Transitioning to Networked Adaptive Exterior Lighting

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Learning Objectives

Identify cities and utilities participating in research activities with CLTC

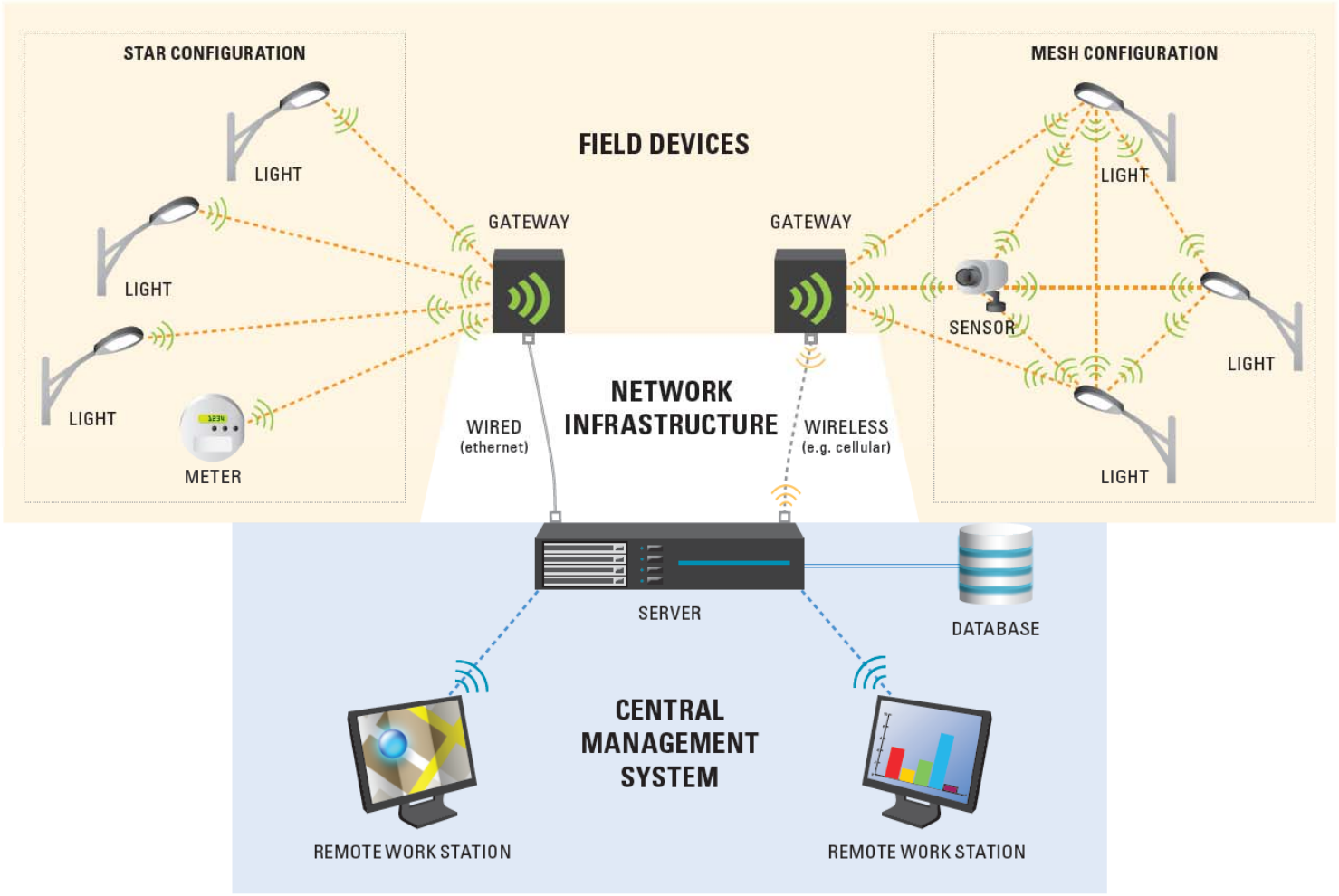
Compare demonstration and research results

Describe the energy savings potential and best practices for the design of outdoor networked lighting systems

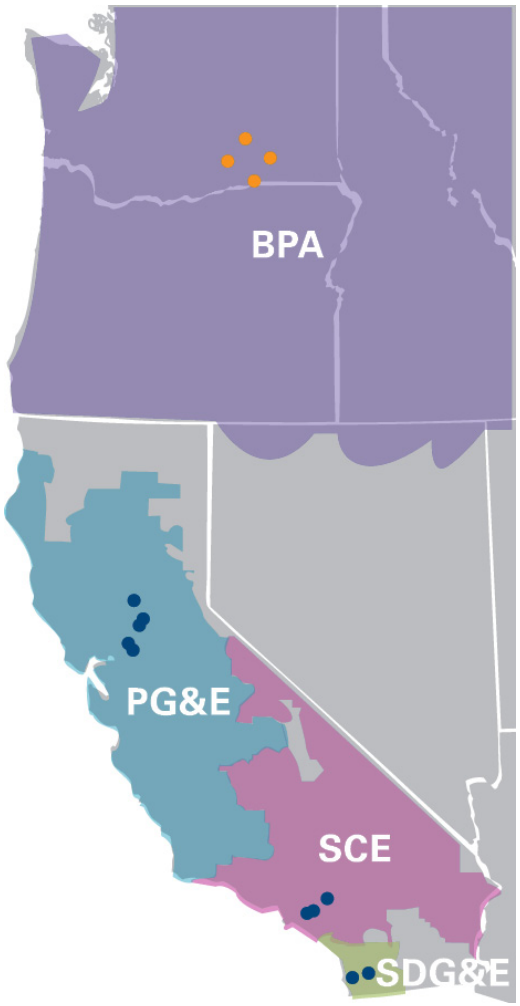
Analyze next steps to support broader adoption of outdoor networked adaptive lighting systems

About the California Lighting Technology Center

Networked Adaptive Exterior Lighting Systems



Research sites: Networked Adaptive Lighting Systems



WASHINGTON SITES

Bonneville Power Administration (BPA)

- Large Office Building A (Richmond, WA)
- K–12 School (Pasa, WA)
- Fast Food Restaurant (Walla Walla, WA)
- Building Supply Franchise (College Place, WA)

CALIFORNIA SITES

Pacific Gas and Electric (PG&E)

- Big Box Store (West Sacramento, CA)
- 2nd St. (L St. to Pole Line Rd.) (Davis, CA)
- UC Davis Campus (Davis, CA)
- Office Campus, Vacaville, CA

Southern California Edison (SCE)

- Office Building B (Long Beach, CA)
- Outdoor Shopping Center (Irvine, CA)
- UC Irvine West Peltason Dr. (Irvine, CA)

San Diego Gas and Electric (SDG&E)

- E. Palomar and Heritage Corner, Chula Vista (San Diego, CA)
- Downtown, near 11th and Island (San Diego, CA)

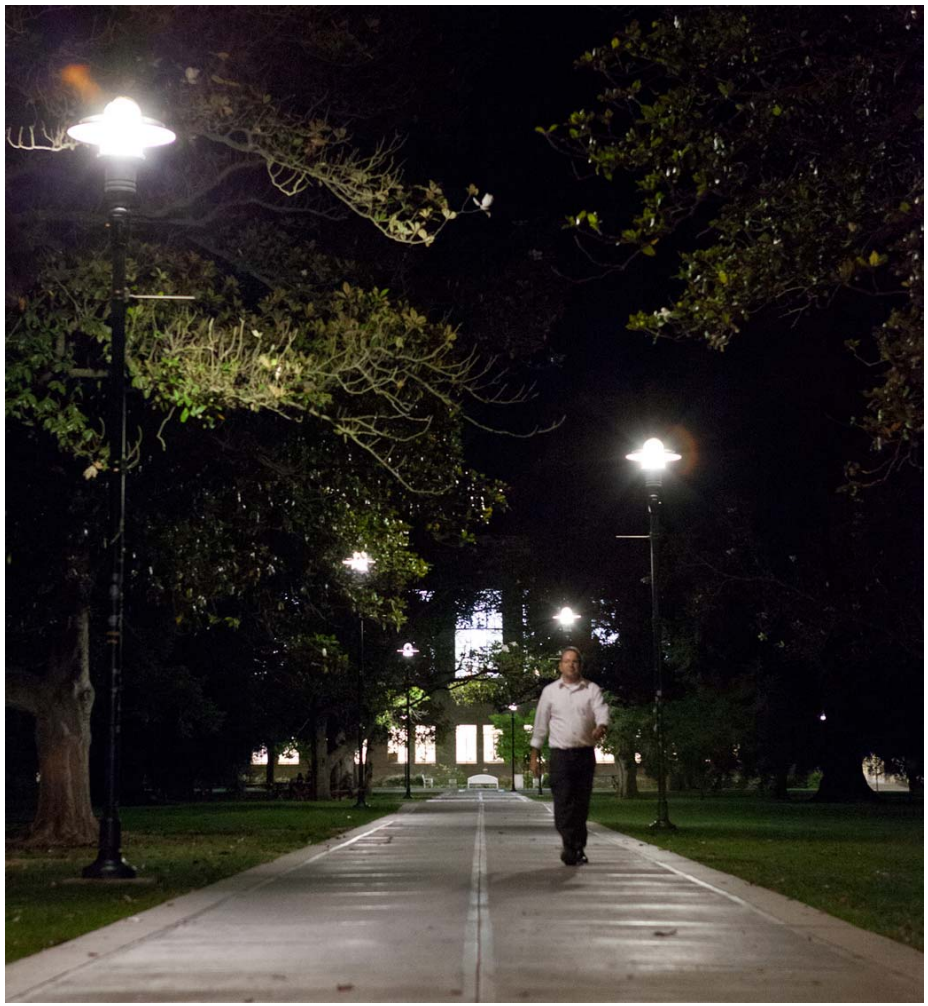
Field: Demonstration Savings

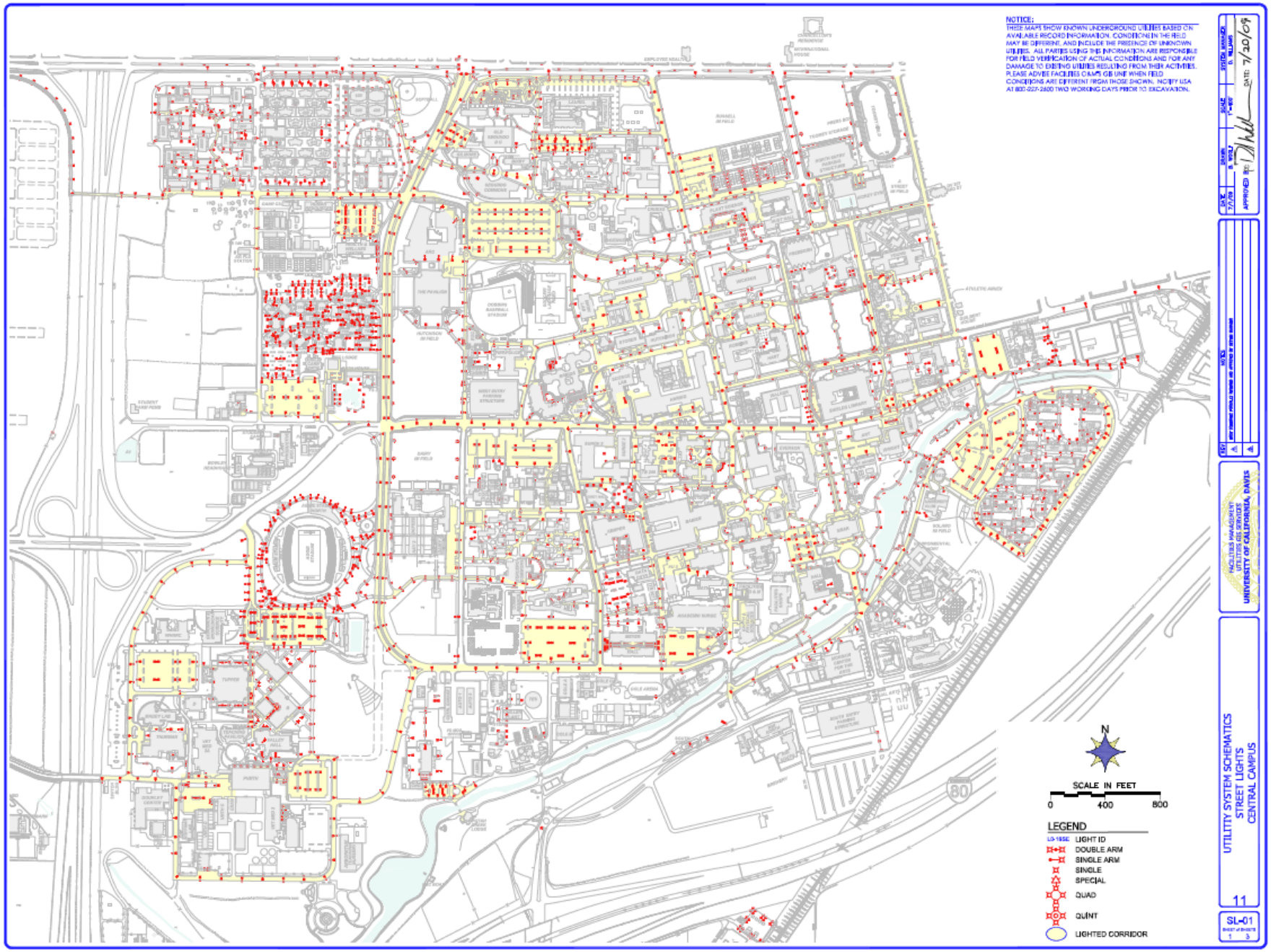
Research Site	Site Type	Control Strategy	Baseline Source Type	Retrofit Source Type	Total Energy Savings
City of Chula Vista	Street	Networked Communication	HPS	LED	Pending
City of San Diego	Street	Networked Communication	HPS	LED and Induction	Pending
UC Davis	Area	Occupancy	HPS and MH	LED and Induction	89%
UC Irvine	Street	Occupancy	Induction	LED	51%*
City of Davis	Street	Occupancy - Varied Time Delays	HPS	LED	27% - 42%
VacaValley Hospital	Area	Occupancy	Induction	LED	66%

Lab: Simulated Savings

Research Site	Site Type	Control Strategy	Baseline Source Type	Retrofit Source Type	Potential Energy Savings Range (%)
Big Box Store	Area	Occupancy - Varied Designs and Time Delays	HPS and MH	LED 100% High/50% Low	71.6% - 79.4%
Office Campus	Area	Occupancy - Varied Designs and Time Delays	HID	LED 100% High/50% Low	73.1% - 85.1%
Office Building, B	Area	Occupancy - Varied Designs and Time Delays	HPS and MH	LED 100% High/50% Low	79.2% - 87.1%
Outdoor Shopping Center	Area	Occupancy - Varied Designs and Time Delays	HID	LED 100% High/50% Low	80.6% - 86.4%
Building Supply Franchise	Area	Occupancy - Varied Designs and Time Delays	MH	LED 100% High/50% Low	69.0% - 78.1%
K-12 School	Area	Occupancy - Varied Designs and Time Delays	MH	LED 100% High/50% Low	80.2% - 83.6%
Large Office Building, A	Area	Occupancy - Varied Designs and Time Delays	Induction	LED 100% High/50% Low	77.9% - 81.6%
Fast Food Restaurant	Area	Occupancy - Varied Designs and Time Delays	MH	LED 100% High/50% Low	70.2% - 72.0%

University of California, Davis



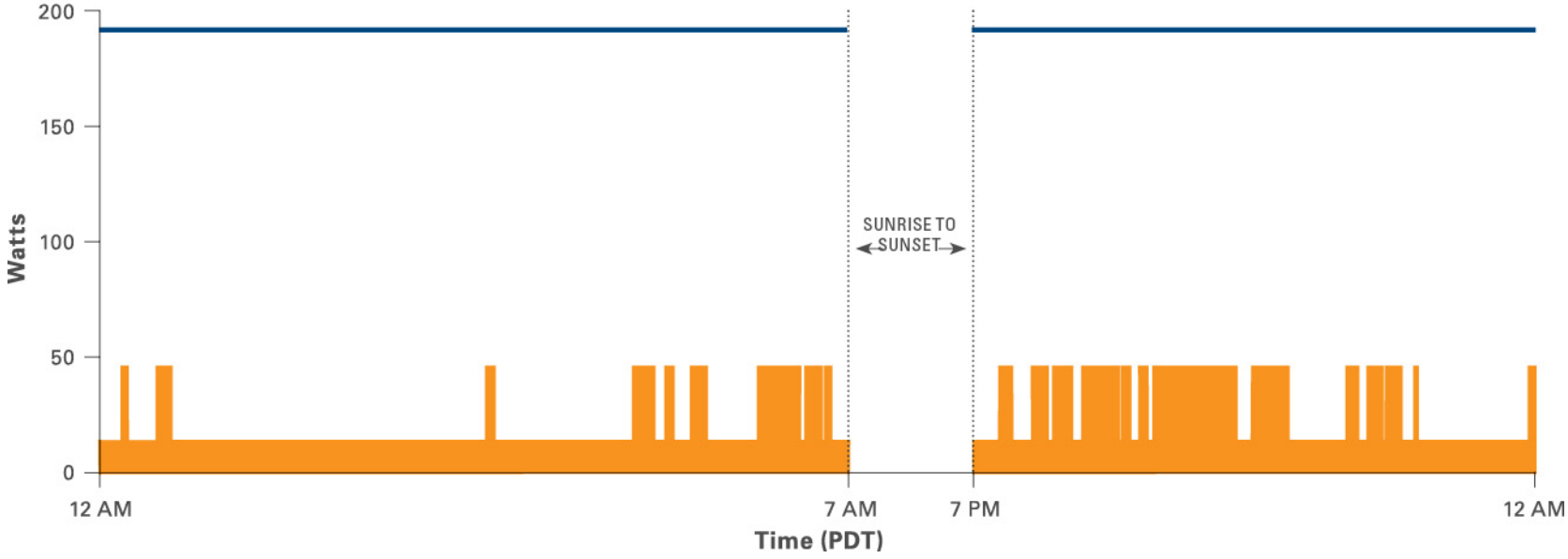

NOTICE:
THESE MAPS SHOW KNOWN UNDERGROUND UTILITIES BASED ON AVAILABLE RECORD INFORMATION. CONDITIONS IN THE FIELD MAY BE DIFFERENT, AND INCLUDE THE PRESENCE OF UNKNOWN UTILITIES. ALL PARTIES USING THIS INFORMATION ARE RESPONSIBLE FOR FIELD VERIFICATION OF ACTUAL CONDITIONS AND FOR ANY DAMAGE TO EXISTING UTILITIES RESULTING FROM THEIR ACTIVITIES. PLEASE ADVISE FACILITIES CAMPUS GIS UNIT WHEN FIELD CONDITIONS ARE DIFFERENT FROM THOSE SHOWN. NOTIFY USA AT 800-227-2600 TWO WORKING DAYS PRIOR TO EXCAVATION.
N
SCALE IN FEET
0
400
800
LEGEND
LD-1856 LIGHT ID
DOUBLE ARM
SINGLE ARM
SINGLE
SPECIAL
QUAD
QUINT
LIGHTED CORRIDOR
80
SYSTEM MANAGER
G. WILLIAMS
SCALE
1" = 400'
DATE: 7/20/09
APPROVED BY:
SHEET
11
SL-01
SHEET 1 OF 3
UTILITY SYSTEM SCHEMATICS
STREET LIGHTS
CENTRAL CAMPUS
FACILITIES MANAGEMENT
UTILITIES DIVISION
UNIVERSITY OF CALIFORNIA, DAVIS

University of California, Davis
Wall Packs, Thermal Energy Storage building

Wall Pack Results:
89% Energy Savings
20% Occupancy

Pre-retrofit HPS
189W

Post-retrofit LED
14W (low) and 45W (high)
Occupancy Rate: 20%



Occupancy Sensor Validation for Roadway

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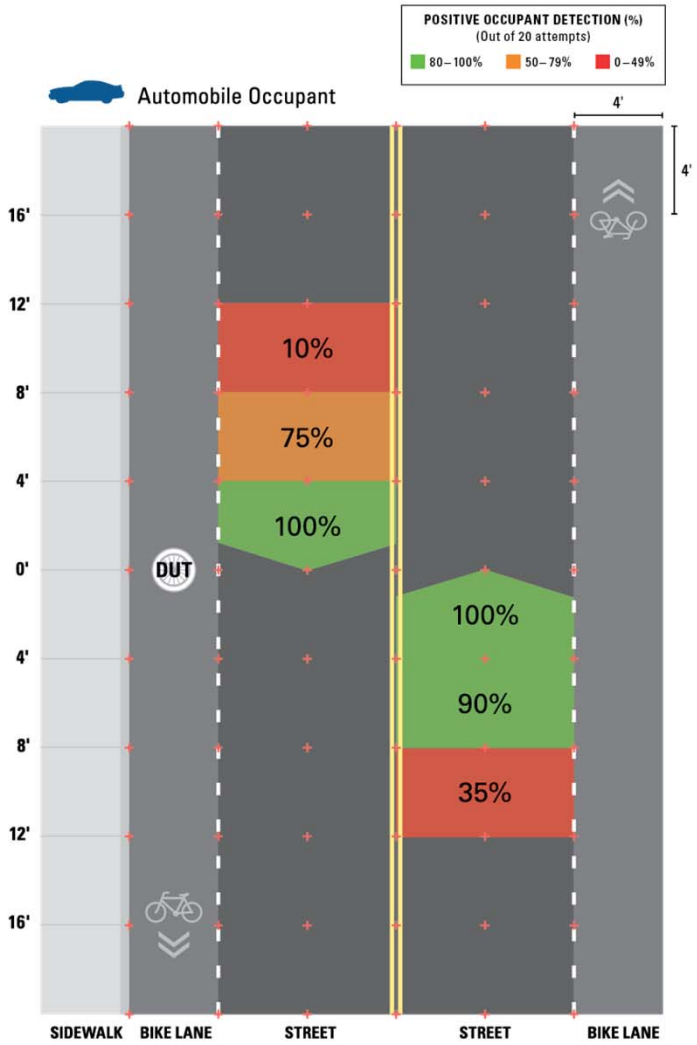

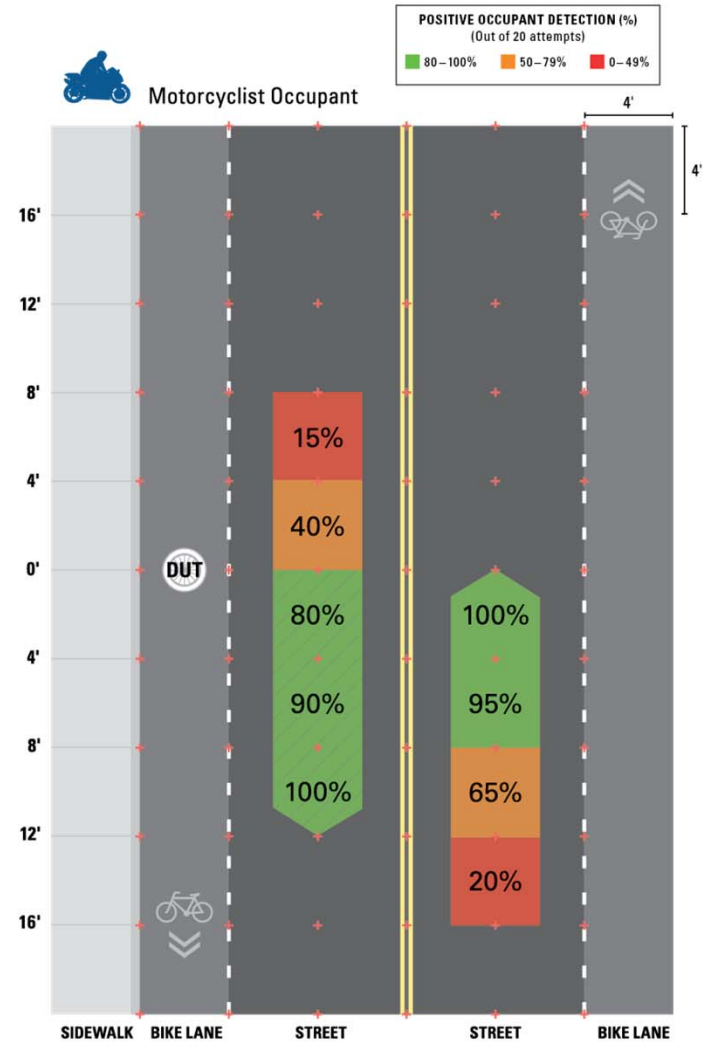

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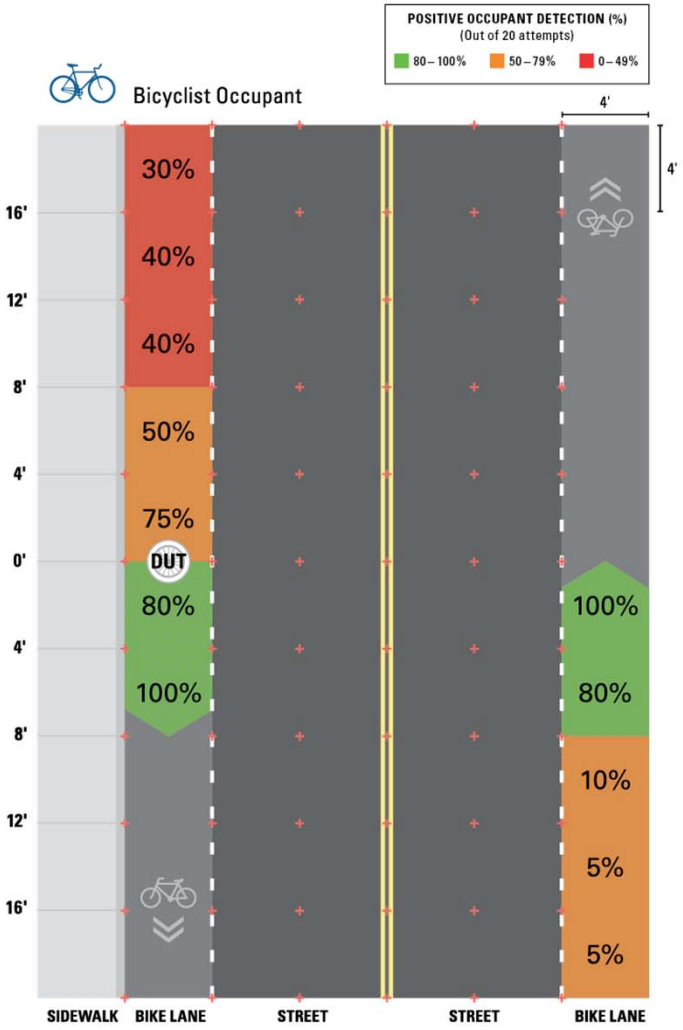
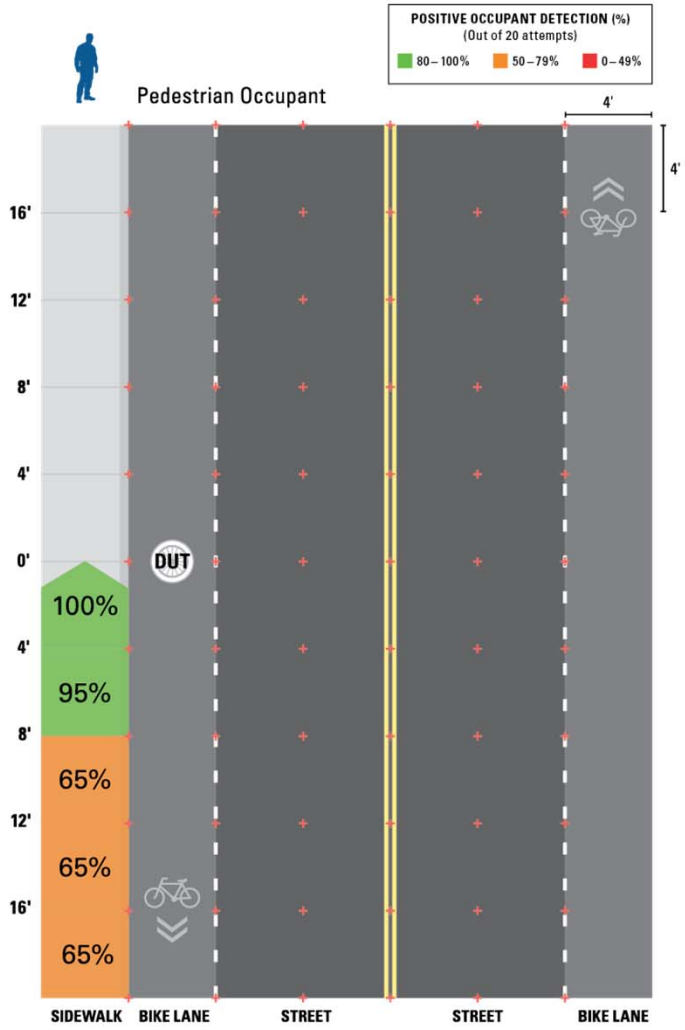
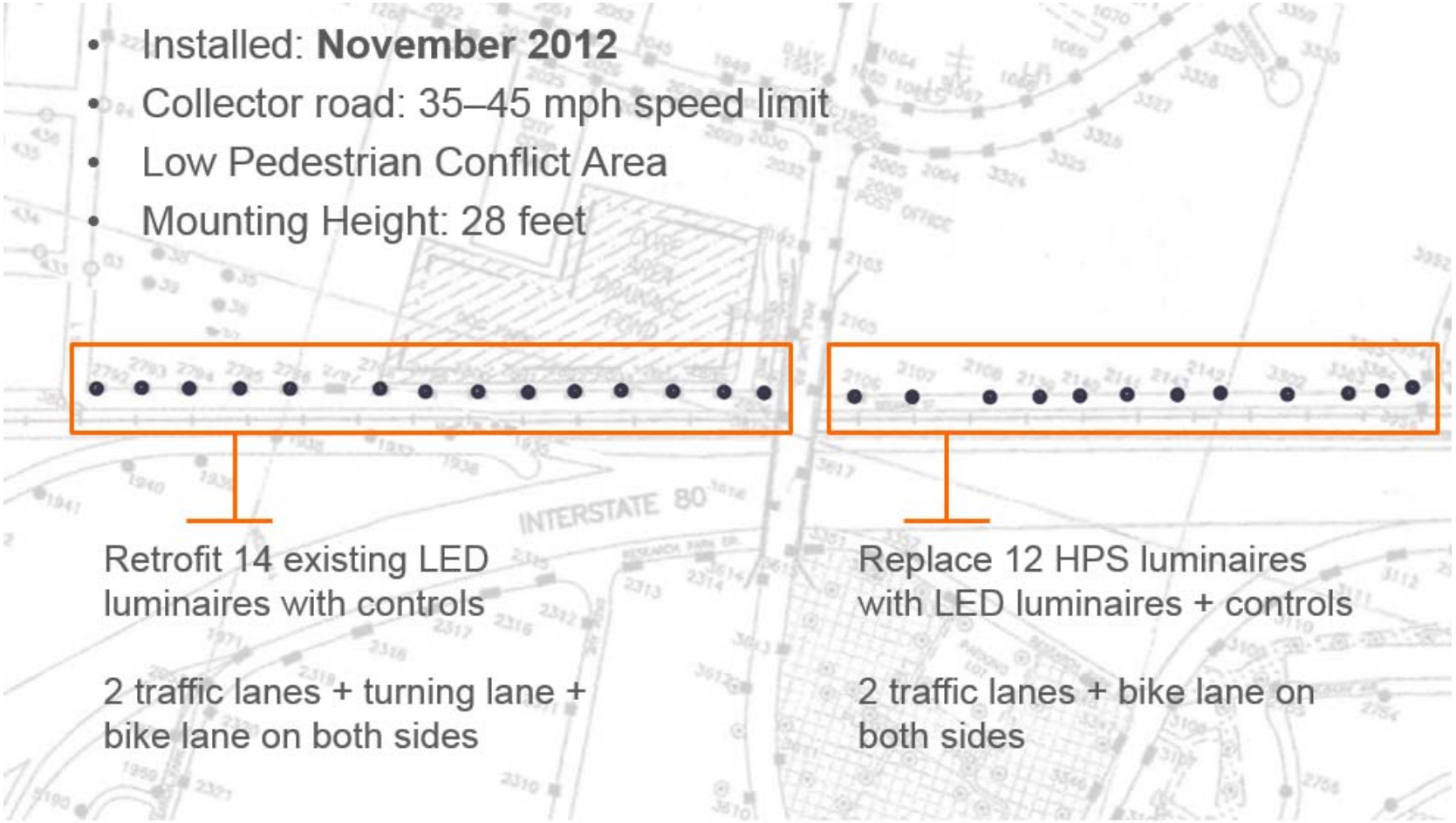




City of Davis



Control Strategies Considered

Occupancy Based Bi-Level

- Low mode: 20% power
- High mode: 100% power

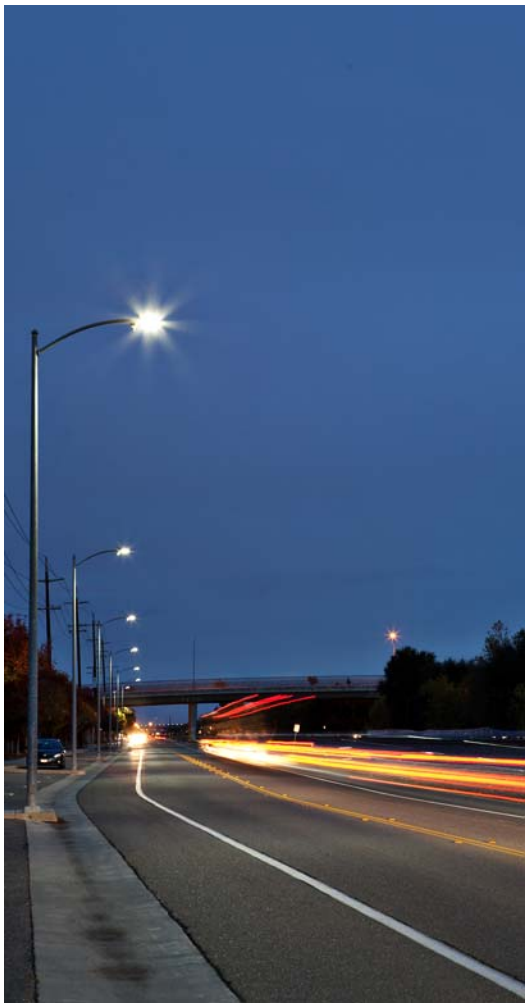
Number of luminaires adjusted per sensor trigger

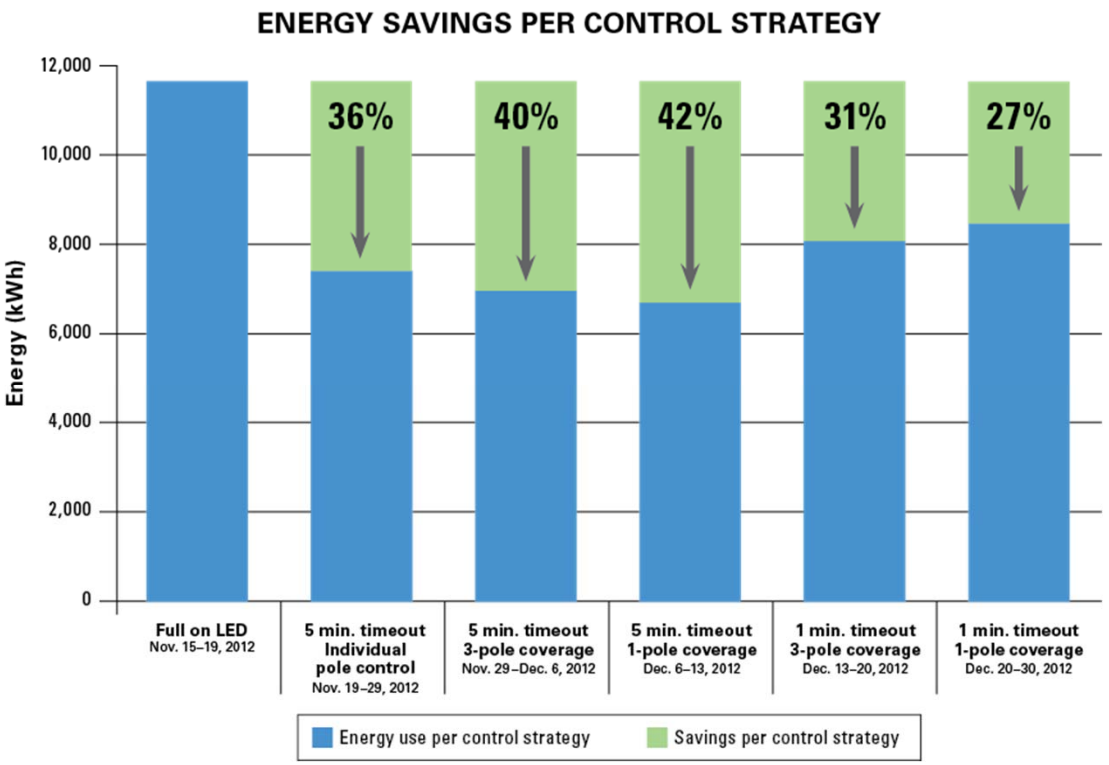
- Individual Pole control
- One luminaire in the direction of travel
- Three luminaires in the direction of travel

Time delay to determine vacancy

- 1 minute
- 5 minutes

City of Davis





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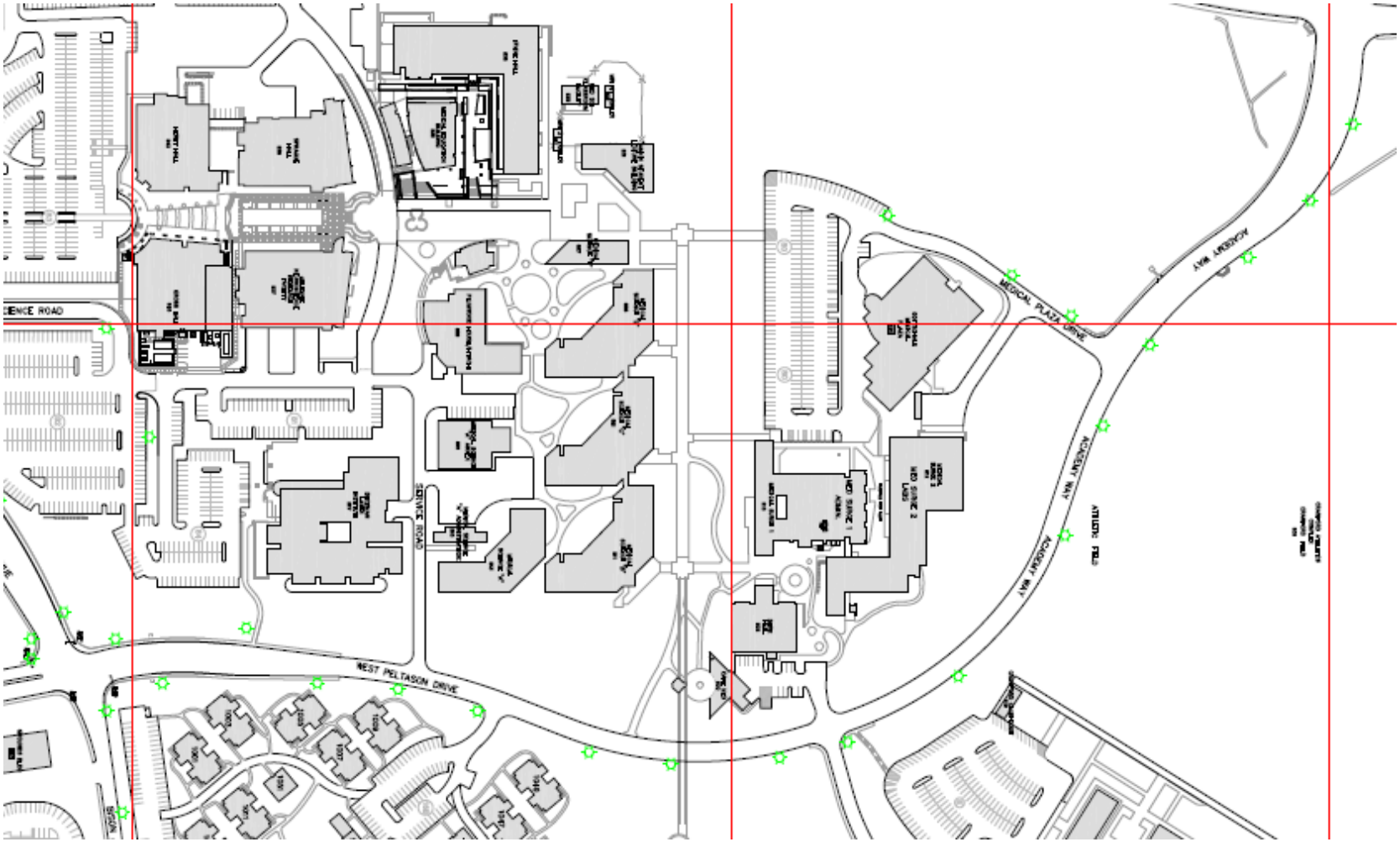

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Luminaire Specifications
Nominal Wattage: 101 W
CCT: 4000 K
CRI: 70
Distribution: Type II

Control System:
RF Communication
Microwave Sensors

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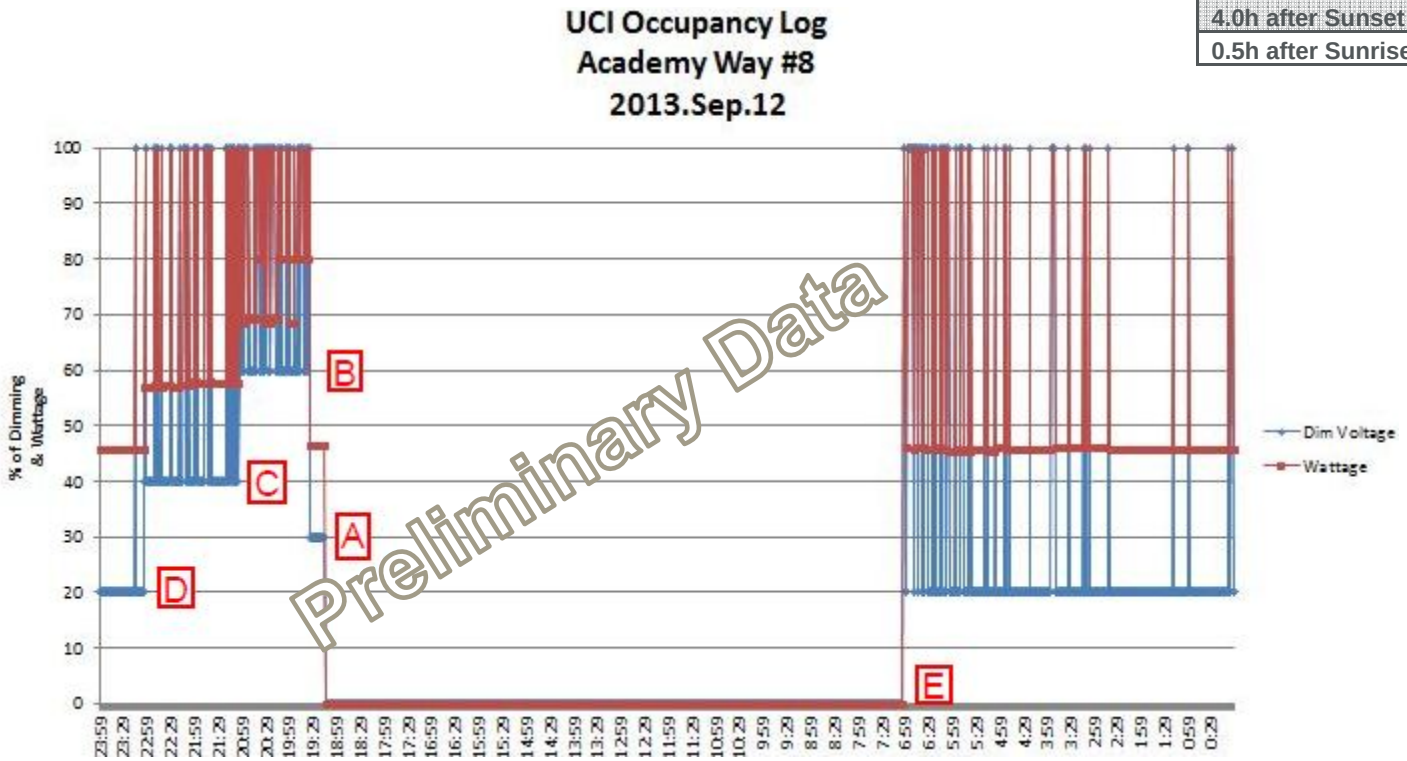
0.5h before Sunset	3.0v [A]
0.5h after Sunset	6.0v [B]
2.0h after Sunset	4.0v [C]
4.0h after Sunset	2.0v [D]
0.5h after Sunrise	0.0v [E]



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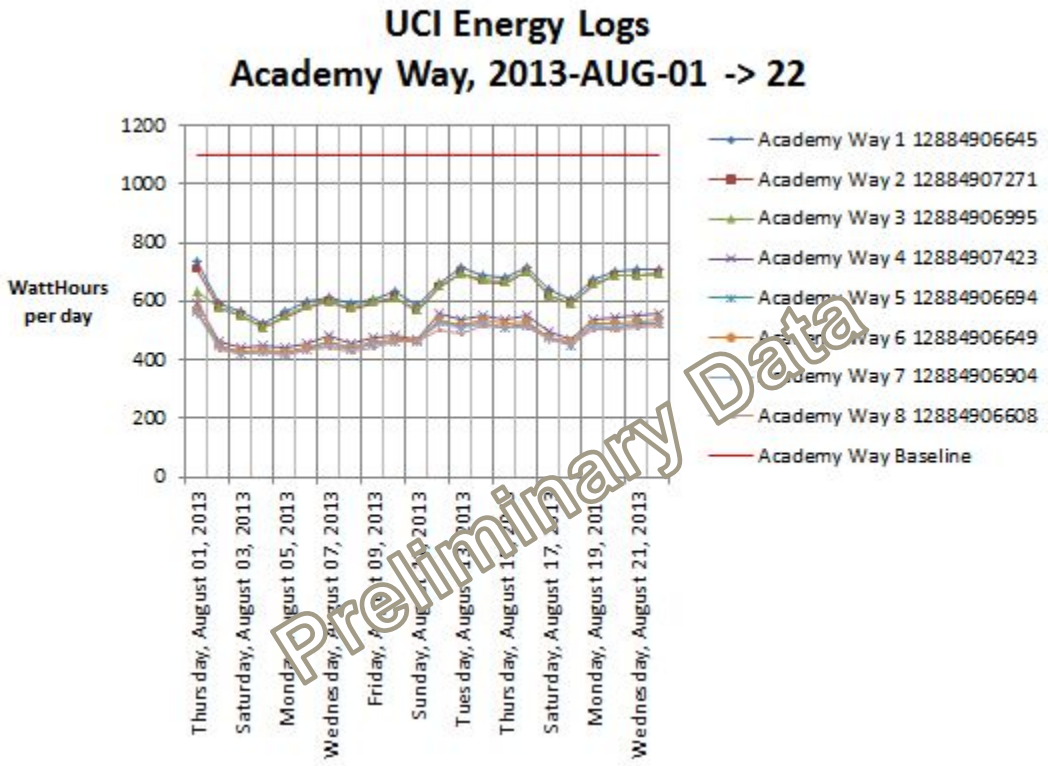
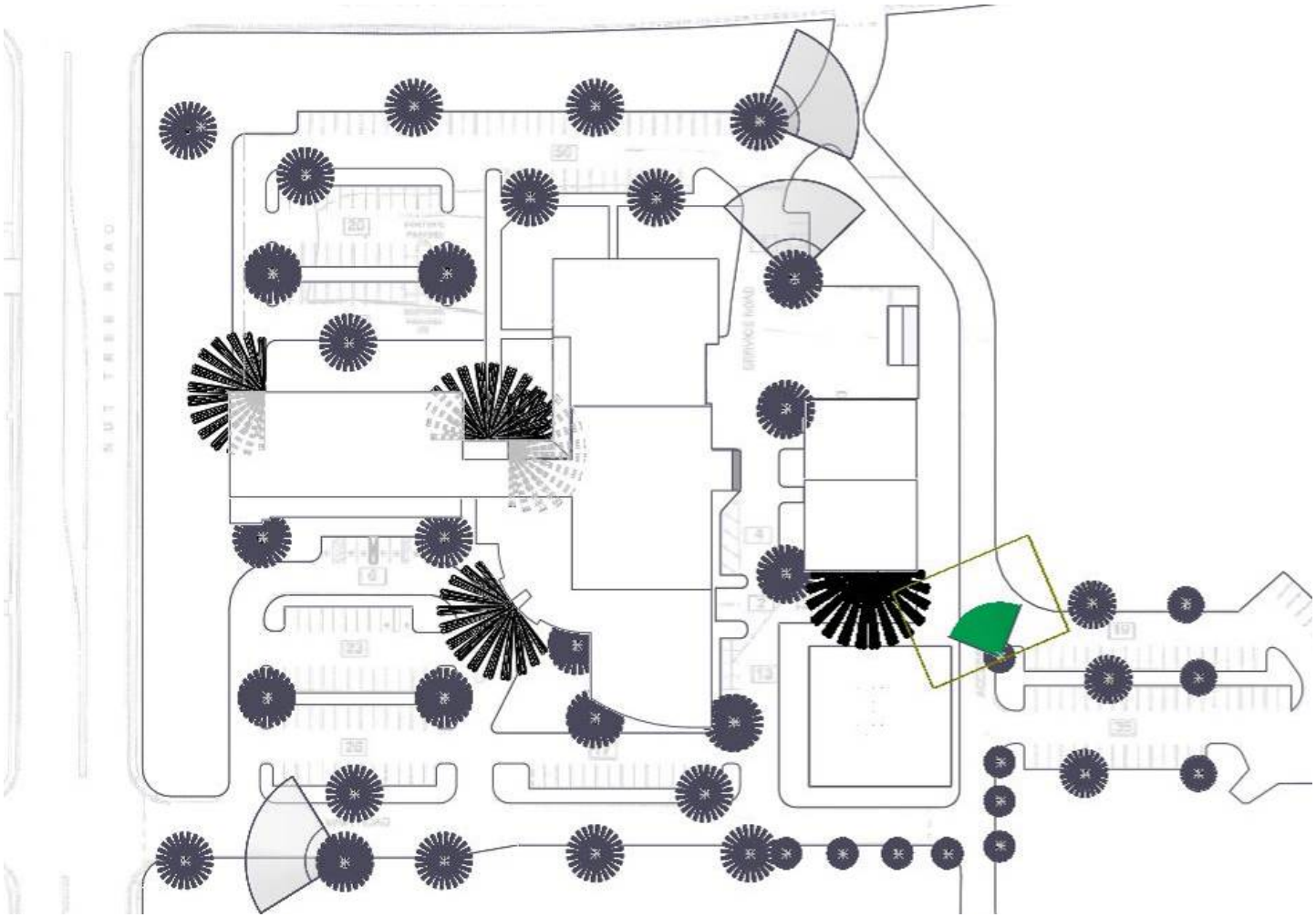


VacaValley Hospital

VacaValley Hospital



VacaValley Hospital

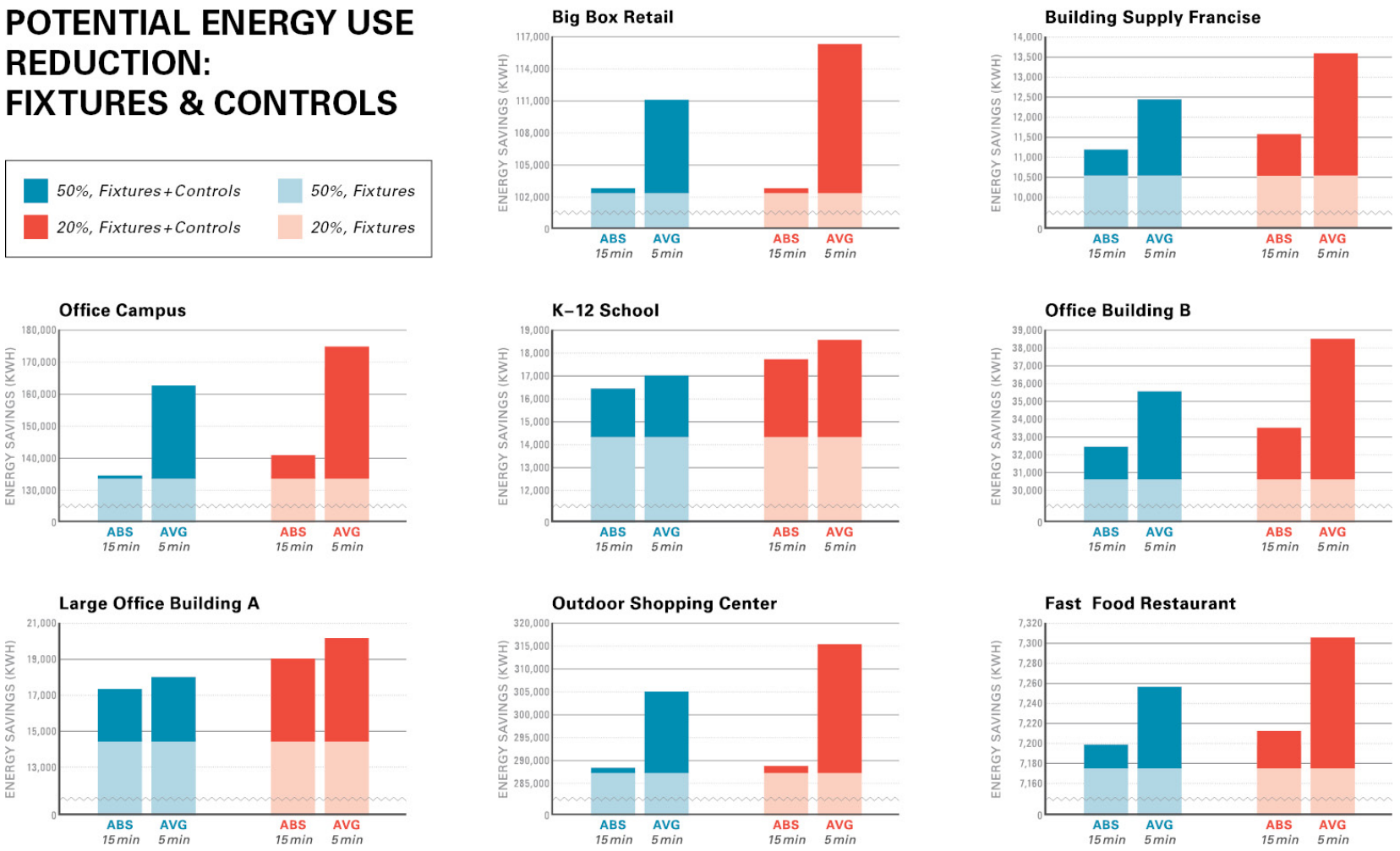
ENERGY SAVINGS
66%

OCCUPANCY RATE
35–55%

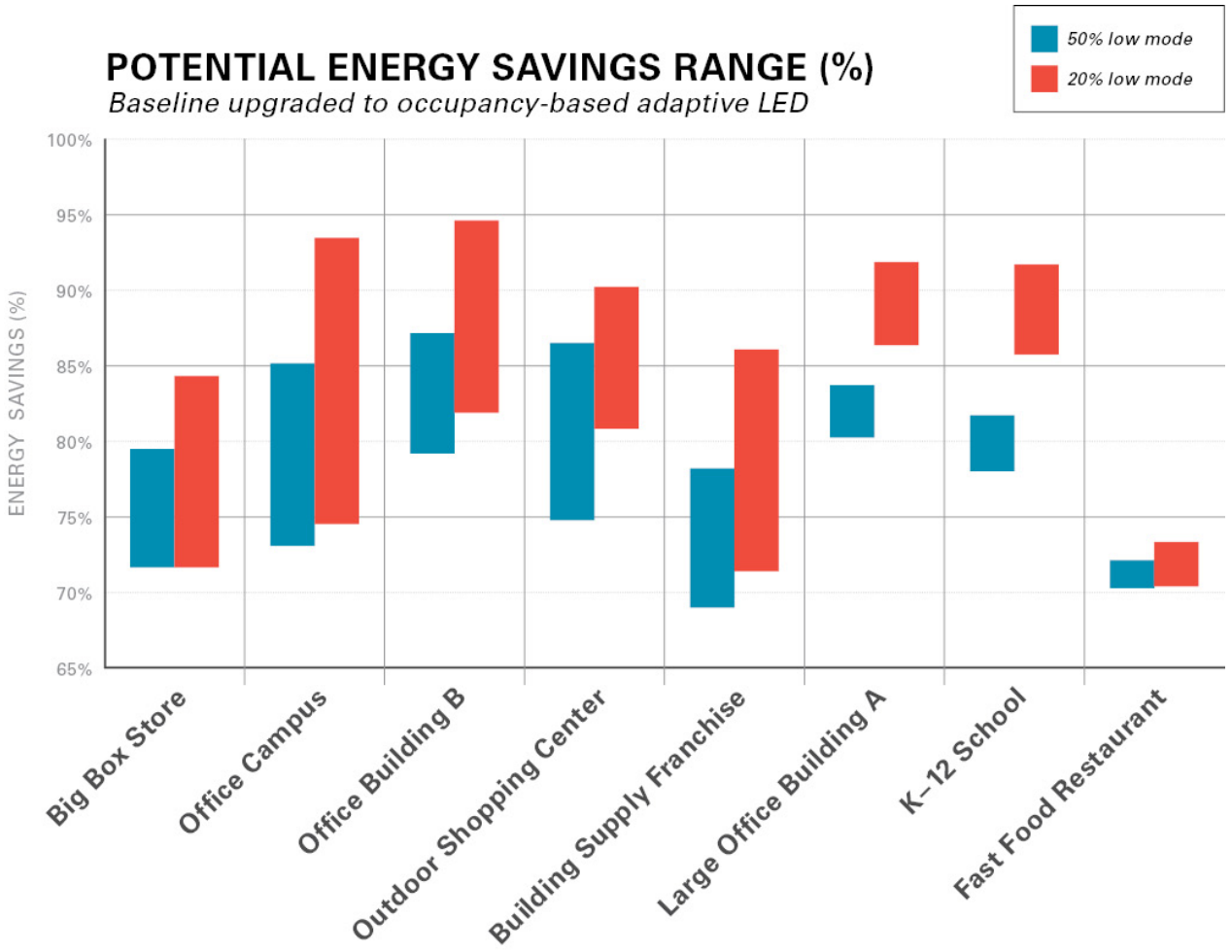
LIFETIME ENERGY COST SAVINGS
$23,220
at $0.08/kWh, over 10 years

2014 LIGHTING ENERGY EFFICIENCY IN PARKING (LEEP) AWARD WINNER
Best Use of Lighting Controls in a Single Facility

Exterior Occupancy Survey: Simulations



Exterior Occupancy Survey: Simulations



Questions?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CENTER