

I-270 North Corridor Access Justification Report Update

Presented to: MoDOT and FHWA: I-270 North Design Build Team

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An AJR update has been prepared for the I-270 North project in North County St. Louis, MO. The first submission of the Environmental Assessment (EA) and Conceptual Access Justification Report (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 STIP: J6I3020B to address the dominant areas of the project study area and J613020C to address the I-270 and Riverview Drive interchange in conjunction with the Chain of Rocks Bridge reconstruction project. The first project was awarded as a design-build project to Millstone Weber in November of 2019. The design team made changes to the Preferred Alternative presented in the first EA and AJR submittals to stretch project scope while addressing all the elements in the purpose and need. This resulted in the need for updates to the EA and AJR. The re-evaluation of the EA and FONSI was submitted by MoDOT and approved by FHWA on December 10, 2019. The proposed concept from Millstone Weber is referred to as the Preliminary Design and the original concept in the first submissions is referred to as the Preliminary Design and the start and this AJR update.

The Preliminary Design proposes changes to the Preferred Alternative presented in the first submission AJR in Areas 2 through 4 from Lindbergh Boulevard to Bellefontaine Road. Pending approval of this document, construction of the Preliminary Design is currently planned to begin in April of 2020. Thus, the Preliminary Design was analyzed under two scenarios: 2020 Preliminary Design Interim Build and 2040 Preliminary Design Full Build.

- The 2020 Interim Build assumes/maintains the existing conditions for all areas which are not being changed in the Preliminary Design. The purpose of evaluating the 2020 Interim Build scenario is to show how the I-270 North Corridor will perform with only the elements of the Preliminary Design constructed. In other words, this scenario illustrates how the Preliminary Design improvements will function when completed as an independent project.
- The 2040 Full Build includes improvements from the Preferred Alternative outside of the Preliminary Design as well as any committed Long-Range Transportation Plan projects. 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 Preliminary Design 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 and AJR.

The traffic and safety analyses prove the proposed changes improve both operations and safety compared to the Preferred Alternative. Proposed actions from the Preferred Alternative in areas not included in the Preliminary Design are not precluded due to this design. The freeway, outer roads, and ramp terminals



operate at LOS D or better in the AM and PM peak periods under 2020 and 2040 conditions. The Preliminary Design is predicted to reduce fatal and injury crashes along the freeway, ramps, terminals, and outer roads by approximately 15.5% and total crashes by approximately 20% over 20-years, when compared to the no-build condition.

Multiple sections of the AJR are updated in this document as a result of the proposed changes by the Preliminary Design. Any tables which are updated from the original AJR kept the same table number for easy 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;
- 2.2.1.2 TSM/TDM and Multimodal Alternatives;
- 2.2.4 Preliminary Design;
- 2.2.6 Conclusion;
- 2.3 Operations and Safety Analysis;
- 2.4.1 Modifications in Access;
- 2.4.2 Design Criteria;
- 2.7.2 Agency and Private Entity Coordination;
- 2.8.2 Social and Environmental Overview;
- 2.8.3 Conclusion; and
- 2.9 Conclusion.

1.4 Proposed Action

The Preliminary Design was developed to optimize reliability, mobility, safety, and cost effectiveness. The Preliminary Design differs from the Preferred Alternative in Areas 2 through 4 from Lindbergh Boulevard to Bellefontaine Road. Proposed actions from the Preferred Alternative in areas not included in the Preliminary Design are not precluded due to this design. Drawings of the Preliminary Design can be viewed in the conceptual signage plans in **Appendix 1**. Proposed actions of the Preliminary Design are as follows.

In Area 2: McDonnell Boulevard to Hanley Road/Graham Road

- Rebuild Lindbergh Boulevard interchange to a modified diamond interchange with separate Lindbergh Boulevard northbound and southbound facilities between Taylor Road and Utz Lane
- Add additional lane in each direction on I-270 east of Lindbergh Boulevard
- Remove all loop ramps at the Lindbergh Boulevard interchange. Replace with diagonal ramps
- Extend and connect Dunn Road through the Lindbergh Interchange
- Include an auxiliary lane in each direction between Lindbergh and I-170
- Replace WB I-270 crossover on-ramp from Dunn Road west of Graham Road with a roundabout
- Widen SB I-170 to three basic lanes between I-270 and Frost Avenue on-ramp
- Add multi-use path along Dunn Road east of Lindbergh Boulevard
- No proposed changes to the Preferred Alternative west of the Lindbergh Boulevard interchange

Addresses Major Elements 1, 2, 3, 4, 5, 6, 8, and 9 from the Purpose and Need Section 1.3.



In Area 3: Hanley Road/Graham Road to Old Halls Ferry Road

- Rebuild outer road system (Dunn Road and Pershall Road) in a one-way configuration (outer roads in other areas remain in two-way configurations)
 - Convert Dunn Road to westbound one-way outer road between Graham Road and Linnell Drive
 - Build Pershall Road as a continuous eastbound one-way outer road between Hanley Road and Old Halls Ferry Road
- Add a through lane eastbound and westbound on I-270 and consolidate ramps
- Provide an EB Pershall Road to WB Dunn Road turnaround at the Washington Street/Elizabeth Avenue and West Florissant Avenue interchanges
- Add contra-flow bus lane from the North County Transit Center to West Florissant Avenue and Florissant Valley Community College
- Add multi-use path along Dunn Road and Pershall Road between Hanley Road/Graham Road and Old Halls Ferry Road and across I-270 on New Florissant Avenue, Washington Street/Elizabeth Avenue, West Florissant Avenue, and Old Halls Ferry Road

Addresses Major Elements 1 through 9 from the Purpose and Need Section 1.3.

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

- Add through lane on eastbound and westbound I-270 west of Route 367
- Construct new bridge over I-270 to connect Pershall Road and Dunn Road west of Route 367
- Extend Pershall Road to the new bridge
- Reconstruct Route 367 interchange as a two-lane partial turbine interchange, with a two-lane flyover ramp from EB 270 to NB 367, diagonal entrance ramps to EB and WB 270, diagonal exit ramps from EB 270 to SB 367 and WB 270 to NB 367, and a single loop ramp from WB 270 to SB 367
- Relocate WB 270 off-ramp to Bellefontaine Road to intersection of WB 270 on-ramp and replace signal with roundabout
- Add multi-use path along Dunn Road between Old Halls Ferry Road and Breezy Point Lane and on Pershall Road over I-270
- Improve Dunn Road between Old Halls Ferry and Breezy Point Lane
- No proposed changes to the Preferred Alternative east of the Bellefontaine Road interchange

Addresses Major Elements 1, 2, 3, 4, 5, 6, 8, and 9 from the Purpose and Need Section 1.3.

2.2.1.2 TSM/TDM and Multimodal Alternatives

The Preliminary Design incorporates many traffic system management (TSM) and travel demand management (TDM) elements in the project for a robust and reliable transportation system in North County. The design includes enhancements of intelligent transportation system (ITS) elements, additional bike and pedestrian facilities, and new transit infrastructure.

Transportation Management System and Operations Improvements

The proposed Intelligent Transportation System (ITS) for the Preliminary Design provides enhanced integrated corridor operations. It incorporates an array of equipment, techniques, and methodologies to fully integrate the freeway, outer roads, arterials, public transit and non-motorized transportation into a cohesive system that builds on the region's showcase ITS program. An exhibit of proposed ITS elements in the project study area are shown in **Exhibit 1**. Descriptions of proposed ITS elements are as follows.

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Freeway DMS Boards

All existing freeway Dynamic Message Sign (DMS) Boards within the work area will be replaced with the modern type MoDOT is currently installing elsewhere in the District. These full-color, full-matrix signs offer a massive improvement in communicating roadway information quickly and efficiently to drivers through easily recognizable colors and graphics. They will also be compatible with MoDOT's Advanced Traffic Management System (ATMS). Depending upon the location and construction activities nearby, some will receive a replacement "shell" only on the existing structure, while others will have an entirely new unit housed on a new structure. The boards will display important travel and weather information with vivid color graphics, as well as data collected from the pertinent detectors. This gives drivers a full understanding of conditions along their route.

Dynamic Trailblazer Assemblies

Dynamic Trailblazer Assemblies will be installed along the one-way outer road sections of Dunn and Pershall Roads to enhance MoDOT's traffic incident management capabilities. These trailblazer signs include changing arrow directions and confirmation message of "Bypass" illuminated in bright LEDs. They will be integrated into the ATMS to give drivers a final message on the best path. When not active under normal driving conditions, the LED arrow points to the freeway entrance ramp. During incidents, the arrow points away towards the next outer road signal to keep drivers off the interstate. A similar assembly is show in **Figure 1**. This pilot installation could lead to similar use elsewhere to efficiently communicate decision information for incident management.



FIGURE 1 DYNAMIC TRAILBLAZER ASSEMBLY EXAMPLE

Road Weather Information System (RWIS)

MoDOT's existing RWIS stations will be supplemented with a new unit. Additional coverage allows for better response to rapidly changing conditions along this vital corridor.

CCTV Cameras

Existing low quality obsolete standard definition Closed Circuit Television (CCTV) cameras will be removed in place of High Definition (HD) models. Supplemental CCTV installations will be added to refine full visibility of the corridor. Full coverage and updated cameras are vital to monitoring not only real time traffic flow and incidents but can also be used to monitor the performance of signalized intersections and corridors, the validity of DMS boards, and to test equipment prior to deployment of resources on site for repair or adjustment.

Freeway Detectors

A new comprehensive freeway detection plan will be implemented along the corridor. Removal of obsolete and redundant detectors followed by strategically placed new or re-installed modern detector units will provide the needed historical data for each lane: volume, speed, occupancy, and classification.

Outer Road Detectors

Utilizing the same philosophy as the Freeway Detector plan, the outer roads will be equipped with similar units for the same purposes. Instrumentation will be minimized by utilizing the carefully placed freeway detectors that can also "view" outer road lanes, and then supplementing with additional detectors first on existing structures to minimize pole installations, and lastly new installations dedicated to detection units.



Transit Signal Priority

A new transit signal priority system will be implemented at nearby and new MoDOT traffic signals along the corridor in coordination with Bi-State Development Agency. Under this system, priority would be given to transit vehicles at MoDOT signalized intersections without the installation of any on-street hardware. Transit vehicles equipped with the appropriate GPS equipment linked to MoDOT's ATMS provides the trigger for programmed traffic signals to favor the transit vehicle's path. This could easily be expanded to surrounding signals outside the impact of this project in the future if the system proves to be effective.

Emergency Vehicle Preemption

Where feasible and appropriate within the project area, MoDOT will work with local agencies to implement an emergency vehicle preemption system at new MoDOT traffic signals. This system allows MoDOT to preempt traffic signal operations for the needs of appropriately equipped emergency vehicles during emergencies. Like the Transit Signal Priority option, the emergency preempt would be done through MoDOT's ATMS and is being designed in other areas in this region. Logs can be viewed and verified at any time to ensure abuse of the system is not taking place. Coordination with local agencies is required to implement this strategy. Agencies within the corridor that are eligible to participate include:

- Fire Districts and Departments
 - o St. Louis County
 - o Robertson Fire
 - Ferguson City
 - Hazelwood City
 - o Berkeley
- Ambulance Services
 - Christian Hospital Emergency Medical Services.

Traffic Signal Upgrades

Antiquated traffic signal, lighting, and ITS components within the project limits will be replaced to the most recent and familiar models to regenerate device reliability. All signal controllers will be the state-of-the art commonly used Advanced Traffic Controller (ATC) models. These and all signal cabinet components will be programmed into the MoDOT network for seamless integration into MoDOT's Advanced Traffic Management System (ATMS) to build upon the MoDOT's existing Arterial Management practices.

All new traffic signals will be equipped with uninterruptible power supplies (UPS) to eliminate signal outages during short-term service interruptions, and to sustain operation of the signals during more substantial power outages. A majority of the ITS devices will be connected to AC power. Solar power will be utilized on devices with low wattage features and in areas where AC power feeds are impractical to establish and maintain.

All signal controllers will be compatible with and integrated into MoDOT's existing Automated Traffic Signal Performance Measurement (ATSPM) system. ATSPM data is a rich source of detailed signalized intersection operations that accelerates the ability to proactively manage signal issues

Automated Traffic Signal Performance Measures (ATSPM)

Automated Traffic Signal Performance Measures (ATSPM) are detail-rich data sets that allow signal operators to analyze traffic signal performance both historically and in real time in ways that have never been available.



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With a standard array of detection, signals are able to not only store the traditional measures of vehicle presence based on a detector actuation but also combine it with the exact display of the signal controller's indications. Data taken every 1/10th of a second compiled over time provides a wide assortment of useful signal performance parameters, such as percentage of arrivals on green, early return to green, and whether or not queued vehicles clear each cycle. This data is stored in the traffic controller and can be retrieved at the controller or via a communication system back to a central ATSPM system.

With this new data that is constantly collected and processed, signals can be proactively managed for deficiencies and adjustments. Signal controllers which are compatible with MoDOT's existing ATSPM system will be installed throughout the corridor, which includes the typically procured Advanced Traffic Controller (ATC) models from McCain or Econolite already in wide use. Some system detection at major approaches on vital north-south routes will also be implemented to supplement the standard intersection stop bar detection. These enhancements will build on MoDOT's initial start into ATSPM use, allow MoDOT engineers to better manage this new roadway system, and provide state of the art equipment that is compatible with the latest signal technology.

Operations Plan/Asset Management Plan

All fiber optic cable network components (cable, conduit, pullboxes, and splices) plus ITS, traffic signal, and communication devices within the limits of the project will be GPS detailed for location. In addition, the geographical description, serial numbers, installation dates and other pertinent information will be tracked and populated into MoDOT's asset management systems.

Travel Demand Management Improvements

The Preliminary Design greatly enhances non-motorized and public transportation through the corridor. This not only provides methods of travel for households in the area without access to a private vehicle, but it also cuts down demand for single-occupancy vehicles. Providing safe areas to walk and ride bikes as well as a reliable and efficient transportation network for public transit riders is a key element for a thriving urban community. Improvements to pedestrian, bike, and transit facilities include:

- Update all existing pedestrian facilities in the project study area to ADA compliance;
- Construct a multi-use path along Dunn Road between Lindbergh Boulevard and Breezy Point Lane;
- Construct a multi-use path along Pershall Road between Hanley Road and Old Halls Ferry Road;
- Construct a new sidewalk along Pershall Road between Hazelwood Road and the new Pershall Road bridge across Coldwater Creek Bridge. The new Pershall Road bridge across Coldwater Creek will have accommodations for this sidewalk so that it can be extended to Lindbergh Boulevard when the previous Ford Assembly Plant site is redeveloped;
- Construct new or improved sidewalks across I-270 at the following interchanges and overpasses:
 - Lindbergh Boulevard
 - o Hanley/Graham Road
 - New Florissant Avenue
 - Washington/Elizabeth
 - West Florissant Avenue
 - New Halls Ferry Road
 - Old Halls Ferry Road
 - Pershall Road over I-270;



- Construct multi-use path connections across I-270 for a complete bike system at the following interchanges and overpasses:
 - New Florissant Avenue
 - Washington Street/Elizabeth Avenue
 - West Florissant Avenue
 - Old Halls Ferry Road
 - Pershall Road over I-270;
- Update Pedestrian crosswalks at signalized intersections to high visibility paint;
- Updated traffic signals to include leading pedestrian intervals and pedestrian countdown timers where applicable;
- Install a Pedestrian Hawk Signal at the crosswalks to the pedestrian bridge east of Hanley Road/Graham Road on Dunn Road and Pershall Road;
- Install a Rectangular Rapid Flash Beacon at the crosswalk on Dunn Road at Pershall Road over I-270;
- Work with Bi-State Development Agency to implement Transit Signal Priority at new MoDOT traffic signals in the project study area; and
- Implement contra-flow bus lane to provide direct connection from the North County Transit Center to West Florissant Avenue and the Florissant Valley Community College to mitigate impacts to the Metro transit system from the one-way outer road system.

2.2.4 Preliminary Design

The Preliminary Design was developed to optimize reliability, mobility, safety, and cost effectiveness. The Preliminary Design differs from the Preferred Alternative in Areas 2 through 4 from Lindbergh Boulevard to Bellefontaine Road. Proposed actions from the Preferred Alternative in areas not included in the Preliminary Design are not precluded due to this design. Drawings of the Preliminary Design can be viewed in the conceptual signage plan provided in **Appendix 1**. Proposed actions of the Preliminary Design are as follows.

In Area 2: McDonnell Boulevard to Hanley Road/Graham Road

- Rebuild Lindbergh Boulevard interchange to a modified diamond interchange with separate Lindbergh Boulevard northbound and southbound facilities between Taylor Road and Utz Lane, creating a one-way grid network of connections between the ramps and Lindbergh Boulevard
- Remove all loop ramps and the WB collector-distributor road at the Lindbergh Boulevard interchange. Replace with diagonal ramps.
- Realign WB 270 off-ramp to connect directly to Lindbergh Boulevard instead of forcing traffic through Taylor Road/Lynn Haven Lane interchange
- Widen northbound and southbound Lindbergh Boulevard to three lanes over Taylor Road
- Realign Dunn Road at Lynn Haven Lane to tie into a four-leg signalized intersection at SB Lindbergh Boulevard off-ramp. Remove SB Lindbergh on-ramp from Lynn Haven Lane/Taylor Road. Consolidate closely spaced intersections.
- Extend and connect Dunn Road through the Lindbergh Interchange, with grade separation under Northbound Lindbergh Boulevard and signalized intersection at Southbound Lindbergh Boulevard
- Tie existing Dunn Road east of Enterprise Rent-A-Car driveway into three-leg signalized intersection with new continuous Dunn Road
- Realign Dunn Road and Taylor Road intersection for a continuous Dunn Road over Coldwater Creek
- Add basic lane in each direction on I-270 east of Lindbergh Boulevard



- Include an auxiliary lane in each direction between Lindbergh Boulevard and I-170
- Replace I-270 West crossover on-ramp from Dunn Road west of Graham Road with a roundabout at Sieloff Drive
- Widen SB I-170 to three basic lanes between I-270 and Frost Avenue on-ramp. Narrow Frost Avenue on-ramp to one lane.
- Add multi-use path along Dunn Road east of Lindbergh Boulevard
- Rehabilitate/reconstruct Dunn Road east of James McDonnell Boulevard
- Rehabilitate /reconstruct Pershall Road over Coldwater Creek
- Improve shoulders and other ancillary lane characteristics
- No proposed changes to the Preferred Alternative west of the Lindbergh Boulevard interchange

In Area 3: Hanley Road/Graham Road to Old Halls Ferry Road

- Rebuild outer road system (Dunn Road and Pershall Road) in a one-way configuration (outer roads in other areas remain in two-way configurations)
 - Convert Dunn Road to westbound one-way outer road between Graham Road and Linnell Drive
 - Build Pershall Road as a continuous eastbound one-way outer road between Hanley Road and Old Halls Ferry Road
- Add a through lane eastbound and westbound on I-270
- Provide an additional NB and SB lane along Hanley Road/Graham Road under the I-270 overpass bridge for a total of 8 lanes (4 each direction)
- Provide an additional lane on the New Florissant Road overpass bridge for a total of 6 lanes (3 each direction)
- Provide an additional NB and SB lane along the Washington Street/Elizabeth Avenue overpass bridge for a total of 6 lanes (3 each direction)
- Provide an additional NB and SB lane along the West Florissant Avenue overpass bridge for a total of 8 lanes (4 each direction)
- Provide an additional lane along New Halls Ferry Road under I-270 for a total of 6 lanes (3 each direction)
- Provide an additional NB and SB lane along the Old Halls Ferry Road overpass bridge for a total of 6 lanes (3 each direction)
- Eliminate the EB I-270 On-Ramp from New Florissant Road and replace it with an EB I-270 Slip Off-Ramp to the Washington Street/Elizabeth Avenue Interchange
- Eliminate the WB I-270 Off-Ramp to New Florissant Road and replace it with a WB I-270 On-Ramp from the Washington Street/Elizabeth Avenue Interchange
- Reverse locations of the EB I-270 on and off-ramps between Washington Street/Elizabeth Avenue and West Florissant Avenue
- Shift the WB I-270 Off-ramp to Washington Street/Elizabeth Avenue east, provide longer deceleration distance, and build as slip off-ramp
- Reconfigure the interchanges of New Halls Ferry Road and Old Halls Ferry Road as a split diamond interchange
- Eliminate the EB I-270 On-Ramp from West Florissant Avenue
- Eliminate the WB I-270 Off-Ramp to West Florissant Avenue



- Convert the EB I-270 Off-Ramp to the New Halls Ferry Road interchange to an EB I-270 Slip Off-Ramp to the interchanges of New Halls Ferry Road and Old Halls Ferry Road
 - Eliminate the WB I-270 Off-Ramp to the New Halls Ferry Road interchange
 - Shift EB I-270 off-ramp to New Halls Ferry Road west, provide longer deceleration distance, and build as slip off-ramp
- Provide auxiliary lanes on EB and WB I-270 between consecutive on and off-ramps
- Provide an EB Pershall Road to WB Dunn Road turnaround at the Washington Street/Elizabeth Avenue and West Florissant Avenue interchanges
- Add contra-flow bus lane from the North County Transit Center to West Florissant Avenue and Florissant Valley Community College
 - This reduces travel distance for all bus routes needing to go westbound from the Transit Center by 1.25 miles, optimizing travel times and operations
 - It is roughly estimated to reduce operating costs for Metro by \$1 Million, compared to the Preferred Alternative solution
 - It satisfies 2017 FONSI Environmental Commitment #16 "MoDOT will work with Metro to investigate reasonable roadway modifications that further improve efficiencies for Metro's operations"
- Add multi-use path along Dunn Road and Pershall Road between Hanley Road/Graham Road and Old Halls Ferry Road and across I-270 on New Florissant Avenue, Washington Street/Elizabeth Avenue, West Florissant Avenue, and Old Halls Ferry Road
- Improve shoulders and other ancillary lane characteristics

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

- Add through lane on eastbound and westbound I-270 west of Route 367
- Construct new bridge over I-270 to connect Pershall Road and Dunn Road west of Route 367
- Reconstruct Route 367 interchange as a two-lane partial turbine interchange,
 - \circ $\;$ Build two-lane flyover ramp from EB 270 to NB 367 $\;$
 - Replace loop ramps with diagonal entrance ramps to EB and WB 270. Add two green-T signalized intersections at new on-ramp termini on Route 367.
 - Replace loop ramps with diagonal exit ramps from EB 270 to SB 367 and WB 270 to NB 367
 - Maintain single loop ramp from WB 270 to SB 367
- Relocate WB 270 off-ramp to Bellefontaine Road to intersection of WB 270 on-ramp and replace signal with roundabout
- Add multi-use path along Dunn Road between Old Halls Ferry Road and Breezy Point Lane and on Pershall Road over I-270
- Rehabilitate/reconstruct Dunn Road to Route 367
- Rehabilitate Pershall Road from Old Halls Ferry Road to bridge over I-270
- No proposed changes to the Preferred Alternative east of the Bellefontaine Road interchange

2.2.6 Conclusion

Preliminary Design – The Preliminary Design was developed out of the design-build process to optimize safety and mobility in the study area within the project budget. The Preliminary Design proposed changes to the Preferred Alternative in Areas 2 through 4 between Lindbergh Boulevard and Bellefontaine Road. The



proposed changes improve both operations and safety compared to the Preferred Alternative and meets the performance measures developed for the project. Proposed actions from the Preferred Alternative in areas not included in the Preliminary Design are not precluded due to this design.

2.3 Operations and Safety Analysis

The Preliminary Design includes improvements between Lindbergh Boulevard to Bellefontaine Road as identified in Section 2.2.4. Proposed actions from the Preferred Alternative in areas not included in the Preliminary Design are not precluded due to this design. As such, the Preliminary Design was analyzed as an Interim Build under existing volumes and a Full Build with future volumes.

- The 2020 Interim Build assumes/maintains the existing conditions for all areas which are not being changed in the Preliminary Design. The purpose of evaluating the 2020 Interim Build scenario is to show how the I-270 North Corridor will perform with only the elements of the Preliminary Design constructed. In other words, this scenario illustrates how the Preliminary Design improvements will function when completed as an independent project.
- The 2040 Full Build includes improvements from the Preferred Alternative outside of the Preliminary
 Design as well as any committed Long Range Transportation Plan projects (including added through lane
 on McDonnell/Howerdshell at Brown Road, basic through lane structure of four lanes in each direction
 from I-70 to MO 367, basic through lane structure of three lanes in each direction from MO 367 to the east
 into Illinois, and widening of the Chain of Rocks Bridge to six lanes). 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 Preliminary Design 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 and AJR.

In the Interim condition, the Preliminary Design significantly improves existing operating conditions. Under future conditions, the Preliminary Design operates equal or better to the Preferred Alternative in both AM and PM peak periods.

Interim Build Traffic Operations

With implementation of the Preliminary Design, interim build conditions under current volumes show significant improvements compared to existing conditions. VISSIM performance for interim build conditions, speed graphs, and SIDRA results tables are provided in **Appendix 2**. The traffic volumes used for analysis of interim build conditions are provided in **Appendix 3**. Freeway and intersection levels of service of the Preliminary Design under 2020 interim conditions are shown in **Exhibit 2**.











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On <u>I-270 Mainline</u>, providing an additional basic freeway lane between Lindbergh Boulevard and MO 367 for both directions of I-270 results in improved freeway LOS during the AM and PM peak hours. During the AM peak hour, the proposed configuration fixes the existing bottleneck along westbound I-270 between New Florissant Road and MO 367. Additionally, the existing bottleneck along southbound I-170 is eliminated with the removal of a lane drop where southbound I-170 transitions from 3 lanes to 2 lanes. This lane drop will be removed, and 3 lanes will be provided on southbound I-170 which results in improved operations along eastbound I-270 between the Lindbergh interchange and I-170 interchange.

During the PM peak hour, the Preliminary Design improves the freeway LOS along eastbound I-270 between James McDonnell Boulevard and West Florissant Avenue. Currently, most segments of eastbound I-270 in this area operate a failing LOS during the PM peak hour. The proposed configuration alleviates the eastbound I-270 bottleneck that currently reach the James McDonnell interchange and provides freeway operations of LOS C or better.

Speeds on I-270 mainline are significantly improved with implementation of the Preliminary Design. In the AM peak period, speeds do not drop below 50 mph on westbound I-270. On eastbound I-270 in the AM peak period, speeds drop to just below 50 mph between Lindbergh Boulevard and I-170 off-ramp due the heavy traffic volumes entering I-270 from Lindbergh and exiting I-270 to I-170 along this section. Speeds also drop to just below 50 mph west of the Riverview Drive interchange, however, this will be re-evaluated during the next phase of I-270 North. Other than these two locations, speeds do no drop below 50 mph in the AM peak period. The Preliminary Design improves southbound I-170 speeds during the AM peak hour from lower than 40 mph, as they exist today, to above 55 mph.

In the PM peak period, speeds also do not drop below 50 mph on westbound I-270. Again, the only location where speeds drop below 50 mph on eastbound I-270 is west of Riverview Drive. Ultimately, these graphs paint a picture of the dire need for improvements to the I-270 Corridor. The Preliminary Design will reduce speed differentials throughout the corridor, improving operations and safety on I-270 mainline.

At <u>Lindbergh Boulevard</u>, the Preliminary Design moves the westbound I-270 to northbound Lindbergh Boulevard movement from the Taylor Road/Lindbergh Ramp signal to mainline MO 67, eliminating traffic queuing onto westbound I-270 and improving operations along Taylor Road. The proposed intersections along the Lindbergh Boulevard interchange will operate at LOS C or better during the AM and PM peak hours.

The proposed roundabout at the westbound I-270 on-ramp from Dunn Road west of Hanley Road operates at LOS B under 2020 volumes in the AM peak and LOS A in the PM peak period, from SIDRA results shown in **Table 1**. The westbound approach has a V/C ratio of .675 in the AM peak and .416 in the PM peak and the eastbound approach has V/C ratio of .399 in the AM peak and 0.560 in the PM peak, meaning there is sufficient capacity for future traffic growth. At this roundabout, westbound volumes are heavier than eastbound volumes, so the V/C ratio is higher for westbound compared to eastbound in the AM peak period. However, eastbound traffic has to yield to all vehicles turning left onto the ramp from westbound (around 800 cars) while westbound vehicles have no opposing traffic. So, eastbound traffic will queue 140 ft and westbound traffic will not have any queues.



TABLE 1 HANLEY ROAD & DUNN ROAD I-270 WEST ON-RAMP ROUNDABOUT 2020 SIDRA LEVEL OF SERVICE

SIDRA Level of Service									
		2020 AM				2020 PM			
Approach	Approach LOS	Approach Approach V/C 95 th % Queue				Approach Delay	v/c	95 th % Queue	
WB	А	9.9	.675	0	А	9.4	.416	0	
EB	В	13.9	.399	65	В	10.5	.560	110	
Overall	В	10.3	.675	65	Α	9.8	.560	110	

Between Hanley Road/Graham Road and Old Halls Ferry Road, the proposed one-way outer road system eliminates conflict areas and allows for better traffic flow on the freeway and outer roads. The Preliminary Design eliminates the westbound I-270 crossover slip ramp intersections along Dunn Road and Pershall Road will be connected as a continuous roadway. The proposed one-way outer road conversion also eliminates an approach at all the intersections along Dunn Road and Pershall Road at the six interchanges between Hanley Road/Graham Road and Old Halls Ferry Road. This results in improved signal operations at the interchanges. The approaches along Dunn Road and Pershall Road at the interchanges will operate under one phase which allows for additional capacity via shared movement lanes. The Preliminary Design results in overall intersection operations to operate at LOS C or better during the AM and PM peak hours for intersections between Hanley Road/Graham Road and Old Halls Ferry Road in the interim build condition.

The intersection of West Florissant Avenue, the Bus Only Lane, and Pershall Road operates at LOS B in the AM peak period, and LOS C in the PM peak period under 2020 volumes. This intersection carries a lot of volume, so the time given to the buses on the Bus Only Lane is limited as there are only approximately 10 buses expected at this approach per hour. With the limited available signal timing, the Bus Only Lane approach is LOS E in the AM peak and LOS F in the PM peak under 2020 volumes. The implementation of Transit Signal Priority will reduce this delay. Transit Signal Priority will GPS track the buses and put the bus calls in the controller earlier, so the wait time will be lower than the models are predicting. Even with the delay at this signal, the Bus Only Lane still significantly reduces travel times for transit riders in the one-way outer road configuration by reducing the travel distance buses would need to reach West Florissant from the Transit Center by 1.25 miles (having to go further east and U-turn at New Halls Ferry as proposed by the Preferred Alternative). As transit is heavily relied upon in this area, this reduction in travel time is significant for it impacts all people on the bus compared to single occupancy vehicles. Also, as previously discussed in Section 2.2.4, this significantly reduces operating costs for Metro and satisfies the 2017 FONSI Environmental Commitment #16.

A roundabout is proposed at the Bus Only Lane intersection with Pershall Road at the Florissant Valley Community College. In VISSIM, this intersection is coded as a single consolidated driveway along this section of Pershall Road to achieve volume balance in the model. This results in higher volumes in VISSIM compared to true field conditions. To analyze the proposed roundabout with true turning movement volumes at this intersection, AM and PM traffic counts were collected at the driveway entrances into Florissant Valley Community College on a typical weekday. **Figure 2** shows the PM counts collected at the three driveways. The central driveway proposed for the roundabout current has less than 100 vph going into the driveway and less than 50 vph exiting the driveway during the PM peak hour.





FIGURE 2 CBB'S SEPTEMBER 2019 TRAFFIC COUNTS AT THE FLORISSANT VALLEY COMMUNITY COLLEGE

A SIDRA analysis was completed for the roundabout with collected counts at the central driveway during the AM and PM peak hour. The proposed roundabout from the Bus Only Lane to the Florissant Valley Community College operates at LOS A in the AM peak and LOS D in the PM peak under 2020 volumes from SIDRA, as shown in **Table 2**. SIDRA shows the eastbound approach in the PM peak is anticipated to have the longest queues at 650' max. However, since this is a roundabout, it is a moving queue. VISSIM results show only a 300' max queues at the eastbound approach in the PM peak hour. This roundabout will provide safe and effective access for automobile traffic, trucks, and buses at the entrance of the Florissant Valley Community College.

SIDRA Level of Service									
		2020 AM				2020 PM			
Approach	Approach LOS	Approach Approach V/C 95 th % Queue			Approach LOS	Approach Delay	v/c	95 th % Queue	
NB	В	10.6	.265	20	В	11.8	.119	7	
SB	А	3.3	.005	0	А	3.3	.005	0	
EB	A	9.6	.532	70	D	34.2	.940	650	
Overall	А	9.7	.532	70	D	33.7	.940	650	

TABLE 2 ELORISSANT VALLEY COMMUNIT	COLLEGE & BUS ONLY LA	NE ROUNDABOUT 2020 S	NDRA LEVEL OF SERVICE
TADLE Z FLORISSANT VALLET CONNIVIONIT	I COLLEGE & DUS UNLI LA	INE ROUNDADOUT 2020 3	IDRA LEVEL OF SERVICE

At the **MO 367 interchange**, the elimination of the southbound MO 367 to eastbound I-270 and northbound MO 367 to westbound I-270 loop ramps results in elimination of a weave for both directions of I-270. The ramp terminals are designed as a green-T intersection, meaning northbound through traffic always has a green light at the north ramp terminal and southbound through traffic always has a green light at the south ramp terminal. The Green-T intersections are expected to operate at an overall LOS of A during both peak hours as well as the left-turn movements are expected to operate at LOS A in the interim build condition.

The proposed roundabout at **<u>Bellefontaine Road</u>** operates at LOS A in the AM and PM peak periods in the interim build condition from SIDRA, as shown in **Table 3**. Traffic is not expected to extend onto the freeway, with max queues from the off-ramp approach only reaching 25 to 35-feet in both the AM and PM peak periods.



TABLE 3 BELLEFONTAINE ROAD I-270 WEST RAMP TERMINAL ROUNDABOUT 2020 SIDRA LEVEL OF SERVICE

SIDRA Level of Service									
		2020 AM				2020 PM			
Approach	Approach LOS	Approach Approach V/C 95 th % LOS Delay V/C Queue			Approach LOS	Approach Delay	v/c	95 th % Queue	
NB	А	4.0	.148	25	А	4.3	.212	35	
WB	А	8.0	.503	105	А	8.1	.540	130	
EB	В	11.2	.010	1	В	14.0	.172	25	
Overall	Α	7.2	.503	105	Α	7.8	.540	130	

Future Build Traffic Operations

The 2040 Preliminary Design Build operations for the freeway are improved compared to the Preferred Alternative results. The Preliminary Design targeted high priority problem areas not only to address existing conditions, but also to make the corridor sustainable for years to come. VISSIM performance for future build conditions, speed graphs, and SIDRA results tables are provided in **Appendix 2**. The 2040 forecasted traffic volumes used to test the proposed concept are provided in **Appendix 3**. Freeway and intersection levels of service of the Preliminary Design under 2040 future build conditions are shown in **Exhibit 3**.

<u>I-270 mainline</u> performs well under 2040 conditions with the Preliminary Design. Under the proposed configuration, the LOS along eastbound and westbound I-270 is expected to operate at LOS D or better during the AM and PM peak hours under 2040 volumes. Just like the Preferred Alternative, all segments on eastbound I-270 in the AM peak operate at LOS C or better. The LOS on eastbound I-270 between the Lindbergh Boulevard on-ramp and the southbound I-170 off-ramp is improved from LOS D to LOS C and the merge from the I-170 on-ramp is improved from LOS F to LOS D comparing the Preferred Alternative to the Preliminary Design in the PM peak. All segments on eastbound I-270 east of Washington Street/Elizabeth Avenue are LOS C or better in the AM and PM peak periods under 2040.

All segments on westbound I-270 east of I-70 operate at LOS C or better in the PM peak under 2040 volumes. In the AM peak period, the level of service on westbound I-270 under the Preliminary Design are very comparable to operations under the Preferred Alternative. There are a few LOS Ds present, but mostly LOS Cs or above. The segment of I-270 West between New Florissant Avenue and Hanley Road, the merge segment for the Hanley Road on-ramp, and the Lindbergh Boulevard on-ramps are improved from LOS D to LOS C comparing the Preliminary Design to the Preferred Alternative.

The speed graphs prove that the Preliminary Design will withstand future volumes. Speeds within the study area are not expected to drop below 50 mph in either the AM or PM peak periods under 2040 volumes with the implementation of the proposed concept with the exception for eastbound I-270 between Lindbergh Boulevard on-Ramp during the PM peak hour. This on-ramp is very heavy (over 1800 vehicles per hour during the PM peak hour), which would attribute to speed differentials. However, they are expected to still operate at sufficient levels of operations and safety.











At the Lindbergh Boulevard Interchange the proposed concept will improve operations compared to the Preferred Alternative. All intersections are anticipated to operate at LOS C or better in the AM and PM peak periods under 2040 volumes with the Preliminary Design, while the Dunn Road and Lindbergh Boulevard connector intersection and the Lindbergh Boulevard and I-270 West ramp terminal intersection are anticipated to operate at LOS D with the Preferred Alternative.

Between <u>Hanley Road/Graham Road and Old Halls Ferry Road</u> the proposed concept operates at comparable levels of service to the Preferred Alternative under 2040 conditions.

• The proposed roundabout at the westbound I-270 on-ramp west of Hanley Road operates at LOS B in both the AM and PM peak periods under 2040 conditions, from SIDRA results (see **Table 4**).

SIDRA Level of Service									
		2040) AM		2040 PM				
Approach	Approach LOSApproach DelayV/C95th % Queue				Approach LOS	Approach Delay	v/c	95 th % Queue	
WB	А	9.8	.606	0	А	9.1	.403	0	
EB	В	12.9	.450	75	В	11.5	.631	140	
Overall	В	10.6	.606	75	В	10.1	.631	140	

TABLE 4 HANLEY ROAD & DUNN ROAD I-270 WEST ON-RAMP ROUNDABOUT 2040 SIDRA LEVEL OF SERVICE

- The level of service at the interchanges of New Florissant Road and Washington Street/Elizabeth Avenue are
 expected to operate similar to the Preferred Alternative. The level of service at the intersection of Elizabeth
 Street and Pershall Road changes from LOS C to LOS D in the PM peak hour with implementation of the
 Preliminary Design compared to the Preferred Alternative. All other intersections operate at LOS C or better
 in the AM and PM peak periods.
- The intersection of West Florissant Avenue, the Bus Only Lane, and Pershall Road operates at LOS B in the AM peak period, and LOS C in the PM peak period under 2040 volumes. This intersection carries a lot of volume, so the time given to the buses on the Bus Only Lane is limited as there are only approximately 10 buses expected at this approach per hour. With the limited available signal timing, the Bus Only Lane approach is LOS D in the AM peak and LOS E in the PM peak under 2040 volumes. The implementation of Transit Signal Priority will reduce this delay. Transit Signal Priority will GPS track the buses and put the bus calls in the controller earlier, so the wait time will be lower than the models are predicting. Even with the delay at this signal, the Bus Only Lane still significantly reduces travel times for transit riders in the one-way outer road configuration by reducing the travel distance buses would need to reach West Florissant from the Transit Center by 1.25 miles (having to go further east and U-turn at New Halls Ferry as proposed by the Preferred Alternative). As transit is heavily relied upon in this area, this reduction in travel time is significant for it impacts all people on the bus compared to single occupancy vehicles. Also, as previously discussed in Section 2.2.4, this significantly reduces operating costs for Metro and satisfies the 2017 FONSI Environmental Commitment #16.



• The proposed roundabout from the Bus Only lane to the Florissant Valley Community College operates at LOS A in both the AM and PM peak periods when evaluated with VISSIM. When evaluated with SIDRA the roundabout operates at LOS A in the AM peak and LOS C in the PM peak under 2040 volumes.

The 2040 VISSIM model is coded with 352 vph turning into and 393 vph turning out of the Florissant Valley Community College during the PM peak hour. These high volumes are present in VISSIM because it is set up with consolidated driveways along this section of Pershall Road to achieve volume balance in the model. To analyze the proposed roundabout with true turning movement volumes at this intersection, AM and PM traffic counts were collected at the driveway entrances into Florissant Valley Community College on a typical weekday. **Figure 3** shows the PM counts collected at the three driveways. The central driveway proposed for the roundabout current has less than 100 vph going into the driveway and less than 50 vph exiting the driveway during the PM peak hour.



FIGURE 3 CBB'S SEPTEMBER 2019 TRAFFIC COUNTS AT THE FLORISSANT VALLEY COMMUNITY COLLEGE

A SIDRA analysis was completed for the roundabout proposed with the collected counts at the central driveway during the AM and PM peak hour. The analysis shows that the roundabout would operate at LOS A in the AM peak hour and LOS C during the PM peak hour, see **Table 5**. Queues are minimal and V/C ratios are low, meaning there is sufficient capacity to operate well under incident management.

TABLE 5 FLORISSANT VALLEY	COMMUNITY COLLEGE &	BUS ONLY LANF RC	DUNDABOUT 2040 SIDRA	A LEVEL OF SERVICE
	COMMONT COLLEGE O			

SIDRA Level of Service								
		2040	AM		2040 PM			
Approach	Approach Approach V/C 95 th % Queue			Approach LOS	Approach Delay	v/c	95 th % Queue	
NB	А	8.6	.134	10	В	13.4	.144	10
SB	А	3.3	.005	0	А	3.3	.005	0
EB	A	9.4	.522	65	С	18.9	.799	220
Overall	А	9.3	.522	65	С	18.7	.799	220

At the <u>MO 367 interchange</u>, the elimination of 3 loop ramps removes the weave on both directions of I-270. These movements will instead be tied into the northbound MO 367 to eastbound I-270 directional ramp and the southbound MO 367 to westbound I-270 directional ramp which results in a left-turn movement for



both directions on MO 367. Green-T intersections are proposed for these left-turn movements. The Green-T intersections are expected to operate at an overall LOS of A during both peak hours.

The proposed roundabout at <u>Bellefontaine Road</u> operates at LOS A with queues less than 200-feet in both the AM and PM peak periods under 2040 volumes, as seen in **Table 6**. Traffic is not expected to extend onto the freeway, with max queues from the off-ramp approach only reaching 25 to 50-feet in both the AM and PM peak periods in 2040.

SIDRA Level of Service									
		2040 AM				2040 PM			
Approach	Approach	Approach	V/C	95 th %	Approach	Approach	V/C	95 th %	
	LOS	Delay	V/C	Queue	LOS	Delay	•/C	Queue	
NB	А	4.1	.155	25	А	4.5	.282	50	
WB	А	7.7	.545	130	А	8.0	.616	180	
EB	В	14.7	.066	10	В	16.3	.296	40	
Overall	Α	7.4	.545	130	Α	8.1	.616	180	

TABLE 6 BELLEFONTAINE ROAD I-270 WEST RAMP TERMINAL ROUNDABOUT 2040 SIDRA LEVEL OF SERVICE

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 2018 Existing Model MOEs provided in Book 4, see **Table 7**.

TABLE 7 INTERIM BUILD	VISSIM NETWORK	MEASURES OF	EFFECTIVENESS

			Alternative	
	Network Measures of			2020 Preliminary
	Effectiveness	2013 Existing	2018 Existing	Design Interim Build
¥	Vehicle Miles Traveled (VMT)	382,443	390,756	397,602
M Pea	Vehicle Hours Traveled (VHT)	8,360	8,453	8,086
	Vehicle Hours of Delay (VHD)	1,733	1,694	1,181
A	Average Speed (mph)	45.7	46.2	49.2
×	Vehicle Miles Traveled (VMT)	418,247	411,653	421,212
реа	Vehicle Hours Traveled (VHT)	9,658	9,748	9,332
Σ	Vehicle Hours of Delay (VHD)	2,305	2,516	1,874
Ъ	Average Speed (mph)	43.3	42.2	45.1
-				

Source: VISSIM

The total vehicle miles traveled increases around 2% while the total vehicle hours traveled decreases around 4% with the implementation of the Preliminary Design in the interim build. This means that more vehicles are able to get to their destinations, and they are able to get there more quickly. The average delay for the network decreases 25 to 30% in the AM and PM peak hours and average speeds are increased 6 to 7%.

The network MOE's in 2040 full-build for the Preliminary Design are very similar to the Preferred Alternative presented in the White Paper, as shown in **Table 2.3-1**. Total vehicle miles traveled are slightly increased compared to 2040 Preferred Alternative White Paper (increase of 0.03% in the AM peak and 0.32%)



in the PM peak), but total vehicular delay is decreased by 0.8 to 1.5%. Average speeds and total travel times are very comparable between the two alternatives.

		Alternative							
			2040 Preferred	2040 Preferred	2040				
	Network Measures of		Alternative	Alternative	Preliminary				
	Effectiveness	2040 No-Build	Original AJR	White Paper	Design				
beak	Vehicle Miles Traveled (VMT)	400,746	443,533	442,322	442,464				
	Vehicle Hours Traveled (VHT)	10,848	8,852	9,188	9,182				
Ξ	Vehicle Hours of Delay (VHD)	3,895	1,106	1,518	1,496				
A	Average Speed (mph)	36.9	50.1	48.1	48.2				
×	Vehicle Miles Traveled (VMT)	415,216	493,808	490,671	492,259				
Реа	Vehicle Hours Traveled (VHT)	14,677	10,685	10,905	10,943				
Ξ	Vehicle Hours of Delay (VHD)	7,346	1,837	2,202	2,184				
٩	Average Speed (mph)	28.3	46.2	45.0	45.0				

Table 2.3-1 2040 Network MOEs Summary for all Alternatives

Source: VISSIM

Conceptual Signage Plan

A conceptual signage plan has been prepared for the Preliminary Design in accordance with the MUTCD and MODOT EPG. The conceptual signing plan demonstrates that the Preliminary Design can be effectively signed for appropriate way finding on the mainline; it can be found in Appendix 1.

Future Build Safety Conditions

The Preliminary Design results in a higher reduction of crashes on mainline I-270 compared to the Preferred Alternative. The total number of mainline crashes are reduced 10% more with the Preliminary Design compared to the Preferred Alternative, and the reduction of fatal and disabling injury crashes is further improved by 14.8%. ISATe predicts fatal and disabling injury crashes along the mainline to be reduced by 21.8% over a 20-year period on I-270 mainline, with the implementation of the Preliminary Design. The total number of predicted crashes are expected to be reduced by 29.5% over a 20-year period on I-270 mainline.

Overall, the proposed changes along the freeway, ramps, terminals and outer roads (ISATe and HSM) is expected to reduce fatal and injury crashes by approximately 15.5% and total crashes by approximately 20% over 20-years, when compared to the No-Build condition.

Predictive Freeway Analysis

The safety of the freeway is first improved through changes to its configuration. Closely spaced ramps, short weaving segments particularly between loop ramps in cloverleaf interchanges, and inadequate acceleration lanes lead to serious deficiencies in safety, which is compounded by heavy traffic volumes and congestion on I-270. The Preliminary Design improves safety on mainline I-270 in the following ways:

- Reduces number of ramps on the freeway by eight;
- Eliminates the many existing short mainline weaves;
 - While a number of weaves remain, 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 are met with two known exceptions at the westbound New Florissant entrance to Hanley/Graham exit (approximately 1,300') and the eastbound I-170 exit to Hanley/Graham exit (approximately 900');

- All acceleration lanes meet AASHTO's minimum requirements;
- Widens the outside shoulder for additional recovery area;
- Eliminates all full cloverleaf interchange designs, which diminish safe driving conditions when operating at failing levels; and
- Eliminated all bottleneck points on the freeway, mitigating congestion.

Improving safety along the freeway facility is further augmented in the following ways:

- Wet Reflective Pavement Markings will be installed on I-270 from Lindbergh Boulevard to MO 367 (11.9% reduction);
- **Chevron Signs** will be installed on the horizontal curves along the four I-170/I-270 ramps as well as the southbound/westbound and eastbound/northbound ramps at MO 367 ramps (27.9% reduction);
- A special pavement mix (Eco Brawn Premium Hot-Hix Paving Mixture) will be used to improve friction from west of Lindbergh Boulevard to MO 367. This systematically reduce crashes by decreasing stopping distance for motorist, which reduce rear end crashes on the freeway which represents approximately 50 percent of the existing crashes on I-270 from 2012 to 2017 and also represents the second most fatal/serious injuries (29%), second only to out of control (39% fatal/serious injuries); and
- Wider outside shoulders will be constructed along I-270 from west of Lindbergh Boulevard to MO 367;
- Inlaid pavement markers will be installed on mainline I-270;
- Rumble strips will be replaced and installed along edge lines on mainline I-270; and
- Wrong-way signs will be implemented according to MUTCD and where appropriate within the project corridor.

Wet reflective pavement markings improve visibility and awareness of lanes under wet and dark conditions, conditions under which vehicles are more susceptible to crashes. The Missouri Blueprint identifies highly retro-reflective signs and markings to be a key strategy for older drivers. The service life for wet reflective pavement markings is estimated around 5 years.

Sharp horizontal curves can also diminish safety. Loop ramps are present at the Lindbergh Boulevard interchange and at the MO 367 interchange. The I-170 Interchange is also comprised of horizontal curves. The MW design removes the loop ramps at the Lindbergh Interchange and replaces with straight diagonal ramps. At the I-170 interchange and the southbound/westbound and eastbound/northbound ramps at the MO 367 interchange, chevron signs will be installed to improve driver visibility and awareness of the sharp curves. The Missouri Blueprint identifies roadway visibility features such as curve and chevron, to be a key strategy for reducing run-off-road/lane departure crashes. The service life for chevron signs is estimated to be 12 to 15 years.

Wider outside shoulders improve the ability to move disabled vehicles out of the travel lanes and provides a better area for drivers to maneuver to avoid crashes as well as recovery areas. The shoulder width is important to reduce the risk of rear-end crashes and can prevent a lane from being closed, which can cause severe congestion and safety problems on urban freeways. Wider shoulders also provide other benefits such as space for enforcement and maintenance activities. The Missouri Blueprint identifies expand and improve



shoulder and treatments as a key engineering strategy for reducing run-off-road/lane departure crashes, reducing distracted and drowsing driving crashes, as well as motorcycle crashes.

Inlaid pavement markers are retroreflective markers embedded in the pavement to improve visibility of lane striping during dark conditions. They are recessed in the pavement to not be impacted by snowplows. They are low-cost but effective safety enhancements.

Rumble Strips are also proven cost-effective solutions for improving safety on freeways. Rumble strips are grooves in the pavement on edge lines to alert drivers when they venture out of the driving lane. Rumble strips will be replaced and installed along I-270 mainline throughout the project limits.

Wrong-way signs are installed on one-way roads to alert drivers if they are travelling the wrong-way on a one-way road. These are particularly important at ramp terminals to prevent cars from entering the highway travelling in the wrong direction since speeds are high and an event is more likely to result in a high severity crash. Wrong-way signs will be implemented throughout the corridor according to MUTCD. To further enhance safety, wrong-way signs will be installed on both sides of the roadway at ramp terminals outside of the one-way outer road system at the interchanges of Lindbergh Boulevard, Hanley Road/Graham Road, and Bellefontaine Road. Additional signs were determined unnecessary on slip ramps on the one-way outer road system since vehicles are less likely to turn onto the off-ramps based on the roadway geometry and all vehicles are already travelling in the same direction on the one-way outer road.

Safety conditions are 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). Unfortunately, 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. Updated historical crash data from 2013 to 2017 was provided by MoDOT and used for analysis of the Preliminary Design.

A summary of the ISATe results, which reflects improvements from the proposed geometric design and safety countermeasures, are shown in **Table 8.** These numbers are not to be taken as a total number of crashes expected but are used only for comparison of predicted conditions between no-build and build scenarios. The proposed changes have a positive impact to each sub area. The detailed results table is provided in **Appendix 4.** ISATe predicts fatal and disabling injury crashes to be reduced by 21.8% over a 20-year period on I-270 mainline, with the implementation of the Preliminary Design. The total number of crashes are expected to be reduced by 29.5% over a 20-year period on I-270 mainline.

Table 2.3-2 shows predicted number of crashes from the Preferred Alternative compared to the Preliminary Design. The No Build and Preferred Alternative was analyzed using ISATe without historical crash data. This explains the difference in No-Build number of crashes between **Table 8** and **Table 2.3-2**. The preferred alternative in the original AJR is anticipated to reduce fatal and disabling injury crashes by approximately 7.0% and reduce the total crashes by approximately 19.5% when compared to the No-Build condition over 20-year timeframe. The Preliminary Design improves safety conditions more than the



<u>Preferred Alternative</u>. The total number of crashes are reduced 10% more with the Preliminary Design compared to the Preferred Alternative, and fatal and disabling injury crashes reduced 14.8% more than the Preferred Alternative.

		No-Build ¹		PRELIMINARY DESIGN ¹		
	Fatal &	Other		Fatal &	Other	
Location	Disabling	(B + C +	Total	Disabling	(B + C +	Total
(I-270 mainline)	(K + A)	PDO)		(K + A)	PDO)	
I-70 to West of MO 370	23.9	947.0	970.9	23.9	947.0	970.9
West of MO 370 to East of James McDonnell Blvd	43.1	1980.2	2023.3	43.1	1980.2	2023.3
East of James McDonnell Blvd to Hanley Rd/Graham Rd	42.5	2626.3	2668.8	28.0	1598.5	1626.5
Hanley Rd/Graham Rd to Old Halls Ferry Rd	61.7	3783.5	3845.2	39.4	1954.8	1994.2
MO 367	15.7	838.6	854.3	9.5	438.3	447.8
Bellefontaine Rd	11.4	513.4	524.8	8.4	406.1	414.5
Lilac Ave	5.6	320.8	326.4	5.6	320.8	326.4
Riverview Dr	7.1	350.0	357.1	7.1	350.0	357.1
Total	211	11.360	11.571	165.0	7.995.7	8.160.7

TABLE 8 EXPECTED NUMBER OF CRASHES ON I-270 MAINLINE (20-YEAR PERIOD)

¹No-Build and Preliminary Design conditions are based off Historical Crash data from 2013 to 2017

Table 2.3-2

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

	No-Build ¹		Preferred Origin	Alternative al AJR ¹	Preliminary Design	
		Fatal and Disabling		Fatal and Disabling		Fatal and Disabling
Location	Total	Injury	Total	Injury	Total	Injury
I-70 to west of MO 370	1,188	27	1,008	21	971	24
MO 370 to McDonnell	2,450	48	2,236	46	2,023	43
Lindbergh to I-170	2,307	41	1,891	41	1,626	28
Hanley/Graham to Old Halls Ferry	4,707	78	3,499	74	1,995	39
MO 367	1,035	18	680	15	448	10
Bellefontaine	577	13	558	12	415	8
Lilac	406	8	330	8	326	6
Riverview	514	10	416	10	357	7
Total	13,185	243	10,619	226	8,161	165

Source: HSM (ISATe)

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



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Not only does the Preliminary Design reduce the number of crashes on the freeway facility, but it also reduces crashes through the entire corridor, including the outer roads, ramps, and ramp terminals. ISATe methodology is limited and is not able to analyze certain improvements, like roundabouts or outer roads. These, rather, are analyzed using the Highway Safety Manual in relation with the outer road system discussed in the subsequent section.

Freeway Ramps and Terminals Safety Analysis

The Preliminary Design will also improve safety on the freeway ramps and terminals. Safety along the ramps and terminals was analyzed using the ISATe with historical crash data from 2013 to 2017. A summary of the preliminary predicted safety benefit from modification to the ramps and terminals are shown in **Table 9**. The proposed changes have a positive impact to each sub area. The detailed results table is provided in **Appendix 4**.

	No-Build			2040 Preliminary Design		
	Fatal &	Other		Fatal &	Other	
Location	Disabling	(B + C +	Total	Disabling	(B + C +	Total
(Interchange ramps, and ramp terminals)	(K + A)	PDO)		(K + A)	PDO)	
US 67; I-170; and Hanley/Graham (west)	12.8	803.5	816.3	13.8 ¹	1,021.0 ¹	1,034.8 ¹
Hanley/Graham (east); Route N;						
Washington/Elizabeth; West Florissant;	18.3	1,399.2	1,417.5	4.6 ²	240.3 ²	244.9 ²
Route AC; and Old Halls Ferry						
MO 367 and Bellefontaine Road	10.6	679.0	689.7	8.9	658.7	667.6
Lilac	1.3	136.0	137.3	1.3	136.0	137.3
Total	43.1	3,017.7	3,060.8	28.6	2,055.9	2,084.6

TABLE 9 EXPECTED NUMBER OF CRASHES ON I-270 RAMPS AND TERMINALS (20-YEAR PERIOD)

1 Crashes on the Crossroad (US 67) at the existing I-270 Loop ramps are NOT included in Existing crash calculation but are included as "Terminal" crashes part of the Build Condition.

2 The Pershall "Terminals" are included in Existing Conditions but no "Terminals" are included in the Build. Instead the "terminals" are part of the outer road system and evaluated in the HSM Analysis

The Preliminary Design also includes the additional safety countermeasure of installing chevrons on the horizontal curves on all four I-170 ramps as well as the eastbound I-270 to northbound 367 flyover and southbound MO 367 to eastbound I-270. Based on the results from the ISATe, the Preliminary Design is expected to decrease the total number of crashes on the ramps and terminals by 32% over a 20-year period. Total injury crashes are predicted to decrease by 33.5% with the implementation of the proposed design over a 20-year period. It should be noted that the Existing Conditions evaluate I-270 ramps as terminals in the existing No-Build condition (no complete outer road system). In the Build condition (with complete one-way outer roads) the "terminal" crashes are shifted to the outer road system and incorporated into the outer roads system and evaluated using the HSM arterials analysis method instead. The total impact of the Preliminary Design can be seen in **Table 10**.

Based on the predictive methods in the ISATe, the Preliminary Design is expected to <u>reduce the fatal</u> and disabling injury crashes along the freeway, ramps and terminals by 23.8% and reduce total crashes by <u>30% over a 20-years when comparing to the no-build condition.</u>



TABLE 10 EXPECTED NUMBER OF CRASHES ON FREEWAY, RAMPS AND TERMINALS (20-YEAR PERIOD)

	No-Build			2040 Preliminary Design		
Location	Fatal &	Other		Fatal &	Other	
(Freeway, Interchange ramps, and ramp	Disabling	(B + C	Total	Disabling	(B + C +	Total
terminals)	(K + A)	+ PDO)		(K + A)	PDO)	
I-70 to West of MO 370	23.9	947.0	970.9	23.9	947.0	970.9
West of MO 370 to East of James McDonnell Blvd	43.1	1,980.2	2,023.3	43.1	1,980.2	2,023.3
East of James McDonnell Blvd to Hanley						
Rd/Graham Rd Interchanges: US 67; I-	55.3	3,429.8	3 <i>,</i> 485.1	41.8	2,619.5	2,661.3
170; and Hanley/Graham (west)						
Hanley/Graham Rd to Old Halls Ferry Rd Interchanges: Hanley/Graham (east); Route N; Washington/Elizabeth; West	80.0	5,182.7	5,262.7	44.0	2,195.2	2,239.2
Florissant; Route AC; and Old Halls Ferry						
MO 367	23.4	1,149.9	1,173.3	15.8	761.3	777.1
Bellefontaine Rd	14.3	881.1	895.4	11.0	741.8	752.8
Lilac Ave	6.9	456.8	463.7	6.9	456.8	463.7
Riverview Dr	7.1	350.0	357.1	7.1	350.0	357.1
Total	254	14,378	14,633	193.6	10,051.8	10,245.4

Outer Road Safety Analysis

The outer roads have some of the highest crash rates in the project study area. Improvements at the interchanges also benefitted outer road safety performance. Many aspects of the geometric configuration of the Preliminary Design were included to target deficiencies in the safety of the outer roads for all users of the transportation network, including vehicles, bicyclists, and pedestrians. These include the following:

- Separating Lindbergh northbound and southbound into two separate facilities reduces the number of conflict areas;
- Implementing a roundabout at the ramp onto westbound I-270 from Dunn Road west of Graham Road reduces crashes (44% reduction);
- Converting Dunn Road from Graham Road to Linnell Drive to one-way eliminates all of the crossover slip ramps in this section of the corridor and greatly reduces the number of conflict areas;
- Converting and constructing Pershall Road from Hanley Road to Old Halls Ferry as a fully continuous one-way outer road reduces number of conflict areas and is more intuitive for drivers, mitigating driver confusion;
- Removing three of the loop ramps at the MO 367 interchange eliminates the two short weaving segments present on I-270 and MO 367;
- Relocating the existing westbound I-270 off ramp for Bellefontaine Road to a single lane roundabout and combining it with the westbound on-ramp eliminates the final unsignalized crossover slip ramp along I-270 in the St. Louis system, this improvement also converts a signalized on-ramp intersection to a roundabout;



- Implementing a multi-use path on Dunn Road from Lindbergh Boulevard Breezy Point Lane and on Pershall Road from Hanley Road Old Halls Ferry Road provides a safe place for bikes and pedestrians to travel through the corridor; and
- Updating all pedestrian facilities, including the connections over I-270 to meet ADA compliance improves safe conditions for vulnerable users of the system.

Safety along the outer roads is further enhanced with the following countermeasures:

- 3-inch Yellow Retroreflective Backplates installed at the following signals (15% reduction):
 - St. Charles Rock Road and Boenker/Pennridge Drive,
 - o James McDonnell Boulevard and Brown Road/Dunn Road,
 - Lindbergh Boulevard and I-270 ramp terminal intersections, Southbound Lindbergh Boulevard at Dunn Road, and at Fee Fee Hills Drive,
 - Dunn Road at Old Dunn Road/Taylor Road, Graham Road, New Florissant Road (Highway N), Washington Street, West Florissant Avenue, New Halls Ferry Road, Old Halls Ferry Road, Benham Road, Lusher Road, and Bellefontaine Road.
 - Pershall Road and Hanley Road, Ford Lane, New Florissant Road (Highway N), North Elizabeth Avenue, West Florissant Avenue, New Halls Ferry Road, Old Halls Ferry Road/I-270 Eastbound on ramp, Old Halls Ferry Road/shopping Center.
 - I-270 eastbound ramps at Bellefontaine Road.
 - MO 367 and I-270 ramp terminal intersections.
- **Transit Signal Priority** implemented at the new signals along Dunn Road between Graham and Old Halls Ferry and the new signals along Pershall Road between Hanley and Old Halls Ferry Road (12.7% reduction);
- **Pedestrian Countdown Timers** installed at the new signals along Dunn Road and Pershall Road between Hanley Road/Graham Road and Old Halls Ferry Road as well as at the US 67 interchange with I-270. (4.8% reduction).
- **Roundabouts**_at Dunn Road and I-270 on/off ramps for Bellefontaine Road as well as the I-270 westbound on ramp, west of Graham Road. Roundabout are proven safety countermeasures that requires vehicles to slow down to significantly reduce the severity of crashes. (44% reduction to stop controlled intersection and 26% reduction when replacing a signal with a roundabout).
- **Systematic signing and striping** at the stop-controlled intersection of Pershall Road and Dunn Road will bring improved attention to the unsignalized intersection (10% reduction in fatal and injury crashes and 8% for Property Damage only).

At signals, retroreflective back plates help improve driver visibility and awareness when approaching signalized intersections. Transit signal priority will modify signal timing if a bus is approaching to improve transit operations and prevent drivers from accelerating to make the light. Pedestrian countdown timers improve safety through warning pedestrians how much time they have before their green phase ends to give time to get out of the roadway before opposing traffic is prompted. The Missouri Blueprint identifies that retro-reflective backplates as a key engineering strategy at signalized intersections. The service life for 3-inch yellow retroreflective sheeting to signal backplates, pedestrian countdown timers and transit priority are estimated to be 10 years.

Roundabouts are a proven safety countermeasure that requires vehicles to slow down to traverse the intersection more safely by yielding to vehicles within the roundabout and to proceed through the roundabout in a slow manor. Roundabouts are an effective way to significantly reduce severe crashes and the Missouri



Blueprint considers roundabouts as a key strategy innovative design for unsignalized intersections. In fact, the Blueprint suggests replacing traffic signals with roundabouts as a key strategy for improving safety at signalized intersections and as a speed management reduction measure. The service life for a roundabout is estimated to be 20 years.

Systematic signing and striping would help to bring attention to the side-street stop intersection. To accomplish this, advanced warning signs with florescent sheeting and advance street name plaques on both sides of the road, along with stop signs with reflective strips posted on both sides of the street as well as improved pavement markings (stop bars, crosswalks, and arrows). The Missouri Blueprint identifies that highly retro-reflective signs and markings to be a key strategy for older drivers. The service life for Implement systematic signing and marking improvements at stop-controlled intersections is estimated to be 5 years for the pavement marking and 12-15 years for the signs.

Although the AJR didn't specifically perform predictive safety analysis for the outer roads, the proposed design will also improve safety on the outer roads. Safety along the Outer Road system was analyzed using the suburban arterial analysis part of the Highway Safety Manual (HSM). Many safety modifications were made to the Outer Road system through implementing the one-way outer road, eliminating all crossover slip ramps as well as implementing various safety countermeasures. A summary of the preliminary predicted safety benefit from the HSM results are shown in **Table 11**. The detailed results table is provided in **Appendix 4**.

		No-Build			2040 Preliminary Design		
		Injury	Property		Injury	Property	
		[K+A+	Damage	Total	[K+A+	Damage	Total
Segment	Facility type	B+C]	Only		B+C]	Only	
Pershall Road							
(from Ford Ln to east of Old Halls	Outer Road	810	1293	2103	1119 ¹	1824 ¹	2943 ¹
Ferry & east and west of Lilac)							
Dunn Road	Outor Bood	FOO	1022	1622	100	602	1100
(west of Hanley Rd/ Graham Rd)	Outer Roau	299	1022	1052	408	092	1100
Dunn Road							
(Hanley Rd/Graham Rd to Old	Outer Road	1334	2284	3618	1317	2129	3446
Halls Ferry)							
Dunn Road	Outor Boad	121	710	1152	707	171	761
(east of Old Halls Ferry)	Outer Roau	454	/19	1122	207	4/4	701
St. Charles Rock Road at	High Severity	107	202	220	100	170	200
Boenker/ Pennridge	Intersection	127	205	550	108	172	200
Lindbergh Boulevard at Fee Fee	High Severity	E 2	01	124	15	60	117
Hills Drive	Intersection	22	01	154	45	09	114
Total		3356	5613	8969	3284	5360	8644

TABLE 11 HSM EXPECTED CRASHES - SAFETY ANALYSIS RESULTS SUMMARY FOR THE OUTER ROAD (20-YEAR PERIOD)

¹ Proposed Build Design includes a full outer road system to serve access to/from the freeway versus interchange terminals that are not present in no-build condition

The freeway "ramp terminal" crashes from the existing condition are shifted to the Pershall Outer Road system in the build condition. Even with the shift in crashes to the outer road system, the fatal and injury crashes on the outer roads are expected to be reduced by approximately 2.1%, while the total crashes are



expected to be reduced by approximately 3.6% overall. The Preferred Alternative design is expected to have a 12% **increase** in both the fatal and injury as well as overall crashes due to this shift from the freeway to the outer road system, while the Preliminary Design will **decrease crashes up to 3.6% on the outer roads**.

Overall, the proposed changes along the freeway, ramps, terminals and outer roads (ISATe and HSM) is expected to reduce fatal and injury crashes by approximately 15.5% and total crashes by approximately 20% over 20-years, when compared to the No-Build condition.

2.3.2 Conclusion

Traffic and Safety conditions are improved with implementation of the Preliminary Design compared to nobuild conditions and the Preferred Alternative. The 2013 Existing and 2040 No-Build conditions presented in the original AJR submitted in November of 2016 were updated in the White Paper presented to FHWA. With the White Paper update, new data was available to better calibrate the models and the baseline conditions were proven to operate better than predicted in the original AJR submission. As such, the improvement to nobuild conditions with the implementation of the Preliminary Design are not as significant as improvements to no-build conditions presented in the first AJR submission. This update to baseline conditions is addressed in the Environmental Assessment Re-Evaluation approved by FHWA on December 10, 2019.

Future AM Traffic Operations – A LOS D or better was achieved for all freeway segments and intersections throughout the study area. The 2040 scenario for the Preliminary Design will increase speeds on the corridor by an average of 11 mph and reduce the overall VHD by over 1,600 hours. Furthermore, even with 20 years of traffic growth, speeds and delay improved by 2 mph and 200 hours compared to 2018 existing conditions.

Future PM Traffic Operations – All LOS on mainline I-270 is reported at LOS D or better. The Preliminary Design will increase speeds on the corridor by an average of 16.7 mph and reduce overall VHD by over 5,000 hours compared to 2040 No-Build. Furthermore, even with 20 years of traffic growth, speeds and delay improved by nearly 3 mph and over 300 hours compared to 2018 existing conditions.

Future Build Safety Conditions – According to HSM, fatal and disabling injury crashes are predicted to be reduced by 21.8% over a 20-year period on I-270 mainline, with the implementation of the Preliminary Design. The total number of predicted crashes are expected to be reduced by 29.5% over a 20-year period on I-270 mainline. Overall, the proposed changes along the freeway, ramps, terminals and outer roads (ISATe and HSM) is expected to reduce fatal and injury crashes by approximately 15.5% and total crashes by approximately 20% over 20-years, when compared to the existing condition.

2.4.1 Modifications in Access

The Preliminary Design offers full access to all crossroads. Eight ramps are consolidated to improve safety and mitigate short weaving segments. Access is maintained through the implementation of the one-way outer road system. One-way outer roads will be implemented on Perhsall Road between Hanley Road and Old Halls Ferry Road and on Dunn Road from Graham Road to Breezy Point Lane. Slip ramps are provided on the one-way outer road system and safety conflicts presented by existing slip ramps on the two-way outer road system are eliminated. No major change in access is proposed by the preliminary design. No new access is being proposed and all access points connect to public roads. **Table 2.4-1** below summarized existing access, the Preferred Alternative proposed access, and the Preliminary Design proposed access by interchange for comparison.



	Existing and Proposed I	-270 Interchange Access	
Interchange	Existing Access Type	Preferred Alternative Proposed Access Type	Preliminary Design Proposed Access Type
I-70	Full system-to-system	Full system-to-system	_
	access	access	
MO 180 – St. Charles Rock Road	Full access	Full access	-
MO 370	Full system-to -system access	Full system-to -system access	_
Missouri Bottom Road	Partial access – ramps to and from West only	No change. Partial access – ramps to and from West only	_
McDonnell Blvd	Full access	Full access	-
US 67 – Lindbergh Blvd	Full access	Full access	Full access
I-170	Full system-to -system access	Full system-to -system access	Full system-to -system access
Hanley Rd/Graham Rd	Full access	Full access*	Full access*
New Florissant Rd	Full access	Full access*	Full access*
Washington St/Elizabeth Ave	Full access	Full access*	Full access*
West Florissant Rd	Full access	Full access*	Full access*
New Halls Ferry Road	Split diamond with Old Halls Ferry – ramps to and from West only	Full access* - consolidates Old Halls Ferry Road access	Full access* - Split diamond with Old Halls Ferry Road
Old Halls Ferry Road	Split diamond with New Halls Ferry – ramps to and from East only	Access provided via New Halls Ferry Road and use of Texas U-Turns and one-way outer roads	Full access* - Split diamond with New Halls Ferry Road
MO 367	Full access	Full access	Full access
Bellefontaine Road	Full access	Full access	Full access
Lilac Drive	Full access	Full access	_
Riverview Drive	Full access	Full access	_

Table 2 4-1

*One-way outer road is proposed from Hanley/Graham Road to Old Halls Ferry Road. Full access is maintained through use of slip ramps between I-270 and the one-way outer road.

Indicates partial access Indicates consolidated access

2.4.2 Design Criteria

Design criteria were developed early in the I-270 North EA in order to guide the development of project alternatives. **Table 2.4-2** below demonstrates how the key design criteria elements included in the FHWA Missouri Division's Prompt List are being addressed by the Preferred Alternative and Preliminary Design.



	Table 2.4-2
I-270 North	Design Criteria Approach
	How does the design address t

	How does the design address the issue?				
Design Criteria	Preferred Alternative	Preliminary Design			
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.			
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.	 Based on EA Commitment #14: As discussed in 2.2.1.2, pedestrian and bicycle improvements include: Update all existing pedestrian facilities in the project study area (MoDOT ADA Transition Plan) to ADA compliance. Construct a multi-use path along Dunn Road between Lindbergh Boulevard and Breezy Point Lane. Construct a multi-use path along Pershall Road between Hanley Road Old Halls Ferry Road. Construct a sidewalk along Pershall Road between Hazelwood Road and the new Pershall Road/Coldwater Creek Bridge. The new Pershall Road/Coldwater Creek Bridge. The new Pershall Road/Coldwater Creek Bridge the sidewalk to Lindbergh Boulevard when the previous Ford Assembly Plant site is redeveloped. Construct new or improved sidewalks across I-270 at the 			



Table 2.4-2 I-270 North Design Criteria Approach How does the design address th

	How does the design address the issue?					
Design Criteria	Preferred Alternative	Preliminary Design				
		following interchanges and overpasses: Lindbergh Boulevard New Florissant Washington/Elizabeth West Florissant New Halls Ferry Old Halls Ferry Pershall Road over I-270				
		 Construct multi-use path connections across I-270 for a complete bike system at the following interchanges and overpasses: New Florissant Avenue Washington/Elizabeth West Florissant Avenue Old Halls Ferry Road Pershall Road over I-270. 				
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 Preliminary Design includes standard acceleration/deceleration and taper lengths for all ramps with the exception of the westbound off-ramp at Bellefontaine Road. An Additional Applicable Standard (AAS) was submitted at this location. This AAS proposes a tapered exit based upon Illinois Department of Transportation design standards. Traffic analysis show 95 th percentile queues do not extend past the gore point.				
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 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 Bellefontaine Road. This reflects an increase of one basic lane from Lindbergh Blvd. to Route 367. There are no proposed changes to the design from Bellefontaine Road to Chain of Rocks Bridge.				



Table 2.4-2 I-270 North Design Criteria Approach How does the design add

	How does the desig	n address the issue?
Design Criteria	Preferred Alternative	Preliminary Design
Length of tapers	It is anticipated that standard exit and	The Preliminary Design provides
	entrance taper lengths will be provided.	standard exit and entrance taper
		lengths.
Spacing between ramps	The proposed configuration placed an	The Preliminary Design eliminates the
	emphasis on eliminating the many	many existing short mainline weaves.
	existing short mainline weaves. While a	While a number of weaves remain,
	number of weaves remain in the	weaving distance is maximized, lane
	Preferred Alternative configuration,	balanced design is utilized, and VISSIM
	weaving distance is maximized, lane	modeling has shown operations to be
	balanced design is utilized, and VISSIM	acceptable. Recommended minimum
	modeling has shown operations to be	ramp terminal spacing per AASHTO
	acceptable.	Greenbook 2011 Fig 10-68 are met with
	Recommended minimum ramp	two known exceptions at the
	terminal spacing per AASHTO	westbound New Florissant entrance to
	Greenbook 2011 Fig 10-68 met with	Hanley/Graham exit (approximately
	known exceptions being westbound	1,300', see Design Exception #2) and
	New Florissant entrance to	the eastbound I-1/0 exit to
	Hanley/Granam exit (under 1600°,	Hanley/Granam exit (approximately
	1400 - 1500) and eastbound I-170 exit	800, see Design Exception #10)
	Lane balance was provided throughout	The Preliminary Design concent
	the corridor – exits and entrances –	provides lane balance along I-270
	with auxiliary and basic lane drops	hetween I-70 interchange ramps and
	achieved via lane balanced two-lane	Route 367
	exits or single lane drons on the right-	Noute 507.
	hand side.	
Uniformity in interchange	Most interchange designs are standard	The Preliminary Design provides
design and operational	industry types (e.g. diamond ramps.	standard industry types (e.g. diamond
patterns (i.e. right-side	loops ramps, slip ramps, etc.) Diverging	ramps, split diamond ramps, loop
ramps, exit design	diamond interchanges are proposed	ramps, slip ramps, etc.). No left side
consistent w/ adjacent	and these are consistent with the	exits/entrances on I-270 are proposed.
interchanges)	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.	



Design Exception #1 – 5' Inside Shoulders

There is a design exception to maintain the existing 5' inside shoulders through the project area. The existing I-270 corridor has outer roads on each side of the interstate, and dense development with tight existing right-of-way along these outer roads. Policy inside shoulder width would increase impacts to the existing outer roads and require the need for additional right-of-way acquisition. The existing pavement crown would also need to be moved 6' or more if the inside shoulder width increased beyond the existing width. This scenario would require reconstruction of the existing pavement structure which is currently planned to be utilized in place with a mill & overlay maintenance treatment. Finally, the existing Median Drainage is currently designed to accommodate the existing 5' shoulder and half of the adjacent lane. (Approximately 23' in total tributary lane width). Any increase in the tributary drainage area may necessitate removal and replacement of the median drainage throughout the corridor due to the increased water in the median. An Additional Applicable Standard (AAS) was also submitted which allows drainage spread across 4', per an Illinois Department of Transportation standard.

Design Exception #2 – 1300' Weaving Segment

There is a design exception to provide 1294' of weaving distance between the I-270 WB on-ramp from New Florissant Road and I-270 WB off-ramp to Hanley Road/Graham Road. This is 306' shy of the minimum 1600' recommended in the AASHTO Policy on Geometric Design of Highways and Streets. The on-ramp from New Florissant Road is proposed at a location 500' west of its existing location to allow more room geometrically for one-way traffic coming from New Florissant Road to execute maneuvers from the furthest outside lane to the exit ramp. The off-ramp to Hanley Road/Graham Road is proposed at a location 270' east of its existing location to allow more distance geometrically for ramp traffic to merge with one-way outer road traffic as they approach the Hanley Road/Graham Road signalized intersection where there are dedicated lanes for left-turn, through, and right-turn movements. The operational and safety conditions under the proposed geometrics are adequate.

Design Exception #3 – 2.5' Inside and Outside Shoulders

This design exception allows 2.5' inside and outside shoulder widths with 10.5' travel lanes on the bridge on Lindbergh Boulevard over Taylor Road. Lindbergh Boulevard will be widened from four lanes to six lanes over Taylor Road. This bridge is currently in good condition and is not slated for replacement as part of this project. Costs incurred from replacement of the bridge not only include the new structure, but also reconstruction of Taylor Road for the new bridge substructure. The driving lanes and shoulder widths on the roadway north and south of the bridge structure is design according to MoDOT policy so that when the bridge is replaced, the future structure can be constructed to accommodate MoDOT policy driving lane and shoulder widths.

Design Exception #4 – 4' Inside and Outside Shoulders

This design exception allows for 4' inside and 4' outside shoulders with 11' lane widths across the bridge on I-270 over Hanley Road to increase the number of eastbound I-270 lanes (from 5 lanes to 6 lanes). The existing shoulders are 5' inside and 10' outside with 12' lane widths. The bridge is structurally sufficient (it was reconstructed in 2007) and does not need to be replace for structural reasons.

Design Exception #5 – 2' to 3'-6" Inside and Outside Shoulders

There is a design exception for 2' inside and outside shoulders and three 12' lanes on the existing 3200' two-lane section of roadway southbound I-170 north of the Frost Avenue on-ramp and for 3' inside and 3'-6" outside shoulders and three 11' lanes on both bridges in this section of southbound I-170. Under existing conditions, I-170 narrows from three lanes to two lanes between I-270 north of the Frost Avenue on-ramp.



I-270 North Design-Build Access Justification Report Update March 3, 2020

The Frost Avenue on-ramp merges with I-170 as a two-lane ramp, bringing I-170 to four lanes south of the onramp. The existing lane drop in southbound I-170 causes congestion in the AM peak period. This congestion is worsened when improvements are made to the I-270 corridor, allowing more vehicles to reach I-170 South more quickly. This creates queues which extend from I-170 South onto I-270 East. To mitigate this bottleneck, the lane drop on I-170 South will be eliminated and the Frost Avenue on-ramp will be narrowed to a singlelane on-ramp. A single-lane on-ramp has sufficient capacity for both existing and future volumes merging from Frost Avenue. The existing pavement and bridge width through this 3,200' section of southbound I-170 will be used to provide a three-lane southbound facility which has 12' lanes and 2' inside and outside shoulders. This section fits on the existing 40' roadway pavement (10' outside shoulder / 2 x 12' lanes / 6' inside shoulder). The bridges have existing 39'-6" width barrier-to-barrier. This design exception proposes 11' lanes on the both bridges, with 3' inside shoulders and 3'-6" outside shoulders. The lanes transition back to 12' lanes with 2' shoulders immediately off of the bridges. All substandard guardrail within this section will be removed and replaced, and 2' shoulders provide necessary shy distance. The existing bridge barriers will remain. Existing shoulders will be improved as necessary to support the traffic loading. The narrowed Frost Avenue on-ramp is designed per MoDOT/AASHTO standard. The proposed three-lane facility will eliminate safety and mobility concerns and it does not preclude a future I-170 widening project to provide standard shoulder widths.

Design Exception #6 – Water Surface Elevation

A design exception is used to allow for a water surface elevation limit no higher than the edge of the lowest shoulder for a 50-year event at Coldwater Creek on I-270, Dunn Road, and Pershall Road. This includes 0' of bridge freeboard at Coldwater Creek on I-270, Dunn Road, and Pershall Road. The existing edge of shoulder elevations at Coldwater Creek are 519.3' for Pershall Road and 518.9' for I-270. Water has not been observed overtopping the structures at Coldwater Creek. Hydraulic modeling indicated water surface elevations for the design flood events will not satisfy EPG requirements for the current profile grade. To meet the EPG Roadway Design Criteria, a significant grade-raise and/or channel widening of Coldwater Creek would be required. Due to constraints of the site, nearness of interchanges and bridges over mainline I-270 and Coldwater Creek FUSRAP area, neither option would be favorable. By allowing the Roadway Design Criteria to meet FHWA's requirement of a 50 year flood for design flood encroachments, the new profile grade would only need to be raised a small amount, minimizing the effects to nearby interchanges and FUSRAP area.

Design Exception #7 – 4' Inside and Outside Shoulders

A design exception for 4' shoulders along the section of I-270 that passes under the fly-over ramps to/from I-170 and on both the eastbound and westbound approaches to the interchange in order to accommodate a fourth basic lane of traffic without having to reconstruct the fly-over ramp structures and MSE walls is also used. These structures were constructed in 2002 and are anticipated to have a 50 to 75-year service life. Based on projected traffic volumes, the basic freeway segments on eastbound I-270 through the I-170 interchange area will operate at level of service F in the design year during the PM peak. With the additional fourth basic lane, levels of service improve to D or better. Along westbound I-270 through the interchange, the basic freeway segments operate at level of service D or better with the existing three basic lanes; however, four basic lanes are needed on the section of the corridor that runs from MO 367 to I-170. Therefore, to keep with the principles of lane balance and not create undesirable weaving conditions, the fourth lane is maintained through the I-170 interchange area. In additional fourth basic lane, the level of service improves to C in current build year and LOS D in 2040. The lane widths on I-270 in the vicinity of the I-170 fly-over ramps are twelve feet which meets current standards. In addition, the existing concrete median barrier under the fly-over ramp structures is Type C which meets current standards.



Design Exception #8 - Vertical Alignment of Dunn Road

Design exceptions for vertical alignment were used on portions of Dunn Road (STA. 412+30 to STA. 413+90, STA. 424+20 to STA. 427+20, and STA. 444+50 to STA. 445+70). The pavement through this portion of Dunn Road can be rehabilitated (minor) and is compatible with the proposed improvements through the corridor. Since these segments are not be reconstructed, they cannot be improved to provide the vertical stopping sight distance (VSSD). At these sag curve locations, lighting will be implemented to satisfy the deficient headlight distance impacted by the existing vertical curves. These locations also do not meet the "comfort criteria" for 40 mph. The existing conditions are most nearly designed for 30 mph comfort criteria. The Dunn Road corridor is within a constrained corridor for both right-of-way, utilities, and private entrances. Changes to the existing vertical alignment through this area will lead to significant impacts to property owners along Dunn Road.

Design Exception #9 – Vertical Alignment of Pershall Road

Design exceptions for vertical alignment were also used on portions of Pershall Road (~STA. 400+80 to STA. 403+80). The portion of Pershall Road is designed with vertical crest curve "K" = 40 (35 mph). The pavement through this portion of Pershall Road will be rehabilitated instead of replaced and is compatible with the proposed improvements through the corridor. Since it is not being reconstructed, this segment of Pershall Road cannot be improved to provide the 305' of VSSD. Pershall Road is within a constrained corridor for right-of-way, utilities, and private entrances. Changes to the existing vertical alignment will lead to additional impacts.

Design Exception #10 – 800' Consecutive Off-Ramp Spacing

A design exception is used for a consecutive off-ramp spacing of 792' between the off-ramps on I-270 East to I-170 South and to Hanley Road/Graham Road. The I-270 and I-170 and the I-270 and Hanley Road/Graham Road interchanges was reconstructed in the early 2000s as successive parallel type single lane exits from a three lane freeway. New 14" thick concrete pavement was used to construct the realigned I-270 in the area of the two interchanges. The distance between the painted gores is 970'.

As part of the I-270 North Design Build Project, no new pavement is being constructed between the I-270 and I-170 and the I-270 and Hanley Rd./Graham Rd. interchanges. However, I-270 will be restriped to provide four thru-lanes in the vicinity of these two interchanges. Additionally, upstream of the EB I-270 to SB I-170 ramp, a continuous auxiliary lane is being constructed between the Lindbergh Boulevard on-ramp and the EB I-270 to SB I-170 off –ramp. The fourth lane of I-270 will be an option lane that will also have the opportunity to utilize the EB I-270 to SB I-170 off-ramp. The off-ramp to Hanley Road/Graham Road will remain a parallel type single lane exit from the freeway. By including an option lane exit from EB I-270 to SB I-170, the painted gore is force to the east by approximately 178' reducing the distance between the two successive off-ramps. However, including an option lane improves the operation of the weave between US67 (Lindbergh Boulevard) and I-170. The location of the physical gore of neither ramp will be changed as part of the project. The overall operations and safety between Lindbergh Boulevard and Hanley Road/Graham Road will operate acceptably in this configuration.

Additional Applicable Standard – Contra-Flow Bus Lane

An Additional Applicable Standard (AAS) was used to design the contra-flow bus lane implemented on Pershall Road from the North County Transit Center to West Florissant Avenue and the Florissant Valley Community College. MoDOT currently does not have specified design standards for contra-flow bus lanes. The design standards presented by the City of Orlando for their Bus Rapid Transit (BRT) LYMMO Orange Line were used for reference. The bus lane geometrics were developed using MoDOT EPG and AASHTO Policy of



Geometric Design of Highways. Pavements, Shoulders, Curbs, Barriers, and Median strips utilized MoDOT Standards. Pavement marking and Signing were developed in accordance with MUTCD Section 3D.02.

Additional Applicable Standard – Taper Exit Ramp

An AAS was also used for the I-270 Westbound off-ramp to Bellefontaine Road. To eliminate the existing unsignalized crossover slip ramp and avoid right-of-way takings, the off-ramp was relocated to the intersection with the on-ramp on the west side of Bellefontaine Road. Without replacing the overpass over Bellefontaine Road, there is no room to allow for a deceleration lane per MoDOT standards. The proposed taper exit was designed after IDOT's Bureau of Design and Environment (Chapter 37: Interchanges). Traffic modeling results from VISSIM and SIDRA show that 95th percentile queues do not extend past the gore point under existing or future conditions. There is 600-feet from the roundabout approach to the gore point. From VISSIM and SIDRA results, shown in **Table 12** and **Table 13**, queues from the off-ramp do not exceed 100' in both AM and PM peak periods in 2020 and 2040. The roundabout provides ample capacity and vehicles are not anticipated to queue into mainline I-270 traffic.

VISSIM Level of Service								
		20	20 AM			20	20 PM	
Annroach	Average	Max	Approach	Approach	Average	Max	Approach	Approach
Approach	Queue	Queue	LOS	Delay	Queue	Queue	LOS	Delay
NB	0	0	А	5.0	0	65	А	5.0
WB	0	150	А	5.6	0	210	А	8.7
EB	0	30	В	10.0	5	95	В	15.5
		20	40 AM		2040 PM			
Approach	Average	Max	Approach	Approach	Average	Max	Approach	Approach
Approach	Queue	Queue	LOS	Delay	Queue	Queue	LOS	Delay
NB	0	25	А	2.0	0	55	А	3.0
WB	0	65	A	2.7	0	130	A	3.7
EB	0	50	A	9.8	10	135	В	16.5

TABLE 12 BELLEFONTAINE ROAD ROUNDABOUT VISSIM LEVEL OF SERVICE

TABLE 13 BELLEFONTAINE ROAD ROUNDABOUT SIDRA LEVEL OF SERVICE

SIDRA Level of Service								
		2020 AM				20	20 PM	
Approach	Average	95 th %	Approach	Approach	Average	95 th %	Approach	Approach
Approach	Queue	Queue	LOS	Delay	Queue	Queue	LOS	Delay
NB	-	25	А	4.0	-	35	А	4.3
WB	-	105	А	8.0	-	130	А	8.1
EB	-	1	В	11.2	-	25	В	14.0
		20	40 AM		2040 PM			
Approach	Average	95 th %	Approach	Approach	Average	95 th %	Approach	Approach
Approach	Queue	Queue	LOS	Delay	Queue	Queue	LOS	Delay
NB	-	25	А	4.1	-	50	А	4.5
WB	_	130	A	7.7	_	180	A	8.0
EB	-	10	В	14.7	-	45	В	16.3



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Additional Applicable Standard – 8' Multi-Use Path

To stretch project scope, an AAS was used to design the 8-foot wide shared use path throughout the corridor. This shared use path will be implemented on Dunn Road from Lindbergh Boulevard to Breezy Point Lane and on Pershall Road between Hanley Road and Old Halls Ferry Road. Multi-use path connections will also be made across I-270 for a complete network at New Florissant Avenue, Washington Street/Elizabeth Avenue, West Florissant Avenue, Old Halls Ferry Road, and Pershall Road over I-270. Constraints which prevent the multi-use path from becoming 10-feet include existing right-of-way, existing utilities, and stormwater management requirements. The multi-use path is designed based on Great Rivers Greenway (GRG) Online Design Standards.

Additional Applicable Standard – 2' Left Shoulder and 8' Right Shoulder on Ramps

An AAS was also used to design particular ramps to/from I-270 with 2' left shoulder and 8' right shoulder. This allows for increased cost efficiency, reduced maintenance costs, and reduced impervious area for stormwater management. This design is accordance with AASHTO Policy on Geometric Design of Highways and Streets as well as Arizona's Department of Transportation's Roadway Design Guide. The 2' left shoulder, 8' right shoulder, and 14' driving lane (minimum) provides sufficient paved area to allow a vehicle to pass in an emergency situation. Ramps which are designed according to this AAS include I-270 on and off-ramps at the Lindbergh Boulevard interchange, the northbound off-ramp from Lindbergh Boulevard to Taylor Road, and all I-270 on and off-ramps from Hanley Road/Graham Road to Old Halls Ferry Road.

All submitted design exceptions and AAS's referenced here are provided in **Appendix 5**.

2.7.2 Agency and Private Entity Coordination

- Community Advisory Group (CAG). Subsequent to approval of the AJR, MoDOT made the decision to complete the project using a design-build procurement method for 14.5 miles of the I-270 North from I-70 to 0.5 miles west of Route H (Riverview Drive). MoDOT held a meeting with the CAG on April 16, 2019 prior to the Public Informational Meeting to brief them on the status of the project, explain the design-build procurement method, and answer questions.
- Elected Official Briefing. Subsequent to approval of the AJR, MoDOT made the decision to complete the project using a design-build procurement method for 14.5 miles of the I-270 North from I-70 to 0.5 miles west of Route H (Riverview Drive). MoDOT held a meeting with elected officials on April 16, 2019 prior to the Public Informational Meeting to brief them on the status of the project, explain the design-build procurement method, and answer questions.
- Public Informational Meetings. Subsequent to approval of the AJR, MoDOT made the decision to complete the project using a design-build procurement method for 14.5 miles of the I-270 North from I-70 to 0.5 miles west of Route H (Riverview Drive). MoDOT hosted an open-house Public Informational Meeting on April 16, 2019 and virtual public meeting was available on the project website, www.i270north.org. At the open house, the were five stations explaining the current status of the corridor and the design-build process. Project staff was available to answer questions. Via surveys at the open house and online, MoDOT solicited feedback to provide data to design-build teams to help develop their proposals.



2.8.2 Social and Environmental Overview

MoDOT prepared a Re-evaluation of the original I-270 North Environmental Assessment and submitted to FHWA on December 4, 2019. Approval was given by FHWA on December 10, 2019. **Table 2.8-1** provides a summary of the changes in impacts associated with the Preliminary Design for the project.

2.8.3 Conclusion

MoDOT prepared a re-evaluation of the original I-270 North Environmental Assessment and submitted to FHWA on December 4, 2019. Approval was given by FHWA on December 10, 2019. The Preliminary Design is consistent with the overall EA, and is consistent with and included in current STIP, TIP, and the region's longrange transportation plan, Connected 2045. As with most urban interstate projects, there are both positive and negative impacts to the human and natural environments. As part of the EA and EA re-evaluation, MODOT has made a number of commitments to mitigate the impacts of the project. The Preliminary Design is consistent with these commitments and provides slightly better overall traffic operations with slightly lower overall environmental impacts. The I-270 North EA re-evaluation can be reviewed for more information on the impact analysis of the Preliminary Design.

2.9 Conclusion

MoDOT requests approval from the Federal Highway Administration (FHWA) to modify proposed changes in access points along I-270 North corridor between Lindbergh Boulevard to Bellefontaine Road. The Preferred Alternative in the first AJR submission approved by FHWA in April of 2017 is Reasonable Alternative 1 with the 1a variation between West Florissant Avenue and New Halls Ferry Road. Through the design-build process, the Preferred Alternative has been altered to optimize mobility and safety through the project corridor within the allotted budget. The proposed design from the design-build project is referred to as the Preliminary Design. The Preliminary Design proposed changes to the Preferred Alternative between Lindbergh Boulevard and Bellefontaine Road. The Preliminary Design meets the performance measures developed prior to the development of the project alternatives and performs better than the Preferred Alternative, Alternative 2, and the No-Build alternative when comparing level of service, travel times between key locations, and networkwide speed and delay. The geometric improvements and proposed modifications to the access points along the corridor will help relieve congestion and improve safety and operation of the system.

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. The re-evaluation of the EA and FONSI with the proposed changes from the Preliminary Design was submitted by MoDOT and approved by FHWA on December 10, 2019. MoDOT has identified funding for two projects within this corridor to prioritize for initial phasing as part of the 2017-2021 STIP, one of which being the design-build project (J6I3020B) instigating this AJR update and the other being the Riverview Drive Interchange project (J6I3020C). Construction of the design-build project is currently planned to begin in April of 2020 pending FHWA approval of this document.

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.

SUMMARY
IMPACT
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2.8-1:1

TABL

	ign	ug	ign	ug		ign	ußi	ligi	ugi	5		igi	ign	ugi	ign
TRAFFIC NOISE IMPACTS	No change from AJR Preferred Alternative Desi	No change from AJR Preferred Alternative Des	No change from AJR Preferred Alternative Des	No change from AJR Preferred Alternative Des		No change from AJR Preferred Alternative Desi	No change from AJR Preferred Alternative Des	No change from AIR Preferred Alternative Des	No change from AJR Preferred Alternative Des	No change from AIR Preferred Alternative Des		No change from AJR Preferred Alternative Des.	No change from AJR Preferred Alternative Des	No change from AJR Preferred Alternative Des	No change from AJR Preferred Alternative Desi
BIKE/PED IMPACTS	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	One-way outer roads tend to benefit pedestrians (because of fewer conflict points). Muti-use path along Dunn and Pershall Roads allow for bicycles to travel in both directions.	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.	One-way outer roads tend to benefit pedetratians (because of the wer conflict points). One-way outer roads tend to result in out-of- direction travel by bioyldist ceraing more conflicts with automobiles.		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
WATERWAY IMPACTS	No change from AIR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No change from AIR Preferred Alternative Design	No change from AIR 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 AIR Preferred Alternative Design	No change from AIR 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
ENVIRONMENTAL JUSTICE IMPACTS	CDONNELL 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	RD TO HANLEY ROAD/GRAHAM ROAD	No change from AJR Preferred Alternative Design	No change from AIR Preferred Alternative Design OAD TO OLD HALLS FERRY ROAD	No change from AIR Preferred Alternative Design	No change from AJR Preferred Alternative Design	Dedicated bus only lane minites out of direction travel required by METRO to connect the North County Transit Careter to how West Foliosisant and St. Louis Community Cellege - Forissant valley, METRO estimates that one-way outer roads will increase their operating experses but the bus only lane minimizes this cost increase.	3Y ROAD TO RIVERVIEW DRIVE	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
PARKS AND RECREATION IMPACTS	AREA 1: 1-70 to EAST OF M 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	REA 2: EAST OF MCDONNELL BOULEVAL	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design AREA 3: HANNEY ROAD/GRAHAM R	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design	No land acquisition required from Little Creek Nature Area. Driveway will be improved as necessary to benefit the facility.	AREA 4: EAST OF OLD HALLS FERF	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
PRELIMINARY PROPERTY ACQUISITION ESTIMATES	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	٩		U acres	Less than 1 acre	+/- 1.5 acres	Less than 1 acre		0 acres	0 acres	No change from AJR Preferred Alternative Design	No change from AJR Preferred
PRELIMINARY STRUCTURE ACQUISITION ESTIMATES	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	4 single family residences	None	No charge from AJR Preferr ed Alternative Design		No change from AJR Preferred Alternative Design	None	No change from AJR Preferred Alternative Design	No change from AJR Preferred Alternative Design
PRELIMINARY DESIGN DESCRIPTION	No change from AIR Preferred Alternative Design	No change from AIR Preferred Alternative Design	No change from AIR Preferred Alternative Design	No change from AIR Preferred Alternative Design		Split Diamond Interchange	No change from AIR Preferred Alternative Design	No change from AIR Preferred Alternative Design	No change from AIR Preferred Alternative Design	Diamond Interchange at West Florissant Split Diamond Interchange (New Halls Ferry to Old Halls Eerry to Old (One-way Dum/Pershall)		Partial Turbine Interchange with Green-T Intersections	Roundabout Buttonhook Interchange Westbound/Diamond Interchange Eastbound	No change from AIR Preferred Alternative Design	No change from AJR Preferred Alternative Design
LOCATION	St. Charles Rock Road	Route 370	Missouri Bottom Road	McDonnell Boulevard		Lindbergh Boulevard	1-170	Hanley Road/ Graham Road	New Florissant Road to Washington Street/Elizabeth Avenue	West Florissant Avenue to Old Halls Ferry Road		Route 367	Belle font aine Road	Lilac Avenue	Riverview Drive