Lighting Design Analysis Report

FPID No. 444612-1-52-01, 444612-1-52-02, & 444612-1-52-03

Manatee County

SR 45 (US 41), from Edwards Drive to Magellan Drive

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Phase II Submittal

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APPENDICES

I. Introduction

The purpose of this report is to summarize the analysis and findings that are reflected in the lighting design plans for in-house FDOT project 444612-1 in Manatee County. The project location is US 41 from Edwards Drive to Magellan Drive. New light poles and luminaire retrofits are proposed along the corridor and at four signalized intersections. The purpose of this lighting design is to meet corridor and intersection lighting criteria within the project limits.

II. Existing and Proposed Conditions

The existing typical section is an undivided seven-lane road (middle two-way left-turn lane) with curb and gutter on both sides. Project 444612-1 is multi-discipline with the intent to convert the existing typical section into a divided six-lane road. Manatee County maintained conventional lighting is present along the majority of the corridor. Many of the existing light poles are proposed to be removed due to their above-ground foundations not meeting clear zone requirements.

When reviewing the existing conditions, the as-builts showed the existing corridor lighting to be either Cooper 250 Watt (mounted at 30') or 400 Watt (mounted at 46') high pressure sodium fixtures with 15' arms. South of Tallevast Road, the mounting heights change from 46', to 30', to a lighting exception between Tallevast Road and Braden Avenue. There is an existing airport, Sarasota Bradenton International, within the project limits. It is probable that the change in mounting heights and exception is a restriction due to the proximity to the airport.

III. Methodology

This section details the methodology used to locate the light poles along the corridor and at the four intersections within the project limits. The lighting design was accomplished using the lighting analysis software AGi32. The criteria used is from the current FDOT Design Manual (FDM), FDOT Specifications, and FDOT Standard Plans.

For the corridor lighting, FDM 231.3 was followed. Horizontal illuminance calculations were performed using the polygon method with points spaced 15' longitudinally and 5' transversely along the roadway. The analysis zones are bounded by the back of sidewalk and the back of the proposed median curb. The corridor lighting analysis is based on the values in **Table 1**, shown below.

Table 1: Corridor Lighting Criteria from FDM Table 231.2.1

Roadway Classification	Illumination Level Average Foot Candle		Illumination Uniformity Ratios		Veiling Luminance Ratio
Or Location Type	Horizontal (H.F.C.)	Vertical (V.F.C.)	Avg./Min.	Max./Min.	$L_{V(MAX)}/L_{AVG}$
Corridor Lighting					
Limited Access Facilities	1.5	N/A	4:1 or Less	10:1 or Less	0.3:1 or Less
Major Arterials	1.5				
Arterial Lighting Retrofit	1.0-1.5				
Other Roadways	1.0				

For this project, the "Major Arterials" category values were used rather than the "Arterial Lighting Retrofit" values because there are more poles being installed than retrofitted. In addition, per FDM 231.2, the average Horizontal Foot Candle (H.F.C.) requirement for corridor lighting must not be exceeded by more than 10%. Therefore, the maximum value the H.F.C. can be for corridor lighting in the "Major Arterial" category is 1.65 (1.50 * 1.10 = 1.65).

For the intersection lighting, both horizonal vertical illuminance calculations were performed using a grid point-by-point analysis to model the proposed lighting conditions. Grid points for the horizontal illuminance were spaced 5' by 5' for the four signalized intersections, as stated in FDM 231.3. In addition, the horizontal area of analysis was bound by the back of the sidewalks and the stop bars of each approach, per FDM Section 321.3.1.

For the vertical illuminance at crosswalks, the points were spaced 1.65' apart, 5' above the pavement, and oriented towards the approach driver. The distance from the crosswalk to the driver was established using the stopping sight distance found in FDM Table 210.11.1. For the thru movement, this is based on the speed limit. For the left and right turning movements, this is based on the operating speed of each curve radius. Operating speeds of curve radii were derived from The Florida Greenbook Figure 3-3.

The signalized intersection lighting analysis is based on **Table 2**, shown below.

Table 2: Signalized Intersection Lighting Criteria from FDM Table 231.2.1

Signalized Intersection and Roundabout Lighting					
New or Reconstruction	3.0 Std. 1.5 Min.	1.5 Std. 1.2 Min.	4:1 or Less	10:1 or Less	N/A
Intersection Lighting Retrofit	1.5 Std. 1.0 Min.	1.5 Std. 1.0 Min.			

Table 2 shows different criteria based on if the lighting is being designed for "New or

Reconstruction" or "Intersection Lighting Retrofit." For an existing intersection, if a full signal upgrade is occurring, then the "New or Reconstruction" criteria shall be used, per FDM 231.3.2.1. On this project, there are four signalized intersections in total. The signalized intersection at Tallevast Road is being reconstructed and the lighting at that intersection will follow the "New or Reconstruction" criteria.

The three other locations will not have full signal upgrades; therefore the "Intersection Lighting Retrofit" criteria will be used. These three intersections are at Braden Avenue, Whitfield Avenue, and Pearl Avenue. Only the thru movement applies for the vertical calculations when "Intersection Lighting Retrofit" criteria is used.

In addition to the horizontal and vertical illuminance values in **Tables 1** and **2**, FDM Table 231.2.2 "Minimum Mounting Heights Based on Maximum Candela" was also adhered to during the design and will be discussed in section **IV, Luminaires**.

IV. Luminaires

The luminaire brand and type were selected based on correspondence with Manatee County, these e-mails are found in **Appendix D**. The correspondence discusses a GE Evolve (now Current Evolve) luminaire with a house side shield in the ERLH series that Mantee County has used on recent projects. The ERLH series is no longer on the FDOT Approved Products List (APL), and has been replaced by the ERLC, ERL1, and ERL2 series. To remain consistent with the Current Evolve brand across the county, five luminaires of types ERL1 and ERL2 were chosen for this project. The luminaires are listed in **Table 3** below.

Table 3: Luminaires

Luminaire Name	Wattage	IESNA Distribution	Longitudinal Distribution	Max. Lumens	Max. Candela
ERL2530C53	242	Type III	Medium	28,800	19,670
ERL2528D53	223	Type III (FWT)	Short	26,800	16,728
ERL2518E53	130	Type II	Short	17,200	13,505
ERL1515D530 WITH ELSHS-ERL1-BLCk	121	Type IV	Short	13,820	9,055
ERL1514E530 WITH ELSHS-ERL1-BLCk	110	Type II	Medium	11,190	11,389

All luminaires selected have 3000K color temperature. Two of the luminaires, the 121 Watt and the 110 Watt are designed with house side shields and are used exclusively at the four intersections. The remaining three luminaires are used for the corridor lighting. It was determined that due to the right of way restraints and the placement of luminaires within the sidewalk that the corridor luminaries won't meet the corridor lighting criteria with shields. Therefore, the 242 Watt, 223 Watt, and 130 Watt are not designed with shields, but they are compatible with them in case an issue arises in the future and they need to be installed.

In one area near the beginning of the project there is a section of right of way that is at the back of curb on the West side, restricting pole locations to only the East side. In this area, the 223 Watt Type III Forward Throw (FWT) luminaire is used. There are only four poles (No. 8, 11, 12, and 15) that are proposed to have this luminaire. These four luminaires have tilt proposed. The forward throw of the luminaire in combination with a 5° tilt is needed to meet the criteria in this area where poles are only on one side of the street.

The mounting height of the luminaires varies between 30, 35 and 45 feet. 30' poles are proposed where there is existing 30' poles, and where there is no existing lighting between Tallevast Road and Braden Ave. 35' poles are used on the side streets of Braden Avenue, Whitfield Avenue, and Pearl Avenue. 45' poles are proposed for the remaining corridor lighting where 46' poles exist. Retrofits are proposed along the corridor where existing poles have been determined to still be suitable.

The arm length of the luminaires also varies. 8, 15, and 16 foot arms are proposed at different locations. In general, 15' arms are used for corridor lighting. 8' arms are used at intersections where 15' arms could not meet the design criteria. 16' arms are used with utility conflict poles. The mounting height and arm lengths of the poles are shown in **Table 4**.

Table 4: Luminaire Mounting Height and Arm Length

Luminaire	Mounting Height	Arm Length
242 Watt	45'	15'
223 Watt	45'	15'
130 Watt	30' / 35'	15' / 16 (utility conflict)
121 Watt	30' / 35' / 45'	8' / 15'
110 Watt	30' / 35' / 45'	8' / 15'

There is an airport on the southeast corner of US 41 at Tallevast Road. The US 41 corridor has 46-foot poles north of Tallevast Road and 30-foot poles south of Tallevast Road. Therefore, proposed luminaire mounting heights were chosen to be 30 feet south of Tallevast. A permit will be required with the Federal Aviation Administration (FAA) based on the proximity of this intersection to the airport. The FAA permit determination will be included in the next project phase.

FDM Table 231.2.2 gives the minimum mounting heights based on the maximum candela and distribution. Below is a list with the minimum mounting heights for each luminaire. As shown, all the minimum heights meet FDM criteria.

1. Current Evolve, 242 Watt LED, Type 3 (19,670 candela & medium distribution) = 25' minimum
2. Current Evolve, 223 Watt LED, Type 3 (16,728 candela & short distribution) = 20' minimum
3. Current Evolve, 130 Watt LED, Type 2, (13,505 candela & short distribution) = 20' minimum
4. Current Evolve, 121 Watt LED, Type 4, (9,055 candela & short distribution) = 20' minimum
5. Current Evolve, 110 Watt LED, Type 2, (11,389 candela & medium distribution) = 25' minimum

Furthermore, FDOT Standard Plans Index 715-002 mentions that the mounting heights for conventual lighting range from 30 feet to 50 feet. Therefore, the proposed poles meet all FDOT criteria.

The luminaire spec sheets for the Current Evolve series are found in **Appendix A**.

V. Results and Conclusion

The maximum cumulative voltage drop was calculated along each branch of the load centers to adequately size all lighting conductors. FDM 231.3.1 states that the maximum allowing voltage drop from service point to any one circuit is 5%. The minimum wire size allowable is 6 AWG, per FDOT Specifications 992-1.3. A summary of the calculations and wire sizes are found in **Appendix C**. The largest number of wires in any one conduit for this project is six #6 THHN-2 wires and three #4 THHN-2 wires in a 2" PVC or HDPE conduit. This is calculated at a 16.12% fill ratio, which is well below the NEC requirement of 40% for more than two wires.

Tables 6 through **10** summarize the lighting statistics calculated in AGi32.

Table 5: Corridor Lighting

Roadway Section	Average Horizontal Foot Candle	Average/Minimum	Maximum/Minimum
Begin to Braden (NB)	1.60	4.00	9.83
Begin to Braden (SB)	1.50	3.85	9.67
Braden to Tallevast (NB)	1.58	3.95	9.90
Braden to Tallevast (SB)	1.60	4.00	9.75
Tallevast to Whitfield (NB)	1.56	3.71	8.81
Tallevast to Whitfield (SB)	1.61	3.93	9.15
Whitfield to Pearl (NB)	1.54	3.95	9.28
Whitfield to Pearl (SB)	1.56	3.90	9.45
Pearl to End (NB)	1.51	3.78	8.98
Pearl to End (SB)	1.60	3.64	9.59

In addition to the values above, the Roadway Optimizer feature in Agi32 was used to confirm that the Veiling Luminance Ratio of each section of corridor lighting was 0.3:1 or less.

Table 6: Braden Avenue (Retrofit Criteria)

			Average	Average/ Minimum	Maximum/ Minimum
Horizontal Calculations (foot-candles)	Entire Intersection		1.76	3.91	6.44
Vertical Calculations (foot-candles)	Eastbound	Thru	1.21	1.27	1.45
	Southbound	Thru	1.84	1.35	1.54
	Westbound	Thru	1.23	1.21	1.41

Table 7: Tallevast Road (New or Reconstruction Criteria)

			Average	Average/ Minimum	Maximum/ Minimum
Horizontal Calculations (foot-candles)	Entire Intersection		3.29	3.96	6.78
Vertical Calculations (foot-candles)	Eastbound	Left	1.21	1.34	2.08
		Right	2.01	1.23	1.50
		Thru	1.80	1.89	2.42
	Northbound	Left	1.23	1.21	1.42
		Right	2.70	1.57	1.95
		Thru	1.99	2.14	2.91
	Southbound	Left	1.42	1.25	1.38
		Right	2.83	1.23	1.35
		Thru	2.60	1.41	1.73
	Westbound	Left	1.21	1.39	2.21
		Right	1.63	2.30	3.32
		Thru	1.96	1.87	2.25

Table 8: Whitfield Avenue (Retrofit Criteria)

			Average	Average/ Minimum	Maximum/ Minimum
Horizontal Calculations (foot-candles)	Entire Intersection		1.77	2.53	3.83
Vertical Calculations (foot-candles)	Eastbound	Thru	1.58	1.12	1.25
	Northbound	Thru	1.20	2.03	3.12
	Southbound	Thru	1.26	1.83	2.71
	Westbound	Thru	1.37	1.76	2.14

Table 9: Pearl Avenue (Retrofit Criteria)

			Average	Average/ Minimum	Maximum/ Minimum
Horizontal Calculations (foot-candles)	**Entire Intersection**		1.16	2.47	5.36
Vertical Calculations (foot-candles)	**Eastbound**	**Thru**	1.66	1.89	2.30
	Northbound	**Thru**	1.05	2.14	3.27
	Southbound	**Thru**	2.55	3.31	5.00
	Westbound	**Thru**	1.26	1.50	2.14

In summary, all lighting levels for the proposed design of project 444612-1-52-01 meet the criteria of the 2022 FDOT FDM, FDOT Specifications, and FDOT Standard Plans. The photometric plans with point-to-point data are provided in **Appendix B**.

APPENDIX A: Luminaire Spec Sheets

EVOLVE

LED Roadway Lighting

ERLC-ERL1-ERL2

Current

EVOLVE

ERL1 Cobra Head
LED Roadway Lighting

CUSTOMER NAME _____

PROJECT NAME _____

DATE _____ TYPE _____

CATALOG NUMBER _____

The Evolve® LED Roadway ERL1 Luminaire is optimized utilizing advanced LED reflective optical system for local, collector and major roadways. The modern design incorporates the heat sink directly into the unit for heat transfer to prolong LED life.

Construction

Housing:	Aluminum die cast enclosure casting integral heat sink for maximum heat transfer
Lens:	Impact resistant tempered glass
Paint:	Corrosion resistant powder paint, ≥ 2.0 mil thickness (RAL & custom colors available) Standard = Black, Dark Bronze, Gray, White Optional = Coastal Finish
Weight:	12.4 lbs (5.6 kgs)

Optical System

Lumens:	2,000 - 15,700
Distribution:	Type II ,III, IV, Type II Narrow and Type II Enhanced Backlight
Efficacy:	111-140 LPW
CCT:	2700K, 3000K, 4000K and 5000K
CRI:	≥70

Electrical

Input Voltage:	120-277V or 347-480V
Input Frequency:	50/60Hz
Power Factor:	≥ 90% at rated watts
Total Harmonic Distortion:	≤ 20% at rated watts

Surge Protection*

STANDARD	OPTIONAL
☐ 10kV/5kA	☐ Secondary 10kV/5kA (R Option) or ☐ Secondary 20kV/10kA (T Option)

*Per ANSI C136.2-2018

Lumen Maintenance

Projected Lxx per IES TM-21-11 at 25°C

LUMEN CODES	DISTRIBUTIONS	LXX(10K) @ HOURS		
		25,000 HR	50,000 HR	60,000 HR
02 ,03, 04, 05, 06	A5, B5, C5, D5, E5	L96	L94	L93
07, 08	A5, B5, C5, D5, E5	L99	L98	L98
09	A5, B5, C5, D5, E5	L98	L97	L96
10	A5, B5, C5, D5, E5	L94	L87	L84
11	A5, B5, C5, D5, E5	L93	L85	L82
12	A5, B5, C5, D5, E5	L96	L95	L94
13	A5, B5, C5, D5, E5	L96	L94	L93
14	A5, B5, C5, D5, E5	L95	L92	L91
15	A5, B5, C5, D5, E5	L93	L88	L86
16	A5, B5, C5, D5, E5	L91	L85	L83

Note: Projected Lxx based on LM80 (≥ 10,000 hour testing). Accepted Industry tolerances apply to initial luminous flux and lumen maintenance measurements.

Ratings

Operating Temp:	-40°C to 50°C
Vibration:	3G per ANSI C136.31-2018
LM-79:	Testing in accordance with IES Standards
EMI:	Title 47 CFR Part 15 Class A
RoHS:	Complies with the material restrictions of RoHS

Controls

Dimming:	Standard-0-10V ☐ Optional-DALI (Option U) ☐
Sensors:	Photo Electric Sensors (PE) available LightGrid Compatible

Warranty

☐ 5 Year (Standard) ☐ 10 Year (Optional)

UL Listed · UL CERTIFIED · UL1598 · IP65 · IK08 · CONTROLS ENABLED

CUSTOMER NAME ______________________
PROJECT NAME ______________________
DATE ____________ TYPE ____________
CATALOG NUMBER ______________________

Ordering Information

E R L 1

_ _ _ _   _   _ _   _ _   _ _   _   _ _ _ _   _ _ _

PROD. ID	VOLTAGE	LUMENS	DISTRIBUTION[3]	CCT	CONTROLS PER ANSI C136.41	COLOR	OPTIONS
E = Evolve	0 = 120-277V[1,2]	02 = 2000 lm[2]	A5 = Type II Narrow	27 = 2700K[4]	A = 7-Pin Receptacle	GRAY = Gray	A = 4 Bolt Slipfitter[5]
R = Roadway	H = 347-480V[1]	03 = 3000 lm	B5 = Type II	30 = 3000K[4]	D = 7-Pin Receptacle with Shorting Cap	BLCK = Black	B = Tether
L = Local	1 = 120V	04 = 4000 lm	C5 = Type III	40 = 4000K	E = 7-Pin Receptacle with non-dimming Long Life PE	DKBZ = Dark Bronze	F = Fusing
1 = Single Module	2 = 208V	05 = 5000 lm	D5 = Type IV	50 = 5000K	Note: 0-10V standard	WHTE = White	G = Internal Bubble Level
	3 = 240V	06 = 6000 lm	E5 = Type II Enhanced Back Light				I = Optional IP66 Optical Enclosure
	4 =277V	07 = 7000 lm					L = Tool-Less Entry
	8 = 120-240V[1,11]	08 = 8000 lm					R = Enhanced Surge Protection (10kV/5kA)
	5 = 480V	09 = 9000 lm					T = Secondary 20kV/10kA SPD
	D = 347V	10 = 10000 lm					U = DALI Programmable[6,7]
		11 = 11000 lm					V1 = Field Adjustable Module[10, 12]
		12 = 12000 lm					X = Single Pack[8]
		13 = 13000 lm					Y = Coastal Finish[9]
		14 = 14000 lm					XXX = Special Options
		15 = 15000 lm					
		16 = 16000 lm					

1 **Fusing requires discrete voltage.**
2 **02 Lumen Level, Voltage options 1, 2, 3 and 8 only**
3 **Nominal IES Type and classing subject to typical variation, individual units may differ**
4 **Select 2700K or 3000K CCT for IDA approved units**
5 **Lead time varies, contact Factory**
6 **Compatible with LightGrid**
7 **Not available in 347V, 480V or 347-480V for Lumen Output Levels 08-16**
8 **Option provides single pack box per fixture. Standard packaging = 23 units per MagnaPak Container**
9 **Recommended for installations within 750 feet from coast. Lead time varies, check with factory.**
10 **Not available with DALI "U" option**
11 **Only available with 02 Lumen Code**
12 **Not compatible with 02 Lumen Code**

Suggested HID Replacement

Approximately 2,000-3,000 lumens to replace 50W-70W HPS Cobra-head
Approximately 4,000-5,000 lumens to replace 100W HPS Cobra-head
Approximately 7,000-9,000 lumens to replace 150W HPS Cobra-head
Approximately 9,000-12,000 lumens to replace 200W HPS Cobra-head
Approximately 12,000-16,000 lumens to replace 250W HPS Cobra-head

Note: actual replacement lumens may vary based upon mounting height, pole spacing, design criteria, etc.

CUSTOMER NAME _____

PROJECT NAME _____

DATE _____ TYPE _____

CATALOG NUMBER _____

LUMEN OUTPUT	DIST.	TYPICAL INITIAL LUMENS			WATTAGE		BUG RATINGS		
		5000K/ 4000K	3000K	2700K	120V 277V	347V 480V	5000K/4000K	3000K	2700K
02	A5	2000	1900	1900	15*	N/A	B1-U0-G1	B1-U0-G1	B1-U0-G1
	B5						B1-U0-G1	B1-U0-G1	B1-U0-G1
	C5						B1-U0-G1	B0-U0-G1	B0-U0-G1
	D5						B0-U0-G1	B0-U0-G1	B0-U0-G1
	E5						B1-U0-G1	B1-U0-G1	B1-U0-G1
03	A5	3000	2900	2800	22	26	B1-U0-G1	B1-U0-G1	B1-U0-G1
	B5						B1-U0-G1	B1-U0-G1	B1-U0-G1
	C5						B1-U0-G1	B1-U0-G1	B1-U0-G1
	D5						B1-U0-G1	B1-U0-G1	B1-U0-G1
	E5						B1-U0-G1	B1-U0-G1	B1-U0-G1
04	A5	4000	3900	3800	29	33	B1-U0-G1	B1-U0-G1	B1-U0-G1
	B5						B1-U0-G1	B1-U0-G1	B1-U0-G1
	C5						B1-U0-G1	B1-U0-G1	B1-U0-G1
	D5						B1-U0-G1	B1-U0-G1	B1-U0-G1
	E5						B1-U0-G1	B1-U0-G1	B1-U0-G1
05	A5	5000	4900	4700	37	39	B1-U0-G1	B1-U0-G1	B1-U0-G1
	B5						B1-U0-G1	B1-U0-G1	B1-U0-G1
	C5						B1-U0-G1	B1-U0-G1	B1-U0-G1
	D5						B1-U0-G1	B1-U0-G1	B1-U0-G1
	E5						B2-U0-G2	B1-U0-G1	B1-U0-G1
06	A5	6000	5800	5700	46	49	B2-U0-G2	B2-U0-G2	B2-U0-G2
	B5						B1-U0-G1	B1-U0-G1	B1-U0-G1
	C5						B1-U0-G2	B1-U0-G2	B1-U0-G2
	D5						B1-U0-G2	B1-U0-G2	B1-U0-G2
	E5						B2-U0-G2	B2-U0-G2	B2-U0-G2
07	A5	7000	6700	6200	50	51	B2-U0-G2	B2-U0-G2	B2-U0-G2
	B5						B1-U0-G2	B1-U0-G2	B1-U0-G1
	C5						B1-U0-G2	B1-U0-G2	B1-U0-G2
	D5						B1-U0-G2	B1-U0-G2	B1-U0-G2
	E5						B2-U0-G2	B2-U0-G2	B2-U0-G2
08	A5	8000	7600	7100	59		B2-U0-G2	B2-U0-G2	B2-U0-G2
	B5						B2-U0-G2	B2-U0-G2	B1-U0-G2
	C5						B1-U0-G2	B1-U0-G2	B1-U0-G2
	D5						B1-U0-G2	B1-U0-G2	B1-U0-G2
	E5						B2-U0-G2	B2-U0-G2	B2-U0-G2
09	A5	9000	8600	8000	68		B2-U0-G2	B2-U0-G2	B2-U0-G2
	B5						B2-U0-G2	B2-U0-G2	B2-U0-G2
	C5						B1-U0-G2	B1-U0-G2	B1-U0-G2
	D5						B1-U0-G2	B1-U0-G2	B1-U0-G2
	E5						B2-U0-G2	B2-U0-G2	B2-U0-G2

NOTE: * 120-240V only

For additional information on ERL1 IES files, please click one of the following links:

Non-Shielded Shielded

CUSTOMER NAME _____

PROJECT NAME _____

DATE _____ TYPE _____

CATALOG NUMBER _____

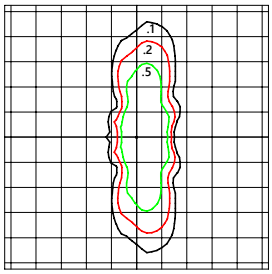
LUMEN OUTPUT	DIST.	TYPICAL INITIAL LUMENS			WATTAGE		BUG RATINGS		
		5000K/ 4000K	3000K	2700K	120V 277V	347V 480V	5000K/4000K	3000K	2700K
10	A5	10000	9600	8900	76		B2-U0-G2	B2-U0-G2	B2-U0-G2
	B5						B2-U0-G2	B2-U0-G2	B2-U0-G2
	C5						B2-U0-G2	B2-U0-G2	B1-U0-G2
	D5						B1-U0-G2	B1-U0-G2	B1-U0-G2
	E5						B3-U0-G3	B2-U0-G2	B2-U0-G2
11	A5	11000	10500	9700	87		B3-U0-G3	B3-U0-G3	B2-U0-G2
	B5						B2-U0-G2	B2-U0-G2	B2-U0-G2
	C5						B2-U0-G2	B2-U0-G2	B2-U0-G2
	D5						B2-U0-G2	B2-U0-G2	B1-U0-G2
	E5						B3-U0-G3	B3-U0-G3	B3-U0-G3
12	A5	12000	11500	11100	93		B3-U0-G3	B3-U0-G3	B3-U0-G3
	B5						B2-U0-G2	B2-U0-G2	B2-U0-G2
	C5						B2-U0-G2	B2-U0-G2	B2-U0-G2
	D5						B2-U0-G2	B2-U0-G2	B2-U0-G2
	E5						B3-U0-G3	B3-U0-G3	B3-U0-G3
13	A5	13000	12400	12000	102		B3-U0-G3	B3-U0-G3	B3-U0-G3
	B5						B2-U0-G2	B2-U0-G2	B2-U0-G2
	C5						B2-U0-G3	B2-U0-G2	B2-U0-G2
	D5						B2-U0-G2	B2-U0-G2	B2-U0-G2
	E5						B3-U0-G3	B3-U0-G3	B3-U0-G3
14	A5	14000	13400	13000	110		B3-U0-G3	B3-U0-G3	B3-U0-G3
	B5						B2-U0-G2	B2-U0-G2	B2-U0-G2
	C5						B2-U0-G3	B2-U0-G3	B2-U0-G3
	D5						B2-U0-G2	B2-U0-G2	B2-U0-G2
	E5						B3-U0-G3	B3-U0-G3	B3-U0-G3
15	A5	15000	14400	13900	121		B3-U0-G3	B3-U0-G3	B3-U0-G3
	B5						B3-U0-G3	B2-U0-G2	B2-U0-G2
	C5						B2-U0-G3	B2-U0-G3	B2-U0-G3
	D5						B2-U0-G2	B2-U0-G2	B2-U0-G2
	E5						B3-U0-G3	B3-U0-G3	B3-U0-G3
16	A5	15700	15000	14600	129		B3-U0-G3	B3-U0-G3	B3-U0-G3
	B5						B3-U0-G3	B3-U0-G3	B2-U0-G2
	C5						B2-U0-G3	B2-U0-G3	B2-U0-G3
	D5						B2-U0-G3	B2-U0-G3	B2-U0-G2
	E5						B3-U0-G3	B3-U0-G3	B3-U0-G3

For additional information on ERL1 IES files, please click one of the following links:

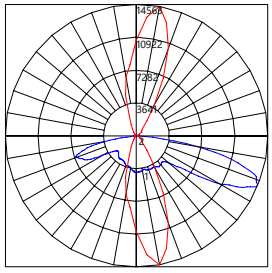
Non-Shielded Shielded

ERL1
Type II Narrow

15700 Lumens
5000K
ERL1_16A550___.IES



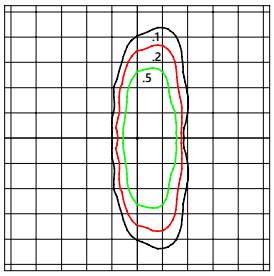
• Mounting Height at 30'
• Initial Footcandle at Grade



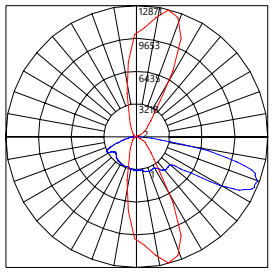
— Vertical plane at max Cd horiz. angle 80°
— Horizontal cone at max Cd vert. angle 68°

ERL1
Type II Wide

15700 Lumens
5000K
ERL1_16B550___.IES



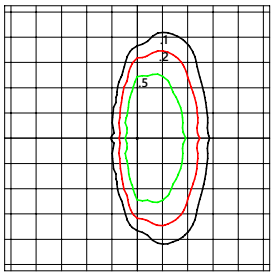
• Mounting Height at 30'
• Initial Footcandle at Grade



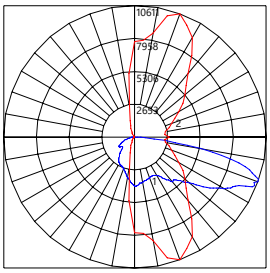
— Vertical plane at max Cd horiz angle 75°
— Horizontal cone at max Cd vert. angle 70°

ERL1
Type III

15700 Lumens
5000K
ERL1_16C550___.IES



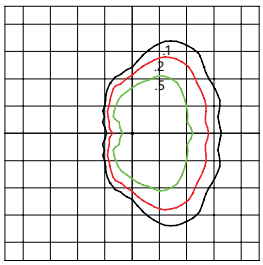
• Mounting Height at 30'
• Initial Footcandle at Grade



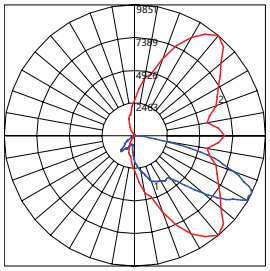
— Vertical plane at max Cd horiz angle 70°
— Horizontal cone at max Cd vert. angle 70°

ERL1
Type IV Short

15700 Lumens
5000K
ERL1_16D550___.IES



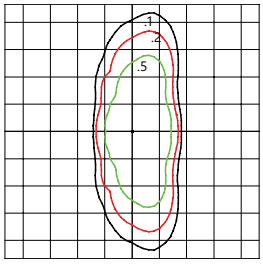
• Mounting Height at 40'
• Initial Footcandle at Grade



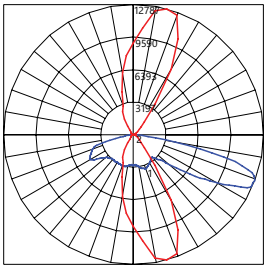
— Vertical plane at max Cd horiz angle 50°
— Horizontal cone at max Cd vert. angle 63°

ERL1
Type II Medium

15700 Lumens
5000K
ERL1_16E550___.IES



• Mounting Height at 40'
• Initial Footcandle at Grade



— Vertical plane at max Cd horiz angle 75°
— Horizontal cone at max Cd vert. angle 69°

ISO illuminate diagrams and polar plots are representative of the SKUs illustrated. Refer to IES files for SKU specific information.

EVOLVE

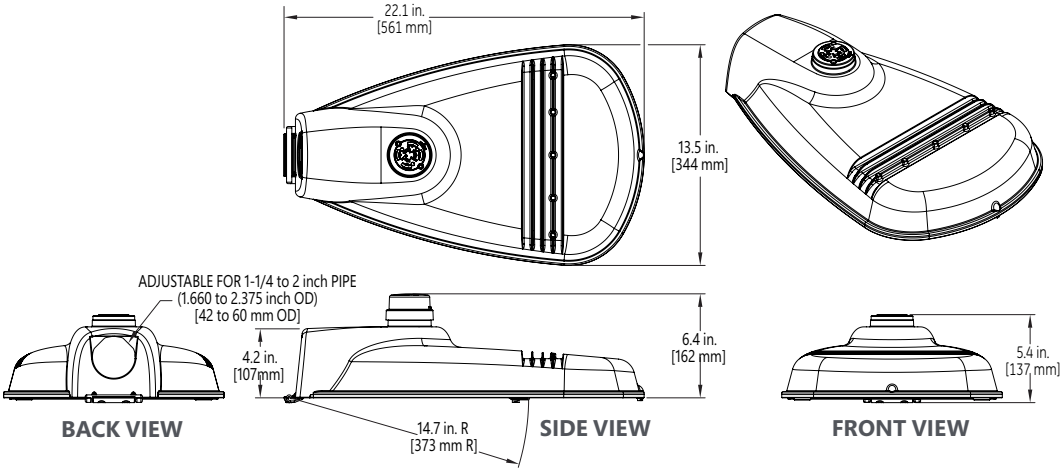
ERL1 Cobra Head
LED Roadway Lighting

CUSTOMER NAME _____

PROJECT NAME _____

DATE _____ TYPE _____

CATALOG NUMBER _____



Mounting

- Adjustable for 1.25 to 2 in. nominal mounting pipe (1.660 to 2.375 inch OD)
- Integral diecast mounting pipe stop
- Slipfitter with +/- 5 degrees of leveling adjustment

Effective Projected Area

- 0.5 sq ft max (0.046 sq m)

Weight

- 12.4 lbs (5.6 kgs)

Accessories

SAP Number	Part Number	Description
93029237G	PED-MV-LED-7	ANSI C136.41 Dimming PE, 120-277V
93029238G	PED-347-LED-7	ANSI C136.41 Dimming PE, 347V
93029239G	PED-480-LED-7	ANSI C136.41 Dimming PE, 480V
28299	PECOTL	Long Life PE 120-277V
93147530	PECHTL	Long Life PE 347-480V
73251	SCCL-PECTL	Shorting Cap

Network Lighting Controls

Current's **LightGrid**™ Outdoor Lighting Control System is designed for Street and Roadway Applications. It enables remote monitoring, control, and asset management of a single
fixture or a group of fixtures through a web enabled Central Management System.

EVOLVE

ERL2 Cobra Head
LED Roadway Lighting

CUSTOMER NAME _____

PROJECT NAME _____

DATE _____ TYPE _____

CATALOG NUMBER _____

The Evolve® LED Roadway ERL2 Luminaire is optimized utilizing advanced LED reflective optical system for local, collector and major roadways. The modern design incorporates the heat sink directly into the unit for heat transfer to prolong LED life.

Construction

Housing:	Aluminum die cast enclosure. Casting Integral heat sink for maximum heat transfer
Lens:	Impact resistant tempered glass
Paint:	Corrosion resistant polyester powder painted, minimum 2.0 mil thickness (RAL & custom colors available) Standard = Black, Dark Bronze Gray, White Optional = Coastal Finish
Weight:	24.0 lbs (10.9 kgs)

Optical System

Lumens:	16,000 - 32,000
Distribution:	Type II Narrow, Type II Wide, Type III, Type IV and Type II Enhanced Back light
Efficacy:	112-140 LPW
CCT:	2700K, 3000K, 4000K, 5000K
CRI (Min):	70 CRI

Electrical

Input Voltage:	120-277V or 347-480V
Input Frequency:	50/60Hz
Power Factor:	≥ 90% at rated watts
Total Harmonic Distortion:	≤ 20% at rated watts

Surge Protection*

STANDARD	OPTIONAL
☐ 10kV/5kA	☐ Secondary 10kV/5kA (R Option) or ☐ Secondary 20kV/10kA (T Option)

***Per ANSI C136.2-2018**

Lumen Maintenance

Projected Lxx per IES TM-21-11 at 25°C

LUMEN CODES	DISTRIBUTIONS	LXX(10K) @ HOURS		
		25,000 HR	50,000 HR	60,000 HR
16	A5, B5, C5, D5, E5	L99	L99	L99
18	A5, B5, C5, D5, E5	L99	L98	L98
19	A5, B5, C5, D5, E5	L99	L98	L97
21	A5, B5, C5, D5, E5	L94	L87	L85
23	A5, B5, C5, D5, E5	L97	L96	L95
25	A5, B5, C5, D5, E5	L96	L95	L95
27	A5, B5, C5, D5, E5	L96	L94	L94
28	A5, B5, C5, D5, E5	L96	L94	L93
30, 31	A5, B5, C5, D5, E5	L95	L93	L92
32	A5, B5, C5, D5, E5	L94	L91	L90

Note: Projected Lxx based on LM80 (≥ 10,000 hour testing). Accepted Industry tolerances apply to initial luminous flux and lumen maintenance measurements.

Ratings

Operating Temp:	-40°C to 50°C *
Vibration:	3G per ANSI C136.31-2018
LM-79:	Testing in accordance with IES Standards
EMI:	Title 47 CFR Part 15 Class A
RoHS:	Complies with the material restrictions of RoHS

***ERL2 (32K Lumen 347-480V SKU) operates at -40°C to 45°C**

Controls

Dimming:	Standard-0-10V ☐ Optional-DALI (Option U) ☐
Sensors:	Photo Electric Sensors (PE) available LightGrid Compatible

Warranty

☐ 5 Year (Standard) ☐ 10 Year (Optional)

Not all product variations listed on this page are DLC qualified.
Visit www.designlights.org/search to confirm qualifications.

UL Listed · UL CERTIFIED · UL1598 · IP65 Optical Enclosures · IK07 · CONTROLS ENABLED

CUSTOMER NAME ______________________
PROJECT NAME ______________________
DATE ______________ TYPE ______________
CATALOG NUMBER ______________________

Ordering Information

ERL2

_ _ _ _   _   _ _   _ _   _ _   _   _ _ _ _   _ _ _

PROD. ID	VOLTAGE	LUMENS (LM)	DISTRIBUTION[3]	CCT	CONTROLS PER ANSI C136.41	COLOR	OPTIONS
E = Evolve	0 = 120-277V [1]	16 = 16,000 lm	A5 = Type II Narrow	27 = 2700K[2]	A = 7-Pin Receptacle	GRAY = Gray	A = 4 Bolt Slipfitter[4]
R = Roadway	H = 347-480V[1]	18 = 18,000 lm	B5 = Type II Wide	30 = 3000K[2]	D = 7-Pin Receptacle with Shorting Cap	BLCK = Black	B = Tether
L = Local	1 = 120V	19 = 19,000 lm	C5 = Type III	40 = 4000K	E = 7-Pin Receptacle with non-Dimming Long Life PE[5]	DKBZ = Dark Bronze	F = Fusing
2 = Double Module	2 = 208V	21 = 21,000 lm	D5 = Type IV[10]	50 = 5000K	Note: 0-10V control standard unless DALI Option "U" requested	WHTE = White	G = Internal Bubble Level
	3 = 240V	23 = 23,000 lm	E5 = Type II Enhanced Back Light				I = Optional IP66 Optical Enclosure
	4 = 277V	25 = 25,000 lm					L = Tool-Less Entry
	D = 347V	27 = 27,000 lm					R = Secondary 10kV/5kA SPD
	5 = 480V	28 = 28,000 lm					T = Secondary 20kV/10kA SPD[1]
		30 = 30,000 lm					U = DALI Programmable[6,7]
		31 = 31,000 lm					V1 = Field Adjustable Module[9]
		32 = 32,000 lm					Y = Coastal Finish[8]
							XXX = Special Options

1 **Not Available with Fusing**
2 **Select 2700K or 3000K CCT for IDA approved units**
3 **Nominal IES Type classing subject to typical variation, individual units may differ**
4 **Lead time varies, contact Factory**
5 **Per ANSI C136.10-2017**
6 **Compatible with LightGrid**
7 **Not available in 347V, 480V or 347-480V**
8 **Recommended for installations within 750 feet from coast. Lead time varies, check with factory.**
9 **Not available with DALI "U" option**
10 **Forward throw distribution. Classifies as Type III for lumen codes 23-32. Review IES curve for application.**

Suggested HID Replacement

Approximately 21,500 -32,000 lumens to replace 400W HPS Cobra-head

Note: actual replacement lumens may vary based upon mounting height, pole spacing, design criteria, etc.

CUSTOMER NAME _____

PROJECT NAME _____

DATE _____ TYPE _____

CATALOG NUMBER _____

LUMEN OUTPUT	DIST.	TYPICAL INITIAL LUMENS			WATTAGE		BUG RATINGS		
		5000K/ 4000K	3000K	2700K	120V 277V	347V 480V	5000K/4000K	3000K	2700K
16	A5	16000	15300	14200	114		B3-U0-G3	B3-U0-G3	B3-U0-G3
	B5						B3-U0-G3	B3-U0-G3	B2-U0-G2
	C5						B2-U0-G3	B2-U0-G3	B2-U0-G3
	D5						B2-U0-G3	B2-U0-G3	B2-U0-G2
	E5						B3-U0-G3	B3-U0-G3	B3-U0-G3
18	A5	18000	17200	16000	130		B3-U0-G3	B3-U0-G3	B3-U0-G3
	B5						B3-U0-G3	B3-U0-G3	B3-U0-G3
	C5						B3-U0-G3	B2-U0-G3	B2-U0-G3
	D5						B2-U0-G3	B2-U0-G3	B2-U0-G3
	E5						B3-U0-G3	B3-U0-G3	B3-U0-G3
19	A5	19000	18200	16900	140		B3-U0-G3	B3-U0-G3	B3-U0-G3
	B5						B3-U0-G3	B3-U0-G3	B3-U0-G3
	C5						B3-U0-G3	B3-U0-G3	B2-U0-G3
	D5						B2-U0-G3	B2-U0-G3	B2-U0-G3
	E5						B3-U0-G3	B3-U0-G3	B3-U0-G3
21	A5	21000	20100	18600	160		B3-U0-G3	B3-U0-G3	B3-U0-G3
	B5						B3-U0-G3	B3-U0-G3	B3-U0-G3
	C5						B3-U0-G3	B3-U0-G3	B3-U0-G3
	D5						B2-U0-G3	B2-U0-G3	B2-U0-G3
	E5						B3-U0-G3	B3-U0-G3	B3-U0-G3
23	A5	23000	22000	21300	177		B3-U0-G3	B3-U0-G3	B3-U0-G3
	B5						B3-U0-G3	B3-U0-G3	B3-U0-G3
	C5						B3-U0-G4	B3-U0-G4	B3-U0-G3
	D5						B2-U0-G3	B2-U0-G3	B2-U0-G3
	E5						B3-U0-G3	B3-U0-G3	B3-U0-G3
25	A5	25000	24000	23200	191		B3-U0-G3	B3-U0-G3	B3-U0-G3
	B5						B3-U0-G3	B3-U0-G3	B3-U0-G3
	C5						B3-U0-G4	B3-U0-G4	B3-U0-G4
	D5						B2-U0-G4	B2-U0-G4	B2-U0-G3
	E5						B4-U0-G4	B4-U0-G4	B4-U0-G4

For additional information on ERL2 IES files, please click one of the following links:

Non-Shielded Shielded

CUSTOMER NAME _____

PROJECT NAME _____

DATE _____ TYPE _____

CATALOG NUMBER _____

LUMEN OUTPUT	DIST.	TYPICAL INITIAL LUMENS			WATTAGE		BUG RATINGS		
		5000K/ 4000K	3000K	2700K	120V 277V	347V 480V	5000K/4000K	3000K	2700K
27	A5	27000	25900	25100	212		B4-U0-G4	B4-U0-G4	B3-U0-G3
	B5						B3-U0-G3	B3-U0-G3	B3-U0-G3
	C5						B3-U0-G4	B3-U0-G4	B3-U0-G4
	D5						B2-U0-G4	B2-U0-G4	B2-U0-G4
	E5						B4-U0-G4	B4-U0-G4	B4-U0-G4
28	A5	28000	26800	26000	223		B4-U0-G4	B4-U0-G4	B4-U0-G4
	B5						B3-U0-G4	B3-U0-G3	B3-U0-G3
	C5						B3-U0-G4	B3-U0-G4	B3-U0-G4
	D5						B3-U0-G4	B3-U0-G4	B2-U0-G4
	E5						B4-U0-G4	B4-U0-G4	B4-U0-G4
30	A5	30000	28800	27900	242		B4-U0-G4	B4-U0-G4	B4-U0-G4
	B5						B3-U0-G4	B3-U0-G4	B3-U0-G4
	C5						B3-U0-G4	B3-U0-G4	B3-U0-G4
	D5						B3-U0-G4	B3-U0-G4	B3-U0-G4
	E5						B4-U0-G4	B4-U0-G4	B4-U0-G4
31	A5	31000	29700	28800	252		B4-U0-G4	B4-U0-G4	B4-U0-G4
	B5						B3-U0-G4	B3-U0-G4	B3-U0-G4
	C5						B3-U0-G4	B3-U0-G4	B3-U0-G4
	D5						B3-U0-G4	B3-U0-G4	B3-U0-G4
	E5						B4-U0-G4	B4-U0-G4	B4-U0-G4
32	A5	32000	30700	29700	265		B4-U0-G4	B4-U0-G4	B4-U0-G4
	B5						B3-U0-G4	B3-U0-G4	B3-U0-G4
	C5						B3-U0-G4	B3-U0-G4	B3-U0-G4
	D5						B3-U0-G4	B3-U0-G4	B3-U0-G4
	E5						B4-U0-G4	B4-U0-G4	B4-U0-G4

For additional information on ERL2 IES files, please click one of the following links:

Non-Shielded Shielded

CUSTOMER NAME _____

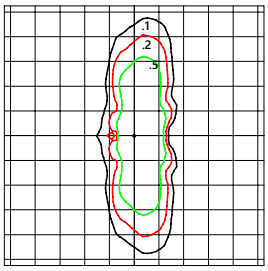
PROJECT NAME _____

DATE _____ TYPE _____

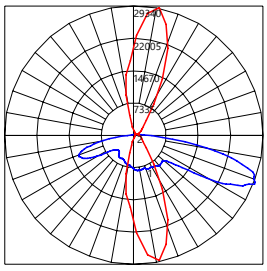
CATALOG NUMBER _____

ERL2
Type II Narrow

32,000 Lumens
5000K
ERL2_32A550_____.IES



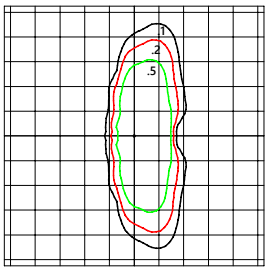
- Mounting Height at 30'
- Initial Footcandle at Grade



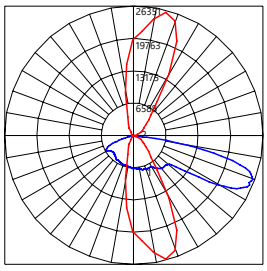
— Vertical plane at max Cd horiz. angle 80°
— Horizontal cone at max Cd vert. angle 68°

ERL2
Type II Wide

32,000 Lumens
5000K
ERL2_32B550_____.IES



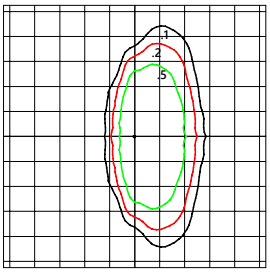
- Mounting Height at 30'
- Initial Footcandle at Grade



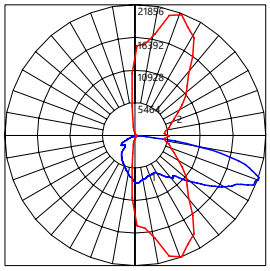
— Vertical plane at max Cd horiz. angle 75°
— Horizontal cone at max Cd vert. angle 70°

ERL2
Type III

32,000 Lumens
5000K
ERL2_32C550_____.IES



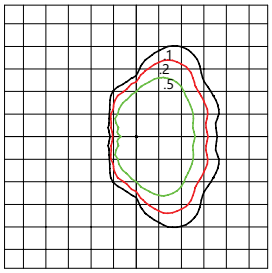
- Mounting Height at 30'
- Initial Footcandle at Grade



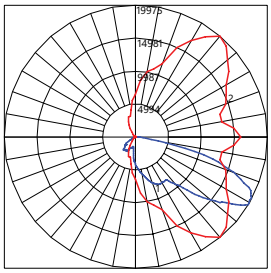
— Vertical plane at max Cd horiz. angle 70°
— Horizontal cone at max Cd vert. angle 70°

ERL2
Type III (FWT)

32,000 Lumens
5000K
ERL2_32D550_____.IES
Forward Throw



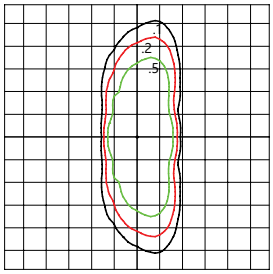
- Mounting Height at 30'
- Initial Footcandle at Grade



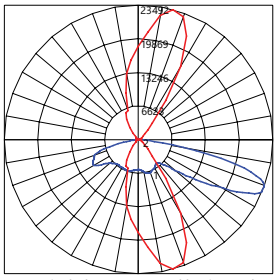
— Vertical plane at max Cd horiz. angle 50°
— Horizontal cone at max Cd vert. angle 59°

ERL2
Type II Medium

32,000 Lumens
5000K
ERL2_32E550_____.IES



- Mounting Height at 30'
- Initial Footcandle at Grade



— Vertical plane at max Cd horiz. angle 75°
— Horizontal cone at max Cd vert. angle 67°

ISO illuminate diagrams and polar plots are representative of the SKUs illustrated. Refer to IES files for SKU specific information.

EVOLVE

ERL2 Cobra Head

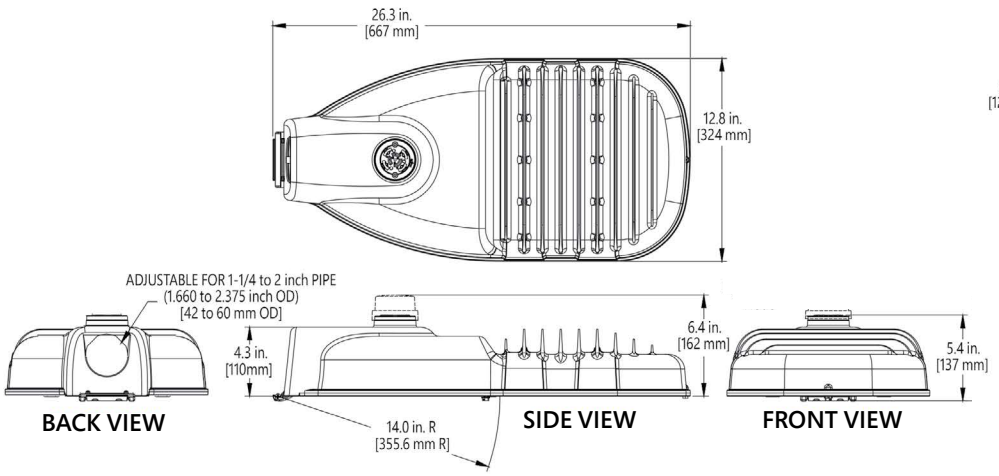
LED Roadway Lighting

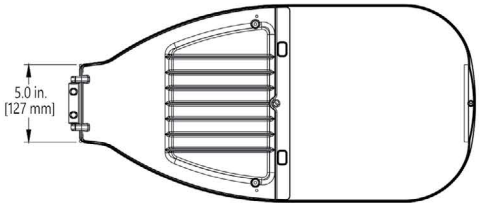
CUSTOMER NAME _____

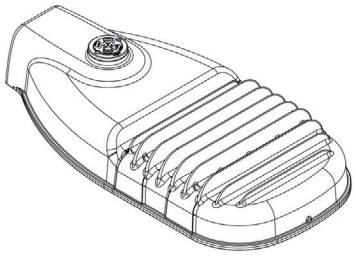
PROJECT NAME _____

DATE _____ TYPE _____

CATALOG NUMBER _____







Mounting

- Adjustable for 1.25 to 2 in. nominal mounting pipe(1.660 to 2.375 inch OD)
- Integral diecast mounting pipe stop
- Slipfitter with +/- 5 degrees of leveling adjustment

Effective Projected Area

- 0.57 sq ft max (0.053 sq m)

Weight

- 24.0 lbs (10.9 kgs)

Accessories

SAP NUMBER	PART NUMBER	DESCRIPTION
93029237G	PED-MV-LED-7	ANSI C136.41 Dimming PE, 120-277V
93029238G	PED-347-LED-7	ANSI C136.41 Dimming PE, 347V
93029239G	PED-480-LED-7	ANSI C136.41 Dimming PE, 480V
28299	PECOTL	Long Life PE 120-277V
93147530	PECHTL	Long Life PE 347-480V
73251	SCCL-PECTL	Shorting Cap

Network Lighting Controls

Current's LightGrid™ Outdoor Lighting Control System is designed for Street and Roadway Applications. It enables remote monitoring, control, and asset management of a single fixture or a group of fixtures through a web enabled Central Management System.

EVOLVE

Cobra Head
Shield Guide

CUSTOMER NAME _____

PROJECT NAME _____

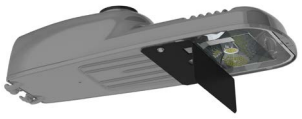
DATE _____ TYPE _____

CATALOG NUMBER _____

HOUSE SIDE SHIELDS

ERLC Shields

Product Code:	93110037G	Description:	ELSHS-ERLC-BLCK
Product Code:	93110038G	Description:	ELSHS-ERLC-GRAY



ERL1 Shields

Product Code:	93024487G	Description:	ELSHS-ERL1-BLCK
Product Code:	93046386G	Description:	ELSHS-ERL1-GRAY
Product Code:	93068998	Description:	ELSHS-ERL1-DKBZ

ERL2 Shields

Product Code:	93070722	Description:	ELSHS-ERL2-BLCK
Product Code:	93085564G	Description:	ELSHS-ERL2-GRAY
Product Code:	93096747G	Description:	ELSHS-ERL2-DKBZ

STREET SIDE SHIELDS

ERLC Shields

Product Code:	93132372	Description:	ELSFS-ERLC-BLCK-10
Product Code:	93132373	Description:	ELSFS-ERLC-BLCK-15
Product Code:	93134760	Description:	ELSFS-ERLC-BLCK-20

ERL1 Shields

Product Code:	93092595	Description:	ELSFS-ERL1-BLCK-10
Product Code:	93108740G	Description:	ELSFS-ERL1-GRAY-10
Product Code:	93092906	Description:	ELSFS-ERL1-BLCK-15
Product Code:	93105144G	Description:	ELSFS-ERL1-GRAY-15
Product Code:	93088130	Description:	ELSFS-ERL1-BLCK-20
Product Code:	93088131G	Description:	ELSFS-ERL1-GRAY-20

ERL2 Shields

Product Code:	93132955G	Description:	ELSFS-ERL2-BLCK-20
Product Code:	93132986G	Description:	ELSFS-ERL2-GRAY-20

CUSTOMER NAME _____
PROJECT NAME _____
DATE _____ TYPE _____
CATALOG NUMBER _____

SIDE SHIELDS (L&R)

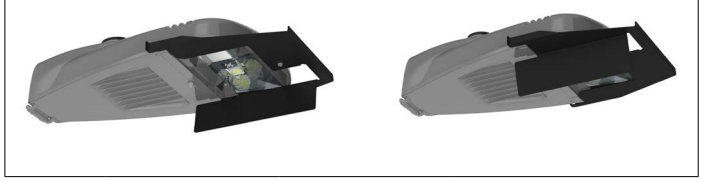
Shipped as a kit - L & R can be used independently

ERLC Shields

Product Code:	93132374G	Description:	ELS-ERLC-LEFTRIGHTSIDEKIT-BLCK-10

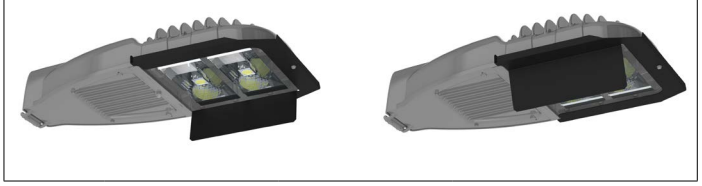
ERL1 SHIELDS

Product Code:	93118695G	Description:	ELS-ERL1H-LEFTRIGHTSIDEKIT-BLCK-10



ERL2 SHIELDS

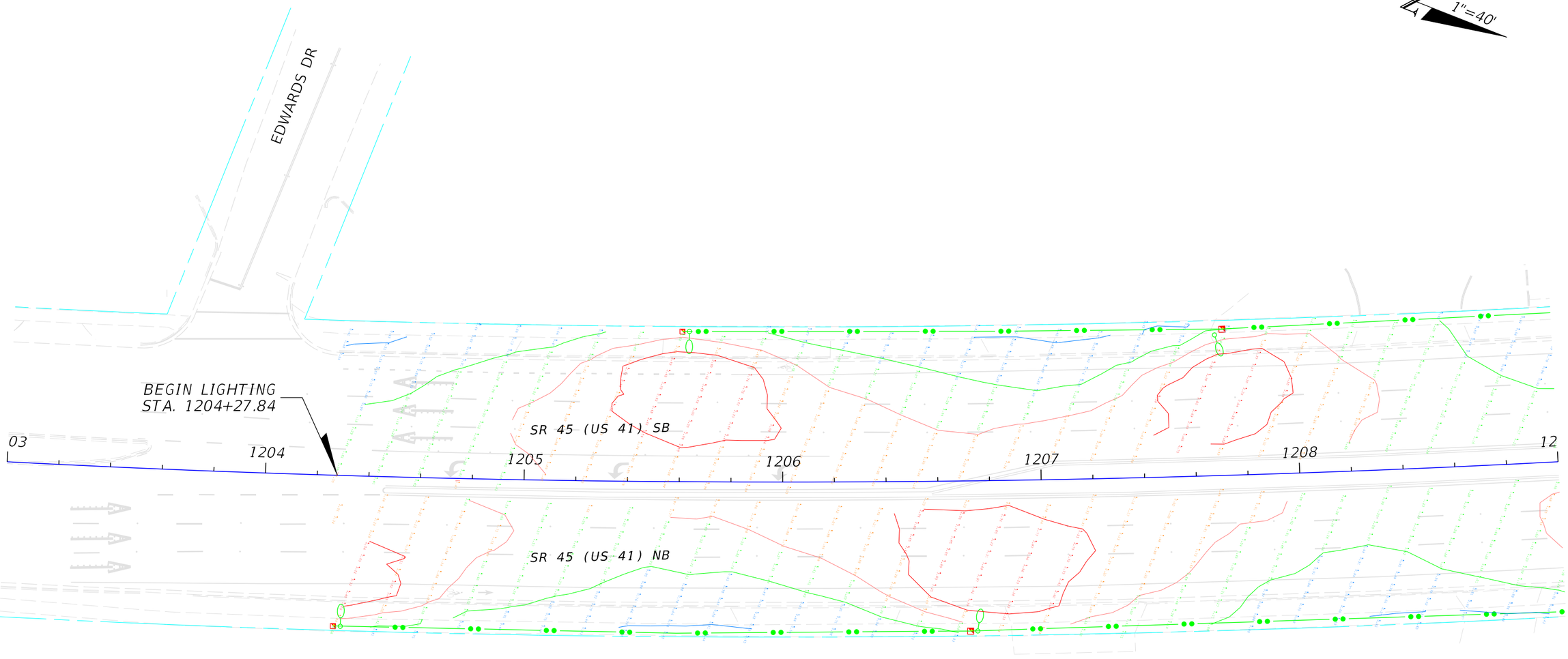
Product Code:	93132989G	Description:	ELS-ERL2-LEFTRIGHTSIDEKIT-BLCK-10



FOOTNOTES:

1) 10 = 1" Shield Depth; 15 = 1.5" Shield Depth; 20 = 2" Shield Depth
2) Black is recommended to reduce potential for glare coming off of the shield
3) Use "House Side" Shield to block light trespass behind the pole
4) Use "Street Side" / Front Shield to block light light trespass across the street

APPENDIX B: Photometric Plan Sheets



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD

ISAMARIE L. MONREAL
LICENSE NUMBER: 72029
FLORIDA DEPT. OF TRANSPORTATION
801 N. BROADWAY AVENUE
BARTOW, FL 33830-3809

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 45	MANATEE	444612-1-52-01

LIGHTING PLAN

SHEET NO.

L-7

C:\projects\FDOT\44461215201\Lighting\eng_data\LDAR\CADD\DSGNLTAGICalcPoints01.dgn : SR 45 - PHOTOMETRIC PLANS [SHEET]
RD152SM 4/17/2024 3:58:48 PM

1"=40'

SEAGATE DR

SR 45 (US 41) SB

09 1210 1211 1212 1213 1214 12

SR 45 (US 41) NB

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD

ISAMARIE L. MONREAL
LICENSE NUMBER: 72029
FLORIDA DEPT. OF TRANSPORTATION
801 N. BROADWAY AVENUE
BARTOW, FL 33830-3809

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 45	MANATEE	444612-1-52-01

LIGHTING PLAN

SHEET NO.

L-8

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RD152SM 4/17/2024 3:58:49 PM

1"=40'

(PRIVATE ASPH.)

(PRIVATE ASPH.)

SR 45 (US 41) SB

15 1216 1217 1218 1219 1220 12

SR 45 (US 41) NB

TOWER RD

REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			LIGHTING PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	ISAMARIE L. MONREAL LICENSE NUMBER: 72029 FLORIDA DEPT. OF TRANSPORTATION 801 N. BROADWAY AVENUE BARTOW, FL 33830-3809	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		L-9
					SR 45	MANATEE	444612-1-52-01		

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RD152SM 4/17/2024 3:58:50 PM

1"=40'

(PRIVATE ASPH.)

SR 45 (US 41) SB

'21 1222 1223 1224 1225 1226 12

SR 45 (US 41) NB

CIARAVELLA CT

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REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			LIGHTING PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	ISAMARIE L. MONREAL LICENSE NUMBER: 72029 FLORIDA DEPT. OF TRANSPORTATION 801 N. BROADWAY AVENUE BARTOW, FL 33830-3809	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		L-10
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1"=40'

SR 45 (US 41) SB

SR 45 (US 41) NB

27 1228 1229 1230 1231 1232 12

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REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD

ISAMARIE L. MONREAL
LICENSE NUMBER: 72029
FLORIDA DEPT. OF TRANSPORTATION
801 N. BROADWAY AVENUE
BARTOW, FL 33830-3809

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 45	MANATEE	444612-1-52-01

LIGHTING PLAN

SHEET NO.

L-11

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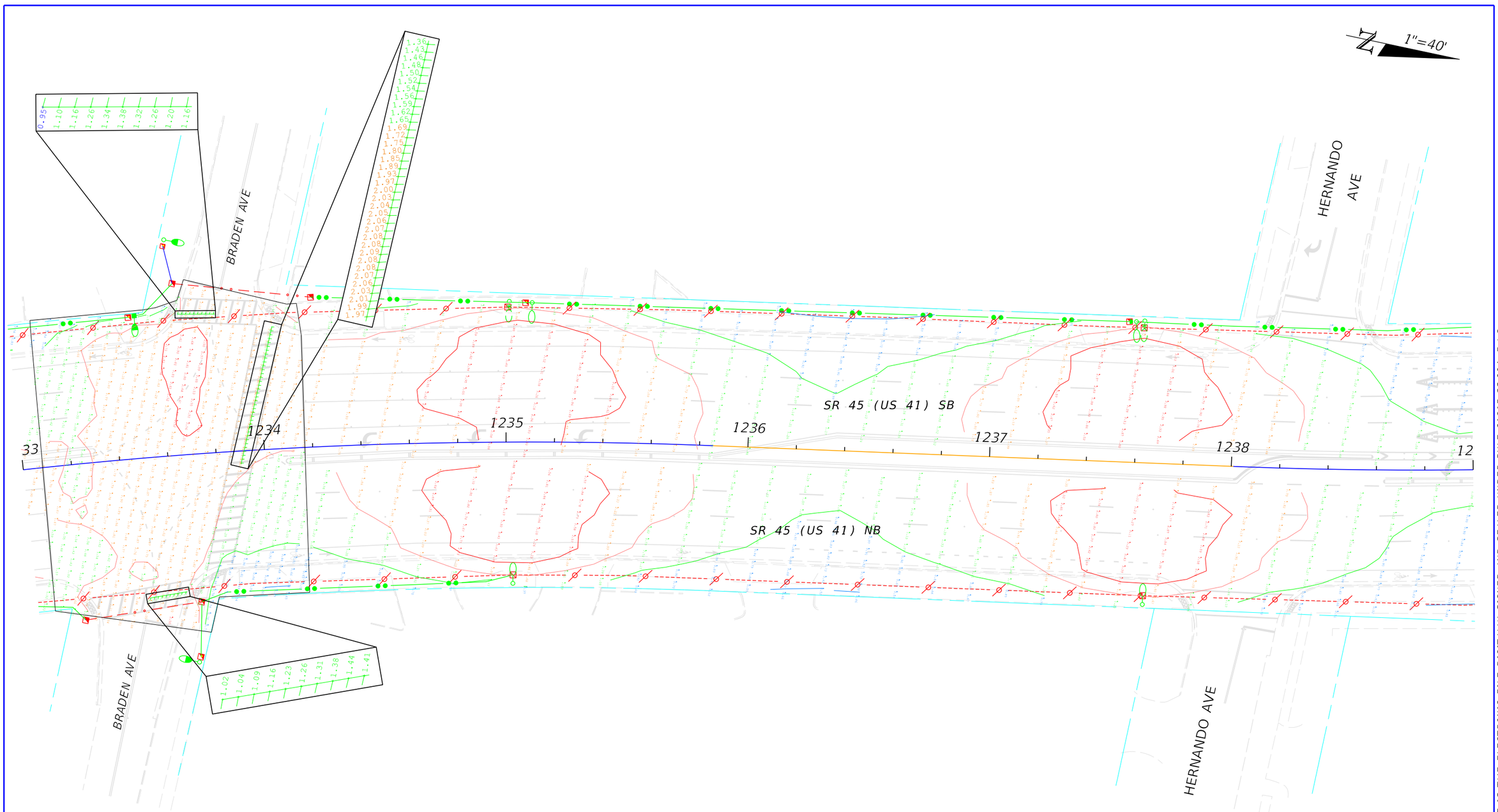

REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			LIGHTING PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	ISAMARIE L. MONREAL LICENSE NUMBER: 72029 FLORIDA DEPT. OF TRANSPORTATION 801 N. BROADWAY AVENUE BARTOW, FL 33830-3809	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		L-12
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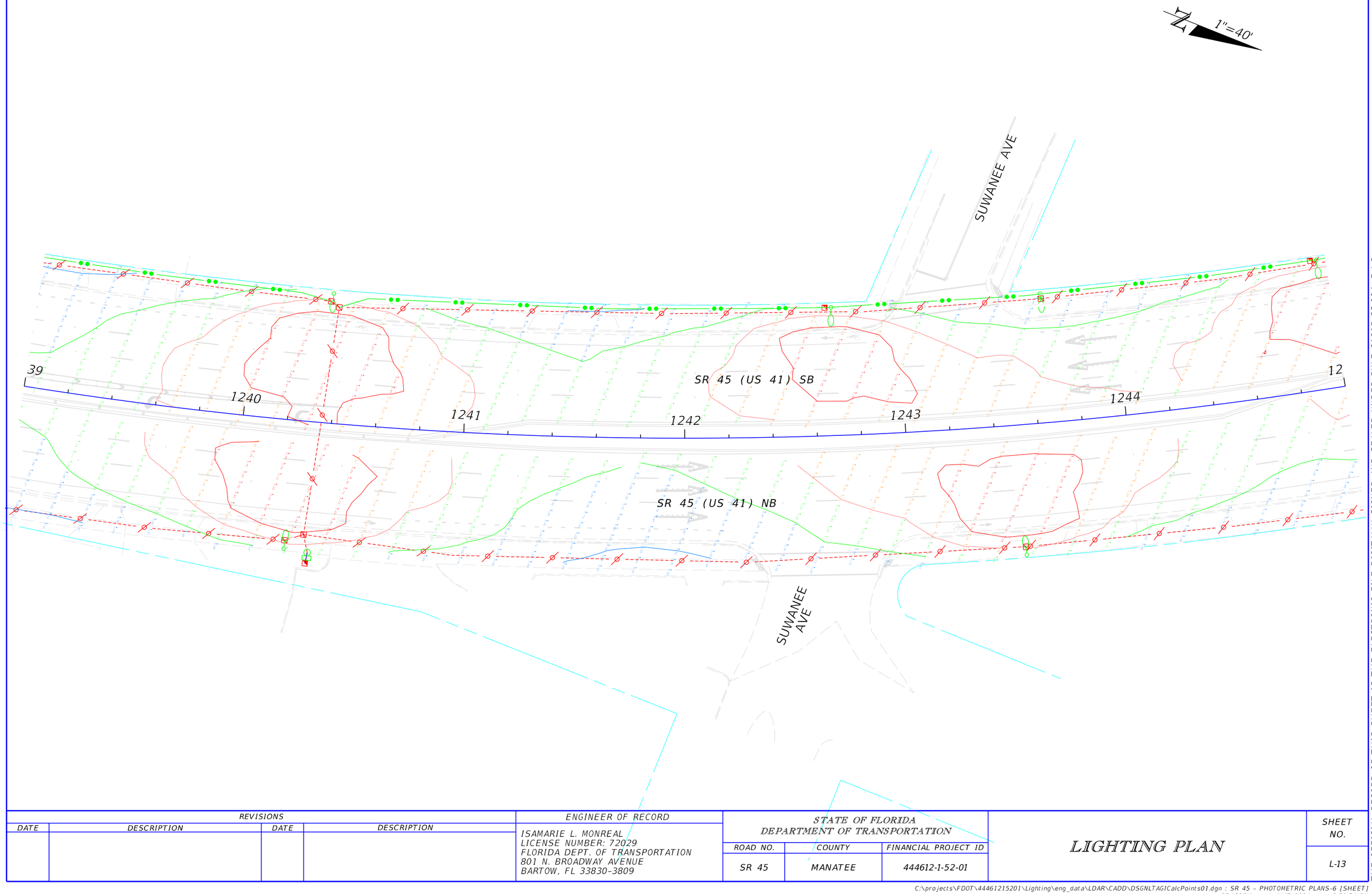

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD

ISAMARIE L. MONREAL
LICENSE NUMBER: 72029
FLORIDA DEPT. OF TRANSPORTATION
801 N. BROADWAY AVENUE
BARTOW, FL 33830-3809

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 45	MANATEE	444612-1-52-01

LIGHTING PLAN

SHEET NO.
L-13

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

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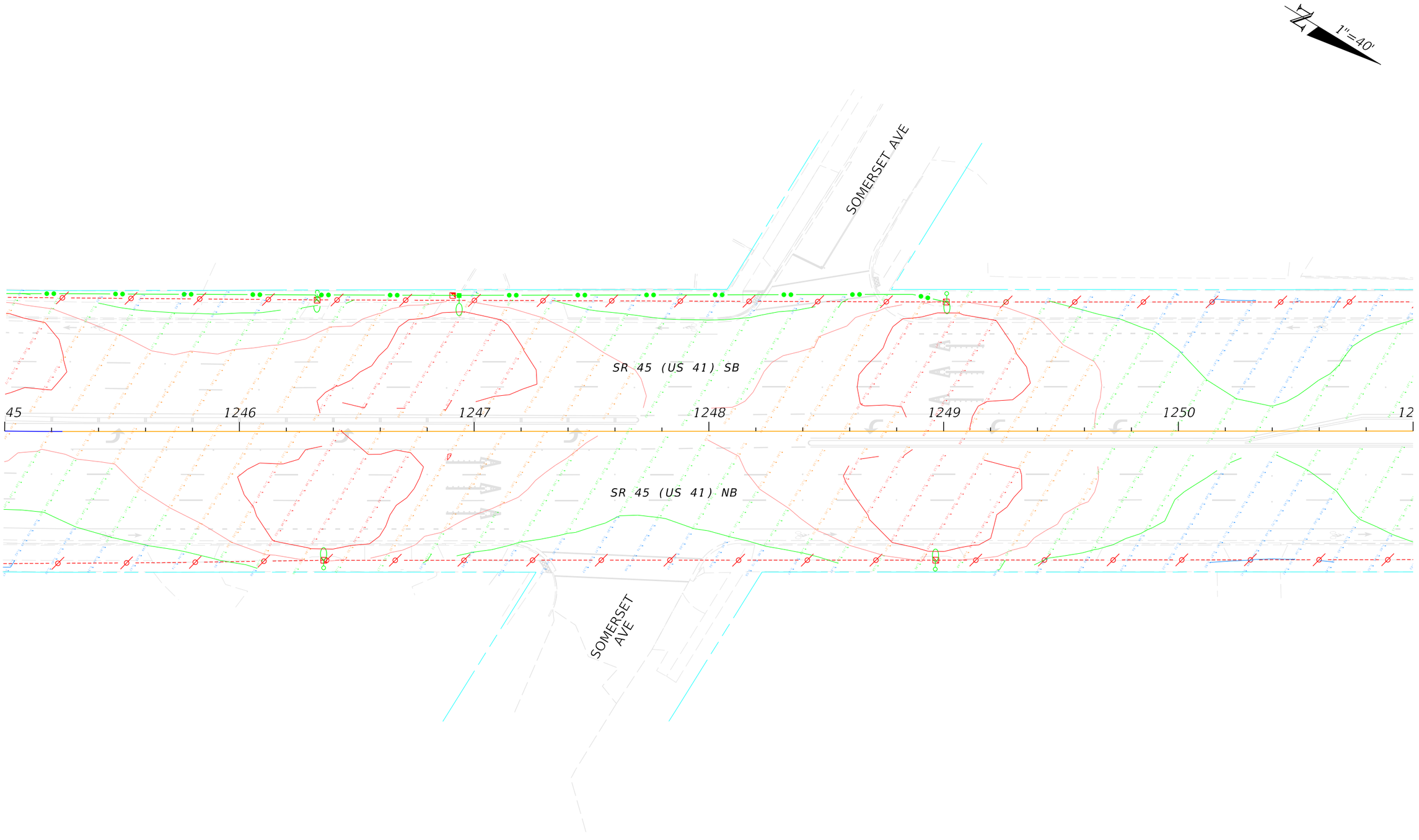

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD

ISAMARIE L. MONREAL
LICENSE NUMBER: 72029
FLORIDA DEPT. OF TRANSPORTATION
801 N. BROADWAY AVENUE
BARTOW, FL 33830-3809

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 45	MANATEE	444612-1-52-01

LIGHTING PLAN

SHEET NO.

L-14

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

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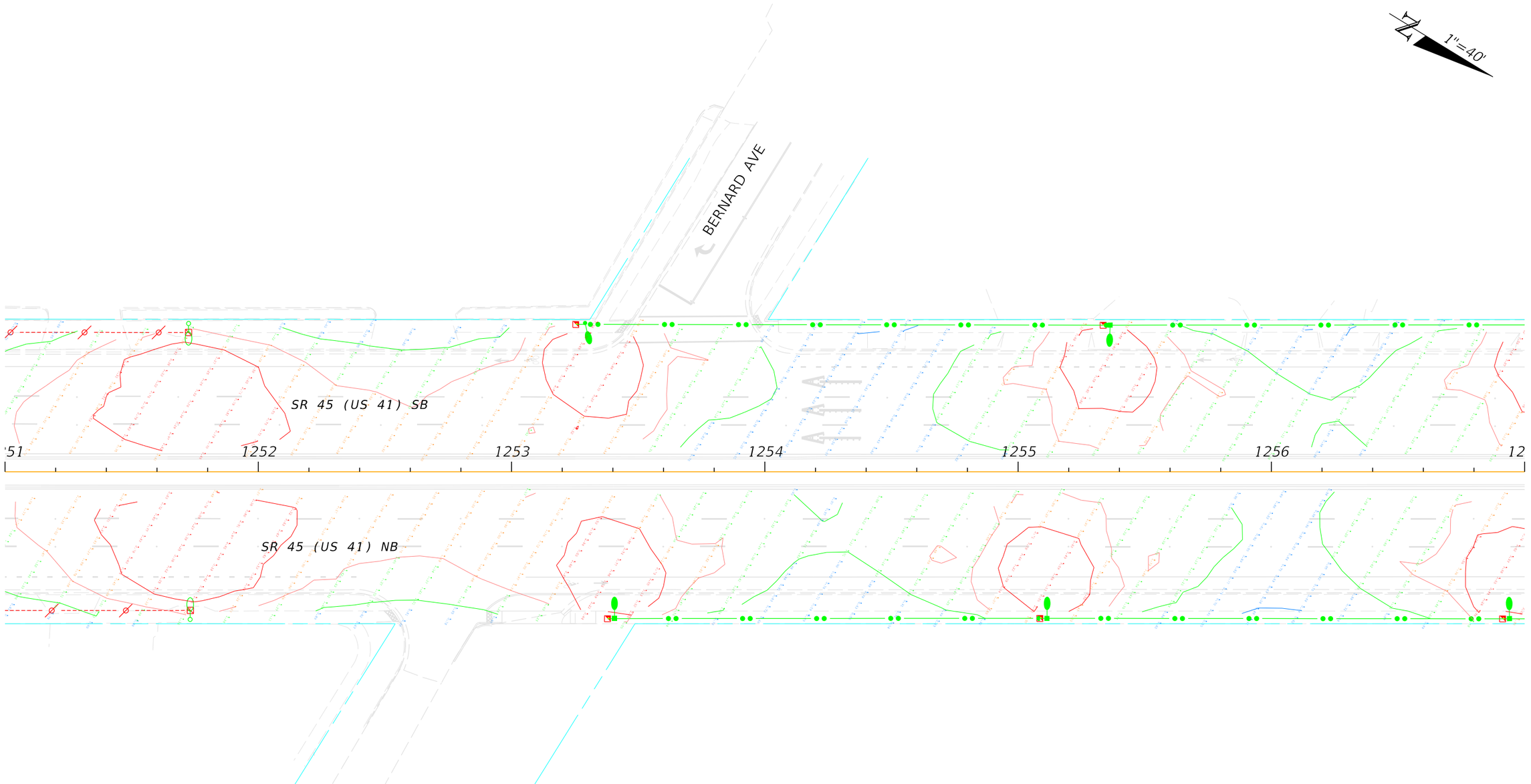

N

1"=40'

REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			LIGHTING PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	ISAMARIE L. MONREAL LICENSE NUMBER: 72029 FLORIDA DEPT. OF TRANSPORTATION 801 N. BROADWAY AVENUE BARTOW, FL 33830-3809	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		L-15
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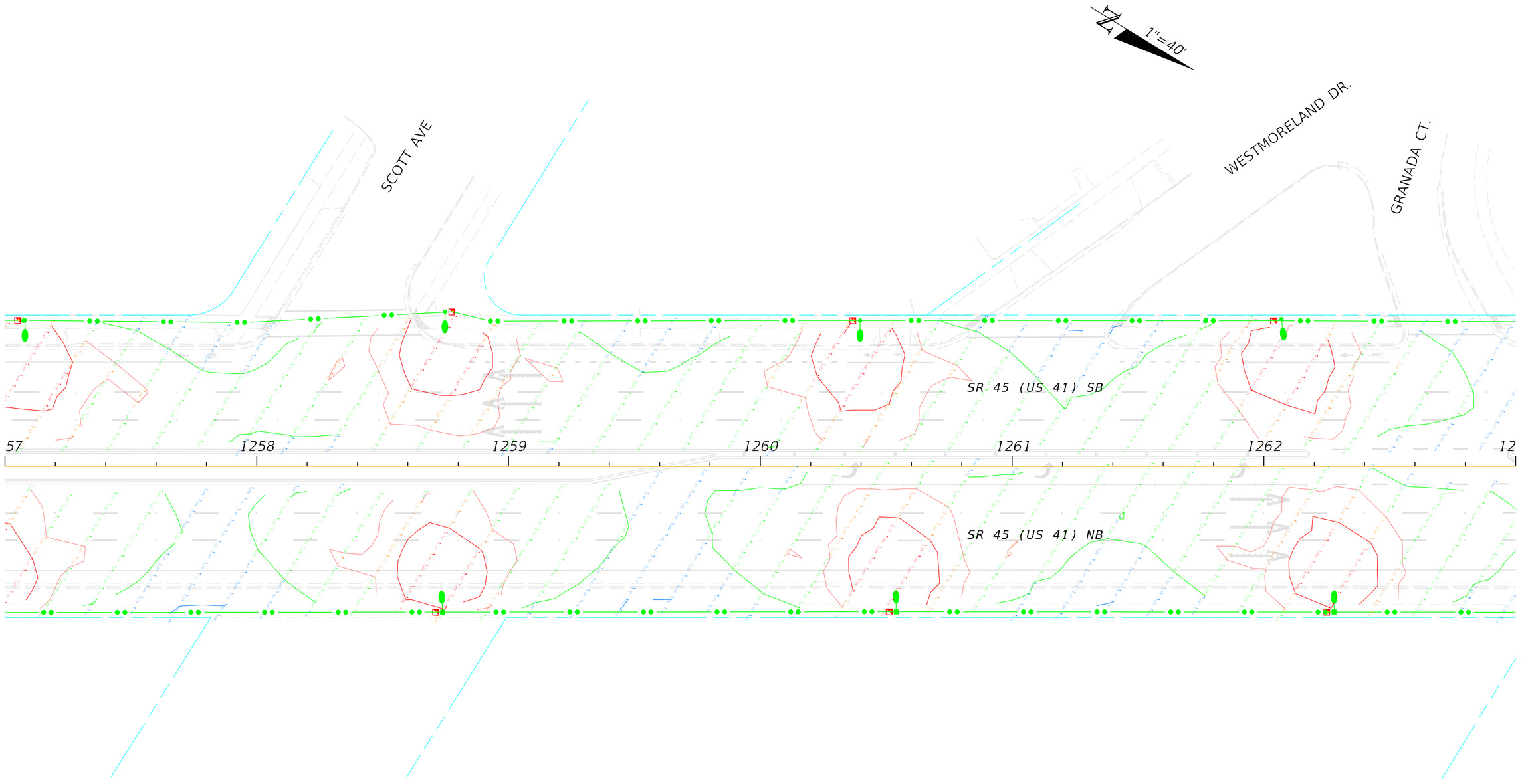

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD

ISAMARIE L. MONREAL
LICENSE NUMBER: 72029
FLORIDA DEPT. OF TRANSPORTATION
801 N. BROADWAY AVENUE
BARTOW, FL 33830-3809

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 45	MANATEE	444612-1-52-01

LIGHTING PLAN

SHEET NO.

L-16

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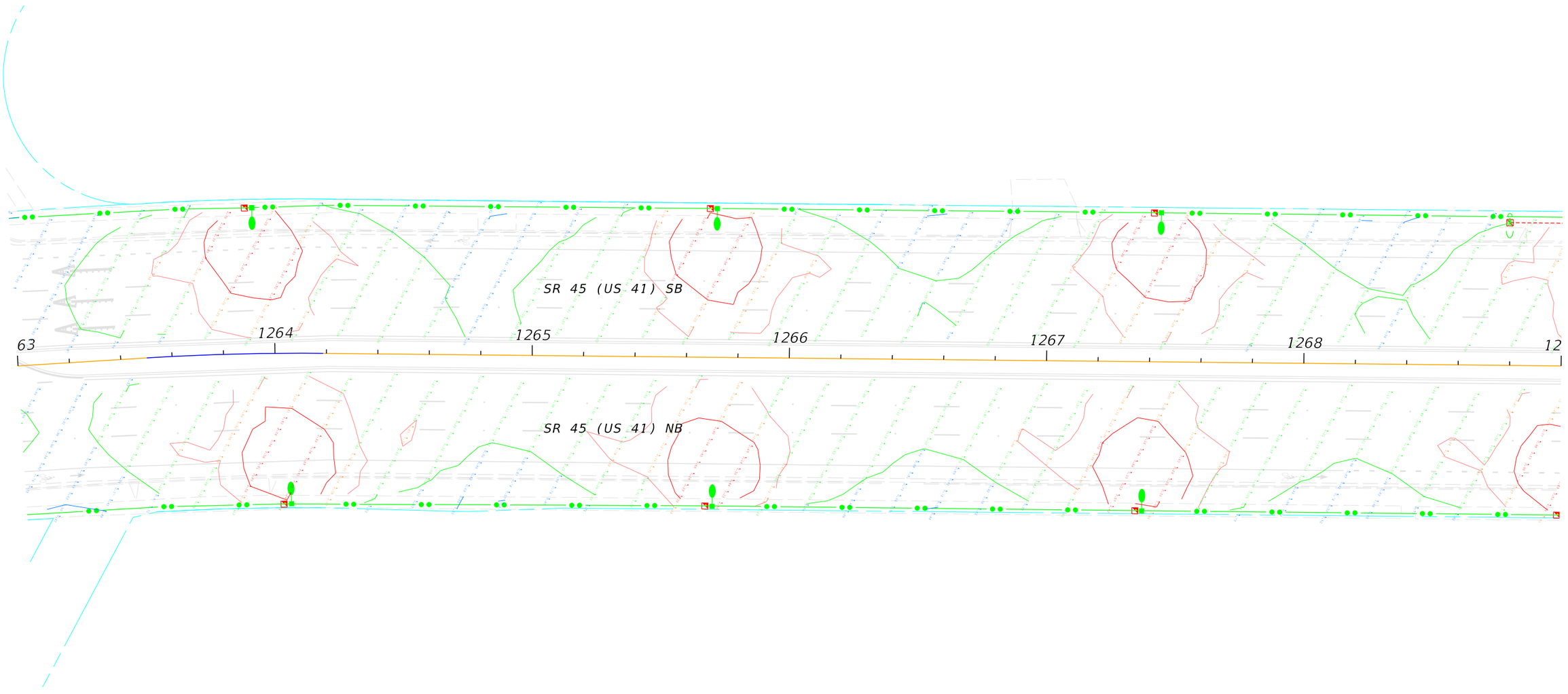

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD

ISAMARIE L. MONREAL
LICENSE NUMBER: 72029
FLORIDA DEPT. OF TRANSPORTATION
801 N. BROADWAY AVENUE
BARTOW, FL 33830-3809

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 45	MANATEE	444612-1-52-01

LIGHTING PLAN

SHEET NO.
L-17

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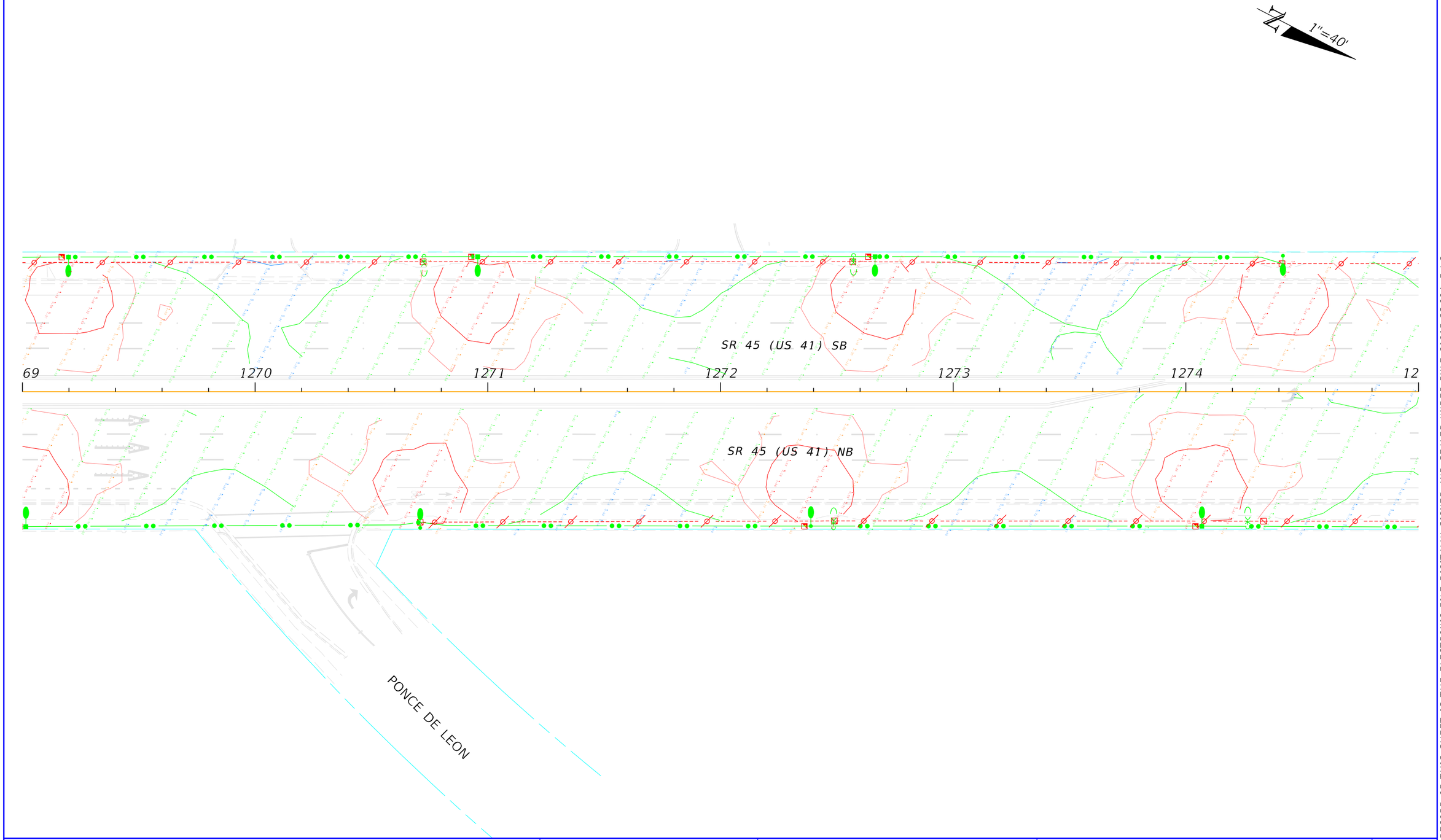


REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD

ISAMARIE L. MONREAL
LICENSE NUMBER: 72029
FLORIDA DEPT. OF TRANSPORTATION
801 N. BROADWAY AVENUE
BARTOW, FL 33830-3809

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

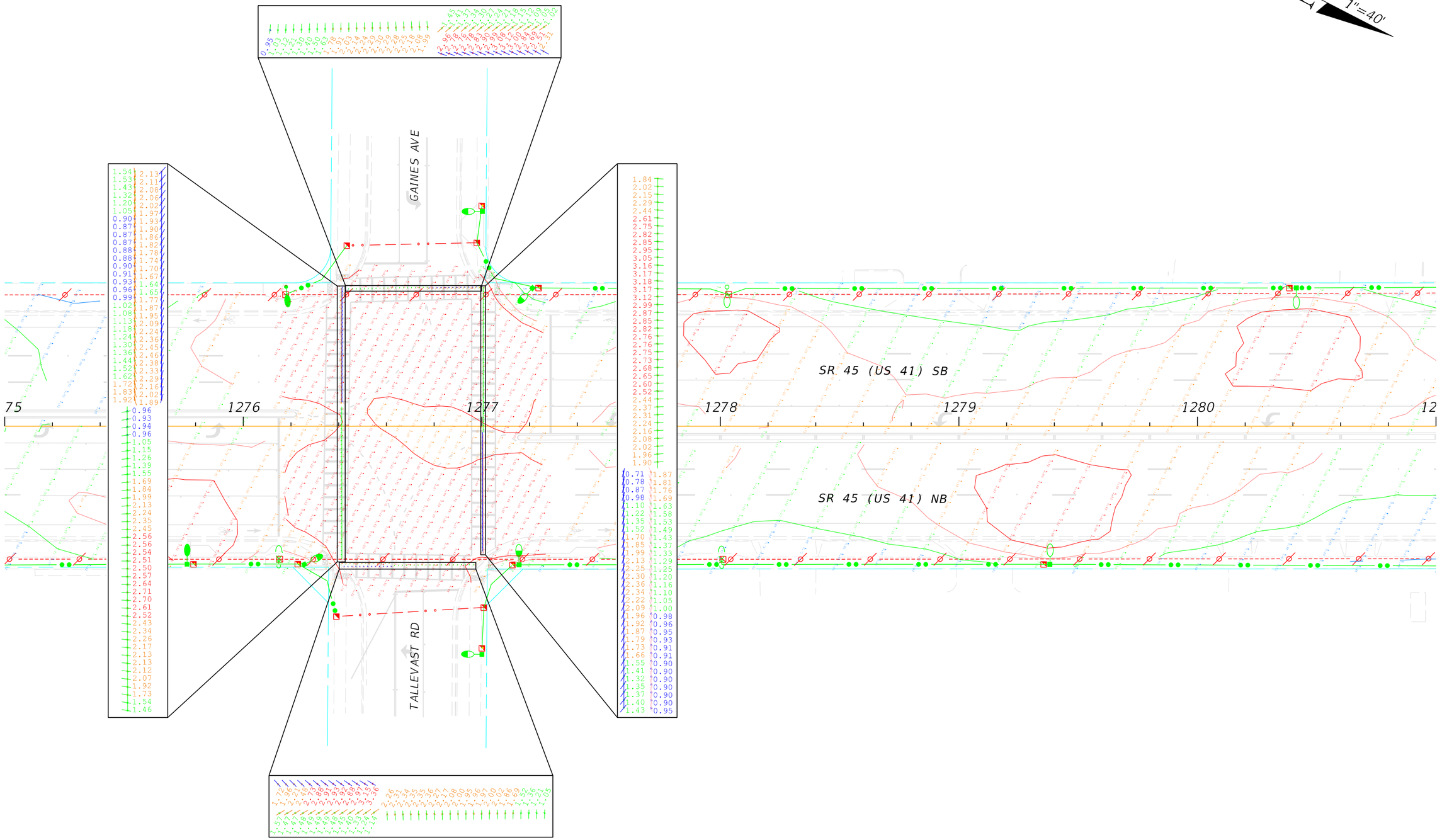
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 45	MANATEE	444612-1-52-01

LIGHTING PLAN

SHEET NO.

L-18

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.



REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			LIGHTING PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	ISAMARIE L. MONREAL LICENSE NUMBER: 72029 FLORIDA DEPT. OF TRANSPORTATION 801 N. BROADWAY AVENUE BARTOW, FL 33830-3809	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		L-19
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THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

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RD152SM 4/17/2024 3:58:59 PM

1"=40'

SR 45 (US 41) SB

SR 45 (US 41) NB

WHITFIELD AVE

WHITFIELD AVE

1281 1282 1283 1284 1285 1286 12

1.41 1.48 1.52 1.65 1.76 1.76 1.68 1.58 1.50 1.46 1.46 1.49 1.56 1.63 1.70

1.84 1.80 1.76 1.71 1.68 1.65 1.63 1.60 1.56 1.51 1.47 1.43 1.40 1.37 1.34 1.29 1.24 1.19 1.13 1.08 1.03 0.97 0.92 0.88 0.85 0.82 0.79 0.76 0.73 0.70 0.67 0.65 0.62 0.59

1.47 1.47 1.54 1.61 1.64 1.67 1.56 1.43 1.32 1.20 1.09 0.98 0.78

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REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			LIGHTING PLAN	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	ISAMARIE L. MONREAL LICENSE NUMBER: 72029 FLORIDA DEPT. OF TRANSPORTATION 801 N. BROADWAY AVENUE BARTOW, FL 33830-3809	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		L-20
					SR 45	MANATEE	444612-1-52-01		

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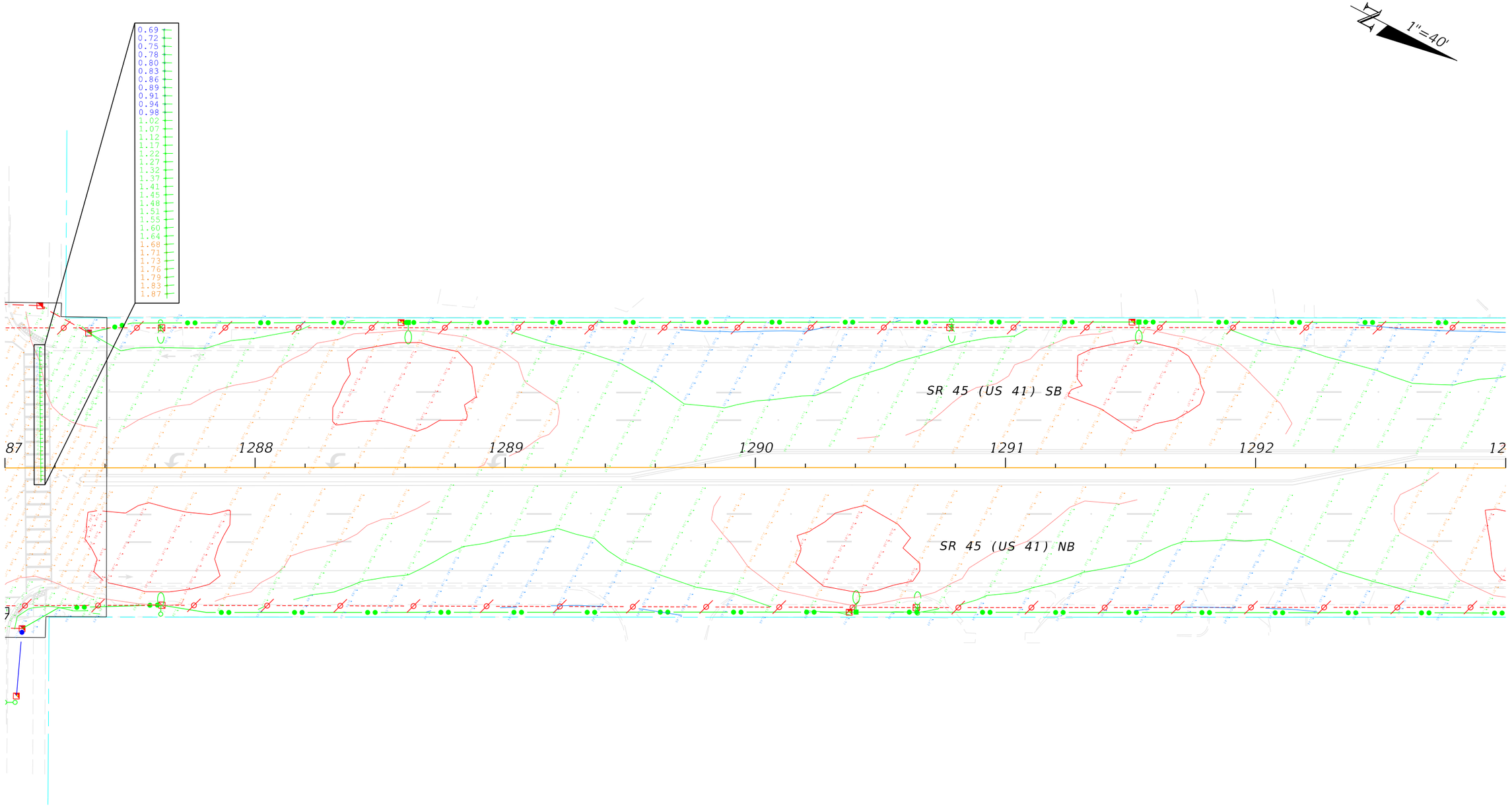

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD

ISAMARIE L. MONREAL
LICENSE NUMBER: 72029
FLORIDA DEPT. OF TRANSPORTATION
801 N. BROADWAY AVENUE
BARTOW, FL 33830-3809

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 45	MANATEE	444612-1-52-01

LIGHTING PLAN

SHEET NO.
L-21

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1"=40'

PEARL AVE

SR 45 (US 41) SB

SR 45 (US 41) NB

93 1294 1295 1296 1297 1298 12

PEARL AVE

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD

ISAMARIE L. MONREAL
LICENSE NUMBER: 72029
FLORIDA DEPT. OF TRANSPORTATION
801 N. BROADWAY AVENUE
BARTOW, FL 33830-3809

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 45	MANATEE	444612-1-52-01

LIGHTING PLAN

SHEET NO.

L-22

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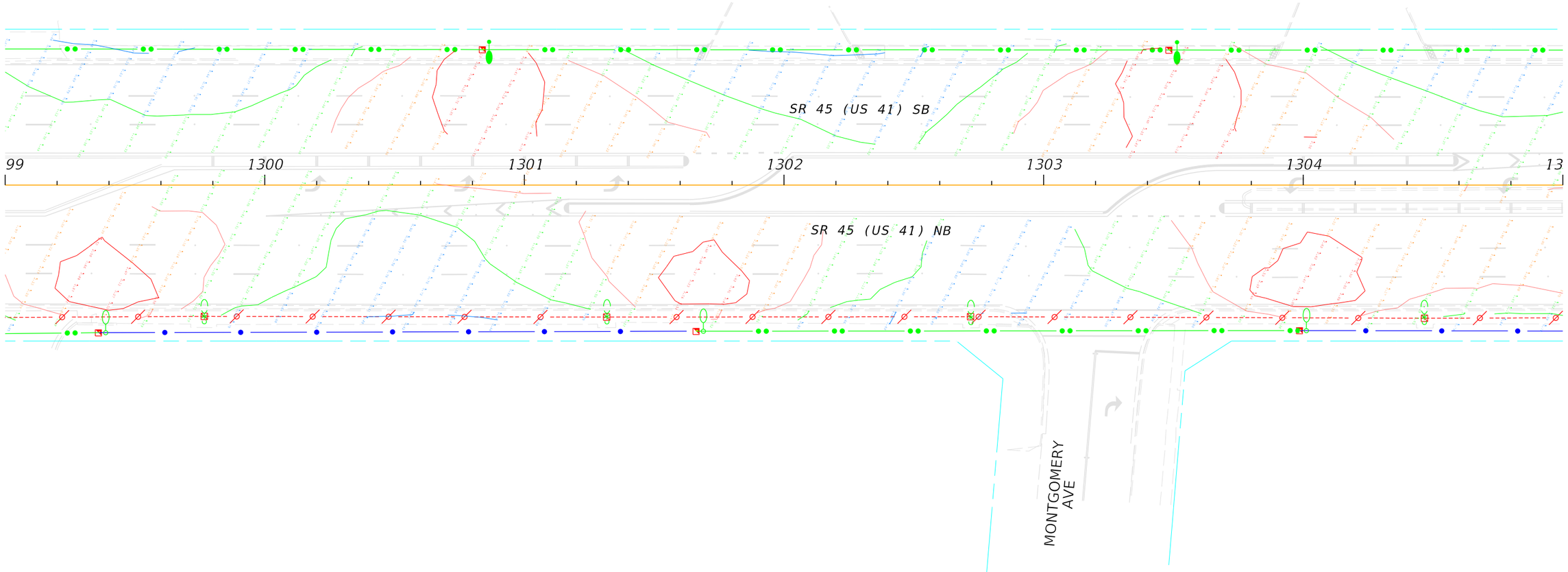

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD

ISAMARIE L. MONREAL
LICENSE NUMBER: 72029
FLORIDA DEPT. OF TRANSPORTATION
801 N. BROADWAY AVENUE
BARTOW, FL 33830-3809

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 45	MANATEE	444612-1-52-01

LIGHTING PLAN

SHEET NO.

L-23

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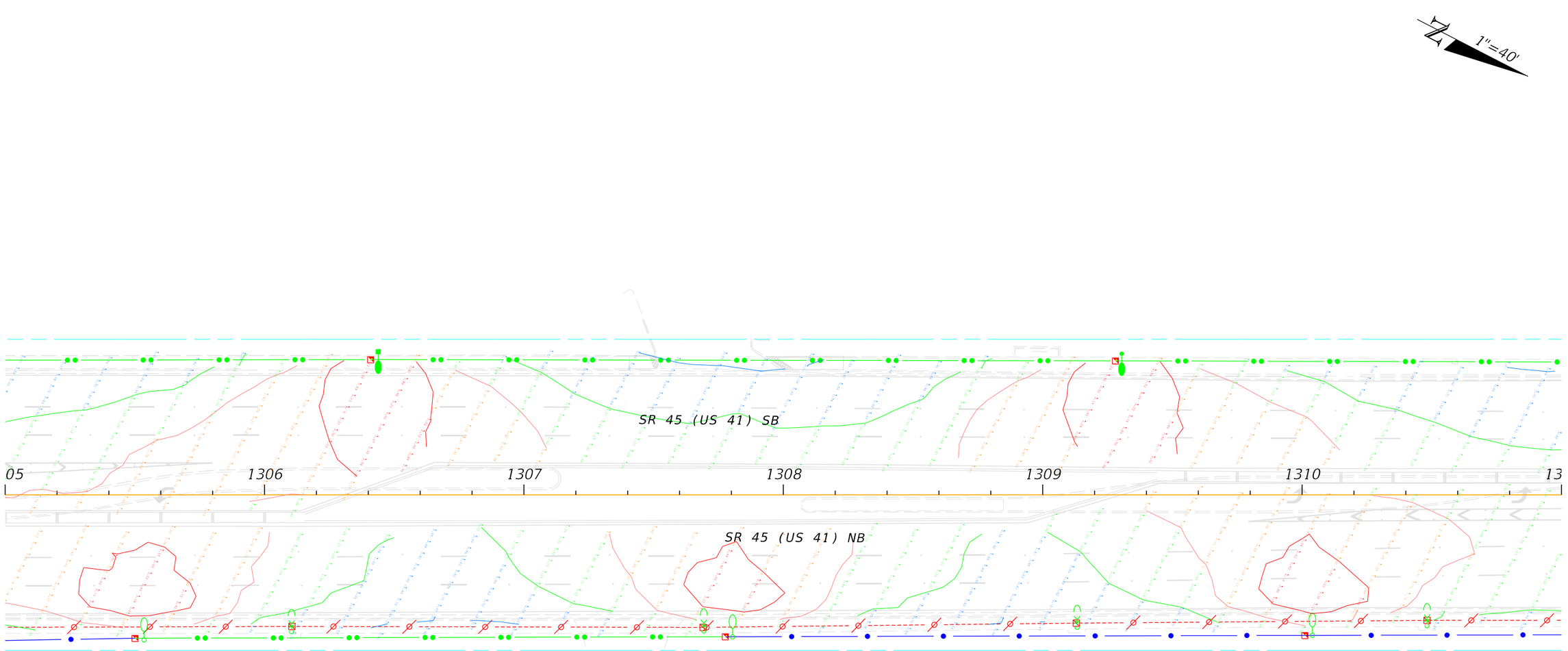

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD

ISAMARIE L. MONREAL
LICENSE NUMBER: 72029
FLORIDA DEPT. OF TRANSPORTATION
801 N. BROADWAY AVENUE
BARTOW, FL 33830-3809

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 45	MANATEE	444612-1-52-01

LIGHTING PLAN

SHEET NO.

L-24

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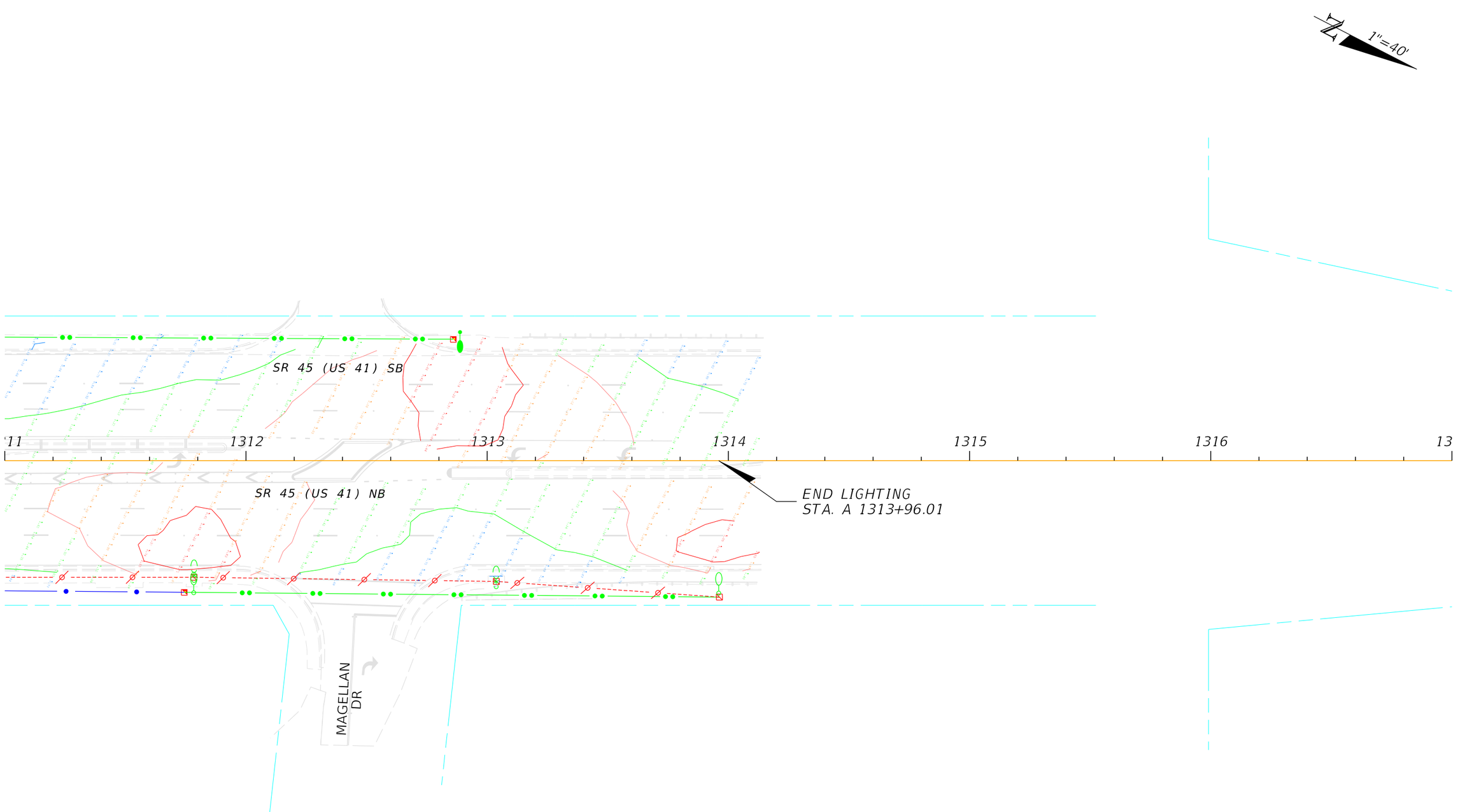

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD

ISAMARIE L. MONREAL
LICENSE NUMBER: 72029
FLORIDA DEPT. OF TRANSPORTATION
801 N. BROADWAY AVENUE
BARTOW, FL 33830-3809

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 45	MANATEE	444612-1-52-01

LIGHTING PLAN

SHEET NO.
L-25

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APPENDIX C: Voltage Drop Calculations

SINGLE PHASE CIRCUIT VOLTAGE DROP CALCULATIONS FOR LOAD CENTER
PROJECT NAME: US 41 EDWARDS DRIVE TO MAGELLAN DRIVE LIGHTING
PROJECT ID: 444612-1-52-01

1 + 3 V_{DROP}	3.49
1 + 2 + 4 V_{DROP}	5.87
1 + 2 + 5 V_{DROP}	5.46

$V_{working}$	480		OVERALL AMPS	4.49		V_{DROP}%	1.22	MAXIMUM V_{DROP}	5.87
SAFETY MARGIN	1		OVERALL KVA	2.16					
V Drop	5% MAX		OVERALL V_{DROP}%	1.24					

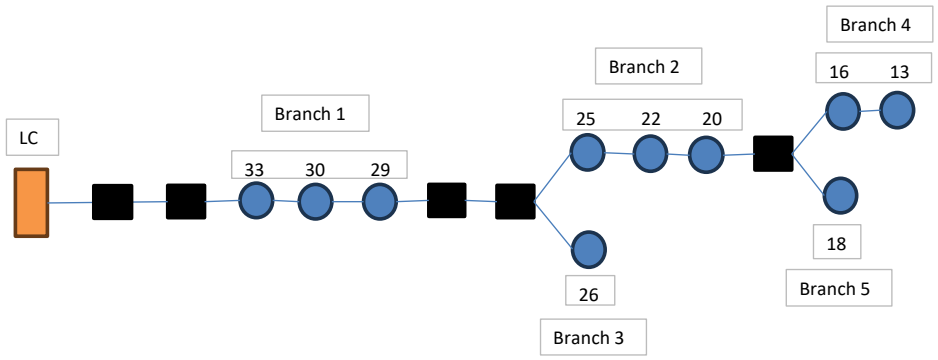
CKT #	FROM POLE #	TO POLE #		AMPS PER	Overall	INPUT WATTS	DISTANCE	CABLE	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 1	4.49					1 V_{DROP}	3.48
A-1	LC	Pull Box		0.00	4.49	0	16	6	0.02	0.07
A-1	Pull Box	Pull Box		0.00	4.49	0	120	6	0.12	0.55
A-1	Pull Box	33		0.50	4.49	242	29	6	0.03	0.13
A-1	33	30		0.50	3.99	242	296	6	0.30	1.20
A-1	30	29		0.50	3.48	242	274	6	0.28	0.97
A-1	29	Pull Box		0.00	2.98	0	105	6	0.11	0.32
A-1	Pull Box	Pull Box		0.00	2.98	0	74	6	0.08	0.22

CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 2	2.75					2 V_{DROP}	1.90
A-1	Pull Box	25		0.23	2.75	110	48	6	0.05	0.13
A-1	25	22		0.50	2.52	242	336	6	0.34	0.86
A-1	22	20		0.50	2.02	242	318	6	0.32	0.65
A-1	20	Pull Box		0.00	1.51	0	160	6	0.16	0.25

CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 3	0.23					3 V_{DROP}	0.01
A-1	Pull Box	26		0.23	0.23	110	40	6	0.04	0.01

CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 4	1.01					4 V_{DROP}	0.49
A-1	Pull Box	16		0.50	1.01	242	320	6	0.33	0.33
A-1	16	13		0.50	0.50	242	316	6	0.32	0.16

CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 5	0.50					5 V_{DROP}	0.08
A-1	Pull Box	18		0.50	0.50	242	160	6	0.16	0.08



SINGLE PHASE CIRCUIT VOLTAGE DROP CALCULATIONS FOR LOAD CENTER
PROJECT NAME: US 41 EDWARDS DRIVE TO MAGELLAN DRIVE LIGHTING
PROJECT ID: 444612-1-52-01

1 + 3 V_{DROP}	4.85
1 + 2 + 4 V_{DROP}	21.58
1 + 2 + 5 V_{DROP}	21.16

$V_{working}$	480		OVERALL AMPS	10.68		V_{DROP}%	4.50	MAXIMUM V_{DROP}	21.58
SAFETY MARGIN	1		OVERALL KVA	5.13					
V Drop	5% MAX		OVERALL V_{DROP}%	4.52					

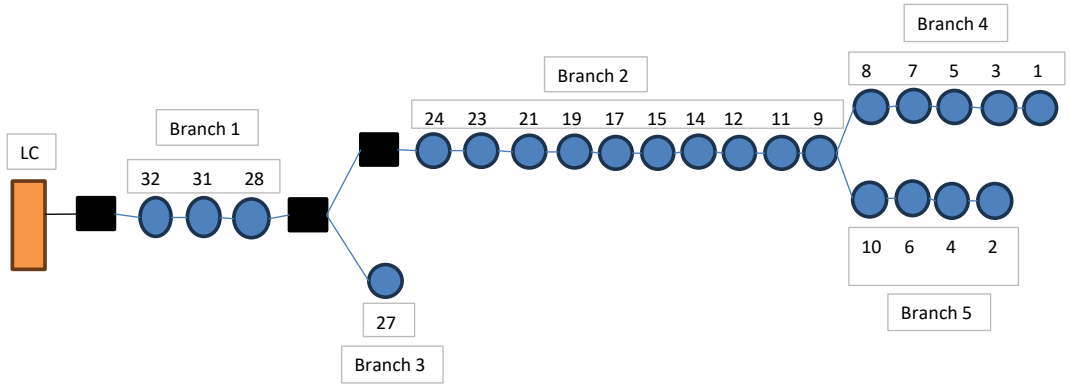
CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 1	10.68					1 V_{DROP}	4.84
A-2	LC	Pull Box		0.00	10.68	0	16	4	0.01	0.11
A-2	Pull Box	32		0.50	10.68	242	33	4	0.02	0.23
A-2	32	31		0.50	10.17	242	288	4	0.18	1.88
A-2	31	28		0.50	9.67	242	284	4	0.18	1.76
A-2	28	Pull Box		0.00	9.16	0	146	4	0.09	0.86

CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 2	8.94					2 V_{DROP}	15.03
A-2	Pull Box	Pull Box		0.00	8.94	0	65	6	0.07	0.59
A-2	Pull Box	24		0.25	8.94	121	74	6	0.08	0.67
A-2	24	23		0.50	8.68	242	124	6	0.13	1.10
A-2	23	21		0.50	8.18	242	289	6	0.29	2.41
A-2	21	19		0.50	7.68	242	315	6	0.32	2.47
A-2	19	17		0.50	7.17	242	329	6	0.34	2.41
A-2	17	15		0.46	6.67	223	198	6	0.20	1.35
A-2	15	14		0.50	6.20	242	178	6	0.18	1.13
A-2	14	12		0.46	5.70	223	189	6	0.19	1.10
A-2	12	11		0.46	5.23	223	155	6	0.16	0.83
A-2	11	9		0.50	4.77	242	203	6	0.21	0.99

CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 3	0.23					3 V_{DROP}	0.01
A-2	Pull Box	27		0.23	0.23	110	47	6	0.05	0.01

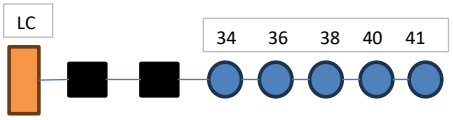
CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 4	2.48					4 V_{DROP}	1.71
A-2	9	8		0.46	2.48	223	199	6	0.20	0.50
A-2	8	7		0.50	2.02	242	185	6	0.19	0.38
A-2	7	5		0.50	1.51	242	250	6	0.26	0.39
A-2	5	3		0.50	1.01	242	294	6	0.30	0.30
A-2	3	1		0.50	0.50	242	271	6	0.28	0.14

CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 5	1.78					5 V_{DROP}	1.29
A-2	9	10		0.50	1.78	242	138	6	0.14	0.25
A-2	10	6		0.27	1.28	130	435	6	0.44	0.57
A-2	6	4		0.50	1.01	242	343	6	0.35	0.35
A-2	4	2		0.50	0.50	242	233	6	0.24	0.12



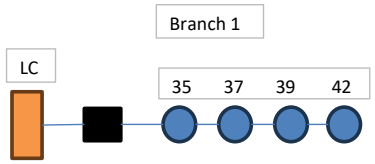
SINGLE PHASE CIRCUIT VOLTAGE DROP CALCULATIONS FOR LOAD CENTER									
PROJECT NAME: US 41 EDWARDS DRIVE TO MAGELLAN DRIVE LIGHTING PROJECT ID: 444612-1-52-01									
$V_{working}$	480		OVERALL AMPS	2.52		V_{DROP}%	0.46	MAXIMUM V_{DROP}	2.22
SAFETY MARGIN	1		OVERALL KVA	1.21					
V Drop	5% MAX		OVERALL V_{DROP}%	0.48					

CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 1	2.52					1 V_{DROP}	2.22
A-3	LC	Pull Box		0.00	2.52	0	16	6	0.02	0.04
A-3	Pull Box	Pull Box		0.00	2.52	0	120	6	0.12	0.31
A-3	Pull Box	34		0.50	2.52	242	244	6	0.25	0.63
A-3	34	36		0.50	2.02	242	245	6	0.25	0.50
A-3	36	38		0.50	1.51	242	221	6	0.23	0.34
A-3	38	40		0.50	1.01	242	235	6	0.24	0.24
A-3	40	41		0.50	0.50	242	295	6	0.30	0.15



SINGLE PHASE CIRCUIT VOLTAGE DROP CALCULATIONS FOR LOAD CENTER									
PROJECT NAME: US 41 EDWARDS DRIVE TO MAGELLAN DRIVE LIGHTING PROJECT ID: 444612-1-52-01									
$V_{working}$	480		OVERALL AMPS	2.02		V_{DROP}%	0.35	MAXIMUM V_{DROP}	1.69
SAFETY MARGIN	1		OVERALL KVA	0.97					
V Drop	5% MAX		OVERALL V_{DROP}%	0.37					

CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 1	2.02					1 V_{DROP}	1.69
A-4	LC	Pull Box		0.00	2.02	0	16	6	0.02	0.03
A-4	Pull Box	35		0.50	2.02	242	352	6	0.36	0.72
A-4	35	37		0.50	1.51	242	315	6	0.32	0.49
A-4	37	39		0.50	1.01	242	285	6	0.29	0.29
A-4	39	42		0.50	0.50	242	300	6	0.31	0.15



SINGLE PHASE CIRCUIT VOLTAGE DROP CALCULATIONS FOR LOAD CENTER
PROJECT NAME: US 41 EDWARDS DRIVE TO MAGELLAN DRIVE LIGHTING
PROJECT ID: 444612-1-52-01

1 + 3 V_{DROP}	2.81
1 + 2 + 5 VDROP	10.09
1 + 2 + 4 + 6 V_{DROP}	21.23
1 + 2 + 4 + 7 V_{DROP}	16.00

$V_{working}$	480		OVERALL AMPS	8.58		V_{DROP}%	4.42	MAXIMUM V_{DROP}	21.23
SAFETY MARGIN	1		OVERALL KVA	4.12					
V Drop	5% MAX		OVERALL V_{DROP}%	4.44					

CKT #	FROM POLE #	TO POLE #		AMPS PER	Overall	INPUT WATTS	DISTANCE	CABLE	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 1	8.58					1 V_{DROP}	2.78
B-1	LC	Pull Box		0.00	8.58	0	11	6	0.01	0.10
B-1	Pull Box	93		0.27	8.58	130	163	6	0.17	1.43
B-1	93	Pull Box		0.00	8.31	0	48	6	0.05	0.41
B-1	Pull Box	Pull Box		0.00	8.31	0	34	6	0.03	0.29
B-1	Pull Box	Pull Box		0.00	8.31	0	67	6	0.07	0.57

CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 2	8.08					2 V_{DROP}	7.30
B-1	Pull Box	Pull Box		0.00	8.08	0	68	6	0.07	0.56
B-1	Pull Box	90		0.50	8.08	242	73	6	0.07	0.60
B-1	90	88		0.50	7.57	242	280	6	0.29	2.16
B-1	88	86		0.50	7.07	242	316	6	0.32	2.28
B-1	86	Pull Box		0.00	6.56	0	141	6	0.14	0.94
B-1	Pull Box	Pull Box		0.00	6.56	0	38	6	0.04	0.25
B-1	Pull Box	Pull Box		0.00	6.56	0	74	6	0.08	0.50

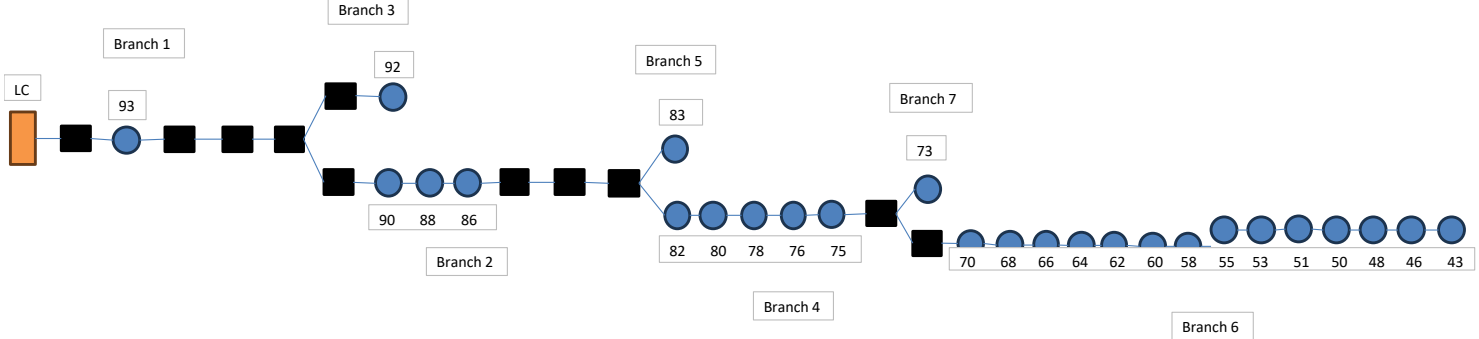
CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 3	0.23					3 V_{DROP}	0.02
B-1	Pull Box	Pull Box		0.00	0.23	0	40	6	0.04	0.01
B-1	Pull Box	92		0.23	0.23	110	58	6	0.06	0.01

CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 4	6.31					4 V_{DROP}	5.91
B-1	Pull Box	82		0.50	6.31	242	79	6	0.08	0.51
B-1	82	80		0.50	5.81	242	295	6	0.30	1.75
B-1	80	78		0.50	5.30	242	316	6	0.32	1.71
B-1	78	76		0.50	4.80	242	260	6	0.27	1.27
B-1	76	75		0.25	4.30	121	104	6	0.11	0.46
B-1	75	Pull Box		0.00	4.04	0	52	6	0.05	0.21

CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 5	0.25					5 V_{DROP}	0.01
B-1	Pull Box	83		0.25	0.25	121	42	6	0.04	0.01

CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 6	3.79					6 V_{DROP}	5.24
B-1	0	Pull Box		0.00	3.79	0	71	6	0.07	0.27
B-1	#REF!	70		0.27	3.79	130	58	6	0.06	0.22
B-1	70	68		0.27	3.52	130	201	6	0.21	0.72
B-1	68	66		0.27	3.25	130	202	6	0.21	0.67
B-1	66	64		0.27	2.98	130	195	6	0.20	0.59
B-1	64	62		0.27	2.71	130	200	6	0.20	0.55
B-1	62	60		0.27	2.44	130	200	6	0.20	0.50
B-1	60	58		0.27	2.17	130	197	6	0.20	0.44
B-1	58	55		0.27	1.90	130	205	6	0.21	0.40
B-1	55	53		0.27	1.63	130	212	6	0.22	0.35
B-1	53	51		0.27	1.35	130	191	6	0.19	0.26
B-1	51	50		0.27	1.08	130	184	6	0.19	0.20
B-1	50	48		0.27	0.81	130	197	6	0.20	0.16
B-1	48	46		0.27	0.54	130	195	6	0.20	0.11
B-1	46	43		0.27	0.27	130	231	6	0.24	0.06

CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 7	0.25					7 V_{DROP}	0.01
B-1	#REF!	73		0.25	0.25	121	40	6	0.04	0.01



SINGLE PHASE CIRCUIT VOLTAGE DROP CALCULATIONS FOR LOAD CENTER
PROJECT NAME: US 41 EDWARDS DRIVE TO MAGELLAN DRIVE LIGHTING
PROJECT ID: 444612-1-52-01

1 + 3 V_{DROP}	10.24
1 + 2 + 4 VDROP	22.06
1 + 2 + 5 V_{DROP}	16.38

$V_{working}$	480		OVERALL AMPS	7.80		V_{DROP}%	4.60	MAXIMUM V_{DROP}	22.06
SAFETY MARGIN	1		OVERALL KVA	3.75					
V Drop	5% MAX		OVERALL V_{DROP}%	4.61					

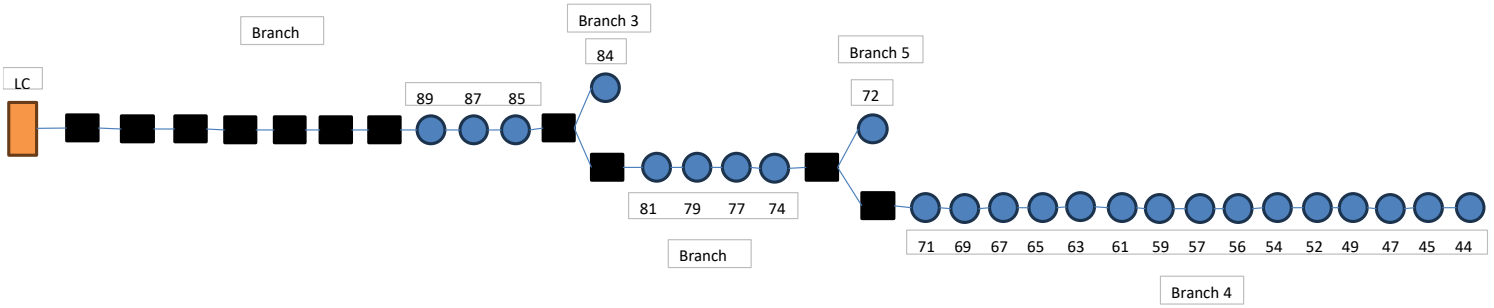
CKT #	FROM POLE #	TO POLE #		AMPS PER	Overall	INPUT WATTS	DISTANCE	CABLE	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 1	7.80					1 V_{DROP}	10.23
B-2	LC	Pull Box		0.00	7.80	0	11	6	0.01	0.09
B-2	Pull Box	Pull Box		0.00	7.80	0	163	6	0.17	1.30
B-2	Pull Box	Pull Box		0.00	7.80	0	48	6	0.05	0.38
B-2	Pull Box	Pull Box		0.00	7.80	0	34	6	0.03	0.27
B-2	Pull Box	Pull Box		0.00	7.80	0	67	6	0.07	0.53
B-2	Pull Box	Pull Box		0.00	7.80	0	68	6	0.07	0.54
B-2	Pull Box	Pull Box		0.00	7.80	0	122	6	0.12	0.97
B-2	Pull Box	89		0.50	7.80	242	166	6	0.17	1.32
B-2	89	87		0.50	7.30	242	306	6	0.31	2.28
B-2	87	85		0.50	6.79	242	299	6	0.30	2.07
B-2	85	Pull Box		0.00	6.29	0	74	6	0.08	0.47

CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 2	6.04					2 V_{DROP}	6.14
B-2	Pull Box	Pull Box		0.00	6.04	0	65	6	0.07	0.40
B-2	Pull Box	81		0.50	6.04	242	192	6	0.20	1.18
B-2	81	79		0.50	5.53	242	305	6	0.31	1.72
B-2	79	77		0.50	5.03	242	298	6	0.30	1.53
B-2	77	74		0.23	4.53	110	247	6	0.25	1.14
B-2	74	Pull Box		0.00	4.30	0	38	6	0.04	0.17

CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 3	0.25					3 V_{DROP}	0.01
B-2	Pull Box	84		0.25	0.25	121	51	6	0.05	0.01

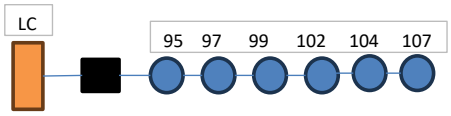
CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 4	4.04					4 V_{DROP}	5.69
B-2	Pull Box	Pull Box		0.00	4.04	0	78	6	0.08	0.32
B-2	Pull Box	71		0.25	4.04	121	54	6	0.06	0.22
B-2	71	69		0.27	3.79	130	68	6	0.07	0.26
B-2	69	67		0.27	3.52	130	199	6	0.20	0.71
B-2	67	65		0.27	3.25	130	192	6	0.20	0.64
B-2	65	63		0.27	2.98	130	189	6	0.19	0.57
B-2	63	61		0.27	2.71	130	196	6	0.20	0.54
B-2	61	59		0.27	2.44	130	188	6	0.19	0.47
B-2	59	57		0.27	2.17	130	191	6	0.19	0.42
B-2	57	56		0.27	1.90	130	188	6	0.19	0.36
B-2	56	54		0.27	1.63	130	199	6	0.20	0.33
B-2	54	52		0.27	1.35	130	198	6	0.20	0.27
B-2	52	49		0.27	1.08	130	204	6	0.21	0.23
B-2	49	47		0.27	0.81	130	204	6	0.21	0.17
B-2	47	45		0.27	0.54	130	207	6	0.21	0.11
B-2	45	44		0.27	0.27	130	195	6	0.20	0.05

CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 5	0.25					5 V_{DROP}	0.01
B-2	Pull Box	72		0.25	0.25	121	41	6	0.04	0.01



SINGLE PHASE CIRCUIT VOLTAGE DROP CALCULATIONS FOR LOAD CENTER									
PROJECT NAME: US 41 EDWARDS DRIVE TO MAGELLAN DRIVE LIGHTING PROJECT ID: 444612-1-52-01									
$V_{working}$	480		OVERALL AMPS	1.63		V_{DROP}%	0.30	MAXIMUM V_{DROP}	1.44
SAFETY MARGIN	1		OVERALL KVA	0.78					
V Drop	5% MAX		OVERALL V_{DROP}%	0.32					

CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 1	1.63					1 V_{DROP}	1.44
B-3	Load Center	Pull Box		0.00	1.63	0	11	6	0.01	0.02
B-3	Pull Box	95		0.27	1.63	130	107	6	0.11	0.18
B-3	95	97		0.27	1.35	130	282	6	0.29	0.39
B-3	97	99		0.27	1.08	130	288	6	0.29	0.32
B-3	99	102		0.27	0.81	130	317	6	0.32	0.26
B-3	102	104		0.27	0.54	130	311	6	0.32	0.17
B-3	104	107		0.27	0.27	130	382	6	0.39	0.11

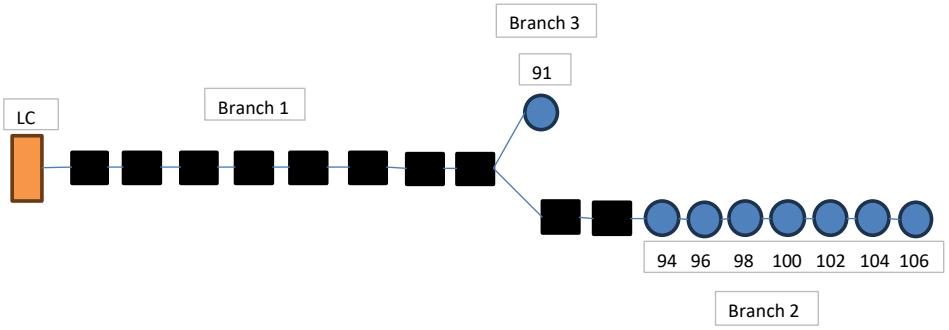


SINGLE PHASE CIRCUIT VOLTAGE DROP CALCULATIONS FOR LOAD CENTER										
PROJECT NAME: US 41 EDWARDS DRIVE TO MAGELLAN DRIVE LIGHTING										
PROJECT ID: 444612-1-52-01										
									1 + 2 V_{DROP}	8.44
									1 + 3 V_{DROP}	2.85
$V_{working}$	480		OVERALL AMPS	4.79		V_{DROP}%	1.76	MAXIMUM V_{DROP}		8.44
SAFETY MARGIN	1		OVERALL KVA	2.30						
V Drop	5% MAX		OVERALL V_{DROP}%	1.77						

CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 1	4.79					1 V_{DROP}	2.83
B-4	Load Center	Pull Box		0.00	4.79	0	11	6	0.01	0.05
B-4	Pull Box	Pull Box		0.00	4.79	0	163	6	0.17	0.80
B-4	Pull Box	Pull Box		0.00	4.79	0	48	6	0.05	0.23
B-4	Pull Box	Pull Box		0.00	4.79	0	34	6	0.03	0.17
B-4	Pull Box	Pull Box		0.00	4.79	0	67	6	0.07	0.33
B-4	Pull Box	Pull Box		0.00	4.79	0	68	6	0.07	0.33
B-4	Pull Box	Pull Box		0.00	4.79	0	122	6	0.12	0.60
B-4	Pull Box	Pull Box		0.00	4.79	0	66	6	0.07	0.32

CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 2	4.54					2 V_{DROP}	5.61
B-4	Pull Box	Pull Box		0.00	4.54	0	66	6	0.07	0.31
B-4	Pull Box	Pull Box		0.00	4.54	0	49	6	0.05	0.23
B-4	Pull Box	94		0.50	4.54	242	144	6	0.15	0.67
B-4	94	96		0.50	4.03	242	249	6	0.25	1.02
B-4	96	98		0.50	3.53	242	254	6	0.26	0.91
B-4	98	100		0.50	3.03	242	256	6	0.26	0.79
B-4	100	101		0.50	2.52	242	175	6	0.18	0.45
B-4	101	103		0.50	2.02	242	252	6	0.26	0.52
B-4	103	105		0.50	1.51	242	247	6	0.25	0.38
B-4	105	106		0.50	1.01	242	198	6	0.20	0.20
B-4	106	108		0.50	0.50	242	246	6	0.25	0.13

CKT #	FROM POLE #	TO POLE #		AMPS PER LUMINAIRE	Overall AMPS	INPUT WATTS	DISTANCE (FT)	CABLE (AWG)	Resistance (Ω)	V_{DROP}
			Total Amp for Branch 3	0.25					3 V_{DROP}	0.02
B-4	Pull Box	91		0.25	0.25	121	71	6	0.07	0.02



APPENDIX D: Coordination E-mails

Benjamin Rodgers

From: Neil Byrne <neil.byrne@mymanatee.org>
Sent: Wednesday, October 7, 2020 7:41 AM
To: Bush, Shannon; Aaron Burkett
Subject: RE: 444612-1: US 41 from Edwards to Magellan- Lighting
Attachments: ERLH_11E340____-ELSHS-ERL1-BLCK.IES; TRAFFIC ENGINEERING MANUAL_190909 - Roadway Lighting Standards.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Shannon,

Attached is an IES file for the GE Evolve that was used on a County project (98 Watt with a house side shield) You can see this one in the field, this is the same one that is used on Rangeland Parkway just east of Post Rd. Note that the ones on Post Road are the same but 82 Watts.

The County's Street Lighting Standard Design Values is attached. For intersections all lighting plans are to be prepared per FDOT Design Manual Chapter 231.
Thank you,

Neil Byrne, P.E.
Project Engineer II
Traffic Engineering Division
Manatee County Public Works
2101 47th Terrace E,
Bradenton, Florida 34203

Office: (941) 749-3500, Ext. 7859
Cell: (941) 363-1352

www.mymanatee.org

From: Bush, Shannon <Shannon.Bush@dot.state.fl.us>
Sent: Monday, October 5, 2020 10:48 AM
To: Neil Byrne <neil.byrne@mymanatee.org>; Aaron Burkett <aaron.burkett@mymanatee.org>
Cc: Chad Butzow <chad.butzow@mymanatee.org>; publicworks <publicworks@mymanatee.org>
Subject: RE: 444612-1: US 41 from Edwards to Magellan- Lighting

Thanks Neil.

Tentatively our group is planning to come to the field toward the end of this month. I was just informed that the schedule for this project has been pushed in significantly (2 fiscal years), hence the urgency in the request. Currently the schedule to start my design for both Signals and Lighting in our new Open Roads designer this November. If there is any way that we can get the information by mid next week, Wednesday Oct. 14th, I would greatly appreciate it. That would give my PM, trainer and I enough time to review then get back with you all if there is anything else we would need.

Thank you,
Shannon Bush
Traffic Designer II- Bartow Design Office
Phone: 863-519-2658
Email: Shannon.Bush@dot.state.fl.us
Mail Station 1-20
My working hours are Monday – Friday 7:00 am to 3:30 pm.

Mission Statement: The In-House Roadway Design Team Professionally Creates Constructible Plans to Provide Transportation Solutions that Improve Safety and Mobility for All Users.

From: Neil Byrne <neil.byrne@mymanatee.org>
Sent: Monday, October 5, 2020 9:00 AM
To: Bush, Shannon <Shannon.Bush@dot.state.fl.us>; Aaron Burkett <aaron.burkett@mymanatee.org>
Cc: Chad Butzow <chad.butzow@mymanatee.org>; publicworks <publicworks@mymanatee.org>
Subject: RE: 444612-1: US 41 from Edwards to Magellan- Lighting

Shannan,

We are working on your request. However, there are other staff I have to coordinate and sometimes that takes a little time based on their schedule and responsibilities. I will follow up when completed.

Thank you,

Neil Byrne, P.E.
Project Engineer II
Traffic Engineering Division
Manatee County Public Works
2101 47th Terrace E,
Bradenton, Florida 34203

Office: (941) 749-3500, Ext. 7859
Cell: (941) 363-1352

www.mymanatee.org

From: Bush, Shannon <Shannon.Bush@dot.state.fl.us>
Sent: Monday, October 5, 2020 7:41 AM
To: Aaron Burkett <aaron.burkett@mymanatee.org>
Cc: Neil Byrne <neil.byrne@mymanatee.org>; Chad Butzow <chad.butzow@mymanatee.org>; publicworks <publicworks@mymanatee.org>
Subject: RE: 444612-1: US 41 from Edwards to Magellan- Lighting
Importance: High

Good Morning Neil,

I reached out early Thursday morning to get more information regarding the luminaries that Manatee has been using in their area and also keep in stock. I received a read receipt confirming the email had been delivered and read but no response.

Please read through the below email chain. We would like to be prepared for design with the correct IES file and additional lighting information that you can provide to us. Also, how do you all pay the power company for signal and lighting usage? Are there separate meters for lighting and signals or is it a flat rate for signals? So that we know how many power service (service pole with meter can) to design for this project and accordingly we can coordinate with the power company. My group is planning on a field review in the coming weeks as we start design very soon.

If you should have any questions, please be sure to let me know by phone or email.

Thank you,
Shannon Bush
Traffic Designer II- Bartow Design Office
Phone: 863-519-2658
Email: Shannon.Bush@dot.state.fl.us
Mail Station 1-20
My working hours are Monday – Friday 7:00 am to 3:30 pm.

Mission Statement: The In-House Roadway Design Team Professionally Creates Constructible Plans to Provide Transportation Solutions that Improve Safety and Mobility for All Users.

From: Bush, Shannon
Sent: Thursday, October 1, 2020 7:04 AM
To: Aaron Burkett <aaron.burkett@mymanatee.org>
Cc: Neil Byrne <neil.byrne@mymanatee.org>
Subject: RE: 444612-1: US 41 from Edwards to Magellan- Lighting
Importance: High

Thank you Aaron for that information! Neil- do you happen to have an IES file for what you all normally use? This was I can start looking to use the correct fixture with it's wattage, etc. to match what Manatee is currently using.

Thank you,

Shannon Bush
Traffic Designer II- Bartow Design Office
Phone: 863-519-2658
Email: Shannon.Bush@dot.state.fl.us
Mail Station 1-20
My working hours are Monday – Friday 7:00 am to 3:30 pm.

Mission Statement: The In-House Roadway Design Team Professionally Creates Constructible Plans to Provide Transportation Solutions that Improve Safety and Mobility for All Users.

From: Aaron Burkett <aaron.burkett@mymanatee.org>
Sent: Wednesday, September 30, 2020 2:54 PM
To: Bush, Shannon <Shannon.Bush@dot.state.fl.us>
Cc: Neil Byrne <neil.byrne@mymanatee.org>
Subject: RE: 444612-1: US 41 from Edwards to Magellan- Lighting

Shannon,
I can refer you to our engineering staff. They oversee review of these types of projects. I do provide them with input from time to time depending on the scope of the project. For roadway lighting projects I typically work closely with Neil Byrne to review plans and offer input.
I can tell you that recent lighting projects in Manatee County have been using GE ERL fixture.

Aaron Burkett

Traffic Operations Division Manager

Public Works Department

Manatee County Government

2904 12th St. Ct. East
Bradenton, FL 34208
Aaron.Burkett@mymanatee.org
(Office) (941) 708-7509

From: Bush, Shannon <Shannon.Bush@dot.state.fl.us>
Sent: Wednesday, September 30, 2020 2:13 PM
To: Aaron Burkett <aaron.burkett@mymanatee.org>
Subject: 444612-1: US 41 from Edwards to Magellan- Lighting
Importance: High

Good Afternoon,

I'm Shannon Bush and I have been assigned as the Lead Designer for both Lighting and Signalization on the above referenced project with FDOT. I wanted to reach out prior to starting design so that I am getting with the correct person for Lighting on this project. If not, could you point me in the right direction?

If you are the correct person, we are planning to replace/update the intersection and corridor lighting from Mile Post 0 - 2.035. Do you all happen to have an IES file that you could provide and/or a fixture type that your agency prefers? Our office would like to coordinate using something that you all are currently using or able to maintain.

Thank you for your time and attention. Again, if you aren't the person in which I need to be in contact with, please be sure to let me know.

Thank you,
Shannon Bush

Traffic Designer II- Bartow Design Office
Phone: 863-519-2658
Email: Shannon.Bush@dot.state.fl.us
Mail Station 1-20
My working hours are Monday – Friday 7:00 am to 3:30 pm.

Mission Statement: The In-House Roadway Design Team Professionally Creates Constructible Plans to Provide Transportation Solutions that Improve Safety and Mobility for All Users.