Centralized Street Lighting Control and Monitoring Demonstration Project

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Project Description

- Demonstration Project
- Retrofit 172 Existing Street Lights with Remote Addressable Dimming Technology
- Test Innovative Product in Real Life Situation
- Identify Challenges and Measure Outcomes

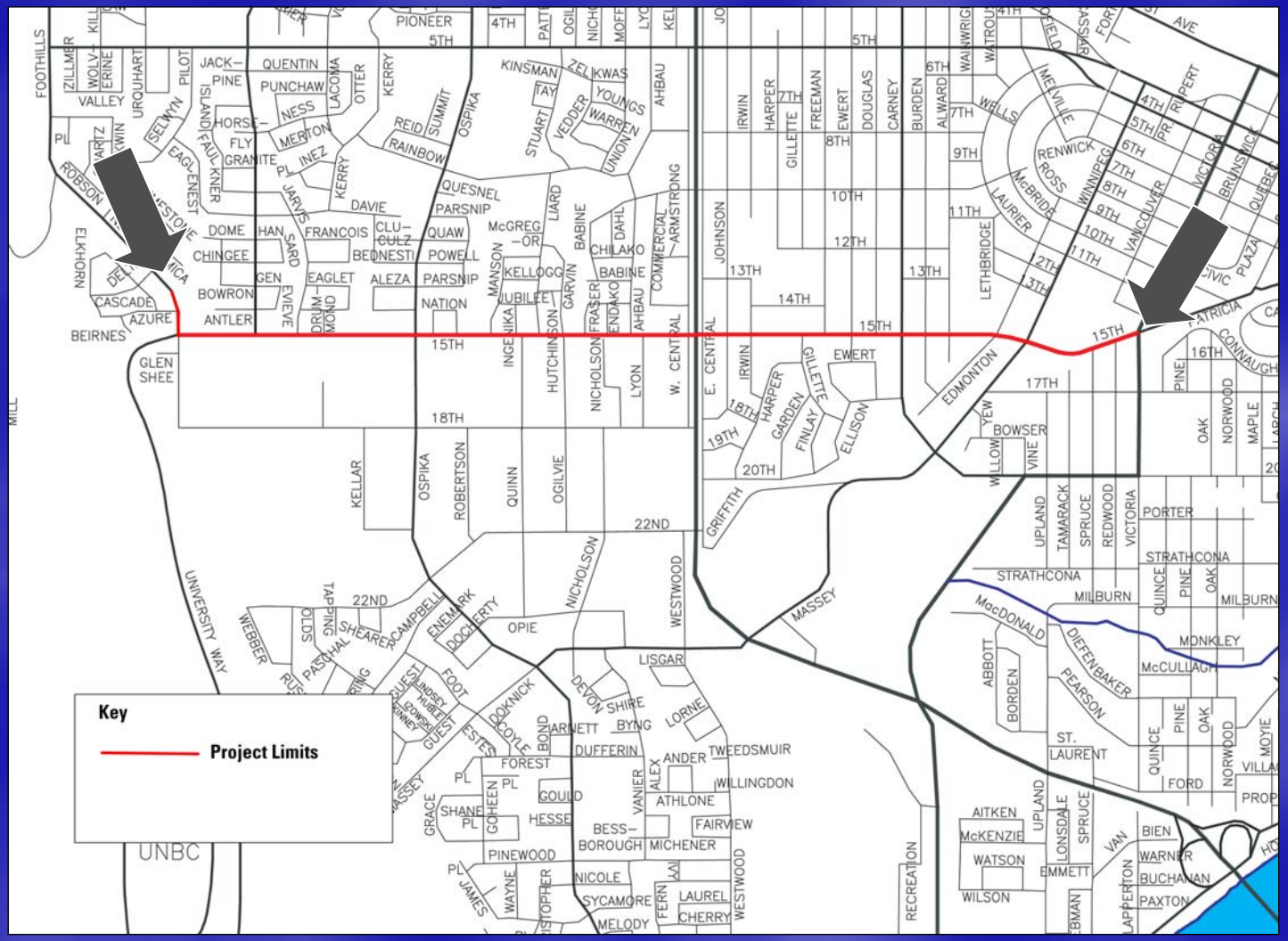
Project Participants

- DMD & Associates Ltd., Consultant
- City of Prince George, BC – Owner
- BC Hydro Power Smart Program – Utility
- Lighting Sciences Inc. – Testing
- BC Ministry of Transportation
- Insurance Company of British Columbia
- Royal Canadian Mounted Police

Project Location

- Located in Prince George, BC
- 72,000 population
- 5000 Total Street Lights Owned by Three Agencies
  - City of Prince George
  - BC Ministry of Transportation
  - BC Hydro (Local Utility)

Project Limits



Project Scope

- Investigate Product Claims
- Manage Testing Program (through LSI)
- Evaluate Results of Testing
- Advise on Deployment
- Evaluate Results of Operation

Advantages to Managed System

- Reduced Energy Consumption
  - For Owner: Reduced Operating Costs
  - For Utility: Reduced Infrastructure Needs
  - For Public: Reduced Rates?
- Streamlined Maintenance
  - Identify Outages
  - Manage Maintenance Routes
  - Track Asset Life/Product Performance
- Reduced Obtrusive Light

Main Theory of Application

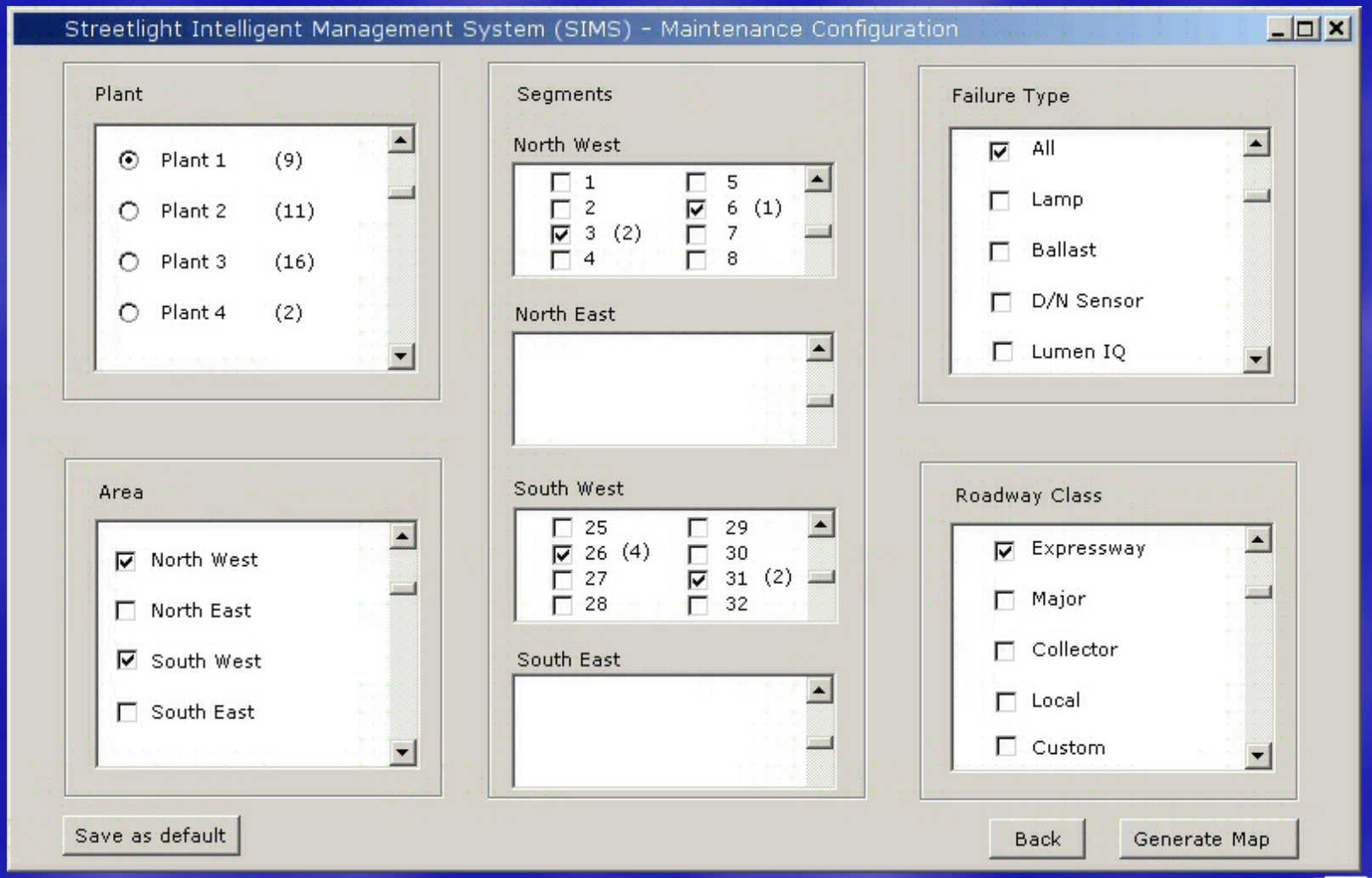
- Based on IESNA Pedestrian Conflict
- When Pedestrian Conflict is Lower, Illumination Level Potential Available
- E.g., High Pedestrian Conflict Until 8 p.m.; Low After 8 p.m.
- Savings: Up to 50% for Dimmed Period

Application – Reduce Illumination Levels in Late Night

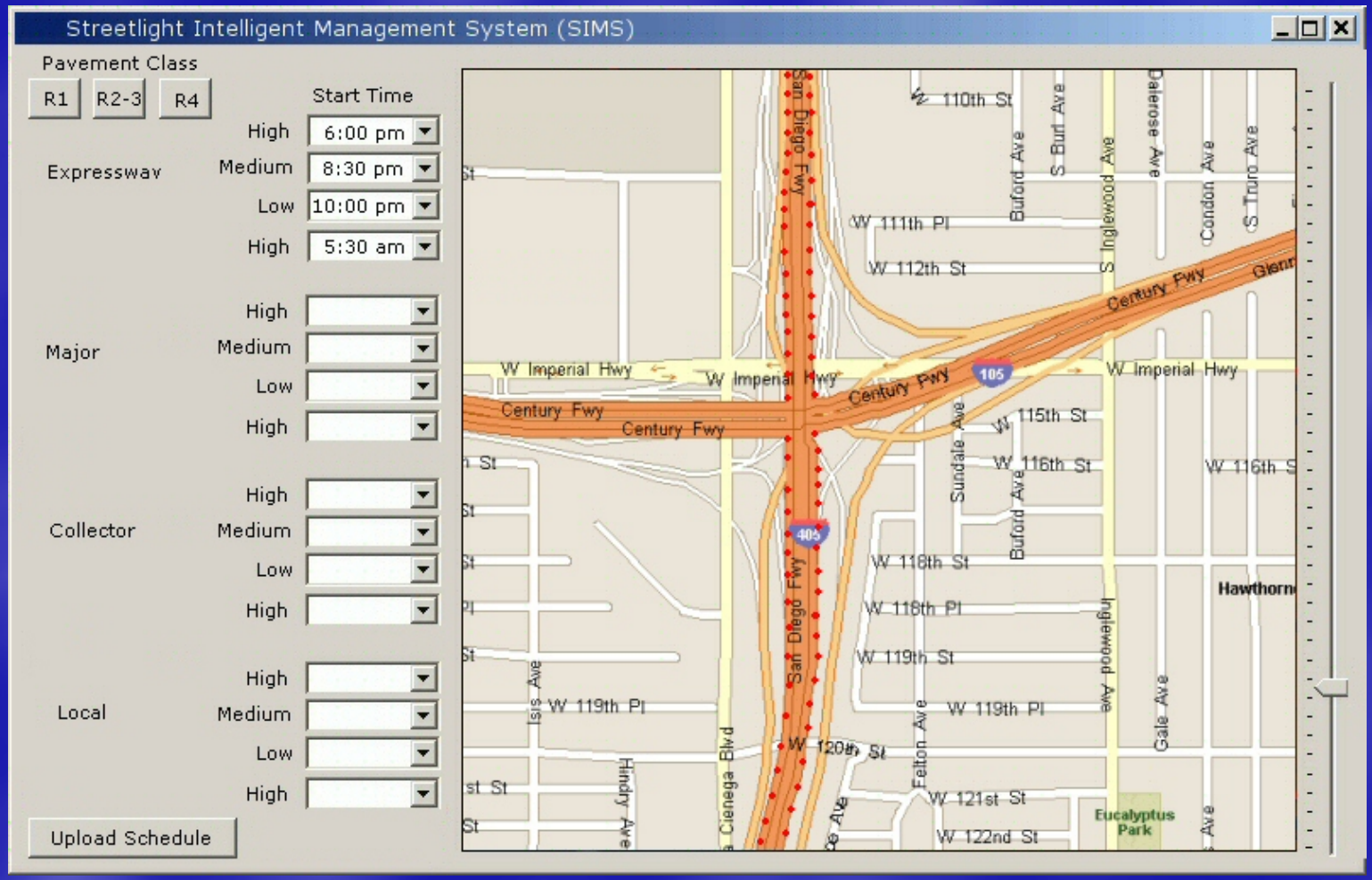
Road and Pedestrian Conflict Area		Pavement Classification (Minimum Manintained Average Values)			Uniformity Ratio	Veiling Luminance Ratio
Road	Pedestrian Conflict Area	R1 lux/fc	R2 & R3 lux/fc	R4 lux/fc	E_{avg}/E_{min}	L_{vmax}/L_{avg}
Freeway Class A		6.0/0.6	9.0/0.9	8.0/0.8	3.0	0.3
Freeway Class B		4.0/0.4	6.0/0.6	5.0/0.5	3.0	0.3
Expressway	High	10.0/1.0	14.0/1.4	13.0/1.3	3.0	0.3
	Medium	8.0/0.8	12.0/1.2	10.0/1.0	3.0	0.3
	Low	6.0/0.6	9.0/0.9	8.0/0.8	3.0	0.3
Major	High	12.0/1.2	17.0/1.7	15.0/1.5	3.0	0.3
	Medium	9.0/0.9	13.0/1.3	11.0/1.1	3.0	0.3
	Low	6.0/0.6	9.0/0.9			
Collector	High	8.0/0.8	12.0/1.2			
	Medium	6.0/0.6	9.0/0.9			
	Low	4.0/0.4	6.0/0.6			
Local	High	6.0/0.6	9.0/0.9			
	Medium	5.0/0.5	7.0/0.7	6.0/0.6	6.0	0.4
	Low	3.0/0.3	4.0/0.4	4.0/0.4	6.0	0.4

Potential for Dimming of 1/3 to 1/2 Based on Pedestrian Conflict Level

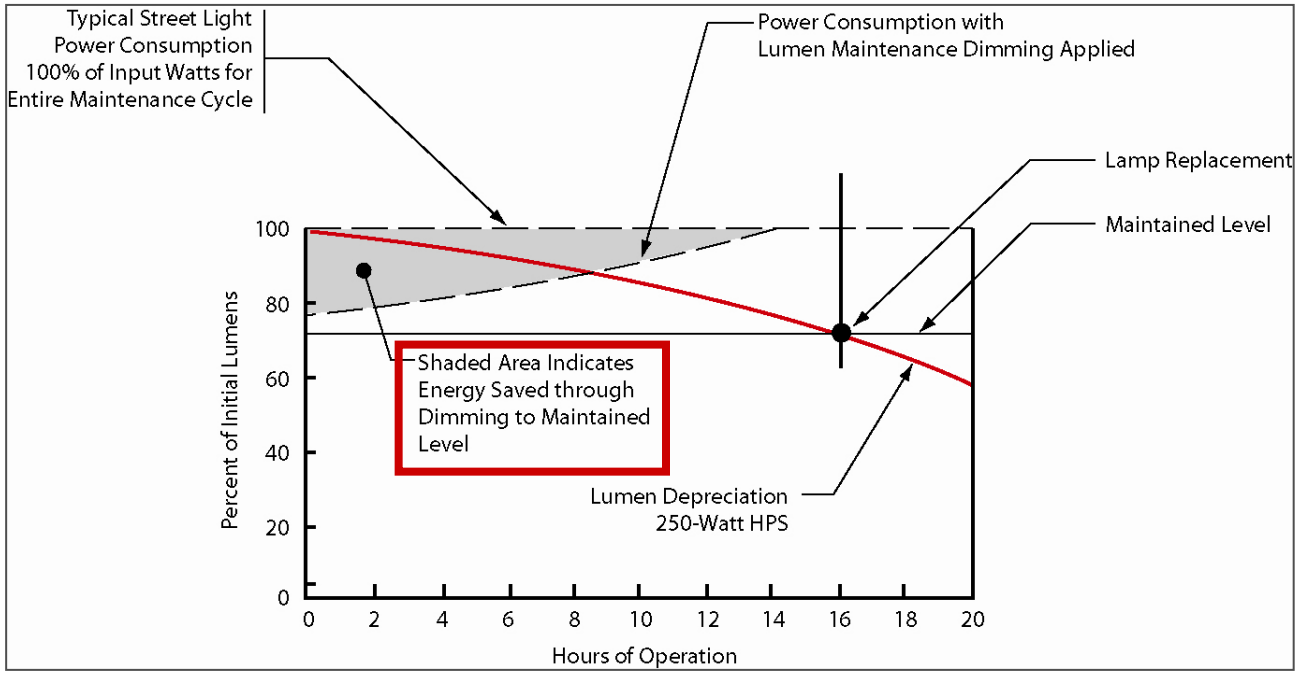
Luminaire Setup



Dimming Control Application



Application – Dim to Maintained Level for Full Lamp Life



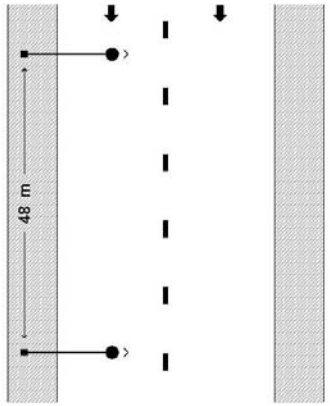
Application – Reduce Lighting in Over-Lighted Areas

Design Information

Project	STI
Number	967
Name	MK
Company	DMD

Roadway Information

Number Left Lanes	2
Left Lane Width	4 m
Median Width	0 m
Number Right Lanes	0
Right Lane Width	0 m
Calculation Method	IES RP8-2000
Pavement Reflectance	Asphalt - R3
Roadway Classification	Local
Pedestrian Conflict	Low



Luminaire Information

Left Side

Label	A
Catalog Number	(not specific to a single catalog number)
Photometric File	GE7286.IES
Lamp Lumens	9500
Light Loss Factor	0.80
Input Power	100 W
Tilt	0°
Arm Length	3 m
Mounting Height	7.5 m
Setback	1.2 m
Quantity	21

Installation Uses Owner Specified Equipment and is Over-Lighted to Meet Uniformity

Calculation Results - Left Side

Luminance

Average	0.5	cd/m²
Max	1.1	cd/m²
Min	0.1	cd/m²
Max/Min	8.8	
Avg/Min	4.0	

Illuminance

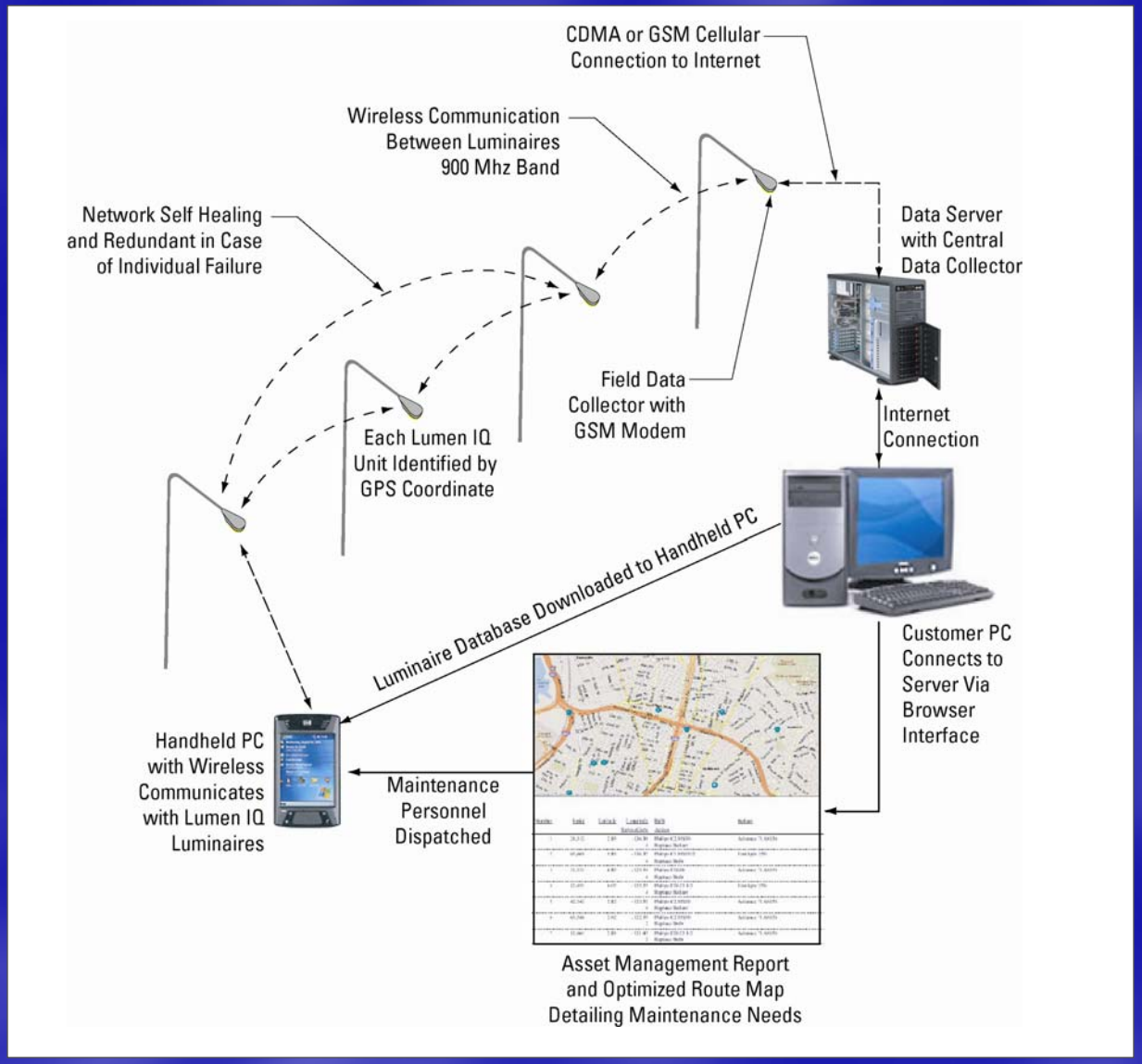
Average	7.4	lux
Max	28.9	lux
Min	1.3	lux
Max/Min	22.0	
Avg/Min	5.7	

Lv Ratio	0.3	
STV	4.4	
Spacing	48	m
Length	1000	m
Quantity	21	

Product Overview

A Microprocessor
B 900 MHz Antenna
C Lamp Lumen Sensor
D Day/Night Sensor

System Overview



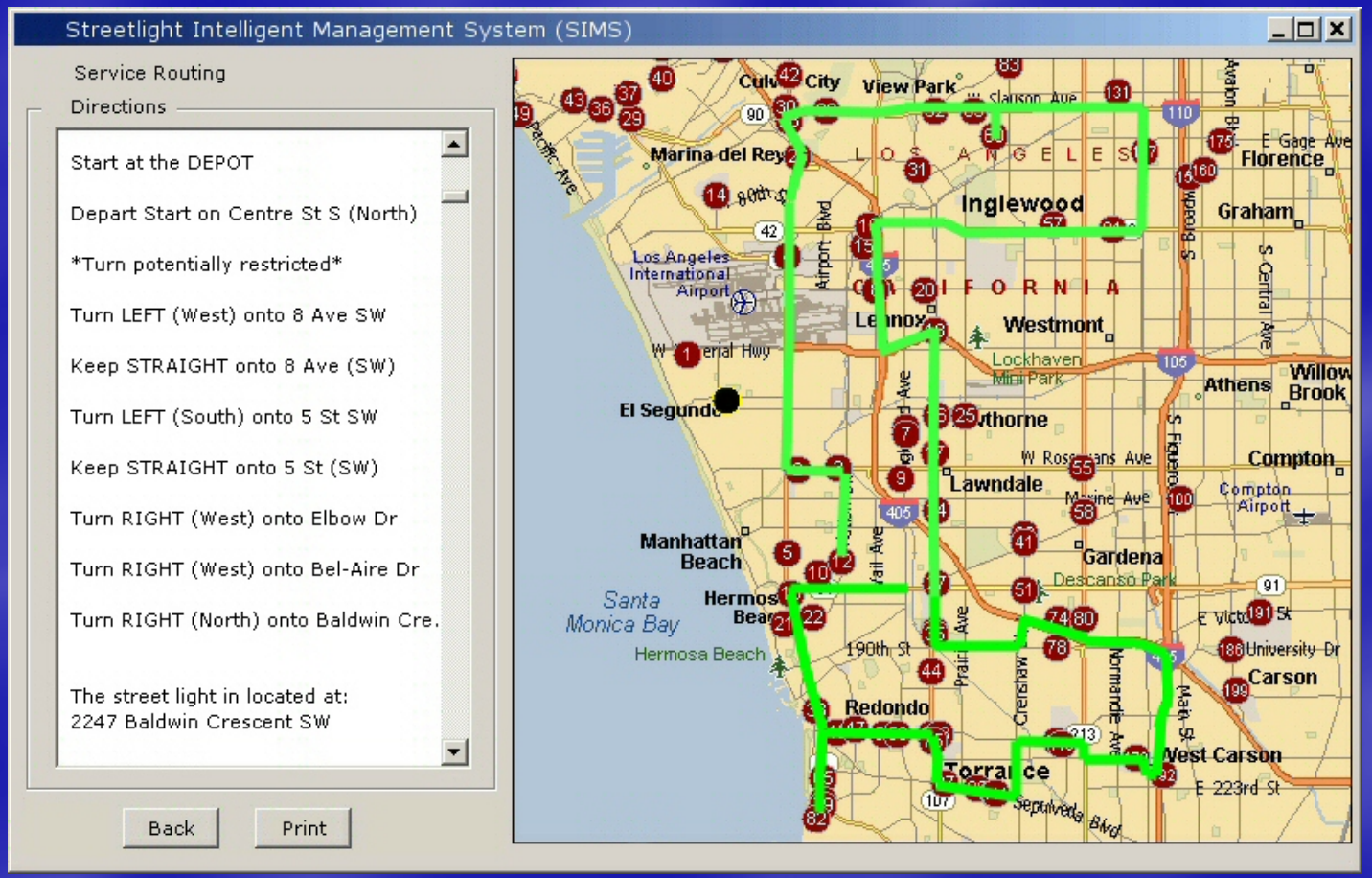
Results of Testing (LSI)

- Testing via Moving Mirror Goniophotometer or Computerized Integrating Sphere
- Spectral Response of Day/Night Sensor Matches the Eye More Closely than a Typical Silicon Detector
- Lamp Sensor Accurately Measures Lumen Output at Every Level of Dimming (Linear Correlation)
- Granular Dimming in 1.1 Percent Increments
- Dimming Operations do not Affect Lumen Distribution
- Linear Correlation Between Lumen Output and Power Input Through All Dimmed Levels
- No Negative Effects Due to Power Factor (No Change Needed for Existing Electrical Systems)
- Dimming Operations Performed Equally Well with Single or Dual Arc Tube Lamps

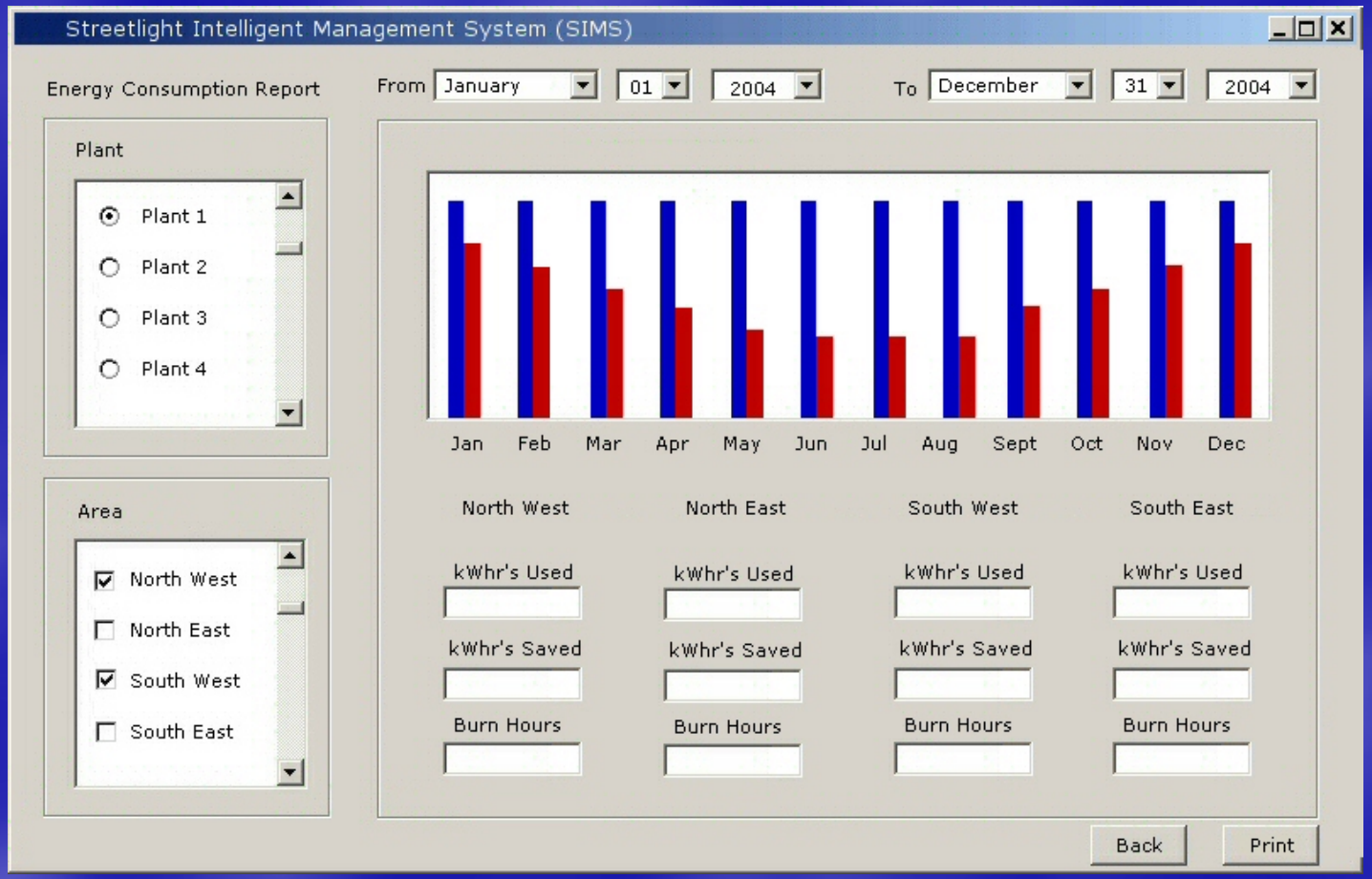
Maintenance Advantages

- Anti-Cycling Technology Reduces Damage
- Lamp Outages/Performance Reported to Owner via Internet
- Map-Point Interface Optimizes Maintenance Route Development
- Energy Consumption Tracked for Billing
- Assessments Possible through Data Analysis (Field Laboratory)

Maintenance Routing Map



Energy Consumption Analysis



Project Status/Next Steps

- Luminaires to Be Installed in April
- Field Testing Will Verify Assumptions
- Public and Agency Responses Will Be Monitored
- Potential Deployment Challenges Will Be Identified
  - Areas of Poor Design
  - Areas Where Dimming is Not Advised
- Track Results

Questions and Answers