. Broadway between 3rd Avenue and 5th Avenue has very minimal lighting. With the brand new, wide sidewalk along this corridor, increased lighting is recommended for pedestrian safety.

To determine how many more lights would need to be installed in these recommended improvement areas, the Town would need to decide which light fixture is desired for the areas

(decorative to be consistent with Main St or cobra heads to save cost). A separate photometric analysis could then be completed in a future project to determine spacing.

8.5 Lighting Standards

Part of this study included preparing criteria for the Town's lighting system. The Town of Lyons has provided a table of roadway classifications that is summarized in the map below. This map shows that the majority of the roads in the Town of Lyons are classified as local, with a couple of collector roads and one arterial road. In the lighting criteria, the road classifications will be an important factor in determining the appropriate lighting levels.

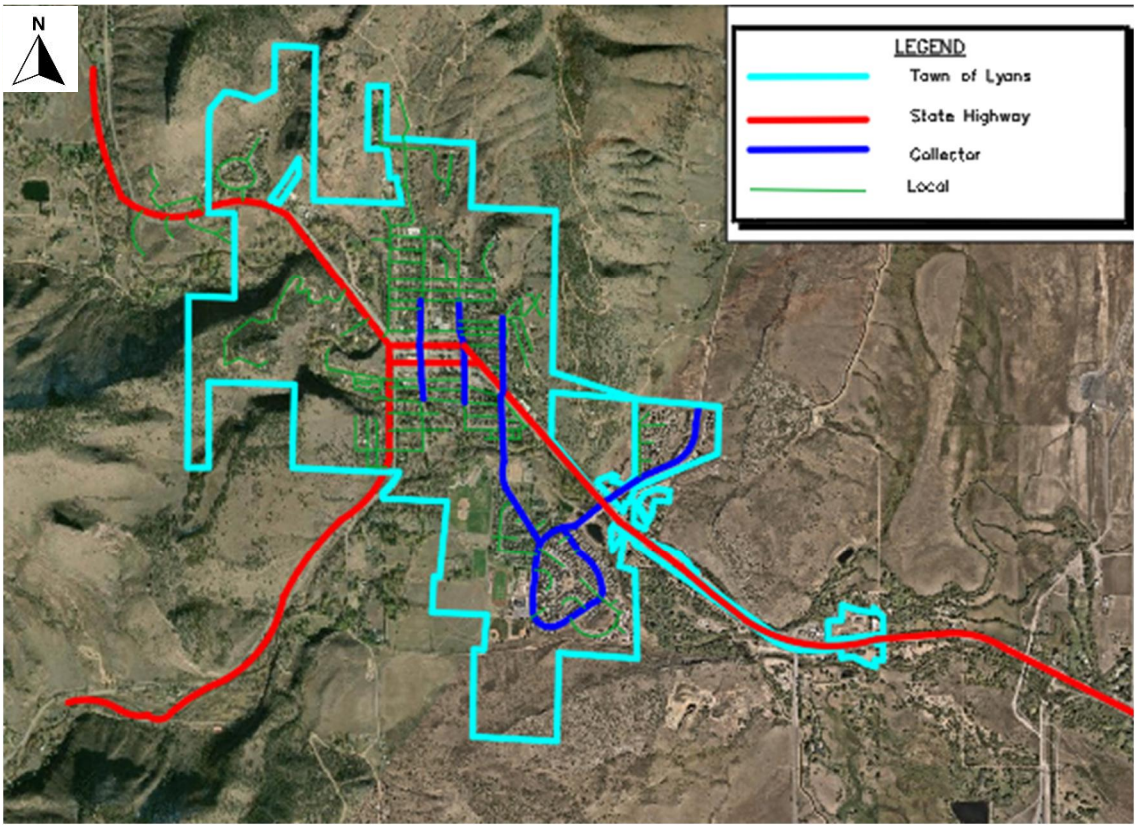

Figure 17: Road Classification Map

During discussions with the Town, areas with higher levels of pedestrian activity were also identified. The figure below shows the area to be considered with high pedestrian activity, another important factor when it comes to determining appropriate lighting levels.

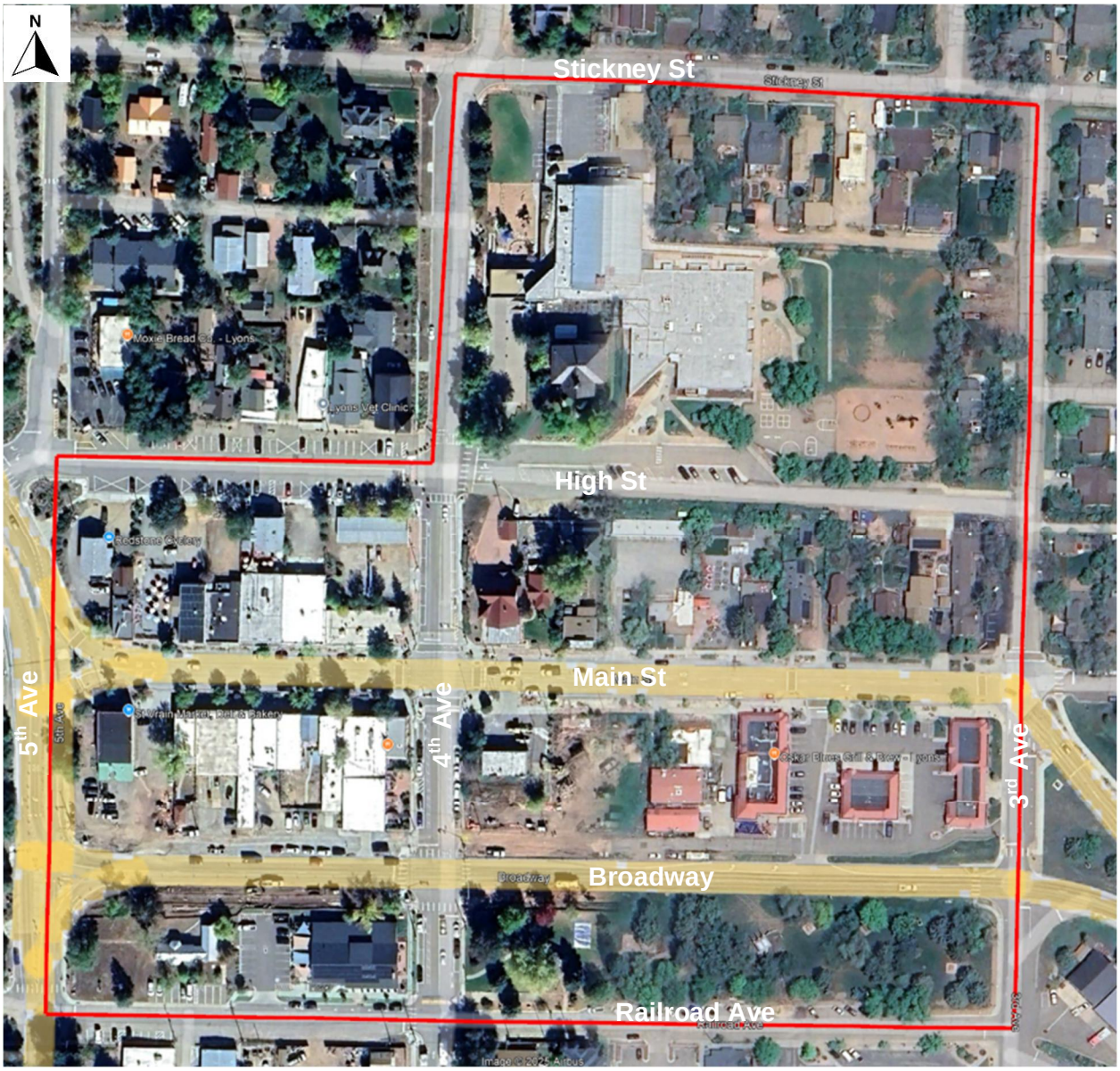

Figure 18: High Pedestrian Activity Level Area

Recommended light levels are generally guided by the Illuminating Engineering Society (IES) Manual. This manual identifies recommended illuminance values for multiple different types of road classifications, pedestrian activity levels, and scenarios (roundabout, intersection, sidewalk, etc.).

The Town of Lyons can take multiple approaches when establishing new lighting standards. The City and County of Denver Lighting Design Guidelines provide a very thorough approach to lighting guidelines that include light level tables, drawings, and definitions. Another approach could be similar to the City of Fort Worth, TX, Engineering Design Manual, a manual identifying lighting criteria for different roadway types and specifying locations where lighting needs to be installed (at all intersections, the ends of cul-de-sacs, and at different pole spacing and mounting height requirements based on the scenario (neighborhood, school, park, library, etc.)).

If the Town of Lyons prefers to specify light levels versus pole spacing, the following tables from the IES manual would be beneficial to include.

Table 7: Lighting Design Criteria for Streets

Street Classification	Pedestrian Activity Classification*	Average Luminance L_{avg} (cd/m²)	Average Uniformity Ratio L_{avg}/L_{min}	Maximum Uniformity Ratio L_{max}/L_{min}	Maximum Veiling Luminance Ratio $L_{v,max}/L_{avg}$
Major	High	1.2	3.0	5.0	0.3
	Medium	0.9	3.0	5.0	0.3
	Low	0.6	3.5	6.0	0.3
Collector	High	0.8	3.0	5.0	0.4
	Medium	0.6	3.5	6.0	0.4
	Low	0.4	4.0	8.0	0.4
Local	High	0.6	6.0	10.0	0.4
	Medium	0.5	6.0	10.0	0.4
	Low	0.3	6.0	10.0	0.4

Table 8: Illuminance for Intersection Lighting (lux/fc)

Illuminance for Intersections				
Functional Classification	Pedestrian Activity Level Classification			E_{avg}/E_{min}
	High	Medium	Low	
Major/Major	34/3.2	26/2.4	18/1.7	3.0
Major/Collector	29/2.7	22/2.0	15/1.4	3.0
Major/Local	26/2.4	20/1.9	13/1.2	3.0
Collector/Collector	24/2.2	18/1.7	12/1.1	4.0
Collector/Local	21/2.0	16/1.5	10/0.9	4.0
Local/Local	18/1.7	14/1.3	8/0.7	6.0

Additional standards to include would be for crosswalk light levels, new neighborhood lighting requirements, and bike path/multi-use trail light level requirements. The standards could also include allowable color temperatures and DarkSky requirements/ratings for the fixtures.

For a focus on DarkSky, City of Boulder and City of Flagstaff lighting codes are great references for the Town. The Town currently has lights installed consistently including along local streets, intersections, mid-block local streets, along collectors, and along arterials. With the importance of DarkSky highlighted in the public input survey, the Town may consider following similar ideology from Boulder and Flagstaff (Chapter 13-12: https://www.codepublishing.com/AZ/Flagstaff/) such as lighting on local streets is not generally provided unless it is a busy local street or local street with high pedestrian activity. For intersections that involve a local street and a higher classification street, lighting would be recommended to remain. On streets that the Town does want to keep lighting such as collectors and arterials, important factors to consider are uniformity (maintained average illuminance values) as shown in Tables 11 and 12 above. The IES manual recommends uniformity due to the impact on the human eye and reducing shadows. As the Town prepares a formal lighting code with DarkSky priorities, it is recommended to have criteria for maximum pole height, shielding requirements, maximum color temperature, and maximum lumen levels similar to Table 9-11 in City of Boulder's Municipal Code Section 9-9-16 (https://library.municode.com/co/boulder/codes/municipal_code?nodeId=TIT9LAUSCO_CH9DE

ST_9-9-16LIOU). If the Town decided to remove existing lighting from local streets, the GIS information collected with this study can be used to determine quantities of lights for different situations the Town is considering. DarkSky also has ordinance and statute templates, the Town could pull data from to include DarkSky criteria.

To have a comprehensive analysis, the Town could also consider solar lighting. While solar fixtures are typically more expensive than standard fixtures, solar lighting would be most cost effective when there is no existing power nearby. This would eliminate the need for conduit, wiring, and a transformer connection which could save a significant amount of money if the lighting is nowhere near the power grid. For each scenario, solar was to be considered, the size and cost of the required battery bank and number of fixtures would need to be compared to cost of infrastructure to tie into the nearest power location. An example of a solar panel, battery, and monitoring system can be found in Appendix H. This system would cost $5,000. Engineering design would need to be completed based on how many and what type of fixtures this system could power to determine if more than one panel and battery were needed.

9.0 Benefit Cost Analysis

Another goal of this project was to determine the return on investment for converting the lighting system to LED. Information on existing electricity costs and maintenance costs for the lighting system were discussed with the Town of Lyons staff. A total LED conversion would have a significant impact on electricity and maintenance cost savings as shown in Table 13 below. Based on the information provided by the Town, it is assumed that approximately 63% of the light fixtures are functioning (147 out of 231). To run the energy savings analysis, the number of functioning LEDs vs functioning non-LEDs was needed. Based on field work and information provided by the Town, it is anticipated that of the 147 lights that are functioning, 54 are LEDs and 93 are non-LEDs.

By converting the 93 functioning non-LED fixtures to LED, an estimated $4,300 would be saved every year in electricity costs alone. This is based on a 200W HPS light fixture vs an 84W LED, $0.09156KWH electricity cost, and average operating time of 12 hours/day for 365 days/year (4,380 hours).

Table 9: Life Cycle Cost

Life Cycle Cost				
Fixture Lifetime (years)	15		LED longevity is 50,000 to 100,000 hrs. 15 years approximates to 65,700 hrs	
	LED	**HID/HPS**	**Cost (Savings)**	**Comment**
Total System Acquisition Cost	$93,000.00	$0.00	$93,000.00	Includes power-supply cost plus total of fixtures and transformer costs.
Total Operating Cost (energy)	$47,218.80	$112,425.90	($65,207.10)	Note: Energy price per kWH is assumed to remain unchanged across the full life-cycle period of the applications being compared.
Routine Maintenance Cost (light-source + labor only)	$71,610.00	$167,400.00	($95,790.00)	Based on routine replacements of light-sources plus labor costs over lifetime of all fixtures.
Total Life Cycle Cost	**$211,828.80**	**$279,825.90**	($67,997.10)	
After 15 years, the total estimated reduction of emissions is 510 metric tons of CO2, or about one year's worth of emissions from 97.5 vehicles or 43.5 to 61.5 homes. The LED maintenance cost is based on driver replacement, which is very common in LED Fixtures.				

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**This calculation was based on an estimated 15-year lifespan of the LED fixture. This approximates to 65,700 hours and the estimated LED longevity is 50,000 to 100,000 hours. Fifteen (15) years with approximately 65,700 hours of use on the fixture is an average lifespan of the fixture.*

As seen in the tables and calculations above, converting the existing, functioning, non-LED fixtures to LED will provide an estimated $65,000 in energy cost savings and $95,000 in maintenance costs over the estimated 15-year lifespan of the LED fixtures. With the LED fixture

investment of $93,000 and the energy and maintenance savings, over 15 years, the LED conversion is anticipated to save over $67,000 in operating and maintenance costs combined compared to keeping current non-LED fixtures. This is equal to over $4,300 per year in savings. The existing energy and maintenance costs were provided by the Town of Lyons.

This equates to an 8.7-year return on investment for the cost of replacing the non-LED fixtures.

The energy savings of one light fixture being converted from a 200W HPS (non-LED) equivalent to an 84W LED would be $46 per year and about $700 over 15 years based on the same metrics as above. The table below shows the metrics over a 15 year lifespan for one fixture conversion.

Table 10: Life Cycle Cost for One Fixture Conversion

Life Cycle Cost				
Fixture Lifetime (years)	15		LED longevity is 50,000 to 100,000 hrs. 15 years approximates to 65,700 hrs	
	LED	**HID/HPS**	**Cost (Savings)**	**Comment**
Total System Acquisition Cost	$1,000.00	$0.00	$1,000.00	Includes power-supply cost plus total of fixtures and transformer costs.
Total Operating Cost (energy)	$507.75	$1,208.85	($701.10)	Note: Energy price per kWH is assumed to remain unchanged across the full life-cycle period of the applications being compared.
Routine Maintenance Cost (light-source + labor only)	$770.00	$1,800.00	($1,030.00)	Based on routine replacements of light-sources plus labor costs over lifetime of all fixtures.
Total Life Cycle Cost	**$2,277.75**	**$3,008.85**	($731.10)	
After 15 years, the total estimated reduction of emissions is 5.4 metric tons of CO2, or about one year's worth of emissions from 1 vehicles or 0.5 to 0.7 homes. The LED maintenance cost is based on driver replacement, which is very common in LED Fixtures.				

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Table 11: Green Savings

GREEN SAVINGS

34,217 KWH: Total LED Energy Consumption per Year

81,468 KWH: Total HID/HPS Energy Consumption per Year

47,251 KWH: Total Energy Consumption Reduction per Year

This LED product solution compared to the alternative product (as estimated above)
reduces carbon emissions as estimated below. For citations and additional information
click the More Information button. More information

34 Metric Tons: Carbon Dioxide
Use of LEDs is equivalent in avoiding the Greenhouse Gas emissions of:

6.5 Passenger vehicles per year
4.1 Homes per year, due to use of electricity only
2.9 Homes per year, due to *all energy* used

Source: EPA Greenhouse Gas Equivalencies Calculator
Reduction (Savings) of Carbon Dioxide Emissions, and Equivalent Sources

As shown in Table 15 above, the LED conversion plays a significant role not only in reducing operating and maintenance costs but also in providing for a positive impact on the environment. This table outlines the greenhouse gas savings from converting the 93 existing non-LED fixtures in the Town of Lyons lighting system to LEDs.

10.0 Conclusion and Recommendation

The Town of Lyons undertook this Streetlight Conversion Study with the primary goals of mapping existing streetlights, identifying ways to reduce energy consumption and maintenance costs, promoting DarkSky principles, addressing public input on light pollution, and recommending design guidelines for street lighting.

The key findings from the study highlighted the following:

1. **Inventory and Analysis**: A detailed inventory of the town's existing streetlights showed 231 fixtures, of which 147 were non-LED and 93 were functioning non-LED fixtures. The study also identified various types of poles and fixtures, emphasizing the need for standardization to simplify maintenance and reduce costs.
2. **Public Input:** The survey revealed significant public interest in reducing light pollution, with preferences for DarkSky compliant solutions and warmer color temperatures. The public also expressed concerns about specific lights being too bright or shining into homes, and highlighted areas needing additional lighting for safety.
3. **Cost Estimates:** Four different cost scenarios were presented ranging from $80,500 to replace only the functioning non-LED fixtures, to $358,200 for replacing all existing fixtures with LED and adding the Ubicquia control system. Each scenario provided a detailed breakdown of the potential savings and investments required.
4. **Photometric Analysis**: The analysis provided a comprehensive review of all of the Town's current light pole locations with the recommended DarkSky fixtures from this report. Areas with sufficient lighting and locations needing improvement were identified.
5. **Energy Savings and ROI**: Converting all functioning non-LED fixtures to LED is projected to save approximately $4,300 annually in electricity costs. The estimated return on investment for the LED conversion is 8.7 years.

The following recommendations are made from this study:

1. **Install DarkSky Approved LED Light Fixtures**: To align with public sentiment and environmental goals, it is recommended to replace all functioning, non-LED fixtures with DarkSky Approved LED fixtures. This includes minimizing SKU variety to streamline maintenance and reduce costs.

2. **Reduce Light Pollution:** Throughout the Town, in locations where the Town decides to keep lighting, it is recommended to reduce light pollution by utilizing DarkSky Approved fixtures with lower lumens, warmer color temperatures, and shielding to minimize light intrusion. The public survey highlighted specific locations where residents are requesting to completely remove lighting which would reduce light pollution more.

3. **Establish a Lighting Code:** Reference the lighting codes of cities such as Flagstaff and Boulder and the DarkSky code template to establish a comprehensive and effective lighting code for the Town of Lyons.

4. **Improve Lighting in High Pedestrian Areas:** Increase lighting in identified dark areas, particularly in high pedestrian activity areas, to improve safety. This includes areas such as the vicinity of Lyons Senior/Middle School and along Broadway between 3rd Avenue and 5th Avenue. Additional lighting in these areas will enhance visibility and safety for pedestrians (Section 8.4). In areas where minimal pedestrian activity is expected at night, motion sensors and/or programming the lights to dim during certain hours would alleviate excessive brightness overnight.

5. **Implement Advanced Lighting Controls:** Consider adopting advanced lighting control systems such as Ubicquia, which offers features like dimming, motion sensing, and fixture health reporting. These controls will provide the town with greater flexibility in managing the lighting infrastructure, optimizing energy usage, and implementing DarkSky principles.

With the public feedback received and the referenced lighting codes of Flagstaff and Boulder, the Town could ultimately decide to remove all lighting in the residential neighborhoods. This would reduce the amount of functioning, non-LED fixtures to be replaced. With this report, a GIS file and KMZ of the entire Town's lighting inventory was created and provided to the Town. The Town can use this to calculate different variations of quantities as decisions are made on which lights to remove.

By following these recommendations, the Town of Lyons can achieve significant energy and maintenance cost savings, reduce light pollution, and enhance the overall quality of street lighting for residents. This strategic approach will not only improve the town's environmental footprint but also ensure a safer and more pleasant night-time environment for all.

Appendix A: Opinion of Probable Construction Cost

Lyons Streetlight Conversion Study

Opinion of Probable Construction Cost

Replacement of Only Functioning, Non-LED Fixtures

Kimley»Horn

Date Prepared: August 1, 2025

	Item	Unit	Quantity	Unit Cost	Extended Cost	Notes
1	Removal of Luminaire	EACH	68	$200.00	$13,600	
2	Decorative LED Fixture (Square) (DSX1 LED P1 30K 70CRI T3M MVOLT SPA PER7 DBLXD)	EACH	5	$800.00	$4,000	
3	Decorative LED Fixture (Pendant) (GBLF3 P20 30K MVOLT ASY ARM BK PR7 AO)	EACH	13	$1,600.00	$20,800	
4	Cobrahead LED Fxture (Round/Square Cobra) (ACM P605 MVOLT R3 D4i 2B 3K GY 20K P7 NBR DDC XL BAA AO)	EACH	50	$400.00	$20,000	
5	Aluminum Cantilever Arm (AMAW T14 US2-8 DNA) (FOR WOOD POLES)	EACH	58	$200.00	$11,600	
	SUB-TOTAL MAJOR CONSTRUCTION ITEMS				**$70,000**	**Notes**
				SUB-TOTAL	**$70,000**	**Notes**
	Contingency (15%)	% of sub-total		15.0%	$10,500	
				Total Project Cost Estimate		**$80,500**

Opinion of Probable Construction Costs

The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

Lyons Streetlight Conversion Study

Opinion of Probable Construction Cost

Replacement of Only Non-LED Fixtures

Kimley»Horn

Date Prepared: August 1, 2025

	Item	Unit	Quantity	Unit Cost	Extended Cost	Notes
1	Removal of Luminaire	EACH	147	$200.00	$29,400	
2	Decorative LED Fixture (Square) (DSX1 LED P1 30K 70CRI T3M MVOLT SPA PER7 DBLXD)	EACH	18	$800.00	$14,400	
3	Decorative LED Fixture (Pendant) (GBLF3 P20 30K MVOLT ASY ARM BK PR7 AO)	EACH	47	$1,600.00	$75,200	
4	Cobrahead LED Fxture (Round/Square Cobra) (ACM P605 MVOLT R3 D4i 2B 3K GY 20K P7 NBI	EACH	83	$400.00	$33,200	
5	Aluminum Cantilever Arm (AMAW T14 US2-8 DNA) (FOR WOOD POLES)	EACH	105	$200.00	$21,000	
	SUB-TOTAL MAJOR CONSTRUCTION ITEMS				**$173,200**	**Notes**
				SUB-TOTAL	**$173,200**	**Notes**
	Contingency (15%)	% of sub-total		15.0%	$26,000	
				Total Project Cost Estimate		**$199,200**

Opinion of Probable Construction Costs

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Lyons Streetlight Conversion Study

Opinion of Probable Construction Cost

Replacement of All Non-LED and LED Fixtures

Kimley»Horn

Date Prepared:	August 1, 2025

	Item	Unit	Quantity	Unit Cost	Extended Cost	Notes
1	Removal of Luminaire	EACH	231	$200.00	$46,200	
2	Decorative LED Fixture (Square) (DSX1 LED P1 30K 70CRI T3M MVOLT SPA PER7 DBLXD)	EACH	18	$800.00	$14,400	
3	Decorative LED Fixture (Pendant) (GBLF3 P20 30K MVOLT ASY ARM BK PR7 AO)	EACH	95	$1,600.00	$152,000	
4	Cobrahead LED Fxture (Round/Square Cobra) (ACM P605 MVOLT R3 D4i 2B 3K GY 20K P7 NBR DDC XL BAA AO)	EACH	119	$400.00	$47,600	
5	Aluminum Cantilever Arm (AMAW T14 US2-8 DNA) (FOR WOOD POLES)	EACH	105	$200.00	$21,000	
	SUB-TOTAL MAJOR CONSTRUCTION ITEMS				**$281,200**	**Notes**
				SUB-TOTAL	**$281,200**	**Notes**
	Contingency (15%)	% of sub-total		15.0%	$42,200	
				Total Project Cost Estimate		**$323,400**

Opinion of Probable Construction Costs

The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

Lyons Streetlight Conversion Study

Opinion of Probable Construction Cost

Lighting Controls (Only Non-LED Fixtures Replaced)

Kimley»Horn

Date Prepared:	August 1, 2025

	Item	Unit	Quantity	Unit Cost	Extended Cost	Notes
1	AO Turndown Module	EACH	147	$10.00	$1,500	Manual control
2	AC Twist Lock Photocell	EACH	147	$20.00	$2,900	Minimal control
3	DC Connect Photocell	EACH	147	$20.00	$2,900	Minimal control
4	Local Connect	EACH	147	$25.00	$3,700	Great option for controls but must be controlled at each individual fixture instead of remotely. If after installation, no regular modifications or monitoring would be necessary, this can be a cost effective option.
5	nLight Air	EACH	147	$80.00	$11,800	Typically used for localized controls like on campuses or office buildings. Requires separate app to create the mesh network from the nodes using Bluetooth
6	Ubicquia (Cellular Control)	EACH	147	$150.00	$22,100	Great option and cost effective for full control with remote accessibility for the entire Town lighting system.

Opinion of Probable Construction Costs

The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

Lyons Streetlight Conversion Study

Opinion of Probable Construction Cost

Lighting Controls (All Fixtures Replaced)

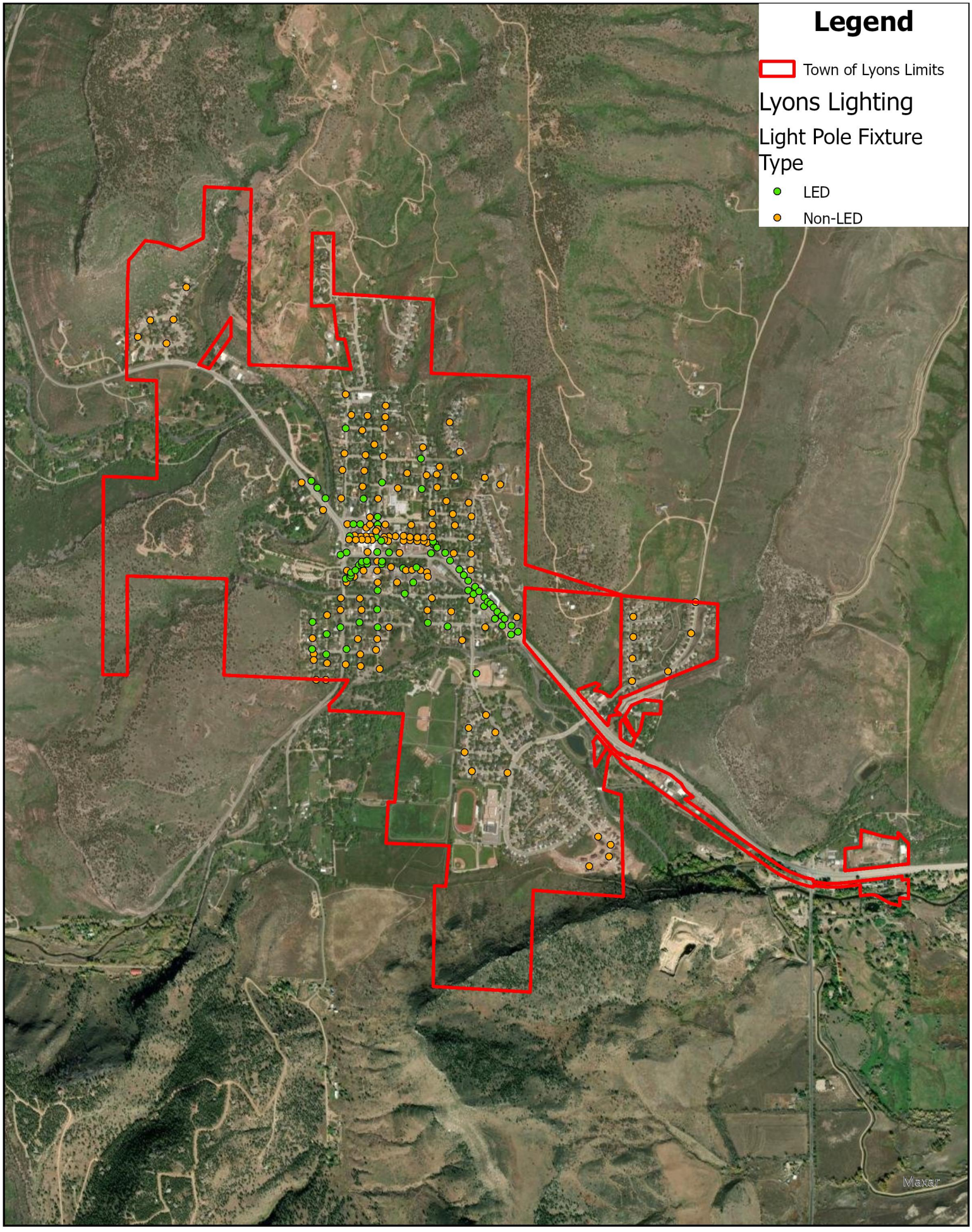
Date Prepared:	August 1, 2025

	Item	Unit	Quantity	Unit Cost	Extended Cost	Notes
1	AO Turndown Module	EACH	232	$10.00	$2,300	Manual control
2	AC Twist Lock Photocell	EACH	232	$20.00	$4,600	Minimal control
3	DC Connect Photocell	EACH	232	$20.00	$4,600	Minimal control
4	Local Connect	EACH	232	$25.00	$5,800	Great option for controls but must be controlled at each individual fixture instead of remotely. If after installation, no regular modifications or monitoring would be necessary, this can be a cost effective option.
5	nLight Air	EACH	232	$80.00	$18,600	Typically used for localized controls like on campuses or office buildings. Requires separate app to create the mesh network from the nodes using Bluetooth
6	Ubicquia (Cellular Control)	EACH	232	$150.00	$34,800	Great option and cost effective for full control with remote accessibility for the entire Town lighting system.

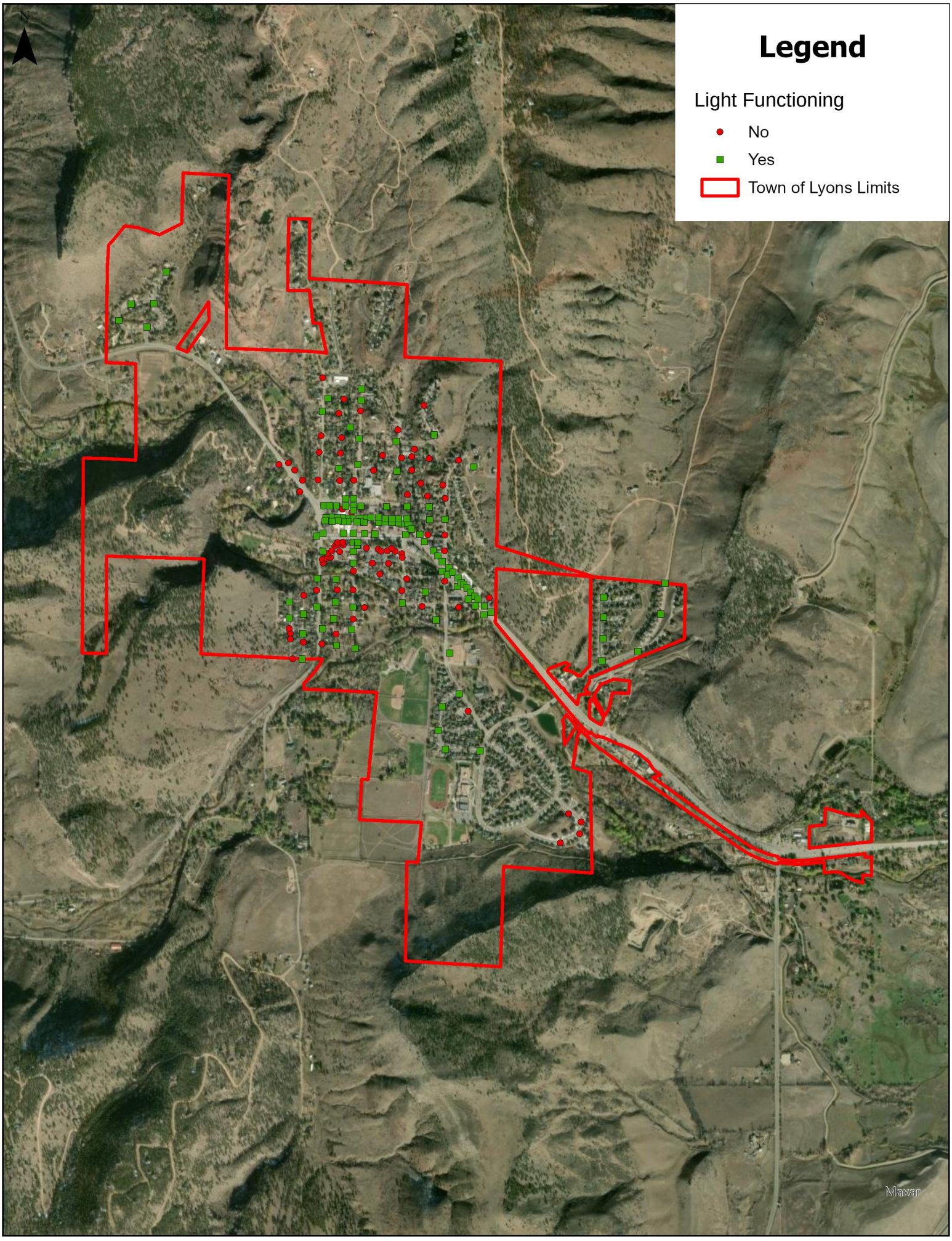
Opinion of Probable Construction Costs

The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

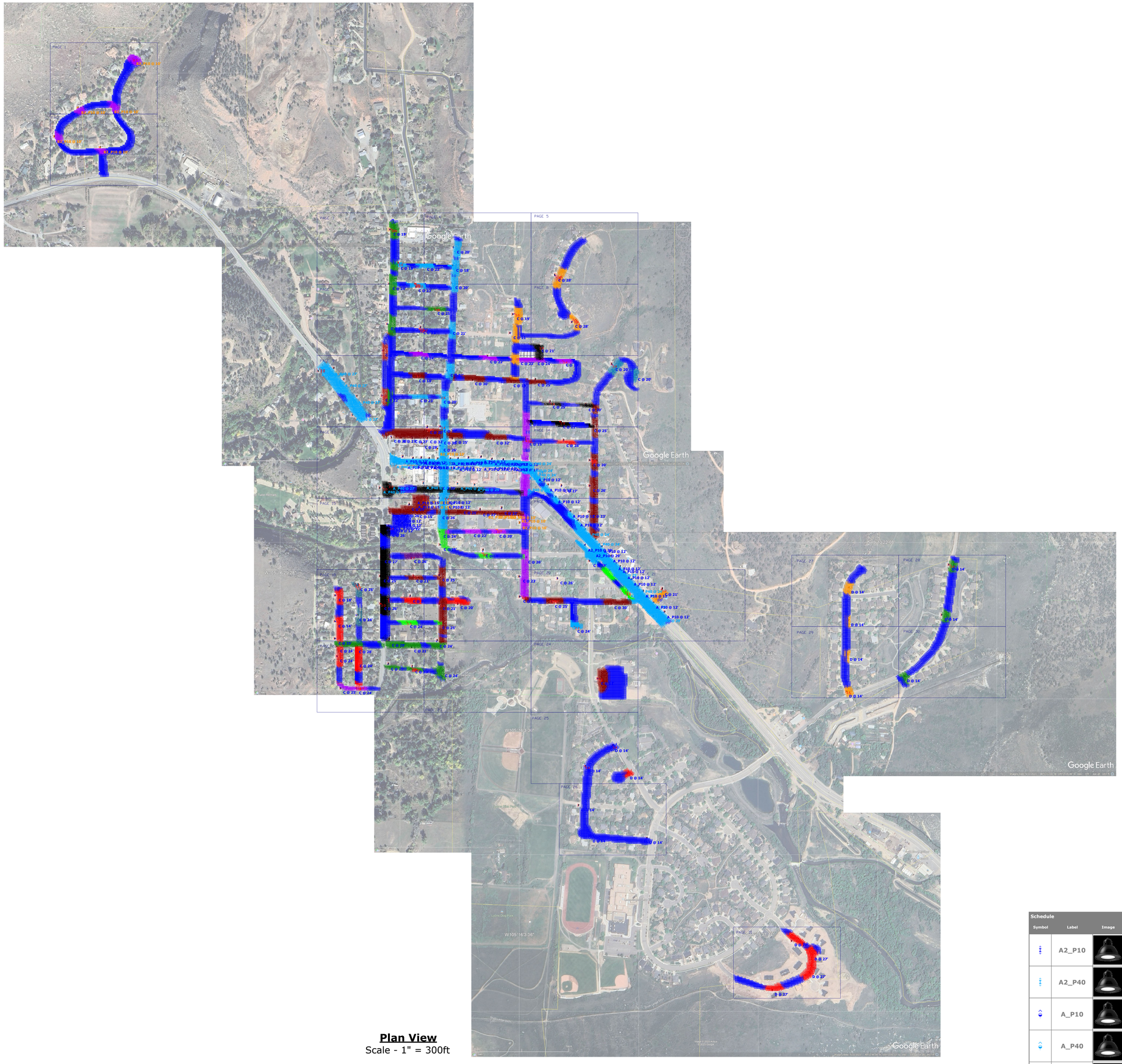
Appendix B: Lighting Inventory Exhibit


Legend
Town of Lyons Limits
Lyons Lighting
Light Pole Fixture Type
LED
Non-LED
Maxar

Appendix C: Lighting Functioning Exhibit


N
Legend
Light Functioning
No
Yes
Town of Lyons Limits
Maxar

Appendix D: Photometrics



Plan View
Scale - 1" = 300ft

Background Image Disclaimer
Please note this design utilizes an image format or converted image such as a PDF or JPEG formats for the background shown. These types of formats can negatively impact accuracy when scaled resulting with inconsistent measurement of lighting levels on project. Acuity Brands strongly suggests the use of AutoCAD formats for all design requests.

SAFETY – Roadway Applications
This design does not conform to current IESNA RP-8-22 levels based for the IES classification of Acuity Brands will not be responsible for any potential safety issues that may arise due to noncompliance of these minimal levels.

General Notes – Roadway
1.) Readings shown are based on a total LLF of 0.9 as shown at grade.
Data references the extrapolated performance projections in a 25c ambient
based on 10,000 hrs of LED testing (per IESNA LM-80-08 and projected per IESNA TM-21-11).
2.) Please refer to the "luminaire locations" for mounting heights.
3.) Product information can be obtained at https://www.acuitybrands.com/ or through your local agent.
4.) Calculations do not account for topography and possible obstructions such as existing old growth trees or foliage.

Statistics

Description	Symbol	Avg	Max	Min	Max/Min	Avg/Min
2ND AVE	◇	0.5 fc	2.6 fc	0.0 fc	N/A	N/A
2ND CT	◇	0.4 fc	3.5 fc	0.0 fc	N/A	N/A
3RD AVE	□	0.6 fc	4.8 fc	0.0 fc	N/A	N/A
3RD AVE	×	0.4 fc	3.0 fc	0.0 fc	N/A	N/A
4TH AVE	+	0.7 fc	2.9 fc	0.0 fc	N/A	N/A
4TH AVE	□	0.8 fc	3.4 fc	0.0 fc	N/A	N/A
5TH AVE	✕	0.3 fc	2.9 fc	0.0 fc	N/A	N/A
5TH AVE	■	0.4 fc	2.0 fc	0.0 fc	N/A	N/A
ALLEY 1	◇	0.3 fc	4.7 fc	0.0 fc	N/A	N/A
ALLEY 2	×	0.6 fc	2.7 fc	0.0 fc	N/A	N/A
ALLEY 3	■	0.6 fc	2.2 fc	0.0 fc	N/A	N/A
ALLEY 4	✕	0.4 fc	3.1 fc	0.0 fc	N/A	N/A
ALLEY 5	×	0.4 fc	2.3 fc	0.0 fc	N/A	N/A
ALLEY 6	◇	0.4 fc	1.7 fc	0.0 fc	N/A	N/A
ALLEY 7	■	0.6 fc	2.2 fc	0.0 fc	N/A	N/A
BLOOMFIELD ALLEY	×	0.5 fc	2.6 fc	0.0 fc	N/A	N/A
BROADWAY	◇	0.3 fc	2.0 fc	0.0 fc	N/A	N/A
CARTER DR	□	0.3 fc	1.1 fc	0.0 fc	N/A	N/A
EAGLE CANYON CIRCLE	×	0.2 fc	8.1 fc	0.0 fc	N/A	N/A
EAGLE VALLEY DR	□	0.2 fc	3.5 fc	0.0 fc	N/A	N/A
EVANS ST	◇	0.4 fc	1.7 fc	0.0 fc	N/A	N/A
EVANS ST	□	0.5 fc	3.1 fc	0.0 fc	N/A	N/A
EWALD AVE	+	0.9 fc	5.5 fc	0.0 fc	N/A	N/A
HIGH ST	+	0.6 fc	2.7 fc	0.0 fc	N/A	N/A
HIGH ST	■	0.4 fc	2.9 fc	0.0 fc	N/A	N/A
LONG PEAK DR	+	0.2 fc	1.4 fc	0.0 fc	N/A	N/A
MAIN ST	✕	0.9 fc	5.2 fc	0.0 fc	N/A	N/A
MC CALL ALLEY	■	0.8 fc	3.9 fc	0.0 fc	N/A	N/A
MELLY ST	□	0.6 fc	2.0 fc	0.0 fc	N/A	N/A
MELLY ST	+	0.9 fc	1.9 fc	0.0 fc	N/A	N/A
MOUNTAIN VIEW DR	◇	0.4 fc	3.4 fc	0.0 fc	N/A	N/A
PARK ST	□	0.4 fc	2.6 fc	0.0 fc	N/A	N/A
PARK ST	+	0.4 fc	1.7 fc	0.0 fc	N/A	N/A
PARKING 1	□	0.5 fc	2.8 fc	0.0 fc	N/A	N/A
PARKING 2	□	0.8 fc	3.0 fc	0.0 fc	N/A	N/A
PARKING 3	□	1.2 fc	4.2 fc	0.1 fc	42.0:1	12.0:1
PARKING 4	◇	1.6 fc	4.3 fc	0.2 fc	21.5:1	8.0:1
PROSPECT ST	✕	0.6 fc	2.6 fc	0.0 fc	N/A	N/A
RAILROAD AVE	□	1.3 fc	8.2 fc	0.0 fc	N/A	N/A
RAILROAD AVE	■	0.6 fc	2.0 fc	0.1 fc	20.0:1	6.0:1
REESE AVE	◇	0.4 fc	1.8 fc	0.0 fc	N/A	N/A
REESE ST	✕	0.4 fc	2.0 fc	0.0 fc	N/A	N/A
SEWARD ST	✕	0.3 fc	1.7 fc	0.0 fc	N/A	N/A
SEWARD ST	■	0.5 fc	3.4 fc	0.0 fc	N/A	N/A
STICKNEY ALLEY	◇	0.4 fc	1.9 fc	0.0 fc	N/A	N/A
STICKNEY ST	✕	0.4 fc	3.2 fc	0.0 fc	N/A	N/A
STONE CANYON DR	✕	0.2 fc	3.4 fc	0.0 fc	N/A	N/A
UPPER 5TH AVE	+	0.5 fc	2.8 fc	0.0 fc	N/A	N/A
W MAIN ST	□	0.4 fc	2.0 fc	0.0 fc	N/A	N/A
WATER TRWATMENT	◇	0.1 fc	1.2 fc	0.0 fc	N/A	N/A
WELCH DR	+	0.3 fc	3.4 fc	0.0 fc	N/A	N/A

Schedule

Symbol	Label	Image	QTY	Manufacturer	Catalog Number	Description	Number Lamps	Filename	Lumens per Lamp	LLF	Wattage	Distribution
	A2_P10		2	Holophane	GBLF3 P10 30K XXXXX ASY	GlasWerks Luminescent LED Bern, P10 Performance Package, 3000K CCT, Asymmetric distribution	1	GBLF3_P10_30K_XXXXX_ASY.ies	3870	0.9	60	TYPE IV, VERY SHORT, BUG RATING: B1 - U0 - G1
	A2_P40		4	Holophane	GBLF3 P40 30K XXXXX ASY	GlasWerks Luminescent LED Bern, P40 Performance Package, 3000K CCT, Asymmetric distribution	1	GBLF3_P40_30K_XXXXX_ASY.ies	9075	0.9	150	TYPE IV, VERY SHORT, BUG RATING: B2 - U0 - G2
	A_P10		43	Holophane	GBLF3 P10 30K XXXXX ASY	GlasWerks Luminescent LED Bern, P10 Performance Package, 3000K CCT, Asymmetric distribution	1	GBLF3_P10_30K_XXXXX_ASY.ies	3870	0.9	30	TYPE IV, VERY SHORT, BUG RATING: B1 - U0 - G1
	A_P40		23	Holophane	GBLF3 P40 30K XXXXX ASY	GlasWerks Luminescent LED Bern, P40 Performance Package, 3000K CCT, Asymmetric distribution	1	GBLF3_P40_30K_XXXXX_ASY.ies	9075	0.9	75	TYPE IV, VERY SHORT, BUG RATING: B2 - U0 - G2
	B2_P10		13	Holophane	GBLF3 P10 30K XXXXX SYM	GlasWerks Luminescent LED Bern, P10 Performance Package, 3000K CCT, Symmetric distribution	1	GBLF3_P10_30K_XXXXX_SYM.ies	3995	0.9	60	TYPE VS, BUG RATING: B2 - U0 - G1
	C		110	American Electric Lighting	ACM P403 R3 3K	ACM P403 Performance package Roadway Type III distribution 3000K CCT	1	ACM_P403_R3_3K.ies	9569	0.9	67	TYPE II, SHORT, BUG RATING: B2 - U0 - G2
	D		17	American Electric Lighting	ACC P304 R3 3K	ACC P304 Performance package Roadway Type III distribution 3000K CCT	1	ACC_P304_R3_3K.ies	5773	0.9	40	TYPE III, SHORT, BUG RATING: B1 - U0 - G1

DISCLAIMER
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This application design is not a professional engineering drawing, and the design, including reported data and calculated results, is provided for informational purposes only, without any warranty as to accuracy, completeness, safety or otherwise. The design is the result of calculations made using Visual® lighting application software, photometric/radiometric data measured in a laboratory, and certain computational and modeling assumptions.
Far-field photometric/radiometric data may have been used to perform one or more calculations. Photometric/radiometric data is typically collected under far-field measurement conditions; far-field data is not generally representative of near-field geometric conditions. When using far-field photometric/ radiometric data, the Visual software applies certain generalizing assumptions to approximate near-field performance. These approximations may result in significant inaccuracies in individual calculated luminous and/or radiant power quantities in areas where a source is in close proximity to a particular surface or point.
The modeling of radiant flux exchange used in the Visual software requires a uniform exitance across each reflecting surface. The Visual software approximates the uniform surface exitance condition by adaptively subdividing surfaces with non-uniform exitances into subsurfaces with sufficiently uniform exitance gradients. Practical restrictions, due to computer hardware limitations, may prevent the subdivision procedure from subdividing surfaces with high exitance gradients into subsurfaces with sufficiently uniform exitance gradients, introducing potential discretization error into calculated values.
Calculations performed by the Visual software assume that all reflected flux is reflected in a perfectly diffuse (Lambertian) and spectrally uniform manner across the spectral range being analyzed. If actual reflectance characteristics differ from these assumptions, observed luminous and/or radiant power quantities may differ from predicted quantities.
As a result of the computational limitations and simplifying modeling assumptions described above, and/or variations in actual product performance from tested product samples, the accuracy of calculated output values identifying expected radiometric quantities and any resulting derived radiation dose calculations may be adversely affected.
In addition, the accuracy of the application design may be adversely affected if information about the physical space provided to Acuity Brands Lighting is incomplete, inaccurate, outdated or not in the required format (including but not limited to floor plans, space layout, reflected ceiling plans, physical structures, electrical design or specifications), if incorrect assumptions are made because of such deficiencies in the information provided, or if typical assumptions made about the depicted physical space are not appropriate for the space. Furthermore, actual field performance may differ from performance calculated using laboratory measurements as the result of miscalculations related to deficiencies in the information provided about the physical space, degradation factors in the end-user environment (including, but not limited to, voltage variation and dirt accumulation), or other possible variations in field conditions. Finally, lamp lumen depreciation and/or depreciation in lamp radiant intensity may result in performance over time that differs from performance calculated using a new lamp. Light loss factors may have been used in the application design to estimate such depreciation, but flaws in these estimates may also result in performance over time that differs from calculated performance.
It is the obligation of the end-user to consult with appropriately qualified Professional Engineer(s) to determine whether this application design meets the applicable requirements for performance, code compliance, safety, suitability and effectiveness for use in a particular application. In no event will Acuity Brands Lighting be responsible for any loss resulting from any use of this application design.

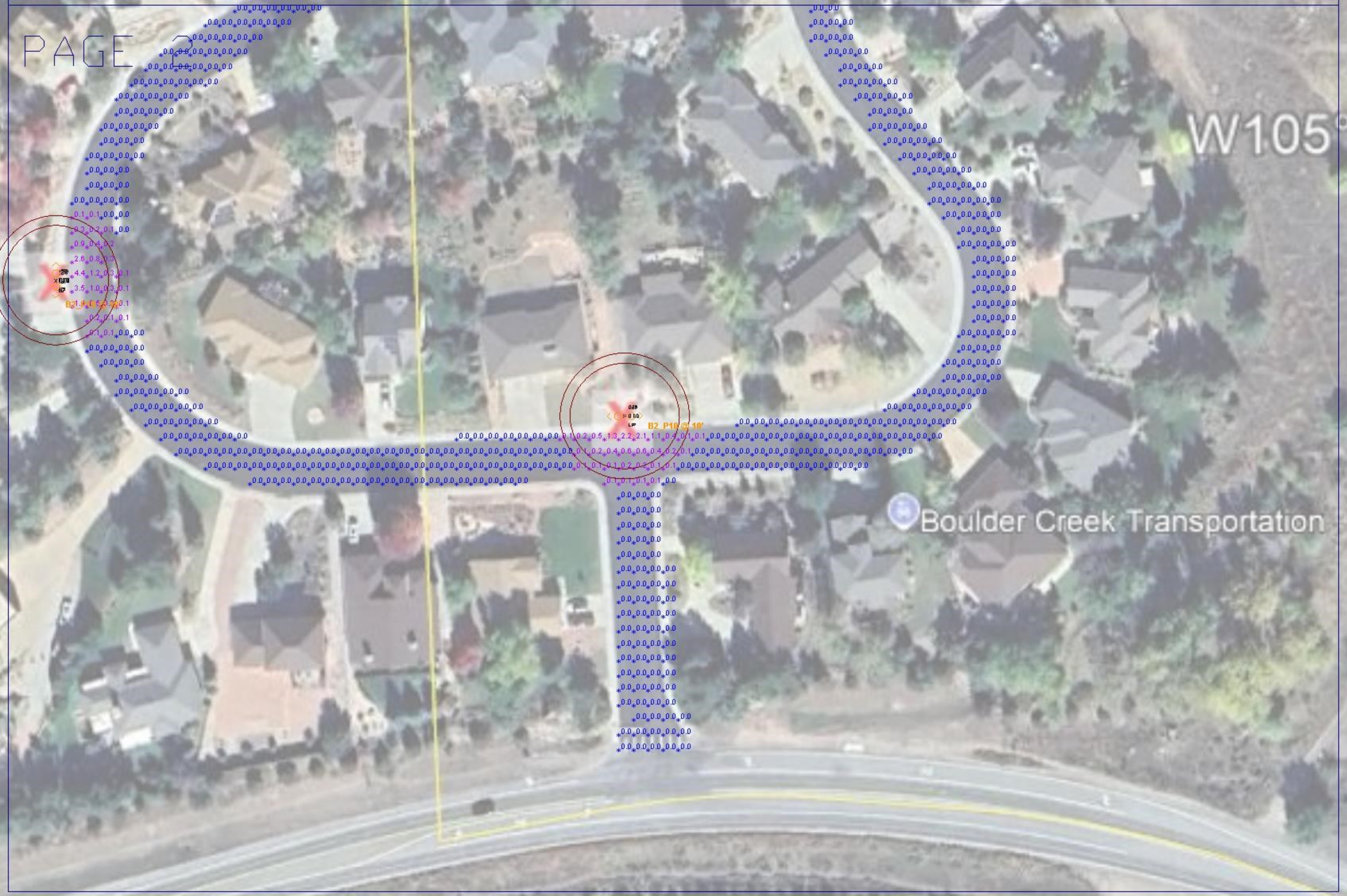
ACUITY BRANDS DESIGN SERVICES
LIGHTING.ACUITYBRANDS.COM

Lyons Municipal Utility Streetlights

Designer
Arnel Uy
Date
02/14/2025
Scale
AS SHOWN
Drawing No.
288765-0 A1

PAGE 1

PAGE 2



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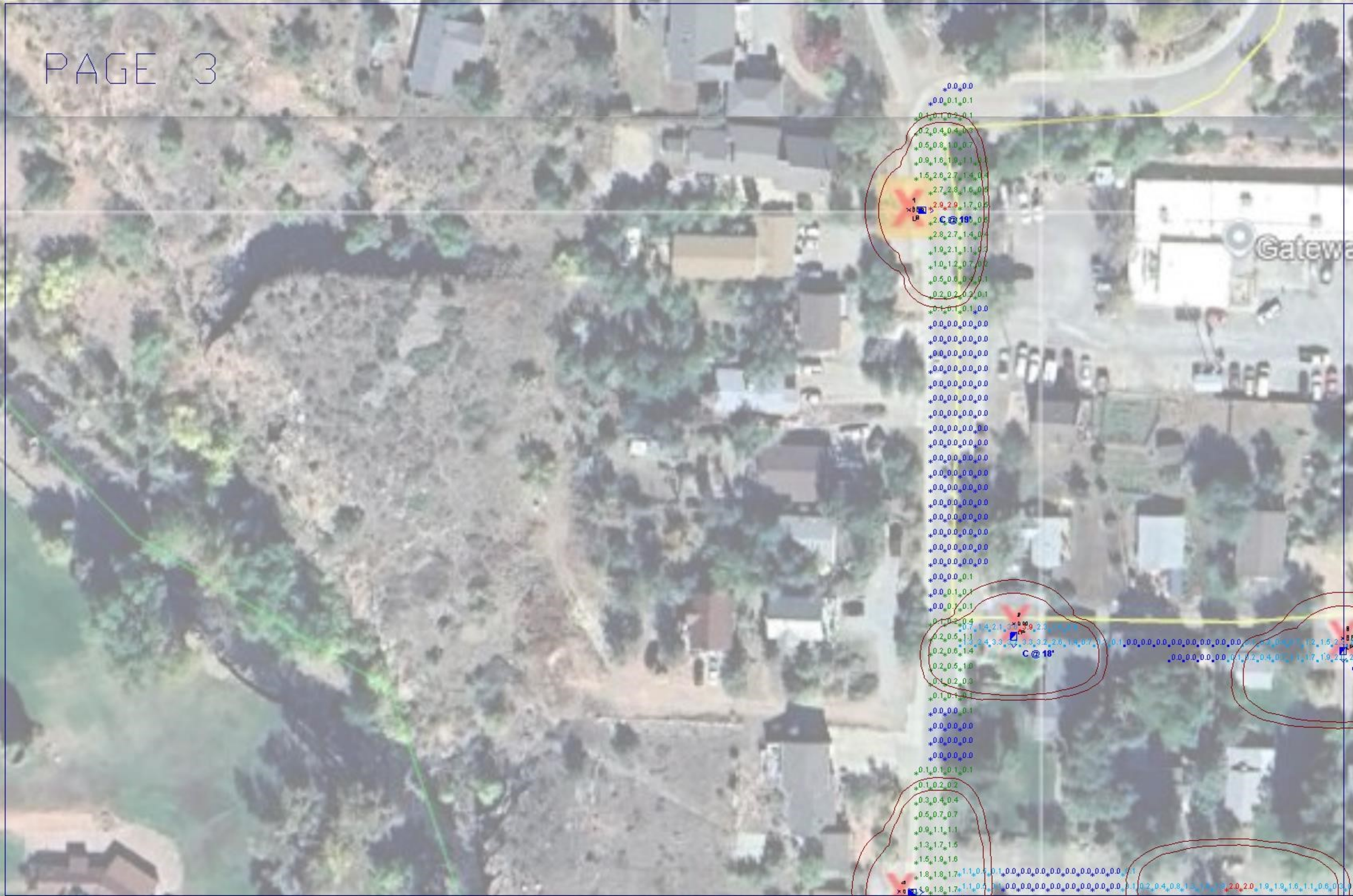
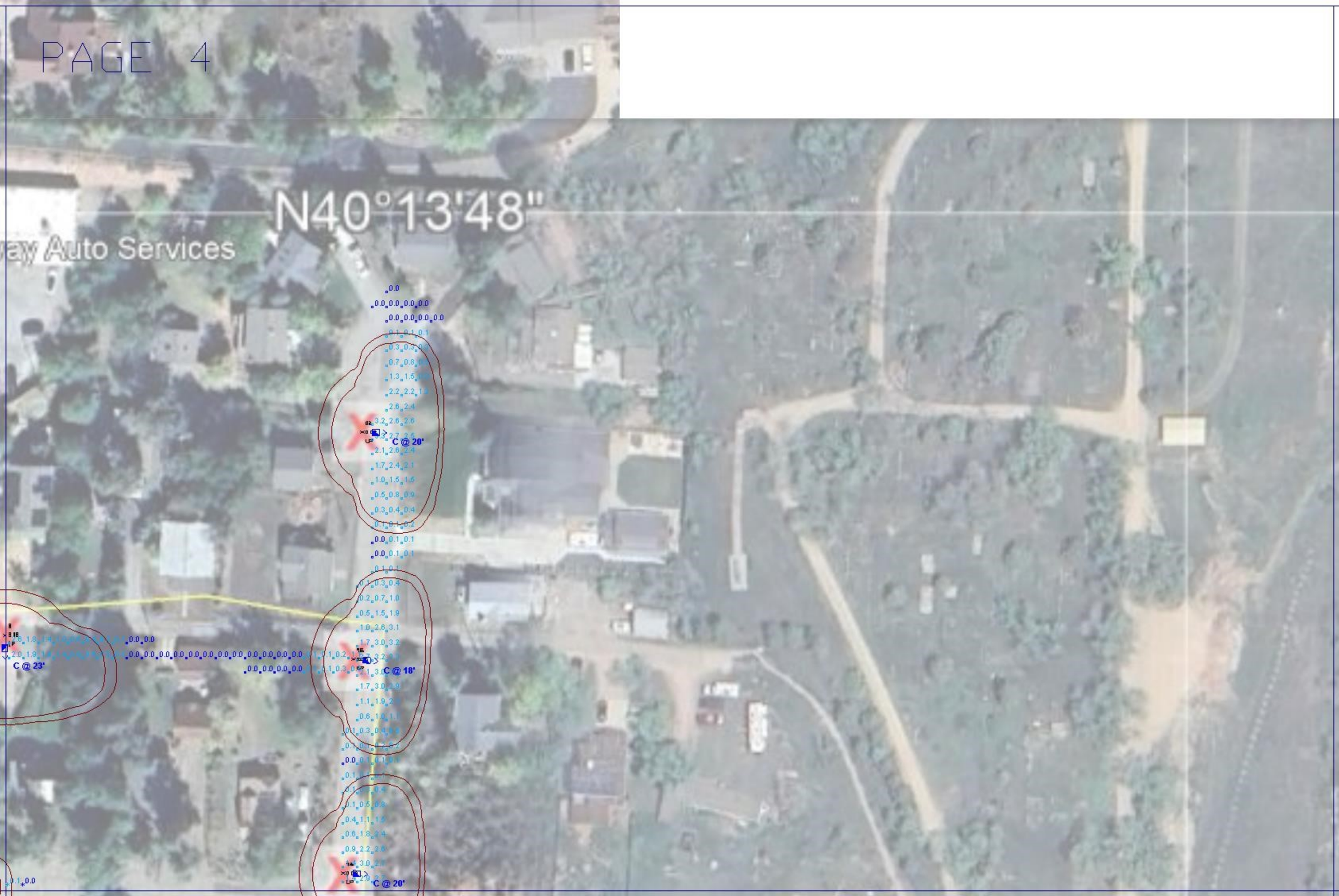


PAGE 4

N40°13'48"

ay Auto Services



PAGE 5

Planet Bluegrass

North Saint Vrain Creek

Office Planet Bluegrass

Living Arts Exquisite

PAGE 7

C @ 25'

C @ 19'

C @ 21'

Floral Designs

W105°16'3


C @ 28'
C @ 21'

PAGE 9


A_P40 @ 25'
A_P40 @ 27'
A_P40 @ 27'
A_P40 @ 27'
C @ 22'
C @ 18'
C @ 23'
West Main Auto Alignment & Tire
Moxie Bread Co. - Lyo

PAGE 10


Ancient Futures Design
C @ 22'
C @ 22'
C @ 30'
C @ 19'
C @ 20'
Lyons Elementary School

C @ 24'

C @ 19'

C @ 20'

C @ 25'

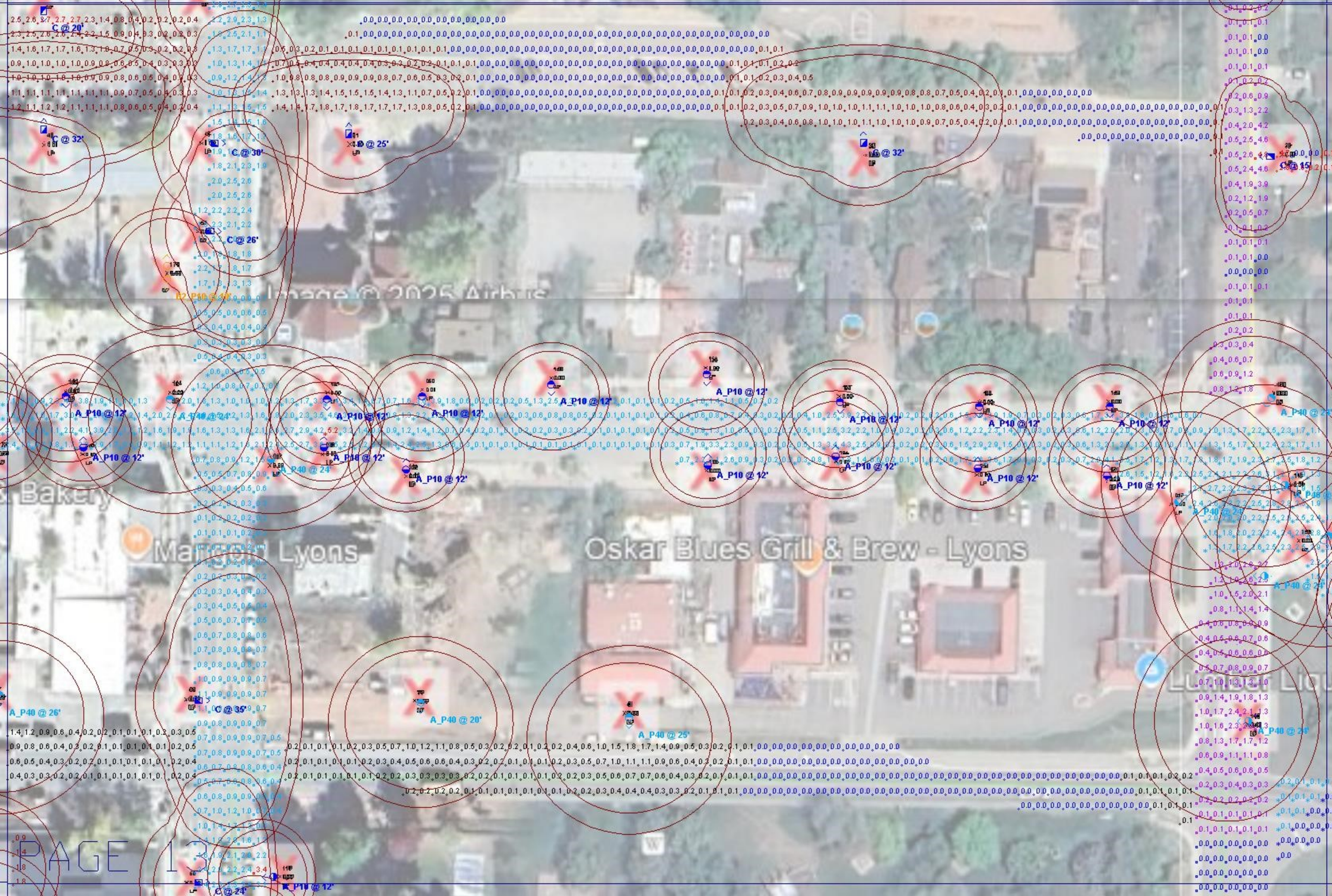
C @ 25'

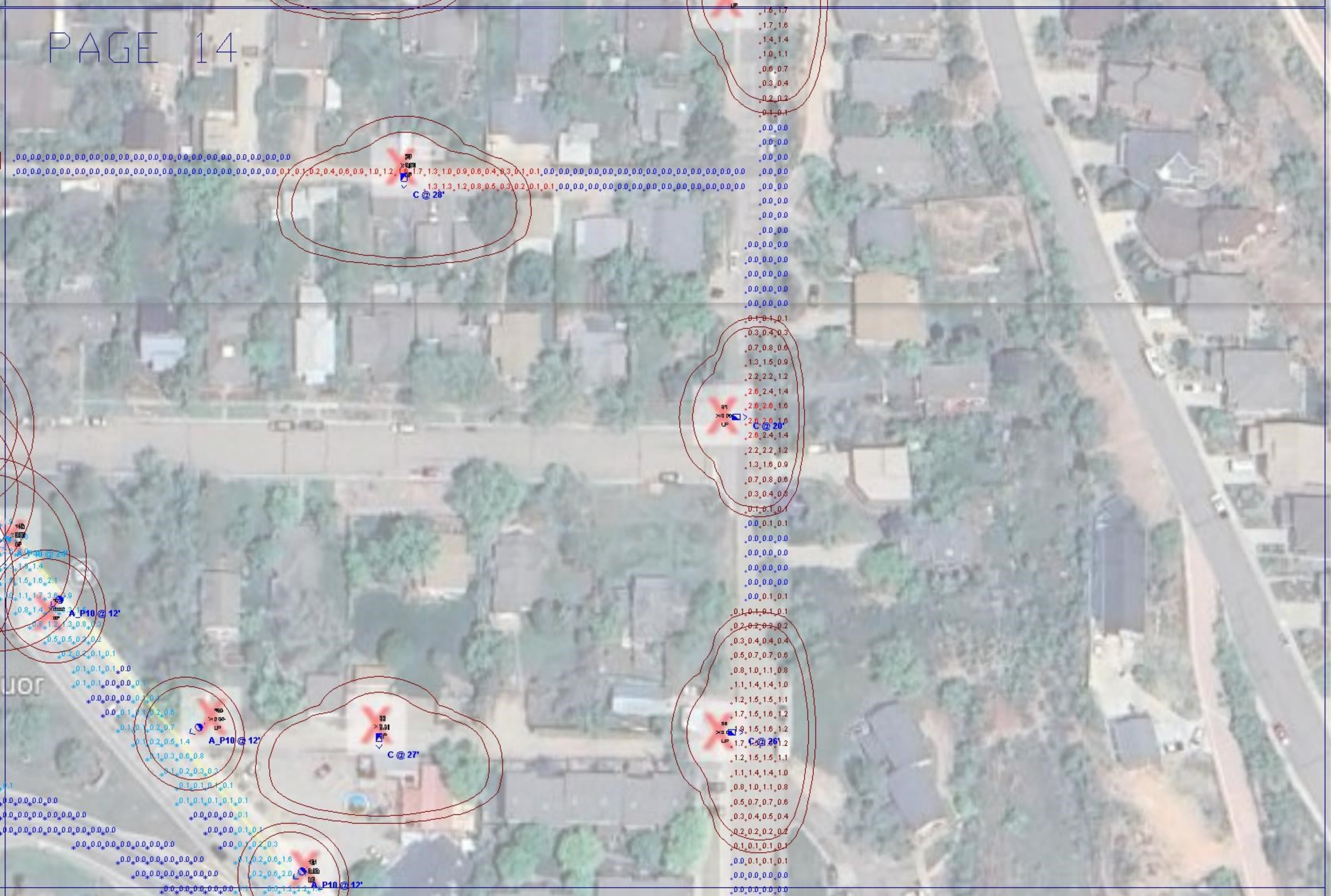
C @ 29'

C @ 21'

C @ 25'


C @ 26'
C @ 27'
C @ 27'
Redstone Cyclery
A_P10 @ 12'
A_P40 @ 24'
A_P10 @ 12'
A_P10 @ 12'
A_P10 @ 12'
A_P40 @ 27'
A_P40 @ 27'
St Vrain Market, Deli &


C @ 20'
C @ 32'
C @ 30'
C @ 25'
C @ 26'
C @ 32'
C @ 15'
A_P10 @ 12'
A_P10 @ 12'
A_P10 @ 12'
A_P10 @ 12'
A_P10 @ 12'
A_P10 @ 12'
A_P10 @ 12'
A_P10 @ 12'
A_P10 @ 12'
A_P10 @ 12'
A_P40 @ 24'
A_P40 @ 24'
A_P40 @ 24'
A_P40 @ 26'
A_P40 @ 20'
A_P40 @ 25'
C @ 35'
C @ 24'
A_P10 @ 12'
Image © 2025 Airbus
Oskar Blues Grill & Brew - Lyons
Market Lyons
Bakery


C @ 28'
C @ 20'
A_P10 @ 12'
C @ 27'
C @ 26'
A_P10 @ 12'
A_P10 @ 12'


Johnson Park
A_P10 @ 15'
C @ 29'
C @ 26'
C @ 15'
A_P10 @ 12'
A_P10 @ 12'
A_P10 @ 12'
C @ 22'
C @ 26'
C @ 27'
C @ 26'

PAGE 16

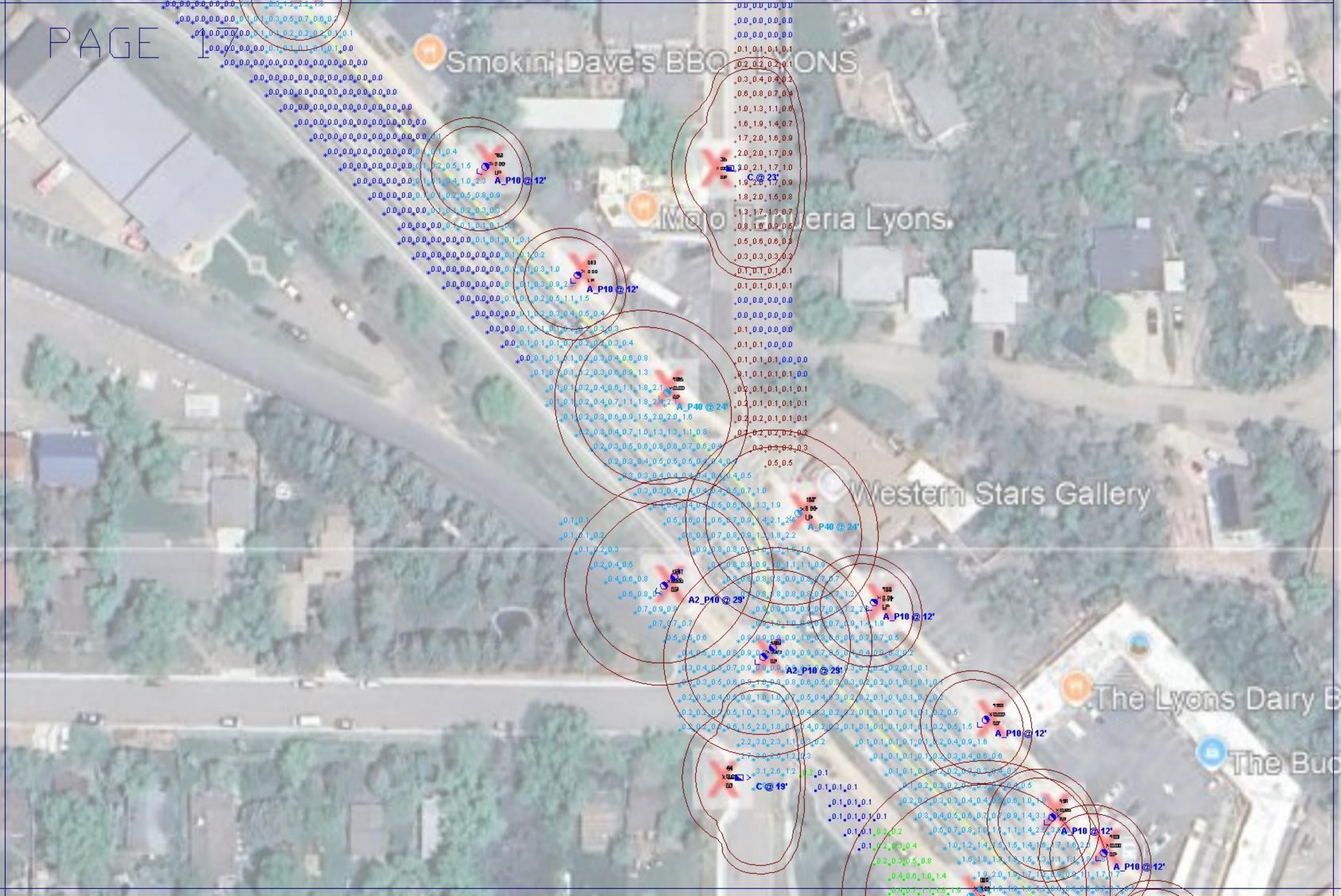
Sandstone Park

N40°13'22.08"

Wreckingroom Studio

North Saint

PAGE 17


Smokin' Dave's BBQ - LYONS
Major Pizzeria Lyons
Western Stars Gallery
The Lyons Dairy B
The Buc
A_P10 @ 12'
A_P10 @ 12'
C @ 23'
A_P40 @ 24'
A2_P10 @ 29'
A_P10 @ 12'
A2_P10 @ 29'
A_P10 @ 12'
C @ 19'
A_P10 @ 12'
A_P10 @ 12'

PAGE 18

PAGE

W105°16'0.36

Vrain Creek

C @ 25'

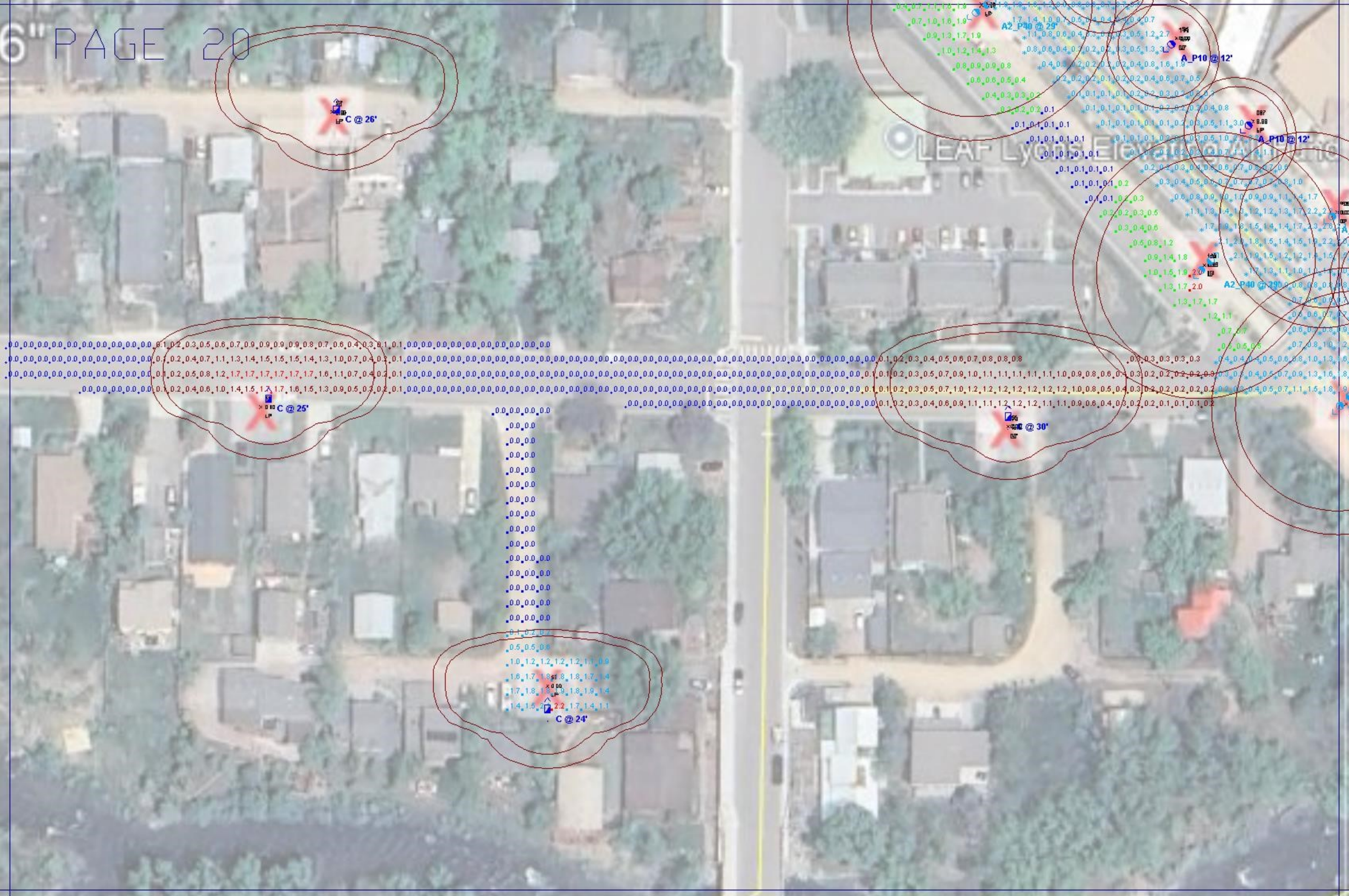
C @ 23'

C @ 21'

C @ 20'

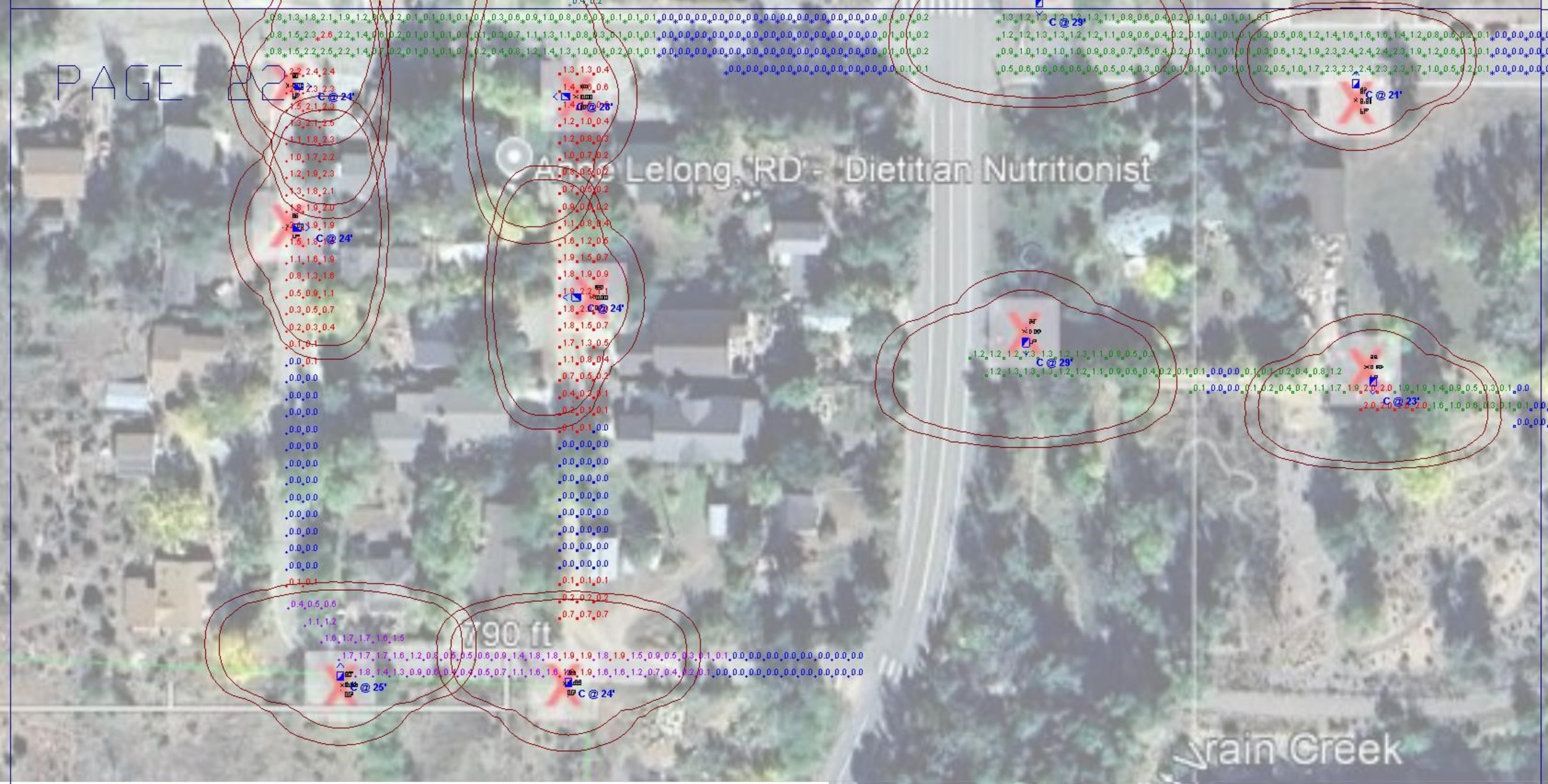
C @ 25'

C @ 25'

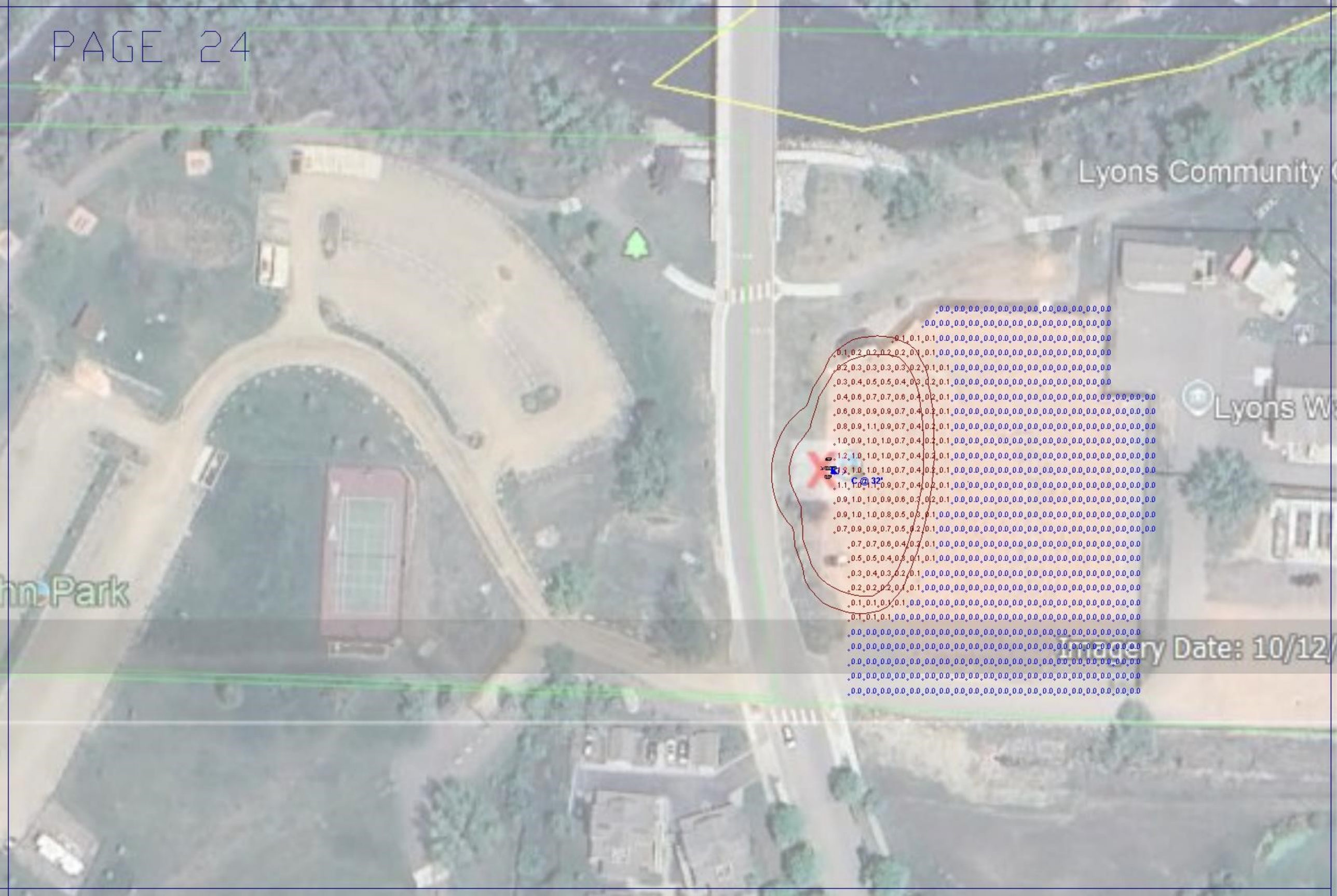

C @ 26'
A2_P40 @ 29'
A_P10 @ 12'
A_P10 @ 12'
A2_P40 @ 29'
C @ 25'
@ 30'
C @ 24'


A_P40 @ 24'
A_P10 @ 12'
C @ 21'
Lyons Quilting
A_P10 @ 12'
A_P10 @ 12'
A2_P40 @ 29'

PAGE 22


Anne Lelong, RD - Dietitian Nutritionist
790 ft
C @ 24'
C @ 24'
C @ 24'
C @ 25'
C @ 24'
C @ 29'
C @ 21'
C @ 29'
C @ 23'
Labyrinth
South Saint Vrain Creek


Confluence Circle
C @ 24'
C @ 24'
Rocky Mountain Botanic Gardens
Image © 2025 Airbus
© 2023 Google
Lyons Hidden PLAYGROUND


Lyons Community
Lyons W
C @ 32'
hn Park
Imagery Date: 10/12/

6"

PAGE 26

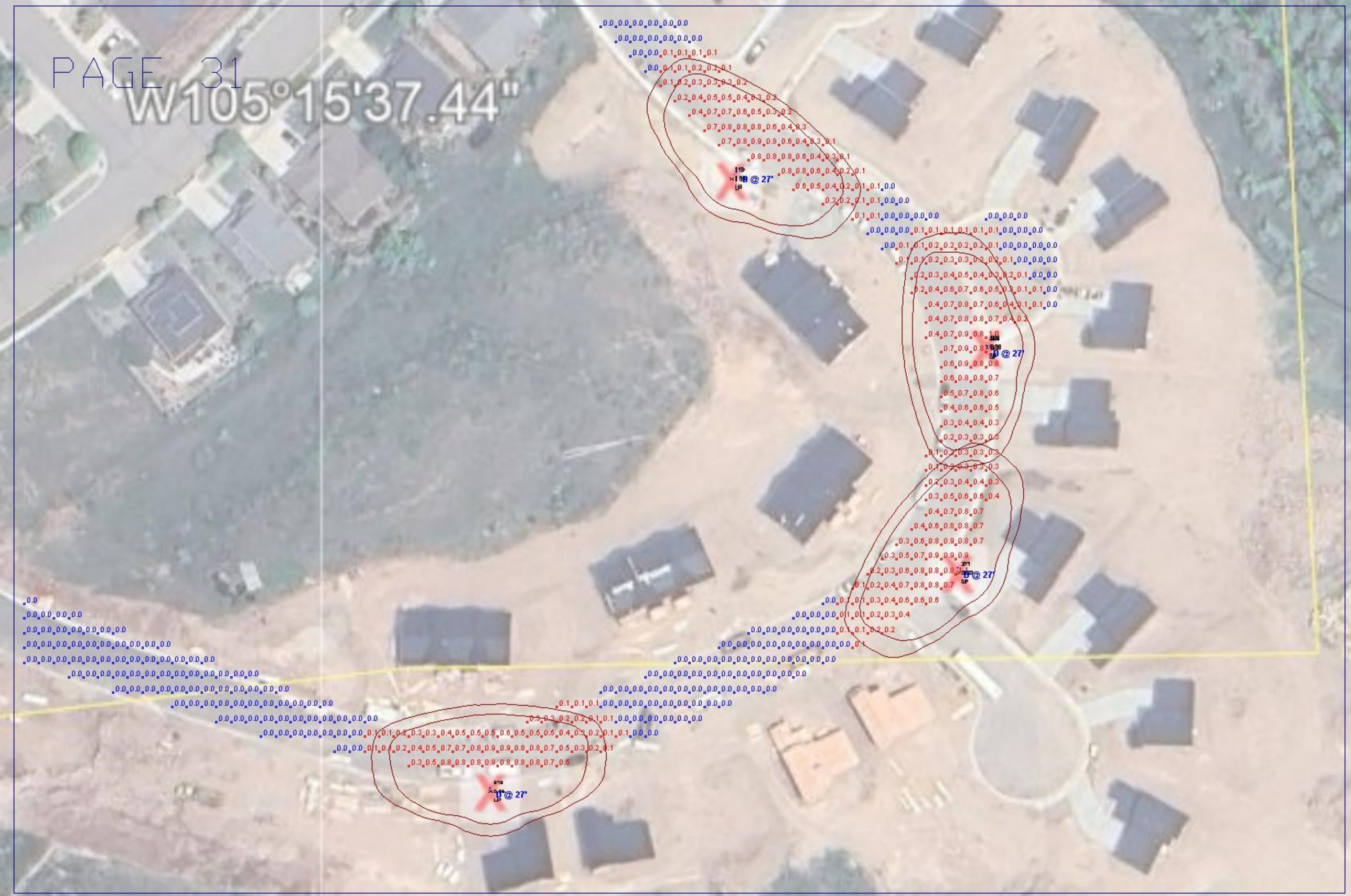
PAGE 27


D @ 14'
D @ 14'


PAGE 29


W105°15'11
rltpathways

W105°15'37.44"



Appendix E: Existing Poles and Fixtures Inventory

General Light Fixture Categories

Figure 1: Main Street LED Light Fixture

Figure 2: Main Street Non-LED Fixture

Figure 3: Non-LED Cobra Head

Figure 4: Non-LED Neighborhood Fixture

Figure 5: Old Style Fixture

Figure 6: Fixture with Shield

Figure 7: LED Fixture

Figure 8: Old Style Flat Fixture

Figure 9: Decorative Neighborhood “Acorn” Fixture

Light Pole Styles

Figure 10: Round Timber Pole

Figure 11: Steel Tiered Round Pole

Figure 12: Steel Three-Tier Round Pole

Figure 13: 32-Foot Round Steel Pole

Figure 14: 35-Foot Green Round Steel Pole

Figure 15: 35-Foot Round Steel Traffic Signal Pole

Figure 16: 24-Foot Tapered Round Steel Decorative Pole

Figure 17: 15-Foot Tapered Round Steel Library Lot Pole

Figure 18: 15-Foot Tapered Round Steel Library Lot Pole Two Fixtures

Figure 19: 12-Foot Round Steel Decorative Pole

Figure 20: 14-Foot Round Steel Neighborhood Pole

Figure 21: 10-Foot Green Round Steel Decorative Neighborhood Pole

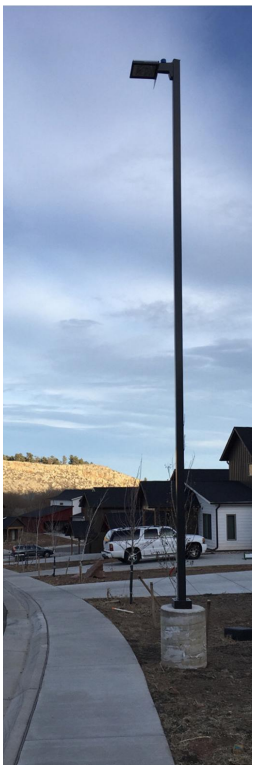


Figure 22: 27-Foot Square Steel Pole

Figure 23: 20-Foot White Round Steel Tapered Pole

Figure 24: 18-Foot Basic Steel Round Pole

All Light Fixtures

Figure 25: Main Street LED Light Fixture

Figure 26: Main Street Non-LED Fixture

Figure 27: Main Street Alternative LED Fixture

Figure 28: LED #51 Fixture

Figure 29: LED #72 Fixture

Figure 30: LED #92 Fixture

Figure 31: LED #105 Fixture

Figure 32: LED D Fixture

Figure 33: LED Single Fixture

Figure 34: Traditional Non-LED Bell Fixture

Figure 35: Non-LED Old Style Fixture

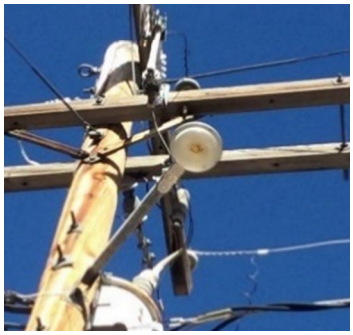


Figure 36: Non-LED Old Style Flat Fixture

Figure 37: Non-LED Neighborhood Fixture

Figure 38: Non-LED Carter Drive Neighborhood Fixture

Figure 39: Non-LED Decorative Neighborhood “Acorn” Fixture

Figure 40: Non-LED #10 Fixture

Figure 41: Non-LED #15 Fixture

Figure 42: Non-LED #25 Fixture

Figure 43: Non-LED #40 Fixture

Figure 44: Non-LED Flat Fixture

Figure 45: Non-LED Fixture

Appendix F: Fixture Control Options

AO Turndown Module

- Manual dimming node inside the fixture
- Settings 1-8 to dim
- Has the capability to be turned down manually to set desired brightness during installation or if complaints were received
- This can be added to existing fixtures that already have a photocell
- $10 addition per fixture

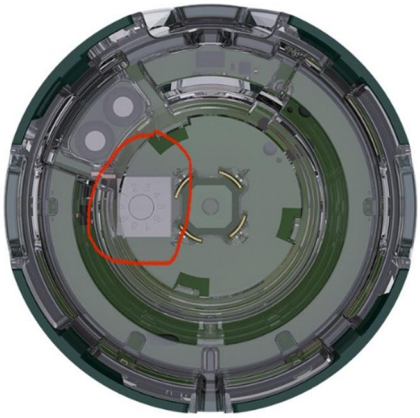


Figure 1: AO Turndown Module

AC Twist Lock Photocell

- Operates with AO turndown module
- Manual dimming node inside the fixture
- Settings 1-8 to dim
- Ideally set when fixture is installed
- Has the capability to be turned down manually if complaints are received
- Can be added to existing fixtures with a P7 connector
- Works with square LED fixture (AEL ATB0)
- $20 for photocell (included in fixture)

Figure 2: AC Twist Lock Photocell

DC Connect Photocell

- Embedded photocell wired on the DC side of the driver

- Manual dimming node inside the fixture
- Settings 1-8 to dim
- Eliminates the on/off in rush current which elongates the life of the photocell/driver
- New technology and future of photometric controls
- Works with rounded LED fixture (AEL ACC)
- $20 for photocell (included in fixture)

Figure 3: DC Connect Photocell

Local Connect

- DC Controls with a Bluetooth connected app
- Controlled from the ground; need to be within 250 feet of each fixture to edit with the app
- Eliminates the need for a bucket truck, making it more efficient for crews to dim a unit, check unit health, pull PO information, etc.
- $25 addition per fixture

Figure 41: Local Connect Photocell

nLight Air (PC Based Control)

- Requires separate app to create the mesh network from the nodes using Bluetooth
- Allows for scheduling, motion sensors, dimming, and remote access in the CLAIRITY+ app or on SensorView software on a PC
- Does not generate reports for pole knockdowns, outages, voltage spikes, etc.
- $80 addition per fixture plus the cost of gateways to be installed throughout Town

Figure 5: nLight Air Module

Ubicquia (Cellular Control)

- Full monitoring and control over the lights remotely via app or computer from any location around the world
- Capabilities to monitor light failures, knock downs, health of the system, and dim all lights completely remotely
- Can generate automatic alerts for pole knockdowns, luminaire outages, voltage spikes, etc.
- Cloudbased monitoring accessible via phone app or computer
- Works with a P7 photocell receptacle (easily retrofittable to existing LEDs)
- $150 addition per fixture
- Town only contracts with Ubicquia for the cellular service at a cost of $45 for a 10 year contract. Ubicquia has an eSIM card inside and is ready to agnostically connect to any of the 5 major 5G cellular networks right out of the box. Ubicquia handles all of the interaction with the cell service providers, so the customer does not have to. Customers typically renew after 10 years since most LED fixtures are designed for a lifespan of 15-20 years and the cost is not anticipated to go up more than $5 after 10 years.

Appendix G: Public Survey Results

Kimley-Horn Social Pinpoint

Report Type: Social Map Results Summary
Date Range: 14-01-2025 - 07-04-2025
Exported: 01-05-2025 10:41:50

Open

Interactive Streetlight Map
Lyons Streetlight Conversion Study

33	48
Contributors	Contributions

Key Statistics

Top-level information about the activity.

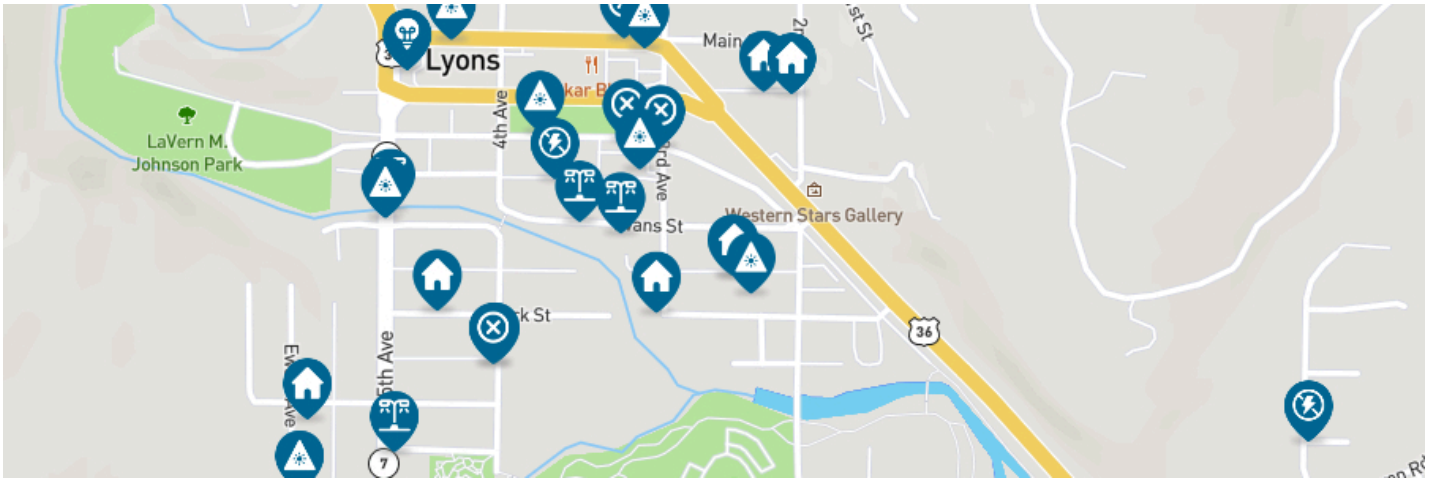
48
Posts
33 contributors

66
Total Votes
2 avg. votes / post

Map Post Summary

Summary of content contributed by participants including location information, voting results and more.

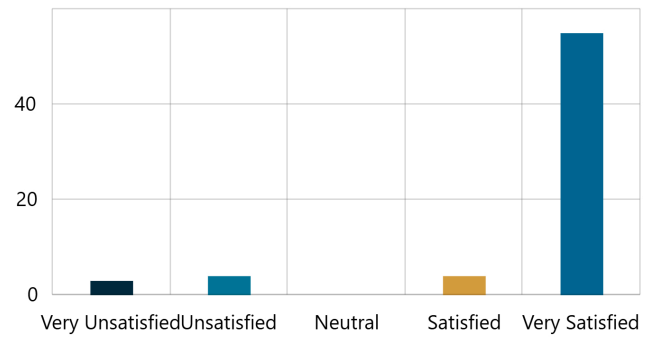
Posts by Location
Map showing all posts contributed by participants.



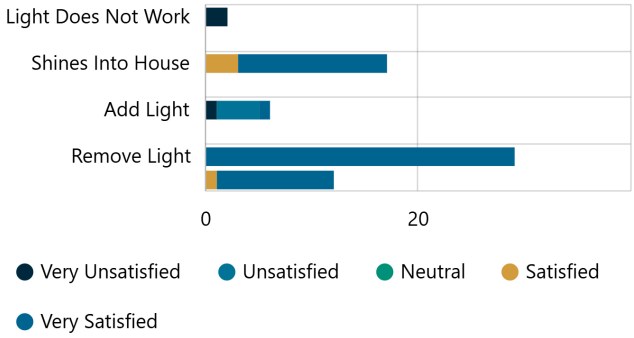
Top Contributions by Location
Top 10 most frequent postal/ZIP codes of posts submitted by participants.

Location	Total Contributions	% Contributions
80540, Lyons, Boulder County, Colorado, United States	48	100%

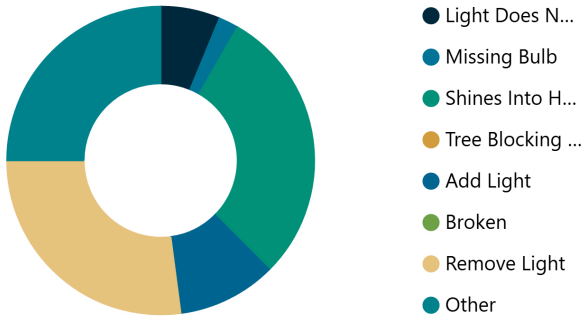
Ratings
Summary of voting and rating activity across all posts.



Ratings by Category
A comparison of the voting and rating activity of the categories contributors selected for their posts.

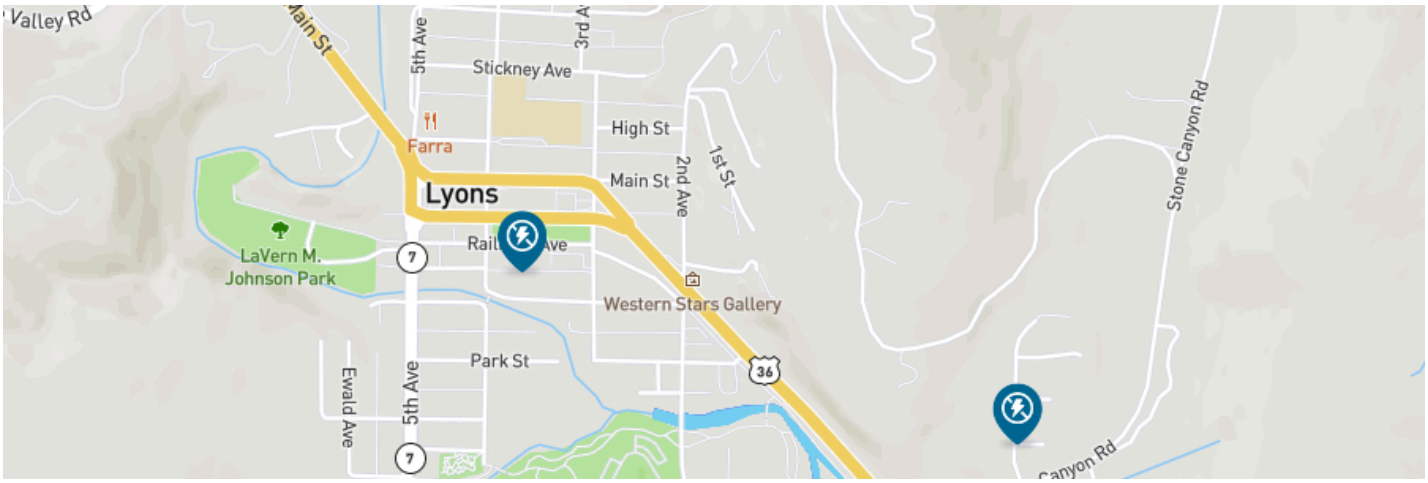


Posts by Category
Comparison showing the number of posts for each category, as selected by participants.



Categories - Light Does Not Work

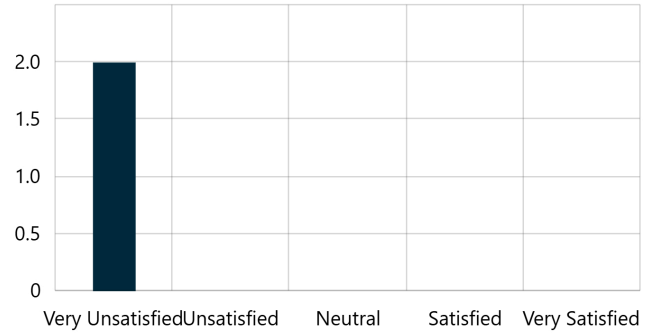
Posts by Location
Map showing posts contributed by participants for nominated category.



Top Contributions by Location
Top 10 most frequent postal/ZIP codes of posts submitted by participants.

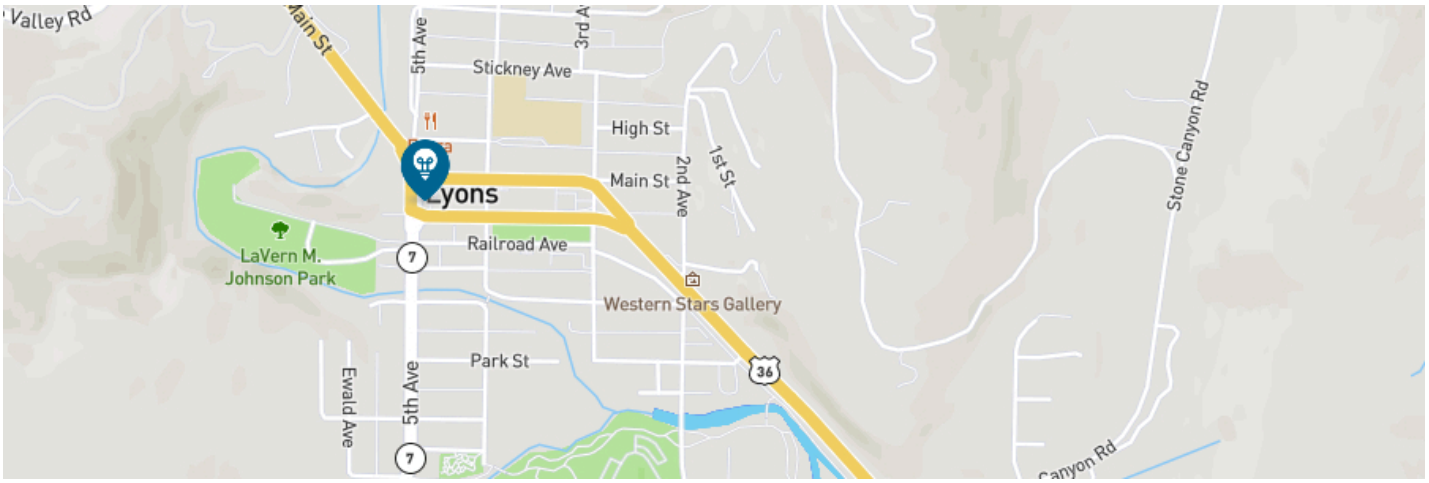
Location	Total Contributions	% Contributions
80540, Lyons, Boulder County, Colorado, United States	3	100%

Ratings
Summary of voting and rating activity on posts per category.



Categories - Missing Bulb

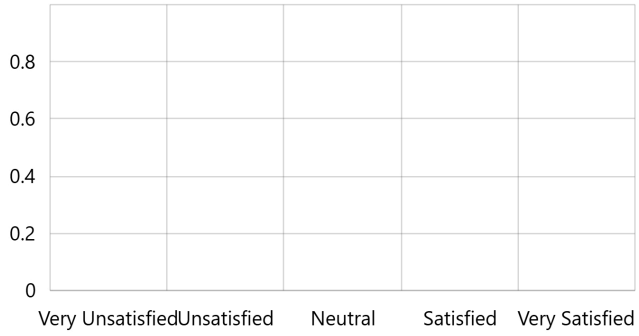
Posts by Location
Map showing posts contributed by participants for nominated category.



Top Contributions by Location
Top 10 most frequent postal/ZIP codes of posts submitted by participants.

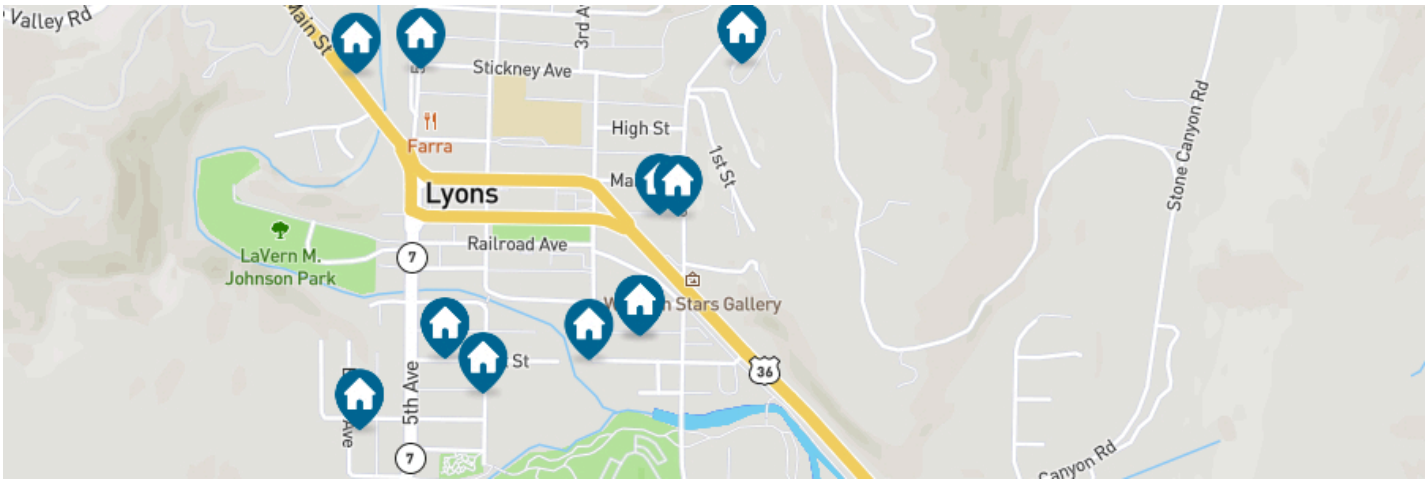
Location	Total Contributions	% Contributions
80540, Lyons, Boulder County, Colorado, United States	1	100%

Ratings
Summary of voting and rating activity on posts per category.



Categories - Shines Into House

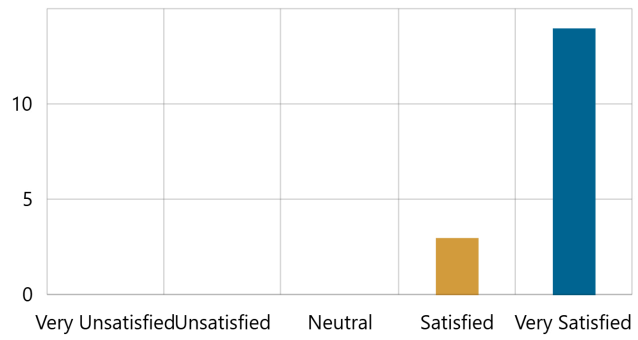
Posts by Location
Map showing posts contributed by participants for nominated category.



Top Contributions by Location
Top 10 most frequent postal/ZIP codes of posts submitted by participants.

Location	Total Contributions	% Contributions
80540, Lyons, Boulder County, Colorado, United States	14	100%

Ratings
Summary of voting and rating activity on posts per category.



Categories - Tree Blocking Light

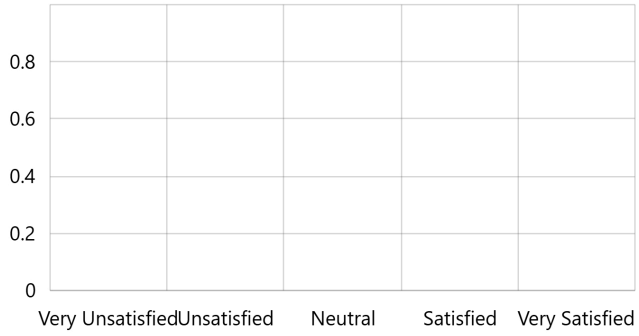
Posts by Location
Map showing posts contributed by participants for nominated category.

No Data Available

Top Contributions by Location
Top 10 most frequent postal/ZIP codes of posts submitted by participants.

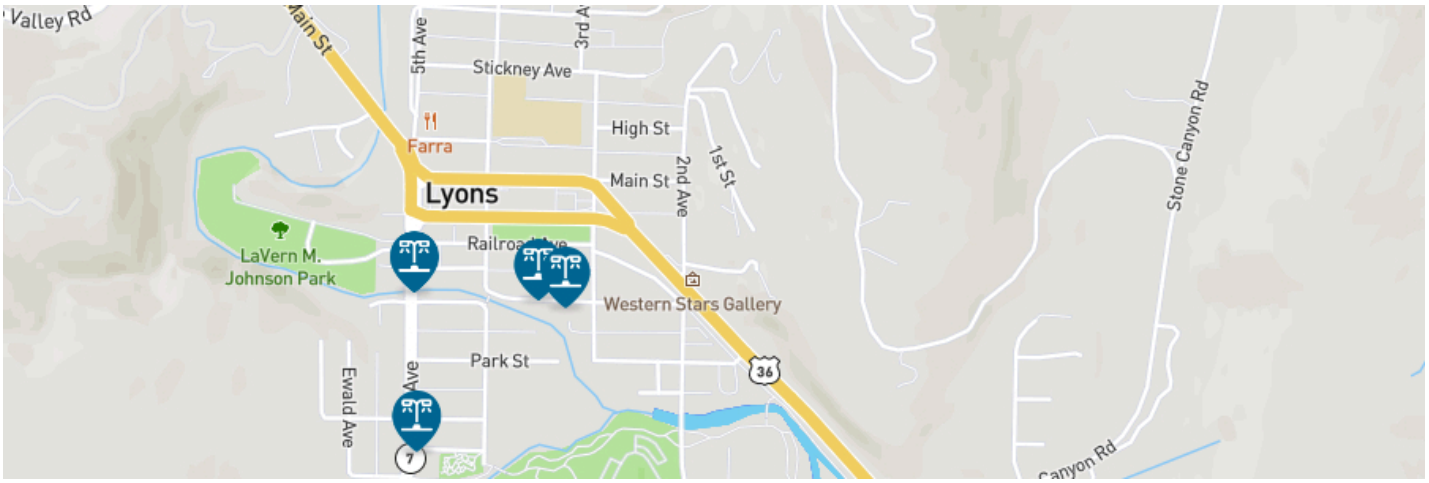
Location	Total Contributions	% Contributions
No Data Available		

Ratings
Summary of voting and rating activity on posts per category.



Categories - Add Light

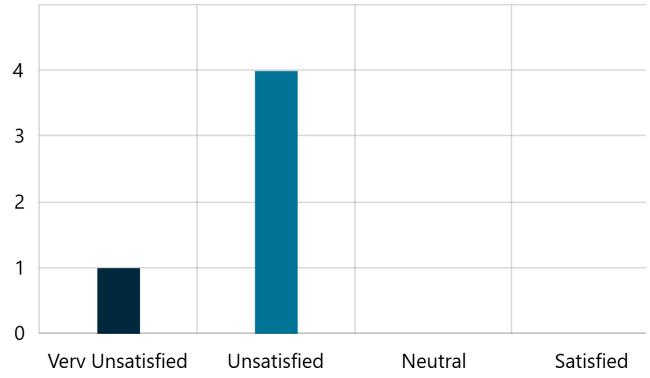
Posts by Location
Map showing posts contributed by participants for nominated category.



Top Contributions by Location
Top 10 most frequent postal/ZIP codes of posts submitted by participants.

Location	Total Contributions	% Contributions
80540, Lyons, Boulder County, Colorado, United States	5	100%

Ratings
Summary of voting and rating activity on posts per category.



Categories - Broken

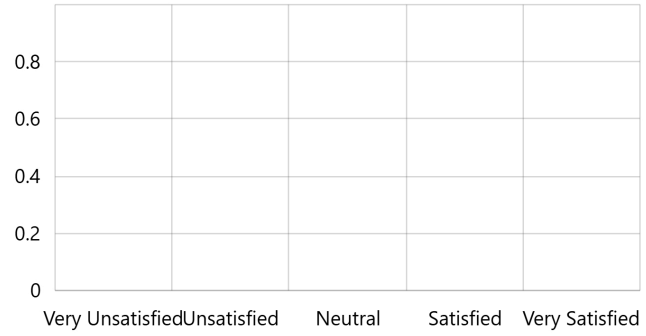
Posts by Location
Map showing posts contributed by participants for nominated category.

No Data Available

Top Contributions by Location
Top 10 most frequent postal/ZIP codes of posts submitted by participants.

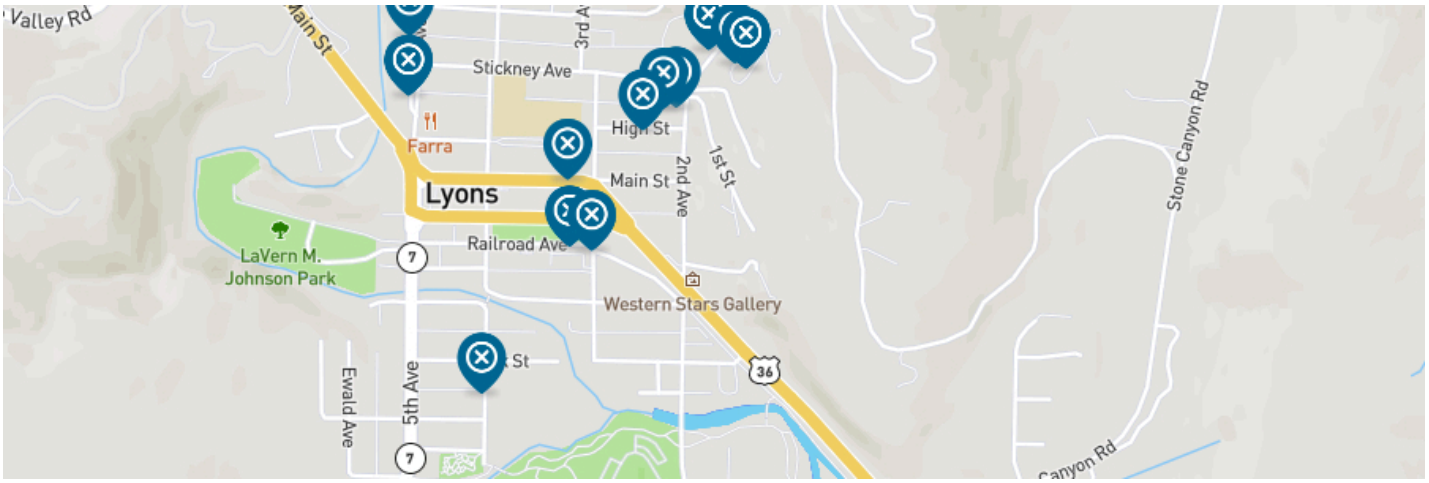
Location	Total Contributions	% Contributions
No Data Available		

Ratings
Summary of voting and rating activity on posts per category.



Categories - Remove Light

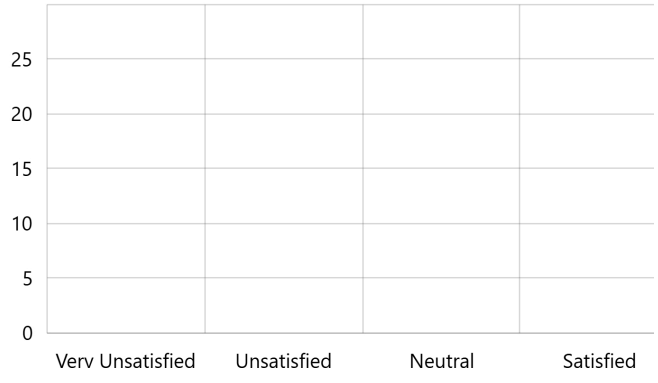
Posts by Location
Map showing posts contributed by participants for nominated category.



Top Contributions by Location
Top 10 most frequent postal/ZIP codes of posts submitted by participants.

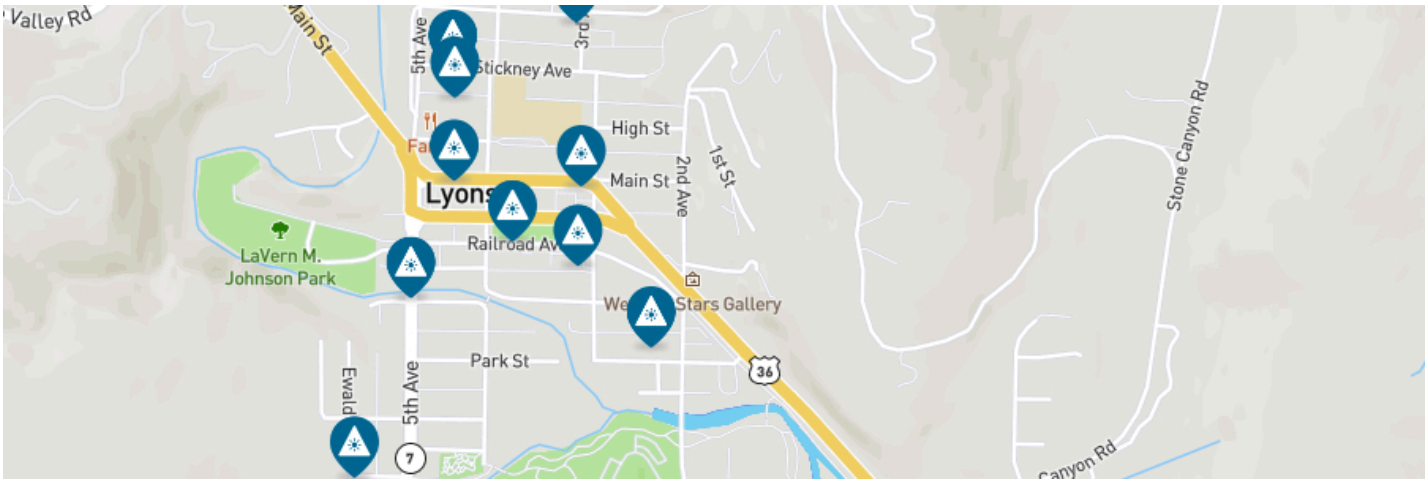
Location	Total Contributions	% Contributions
80540, Lyons, Boulder County, Colorado, United States	13	100%

Ratings
Summary of voting and rating activity on posts per category.



Categories - Other

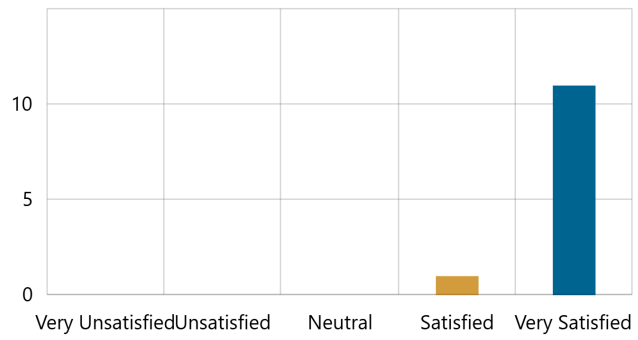
Posts by Location
Map showing posts contributed by participants for nominated category.



Top Contributions by Location
Top 10 most frequent postal/ZIP codes of posts submitted by participants.

Location	Total Contributions	% Contributions
80540, Lyons, Boulder County, Colorado, United States	12	100%

Ratings
Summary of voting and rating activity on posts per category.



1. Your comment Required
Long Text | Skipped: 0 | Answered: 12 (100%)

Sentiment

No sentiment data

Tags

No tag data

Featured Contributions

No featured contributions

Lyons Streetlight Conversion Study

Title/Question: Interactive Streetlight Map
Tool Type: Social Map
Activity ID: 182
Report Date Range: 14 Jan 2025 - 7 Apr 2025

Contribution ID	Date Submitted	Your comment	Category								Latitude	Longitude
			Light Does Not Work	Missing Bulb	Shines Into House	Tree Blocking Light	Add Light	Broken	Remove Light	Other		
15902	Apr 07, 2025, 01:04 PM	String of lights on Railroad Ave by the PO. Extremely bright! One pole of 2 lights within 10 feet of my apartment at W. Self obnoxiously lights up my whole apartment. Please remove or at the very least dim it down significantly							1		40.22352731	-105.2680436
14580	Mar 11, 2025, 12:55 PM	The street lights in town could be on the warmer spectrum and still be useful. The light midblock on the south side of the street is very bright and makes it difficult to stargaze. All of our streetlights could be updated re covers and color temp. I do support street lights for safety reasons.								1	40.221762	-105.266171
14479	Mar 10, 2025, 12:12 PM	I just want to mention I think the town's done a really nice job with the decorative lighting along the main drag these last couple of years. It's tasteful and it adds a lot especially during holiday seasons.								1	40.22468406	-105.2706903
14476	Mar 10, 2025, 12:08 PM	I recognize that it's probably not directly within the scope of this survey, but the new lighting on the Post Office is extremely bright and harsh.								1	40.2231909	-105.2678511

14475	Mar 10, 2025, 12:06 PM	I know folks whose residences or garages open directly onto the alley benefit from some light here, but this LED is absurdly bright and shines directly into at least 5 homes, probably more. If the blackout curtains we've had to put up at the back of our house are open, I can read a book at the front of the house by it. At minimum, something to direct it downward would help a lot.			1						40.22196492	-105.2664587
14442	Mar 09, 2025, 07:21 PM	Don't need a light shinning into our house from across the street. Dark night skies are very important.							1		40.22805195	-105.2678118
14440	Mar 09, 2025, 06:50 PM	This light desperately needs a shield on it. It destroys any possibility of seeing the stars, and it's so overly bright that it lights up our entire house.			1						40.22196254	-105.2664228
14438	Mar 09, 2025, 06:48 PM	Please put some kind of light shield here. This is a good spot for a safety light, but it's so bright it reaches several blocks and could be shielded so we could actually see the stars.			1						40.22154018	-105.2675967

14419	Mar 09, 2025, 12:38 PM	The lighting at the entrance to Eagle Canyon is very bright and illuminates our house and the immediate neighborhood far too much. The neighborhood street lights around Eagle Canyon Circle are also fairly bright, and it would be fantastic to have dark sky compliant lights. Thanks.			1						40.23159682	-105.2801762
14333	Mar 07, 2025, 11:52 PM	Way too many hanging lights at the air lodge that stay on all the time and with all the lights from Oskar Blues parking lot it just keeps adding more light when we used to be able to have dark sky nights . Can we just turn them off when they're not open for business?							1		40.22470112	-105.2680866
14274	Mar 07, 2025, 06:44 PM	A less bright light would be great.								1	40.22874716	-105.2714077
13363	Feb 22, 2025, 11:47 AM	Super bright--could it be replaced with something that is effective. but minimizes light pollution?								1	40.22745523	-105.2678891
13176	Feb 18, 2025, 06:37 PM	This light is too bright or shines horizontally. I would like it to follow Dark Skys recommendations OR be removed.			1						40.22095455	-105.2700278
13163	Feb 18, 2025, 10:24 AM	Fix it. Street too dark	1								40.22307933	-105.2691292
13161	Feb 18, 2025, 08:02 AM	The light only operates intermittently.	1								40.22005571	-105.2577614
13129	Feb 16, 2025, 02:52 PM	This light illuminates my yard and shines into the house much more than it illuminates the street.			1						40.220312	-105.272864

13109	Feb 15, 2025, 06:47 AM	CDOT put these highway lights up about nine or 10 years ago. Two or three light posts . Since then, they really disrupt the dark western night sky and star viewing. It would be great if they would turn off when no traffic is detected or if they were less bright or had more downward facing hoods.			1						40.22655528	-105.2729377
13108	Feb 15, 2025, 06:43 AM	The street lamp shines into the bedroom windows of homes at night on upper fifth Avenue. Westward of the lamp. Having darkness at night would be nice			1						40.22663964	-105.2714567
13106	Feb 15, 2025, 06:39 AM	The street lamp has not worked in years. The darkness is nice at night sad the stars are more apparent.It would be nice to not have one there.							1		40.22721829	-105.271712
13105	Feb 15, 2025, 06:35 AM	The street lamp has not worked in years. The darkness is at night so the stars are more apparent.It would be nice to not have one there.							1		40.22617094	-105.2717393
13096	Feb 14, 2025, 09:46 PM	Really could use a better lighting method, something that would be esthetically pleasing, while not shining into nearby apartments.Downlighting would look really nice here								1	40.2236207	-105.2693508
13090	Feb 14, 2025, 05:56 PM	This light is terribly bright and major source of light pollution as it sits up high. This one should be removed.							1		40.2267354	-105.2642421

13084	Feb 14, 2025, 05:18 PM	Position to light intersection of 2nd and Cobblestone Court, as well as Cobblestone Court itself, without shining into the back yards or houses on Welch Court that back up to this location.					1				40.21702856	-105.2639158
12941	Feb 12, 2025, 04:56 PM	permanent street light here -- there's already a lot of light from the street that shines into my house from this area. If folks are afraid to cross bridge at night due to low light, please carry a flashlight or install a motion detector light. There's already a ton of light pollution in this area at night that still shines through my house even with blinds + window coverings! Also LED produce the most blue light which disrupts sleep cycles/circadian rhythms. If there's a motion detected lamp - please keep it on the warmest light output as that provides the least amount of blue light. Thanks!								1	40.22262944	-105.2716851
12675	Feb 10, 2025, 08:35 PM	Safety reasons.....people walk in the middle of the street, no upgraded sidewalks.					1				40.22258649	-105.2687577
12674	Feb 10, 2025, 08:33 PM	We need street lights in this area.....Our street is very dark, not only for safety, but for people who walk their dogs in the evenings, and early mornings. Primarily for potential break-ins....it does happen.					1				40.22245465	-105.2681346

12514	Feb 09, 2025, 02:13 PM	The lights in this area have been off for 20 years and no complaints! In addition of LED lights consider lowering lights to 10 feet from ground. Consider motion sensors, headlight sensors and dimming. Consider solar and battery powered. Carry a flashlight at night when walking.								1	40.2194808	-105.2729812
12510	Feb 09, 2025, 01:08 PM	The light shines too brightly into our bedroom windows. Please add LED bulbs and reduce the lumens. Thanks			1						40.232063	-105.281053
12497	Feb 08, 2025, 07:36 PM	Fix this light. I reported it on 9/18/23 because there were two elderly people living next to it at the top of the hill and the broken light made them feel unsafe. The light has been out since then and one of them has since died. Please fix this light before the other person dies having lived the last of her years in darkness and municipal neglect.	1								40.22924115	-105.2712693
12491	Feb 08, 2025, 04:51 PM	Completely unshielded lights by the PO, obnoxiously contaminating way up to the ridgetop.							1		40.22345511	-105.2675322
12490	Feb 08, 2025, 04:47 PM	Please remove this intrusive and unnecessary light.							1		40.22664202	-105.2639956

12486	Feb 08, 2025, 04:02 PM	This system is not very friendly. I am trying to indicate that lighting along 36 is bright enough with so many and also headlights. So much LED is too much for our eyes, not to mention being unattractive.								1	40.22458696	-105.2677745
12484	Feb 08, 2025, 03:55 PM	this section over the bridge seems too dark and scary for pedestrians at night. car headlights over-power the ambient street lighting to make this stretch of pedestrian experience feel dangerous					1				40.22272426	-105.2716054
12483	Feb 08, 2025, 03:53 PM	This light is a neighborhood nuisance in that it shines into/on several neighbors' houses. Perhaps it could be hooded to shine on the street and right of way without washing house fronts.			1						40.22156341	-105.2709021
12482	Feb 08, 2025, 03:12 PM	if it could be turn on very minimal and only shine downward that'd be great, otherwise it should remain off, as it would shine right into the second story ADU bedroom. please contact me if you need clarification.								1	40.2261392	-105.2706779
12481	Feb 08, 2025, 03:08 PM	could be less bright, but it's still important have here.								1	40.22660633	-105.270722
12474	Feb 08, 2025, 02:38 PM	Bright Light comes through windows and I wish it was directed downward more to help with the dark sky.			1						40.22405933	-105.2655568

12471	Feb 08, 2025, 01:15 PM	Dangerous arc of curve here ~ complicated by vehicular Meily traffic / brush that needs to be trimmed back at the intersection for visibility / foot traffic & blind crosswalk to Bohn Park & Labyrinth / speeders heading out of town					1				40.21993408	-105.2715505
12468	Feb 08, 2025, 12:50 PM	Please remove light							1		40.2259613	-105.2655964
12467	Feb 08, 2025, 12:50 PM	Please remove light							1		40.22594272	-105.2658862
12466	Feb 08, 2025, 12:49 PM	Please remove light							1		40.22556574	-105.2663612
12461	Feb 08, 2025, 12:28 PM	This light has been turned off at our request and we do not want it to be replaced nor turned back on through any type of lighting or direction.							1		40.22095117	-105.2700594
11288	Jan 18, 2025, 09:38 PM	Nees to be shielded better and only shine down.			1						40.22672886	-105.2640828
11287	Jan 18, 2025, 09:37 PM	Currently not operational and needs to stay that way.							1		40.22697393	-105.2648478
11286	Jan 18, 2025, 09:35 PM	Should only shine down.			1						40.2278919	-105.2660079
11282	Jan 18, 2025, 08:49 PM	Needs to only shine down.			1						40.22408391	-105.2659809

Kimley-Horn Social Pinpoint

Report Type: Form Results Summary
Date Range: 14-01-2025 - 07-04-2025
Exported: 01-05-2025 11:03:31

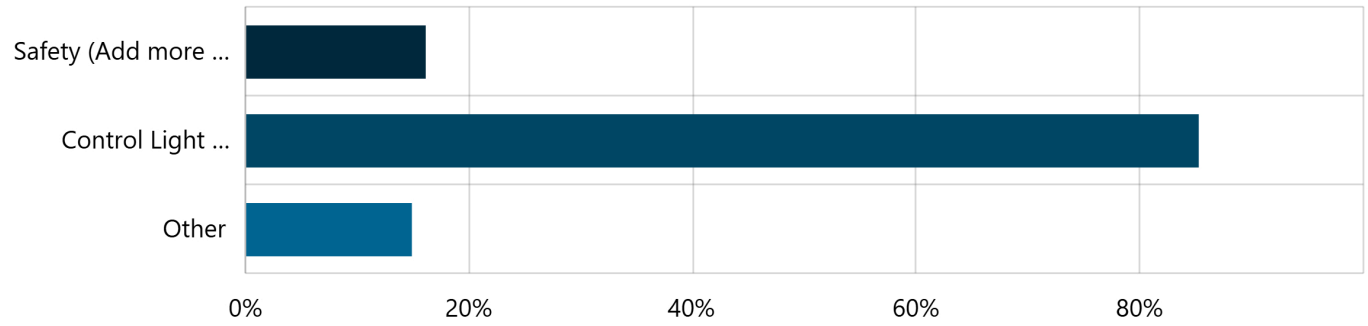
Open

Lyons Streetlight Survey
Lyons Streetlight Conversion Study

73	81
Contributors	Contributions

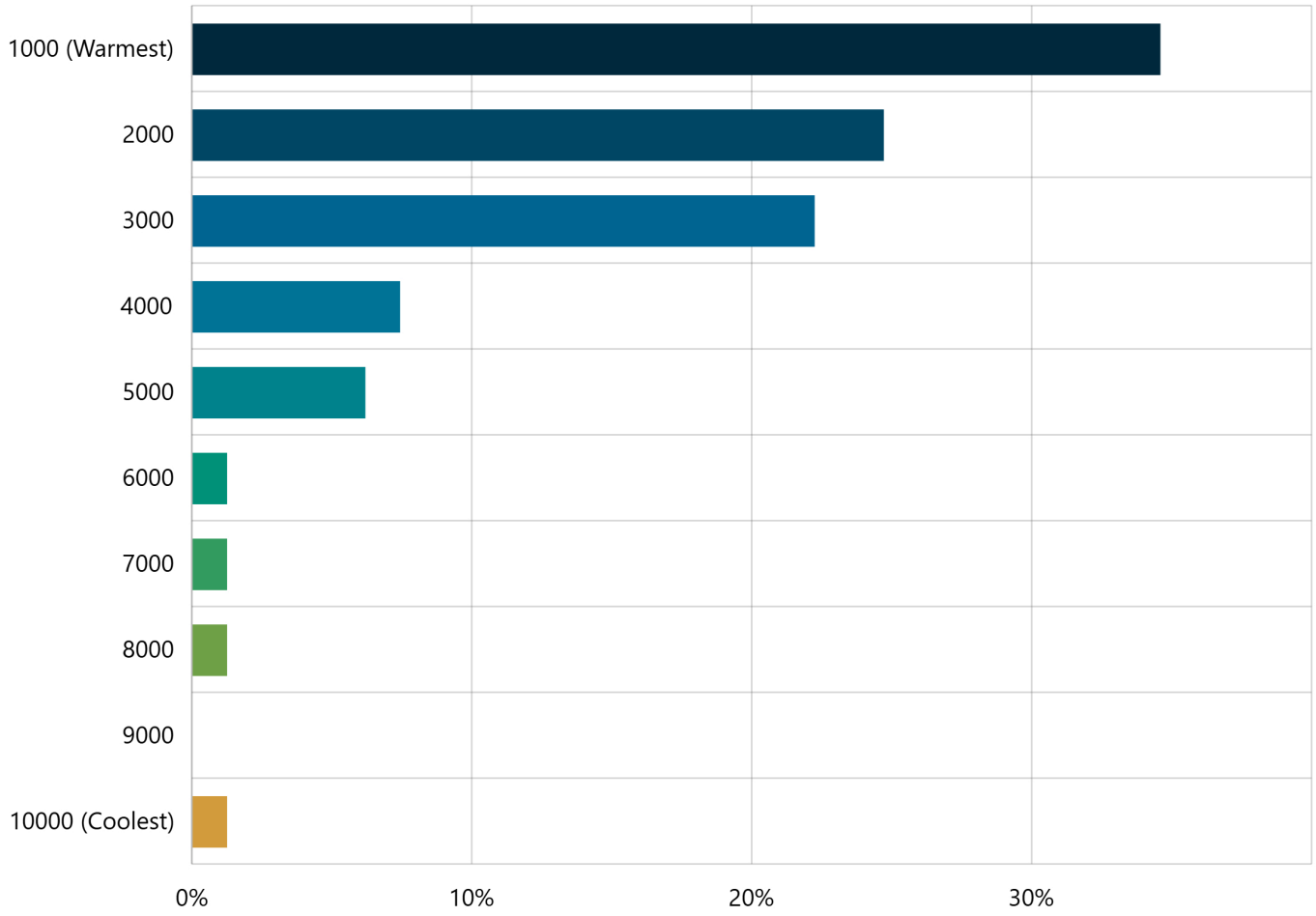
Contribution Summary

1. What is your priority? Required
Multi Choice | Skipped: 0 | Answered: 81 (100%)



Answer choices	Percent	Count
Safety (Add more lighting)	16.05%	13
Control Light Pollution (Focus on DarkSky)	85.19%	69
Other	14.81%	12

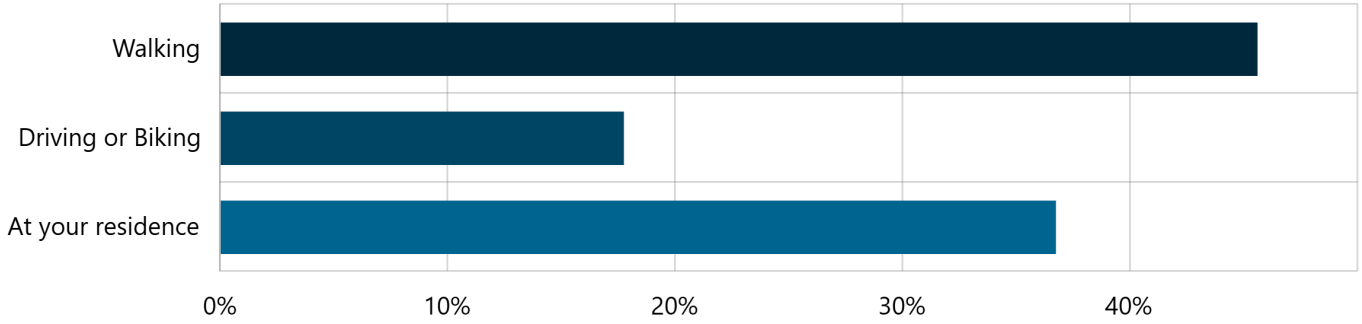
2. What color temperature of light do you prefer? Required
Multi Choice | Skipped: 0 | Answered: 81 (100%)



Answer choices	Percent	Count
1000 (Warmest)	34.57%	28
2000	24.69%	20
3000	22.22%	18
4000	7.41%	6
5000	6.17%	5
6000	1.23%	1
7000	1.23%	1
8000	1.23%	1
9000	0%	0
10000 (Coolest)	1.23%	1

Total	**100.00%**	**81**

3. When do you primarily notice the streetlights? Required
Multi Choice | Skipped: 2 | Answered: 79 (97.5%)



Answer choices	Percent	Count
Walking	45.57%	36
Driving or Biking	17.72%	14
At your residence	36.71%	29
Total	**100.00%**	**79**

Lyons Streetlight Conversion Study

Title/Question: Lyons Streetlight Survey
Tool Type: Form
Activity ID: 183
Report Date Range: 14 Jan 2025 - 7 Apr 2025

Contribution ID	Date Submitted	What is your priority?			What color temperature of light do you prefer?										When do you primarily notice the streetlights?		
		Safety (Add more lighting)	Control Light Pollution (Focus on DarkSky)	Other (please specify)	1000 (Warmest)	2000	3000	4000	5000	6000	7000	8000	9000	10000 (Coolest)	Walking	Driving or Biking	At your residence
15913	Apr 07, 2025, 07:55 PM		1		1											1	
15903	Apr 07, 2025, 01:04 PM		1		1												1
15846	Apr 07, 2025, 10:10 AM		1		1											1	
14644	Mar 12, 2025, 08:53 AM		1				1								1		
14559	Mar 11, 2025, 07:10 AM		1				1									1	
14480	Mar 10, 2025, 12:18 PM		1	Mitigate harsh color temps and excessive brightness of LEDs.	1												1
14468	Mar 10, 2025, 11:01 AM	1				1									1		
14439	Mar 09, 2025, 06:48 PM		1		1										1		
14422	Mar 09, 2025, 01:58 PM		1		1											1	
14420	Mar 09, 2025, 12:40 PM		1			1											1
14418	Mar 09, 2025, 12:09 PM		1				1								1		
14374	Mar 08, 2025, 12:00 PM		1				1										1
14366	Mar 08, 2025, 10:29 AM	1							1						1		
14365	Mar 08, 2025, 09:52 AM		1		1												1
14361	Mar 08, 2025, 09:22 AM		1				1								1		
14336	Mar 08, 2025, 12:55 AM		1		1											1	
14334	Mar 07, 2025, 11:52 PM		1		1												1
14328	Mar 07, 2025, 10:54 PM		1			1									1		
14326	Mar 07, 2025, 10:38 PM		1				1									1	
14324	Mar 07, 2025, 09:52 PM		1				1								1		
14320	Mar 07, 2025, 09:32 PM		1				1									1	
14317	Mar 07, 2025, 09:17 PM			Ambiance, attractiveness with safety					1						1		
14309	Mar 07, 2025, 08:38 PM			What would be the COST to homeowners ?			1									1	
14308	Mar 07, 2025, 08:33 PM	1	1		1											1	
14277	Mar 07, 2025, 06:48 PM	1			1										1		
14241	Mar 07, 2025, 06:12 PM		1		1												1
14238	Mar 07, 2025, 05:55 PM		1			1									1		
14237	Mar 07, 2025, 05:42 PM		1		1												1
14236	Mar 07, 2025, 05:34 PM		1		1										1		
13805	Mar 04, 2025, 02:23 PM		1		1											1	
13364	Feb 22, 2025, 11:47 AM		1		1										1		
13294	Feb 21, 2025, 06:43 PM		1	Electrical pole (upper 5th Ave. extending down Seward alley) is leaning toward my home	1												1

13212	Feb 20, 2025, 12:52 AM		1				1									1	
13210	Feb 19, 2025, 11:36 PM		1						1							1	
13177	Feb 18, 2025, 06:37 PM		1				1								1		
13164	Feb 18, 2025, 10:27 AM	1				1									1		
13162	Feb 18, 2025, 08:03 AM		1			1									1		
13128	Feb 16, 2025, 10:22 AM		1	Energy efficiency		1											1
13123	Feb 15, 2025, 01:46 PM		1			1											1
13121	Feb 15, 2025, 01:12 PM		1			1									1		
13115	Feb 15, 2025, 11:32 AM	1	1					1							1		
13107	Feb 15, 2025, 06:39 AM		1						1								1
13092	Feb 14, 2025, 06:46 PM	1	1				1										1
13091	Feb 14, 2025, 05:57 PM		1		1										1		
13089	Feb 14, 2025, 05:48 PM		1			1											1
13087	Feb 14, 2025, 05:45 PM		1									1					1
13085	Feb 14, 2025, 05:18 PM	1					1									1	
13057	Feb 14, 2025, 12:21 PM	1							1						1		
12989	Feb 13, 2025, 09:42 AM		1			1									1		
12935	Feb 12, 2025, 04:52 PM		1	Please don't install LED lig	1										1		
12596	Feb 10, 2025, 12:58 PM			Aesthetics		1									1		
12590	Feb 10, 2025, 12:17 PM		1		1										1		
12569	Feb 10, 2025, 10:15 AM		1			1											1
12568	Feb 10, 2025, 10:14 AM		1			1									1		
12567	Feb 10, 2025, 10:13 AM		1				1										1
12566	Feb 10, 2025, 10:12 AM		1			1											1
12563	Feb 10, 2025, 10:07 AM		1			1											1
12556	Feb 10, 2025, 09:42 AM		1		1												1
12520	Feb 09, 2025, 05:45 PM		1							1					1		
12512	Feb 09, 2025, 01:15 PM		1	Any considerations of adding/changing streetlights should include a limited downward beam pattern in most cases.	1										1		
12511	Feb 09, 2025, 01:08 PM		1			1											1
12509	Feb 09, 2025, 12:27 PM	1						1							1		
12505	Feb 09, 2025, 06:23 AM		1											1	1		
12498	Feb 08, 2025, 07:38 PM		1		1												1
12494	Feb 08, 2025, 06:15 PM		1						1							1	
12492	Feb 08, 2025, 04:51 PM		1	Let's reduce light pollution, and burn less coal.			1								1		
12485	Feb 08, 2025, 03:55 PM		1					1									1
12480	Feb 08, 2025, 03:06 PM	1				1									1		
12478	Feb 08, 2025, 03:00 PM		1	Keep light temperature well under 3000K to minimize environmental impact.		1									1		
12477	Feb 08, 2025, 02:47 PM		1					1									1
12476	Feb 08, 2025, 02:40 PM		1	Please do NOT add more lighting. Our community		1											1
12475	Feb 08, 2025, 02:38 PM		1					1									1
12472	Feb 08, 2025, 01:15 PM	1					1								1		
12469	Feb 08, 2025, 12:51 PM		1		1												1

12465	Feb 08, 2025, 12:38 PM		1	energy convservation			1								1		
12464	Feb 08, 2025, 12:33 PM		1		1												1
12462	Feb 08, 2025, 12:30 PM		1		1												1
12460	Feb 08, 2025, 12:07 PM		1		1										1		
12458	Feb 08, 2025, 11:42 AM		1					1							1		
11283	Jan 18, 2025, 08:50 PM		1		1												

Appendix H: Solar Lighting System Option

Sol® by Sunna Design®

DETAILED SOLAR LIGHTING SPECIFICATIONS

PROJECT :

Location
Albuquerque, NM, USA

Application
Street

Dimensions
100 ft

Estimate ID#
2-24751-1

Date
2025/05/14 17:30:44

Solution Overview

System configuration

Model	EverGen™ M Series
System Color	NF
Tilt Angle	30 Degrees
Solar Panel Wattage	400W
Remote monitoring	Cloud-based dashboard and automatic notifications

Battery Details

Battery Type	GEL
Battery Quantity	4
Battery Capacity	95.0 Ah
Battery Location	LOW

Fixture Details

LED Fixture	ATB0P20X
Lumens per Fixture (approx.)	9223 Lumens
Individual Fixture Wattage	60 W
Light Color Temperature	4000 K
Optical Distribution Type	R3
Fixtures per System	1

System Order Key:

EVERGEN-NF-2-200-4-GEL5-LOW-N-30-1-ATB0P20X-R3-40K-SV-EXCLUDE-NONE-NONE-NONE-60-D2D-NONE

Warranty Details

Battery	5 Years
Solar PV Panel Output Power	Manufacturer's Warranty
Mounting Hardware and Electronics	10 Years
Pole (if provided)	Manufacturer's Warranty
LED Fixture	Manufacturer's Warranty

Certifications

Additional Details

Weight (with batteries)	358 lb (162.53 kg)
EPA	16.3 Sq Ft (1.51 Sq m)
Tenon Requirement	3.5" OD x 6" long

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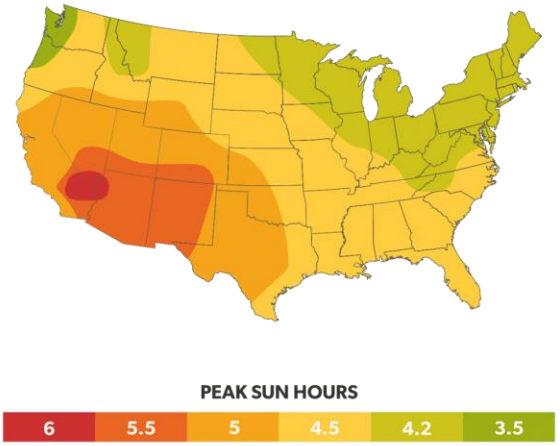
Sizing methodology

Custom-sized for your project

Location

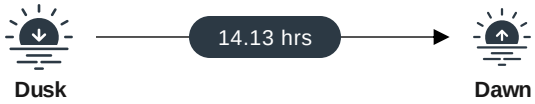
Location	Albuquerque,NM, USA
Latitude	35N
Longitude	107W
Wind Zone (per ASCE-7-05)	NONE



- Each Sol lighting system is tailored to its specific location and operating needs, ensuring reliable performance for 365 days/year. **Calculations are based on 20 years of NASA data and the location's shortest day**.

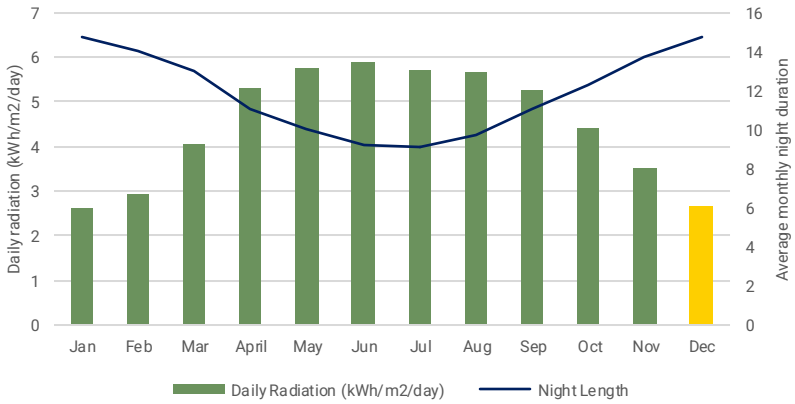
Sizing Parameters

We use **December 21st** as the longest night length of the year for this location.

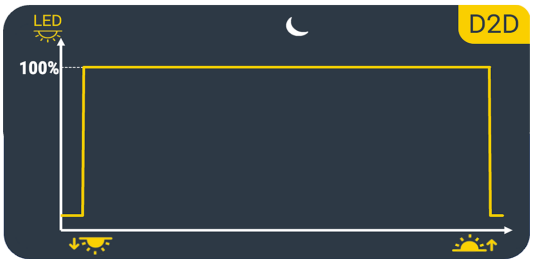


We use **December** in our sizing calculation. It has the worst average solar irradiation for this location.

4.56 kWh/m²/day



Operating profile



On at dusk at 100% lumen output, then off at dawn.

Nominal load	60 W
Solar Panel size	400W
Battery quantity	4
Battery capacity	95.0 Ah

Backup power* **4.05 days**

** Backup power is based on worst-case winter conditions.*

Array-to-load ratio **1.38**

- We size our solar panels to ensure we collect enough energy during the day to last through the night, maintaining an **Array-to-Load ratio of 1.2** or more. This ensures the solar array generates at least 20% more power than needed to fully recharge the battery.
- Without external power sources, solar lights need enough battery storage to last through low or no sunlight for multiple days. We collaborate with clients to determine the appropriate backup power based on their location and comfort level.

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Solution Overview

Benefits of the EverGen M

TOP-TIER LED FIXTURES

Compatible with a variety of cobra head and decorative fixtures from Acuity Brands, top-quality optics provide directional, uniform light without glare.

REMOTE MONITORING & ASSET MANAGEMENT

Access your systems remotely from any connected device. Locate systems on a map, view product types and warranties, download data, and receive alerts of system issues.

SIZED FOR YEAR-ROUND PERFORMANCE

Customizing the solar panel(s) and batteries to the project location and operational requirements ensures reliable, uninterrupted light 365 days a year.

MEETS IES ROADWAY LIGHTING STANDARDS

Achieve and maintain IES-recommended light levels for a variety of applications, including roadways, while avoiding negative health and gaining environmental benefits.

COMPLIANT WITH BUILD AMERICA, BUY AMERICA ACT

Up to 100% of the components used in our lights can be manufactured in America to comply with BABA requirements.

UL CE RoHS EN 61547 Emissions Caltrans 611 Vibration FC Radio

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Solution Overview

Component Specifications

Solar Panel

Technology	Photovoltaic module (Polycrystalline Silicon)
Power	400W
Electrical specifications per panel	Voc = 23.20 V / Vmp = 19.60 V / Isc = 9.35 A / Imp = 8.77 A / Number of cells = 36
Panel dimensions	59.06 x 26.30 x 1.57 in (1500 x 668 x 40 mm)
Lifespan	> 20 years at 80% of initial power
Tilt	30 Degrees
Structure	Clear anodized aluminum frame
Certificates	UL 1703

Battery

Technology	GEL
Voltage	12V
Capacity	95.0 Ah
Battery quantity	4
Operating temperature	Discharge: -4~140°F (-20~60°C) / Charge: 32~122°F (0~50°C)
Lifespan	> 10 years

Fixture

LED fixture type	ATB0P20X
Luminous flux	9223 Lumens
Nominal wattage	60 W
Color temperature	4000 K
Lifespan	100 000 hours certified by IESNA LM-90 B-50

General

Material	Aluminum frame and stainless steel fasteners
EPA (excluding pole and arm)	16.3 Sq Ft (1.51 Sq m)
Pole tenon requirement	3.5 in. OD x 6 in. long
Weight (excluding pole and arm)	358 lb (162.53 kg)
Warranty	System: 10 Years | Battery: 5 Years
Monitoring	Sol Insight™ Cloud-based dashboard and automatic notifications
Communication technology	Bluetooth® app for commissioning and satellite modem for monitoring

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Asset Management & Remote Monitoring

Sol Insight™

Helpful data when you want it, automatic alerts when you need it.™

- Insight remote monitoring allows you to view how your entire network of solar lights are performing on the ground – from the comfort of your desk.
- At any time, simply log in to the Insight platform to see the status and geolocation of each light. If further diagnostics are desired, you can drill down into recent data to determine if a system was commissioned properly and if it is working as expected. And if regularly reviewing your dashboard doesn't fit into your schedule, Insight will send automatic notifications if any system is compromised or not working the way it's supposed to.

Sol's Insight platform is a tool that can save your department time by removing the guesswork and by protecting your investment.

Sol Insight™: Monitor your lights remotely

Monitor your lights in real-time and be notified when maintenance is needed.

Sol Insight™ is included with your purchase for one year, after which you can continue to enjoy this service with a subscription.

- API integration available
- Check light status anytime
- Receive automated notifications
- Receive commissioning confirmation
- Get help from expert product technologists

Sol Insight™, our cloud-based remote monitoring system, is the ideal solution for modern, efficient management of your solar street lighting. It utilizes one of the most reliable and affordable communication technology available today: **satellite.**

Learn more about our monitoring capabilities at www.solarlighting.com/monitoring/

To receive Insight remote monitoring, customers must sign off on terms and conditions.
An email address is also required to receive Insight services. Contact a Sol sales representative for details.

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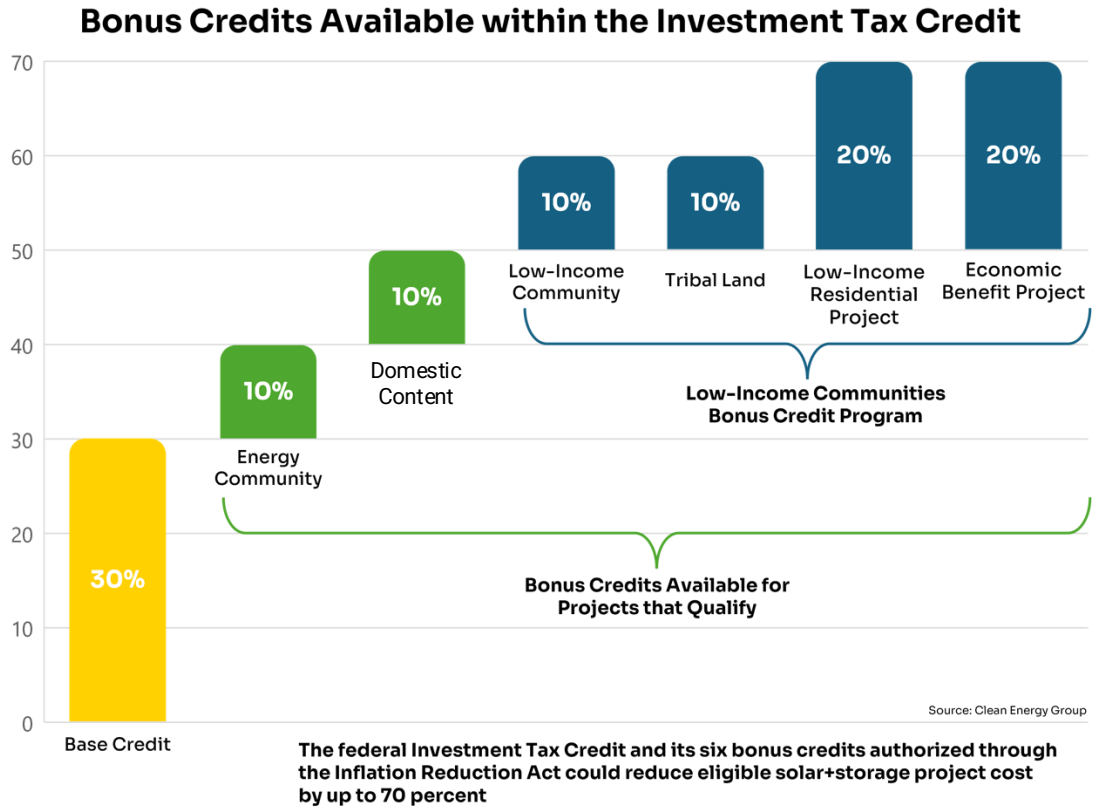
Finance your solar lighting project

Available tax credits, grants, and leasing options

Did you know that if you **purchase and install a solar lighting system** in the **U.S. before 2033**, **the federal government will reimburse you 30% (or more) of the cost?**

It's true. The Investment Tax Credit was recently expanded and adapted under the Inflation Reduction Act (IRA), allowing businesses, state and local governments, tribal councils, and more to **significantly reduce the cost of their renewable infrastructure investments.**

- Tax-exempt organizations like cities and counties can now receive cash payments instead of tax credits using a provision called "direct pay," while for-profit companies can sell their credits to an unrelated party without having to partner with a bank. Plus, **the ITC can be combined** with other government incentives like **the Energy Efficiency and Conservation Block Grant Program to make solar lighting even more affordable.**



The federal Investment Tax Credit and its six bonus credits authorized through the Inflation Reduction Act could reduce eligible solar+storage project cost by up to 70 percent

Learn about the ITC, available grants and our Solar Lighting as a Service program at www.solarlighting.com/financing/

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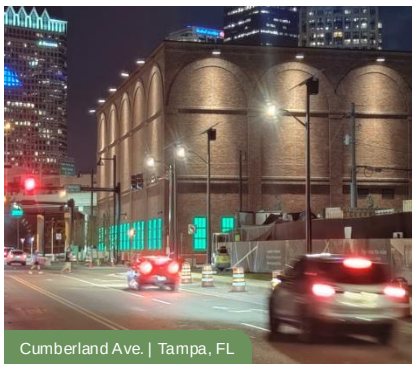
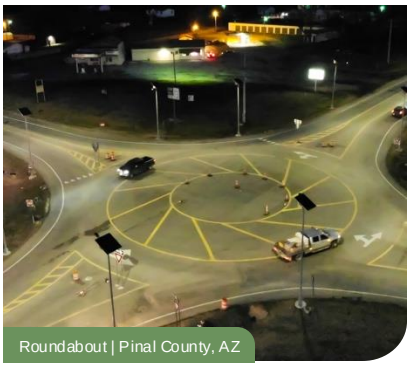
Success stories

50,000+ systems installed in the U.S.


Greenway Trail | Whittier, CA


Sabey Data Center | Austin, TX


Cumberland Ave. | Tampa, FL


Roundabout | Pinal County, AZ


Washington Village | Norwalk, CT


Red Rock Amphitheater | Denver, CO


Oklahoma DOT | Kansas, OK

They also trust Sol.

D·R·HORTON America's Builder

TECO AN EMERA COMPANY

ENGIE

AMERESCO Green • Clean • Sustainable

CITY OF ORLANDO

NYC

LOCKHEED MARTIN

New Mexico DEPARTMENT OF TRANSPORTATION MOBILITY FOR EVERYONE

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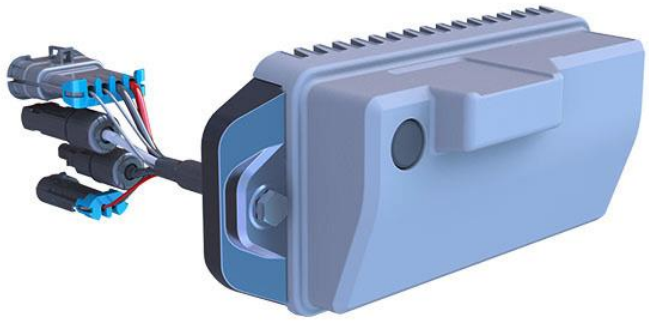
Datasheet

EverGen™ EMS Solar Lighting Controller / LED Driver

Programmed or custom run modes include:

- Hours after Dusk: 03, 05, 07, 09, or All Night
- Dimming Percentage: None, 30%
- Hours Before Dawn: 02, or All Nighty



Features

- Bluetooth and App for local configuration and testing
- Satellite modem for remote monitoring with Insight Remote Monitoring Platform Subscription
- Solar panel and battery overvoltage protection
- LED short circuit protection and unconnected LED protection
- Internal PV disconnect (no external diodes required)
- Reverse battery polarity protection
- Self calibrating load, timing, and charging circuitry

Benefits

- Flexible operating modes (dusk-to-dawn, split night, split night with dimming)
- Fully tested at the Sol factory before installation and shipment to ensure reliable operation and trouble-free startup
- Programmed by Sol based on your project requirements eliminating confusing switch and knob setting
- Bluetooth and app for simple and secure setup
- Integrated MPPT charging and LED driving system reduces system failures, overall system complexity, and cost
- Integrated surge protection and noise reduction
- Keyed connectors for simple and reliable assembly
- Temperature-compensated and MPPT-controlled battery charging to maximize battery life and energy collection
- High-temperature charge compensation to ensure component longevity
- Ruggedized solid-state design ensures long life and no maintenance
- Memory averaging to ensure accurate turn-on and turn-off of lights to prevent false responses due to weather variations
- Ten-year limited warranty

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Datasheet

EverGen™ EMS Solar Lighting Controller / LED Driver

ELECTRICAL

Operating Voltage	12/24 VDC
Operating Current	25A max
LED Drive Current	3.5A max. 100W
Lamp Drive Voltage	65 VDC max.
PV Voltage Input	55 VDC max.
Low Voltage Disconnect (LVD)	11.6 / 23.2 VDC
Low Voltage Reconnect (LVR)	12.1 / 24.2 VDC

CHARGING

Self-consumption	< 5 mA
Charging Method	Maximum Power Point Tracking (MPPT)
Battery Fuse, External	30A max.

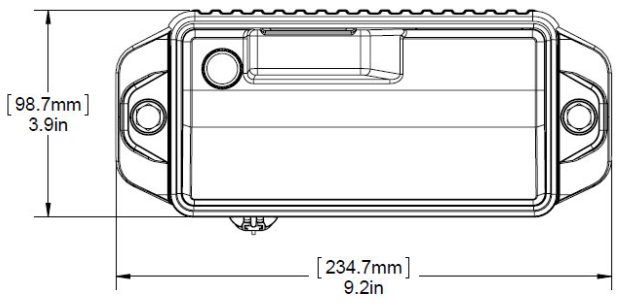
COMMUNICATION

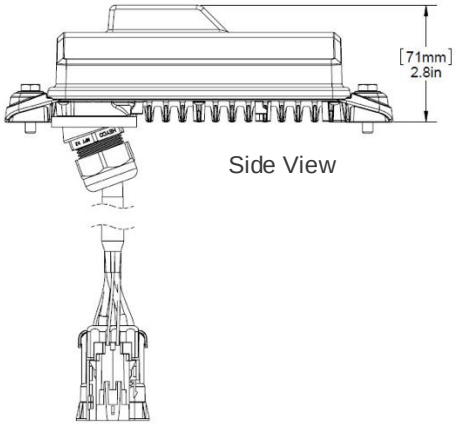
Local Control	Bluetooth and app
Remote Monitoring	Satellite modem to Insight remote monitoring platform

PHYSICAL

Operating Temperature	-40 to +60 °C (-40 to +140 °F)
Humidity	100% Condensing
Packaging	Aluminum heatsink, polycarbonate cover, gasket and vent, IP68
Weight	0.74 kg (26 oz.)
Size (L x W x H)	234.7 x 98.7 x 71.0 mm (9.2 x 3.9 x 2.8 in)

Top View





Side View

Specifications subject to local environmental conditions.
Specifications may be subject to change.
US and International patents apply. Other patents pending.
“Sol” logo is a trademark of Sunna Design

All Sol products are manufactured in facilities certified to ISO quality standards.

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NIGHTTIME FRIENDLY™

Consistent with LEED® goals & Green Globes™ criteria for light pollution reduction

BAA

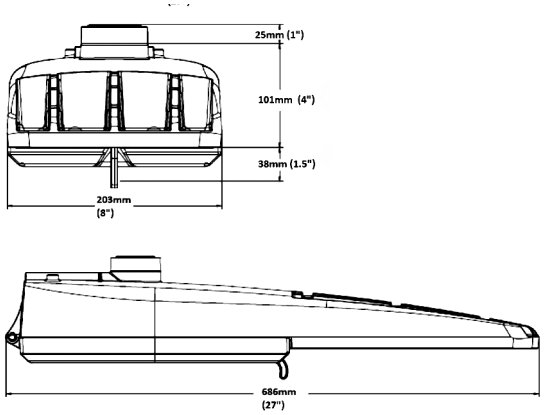
Autobahn Series ATB0 - Solar
Roadway Lighting

PRODUCT OVERVIEW

Applications:

- Roadways
- Off ramps
- Residential streets
- Parking lots

DIMENSIONS



Effective Projected Area (EPA): The EPA for the ATB0 is 0.76 sq. ft.
Approx. Wt. = 14 lbs.

STANDARDS

Color temperatures of ≤ 3000K must be specified for International Dark-Sky Association certification.

Rated for -40°C to 40°C ambient
Complies with ANSI: C136.2, C136.10, C136.14, C136.31, C136.15, C136.37

BUY AMERICAN ACT — Product with the BAA option is assembled in the USA and meets the Buy America(n) government procurement requirements under FAR, DFARS and DOT regulations. Please refer to www.acuitybrands.com/buyamerican for additional information.

Features:

OPTICAL

The Autobahn's new molded silicone optics provide exceptional performance. Silicone optics are superior to other polymeric materials in the areas of; optical efficiency, thermal performance, and reduction in dirt accumulation, all of which can lead to long term lumen degradation and a shift in optical distribution. Also, because silicone allows for the molding of fine details as well as thick sections, it produces the most crisp, clean and well-defined lighting distributions available. Silicone optics paired with modern LED's allow the Autobahn to take full advantage of both technologies.

Same Light: Performance is comparable to 100 - 400W HPS roadway luminaires.

White Light: Correlated color temperature - 4000K, or optional 2700K, 3000K or 5000K, all 70 CRI minimum.

Unique IP66 rated LED light engines provided 0% uplight and restrict backlight to within sidewalk depth, providing optimal application coverage and optimal pole spacing. Available in Type II, III, IV, and V roadway distributions.

ELECTRICAL

Expected Life: LED light engines are rated >100,000 hours at 25°C, L70.

Lower Energy: Saves an expected of 40-60% over comparable HID luminaires.

MECHANICAL

Includes standard AEL lineman-friendly features such as tool-less entry, 3 station terminal block and quick disconnects. Bubble level located inside the electrical compartment for easily leveling at installation.

Rugged die-cast aluminum housing and door are polyester powder-coated for durability and corrosion resistance. Rigorous five-stage pre-treating and painting process yields a finish that achieves a scribe creepage rating of 7 (per ASTM D1654) after over 5000 hours exposure to salt fog chamber (operated per ASTM B117).

Mast arm mount is adjustable for arms from 1-1/4" to 2" (1-5/8" to 2-3/8" O.D.) diameter. Provides a 3G vibration rating per ANSI C136.31

Wildlife shield is cast into the housing (not a separate piece).

Note: Specifications subject to change without notice. Actual performance may differ as a result of end-user environment and application.

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AEL American Electric Lighting®

Autobahn Series ATB0 - Solar
Roadway Lighting

ORDERING INFORMATION

Series
ATB0 Autobahn LED Roadway

Performance Packages
P201 5,369 lumens nominal
P202 6,943 lumens nominal
P203 10,056 lumens nominal
P204 12,176 lumens nominal
P205 13,767 lumens nominal

Solar
Solar Only Compatible with Sol By Sunna Design's Solar Lighting Solutions [1]

Optics
R2 Roadway Type II
R3 Roadway Type III
R4 Roadway Type IV
R5 Roadway Type V

Options

Color Temperature (CCT)
(Blank) 4000K CCT, 70 CRI Min.
27K 2700K CCT, 70 CRI Min.
3K 3000K CCT, 70 CRI Min.
5K 5000K CCT, 70 CRI Min.

Paint
(Blank) Gray (Standard)
BK Black
BZ Bronze
DDB Dark Bronze
WH White

Terminal Block
(Blank) Terminal Block (Standard)

Misc.
BL External Bubble Level
HSS House-Side Shield
NL Nema Label
XL Not CSA Certified
UMR-XX 8" Horizontal Arm for Round Pole, Painted to match Fixture
UMS-XX 8" Horizontal Arm for Square Pole, Painted to match Fixture
UMR-GALV 8" Horizontal Arm for Round Pole, Galvanized
UMS-GALV 8" Horizontal Arm for Square Pole, Galvanized
BAA Buy America(n) Act Compliant

Packaging
(Blank) Single Unit (Standard)
JP Job Pack (42/Pallet)

Accessories:
House Side Shields for field installation
ATB0P20XR2/R5HSS for use with P201 - P205, R2 & R5 distributions
ATB0P20XR3/R4HSS for use with P201 - P205, R3 & R4 distributions
ATB0P30XR2/R5HSS for use with P301 - P305, R2 & R5 distributions
ATB0P30XR3HSS for use with P301 - P305, R3 distribution
ATB0P30XR4HSS for use with P301 - P305, R4 distribution
ATB0P45XR2/R5HSS for use with P451 - P457, R2 & R5 distributions
ATB0P45XR3HSS for use with P451 - P457, R3 distribution

Notes:
1. No Driver included, input power managed via Sol By Sunna's Solar Engine. Wattage depends on project location and Solar Engine size.

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www.americanelectriclighting.com Phone: 1-866-HOLOPHANE
Email: TechSupportINF@AcuityBrands.com
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Note: Actual performance may differ as a result of end-user environment and application. All values are design or typical values, measured under laboratory conditions at 25 °C. Specifications subject to change without notice.

Please contact your sales representative for the latest product information.

PERFORMANCE PACKAGE

ATB0	Distribution	Input Watts	2700K	3000K	4000K/5000K
			Lumens	Lumens	Lumens
P201	R2	*	4,983	5,473	5,488
	R3		4,952	5,107	5,553
	R4		5,045	5,130	5,346
	R5		5,084	5,384	5,387
P202	R2	*	6,429	7,100	7,203
	R3		6,390	6,679	7,237
	R4		6,517	6,749	6,906
	R5		6,560	6,988	6,951
P203	R2	*	9,005	10,050	10,150
	R3		8,951	9,471	10,260
	R4		9,494	9,673	10,060
	R5		9,188	9,784	9,736
P204	R2	*	11,007	11,800	12,410
	R3		10,940	11,490	12,470
	R4		11,485	11,900	12,170
	R5		11,230	11,780	11,900
P205	R2	*	12,339	12,650	13,920
	R3		12,264	13,110	14,130
	R4		13,051	13,680	13,830
	R5		12,589	13,080	13,340

*Wattage depends on project location and Solar Engine size. Contact the Sol By Sunna Design's Sales Team for quoting your Acuity Solar Lighting Solutions.
Email: sales@solarlighting.com or Call: 1-800-959-1329

ATB0 LLD Multiplier	15C	20C	25C	30C	35C	40C
	1.02	1.01	1.00	0.99	0.98	0.97

To calculate the LLD for a temperature other than 25°C, multiply the LLD @ 25°C (shown in the performance package table) by the LLD multiplier for the selected temperature.

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PERFORMANCE PACKAGE

LLD @ 25°C									
ATB0	R2, R3 Distributions 3000K & 4000K CCT			R2, R3 Distributions 2700K & 5000K CCT*			R4 & R5 Distributions Any CCT		
	50k Hours	75k Hours	100k Hours	50k Hours	75k Hours	100k Hours	50k Hours	75k Hours	100k Hours
P201	0.96	0.95	0.94	0.92	0.88	0.85	0.92	0.88	0.85
P202	0.96	0.95	0.94	0.92	0.88	0.85	0.92	0.88	0.85
P203	0.96	0.95	0.93	0.91	0.88	0.85	0.91	0.88	0.85
P204	0.96	0.95	0.93	0.91	0.88	0.84	0.91	0.88	0.84
P205	0.96	0.95	0.93	0.91	0.87	0.83	0.91	0.87	0.83

*** Also includes any custom (non-catalog) CCT**

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Please contact your sales representative for the latest product information.

B.U.G. Ratings

ATB0	Distribution	2700K			3000K			4000/5000K		
		B	U	G	B	U	G	B	U	G
P201	R2	1	0	1	2	0	2	2	0	2
	R3	1	0	1	1	0	1	1	0	1
	R4	1	0	2	1	0	2	1	0	2
	R5	3	0	1	3	0	1	3	0	1
P202	R2	2	0	2	2	0	2	2	0	2
	R3	1	0	2	1	0	2	1	0	2
	R4	1	0	2	1	0	2	1	0	2
	R5	3	0	1	3	0	2	3	0	2
P203	R2	2	0	2	2	0	2	2	0	2
	R3	2	0	2	2	0	2	2	0	2
	R4	2	0	3	2	0	3	2	0	3
	R5	3	0	2	4	0	2	4	0	2
P204	R2	3	0	3	3	0	3	3	0	3
	R3	2	0	2	2	0	2	2	0	2
	R4	2	0	3	2	0	3	2	0	3
	R5	4	0	2	4	0	2	4	0	2
P205	R2	3	0	3	3	0	3	3	0	3
	R3	2	0	2	2	0	2	2	0	2
	R4	2	0	3	2	0	3	2	0	3
	R5	4	0	2	4	0	2	4	0	2

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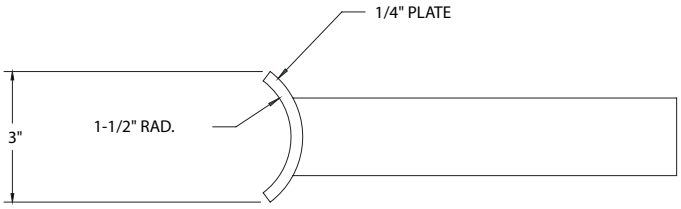
Warranty Five-year limited warranty. This is the only warranty provided and no other statements in this specification sheet create any warranty of any kind. All other express and implied warranties are disclaimed. Complete warranty terms located at: www.acuitybrands.com/support/warranty/terms-and-conditions

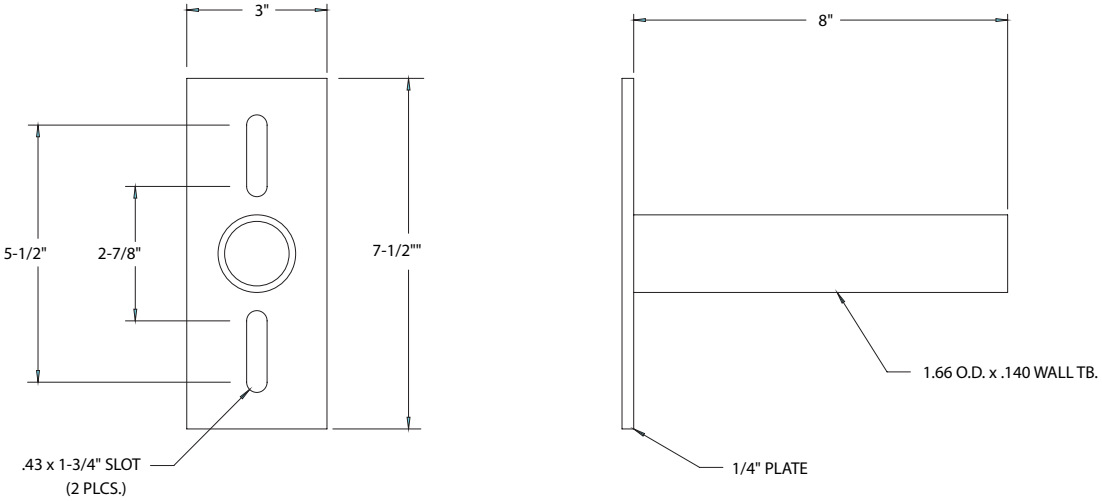
Note: Actual performance may differ as a result of end-user environment and application. All values are design or typical values, measured under laboratory conditions at 25 °C. Specifications subject to change without notice.

Please contact your sales representative for the latest product information.

UMR POLE ADAPTOR

RECOMMENDED FOR USE WITH POLES OF 4" DIAMETER OR SMALLER





UMS POLE ADAPTOR

American Electric Lighting®
AEL Headquarters, One Lithonia Way, Conyers Georgia 30012
www.americanelectriclighting.com Phone: 1-866-HOLOPHANE
Email: TechSupportINF@AcuityBrands.com
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Datasheet

Gel Deep Cycle Solar Battery

FEATURES

- Gel deep cycle battery
- Ideal for solar applications
- Maintenance-free, sealed construction
- Spill proof / leak proof
- ABS case and cover
- UL recognized
- 100% recyclable
- **5-year warranty***

SOL-GEL-100

SPECIFICATIONS

Nominal Voltage	12V
Nominal Capacity	95.0 Ah
Rated Capacity (at 77°F//25°C)	100.0Ah/1.00A (100hr,1.80V/cell) 85.0Ah/4.25A (20hr,1.80V/cell)
Nominal Operating Temperature	77 ±5° F (25 ±3° C)
Operating Temperature Range	Discharge: -4-140°F (-20~60°C) Charge: 32-122°F (0~50°C)
Maximum Discharge Current	850A (5s)
Internal Resistance	Approx 6.0mΩ
Cycle Use	Initial Charging Current less than 25.0A. Voltage: 14.4V~15.0V at 77°F (25°C) Temp. Coefficient -30mV/°C
Standby Use	No limit on Initial Charging Current Voltage: 13.5V~13.8V at 77°F (25°C) Temp. Coefficient -20mV/°C
Self Discharge	Batteries can be stored for up to 6 months at 77°F (25°C) before a freshening charge is required. **Batteries stored at temperatures greater than 77°F (25°C) will require a recharge sooner.*
Certifications	UL; CE; IEC60896-21 & 22

MATERIALS AND MECHANICAL

Case and Cover	ABS
Separator	PVC-SiO2
Active	PbO2 + Pb
Electrolyte	LPG Sulfuric Acid Gel
Venting Valve	Rubber, opening pressure 8-20k Pa
BCI Group #	27
Terminals	T6
Carrying	Integrated Flush Mount Handle

DIMENSIONS

Length	12.01 in / 305 mm
Width	6.61 in / 168 mm
Height	8.15 in / 207 mm
Total Height (including terminals)	8.38 in / 213 mm
Weight	59.8 lbs / 26.7 kg

UL Recognized Component MH29024

LEAD RETURN RECYCLE

Specifications subject to local environmental conditions.
Specifications may be subject to change.
US and International patents apply. Other patents pending.
“Sol” logo is a trademark of Sunna Design

All Sol products are manufactured in facilities certified to ISO quality standards.

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Datasheet

200 Watt Polycrystalline Solar Panel

Reliable

- Sol's SOL-200 is a high-efficiency polycrystalline solar module that provides outstanding performance and cost-effective solar power for high-end off-grid and mobile applications. The module is built to last and features a 20-year limited power output warranty.

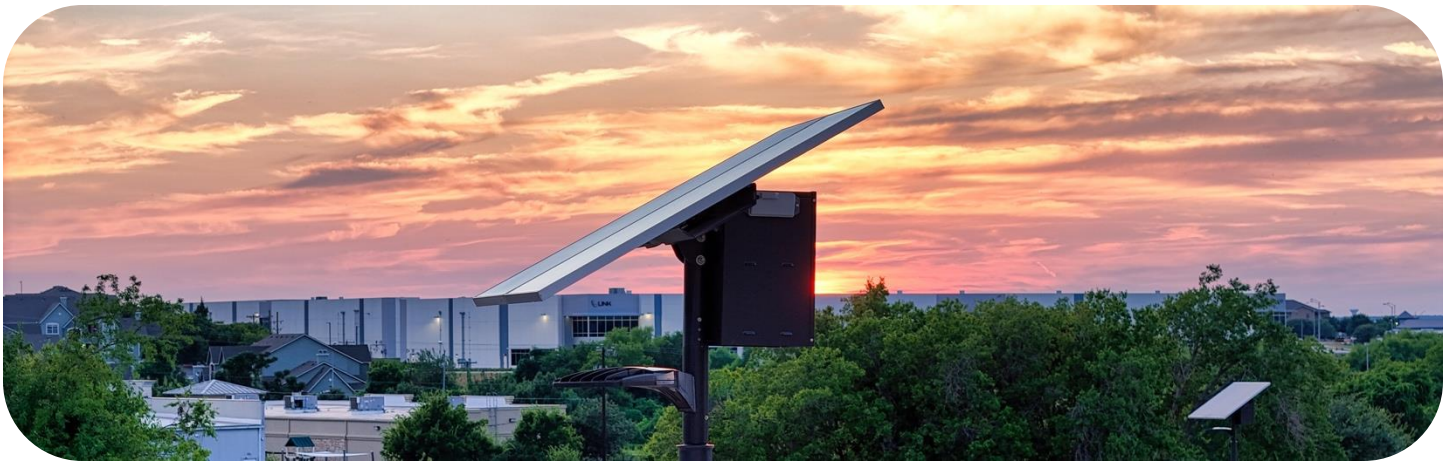
Durable

- To ensure long life, the high-efficiency solar cells are encapsulated between a special tempered, low-iron solar glass and a Tedlar® / polyester backing material. The mounting frame, manufactured from anodized marine-grade aluminum, allows the SOL-200 to be installed in extreme conditions.

SOL-200

FEATURES

- Compact and rugged design
- Plug and play junction box
- Lightweight anodized aluminum frame
- High transmissivity tempered glass
- Industry standard quick-connect cables (MC4) work in series or in parallel
- **20-year limited power output warranty**



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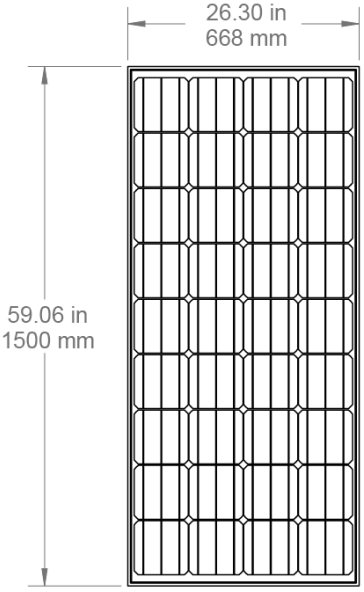
Datasheet

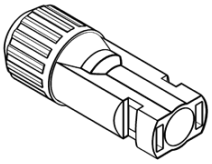
200 Watt Polycrystalline Solar Panel

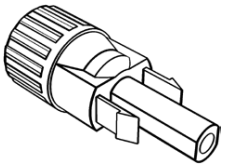
SPECIFICATIONS

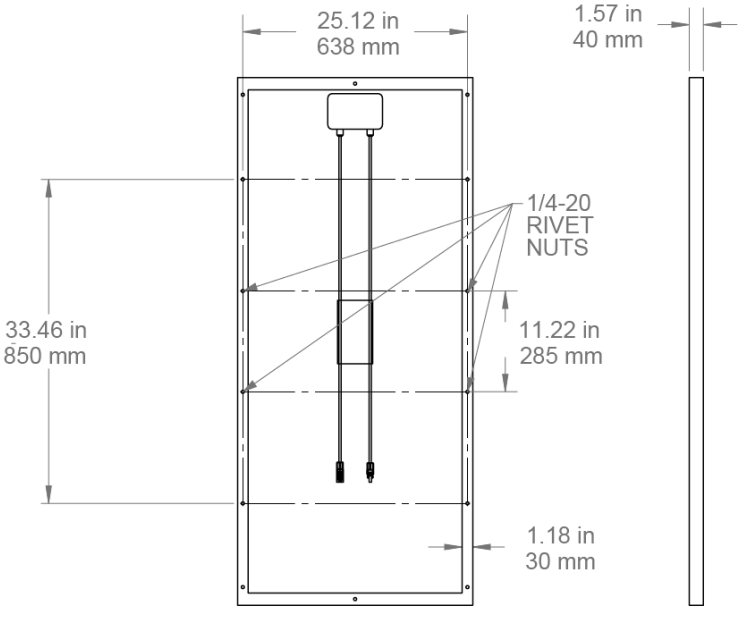
Rated power (Pm)	200W
Maximum power voltage (Vmp)	20.90V
Maximum power current (Imp)	9.57A
Open circuit voltage (Voc)	24.50V
Short circuit current (Isc)	10.05A
Power coefficient	–0.39% / °C
Voltage coefficient	–0.31% / °C
Current coefficient	0.045% / °C
Max power tolerance	+/- 5W
Cell type	Monocrystalline
Module efficiency	21.5%
Series fuse rating	15A
Maximum system voltage	600VDC
Operating temperature	-40°C to 85°C (-40°F to 185°F)
Weight	24.6 lbs (11.6 kg)
Dimensions	59.1 x 26.3 x 1.57 in 1500 x 668 x 40 mm
Frame type / material	Clear anodized aluminum
Certifications	UL 1703



Front view


MC4 Negative


MC4 Positive

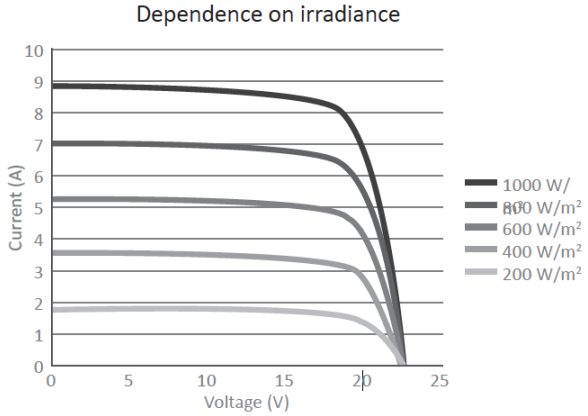


Back view

Side view

Power specifications calculated at STC
- Irradiance: 1000 W/m2
- Cell Temperature: 77°F (25°C)
- Air Mass: 1.5

IV CURVE PARAMETERS



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US and International patents apply. Other patents pending.
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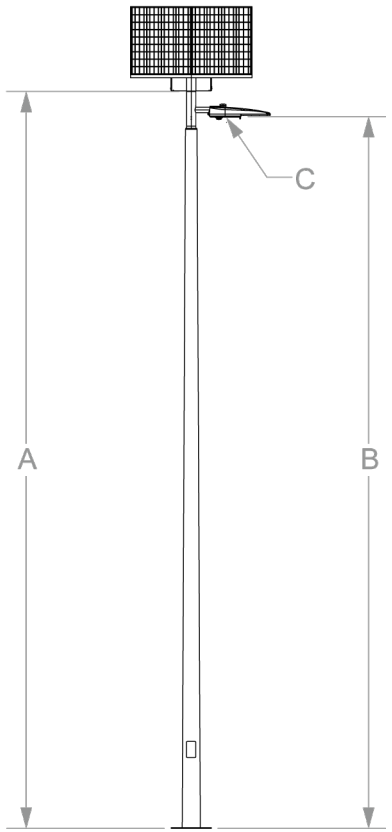
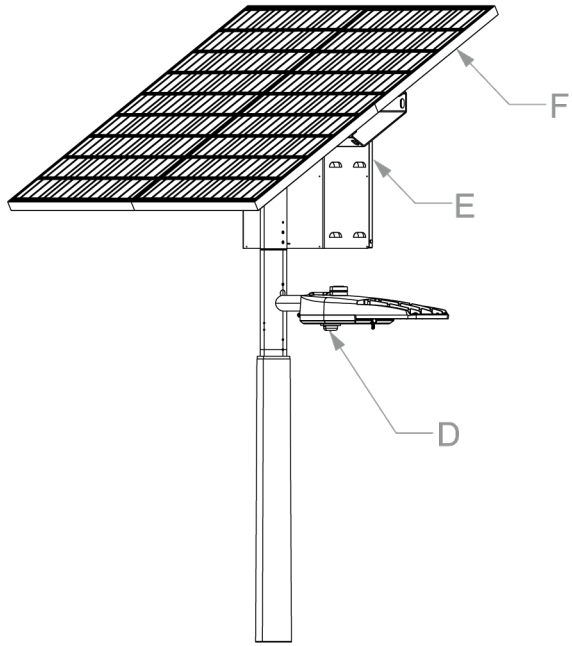
System Drawing

MODEL	A [Pole Length Above Grade]	B [Fixture Mount Height]	C/D [Arm Type]	E [Battery Mount]	F [System EPA]	[System Weight]	POLE Type	POLE Info 1	POLE Info 2
EverGen™ M Series	NONE	Based on Photometric Design**	NONE	LOW	16.3 Ft² (1.51 m²)	358.0LB	No Pole Provided	N/A	N/A

Note: Line Drawings May Not Entirely Resemble Shipped Product





**DISCLAIMER: Arm(s) will be drilled and installed on site as per customer or photometric requirements.

WARNING: DO NOT INSTALL POLES WITHOUT SOLAR LIGHTING SYSTEMS

UNLESS OTHERWISE SPECIFIED
DO NOT SCALE DRAWING
INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.100-2000
TOLERANCES APPLY AS SHOWN BELOW

DECIMALS		SURF FINISH	ANGLES
.X	±.1	63	±1°
.XX	±.01		
.XXX	±.005		
.XXXX	±.0005		

INCHES

THIRD ANGLE PROJECTION

SCALE 1:64

PDM MAINTAINED DATA
CHANGES SHALL BE INCORPORATED ELECTRONICALLY BY THE DESIGN AUTHORITY

PROPRIETARY

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Sol by Sunna Design.

990 Biscayne Blvd., Office 701
Miami, FL 33132,
USA
Tel 1.800.959.1329

Estimate ID: 2-24751-1

Pole Part #: NONE

Setting up your EverGen®

4 steps to get started

STEP 1

Ensure your installer has the right tools before going on site.

- Smartphone or tablet built within the last five years (running iOS 12.0+/Android 6.0+)
- The EverGen Setup App (see step 2)
- The Sol order number (e.g. ORD12345)

STEP 2

Download the app.

From a smartphone/tablet, the installer can go to the iOS App Store or Google Play Store and search for **EverGen Setup App** by Sunna Design (or click the links below).

Available on the App Store

GET IT ON Google Play

STEP 3

Sign up for access in the app.

Using the “sign up” tab, installers can enter their information to create a profile to access the app. A verification email will be sent to the address used for the profile. Once the account is verified, login and move to step 4.

STEP 4

Download the order information to the app.

Prior to installation, the installer will need to download their order information to the app so the correct settings can be applied to the EverGen. Enter the order number provided on the shipping documentation (ORDXXXXXX). Downloading requires an internet connection.

If there will be no internet access onsite, the contractor should download order information before arriving. After downloading the order information, the contractor can complete the rest of the steps even while offline. Order information remains available in the app for two weeks.

Next steps: Follow the EverGen Setup App instructions onsite.

To receive Insight remote monitoring, customers must sign off on terms and conditions.
An email address is also required to receive Insight services. Contact a Sol sales representative for details.

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About Sol

Key figures

Assembled in **Texas**

14 patents

35 years of expertise

1000+ customers

60 employees

ISO 9001

ISO 14001

Factory awarded **« Factory of the Future »**

More than 150 000 products installed worldwide

Operating in **60 countries**

15 million + people illuminated every night

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About Sol

6 reasons to choose Sol

INDUSTRY-LEADING WARRANTY

We offer a 10-year municipal-grade warranty on the entire solar lighting system, battery included.

PROMPT SERVICE & QUICK TURNAROUND

Whether you have a technical question, need a lighting layout, or require troubleshooting support, our highly qualified team is always quick to help. We can typically provide lighting layouts in 24 hours.

BUILT TO RESIST THE MOST SEVERE WEATHER

Sol's products are engineered tough and have been field-tested to withstand extreme heat, cold, wind, and precipitation. No matter the weather, they perform as intended.

BABA AND BAA COMPLIANT

Sol operates a manufacturing facility in Houston, Texas. 100% of the components used in the EverGen Series are Made in America.

REDUCED DOWN-TIME AND MAINTENANCE COSTS

Thanks to careful solar sizing and local and remote monitoring, required maintenance is greatly reduced or eliminated.

COMPREHENSIVE PORTFOLIO

Sol is the only solar lighting manufacturer offering both all-in-one and modular systems. Our range of low-power to high-power systems with unique aesthetics and performance capabilities means we have a product for every project and budget.

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Terms and conditions of warranty

Limited Warranty

By purchasing the Product, the Buyer, or the owner of the Product ("**you**") are agreeing to be bound by the terms of this limited warranty. The Company provides the following limited warranty coverage as applicable to the Product. Subject to the terms and conditions of the Limited Warranty as set forth herein (the “Terms and Conditions of Warranty”), a Product shall be considered a “Deficient Product” if Buyer provides written notification of the occurrence of the following within the associated warranty period enumerated below and proves to SUNNA DESIGN’s satisfaction that the defect exists.

The Limited Warranty applies exclusively to the Buyer, and third parties will have no rights or benefits under the Limited Warranty. The Limited Warranty is non-assignable, except upon the written consent of SUNNA DESIGN INC. Claims for a breach of the Limited Warranty can only be made: (i) during the relevant Limited Warranty periods as set forth above, (ii) with a proof of purchase as was issued by SUNNA DESIGN to Buyer which includes the Product purchase date and (iii) written notification of such Limited Warranty claim being given in writing within thirty (30) days of the alleged occurrence giving rise to the Limited Warranty claim to SUNNA DESIGN INC at the following address: 990 Biscayne Boulevard, Suite 701, Miami, 33132 Florida.

What the Warranty Covers and for How Long

- Subject to the exclusions and claim procedure set out below, the Company warrants each new lighting system to be free from defects in materials and workmanship that performs under normal use and service. The Company will, at its option and discretion, repair or replace any system or system component that is defective in materials or manufacture within a specific timeframe after purchase—the Warranty Period (the “Warranty”). Additionally, specific items within the system may have extended warranty protection, as noted.
- The Company shall be entitled, at its discretion, to use new and/or reconditioned parts or products to perform warranty repair or provide a replacement Product in accordance with the Warranty Coverage. The Company also reserves the right to use parts or products of original or improved design in any repair or replacement in accordance with the Warranty Coverage. It further reserves the right to make changes in design or improvements to its products without notice to you and without obligation to incorporate the same in any product previously manufactured. Any replaced products or parts shall become the Company's property.
- If the Company repairs or replaces a Product in accordance with the Warranty Coverage, the Warranty will continue to apply and remain in effect for the balance of the Warranty Period calculated from the date you purchased the Product from the Company (the "**Date of Purchase**") and not the repair or replacement date.
- If the Company chooses to offer a credit towards the purchase of a new Product in accordance with the Warranty Coverage, then the warranty applicable to the new product shall apply. All credits must be used within 90 days of issuance from the Company, or such credits become null and void.
- Shipping the Product to the Company’s factory remains at the expense and responsibility of the Buyer. The Warranty does not cover import fees, duties, and taxes.

What the Warranty Does Not Cover

The Warranty does not provide coverage for the following, which are expressly excluded from the Warranty:

- Failure due to normal wear and tear of the Product;
- Failure caused by improper user programming of Product settings through computer software supplied with or associated with the Product;
- Failure due to accident, abuse, misuse, liquid contact, neglect, improper installation, generalized corrosion, biological infestations, or input voltages that create operating conditions beyond the maximum or minimum listed in the Company’s specifications;
- Products that have been repaired or altered other than by the Company or as authorized by its employees or agents;
- Products that have their original identification (including, but not limited to, trademarks or serial numbers) markings defaced, altered or removed;
- Products utilized as a component part of a product expressly warranted by another manufacturer;
- Operation or storage of the Product outside the specification ranges disclosed by the Company, and/or alteration or deployment of the Product other than in accordance with any published or provided user, storage, or maintenance requirements; Specifically, the warranty does not cover storage of the Product for more than 365 days, or in a location where temperatures may exceed 25°C (77°F).
- Failure that is in any way attributable to the improper use, storage, maintenance, installation, or placement of the Product;
- Failure caused by use in violation or contravention of any applicable laws, statutes, rules, regulations, and ordinances or any applicable standard, code, or instructions for use in installations, including, but not limited to, those contained in the National Electrical Code and published by the Standards for Safety of Underwriters Laboratory, the International Electrotechnical Commission, the American National Standards Institute, and the Canadian Standards Association;
- Failure caused by any acts of God, including, but not limited to, earthquakes, lightning strikes, and flooding; and
- Any additional costs required to repair or replace the defective Product, including, but not limited to, legislatively imposed fees where applicable.

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Terms and conditions of warranty

Restrictions and Limitations to Warranty

- The Company is not responsible for repairs, disassembly, or re-assembly of other products that are not supplied, provided, or sold by the Company.
- The Company is not liable for any losses, expenses, damages, or costs incurred by you incidental or collateral to the Warranty, including, but not limited to, shipping, retrieval, and redeployment of the Product.
- This Warranty is not transferable or assignable by you and only applies to you. Upon written notice to you, the Company may assign this Warranty. In other words, warranty claims can only be made by the company that purchased the products from the Company.
- The Company does not warrant the results obtained from the implementation of recommendations made by the Company or its authorized distributors concerning the use, design, or application of the Product.
- You assume all responsibility and liability for loss or damage resulting from your handling or use of the Product.
- The onus is on you to provide evidence satisfactory to the Company that any event that may invalidate the Warranty has not occurred, including, but not limited to, providing evidence of specific storage, maintenance, or operational procedures to assure Product performance.
- The Company has the sole discretion in determining the validity of any Warranty claim and reserves the right to determine the cause of Product defect including examining patterns in Product usage, trends in Product failure, and to review your documentation of installation, use, maintenance, storage procedures, and test results.
- The Company's liability on any claim, whether in warranty, contract, negligence, or any other legal theory, for loss, damage, or injury arising directly or indirectly from or in relation to the use of the Product shall in no event exceed the purchase price paid by you for the Product as stated in the original invoice.
- The repair or replacement of the Product or granting of credit by the Company in accordance with the Warranty Coverage shall be your sole remedy and IN NO EVENT SHALL THE COMPANY BE LIABLE FOR PUNITIVE, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES INCURRED BY YOU WHETHER FORSEEABLE OR NOT, INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS OR REVENUES, LOSS OF USE OF GOODS (EXCLUDING THE PRODUCT), LOSS OF BARGAIN, LOSS OF BUSINESS, LOSS OF OPPORTUNITY, OR LOSS OF REPUTATION.
- The Warranty set out above is the sole warranty granted by the Company with respect to the Product. No oral understanding, representations or warranties shall be of any effect and the Company makes no further warranties, express or implied, concerning the Product other than the Warranty. You, where permitted by applicable law, hereby expressly waive any statutory or implied warranties including, but not limited to, that the Product shall be merchantable, fit for a particular purpose, or durable. All other warranties, conditions, and representations are hereby cancelled and are null and void. This Warranty may only be modified or amended by written agreement signed by the Company.
- This Warranty Terms shall be governed exclusively by the laws of the state of Delaware, United States excluding rules of international law that would result in the application of the laws of any other jurisdiction. The United Nations Convention on Contracts for the International Sale of Goods (1980) does not apply to this Agreement. If Buyer's principal place of business is located within the United States, the parties hereby irrevocably attorn and submit to the exclusive jurisdiction of Delaware, United States of America regarding all disputes arising under or in respect of this Agreement. If Buyer's principal place of business is located outside of the United States of America, then all disputes arising out of or in respect of this Agreement shall be determined by arbitration administered by the International Centre for Dispute Resolution in accordance with its International Arbitration Rules. The number of arbitrators shall be one. The place of arbitration shall be Wilmington, Delaware, United States of America. The language of the arbitration shall be English.
- To the extent that this Warranty is inconsistent with mandatory applicable laws, this Warranty shall be deemed modified to be consistent with such mandatory applicable local laws.

SUNNA DESIGN shall, at its sole option and discretion, either repair or replace with a comparable product, or give a credit to Buyer ("Remedy"). Buyer and SUNNA DESIGN acknowledge and agree that the Remedy is SUNNA DESIGN's sole and exclusive obligation and Buyer's sole and exclusive remedy under this Limited Warranty and with respect to the Product. Where a Deficient Product is no longer being manufactured by SUNNA DESIGN, SUNNA DESIGN reserves the right to supply another type. Absence of SUNNA DESIGN's receipt of written notification within the applicable warranty period in compliance with the terms and conditions set forth herein shall constitute a waiver of all claims under the Limited Warranty.

SUNNA DESIGN's performance of a Remedy shall not cause the beginning of a new warranty period, nor otherwise extend the applicable warranty period. SUNNA DESIGN's cumulative aggregate liability under this Limited Warranty shall not exceed the original purchase price of the Product. Buyer shall bear all costs of shipment and transportation related to the repair or replacement of Deficient Product.

EXCEPT FOR THE LIMITED WARRANTY EXPRESSLY SET FORTH HEREIN, SUNNA DESIGN MAKES NO REPRESENTATION OR WARRANTY OF ANY KIND WHATSOEVER REGARDING THE PRODUCT AND DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, COURSE OF DEALING AND USAGE OF TRADE.

IN NO EVENT SHALL SUNNA DESIGN BE LIABLE FOR, AND BUYER HEREBY AGREES TO INDEMNIFY SUNNA DESIGN FROM AND AGAINST, ANY AND ALL CLAIMS AND COSTS, INCLUDING ATTORNEY'S FEES, ARISING IN ANY WAY FROM THE SALE, USE OR INABILITY TO USE THE PRODUCT, BASED ON: LOSS OF USE, REVENUE OR PROFIT; DIRECT, INDIRECT, SPECIAL, PUNITIVE, LIQUIDATED, INCIDENTAL, CONSQUENTIAL, OR ANY OTHER DAMAGE; OR INJURY TO PERSONS OR PROPERTY.

The rights, obligations and limitations contained herein are specifically negotiated as part of the agreement between the parties, and represent the specific intent to allocate risks, including those arising due to each party's own negligence or breach, and the potential of the Limited Warranty failing of its essential purpose. Neither the sales personnel of SUNNA DESIGN nor its distributors are authorized to make warranties or representations, whether oral or written about the Products beyond those set forth in these Warranty Terms and Conditions, and no other warranties are given to Buyer other than the Limited Warranty set forth herein. These Warranty Terms and Conditions constitute the final expression of the parties' agreement, and it is a complete and exclusive statement of the terms of that agreement and supersedes all prior agreements, warranties, or statements regarding Products or any warranty associated with the Products. These Warranty Terms and Conditions cannot be amended, altered or modified in any way except in writing signed by an authorized officer of SUNNA DESIGN. These Warranty Terms and Conditions shall be governed by and construed in accordance with the laws of the State of Delaware without regard to principles of conflicts of laws.

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Terms and conditions of warranty

10 Year Limited Warranty

The Company warrants that each new solar lighting system to have a component or system free from defects in materials and workmanship that performs under normal use and service. The Company will, at its option, repair or replace any system or system component that is defective in materials or manufacture within a specific timeframe after purchase. Warranties are a minimum of five (5) years, with specific items within the system noted below having additional warranty protection against failure. For full details regarding this warranty, review the Terms and Conditions below.

Item	EverGen Series	iSSL & UP Series
Solar PV Panel Output Power	20 years	10 years
Mounting Hardware	10 years	10 years
Pole (if provided)	Manufacturer's warranty	Manufacturer's warranty
LED Fixture	Manufacturer's warranty	Manufacturer's warranty
Electronics (Charge Controller, LED Driver)	10 years	10 years
Energy Storage Array (Battery)	5 years / 10 years*	10 years**

* Batteries provided by the Company have a limited warranty for battery replacement (batteries must be provided by Sunna Design), based on the date of shipment, with the following pro-rated coverage:

** This warranty is applicable for products installed in the United States and Canada only. iSSL & UP systems installed in other territories benefit from a 6 Years warranty.

5 Year EverGen Series Battery Warranty

- 0 to 36 months: 100% credit (user pays 0% of replacement battery price)
- 37 to 48 months: 40% credit (user pays 60% of replacement battery price)
- 49 to 60 months: 20% credit (user pays 80% of replacement battery price)

10 Year EverGen, iSSL and UP Series Battery Warranty

- 0 to 84 months: 100% credit (user pays 0% of replacement battery price)
- 85 to 96 months: 30% credit (user pays 70% of replacement battery price)
- 97 to 108 months: 20% credit (user pays 80% of replacement battery price)
- 109 to 120 months: 10% credit (user pays 90% of replacement battery price)

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