

Initial Arterial Street Lighting Report

Sunset Road Interstate 10 to River Road

Prepared for:



Submitted by:



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PCDOT Project No. 4SRRIV
CONSOR Project No. 2019-023
AECOM Project No. 60616874

August 2020

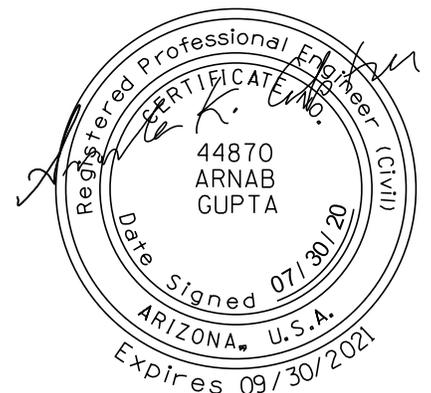


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Appendix A – Lighting Analysis and Design

1.0 PROJECT DESCRIPTION

The Sunset Road: Interstate 10 (I-10) to River Road (Segment II) project, located in northeastern Pima County, Arizona, will construct Sunset Road from just west of I-10 to River Road as a new four-lane roadway with 12-foot wide travel lanes, left- and right-turn lanes, six-foot wide paved shoulders and raised median. Sunset Road will tie into River Road, creating a new T-intersection. The roadway typical section will also include six-foot wide sidewalk along both sides of Sunset Road for most of the project length. Twelve-foot wide asphaltic concrete paths will also be constructed along both sides of Sunset Road to connect shared use path users to “The Loop” bike and pedestrian facility. A new Sunset Road/I-10 Traffic Interchange (TI) is proposed to be constructed as part of the Arizona Department of Transportation’s (ADOT) I-10 widening project between Ina Road and Ruthrauff Road and include new intersections at Sunset Road with the I-10 eastbound and westbound frontage roads.

With these proposed improvements, it must be ensured that the new intersections and roadway are illuminated appropriately. Light levels must be sufficient for the traveling public and meet Tucson Department of Transportation’s (TDOT) standards/guidelines. This initial arterial street lighting analysis was developed to accompany the Design Concept Report for this project.

The project location is shown in **Figure 1**.

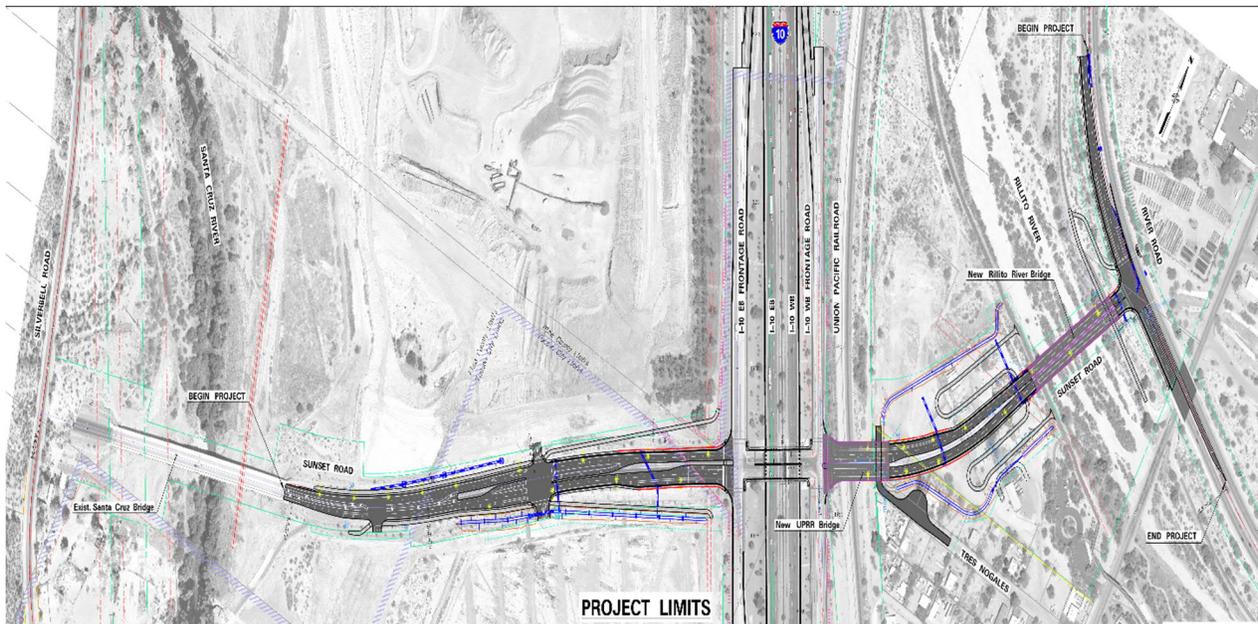


Figure 1: Proposed Project limits

2.0 EXISTING CONDITIONS

The TI within the project limits is currently illuminated with conventional ADOT light poles and 400-watt (W) high pressure sodium (HPS) luminaires. There is an existing light pole on the northwest and southeast corner of the Sunset Road/Eastbound Frontage Road intersection (two total). At the Sunset Road/Westbound Frontage Road intersection, there are two light poles on the southeast corner and one light pole on the southwest corner of the intersection. The entrance/exit ramps at the TI also has lighting. Existing service for the TI lighting is an ADOT Type V 240/480V service provided by Tucson Electric Power (TEP).

3.0 LIGHTING DESIGN APPROACH

The lighting design for the new TI will involve lighting for the Sunset Road underpass using horizontal mounted cobrahead light fixtures on new poles and providing underdeck lights for the freeway underpass using wall pack luminaires. Wall pack luminaires will be provided inside the proposed equipment pass for the Loop shared use path that runs parallel to the Eastbound Frontage Road. Sunset Road shall have continuous lighting within the project limits with the spacing and offset determined by TDOT standards and guidelines. All new luminaires used in the design will be light-emitting diode (LED) luminaires. It will be determined during the final design of the TI if the lighting within ADOT's right-of-way will utilize their existing load center. A new load center will be provided for lighting outside of ADOT's right-of-way that will be paid for and maintained by the City of Tucson (COT).

The proposed Sunset Road/River Road intersection shall utilize new intersection lighting which shall conform to TDOT standards. Lighting will be powered by the future metered service pedestal connection for the new traffic signal that will paid for and maintained by COT.

3.1 Design Criteria

The lighting design criteria outlined in the Pima Associations of Governments (PAG) Standard Detail T 324 – Lighting Design Criteria was used to determine the spacing along the alignment. The PAG lighting criteria is outlined below in **Table 1**. Per the land usage and the roadway type, the roadway was determined to be a collector within a residential area, which required an average illuminance of 0.6 Fc, with an average-to-minimum uniformity ratio of 6:1. A staggered lighting configuration will be used where possible.

Table 1: PAG Detail No. T 324

AVERAGE MAINTAINED HORIZONTAL ILLUMINATION: (FOOTCANDLES)

	COMMERCIAL	URBAN INTERMEDIATE	RESIDENTIAL
MAJOR	2.0	1.4	1.0
COLLECTOR	1.2	0.9	0.6
LOCAL	0.9	0.7	0.4
ALLEYS	0.6	0.4	0.4

AVERAGE-TO-MINIMUM UNIFORMITY RATIOS:

COMMERCIAL AREAS	3:1
INTERMEDIATE AREAS	3:1
RESIDENTIAL AREAS	6:1

The design for the intersection lighting at the TI will be determined by the ADOT consultant.

3.2 Evaluation of Proposed Lighting

The proposed lighting design includes installing new 95W LED luminaires on TDOT-spec poles (T 445, Type 2B) along Sunset Road. All fixtures will be full-cutoff Type III distribution with a 3000K correlated color temperature (CCT). A staggered lighting configuration will be utilized where possible. All proposed lighting fixtures will adhere to the Pima County Outdoor Lighting Code (and its associated zone requirements), as well as COT requirements and Dark-sky compliance. The results of the lighting analysis are presented in **Table 2**. TDOT traffic signal poles with a street light mast arm will be installed at the proposed T-intersection of Sunset Road and River Road.

Table 2: Analysis of Proposed Lighting Levels

Analysis Area	Minimum (fc)	Average (fc)	Avg/Min Ratio
NB Sunset Campus to I-10	0.2	0.68	3.40
NB I-10 to River Road	0.2	0.87	4.35
SB River Road to I-10	0.2	1.00	5.00
SB I-10 to Sunset Campus	0.2	0.66	3.30

These results indicate that the light levels will support uniform and sufficient light levels for Sunset Road in all areas. The lighting analysis and design is presented in Appendix A.

4.0 CONCLUSIONS

The proposed roadway lighting design reflected on the roadway plans in Appendix A will meet the lighting standards as required by TDOT for Sunset Road. This street lighting concept utilizes the T 445 Type 2B street light pole with a 20-foot span mast arm and a mounting height of 35 feet. All fixtures will be 95W LED Autobahn ATBM or equivalent luminaires with full-cutoff Type III distribution and 3000K CCT. A new load center will be provided for lighting along Sunset Road outside of ADOT’s right-of-way that will be paid for and maintained by COT.

The proposed Sunset Road/River Road intersection shall utilize intersection lighting which shall

conform to TDOT's traffic signal standards. Lighting will be powered by the proposed metered service pedestal connection for the new traffic signal that will be paid for and maintained by COT.

APPENDIX A

LIGHTING ANALYSIS AND DESIGN



Luminaire Definition(s)

ATBM_D_XXXXX_R3_XXXX

ATBM D XXXXX R3 XXXX

Filename	ATBM_D_XXXXX_R3_XXXX.ies
Lumens Per Lamp	N.A.
Number of Lamps	1
Total Lamp Lumens	N.A.
Arrangement Lamp Lumens	N.A.
Arrangement Luminaire Lumens	11690
Luminaire Lumens	11690
Luminaire Efficiency (%)	N.A.
Total Light Loss Factor	0.875
Luminaire Watts	95
Arrangement Watts	95
Arrangement	SINGLE
Arm Length	20.697
Offset	0
Pole Mounted	
Road Classification	Type III, Short, N.A. (deprecated)
Upward Waste Light Ratio	0.00

Luminaire Classification System (LCS)	Lumens	% Lamp	% Luminaire
LCS-FL	1134.1	N.A.	9.7
LCS-FM	4966.9	N.A.	42.5
LCS-FH	3446.6	N.A.	29.5
LCS-FVH	252.6	N.A.	2.2
LCS-BL	532.4	N.A.	4.6
LCS-BM	807.5	N.A.	6.9
LCS-BH	511.9	N.A.	4.4
LCS-BVH	38.0	N.A.	0.3
LCS-UL	0.0	N.A.	0.0
LCS-UH	0.0	N.A.	0.0
Total	11690.0	N.A.	100.0

B2-U0-G3

Indoor Classification Direct

LER 123

Calculation Summary

EB I-10 to River Rd

Project: Project_1

Points along a line

Coordinates in Feet

Point Spacing 10

Meter Type Horizontal

Illuminance (Fc)

Average 0.87

Maximum 2.9

Minimum 0.2

Avg/Min 4.35
Max/Min 14.50

EB Sunset Campus to I-10

Project: Project_1

Points along a line

Coordinates in Feet

Point Spacing 10
Meter Type Horizontal

Illuminance (Fc)

Average 0.68
Maximum 2.5
Minimum 0.2
Avg/Min 3.40
Max/Min 12.50

WB I-10 to Sunset Campus

Project: Project_1

Points along a line

Coordinates in Feet

Point Spacing 10
Meter Type Horizontal

Illuminance (Fc)

Average 0.66
Maximum 2.6
Minimum 0.2
Avg/Min 3.30
Max/Min 13.00

WB River to I-10

Project: Project_1

Points along a line

Coordinates in Feet

Point Spacing 10

Meter Type Horizontal

Illuminance (Fc)

Average 1.00

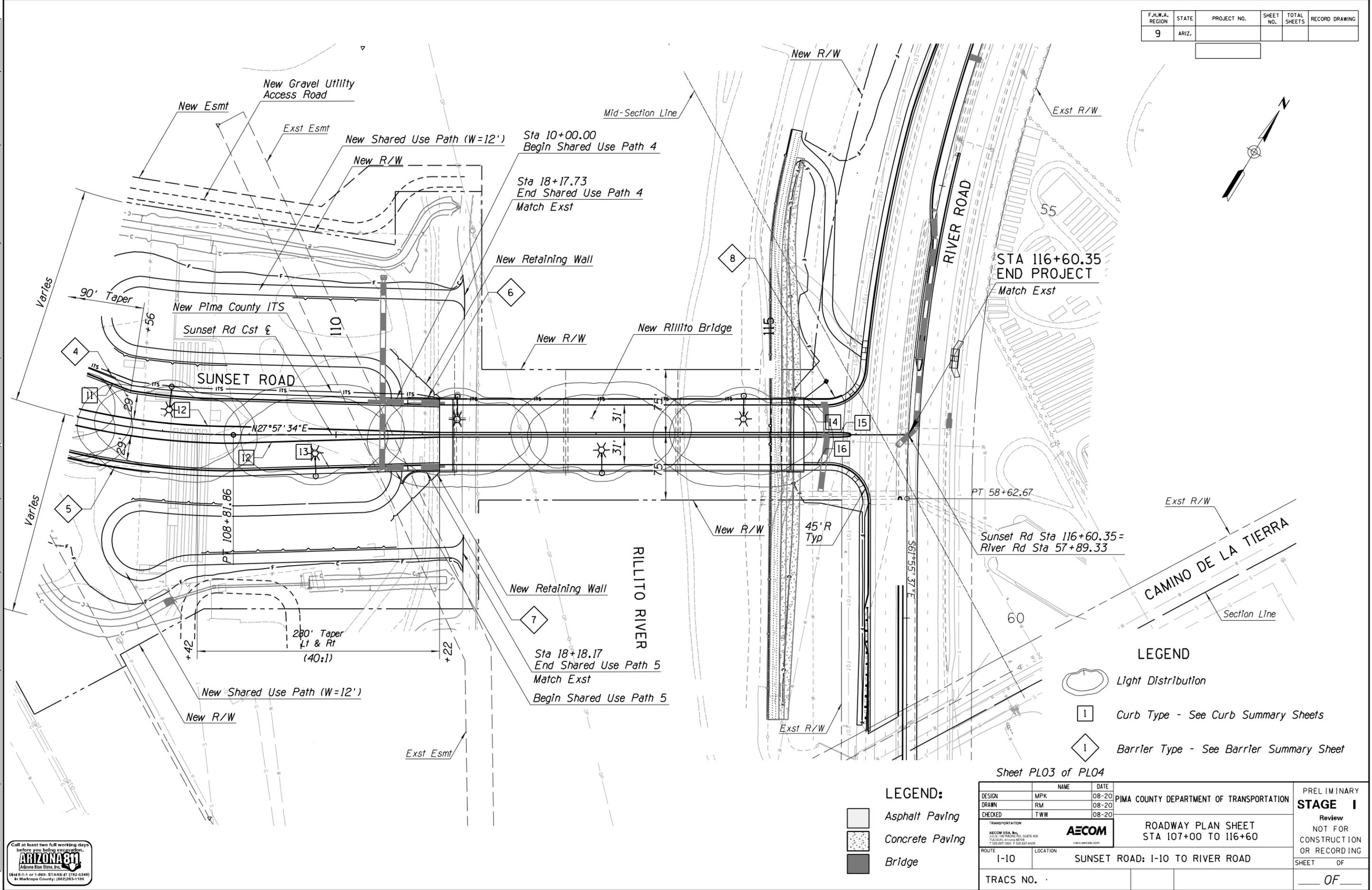
Maximum 2.8

Minimum 0.2

Avg/Min 5.00

Max/Min 14.00

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	ARIZ.				



- LEGEND**
- Light Distribution
 - Curb Type - See Curb Summary Sheets
 - Barrier Type - See Barrier Summary Sheet

- LEGEND:**
- Asphalt Paving
 - Concrete Paving
 - Bridge

Sheet PLO3 of PLO4

DESIGN	MPK	DATE	08-20	PIMA COUNTY DEPARTMENT OF TRANSPORTATION	PRELIMINARY STAGE I Review NOT FOR CONSTRUCTION OR RECORDING
DRAWN	RM	DATE	08-20		
CHECKED	TWW	DATE	08-20		
TRANSPORTATION		AECOM		ROADWAY PLAN SHEET STA 107+00 TO 116+60	
ROUTE	1-10	LOCATION	SUNSET ROAD: I-10 TO RIVER ROAD		
TRACS NO.					

SURVEY NO. FINISHED PLANS. DATE. REVISIONS. LOCATION. DATE. FINISHED PLANS. SURVEY NO.

Call at least two full working days before you begin excavation.

ARIZONA 811
Arizona Blue Stake, Inc.

Unit 8-1-1 or 1-800-STAKE-41 (782-6348)
Maricopa County: (602)263-1188