

# Executive Summary

## Introduction

This SIMR for the I-4 interchanges between County Road (CR) 532 and State Road (SR) 429 in Osceola County covers the documentation requirements agreed upon in the approved Methodology Letter of Understanding (MLOU). This report provides existing conditions data, future traffic forecasts, and the operational analysis for the existing (2018), opening year (2022), mid-design year (2032) and design year (2042) conditions.

The study segment was previously evaluated as part of the I-4 Beyond the Ultimate (BtU) South Section Systems Access Modification Report (SAMR) that received a determination of Safety, Operational and Engineering (SO&E) Acceptability on May 9, 2017 from the Federal Highway Administration (FHWA). The SAMR identified a series of improvement recommendations for the interchanges and I-4 mainline, however, these improvements are not scheduled until the mid-2040s and interim improvements identified as part of this SIMR are advanced by Florida Department of Transportation (FDOT) and Osceola County in response to concerns brought forth by area residents and businesses through local agencies. The project location map is shown in **Figure A**.

## Purpose and Need

Rapid growth in residential, commercial/retail, and industrial development within ChampionsGate and Poinciana over the last several years has resulted in a significant increase in travel demand and traffic impacts (daily recurring congestion) on I-4 within the vicinity of the CR 532 and SR 429 interchanges. The existing congestion along I-4 that spans across multiple interchanges is tied to unique traffic patterns within the study area with overlapping traditional morning and evening work-based trips and tourist trips generated by the nearby Disney attractions and new development within the study area.

Under the existing conditions, traffic routinely backs up along eastbound I-4 from CR 532 eastbound on ramp merge to US 27 in the morning peak period and backs up along westbound I-4 from the CR 532 westbound off ramp diverge to US 192 in the afternoon peak period. The interchange at I-4 and SR 429 also regularly experiences backups on the ramps to and from I-4 (west of SR 429). Operational deficiencies that occur within the I-4 and CR 532 interchange area combined with a short weaving distance between the I-4 at CR 532 and I-4 at SR 429 interchanges create major bottlenecks near the study area that cause recurring daily congestion on the I-4 mainline. The lack of adequate capacity to accommodate the existing traffic demand is most prevalent with the westbound off ramp and the eastbound on ramp at the I-4 and CR 532 interchange.

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**Figure A**

Project Location Map  
I-4/CR 532/SR 429 Systems Interchange  
Modification Report (SIMR)

The capacity-constrained conditions that currently exist create congested conditions and adverse impacts to the I-4 mainline, SR 429 mainline and ramps, and CR 532 cross-street operations. These conditions are anticipated to worsen in the future as more development occurs within the study area. Given the extent of congestion along I-4, major capacity improvements such as I-4 widening to 10 lanes (as proposed in the I-4 BtU project) and CR 532 widening to six lanes are needed to appropriately alleviate the severe existing and anticipated future congestion issues. However, there is an urgent need to alleviate the adverse traffic conditions that currently impact the operations as well as safety of all road users within the study area.

As such, the primary purpose of this SIMR is to identify interim solution to improve traffic operations, reduce congestion, and enhance safety at the study interchanges, until the approved concept for the I-4 BtU along with widening of CR 532 can be funded and implemented. Identified Interim Improvements

**Figure B** illustrates the proposed interim improvements (and the corresponding financial project numbers) based on information provided by FDOT. The DDI improvement at the I-4 and CR 532 interchange is being coordinated through a Joint Participation Agreement (JPA) with Osceola County and with local developers to facilitate congestion relief in the near term. Additionally, the Department is seeking to advance funding for the interchange improvements through the SIS Quick Fix program and work with MetroPlan Orlando to leverage Surface Transportation Program (SU) funds for urban areas of population over 200,000. The auxiliary lanes project along I-4 between CR 532 and SR 429, and SR 429 improvements will be completed jointly by Florida's Turnpike Enterprise (FTE) and FDOT.

Per the approved MLOU, this SIMR evaluated a No Build alternative and a Build alternative as noted below:

- **No Build Alternative:** This alternative maintains the existing configuration along I-4 and CR 532 and SR 429.
- **Build Alternative:** The build condition includes the following interim improvements:
  - Diverging Diamond Interchange (DDI) at the I-4 and CR 532 interchange (FPID #444187-1).
  - Widening the existing westbound off ramp and eastbound on ramp at I-4 and CR 532 to two lanes (FPID #444329-1). Please note that widening the existing eastbound on ramp from CR 532 to I-4 to two lanes was not identified in the MLOU, as amended in September 2019. The decision to widen the I-4 eastbound on-ramp from CR 532 was made during the operational analysis effort, and additional information in this regard is provided in Section 4.1.1 of this SIMR.
  - Adding an auxiliary lane in each direction along I-4 between the CR 532 and SR 429 ramps (FPID #444329-1).
  - Widening the existing ramps to two lanes, from eastbound I-4 to northbound SR 429 and southbound SR 429 to westbound I-4 (FPID #444329-1).

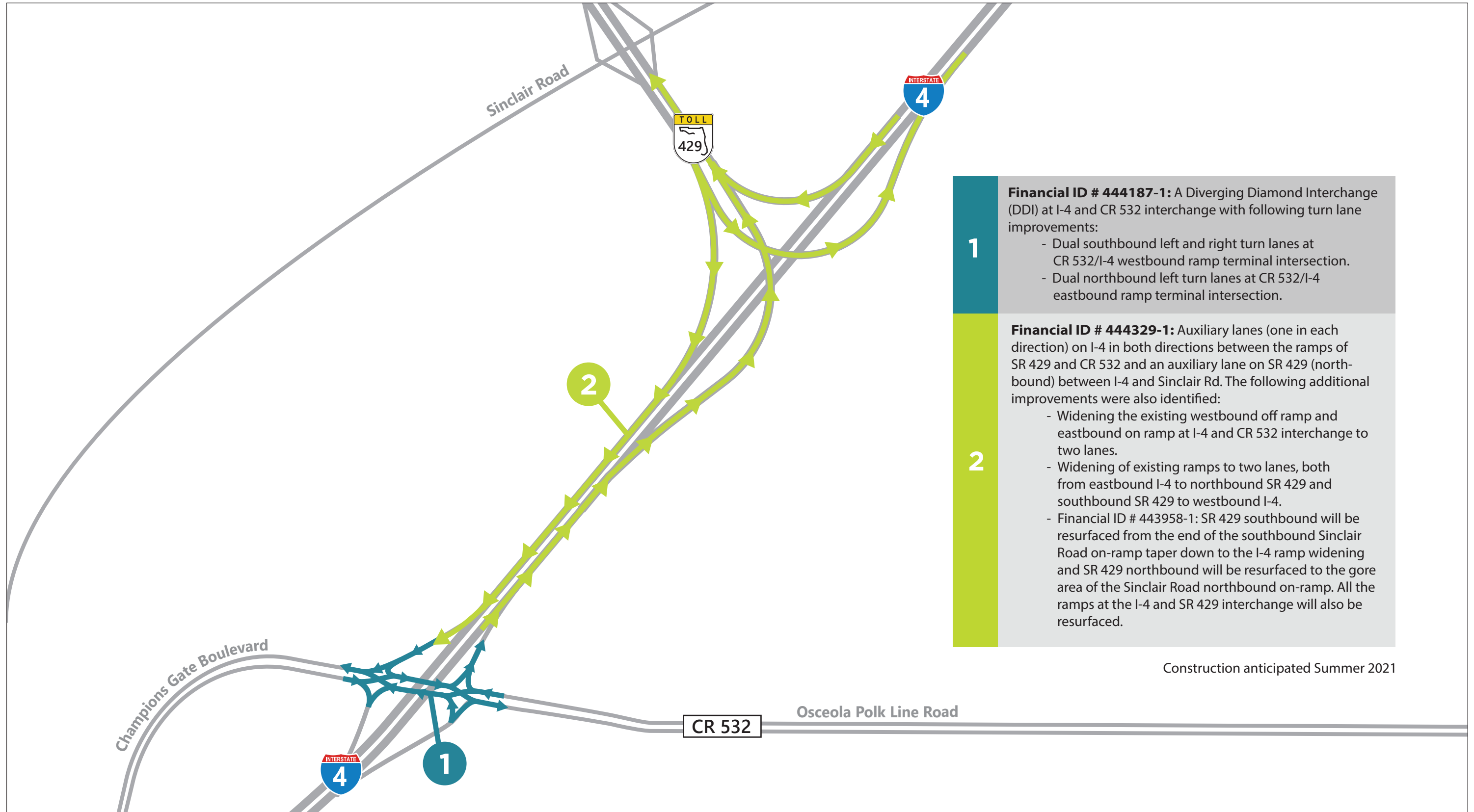
- Widening SR 429 in the northbound direction to add an auxiliary lane to the outside, to the Sinclair Road interchange (FPID #444329-1).

A signal at CR 532 and Kemp Road intersection is considered in both the No Build and Build alternatives, which will be in place by opening year 2022 based on discussion with Osceola County. In addition, based on coordination between FDOT and Osceola County, the northbound left turn and through movements at the intersection of CR 532 and S Goodman Road are restricted to improve safety and operations under the Build alternative.

The proposed interim improvements will achieve this study objective as illustrated below:

- Improve operational and safety deficiencies with innovative interim improvements and without the need to widen CR 532, SR 429 and I-4
- Mitigate traffic bottleneck at the interchange of I-4 and CR 532
- Extend operational life of the study area “with limited Strategic Intermodal System (SIS) Quick Fix Funds”
- The auxiliary lanes along I-4 between CR 532 and SR 429 ramps will provide added capacity between the interchanges and increase the available distance for entering traffic (from the proposed two-lane ramps – eastbound on ramp from CR 532 to I-4 eastbound and southbound SR 429 on ramp to I-4 westbound) to merge with the I-4 mainline,
- The interchange at I-4 and CR 532 modification will alleviate the existing recurring traffic congestion along CR 532 and queueing on the westbound off ramp, and improve the safety characteristics for all road users, and
- The widening of existing ramps from I-4 eastbound to northbound SR 429 and widening of SR 429 northbound to add an auxiliary lane up to the Sinclair Road interchange will help flush traffic away from the I-4 mainline at a faster rate.

**In conclusion, short term improvements that can be constructed quickly without significant project costs and without need for acquiring right-of-way are identified as part of this SIMR. There are no funds available to build other improvements currently.**



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|---|---|
| 1 | <p><b>Financial ID # 444187-1:</b> A Diverging Diamond Interchange (DDI) at I-4 and CR 532 interchange with following turn lane improvements:</p> <ul style="list-style-type: none"> <li>- Dual southbound left and right turn lanes at CR 532/I-4 westbound ramp terminal intersection.</li> <li>- Dual northbound left turn lanes at CR 532/I-4 eastbound ramp terminal intersection.</li> </ul>  |
| 2 | <p><b>Financial ID # 444329-1:</b> Auxiliary lanes (one in each direction) on I-4 in both directions between the ramps of SR 429 and CR 532 and an auxiliary lane on SR 429 (northbound) between I-4 and Sinclair Rd. The following additional improvements were also identified:</p> <ul style="list-style-type: none"> <li>- Widening the existing westbound off ramp and eastbound on ramp at I-4 and CR 532 interchange to two lanes.</li> <li>- Widening of existing ramps to two lanes, both from eastbound I-4 to northbound SR 429 and southbound SR 429 to westbound I-4.</li> <li>- Financial ID # 443958-1: SR 429 southbound will be resurfaced from the end of the southbound Sinclair Road on-ramp taper down to the I-4 ramp widening and SR 429 northbound will be resurfaced to the gore area of the Sinclair Road northbound on-ramp. All the ramps at the I-4 and SR 429 interchange will also be resurfaced.</li> </ul> |

Construction anticipated Summer 2021



N.T.S.



**Figure B**

Proposed Interim Improvements & Financial Project IDs  
 I-4/CR 532/SR 429 Systems Interchange  
 Modification Report (SIMR)

## FDOT's Commitment to Improving I-4 Operations

This SIMR established that beyond year 2032, additional major capacity improvements including those shown in the I-4 BtU and CR 532 widening are needed to provide improved levels of service within the study area. As such, FDOT realizes the need for further improvements along I-4 as well as the interchanges in the vicinity of the study area and will be ready in case funding becomes available for advancement of the proposed I-4 BtU improvements. Below is the list of activities programmed and planned for I-4 in the study area:

- Interim improvements for this area are programmed in collaboration with the local agencies.
- I-4 BtU is included as a planned improvement in the latest SIS Long Range Cost Feasible FY 2029-2045 (FY 2036-2040)
- I-4 Florida's Regional Advanced Mobility Elements (FRAME) study
  - This study, currently underway, is a regional, intercity integrated corridor management (ICM) project running from the Central Business District in Tampa to the southwest side of Orlando at the Florida Turnpike.
  - It will add Connected Vehicle (CV) devices to inform the public on congestion along I-4 and provide alternatives.
- Furthermore, in support of the continued commitment to long term I-4 BtU improvements in this area, FDOT has completed the following:
  - Completed the concept design plans and right-of-way maps
  - Began acquisition of parcels in this segment
  - Is in the process of obtaining environmental permits

## Compliance with FHWA Policy Points

As demonstrated in the study analysis results, the proposed interim improvements including the I-4 at CR 532 interchange modification, addition of auxiliary lanes along I-4 between CR 532 and SR 429, and widening of existing critical ramps at the study interchanges (I-4 at CR 532 and I-4 at SR 429 interchanges) will provide immediate and near-term relief from the recurring traffic congestion within the study area, and will improve safety for all road users. The two policy points per the FHWA Requirements and Guidelines were examined and addressed in this SIMR as stated below:

***Policy Point 1:*** *An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, and ramp intersections with crossroad) or on the local street network based on both the current and the planned future traffic projections.*

Response:

## Operational Analysis

A detailed traffic operational analysis for the existing year (2018), opening year (2022), mid-design year (2032) and design year (2042) conditions was conducted for this SIMR within the area of influence. Key performance measures from microsimulation (VISSIM) analysis including networkwide metrics, freeway travel times, speeds, densities and LOS, arterial travel times, intersection LOS and delays, and off ramp queues are used in this SIMR. Since existing congestion spans across multiple interchanges and time periods, non-traditional Measures of Effectiveness (MOEs) including unmet demand (termed as blocked vehicles in this report), processed vehicles (network-wide and segment-based) and blocked vehicle queues (upstream of the network entry points) were also used in this SIMR to identify the true benefits of the Build alternative, instead of individual segment MOEs for I-4. Based on the operational analysis conducted for this SIMR, the following high-level operational analysis observations are made, and detailed results are provided in the Future Operational Analysis section (Section 4.2) of this report:

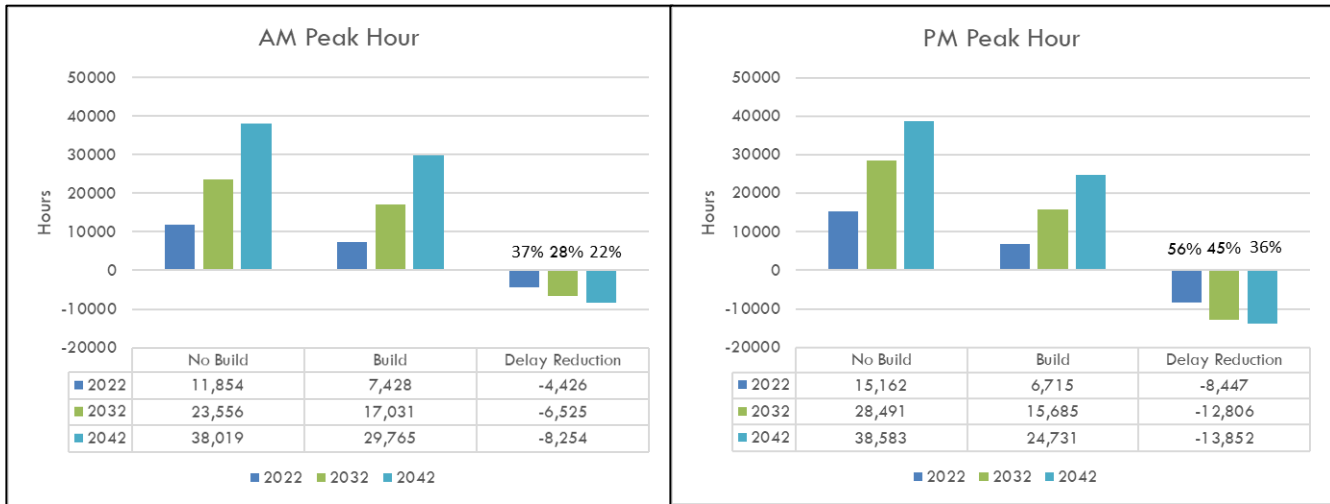
### ▪ **General Observations**

- The Build alternative provides benefits (compared to the No Build alternative) within the study area through 2042 as evidenced from the MOEs including overall network performance, average speeds and number of vehicles processed along I-4 and CR 532.
- Given the extent of congestion and interim nature of the Build alternative, it is not anticipated that the proposed improvement along I-4 (auxiliary lanes on both sides of I-4 between CR 532 and SR 429) will provide capacity comparable to a full through lane. Therefore, I-4 will continue to have oversaturated conditions through the design year 2042 conditions. However, as described below, substantial benefits in several performance metrics are observed, especially for 2022 and 2032 traffic conditions.

### ▪ **VISSIM Networkwide Performance Results**

- The Build alternative provides better operational efficiency with reduced networkwide travel time, delay time and latent delay time compared to the No Build alternative, especially for 2022 and 2032 traffic conditions. The AM peak hour delay reduction ranges between 22% and 37%, while the PM peak hour delay reduction ranges between 36% and 56%. The Build alternative provides more benefits in the PM peak hour compared to the AM peak hour (see **Figure C**).
- The Build alternative provides higher speeds and lower average delays for vehicles within the study area compared to the No Build alternative.
- The Build alternative processes a greater number of vehicles and has lower latent demand compared to the No Build alternative.

**Figure C: Total Delay Plus Latent Delay (hours) Summary**



▪ **Freeway Operational Results**

Under the Build alternative, average speed, simulated volume and density improved in the westbound direction for both the AM and PM peak hours and eastbound direction for the PM peak hour.

It should be noted that due to the unique nature of the study area and interim nature of the Build improvements, worse LOS conditions are observed for certain I-4 segments under the Build alternative compared to the No Build alternative. The following list provides the reasons for these conditions and justification that shows the true benefits of the Build alternative:

- Because of the proposed improvements under the Build alternative, a higher number of vehicles are processed on I-4 between CR 532 and SR 429, and therefore this segment shows more congestion (or worse LOS) compared to the No Build alternative. Based on a supplemental 2032 AM peak hour HCS freeway analysis using the same projected demand for the two study alternatives, this segment is shown to operate at LOS E under the Build alternative and at LOS F under the No Build alternative.
- Under the Build alternative, I-4 westbound between CR 532 and US 27 during the PM peak hour for 2022 and 2032 shows more congestion (or worse LOS) compared to the No Build alternative, because the Improvements upstream of this segment resulted in a higher throughput and consequently a higher density along I-4 westbound in this segment. For instance, a throughput improvement of approximately 36% on I-4 westbound between CR 532 and US 27 in 2032 PM peak hour is noted under the Build alternative.



- Blocked vehicle queues on I-4 is another non-traditional MOE to gauge the benefit of the Build alternative. For example, when compared to the Build alternative, the No Build alternative will have an approximately three-mile longer queue in the AM peak hour, and an approximately six-mile longer queue in the PM peak hour on I-4 eastbound west of US 27 and on I-4 westbound east of SR 417/World Drive, respectively.
- **Travel Time Results**
  - Based on input from FDOT, travel times in vehicle-hours are calculated for vehicles inside and outside (blocked vehicles) the network for I-4 and CR 532.
  - **I-4:** Build alternative travel time results along I-4, in general, show improvements in both directions when compared to the No Build alternative with the inclusion of blocked vehicles. The travel time savings are more significant in the PM peak hour compared to the AM peak hour (see **Figure D**).
  - **CR 532:** The total travel time (vehicle-hours) saving along CR 532 in the Build alternative is significantly more when compared to the No Build Alternative in all analysis years (See **Figure E**).
- **CR 532 Intersection Performance Results**
  - The ramp terminal intersections are estimated to operate at a significantly improved LOS D or better through 2032 under the Build alternative compared to the No Build alternative. Under the Build alternative, there is a significant improvement with all intersections operating at LOS E or better in 2022 AM and PM peak hours.
  - Cumulative intersection delays (sum of overall study intersection delays) under the Build alternative show more than 60% improvement in 2022 (AM and PM peak hours) and more than 45% (PM peak hour) improvement in 2032 versus the No Build alternative, which indicates noticeably improved traffic conditions in the Build alternative (see **Figure F**).

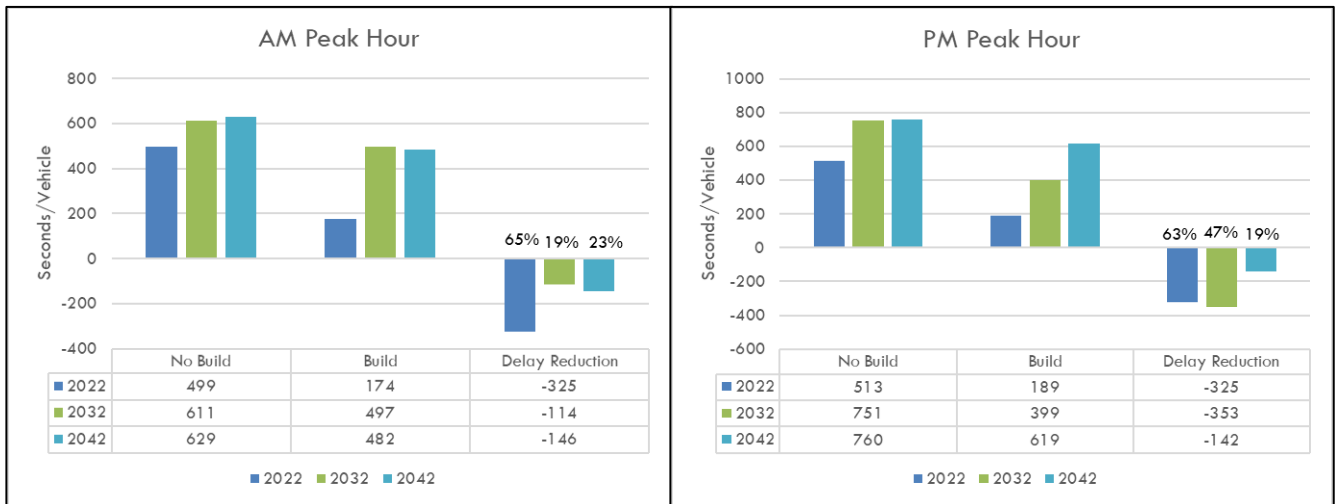
**Figure D: I-4 Total Travel Time (veh-hours) Summary**



**Figure E: CR 532 Total Travel Time (veh-hours) Summary**



**Figure F: Cumulative Intersection Delay (seconds/vehicle) Summary for CR 532**



### ▪ CR 532 Off Ramp Queue Results

- As part of the Build alternative, the proposed off ramp improvements at both I-4 eastbound and westbound ramp terminals will help avoid queue backups from the ramp terminals to the freeway mainline during the peak hours through design year 2042. Similarly, capacity improvements for the westbound off ramp from I-4 at the CR 532 interchange, the off ramp from eastbound I-4 to northbound SR 429 in combination with an auxiliary lane along northbound SR 429 from I-4 to Sinclair Road will help divert traffic away from I-4 mainline at a faster rate during the peak hours. **The operational analysis for the Build alternative shows that the ramp queues will not backup onto I-4 mainline through the design year 2042.**

Based on the above mentioned key performance results, benefits are seen in the Build alternative in the AM and PM peak hours for 2022 and 2032. However, based on networkwide metrics and cumulative intersection delays, the Build alternative will begin to fail after 2032 indicating additional improvements are warranted in the study area beyond 2032.

### Safety Analysis

The Build option provides improved safety benefits over the No Build alternative. Based on safety analysis and information contained in the Crash Modification Factor (CMF) Clearinghouse, the Build alternative is anticipated to:

- **Reduce the number of crashes by approximately 23 crashes per year, and therefore save \$4,164,900 in total crash costs (fatal, injuries and property damage only) per year** compared to the No Build alternative.
- Reduce freeway crashes by 20% because of the proposed addition of auxiliary lanes (one in each direction) on I-4 between CR 532 and SR 429
- Reduce interchange related crashes by approximately 40% because of the proposed conversion of the existing diamond configuration to a DDI at the interchange of I-4 and CR 532.

### Conceptual Signing Plan

A conceptual signing plan is developed (**Figure 29**) for the proposed interchange modification alternative. Modifications to the existing roadway signs were evaluated in conjunction with the proposed modifications to ensure that a proper signing plan is implemented within the study area.

**Policy Point 2:** *The proposed access connects to a public road only and will provide for all traffic movements.*

**Response:**

Full access interchange conditions, as offered by the existing interchanges at I-4 and CR 532 as well as at I-4 and SR 429, will remain with the proposed modification improvements. In addition, this project will achieve benefits to the transportation system with no adverse impact to the public. The proposed improvements have been, and will continue to be, coordinated with the public and local government agencies. The design of the proposed improvements will follow the applicable FHWA and FDOT design standards.