SOUTH BURLINGTON KENNEDY DRIVE SHARED- USE PATH LIGHTING

JULY 26, 2023

PREPARED FOR THE CITY OF SOUTH BURLINGTON AND THE CHITTENDEN COUNTY REGIONAL PLANNING COMMISSION

PRESENTED TO CITY OF SOUTH BURLINGTON BICYCLE AND PEDESTRIAN COMMITTEE

South Burlington, through the CCRPC, sought the support of WSP to provide technical services for exploring lighting improvements to better serve the needs of bicyclists and pedestrians using the separated, 1.5-mile, shared-use path that runs parallel to the west bound lanes of Kennedy Drive between Dorset Street and Williston Road. The intent was to light the path only, not the roadway.

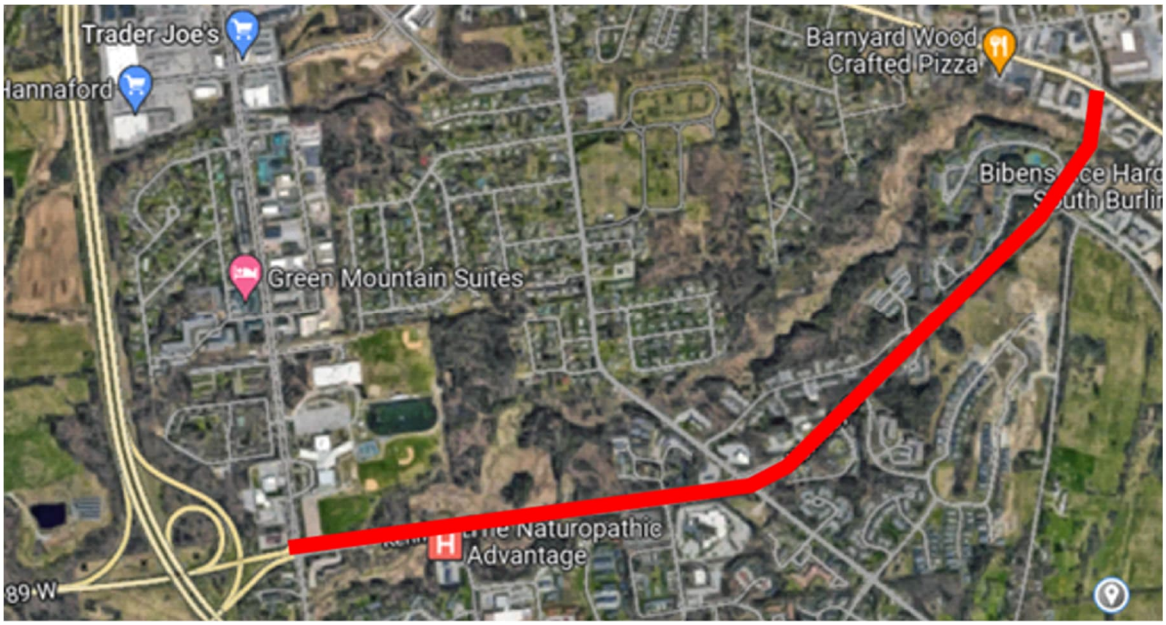

Figure 1: Project Limits of Kennedy Drive, South Burlington, VT

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EXISTING CONDITIONS

A site visit was completed on 11/15/2022 to evaluate existing conditions on the shared use path along the westbound side of Kennedy Drive, running from Dorset Street to Williston Road, in South Burlington, VT. The following were observed:

- The 10' wide shared use path is separated from the roadway with a curb and a varying width of grass and/or trees.

Figure 2: Typical Section of Shared Use Path

- Posted speed on Kennedy Drive is 40 miles per hour.
- VTrans data indicates that no crashes have occurred between pedestrians/bicyclists and vehicles along Kennedy Drive over the past 5 years.
- The area along the shared use path is mostly wooded with limited ambient light.

Figure 3: Intersection of Kennedy Drive and Dorset Street

— Kennedy Drive roadway is not lighted within the project limits except for a few intersections with crosswalks and approaching the interchange with I-189.

Figure 4: Crosswalk at Twin Oaks Drive

— A crosswalk with newly installed pole with push button flashing crosswalk system is located at the intersection of Kennedy Drive and Twin Oaks Terrace.
— The shared use path was observed at night. There are fairly few businesses and residences along the path, thus, providing low ambient lighting, therefore the path was dark. A bicyclist was traveling on the path and was only detected due to the flashing light on the bike.

RECOMMENDED DESIGN CRITERIA

The design criteria for the shared use path will follow the recommendations of ANSI/IES RP-8-21, Recommended Practice: Lighting Roadway and Parking Facilities.

Table 11-2. Recommended Design Criteria for Walkways Within Road Right of Way

Condition	E_{avg}, lux (fc)	$E_{v,avg}$ lux (fc)	E_{avg}/E_{min}*
High pedestrian activity	10 (0.9)	5 (0.5)	5.0
Medium pedestrian activity	5 (0.5)	2 (0.2)	5.0
Low pedestrian activity	2 (0.2)	1 (0.1)	10.0

Table Notes:

E_{avg}: Minimum maintained average horizontal illuminance at pavement

E_{min}: Minimum horizontal illuminance at pavement

$E_{V,avg}$: Average vertical illuminance at 1.5m above the pavement in both directions and parallel to the main pedestrian flow

* Horizontal only

WSP recommends medium pedestrian activity based on site conditions. This means an average of 0.5 footcandles (fc) measured horizontally at the ground and 0.2 fc average measured vertically at eye level. The average to minimum ratio should not exceed 5:1.

— Only the path is to be lit; no roadway lighting required.
— Lighting design to consider glare, light trespass, and sky glow.
— Calculations will include both vertical and horizontal grids. Surround ratios are not required.

ALTERNATITVE ANALYSIS

WSP researched and presented three solar options and three wired options to the Bicycle and Pedestrian Committee for discussion at their April 12,2023 meeting. The alternatives represent a variety of styles of luminaire that will meet the performance criteria and project goals.

Using IES files provided by the manufacturers, typical calculations were prepared for each option to estimate performance. The options presented are summarized below:

OPTION 1: FONROCHE/GARDCO

- Fonroche Solar Panel with Gardco Luminaire
- Type II Distribution
- 4,800 lumens / 38Watts
- 4000K CCT
- 15' pole with 4' arm
- Approximately 120' spacing, 44 fixtures per mile.
- 48 hours autonomy

Figure 5: Fonroche Panel System with Gardco Luminaire

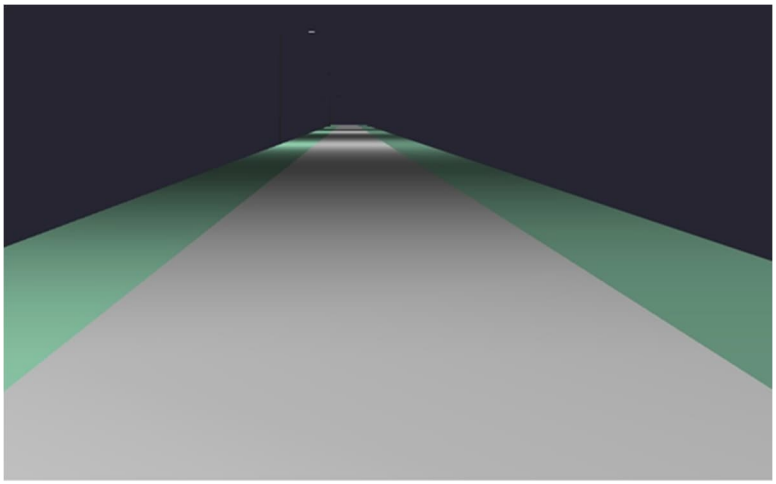

Figure 6: Rendering of Path Using Gardco Luminaire

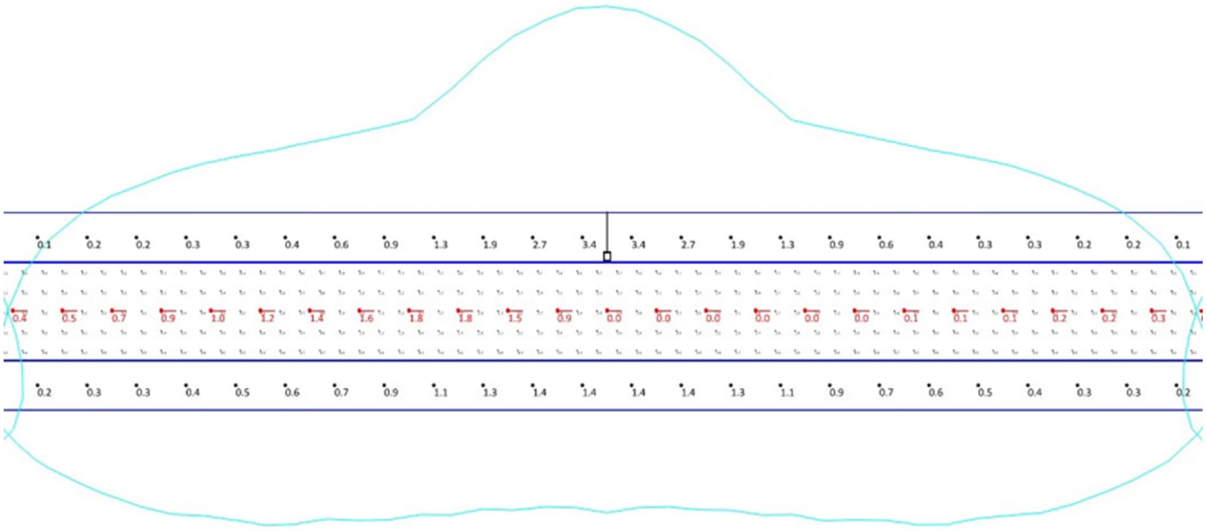

Figure 7: Plan Showing Calculation Points using Gardco Luminaire

Calculation Summary						
Label	CalcType	Units	Avg	Max	Min	Avg/Min
N Grass	Illuminance	Fc	1.08	3.4	0.1	10.80
Path Horizontal	Illuminance	Fc	1.15	3.7	0.2	5.75
Path Vertical	Illuminance	Fc	0.58	1.8	0.0	N.A.
S Grass	Illuminance	Fc	0.78	1.4	0.2	3.90

Figure 8:Calculation Summary using Gardco Luminaire

OPTION 2: SOLARPATH ALPHA

- Solar Pole or Solar Panel Option
- Type II Distribution
- 4,000 lumens / 32Watts
- 5000K CCT
- 15’ pole
- Approximately 105’ spacing, 51 fixtures per mile.
- 48 hours autonomy

Figure 9: SolarPath Alpha Luminaires on Solar Panel Pole

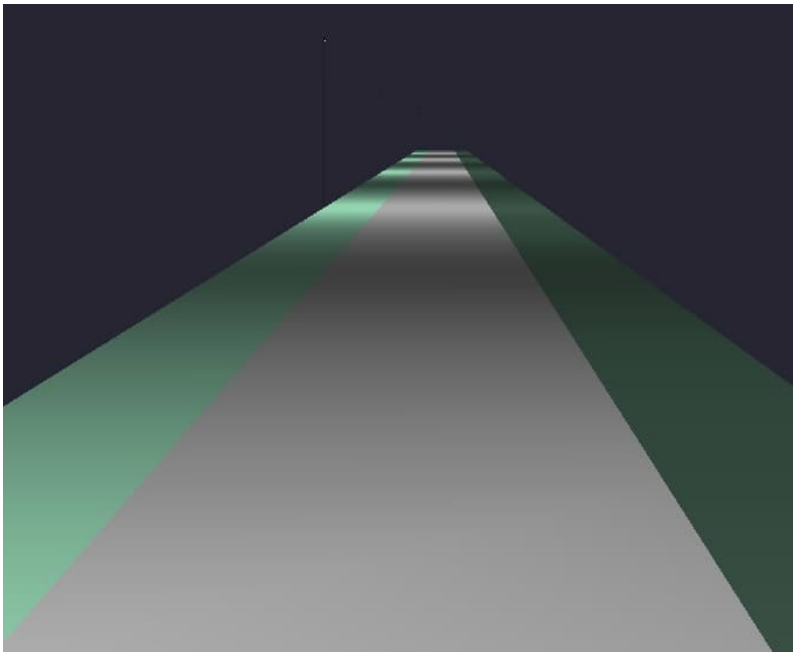

Figure 10: Rendering of Path using SolarPath Alpha Luminaire

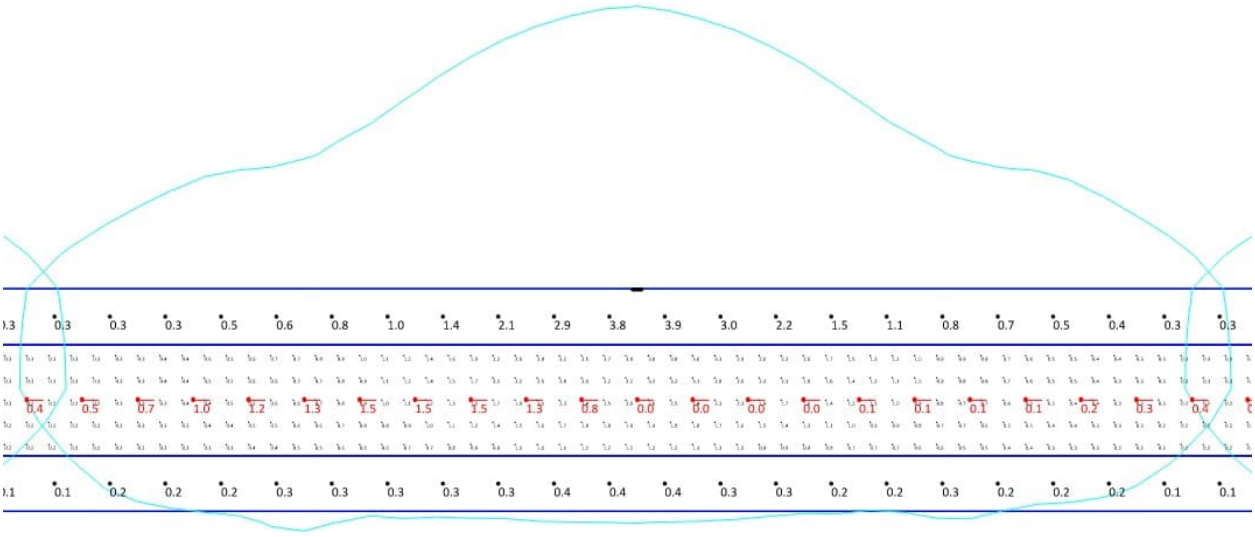

Figure 11: Plan Showing Calculation Points Using SolarPath Alpha Luminaire

Calculation Summary						
Label	CalcType	Units	Avg	Max	Min	Avg/Min
N Grass	Illuminance	Fc	1.31	3.9	0.3	4.37
Path Horizontal	Illuminance	Fc	1.02	3.9	0.2	5.10
Path Vertical	Illuminance	Fc	0.57	1.5	0.0	N.A.
S Grass	Illuminance	Fc	0.25	0.4	0.1	2.50

Figure 12: Calculation Summary using SolarPath Alpha Luminaire

OPTION 3: LIGMAN USE

- Solar Pole
- Type II Distribution
- 4,000 lumens / 32Watts
- 4000K CCT
- 15' pole
- Approximately 95' spacing, 56 fixtures per mile.
- 72 hours autonomy

Figure 13: Ligman USE Luminaire on Solar Panel Pole

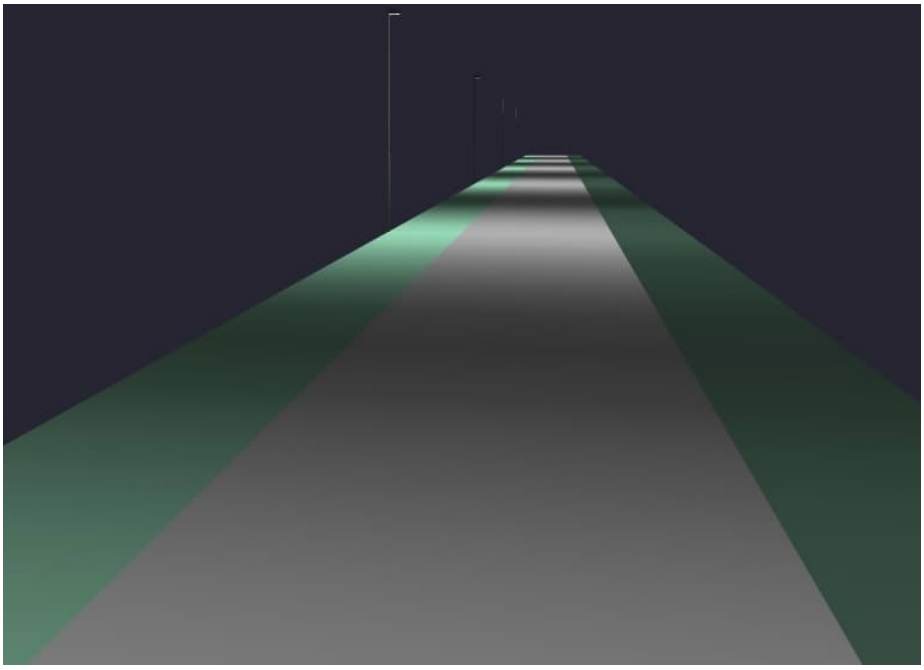

Figure 14: Rendering of Path using Ligman USE Luminaire

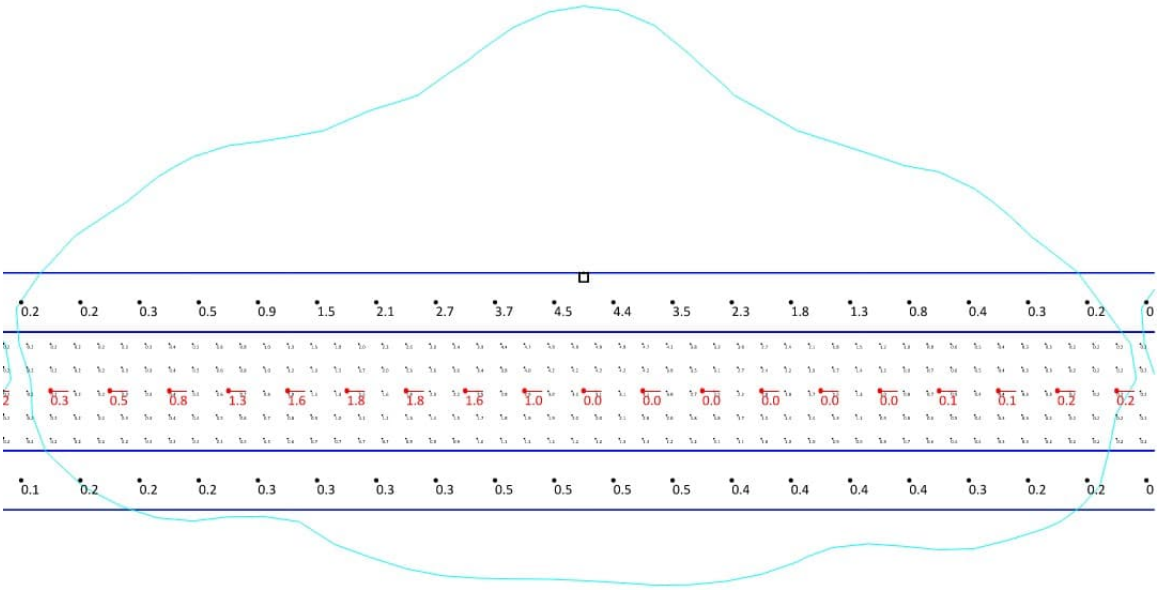

Figure 15: Plan Showing Calculation Points Using Ligman USE Luminaire

Calculation Summary						
Label	CalcType	Units	Avg	Max	Min	Avg/Min
N Grass	Illuminance	Fc	1.71	4.5	0.2	8.55
Path Horizontal	Illuminance	Fc	1.37	4.9	0.2	6.85
Path Vertical	Illuminance	Fc	0.56	1.8	0.0	N.A.
S Grass	Illuminance	Fc	0.33	0.5	0.1	3.30

Figure 16: Summary of Calculation using Ligman USE Luminaire

OPTION 4: KIM OURO

- Wired post-top.
- Type II Distribution
- 3,000 lumens / 25Watts
- 4000K CCT
- 15' pole
- Approximately 110' spacing, 48 fixtures per mile.

Figure 17: Kim Ouro Luminaire

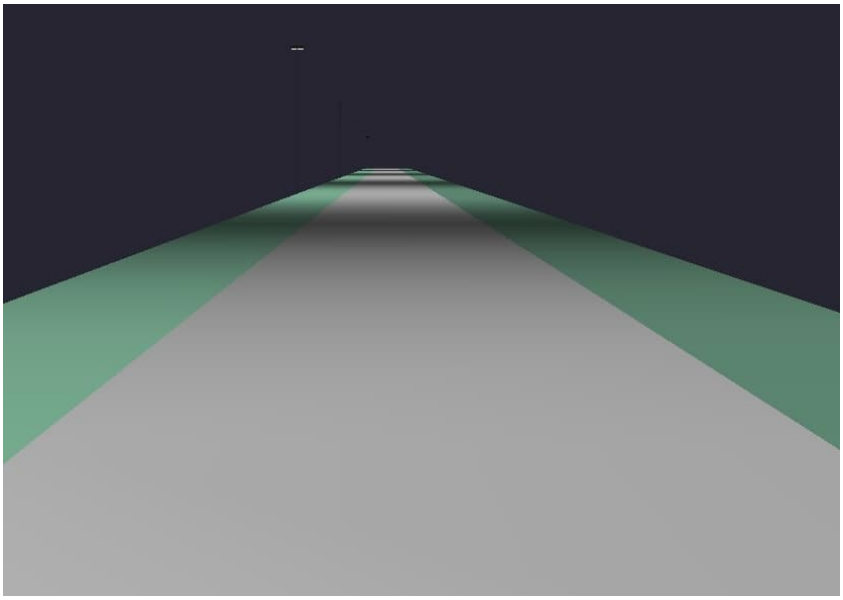

Figure 18: Rendering of Path using Kim Ouro Luminaire

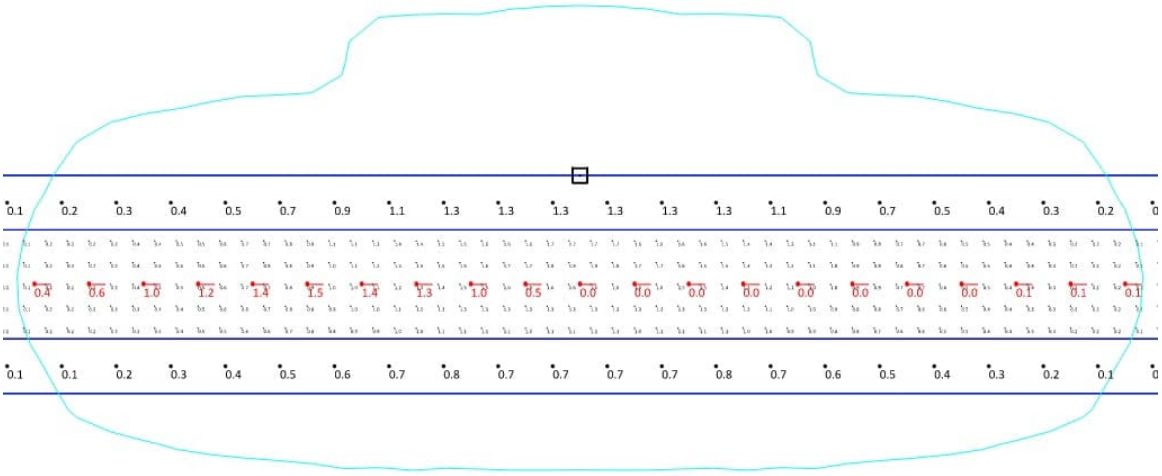

Figure 19: Plan Showing Calculation Points Using Kim Ouro Luminaire

Calculation Summary						
Label	CalcType	Units	Avg	Max	Min	Avg/Min
N Grass	Illuminance	Fc	0.73	1.3	0.1	7.30
Path Horizontal	Illuminance	Fc	0.80	1.9	0.1	8.00
Path Vertical	Illuminance	Fc	0.44	1.5	0.0	N.A.
S Grass	Illuminance	Fc	0.46	0.8	0.1	4.60

Figure 20: Summary of Calculation using Kim Ouro Luminaire

OPTION 5: LUMEC DOMUS

- Wired pole mount
- Type II Distribution
- 2,600 lumens / 29Watts
- 4000K CCT
- 15’ pole
- Approximately 110’ spacing, 48 fixtures per mile.

Figure 21: Lumec Domus Luminaire

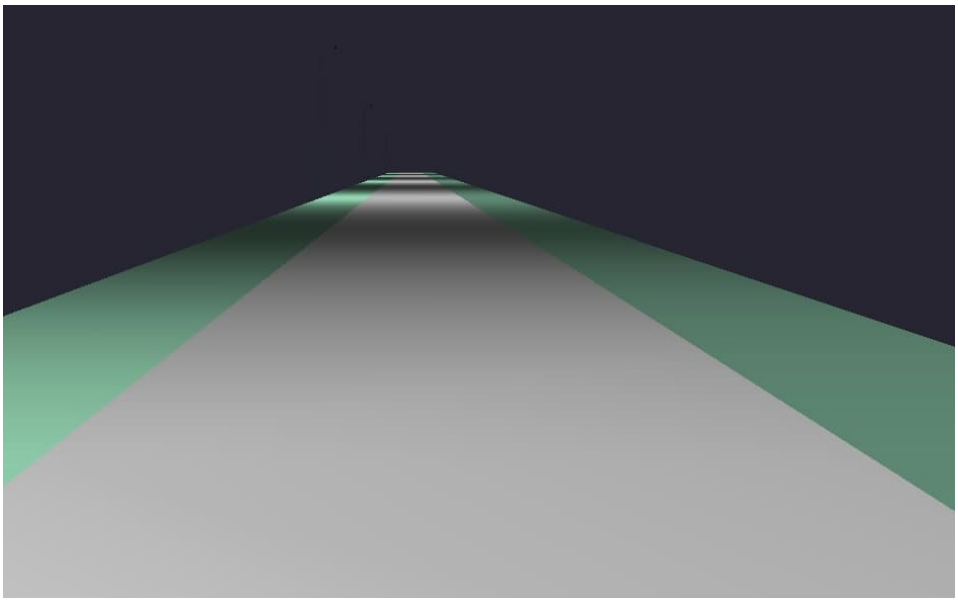

Figure 22: Rendering of Path using Lumec Domus Luminaire

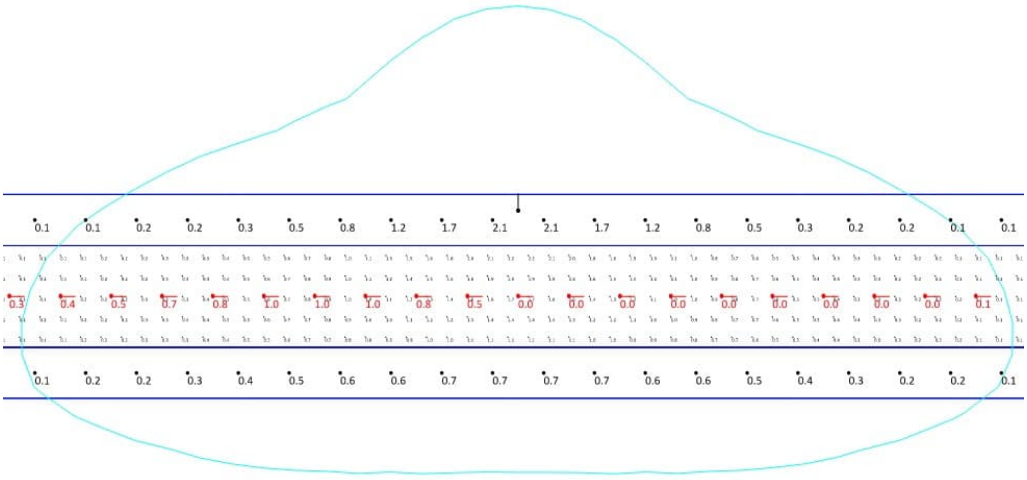

Figure 23: Plan Showing Calculation Points Using Lumec Domus Luminaire

Calculation Summary						
Label	CalcType	Units	Avg	Max	Min	Avg/Min
N Grass	Illuminance	Fc	0.66	2.1	0.1	6.60
Path Horizontal	Illuminance	Fc	0.65	2.2	0.1	6.50
Path Vertical	Illuminance	Fc	0.30	1.0	0.0	N.A.
S Grass	Illuminance	Fc	0.40	0.7	0.1	4.00

Figure 24: Summary of Calculation using Lumec Domus Luminaire

OPTION 6: SELUX SATURN

- Wired post-top.
- Type II Distribution
- 3,400 lumens / 39Watts
- 4000K CCT
- 15’ pole
- Approximately 85’ spacing, 63 fixtures per mile.

Figure 25: Selux Saturn Luminaire Family

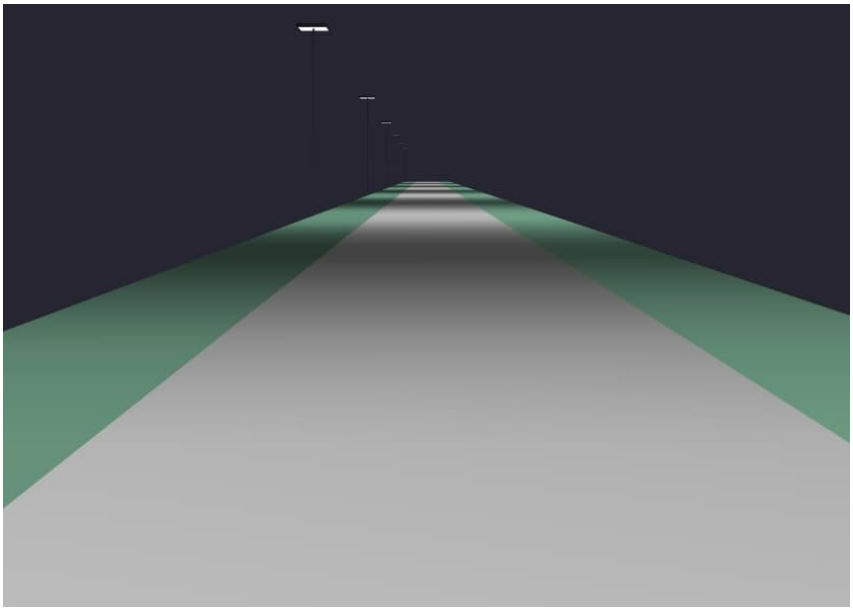

Figure 26: Rendering of Path using Selux Saturn Luminaire

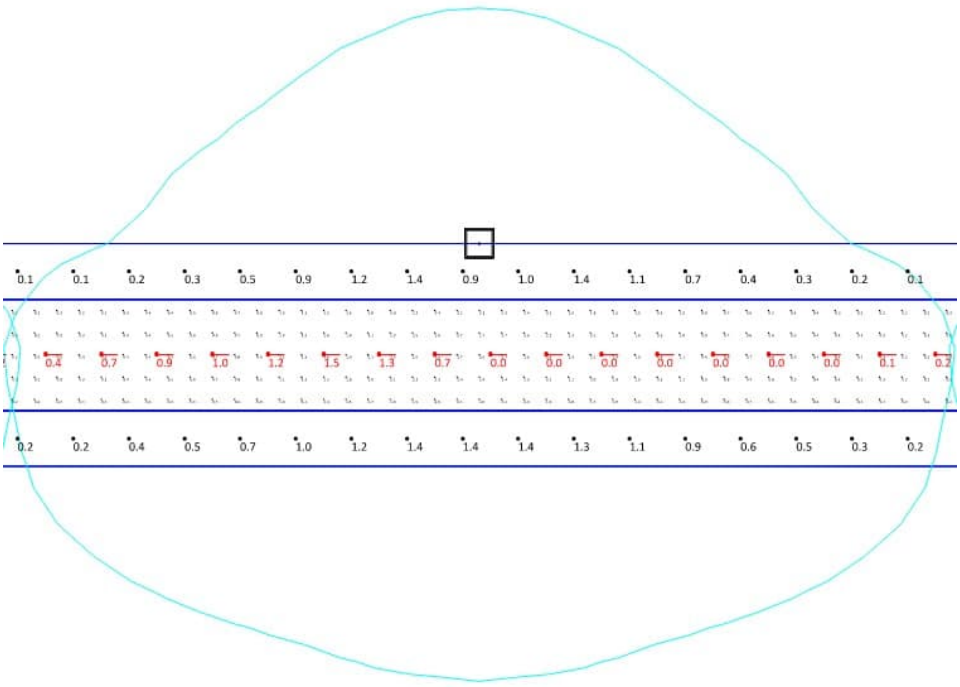

Figure 27: Plan Showing Calculation Points Using Selux Saturn Luminaire

Calculation Summary						
Label	CalcType	Units	Avg	Max	Min	Avg/Min
N Grass	Illuminance	Fc	0.61	1.4	0.1	6.10
Path Horizontal	Illuminance	Fc	1.07	2.7	0.2	5.35
Path Vertical	Illuminance	Fc	0.46	1.5	0.0	N.A.
S Grass	Illuminance	Fc	0.77	1.4	0.1	7.70

Figure 28: Summary of Calculation using Selux Saturn Luminaire

INITIAL “BALLPARK” COST ESTIMATE:

— Similar recent wired installation priced at $7K per pole, equipment only. Solar assembly adds 40-50% to pole cost, approximately $10K per pole.
— Solar alternatives claim 80% less installation cost (no wiring, conduit, or trenching). $7K wired versus $1.5K solar.
— Total cost of wired installation $14K versus $11.5K solar

ONGOING COSTS

— Solar installation has no utility cost. Wired fixtures approximately $14 per fixture per year.
— Both have incidental maintenance over a 20-year life.

Solar Options	Fonroche/Gardco	SolarPath Alpha	Ligman USE
Approximate Initial Cost per mile	$506K	$575K	$644K

Wired Options	Kim Ouro	Lumec Domus	Selux Saturn
Approximate Initial Cost per mile	$616K	$672K	$686K

ALTERNATIVE DISCUSSION

During the presentation and discussion at the meeting on 4/12/2023, three alternatives were favored with questions for each.

Questions and Response:

1. Kim Ouro: Is there a solar option for this fixture, which is already used elsewhere in the City?
    a. Yes, Hubbell (parent company of Kim Lighting) has worked with SEPCO in the past. Some engineering would be required as this combination has not been used.
2. Fonroche/Gardco: Are there norther latitude installations? What is their operational history?
    a. Response from the manufacturer: "The oldest installations in the US are approaching 10 years in S. Dakota. We also have several snow climate installations in MN, MA, NH, ID, CO, WY, UT, NY, Canada, Switzerland to name a few others. Here is a US installation map: https://www.google.com/maps/d/viewer?mid=1o8dLFvwK1APS5utcvhyWH3sWVU6s0LSC&ll=36.56239036610798%2C-97.43140441560993&z=4" The nearest installations to South Burlington are Roxbury Street in Keene, NH or Tanker Truck Area in Waterford, NY.
    b. Fonroche has recently changed offerings and no longer uses the Gardco fixtures. They have their own offering which does not perform as well (100' spacing rather than 120'). This would increase cost and make the Fonroche option less attractive.
3. SolarPath Alfa: Do you have any northern latitude installations? How long do the batteries typically last? Can we extend the autonomy length due to concerns about cloudy days?
    a. Manufacturer has installations in NY, NJ, and PA. Battery life span is 7 years to 10 years. They customize the solar engine per the installation location and to customer requirement.

PREFERRED ALTERNATIVE

After discussion of the three favored alternates, some further investigation and additional information, the committee agreed the preferred option was the Kim Ouro luminaire with a solar pole. There are advantages to the city standardizing using the Ouro fixture, and the solar option would save some installation and wiring costs.

WSP reached out to SEPCO, who engineered a complete solar system based on the requirements. Their system can operate a 25-Watt fixture from dusk to dawn powered by a 275-Watt solar power assembly and a 224-Amp hour battery assembly. The complete system will be powder coated black to match the pole and fixture. The pole will be a 20' above grade, anchor base steel pole. It included the option for the decorative fixture arm for the Ouro fixture.

The solar lighting system has a minimum of five nights backup for inclement weather times and extends the battery's life. Attached are system cut sheets and the lifecycle/warranty information. This responds to concerns raised by the Committee but exceeds the initial information from manufacturers.

However, the cost was significantly higher ($20K per pole, $960K per mile) than initially estimated. Since this combination of luminaire and panel have not been used before, this a new design rather than "off the shelf," so there is likely some of the initial engineering cost included. Other reasons for the cost increase include taller pole and arm assembly for this luminaire, as well as larger solar array and battery assembly for additional autonomy time. Reducing the capacity of both would reduce the cost, and these options can be considered.

Since the solar option was more expensive than anticipated, the City can also consider the wired option ($616K per mile) of the same fixture for consistency and standardization. This eliminates the taller pole, arm, batteries and panel for substantial up front savings. However, electricity costs would be about $800/year per mile at a rate of $0.15/kWh.