State Route 141 Hartsville Bypass

PROFESSIONAL ENGINEERS, INC.
Delivering Quality Solutions

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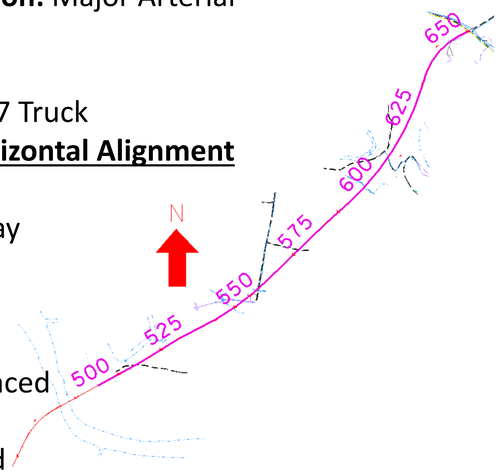
CEE 4950: Senior Design Project Spring 2021

Transportation

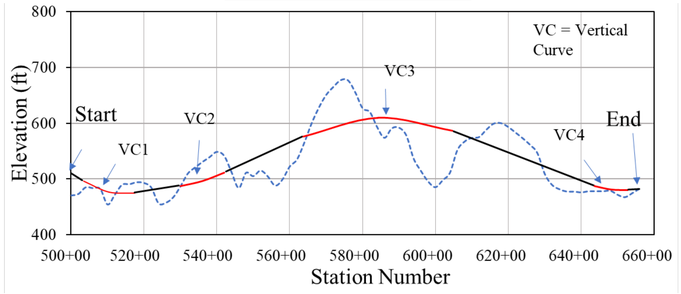
Design Speed: 70 mph
Functional Classification: Major Arterial
Terrain Type: Rolling
Area Type: Rural
Design Vehicle: WB-67 Truck

Horizontal Alignment

- Two-Lane Highway
- 2.8 Miles of Highway
- 12-foot Lanes
- 8-foot Shoulders
- 7 curves
- 3 Residences Displaced
- 6 Streams Crossed
- 6 Roads Intersected

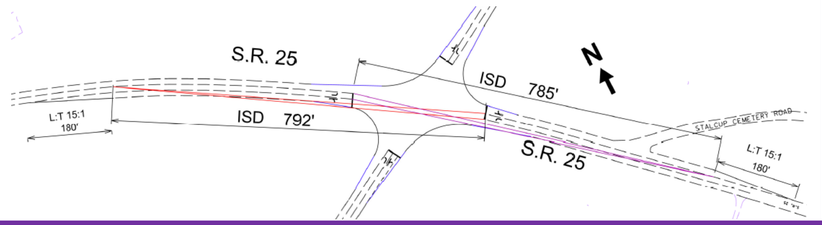


Vertical Alignment



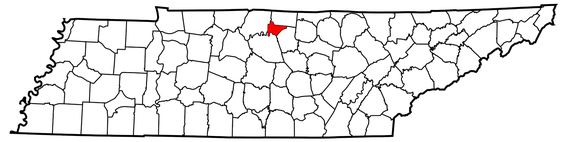
Intersection Design

Intersection sight distance (ISD) for SR-25 left turns



Project Scope

The purpose of this project was to design a new section of SR-141 in Trousdale County, TN. This new section of highway will be constructed from a new bridge spanning the Cumberland River to intersect SR-10/25 three miles to the north. This new alignment will bypass Hartsville and improve traffic flow for the connected highways.



Environmental

Permits

- National Pollutant Discharge Elimination system (NPDES)
  - CGP Permit No. TNR100000
  - Stormwater Pollution Prevention Plan (SWPPP)
- Aquatics Resource Alterations Permit (ARAP)

Best Management Practices

- Surface Roughening
- Straw Mulch
- Silt Fence
- Check Dam
- Construction Exit
- Riprap

Roadway Drainage

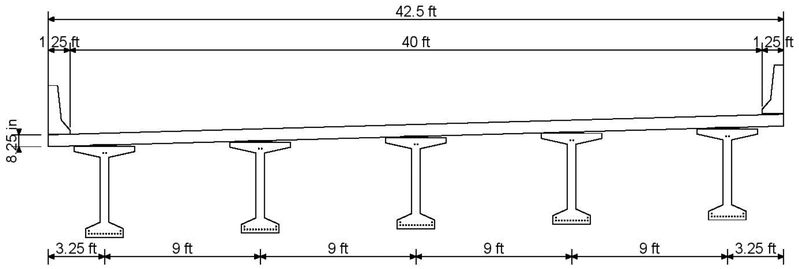
Drainage Area	Area	Method	Q_{50}	Q_{100}
CDA #1	15.09 acres or 0.024 mi²	Rational	17 cfs	19 cfs
CDA #2	87.23 acres or 0.136 mi²	Rational	78 cfs	88 cfs
CDA #3 (STR-5)	183.82 acres or .287 mi²	USGS Regression	336 cfs	384 cfs
CDA #4 (STR-8)	158.45 acres or 0.248 mi²	USGS Regression	301 cfs	344 cfs
CDA #5	128.22 acres or 0.200 mi²	USGS Regression	256 cfs	294 cfs
CDA #6 (STR-10)	339.2 acres or 0.530 mi²	USGS Stream Stats	569 cfs	652 cfs

Designation	Type	Size	Station	Skew	Length
Culvert #1	RCP	2.5ft – Dia.	510+28.45	20° 51' 40" (RT)	150.55 feet
Culvert #2	RCP	2.5ft – Dia.	523+61.83	0°	142.9 feet
Culvert #3 (STR-5)	Concrete Box	8ft x 4ft	545+88.8	20° 26' 53" (LT)	219.0 feet
Culvert #4 (STR-8)	Concrete Box	10ft x 5ft	598+97.57	0°	518.8 feet
Culvert #5	Concrete Box	8ft x 4ft 2-Barrel	644+71.11	0°	108.66 feet
Culvert #6 (STR-10)	Concrete Box	8ft x 7ft	651+50	76° 17' 25" (LT)	471.95 feet

Structures

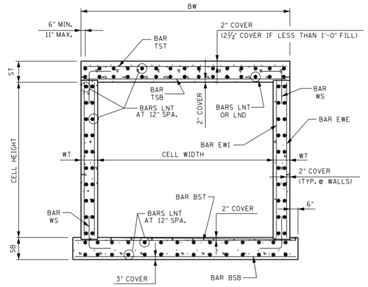
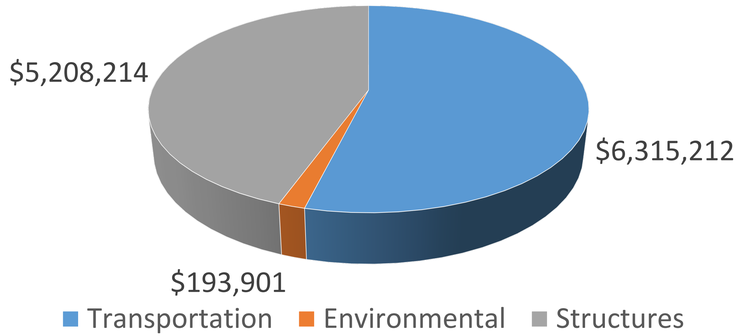
Lock Six Road Overpass

- Five girder cross-section
- 3 100' spans
- Drilled shaft columns and pile cap abutments



Box Culverts

- 4 box culverts needed
- Based on TDOT standards
- Used for large flowrates



Project Cost