City of Palo Alto Streetlight Pilot Project & Long Term Plans

June 26, 2009

Overview

- Overview of City's Street lights
- Projected Long Term Benefits and Cost of Replacing Existing Fixtures
- Pilot Project Overview
- Next Steps

Overview of City's Present Street Lights

- Total number of High Pressure Sodium (HPS) fixtures 6,300
  - Type of HPS fixtures: 70, 100, 150 and 250 Watts
  - Accounts for ~0.4% of communitywide electric use
- Streetlight operations and maintenance
  - Two full time employees (FTE)
  - Annual Budget: Staff/supplies ($0.4M), energy ($0.3M)
  - HPS bulbs on group replacement every 5 years
- A 1985-1997 Capital Improvement Project replaced old incandescent and mercury vapor fixtures plus associated wiring with the existing HPS system at a total cost of $3.5 million over a 10-year period

Projected Benefits & Cost of Replacements

- Energy Efficiency Savings
  - Potential energy efficiency gains 40%
  - Equivalent of 600 metric tons of greenhouse gases (GHG) reduction each year
  - GHG reduction equivalent to 0.5% of the 2020 community + City target of 119,00 tons by 2020.
- Lower Maintenance Cost
  - Life of LED/Induction lamps longer
- LED lamps do not contain mercury – reduced disposal costs
- Replacement of all 6,300 fixtures could cost ~$4 million
- Preliminary assessment of projected payback: 8 to 12 years

Pilot Program Objectives

- Evaluate the energy and operational cost saving of different types of street lighting fixtures compared to HPS fixtures.
  - Light Emitting Diode (LED)
  - Induction technology
- Test street lighting control technologies
  - Remote control
  - Dimming after mid-night
  - Elements of smart grid technologies
- Seek community feedback on alternative street lighting technologies
- Evaluate the economic and operational merits of converting to LED or induction streetlights
- Develop a long term plan to phase out HPS fixtures

Comparison of Streetlight Technologies

HPS

- Low Color Rendering Index (CRI = 22), i.e. light output has yellow tinge (daylight has a CRI of 100).
- Lighting tends to be less uniform, with hotspots under fixtures.
- Lamps expected to live approximately 24,000 hours.
- Contains mercury.

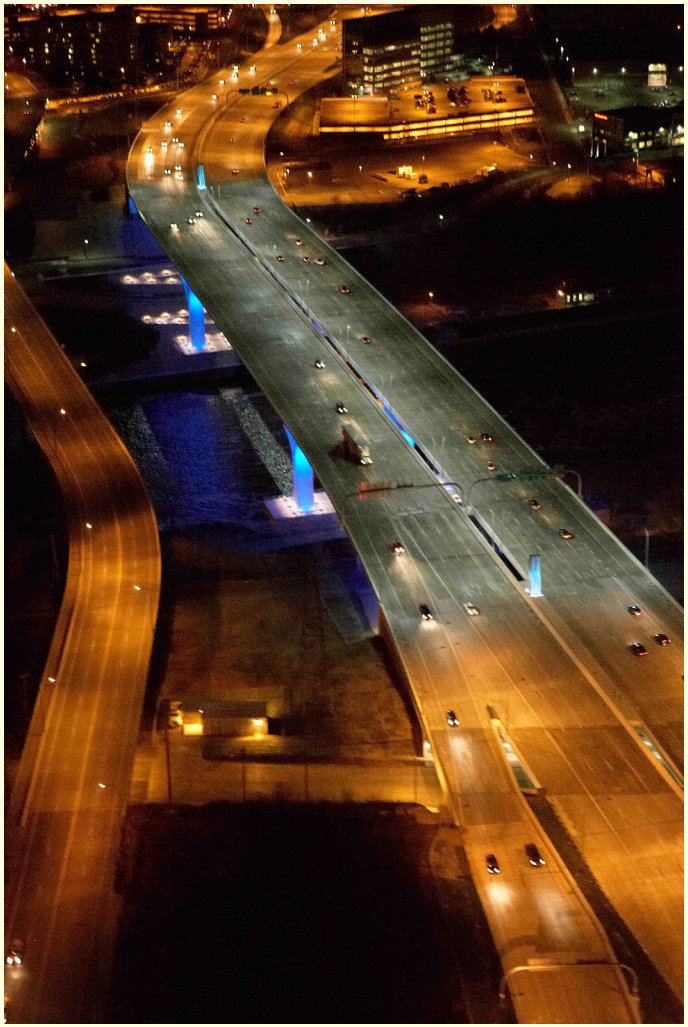
LED

- Whiter light—High Color Rendering Index (CRI = 70 to 80).
- Given the directional capability to point multiple LEDs in a fixture, light is more uniform.
- Rated lamp life of 100,000 hours.
- About 40% energy savings over HPS.
- Does not contain mercury.

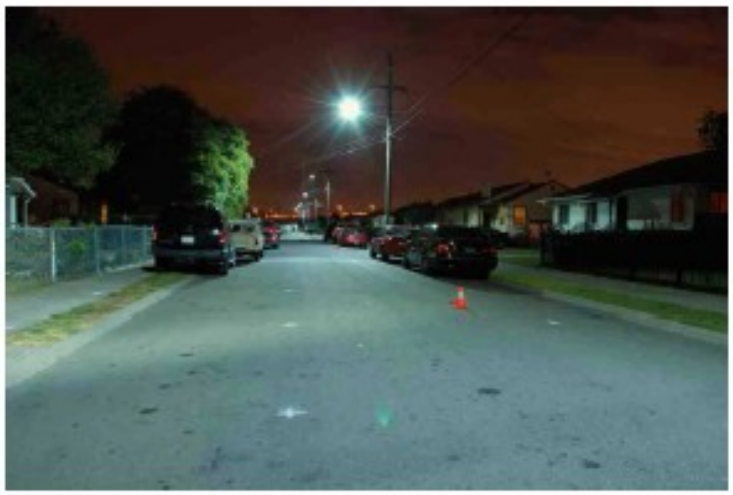
Induction

- Whiter light—High Color Rendering Index (CRI = 80).
- Lighting tends to be less uniform.
- Rated lamp life of 100,000 hours.
- Approx. 10-20% energy savings over HPS.
- Contains mercury.

Lighting photos



I-35 bridge in Minneapolis, MN



Oakland LED Streetlight Pilot

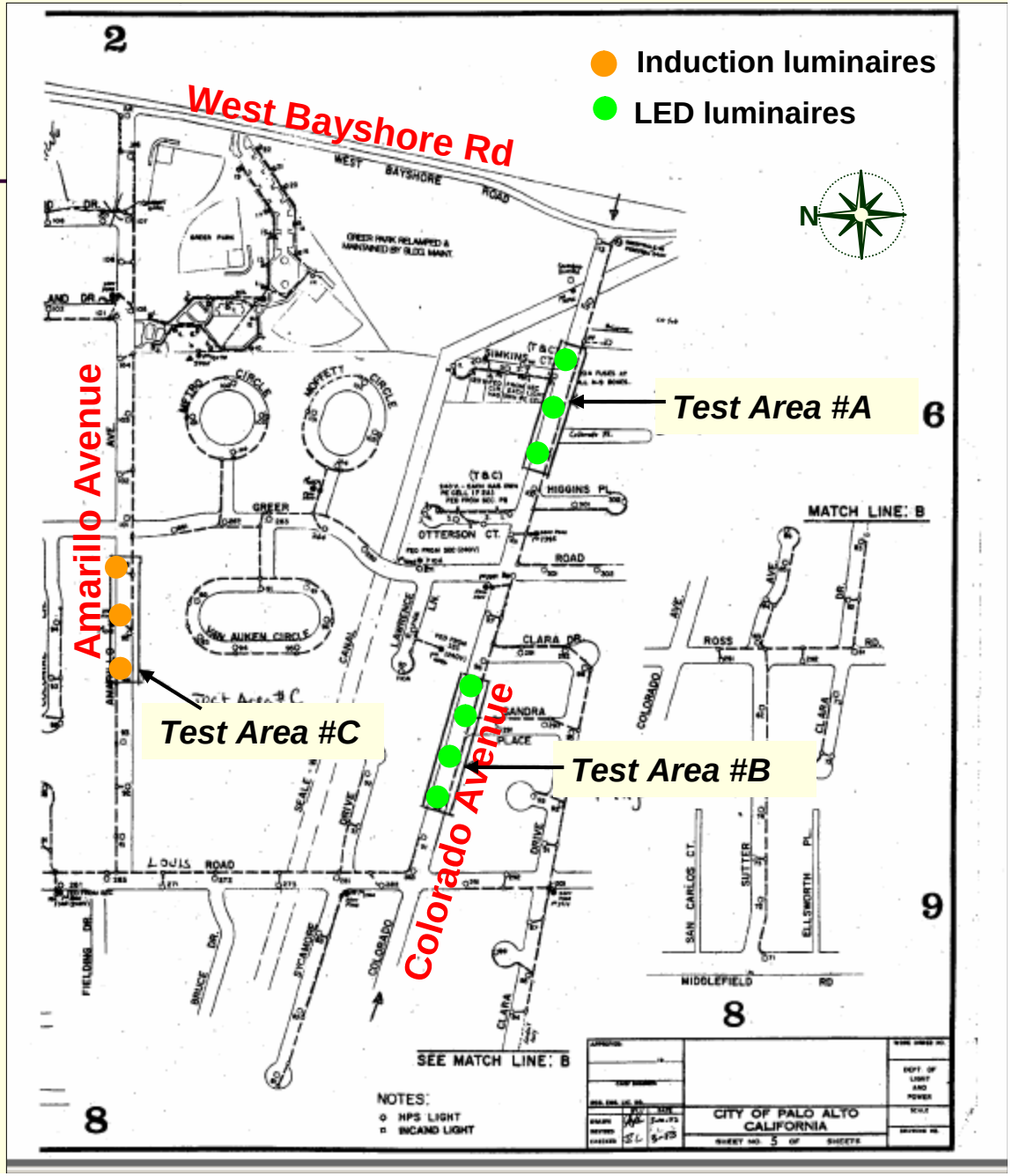
Scope of the Pilot Project

- Replace selected HPS light fixtures (luminaires) on residential streets with LED and induction fixtures (Colorado and Amarillo).
- Replace selected HPS fixtures near City Hall with LED and induction fixtures.
- Include monitoring technology that allows for:
  - dimming of individual fixtures based on lighting needs
  - Remote access and alarms to assist with maintenance

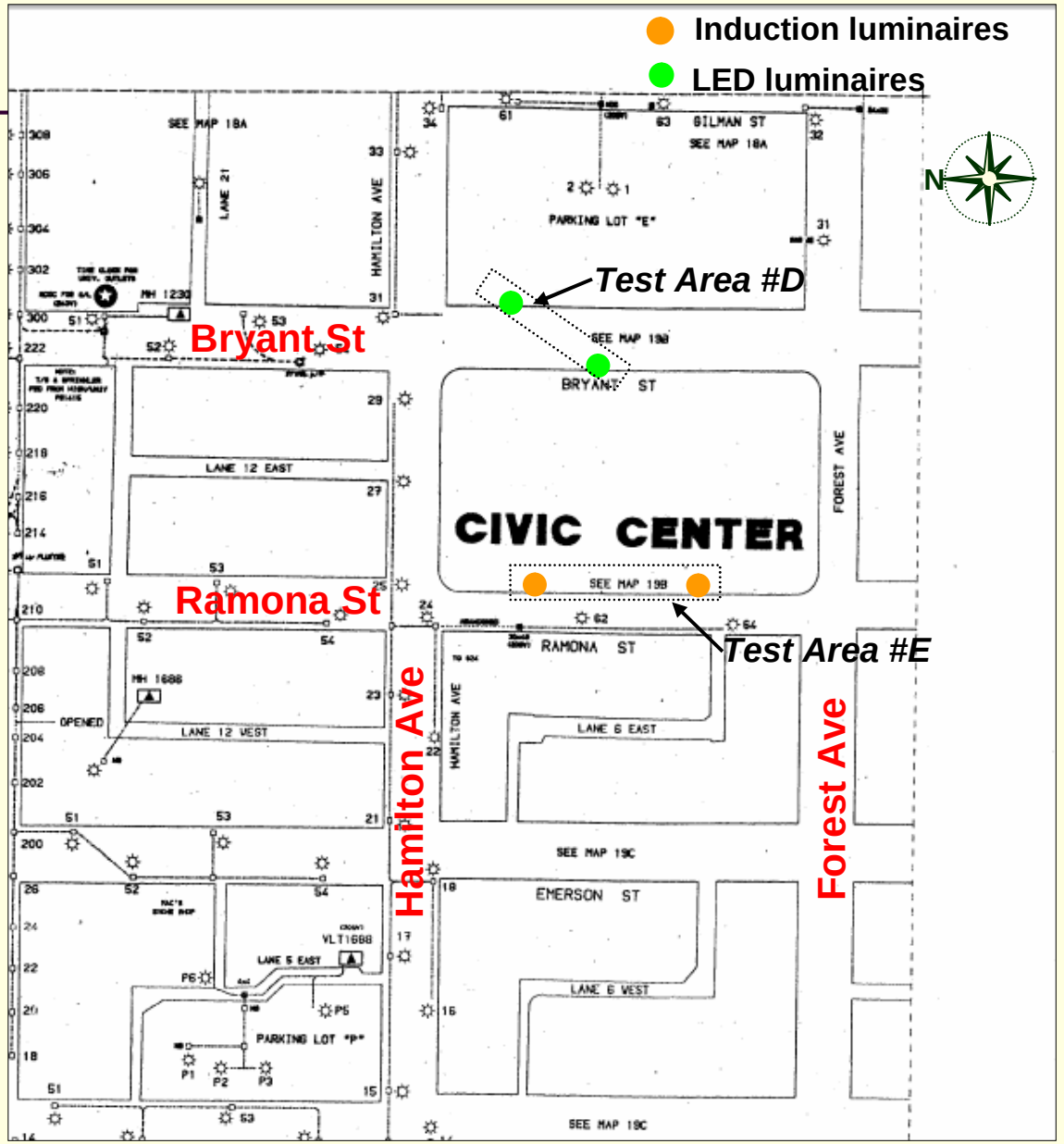
Work accomplished to date

- Selected test sites based on CEAP recommendations
- Secured free assistance from Pacific Northwest National Laboratory (DOE) for measurement and assessment (value of ~$25k)
- Selected one vendor each for LED and induction lamps based on:
  - modeling results using photometric files
  - matching existing street lighting levels
- Placed order for:
  - 9 LED fixtures
  - 6 induction fixtures
  - hardware and software for remote monitoring and dimming.
- Conducted preliminary economic analysis using current LED streetlight costs.

Test Sites


Induction luminaires
LED luminaires
West Bayshore Rd
Amarillo Avenue
Colorado Avenue
Test Area #A
Test Area #B
Test Area #C
MATCH LINE: B
SEE MATCH LINE: B
NOTES:
HPS LIGHT
INCAND LIGHT
CITY OF PALO ALTO
CALIFORNIA

Test Sites


Induction luminaires
LED luminaires
Test Area #D
Test Area #E
Bryant St
Ramona St
Hamilton Ave
Forest Ave
CIVIC CENTER
BRYANT ST
RAMONA ST
EMERSON ST
GILMAN ST
PARKING LOT "E"
PARKING LOT "P"
LANE 12 EAST
LANE 12 WEST
LANE 5 EAST
LANE 6 EAST
LANE 6 WEST
FOREST AVE
HAMILTON AVE
SEE MAP 19A
SEE MAP 19B
SEE MAP 19C
N

Pilot Schedule

Week of June 22	Install LED/induction luminaires (4) near City Hall with Echelon control equipment.
July 6 -7	Install LED/induction luminaires (10) along Colorado and Amarillo Ave. Before and after field measurements of lumen levels and power consumption: 10 pm to 2am.
August/Sept	Compile community and police feedback.
Fall 2009	Present pilot project results to Council.
Fall/Winter	Phase 2: evaluate additional vendor products for bulk purchase.
Spring 2010	Seek approval for long term replacement CIP
Spring 2010	Issue RFP for LED fixtures (400) funded by the DOE Energy Efficiency block grant.
2015-16	Complete retrofit of all HPS fixtures in Palo Alto.

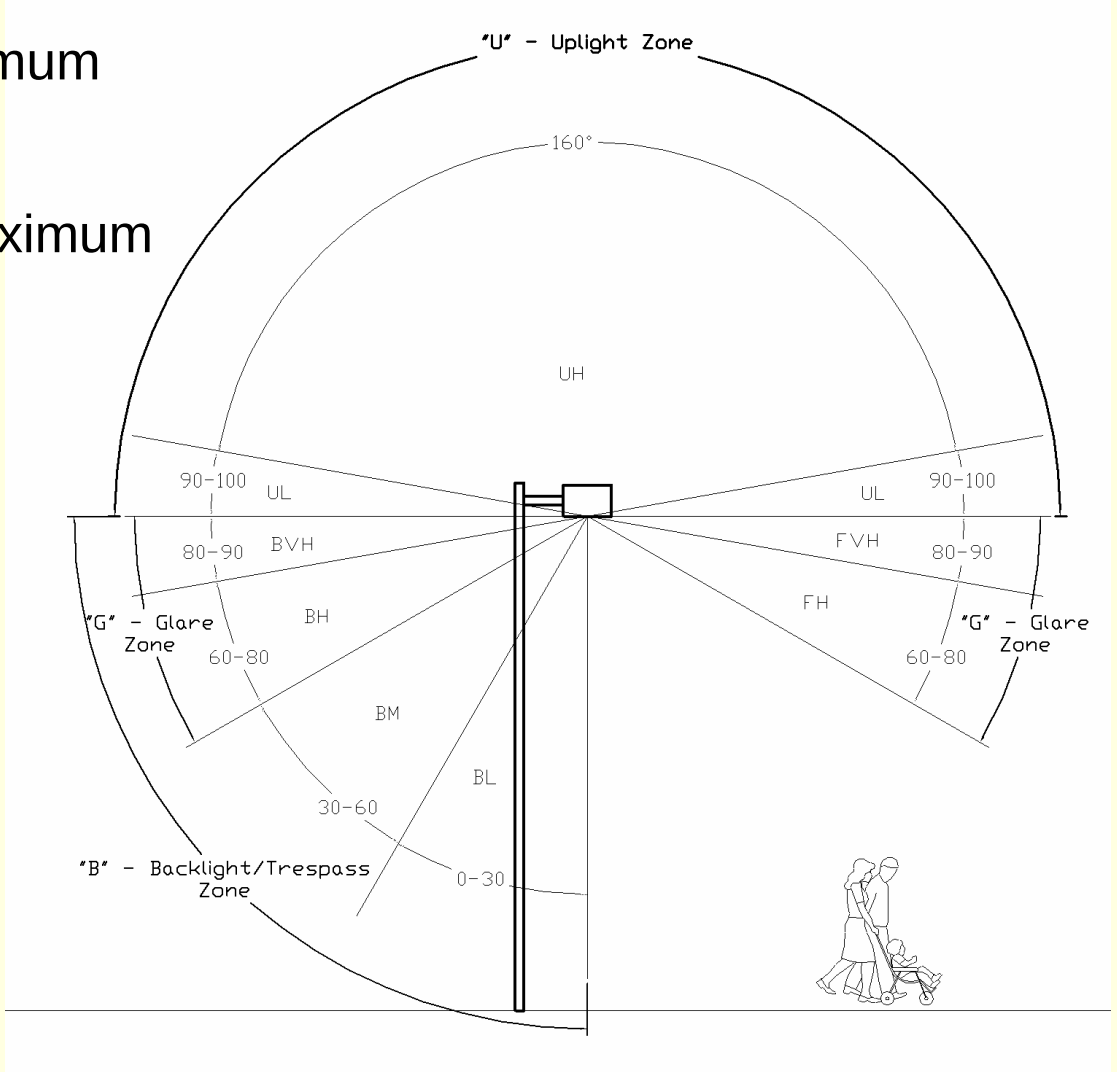
Outreach and Communication

June 30	Distribute letters to residents nearby Colorado Avenue and Amarillo Avenue.
August (tbd)	Conduct neighborhood walks with residents residents.
August 3	Demonstrate City Hall fixtures to Utility Advisory Commission (UAC).
September	Demonstrate to City Council.

Back up slides

Key Issues for Luminaire Selection

- Illumination level (minimum illuminance).
- Lighting uniformity (maximum to minimum ratio).
- Quality of light
- Glare.
- Light trespass.
- Economics.



Survey questions

1. Did you notice that the streetlights in Test Area #A along Colorado Avenue have been replaced?
   ☐ Yes ☐ No

2. How did you experience the new lights?
   ☐ By car ☐ By bicycle ☐ As a pedestrian ☐ From a residence

3. Do you feel that the new street lights have improved your visibility as a pedestrian compared to the older HPS-based adjacent fixtures?
   ☐ Yes ☐ No ☐ About the same

4. Do you feel that the new street lights have improved your visibility as a driver?
   ☐ Yes ☐ No ☐ About the same

5. If the new lights are installed along the entire street, it would make the street feel:

Safer?	☐ Yes	☐ No	☐ About the same
Better ambiance?	☐ Yes	☐ No	☐ About the same
Too bright?	☐ Yes	☐ No	☐ About the same
Too dim?	☐ Yes	☐ No	☐ About the same
Better color distinction?	☐ Yes	☐ No	☐ About the same