

**RIDGWAY COMPREHENSIVE PLAN**  
**LIGHTING ELEMENT**

Town of Ridgway  
Final Plan: May 2010

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## I. Introduction

Ridgway is a dark-skies community valuing the appeal of the night sky with an appreciation for appropriate and efficient illumination for public way-finding and safety. The majority of lighting throughout the Town complies with these values. With the variety of fixtures, bulbs, poles and placement patterns that now exist, and the limited resources available to maintain, repair, replace, and inventory these components, there is a desire to standardize illumination on public rights-of-way for both residential and commercial applications and to more clearly define roles and responsibilities. In addition, as more efficient and cost-effective technologies arise, the Town wishes to be in a position to capitalize on these efficiencies.

In 2006, the Town completed a Downtown Streetscape Plan for the Historic Business District. The plan received significant community input and includes recommendations on street lighting layout with general fixture and pole design concepts for the downtown area. Pursuant to the plan recommendations, a Lighting Committee was formed to further define lighting preferences for the business core, residential, commercial and highway applications, and pedestrian illumination of the Uncompahgre Trail as it traverses Hartwell Park. The Committee was tasked with developing town-wide standards, including fixture, bulb, pole, and placement preferences, toward the goal of creating a simple and efficient process for inventory, maintenance, repair and replacement throughout Town.

This plan considers lighting in the public rights-of-way as well as high profile illumination on private property. The focus is on street, pedestrian, public spaces including parks and trails, and parking lot fixtures. Provided is a summary of existing lighting followed by a town-wide plan, inclusive of general recommendations and specifications for future lighting. While the original intent was to provide more specific detail, the current economy and rapidly changing technology with increasing efficiencies and decreasing costs, are more conducive to leaving options open.

It is understood that the current provisions for outdoor lighting in the Municipal Code §6-5 are sufficient whereby existing, private lighting that is affixed to structures or used in landscaping are largely compliant and shall remain at the discretion of the property owner. As such, smaller-scale, private lighting is not included with this plan. The term “lighting” is used to loosely refer to poles, fixtures and lamps although many other factors such as location, light distribution, color, spectrum, brightness, and efficiency are considered with the overall evaluation and recommendations.

The Lighting Committee invested a significant amount of time and effort over many months to develop this plan. Municipal lighting schemes can be very complicated. There are many factors to consider and evaluate to arrive at a preferred and widely-accepted plan. Consolidated Electrical Distributors (CED) in Montrose, in collaboration with regional lighting sales representatives provided technical information to the group, to educate the committee on lighting and LED technology. In addition, Alternative Power Enterprises of Ridgway presented grid-tied solar power information and LED illumination alternatives. Sensible and cost effective solutions are put forth in a simplified and manageable manner, with respect for a rapidly progressing industry.

Committee members include Town Councilors, a Community Member, and Town Staff:

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This document is organized into 15 sections:

- I. Introduction
- II. Background Information
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## II. Background Information

The Town of Ridgway has a variety of light poles, fixtures and lamps on both public and private properties including streets, pathways, parking areas, and other public spaces. While new development is responsible for the identification, installation, and placement of fixtures, the local power utility provider, San Miguel Power Association (SMPA), coordinates with Town staff to repair and replace street lights. As needed, the Town contracts with a local electrician to service lighting in the public rights-of-way. There is no lighting plan, standards or specifications identifying new or replacement lighting (bulbs, fixtures, poles, placement, installation heights, bury depths, etc.). Town staff is ill-equipped to install, maintain or repair light poles, fixtures and lamps above 10' in height, and relies on SMPA or local contractors for these services.

In 2002 a citizen-initiated effort to promote dark-skies and energy-efficiency brought together the Town, SMPA and community members to replace the inefficient, mercury vapor and ranch-style street lights with more efficient, dark-skies compliant General Electric 250 Cobra Head Luminaries (Cobra Heads) and high-pressure sodium lamps (HPS). The Cobra Heads in the residential neighborhoods contain 50 watt HPS lamps, and fixtures along the state highways contain 70 watt HPS lamps. These are now the primary street lights throughout Town, in both residential and commercial areas.

The 2006 Downtown Streetscape Plan provides recommendations for preferred street and pedestrian lighting locations as well as fixture and pole styles for the historic downtown area. As an initial step toward realization of the Streetscape Plan, and in consideration of a future parking lot, the Town Council prioritized the purchase and installation of pedestrian lighting for the Uncompahgre Trail through Hartwell Park from the Post Office to Town Hall and Charles Street, connecting the downtown area to the public library and public parking. Although this pedestrian lighting was budgeted for completion in 2009, budget constraints prohibited realization of the project.

Within the past decade there have been efforts to increase the overall efficiency of lighting throughout Town, from replacement of mercury vapor bulbs to the retrofit of a few incandescent bulbs to compact fluorescents in the River Park subdivision. During the 2008 holiday season, with the support of San Miguel Power, traditional holiday string lighting in Hartwell Park was replaced with light-emitting diode (LED) strands. The Town realized cost and energy savings with the transition to LED in accordance with other energy savings measures including a decrease in the overall amount of holiday lighting as well as a reduction in the hours of illumination (Attachment A).

116 uniquely located fixtures, including 15 different fixture styles, variably sized metal and wooden poles, and 5 different lamp types are identified within the Town. The majority of fixtures are GE Cobra Heads on wooden poles approximately 25' above ground, with 50 watt HPS lamps. 67 of the fixtures are located on public property (Town Rights-of-Way), 46 fixtures are on private property and 3 are on property belonging to Ouray County. The inventory, photos and location map are appended to this plan (Attachments B, C, and D).

Generally, in newer residential subdivisions the street lights are located at road intersections although this is not always true. There are no apparent patterns for spacing, light distribution, or fixture height. Pedestrian lighting is non-existent, although there are some low-level, non-compliant bollards at the Town Hall parking lot and the pedestrian bridge in Rollans Park. Vista Terrace, Sweetwater, and RiverSage Subdivisions are more rural in nature, and do not have street or pedestrian lighting, in order to minimize lighting impact in these areas, which are higher in elevation and very visible from the Town core.

Street lights in the Historic Residential and Business Districts are generally located at street intersections and alternating street sides although this is not consistent. Lights are commonly at least 300' apart with a much greater span in a number of areas. Street lights along Sherman Street are more luminous and frequent, located about every 140' – 350'. Most alley intersections along Highway 62 through downtown are illuminated, usually alternating between the north and south sides.

The following areas have limited or no functional lighting: Highway 62 from Liddell Street to Highway 550, North Railroad Street, Amelia Street (north of Charles and South of Marie Street), most of Ridgway USA to the north, much of the Historic Residential area between North Amelia and Laura Streets at Otto and Frederick (undeveloped parcels), and the following subdivisions: Cedar Creek Minor, Le Ranch, Cottonwood, Liddell-Stanton, and Solar Ranches. In general, the Town is quite dark.

### III. Definitions

Color Rendering Index (CRI) – A relative measure of the ability of a lamp to render colors in comparison to an agreed upon “good” color rendering source such as incandescent or daylight. (i.e.: light that provides the ability to distinguish colors). A higher CRI yields greater color distinction.

Footcandle – The amount of light falling on a surface; One footcandle is defined as one lumen per square foot and roughly equivalent to the illumination of a full moon on the ground

Lamp – Light emitting device, referred commonly here as a bulb (e.g. (types): High Pressure Sodium, Light Emitting Diode, Incandescent, Compact Fluorescent, etc.)

Lamp Lifetime – Number of hours the lamp will output a desired amount of light or lumens

Leadership in Energy and Environmental Design (LEED) footcandle recommendations:

LZ1/Light zone 1 Dark (Park and Rural Settings): 0.01 footcandles (fc)

LZ2/Low (Residential Zones): 0.1 fc

LZ3/ Medium (Commercial/Industrial, High Density Res): 0.2 fc

LZ4/ High (Major City Centers): 0.6 fc

Lumens – Unit of luminous flux; used to measure the amount of light emitted by lamps

Lumens per Watt - the amount of light produced for each watt of electricity that is consumed, known as luminous efficacy; high luminous efficacy is desirable (eg: 75)

Luminous Efficacy – see ‘lumens per watt’

Pole Height – Vertical distance from the light source to the ground

Watts – A derived unit of power, measuring the rate of energy conversion; volts x amperes = watts

#### **IV. Scope and Purpose**

This plan memorializes the history and presence of lighting in Ridgway, and identifies goals and objectives for Town-wide illumination. It addresses illumination of residential and commercial streets, pedestrian pathways, parks and trails, parking areas, and public spaces. Both public and private properties are evaluated with recommendations to guide development, and to encourage compliance for existing, nonconforming lighting. This is a guidance document, not intended to supersede the existing lighting regulations of the Town, but rather to expand the scope of what has previously been considered, and to formalize community desires. The Town may wish to consider adoption of standards and specifications pursuant to the recommendations.

Town-wide lighting is inventoried and evaluated for compliance, function, placement, and ownership. Standards and specifications for residential and commercial lighting are offered to guide future growth and provide direction for replacing noncompliant lighting. In keeping with the goals of sustainability and efficiency, lamp alternatives and life-cycle costs are presented. Guidance on responsibilities for installation, inventory, maintenance, repair, and replacement are put forth. Finally, priorities for implementation of the plan are suggested, including funding opportunities for plan realization.



## V. Objectives

The following objectives, in no particular order, were established to guide the discussion and plan outcomes. More specific goals are defined within the plan for each area, as appropriate.

### Energy-Efficiency and Expenditures

Create a balance between available technologies and efficient layout patterns to maximize desired illumination and energy savings, including calculations and comparisons of energy and monetary costs associated with the technologies and patterns

### Regional Cooperation

Cooperate with local utility provider and regional governments for maximum cost and energy savings

### Illumination and Dark-Skies

Optimize illumination with Dark Skies and Outdoor Lighting Ordinance compliance, including evaluation of current lamp types and fixture heights for preferred spectrum, color, brightness and distribution

### Safety

Optimize safety with appropriate (not necessarily more or brighter) lighting for cars, pedestrians, and bicycles

### Aesthetics

Select visually appealing and appropriate lighting for Ridgway

### Responsibility

Clarify responsibilities for purchase, installation, maintenance and repair, including delineation of public and private responsibilities

### Consistency and Efficiency

Identify standard fixtures for commercial and residential applications to provide clear direction on new street and pedestrian lighting for ease of inventory, installation, maintenance and repair

### Inventory

Identify a phasing plan for retrofit of existing fixtures and bulbs to more efficient illumination mechanisms, as appropriate

### Location

Identify preferred locations for lighting: curbs, intersections, etc.

### Compliance

Provide recommendations on retrofits and modifications for compliance to owners of non-compliant lighting

## VI. General Recommendations

These recommendations are limited to a few lighting options for varied applications, including pedestrian level illumination (bollards or lower-level lighting), residential, and commercial applications (parking lot and street lights). Vehicular intensity, in accordance with the Town's 2007 Transportation Plan, and general land uses were considered with these recommendations. The fixture head, pole style, and lamp are nearly identical for each application, excluding bollards, with slight variations in pole height, fixture size, and lumens (light output) to accommodate safety and intensity appropriate for the application. The style and size selections are limited to facilitate and minimize installation, replacement, and inventory. The components identified are modular, such that if one component of the lighting fails (e.g.: lamp, pole, fixture, filter, etc.) the entire system is not subject to replacement but may be replaced as a singular component of the whole. The theme is simple, and locally-crafted where feasible, representing the preferred community options put forth during the 2006 Streetscape Plan.

It is understood that the final fixture style and lamps may differ from what is presented here (Exhibits B, D). The energy and cost savings achieved in transitioning from current light sources (HPS) and fixtures, the time frame associated with installation of new fixtures in Town, and the rapidly changing technology for street lighting may affect the final product selection. When implementation is imminent, an updated evaluation of new technologies with lifecycle and investment costs is recommended. A spreadsheet is available at Town Hall to facilitate this process (page 19). Additional incentives or grant funding to retrofit existing lamps may also arise to offset investment costs.

At this time, the "warmer" illumination of lower-wattage high pressure sodium bulbs is preferred to the bright or warm white of the current LED, although the transition to the warmer LED or incorporating a colored lens for the LED technology may be practical in the future. Compact fluorescent (CF) bulbs do not perform effectively or efficiently in Ridgway's cold climate, and are therefore not considered with these outdoor applications. However, light output measurements for cold cathode bulbs CF are provided in case it becomes a feasible option.

Illumination recommendations for each application (Highway, Commercial, Residential, and Industrial) are put forth, with additional detail located in the Exhibit section of the report. It is suggested that all fixtures have a minimum 3 year warranty.

Street light locations in residential and commercial areas are based on safety and traffic volume classifications defined in the Town's 2007 Transportation Plan Element, as follows:

Arterial Streets (e.g.: Highways 550 and 62): Lighting at all roadway intersections with the highways, streets and alleyways

Collector Streets (e.g.: Railroad and Amelia Streets, Hunter Parkway): Lighting at each street intersection

Local Streets (Streets in residential areas such as Vista Terrace, River Park, Solar Ranches, Cora, Laura, Mary, etc.): Lighting at significant road intersections, but not all intersections

Lighting should be designed and situated such that light is directed downward illuminating the desired intersection or parking area, not adjoining properties or residences.

Replacement of existing, functional cobra-head fixtures, and power poles is a low priority at this time, as removing, replacing, and land-filling fully functional, efficient fixtures is not compatible with environmental stewardship objectives. At such time it makes financial and ecological sense to replace these fixtures, it is suggested that a singular, town-wide effort occur. In the alternative, a phasing plan is presented whereby lighting installation in specific areas or streets are completed simultaneously so as to not propagate a multitude of lighting components and/or varied color outputs (e.g.: yellowish HPS light vs. whiter LED light) throughout Town. Methods of recycling the cobra head fixtures and high-pressure sodium bulbs should be explored. It is also assumed that the utilities will be undergrounded and the utility poles removed in the future, so adhering to existing pole locations is not a priority.

Today there are a variety of efficient lamp options available, with the technology rapidly changing (e.g.: incandescent, induction, compact fluorescent, LED, high pressure sodium). More efficient sources are entering the marketplace and existing lamp types are becoming more affordable.

The standards within this plan generally comport with town-wide zoning, with some overlap in residential and commercial uses (e.g.: Downtown Services and Historic Business districts). In areas of uncertainty, the Conceptual Lighting Plan Map (Exhibit A) clarifies preferred illumination patterns and locations.

Installation of a grid-tied, solar-electric system is recommended to offset electricity use for the street and pedestrian lighting. In late 2009, the estimated cost of a 215 watt PV system, including installation materials, labor, and monitoring system is \$2700, producing 814 kWh annually. Rebates and funding opportunities to offset this expense may be available through the Governor's Energy Office, and are identified in Section XIII. The relatively low-cost of the system combined with available incentives may warrant prioritization the grid-tied system to immediately offset other energy demands and maximize financial savings.

## VII. Highway Corridors

This area encompasses the Highway 62 and 550 corridors through Town, addressing lighting on the highway rights-of-way. The primary purpose is to illuminate these arterial streets for safety as they are the principal roadways through Town. More frequent and more intensive lighting is recommended here, with fixtures at each street-highway intersection and also each alley along Highway 62 through the Historic Business and Downtown Service Districts (Exhibit A). To maximize illumination, the recommended pole and fixture height is the highest in the Town at 25', with the Leadership in Energy and Environmental Design (LEED) recommended maximum of .6 footcandles. Intersections with private driveways or accesses to private property are not considered here. The street light mid-block on the south side of Highway 62 between Liddell Drive and South Railroad Street should be removed. New street lights should be located at the Liddell Street and South Railroad Street intersections with Highway 62.

## **VIII. Commercial Areas:**

### **Downtown Historic Business, Highway Commercial, Light Industrial**

Three different areas are addressed in this section: Downtown Historic Business District, Highway Commercial (Highway 550 and 62/ Sherman Street), and the Light Industrial zones.

#### **A. Downtown Historic Business Core**

The objectives for the Downtown Business area are to provide appropriate and aesthetic illumination that clearly defines the area from the rest of Town. The plan is for a mix of the recommended street light fixtures and locally-crafted, low-level pedestrian bollards. The mixture of street and bollard illumination was the preferred scheme of the community during the downtown streetscape planning process. This combination provides for unique, commercial illumination while minimizing both energy and financial expenditures.

The 2006 Streetscape Plan defines street light and bollard locations for this area, which are integrated into this plan (Exhibit A). Light poles are located at opposing corners of street intersections with bollards placed in between and along both sides of the streets (Exhibit C). Input from the community was for quality illumination with some local artist participation and appropriate illumination levels for a vibrant downtown.

With two streetlights proposed for each intersection, as opposed to one light at each intersection in the rest of Town, the light source is proposed at the residential level of 3600 lumens (50 watt HPS), and the fixture height at 20'. The LEED recommended maximum of .6 footcandles is proposed for this area. The fixture head is similar to the remainder of Town. The bollards are locally crafted (Exhibits B and D). It is recommended that an assessment and evaluation of the Downtown Historic District lighting plan be completed by a lighting professional prior to purchase and installation of the identified final lighting product(s).

#### **B. Highway Commercial**

This area encompasses the General Commercial district surrounding the intersection of Highways 62 and 550. There are commercial and residential uses within this area. As such, the recommendations are for more intensive lighting on the highway corridors as arterial roadways and less intensive lighting in the more residential areas accessed via collector and local streets. Reference the Conceptual Lighting Plan Map in Exhibit A for specific locations.

There are a significant number of privately-held, non-compliant and non-functional street and pedestrian-level lights in the area east of Highway 550. It is suggested that the property owner(s) be contacted and notified of the non-compliant lighting and the proposed specifications for this area. While there is a significant amount of light in this area (Attachment E), better illumination here could greatly enhance the Town's gateway and facilitate continuity between the Highway Commercial and Downtown Areas. Fixture heights in this area are recommended at 20', just higher than the residential standard, but lower than the Highway Corridor lighting for arterial streets, with the LEED recommended maximum of .6 footcandles. This will provide for greater light distribution on the ground for the commercial area, and also respect the many residential uses here. This area does not include the Highway rights-of-way, which are defined in Section VI, Highway Right-of-Way.

### C. Light Industrial Park

As the Light Industrial Park is central to Town and adjoins residential neighborhoods on all sides, illumination in this area should comport generally with the rest of Town. The proposed fixtures, poles, lamps (50 watt HPS, 3600 lumens), and heights (18') are the same as those recommended for the Historic Residential and Residential areas. The LEED recommendation for industrial areas is a maximum of .2 fc. Street lights are located at each road intersection.

## IX. Residential Areas

Residential areas are primarily zoned Historic Residential (HR) and Residential (R), and are the focus of this section. Residential uses within commercial zones are addressed in the Highway Commercial section of the plan. The rural subdivisions of Vista Terrace, RiverSage, Sweetwater, and other future rural subdivisions within the Town are not considered here. In order to minimize light pollution, glare and visual impact from the hills surrounding the core of Town, little or no lighting is recommended in these rural areas, although sufficient illumination may be appropriate at major intersections accessing the subdivision(s).

Limited illumination providing for vehicular and pedestrian safety at major road intersections is desired. The lighting plan generally comports with the arterial, collector, and local street designations previously stated. Because the residential areas consist mostly of local streets, lighting is planned at significant road intersections only, and no illumination of alleyways. In the downtown Historic Residential area, where major intersections occur only on the perimeter and along the highway, lighting is proposed at alternating intersections within the district.

To eliminate or minimize trespass onto private properties the pole and fixture height are reduced to a maximum of 18', with the LEED recommended maximum of .1 footcandles. Light distribution should be sufficient enough to illuminate the intersection while respecting the desire for relative darkness in these areas.

The intersection at Amelia/ Moffat Streets, the entry to Le Ranch Subdivision at South Amelia/ Le Ranch Boulevard, and the intersection at South Lena Street/ Chipeta accessing Solar Ranches should have new street lights. The non-functional street lights in Solar Ranches should be removed and replaced as recommended for residential lighting.

## **X. Parks and Trails**

If bollard-style lighting is desired in the parks or improved public spaces, it is recommended that the selected styles and associated specifications be incorporated to establish artful continuity throughout the Town. Otherwise, the specified pedestrian level (18') illumination may be appropriate.

Where there are significant trail crossings or when a pedestrian trail intersects a roadway, taller, pedestrian lighting (18') should be present. The recommended pole and fixture styles are the same as the residential lighting (Exhibits B and D). Specifically, these pedestrian lights are to be located at the Uncompahgre Riverway trail intersections with Charles, Otto, and Railroad Streets. It is also recommended that the existing, non-compliant bollards in the Town Hall parking lot be replaced with these taller (18') pedestrian light fixtures (refer to plan map, Exhibit C).

The recommended maximum height for the bollards is 3.5' (42") with the LEED recommended maximum of .2 footcandles. The bollards should be visible above winter snow yet low enough to minimize direct lighting at eye-level. Bollards should be sturdy, without sharp edges and constructed to mitigate vandalism and injury. Two local designers, Attraction Lights and Issenberg Design, submitted design proposals, which are included here, in part, in Exhibits B and D. Complete proposals for the bollards are available at Town Hall. It is recommended that the existing, non-compliant bollards at the Uncompahgre River pedestrian bridge connecting Rollans Park to River Bank Minor Subdivision be replaced with these specified bollards.

### **A. Hartwell Park**

The purpose of illuminating the pedestrian trail through Hartwell Park is to provide connectivity between the downtown business district, post office, Sherman Street, Town Hall, and the Ridgway Library. The bollards should be spaced approximately every 50 linear feet, such that pedestrians can easily follow to the path. The initial phase will begin at the eastern edge of the post office at Lena and Clinton Streets moving west to the sidewalk intersection at Town Hall and then north along the sidewalk to Charles Street. This will connect the downtown historic district at the post office to the library and public parking area east of North Railroad Street. When feasible, additional bollards should be placed along the sidewalk from Town Hall to Sherman Street.



## XI. Lifecycle Costs

SMPA has 2 meters on existing streetlights for tracking and billing kWh usage for the Town street lights. One meter measures the power supply for the 70w HPS streetlights and is located at Railroad Street/ Highway 62. The other meter measures power supply on the 50w HPS streetlights and is located at Cora/Clinton Street. The usage is then multiplied by the number of fixtures that have 70 watt or 50 watt bulbs in order to arrive at a final usage and invoice total for the Town's 53 streetlights.

The table below displays the average energy usage (kWH) and cost (\$) per fixture, and for all fixtures town-wide using a similar wattage (50 or 70) for each of the two meters. The wattage and cost are the averages as reflected on the SMPA billing statements from August 2008 – July 2009. The 2009 rate for kWh usage is \$0.13 / kWh.

Street Light Meter #	Location	Mult*	Per Fixture Costs		Total Fixture Costs			
			kWH/ fix (mo. avg)	\$/fix (mo.)	Total kWH (mo.)	Total Avg. Cost (mo.)	Total kWH (year)	Total Annual Cost
93100602	RR St./Hwy 62 (70w HPS)	14	16	\$2.08	225	\$29.25	2702	\$351.26
32249709	Cora/Clinton (50w HPS)	30	18	\$2.38	550	\$71.50	6600	\$858.00

\*"Mult" is the multiplier for SMPA, which is equal to the number of street lights in Town that have similar wattage (50 or 70) used to estimate energy use in lieu of having a meter for each street light

At the time of this assessment, the 70 watt HPS light bulb in the Railroad Street/Hwy 62 fixture was at the end of its useful life. Therefore the 50w HPS monthly average use (kWH) and cost per fixture (\$/fix) are greater than the 70w HPS fixture usage and cost at this time. It is estimated when the 70 watt bulb is replaced, the kilowatt usage and cost will increase accordingly.

Total Annual Energy Use (kWH) for all Town Street Lights: 9,302 kWH

Total Annual Cost (\$) for all Town Street Lights: \$1,209.26 (at \$0.13 / kWh)

The energy use and cost for the Town's streetlights reflect the darkness of the Town. Similarly, maintenance costs on the existing cobra head fixtures and HPS bulbs are negligible. The existing poles are maintained by SMPA. Some HPS lamps have been replaced since installation and some need replaced at this time. Replacement costs for the HPS lamps are \$10.45 for the 50 watt and \$17.35 for the 70 watt, as of September 2009 from CED.

The current efficiency levels of the 50 and 70 watt high pressure sodium lamps and the significant cost of purchasing and retrofitting these lamps and/or fixtures with the LED technology available today, reveals that there is no demonstrated financial or energy conservation benefit for converting to LED technology at this time.

As technology advances, prices decrease, more color options become available, and/or the existing fixtures and lamps begin to reach the end of their useful life, the Town may wish to

consider the transition to more efficient lamps such as LEDs. The LED source with a warm filter may provide efficiency while filtering the bright white nature of the technology.

Incandescent lamps are not considered here as the technology is being phased out pursuant to federal legislation, and therefore, it is not a feasible option for the future. Likewise, compact fluorescent technology is generally not suitable to the cold temperatures in Ridgway. In researching lifecycle costs, comparison values for LEDs vs. HPS lamps are not readily available. Therefore, a comparison has been created using the existing Town lighting and representative LED lighting available on the market today (see Lifecycle Energy and Financial Cost Comparison on page 19).

In the chart on the next page, varied wattages and applications of HPS and LED lamps/fixtures are compared for both energy and cost savings. Specifications for high-pressure sodium lamps are from Consolidated Electrical Distributors (CED) in Montrose. Beta LED streetlight specifications and pricing are based on basic streetlights recently installed in the City of Ouray and also from CED. Note that the Town already owns 39 Cobra Head fixtures; therefore the up front cost of the Cobra Head street light options would be slightly less than indicated.

According to the US Department of Energy (DOE), the energy efficiency of lamps is typically measured in lumens per watt (lm/W), meaning the amount of light produced for each watt of electricity that is consumed. This is known as luminous efficacy. As such, lumens per watt are presented here to compare each light source or fixture.

The DOE also reports the useful life of a lamp is generally accepted to be at a point where the lumen output of the lamp has degraded by up to 30%. This is represented as operating at 70% of the initial lamp output level, or providing 70% of the initial lumens, abbreviated as  $L_{70}$  for general lighting and  $L_{50}$  for decorative lighting. Because the LED technology for the applications here is relatively new, the demonstrated lifetime hours are estimates from the manufacturer's specifications and have not yet been tested. More information on lamp life may be found at: [http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/lifetime\\_white\\_leds\\_aug16\\_r1.pdf](http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/lifetime_white_leds_aug16_r1.pdf)

*Lifecycle Energy and Financial Cost Comparison of LED and HPS lamps and fixtures*

	Bollard		Lower Luminance Street Light			Higher Luminance Street Light				
	HPS Bollard (50w HPS)	LED Bollard (Array Par 30 warm)	Existing HPS (50 watt)	Leotek LED SLN- 036	Beta LED 034 Fixture	Existing HPS (70 watt)	Leotek LED SLN- 048	Beta LED 051 Fixture	Sylvania LED Cobra Retrofit	WARP 9 LED Fixture
<b>Watts</b>	50	7.8	50	48	84	70	58	117	40	175
<b>Lumens</b>	4000	550	4000	3600	4140	6300	4800	6210	2800	5942
<b>Lumens/ Watt</b>	80	71	80	75	49	90	83	53	70	34
<b>Color Temperature</b>	2100K	3000K	2100K	3500K	6000K	1900K	3500K	6000K	5700K	3500- 5100K
<b>Retail Cost of Lamp/Fixture (Sep/Dec 2009)</b>	\$40.75	\$112.50	\$10.45	\$449.00	\$500.00	\$10.45	\$449.00	\$700.00	\$595.00	\$1,100.00
<b>Actual Lamp Lifetime Hours</b>	24,000	50,000	24,000	50,000	50,000	24,000	50,000	50,000	50,000	64,000
<b>Target Lifetime Hours</b>	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
<b>Cost (\$)/kWH (SMPA 2009)</b>	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
<b># Lamps Needed for 50K Hours</b>	2.08	1.00	2.08	1.00	1.00	2.08	1.00	1.00	1.00	0.78
<b>Cost of lamps for 50K Hours</b>	\$85	\$113	\$22	\$449	\$500	\$22	\$449	\$700	\$595	\$859
<b>Retail Cost of Fixture (Sep 2009)</b>	\$450	\$450	\$75	incl above	incl above	\$75	incl above	incl above	incl above	incl above
<b>Total # Fixtures Town wide (estimated)</b>	12	12	90	90	90	90	90	90	90	90
<b>Lifetime Cost (\$): elect.+bulb+fixt (per lamp)</b>	\$860	\$613	\$422	\$761	\$1,046	\$552	\$826	\$1,461	\$855	\$1,997
<b>kWH Electricity Used over 50K Hrs (per lamp)</b>	2500	390	2500	2400	4200	3500	2900	5850	2000	8750
<b>Total Lifetime Cost (\$) - All Fixtures</b>	\$10,319	\$7,358	\$37,959	\$68,490	\$94,140	\$49,659	\$74,340	\$131,445	\$76,950	\$179,719
<b>Total Lifetime Energy Cost (kWH) -All Fixtures</b>	30,000	4,680	225,000	216,000	378,000	315,000	261,000	526,500	180,000	787,500

**CHART CLARIFICATIONS:** Bollard pricing (“retail cost of lamp/fixture”) includes lamp and housing, but not the decorative bollard. “Retail cost of the fixture” is the estimated cost of the artistic bollard housing and therefore the same for all lamp sources identified in the chart. LED street light pricing includes lamp and fixture costs, although the HPS bulbs and Cobra Head fixtures are priced separately. To accommodate this, the retail cost of the cobra head fixtures are added into the overall cost of the estimated 90 HPS bulbs and fixtures. This allows for a more accurate comparison of cost. However, it is noted that cobra head fixture with HPS lamp cost is now inflated as the Town already owns 39 Cobra Head fixtures and HPS bulbs. For a true comparison, the overall cost of the Cobra head/HPS may be reduced by \$2925, excluding the lamps, which is 39\*\$75 (39=fixtures already owned, \$75 is cost of GE Cobra head fixture), although this is quite negligible to overall costs.

2009 specifications and estimates are from Consolidated Electrical Distributors in Montrose, Colorado and manufacturer’s specifications. The Beta LED-034 specifies a lamp life of 121,000 hours and the Beta LED 051 specifies 80,000 hours. This is significantly higher than other estimates for LED lamp life, which are estimated at 50,000 hours with qualifying language that the life is uncertain at this time as the technology is relatively new. In order to make a more equitable comparison, the BETA fixtures are specified here at 50,000 hours. Also of note are the lumens for the LED Par 30 lamp (bollard) and the 2800 lumen output of the Sylvania retrofit, which are significantly lower than the lumens for the other lamps.

In late 2009 AAL, the distributor of the specified street lights, notified the Town that the specified street light fixture (Universe series) will soon be available in LED, at which time additional and updated comparison may be beneficial. Color temperature on LED fixtures varies from 3000-6000K depending on selection of warm white for higher brightness.

## Summary of Comparison Chart

The LED / HPS comparison chart is categorized into 3 options: low-level pedestrian bollards, lower-luminance street lights (eg: residential applications), and higher-luminance street lights (commercial applications). The lower-luminance compares the existing 50-watt HPS GE Cobra Head fixtures with two LED fixture options of comparable luminance. The higher-luminance compares the existing 70-watt HPS GE Cobra Head fixtures with three LED fixture options of comparable and higher luminance, as well as a Sylvania LED retrofit option for the existing GE Cobra Head fixtures.

The comparison prioritizes similar light output, or lumens, although there is some fluctuation within each category. When comparing lumens per watt to understand lamp efficiency, the LED lamps are more efficient than the HPS lamps, which is unsurprising. The color temperature also indicates that LED lamps emit a “whiter” light, as compared the “yellowish” illumination of the HPS.

Overall the LED fixtures are much more expensive to purchase than the GE Cobra Head fixtures with HPS lamps. When considering the purchase of 90 street lights in realization of this plan, not including future subdivisions, the cost of purchasing the LED fixtures is about twice as expensive as the HPS GE fixtures. While the lower wattage LED fixtures realize some energy savings over the lifetime of the fixtures when measured in kilowatt hours, the higher wattage LED fixtures appear to use more energy than the existing HPS GE fixtures. The far lower wattage of the LED Par 30-array (10 watts vs. 50 watts) specified for the bollard illustrates this clearly. The lower-wattage Sylvania retrofit also yields significant energy savings over the lifetime of the fixture. Outside of the low-watt LED lamp for the bollard and the Sylvania LED Retrofit Lamp for the cobra head fixtures, the higher wattages of the LED street lights do not result in real energy savings over the existing 50 and 70 watt high pressure sodium lamps. Until such time lower wattage LEDs are available in the desired illumination and fixture style, and at a more reasonable up-front investment cost, there is no apparent or significant benefit to switching from HPS to LED at this time. Of course, subsidization of the investment may offset costs sufficiently to justify a transition to LED technology for street light applications. This opportunity is addressed in the next section.

In the November 2009 report prepared for the US Department of Energy comparing HPS GE fixtures with the Leotek LED street lights, Pacific Northwest National Laboratory reports a 20 year payback period for replacement of 100 watt HPS GE Cobra Head fixtures with a comparable Leotek LED street light luminary, and a 7.6 year payback for new installations.<sup>1</sup>

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<sup>1</sup> Pacific Northwest National Laboratory. Demonstration Assessment of Light-Emitting Diode (LED) Street Lighting on Lija Loop in Portland, Oregon. November 2009. Page 7. Retrieved February 24, 2010 from: [http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway\\_lija-loop.pdf](http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway_lija-loop.pdf)

## **XII. Responsibility**

It is understood that maintenance, repair and replacement of lighting on Town-owned property is the responsibility of the Town, while lighting on private property is the responsibility of the property owner. It is also understood that all lighting is subject to the regulations of the Town, although there are a number of pre-existing, non-compliant lights. This plan seeks to present compliant alternatives in order to encourage the phasing out of existing, non-conforming lights with preferred alternatives that meet the goals identified herein.

As stated previously, in consideration of community desires for a dark-skies community, it is recommended that owners of non-compliant fixtures be advised of this Town-wide Lighting Plan and specifications for compliant illumination.

As the Town does not currently have the equipment or expertise to maintain, repair and replace the existing GE Cobra Head fixtures on the SMPA utility poles, the current arrangement with SMPA seems appropriate. However, at such time the new, street lighting is installed, it is understood that SMPA may not be willing to maintain, repair, and inventory the poles, fixtures, and lamps, as they are doing today. The Town will need to work with SMPA to identify resources for installation, maintenance, repair and inventory methods.

As new development occurs and street or pedestrian lights are purchased and installed in the Town rights-of-way, with the cooperation of the local electric utility provider, it is recommended that the fixtures be dedicated to the Town, similar to other subdivision improvements required by the Town Code, such as sidewalks, roads, utilities, etc.

### **XIII. Phasing Plan and Financing Opportunities**

#### Phasing Plan

The proposed phasing plan, in the order of first priority to last for installation of new lights, considers community inputs during the downtown Historic Streetscape planning in 2006, as well as existing financial feasibility for the Town.

1. Follow up with existing non-compliant lighting to encourage compliance, particularly at the Town Gateway at Highways 62/550
2. Pedestrian Lighting in Town Park with grid-tied solar electric system at Town Hall
3. Historic Business District: Clinton Street, Lena to Laura then remainder of streetscape
4. Remainder of HB District
5. Highway Commercial
6. Highway Rights-of-Way
7. Residential Areas

#### Financing Opportunities

There are a number of financing opportunities available to the Town for lighting, from a variety of sources. This is not a comprehensive listing, only a starting point. Award for some opportunities may be contingent upon demonstrated energy savings. The installation and utilization of a grid-tied system to offset lighting costs may also assist in securing financing to offset the financial cost of installing the system(s).

1. LOCAL: Town of Ridgway  
Utilize portion of unexpended 0.6% sales tax revenues for pedestrian lighting through Hartwell Park.
2. STATE: Governor's Energy Office - Alternative Energy and Energy Efficiency<sup>2</sup>
  - a. Street Lighting Grant - Limited funding for EECBG non-entitled communities to pay for the cost of LED or high-efficiency incandescent streetlights. Funds are for the cost of equipment only and only non-entitled EECBG local governments may apply. This grant opens in mid-April 2010
  - b. NEED Grant - Grants for projects that involve installations or programs that lead to the installation of established energy efficiency or renewable energy technology. This grant opens in mid-July 2010.
  - c. Additional opportunities – with American Recovery and Reinvestment funding and other GEO initiatives, additional opportunities may arise over time.
3. UTILITIES: SMPA and Tri-State Generation
  - a. Net Metering on Grid-tied System/ Power Purchase Agreements  
Pursuant to Colorado law, utilities are required to offer net metering to all eligible renewable energy resources for systems less than 25 kW in size. Any net excess generation is credited to customer's next bill at retail rate. Per current SMPA

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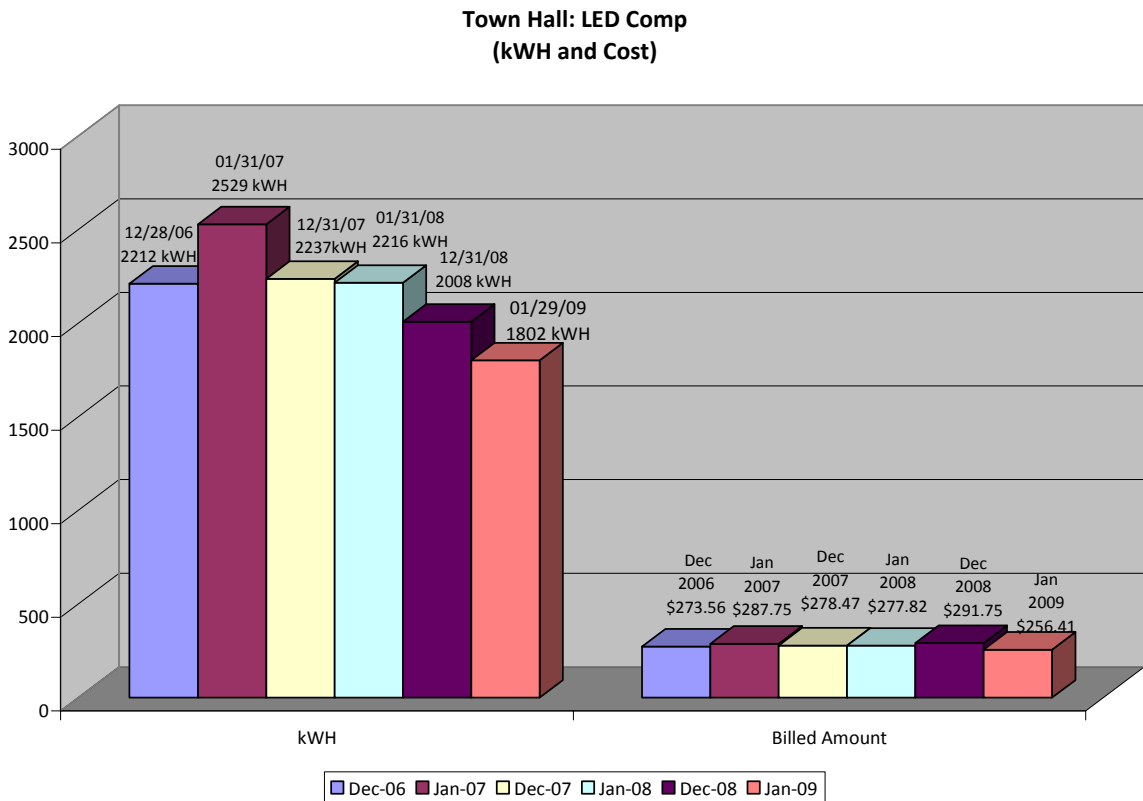
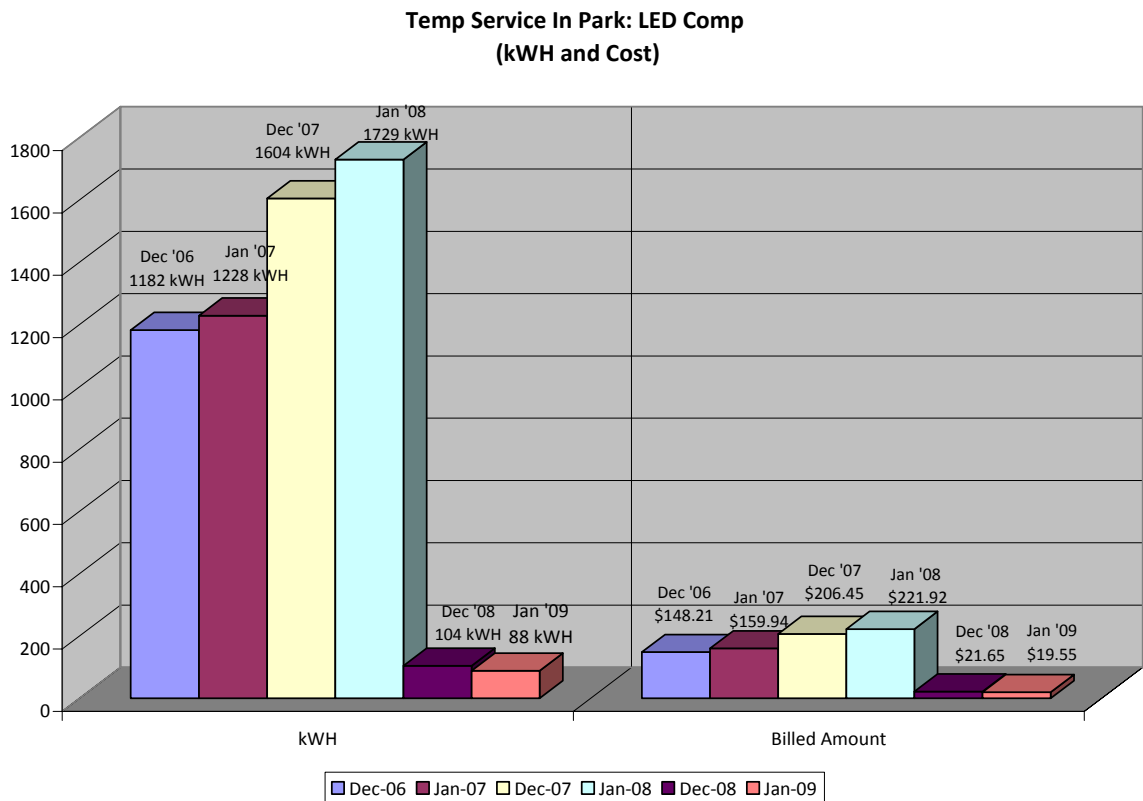
<sup>2</sup> GEO Grants: <http://www.colorado.gov/energy/index.php?/resources/category/funding-opportunities/>

- guidelines, any net excess energy sales to SMPA are paid, through an annual reconciliation process, at SMPA's avoided energy charge (which does not include SMPA's demand charge).
- b. Financial Partner – SMPA may also be explored as a financial partner with the Town to assist in reaching the utility's energy goals.
4. PRIVATE:
- a. Strategic Environmental Project Pipeline (StEPP) Foundation – a 501(c)(3) non-profit organization operating throughout the United States and “dedicated to helping organizations realize their vision of a clean and safe environment by matching projects with funders”. A majority of Foundation awards are made in Colorado.<sup>3</sup>

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<sup>3</sup> StEPP Foundation - <http://www.steppfoundation.org/main.htm>

ATTACHMENT A: LED Comparison Charts in Town Park and Town Hall 2008-2009





## ATTACHMENT B: LIGHTING INVENTORY SPREADSHEET (Feb 2009)

Pole	Fixt	Bulb	Pole Ht	Comment	Status	Dark Skies	Property
wood	#3	50wHPS	23	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	50wHPS	25	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	50wHPS	24	GE250 Cobra Head Luminaries	Not Working	Yes	Public
wood	#3	50wHPS	25	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	50wHPS	25	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	50wHPS	25	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	50wHPS	25	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	70wHPS	25	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	70wHPS	25	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	70wHPS	25	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	70wHPS	25	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	70wHPS	25	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	50wHPS	25	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	50wHPS	24	GE250 Cobra Head Luminaries	Not Working	Yes	Public
wood	#3	50wHPS	22	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	50wHPS	23	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	70wHPS	25	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	50wHPS	25	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	50wHPS	25	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#4	UNK	14	Solar Ranches Solar Light	Not Working	No	Public
wood	#4	UNK	14	Solar Ranches Solar Light	Not Working	No	Public
wood	#4	UNK	14	Solar Ranches Solar Light	Not Working	No	Public
wood	#3	50wHPS	22	GE250 Cobra Head Luminaries	Not Working	Yes	Public
wood	#5	UNK	32	Land Use Office (mercury?)	Working	Yes	County
metal	#7	UNK	10	RUSA 3-5 Head	Working	No	Private
metal	#7	UNK	10	RUSA 3-5 Head	Working	No	Private
metal	#3	70wHPS	40	GE250 Cobra Head Luminaries	Working	Yes	Public
metal	#7	UNK	10	RUSA 3-5 Head	Working	No	Private
metal	#7	UNK	10	RUSA 3-5 Head	Working	No	Private
metal	#7	UNK	10	RUSA 3-5 Head	Working	No	Private
metal	#7	UNK	10	RUSA 3-5 Head	Not Working	No	Private
metal	#7	UNK	10	RUSA 3-5 Head	Working	No	Private
metal	#7	UNK	10	RUSA 3-5 Head	Not Working	No	Private
metal	#8	UNK	16	Christian Center (Single Head)	Working	Yes	Private
metal	#8	UNK	16	Christian Center (Single Head)	Working	Yes	Private
wood	#9	UNK	35	Fairgrounds		No	Public
wood	#9	UNK	35	Fairgrounds		No	Public
wood	#9	UNK	35	Fairgrounds		No	Public
wood	#9	UNK	35	Fairgrounds		No	Public
wood	#9	UNK	35	Fairgrounds		No	Public
wood	#9	UNK	35	Fairgrounds		No	Public
metal	#8	UNK	20	Ridgway Lodge and Suites	Working	Yes	Private
metal	#8	UNK	20	Ridgway Lodge and Suites	Working	Yes	Private
metal	#8	UNK	20	Ridgway Lodge and Suites	Working	Yes	Private
metal	#6	Incand	13	Parkside	Not Working	Yes	Public
metal	#6	CF	12	River Park, hardwire CF 08	Working	Yes	Public
metal	#6	CF	13	River Park, hardwire CF 08	Working	Yes	Public
metal	#6	CF	13	River Park, hardwire CF 08	Working	Yes	Public
metal	#6	CF	13	River Park, hardwire CF 08	Working	Yes	Public
metal	#6	Incand	13	River Park, hardwire CF 08	Working	Yes	Public
wood	#3	50wHPS	22	GE250 Cobra Head Luminaries	working	Yes	Public
wood	#5	Incand	28	Glen Pauls Light	Not Working	Yes	Private
wood	#5	50wHPS	30	Block 31 Alley	Working	Yes	Public
wood	#3	50wHPS	22	GE250 Cobra Head Luminaries	Not Working	Yes	Public

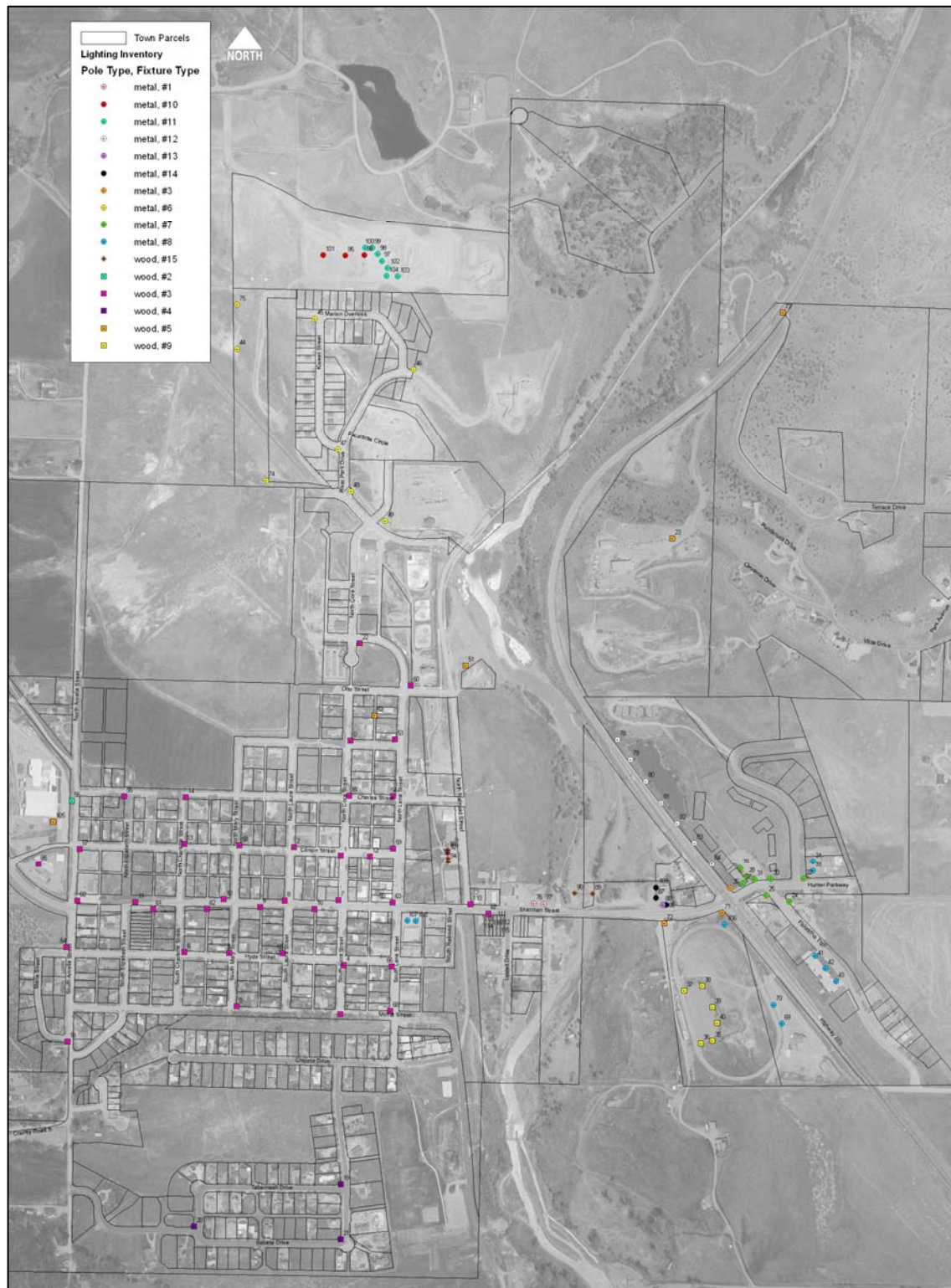
Pole	Fixt	Bulb	Pole Ht	Comment	Status	Dark Skies	Property
wood	#3	50wHPS	25	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	50wHPS	27	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#2	UNK	25	Amelia Street and Charles	Working	No	Public
wood	#3	50wHPS	28	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	50wHPS	24	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	50wHPS	22	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	70wHPS	28	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	70wHPS	25	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	70wHPS	24	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	70wHPS	28	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	50wHPS	27	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	50wHPS	27	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	50wHPS	25	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	70wHPS	35	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#3	50wHPS	25	GE250 Cobra Head Luminaries	Working	Yes	Public
metal	#8	UNK	16	County Fairgrounds County Property	Not Working	Yes	County
metal	#8	UNK	16	County Fairgrounds County Property	Not Working	Yes	County
metal	#3	70wHPS	40	GE250 Cobra Head Luminaries	Working	Yes	Public
wood	#5	UNK	30	Ingo Entry	Not Working	Yes	Public
wood	#5	UNK	28	VT Entry (incand or HPS)	Not Working	Yes	Public
metal	#6	Incand	13	Parkside	Not Working	Yes	Public
metal	#6	Incand	13	Parkside	Not Working	Yes	Public
metal	#1	Incand	18	Grady install 2008 Share Cost with Town	Working	Yes	Private
metal	#1	Incand	18	Grady install 2008 Share Cost with Town	Working	Yes	Private
metal	#12	UNK	10	RUSA Single	Working	No	Private
metal	#12	UNK	10	RUSA Single	Not Working	No	Private
metal	#12	UNK	10	RUSA Single	Working	No	Private
metal	#12	UNK	10	RUSA Single	Not Working	No	Private
metal	#12	UNK	10	RUSA Single	Not Working	No	Private
metal	#12	UNK	10	RUSA Single	Working	No	Private
metal	#12	UNK	10	RUSA Single	Working	No	Private
wood	#3	50wHPS	30	GE250 Cobra Head Luminaries	Working	Yes	Public
metal	#14	UNK	23	Lot 1 River Bank Minor	Working	No	Private
metal	#14	UNK	23	Lot 1 River Bank Minor	Working	No	Private
metal	#13	UNK	23	Lot 1 River Bank Minor	Working	No	Private
wood	#15	Incand	3	Town Bollards	Working	No	Public
wood	#15	Incand	3	Town Bollards	Working	No	Public
wood	#15	CF	3	Town Bollards	Working	No	Public
wood	#15	CF	3	Town Bollards	Working	No	Public
wood	#15	CF	3	Town Bollards	Working	No	Public
wood	#15	CF	3	Town Bollards	Working	No	Public
metal	#10	Incand	30	School Double Arch	Working	Yes	Private
metal	#10	Incand	30	School Double Arch	Working	Yes	Private
metal	#11	Incand	30	School Single Arch	Working	Yes	Private
metal	#11	Incand	30	School Single Arch	Working	Yes	Private
metal	#11	Incand	30	School Single Arch	Working	Yes	Private
metal	#11	Incand	30	School Single Arch	Working	Yes	Private
metal	#10	Incand	30	School Double Arch	Working	Yes	Private
metal	#11	Incand	30	School Single Arch	Working	Yes	Private
metal	#11	Incand	30	School Single Arch	Working	Yes	Private
metal	#11	Incand	30	School Single Arch	Working	Yes	Private
wood	#5	UNK	30	Elementary School	Working	Yes	Private
metal	#8	UNK	16	Heritage Park	Working	Yes	Public
metal	#8	UNK	25	Mountain Market	Working	Yes	Private
metal	#8	UNK	25	Mountain Market	Working	Yes	Private

Pole	Fixt	Bulb	Pole Ht	Comment	Status	Dark Skies	Property
metal	#14	UNK	23	Lot 1 River Bank Minor	Working	No	Private
metal	#16	UNK	3	Alpine Bank Bollards	Working	Yes	Private
metal	#16	UNK	3	Alpine Bank Bollards	Working	Yes	Private
metal	#16	UNK	3	Alpine Bank Bollards	Working	Yes	Private
metal	#16	UNK	3	Alpine Bank Bollards	Working	Yes	Private
metal	#16	UNK	3	Alpine Bank Bollards	Working	Yes	Private
metal	#16	UNK	3	Alpine Bank Bollards	Working	Yes	Private

Totals	
Total Light Fixtures	116
On Public Property	67
On Private Property	46
On County Property	3
Fixture/Bulb Working	90
Fixture/Bulb Not Wrk	20
Bulb (50W HPS)	27
Bulb (70W HPS)	13
Bulb (CF)	8
Bulb (Incand)	19
Bulb (UNK)	49
Pole (metal)	57
Pole (wood)	59
Dark Skies Compliant	81
Dark Skies Non-Compl	35
Non-Compl (Public)	16
Non-Compl Private)	19
Non-Compl (Other)	0

Fixture Types	
#1	2
#2	1
#3	39
#4	3
#5	6
#6	8
#7	8
#8	10
#9	6
#10	3
#11	7
#12	7
#13	1
#14	3
#15	6
#16	6
<b>Total:</b>	<b>116</b>

## ATTACHMENT C: LIGHTING INVENTORY MAP (February 2009)





## ATTACHMENT D: LIGHTING INVENTORY PHOTOGRAPHS



#1



#2



#3



#4



#5



#6



#7



#8



#9



#10



#11



#12



#13



#14



#15



#16

## ATTACHMENT E: LIGHT OUTPUT MEASUREMENTS

Location	Distance*	EV	Lux	FC	Lamp	Wattage
North Amelia/ Charles	direct	1.3	6.2	0.576	HPS	50
	6'	1.7	8.1	0.753		
	20'	1.4	6.6	0.613		
Marie / South Amelia	6'	1.7	8.1	0.753	HPS	50
South Cora/ Moffat	6'	1.7	8.1	0.753	HPS	50
	12'	1.5	7.1	0.659		
	28'	0.4	3.3	0.307		
62/550 (on SW ped island)	direct	4.3	49	4.552	HPS	70
Rio Grande Western Building (ped light)	direct	6.7	260	24.155	HPS	50
	5'	6.0	160	14.864		
	10'	5.0	80	7.432		
North Railroad / Hwy 62	direct	3.1	21	1.951	HPS	70
	15'	3.0	20	1.858		
	25'	2.2	12	1.115		
	40'	0.8	4.4	0.409		
Town Hall Parking Lot Ped Bollard (CC)**	5'	1.6	7.6	0.706	CC	8
Town Hall Parking Lot Ped Bollard (CF)***	5'	1.9	9.3	0.864	CF	9
North Railroad/ North Cora (ind.pk)	direct	3.9	37	3.437	CF	18
	5'	3.4	26	2.415		
	10'	1.9	9.3	0.864		
North Railroad / River Park Drive (ind.pk)	direct	3.4	26	2.415	CF	18
	5'	3.0	20	1.858		
	10'	1.6	7.6	0.706		
Clinton/ North Lena	direct	1.8	8.7	0.808	HPS	50
	10'	1.3	6.2	0.576		
	20'	0.6	3.8	0.353		
City of Ouray (north town entry)****	Direct	2.4	13	1.208	LED	78
	25'	2.0	10	0.929		
	40'	1.6	7.6	0.706		
City of Ouray***** (pole 347: 4 <sup>th</sup> Ave, west of Main)	Direct	2.6	15	1.394	LED	53
	25'	.6	3.8	0.353		
	40'	1.6	7.6	0.706		

Ridgway Measurements taken April 2010 by Bill Liske and Jen Coates

Ouray Measurements taken May 2010 by Jen Coates

18 watt CF lamps in River Park are equivalent to 100 watt incandescent

Where appropriate, road centerline measurements were targeted

\*Distance = distance from nadir; direct= directly under lamp at existing fixture height; 5, 10, 20 etc. is horizontal distance, in feet, from the nadir (nadir is the location directly below the lamp).

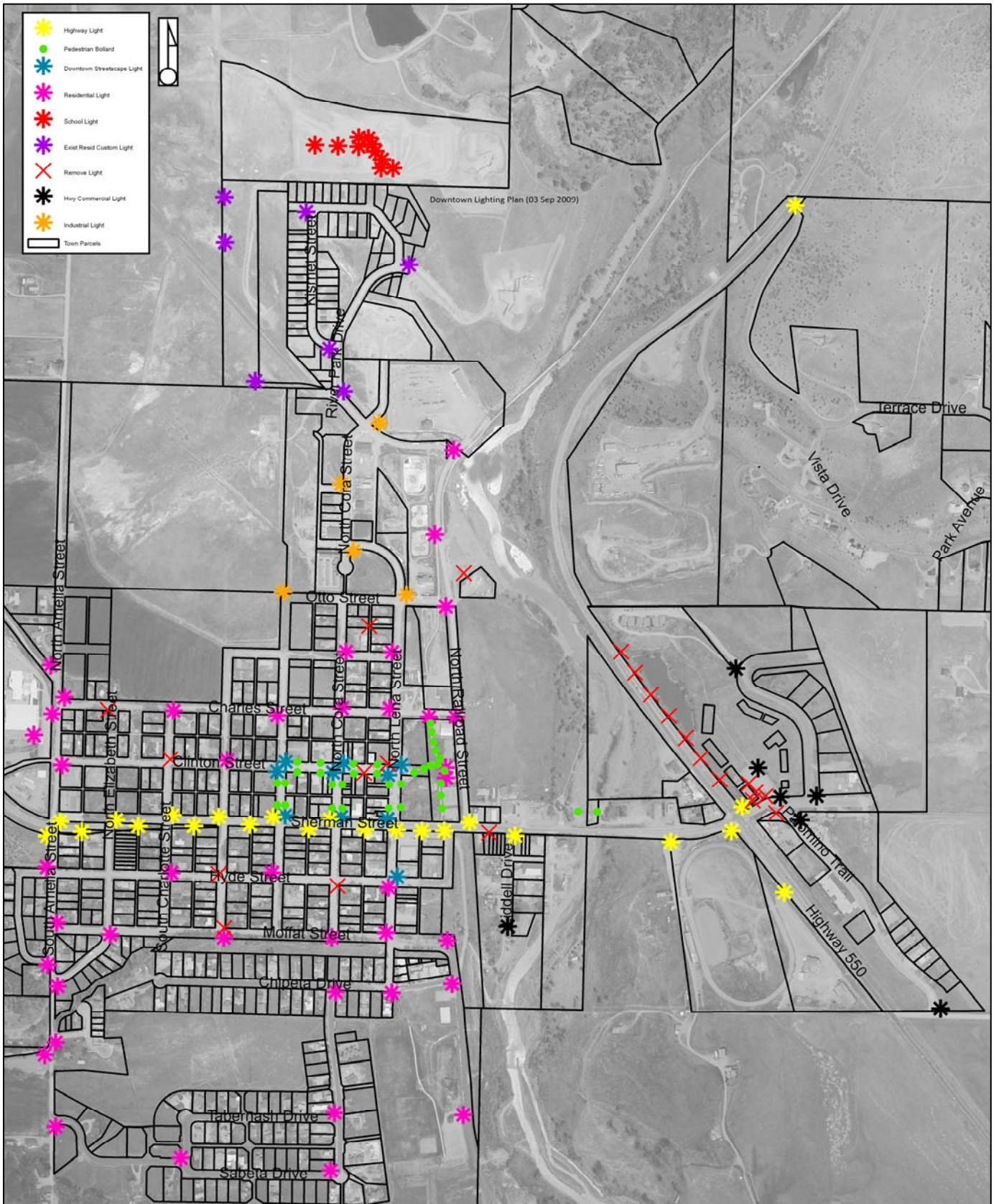
\*\*CC = Cold Cathode Compact Fluorescent Lamp

\*\*\*CF = Compact Fluorescent

\*\*\*\*streetlight located ~1/4 mile south of Hot Springs Inn at North Town entry on Hwy 550

\*\*\*\*\*discrepant measurements may be due to a number of factors, including mounting height (lamp source is closer to ground on side streets), light direction, slope of the land, etc. The 'direct' measurement may be the most reliable in this circumstance.

## EXHIBIT A: 2009 CONCEPTUAL LIGHTING PLAN MAP





## EXHIBIT B: SAMPLE LIGHTING STANDARDS AND SPECIFICATIONS

	Lamp and Light Output	Fixture Height	Location
<b>Highway Corridor Lighting</b>	70w HPS/6400 lumens* (streets) 50w HPS/3600 lumens (alleys) 0.6 footcandles (fc)	25'	All public street & alley intersections along Highway 62 through Town; Approximately every 150'
<b>Hartwell Park</b>	50w HPS/ 3600 lumens/ 0.2 fc	3.5' (42") max	Approximately 50' spacing along sidewalk
<b>Downtown Business (Streetlight)</b>	50w HPS / 3600 lumens/ 0.6 fc	20'	2 opposing streetlights at each intersection except on Hwy 62; Approximately every 300' per block, 75' from bollards; distance across intersections excepted
<b>Downtown Business (Bollard)</b>	50w HPS/ 3600 lumens/ 0.2 fc	3.5' (42") max	2 opposing bollards each ½ block, centrally located; Approximately every 150', 75' from street lights
<b>Highway Commercial</b>	50w HPS / 3600 lumens/ 0.6 fc	20'	All public street intersections, including County Roads
<b>Residential</b>	50w HPS / 3600 lumens/ 0.1 fc	18'	Alternating (grid layout) or significant (other layout) intersections as appropriate; Approximately every 666'
<b>Pedestrian Trail / Road Intersections</b>	50w HPS / 3600 lumens/ 0.1 fc	18'	All trail-road intersections (e.g.: <i>Charles, Otto and Railroad Streets</i> )
<b>Industrial Park</b>	50w HPS / 3600 lumens/ 0.2 fc	18'	All public street intersections
<b>Commercial Parking Areas</b>	50w HPS / 3600 lumens/ 0.2 fc	18'	Commercial and Public Parking Areas



### EXHIBIT C: CONCEPTUAL LIGHTING PLAN MAP FOR DOWNTOWN AREA

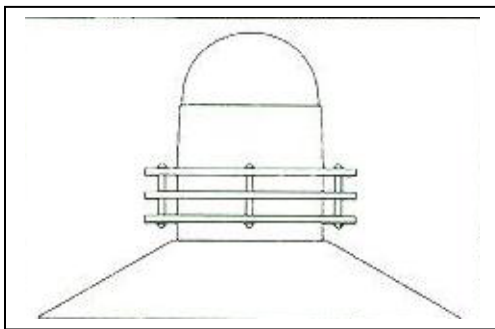


## Exhibit D: RENDITIONS AND SPECIFICATIONS OF PROPOSED FIXTURES\*

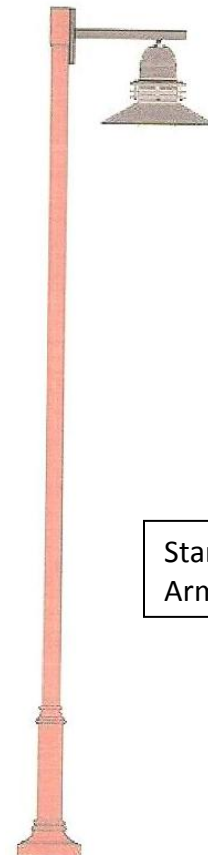
Location	Serial Number/ Color, Style	Fixture Style & Lamp	Pole Style & Mount	Manufacturer Distributor	2009 Retail**
<b>Highway Corridor Lighting</b>	(UCL-SR-STR- DBZ- 70HPS-SLA20) Dark Bronze, Full Cutoff	AAI Universe UCL (large) No luminous element Straight Shade	Flat Arm; 5" Round Aluminum Pole	Architectural Area Lighting/ CED	\$3268.25
<b>Hartwell Park</b>		Local, Custom Refer to photos (Exhibit D)	Bollard	Attraction Lights Lamp - CED	
<b>Downtown Business (Streetlight)</b>	(UCM-SR-STR- DBZ- 50HPS-SLA20) Dark Bronze, Full Cutoff	AAI Universe UCM (medium) No luminous element Straight Shade	Flat Arm; T4P Multi-Post Pole	Architectural Area Lighting/ CED	\$2,245.00
<b>Downtown Business (Bollard)</b>		Local, Custom Refer to photos (Ex D)	Bollard	Issenberg Design Lamp - CED	
<b>Highway Commercial</b>	(UCM-SR-STR- DBZ- 50HPS-SLA20) Dark Bronze, Full Cutoff	AAI Universe UCM (medium) No luminous element Straight Shade	Flat Arm; 4" Round Aluminum Pole	Architectural Area Lighting/ CED	\$2,245.00
<b>Residential</b>	(UCS-SR-STR- DBZ- 50HPS-SLA20) Dark Bronze, Full Cutoff	AAI Universe UCS (small) No luminous element Straight Shade	Flat Arm; 4" Round Aluminum Pole	Architectural Area Lighting / CED	\$1721.50
<b>Pedestrian Trail / Road Intersections</b>	(UCS-SR-STR- DBZ- 50HPS-SLA20) Dark Bronze, Full Cutoff	AAI Universe UCS (small) No luminous element Straight Shade	Flat Arm; 4" Round Aluminum Pole	Architectural Area Lighting / CED	\$1721.50
<b>Industrial Park</b>	(UCS-SR-STR- DBZ- 50HPS-SLA20) Dark Bronze, Full Cutoff	AAI Universe UCS (small) No luminous element Straight Shade	Flat Arm; 4" Round Aluminum Pole	Architectural Area Lighting / CED	\$1721.50

\*Representative samples only, recognizing the industry is rapidly changing and it is likely the specified fixtures will change as well.

\*\*2009 retail on AAL includes: freight, lamp, fixture, and pole.



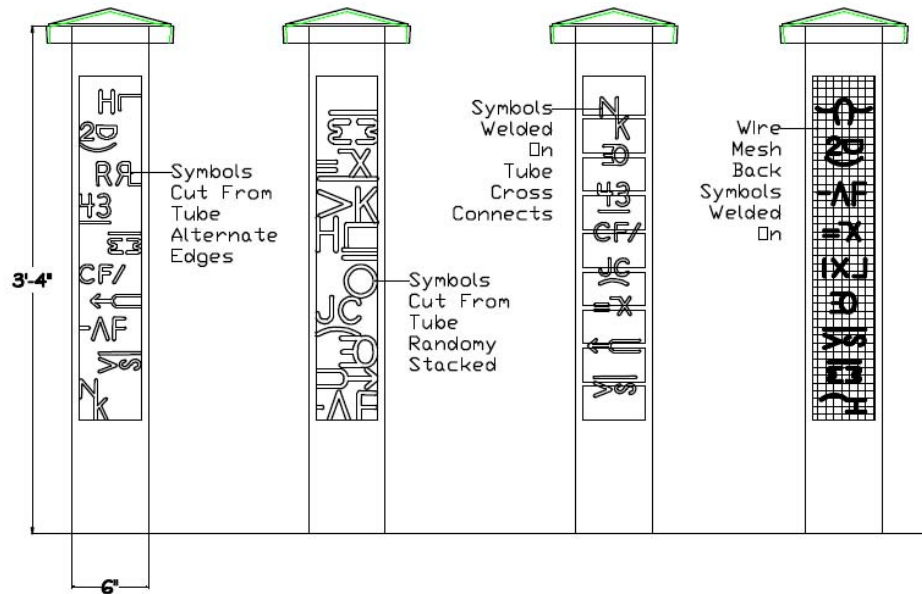
Standard Fixture Head



Standard Fixture,  
Arm, and Pole

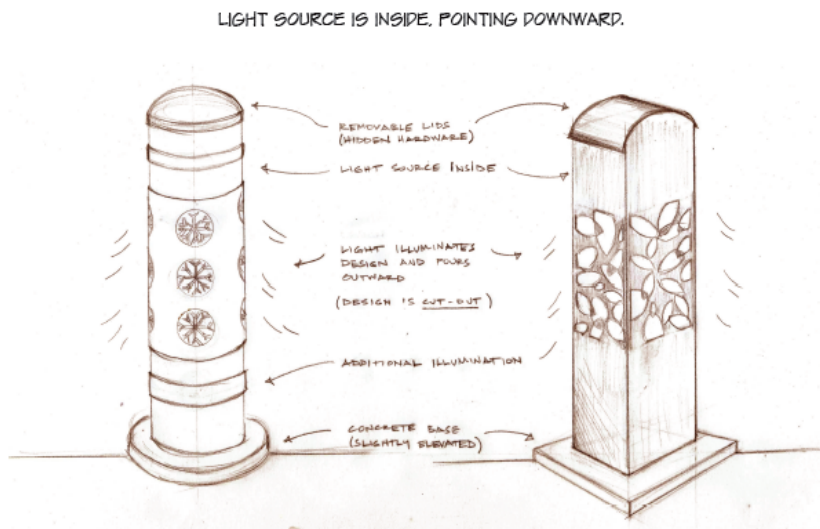
## Attraction Lights Proposal

### Ridgway Park Bollards - Ranch Brands



## Issenberg Design Proposal

### TOWN OF RIDGWAY BOLLARD PROPOSAL



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RIDGWAY BOLLARD DESIGNS

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