I-270 North Route H/Riverview Drive Interchange Access Justification Report Update

Presented to: MoDOT and FHWA

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Job #: J613020C

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An Access Justification Report (AJR) update has been prepared for the Route H/Riverview Drive Interchange within the I-270 North project in North County St. Louis, MO. A new Chain of Rocks Mississippi River bridge will be reconstructed south of the existing structure. The original corridor-wide Environmental Assessment/Finding of No Significant Impact (EA/FONSI) and AJR assumed this bridge to be reconstructed in its existing location, so slight changes to the Route H/Riverview Drive interchange geometrics are required to accommodate the new bridge location. Geometric changes to the original design presented in the approved EA/FONSI and AJR include 1) shifting the eastbound I-270 ramp terminal intersection 90-feet south, 2) increasing ramp terminal intersection spacing on Route H/Riverview Drive and 3) a slight realignment of I-270 mainline at Route H/Riverview Drive to mitigate traffic impacts during construction. In addition, the ramp terminal intersections are proposed to be signalized as part of this project.

The first submissions of the I-270 North EA/FONSI and AJR were completed in November of 2016 and approved in April of 2017. The purpose and need identified for I-270 North is to address the aging infrastructure along I-270, improve mobility and operations within the I-270 corridor, achieve accessibility consistent with the designated uses of I-270, and improve safety within the I-270 corridor. The project limits for these reports are from I-70 to the Chain of Rocks Bridge. There are two projects in the study area currently programmed in the Missouri State Transportation Improvement Program (STIP): J6I3020B to address I-270 between Lindbergh Boulevard and Bellefontaine Road and J613020C to address the I-270 and Route H/Riverview Drive interchange in conjunction with the IDOT Chain of Rocks Mississippi River Bridge reconstruction and widening project (P-98-001-15/P-98-001-18).

The first project (J6I3020B) was awarded as a design-build project to Millstone Weber in November of 2019. The project implements new interchange configurations, I-270 widening, and improvements to the outer roads from Lindbergh Boulevard to Bellefontaine Road. The re-evaluation of the EA/FONSI for the design-build project was submitted by MoDOT and approved by FHWA on December 10, 2019. An updated AJR for changes proposed by the design-build team was submitted and approved on March 26, 2020. The design-build project

was referred to as the "Preliminary Design" throughout the AJR re-evaluation. The "Preliminary Design" will be used to refer to the design-build project throughout this document as well.

The second funded project (J613020C) is the Route H/Riverview Drive interchange project discussed throughout this document. Slight changes are proposed at the Route H/Riverview Drive interchange due to the shift in the I-270 Chain of Rocks Bridge alignment, creating the need for this AJR update. At the Missouri Abutment, C/L shift in bridge alignment from existing is 81-feet south, as the existing baselines diverge going west. The EB baseline maximum shift from existing is 78-feet North and the WB baseline maximum shift from existing is 76-feet South. We are proposing the same basic interchange design presented in the approved EA/FONSI with the eastbound I-270 ramp terminal shifted 90-feet south, slight realignment of I-270 mainline to tie into the new Chain of Rocks Mississippi River bridge, and signalization of the ramp terminals. In preparing the final design for this interchange, slight changes to acceleration and deceleration lanes on I-270 to/from Route H/Riverview Drive were also made due to the new alignments and bridge abutment locations. The proposed deceleration lanes lengths and ramp lengths were first determined using guidelines from the MoDOT EPG Section 234.2 "Diamond Interchanges" and Tables 10-5 and 10-6 in Chapter 10 of the AASHTO "A Policy on Geometric Design of Highway and Streets" (2018, 7th Edition). The lengths of the deceleration lanes and ramp lengths were then verified with traffic modeling. **Table 1** shows the difference in geometric changes at the Route H/Riverview Drive interchange compared to existing, the design in the approved EA/FONSI, and our proposed design in this Route H/Riverview Drive update.

TABLE 1 GEOMETRIC CHANGES TO I-270 AND ROUTE H/RIVERVIEW DRIVE INTERCHANGE

	Existing	Approved EA/FONSI	Riverview Update	Difference between Approved EA/FONSI and Riverview Update
Interchange Type	Diamond	Diamond	Diamond	
Eastbound I-270 On-Ramp Acceleration Lane Length	780'	1040'	975'	-65'
Eastbound I-270 Off-Ramp Deceleration Lane Length	740'	690'	760'	+70'
Westbound I-270 On-Ramp Acceleration Lane Length	485'	950'	865'	-85'
Westbound I-270 Off-Ramp Deceleration Lane Length	780'	885'	760'	-125'
Distance between Dunn Road Intersection and Westbound I-270 Ramp Terminal	340'	340'	340'	0'
Distance between I-270 Ramp Terminals	380'	380'	470'	+90'
Eastbound I-270 Ramp Terminal Intersection Control	Side-Street Stop	Side-Street Stop	Signal	
Westbound I-270 Ramp Terminal Intersection Control	All-Way Stop	All-Way Stop	Signal	

As shown, the changes are minor with most changes less than 100-feet compared to the approved EA/FONSI design with the exception of the westbound I-270 off-ramp which is 125-feet shorter. The proposed changes have minimal impact to traffic operations and safety.

Table 2 outlines the Riverview Drive/Route H Interchange design criteria standards. Drawings of the proposed Route H/Riverview Drive interchange in both the interim and full-build conditions can be found in **Appendix 1**.

This AJR update builds on top of the AJR update approved by FHWA in March 2020 for the Preliminary Design from the I-270 North Design-Build project. We used the VISSIM models prepared for the Preliminary Design as a base for this AJR update and followed the same process throughout this AJR update as was approved by FHWA for the I-270 North Design-Build project. The interchange at Route H/Riverview Drive was analyzed under two scenarios: 2020 Interim Build and 2040 Full Build.

The full Route H/Riverview Drive interchange will be constructed in coordination with the Chain of Rocks Mississippi River Bridge. Until widening occurs between Lilac Avenue and Route H/Riverview Drive Interchange, the Route H/Riverview Drive Interchange will be striped in an interim condition with only four mainline I-270 lanes through the interchange to maintain lane balance west of the river. Likewise, the new Mississippi River bridge will be striped with four through lanes and two auxiliary lanes. The auxiliary lanes on the Chain of Rocks Mississippi River Bridge will be picked up/dropped off at the Route H/Riverview Drive ramps on the east side of the interchange. The four basic lanes on the bridge will tie into the existing four lane section west of the limits of the project. The tapers on the ramps on the west side of the interchange will remain the same between the interim and full build conditions. The ramp tapers on the east side of the interchange will differ between the interim and full build conditions since these will feed directly from the additional lanes on the Chain of Rocks Mississippi River Bridge in the interim condition.

The 2020 Interim Build condition also assumes proposed geometrics from the Preliminary Design from the I-270 North Design-Build project. Approximately two miles west of the Riverview Drive project, construction on the I-270 North project began in April of 2020 and is anticipated to be completed in 2023, before the Route H/Riverview Drive interchange and Chain of Rocks Bridge Mississippi River Bridge reconstruction and widening project. Existing conditions are maintained for all areas which are not being altered with this project or the design-build project. The purpose of evaluating the 2020 Interim Build scenario is to show how the project will perform on opening day when construction is complete.

The 2040 Full Build includes the proposed full-build geometrics at the Route H/Riverview Drive interchange with six basic lanes on I-270 through the interchange. I-270 will accommodate six through lanes over the river bridge and through the limits of the Riverview Drive improvement utilizing all previously constructed pavement through revisions in striping. The ramps on the west side of the interchange will remain the same between interim and full build conditions. The ramps on the east side of the interchange will both be shortened to accommodate tying into the third through lane rather than continuing as an auxiliary lane.

TABLE 2 I-270 RIVERVIEW DRIVE INTERCHANGE IMPROVEMENTS DESIGN STANDARDS				
Based on AASHTO's "A Policy on Geometric Design of Highways and Streets" (2018)	**INTERSTATE 270**	**I-270 RAMPS**	**RIVERVIEW DRIVE/ROUTE H**	**COMMENTS**
Geometrics				
Functional Classification	Interstate	Interstate (Ramp)	Minor Arterial	
Average Daily Traffic (2040)	72,000 (both directions)	Varies	19,000	
Design Speed/Posted Speed	60 mph	45 mph	40 mph	
Clear Zone	30'	16'	14'	
Typical Section				
Lane Width	12'	14'	12'	
Lane Cross Slope	2%	2%	2%	
Shoulder	10'	8' outside/4' inside	8'	
Shoulder Cross Slope	2%	2%	2%	
Superelevation	8% max	8% max	8% max	
Sidewalk Width	---	---	6'	
Foreslope in Clear Zone	6:1	6:1	6:1	
Foreslope out of Clear Zone	3:1	3:1	3:1	
Backslope	3:1	3:1	3:1	
Ditch Width x Depth	8' x 4' [(1)]	8' x 2' [(1)]	8' x 4' [(1)]	[(1)] Typical Width and Depth may be less to save R/W
Minimum Radius Horizontal Curves	1200'	587'	444'	
Gradient (% Max.)	4%	5%	7%	
Stopping Sight Distance (Min.)	570'	360'	305'	
Sag Vertical Curve (K Value)	136	79	64	
Crest Vertical Curve (K Value)	151	61	44	
Bridge (for I-270 over Riverview Drive/Route H)				
Design Live Loading	HL93			
Bridge Clearance	15'-6"			
Horizontal	30'			
Vertical	15'-6"			
Gutter Flow Spread	---			
Bridge Width	58'-8"			
Hydrology and Hydraulics	---			
Design Specifications	2011 AASHTO LRFD Bridge Design Specifications (6th Edition) and 2013 Interim Revisions			
Load Rating/Posting	Legal Loads			
Curbs and Railings	Type D			
Bridge Approach Slabs	Yes			
Lighting	To be determined	To be determined	To be determined	
Drainage Design [(2)]				[(2)] These standards come from the MoDOT Engineering Policy Guide
Cross Road Structures				
Design Storm Boxes (Crossing)	1' Below Shoulder 100 Yr	1' Below Shoulder 100 Yr	1' Below Shoulder 25 Yr	
Design Storm Pipes (Crossing)	1' Below Shoulder 50 Yr	1' Below Shoulder 50 Yr	1' Below Shoulder 10 Yr	
Less than 200 acres	Rational	Rational	Rational	
Greater than 200 acres	USGS Regression	USGS Regression	USGS Regression	
Minimum pipe size	18"	18"	18"	
Type of pipe	Group A	Group A	Group A	
Design Storm Pavement	10 Yr On-Grade, 10 Yr Sag	10 Yr On-Grade, 10 Yr Sag	10 Yr On-Grade, 10 Yr Sag	
Gutter Flow Spread [(3)]	Shoulder or 12' Maximum	Shoulder or 12' Maximum	Shoulder + 1/2 lane [(4)]	[(3)] 640.1.2.2 [(4)] Posted speed is less than or equal to 45mph
Depth of Gutter Flow (6" Curb) [(5)]	0.4'	0.4'	0.4'	[(5)] 640.1.2.3
Any deviations from this chart will require a design exception.				

The 2040 Full-Build scenario also includes all other improvements from the Preferred Alternative submitted in the original AJR, the design-build project, and any committed Long-Range Transportation Plan projects outside of this project. The purpose of evaluating this scenario is to illustrate how theI-270 North Corridor will perform in its final configuration. In other words, this scenario illustrates how the improvements will function as a part of and in conjunction with plans for the overall reconstruction of the I-270 North corridor as described in the approved EA/FONSI and AJR and updates.

The traffic and safety analyses completed for this update prove that the proposed changes will operate well in both the interim and full build condition. The freeway, outer road intersections, and ramp terminals operate at LOS D or better in the AM and PM peak periods under 2020 conditions and LOS C or better in 2040 conditions. The fatal and disabling injury crashes along the freeway near Route H/Riverview Drive are expected to be reduced by 4% over a 20-year period with the proposed Route H/Riverview Drive interchange design compared to no-build. Predicted total crashes on the I-270 mainline near the Route H/Riverview Drive interchange are expected to be reduced by 16%. These metrics are consistent with the Corridor Wide Performance Measures submitted in the EA/FONSI re-evaluation for this project.

Multiple sections of the AJR are updated in this document as a result of the proposed changes at the Route H/Riverview Drive interchange. Any tables which are updated from the original AJR kept the same table number for reference. There are several new tables included in this document with supplemental information and are numbered consecutively starting from 1 within this document. Updated sections of the AJR included in this document are:

1.4 Proposed Action;
2.2.4 Route H/Riverview Drive Interchange Update;
2.3 Operations and Safety Analysis;
2.4.2 Design Criteria;
2.8.2 Social and Environmental Overview;
2.8.3 Conclusion; and
2.9 Conclusion.

1.4 Proposed Action

The Chain of Rocks Mississippi River bridge is being reconstructed immediately south of the existing structure. This results in some slight mainline 270 realignment. At Missouri Abutment C/L shift from existing is 81-feet south, as the existing baselines diverge going west. The EB baseline maximum shift from existing is 78-feet North and the WB baseline maximum shift from existing is 76-feet South. This realignment moves the eastbound I-270 ramp terminal 90-feet south of its existing location. Proposed actions from the Preferred Alternative in areas not included in the Route H/Riverview Drive design area are not precluded due to this design.

The full Route H/Riverview Drive interchange will be constructed in coordination with the Chain of Rocks Mississippi River Bridge. Until widening occurs between Lilac Avenue and Route H/Riverview Drive Interchange, the Route H/Riverview Drive Interchange will be striped in an interim condition with only four mainline I-270 lanes through the interchange to maintain lane balance west of the river and the new Mississippi River bridge will be striped with four

through lanes and two auxiliary lanes. This is the cleanest and most driver intuitive way to transition from a four lane to six lane section. Once the widening between Lilac Avenue and Route H/Riverview Drive occurs, the Route H/Riverview Drive interchange will be restriped for the full six lane configuration.

In Area 4: Old Halls Ferry Road to Chain of Rocks Bridge

- At Route H/Riverview Drive interchange, modify existing diamond interchange (extend ramps when bridge is replaced)
- Slight changes to ramp lengths and acceleration and deceleration lanes compared to the design from the approved EA/FONSI (most are less than 100-feet different except for the westbound on-ramp acceleration lane, see **Table 1**)
- Increased ramp terminal spacing of 90-feet
- Signalize Route H/Riverview Drive ramp terminal intersections
- No proposed changes west of Route H/Riverview Drive interchange

Addresses Major Elements 1, 2, 3, 5, 6, and 9 from the Purpose and Need Section 1.3.

2.2.4 Route H/Riverview Drive Interchange Update

The Chain of Rocks Mississippi River bridge is being reconstructed immediately south of the existing structure. This results in some slight mainline 270 realignment and moves the eastbound I-270 ramp terminal 90-feet south of its existing location. Proposed actions from the Preferred Alternative in areas not included in the proposed Route H/Riverview Drive design area are not precluded due to this design.

The full Route H/Riverview Drive interchange will be constructed in coordination with the Chain of Rocks Mississippi River Bridge. Until widening occurs between Lilac Avenue and Route H/Riverview Drive Interchange, the Route H/Riverview Drive Interchange will be striped in an interim condition with only four mainline I-270 lanes through the interchange to maintain lane balance west of the river and the new Mississippi River bridge will be striped with four through lanes and two auxiliary lanes. This is the cleanest and most driver intuitive way to transition from a four lane to six lane section. Once the widening between Lilac Avenue and Route H/Riverview Drive occurs, the Route H/Riverview Drive interchange will be restriped for the full six lane configuration.

In Area 4: Old Halls Ferry Road to Chain of Rocks Bridge

- Reconstruct Route H/Riverview Drive interchange as a diamond interchange with extended ramp speed-change lanes (when Chain of Rocks Bridge is replaced)
- Slight changes to ramp lengths and acceleration and deceleration lanes compared to the design from the approved EA/FONSI (most are less than 100-feet different except for the westbound on-ramp acceleration lane, see **Table 1**)
- Increased ramp terminal spacing of 90-feet
- Signalize Route H/Riverview Drive ramp terminal intersections
- No proposed changes west of Route H/Riverview Drive interchange

Drawings of the proposed Route H/Riverview Drive interchange in both the interim and full-build conditions can be found in **Appendix 1**.

2.2.6 Conclusion

Route H/Riverview Drive Interchange Update- The Route H/Riverview Drive interchange has been slightly adjusted due to the realignment of the Chain of Rocks Mississippi River Bridge to the south. As outlined previously in **Table 1**, there are slight geometric changes to the ramp lengths and acceleration/deceleration lanes compared to the Preferred Alternative from the first EA/AJR submission. Most adjustments are less than 100-feet difference from the original design proposed in the first EA/FONSI submission. The one exception is the westbound off-ramp deceleration lane is 125-feet shorter than the approved EA/FONSI design. The intersection spacing between the ramp terminals is also adjusted with an increase of 90-feet. The geometric changes are anticipated to result in minimal impact to operations and safety. Proposed actions from the Preferred Alternative in areas not included in the Route H/Riverview Drive interchange design are not precluded due to this design.

2.3 Operations and Safety Analysis

The traffic operations of the interchange at Route H/Riverview Drive were analyzed under two scenarios: 2020 Interim Build and 2040 Full Build.

The full Route H/Riverview Drive interchange will be constructed in coordination with the Chain of Rocks Mississippi River Bridge. Until widening occurs between Lilac Avenue and Route H/Riverview Drive Interchange, the Route H/Riverview Drive Interchange will be striped in an interim condition with only four mainline I-270 lanes through the interchange to maintain lane balance west of the river and the new Mississippi River bridge will be striped with four through lanes and two auxiliary lanes. The auxiliary lanes on the Chain of Rocks Mississippi River Bridge will be picked up/dropped off at the Route H/Riverview Drive ramps on the east side of the interchange. The four basic lanes on the bridge will ultimately tie into the existing four lane section west of the limits of the project. The tapers on the ramps on the west side of the interchange will remain the same between the interim and full build conditions. The ramp tapers on the east side of the interchange will differ between the interim and full build conditions since these will feed directly from the additional lanes on the Chain of Rocks Mississippi River Bridge in the interim condition.

The 2020 Interim Build condition also assumes proposed geometrics from the Preliminary Design from the I-270 North Design-Build project. Approximately two miles west of the Riverview Drive project, construction on the I-270 North project began in April of 2020 and is anticipated to be completed in 2023, before the Route H/Riverview Drive interchange/Chain of Rocks Bridge Mississippi River Bridge reconstruction and widening project. Existing conditions are maintained for all areas which are not being altered with this project or the design-build project. The purpose of evaluating the 2020 Interim Build scenario is to show how the project will perform on opening day when construction is complete.

The 2040 Full Build includes the proposed full-build geometrics at the Route H/Riverview Drive interchange with six basic lanes on I-270 through the interchange. I-270 will accommodate six through lanes over the river bridge and through the limits of the Riverview Drive improvement utilizing all previously constructed pavement through revisions in striping. The tapers on the ramps on the west side of the interchange will remain the same between the

interim and full build conditions. The ramps on the east side of the interchange will both be shortened to accommodate tying into the third through lane rather than continuing as an auxiliary lane. The 2040 Full-Build scenario also includes all other improvements from the Preferred Alternative submitted in the original AJR, the design-build project, and any committed Long-Range Transportation Plan projects outside of this project. The purpose of evaluating this scenario is to illustrate how the I-270 North Corridor will perform in its final configuration. In other words, this scenario illustrates how the improvements will function as a part of and in conjunction with plans for the overall reconstruction of the I-270 North corridor as described in the approved EA/FONSI and AJR and updates.

Existing and future forecasted traffic volumes at the Route H/Riverview Drive Interchange were adjusted in the VISSIM models for both scenarios to account for updated traffic counts and to include planned developments. 24-hour weekday traffic counts collected in June of 2016 on Route H/Riverview Drive at the I-270 ramp terminals and the intersection of Dunn Road were provided by IDOT. CBB also collected 24-hour weekday traffic counts at the I-270 ramp terminals at Route H/Riverview Drive in February of 2019 to validate the provided counts. The AM peak hour occurred between 7:15 AM and 8:15 AM and the PM peak hour occurred between 4:15 PM and 5:15 PM. Existing traffic volumes can be viewed in **Appendix 2.**

The proposed Pier Development located on the east side of Route H/Riverview Drive just north of the I-270 interchange (see **Figure 1**) is anticipated to draw over 1,000 additional vehicles in the peak hours once fully developed.

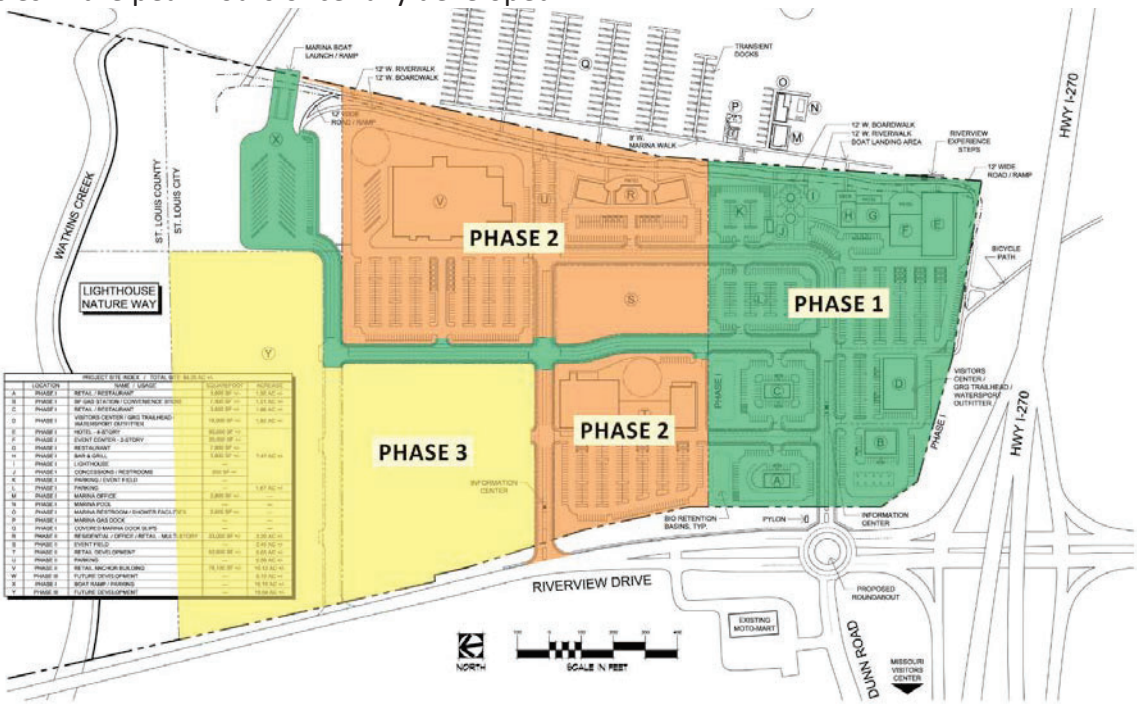

FIGURE 1 PIER DEVELOPMENT CONCEPT SITE PLAN (PROVIDED BY OTHERS)[1]

[1] This is an illustrative site plan from the Traffic Impact Study Report. The roadway improvement shown in this drawing are not final and are subject to change based on MoDOT's Traffic Impact Study and permitting process.

Generated traffic volumes from the *Pier St. Louis Traffic Impact Study* prepared in August of 2016 were added to the VISSIM models to ensure that the new interchange would be able to accommodate future development. This study assumed the site entrance across from Dunn Road would serve as the main entrance to the development. The traffic forecasts presented in the I-270 AJR did not include these additional trips. As such, the volumes in this study headed to and from Route H/Riverview Drive north of I-270 are considerably higher than those used in the previous I-270 North AJR submissions. Volumes at the Route H/Riverview Drive interchange with the full build-out of the Discovery Pier development are shown in **Appendix 2**.

In general, the traffic operations provided in this update are slightly degraded as compared to results from the Preliminary Design AJR update because the traffic volumes have been increased at the interchange in this AJR update to better reflect known conditions. To handle the additional volumes, the ramp terminals will be signalized as part of this project. With the signalization of the ramp terminals, the interchange operates at LOS D or better in the AM and PM peak periods under 2020 conditions and LOS C or better in 2040 conditions.

Interim Build Traffic Operations

The I-270 and Route H/Riverview Drive interchange operates well under 2020 volumes, with average vehicular densities below 28 pc/mi/ln and average speeds above 60 mph. With the reconstruction and widening of the Chain of Rocks Mississippi River bridge and signalization of the ramp terminals, operations at the I-270 and Route H/Riverview Drive interchange are improved compared to Preliminary Design results. The freeway operates at LOS D or better and the ramp terminal intersections operate at LOS C or better in the AM and PM peak periods as it does under the Preliminary Design.

In the AM peak period, all segments on eastbound I-270 operate at LOS B or better and westbound I-270 operates at LOS D or better. Changes in LOS on I-270 in the AM peak period compared to the Preliminary Design results are:

- Eastbound I-270 between Route H/Riverview Dr Ramps changed from LOS A to LOS B;
- Eastbound I-270 between Route H/Riverview Dr and Route 3 improved from LOS B to LOS A;
- Eastbound I-270 Route 3 SB off-ramp improved from LOS B to LOS A;
- Westbound I-270 Route 3 off-ramp improved from LOS C to LOS B;
- Westbound I-270 Route 3 NB on-ramp improved from LOS C to LOS B;
- Westbound I-270 Route 3 SB on-ramp improved from LOS D to LOS B;
- Westbound I-270 between Route H/Riverview Dr and Route 3 improved from LOS C to LOS B;
- Westbound I-270 between Lilac Ave and Route H/Riverview Dr changed from LOS C to LOS D; and
- Westbound I-270 between Lilac Ave ramps changed from LOS C to LOS D.

We see an improvement in level of service on I-270 between Route H/Riverview Drive and IL Route 3 since this project includes the Chain of Rocks Mississippi River bridge widening from 4 to 6 lanes, whereas this widening is not included in the Preliminary Design Interim build conditions. In the interim condition, the bridge will have four basic lanes and two auxiliary lanes until widening on I-270 between Lilac Avenue and Route H/Riverview Drive occurs. The changes in level of service on eastbound I-270 between the Route H/Riverview Drive ramps and on westbound I-270 between Lilac Avenue and Route H/Riverview Drive and between the Lilac Avenue ramps are caused by the slight adjustment in volumes to better reflect existing volumes. The level of service at the segments were already at the threshold value (≥11.0 for LOS B and ≥26.0 for LOS C), so the slight change in volumes pushed the level of service over to the next category. Overall the proposed changes to the Route H/Riverview Drive interchange with the Chain of Rock Mississippi River bridge widening improves level of service on I-270 in the AM peak under 2020 volumes.

In the PM peak period, all segments on eastbound I-270 operate LOS D or better and westbound I-270 operates LOS B or better. Changes in LOS in I-270 in the PM peak period compared to the Preliminary Design results are:

- Eastbound I-270 between Lilac Ave and Route H/Riverview Drive changed from LOS C to LOS D;
- Eastbound I-270 Route H/Riverview Drive on-ramp improved from LOS C to LOS B;
- Eastbound I-270 between Route H/Riverview Drive and Route 3 improved from LOS D to LOS B;
- Eastbound I-270 Route 3 SB off-ramp improved from LOS C to LOS B;
- Westbound I-270 Route 3 NB on-ramp changed from LOS A to LOS B;
- Westbound I-270 Route 3 SB on-ramp improved from LOS B to LOS A;
- Westbound I-270 between Route H/Riverview Drive and Route 3 improved from LOS B to LOS A; and
- Westbound I-270 Route H/Riverview Drive off-ramp improved from LOS B to LOS A.

Again, we see an improvement in level of service between Route H/Riverview Drive and IL Route 3 due to the Chain of Rocks bridge widening. The change in level of service on eastbound I-270 between Lilac Avenue and Route H/Riverview Drive can be attributed to the adjustment in volumes to better match existing volumes. This segment was at LOS C threshold density of 26.0 pc/mi/ln, so the slight increase in volume pushed the density to 26.4 pc/mi/ln over the threshold to LOS D. Overall the proposed changes to the Route H/Riverview Drive interchange with the Chain of Rock bridge widening improves level of service on I-270 in the PM peak under 2020 volumes. The freeway levels of service of the Route H/Riverview Drive update compared to the Preliminary Design are provided in **Appendix 3**.

At the ramp terminal intersections, all intersections operate at LOS C or better for Lilac Avenue, Route H/Riverview Drive, and IL Route 3 in the AM and PM peak periods in 2020. The ramp terminals at the I-270 and Route H/Riverview Drive interchange will be signalized to address queuing and operational concerns. The intersection at Dunn Road is kept as side-street stop in the Interim condition. In the future, this intersection control will likely need to be

changed to accommodate the Pier development, as discussed further under Future Build Traffic Operations.

The only changes in intersection level of service outside of Route H/Riverview Drive from the Preliminary Design occur at the intersection of Lilac Avenue and Dunn Road. The level of service in the AM peak hour slightly improved from LOS B to LOS A. The delay slightly decreased from 10.1 s to 9.9 s changing the level of service. Overall the intersections at Lilac Avenue and IL Route 3 operate very closely to the Preliminary Design results in both the AM and PM peak periods.

The intersections at Route H/Riverview Drive are improved with the signalization of the ramp terminals. The ramp terminals and the intersection with Dunn Road operates at LOS A in both the AM and PM peak periods. We see an improvement at the westbound I-270 ramp terminal in the PM peak period, increasing from LOS C from the Preliminary Design results to LOS A with the Route H/Riverview Drive update. All three intersections operate with minimal queues and delays, as shown in **Table 3**. Max queues from the eastbound off-ramp is 100-feet and 200-feet from the westbound off-ramp in the AM and PM peak periods, showing there is sufficient storage from the ramps to prevent queueing onto the interstate and the deceleration lane lengths are sufficient from AASHTO standards.

TABLE 3 2020 ROUTE H/RIVERVIEW DR INTERSECTION LEVELS OF SERVICE

VISSIM Levels of Service I-270 & Route H/Riverview Drive Interchange 2020 Interim Build										
Approach	**2020 AM Peak**				**Approach**	**2020 PM Peak**			
	LOS	**Delay**	**Ave. Queue**	**Max Queue**		**LOS**	**Delay**	**Ave. Queue**	**Max Queue**
Riverview Drive & I-270 East Ramp Terminal (Signal)					***Riverview Drive & I-270 East Ramp Terminal (Signal)***				
Eastbound	A	6.53	7'	93'	Eastbound	A	8.88	9'	100'
Northbound	A	6.81	1'	80'	Northbound	B	10.60	7'	212'
Southbound	A	1.29	1'	61'	Southbound	A	2.65	1'	60'
Overall	**A**	**5.11**	--	--	**Overall**	**A**	**8.78**	--	--
Riverview Drive & I-270 West Ramp Terminal (Signal)					***Riverview Drive & I-270 West Ramp Terminal (Signal)***				
Northbound	A	3.30	2'	73'	Northbound	A	3.97	6'	191'
Westbound	B	18.32	23'	202'	Westbound	B	16.78	11'	135'
Southbound	A	2.67	2'	61'	Southbound	A	4.21	2'	68'
Overall	**A**	**8.12**	--	--	**Overall**	**A**	**5.74**	--	--
Riverview Drive & Dunn Road (Side-Street Stop)					***Riverview Drive & Dunn Road (Side-Street Stop)***				
Northbound	A	1.00	0'	49'	Northbound	A	0.76	0'	46'
Eastbound	A	8.43	11'	145'	Eastbound	A	8.17	10'	133'
Southbound	A	0.14	0'	0'	Southbound	A	0.58	0'	31'
Overall	**A**	**2.90**	--	--	**Overall**	**A**	**2.31**	--	--

Overall the geometric modifications at Route H/Riverview Drive and the reconstruction and widening of the Chain of Rocks Mississippi River bridge improves operations in the Interim Condition compared to the Preliminary Design. The intersection levels of service for the I-270 and Route H/Riverview Interchange update compared to the Preliminary Design are provided in **Appendix 3**.

Future Build Traffic Operations

The I-270 and Route H/Riverview Drive Interchange operates well under 2040 volumes. With the increase volumes from nearby developments, the 2040 results are slightly degraded as compared to the previous Preliminary Design AJR submission. However, with the signalization of the ramp terminals and extension of acceleration lanes, the freeway and ramp terminal intersections operate at LOS C or better in both the AM and PM peak periods. These results are better than the 2020 Interim condition since the interchange is assumed to be restriped to the full six basic lanes through the Route H/Riverview Drive interchange by 2040.

In the AM peak period, all segments of I-270 operate at LOS C or better as they did with the Preliminary Design. A few segments were pushed over the threshold from a LOS B to LOS C due to increased traffic forecasts from anticipated development as compared to the Preliminary Design models. These segments are:

- Eastbound I-270 between Bellefontaine Road and Lilac Avenue;
- Westbound I-270 between IL Route 3 Ramps; and
- Westbound I-270 southbound IL Route 3 On-Ramp.

All vehicle speeds on I-270 in the AM peak period are 60 mph or higher, showing the proposed geometrics at the Route H/Riverview interchange are able to handle forecasted volumes well.

In the PM peak period, all segments of I-270 still operate at LOS C or better as they did with the Preliminary Design. Again, a few segments were pushed over the threshold from LOS B to LOS C due to the volume increased traffic forecasts from anticipated development as compared to the Preliminary Design models. These segments are:

- Eastbound I-270 between Lilac Ave and Route H/Riverview Drive;
- Eastbound I-270 IL Route 3 northbound Off-Ramp;
- Eastbound I-270 IL Route 3 On-Ramp; and
- Westbound I-270 between Lilac Avenue and Route H/Riverview Drive.

As with the AM peak, all vehicle speeds on I-270 in the PM peak period are 60 mph or higher, showing the geometrics at the I-270 and Route H/Riverview Drive interchange are able to handle forecasted volumes well.

I-270 west of the Chain of Rocks Mississippi River Bridge operates at better levels of service in the full build condition compared to the interim build condition since the freeway will have six basic lanes in the full build compared to four basic lanes in the interim build. The freeway levels of service of the Route H/Riverview Drive Update compared to the Preliminary Design are provided in **Appendix 3**.

At the ramp terminal intersections, all intersections operate at LOS C or better for Lilac Avenue, Route H/Riverview Drive, and IL Route 3 in the AM and PM peak periods in 2040. The Dunn Road and Route H/Riverview Drive intersection is assumed to be signalized under the full-build condition to accommodate traffic volumes for the Pier development. A roundabout has also been considered at the intersection of Route H/Riverview Drive and Dunn Road. The final intersection control at Dunn Road will be decided upon through MoDOT's traffic impact study and permitting process. The ultimate intersection control at Dunn Road will be developed to work with the I-270 interchange design.

Only the intersections on Route H/Riverview Drive are impacted by the modified geometrics at the Route H/Riverview Drive interchange with I-270 outlined in **Table 1**. The intersections of Lilac Avenue and the ramp terminal, Lilac Avenue and the outer roads, and IL Route 3 and the ramp terminals operate at the same level of service outputted by the Preliminary Design models in both peak periods.

At Route H/Riverview Drive, the level of service at the ramp terminals is changed from LOS A to LOS B in the AM peak period due to the increased volumes from anticipated development, see **Table 4**.

TABLE 4 2040 ROUTE H/RIVERVIEW DR INTERSECTION LEVELS OF SERVICE

VISSIM Levels of Service I-270 & Route H/Riverview Drive Interchange 2040 Full Build										
Approach	**2040 AM Peak**				**Approach**	**2040 PM Peak**			
	LOS	**Delay**	**Ave. Queue**	**Max Queue**		**LOS**	**Delay**	**Ave. Queue**	**Max Queue**
Riverview Drive & I-270 East Ramp Terminal (Signal)					***Riverview Drive & I-270 East Ramp Terminal (Signal)***				
Eastbound	B	19.56	82'	520'	Eastbound	C	23.16	65'	402'
Northbound	B	14.34	12'	195'	Northbound	C	31.53	93'	604'
Southbound	A	4.02	4'	91'	Southbound	B	10.29	22'	252'
Overall	**B**	**13.77**	--	--	**Overall**	**C**	**22.51**	--	--
Riverview Drive & I-270 West Ramp Terminal (Signal)					***Riverview Drive & I-270 West Ramp Terminal (Signal)***				
Westbound	B	14.32	45'	256'	Westbound	C	21.36	34'	212'
Northbound	B	10.71	21'	222'	Northbound	B	10.19	39'	269'
Southbound	A	4.86	7'	121'	Southbound	B	10.34	48'	332'
Overall	**B**	**10.24**	--	--	**Overall**	**B**	**11.59**	--	--
Riverview Drive & Dunn Road (Signal)					***Riverview Drive & Dunn Road (Signal)***				
Westbound	C	28.52	26'	215'	Westbound	C	30.51	30'	229'
Northbound	A	4.13	12'	176'	Northbound	A	4.06	8'	134'
Eastbound	C	20.50	24'	190'	Eastbound	C	22.34	24'	201'
Southbound	A	7.67	7'	120'	Southbound	B	14.74	43'	358'
Overall	**A**	**9.31**	--	--	**Overall**	**B**	**13.13**	--	--

With the signalization of these intersections, the interchange operates well in the AM peak period with minimal queues and delays. Max queues from the eastbound off-ramp are 520-feet and 250-feet from the westbound off-ramp, showing there is sufficient storage from the ramps to prevent queueing onto the interstate and the deceleration lane lengths are sufficient from AASHTO standards.

In the PM peak hour, the intersections on Route H/Riverview Drive operate at LOS C or better. Comparing to the Preliminary Design model results, the LOS at the 270 East ramp terminal is changed from LOS B to LOS C, the LOS at the 270 West ramp terminal is improved from LOS C to LOS B, and the LOS at the intersection of Dunn Road is changed from LOS A to LOS B. This is due to the increase in volumes from anticipated development. It is apparent that the signals are able to handle these added volumes. From **Table 4**, the delays and queues are minimal. The eastbound off-ramp max queues extend 400-feet and westbound off-ramp max queues extend 200-feet in the PM peak, showing there is sufficient storage from the ramps to prevent queueing onto the interstate and the deceleration lane lengths are sufficient from AASHTO standards.

The intersection levels of service for the Route H/Riverview Drive Interchange update compared to the Preliminary Design are provided in **Appendix 3**.

System Area Measures of Effectiveness

The network measures of effectiveness (MOEs) were collected from the interim build VISSIM models for the AM and PM peak hours. The interim build MOEs were compared to the MOE's presented by the Preliminary Design in the previous AJR update. From **Table 5**, the Route H/Riverview Drive Update results are very comparable to the Preliminary Design results. The slight differences are due to the volume adjustments made to the model to reflect more updated traffic counts and the stochastic nature of VISSIM models. Most MOE's saw less than 1% change, except VHD in the AM increased 1.6% and decreased in the PM by 1.2%.

TABLE 5
2020 Network MOEs Summary for all Alternatives

		Alternative			
	Network Measures of Effectiveness	2013 Existing	2018 Existing	2020 Preliminary Design Interim Build	2020 Riverview Update Interim Build
AM Peak	Vehicle Miles Traveled (VMT)	382,443	390,756	397,602	397,330
	Vehicle Hours Traveled (VHT)	8,360	8,453	8,086	8,100
	Vehicle Hours of Delay (VHD)	1,733	1,694	1,181	1,200
	Average Speed (mph)	45.7	46.2	49.2	49.1
PM Peak	Vehicle Miles Traveled (VMT)	418,247	411,653	421,212	422,283
	Vehicle Hours Traveled (VHT)	9,658	9,748	9,332	9,323
	Vehicle Hours of Delay (VHD)	2,305	2,516	1,874	1,852
	Average Speed (mph)	43.3	42.2	45.1	45.3

Source: VISSIM

Table 2.3-1 shows the 2040 Network MOE's for the Route H/Riverview Update compared to the results presented by the Preliminary Design in the previous AJR update. Since over 1,000 vehicles were added to the 2040 AM and PM Route H/Riverview update models which were not included in the previous models, we see an increase in the MOE's up to 2.3%. Since the total number of vehicles are increased, vehicle miles traveled see an increase which results in an increase in vehicle hours of delay. The difference between average speeds is negligible. Ultimately, the proposed changes at the Route H/Riverview Drive interchange are minor, and we would expect to see equal or better network performance measures if the volumes were consistent between all models.

From the values provided in Table 2.3-1, the vehicle hours of delay in the entire VISSIM network in 2040 were reduced by 61.3% in the AM peak and 69.6% in the PM peak compared to 2040 No-Build. The average speeds in the entire VISSIM network area in 2040 was increased by 31.2% in the AM peak and 59.0% in the PM peak. As mentioned earlier, the 2040 Route H/Riverview Drive update includes additional volumes that are not included in the 2040 No-Build which impacts these results. These values are consistent with those outlined in the Corridor Wide Performance Measures in the EA/FONSI re-evaluation for this project.

Table 2.3-1
2040 Network MOEs Summary for all Alternatives

		Alternative				
	Network Measures of Effectiveness	**2040 No-Build**	**2040 Preferred Alternative Original AJR**	**2040 Preferred Alternative White Paper**	**2040 Preliminary Design Full Build**	**2040 Riverview Update Full Build**
AM Peak	Vehicle Miles Traveled (VMT)	400,746	443,533	442,322	442,464	452,211
	Vehicle Hours Traveled (VHT)	10,848	8,852	9,188	9,182	9,354
	Vehicle Hours of Delay (VHD)	3,895	1,106	1,518	1,496	1,507
	Average Speed (mph)	36.9	50.1	48.1	48.2	48.4
PM Peak	Vehicle Miles Traveled (VMT)	415,216	493,808	490,671	492,259	500,045
	Vehicle Hours Traveled (VHT)	14,677	10,685	10,905	10,943	11,121
	Vehicle Hours of Delay (VHD)	7,346	1,837	2,202	2,184	2,235
	Average Speed (mph)	28.3	46.2	45.0	45.0	45.0

Source: VISSIM

Conceptual Signage Plan

A conceptual signage plan has been prepared for the Route H/Riverview Drive Update in accordance with the MUTCD and MoDOT EPG. The conceptual signage plan demonstrates that the proposed design can be effectively signed for appropriate way finding on mainline I-270. It can be found in **Appendix 5**.

Future Build Safety Conditions

The proposed changes in the I-270/Riverview Drive interchange results in a similar reduction of crashes on mainline I-270 between Lilac and Route H/Riverview Drive compared to the Preliminary Design in the approved AJR update. The Preliminary Design is predicted to

reduce the total mainline crashes along I-270 near Route H/Riverview Drive by approximately 19%, while the Route H/Riverview Drive update is predicted to reduce total crashes in the same area by approximately 16%.

The Preliminary Design is predicted to reduce the severe crashes along the freeway by 3%, while the implementation of the Route H/Riverview Update is predicted to reduce severe crashes along the freeway by 4%. The Preliminary Design did not evaluate the change in severe crashes for the Route H/Riverview ramps and ramp terminals, while the implementation of the Route H/Riverview Update is predicted to have a small increase (1.5 severe crashes over 20 years) in severe crashes for the Route H/Riverview ramps and ramp terminal. This increase is primarily due to the conversion from stop-controlled terminals to signalized ramps terminals.

The Preliminary Design is not predicted to change the fatal crashes (0%) along the freeway, while the implementation of the Route H/Riverview Update is predicted to reduce fatal crashes by 4% along the freeway. The Preliminary Design did not evaluate the change in fatal crashes for the Route H/Riverview ramps and ramp terminals, while the implementation is not expected to change the fatal crashes for the Route H/Riverview ramp and ramp terminals. These values are consistent with those outlined in the Corridor Wide Performance Measures in the EA/FONSI re-evaluation for this project.

Freeway Analysis

Safety conditions were analyzed using *Highway Safety Manual*. The AASHTO *Highway Safety Manual* (HSM; 1st Edition, 2010) methodologies are the preferred method for predictive safety analysis. The HSM provides guidance for quantifying effects of crash rates resulting from design decisions on a future facility. Crash frequency is defined as the number of crashes occurring on a particular facility in a one-year period. The HSM methodology begins with a comparison of past safety performance and statistical estimates using available Safety Performance Functions (SPFs). There is a lack of research on Interstate facilities in the first edition of the HSM, especially those in urban areas. It is our understanding that research is being gathered and will be included in future editions. The Interchange Statistical Analysis Tool enhanced (ISATe), developed in cooperation with NCHRP, incorporates new research for the freeway system for assessing the safety effects of basic geometric design. ISATe was used in this analysis to evaluate safety along the mainline freeway, freeway ramps and ramp terminals.

Predictive Freeway Analysis

The first submission of the I-270 North EA/FONSI evaluated safety along the mainlines of the freeway using ISATe and the predicted number of crashes, which does not use historical crash data within the study area. **Table 2.3-2** from the I-270 North EA/FONSI shows the predicted number of crashes over 20-years the for the No-Build, Preferred Alternative Original AJR, Preliminary Design, and the proposed Route H/Riverview Update alternatives.

As can be seen in the ***Lilac interchange area***, the Preliminary Design and the Route H/Riverview Drive updated interchange design are predicted to reduce fatal and disabling injury crashes along the mainline as well as the total crashes when compared to the No-Build condition over the 20-year timeframe. The only difference in the predicted number of crashes

between the Preliminary Design and the Route H/Riverview Update is that the traffic volumes are heavier in the Route H/Riverview Update to include traffic for anticipated development at the Route H/Riverview Drive interchange. The predicted crashes are expected to be reduced by approximately 4% for the severe crashes and by approximately 14% for the total crashes when compared to the No-Build condition over 20-year timeframe.

Table 2.3-2

Predicted Number of Crashes on Mainline I-270 (2021 to 2040)

	No-Build[1]		Preferred Alternative Original AJR[1]		Preliminary Design		Riverview Drive Update[2]	
Location	**Total**	**Fatal and Disabling Injury**	**Total**	**Fatal and Disabling Injury**	**Total**	**Fatal and Disabling Injury**	**Total**	**Fatal and Disabling Injury**
Lilac	406	8	330	8	330	8	349	8
Riverview	514	10	416	10	416	10	433	10
River to IL 3	NA	NA	NA	NA	NA	NA	961	21

Source: HSM (ISATe)

[1] No-Build and Preferred Alternative Original AJR conditions show the results of predicted only crashes and do not consider the impacts of Historical crash data

[2] The Riverview Update includes higher traffic volumes along mainline I-270 to account for the build-out of anticipated development near I-270 at Riverview Drive

At the Route H/Riverview Drive ***interchange area***, the Preliminary Design and the updated Route H/Riverview Drive interchange design are very similar, and both are predicted to reduce total crashes as well as the fatal and disabling injury crashes when compared to the No-Build condition over the 20-year timeframe. The proposed changes to the Route H/Riverview Drive interchange include minor modification to the speed change lanes (acceleration/deceleration lanes for the for the Route H/Riverview Drive andI-270), horizontal curvature of the freeway, to the inside/outside shoulder widths, presence and location of barriers and median width. Additionally, the Route H/Riverview Update scenario also includes traffic for the build-out of the "Pier Development" north of I-270 at the Route H/Riverview Drive interchange that was not included in the traffic forecasts assumed for the Preliminary Design. The Route H/Riverview Update in the Route H/Riverview Drive area is predicted to reduce the severe crashes by approximately 4% for and the total crashes by approximately 16% when compared to the No-Build condition over a 20-year timeframe.

The I-270 North project did not document the safety impacts to the next interchange to the east in Illinois (***Illinois Route 3***). The Route H/Riverview Update of this project extended the study area to Illinois Route 3. The freeway section of I-270 from Route H/Riverview Drive to IL Route 3 was assumed to be widened to provide three lanes each direction. The shoulders on the bridge were assumed to be widened to 10-foot, but east of the bridge the shoulders and existing curves would remain similar to the existing condition. The widening of mainline I-270 to 6-lanes from 4-lanes is expected to slightly increase the fatal and severe crashes but reduces

the total number of predicted crashes. The reason for this is that the fatal and injury crash Safety Performance Function (SPF) for a 6-lane freeway is higher than the SPF for a 4-lane Freeway.

Expected Freeway Analysis

The expected number of crashes are generally accepted as a more accurate representation of the future crashes since the expected crashes include historical crash data. In this instance, crash data from 2013 to 2017 in both Missouri and Illinois was utilized to estimate the expected number of crashes for the study area (Lilac Avenue to Illinois Route 3).

A summary of the expected crash results from ISATe over a 20-year period that compares the No-Build scenario to the proposed Route H/Riverview Drive interchange are shown in **Table 6**. The detailed results table is provided in the **Appendix 4.**

The ISATe predicts fatal and disabling injury crashes to be reduced by approximately 4% over a 20-year period on I-270 mainline, with the proposed geometrics at the Route H/Riverview Drive interchange. The total number of crashes are expected to be reduced by approximately 16% over a 20-year period on I-270 mainline.

TABLE 6 EXPECTED NUMBER OF CRASHES ON I-270 MAINLINE (20-YEAR PERIOD)

	NO-BUILD			PRELIMINARY DESIGN			RIVERVIEW UPDATE [1]		
Location (I-270 mainline)	**Fatal & Disabling (K + A)**	**Other (B + C + PDO)**	**Total**	**Fatal & Disabling (K + A)**	**Other (B + C + PDO)**	**Total**	**Fatal & Disabling (K + A)**	**Other (B + C + PDO)**	**Total**
Lilac Avenue	5.6	320.8	326.4	5.2	260.1	265.3	5.5	275.3	280.8
Riverview Drive	7.1	350.0	357.1	6.9	282.3	289.2	6.8	293.9	300.7
Mississippi River to IL 3	15.5	1,020	1,035.5	N/A	N/A	N/A	16.2	882.9	899.1

[1] The Riverview Update includes higher traffic volumes along mainline I-270 to account for the build-out of anticipated development near I-270 at Route H/Riverview Drive

Again, the Route H/Riverview Update is expected to reduce the total number of crashes on the freeway facility as well as the fatal and injuries in Route H/Riverview interchange area when compared to the No-Build. As mentioned earlier, the change in crashes are a result of the proposed changes to the Route H/Riverview Drive interchange which include minor modification to the speed change lanes (acceleration/deceleration lanes for the for the Route H/Riverview Drive andI-270), horizontal curvature of the freeway, to the inside/outside shoulder widths, and presence and location of barriers and median width. The addition of extra freeway lanes is expected to have a minor increase in the fatal/severe injury crashes on the bridge and into Illinois but have a significant decrease in the non-severe crashes. It should also be reiterated that the traffic volumes in the Route H/Riverview Update were increased when compared to the No-Build and the Preliminary Design alternatives due to anticipated development on Route H/Riverview Drive, which impact crash results.

Freeway Ramps and Terminals Safety Analysis

Although the I-270 North EA/FONSI and subsequent AJR didn't specifically perform predictive safety analysis for the ramps and ramp terminals, the proposed ramp design and change in ramp terminal traffic control was also evaluated using the ISATe methodology. Again, the historical crash data from 2013 to 2017 was utilized to generate expected crashes over the 20-year period for the ramps and the ramp terminals. **Table 7** summarizes the change in safety to the ramps and ramp terminals.

As can be seen, the fatal and severe crashes on ramps are expected to have a very small increase compared to the no-build, while the other (B+C+PDO) is expected to have more of an increase. The change between the existing and proposed Route H/Riverview Drive interchange include the following: the ramps are slightly longer in the proposed, the proposed design includes travel lanes that are 14-foot wide while the existing lanes are generally 18 feet wide, and once again, the traffic volumes are heavier in the Route H/Riverview Update to account for the build-out of anticipated development on Route H/Riverview Drive.

As can be seen, the fatal and severe crashes at the ramp terminals are expected to have a very small increase compared to the no-build, while the other (B+C+PDO) is expected to have more of an increase.

The change between the existing and proposed include the following at the north ramp terminal: The traffic control changes from an all-way stop to a traffic signal, flashing yellow arrow left-turn phasing for the northbound left-turn, the spacing between terminals is slightly increased, and once again, the traffic volumes are heavier to account for anticipated development traffic.

TABLE 7 EXPECTED NUMBER OF CRASHES ON I-270 RAMPS AND TERMINALS (20-YEAR PERIOD)

	NO-BUILD[1] SIDE STREET STOP-CONTROLED INTERSECTIONS			RIVERVIEW UPDATE TRAFFIC SIGNAL CONTROLED INTERSECTIONS			RIVERVIEW UPDATE WITH SAFETY COUNTERMEASURES		
LOCATION	Fatal & Disabling (K + A)	Other (B + C + PDO)	**Total**	Fatal & Disabling (K + A)	Other (B + C + PDO)	**Total**	Fatal & Disabling (K + A)	Other (B + C + PDO)	**Total**
RIVERVIEW DRIVE RAMPS	0.7	25.0	25.7	1.2	43.8	45.0	1.2	43.8	45.0
RIVERVIEW TERMINALS	0.9	136.5	137.4	2.5	436.8	439.6	1.6	277.3	278.9

[1] The safety of the Riverview Drive ramps and terminals were not evaluated in the I-270 North project but ISATe files were generated for the existing and No-Build condition for comparison purposes.

The change between the existing and proposed Route H/Riverview Drive interchange include the following at the south ramp terminal: The traffic control changes from side street stop to a traffic signal, the eastbound right-turn lane is lengthened from a channelized right turn to a full right-turn lane to avoid the left-turn queues, a northbound right-turn lane is proposed on Route H/Riverview Drive, flashing yellow arrow left-turn phasing for the southbound left-turn, the spacing between terminals is slightly increased, and once again, the

traffic volumes are heavier in the Route H/Riverview Update to account for the build-out of the Pier Development north of I-270.

Based on the ISATe ramp terminals analysis, the proposed change from unsignalized terminals to signalized terminals are expected to increase crashes over the next 20-years. Auxiliary turn lanes are maintained in the proposed design, so there is little improvement at the ramp terminals. As a result, the following safety countermeasures for the signals are recommended at the ramp terminals:

- **3-inch Yellow Retroreflective Backplates** at both terminals (15% reduction):
- **Flashing Yellow Arrows (FYA)** at both terminals. (14.3% reduction for left-turn movements), and
- **Coordinate Arterial Signals** (21% reduction).

At signals, retroreflective back plates help improve driver visibility and awareness when approaching signalized intersections. The Missouri Blueprint identifies that retro-reflective backplates as a key engineering strategy at signalized intersections.

Flashing Yellow Arrows (FYA) are also a proven safety countermeasure to more clearly convey to instructions to drivers to proceed with caution for left turns. Missouri currently uses FYA at many urban locations in the district.

It is also recommended that the ramp terminals signal timing be coordinated together to minimize the delays and queuing between the intersections. With these three safety countermeasures, the safety of the signalized intersections is maximized.

2.3.2 Conclusion

Traffic and Safety conditions are acceptable at the I-270 and Route H/Riverview Drive interchange. The Route H/Riverview Drive interchange was analyzed with increased 2040 volumes anticipated from anticipated development on Route H/Riverview Drive. These volumes were not accounted for in the previous traffic forecasts assumed for the original AJR submission or the I-270 North design-build Preliminary Design AJR update. As such, the delay shown from the 2040 Route H/Riverview Update models are slightly higher compared to the Preliminary Design models. Ultimately, the proposed changes at the Route H/Riverview Drive interchange are minor (and in most cases improved), and we would expect to see equal or better results if the volumes were consistent between all models. Overall, the Route H/Riverview Drive interchange is proven to handle forecasted volumes well, operating at a LOS C or better in 2040 AM and PM peak periods.

Future AM Traffic Operations – All segments of I-270 between Lilac Ave and Route 3 operate at LOS C or better as they did with the Preliminary Design. A few segments were pushed over the threshold from a LOS B to LOS C due to the forecasted volume increases compared to the Preliminary Design models. At Route H/Riverview Drive, the level of service at the ramp terminals is changed from LOS A to LOS B due to the increased volumes. With the signalization of these intersections, the interchange operates well in the AM peak period with minimal queues and delays. Max queues from the eastbound off-ramp is 520-feet and 250-feet from the

westbound off-ramp, showing there is sufficient storage from the ramps to prevent queueing onto the interstate and the deceleration lane lengths are sufficient from AASHTO standards.

Future PM Traffic Operations – All segments of I-270 between Lilac Ave and Route 3 operate at LOS C or better as they did with the Preliminary Design. A few segments were pushed over the threshold from a LOS B to LOS C due to the increased forecasted traffic volumes as compared to the Preliminary Design models. Comparing to the Preliminary Design model results, the LOS at the 270 East ramp terminal is changed from LOS B to LOS C, the LOS at the 270 West ramp terminal is improved from LOS C to LOS B, and the LOS at the intersection of Dunn Road is changed from LOS A to LOS B. The delays and queues on Route H/Riverview Drive are minimal. The eastbound off-ramp max queues extend 400-feet and westbound off-ramp max queues extend 200-feet in the PM peak, showing there is sufficient storage from the ramps to prevent queueing onto the interstate and the deceleration lane lengths are sufficient from AASHTO standards.

Future Build Safety Conditions – According to ISATe analysis, the severe crashes along the freeway near Route H/Riverview Drive are expected to be reduced by 4% over a 20-year period with the proposed Route H/Riverview Drive interchange design. The total number of predicted crashes are expected to be reduced by 16% over a 20-year period on I-270 mainline near the Route H/Riverview Drive interchange. The conversion of the unsignalized ramp terminals to signalized terminals is expected to have an increase in crashes. As a result, three safety countermeasures are recommended: 3-inch yellow retroreflective signal backplates, Flashing Yellow Arrows and the coordination of the ramp signals. These countermeasures are intended to minimize the safety impacts of signalizing the ramp terminals.

2.4.2 Design Criteria

Table 2.4-2 shows the Design Criteria Approach for the Riverview Update compared to the Preferred Alternative. There are no proposed design exceptions for the Route H/Riverview Drive interchange. Drawings of the proposed Route H/Riverview Drive interchange in both the interim and full-build conditions can be found in **Appendix 1**. Refer to **Table 2** for design details.

Table 2.4-2
I-270 North Design Criteria Approach

	How does the design address the issue?	
Design Criteria	**Preferred Alternative**	**Riverview Update**
Sight distance at ramp terminals (Note signal heads obscured by structures.)	There are no anticipate major sight distance issues at ramp terminals.	There are no anticipated major sight distance issues at ramp terminals.
Sufficient storage on ramp to prevent queues from spilling on to the Interstate (based on current and/or future projected traffic demand)	Based on traffic modeling of current and future traffic projections, the proposed ramp lengths provide sufficient storage.	Based on traffic modeling of current and future traffic projections, the proposed ramp lengths provide sufficient storage.

Table 2.4-2
I-270 North Design Criteria Approach

	How does the design address the issue?	
Design Criteria	**Preferred Alternative**	**Riverview Update**
Vertical clearance	No vertical clearance exceptions have been identified at this time as it is expected that the ultimate build out of the Preferred Alternative will result in the reconstruction of interchanges and other crossroad bridges throughout the corridor.	No vertical clearance exceptions are required.
Pedestrian access through the interchange	Based on EA Commitment #14: With regard to bicycle/pedestrian facilities, all alternatives could have the potential for a positive impact. Where prudent and feasible, plans for appropriate pedestrian, bicycle and wheelchair access will be developed during the final design process. Coordination with interested parties, during the final design process is an environmental commitment of this project. Spatial and cost considerations have been made to provide pedestrian (and bicycle) access throughout the corridor including interchanges. Prudent and feasible plans for appropriate facilities will be developed during subsequent phases of design. Pedestrian facilities through higher level interchanges, especially the system interchanges with Route 370, I-170, and Route 367, may not be prudent and feasible.	There are no existing sidewalks along Route H/Riverview Drive either north or south of I-270. Great Rivers Greenway intends to extend the North Riverfront Trail (which currently terminates at the Historic Chain of Rocks/US Route 66 bridge) to the north side of I-270 as a part of the Mississippi Greenway[2]. The proposed I-270 and Route H/Riverview Interchange design accommodates this future extension by providing space for a 10-foot multi-use path along both sides of the roadway underneath the I-270 overpass. The proposed Mississippi River Bridge design also provides room near the abutments for the trail to be built away from vehicular traffic and closer to the river. The design team will upgrade any existing pedestrian facilities to make ADA compliant within the project area. The design of the Riverview Interchange will allow the space to accommodate, either pedestrian facilities or shared-used paths, with construction by others in the future.
Length of acceleration/deceleration lanes	It is anticipated that standard length will be provided on acceleration/deceleration lanes. The extension of any acceleration/deceleration lanes that do not meet current standards will be considered a priority in the preferred alternative. Remaining sub-standard lengths, if any, will be acknowledged and recorded in the form of MoDOT design exceptions during future phases of design.	The Route H/Riverview Drive Interchange update includes standard acceleration/deceleration and taper lengths for all ramps.

[2] https://greatriversgreenway.org/greenway-search/

Table 2.4-2
I-270 North Design Criteria Approach

	How does the design address the issue?	
Design Criteria	**Preferred Alternative**	**Riverview Update**
Lane continuity	Lane continuity has been provided throughout the corridor with changes in basic lanes located at logical major interchanges. The proposed configuration creates four basic lanes from the I-70 interchange ramps to Route 367 and three basic lanes from Route 367 to the Chain of Rocks bridge. This reflects an increase of one basic lane from Lindbergh Blvd. to Route 367 and from Lilac to the Chain of Rocks Bridge.	Lane continuity has been provided between Lilac and Route 3.
Length of tapers	It is anticipated that standard exit and entrance taper lengths will be provided.	The Route H/Riverview Drive Interchange update provides standard exit and entrance taper lengths.
Spacing between ramps	The proposed configuration placed an emphasis on eliminating the many existing short mainline weaves. While a number of weaves remain in the Preferred Alternative configuration, weaving distance is maximized, lane balanced design is utilized, and VISSIM modeling has shown operations to be acceptable. Recommended minimum ramp terminal spacing per AASHTO Greenbook 2011 Fig 10-68 met with known exceptions being westbound New Florissant entrance to Hanley/Graham exit (under 1600', ~1400'-1500') and eastbound I-170 exit to Hanley/Graham exit (under 1000', ~900')	Recommended minimum ramp terminal spacing per AASHTO Greenbook 2011 Fig 10-68 are met at the Route H/Riverview Drive Interchange.
Lane balance	Lane balance was provided throughout the corridor – exits and entrances – with auxiliary and basic lane drops achieved via lane balanced, two-lane exits or single lane drops on the right-hand side.	Lane balance along I-270 is provided between Lilac and Route 3.
Uniformity in interchange design and operational patterns (i.e. right-side ramps, exit design consistent w/ adjacent interchanges)	Most interchange designs are standard industry types (e.g. diamond ramps, loops ramps, slip ramps, etc.) Diverging diamond interchanges are proposed and these are consistent with the existing interchange located on I-270 at Dorsett located just to the South and West of this project area. No left side exits/entrances are proposed. Single exit design used through the corridor with exits in advance of crossroads.	The Route H/Riverview Drive interchange design provides standard industry diamond type ramps. No left side exits/entrances on I-270 are proposed.

2.7.2 Agency and Private Entity Coordination

The Route H/Riverview Drive portion of the project is closely associated with the IDOT led reconstruction of the Mississippi River Bridge project. The IDOT led planning project which included the Riverview Drive improvements has utilized Context Sensitive Solutions (CSS) methodologies to engage and inform the public of planned improvements. As the two projects move into development of construction plans, the projects will continue to share public meetings venues, materials and events since they are so closely related.

- **FHWA led Design Charrette –** A multi-disciplinary FHWA led design Charrette was accomplished which covered the bridge replacement and the interchange improvement project.
- **Community Advisory Group (CAG) –** Two CAG meetings were held as part of the IDOT planning study. One meeting to introduce the project, set the existing context and set the purpose and need for the project. The second CAG meeting explained the preferred alternative and the process in selecting the bridge and interchange combination.
- **Individual Stakeholder Meetings –** Stakeholder meetings were held with key stakeholders in Illinois and Missouri during the IDOT planning study. These meetings provided an opportunity for the stakeholders to provide input to both Departments of Transportation.
- **Public Informational Meetings –** IDOT and MoDOT co-hosted two public meetings during the IDOT planning phase for the bridge replacement project. Both meetings were open-house Public Informational Meetings. The first open house was held for two consecutive nights, hosting one meeting in Illinois and one in Missouri. The meeting was held to introduce the project to the public. At the open house, team members from IDOT, MoDOT, and the consultant team were present to discuss the need for the project, timeline and key issues for the project team to consider. Comment forms were collected and responded to as part of the CSS process. A second meeting was held to present the preferred alternative and collect public comments. Project staff was available to answer questions. A future public meeting is planned after design details are known. IDOT and MoDOT will jointly attend and provide information concerning their projects for public review and comment.
- **Project Newsletter –** Three newsletters were produced and mailed or emailed to all interested parties during the planning study. An additional newsletter is planned to update the public on the status of the design and progress made.
- **Project Website –** Throughout the CSS process the following website was maintained http://idot.illinois.gov/projects/i-270-over-the-mississippi-river which housed all Public meeting materials for online review. The website will be continued during construction plan development.

2.8.2 Social and Environmental Overview

The re-evaluation of the original I-270 North Environmental Assessment/FONSI for the Route H/Riverview Drive update was approved on July 21, 2020. **Table 2.8-1** provides a summary of the changes in impacts associated with the Route H/Riverview Drive Interchange Update for the project.

2.8.3 Conclusion

MoDOT has submitted a re-evaluation of the original I-270 North Environmental Assessment/FONSI. This was approved on July 21, 2020. The Route H/Riverview Drive Interchange Update is consistent with the overall EA/FONSI, and is consistent with and included in current STIP, TIP, and the region's long-range transportation plan, Connected 2045.

TABLE 2.8-1: ENVIRONMENTAL IMPACT SUMMARY
Preliminary Design

LOCATION	PRELIMINARY DESIGN DESCRIPTION	PRELIMINARY STRUCTURE ACQUISITION ESTIMATES	PRELIMINARY PROPERTY ACQUISITION ESTIMATES	PARKS AND RECREATION IMPACTS	ENVIRONMENTAL JUSTICE IMPACTS	WATERWAY IMPACTS	BIKE/PED IMPACTS	TRAFFIC NOISE IMPACTS
AREA 1: I-70 to EAST OF MCDONNELL BOULEVARD								
St. Charles Rock Road	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design
Route 370	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design
Missouri Bottom Road	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design
McDonnell Boulevard	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design
AREA 2: EAST OF MCDONNELL BOULEVARD TO HANLEY ROAD/GRAHAM ROAD								
Lindbergh Boulevard	Split Diamond Interchange	No change from AJR Preferred Alternative Design	0 acres	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design
I-170	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design		No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design
AREA 3: HANLEY ROAD/GRAHAM ROAD TO OLD HALLS FERRY ROAD								
Hanley Road/ Graham Road	No change from AJR Preferred Alternative Design	4 single family residences	Less than 1 acre	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	One-way outer roads tend to benefit pedestrians (because of fewer conflict points). Multi-use path along Dunn and Pershall Roads allow for bicycles to travel in both directions.	No change from AJR Preferred Alternative Design
New Florissant Road to Washington Street/ Elizabeth Avenue	No change from AJR Preferred Alternative Design	None	+/- 1.5 acres	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	One-way outer roads tend to benefit pedestrians (because of fewer conflict points). Multi-use path along Dunn and Pershall Roads allow for bicycles to travel in both directions.	No change from AJR Preferred Alternative Design
West Florissant Avenue to Old Halls Ferry Road	Diamond Interchange at West Florissant Split Diamond Interchange (New Halls Ferry to Old Halls Ferry) (One-way Dunn/Pershall)	No change from AJR Preferred Alternative Design	Less than 1 acre	No land acquisition required from Little Creek Nature Area. Driveway will be improved as necessary to benefit the facility.	Dedicated bus only lane minizes out of direction travel required by METRO to connect the North County Transit Center to both West Florissant and St. Louis Community College - Florissant Valley. METRO estimates that one-way outer roads will increase their operating expenses but the bus only lane minimizes this cost increase.	No change from AJR Preferred Alternative Design	One-way outer roads tend to benefit pedestrians (because of fewer conflict points). One-way outer roads tend to result in out-of-direction travel by bicyclists creating more conflicts with automobiles.	No change from AJR Preferred Alternative Design
AREA 4: EAST OF OLD HALLS FERRY ROAD TO RIVERVIEW DRIVE								
Route 367	Partial Turbine Interchange with Green-T Intersections	No change from AJR Preferred Alternative Design	0 acres	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design
Bellefontaine Road	Roundabout Buttonhook Interchange Westbound/Diamond Interchange Eastbound	None	0 acres	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	Limited culvert extensions of existing culverts within Watkins Creek.	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design
Lilac Avenue	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design
Riverview Drive	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	+/- 3.34 acres	Small section of Great Rivers Greenway (GRG) property required for EB Entrance Ramp. Coordinated with GRG and included in GRG's future plans for the property. Team will minimize required ROW from GRG through refinement of the design.	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design

LEGEND	
"XX"	Indicates changes from J6I3020B I-270 North Design-Build
"XX"	Indicates changes from J6I3020C Route H/Riverview Drive Interchange Update

2.9 Conclusion

MoDOT requests approval from FHWA to modify proposed changes in access points at the Route H/Riverview Drive Interchange with I-270. The Preferred Alternative in the AJR approved by FHWA in June of 2017 (Reasonable Alternative 1" with the 1a variation between West Florissant Avenue and New Halls Ferry Road) shows a diamond interchange at Route H/Riverview Drive. The Route H/Riverview Drive Diamond Interchange has slightly altered proposed geometrics due to the new alignment of the Chain of Rocks Mississippi River Bridge, which will be constructed immediately south of its existing location to mitigate impacts to traffic during construction. Geometric changes to the original design presented in the approved EA/FONSI include shifting the eastbound I-270 ramp terminal intersection 90-feet south, increasing intersection spacing, and slight realignment of I-270 mainline at Route H/Riverview Drive. In addition, the ramp terminal intersections are proposed to be signalized as part of this project. These changes result in minimal impacts to traffic operations and safety.

There are slight increases in delay since volume was added to the Route H/Riverview Drive update traffic models to include additional volume generated by the Pier Development located in the northeast quadrant of the interchange. Ultimately, the proposed changes at the Route H/Riverview Drive interchange are minor, and we would expect to see equal or better results if the volumes were consistent between all models. Overall, the Route H/Riverview Drive interchange is proven to handle forecasted volumes well, operating at a LOS C or better in 2040 AM and PM peak periods.

The Route H/Riverview Update is predicted to reduce total crashes in the same area by approximately 16%, while the Preliminary Design is predicted to reduce the total mainline crashes along I-270 near Route H/Riverview Drive by approximately 19%. For severe crash reduction, the Route H/Riverview Update is predicted at 4% reduction compared to 3% reduction given by the Preliminary Design. This proves that the proposed changes at Route H/Riverview Drive are very comparable to the approved design from previous AJR submissions.

An Environmental Assessment for the I-270 North corridor was submitted to FHWA with a Finding of No Significant Impact (FONSI) in November of 2016 and approved in April of 2017. MoDOT also prepared a re-evaluation of the EA/FONSI with the proposed changes from the Route H/Riverview Drive Interchange Update, which was approved on July 21, 2020.

This report has documented that the proposed modifications in access to the I-270 North corridor satisfies the requirements outlined in the Federal Register and the FHWA's Missouri Division guidance for justifying modifications in interstate access.