



Sunset Road: Silverbell Road to Interstate 10  
PCDOT Project Number 4RTSUN

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**SUNSET ROAD BRIDGE AT THE SANTA CRUZ RIVER  
STRUCTURE SELECTION MEMORANDUM**

DRAFT

Prepared by:



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## Introduction

This project consists of the construction of Sunset Road from Silverbell Road to Interstate 10 along a new alignment. It crosses the Santa Cruz River at a location approximately 1,200 feet south of where the old Sunset Road bridge was located before it washed away in the 1983 flood. The new alignment was governed by the hydrology and hydraulics associated with the Santa Cruz River. The river banks at this location will remain in their natural state at this location with no armoring or protection.

## Bridge Criteria

The criteria that will be used for the bridge design is based on:

- AASHTO LRFD Bridge Design Specifications, 6<sup>th</sup> Edition, 2012
- Current ADOT Bridge Design Guidelines

## Bridge Length

Sunset Road will cross the Santa Cruz River on a 724' 6" long six-span structure. The structure length was established through the hydraulic modeling effort associated with the project. This is the length required to convey the 100 year design flood event in the Santa Cruz River to span the remapped floodway.

## Superstructure

The western abutment location and the structure depth were established based upon two driving factors. The first was to place the west abutment as close to Silverbell Road as possible and have a maximum longitudinal slope of approximately five percent between the beginning of the structure and the intersection with Silverbell Road. The second was the desired to maintain four feet of freeboard during the 100 year design flood event in the Santa Cruz River based upon earlier flood elevation modelling. These two factors led to a maximum structural depth of approximately six feet.

The presence of waters of the U.S. as well as recognized wetlands limits the area of ground disturbance allowed during the construction of the bridge. Cast-in-place bridge options were eliminated due to the need for false-work that would create an excessive amount of disturbance. In addition, the live stream flow cannot be disturbed and the contractor will have to either construct a temporary bridge over the stream or construct the bridge from either side of the flow. As a result, a prefabricated system such as steel girders, pre-cast box beams or pre-cast girders is required. Given the length of the bridge, AASHTO girders were chosen as the most effective bridge system for this particular application. With the allowable structure depth (six feet), a Type V (modified) AASHTO girder was selected with each girder measuring 119'-5" to achieve the required bridge length in six spans. Both the east and west

bridge abutments will be constructed to allow for future addition of The Urban Loop (“The Loop”) multi-use path on the east side of the river and the Juan Bautista de Anza Trail (Anza Trail) on the west side of the river.

The bridge cross section was established to accommodate:

- Separate vehicular and pedestrian barriers on the south
- An eight foot multi-use path on the south
- Two six foot shoulders
- Two eleven foot traffic lanes
- A twelve foot two way left turn lane (TWLTL)
- A six foot eight and a half inch wide sidewalk with a six inch high curb on the north with connection to the five foot asphaltic sidewalks
- A combined pedestrian vehicular barrier on the north.

## **Girder spacing**

Given the use of AASHTO Type V (modified) girders for the 64 foot 3 ½ inch wide bridge, a number of girder spacing alternatives were evaluated.

Ten AASHTO Type V (modified) girders spaced at 6’ 6” were evaluated and found to have excess capacity. Nine and eight girder lines spaced at 7’3” and 8’2” respectively were then evaluated. The eight girder alternative was overstressed. The Nine girder alternative was found to adequately carry the load. Note, the loading was assumed to be for five lanes of traffic, in case there is the need in the future to remove the sidewalk and barrier to accommodate one additional lane of traffic in each direction.

Expansion joints will be placed at the abutments and pier 3, with pinned connections at piers 1, 2, 4, and 5.

## **Drainage**

The vertical profile of the bridge encompasses a crest vertical curve. It will drain into scuppers placed at the quarter point along each span.

## **Utilities**

At this point in time a Century Link duct, a PCDOT ITS conduit and a water line for irrigation purposes are proposed to be attached to the bridge. Tucson Electric Power has expressed an

interest in having accommodation for electrical conduits as well. Tucson Water may want to add a water line.

## **Aesthetics**

Aesthetics for the bridge will consist of artistic treatments to the railing on the south (outboard) side of the multi-use path. The railing design will meet all applicable AASHTO codes.

## **Estimated Construction Cost**

At this point in the design process, the estimate construction cost of the bridge is based upon the parametric estimate of \$100 per square foot of bridge deck. In this case, the square footage of the bridge deck is 46,546 square feet resulting in an estimated construction cost of \$4,654,600.

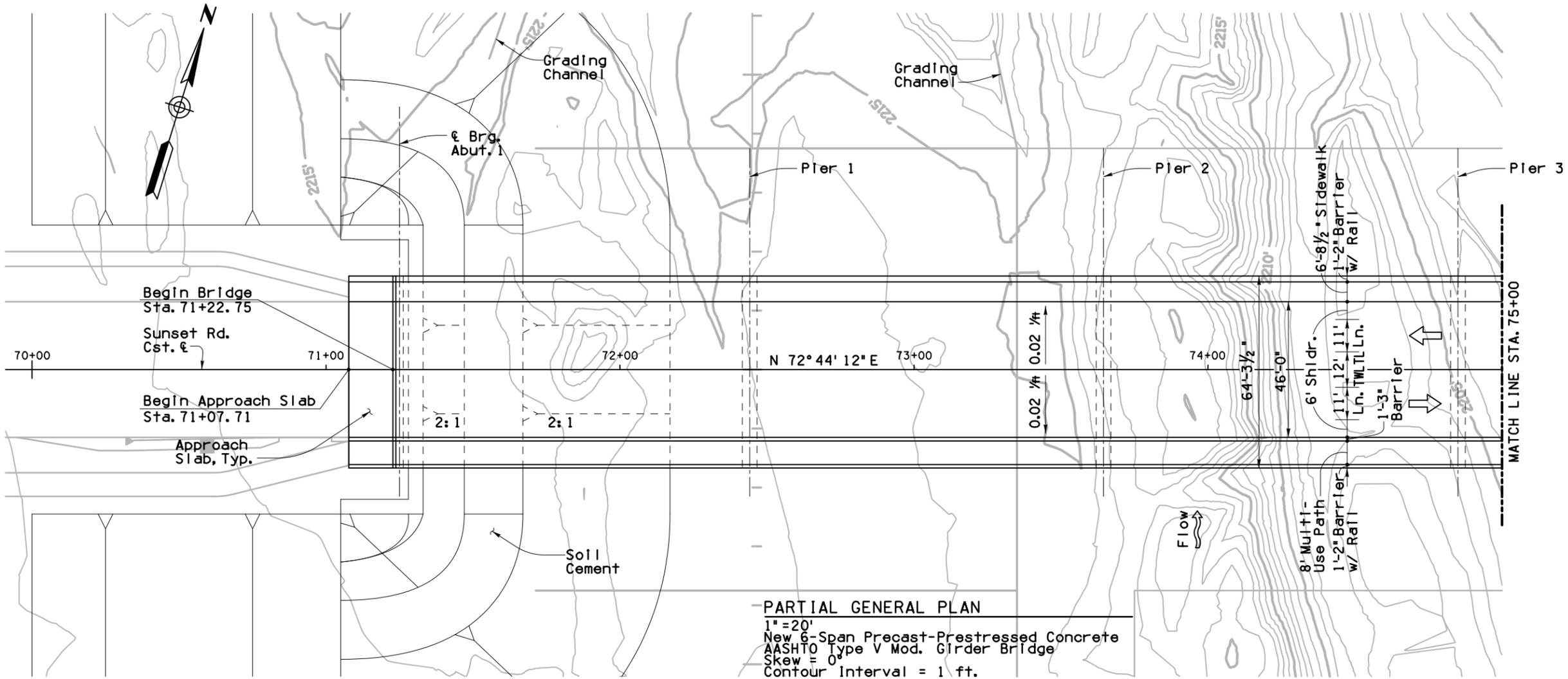
## **Conclusion**

The Santa Cruz River Hydraulics coupled with the permitting process and constraints associated with the waters of the U.S. and wetlands governed the bridge type and spans for this particular bridge. The dimensions of the six span bridge, along with the placement of the expansion and pinned joints were established to provide a uniform girder length of 119' 5".

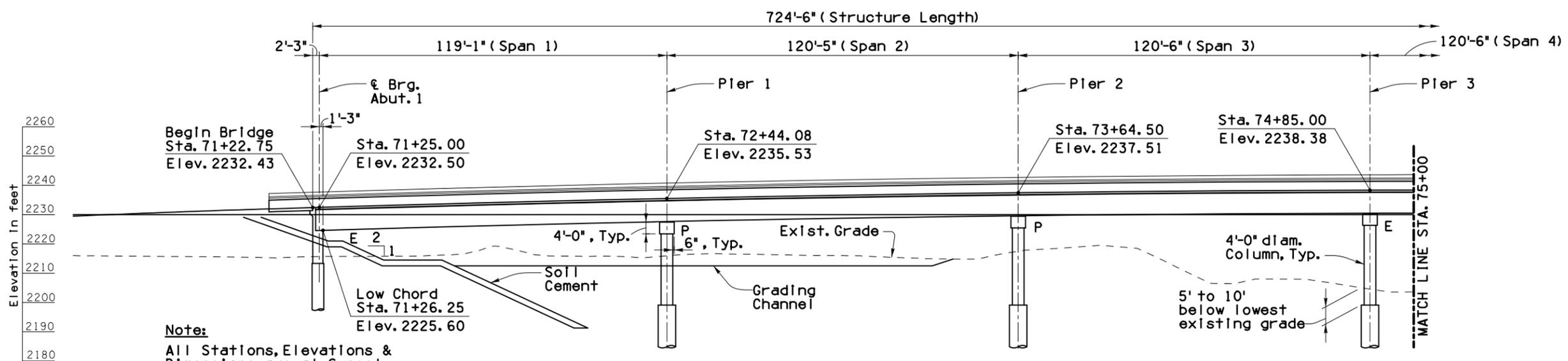
# **APPENDIX A- Drawings**

## **Plan & Elevation of Bridge: GP01 & GP02**

## **Typical Section of Bridge: XS01**



**-PARTIAL GENERAL PLAN**  
 1" = 20'  
 New 6-Span Precast-Prestressed Concrete  
 AASHTO Type V Mod. Girder Bridge  
 Skew = 0°  
 Contour Interval = 1 ft.



**Note:**  
 All Stations, Elevations &  
 Dimensions are at Sunset  
 Road Cst. &.

**PARTIAL ELEVATION**  
 1" = 20'

Priscilla S. Cornello, P.E., Director

Date	Designated	Drawn	Checked	Proj. Engr.
08/14	JAM	JMS, MLL	GGP	JAM
08/14				
08/14				
08/14				

No.	Revision Description	Engineer	Date

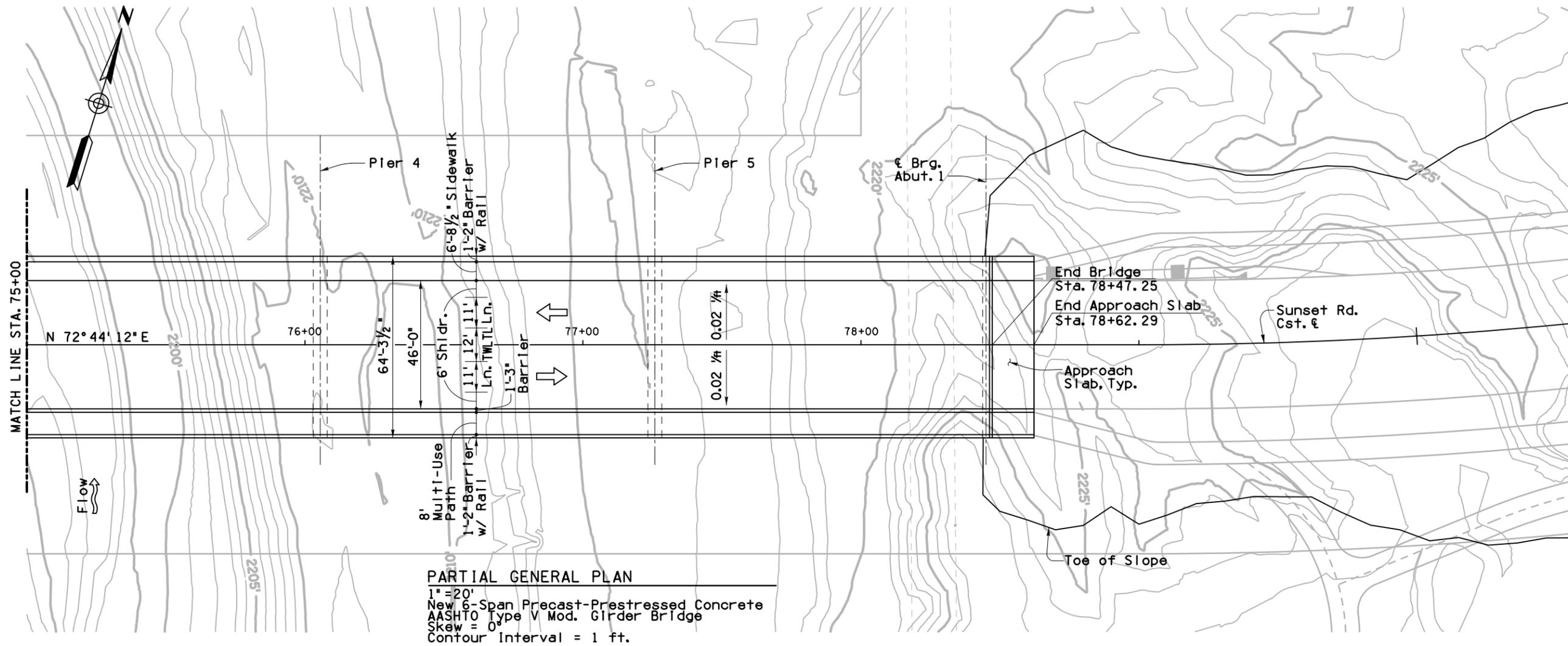
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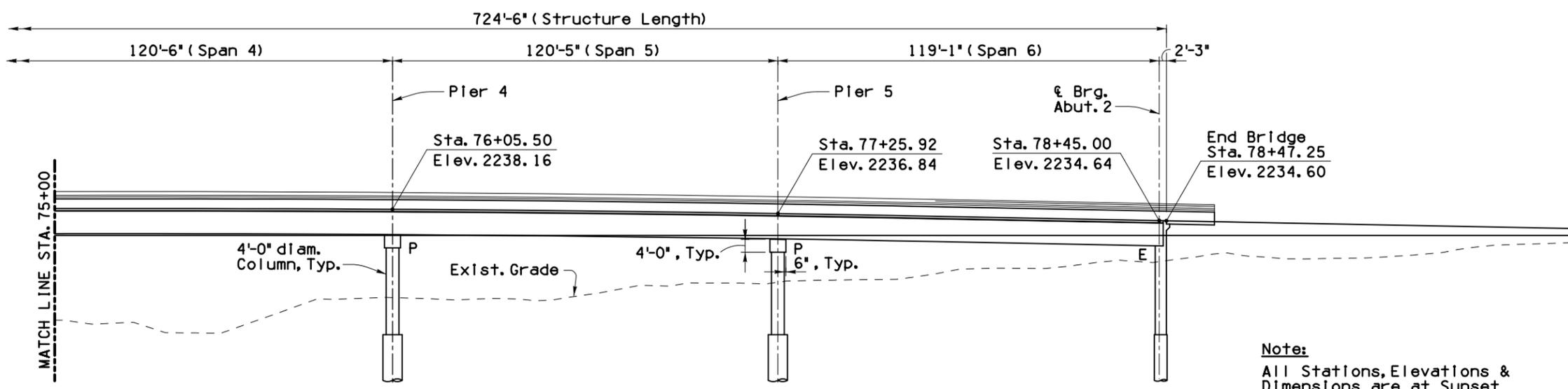
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**GENERAL PLAN & ELEVATION - 1 OF 2**  
 SUNSET ROAD - SEGMENT 1  
 SILVERBELL RD. TO I-10  
 PROJECT NO. 4RTSUN

SUNSET ROAD - SILVERBELL ROAD TO I-10 - PROJECT NO. 4RTSUN

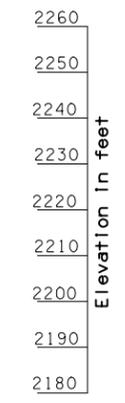


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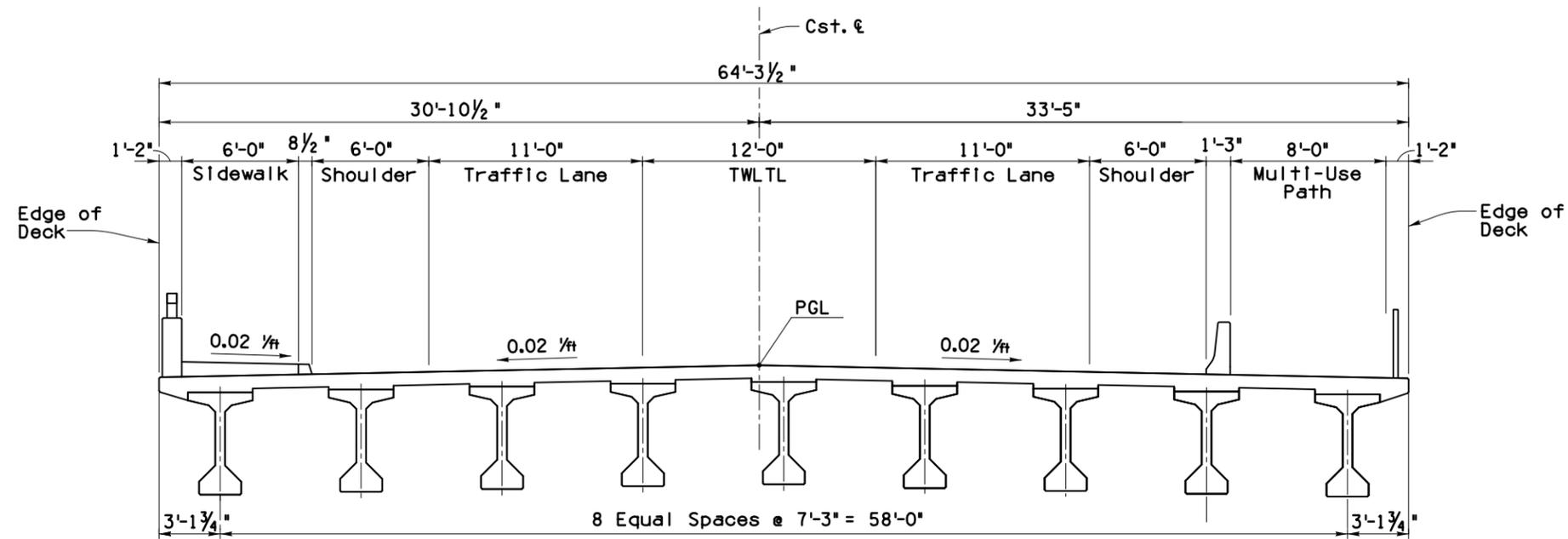
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**GENERAL PLAN & ELEVATION - 2 OF 2**  
 SUNSET ROAD - SEGMENT 1  
 SILVERBELL RD. TO I-10  
 PROJECT NO. 4RTSUN



SECTION  
 1/4" = 1'-0"

Priscilla S. Cornello, P.E., Director

Date	JAN
08/14	
Designed	JMS, MLL
Drawn	GP
Checked	JAN
Proj. Engr.	

No.	Revision Description	Engineer	Date

PRELIMINARY  
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TYPICAL CROSS SECTION  
 SUNSET ROAD - SEGMENT 1  
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 PROJECT NO. 4RTSUN

SUNSET ROAD - SILVERBELL ROAD TO I-10 - PROJECT NO. 4RTSUN