DESIGN EXCEPTION REQUEST FORM

TO: TDOT Region 2 Project Development Director

FROM: Design Manager, Project Development, TDOT

DATE: **3/23/2022**

This form is to be used on projects requesting a Design Exception where roadway projects do not meet the 10 controlling elements of the geometric design criteria.

Design Exception:

Type I Exception to Controlling Criteria

- Design Speed
- Design Loading Structural Capacity

For exceptions based on Type I Criteria, all roadways on the **NHS** may require FHWA's review. The Roadway Design Division Director provides final approval. Exceptions to Type I criteria are rare and additional information shall be provided.

Type II Exception to Controlling Criteria

- Lane Width
- Horizontal Curve Radius
- Stopping Sight Distance
- Shoulder Width
- Cross Slopes
- Vertical Clearance
- Superelevation Rate
- Maximum Grade

For exceptions based on Type II Criteria, all roadways on the **NHS** with design speeds **≥** 50 mph may require FHWA's review. The Roadway Design Division Director provides final approval.

All other roadways (non-NHS) exceptions to controlling criteria do not require FHWA's review; the Roadway Design Division Director provides final approval.

Note:
Roadways on the Appalachian Development Highway System, or FHWA Projects of Division Interest (PODI) may require FHWA's review for design exceptions regardless of the controlling criteria.

DOCUMENTATION

A design ***exception*** is a variance based on one or more of the controlling criteria (either Type I or Type II). All requests shall be documented on this form. Plan sheets, location map, and supplemental information (i.e. Google maps) must be enclosed for a timely review by the Department. All design exception requests must be justified based on the objective and context demonstrating compliance with accepted transportation engineering principles and reasons for the decisions. The proposed variation shall not

diminish the existing operation and safety of the facility. Historical in-service performance or a traffic engineering study (on site or simulation) may be required.

Type I Exception to Controlling Criteria requires additional documentation:

- Design Speed exceptions. Length of section with reduced design speed compared to overall length of project. Measures used in transitions to adjacent sections with higher or lower design or operating speeds.
- Design Loading Structural Capacity exceptions. Verification of safe load-carrying capacity (load rating) for all State unrestricted legal loads or routine permit loads, and in the case of bridges and tunnels on the Interstate, all Federal legal loads.

Type II Exception to Controlling Criteria requires additional documentation:

- Specific design criteria that will not be met.
- Existing roadway characteristics.
- Alternatives considered.
- Comparison of the safety and operational performance of the roadway and other impacts such as right-of-way, community, environmental, cost, and usability by all modes of transportation.
- Proposed mitigation measures.
- Compatibility with adjacent sections of roadway.

Additional guidance can be found in the Highway Capacity Manual, Highway Safety Manual, Performance Based Practical Design, and Flexibility in Design. Design Exception Requests located within the city limits require a letter from the local agency approving the request.

All other geometric design variances on facilities outside the category I and II criteria shall be documented on a Design Waiver Request form.

PROJECT DATA	
Current Project Phase	**Planning** ☐ **Design** ☒ **Construction** ☐ **Scope change** ☐ **(Evaluate NEPA impact)**
County/ City	**Hamilton/Chattanooga**
PIN	**114174.01**
Federal Project No.	**IM/NH-75-1(131)**
State Project No.	**33005-1185-44**
Project Limits	**I-24 from west of Germantown Road to east of Spring Creek Road and I-75 from south of CSXT RR bridge to E. Brainerd Road**
Local Program Project **State Let** **Local Let**	Yes☐ No ☐ If yes, then Yes☒ No ☐ Yes☐ No ☒
Project Type	New Alignment ☐ Reconstruction ☒ Resurfacing ☐ Road Diet/Road Reconfiguration ☐ (Note: Road Diet Evaluation form may be required) Maintenance ☐ Road Safety Audit ☐ Bridge Repair ☐ Bridge Rehabilitation ☐ Signalization ☐ Other ☒
US Route/NHS	Yes☒ No ☐
State Route	Yes☐ No ☒
Appalachian Development Highway System	Yes☐ No ☒
FHWA PODI Project	Yes☒ No ☐
Project Scope (Briefly describe the objective of project)	The project proposes to add lanes along I-24 between Germantown Road and the added lanes at the I-75 interchange just west of Spring Creek Road. Also, the ingress/egress ramps in this same area will be modified to move the weave from I-24 to N and S Terraces and the bridges over the interstate at S Moore Road and McBrien Road will be replaced. The project proposes to also add a lane in each direction along I-75 between the end of the Phase 1 interchange improvements to the north connecting with E. Brainerd Road interchange ramps. The widening on I-75 will also require that the existing bridge over the CSX Railroad to be replaced.
Project Commitments	No project commitments are currently identified.

ROADWAY GEOMETRIC DESIGN DATA	
Highway Functional Classification: **(See Green Book 2011 Section 1.3)**	Freeway ☒ Arterial ☐ Collector ☐ Local Road/Street ☐
Rural or Urban Context	Rural ☐ Rural Town (city limits) ☐ Suburban (initially designed as rural but currently in city limits) ☐ Urban (city limits) ☒ Urban Core (in the metropolitan government jurisdiction) ☐
Roadway Typical Section Standard Drawing:	RD11-TS-5W
Existing Design Speed:	60 mph
Existing Posted Speed:	55 mph
Proposed Design Speed:	60 mph
Proposed Posted Speed:	55 mph
Type of Terrain:	Level ☐ Rolling ☒ Mountainous ☐
Traffic Data:	ADT (2021): 118,410 D: 50/50 ADT (2041): 146,100 T: 18% DHV: 12%
Access Control	None☐ Partial ☐ Full☒
Multimodal Design Elements Included in the scope of the Project	Pedestrian ☒ Curb Ramps ☒ Pedestrian Signals ☒ Shared-Use Path ☐ New sidewalks ☐ Non-motorized Enhancement ☐ Bicycle ☒ (including bike route/lane, tract addition to existing roadway facility)
Bus Route	Yes ☐ No ☒

GEOMETRIC DESIGN CONTROLLING CRITERIA Design Exception Requests Controlling elements must be completed for items where an exception is requested.			
	Existing	**Proposed**	**Exception**
Design Speed:	60 mph	60 mph	No
Design Loading structural capacity:	n/a	n/a	n/a
Lane width:	12 ft	12ft`	No
Shoulder width (inside/outside):	6/10	12/6.91	Yes
Cross Slope:	0.02'/'	0.02'/'	n/a
Superelevation Rate:	0.08'/'	0.08'/'	n/a
Horizontal Curve Radius:	3,314.00	3,314.00	n/a
Stopping Sight Distance:	582'/591'- sag/crest	582'/591' – sag/crest	n/a
Maximum Grade:	4.95%	4.95%	n/a
Vertical Clearance:			
Navigational Waterway:	n/a	n/a	n/a
Grade separation:	16'6"	16'6"	n/a
Railroad crossing:	22.04'	23'0"	n/a

BRIDGE DESIGN FEATURES Complete if the bridge feature values differ from those listed in the Geometric Design Controlling Criteria Section.				
	Existing	**Proposed**	**Exception**	**REQ**
Traffic Lane Widths:	12'	12'	n/a	☐
Outside Shoulder Widths:	12'	17'	n/a	☐
Inside Shoulder Widths:	11'	11'	n/a	☐
Sufficiency Rating:				☐

CRASH HISTORY SUMMARY REPORT			
Years Reviewed	Total Crashes	Fatal Crashes	Injury Crashes

TDOT DIRECTIVES TO BE CONSIDERED FOR THE EXCEPTION REQUEST			
	YES	**NO**	**N/A**
SAFETY			
Crash history data has been reviewed and is enclosed.	☐	☒	☐
All roadway and roadside safety mitigation measures have been considered and provided.	☒	☐	☐
The proposed variance from the minimum roadway design standards does not adversely affect the safety of the facility.	☒	☐	☐
The Highway Safety Manual was used to justify the design exception.	☐	☒	☐
OPERATIONS			

The operation of the proposed typical cross-section is comparable with operation of the adjacent cross-sections.	☒	☐	☐
The proposed design does not cause a reduction in capacity or adversely affect traffic flow of the facility.	☒	☐	☐
The proposed design does not adversely affect long-term operations.	☒	☐	☐
The proposed design does not impact the existing access control.	☒	☐	☐
Travel demand management solutions have been evaluated.	☐	☒	☐
ROADWAY DESIGN			
It is not feasible to meet the minimum roadway design standards due to right-of-way restrictions, environmental impacts, etc.	☒	☐	☐
The proposed design maintains the same level of service compared to the design based on minimum roadway design standards.	☒	☐	☐
The proposed design results in a significant cost savings compared to the design based on minimum roadway design standards.	☒	☐	☐
ENVIRONMENTAL (Consult TDOT Environmental Division, if needed)			
Does the request affect the NEPA environmental boundary?	☐	☒	☐
Does the request affect environmental permit requirements? (TDEC/TVA/CORPs/TWRA, etc.)	☐	☒	☐
Does the request affect Historical Section 106?	☐	☒	☐
WORK ZONE			
Will the proposed variation affect the TMP?	☐	☒	☐

DESCRIBE THE REASONING AND JUSTIFICATION OF THE DESIGN EXCEPTION REQUEST:

(Address project needs, with consideration of all transportation modes, community engagement, safety, and with consistency towards long term planning and vision. Provide an explanation of the requested design exception and describe other nationally recognized guidance that is met and that the design is based upon. Attach documentation of the specific design guidance met.)

The project is located in a heavily developed area along I-24 that is also flanked with two adjacent roadways used as access roads to/from the interstate. Multiple construction projects have been occurring in the area to address congestion and deficient bridges.One of the overpassing bridges on Belvoir Avenue was replaced with the intent to accommodate the recent capacity improvements at the I-75/I-24 interchange (Phase 1 Improvements). Retaining wall abutments were constructed to minimize the impacts to the parallel roadways (N Terrace and S Terrace).

During the design of the Phase 2 Improvements, the decision was made to make an operational and safety improvement on the interstate to assist merging traffic from the Phase 1 construction at the I-75/I-24 interchange, a westbound auxiliary lane is proposed to be constructed from west end of the Phase 1 improvements near Spring Creek Road to S Germantown Road. This change will take the 5-lane width moving west from the interchange and transition to match the existing 3-lane section at S Germantown Road. The 5th lane will drop at Exit 184 to Moore Road. The proposed ramp will be modified to a 2-lane ramp with one of the lanes being an exit only. The 4-lane section would then continue west and taper in before S Germantown Road. This will allow approximately another 7,500 ft for traffic to merge into the 3-lane section continuing west. An auxiliary lane is also proposed to be added in the eastbound direction from S Germantown Road to connect to the I-75/I-24 Interchange Phase 1 Improvements. The 4th eastbound lane will taper open at the bridge over S Germantown Road and continue under Belvoir Avenue to the end of the proposed work on I-24. A 5th lane is proposed to be added at the entrance ramp from McBrien Road and continue to the connection with the Phase 1 Improvements. This additional auxiliary lane will allow local traffic using the proposed

access ramps to separate from the higher speed through movements heading to the I-75 interchange.

The bridge at Belvoir Avenue was constructed with a clear opening of over 66 ft for the westbound roadway and approximately 66 ft for the eastbound roadway. To accommodate the 4-lane sections, the inside shoulder widths will be maintained but the outside shoulders for both roadways will need to be narrower than the 2011 AASHTO Green Book requires. The bridge over Belvoir Avenue is a two span bridge with a bent in the median wall between the eastbound and westbound lanes. The abutments are already constructed sitting immediately behind retaining walls so there is no room to cut into an abutment slope and gain additional width. The existing structure is being retained which prevents the both roadways from maintaining full width outside shoulders.

On the both roadways, the outside shoulder transitions can be minimized to a 20:1 approach along the proposed retaining wall and barrier rail. Once the Belvoir overpass is cleared, the shoulder can transition back out to full width on the "off end" of the overpass bridge abutment. On the eastbound roadway, the full width shoulder transitions from 12.00 ft wide to 7.22 ft between STA 98+83.08 and STA 99+79.38. The 7.22 ft width is held from STA 99+79.38 to STA 101+01.72 where it transitions immediately out to 12.00 ft width again. The total length of exception on the eastbound roadway is 218.64 ft. On the westbound roadway, the outside shoulder transitions from 12.00 ft to 7.34 ft between STA 102+11.25 and STA 101+18.14. The reduced width transitions slightly under the Belvoir Avenue bridge from 7.34 ft to 6.91 ft from STA 101+18.14 to STA 99+00. The shoulder then transitions from 6.91 ft back out to 12.00 ft between STA 99+00 and STA 98+50. The total length of exception on the westbound roadway is 361.25 ft.

The reason for selecting this option was the benefit of the interstate operation in this area and the cost to mitigate a limited section of narrow shoulders. The operational benefit of the auxiliary lanes outweighs the limited area of shoulder width reduction. The outside shoulders as proposed will be limited to a short distance in both directions and in both cases, the shoulders will provide enough space for a vehicle to pull out of the through lanes and have a minimal encroachement on the mainline lanes (2 ft or less). The 2011 Green Book encourages providing a shoulder width that allows a vehicle to pull over and occupy no more than 1-4 ft of the traveled way so that the remaining traveled way width can still be used by passing vehicles. The design exception is justified based on the improved operations and limited area of exception.

DESIGN EXCEPTION REQUEST – JUSTIFIED BASED ON GUIDANCE FROM THE FOLLOWING:					
Design Guidance Source	Design Guidance Met				
	YES	NO	N/A	Do Not Know	Source Reference if answered "Yes" (page, section, drawing, etc.)
AASHTO Publication	☒	☐	☐	☐	A Policy on Geometric Design of Highways and Streets (2011) section 4.4.2
Highway Safety Manual	☐	☒	☐	☐	
Highway Capacity Manual	☐	☒	☐	☐	
FHWA Publication	☐	☒	☐	☐	
NCHRP Publication	☐	☒	☐	☐	
TRB Publication	☐	☒	☐	☐	
TDOT Design Guidelines	☐	☒	☐	☐	
TDOT Standard Drawings	☐	☒	☐	☐	
Guidance from other states	☐	☒	☐	☐	
Other					

DESCRIBE THE ALTERNATIVES CONSIDERED
(Provide an explanation of proposed mitigation measures to offset impact such as cost, ROW, environmental, multimodal, safety and operation, community and usability, or compatibility with adjacent section of the roadway)

Based on the available width on the eastbound and westbound roadways underneath the Belvoir Avenue bridge, there are limited options to mitigate the narrow shoulders proposed.

1. **Narrow the mainline lanes to 11 ft width to give additional width to the outside shoulder.**
2. **Shift the mainline lanes to the inside and narrow the inside shoulders to give the additional width to the outside shoulders.**
3. **Shift the beginning/ending station of the auxiliary lanes to the east of the Belvoir Avenue overpass.**
4. **Reconstruct the Belvoir Avenue bridge to widen the span and accommodate the additional roadway width.**

Option 1 was not chosen due to the traffic volumes and the heavy percentage of truck traffic. Maintaining 12 ft lanes on the mainline is more desirable on high-speed, high-volume roadways as it provides a greater level of comfort for drivers. It affects the level of service as narrower lanes force drivers to operate their vehicles closer to each other laterally than they would normally desire. This would be more evident with a heavier percentage of commercial vehicles

Option 2 was not chosen for safety and operational reasons. Keeping a full width shoulder adjacent to the inside lane is more desirable due to typically higher speed vehicles using the inside lane. If a vehicle were to pull off onto the inside shoulder and maintain a shy distance from the barrier rail, a narrower shoulder would increase the possibility of the vehicle encroaching into the inside travelway. The encroachment into

the higher speed lane would create a greater safety concern and have a more detrimental effect on traffic flow.

Option 3 was not chosen for operational purposes. It is more desirable to separate the traffic movements associated with the beginning or end of an auxiliary lane out of the area of influence of an interchange. Separating the decision points for drivers allows them more time to make appropriate decisions and manuver their vehicles. Giving more than an additional ½ mile as proposed will allow traffic to merge and adjust before the next decision point at the exit ramps or end of the auxiliary lane.

Option 4 was not chosen for financial reasons. The existing Belvoir Avenue overpass was constructed within the last two years and was prior to the decision to extend the auxiliary lanes to Germantown Road. The existing bridge was constructed with vertical abutment walls de to the proximity of the intersecting streets at both ends of the bridge. With existing vertical abutment walls, there is no opportunity to widen the available width under the bridge without a complete reconstruction. To do so would be a multi-million dollar increase for the limited length of exception requested.

DESIGN EXCEPTION IS REVIEWED AND RECOMMENDED FOR APPROVAL BY:

Robert W Rodgers — 3/29/2022

Regional Project Development Director **Date**

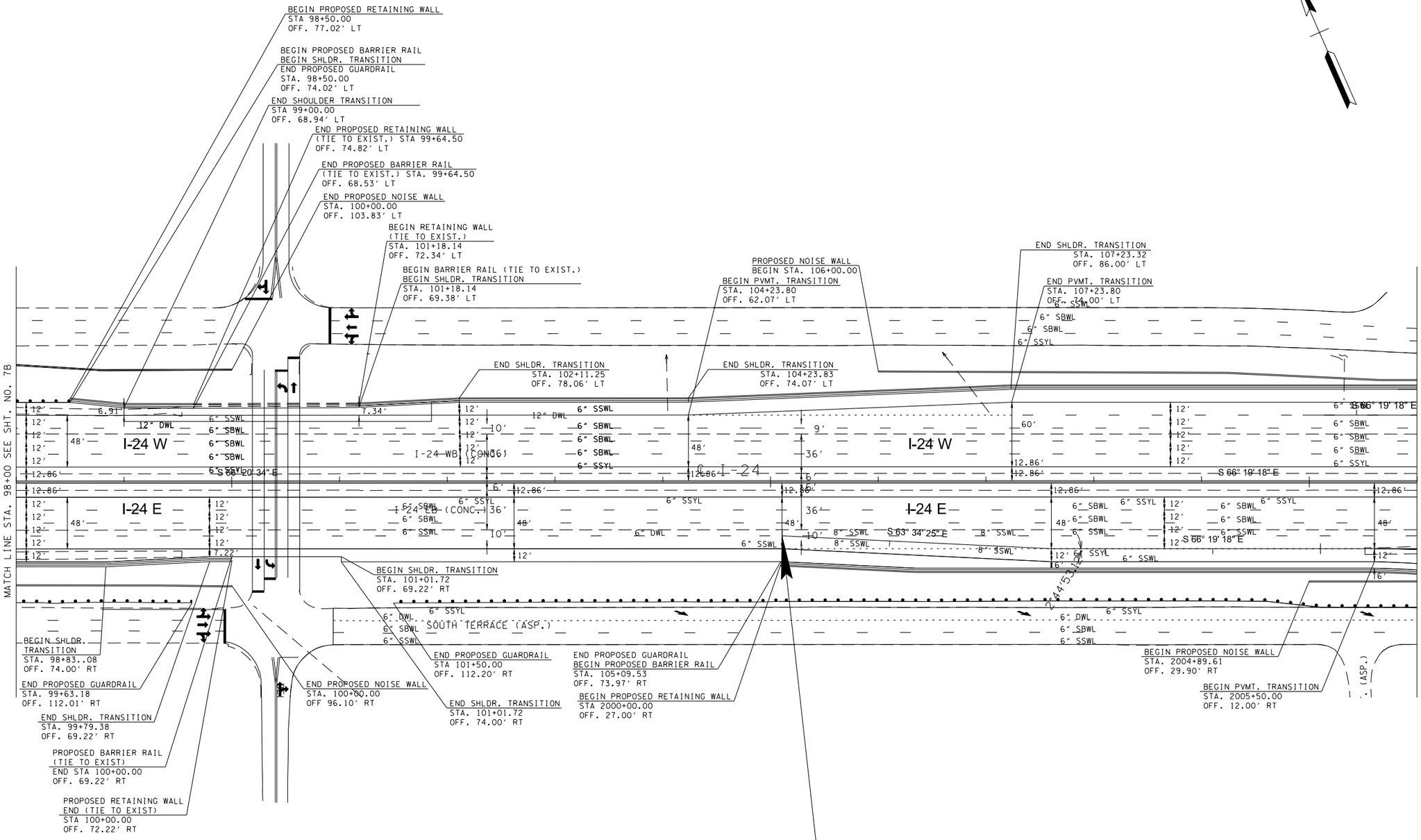
DESIGN EXCEPTION APPROVED BY:

Jennifer Lloyd — 3/29/2022

Roadway Design Division Director **Date**

☐ Reviewer Comments Attached
☒ Additional Design Exception Information Attached

TYPE	YEAR	PROJECT NO.	SHEET NO.
FUNCT.	2022	IM/NH-75-1(131)	8B



BEGIN CONST. RAMP (K) STA. 2000+00.00
= I-24 STA 105+10.68 OFF 50.00' RT
N: 247324.71
E: 2195306.45

PRE-RFP RELEASE FUNCTIONAL PLANS 2/3/2022

CAUTION ! FUNCTIONAL PLANS SUBJECT TO CHANGE

SEALED BY

COORDINATES ARE NAD/83(1995), ARE DATUM ADJUSTED BY THE FACTOR OF 0.99998 AND TIED TO THE TGRN. ALL ELEVATIONS ARE REFERENCED TO THE NAVD 1988.

STATE OF TENNESSEE DEPARTMENT OF TRANSPORTATION

PROPOSED LAYOUT

STA.98+00 TO STA.111+00
SCALE: 1"=50'

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