City of Elk Grove

MAY 5, 2014

Street Lighting Inventory Analysis

WILLDAN

Contents

1. Executive Summary: Street Lighting Inventory

The City of Elk Grove plans to install LED street lighting. Advantages of LED street lighting include improved nighttime visibility and safety (through better color rendering and more uniform light distribution), reduced direct uplight and reflected uplight (which are the primary causes of light pollution), 40 to 80 percent energy savings (depending on the existing lighting source and lighting design criteria), and 50 to 75 percent street lighting maintenance savings.

In support of this project, Willdan Energy Solutions completed a comprehensive inventory of the City's existing streetlights. Streetlight data was collected using a geographic information system (GIS) application on a wireless tablet. The collected data, an inventory of 14,550 lights, is presented in this report.

Estimated Savings Based on This Street Lighting Inventory

Willdan estimates the annual energy usage of the City's streetlights to be 9.2 million kilowatt-hours (kWh). As a result of this project, the annual energy savings are conservatively estimated to be 4.6 million kWh. These savings are equivalent to the electric energy usage of approximately 525 homes. (According to a 2012 Annual Report, the average Sacramento Municipal Utility District (SMUD) residential customer uses approximately 8,700 kWh per year.)

The annual cost of energy for the existing streetlights is approximately $488,000 (based on a calculated SMUD monthly tariff of $0.0237 per watt of connected load). The annual avoided cost resulting from this project is conservatively estimated to be $244,000.

Energy usage is estimated using the complete street lighting inventory, using the existing fixture wattage (which was obtained from the Table of Standard Fixture Wattages in the 2013 Statewide Customized Offering Procedures Manual for Business), and using 4,100 operating hours per year (per the Database for Energy Efficiency Resources, DEER). The wattage for the LED streetlights is conservatively estimated to be 50 percent of the existing streetlight wattage.

Summary of Results

Willdan's street lighting inventory increased the accuracy of the streetlight database for 42 percent of the City of Elk Grove's 14,550 streetlights. 57 percent of the streetlights in the database were confirmed to be accurate and 1 percent of the streetlights were excluded from the inventory (as those streetlights were located inside gated communities).

Category	Code in Data	Fixture Quantity	Percent of Total
Confirmed	YES	8,340	57%
Edited	YES	2,118	15%
Added	ADDED	2,161	15%
Moved	MOVE	1,315	9%
Not Found	NOT FOUND	488	3%
Not Inspected	NO	128	1%
Total		**14,550**	**100%**

Personnel

For the City of Elk Grove, Jason Latoski and Steve Gay prepared the street lighting database. John Scott and Richard Shepard, PE provided information at the kickoff. Jeff Werner, PE managed the project for the City.

For Willdan Energy Solutions, Micah Reich and Kevin Wheatley collected the data. Kit Legg, PE provided training, oversight, and quality control. Jay Martin managed the project for Willdan.

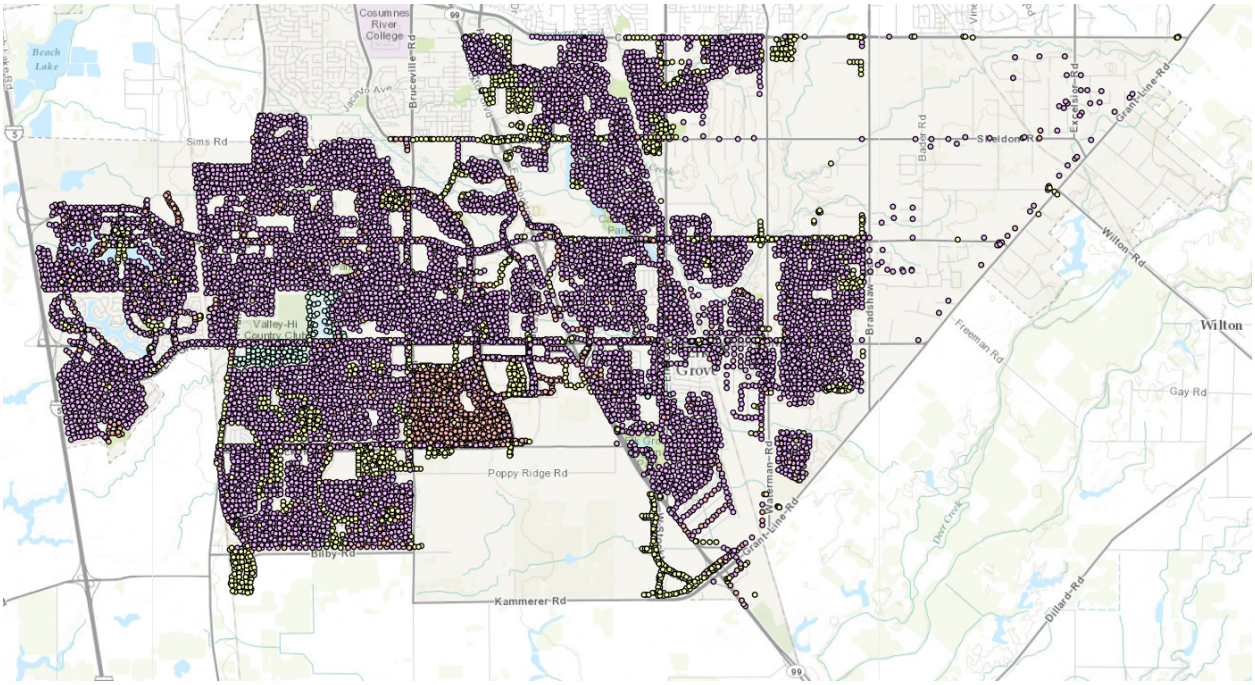


Figure 1. Map of Final Streetlight Inventory (ArcGIS Online Map)

- YES
- NO
- MOVE
- ADDED
- NOT FOUND

Figure 2. Legend of Inspection Categories on Maps

Alignment of Maps

A slight misalignment appears in the city maps in this report. For example, in figure 1 the streetlights appear displaced from Grant Line Rd. By contrast, the streetlights appear in the correct position at the map scale used for data collection, as shown in figure 3. The misalignment is a problem with the display of the data, not with the data itself.

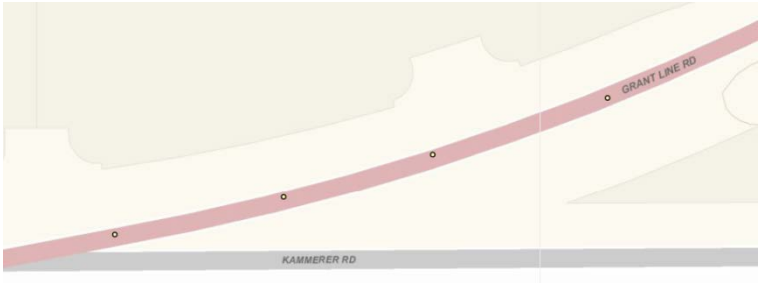


Figure 3. Streetlights Added on Median of Grant Line Rd

2. Fixture Types

Fixture Type	Code in Data	Fixture Quantity
Common Type Series A	CTA	2,144
Common Type Series B	CTB	8,296
Induction	INDUCTION	211
LED	LED	213
Laguna Ridge Series A Dual	LR2	94
Laguna Ridge Series A	LRA	431
Laguna Ridge Series B	LRB	795
Laguna West Dual	LW2	418
Laguna West Series B	LWB	1,056
Old Town Series B	OTB	37
Other or Unknown	OTHER	109
Power Pole Attached	PPA	130
Not Found		488
Not Inspected		128
Total		**14,550**

2.1. Common Type Series A (CTA)

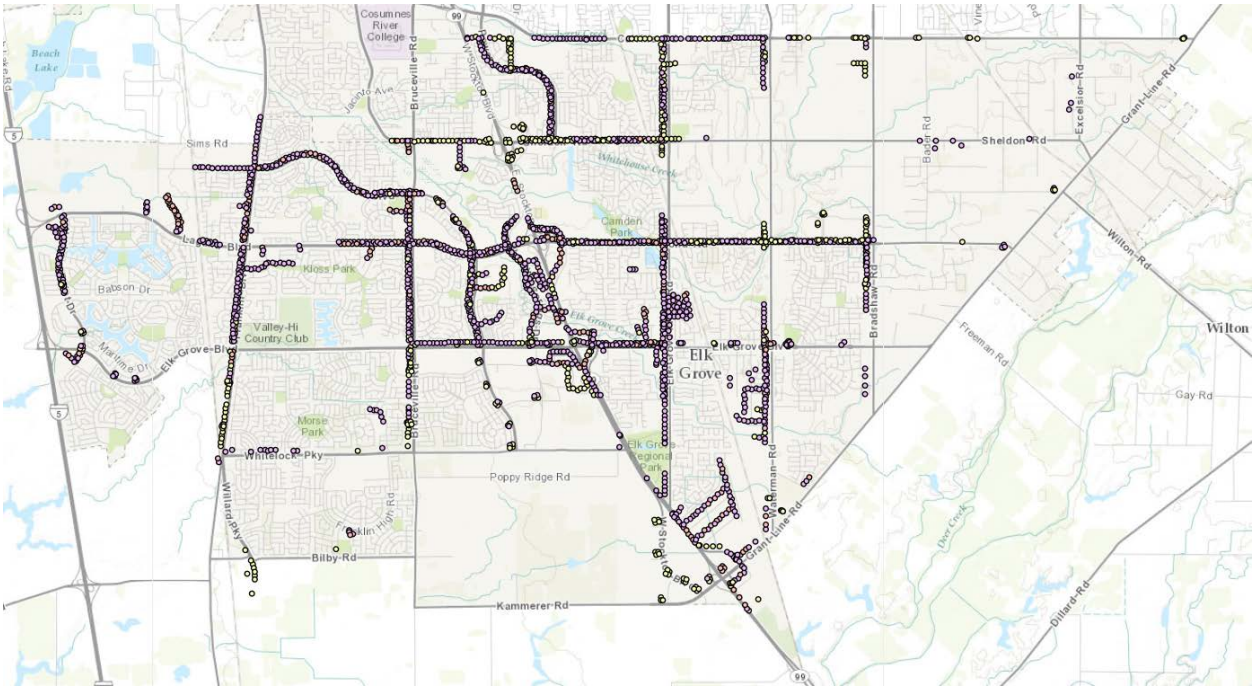


Figure 4. Map of Common Type Series A Streetlights

2.1.1. Quantity and Description

2,144 streetlights are Common Type Series A (CTA). The existing specification is a 150 watt high pressure sodium (HPS) or 250 watt HPS fixture mounted on an 8 foot arm at a height of 30.75 feet. (See Standard Drawing SL-1.)

CTA streetlights typically have a wattage label on the fixture, as shown in figure 5. In addition the specified wattages, several other wattages were found during the inventory.

Wattage	Quantity
100	64
150	781
200	344
250	935
310	11
400	9
Total	**2,144**

Figure 5. 200 watt Label

Willdan assumes the following for the non-specified fixtures wattages:

- 100 watt CTA streetlights are primarily found in residential areas, typically served by 100 watt Common Type B streetlights as described below. According to the Standard Drawings, CTA streetlights are not specified for single family and duplex family zoning or for ≤56 foot right-of-ways.
- 200 watt CTA streetlights are primarily found mounted to signal masts above traffic lights. Willdan understands that this was by design to increase safety at the intersection.

- 310 watt CTA streetlights are mounted to signal masts above traffic lights. Willdan understands that this was by design to increase safety at the intersection.
- 400 watt CTA streetlights are mounted to signal masts above traffic lights. Willdan understands that this was by design to increase safety at the intersection.

Figure 6. 150 watt CTA Streetlights on Big Horn Boulevard

2.1.2. Attachments on Poles

73 CTA streetlights have attachments, such as cameras or wifi devices.

2.2. Common Type Series B (CTB)

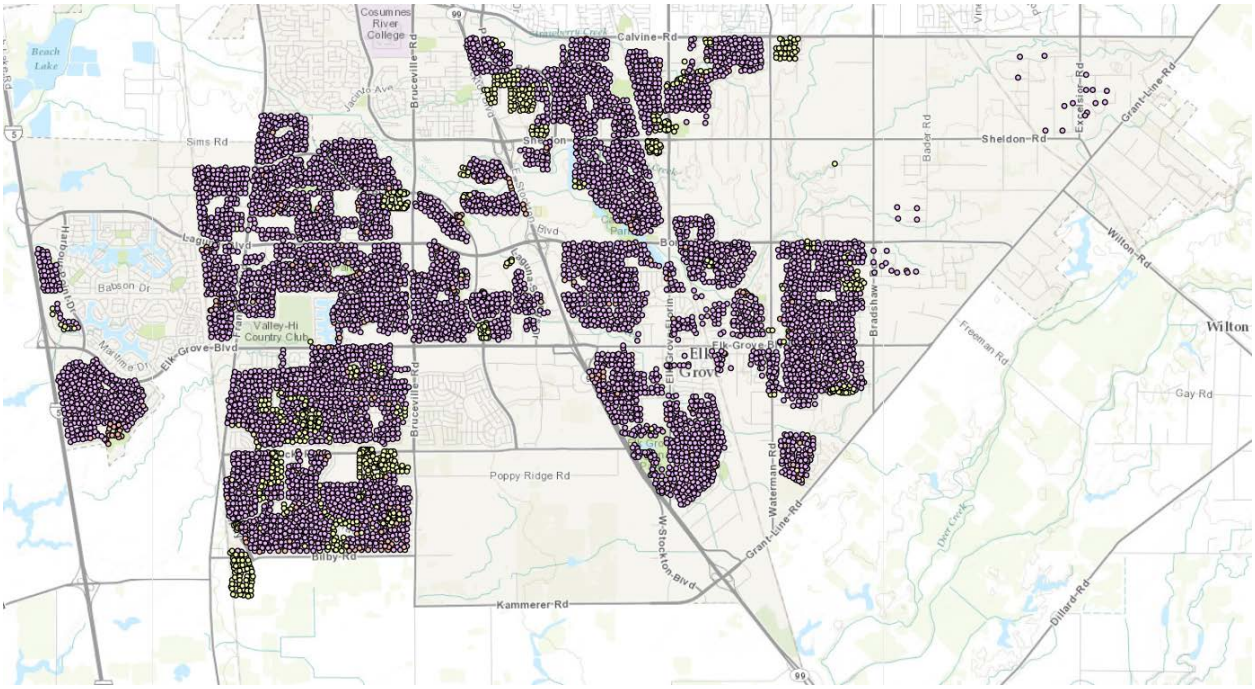


Figure 7. Map of Common Type Series B Streetlights

2.2.1. Quantity and Description

8,296 streetlights are Common Type Series B (CTB), the most numerous type. The existing specification is a 100 watt HPS fixture mounted as a post-top at a height of 21 feet. (See Standard Drawing SL-1.) CTB streetlights are found in both streets and parks.

2.2.2. Attachments on Poles

Eight CTB streetlights have a wifi or other attachment. Two CTB streetlights have traffic signals on Elk Grove Boulevard, east of Waterman Road (as shown in figure 8) the mounting type was recorded as signal mast.

2.2.3. Data in Photographs

CTB streetlights in parks often have multiple labels as shown in figure 9 this data was collected in photographs. An obstruction was often photographed in lieu of writing a descriptive note; however 60 streetlights include notes regarding obstructions, such as trees. Finally, four streetlights include a note about damage or exposed wires.

Figure 8. CTB Streetlight With Traffic Signal

Figure 9. Labels in Park

2.3. Induction Lighting

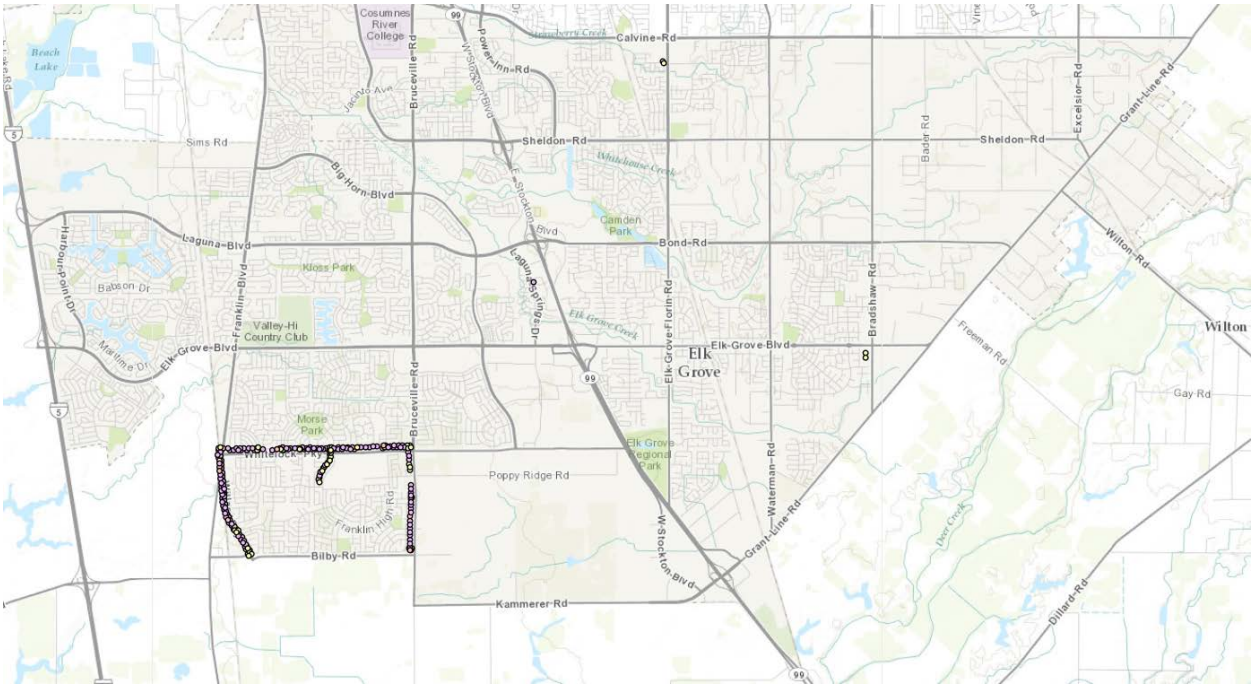


Figure 10. Map of Induction Streetlights

2.3.1. Quantity and Description

211 streetlights use induction fixtures, of which 68 are 100 watt, 58 are 150 watt, and 86 are 200 watt. Further investigation is required to identify the appropriate LED replacements. 49 induction streetlights are on mounted on signal masts and the remaining induction streetlights are mounted on series A poles. 85 watt induction streetlights were assumed to be each equivalent to 100 watt induction streetlights.

2.3.2. Attachments on Poles

Five induction streetlights have an attachment.

Figure 11. Induction Streetlight on a Signal Mast

2.4. LED Streetlights

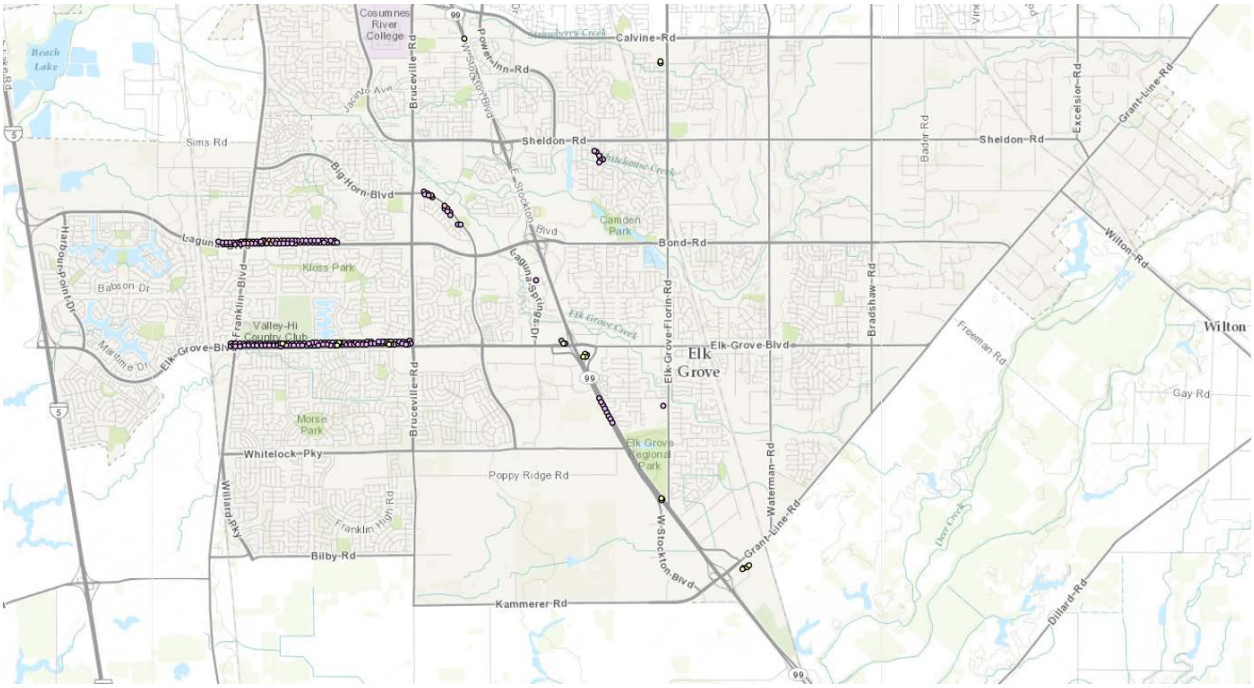


Figure 12. Map of LED Streetlights

2.4.1. Quantity and Description

213 LED streetlights are already in use. Several LED fixtures were installed at test locations as part of this project. Presumably, LED streetlights will not be replaced.

2.4.2. Attachments on Poles

Seven LED streetlights have an attachment.

Figure 13. LED Streetlight

2.5. Laguna Ridge Dual (LR2)

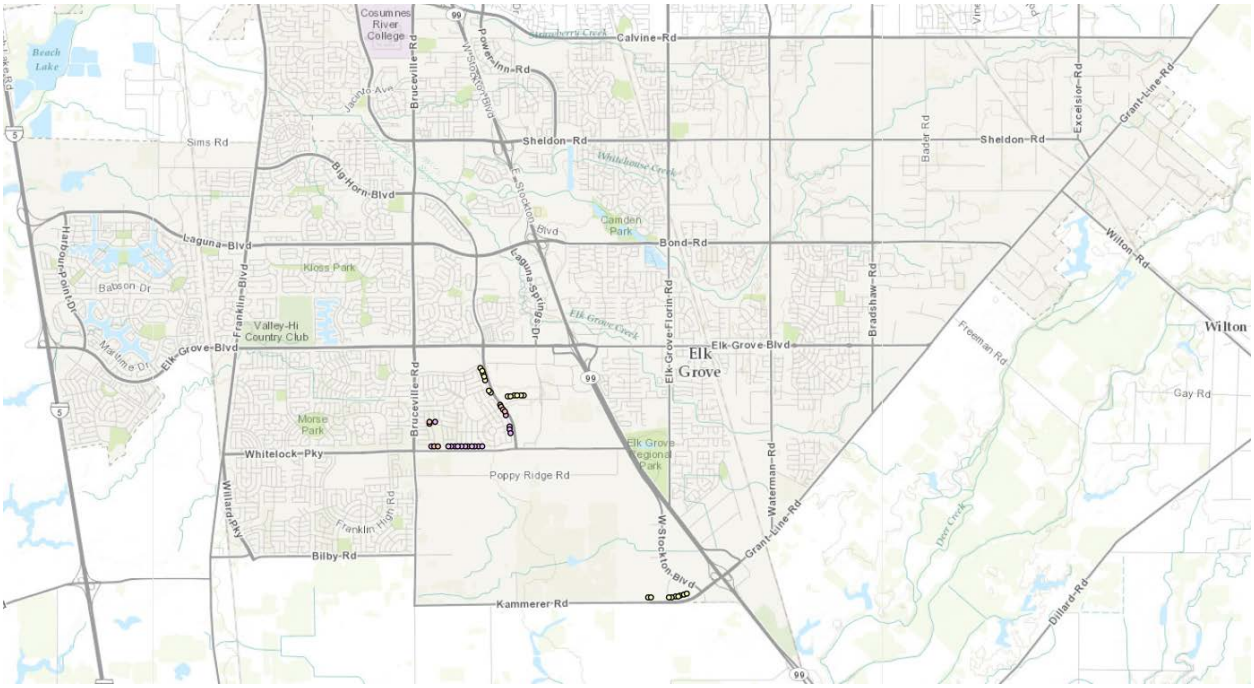


Figure 14. Map of Laguna Ridge Dual Streetlights

2.5.1. Quantity and Description

94 streetlights are Zone 2 Dual Arm (Laguna Ridge Dual, LR2). The existing specification is a 250 watt HPS fixture mounted on a 4 foot arm at a height of 28 feet. (See Standard Drawing SL-30.)

Six LR2 streetlights are in the parking lot of the Arbour Lodge at Glenbrooke, 7700 Del Webb Blvd.

Figure 15. LR2 Streetlights on Median With LRB Streetlights on Sidewalk

2.6. Laguna Ridge Series A (LRA)

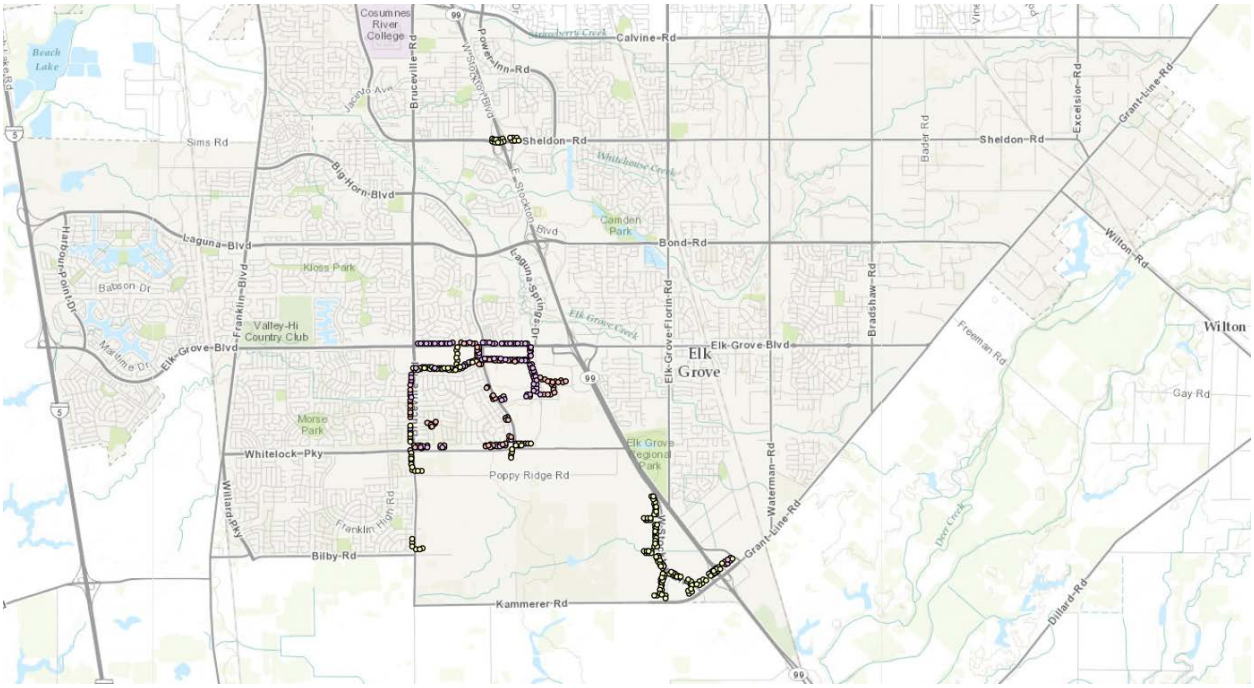


Figure 16. Map of Laguna Ridge Series A Streetlights

2.6.1. Quantity and Description

431 streetlights are Zone 2 Series A (Laguna Ridge Series A, LRA). The existing specification is a 250 watt, 150 watt, or 100 watt HPS fixture mounted on a 4 foot arm at a height of 28 feet. (See Standard Drawings SL-31 and SL-36.) Some LRA streetlights are installed outside Zone 2.

2.6.2. Attachments on Poles

One LRA streetlights has an attachment.

Figure 17. LRA Streetlights

2.7. Laguna Ridge Series B (LRB)

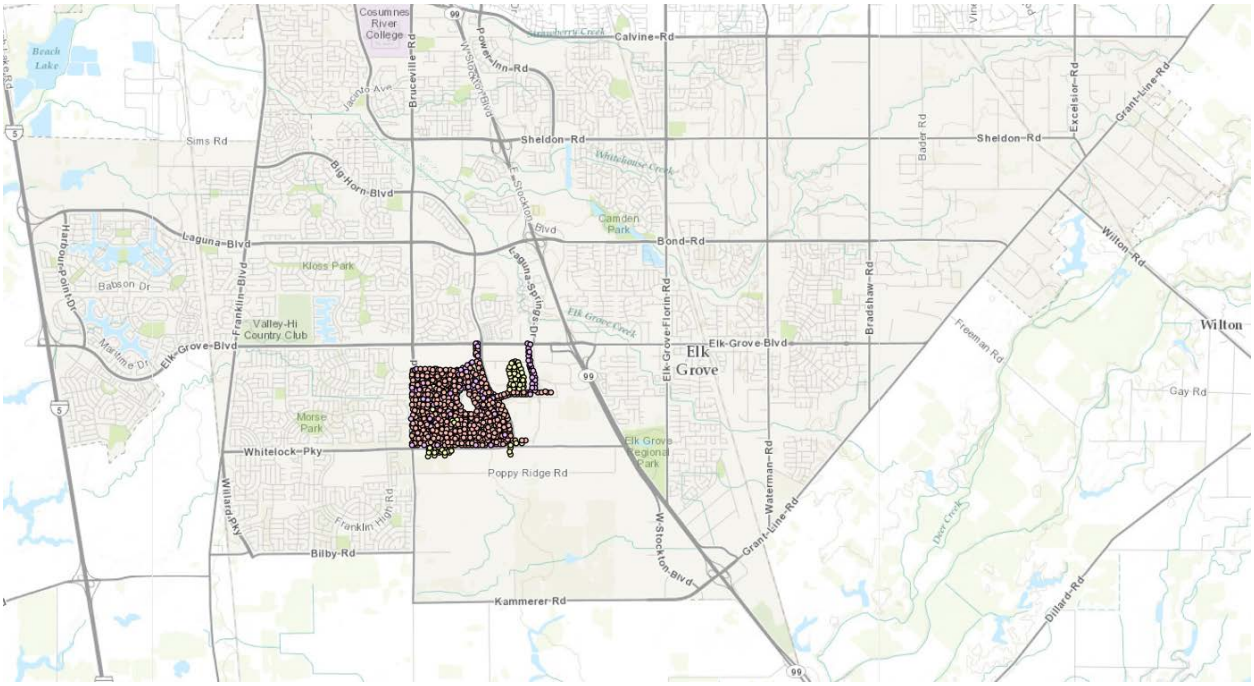


Figure 18. Map of Laguna Ridge Series B Streetlights

2.7.1. Quantity and Description

795 streetlights are Zone 2 Series B (Laguna Ridge Series B, LRB). The existing specification is a 150 watt or 100 watt HPS fixture mounted as a post-top at a height of 14 feet. (See Standard Drawings SL-34 and SL-36.)

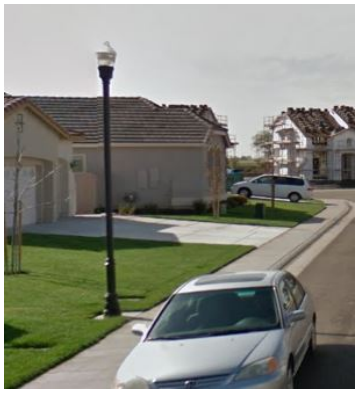


Figure 19. LRB Streetlights

2.8. Laguna West Dual (LW2)

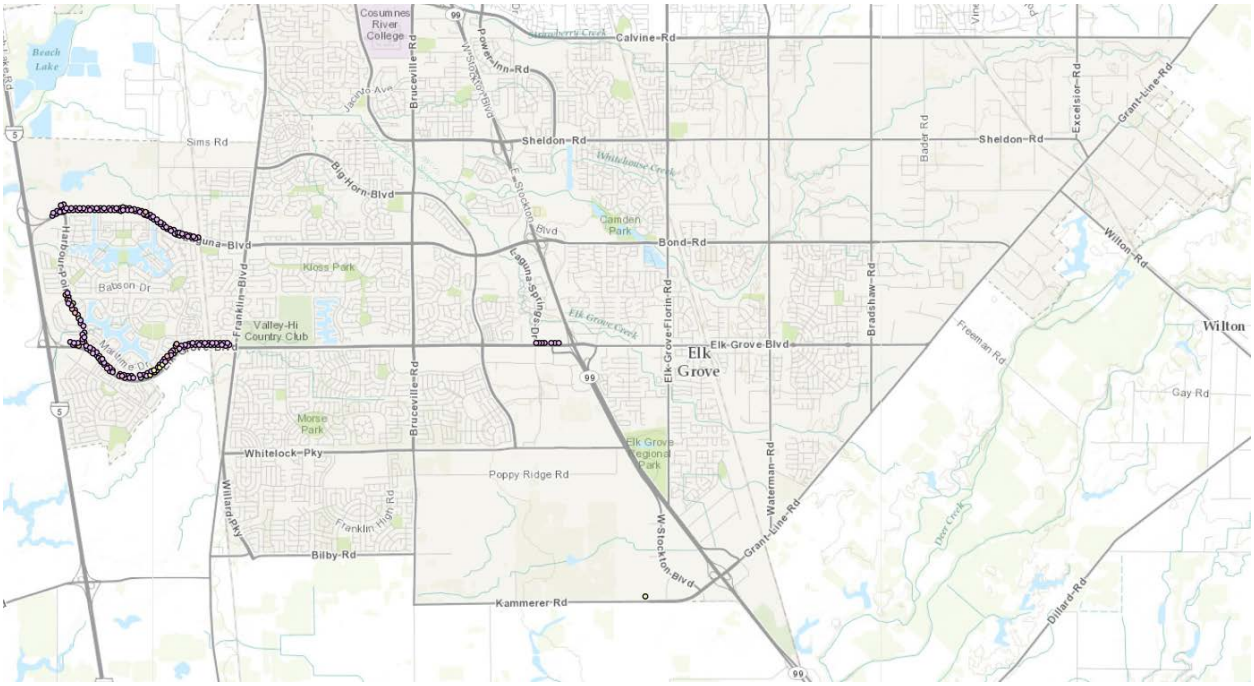


Figure 20. Map of Laguna West Dual Streetlights

2.8.1. Quantity and Description

418 streetlights are Laguna West Dual (LW2). The existing specification is two 150 watt HPS fixtures mounted on short arms at a height of 20.5 feet. (See Standard Drawings SL-40.)

32 streetlights were identified as CT2 in the original data. They were found to be LW2 fixtures on signal masts instead of the usual pole. Similar streetlights were identified correctly as LW2.

2.8.2. Attachments on Poles

One LW2 streetlights has an attachment.

Figure 21. LW2 Streetlight on Elk Grove Blvd

Figure 22. LW2 Streetlight on Signal Mast

2.9. Laguna West Series B (LWB)

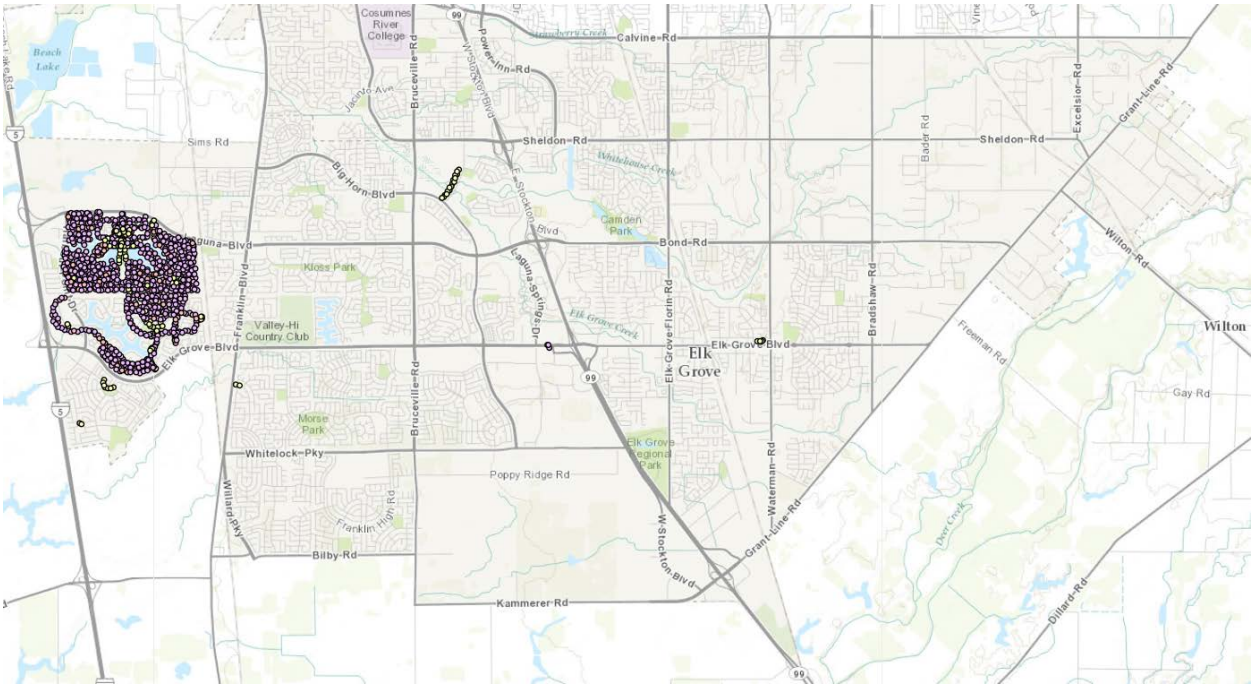


Figure 23. Map of Laguna West Series B Streetlights

2.9.1. Quantity and Description

1,056 streetlights are Laguna West Series B (LWB). The existing specification is a 150 watt HPS fixture mounted at a post-top height of 12 feet. (See Standard Drawings SL-42 and SL-43.)

Some LWB streetlights are outside Laguna West, notably on Lewis Stein Road.

Figure 24. LWB Streetlight on Lewis Stein Road

2.10. Old Town Series B (OTB)

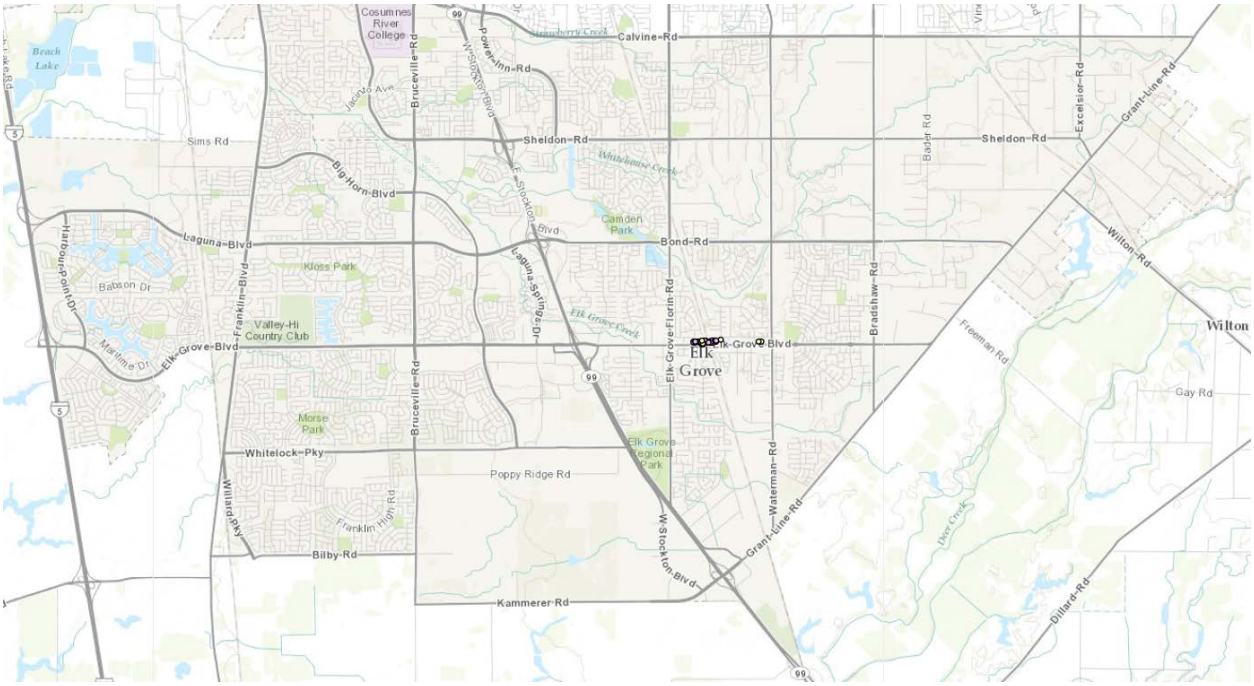


Figure 25. Map of Old Town Series B Streetlights

2.10.1. Quantity and Description

37 streetlights are Old Town Series B (OTB). The existing specification is a 100 watt HPS fixture mounted as a post-top at a height of 10.5 feet. (See Standard Drawings SL-46 and SL-47.)

52 OTB streetlights in the database were not inspected because they are in a gated community not in Old Town.

Figure 26. OTB Streetlights on Elk Grove Blvd

2.11. Other Streetlights

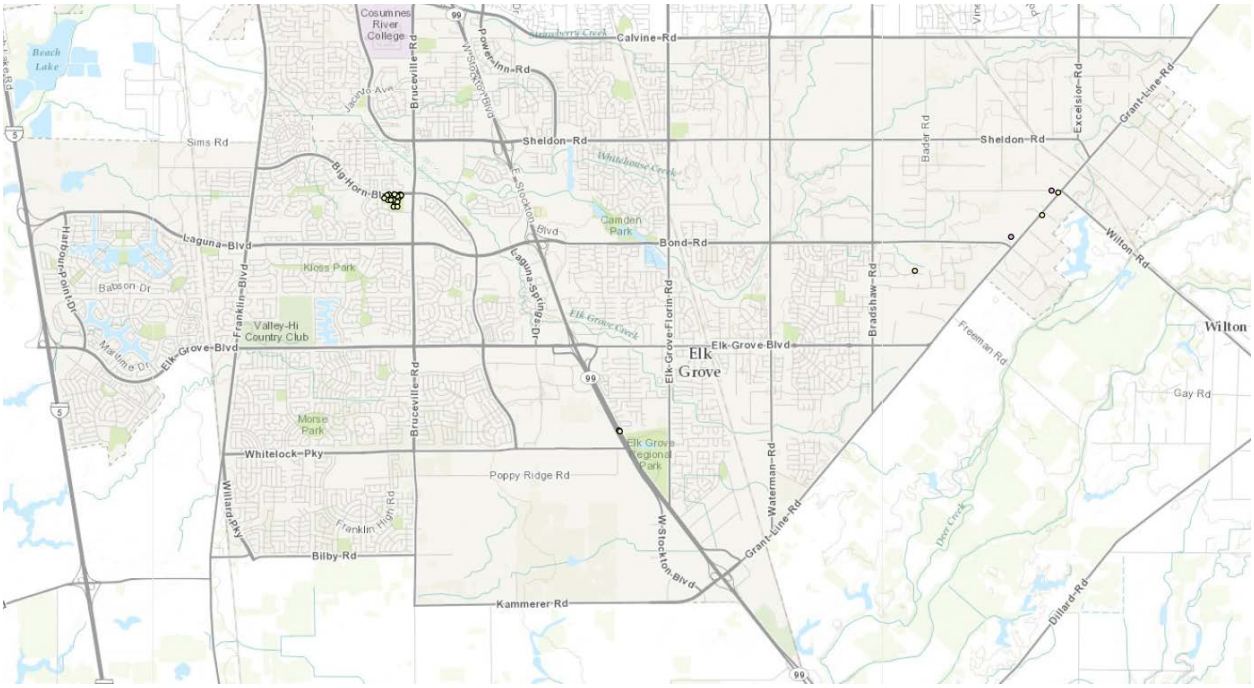


Figure 27. Map of Other Streetlights

2.11.1. Quantity and Description

Other lights include 31 lights for the playing fields at Laguna Community Park, two lights in a parking lot at Elk Grove Regional Park, four lights that are unconventional power pole attachments, and one light which might be privately owned.

After a thorough inventory of the first park, the City provided instructions to include pathway and parking lot lighting in parks but to exclude the lighting for playing fields.

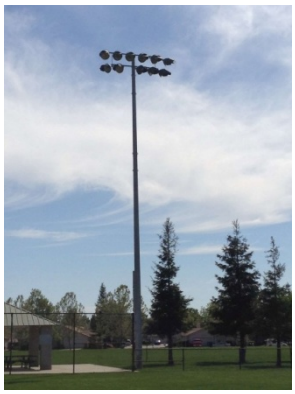


Figure 28. Field Light at Laguna Community Park

Figure 29. Other Light in the Parking Lot of Elk Grove Regional Park

2.12. Power Pole Attachment (PPA)

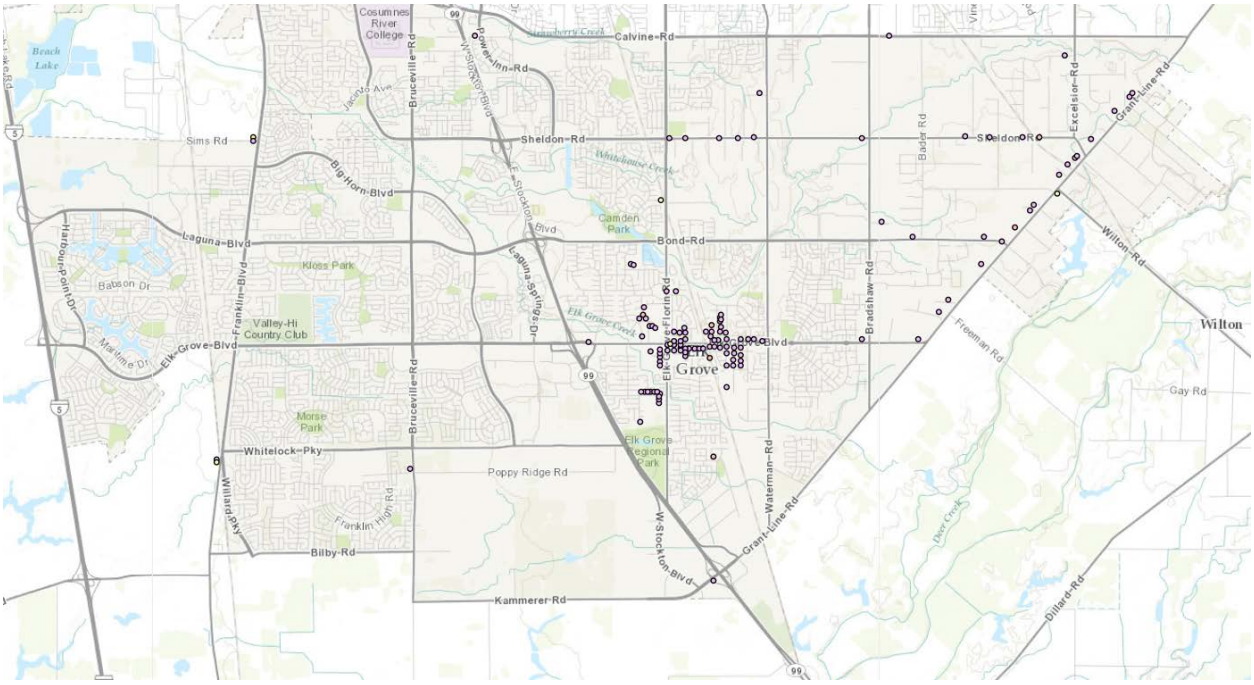


Figure 30. Map of Power Pole Attachment (PPA) Streetlights

2.12.1. Quantity and Description

152 streetlights are attached directly to power poles and classified as Power Pole Attachments (PPA). The type of fixture varies from CTA to hooded incandescent fixtures. Willdan's understanding is that very few of these fixtures are owned by the City. Further investigation is required in order to determine the appropriate action for these streetlights.

Figure 31. Power Pole Attached Streetlight

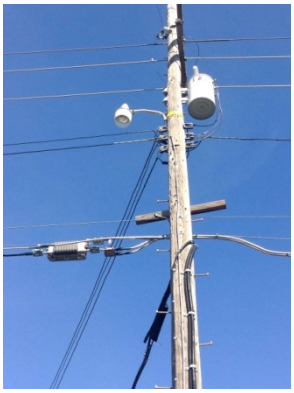


Figure 32. Less Common Power Pole Attached Streetlight

2.13. Streetlights Not Inspected

Some streetlights in the database were not inspected, at the direction of the city:

- Laguna Estates South (south of Elk Grove Blvd, east of Franklin Blvd)
- Laguna Lake (north of Elk Grove Blvd midway between Franklin Blvd and Bruceville Rd)

The lights in the parking lot at Elk Grove High School were not inspected, as shown in figure 33. The three lights in the database did not correspond to the numerous parking lot lights.

Other lighting was not in the inventory and was not added to the inventory:

- The Aspens, a gated community along Tamarindo Lane
- Monterey Village, a gated community at Franklin Blvd and Whitelock Pkwy
- Park & Ride at the corner of East Stockton Blvd and Geneva Pointe Drive

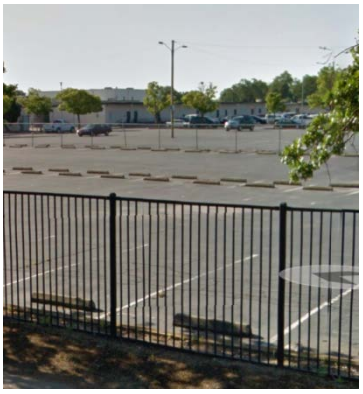


Figure 33. Light in High School Lot

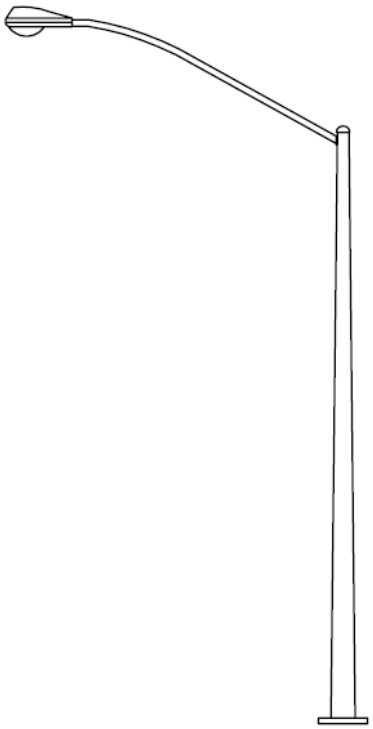
3. Appendixes

3.1. Database Input Fields for the GIS Application

Data field	Allowed values (and notes)
Inspected	No (default), Yes, Added, Moved, Not Found
Inspected_Date	(today)
Pole_ID	(Edit or enter.)
Mounting	Power Pole, Signal Mast, Sub Type A (arm), Sub Type B (post-top), Other
Street_Light_Type	CTA, CTB, LR2, LRA, LRB, LW2, LWB, OTB, PPA, Other, Induction, LED
Lamp_Wattage	100, 150, 250, 400, Unknown, Other (Some fixtures have a wattage label that is clearly visible.)
Fixture_Num	1, 2, etc.
Accessories	Wifi, Red Light Camera, Traffic Device, Other (Some fixtures have an accessory mounted on or wired to the fixture.)
Pole_Labeled	Yes, No (The city requested this field.)
Pole_Label_Type	Cnty, City, None, Other (The city requested this field.)
Other_Descrip	(Enter a description of the accessory or any other notes.)
Notes. Location is shown on a map (and can be moved). Photos can be attached.	

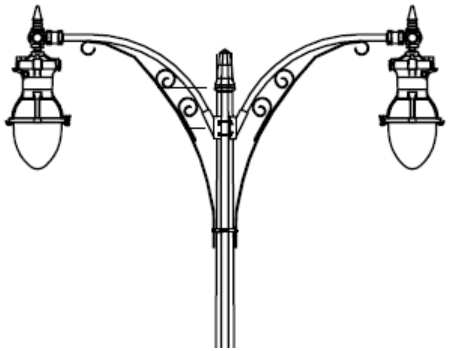
3.2. Streetlight Type Reference Sheet

CTA: Common Type A

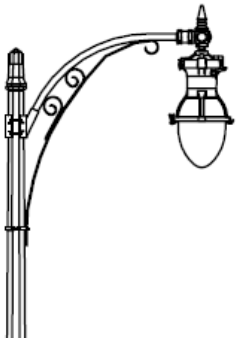


CTB: Common Type B

LR2: Laguna Ridge Dual

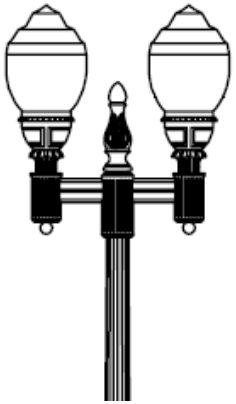


LRA: Laguna Ridge A



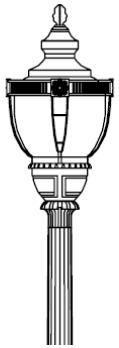
LRB: Laguna Ridge B

LW2: Laguna West Dual



LWB: Laguna West B

OTB: Old Town B



Other Examples

MOUNTING: POWER POLE

STREET LIGHT TYPE: PPA

MOUNTING: SIGNAL MAST

STREET LIGHT TYPE: LED

ACCESSORIES: OTHER

OTHER DESCRIP: Wifi, traffic device

Sources: **Images from the City of Elk Grove Public Works Dept. and Google Street View.**

3.3. Maps of Streetlight Inspection Categories

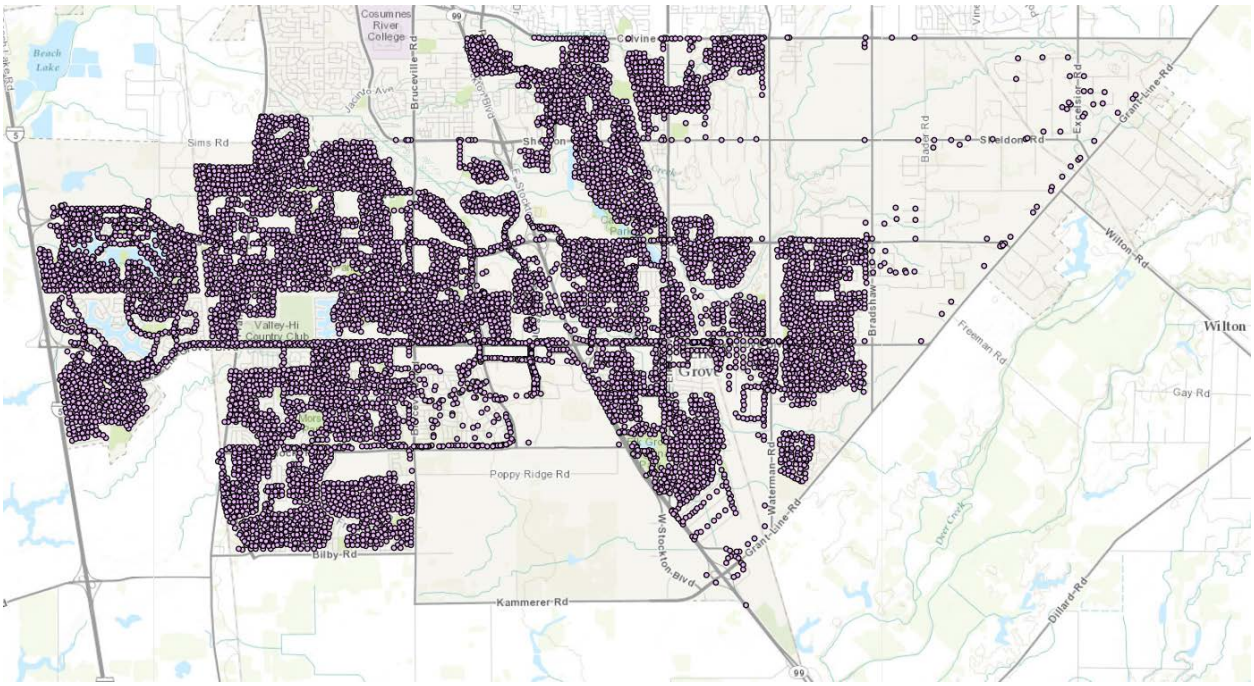


Figure 34. Map of Streetlights Confirmed and Edited

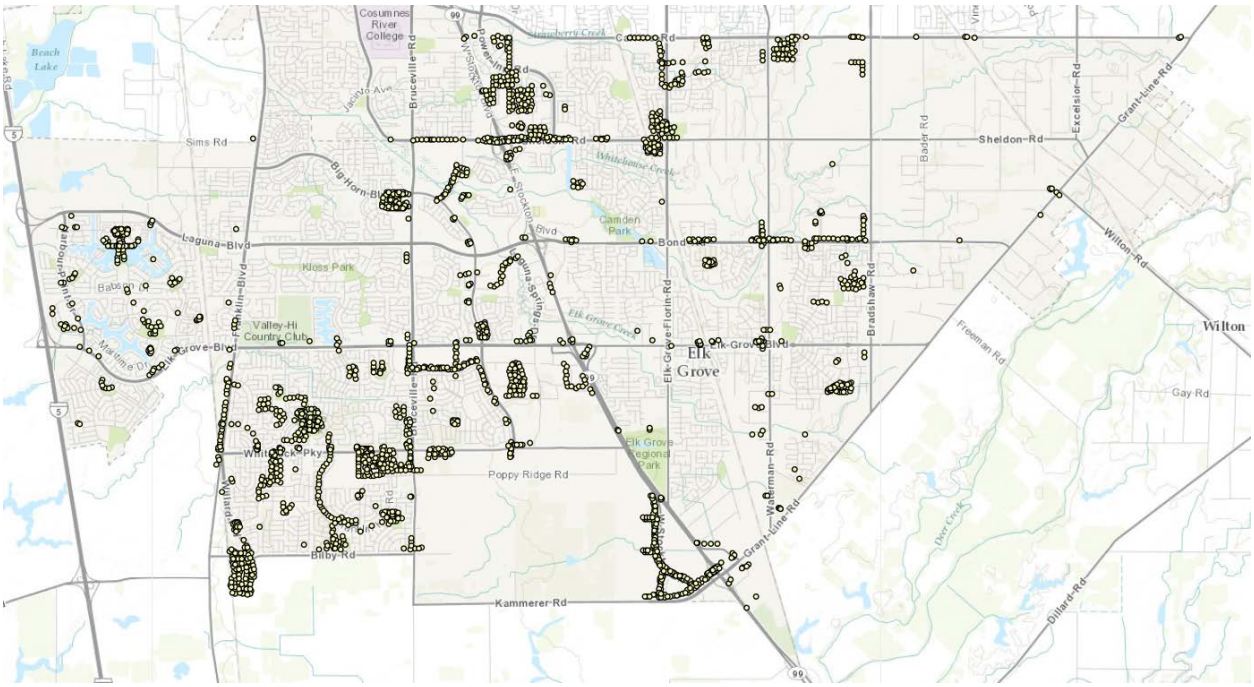


Figure 35. Map of Streetlights Added

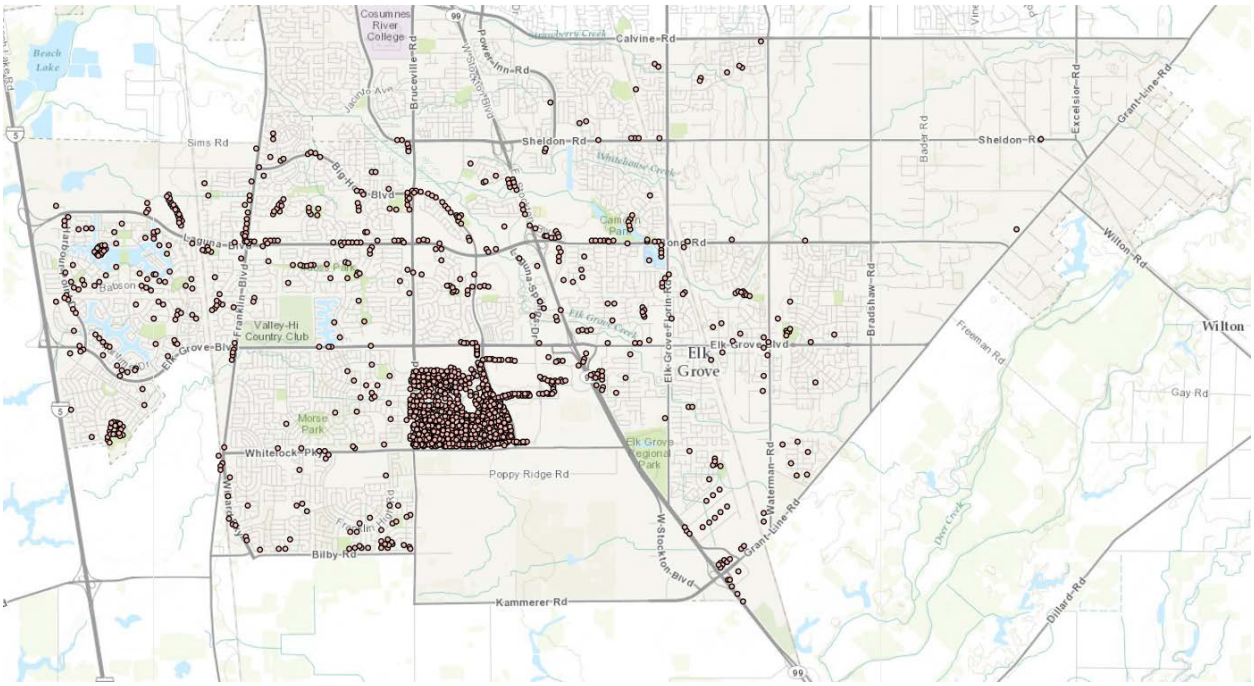


Figure 36. Map of Streetlights Moved

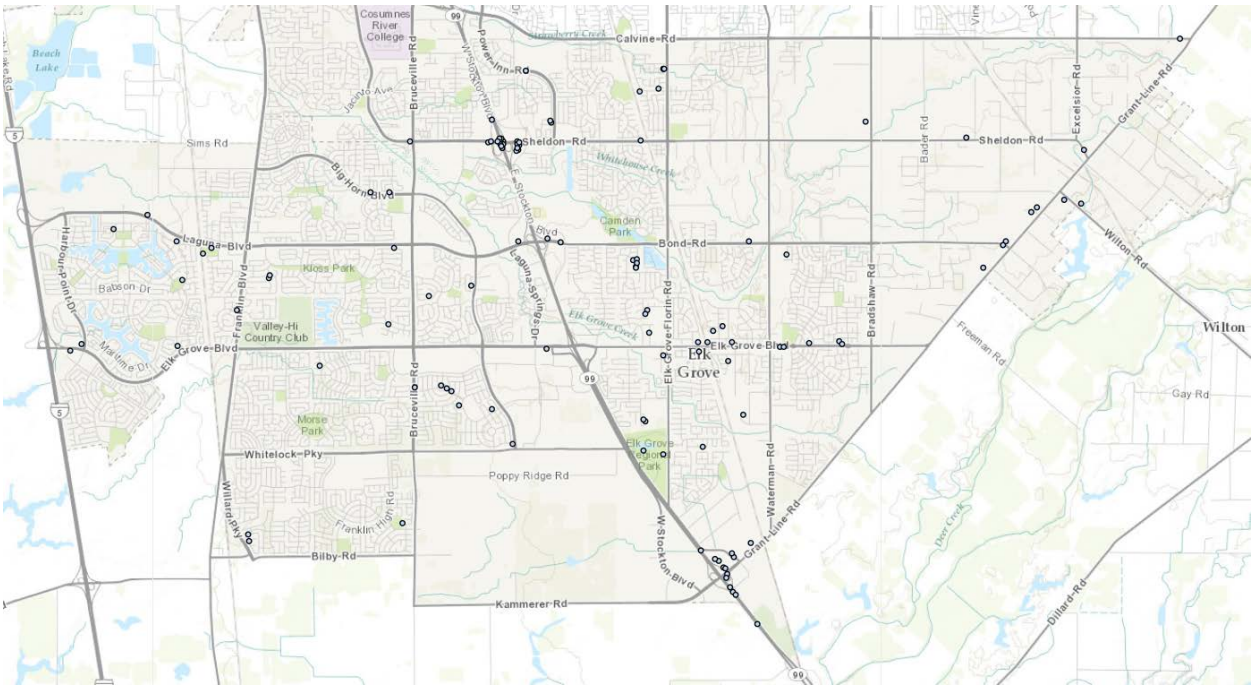


Figure 37. Map of Streetlights Not Found

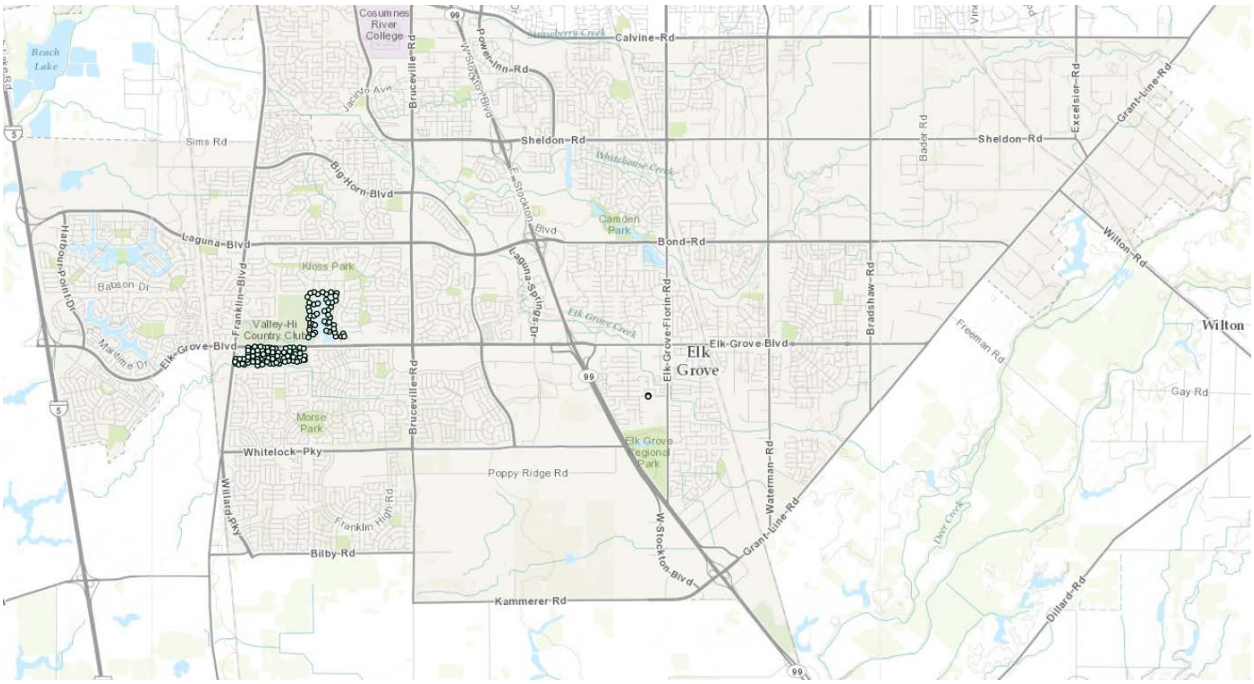


Figure 38. Map of Streetlights Not Inspected

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