2022 California High Occupancy Vehicle Facilities Degradation Action Plans

Prepared by

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Division of Traffic Operations
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1. OVERVIEW

As required by Title 23 of the United States Code, section 166 (23 U.S.C. § 166), the California Department of Transportation (Caltrans) has prepared the *2021 California High Occupancy Vehicle Facilities Degradation Action Plan*. This document details the actions Caltrans will take to make significant progress toward bringing degraded high occupancy vehicle (HOV) facilities on State highways into compliance with the federal performance standard. These actions could include changes to the operation of the facility or other improvements.

2. COMMON CAUSES FOR DEGRADATION ON HOV FACILITIES

The analyses conducted by the districts identified some common causes for degradation on HOV facilities. These are listed below.

Demand Exceeding Capacity

Heavy vehicle volumes on HOV lanes produce congestion and slow traffic conditions. HOV facilities with high volumes tend to be located on commute routes which lead toward job centers in the morning peak hour period and away from job centers in the return afternoon peak hour period. In addition, heavy use of the HOV lanes can occur at some locations as a result of special events, or because of recreational travel, such as the traffic on routes leaving urban areas just before the weekends. In order to ensure that HOV lanes continue to offer a time-savings incentive to carpool, Caltrans has traditionally set 1,650 vehicles per hour as the maximum capacity of HOV lanes. Some of the most heavily used HOV lanes on the State Highway System are exceeding this threshold.

Friction Factor

The term "friction factor" refers to the slowing of vehicles in the HOV lane because of the presence of slow vehicles in the adjacent general purpose (GP) lanes. The speed differential between the HOV lane and the GP lanes can cause travelers in the HOV lane to decelerate in anticipation of slow-moving vehicles suddenly merging into the HOV lane. It can also cause vehicles in the HOV lane to slow as they prepare to change lanes into the slow-moving adjacent traffic in order to access exit ramps on the right side of the freeway. The effect of friction is reduced when there is less expectation that vehicles will change lanes into the HOV lane (such as through the use of painted buffers or physical barriers), and when easier merge opportunities exist for leaving the HOV lane.

Roadway Geometry

The geometry of the GP lanes or the HOV lanes affects traffic by introducing a disruption in the smooth flow of vehicles. Lane drops and bottlenecks in the GP lanes can cause congestion and thus associated lane friction for the HOV lane. Unless otherwise noted, the bottlenecks referred to in these action plans are located in the GP lanes. When an HOV facility ends at the edges of the HOV network or where there is a gap in the HOV network, vehicles must exit the HOV lane and merge into (potentially) slower general traffic.

For HOVs traveling on more than one facility, the lack of direct connectors between intersecting freeways also requires HOVs to merge back into general traffic temporarily, potentially causing slowing and congestion in the HOV lanes.

3. STATEWIDE PLANS FOR ADDRESSING DEGRADATION

Subsection (d) of 23 U.S.C. § 166 requires Caltrans to develop a remediation plan to address degradation. Each district is expected to review local traffic data and field conditions to identify potential causes of degradation on each HOV facility and develop appropriate solutions. These actions could include:

- Increasing the occupancy requirement for the HOV facility
- Varying the toll charged to toll-paying vehicles to reduce demand
- Discontinuing allowing exempt vehicles to use the HOV facility
- Increasing the available capacity of the HOV facility

A list of potential actions has been developed for all districts to consider as they develop their action plans. This list can be found in Table 1. It includes all four (4) of the strategies listed above as well as other strategies identified by the districts and Headquarters. Actions are listed in order of their potential ability to address degradation, as well as whether they can be implemented in the near-term or may require some time to implement.

TABLE 1. STATEWIDE HOV DEGRADATION REMEDIATION STRATEGIES

HOV Degradation Remediation Strategy	Type of Project	Purpose	Potential to Address Degradation	Time to Implementation
Increase Occupancy Requirements	Operational	Operational Improvement	High	Near-Term
Increase Occupancy Requirements and Convert to HOT Lane	Operational Capital	Operational Improvement	High	Near to Mid-Term
Addition of HOV auxiliary (weave) lanes.	Capital	Operational Improvement	High	Mid- to Long-Term
Addition of a second HOV lane.	Capital	Add Capacity	High	Mid- to Long-Term
Install flexible delineators	Operational	Operational Improvement	Medium to High	Near-Term
Enhanced, dedicated, and targeted HOV enforcement including the establishment of enforcement zones.	Operational Capital	Enforcement	Medium to High	Near- to Mid-Term
Revise pricing strategy on HOT lanes to address degradation.	Operational	Operational Improvement	Medium to High	Near to Mid-Term
Toll exempted clean air vehicles on HOT lanes using tiered/reduced rates	Operational	Operational Improvement	Medium to High	Near to Mid-Term

HOV Degradation Remediation Strategy	Type of Project	Purpose	Potential to Address Degradation	Time to Implementation
Implement access strategies, including access restrictions, increasing the length of access openings or modification/elimination of bottlenecks such as ingress/egress locations.	Operational Capital	Operational Improvement	Medium to High	Near- to Mid-Term
Use Shoulders to Provide Additional Managed Lane Capacity	Capital	Add Capacity	Medium to High	Mid- to Long-Term
Implementation of Integrated Corridor Management, or other traffic management techniques such as speed harmonization and lane control signals to optimize system performance.	Capital	Operational Improvement	Medium to High	Mid- to Long-Term
Close gaps in the HOV lane network	Capital	Operational Improvement	Medium to High	Long-Term

HOV Degradation Remediation Strategy	Type of Project	Purpose	Potential to Address Degradation	Time to Implementation
Interchange improvements including, but not limited to, construction of direct HOV connectors, ramp widenings, or truck climbing lanes.	Capital	Add Capacity	Medium to High for direct HOV connectors, Low to Medium for other improvements	Long-Term
Increase public awareness. Update HOV violation fine amount on the existing signs to the current value.	Operational	Education	Low to Medium	Near-Term
Mark the number of minimum occupants in sequence after the pavement HOV diamond symbol	Operational	Education	Low to Medium	Near-Term
Improvement in Traffic Incident Management including the deployment or expansion of Freeway Service Patrol.	Operational	Operational Improvement	Low to Medium	Near- to Mid-Term
Evaluate the impacts of incidents, weather or construction	Analysis	Analysis	Medium to High	Immediate

HOV Degradation Remediation Strategy	Type of Project	Purpose	Potential to Address Degradation	Time to Implementation
Expand the use of ramp metering, through the addition of new meters, metering HOV preferential lanes, or corridor wide adaptive ramp metering	Capital	Operational Improvement	Low to Medium	Near- to Mid-Term
Standardize managed lane signing and markings statewide.	Capital	Education	Low to Medium	Near- to Mid-Term
Additional or enhanced signing and markings at the beginning and along the HOV lanes.	Capital	Education Enforcement	Low to Medium	Near- to Mid-Term
Implement or expand commuter assistance programs such as vanpools and Park-and-Ride facilities.	Operational Capital	Operational Improvement	Low to Medium	Mid to Long-Term
Addition of general-purpose auxiliary lanes.	Capital	Operational Improvement	Low	Mid- to Long-Term

3.1. FUNDING FOR ADDRESSING DEGRADATION

Caltrans has set aside a one-time allocation of approximately $30 million from the Operational Improvement (OI) program in the State Highway Operations and Protection Program (SHOPP) for the purpose of addressing HOV degradation. Six Caltrans districts were provided the opportunity to identify projects to address degradation. Funds were required to be used specifically for projects intended to address degradation and any remaining funds were redirected back to the OI program. As a result, the districts and headquarters staff identified five projects to be included in the 2024 SHOPP. The 2024 SHOPP is under public comment as of the date of this report.

In addition, districts are now required to conduct operational investigations for degraded HOV facilities. These investigations will result in either no action or identify improvements needed which can then become candidates for SHOPP funding.

3.2. RESTRICTIONS ON EXEMPT VEHICLES

Currently, California has no plans to prohibit clean air vehicles (CAVs) from HOV facilities since it is state policy to encourage the purchase and use of CAVs, and access to HOV facilities is a primary incentive. There are also no plans at this time to convert high occupancy/toll (HOT) facilities back to HOV lanes. Caltrans coordinates regularly with the regional transportation agencies who operate the HOT facilities to ensure that provisions are in place to keep the facilities in compliance with the federal performance standard. These operators generally keep track of the performance of these facilities in addition to Caltrans. Provisions that have been implemented already or are being implemented include raising tolls, operating the facilities in an "HOV Only" mode, and automated enforcement.

The expiration dates of the decals are set in state law. Starting January 1, 2019, the decals are only valid until January 1 of the fourth year after the year of issuance. Decals issued after January 1, 2022, cannot be renewed. Changes to the expiration dates would require legislative action and Caltrans is not looking to make any changes to the program. The program that allows clean air vehicle to access HOV lanes is governed by federal law and the enabling federal statute is currently set to expire on September 30, 2025.

3.3. CHANGING VEHICLE OCCUPANCY REQUIREMENTS

In November 2020 Caltrans released a policy that directed districts to consider changing vehicle occupancy requirements on HOV and HOT lanes under

certain conditions and provided guidance to the districts on this process. One of the conditions is if an HOV facility is very degraded. The analysis would consider the geographic, geometric, and traffic demand characteristics of both the individual HOV facility and the region. All potential issues and actions would be explored, including violation rates, toll rates on HOT lanes, planned capital improvements to the facility or the other lanes of the freeway, and other multimodal improvements that might be expected to reduce traffic volumes. The guidance recommends that HOV lanes be converted to HOT lanes whenever vehicle occupancy requirements are increased. This can help offset the impacts on freeway performance caused by increasing vehicle occupancy requirements. Other improvements also need to be considered, such as park and ride facilities, and transportation demand management strategies such as vanpools, or other types of programs that can encourage higher vehicle occupancies and/or modal shift.

Occupancy changes on HOV facilities in California typically occur only as part of conversions to HOT operations for the reasons outlined above. In October 2020, occupancy requirements were increased on the HOV facility on Route 880 in District 4 as part of the conversion of that facility to HOT operations. Vehicles with three or more occupants can use the lanes without paying a toll, while vehicles with two occupants pay fifty percent of the posted toll. A similar operational change was implemented on the HOT facility on Route 237, which connects directly with the facility on Route 880. In February 2022, similar operational changes were made on HOT facilities on Routes 85 and 101. As noted in the action plans, changes in occupancy requirements are under consideration or planned for several other HOV facilities as part of planned conversions to HOT lanes. And the Los Angeles County Metropolitan Transportation Authority is proposing to raise vehicle occupancy requirements on the Route 10 HOT facility from 3 persons to 5 persons during peak periods.

3.4. COORDINATION WITH THE CALIFORNIA HIGHWAY PATROL

The California Highway Patrol (CHP) is responsible for law enforcement on California highway facilities including the enforcement of vehicle occupancy requirements on all HOV facilities. Caltrans is committed to regular coordination with the CHP, both at the headquarters and the district level, to address the high number of violations on HOV lanes. Each district coordinates with and provides their regional CHP offices with annual reports that identify the number of violations on district HOV facilities. The purpose of these annual reports is to inform the CHP where additional enforcement may be needed. Districts are also encouraged to coordinate with the CHP to obtain historical HOV lane

enforcement data to identify the effects of past enforcement. HOT lane operators typically have agreements in place with the CHP to provide additional enforcement on those facilities above and beyond what the CHP normally provides; this is funded by toll revenues. Caltrans and some HOT lane operators are testing Automated vehicle occupancy detection. The data from these systems is expected to improve the accuracy of the violation rates on our HOV facilities and help identify occupancy trends, improve enforcement, and reduce violations through continuous coordination with the CHP. Additionally, districts have reported violation data that vary between other HOV facilities and districts. Caltrans is pursuing the possibility of implementing a single statewide occupancy contract to increase count consistency, efficiency, and potentially reduce violation variations between HOV facilities. These ongoing efforts are anticipated to reduce the rate of violations reported in future action plans. More information and results from these efforts can be found in the future district-specific degradation analyses and action plans.

3.5. COORDINATION WITH TOLL OPERATORS

Caltrans Traffic Operations received a letter on September 29, 2023, regarding collaboration with the California Toll Operators Committee (CTOC) on the degradation of Express lanes. CTOC is collaborative organization composed of fourteen California toll facility operators/owners and Caltrans. The committee serves as the primary resource for interoperability, education, and advocacy among facilities in operation throughout California. The existing express lane operators agree to take the following actions to ensure that the Express Lanes facilities meet the requirements of 23 U.S.C § 166:

1. Partner with Caltrans in reviewing locations on Express Lanes facilities where degradation was observed. If, after such review, it is mutually determined that the facility is degraded pursuant to 23 U.S.C § 166, the Express Lanes operator will agree to collaborate with Caltrans on solutions to identify actions to address the degradation for inclusion in the Action Plan, and work with Caltrans to support the implementation of such actions for which the Express Lanes operator is responsible.
2. Work with Caltrans to determine if the Express Lanes operators can provide speed and volume data to either supplement or replace the data that Caltrans uses to develop the Degradation Report.

Caltrans has collaborated with toll operators to establish action plans for the maintenance of express lanes. Ongoing coordination, both at the headquarters

and district levels, will persist to identify and address any degradation in the express lanes.

3.6. TH TRAFFIC INVESTIGATION ON DEGRADED HOV FACILITIES

On February 15, 2022, Caltrans Headquarters issued TOPD 22-04, mandating that districts conduct a type "TH" traffic investigation for each degraded HOV facility listed in the annual California High Occupancy Vehicle (HOV) Facilities Degradation Report. Traffic investigations were initiated by Caltrans HQ in June 2022, after to the completion of the 2021 HOV facility degradation report. The traffic investigations for the 2021 HOV degraded facilities has been concluded and the findings along with the analysis performed will be the basis to support the actions districts are taking to improve degradation. When available, recommendations will be incorporated.

3.7. WAIVERS

Per 23 U.S.C. § 166, sanctions may be imposed if Caltrans fails to bring degraded HOV facilities into compliance with the federal performance standard. Sanctions may include withholding of Federal transportation funds or approval of projects. A waiver from sanctions may be requested for degraded facilities where good faith efforts have been attempted and found still ineffective, and where it is determined that such a waiver may be in the best interest of the traveling public. However, it's essential to note that Caltrans has chosen not to request any waivers at this time. All waiver requests require review and approval by the U.S. Secretary of Transportation's office before the action plan can be accepted. Instead of facing the potential risks and delays associated with submitting waiver requests, the FHWA has recommended that the most effective approach is to define a set of actions so that all degraded segments can be classified as "likely to make significant progress." Upon review of the action plans, the FHWA may modify the conditional of approval items for the 2021 HOV degradation action plans for the conditional of approval items for the 2022 HOV degradation action plans or identify a set of actions for all degraded segments to achieve the desired outcomes. These actions will be performed by either Caltrans HQ or districts. All the HOV facilities will continue to be monitored for compliance with the federal performance standards and under the conditions of the waiver, certain actions may still be required on those facilities.

3.8. FRICTION FACTOR IMPACT STUDY AND ACCESS POINT WEAVING IMPACT STUDY

Caltrans is working with a consultant, Parsons Transportation Group Inc., to conduct two studies of the effects that friction factor and weaving have on HOV lane degradation.

Friction factor has been cited as a cause of degradation at locations where the performance of the adjacent congested general purpose (GP) lane is assumed to negatively affect the performance of the HOV lane. This has been witnessed in HOV segments where the demand in the HOV lanes is below its capacity, however speeds are below free-flow speeds. HOV lanes have shown evidence of not operating at their expected operating speeds relative to the measured traffic volumes. In many instances, the speeds of an HOV lane that is adjacent to a congested general purpose (GP) lane is often less than expected even though the traffic demand is well below capacity. The purpose of this study is to (1) verify the existence of a friction factor by showing that adjacent GP lane congested speeds negatively affect the operating speeds of the HOV lanes and (2) quantify the friction factor in which the sympathy speed phenomenon impacts the travel speed of the HOV lane.

Weaving has been cited as a cause of degradation for HOV facilities. The access points at these facilities have increased ingress and egress between the HOV lanes and adjacent lanes. Excess weaving is assumed to negatively affect the performance of the HOV lane. Weaving has typically been cited as a cause of degradation when there are nearby onramps, nearby offramps, excess congestion in the general purpose (GP) lanes, closely spaced interchanges, platoon leader's speed, and an end to the HOV lane. The purpose of this study is to verify if weaving is a cause of degradation on HOV facilities.

The FHWA has conducted a review of the two studies scope of work prior to Caltrans's initiation. The work under those studies commenced on 08/23/2023 and is scheduled to conclude on 05/31/2024.

4. DISTRICT-SPECIFIC ACTION PLANS

Each district has developed an action plan for each route which has a degraded HOV facility. No summary is provided for District 10 because no HOV facilities in that district were degraded. A list of HOV facilities that were identified as degraded in 2022 is provided in Appendix A. Caltrans classifies degradation into three (3) categories based on how frequently degradation occurs in order to identify potential causes and to formulate remediation strategies. The criteria for each category of degradation status are as follows:

- Slightly Degraded—degradation occurs from 10 to 49 percent of the time.
- Very Degraded—degradation occurs from 50 to 74 percent of the time.
- Extremely Degraded—degradation occurs 75 percent or more of the time.

The action plans may include general information related to district-wide studies or plans developed to address degradation. These include plans developed by the districts as well as those developed by regional partners.

As part of analyzing each HOV facility for degradation, the peak period average speed was calculated for each detection station on the facility and a count was taken of the number of times the average speed went below 45 mph. This count was then divided by the number of days for which data was available from that detection station in order to determine the percentage of time the speed was below 45 mph. The average speed and this percentage data were then plotted. The districts review this data and the plots (hereafter referred to as "profiles") to identify the locations and causes of degradation, such as roadway geometrics, traffic and travel patterns on the route, or other freeway performance issues. If necessary, the districts may conduct additional operational analyses of the facilities if the cause is unclear. The speed and degradation profiles for each degraded facility in the district are provided at the beginning of each district's section. These plots should be read from left to right. The outcomes of these reviews and analyses are reported in the "Analysis" section of each action plan. This section also includes statistics such as violation rates or percentages of CAVs if those are causes.

If a facility experienced severe, pervasive degradation, the "Analysis" section of the action plans may also include the "spot time" plots or the plots showing the HOV and adjacent GP lane speeds along the length of the HOV facility. The purpose of providing these plots is to provide additional information related to bottlenecks and the length and duration of congestion on HOV facilities and also to provide a snapshot of GP lane performance alongside the HOV facilities. As noted in section 2, GP lane performance issues are a significant contributor to degradation.

The "Remediation Strategies" section describes the specific actions for the route based on the analyses. The actions should be tied back to the causes identified in the "Analysis" section. These actions may include strategies for individual spots on a facility, for portions of a facility, for a facility as a whole, or for the entire route. Information is provided regarding the scope and schedule of the proposed actions and expected outcomes.

The "Remediation Strategies" section will include information on these and other actions that have been taken in the past and the results of those actions, where such information is available. It is important to note that the analyses may also pre-date some of these improvements, and any impacts resulting from those improvements will be addressed in future degradation reports and action plans. In the future, districts will also be asked to provide regular updates on the status of the action plans and any observed outcomes. This evaluation will be included as part of the action plans for each route going forward.

4.1. DISTRICT 3 2022 DEGRADATION ACTION PLANS

4.1.1 SUMMARY OF DEGRADATION ON HOV FACILITIES IN DISTRICT 3

APPENDIX A provides the list of degraded facilities in District 3 that were identified in the 2021 California High Occupancy Vehicle Facilities Degradation Report. The speed and degradation profiles for each degraded facility are provided in ATTACHMENT A.

4.1.2 DISTRICT-WIDE ACTIONS RELATED TO DEGRADATION

District 3 is currently developing a Managed Lanes System Plan to identify and prioritize future managed lanes projects and strategies over the next 20 years. This effort is being led by District 3 Division of Planning, with support from District 3 Traffic Operations and in consultation with regional transportation agencies and other stakeholders. One of the major factors being considered is how to address existing and future HOV degradation.

While the scope of work for the study is still being developed, HOV degradation remediation will be a major part of the project and strategy scoring system. The study was started in March 2022 and will be completed in 2024.

4.1.3 ACTION PLAN FOR HOV FACILITIES ON INTERSTATE 80

A. Analysis

Interstate 80 (I-80) in Sacramento experiences heavy directional congestion during the PM peak period in the eastbound and westbound directions. This heavy directional congestion is the result of jobs/housing imbalance where the residents of large housing developments in Placer County and the surrounding cities commute to employment centers to the west, such as the San Francisco Bay Area and Downtown Sacramento, using I-80 as the connection.

The HOV lanes on I-80 initially provided a reliable commute option for carpoolers and transit users traveling between Roseville and downtown Sacramento.

However, as travel demand has increased along this corridor, the HOV lanes have become a less reliable option in some segments for commuters during the peak periods.

Eastbound AM

Eastbound I-80 does not experience HOV degradation during the AM peak period.

Eastbound PM

The Eastbound I-80 HOV lane experiences slight degradation during the afternoon commute period in a 0.94-mile segment from Absolute PM 95.901 to 96.554 (SAC 12.401 to 13.054). The degradation occurs at the Greenback Lane interchange and extends west through the Madison Avenue interchange. The primary cause of the degradation at this location is due to friction between the HOV lane and the general-purpose (GP) lanes. Other reasons for degradation on eastbound I-80 include HOV violation and recreational traffic.

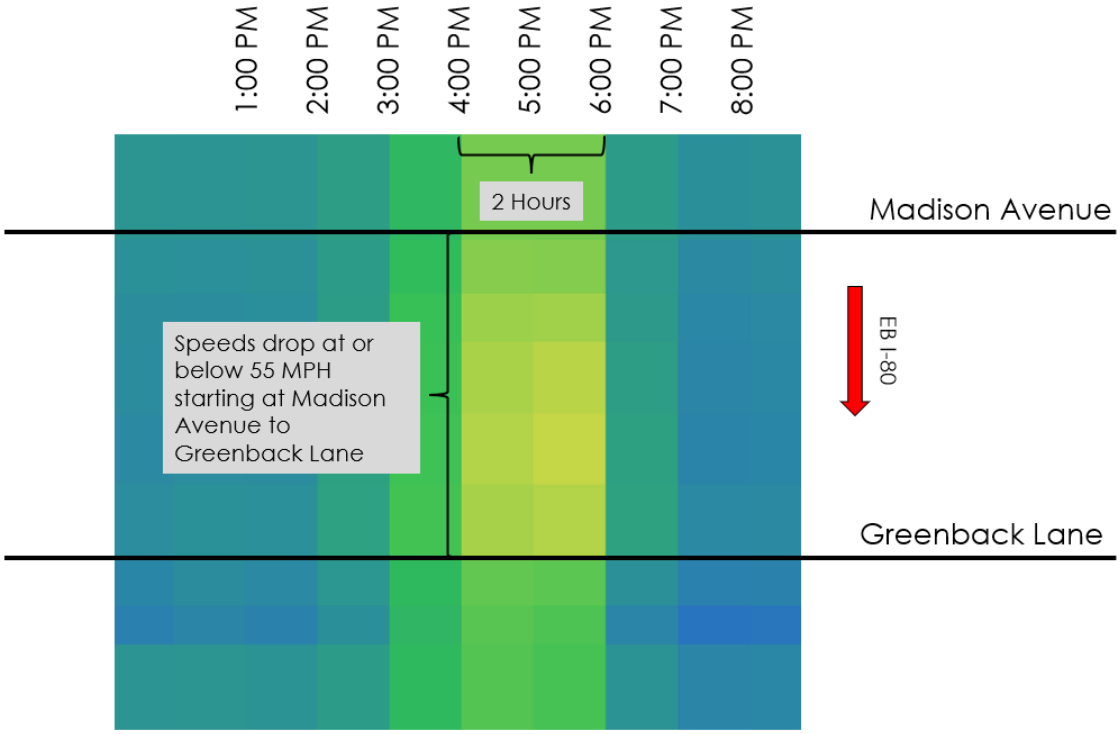
Friction Factor

The friction between the HOV lane and GP lanes is a predominant reason why there is slight degradation on eastbound I-80 during the afternoon commute. The primary cause of the friction is due to congestion and slow-moving vehicles in the GP lanes caused by high demand for the off-ramp from eastbound I-80 to Greenback Lane, which results in a queue that spills back to the mainline and impacts multiple lanes of the freeway.

Figure 4.1-1 is a 2022 speed heat map for eastbound I-80 across all lanes during the PM peak period. The figure shows a segment where speeds decline between 4:00 PM and 6:00 PM between Greenback Lane and west of Madison Avenue, which coincides with the limits of HOV degradation.

Figure 4.1-1: EB I-80 Speed Heat Map from Madison Avenue to Greenback Lane

Figure of speed heat map from Madison Avenue to Greenback Lane on Eastbound Interstate 80.



Source: INRIX (weekdays between July 1, 2022 to December 31, 2022)

Analysis of PeMS lane by lane speed data confirms that the #2 lane speeds during the PM peak hour drop slightly below 60 mph increasing friction between the HOV lane, leading to slight degradation. Table 4.1-1 shows the #2 lane and average GP lane speeds for select locations on eastbound I-80 during the PM peak hour and period. In general, speeds should be lower in all GP lanes compared to the #2 GP Lane, however detector health issues contributed to some data discrepancies. Overall, the table displays GP lane speeds impact HOV lane speeds as well.

Table 4.1-1: EB I-80 Lane Speeds and Volume Data in 2022 Via PeMS

Locations		Peak Period		Peak Hour	
		Speed (mph)	Volume (vph)	Speed (mph)	Volume (vph)
East of Madison Avenue	HOV Lane	66	1103	63	1129
	#2 GP Lane	59	1800	55	1731
	All GP Lanes	54	7525	49	7291

Source: Caltrans Performance Measurement System (PeMS) Fall 2022.

Ramp Metering

Unmetered HOV preferential lanes at on-ramps within congested segments limit District 3's ability to control freeway volume. This leads to the freeway reaching capacity, resulting in an increasing friction factor.

HOV Violations

HOV violators also cause degradation by using up available capacity and increasing the density of vehicles in the lane. The HOV lane violation rates during the peak traffic period on eastbound I-80 is 29 percent (measured spring 2022), adding more vehicles to the lane and impairing performance.

Recreational Traffic

Eastbound I-80 experiences heavy recreational traffic because the corridor connects the Bay Area/Sacramento Area with Reno, NV and Lake Tahoe, CA. Average PM peak period travel speeds on Fridays going towards Reno/Lake Tahoe (in the eastbound direction between Madison Avenue and Greenback Lane) are 4 to 11 mph lower than typical weekday travel speeds, likely due to the increase in demand associated with recreational travel. According to INRIX data from 2022, the minimum average speed measured on Fridays on this segment occurs at 3:00 PM, whereas the minimum average speed measured on the other days of the week occurs at 5:00 PM. The earlier congestion suggests Friday traffic is comprised of non-work-related trips.

Westbound I-80 AM

Westbound I-80 does not experience HOV degradation during the AM peak period.

Westbound I-80 PM

During the PM peak period, the HOV lanes on westbound I-80 experiences degradation ranging from slight to extreme. The degradation occurs for roughly

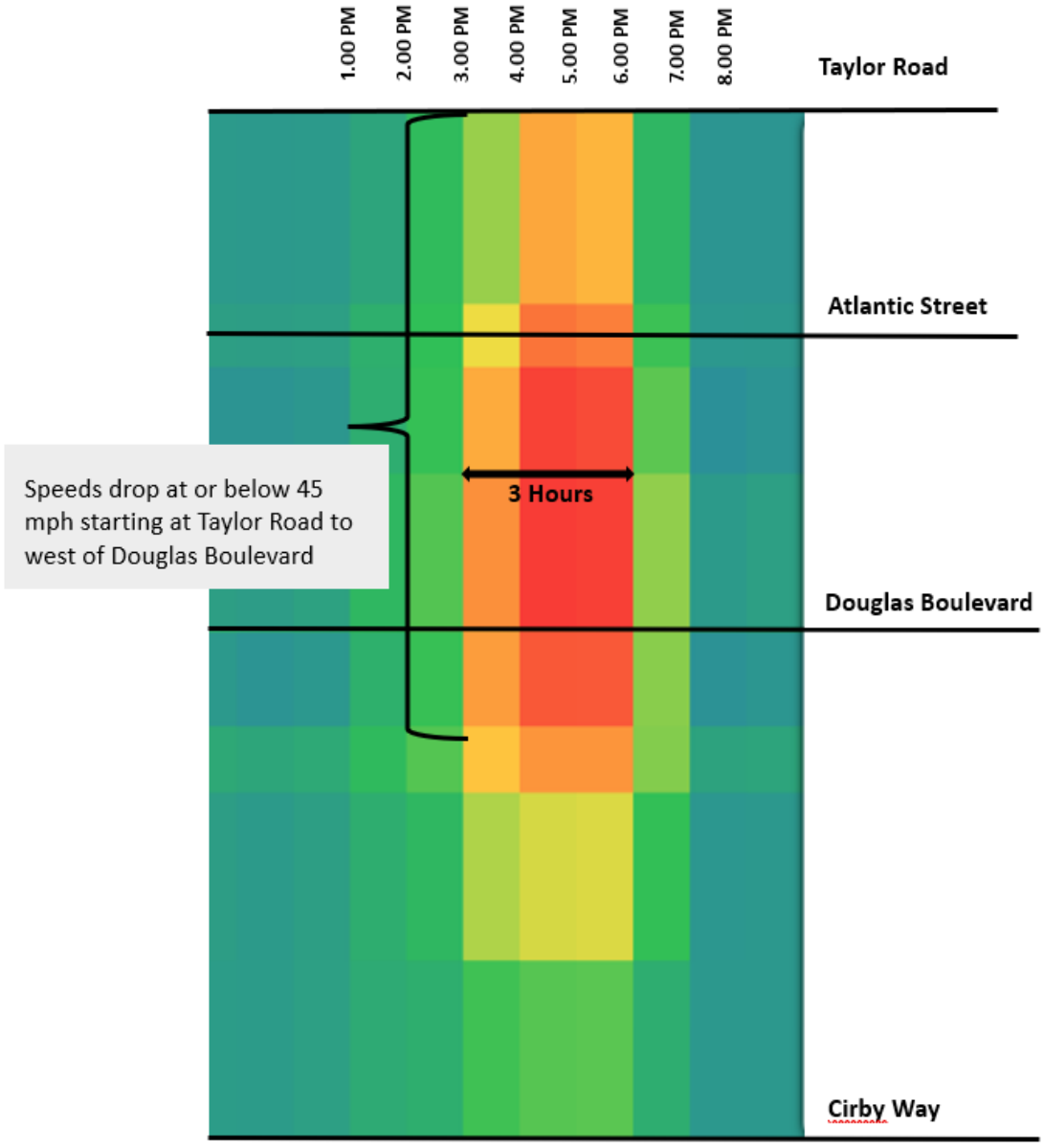
2.96 miles from Taylor Road to Cirby Way Absolute PM 102.177 to 105.137 (PLA 0.677 to 3.637). Approximately 1.1 miles of extreme degradation occurs from Atlantic Street to west of Douglas Boulevard. There are three causes of degradation for this direction and time period: friction between the GP lanes and HOV lane, unmetered on-ramps, and a high percentage of HOV lane violators.

Friction Factor

The friction between the HOV lane and GP lanes is a major reason why there is slight to extreme degradation on westbound I-80 during the afternoon commute. The primary cause of the friction is the lane drop at the Douglas Boulevard off-ramp, which causes congestion and queueing. This lowers the capacity on westbound I-80 by reducing the number of available lanes from 5 to 4, bringing the V/C ratio closer to 1 and ultimately leads to the formation of a bottleneck and an increased friction factor between the GP lanes and the HOV lane.

Figure 4.1-2 is a 2022 speed heat map for westbound I-80 across all lanes in the afternoon commute. The figure shows significant congestion between 3:00 PM and 6:00 PM from Atlantic Street to west of Douglas Boulevard, which coincides with the limits of HOV degradation.

Figure 4.1-2: WB I-80 Speed Heat Map from Taylor Road to Cirby Way



Source: INRIX (weekdays between July 1, 2022 to December 31, 2022)

Analysis of PeMS lane by lane speed data confirms that lane #2 speeds during the PM peak hour and peak period drop significantly below 45 mph causing HOV lane speeds to drop below 45 mph. Table 4.1-2 shows the #2 lane and average GP lane speeds for select locations on westbound I-80 during the PM peak hour and period.

Table 4.1-2: WB I-80 Lane Speeds and Volume Data in 2022 Via PeMS

Locations		Peak Period		Peak Hour	
		Speed (mph)	Volume (vph)	Speed (mph)	Volume (vph)
Douglas Boulevard	HOV Lane	39	1401	37	1460
	#2 GP Lane	36	1699	33	1649
	All GP Lanes	31	4203	27	4118

Source: Caltrans Performance Measurement System (PeMS) Fall 2022.

Ramp Metering

On-ramps with limited storage limits District 3's ability to control the flow of vehicles entering the freeway since more vehicles need to be released at a higher rate to avoid queue spillback onto the local system.

HOV Violations

HOV violators also cause degradation by using up available capacity and increasing the density of vehicles in the lane. From counts done in Spring 2022, the observed HOV lane violation rates during the peak traffic period on westbound I-80 is at 32 percent[1], adding more vehicles to the lane and impairing performance.

B. Remediation Strategies

Both Directions

Long Term Solution

District 3 has completed the K-Phase for the project (03-2J180) to address degradation by evaluating other managed lanes strategies by converting the existing HOV lanes along the I-80 corridor between West El Camino Avenue in West Sacramento and SR 65 in Roseville. Changes in managed lane type, minimum occupancy requirements, and operational improvements, such as reducing weaving and friction from slower operating GP lanes through limited access striping, will be studied and part of the project alternatives. The Project Initiation Document was completed December 2022.

HOV Violations

In coordination with CHP, District 3 performed a Pilot Special Enforcement Study on State Route 99 (SR 99) from September 19, 2022, to October 14, 2022. This

[1] Observations were conducted during the AM peak period. PM peak period data is not available.

study evaluated the effects of special enforcement (two CHP units dedicated to pulling over violators in the HOV lane to issue citations and verbal warnings) during the weekday peak period on travel speeds, lane volumes, HOV lane degradation, and HOV violation rates. Because of limited resources, CHP conducted this special enforcement three days a week in the northbound direction during the AM peak period, but the whole week was studied along with the PM peak period in the southbound direction to determine its full impact. District 3 studied conditions Before, During, and After the special enforcement period.

The results showed that increased CHP presence during the AM peak period correlated with lower violation rates in the HOV lane. However, the degradation in the HOV lane increased and speeds in the HOV and GP lanes decreased. This is believed to be the result of increased friction between the #2 GP lane and HOV lane, as drivers who would violate the occupancy requirements of HOV lane moved to the GP lane, and of drivers slowing down to observe CHP activity along the corridor.

While these results are not in line with expectations, further study of increased enforcement of HOV lane violations would be necessary to determine impacts on HOV lane degradation. District 3 recommends that future iterations of this study include automated vehicle occupancy detection (AVOD) and larger sample sizes (e.g., longer time periods) of data collection for both Before, During, and After the enhanced enforcement period.

Occupancy Detection

In 2022, District 3 conducted a Special Enforcement Study on SR 99 in partnership with FHWA California Division, which included CHP enforcement of the HOV lane occupancy requirements and District 3 staff conducting visual occupancy counts downstream of the enforcement area. This was to demonstrate the potential benefit of CHP enforcement to reduce the number of HOV violators in the HOV lane on our most degraded corridor. However, as mentioned previously, the results showed that increased CHP presence correlated with lower violation rates but slower speeds and higher amounts of degradation in the HOV lane.

District 3 met with FHWA California Division on December 6, 2022, to discuss a similar focus on I-80, and committed to install AVOD systems to further enhance the accuracy of future studies and set baseline occupancy for the HOV lanes on SR 99 and I-80 (degraded routes in our 2021 HOV Action Plans). District 3 has acquired one of these systems and staff is currently testing the system to refine settings before implementing in the field. District 3 has acquired one system and

has plans to acquire more. Additionally, funding for AVOD Comparison has been approved by the Division of Research, Innovation, and System Information as Task 4412. In 2024, District 3 plans to conduct field tests on degraded facilities.

Friction Factor

District 3 conducted an investigation that looked further into the eastbound I-80 degradation. The investigation was completed in November 2022 and concluded that signal timing changes on Greenback Lane need to be made by Sacramento County, who are responsible for operating the signals at the interchange. Sacramento County staff are in the process of coordinating the traffic signals along Greenback Lane. However, currently the intersection of Greenback Lane/Garfield Avenue/Verner Avenue remains in free operation.

District 3 staff will continue to work with Sacramento County and monitor the changes that are made, in an attempt to reduce queuing at the off-ramp. Routinely conducted analysis will be needed to determine if any changes made are beneficial to the SHS and to HOV degradation.

Ramp Metering

District 3 has identified several ramp metering issues along the eastbound I-80 corridor associated with unmetered HOV preferential lanes, which greatly impact the effectiveness of the ramp meters along this corridor. This degraded segment has four unmetered HOV preferential lanes (two at Madison Avenue and two at Greenback Lane) that contribute to congestion and increased friction factor along the corridor in specifically in the degraded segment. Project 03-3J210 will meter the two unmetered HOV preferential lanes at Greenback Lane within the degraded segment of eastbound I-80. Project 03-4J530 will meter the two unmetered HOV preferential lanes at Madison Avenue within the degraded segment of eastbound I-80. Due to bids coming back much higher than the engineer's estimate these projects have been pushed back and will begin construction when costs come down.

Westbound I-80

Friction Factor

District 3 received Cycle 2 Trade Corridor Enhancement Program funding for a project that eliminates the lane drop at Douglas Boulevard, which is the cause of extreme degradation in the afternoon. The project EA is 03-3F23U.The project is scheduled to complete construction in July 2024. This project will construct an auxiliary lane which will extend the fourth GP Lane (i.e., the fifth mainline lane) from Douglas Boulevard to Riverside Avenue and upgrade existing on-ramps to help limit congestion and increase throughput at Douglas Boulevard.

Ramp Metering

The Atlantic Street on-ramp has limited storage which limits District 3's ability to meter this location effectively. Vehicles must be released at a faster rate to limit queue spillback onto local streets. Project 03-0H460 was completed in July 2022 and widened the previous single lane on-ramp to a three-lane on-ramp, which allows for greater storage and gives District 3 the ability to better manage traffic entering the freeway on this degraded section of westbound I-80. Field observations have shown qualitative benefits, but more time is needed to demonstrate the quantitative benefits of adding additional storage. District 3 will conduct a before/after study to quantify the effects of widening the ramp within the next year.

4.1.4 ACTION PLAN FOR HOV FACILITIES ON STATE ROUTE 51/99

A. Analysis

State Route 99 (SR 99) in Sacramento experiences heavy directional congestion during the AM peak period in the northbound direction and during PM peak period in the southbound directions. This heavy directional congestion is the result of the jobs/housing imbalance where the residents of large housing developments in Sacramento County and the surrounding cities commute to employment centers to the north, such as Downtown Sacramento and the City of Elk Grove, using SR 99 as a connection.

The HOV lanes on SR 99 initially provided a reliable commute option for carpoolers and transit users traveling between Elk Grove and Downtown Sacramento. However, as travel demand has increased along this corridor, the HOV lanes have become a less reliable option in some segments for commuters during the peak periods.

Northbound SR 51/99 AM and PM:

Northbound SR 99 experiences degradation during both AM and PM commute periods from Abs. PM 292.02 to 297.67 (SAC 15.47 to RR23.10). The degradation occurs at the Laguna Road interchange and extends north through T Street (Downtown SR 51) with non-degraded segments at various locations in between. The degradation segment length is about 5.7 miles for the AM peak period and 1.6 miles for the PM peak period. On northbound 51 there is also degradation along the whole mile long segment stemming from a bottleneck that occurs just north of E street where there are two lanes drops, and a horizontal a vertical curve as well as the HOV lane ends limiting overall throughput and causing a large bottleneck. The primary causes of the degradation on northbound SR 51/99 are friction between the GP lanes and

HOV lane, demand exceeding capacity, HOV violators, and unmetered on-ramps.

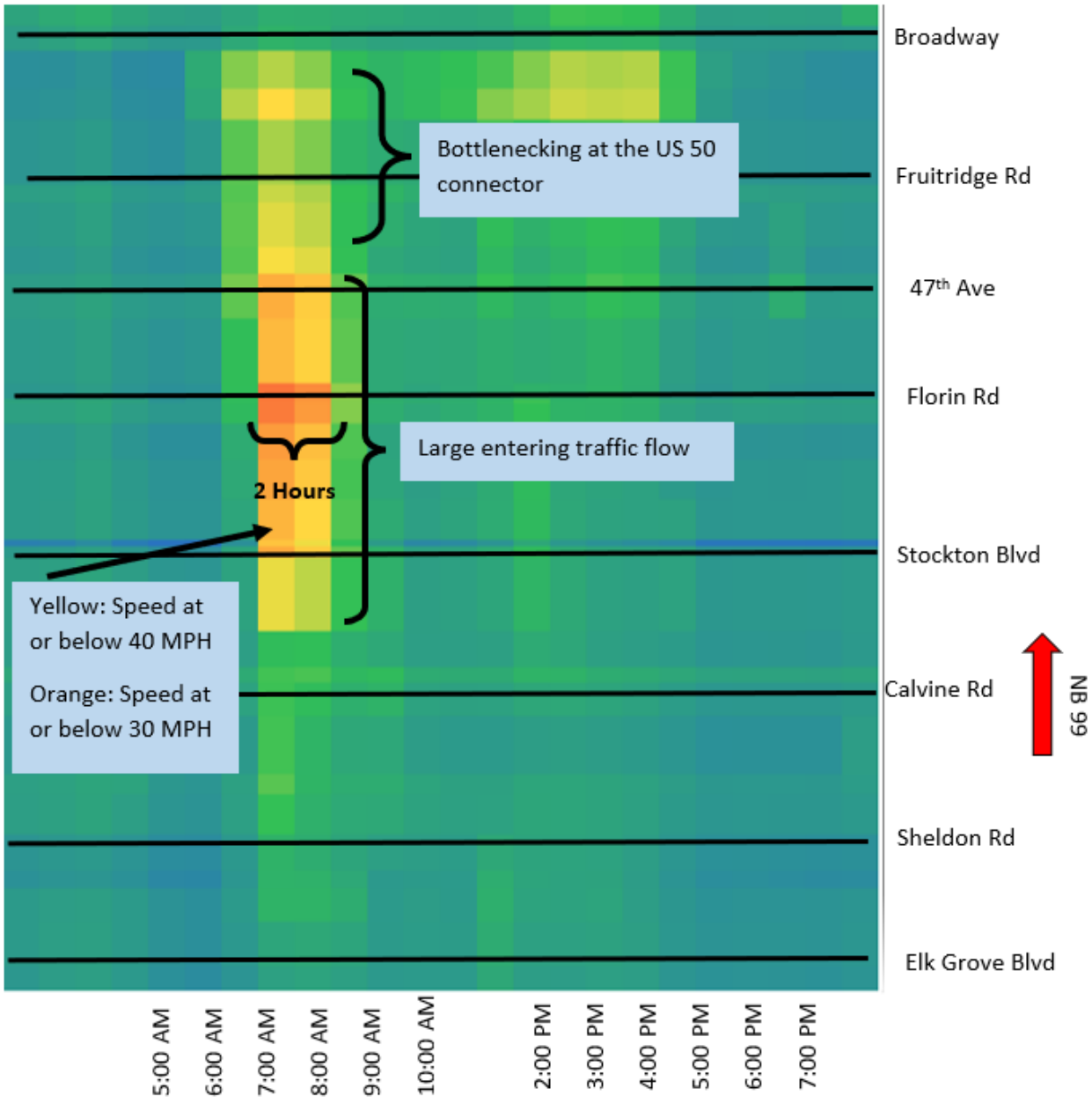
Friction Factor

Friction between HOV lane and GP lanes is a major factor in degradation. The primary cause is the heavy demand for the HOV lane from Elk Grove to the US 50 connector, which requires vehicles to cross all GP lanes, causing a weaving movement. Additionally, the heavy directional demand leads to mainline SR 99 being over capacity across all lanes. This results in the formation of bottlenecks and an increased friction factor between the GP lanes and the HOV lane.

The friction factor is also present due to the lack of standard inside shoulders. Most of the 7 miles of the degraded segment features non-standard inside shoulder widths that increase friction. This means that drivers experience friction on both sides of their vehicles, lowering speeds and increasing the extent of degradation.

Figure 4.1-3 displays 2022 speeds for northbound SR 99 across all lanes during the AM and PM peak periods via INRIX Analytics. The figure shows a segment where speeds decline between 7:00 to 9:00 AM, and 3:00 to 6:00 PM from Elk Grove Boulevard to Broadway, which coincides with the limits of HOV degradation.

Figure 4.1-3: NB SR 99 Speed Heat Maps from Elk Grove Boulevard to Broadway in 2022 via INRIX



Source: INRIX (weekdays between July 1, 2022 to December 31, 2022)

Demand Exceeding Capacity

Another factor that leads to degradation is the volume over capacity ratio. According to PeMS, at the 47th Avenue interchange, the V/C ratio (based on a theoretical capacity of 1600 vph due to friction factor between GP lanes and limited shoulder widths) for the #2 GP lane is 0.75 and HOV is 0.73. However, the

bottlenecks at the US-50 connector (as shown in Figure 4.1-3), have led to slower speeds and reduced capacity across all lanes. Table 4.1-3 provides volume and speed information for the HOV lane, #2 GP lane, and all GP lanes combined.

Table 4.1-3: NB SR 99 Lane Speeds and Volume Data in 2022 Via PeMS

Location		Peak Period		Peak Hour		
		Speed (mph)	Volume (vph)	Speed (mph)	Volume (vph)	Volume/Capacity
47th Avenue	HOV Lane	48	1,262	44	1,351	0.8444
	#2 GP Lane	47	1,342	43	1,347	0.8419
	All GP Lanes	46	3,701	42	3,762	0.7838
Florin Road	HOV Lane	49	1,115	42	1,200	0.7500
	#2 GP Lane	45	1,537	36	1,171	0.7319
	All GP Lanes	43	3,664	35	3,700	0.7708

Source: Caltrans Performance Measurement System (PeMS) Fall 2022.

Ramp Metering

Unmetered HOV preferential lanes at the on-ramps within congested segments limits District 3's ability to control freeway volume and leads to the freeway reaching capacity, resulting in an increasing friction factor and an increase V/C ratio. Project 03-1H630 is currently in PS&E phase and will add metering on the HOV preferential lane at the Calvine Road interchange, Sheldon Road interchange, and Elk Grove Boulevard interchange. The project is scheduled to go to construction in the spring of 2024.

HOV Violations

HOV violators also cause degradation by using up available capacity and increasing the density of vehicles in the lane. The HOV lane violation rates during the peak traffic period on northbound SR 99 is 36 percent, adding more vehicles to the lane and impairing performance.

Southbound SR 99 AM:

Southbound SR 99 does not experience HOV degradation during the AM peak period.

Southbound SR 51/99 PM:

The southbound SR 99 HOV lane also experiences degradation during the afternoon commute period from Abs PM 290.6 to 299.6 (SAC 16.04 to R24.332). The degradation occurs at N Street on State Route 51 (SR 51) and extends south through the Calvine Road interchange, with non-degraded segments at various locations in between. The degradation segment length is about 7.4 miles during the afternoon peak period. The primary causes of the degradation on southbound SR 99 are friction between the GP lanes and HOV lane, demand exceeding capacity, HOV violators, and unmetered on-ramps.

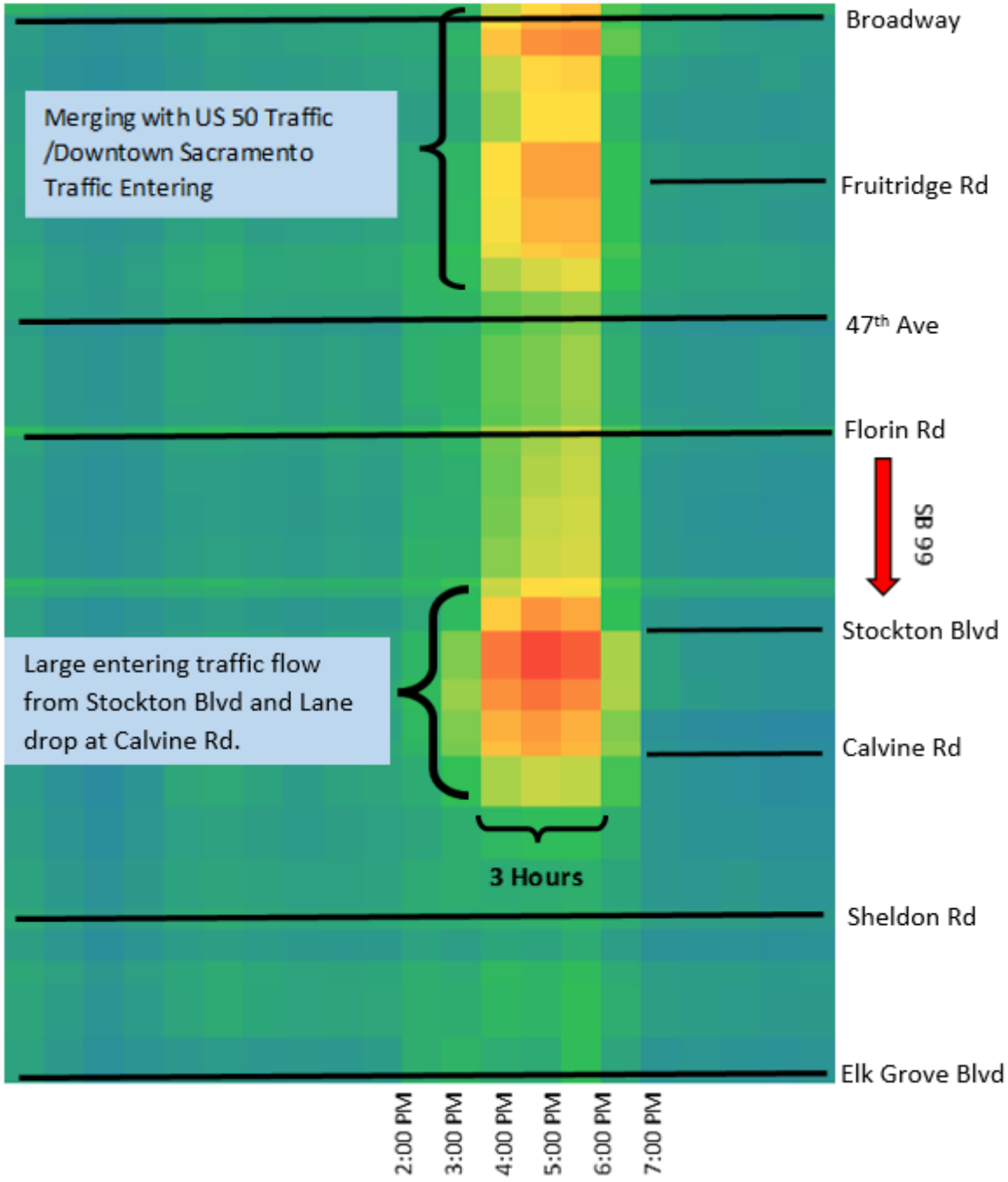
Friction Factor

Friction between HOV lane and GP lanes is a major factor in degradation. At the northern portion, the merging operation of exiting US 50 traffic onto southbound SR 99 traffic has reduced the capacity of the freeway and increases the V/C ratio across all lanes. At the southern portion of the degradation segment, there is a GP lane drop at the Calvine Road off-ramp, which lowers capacity and increases the V/C ratio in the GP lanes. This leads to the formation of an extremely intense bottleneck and an increased friction factor between the GP lanes and the HOV lane.

The friction factor is also present due to the lack of standard inside shoulders. Most of the almost 7.4-mile degraded segment includes non-standard inside shoulder widths that increase friction. This means that drivers experience friction on both sides of their vehicles, lowering speeds and increasing the extent of degradation.

Figure 4.1-4 displays 2022 speeds for southbound SR 99 across all lanes during the PM peak period via INRIX Analytics. The figure shows a segment where speeds decline between 3:00 and 6:00 PM from N Street to Elk Grove Boulevard, which coincides with the limits of HOV degradation.

Figure 4.1-4: SB SR 99 Speed Heat Maps from N Street to Elk Grove Boulevard in 2022 via INRIX



Source: INRIX (weekdays between July 1, 2022 to December 31, 2022)

Demand Exceeding Capacity

Another factor that leads to degradation is the volume to capacity ratio. According to PeMS, near the Calvine Road lane drop, the V/C ratio (based on a theoretical capacity of 1600 vph due to friction factor between GP lanes and limited shoulder widths) for the #2 GP lane is 0.96 and HOV is 0.81. This high demand for the lane leads to slower speeds and reduced capacity in the HOV lane. Table 4.1-4 shows the HOV lane, the #2 GP lane, and overall GP lane speeds and volumes at one of the major bottleneck locations on southbound SR 99 during the PM peak hour and period. Capacity is lowered in the HOV lane due to the increased friction factor causing lower speeds and reduced throughout in the HOV lane.

Table 4.1-4: SB SR 99 Lane Speeds and Volume Data in 2022 Via PeMS

Location		Peak Period		Peak Hour		
		Speed (mph)	Volume (vph)	Speed (mph)	Volume (vph)	Volume/Capacity
Stockton Boulevard	HOV Lane	38	1,254	38	1,214	0.7588
	#2 GP Lane	26	1,383	26	1,378	0.8613
	All GP Lanes	24	3,556	24	3,571	0.7440
Calvine Road	HOV Lane	40	1,334	41	1,291	0.8069
	#2 GP Lane	34	1,553	34	1,536	0.9600
	All GP Lanes	31	2,811	33	2,789	0.8716

Source: Caltrans Performance Measurement System (PeMS) Fall 2022.

Ramp Metering

Unmetered on-ramps at Sheldon Road and Laguna Boulevard limits District 3's ability to control freeway volume and leads to the freeway reaching its capacity, resulting in an increasing friction factor.

HOV Violations

HOV violators also cause degradation by using up available capacity and increasing the density of vehicles in the lane. The HOV lane violation rate during the peak traffic period on southbound SR 99 is 25 percent, adding more vehicles to the lane and decreasing performance.

B. Remediation Strategies

Both Directions

Long Term Solution

In July 2021, District 3 completed a preliminary Managed Lanes Study on SR 99. This study contained seven (7) alternatives that analyzed conversion of the current HOV 2+ lane (see Table 4.1-5 below for reference). The analysis was conducted to address the short and long term HOV degradation in both directions of SR 99. Although this analysis focused on SR 99, the changes made on SR 99 would also be extended through the segments of the SR 51 HOV lanes.

Table 4.1-5: Managed Lanes Study Alternatives

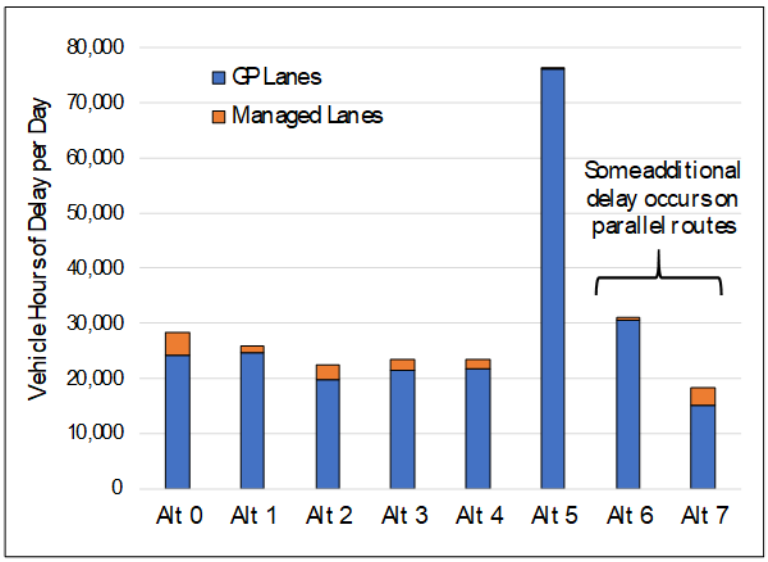
Alt	Managed Lane Alternative Description
1	No Build
2	Convert HOV 2+to HOT 2+ (HOV 2+Free, SOV Pay Full)
3	Convert HOV 2+to HOT 3+(HOV 3+ Free, HOV 2Pay Half, SOV Pay Full)
4	Convert HOV 2+to HOT 3+ (HOV 3+ Free, HOV 2/ SOV Pay Full)
5	Change Minimum Occupancy from HOV 2+to HOV 3+
6	Convert Inside GP lane to HOV 2+ (two HOV 2+lanes)
7	Convert HOV 2+and inside GP lane to HOT 2+(two HOT 2+lanes, HOV 2+ Free, SOV Pay Full)

Of the seven alternatives, three of them were recommended to be analyzed going forward. Those included: Alternatives 3 and 4, where the lane would be converted to a HOT 3+ lane in each (HOV 2+ pays half) and Alternative 6, where the inside GP lane would be converted to an HOV 2+ lane giving the corridor two HOV 2+ lanes in each direction.

As a result of the July 2021 Managed Lanes study, limited access striping was also evaluated on northbound and southbound SR 99. Limited access on northbound SR 99 proved to be an equity concern and consideration for limited access on northbound SR 99 was dropped, however on southbound SR 99 limited access is being considered on two segments: from the SR 99/US 50 Interchange to Fruitridge Road, and upstream of Mack Road to Calvine Road. This limited access striping project has been added to the 2026 SHOPP.

The performance of each alternative, in term of vehicle hours of delay (VHD) in the year 2050, is presented in Figure 4.1-5 below.

Figure 4.1-5: Forecast of Vehicle Hours of Delay in the Corridor in 2050



District 3 considered an incremental approach to fixing HOV degradation by converting the HOV 2+ lane to an HOV 3+ lane. As identified by Figure 4.1-5, the conversion from HOV2+ to a HOV3+ lane in Alternative 5 performs very well in the managed lane due to the low number of users. Conversely, the GP lanes perform very poorly due to the addition of HOV2 that would be prohibited from using the managed lane.

District 3 is in the planning stage for project 03-2J210 (Sacramento 99-51 Managed Lanes) to address degradation by evaluating other managed lanes strategies for the existing HOV lanes along the SR 99 corridor between the City of Elk Grove and downtown Sacramento. Changes in managed lane type, minimum occupancy requirements, access control (e.g., limited access striping), and operational improvements will be studied and part of the project alternatives. Capacity will not be able to be added on SR 99 due to geometric

constraints, however, this project will help to redistribute demand across the GP lanes to better control demand in the managed lane. District 3 is in the process of applying for grants to move the project forward, the Project Initiation Document (PID) was approved on December 30th, 2022.

HOV Violations

In coordination with CHP, District 3 performed a Pilot Special Enforcement Study on SR 99 from September 19, 2022, to October 14, 2022. This study evaluated the effects of special enforcement (two CHP units dedicated to pulling over violators in the HOV lane to issue citations and verbal warnings) during the weekday peak period on travel speeds, lane volumes, HOV lane degradation, and HOV violation rates. Because of limited resources, CHP only conducted this special enforcement three days a week in the northbound direction during the AM peak period, but the whole week was studied along with the PM peak period in the southbound direction to determine its full impact. District 3 studied conditions Before, During, and After the special enforcement period.

The results showed that increased CHP presence during the AM peak period correlated with lower violation rates in the HOV lane. However, the degradation in the HOV lane increased and speeds in the HOV and GP lanes decreased. This is believed to be the result of increased friction between the #2 GP lane and HOV lane, as drivers who would violate the occupancy requirements of HOV lane moved to the GP lane, and of drivers slowing down to observe CHP activity along the corridor. The changes observed in the PM peak period metrics were nominal and likely represent daily variation in the data.

While these results are not in line with expectations, further study of increased enforcement of HOV lane violations is necessary to address HOV lane degradation. District 3 recommends that future iterations of this study include AVOD and larger sample sizes (e.g., longer time periods) of data collection for both Before, During, and After the enhanced enforcement period.

Occupancy Detection

In 2022, District 3 conducted a Special Enforcement Study on SR 99 in partnership with FHWA California Division, which included CHP enforcement of the HOV lane occupancy requirements and District 3 staff conducting visual occupancy counts downstream of the enforcement area. This was to demonstrate the potential benefit of CHP enforcement to reduce the number of HOV violators in the HOV lane on our most degraded corridor. However, as mentioned previously, the results showed that increased CHP presence

correlated with lower violation rates but slower speeds and higher amounts of degradation in the HOV lane.

District 3 met with FHWA California Division on December 6, 2022, to discuss a similar focus on I-80, and committed to install AVOD systems to further enhance the accuracy of future studies and set baseline occupancy for the HOV lanes on SR 99 and I-80 (degraded routes in our 2021 HOV Action Plans). District 3 has acquired one of these systems and staff is currently testing the system to refine settings before implementing in the field. District 3 has acquired one system and has plans to acquire more. Additionally, funding for AVOD Comparison has been approved by the Division of Research, Innovation, and System Information as Task 4412. In 2024, District 3 plans to conduct field tests on degraded facilities.

Northbound SR 99

Friction Factor

District 3 completed an investigation last year (2022) that proposes a conversion of the HOV lane to an HOT lane. Currently, this study is in PID phase and District 3 is working funding.

Ramp Metering

District 3 has identified several ramp metering deficiencies along the northbound SR 99 corridor associated with unmetered HOV preferential lanes. Recent ramp count data shows HOV preferential lanes violation rates of over 60 percent, which greatly impacts the effectiveness of the ramp meters along this corridor. Recently, District 3 implemented its first HOV preferential lane metering in this segment of SR 99 (Mack Road slip to northbound SR 99) and observed improvements in travel times across all lanes in the project area (roughly 2 percent to 4 percent).

District 3 has initiated projects to meter nine unmetered HOV preferential lanes along the degraded portion of this corridor. Project 03-1J460 will meter two HOV preferential lanes at both on-ramps from 47th Avenue to northbound SR 99. Project 03-1J460 was completed in December 2022, so now the on-ramps to SR 99 NB from 47th Avenue have metered HOV preferential lanes. Project 03-3J220 will meter two HOV preferential lanes at the Florin Road slip on-ramp and the Mack Road loop on-ramp. The project was programmed to be construction in October 2023, but bids came back much higher than the engineer's estimate so the project will be split into two minor projects, timeline depends on construction costs. Project 03-1H630 is currently in the environmental phase and will meter five HOV preferential lanes at Calvine Road (slip and loop), Sheldon Road (slip and

loop), and Elk Grove Boulevard (slip). The project is currently scheduled to complete construction in October 2025.

Once these projects are completed, District 3 will have no unmetered on-ramps in the northbound direction of SR 99 within the HOV lane limits.

Southbound SR 99

Friction Factor

District 3 will implement Limited Access Control on southbound SR 99 from the US 50/SR 99 interchange to Fruitridge Road (EA 03-0J420) to mitigate friction factor deficiency, this project is scheduled to go to construction in the spring of 2026. District 3 is also proposing one other location of limited access on southbound SR 99 from Mack Road to Calvine Road, which will be added to an upcoming project with similar limits.

Ramp Metering

District 3 added ramp meters at Sheldon Road and Laguna Road with a Change Order, which is attached to the on-going SAC-99 CAPM project (EA 03-0H480). Installation of these meters was completed at the end of 2022 and activated in January 2023.

Currently, there will only be one unmetered on-ramp on southbound SR 99/Elk Grove Boulevard within the HOV lane limits. District 3 is planning to meter this location with a SHOPP 2026 program.

4.2. DISTRICT 4 2022 DEGRADATION ACTION PLANS

4.2.1 SUMMARY OF DEGRADATION ON HOV FACILITIES IN DISTRICT 4

APPENDIX A provides the list of degraded facilities in District 4 that were identified in the *2022 California High Occupancy Vehicle Facilities Degradation Report*. The speed and degradation profiles for each degraded facility are provided in ATTACHMENT A.

4.2.2 DISTRICT-WIDE ACTIONS RELATED TO DEGRADATION

In 2022, overall traffic volumes were up due to the change in travel patterns with more employees going back into the office as the pandemic subsides. The following routes that were not degraded in 2021 have become degraded in 2022:

- Contra Costa (CC) County State Route (SR) 4 (eastbound, PM peak period),

- Alameda (ALA) County Interstate (I) 80 (eastbound, AM peak period),
- ALA SR 92 (westbound, AM peak period),
- Santa Clara (SCL) County SR 237 (eastbound, AM and PM peak period),
- ALA I-880 (southbound, PM peak period), and
- SCL I-880 (southbound, AM peak period).

However, with the implementation of Express Lane tolling improvement projects the following routes that were degraded in 2021 are no longer degraded in 2022:

- San Mateo (SM) and SCL United States (US) 101 (northbound AM and PM peak period.),
- SCL US 101 (southbound, AM peak period), and ALA I-580 (eastbound, PM peak period).

4.2.3 ACTION PLAN FOR DEGRADED MANAGED LANES ON ROUTE 4

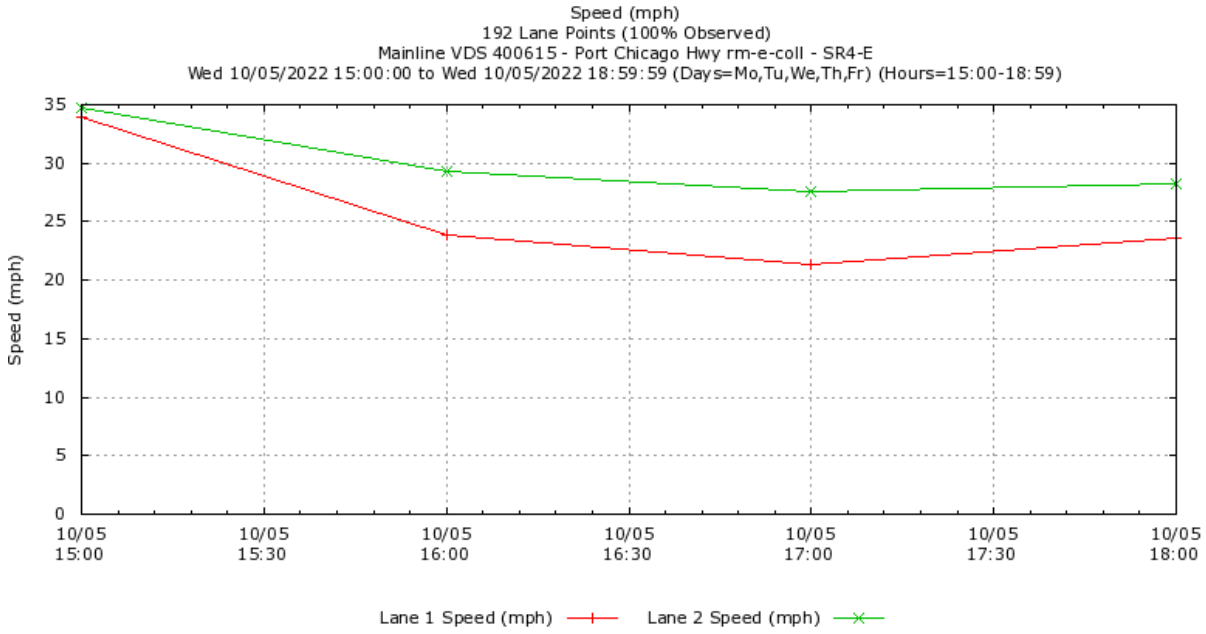
In I2021, the HOV lane on SR 4 in the eastbound direction during the PM peak period was not degraded due to the reduced traffic volumes caused by the pandemic. In 2022, as the pandemic was waning and commuters started returning to the office, approximately 1.4 miles of the eastbound SR 4 HOV lane during the PM peak period was degraded.

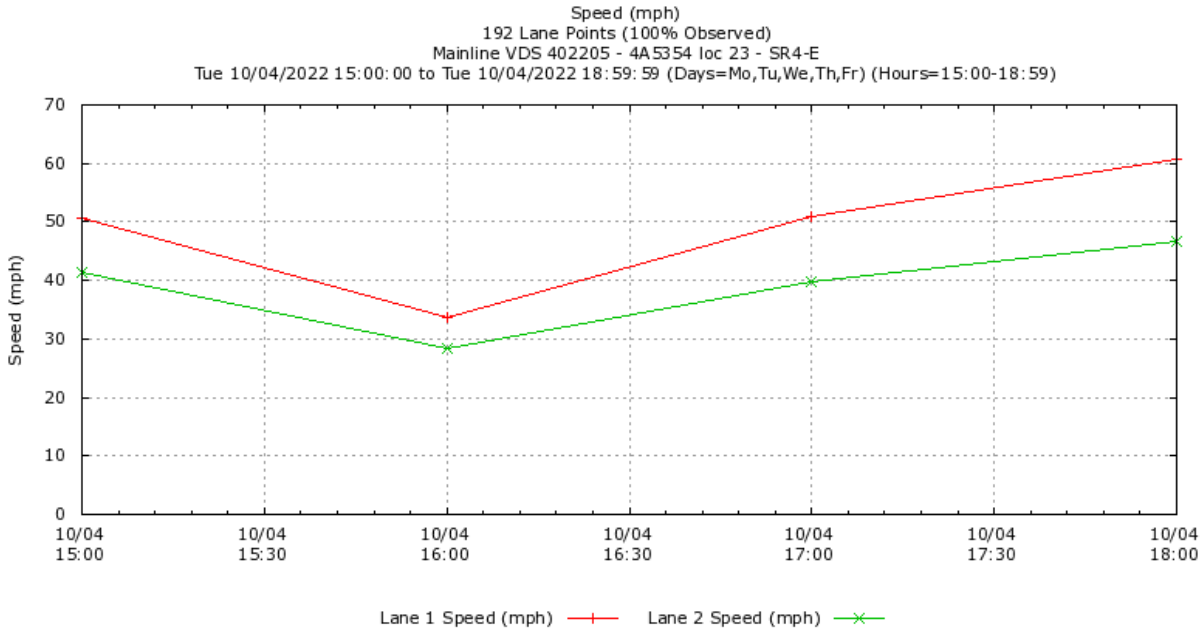
In 2021, westbound SR 4 had 4.8 lane-miles of degraded HOV lane in the AM peak period, while in 2022, westbound SR 4 had 5.3 lane-miles of degraded HOV lane in the AM peak period. This was a slight increase in degraded lane-miles mainly the result of a change in commute travel pattern with more people returning to work as the pandemic subsided.

A. Analysis:

SR 4 Eastbound: I-680 to Hillcrest Avenue

The eastbound HOV lane on SR 4 between Port Chicago Highway and Willow Pass Road (Concord) is degraded due to PM peak period recurrent congestion in the general-purpose lanes which reduced HOV lane performance and speed. In addition, demand exceeding capacity in the HOV lane also causes congestion in the HOV lane at Port Chicago Highway. A "spot time" plot of the HOV and general-purpose (GP) lane speeds on eastbound Route 4 for a typical morning peak period are shown in the figure below. Lane 1 represents the HOV lane and lane 2 represents the adjacent GP lane. This illustrates how the congested speeds of the GP lanes have an effect on the speeds in the HOV lane.





The HOV 2+ demand on this route is relatively high which can also have an effect on the speed in the HOV lane when the adjacent GP lanes are congested due to this friction factor. The HOV lane demand is greater than the effective capacity of the lane in order to maintain a speed at 45 mph or greater.

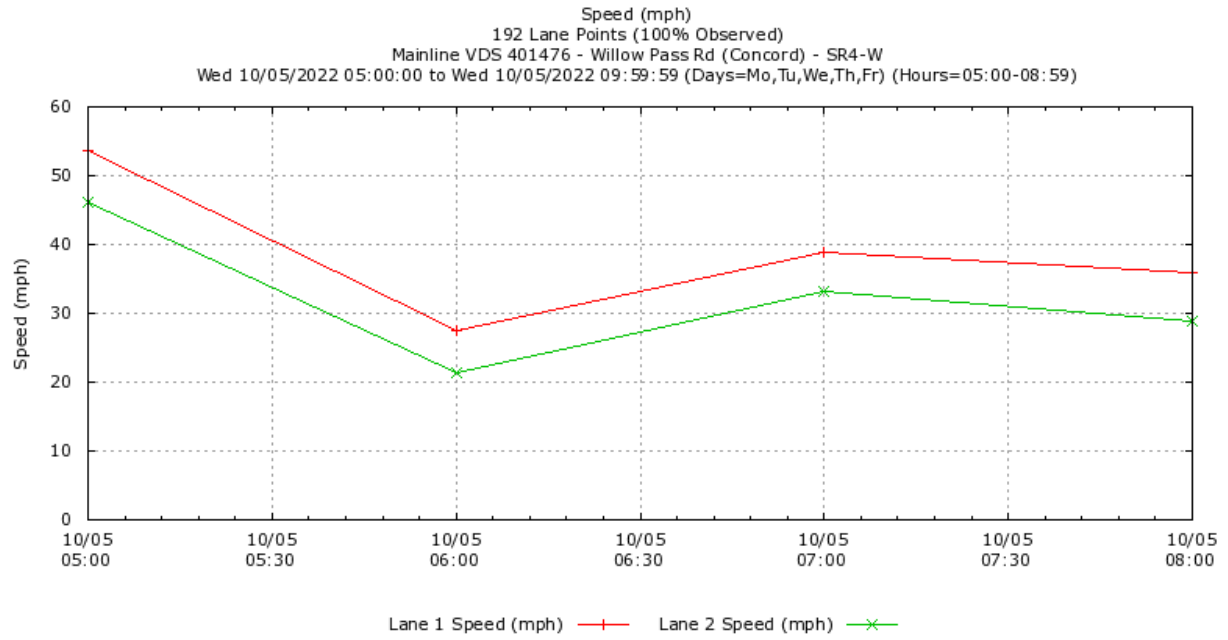
EB SR 4 Port Chicago Highway

Hour	HOV Lane Flow (Veh/Hour)	HOV Lane Speed (mph)	GP Lane Flow (Veh/Hour)	GP Lane Speed (mph)
10/3/2022 15:00	1661	57	1917	47
10/3/2022 16:00	1637	52	1834	43
10/3/2022 17:00	1502	39	1666	34
10/3/2022 18:00	1356	56	1600	50
10/4/2022 15:00	1448	51	1687	41
10/4/2022 16:00	1336	34	1426	29
10/4/2022 17:00	1719	51	1911	40
10/4/2022 18:00	1642	61	1842	47
10/5/2022 15:00	1624	55	1895	46
10/5/2022 16:00	1627	50	1906	46
10/5/2022 17:00	1635	54	1806	47
10/5/2022 18:00	1650	54	1841	48
10/6/2022 15:00	1715	49	1955	42
10/6/2022 16:00	1644	46	1947	47
10/6/2022 17:00	1699	52	1975	46
10/6/2022 18:00	1549	50	1744	46
10/7/2022 15:00	1669	45	1875	45
10/7/2022 16:00	1444	29	1558	28
10/7/2022 17:00	1729	50	1903	47
10/7/2022 18:00	1664	53	1832	50

Note: Speeds below 35 mph would be locations in congestion and corresponding volumes would be constrained volumes, demand exceeds capacity.

SR 4 Westbound: Hillcrest Avenue to East of Port Chicago Highway

Westbound SR 4 experiences recurrent AM peak period congestion in all lanes, including the HOV lane, approaching a bottleneck between the Willow Pass Road (Concord) on-ramp and the Port Chicago Highway off-ramp. Queues typically extend upstream for over 8 miles to east of the Loveridge Road interchange. The primary factors resulting in reduced HOV lane speed are friction between the HOV lane and the general purpose lanes within the area of congestion and weaving at the end of the HOV lane within the bottleneck section. A "spot time" plot of the HOV and GP lane speeds on westbound SR 4 for a typical morning peak period are shown in the figure below. Lane 1 represents the HOV lane and lane 2 represents the adjacent GP lane. This illustrates how the congested speeds of the GP lanes have an effect on the speeds in the HOV lane.



B. Remediation Strategies:

SR 4 Eastbound: I-680 to Hillcrest Avenue

The eastbound SR 4 HOV lane was extend to I-680 in 2021, however with the return of evening commute traffic, the high-volume SR 242 on-ramp and lane drop at the Port Chicago Highway interchange add to the reoccurring congestion on this route impacting the HOV lane at this location. There are no current projects to address the eastbound bottleneck at this time. However, Caltrans Headquarters in currently working on Managed Lane weaving and friction factor studies scheduled to be completed in June 2024. Conclusions from these studies could lead to future Managed Lane improvement projects. In addition, the Clean Air Vehicle (CAV) exemption is currently scheduled to sunset at the end of September 2025, the removal of CAVs from the Managed Lane would improve the Managed Lane operations.

SR 4 Westbound: Hillcrest Avenue to East of Port Chicago Highway

An Operation Improvements Project (OIP) includes several phases to add sections of GP lane or auxiliary lanes in the westbound direction and widen off-ramps on SR 4 between SR 242 and Bailey Road. This project includes future phases for westbound improvements of new auxiliary lanes, conversion of auxiliary lanes to GP lanes, or new GP lanes. First Phase of project is currently in PA&ED, with construction completion schedule in 2025 (project currently on hold). PSR-PDS completed in 2016 estimated entire OIP project cost estimate is $220M. Caltrans Headquarters in currently working on Managed Lane weaving

and friction factor studies scheduled to be completed in June 2024. Conclusions from these studies could lead to future Managed Lane improvement projects. In addition, the Clean Air Vehicle (CAV) exemption is currently scheduled to sunset at the end of September 2025, the removal of CAVs from the Managed Lane would improve the Managed lane operations.

4.2.4 Action Plan for DEGRADED managed lanes on Route 80

There are HOV facilities on two segments of I-80 in District 4. The first segment is located in Alameda, Contra Costa, and Solano Counties between the San Francisco-Oakland Bay Bridge and SR 29. The second segment is located in Solano County between Red Top Road and Airbase Parkway.

In 2021, eastbound I-80 between the I-880 and Cummings Skyway there was no degraded HOV lane-miles in the AM peak period and 10.5 degraded HOV lane-miles in the PM peak period. In 2022, this segment of I-80 had 0.8 degraded HOV lane-miles in the AM peak period and 11.3 degraded HOV lane-miles in the PM peak period.

In 2021, westbound I-80 between SR 29 and San Francisco-Oakland Bay Bridge Toll Plaza there was 8.0 degraded HOV lane-miles in the AM peak period and 0.4 degraded HOV lane-miles in the PM peak period. In 2022, this segment of I-80 had 9.0 degraded HOV lane-miles in the AM peak period and 2.2 degraded HOV lane-miles in the PM peak period.

Eastbound I-80 between Red Top Road and Airbase Parkway there was no degraded HOV lane-miles in the AM peak period in 2022 which was the same conditions as in 2021. In 2021, eastbound I-80 within this segment there was 2.1 degraded HOV lane-miles and in 2022, there was 2.6 degraded HOV lane-miles in the PM peak period.

Westbound I-80 between Airbase Parkway and westbound SR 12 there was no degraded HOV lane-miles in 2022 in either the AM or PM peak period. This was the same conditions as in 2021.

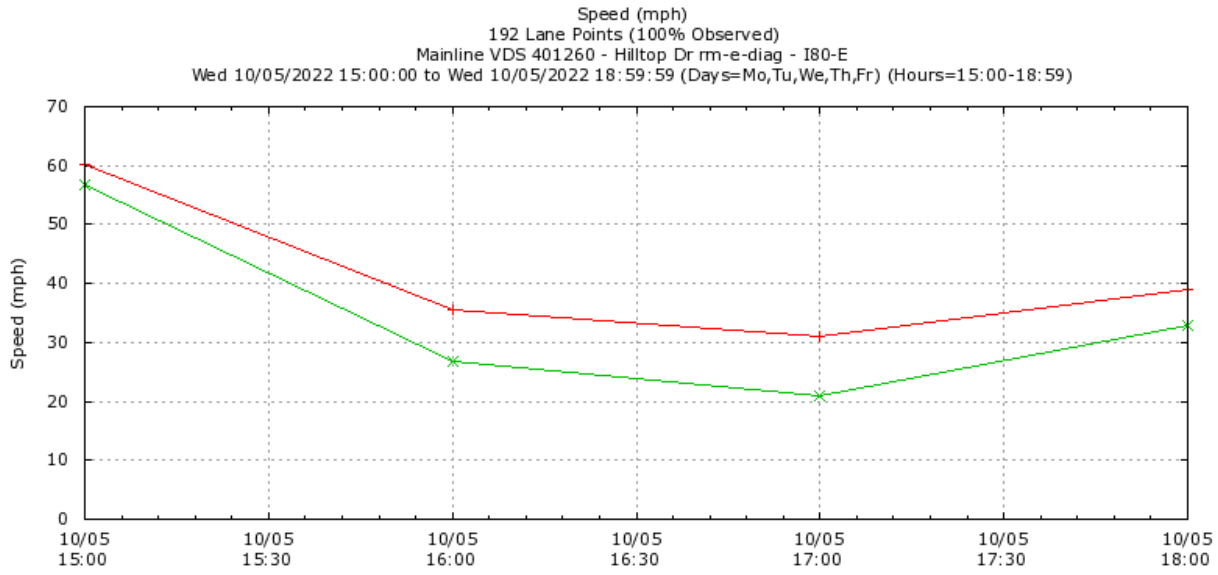
A. Analysis:

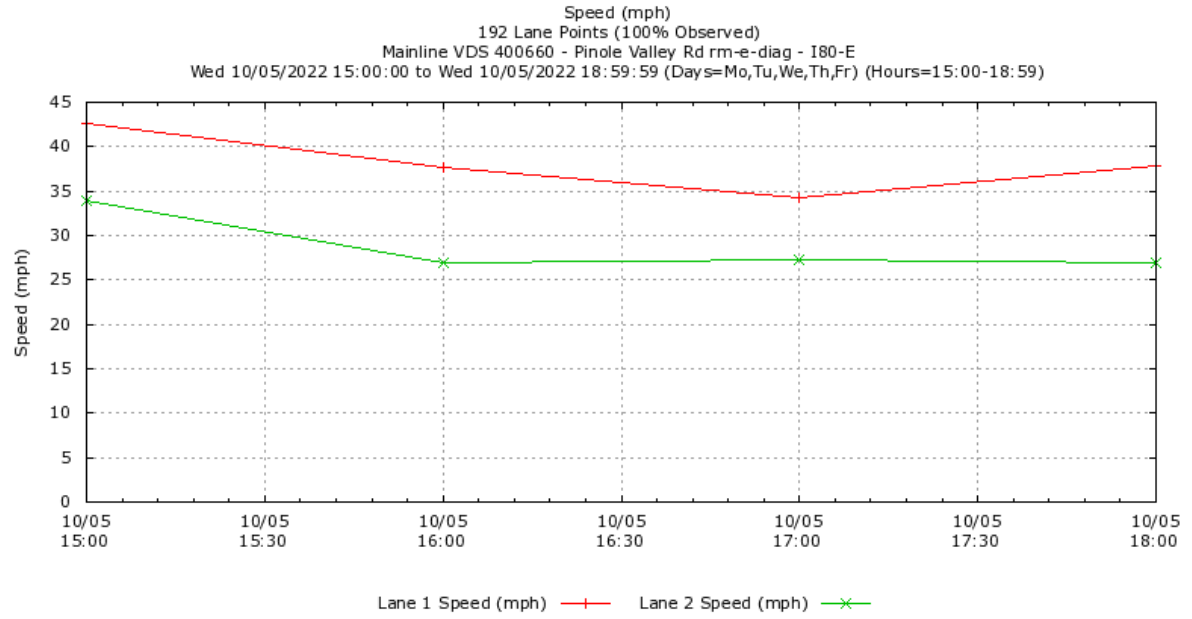
I-80 Eastbound: I-880 to Cummings Skyway

There are two controlling bottlenecks on eastbound I-80 in the PM peak period. One bottleneck is between the Gilman Street on-ramp and the Buchanan Street off-ramp. The queue from this bottleneck extends back beyond the start of the HOV lane on eastbound I-80 approximately 4.5 miles. The other bottleneck is downstream between Pinole Valley Road on-ramp and the SR 4 off-ramp. The

queue from this bottleneck extends back to Central Avenue, approximately 8.5 miles. Peak period recurrent congestion in

the GP lanes due to these conditions reduces HOV lane performance and speed due to the friction factor between these lanes. Even though the HOV lanes are degraded, HOVs in the eastbound direction experiences a travel time savings over the general-purpose traffic during the afternoon peak hour. A "spot time" plot of the HOV and GP lane speeds on eastbound I-80 for a typical afternoon peak period is shown in the figures below. Lane 1 represents the HOV lane and lane 2 represents the adjacent GP lane. This illustrates how the congested speeds of the GP lanes have an effect on the speeds in the HOV lane.





The HOV 3+ demand on this route is relatively high which can also have an effect on the speed in the HOV lane when the adjacent GP lanes are congested due to this friction factor. The HOV lane is near or at the effective capacity of the lane in order to maintain a speed at 45 mph or greater.

EB I-80 Pinole Valley Rd.

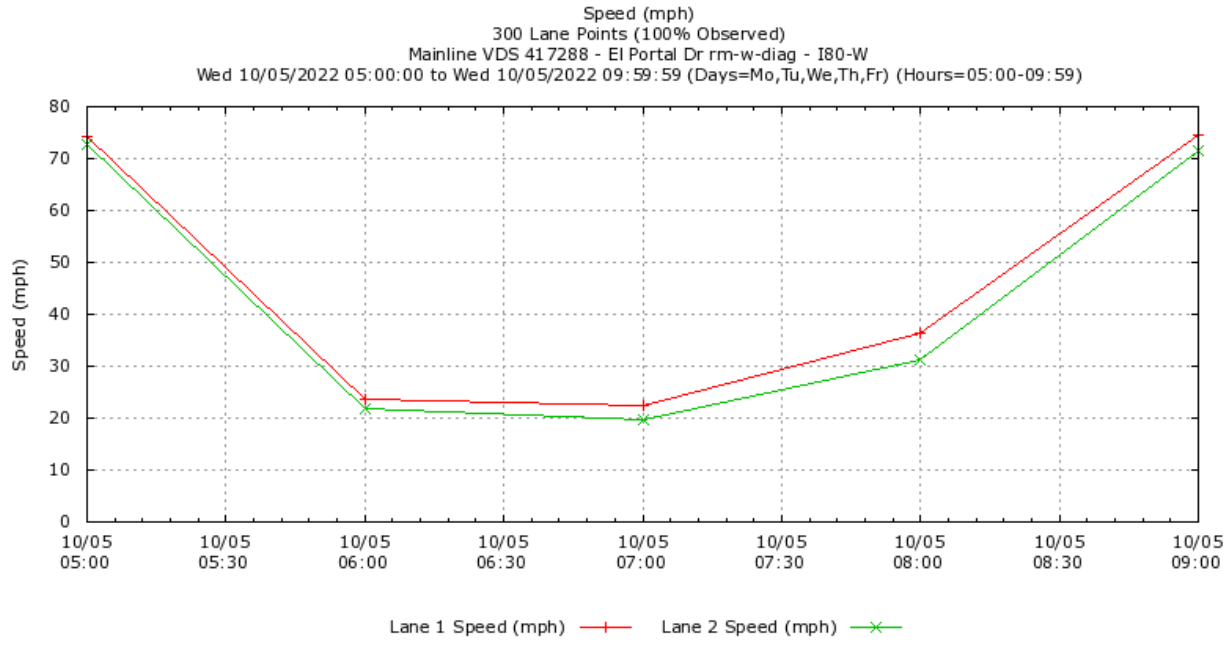
Hour	HOV Lane Flow (Veh/Hour)	HOV Lane Speed (mph)	GP Lane Flow (Veh/Hour)	GP Lane Speed (mph)
10/3/2022 15:00	1592	52	1884	44
10/3/2022 16:00	1808	39	1622	28
10/3/2022 17:00	1687	40	1614	28
10/3/2022 18:00	1092	56	1556	46
10/4/2022 15:00	1616	51	1748	41
10/4/2022 16:00	1761	41	1617	28
10/4/2022 17:00	1734	38	1600	27
10/4/2022 18:00	1323	47	1537	36
10/5/2022 15:00	1755	43	1698	34
10/5/2022 16:00	1723	38	1590	27
10/5/2022 17:00	1738	34	1575	27
10/5/2022 18:00	1754	38	1589	27
10/6/2022 15:00	1858	37	1682	30
10/6/2022 16:00	1755	36	1569	27
10/6/2022 17:00	1758	36	1574	28

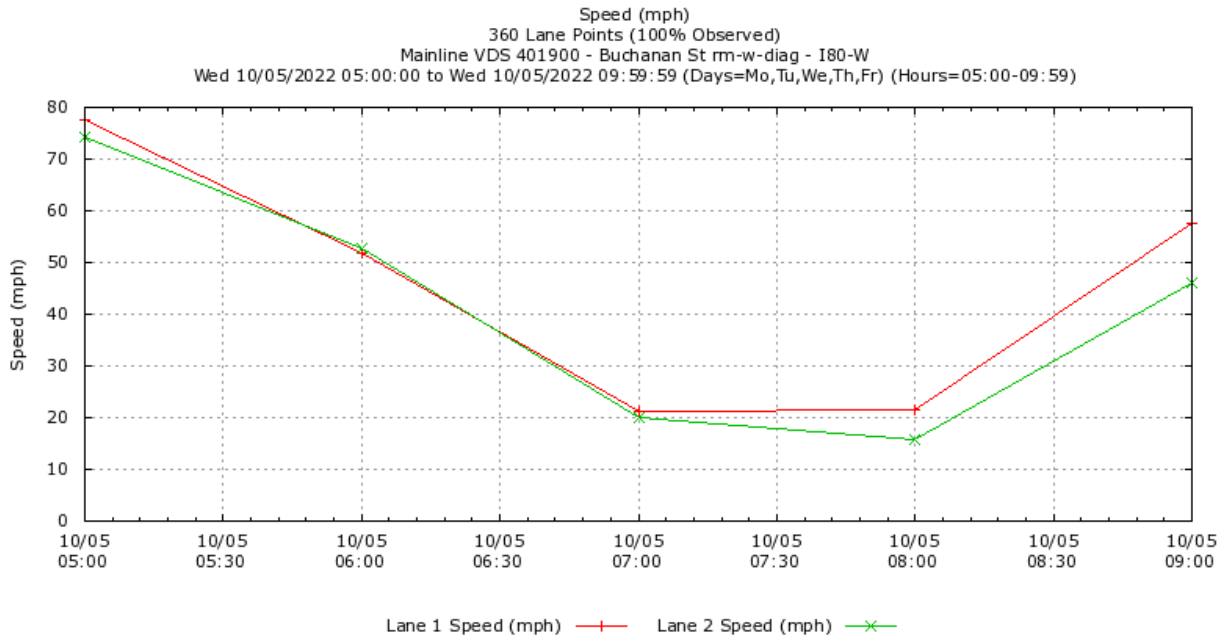
Hour	HOV Lane Flow (Veh/Hour)	HOV Lane Speed (mph)	GP Lane Flow (Veh/Hour)	GP Lane Speed (mph)
10/6/2022 18:00	1712	39	1616	28
10/7/2022 15:00	1787	34	1611	27
10/7/2022 16:00	1736	32	1569	25
10/7/2022 17:00	1739	32	1568	27
10/7/2022 18:00	1575	32	1351	25

Note: Speeds below 35 mph would be locations in congestion and corresponding volumes would be constrained volumes, demand exceeds capacity.

I-80 Westbound: SR 29 to San Francisco-Oakland Bay Bridge Toll Plaza

In the westbound direction in the AM peak period, there is a bottleneck at the San Francisco-Oakland Bay Bridge mainline metering lights in the AM peak period. This congestion extends back towards the I-80/I-580/I-880 junction. There is also a bottleneck between the Gilman Street on-ramp and the University Avenue off-ramp. The queue from this bottleneck extends back to the Appian Way interchange, approximately 9.3 miles. Peak period recurrent congestion in GP lanes reduces HOV lane performance and speed due to the friction factor. Even though the HOV lanes are degraded, HOVs in the westbound direction experiences a travel time savings over the general-purpose traffic during the morning peak period. Figures below shows a "spot time" plot of the HOV and GP lane speeds on westbound I-80 during a typical morning peak period. Lane 1 represents the HOV lane and lane 2 represents the adjacent GP lane.





The HOV 3+ demand on this route is relatively high which can also have an effect on the speed in the HOV lane when the adjacent GP lanes are congested due to this friction factor. The HOV lane is near the effective capacity of the lane in order to maintain a speed at 45 mph or greater.

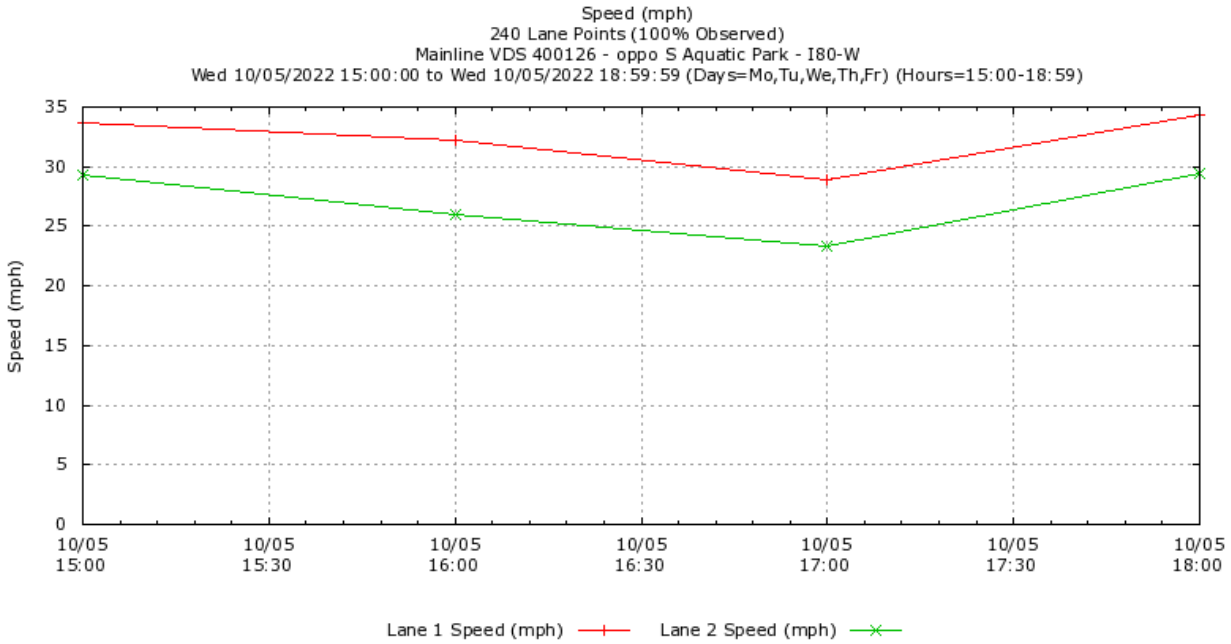
WB I-80 San Pablo Dam Rd.

Hour	HOV Lane Flow (Veh/Hour)	HOV Lane Speed (mph)	GP Lane Flow (Veh/Hour)	GP Lane Speed (mph)
10/3/2022 5:00	1477	43	1634	42
10/3/2022 6:00	1314	18	1218	14
10/3/2022 7:00	1273	16	1195	13
10/3/2022 8:00	1476	25	1369	18
10/3/2022 9:00	1163	52	1582	27
10/4/2022 5:00	1752	75	1915	74
10/4/2022 6:00	1494	25	1499	25
10/4/2022 7:00	1444	21	1431	19
10/4/2022 8:00	1392	25	1414	20
10/4/2022 9:00	862	66	1693	52
10/5/2022 5:00	1711	73	1946	69
10/5/2022 6:00	1450	24	1448	23
10/5/2022 7:00	1462	24	1428	21
10/5/2022 8:00	1306	37	1583	30

Hour	HOV Lane Flow (Veh/Hour)	HOV Lane Speed (mph)	GP Lane Flow (Veh/Hour)	GP Lane Speed (mph)
10/5/2022 9:00	887	74	1813	70
10/6/2022 5:00	1743	82	1975	77
10/6/2022 6:00	1716	42	1754	40
10/6/2022 7:00	1471	29	1466	24
10/6/2022 8:00	1523	37	1505	23
10/6/2022 9:00	858	70	1841	67
10/7/2022 5:00	1510	72	1782	68
10/7/2022 6:00	1408	40	1536	32
10/7/2022 7:00	1494	46	1701	39
10/7/2022 8:00	1062	63	1781	54
10/7/2022 9:00	907	74	1912	69

Note: Speeds below 35 mph would be locations in congestion and corresponding volumes would be constrained volumes, demand exceeds capacity.

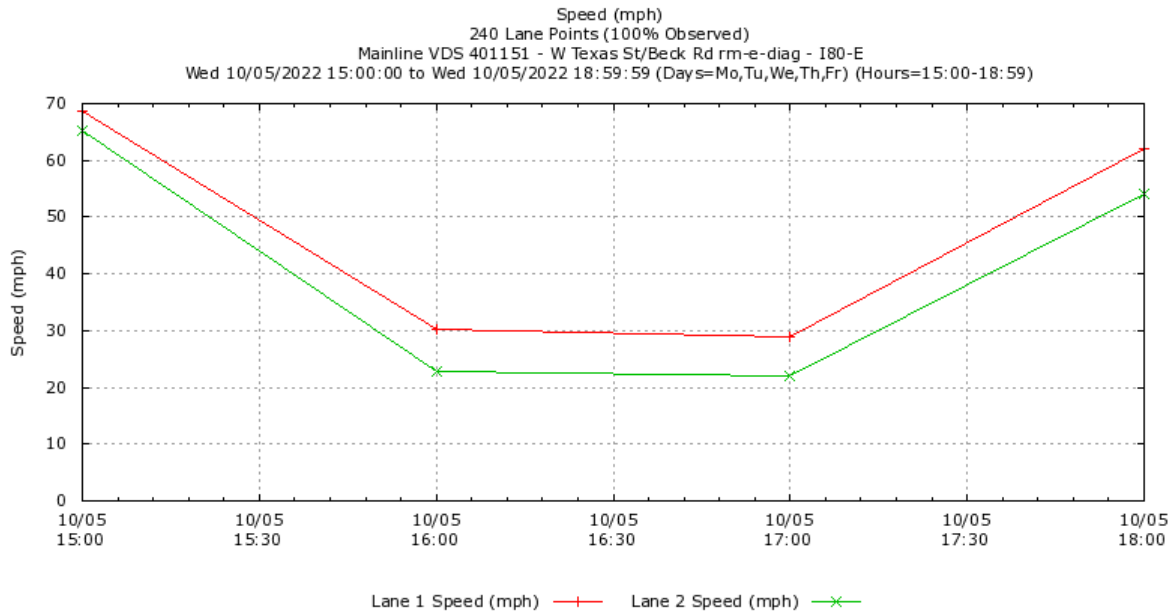
On westbound I-80 in the PM peak period, there is a bottleneck that develops between the Powell Street loop on-ramp and the I-80/I-580/I-880 junction. A queue from this bottleneck extends back to the University Avenue interchange, approximately 2.3 miles. Peak period recurrent congestion in GP lanes reduces HOV lane performance and speed due to the friction factor. Even though the HOV lanes are degraded, HOVs in the westbound direction experiences a travel time savings over the general-purpose traffic during evening peak period. Figures below shows a "spot time" plot of the HOV and GP lane speeds on westbound I-80 during a typical evening peak period. Lane 1 represents the HOV lane and lane 2 represents the adjacent GP lane.

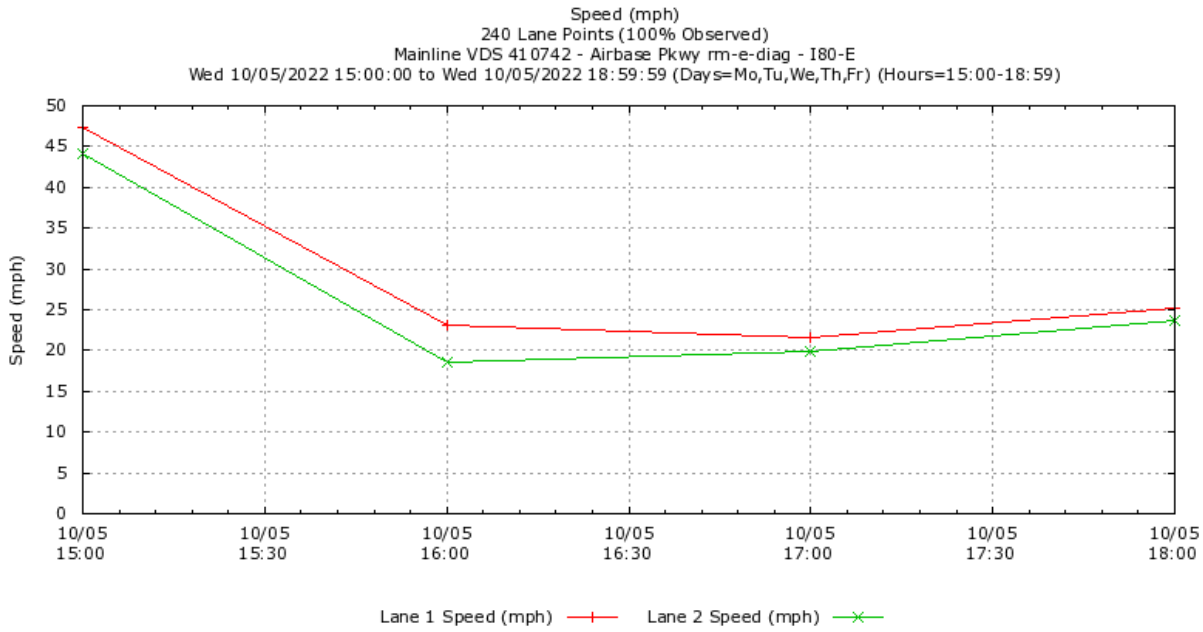


I-80 Eastbound: Red Top Road to Airbase Parkway:

During the normal afternoon peak period the HOV lane is degraded, congestion in the GP lanes reduces HOV lane performance and speed due to the friction factor. This is due to several geometric factors on the GP lanes. In the eastbound direction there are two consecutive general-purpose lane drops – first is a mandatory off to eastbound SR 12 (7 lanes to 6 lanes), second is a lane drop after the connector to SR 12 (from 6 to 5 lanes). There is also a lane drop downstream of the end of HOV lane causing congestion to queue back into the end of the HOV lane. In addition, this route is a getaway route for drivers heading to the Tahoe/Reno area, congestion on the mainline occurs around the major holidays (Independence Day, Labor Day, Thanksgiving, and week before Christmas).

Speed profiles showing friction between HOV lane #1 and GP lane #2 is shown on the graphs below, along with the congestion in the HOV lane due to the lane drop downstream of the end of the HOV lane.





B. Remediation Strategies:

San Francisco-Oakland Bay Bridge to Carquinez Bridge

Starting in July 2018, the Metropolitan Transportation Commission (MTC) provided $1.2 million in funding to the CHP for one year (with an option to extend it to three years) for four CHP officers to specifically conduct enhanced HOV enforcement. The limits on I-80 for this CHP enforcement pilot project are from the Carquinez Bridge to the San Francisco-Oakland Bay Bridge. MTC and

Caltrans collected data to evaluate effectiveness of the enhanced enforcement effort. This enforcement pilot was stopped in 2020 due to the shelter in place (SIP) order caused by the pandemic. Results only showed slight reduction in violation and did not significantly reduce degradation.

Caltrans has updated the HOV violation fine amount on existing signs along this corridor to the current dollar amount to support the enhanced HOV enforcement effort, completed end of 2018. However, this did not have a significant impact on addressing the degradation on this corridor.

Caltrans is utilizing the westbound I-80 electronic overhead lane use control sign to display HOV diamond symbol over lane #1 during the HOV lane hours of operation (5-10 AM and 3-7 PM). Results did not show a significant impact on the degradation on this corridor.

A future project will convert the HOV lanes to HOT lanes. Preliminary engineering and environmental studies are pending. Scheduled to open 2030/31 with preliminary project cost is estimated at $190 million and would be funded by MTC. With HOT lane projects there is dedicated funding provided by the HOT lane operators for CHP enforcement of the HOT lanes. This will insure a more consistent approach to enforcing and deterring violations of the HOT lanes.

In addition, MTC is embarking on a design alternative assessment (DAA) on I-80. The DAA will identify and evaluate a range of near-term and mid-term operational improvements and demand management strategies to address congestion in the corridor focusing on improving high occupancy modes of travel such as express buses and carpools, Managed lanes, and associated operational policies. The outcome of the DAA will be a set of near-and mid-term project concepts, started in November 2020 and completed by end of 2022. Potential implementation of DAA alternatives would be within 4 years.

Caltrans has discussed with CHP the Managed Lane high violation locations throughout the San Francisco Bay Area in early 2023. This will allow CHP to concentrate their enforcement efforts in these areas.

I-80 Eastbound Red Top Road to Airbase Parkway

A project will convert the existing HOV lanes to HOT lanes and will extend them from Airbase Parkway eastward to I-505 in Vacaville in both directions of I-80. The project cost is $179 M, completion scheduled for July 2025. With HOT lane projects there is dedicated funding provided by the HOT lane operators for CHP enforcement of the HOT lanes. This will insure a more consistent approach to enforcing and deterring violations of the HOT lanes. In addition, Solano County Transportation Authority and MTC are studying increasing the occupancy for the

HOT to 3+ no toll with HOV 2 and CAV charged a 50% discounted toll prior to opening the lane to tolling.

4.2.5 ACTION PLAN FOR DEGRADED MANAGED LANES ON ROUTE 85

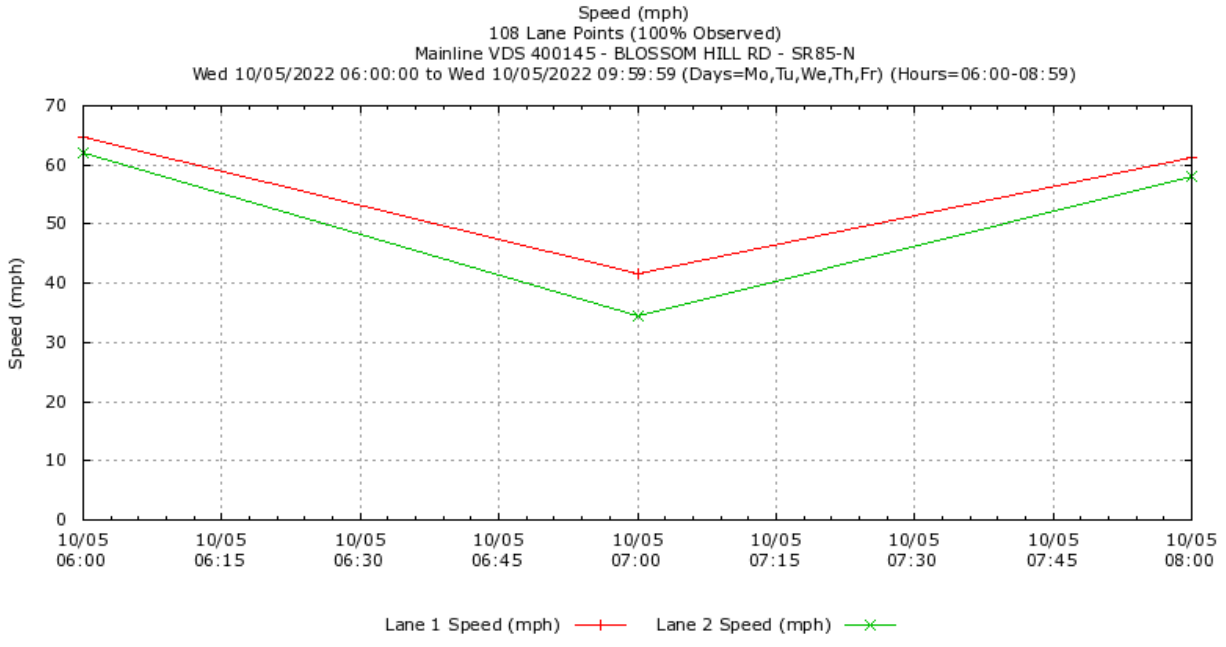
In 2021, northbound I-85 in the AM peak period had 4.6 lane-miles of degraded HOV lanes. In 2022, the number of degraded HOV lane-miles in the AM peak period grew to 5.3 miles.

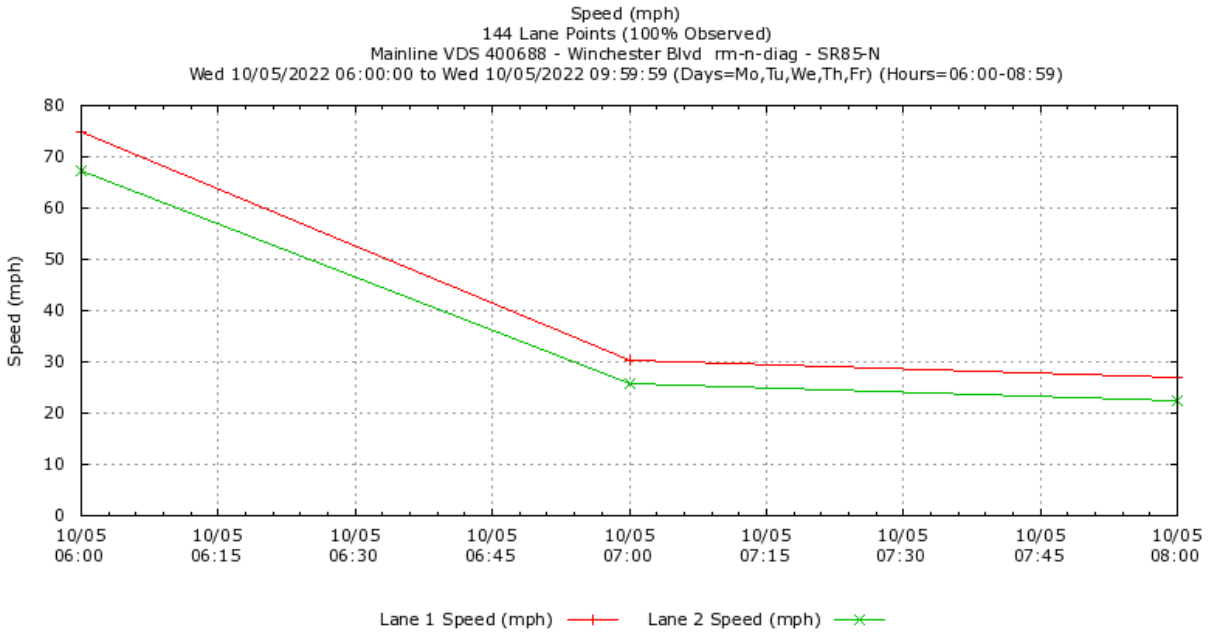
In 2021, southbound I-85 in the PM peak period had 8.3 lane-miles of degraded HOV lane-miles. In 2022, the degraded HOV lane-miles reduced to 7.6 miles in the southbound PM peak period.

A. Analysis:

SR 85 Northbound: US 101 (S. San Jose) to US 101 (Mountain View)

In the northbound direction during the AM peak period traffic conditions started to return to pre-pandemic conditions. There is a bottleneck between the Winchester Boulevard on-ramp and the Saratoga Avenue off-ramp. The queue from this bottleneck currently extends upstream beyond the Blossom Hill Road interchange. There is a bottleneck that develops downstream between the Fremont Avenue on-ramp and the El Camino Real (SR 82) diagonal off-ramp. Queues from this bottleneck extend upstream to the Stevens Creek Boulevard interchange. Peak period recurrent congestion in the GP lanes reduces HOV lane performance and speed due to the friction factor between these lanes.





The HOV 2+ demand on this route is relatively high which can also have an effect on the speed in the HOV lane when the adjacent GP lanes are congested due to this friction factor. The HOV lane is near the effective capacity of the lane in order to maintain a speed at 45 mph or greater.

NB I-85 Union Avenue

Hour	HOV Lane Flow (Veh/Hour)	HOV Lane Speed (mph)	GP Lane Flow (Veh/Hour)	GP Lane Speed (mph)
10/3/2022 6:00	800	74	1672	60
10/3/2022 7:00	1587	47	1826	37
10/3/2022 8:00	1503	40	1588	26
10/4/2022 6:00	939	74	1825	66
10/4/2022 7:00	1500	34	1539	27
10/4/2022 8:00	1608	37	1648	27
10/5/2022 6:00	975	71	1695	58
10/5/2022 7:00	1615	40	1711	30
10/5/2022 8:00	1565	40	1661	29
10/6/2022 6:00	1019	74	1790	54
10/6/2022 7:00	1585	40	1670	30
10/6/2022 8:00	1584	37	1642	28
10/7/2022 6:00	813	73	1585	68

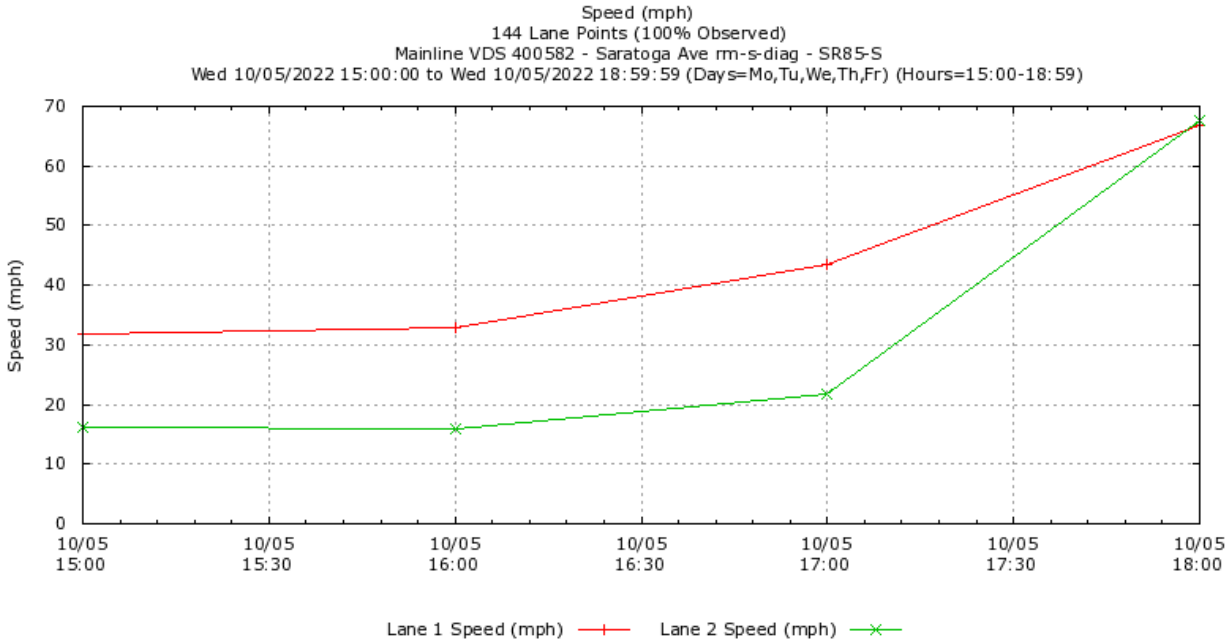
Hour	HOV Lane Flow (Veh/Hour)	HOV Lane Speed (mph)	GP Lane Flow (Veh/Hour)	GP Lane Speed (mph)
10/7/2022 7:00	1596	44	1811	38
10/7/2022 8:00	1404	44	1677	33

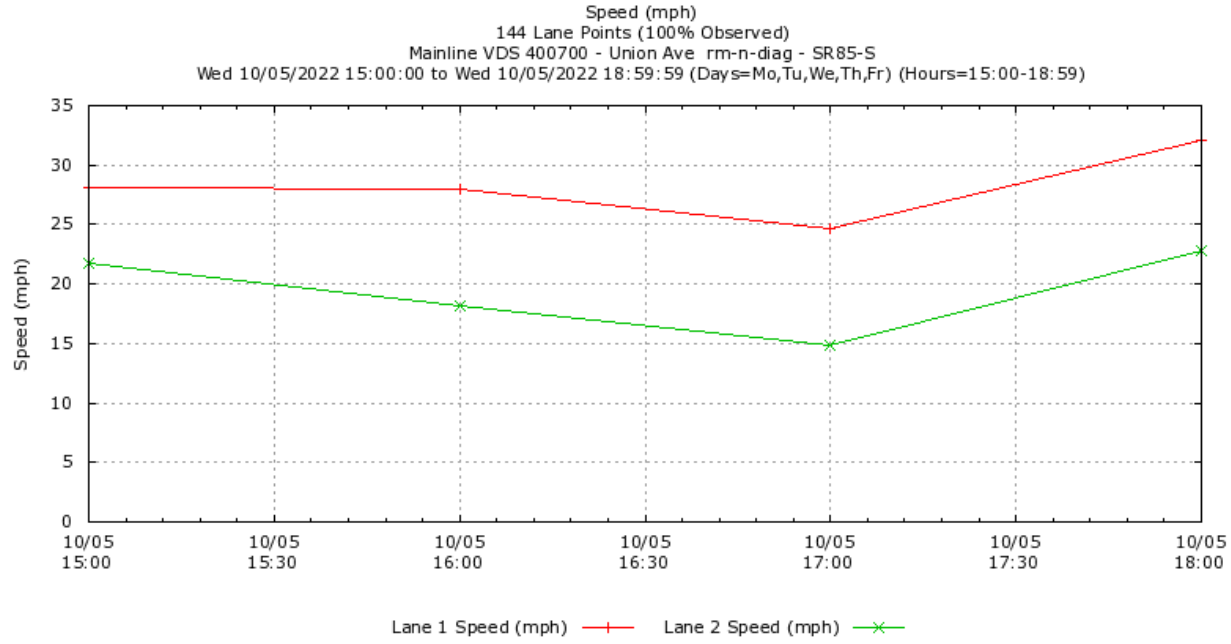
Note: Speeds below 35 mph would be locations in congestion and corresponding volumes would be constrained volumes.

SR 85 Southbound: US 101 US 101 (Mountain View to (S. San Jose)

In the AM peak period the PeMS data initially indicated that there was a degraded segment at the Central Expressway on-ramp and at the Winchester Boulevard on-ramp. However, it was determined that the PeMS data was from bad detectors and that this should have been removed from the analysis. There are no degraded segments on southbound SR 85 in the AM peak period in 2022.

In the southbound direction during the PM peak period traffic conditions are starting to return to pre-pandemic conditions. However, as the severity of the congestion has been reduced this has uncovered multiply bottlenecks along this route. The multiple bottlenecks along this route are as follows, between the SR 237 and the El Camino Real interchanges, between the Fremont Avenue on-ramp and the Homestead Road off-ramp, from the Saratoga Avenue on-ramp to the Winchester Boulevard off-ramp, between the Union Avenue on-ramp and the Camden Avenue off-ramp and between SR 87 and Blossom Hill Road off-ramp. PM peak period recurrent congestion in the GP lanes reduces HOV lane performance and speed due to the friction factor between these lanes.





The HOV 2+ demand on this route is relatively high which can also have an effect on the speed in the HOV lane when the adjacent GP lanes are congested due to this friction factor. The HOV lane is near the effective capacity of the lane in order to maintain a speed at 45 mph or greater.

NB I-85 Union Avenue

Hour	HOV Lane Flow (Veh/Hour)	HOV Lane Speed (mph)	GP Lane Flow (Veh/Hour)	GP Lane Speed (mph)
10/3/2022 15:00	1591	32	1527	25
10/3/2022 16:00	1566	32	1455	20
10/3/2022 17:00	1556	30	1429	19
10/3/2022 18:00	926	44	1570	39
10/4/2022 15:00	1620	32	1460	20
10/4/2022 16:00	1552	28	1409	19
10/4/2022 17:00	1528	32	1343	16
10/4/2022 18:00	1514	36	1477	21
10/5/2022 15:00	1598	28	1453	22
10/5/2022 16:00	1523	28	1423	18
10/5/2022 17:00	1503	25	1281	15
10/5/2022 18:00	1307	32	1476	23
10/6/2022 15:00	1579	23	1482	21
10/6/2022 16:00	1554	23	1460	21
10/6/2022 17:00	1502	21	1318	17
10/6/2022 18:00	1589	25	1492	20
10/7/2022 15:00	1565	26	1475	21
10/7/2022 16:00	1529	24	1451	21
10/7/2022 17:00	1550	25	1391	19
10/7/2022 18:00	1335	36	1579	30

Note: Speeds below 35 mph would be locations in congestion and corresponding volumes would be constrained volumes.

B. Remediation Strategies:

There is a project to convert existing HOV lanes to HOT lanes and add a second HOT lane to provide a dual lane facility. The project limits are from the US 101 interchange in south San Jose to the US 101 interchange in Mountain View. Preliminary project cost is estimated at $185 million and would be funded by the Santa Clara Valley Transportation Authority (VTA) through the design stage of the project. There is also a proposal to raise occupancy to HOV 3+ with HOT lane conversion. In addition, HOV 2 and Clean Air Vehicles would be tolled at a discounted rate. VTA plans to build this project and the US 101 HOT lane project in phases. The first segment on SR 85 opened in February 2022 between Central Expressway and US 101 (Mountain View). The segment from US 101 (south San Jose) to SR 87 is currently in the design phase with construction to start in 2024,

and completed in 2027, with a project cost of $64M. The middle section of the SR 85 HOT lane conversion and lane addition will follow this project.

A project to widen the metered on-ramps at Camden Avenue, Union Avenue, Bascom Avenue, and SR 17 to SR 85 connector on southbound SR 85 is at the PID stage. An addition lane at these on-ramps will provide more vehicle storage. This additional storage would allow the ramp meters to restrict more of the on-ramp demand to southbound SR 85 and improve traffic flow along this route. The project is planned to be programmed in the 2026 SHOPP.

4.2.6 ACTION PLAN FOR DEGRADED MANAGED LANES ON ROUTE 87

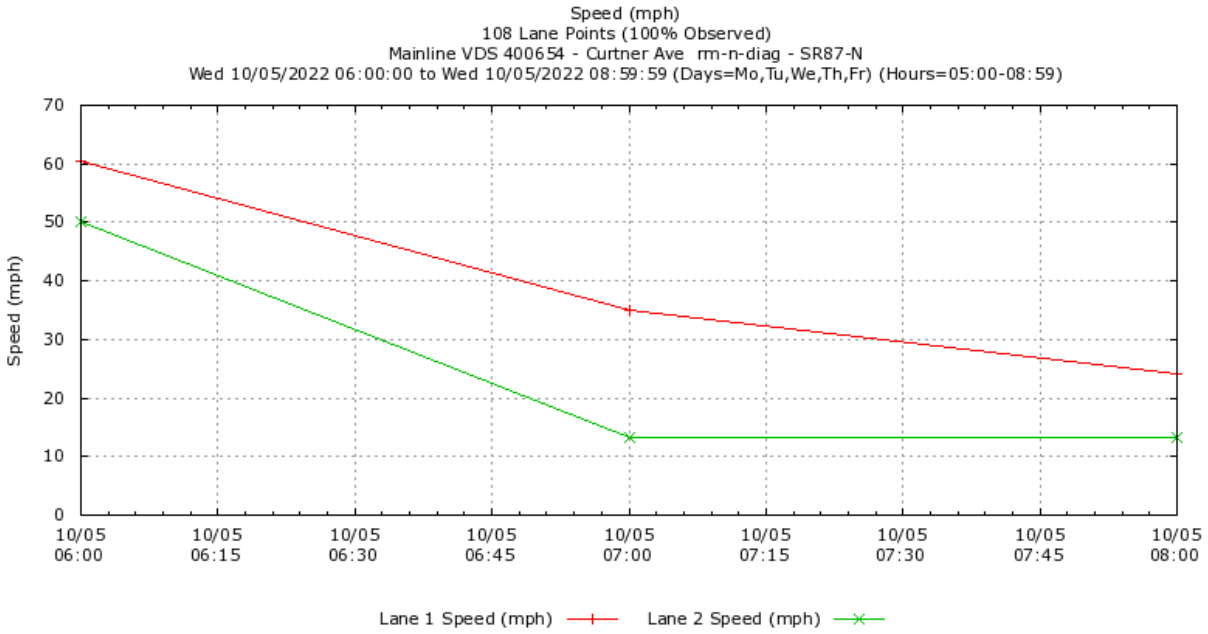
In 2021, northbound SR 87 in the AM peak period had 1.3 lane-miles of degraded HOV lanes. In 2022, there was 1.9 lane-miles of degraded HOV lanes in the AM peak period. In 2021, northbound SR 87 had 0.5 lane-miles of degraded HOV lane-miles in the PM peak period while 2022, had only 0.4 miles of degraded HOV lane-miles in the PM peak period.

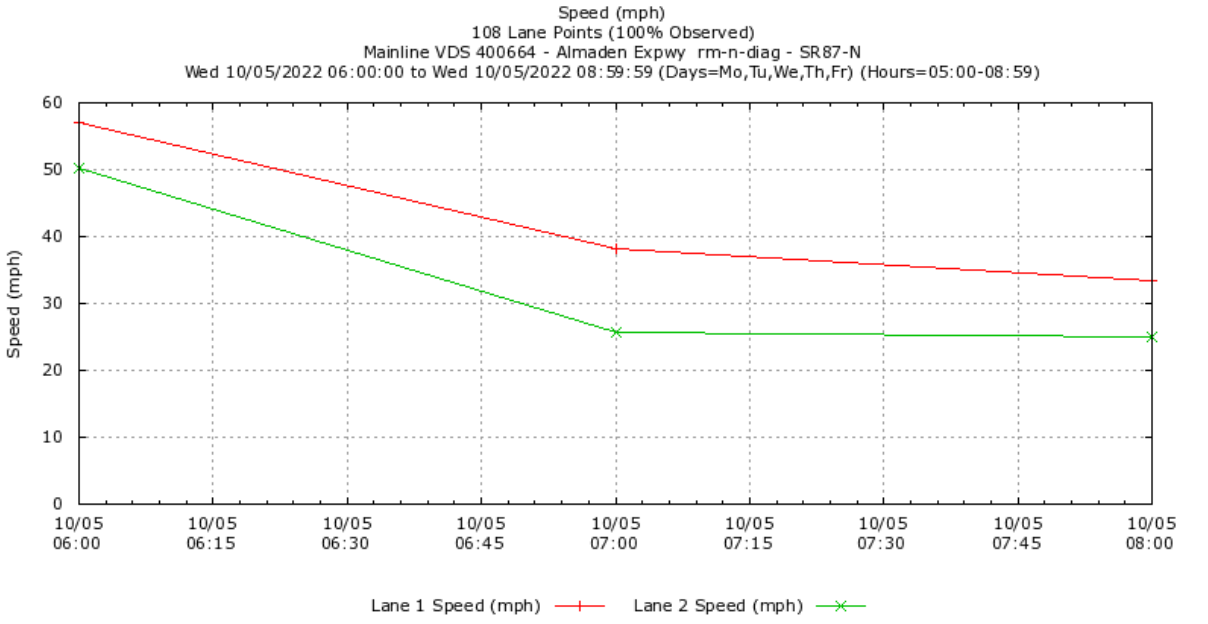
In 2021, southbound SR 87 in the PM peak period had 0.5 lane-miles of degraded HOV lanes while 2022, had 3.9 miles of degraded HOV lane-miles in the PM peak period.

A. Analysis:

SR 87 Northbound: SR 85 to US 101

On northbound SR 87 during the AM peak period there is currently a bottleneck at the Almaden Expressway on-ramp with queues extending upstream to the Chynoweth Avenue. Peak period recurrent congestion in the GP lanes reduces HOV lane performance and speed due to the friction factor between these lanes.





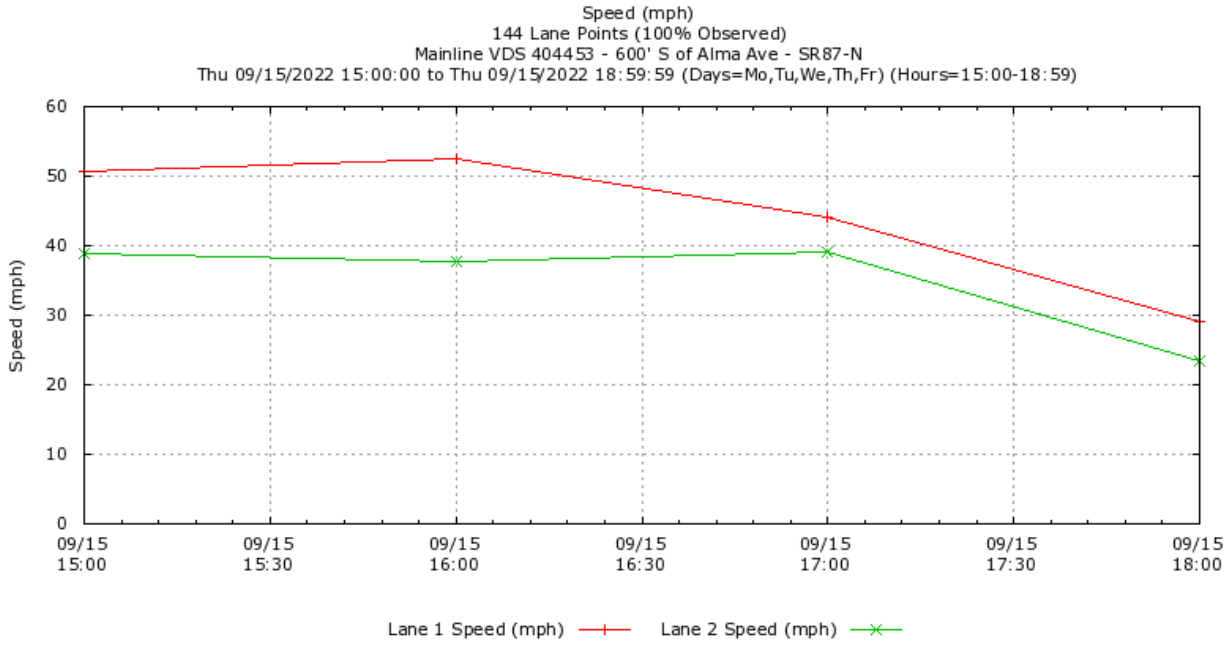
The HOV 2+ demand on this route is relatively high which can also have an effect on the speed in the HOV lane when the adjacent GP lanes are congested due to this friction factor. The HOV lane is at the effective capacity of the lane in order to maintain a speed at 45 mph or greater.

NB I-87 Almaden Expressway

Hour	HOV Lane Flow (Veh/Hour)	HOV Lane Speed (mph)	GP Lane Flow (Veh/Hour)	GP Lane Speed (mph)
10/3/2022 6:00	1288	72	1842	49
10/3/2022 7:00	1642	40	1565	23
10/3/2022 8:00	1591	38	1427	20
10/4/2022 6:00	1402	57	1860	47
10/4/2022 7:00	1702	40	1545	23
10/4/2022 8:00	1490	33	1534	23
10/5/2022 6:00	1379	57	1837	50
10/5/2022 7:00	1687	38	1550	26
10/5/2022 8:00	1672	33	1546	25
10/6/2022 6:00	1338	60	1884	52
10/6/2022 7:00	1697	37	1541	23
10/6/2022 8:00	1653	35	1561	23
10/7/2022 6:00	1318	66	1902	56
10/7/2022 7:00	1713	38	1586	26
10/7/2022 8:00	1590	38	1477	24

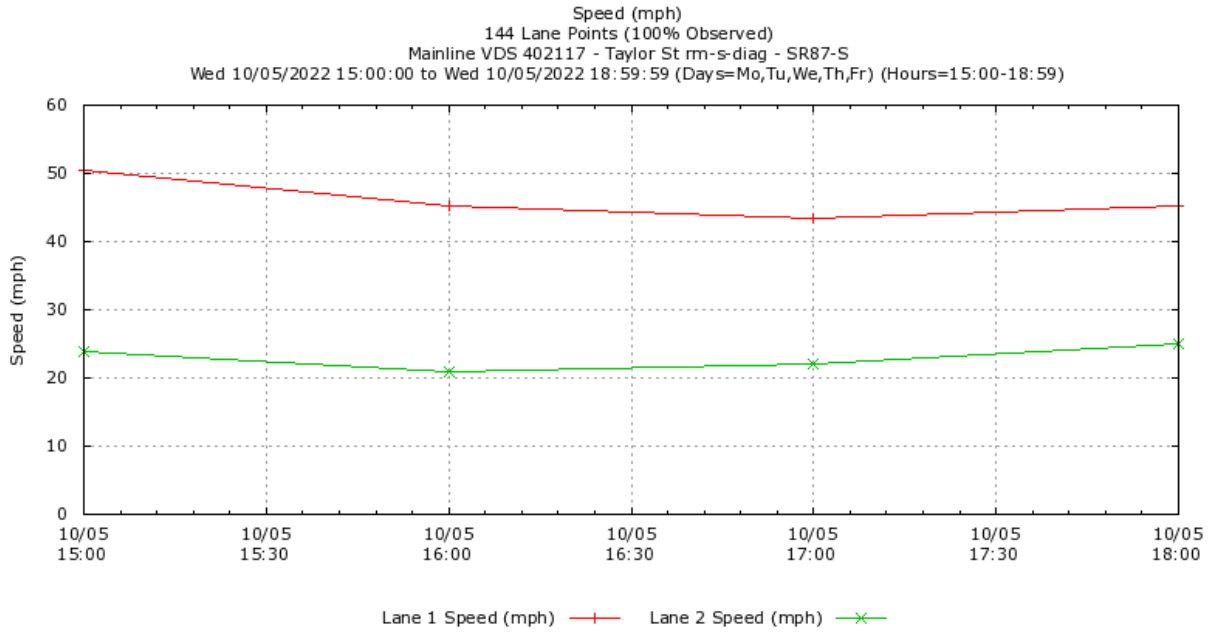
Note: Speeds below 35 mph would be locations in congestion and corresponding volumes would be constrained volumes, at capacity.

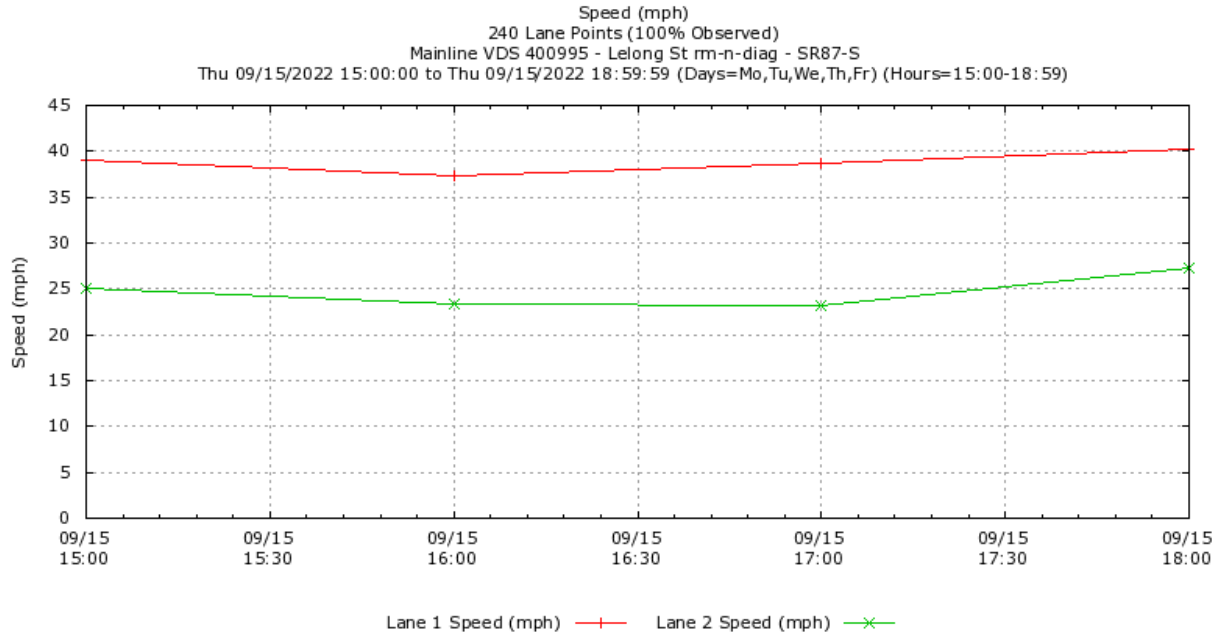
On northbound SR 87 during the PM peak period one detector location shows speeds in the HOV lane drop below 45 mph 13 % of the time. This is due to a queue from the NB SR 87 to SB I-280 connector queuing back onto northbound SR 87. This congestion is in the general-purpose lanes which reduced the HOV lane performance and speed due to the friction factor between these lanes.



SR 87 Southbound: US 101to SR 85

On southbound SR 87 there is one controlling bottleneck in the afternoon peak period between the I-280 on-ramp and the Almaden Expressway off-ramp. The queue from this bottleneck extends back to US 101. Peak period recurrent congestion in the GP lanes reduces HOV lane performance and speed due to the friction factor between these lanes.





B. Remediation Strategies:

VTA conducted a corridor study and is planning a future project to convert the HOV lane to a HOT lane. At the time of conversion, occupancy may be increased to HOV 3+ no toll. In addition, HOV 2 and Clean Air Vehicles could be tolled at a discounted rate. The corridor study was completed in August 2018

however the HOT lane conversion does not currently have a schedule completion date.

A Technology-Based Corridor improvement project ($3 Million), part-time lane (Bus), which would convert the right shoulder to a part-time lane for transit, was scheduled to start construction in the Summer of 2023 with completion in fall 2024. VTA however has put this project on hold for the time being.

A project headed by VTA and partnered with Caltrans, City of San Jose and Santa Clara County Roads and Airports, would modify the on and off-ramps between SR 87/Capitol Expressway interchange and Narvaez Avenue to improve traffic operations and provide multimodal transportation. Different alternatives for HOV bypass at the ramp locations are being evaluated with consideration of the future Transit-Oriented Development (TOD) planned at the southeast side of the project site (Further discussed below). This $50 Million project is at the PA&ED stage with construction scheduled to start in the Spring of 2027 for completion by Summer 2029.

A mixed-use TOD is planned at the Capitol station at Capitol Expressway/Narvaez Avenue in San Jose. The development, which provides affordable housing near public transportation, would encourage transit use and relieve traffic congestion. Construction is scheduled to start early 2026 for completion by mid-2028.

Caltrans Headquarters in currently working on Managed Lane weaving and friction factor studies scheduled to be completed in June 2024. Conclusions from these studies could lead to future Managed Lane improvement projects. In addition, the Clean Air Vehicle (CAV) exemption is currently scheduled to sunset at the end of September 2025, the removal of CAVs from the Managed Lane would improve the Managed lane operations.

Caltrans has discussed with CHP the Managed Lane high violation locations throughout the San Francisco Bay Area in early 2023. This will allow CHP to concentrate their enforcement efforts in these areas.

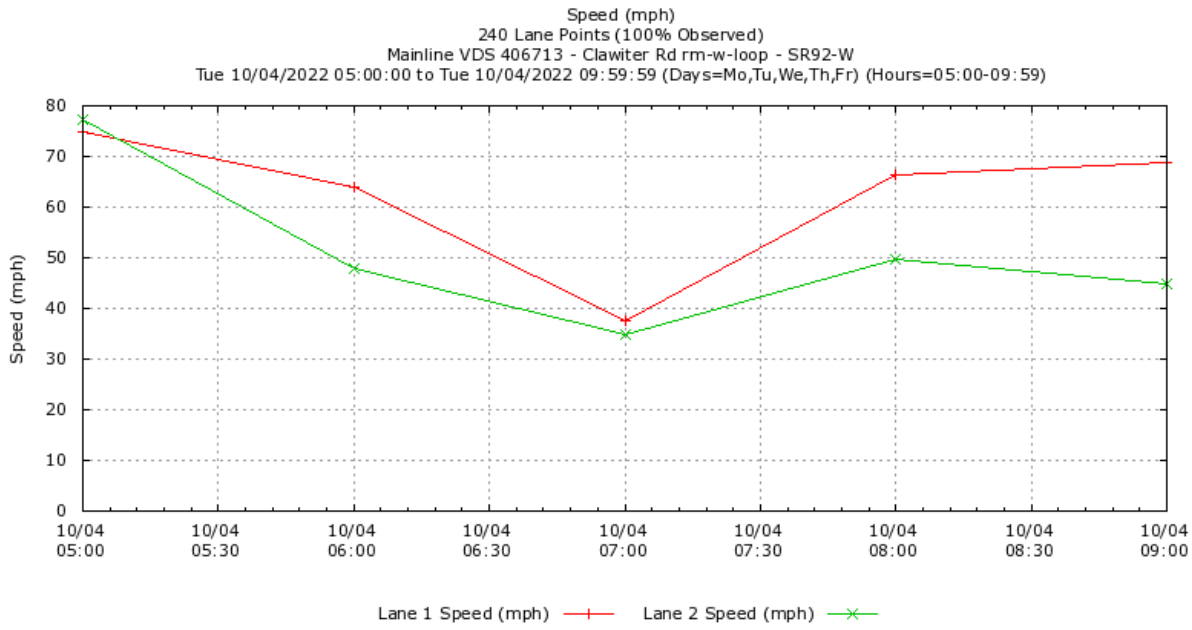
4.2.7 ACTION PLAN FOR DEGRADED MANAGED LANE ON ROUTE 92

In 2021, the westbound SR 92 HOV lane was not degraded in the AM peak period. In 2022, there was 0.2 lane-miles of degraded HOV lane in the westbound AM peak period.

A. Analysis:

In March 2020, toll collection was converted to only FasTrak toll tags and mailed invoices. Therefore, the toll plaza is no longer the bottleneck on this route. The

current bottleneck on this route is the San Mateo-Hayward Bridge. This bottleneck causes a queue to extend upstream towards I-880, a distance of 4.0 miles. Peak period recurrent congestion in the general-purpose lanes reduces HOV lane performance and speed due to the friction factor between these lanes.



B. Remediation Strategies:

MTC was previously studying increasing HOV occupancy to HOV 3+ due to legislative requirements at the San Mateo-Hayward Bridge Toll Plaza. Currently there is no timeline on when this increase in occupancy requirement will be implemented.

Caltrans Headquarters in currently working on Managed Lane weaving and friction factor studies scheduled to be completed in June 2024. Conclusions from these studies could lead to future Managed Lane improvement projects. In addition, the Clean Air Vehicle (CAV) exemption is currently scheduled to sunset at the end of September 2025, the removal of CAVs from the Managed Lane would improve the Managed Lane operations.

Caltrans has discussed with CHP the Managed Lane high violation locations throughout the San Francisco Bay Area in early 2023. This will allow CHP to concentrate their enforcement efforts in these areas.

4.2.8 ACTION PLAN FOR DEGRADED MANAGED LANES ON ROUTE 101

There are multiple HOV/HOT facilities on US 101 in District 4. There are HOV lanes located in Santa Clara County between Cochrane Road and Mathilda Avenue and HOT lanes between Mathilda Avenue and Whipple Avenue in Santa Clara and San Mateo Counties. A second set of HOV facilities are located in Marin County between Richardson Bay Bridge and Atherton Avenue. There are also HOV facilities in Sonoma County between the Marin County line and Windsor River Road.

In 2021, northbound US 101 in the AM peak period had 1.8 degraded HOV lane-miles and no degraded lane-miles in the PM peak period between Cochrane Road and Whipple Avenue. In 2022, northbound US 101 in the AM peak period had 4.9 degraded HOV lane-miles within the HOV lane segment in San Clara County. There was no degrade HOV/HOT lane-miles in 2022, between Cochrane Road and Whipple Avenue on NB 101 in the PM peak period.

In 2021, southbound US 101 in the AM peak period had 0.3 lane-miles of degraded HOV lane-miles between Whipple Avenue and Cochrane Road. There was no degraded HOV/HOT lane-miles in 2022, in the AM peak period within this segment. In 2021, there was 5.8 degraded HOV lane-miles between Whipple Avenue and Cochrane Road in the PM peak period. While there was only 9.8 degraded HOV/HOT lane-miles within this segment in the 2022 PM peak period.

In 2021, northbound US 101 in the PM peak period had 1.7 degraded HOV lane-miles between Richardson Bay Bridge and Atherton Avenue. In 2022, within this segment there was 3.0 degraded HOV lane-miles in the PM peak period.

In 2021, southbound US 101 had 2.7 degraded HOV lane-miles between De Long Avenue and Richardson Bay Bridge in the AM peak period with 3.1 degraded HOV lane-miles within this segment in 2022.

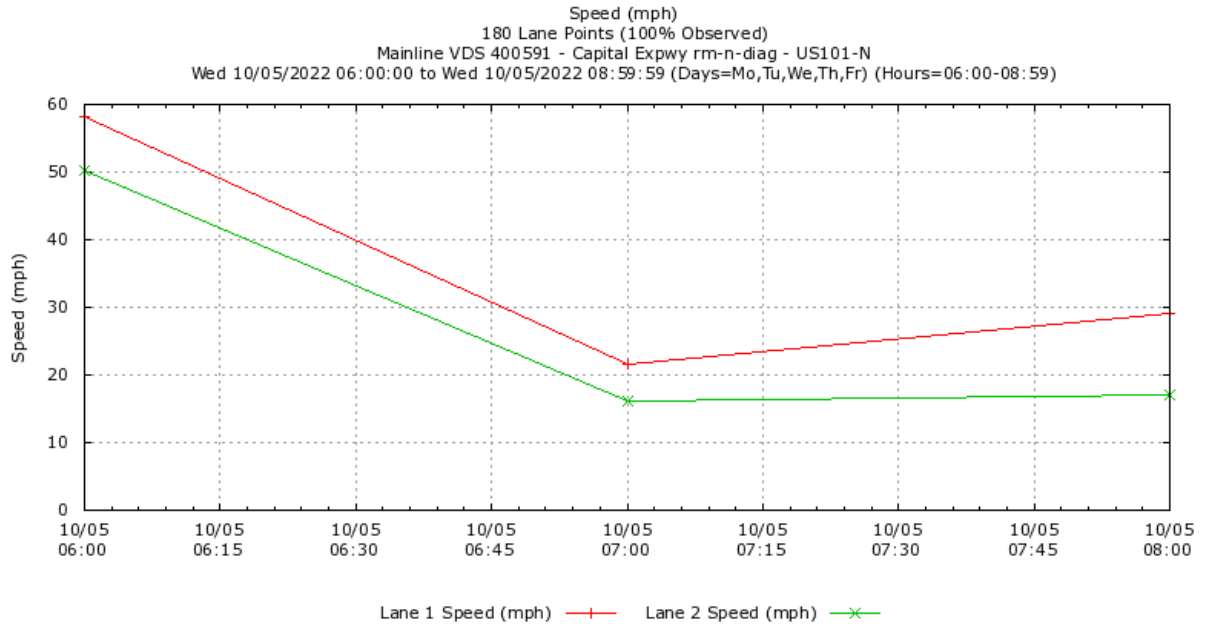
In 2021, northbound US 101 between the Marin/Sonoma County line and Windsor River Road had 1.8 lane-miles of degraded HOV lanes in the PM peak period. There was 2.4 degraded HOV lane-miles within this segment in the PM peak period in 2022.

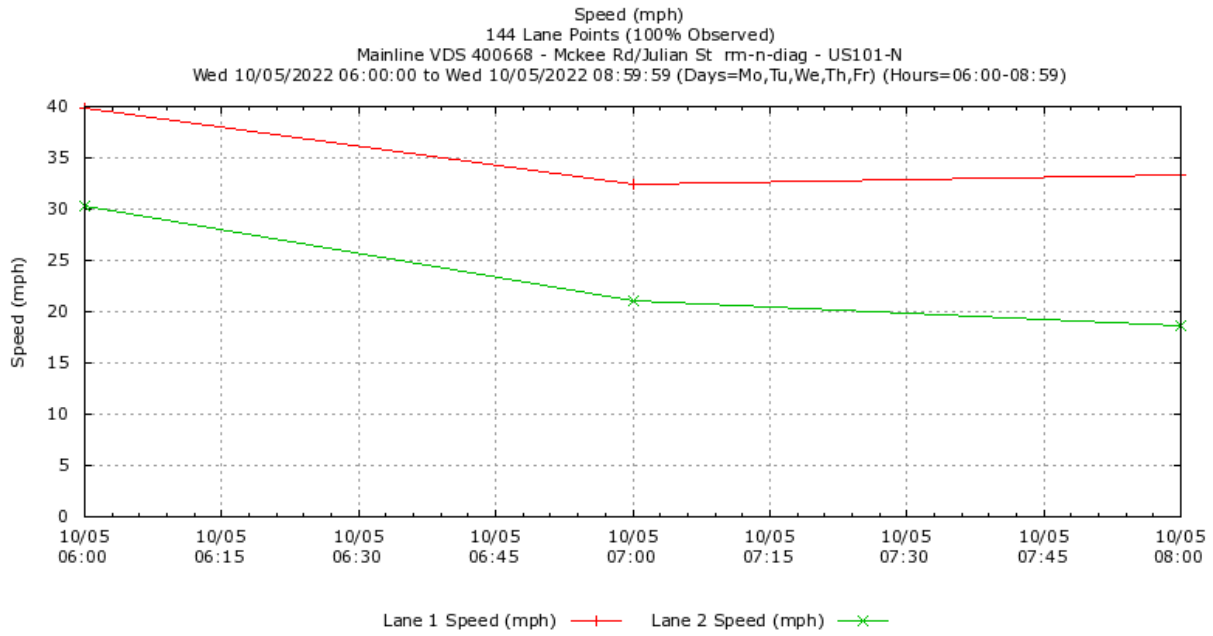
In 2021, southbound US 101 between Windsor River Road and north of the Marin/Sonoma County line had 4.0 degraded HOV lane-miles in the PM peak period. In 2022, there was only 3.1 degraded HOV lane-miles within this segment in the PM peak period.

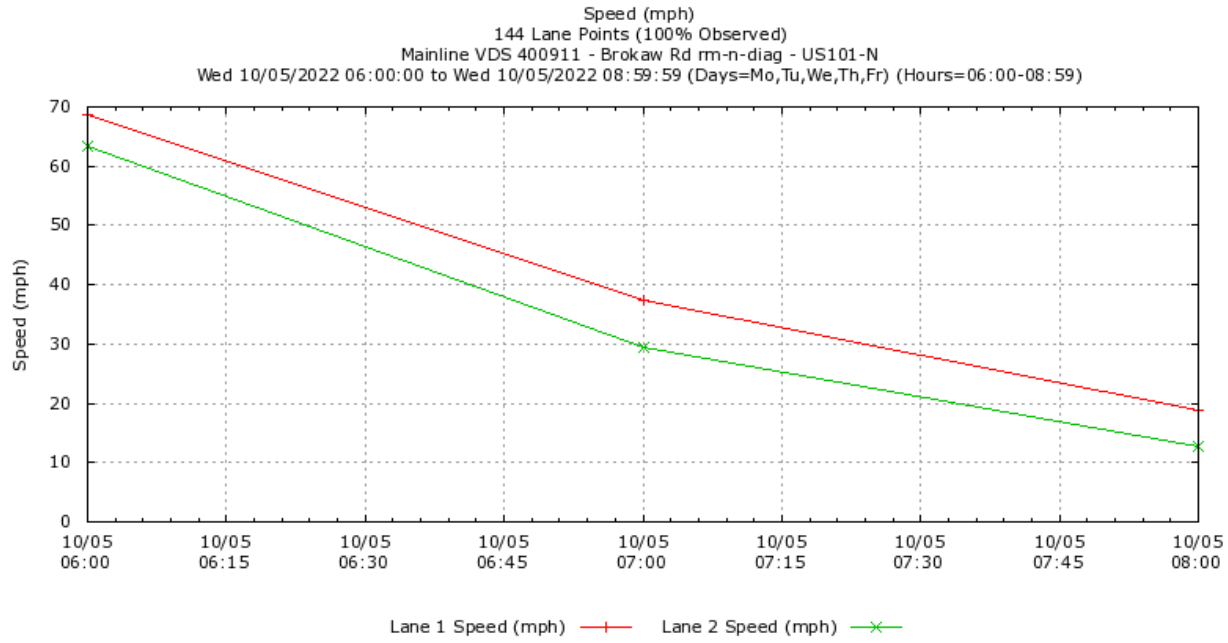
A. Analysis:

US 101 Northbound Cochrane Road to Whipple Avenue

In the morning peak period, there are multiply bottlenecks along northbound US 101. The bottlenecks between the McKee Road on-ramp and the Old Oakland Road off-ramp and Tully Road on-ramp and I-280/I-680 off-ramp cause a queue to extend to the Blossom Hill Road interchange. Another bottleneck develops downstream between Trimble Road and Montague Expressway with queues extending upstream to the Old Bayshore Highway on-ramp. A third bottleneck develops between the Shoreline Boulevard on-ramp and the Rengstorff Avenue off-ramp with queues extending upstream to the Ellis Street interchange. These bottlenecks cause recurrent congestion in the GP lanes that reduces HOV lane performance and speed due to the friction factor between these lanes.







The HOV 2+ demand on this route is relatively high which can also have an effect on the speed in the HOV lane when the adjacent GP lanes are congested due to this friction factor. The HOV lane is at the effective capacity of the lane in order to maintain a speed at 45 mph or greater.

NB US 101 McKee Road

Hour	HOV Lane Flow (Veh/Hour)	HOV Lane Speed (mph)	GP Lane Flow (Veh/Hour)	GP Lane Speed (mph)
10/3/2022 6:00	1618	53	1933	42
10/3/2022 7:00	1767	44	1915	29
10/3/2022 8:00	1577	47	1778	29
10/4/2022 6:00	1631	53	2027	45
10/4/2022 7:00	1788	41	1924	29
10/4/2022 8:00	1715	41	1812	28
10/5/2022 6:00	1840	47	1884	36
10/5/2022 7:00	1859	45	1984	34
10/5/2022 8:00	1748	41	1728	23
10/6/2022 6:00	1701	52	1944	42
10/6/2022 7:00	1744	36	1763	28
10/6/2022 8:00	1647	41	1618	24
10/7/2022 6:00	535	50	999	44
10/7/2022 7:00	1786	43	1936	33
10/7/2022 8:00	1398	46	1477	22

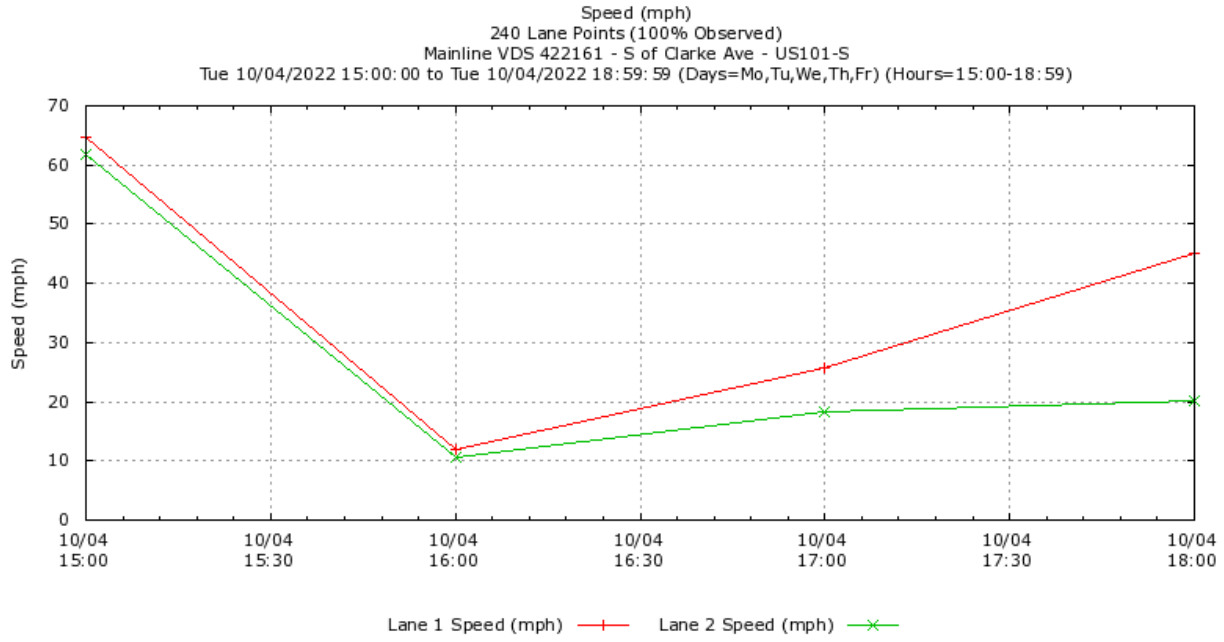
Note: Speeds below 35 mph would be locations in congestion and corresponding volumes would be constrained volumes. HOV lane bottleneck output volumes, demand exceeds capacity.

US 101 Southbound Whipple Avenue to Cochrane Road

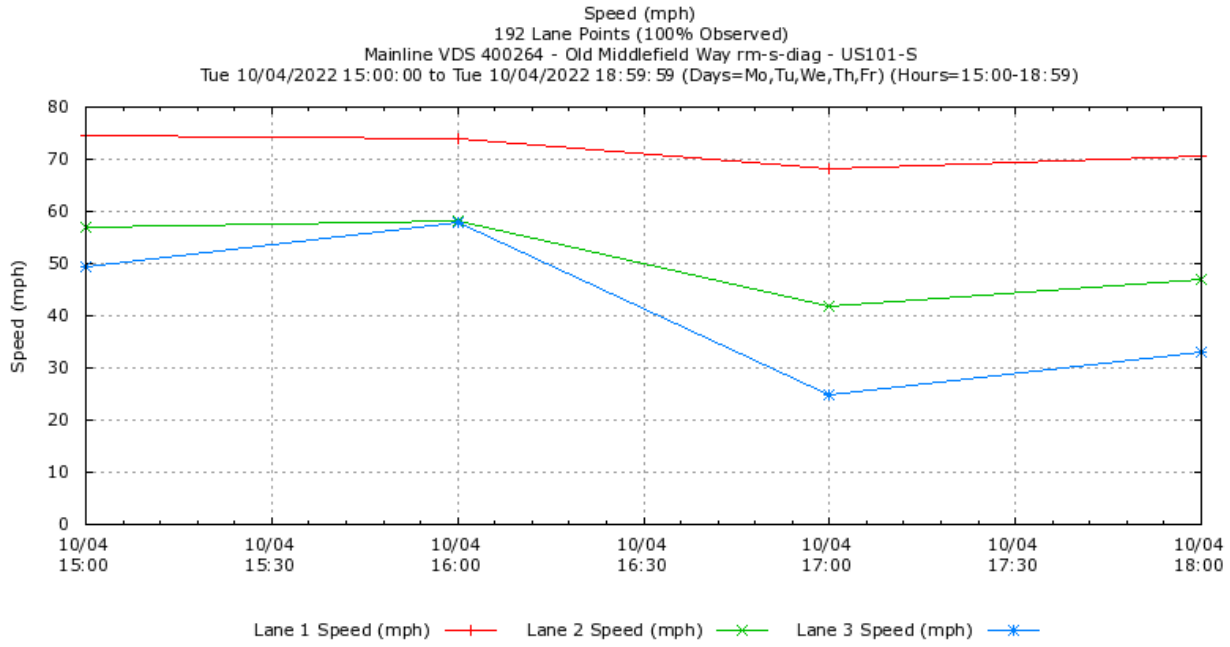
There are multiple bottlenecks on southbound US 101 in the afternoon peak period. A bottleneck between the Rengstorff Avenue on-ramp and southbound SR 85 off-ramp causes a queue to extend back to towards the University Avenue interchange. Further downstream there is a bottleneck between the De La Cruz Boulevard diagonal on-ramp and the southbound SR 87 off-ramp. Queue from this bottleneck extends upstream of the Shoreline Boulevard interchange. Downstream of this bottleneck there is another bottleneck between the Old Oakland Road on-ramp and the Julian Street off-ramp. Queue from this bottleneck extends upstream to the SR 87 interchange. The recurrent congestion in the GP lanes associated with these bottlenecks reduces HOV lane performance and speed due to the friction factor between these lanes.

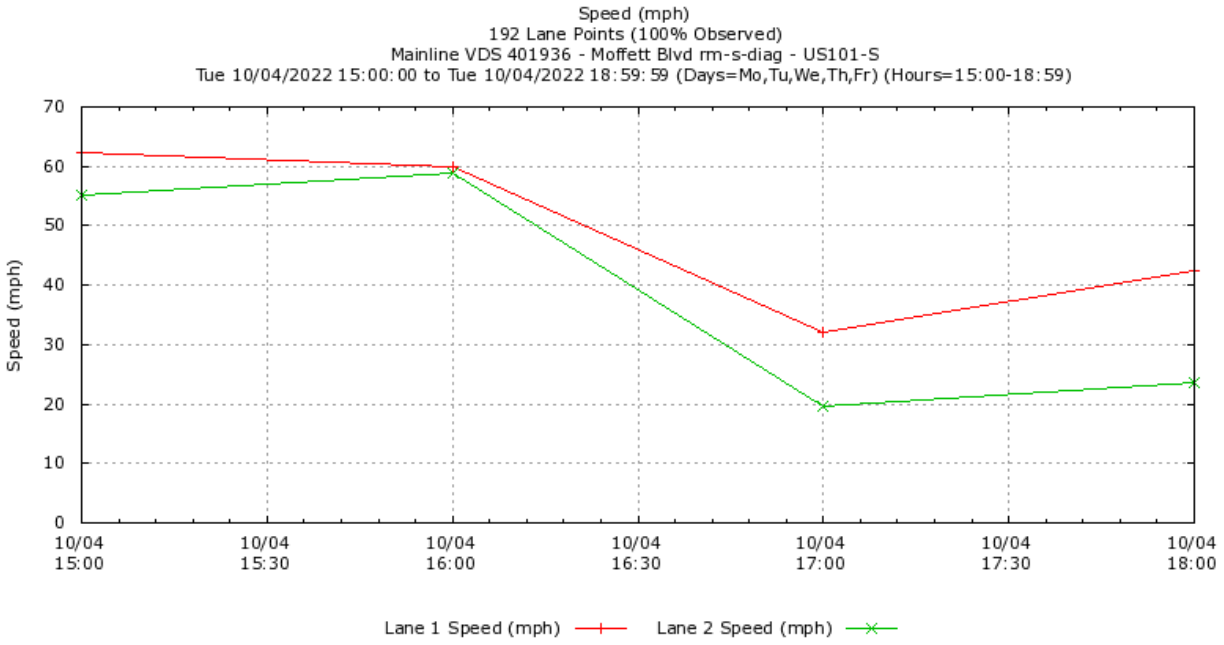
In addition, there is a bottleneck south of the end of the HOV lane between the Cochrane Road on-ramp and the Dunne Avenue off-ramp. This causes a queue to extend back into the end of the HOV lane towards the Bailey Road

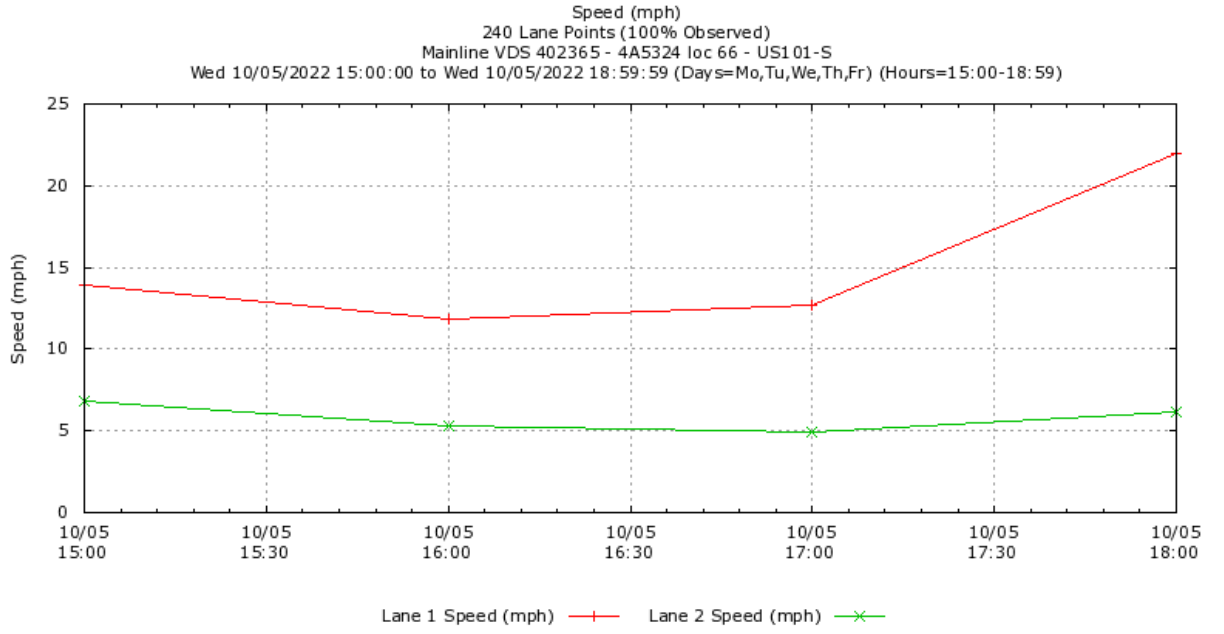
interchange. This results in reduced speeds in all lanes with the HOV lane operating at similar speeds as the GP lanes.

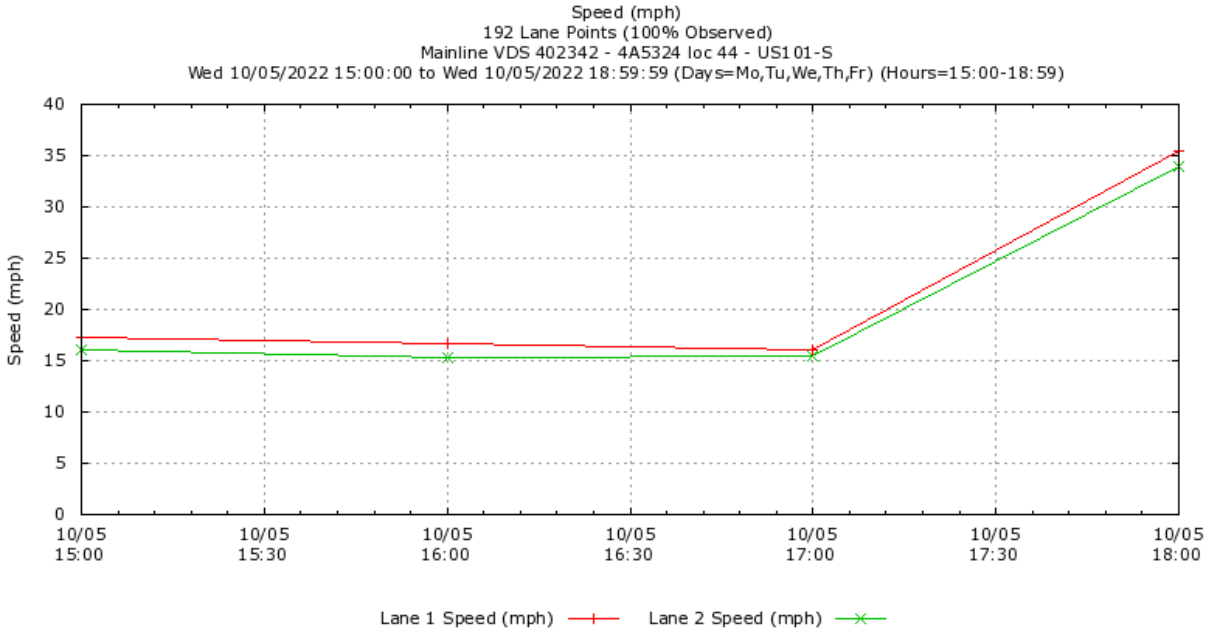


Two lane Express lane (lanes 1 and 2), GP lane (lane 3)



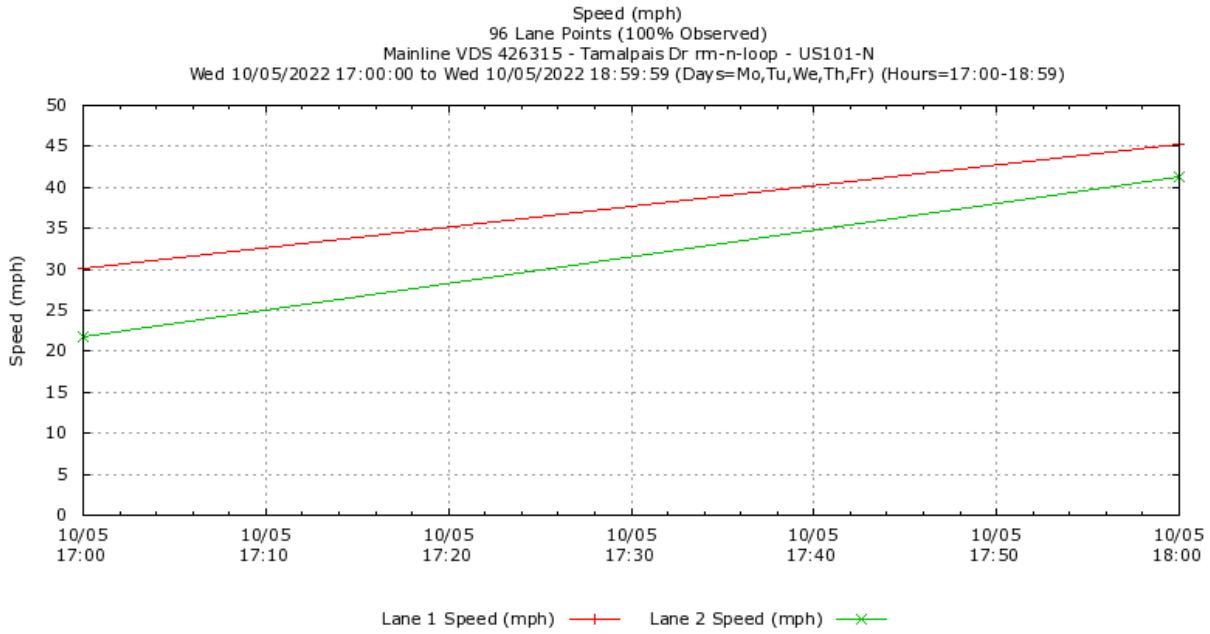

Speed (mph)
192 Lane Points (100% Observed)
Mainline VDS 401936 - Moffett Blvd rm-s-diag - US101-S
Tue 10/04/2022 15:00:00 to Tue 10/04/2022 18:59:59 (Days=Mo,Tu,We,Th,Fr) (Hours=15:00-18:59)
Speed (mph)
70
60
50
40
30
20
10
0
10/04 15:00
10/04 15:30
10/04 16:00
10/04 16:30
10/04 17:00
10/04 17:30
10/04 18:00
Lane 1 Speed (mph)
Lane 2 Speed (mph)


Speed (mph)
240 Lane Points (100% Observed)
Mainline VDS 402365 - 4A5324 loc 66 - US101-S
Wed 10/05/2022 15:00:00 to Wed 10/05/2022 18:59:59 (Days=Mo,Tu,We,Th,Fr) (Hours=15:00-18:59)
Speed (mph)
25
20
15
10
5
0
10/05 15:00
10/05 15:30
10/05 16:00
10/05 16:30
10/05 17:00
10/05 17:30
10/05 18:00
Lane 1 Speed (mph)
Lane 2 Speed (mph)



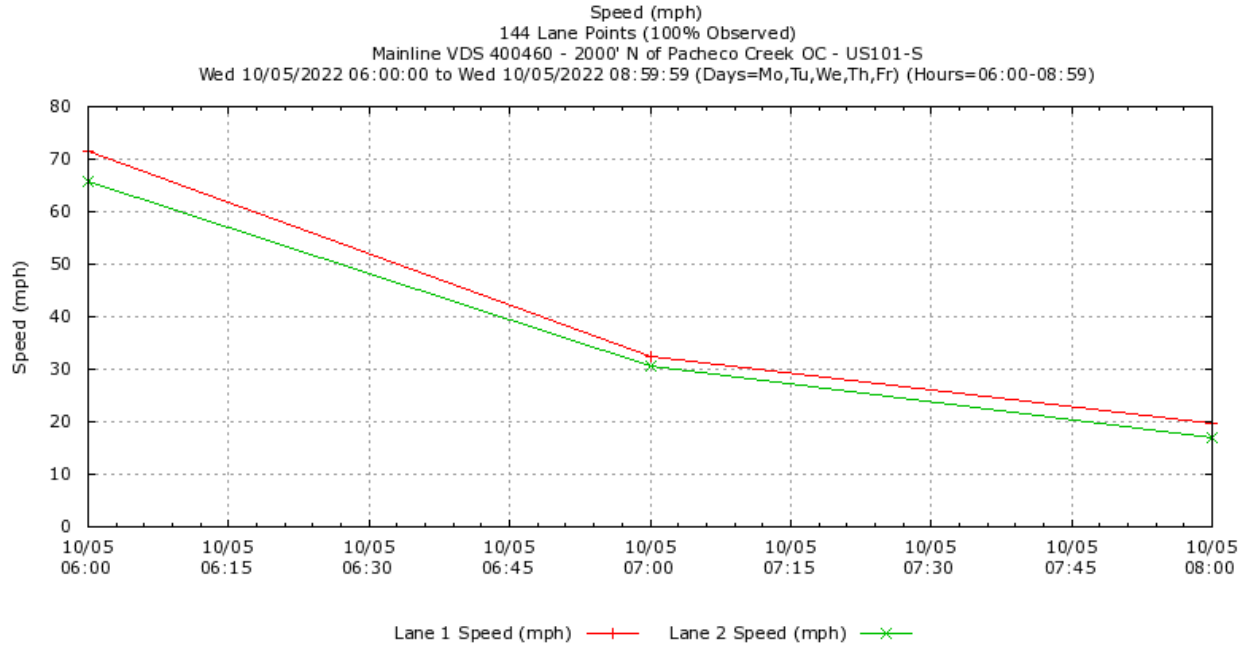
US 101 Northbound: Richardson Bay Bridge to Atherton Avenue

There are two controlling bottlenecks on northbound US 101 in Marin County. The first bottleneck is between the Tamalpais Drive diagonal on-ramp and the Lucky Drive off-ramp. The queue from this bottleneck extends upstream south of the N. Bridge Boulevard interchange. The second bottleneck is typically downstream at the end of the HOV lane caused by a general-purpose lane drop north of the Atherton Avenue on-ramp. Queue from this bottleneck extends beyond the Atherton Avenue interchange. The bottleneck between the Tamalpais Drive diagonal on-ramp and the Lucky Drive off-ramp causes recurrent congestion in the general-purpose lanes that reduces HOV lane performance and speed due to the friction factor between these lanes.



US 101 Southbound De Long Avenue to Richardson Bay Bridge

In the AM peak period there is bottleneck at the Lucas Valley Road on-ramp to the Manuel Freitas Parkway off-ramp. The queue from this bottleneck extends upstream to the Rowlands Boulevard interchange. The recurrent congestion in the GP lanes caused by this bottleneck reduces HOV lane performance and speed due to the friction factor between these lanes.

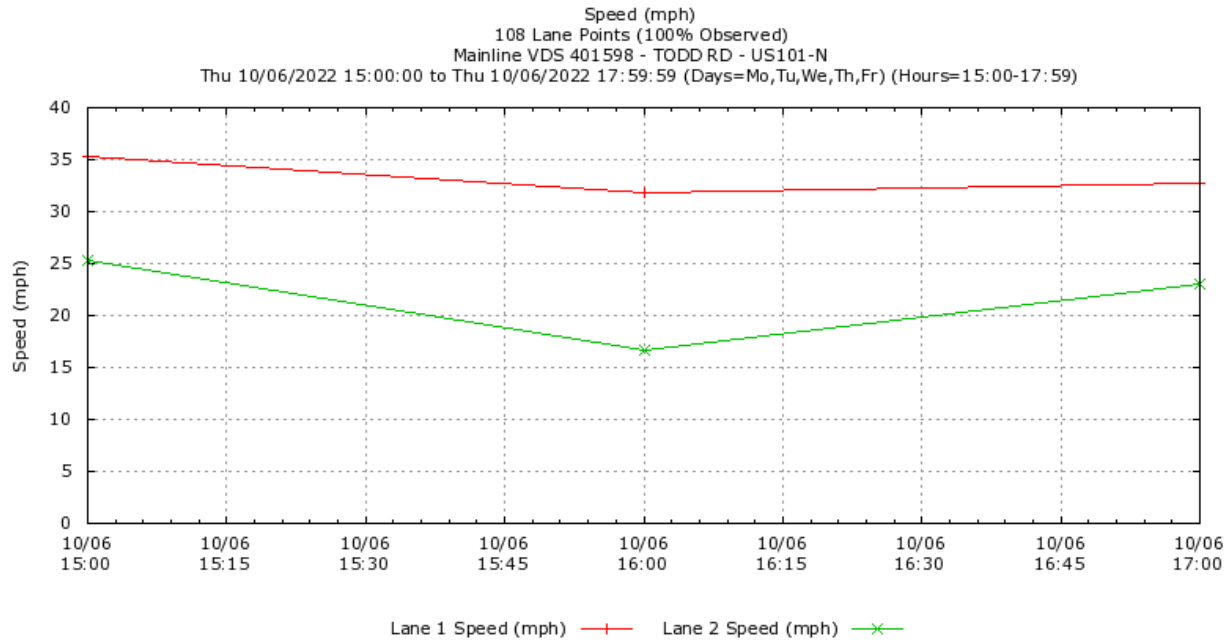


Note: HOV lane is only in operation between 6:30 – 8:30 am, only the 7 am on this table is actually speed when HOV lane is in operations.

US 101 Northbound: South of Marin/Sonoma County Line to Windsor River Road

In the AM peak period initial PeMS data indicated a degraded segment at College Avenue however it was determined that the PeMS speed data for the HOV lane was actually the GP lane speed. Lane #1 and Lane #3 were miscoded and there is no degradation in the HOV lane at this location.

In the PM peak period there is minor bottleneck between the Hearn Avenue on-ramp and the SR 12 off-ramp due to weaving between these ramps. Slow speeds extend upstream to Rohnert Park Expressway interchange. The recurrent congestion in the GP lanes caused by this bottleneck reduces HOV lane performance and speed due to the friction factor between these lanes.

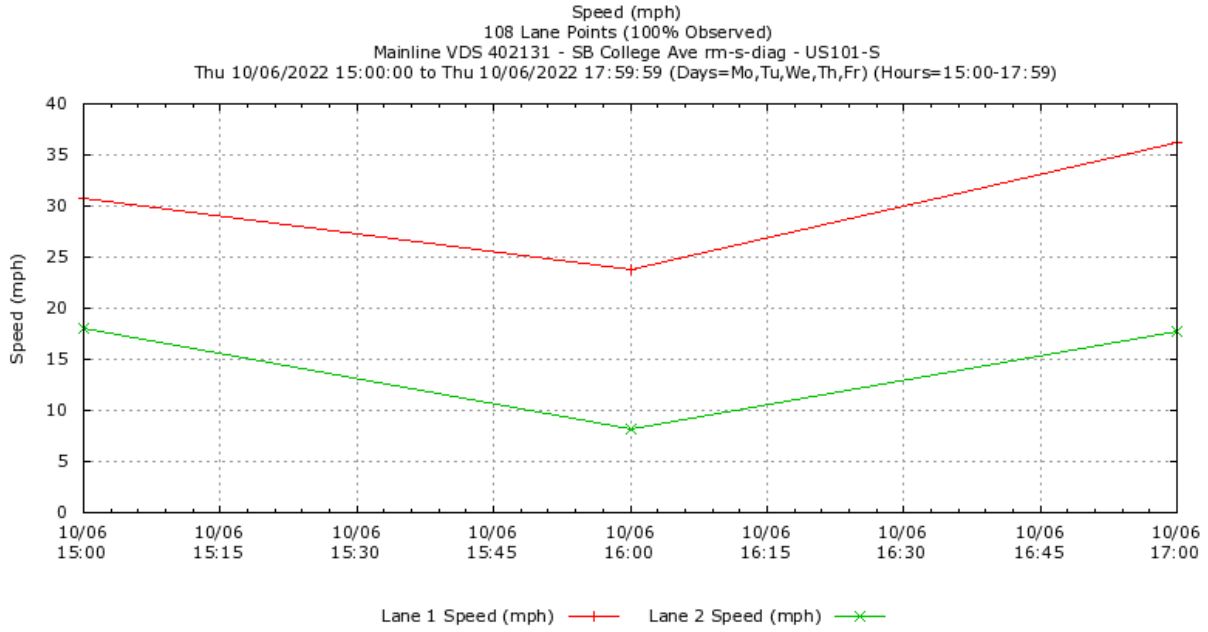


Note: HOV lane is only in operation between 3:00 – 6:30 pm, only the speeds up to 6:30 pm on this table are actually speed when HOV lane is in operations.

US 101 Southbound: Windsor River Road to North of Marin/Sonoma County Line

In the AM peak period, PeMS data indicated at the eastbound SR 12 on-ramp the HOV lane was degraded. However, it was determined that this was a bad detector and should have been removed from the analysis. There are no degraded segments on southbound US 101 in the AM peak period in 2022.

On southbound US 101 there is a bottleneck between the SR 12 on-ramp and the Baker Avenue off-ramp in the PM peak period. The queue from this bottleneck extends upstream to the Hopper Avenue interchange. The recurrent congestion in the GP lanes caused by this bottleneck reduces HOV lane performance and speed due to the friction factor between these lanes.



Note: HOV lane is only in operation between 3:00 – 6:30 pm, only the speeds up to 6:30 pm on this table are actually speed when HOV lane is in operations.

B. Remediation Strategies:

Northbound and Southbound US 101 Cochrane Road (SCL County) to Whipple Avenue (SM County)

There are plans to convert the existing HOV lanes to HOT lanes and add a second HOT lane to create a dual lane facility. The project limits are from East Dunne Avenue to the SCL/SM County line in Santa Clara County. Preliminary project cost is estimated at $416M and would be funded by VTA. VTA plans to build this project and the SR 85 HOT lane project in segments. The first segment on US 101 is between SR 237 and the San Mateo County line. Construction began March 8, 2019, and was completed in February 2022. Occupancy requirement for toll free travel on this segment was increased to HOV 3+ with this HOT lane conversion. HOV 2 and Clean Air Vehicles are tolled at a discounted rate. With HOT lane projects there is dedicated funding provided by the HOT lane operators for increased CHP enforcement of the HOT lanes. This will insure a more consistent approach to enforcing and deterring violations of the HOT lanes. The second phase, between SR 237 and Old Oakland Road, is now in the PS&E phase, with a start construction date of April 2025, opening to traffic in October 2027 as a dual HOT lane.

San Mateo County Transportation Agency, City/County Association of Governments, and Caltrans developed a project to add HOT lanes between

the SCL/SM County line and I-380. This lane is a HOT 3+ lane and began construction in February 2020. Estimated cost of the project is $514M completed in March 2023. This project converted the existing HOV lane between the Santa Clara County line and Whipple Avenue into a HOT lane; this conversion was completed in February 2022. Between Whipple Avenue and I-380, the project added a HOT lane in both directions. The lane was opened in "HOV 3+ Only" in the fall 2022 so that the toll system could be tested under live traffic conditions, tolling began in March 2023. Occupancy requirements were increased to HOV 3+ no toll with HOT lane conversion. In addition, HOV 2 and Clean Air Vehicles are tolled at a discounted rate. With HOT lane projects there is dedicated funding provided by the HOT lane operators for increased CHP enforcement of the HOT lanes. This will insure a more consistent approach to enforcing and deterring violations of the HOT lanes.

A project to widen the connector from southbound US 101 to southbound SR 87 to two lanes was undertaken due to the demand for this off-ramp exceeding the capacity of a one lane ramp. This caused congestion to queue back onto southbound US 101. Construction started in February 2022 and was completed in October 2022, with a cost of $4.2M.

A project to fill in the ramp metering gaps and extend ramp metering on northbound US 101 from Fair Oaks Avenue to Embarcadero Road was completed in June 2021, project cost $8.3M.

A new interchange at Zanker Road to improve access to and across US 101, to the Mineta San Jose international Airport and to connect portions of north and central San Jose that are separated by US 101 is in the PA&ED stage. Estimated project cost is $308 M with start of construction at the end of 2028.

A project to modify the interchanges at Rengstorff Avenue and San Antonio Road will provide HOV lanes at all on-ramps. Estimated project cost is $192M with construction to start at the end of 2027 and completed by 2029.

Northbound and Southbound US 101 Richardson Bay Bridge to Atherton Avenue

Part Time Transit Bus Only Lane (Bus on Shoulder) pilot project from Novato Boulevard to Mission Boulevard is currently being studied by the Transportation Authority of Marin (TAM). Currently TAM is seeking funding to begin a Project Initiation Document (PID) for this project.

TAM also has a US 101 Highway Interchanges and Approaching Roadway Project Initiation Document (PID) for the following interchanges 1) E. Blithedale Ave./Tiburon Blvd. (Highway 131) – PM 5.69, 2) Freitas Parkway/Civic Center Dr. – PM 13.71, and 3) Alameda del Prado/Nave Dr. – PM 16.64. There may be an

opportunity to reduce the friction factor by selecting roadway geometry and ITS components that could improve the flow of the general-purpose lanes. This project does not currently have funding past the PID phase.

The Marin/Sonoma County narrows HOV lane gap closure project between De Long Avenue and north of the Marin/Sonoma County line started construction in July 2022. This project is scheduled to be completed October 2025 with a cost of $180M. This project will close the gap in the HOV lane between the two counties. Current HOV hours of operation in Marin County are 6:30 AM – 8:30 AM in the southbound direction and 4:30 PM – 7:00 PM in the northbound direction. The HOV lane hours of operation in Sonoma County are 7:00 AM – 9:00 AM and 3:00 PM – 6:30 PM in both directions. Once the gap closure project is completed the hours of operation in both counties will need to match.

Caltrans Headquarters in currently working on Managed Lane weaving and friction factor studies scheduled to be completed in June 2024. Conclusions from these studies could lead to future Managed Lane improvement projects. In addition, the Clean Air Vehicle (CAV) exemption is currently scheduled to sunset at the end of September 2025, the removal of CAVs from the Managed Lane would improve the Managed Lane operations.

Caltrans has discussed with CHP the Managed Lane high violation locations throughout the San Francisco Bay Area in early 2023. This will allow CHP to concentrate their enforcement efforts in these areas.

Northbound and Southbound US 101 South of the Marin/Sonoma County line to Windsor River Road

The HOV lane projects were completed in 2021/2022 to close gaps in the HOV lane for a continuous HOV lane between the Marin/Sonoma County line and Windsor River Road.

There are no current projects to address the bottlenecks near SR 12 which is causing degradation in the northbound and southbound US 101 HOV lanes in Sonoma County. Heavy traffic to and from SR 12 is causing bottlenecks on northbound and southbound US 101.

Caltrans Headquarters in currently working on Managed Lane weaving and friction factor studies scheduled to be completed in June 2024. Conclusions from these studies could lead to future Managed Lane improvement projects. In addition, the Clean Air Vehicle (CAV) exemption is currently scheduled to sunset at the end of September 2025, the removal of CAVs from the Managed Lane would improve the Managed Lane operations.

Caltrans has discussed with CHP the Managed Lane high violation locations throughout the San Francisco Bay Area in early 2023. This will allow CHP to concentrate their enforcement efforts in these areas.

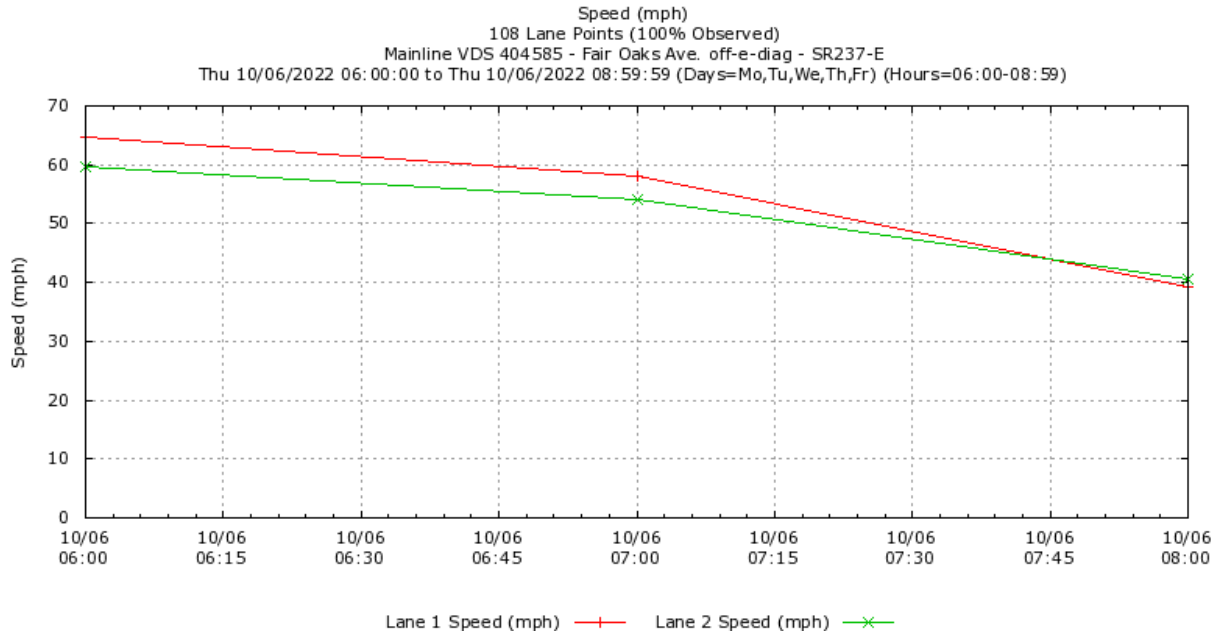
4.2.9 ACTION PLAN FOR DEGRADED MANAGED LANE ON ROUTE 237

In 2021, the eastbound and westbound SR 237 HOT lane was not degraded. A combination of raising occupancy to HOT 3+ and reduced traffic due to the pandemic increased speeds in the HOT lane above 45 mph. In 2022, there was no degraded HOT lane-miles on westbound SR 237 in either the AM or PM peak periods. On eastbound SR 237 there was 0.4 degraded HOT lane-miles in the AM peak period. Degraded HOT Lane was at a spot location near Fair Oaks Avenue off-ramp. Eastbound SR 237 in the PM peak period had 2.1 degraded HOT lane-miles in 2022.

A. Analysis:

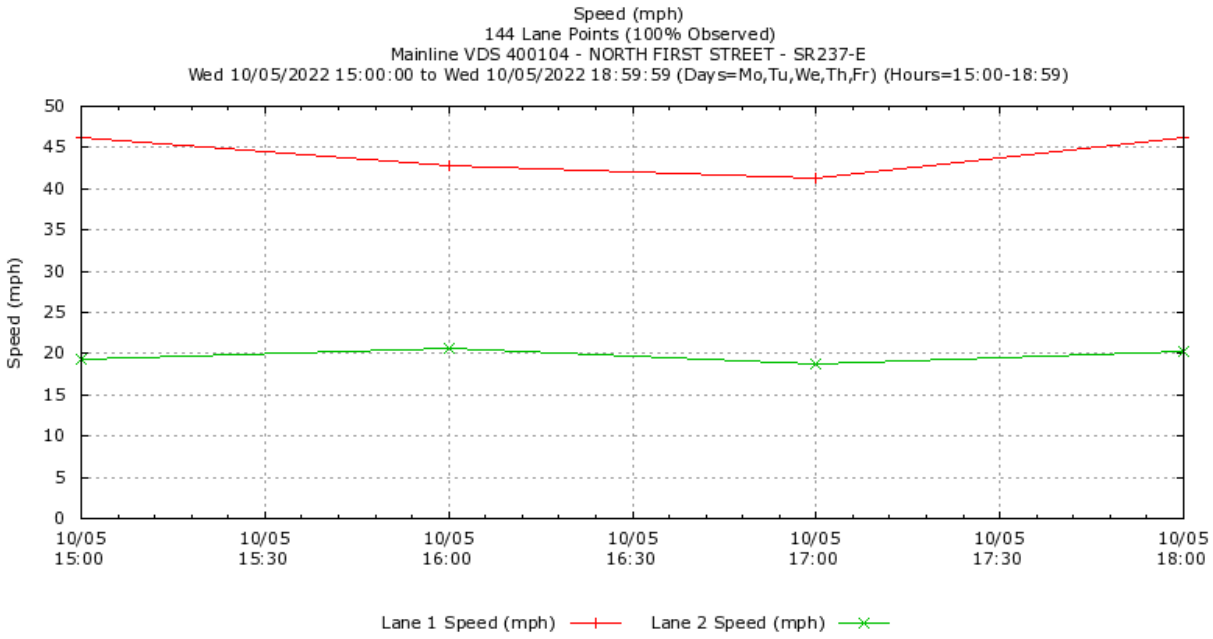
SR 237 Eastbound: Mathilda Avenue to I-880

There is no recurring bottleneck on eastbound SR 237 in the AM peak period. Occasional slowdown in the GP lanes at this spot location may be impacting the HOT lane speeds as vehicles exit the HOT lane to access the off-ramps downstream of Fair Oaks Avenue.



On eastbound SR 237 in the PM peak period a bottleneck develops between North First Street on-ramp and Zanker Road off-ramp. The queue from this

bottleneck extends upstream to the West Maude Avenue interchange. This bottleneck causes recurrent congestion in the GP lanes that reduces HOV lane performance and speed due to the friction factor between these lanes.



B. Remediation Strategies:

SR 237 Eastbound: Mathilda Avenue to I-880

A future project will add an auxiliary lane in the eastbound direction by widening the freeway between North 1st Street and Zanker Road. The Project Approval and Environmental Document (PA&ED) phase was completed August 2020. Construction started in 2022, with an estimated to be completed by 2024, cost of $15.2M.

A project to add auxiliary lanes to SR 237 in both directions between Middlefield Road and SR 85 is in the PA&ED stage. A HOV direct connector may be added to the project if funding is available. Estimated project cost is $55M with construction to start in mid-2026 and completed by early 2028.

A road widening project between I-880 and Milpitas Blvd is at the PA&ED stage. The project will improve general-purpose speeds within the limits and enhance access to the HOV lanes at the McCarthy Blvd interchange. Estimated project cost is $143M with construction to start in 2027 and completed by 2029.

4.2.10 ACTION PLAN FOR DEGRADED MANAGED LANES ON ROUTE 280

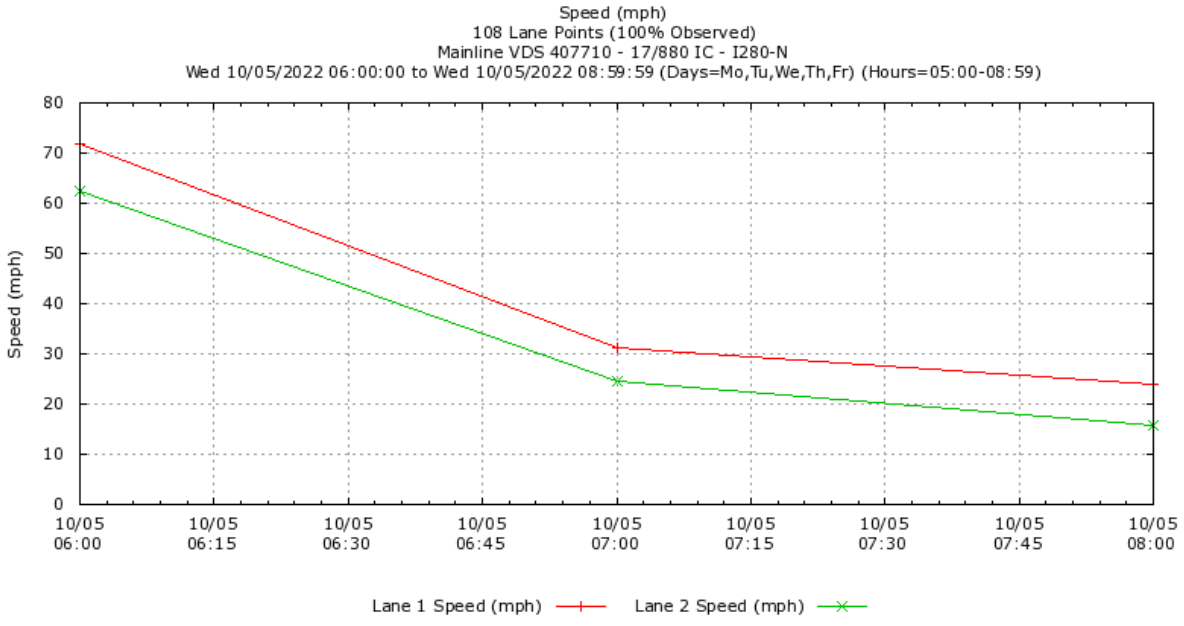
In 2021, northbound I-280 between south of Leland Avenue to Magdalena Avenue in the AM peak period had 1.9 degraded HOV lane-miles. In 2022, northbound I-280 within this segment also had 1.9 degraded HOV lane-miles in the AM peak period.

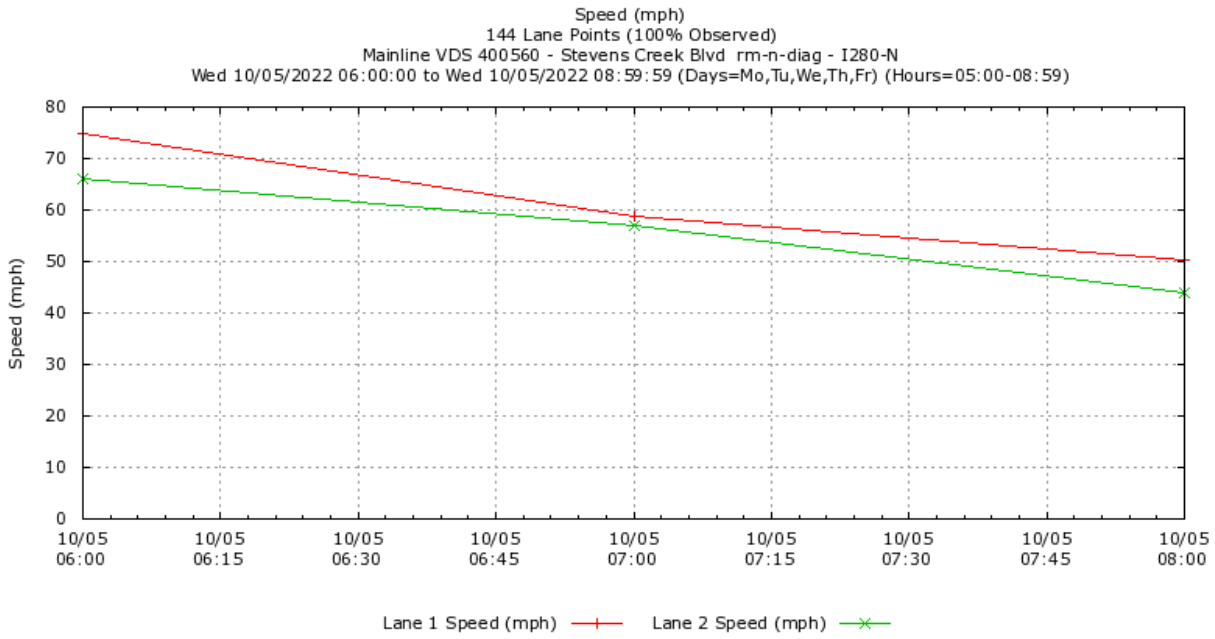
In 2021, southbound I-280 between north of Magdalena Avenue to Leland Avenue in the PM peak period had 2.6 degraded HOV lane-miles. In 2022, southbound I-280 within this segment had 7.2 degraded HOV lane-miles in the PM peak period.

A. Analysis:

I-280 northbound: South of Leland Avenue to Magdalena Avenue

In the AM peak period the controlling bottleneck is between the SR 17/I-880 I/C and the Saratoga Avenue off-ramp. A queue from this bottleneck extends upstream to beyond the US 101 interchange. The peak period recurrent congestion in the GP lanes reduces HOV lane performance and speed due to the friction factor between these lanes.





The HOV 2+ demand on this route is relatively high which can also have an effect on the speed in the HOV lane when the adjacent GP lanes are congested due to this friction factor. The HOV lane is at the effective capacity of the lane in order to maintain a speed at 45 mph or greater.

NB I-280 SR 17/I-880 I/C

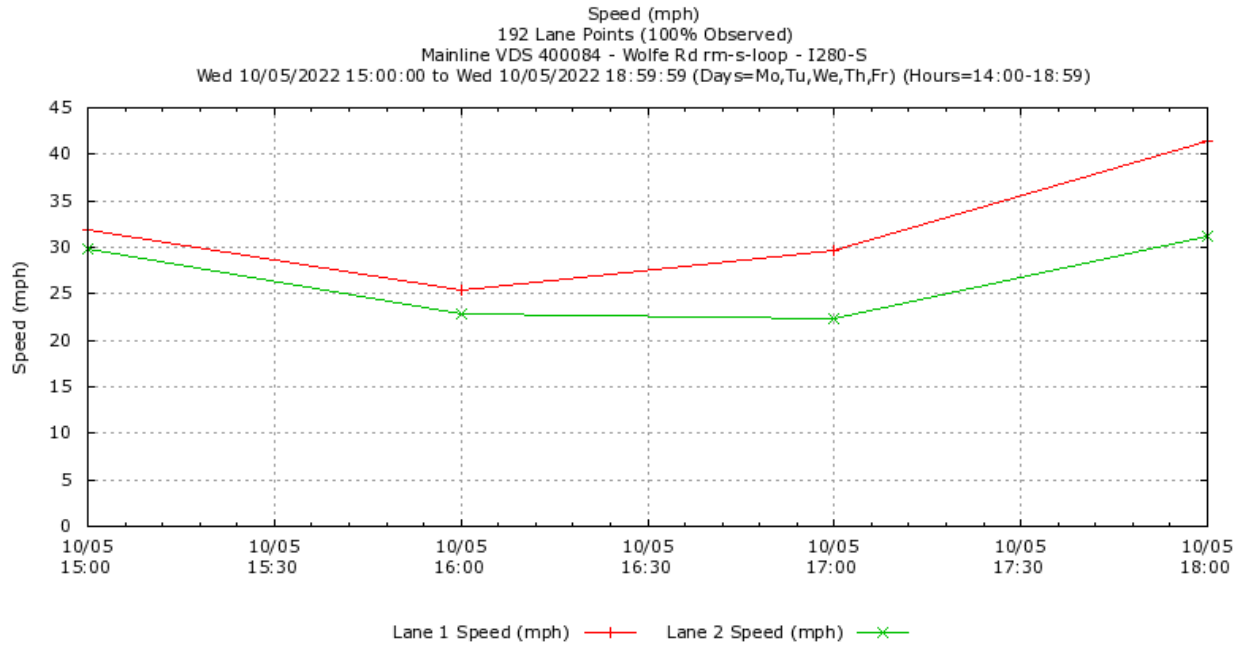
Hour	HOV Lane Flow (Veh/Hour)	HOV Lane Speed (mph)	GP Lane Flow (Veh/Hour)	GP Lane Speed (mph)
10/3/2022 5:00	761	75	509	70
10/3/2022 6:00	1391	65	1108	63
10/3/2022 7:00	1715	45	1689	46
10/3/2022 8:00	1616	38	1678	38
10/4/2022 5:00	788	78	513	72
10/4/2022 6:00	1467	64	1191	62
10/4/2022 7:00	1708	43	1694	43
10/4/2022 8:00	1554	30	1602	33
10/5/2022 5:00	764	76	537	70
10/5/2022 6:00	1384	65	1130	62
10/5/2022 7:00	1755	48	1655	48
10/5/2022 8:00	1679	36	1673	38
10/6/2022 5:00	758	75	549	74
10/6/2022 6:00	1394	65	1156	62
10/6/2022 7:00	1681	40	1653	41

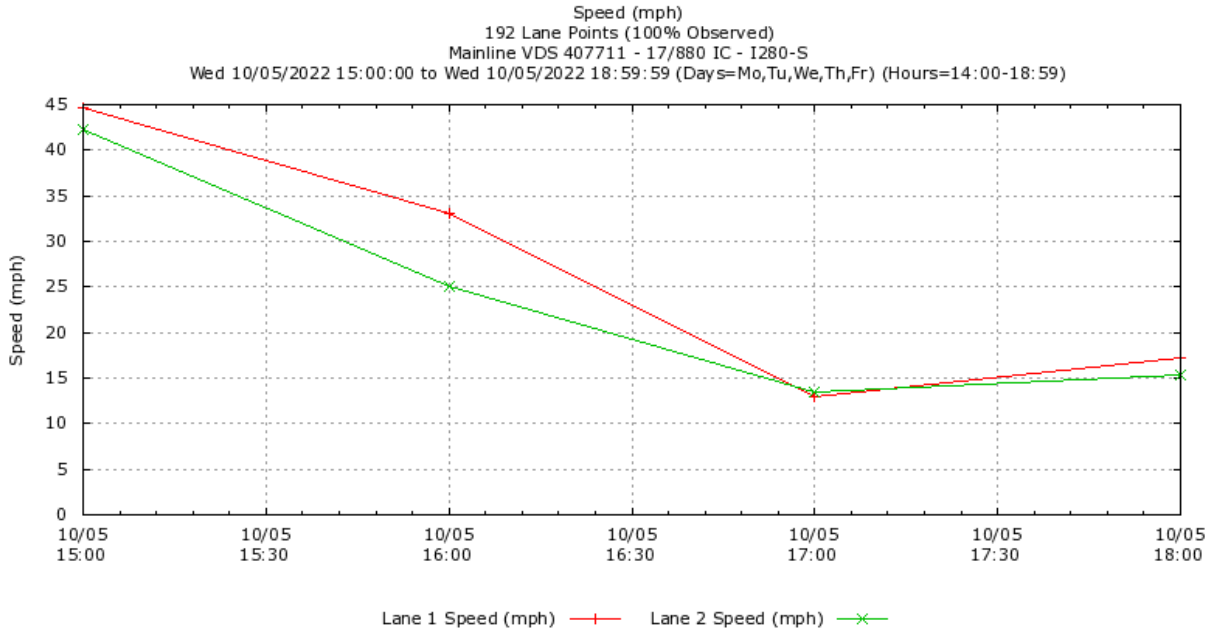
Hour	HOV Lane Flow (Veh/Hour)	HOV Lane Speed (mph)	GP Lane Flow (Veh/Hour)	GP Lane Speed (mph)
10/6/2022 8:00	1637	34	1622	34
10/7/2022 5:00	732	75	508	74
10/7/2022 6:00	1331	65	1073	64
10/7/2022 7:00	1692	45	1739	44
10/7/2022 8:00	1632	51	1663	50

Note: Speeds below 35 mph would be locations in congestion and corresponding volumes would be constrained volumes. HOV lane bottleneck output volumes, demand exceeds capacity.

I-280 Southbound, North of Magdalena Avenue to Leland Avenue

In the PM peak period, the controlling bottleneck develops between the 7th Street on-ramp and the Mclaughlin Avenue off-ramp with a queue extending to the SR 85 interchange. The peak period recurrent congestion in the GP lanes reduces HOV lane performance and speed due to the friction factor between these lanes. In addition, as the bottleneck is downstream of the end of the HOV lane limits, speeds are similar in all lanes as the queue from this bottleneck spills back into the end of the HOV lane.





B. Remediation Strategies:

Projects programmed and listed in Envision Silicon Valley Project List dated October 1, 2015, include a phased strategy for northbound and southbound I-280 for a HOV lane extension between US 101 and Leland Avenue and Magdalena Avenue and the San Mateo County line. Total cost: $112M. Then a Magdalena Avenue to San Mateo County Line HOT Lane conversion project at a cost of $95M, Leland Avenue to Magdalena Avenue HOT lane conversion project at a cost of $63M and US 101 to Leland Avenue HOT lane conversion project at a cost of $27M. With conversion to a HOT lane, raising occupancy to HOV 3+ can be considered.

Southbound I-280 HOV lane was extended to 0.3 miles north of the Magdalena Avenue interchange in August 2021, to address a bottleneck at Magdalena Avenue.

A project at the I-280/Winchester Boulevard interchange will construct a new direct northbound SR 17 to northbound I-280 flyover metered connector ramp and add ramp metering to the southbound I-880 to northbound I-280 connector. This will improve GP lane speeds within the limits and reduce friction between HOV lane and GP lane traffic. Estimated project cost is $229M with construction to start in 2026 and completed by 2029.

A project at the I-280/Wolfe Road interchange will widen the existing diagonal on-ramps to accommodate HOV lanes. Estimated project cost is $120M with construction to start in 2024 and completed by 2027.

Caltrans Headquarters in currently working on Managed Lane weaving and friction factor studies scheduled to be completed in June 2024. Conclusions from these studies could lead to future Managed Lane improvement projects. In addition, the Clean Air Vehicle (CAV) exemption is currently scheduled to sunset at the end of September 2025, the removal of CAVs from the Managed Lane would improve the Managed lane operations.

Caltrans has discussed with CHP the Managed Lane high violation locations throughout the San Francisco Bay Area in early 2023. This will allow CHP to concentrate their enforcement efforts in these areas.

4.2.11 MANAGED LANE FACILITIES ON ROUTE 580

In 2021, eastbound I-580 between Hacienda Drive and Greenville Road in the PM peak period had 1.2 degraded HOT lane-miles with no degraded HOT lane-miles in the westbound direction. In 2022, there was no degraded HOT lane-miles on either eastbound or westbound I-580.

4.2.12 ACTION PLAN FOR DEGRADED MANAGED LANES ON ROUTE 680

There are multiple HOV facilities on I-680 in District 4. HOT lanes operate in Santa Clara and Alameda Counties between SR 237/Calaveras Boulevard and SR 84. HOT and HOV lanes also operate in Contra Costa County between Alcosta Boulevard and Marina Vista Avenue.

In 2021, northbound I-680 between South Grimmer Boulevard and SR 84 had 0.2 lane-miles of degraded HOT lanes in the PM peak period. There was no degraded HOT lane-miles in 2022, on northbound I-680 within these limits during the AM or PM peak periods. There was also no degraded HOT lane-miles in the southbound direction between SR 84 and SR 237 in 2021or 2022. In both the northbound and southbound direction this lane operated in "HOV Only" mode during the years 2021 and 2022 as the county was working on the tolling infrastructure. Tolling began in March 2023.

In 2021 northbound I-680 between Alcosta Boulevard and Livorna Road had 3.3 degraded HOT lane-miles in PM peak period. In 2022, northbound I-680 within this segment had 3.4 degraded HOT lane-miles in the PM peak period.

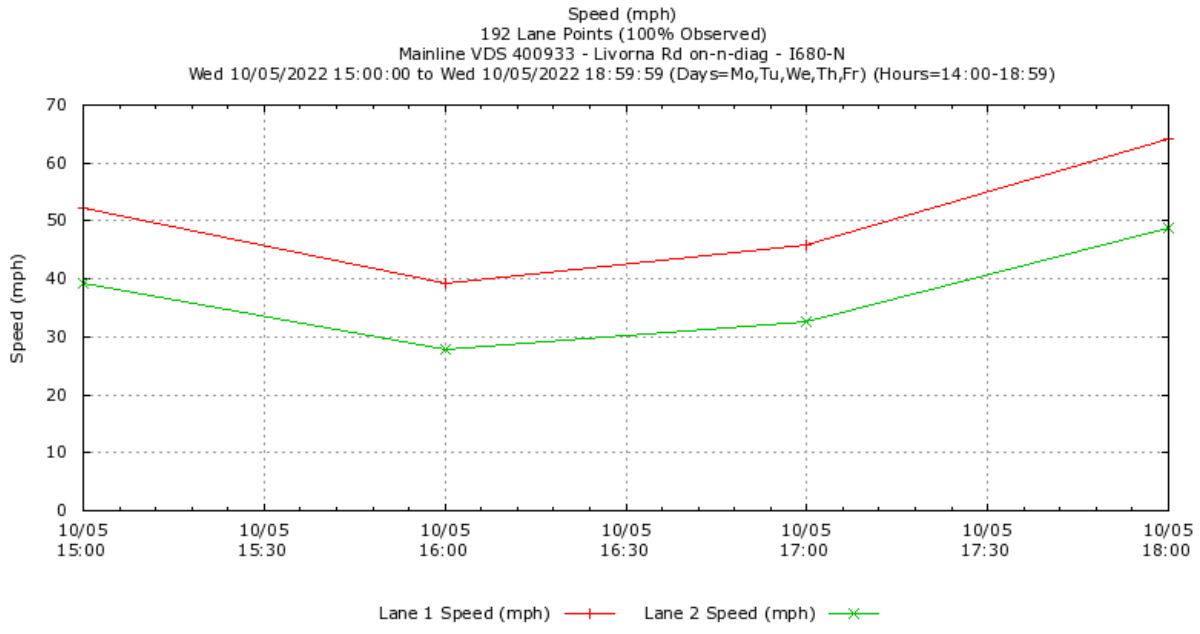
In 2021, southbound I-680 between Marina Vista Avenue and Alcosta Boulevard had 0.6 lane-miles of degraded HOT lanes in the AM peak period. In 2022, southbound I-680 had only 0.5 degraded HOT lane-miles.

A. Analysis:

The HOV facilities on I-680 underwent significant operational changes in 2020 as mentioned in the 2020 California High Occupancy Vehicle Facilities Degradation Report. A new northbound HOT (Express Lane) facility was opened to traffic between South Grimmer Boulevard and SR 84. This lane was signed as an Express Lane in "HOV Only" mode from 5:00 AM to 8:00 PM. In addition, the southbound HOT lane between SR 84 and SR 237 was converted from a limited access facility to a continuous access facility and operated in "HOV only" mode until tolling began in March 2023. In 2020, a gap in the southbound direction between Treat Boulevard and Rudgear Road was closed by adding a HOT lane, and the HOV lane between Marina Vista Avenue and Treat Boulevard was converted to HOT operations to provide one continuous HOT lane facility in the southbound direction between Marina Vista Avenue and Alcosta Boulevard. The HOT Lane on southbound I-680 between Marina Vista Avenue and Rudgear Road originally was opened in "HOV Only" mode and started collecting tolls August 20, 2021.

I-680 Northbound, Alcosta Boulevard to Marina Vista Avenue

There are two managed lane facilities on northbound I-680 in Contra Costa County, a HOT lane facility between Alcosta Boulevard and Livorna Road and an HOV lane facility between SR 242 and Marina Vista Avenue, leaving to a gap in the managed lanes between Livorna Road and SR 242. A significant northbound PM peak period bottleneck develops within the manage lane gap between the Lawrence Way on-ramp and the Treat Boulevard off-ramp. Queues and slow speeds approaching this bottleneck regularly extend south nearly 10 miles to south of the Sycamore Valley Road interchange. Friction between traffic in the continuous access HOT lane and traffic in the slower moving GP lanes results in reduced HOT lane speeds and performance. A second contributing factor to degradation is the in-queue weaving that takes place between HOT lane traffic and general-purpose lane traffic near the northern end of the HOT lane at Livorna Road.



I-680 Southbound, Marina Vista Avenue to Alcosta Boulevard

In the southbound direction, a recurrent AM peak period bottleneck develops between the Main Street on-ramp and the SR 24 off-ramp. Queues approaching this bottleneck extend north about 5 miles to the area of the Willow Pass Road interchange and also extending back onto SR 242 to the Concord Avenue interchange. In addition, there is a downstream bottleneck between the Rudgear Road on-ramp and the Livorna Road off-ramp. Slight HOT Lane degradation occurs near the end of the buffer separation at the Stone Valley Road on-ramp in the AM peak period.

B. Remediation Strategies:

I-680 Northbound and Southbound: Alcosta Boulevard to Marina Vista Avenue

Innovate 680, sponsored by the Contra Costa Transportation Authority, is a comprehensive initiative plan that includes completion of the northbound HOT lane network as well as other northbound improvements including part time transit lanes, shared mobility hubs and a corridor adaptive ramp metering project between the Bollinger Canyon Road and Ygnacio Valley Road interchanges. The HOT lanes completion and adaptive ramp metering projects are currently in PA&ED phases with estimated costs of $389M and $25M, respectively. Both projects are expected to be implemented in 2027.The part time transit lane on northbound I-680 is currently in the planning phase with an estimated cost of about $20M with an implementation date of 2025. Smart mobility hubs project is in the earlier stages of planning. A concept plan was

completed in January 2023 and implementation and phasing plans are still to be developed.

4.2.13 ACTION PLAN FOR DEGRADED MANAGED LANES ON ROUTE 880

There are multiple managed lane facilities on I-880 in District 4. HOT lanes operate in Santa Clara and Alameda Counties between Hegenberger Road and SR 237 in the southbound direction and between south of SR 262 and south of SR 238 in the northbound direction. HOV lanes also operate in Alameda and Santa Clara Counites at the north end of the route and between Old Bayshore Highway and south of SR 262 in the northbound direction and between SR 237 and US 101 in the southbound direction.

In 2021, northbound I-880 between south of SR 262 and south of SR 238 had 3.0 degraded HOT lane-miles in the PM peak period. In 2022, northbound I-880 within this segment had 2.7 degraded HOT lane-miles in the PM peak period.

In 2021, southbound I-880 between Hegenberger Road and SR 237 had 2.4 degraded HOT lane-miles in the AM peak period with no degraded HOT lane-miles in the PM peak period. In 2022, within this segment there was 5.7 degraded HOT lane-miles in the AM peak period and 0.7 degraded HOT lane-miles in the PM peak period.

In 2021, southbound I-880 between SR 237 and US 101 had no degraded HOV lane-miles in the AM peak period and 1.5 degraded HOV lane-miles in the PM peak period. In 2022, southbound I-880 within this segment had 0.5 degraded HOV lane-miles in the AM peak period and 1.7 degraded HOV lane-miles in the PM peak period.

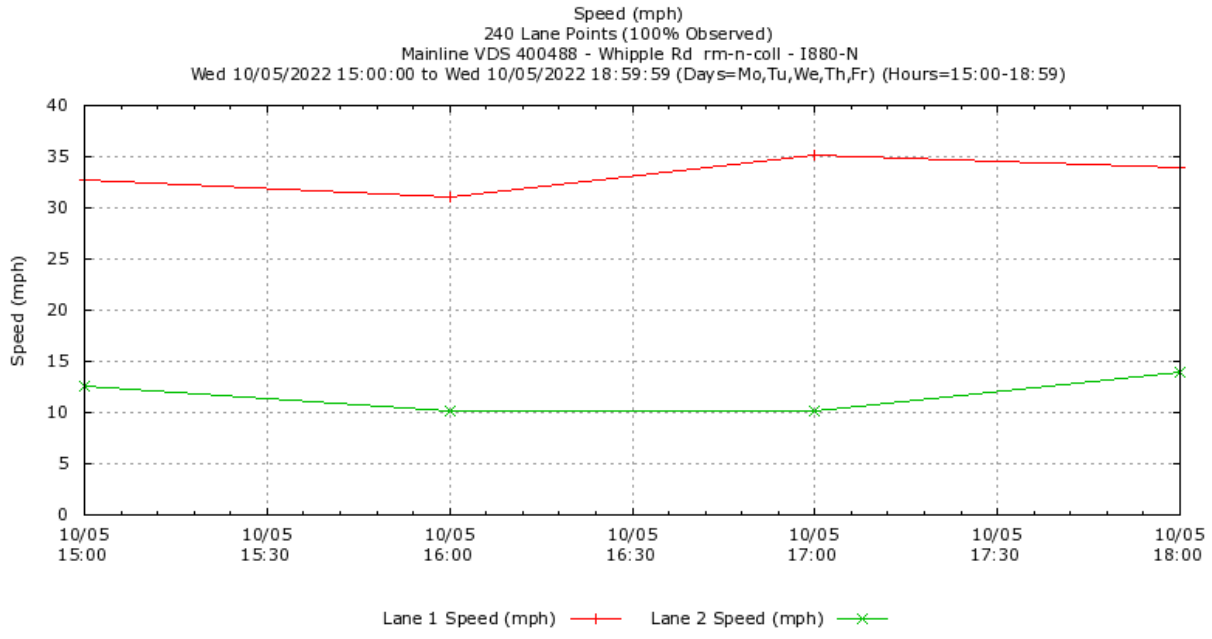
A. Analysis:

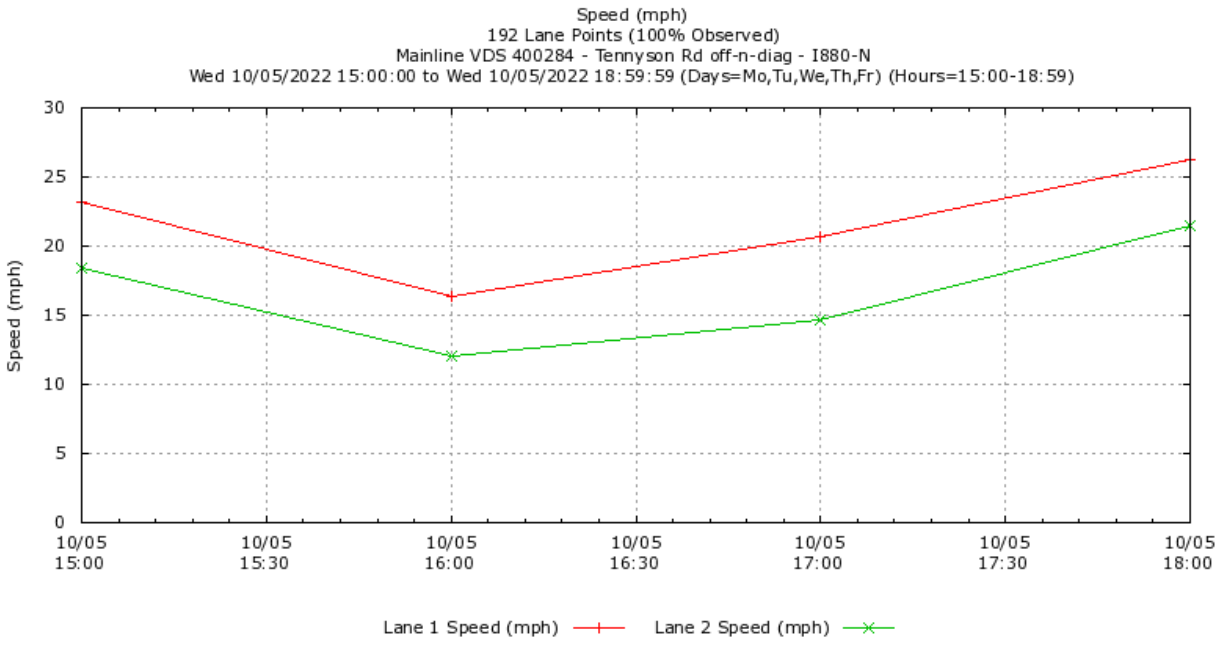
The HOV facilities on I-880 underwent significant operational changes in 2020 as mentioned in the *2020 California High Occupancy Vehicle Facilities Degradation Report*. These facilities were converted from HOV to HOT operation, occupancy requirements were increased, and stripped buffers were added between the HOT lane and the GP lanes along portions of both northbound and southbound I-880. The HOV lane was converted to a HOT 3+ lane with HOV 2 and Clean Air Vehicles charged a discounted toll. The limits of this HOT lane are between south of SR 262 to south of SR 238 on northbound I-880 with the segment between Old Bayshore Highway and south of SR 262 remaining an HOV 2+ lane. In addition, there are three separate HOV lanes approaching I-80, West Grand to eastbound I-80, West Grand to the San Francisco Oakland Bay Bridge (SFOBB) metering lights and 16th Street to the

SFOBB metering lights, at the north end of the corridor. In the southbound direction, the HOT 3+ lane limits are from Hegenberger Road to the SR 237 interchange. From the SR 237 interchange to the US 101 interchange the lane continues as an HOV 2+ lane.

I-880 northbound: Old Bayshore Highway and South of SR 238

Several bottlenecks develop along northbound I-880 during the PM peak period, with the primary controlling bottleneck developing between the Winton Avenue on-ramp and the A Street off-ramp near the northern end of the HOT lane corridor. Queues approaching this bottleneck typically extend about 9 miles upstream to the Thornton Avenue interchange. Friction between the HOT lane and the GP lane vehicles results in degraded HOT lane operations in the open access portions of the facility between the Thornton Avenue and Whipple Road interchanges. Additional HOT Lane degradation develops near the end of the HOT lane south of SR 238, where general purpose lane vehicles merge into the left freeway lane.





Another factor contributing to the low HOT lane speeds is HOT lane demands that are frequently at or near the effective capacity of the HOT lane facility in order to maintain a speed of 45 mph or greater. See the table below for HOT lane and average general purpose lane volumes and speeds in the area of the Tennyson Road and Winton Avenue interchanges.

NB I-880 Tennyson Road I/C

Hour	HOT Lane Flow (Veh/Hour)	HOT Lane Speed (mph)	GP Lane Flow (Veh/Hour)	GP Lane Speed (mph)
10/3/2022 15:00	1025	20	1031	16
10/3/2022 16:00	953	18	963	14
10/3/2022 17:00	1078	21	1019	15
10/3/2022 18:00	1158	23	1177	19
10/4/2022 15:00	1033	31	1015	24
10/4/2022 16:00	1080	22	1016	14
10/4/2022 17:00	1118	23	1032	15
10/4/2022 18:00	1131	26	1135	19
10/5/2022 15:00	1054	23	1077	18
10/5/2022 16:00	924	16	857	12
10/5/2022 17:00	1087	21	1025	15
10/5/2022 18:00	1187	26	1184	22
10/6/2022 15:00	1086	23	1096	17

Hour	HOT Lane Flow (Veh/Hour)	HOT Lane Speed (mph)	GP Lane Flow (Veh/Hour)	GP Lane Speed (mph)
10/6/2022 16:00	1116	24	1150	19
10/6/2022 17:00	1063	22	1058	17
10/6/2022 18:00	1145	25	1099	18
10/7/2022 15:00	1110	23	1091	17
10/7/2022 16:00	1137	25	1099	18
10/7/2022 17:00	1093	23	1040	16
10/7/2022 18:00	1088	23	1068	17

Note: Speeds below 35 mph would be locations in congestion and corresponding volumes would be constrained volumes, demand exceeds capacity.

NB I-880 Winton Avenue I/C

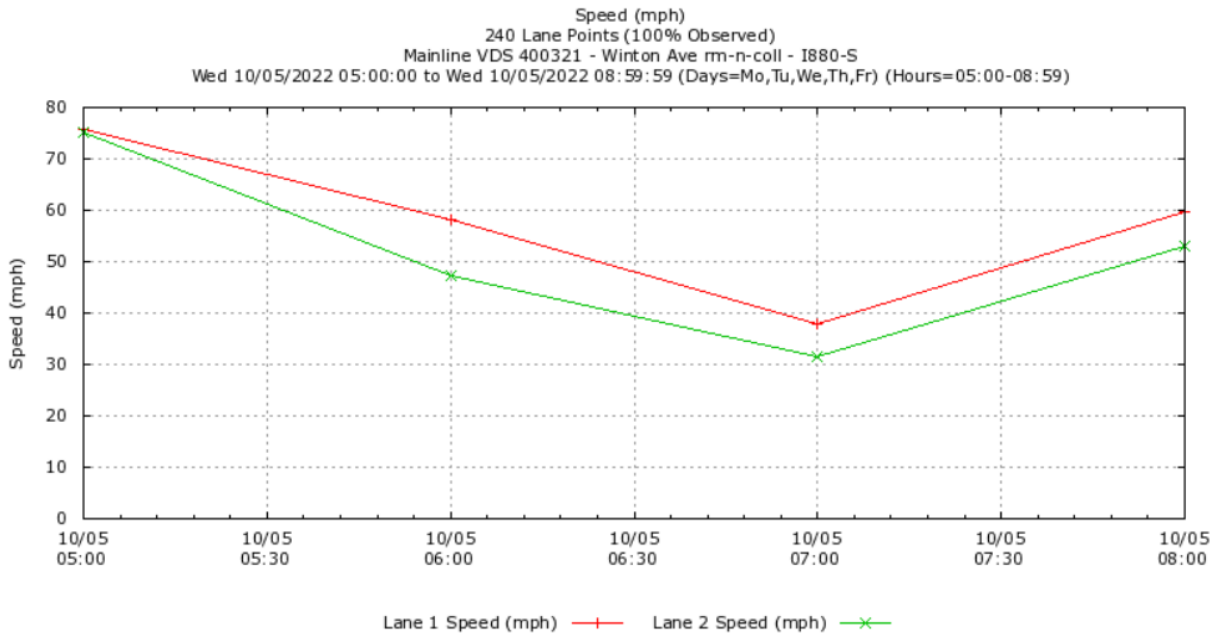
Hour	HOT Lane Flow (Veh/Hour)	HOT Lane Speed (mph)	GP Lane Flow (Veh/Hour)	GP Lane Speed (mph)
10/3/2022 15:00	1621	56	1629	32
10/3/2022 16:00	1677	56	1625	29
10/3/2022 17:00	1680	57	1614	30
10/3/2022 18:00	1463	62	1723	42
10/4/2022 15:00	1584	64	1597	34
10/4/2022 16:00	1680	61	1640	34
10/4/2022 17:00	1779	56	1630	33
10/4/2022 18:00	1612	63	1543	41
10/5/2022 15:00	1660	66	1656	35
10/5/2022 16:00	1633	52	1312	20
10/5/2022 17:00	1686	62	1637	34
10/5/2022 18:00	1721	64	1652	40
10/6/2022 15:00	1759	59	1658	35
10/6/2022 16:00	1760	59	1673	34
10/6/2022 17:00	1735	55	1648	33
10/6/2022 18:00	1679	57	1654	37
10/7/2022 15:00	1782	60	1701	38
10/7/2022 16:00	1815	57	1645	37
10/7/2022 17:00	1748	54	1607	32
10/7/2022 18:00	1515	56	1465	39

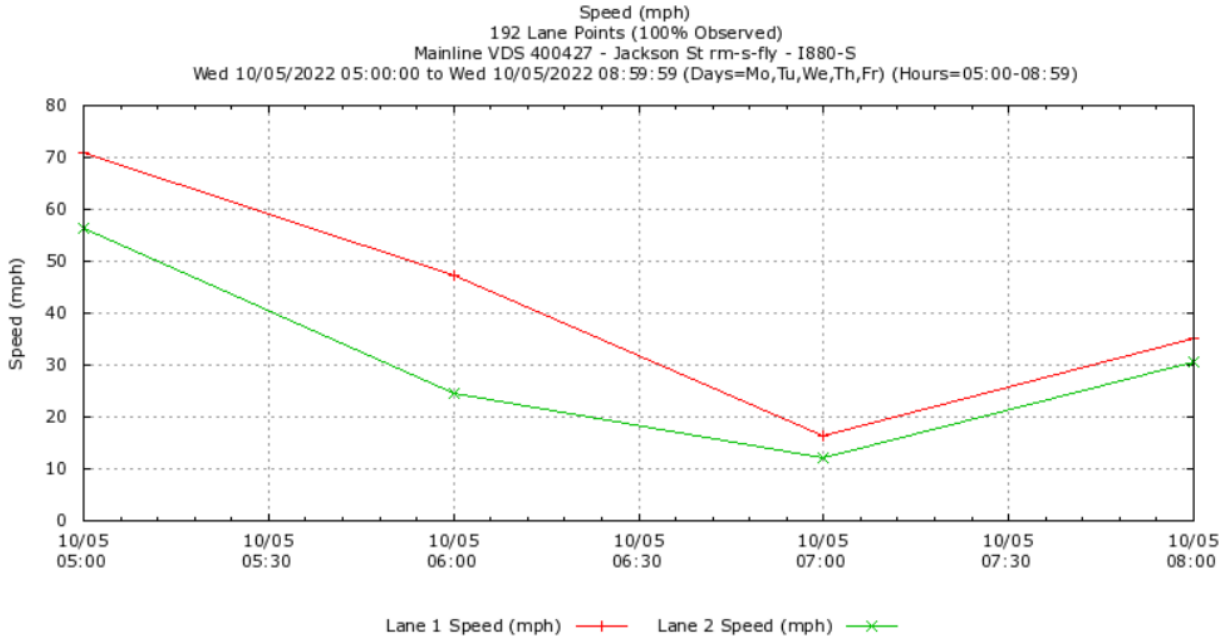
Note: HOT lane bottleneck output volumes, demand exceeds capacity.

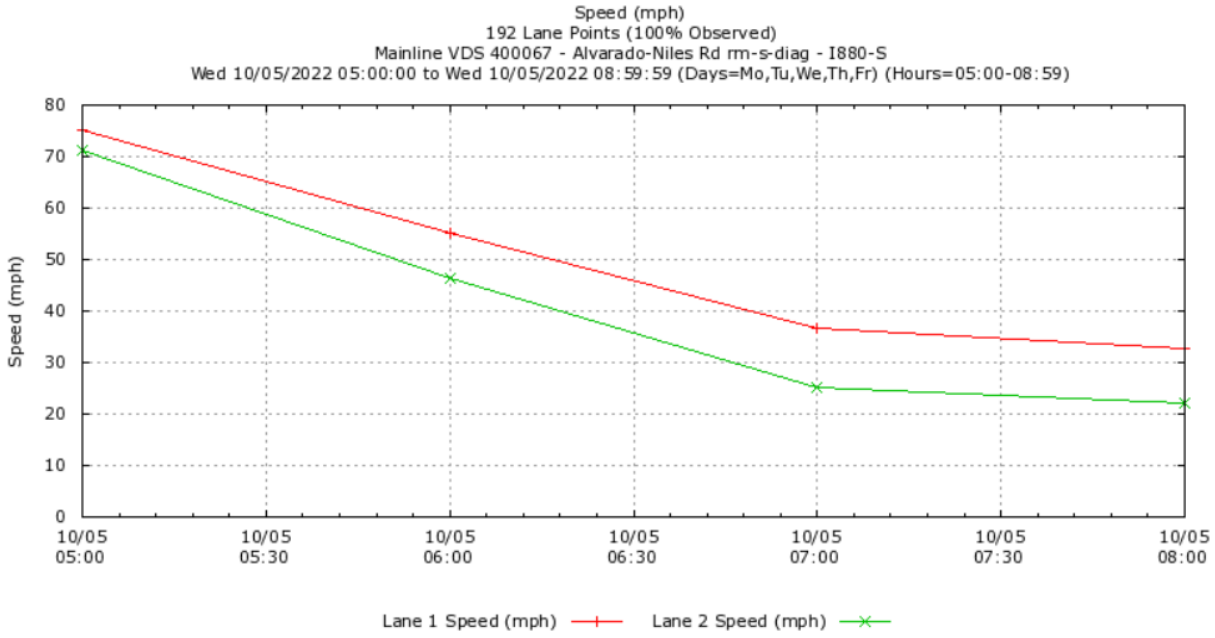
I-880 southbound: Hegenberger Road to US 101

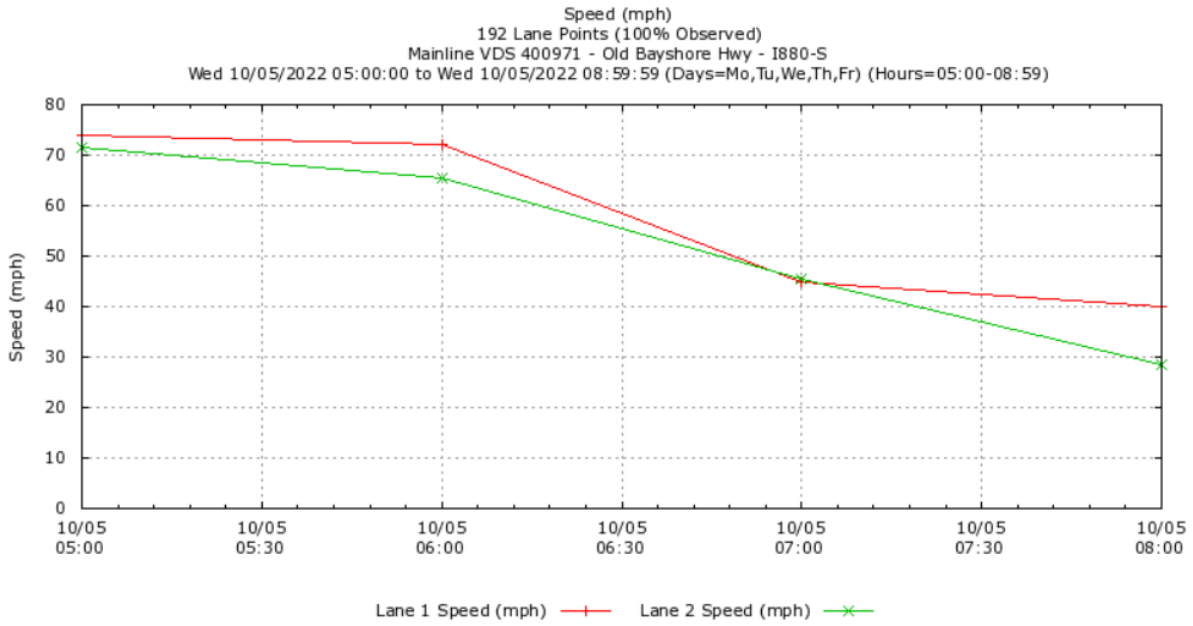
Multiple bottlenecks develop on southbound I-880 within the HOT lane segment during the AM peak period; however, two primary bottlenecks generally control traffic operations for the majority of the peak. A northern bottleneck between the A Street on-ramp and the Winton Avenue off-ramp and a southern bottleneck between the Stevenson Boulevard on-ramp and the Auto Mall Parkway off-ramp. Queues associated with the northern bottleneck typically extend north for about 2 miles to the SR 238 interchange and queues from the southern bottleneck extend as far north as the SR 92 interchange, a distance of about 12 miles. Friction between HOT lane and GP lane vehicles results in degraded HOT lane operations in the open access portions of the facility from the SR 92 interchange to south of the Tennyson Road interchange and south of the Whipple Road interchange.

A bottleneck develops south of US 101 interchange between the North First Street on-ramp and the Coleman Avenue off-ramp. The queue from this bottleneck extends upstream into the end of the HOV lane at the US 101 interchange.




Speed (mph)
192 Lane Points (100% Observed)
Mainline VDS 400427 - Jackson St rm-s-fly - I880-S
Wed 10/05/2022 05:00:00 to Wed 10/05/2022 08:59:59 (Days=Mo,Tu,We,Th,Fr) (Hours=05:00-08:59)
Speed (mph)
80
70
60
50
40
30
20
10
0
10/05 05:00
10/05 05:30
10/05 06:00
10/05 06:30
10/05 07:00
10/05 07:30
10/05 08:00
Lane 1 Speed (mph)
Lane 2 Speed (mph)


Speed (mph)
192 Lane Points (100% Observed)
Mainline VDS 400067 - Alvarado-Niles Rd rm-s-diag - I880-S
Wed 10/05/2022 05:00:00 to Wed 10/05/2022 08:59:59 (Days=Mo,Tu,We,Th,Fr) (Hours=05:00-08:59)
Speed (mph)
80
70
60
50
40
30
20
10
0
10/05 05:00
10/05 05:30
10/05 06:00
10/05 06:30
10/05 07:00
10/05 07:30
10/05 08:00
Lane 1 Speed (mph)
Lane 2 Speed (mph)



Another factor contributing to the low HOT lane speeds is HOT lane demands that are frequently at or near the effective capacity of the HOT lane facility in order to maintain a speed of 45 mph or greater. See the table below for HOT lane and GP lane volumes and speeds in the area of the Winton Avenue interchange.

SB I-880 Winton Avenue I/C

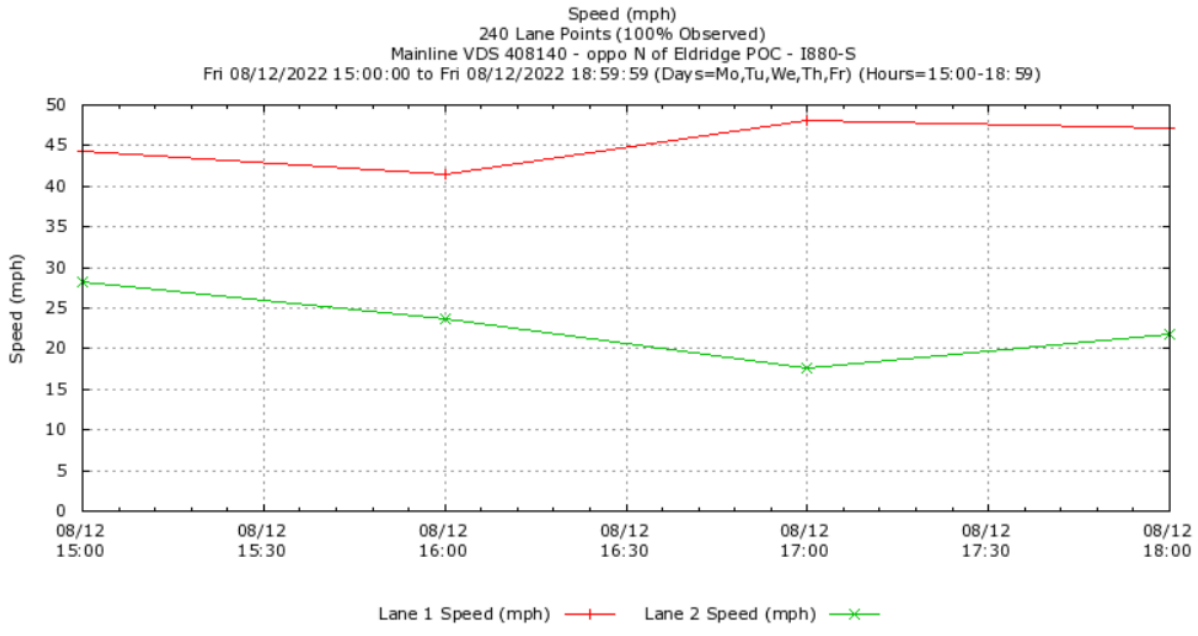
Hour	HOT Lane Flow (Veh/Hour)	HOT Lane Speed (mph)	GP Lane Flow (Veh/Hour)	GP Lane Speed (mph)
10/3/2022 5:00	1764	69	1448	59
10/3/2022 6:00	1628	52	1437	43
10/3/2022 7:00	1554	46	1443	39
10/3/2022 8:00	1463	59	1414	44
10/4/2022 5:00	1738	77	1519	74
10/4/2022 6:00	1704	51	1523	46
10/4/2022 7:00	1412	37	1421	35
10/4/2022 8:00	1547	47	1458	38
10/5/2022 5:00	1796	53	1463	49
10/5/2022 6:00	1627	39	1433	36
10/5/2022 7:00	1435	32	1296	29
10/5/2022 8:00	1481	57	1343	45
10/6/2022 5:00	1457	44	1233	48
10/6/2022 6:00	1585	36	1406	34

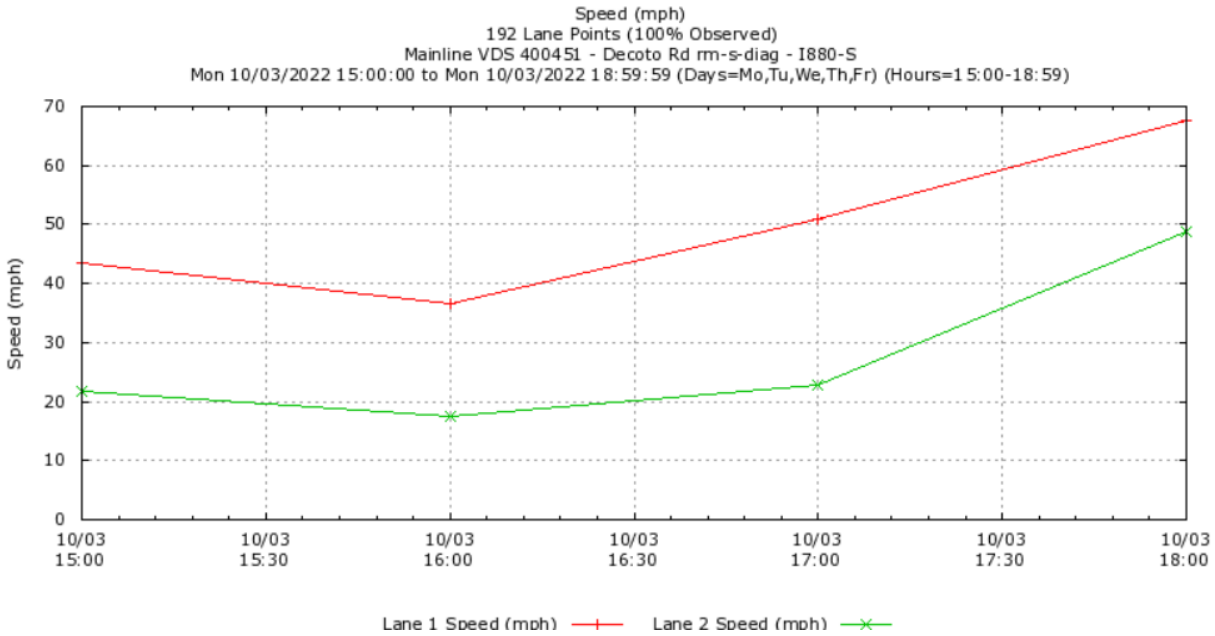
Hour	HOT Lane Flow (Veh/Hour)	HOT Lane Speed (mph)	GP Lane Flow (Veh/Hour)	GP Lane Speed (mph)
10/6/2022 7:00	1501	32	1416	29
10/6/2022 8:00	1491	46	1321	38
10/7/2022 5:00	1720	47	1390	43
10/7/2022 6:00	1615	37	1454	32
10/7/2022 7:00	1502	36	1370	33
10/7/2022 8:00	1532	62	1399	51

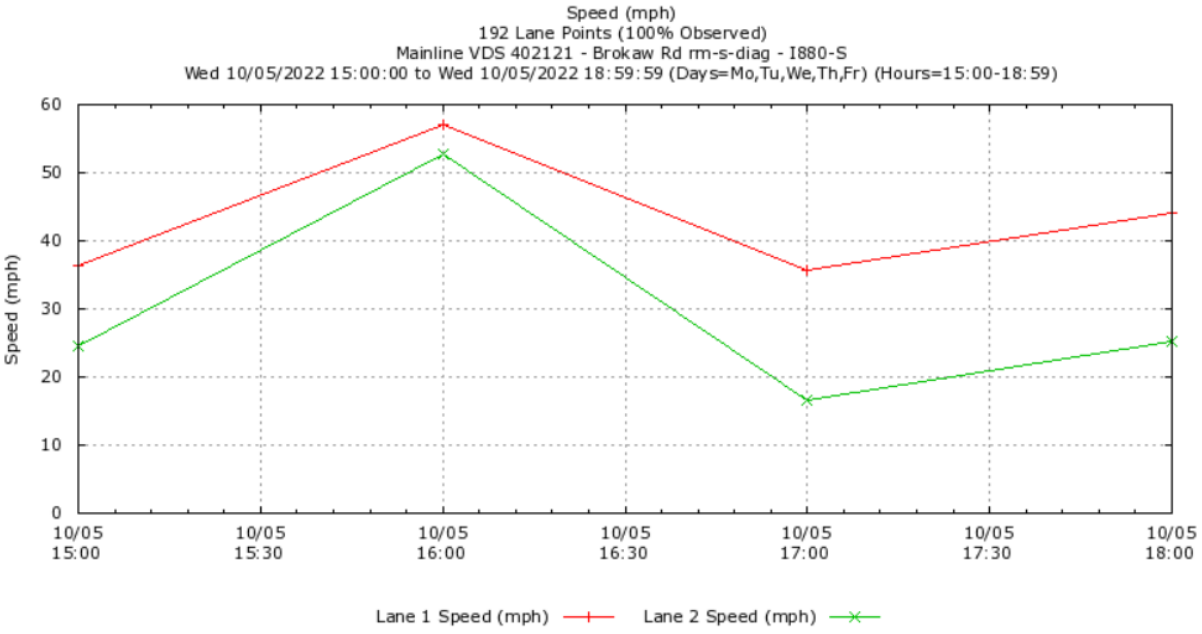
Note: Speeds below 35 mph would be locations in congestion and corresponding volumes would be constrained volumes, demand exceeds capacity.

During the PM peak, southbound I-880 experiences intermittent congestion at various locations along most of the corridor, including the areas of HOT lane degradation north of the Industrial Boulevard and Decoto Road interchanges. Friction between HOT lane and GP lane vehicles results in degraded HOT lane operations at these locations.

On southbound I-880 in the PM peak period a bottleneck develops between the North First Street diagonal on-ramp and the Coleman Avenue off-ramp. This bottleneck along with a right lane overload due to the queue on the southbound US 101 loop off-ramp spilling back onto southbound I-880 causing a queue to extend upstream to the Montague Expressway interchange. The queuing associated with these bottlenecks beyond the end of the HOV lane at the US 101 interchange reduces the speeds within the HOV lane.







B. Remediation Strategies:

I-880 northbound: Old Bayshore Highway to South of SR 238

Adaptive ramp metering was implemented between Mowry Avenue and State Route 238 starting in May 2022 and completed in Sept 2022. This project will

improve GP lane speeds within those limits and reduce friction between HOT lane and GP lane traffic.

The I-880/Winton Avenue/A Street Interchange Improvements project will provide a northbound auxiliary lane between the Winton Avenue and the A Street interchanges, reducing the congestion associated with the primary corridor bottleneck between the interchanges and further reducing friction between HOT lane and GP lane traffic. Project to complete PA&ED phase in March 2024 with start of construction 2027 and competing construction in 2030. Estimated construction cost of $79M.

The district will work with the Metropolitan Transportation Commission to increase pricing of the express lane during peak traffic periods to better manage demand.

I-880 southbound: Hegenberger Road to US 101

Adaptive ramp metering was implemented between Mowry Avenue and State Route 238 starting in May 2022 and completed in Sept 2022. This project will improve GP lane speeds within those limits and reduce friction between HOT lane and GP lane traffic.

The I-880/Winton Avenue/A Street Interchange Improvements project will provide a southbound auxiliary lane between the Winton Avenue and the A Street interchanges, reducing the congestion associated with the primary corridor bottleneck between the interchanges and further reducing friction between HOT lane and GP lane traffic. Project to complete PA&ED phase in March 2024 with start of construction 2027 and competing construction in 2030. Estimated construction cost of $79M.

MTC conducted a pilot project (Video Occupancy Detection) to increase enforcement on Route 880; this pilot was completed in May 2018. Results showed an accuracy rate at about 75 percent. This was too low to use as an occupancy enforcement tool. MTC is also exploring additional technology for occupancy enforcement, including mobile based applications which could help reduce degradation. The district will work with the Metropolitan Transportation Commission to increase pricing of the express lane during peak traffic periods to better manage demand.

4.3. DISTRICT 5 2022 DEGRADATION ACTION PLAN

4.3.1 SUMMARY OF DEGRADATION ON HOV FACILITIES IN DISTRICT 5

APPENDIX A provides the list of degraded facilities in District 5 that were identified in the *2021 California High Occupancy Vehicle Facilities Degradation Report*. The speed and degradation profiles for each degraded facility are provided in ATTACHMENT A.

4.3.2 ACTION PLAN FOR HOV FACILITIES ON U.S. ROUTE 101

A. ANALYSIS:

Northbound and southbound U.S. Route 101 in Santa Barbara County were identified as having slightly degraded HOV facility between State Route 150 and Santa Monica Road in 2022. The analysis conducted by District 5 identified a common cause resulting in the slight degradation of the northbound and southbound U.S. Route 101 HOV Facility in Santa Barbara County in the Year 2022.

The degradation of the NB U.S. Route 101 HOV Facility in 2022 was due to construction activities coupled with a three to two lane drop bottleneck which produced congestion and slow traffic conditions. Our analysis concluded that the average vehicle demand during the analysis period of 3,058 vehicles per hour during the AM peak hour commute period exceeded the capacity of the downstream three to two lane drop bottleneck and construction zone of 2,660 vehicles per hour (1,330 VPHPL) resulting in a 0.631-mile length of vehicle queue. Within the existing three lane facility, the U.S. Route 101 Northbound HOV Facility was carrying an average of 959 vehicles per hour during the AM peak hour commute period which is under the established threshold of 1,650 vehicles per hour. To ensure that HOV lanes continue to offer a time-savings incentive to carpool, Caltrans has traditionally set 1,650 vehicles per hour as the maximum capacity of HOV lanes.

The degradation of the SB U.S. Route 101 HOV Facility in 2022 was suspected to be due to congestion from downstream construction activities on U.S. Route 101 as part of a District 7 pavement rehabilitation project (07-30240) in Ventura County from PM R36.3 to R40.6 which included a three to two lane drop and a crossover. The HOV degradation on SB U.S. Route 101 in 2022 could not be confirmed to be due to the District 7 project because PeMS count stations on U.S. Route 101 in Ventura County were non-operational during construction in this time period. Within the existing three lane facility, the U.S. Route 101 Southbound HOV Facility was carrying 895 vehicles per hour during the AM peak hour commute period which is under the established threshold of 1,650 vehicles per hour. To ensure that HOV lanes continue to offer a time-savings incentive to

carpool, Caltrans has traditionally set 1,650 vehicles per hour as the maximum capacity of HOV lanes.

B. Remediation Strategies

In 2022, District 5 had active construction work for Phase 4C (05-0N703) which will build an additional 4.6 bi-directional lane-miles of HOV lanes on U.S. Route 101 in Santa Barbara County between Padaro Lane (PM R7.3) and Posilipo Lane (PM 9.6). Of the 4.6 additional lane-miles, 2.3 lane-miles will be added in the northbound direction of travel. Due to funding issues, Phase 4C went to construction before Phase 4B. This means that although Phase C is expected to complete construction work in November 2023, the HOV lane will be intermittent until construction work for Phase 4B is completed in December of 2024. It should also be noted that District 5 currently has two additional phases (4D & 4E) encompassing 6.6 additional HOV lane-miles (3.3 NB & 3.3 SB) in the late stages of Plans, Specifications, and Estimates (PS&E) within this U.S. Route 101 corridor. The anticipated completion date of these additional 6.6 bi-directional lane-miles of HOV lanes is slated for April 2032, so the full usage of the HOV lane will not materialize until after construction work for Phases 4D and 4E are completed.

As noted above, Phase 4A was completed in June 2022. The directional breakdown of new HOV lane-miles open to traffic is provided below.

- District 5 has increased the HOV lane-miles in the northbound direction of travel by 3.005 lane miles (265%). Total number of northbound HOV lane-miles in operation as of July 1, 2022, is 4.14 lane-miles.
- District 5 has increased the HOV lane-miles in the southbound direction of travel by 2.271 lane miles (118%). Total number of southbound HOV lane-miles in operation as of July 1, 2022, is 4.19 lane-miles.
- District 5 has increased the HOV lane-miles in both directions of travel by 5.276 lane miles (173%). Total number of northbound and southbound HOV lane-miles in operation as of July 1, 2022, is 8.33 lane-miles.

In 2022, District 7 had active construction work for 07-30240 which reduced the number of travel lanes on U.S. Route 101 from three lanes in each direction to 2 lanes in each direction for the majority of 2022, which reduced the capacity of U.S. Route 101 in both directions. This is suspected of forming a bottleneck for traffic on southbound U.S. Route 101 in Santa Barbara County. Project 07-30240 is expected to complete construction in July of 2024.

4.4. DISTRICT 7 2022 DEGRADATION ACTION PLAN

4.4.1 SUMMARY OF DEGRADATION ON HOV FACILITIES IN DISTRICT 7

APPENDIX A provides the list of degraded facilities in District 7 that were identified in the 2021 California High Occupancy Vehicle Facilities Degradation Report and Action Plan. The speed and degradation profiles for each degraded facility are provided in ATTACHMENT A.

4.4.2 DISTRICT-WIDE APPROACH TO HOV/HOT LANE DEGRADATION

District 7's HOV/HOT lane operations continue to be significantly impacted by common causes, which have been documented in previous degradation action plans. Below are some of the aforementioned common causes:

- High violation rates are observed on HOV lanes in 2022.
- Single occupant vehicles (SOV) utilizing the Clean Air Vehicle (CAV) Decal program. The CAV decal rate (CAV volume/total HOV volume) in HOV lanes continues to increase each year.
- Congestion on the general-purpose (GP) lanes causes "friction" between GP and HOV lanes [(HOV motorists tend to drive less than 45 mph (federal HOV degradation minimum threshold), next to very congested/stopped GP lane traffic)], which causes slow speeds in the HOV lanes.
- Data coverage and quality issues occur district wide. District 7's PeMS data indicates that only 39% of the detection sensors are "healthy" overall. Route 134 HOV facilities only have a few "healthy" detection sensors due to the construction. The Degradation and Action Plan Reports use PeMS as the sole source of data.
- Degradation worsened after the HOV lanes were converted to ExpressLanes. In fact, over 70 and 84 percent of vehicles found in the I-10 and I-110 ExpressLanes respectively, are single-occupant vehicles. Approximately 30 to 60 percent of users (occupancy violators) are not setting the transponder correctly, to the correct number of people in the vehicle. As the owner of state highways, Caltrans has only an advisory role on these ExpressLanes. Pursuant to California Senate Bill 1298 (SB 1298) approved on September 21, 2014, Metro has the authority to operate ExpressLanes on the I-10 (Alameda Street to Route 605) and I-110 (Adams Boulevard to Harbor Gateway Transit Center) indefinitely.

4.4.3 ACTION PLAN FOR HOV FACILITIES ON ROUTE 5

A. Analysis

Afternoon peak period recurrent extreme congestion (degradation) in all lanes reduces northbound HOV lane performance between Branford St. (PM 153.4) and Osborne St. (PM 154.0) (Fig.1 and 2). Volume exceeds capacity. The max flow is 1,846 vehicles/hour during the 1-hour-peak period at Branford St. The degradation level of the rest of the northbound HOV lane was very degraded (at Laurel Canyon Blvd, PM 157.1) or slightly degraded.

The entire volume of the northbound Route 170 and 405 merges onto the Route 5 freeway. The Route 170 merging point shows the highest percentage of degradation on the northbound HOV lane (Fig. 4.4-1 and 4.4-2) due to congestion in the GP lane and HOV direct connector traffic from Route 170.

Northbound GP lane drops at San Fernando Mission Blvd (PM 156.0), causing a bottleneck.

Vehicle weaving conflicts along northbound ingress/egress (I/E) locations (6 I/E's in the southbound direction and 7 I/E's in the northbound direction) due to congestion in the GP lane and HOV direct connector traffic from Route 170.

High truck volumes (9.4%) from Westbound Route 210 merging onto Northbound Route 5, cause GP and HOV degradation. The max flow is 1,704 vehicles/hour during the 1-hour-PM peak period north of Route 210. The NB truck lane begins at approximately PM 160.0 and rejoins the GP lanes at approximately PM 162.6.

The right lane drops just upstream of the end of the northbound HOV lane. Then within one mile from the end of HOV lane, the separate designated truck route merges into the northbound Route 5.

Morning peak period recurrent congestion in all lanes reduces southbound HOV lane performance (Fig. 4.4-3 and 4.4-4). The HOV lane is slightly and very degraded between Osborne St. and Paxton St. (PM 154.0-155.7) around Routes 5 and 118 interchange. The volume of eastbound Route 118 merges into Route 5 (Fig. 4.4-3 and 4.4-4). Two lane drops on GP lanes (on southbound Route 5) contribute to congestion on GP lanes and then cause the friction factor for the HOV lane.

CAV decal rate has increased to 10.5 percent. The solo violation rate has increased to 11.3 percent (These numbers are higher than in 2021).

The HOV lane loop detections were installed on the freeway. However, HOV lane detection stations on this segment (PM 148-153) have not been incorporated into the PeMS system. No data has been reported on this segment. Consequently, District 7 conducts annual manual counts at PM 151.758 (Peoria St.). The AM and PM peak hour flows were 1,215 and 1,293 vehicles/hour respectively for 2022, which were observed to be at free-flow conditions.

Figures 4.4-1 and 4.4-2 provide plots of northbound HOV and GP lane speeds during the fourth quarter of 2022. Figures 4.4-3 and 4.4-4 provide plots of southbound HOV and GP lane speeds during the same quarter. Note that PeMS' data does not cover the entire length of the HOV facility.

FIGURE 4.4-1. AVERAGE HOV LANE SPEEDS – NORTHBOUND ROUTE 5, Q4 2022

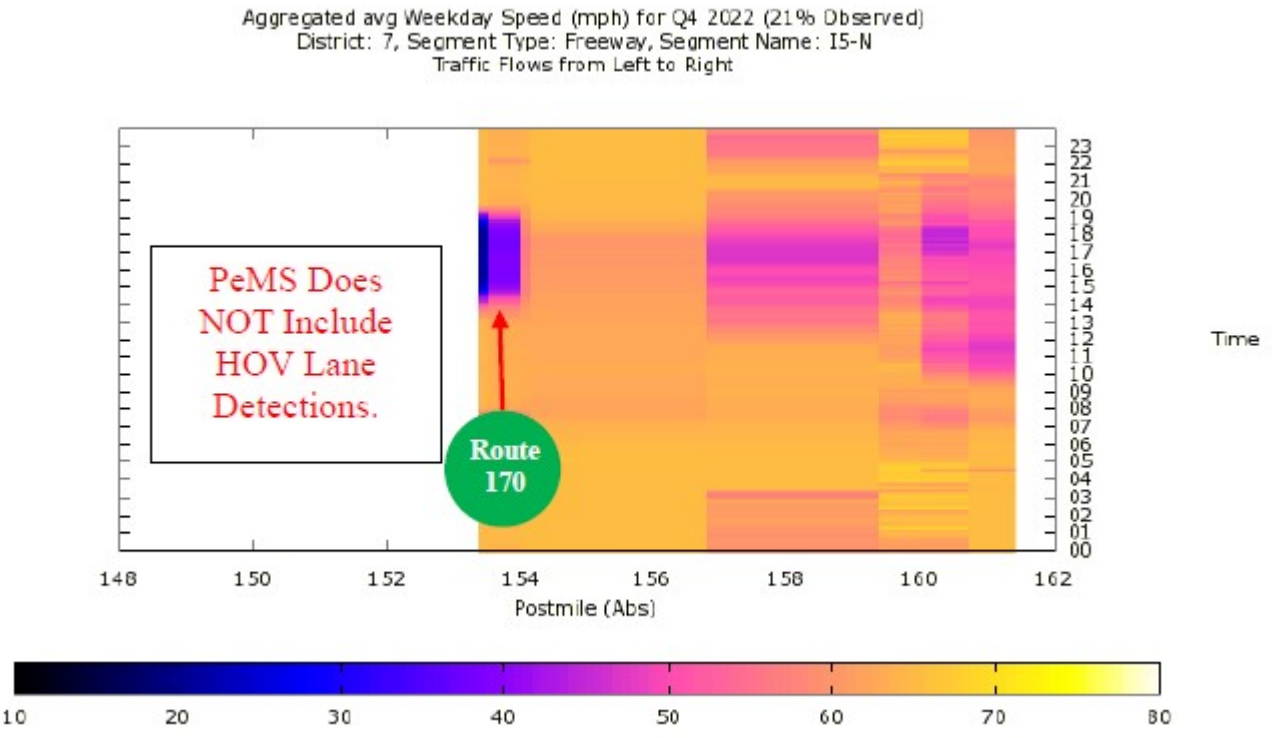


FIGURE 4.4-2. AVERAGE GP LANE SPEEDS – NORTHBOUND ROUTE 5, Q4 2022

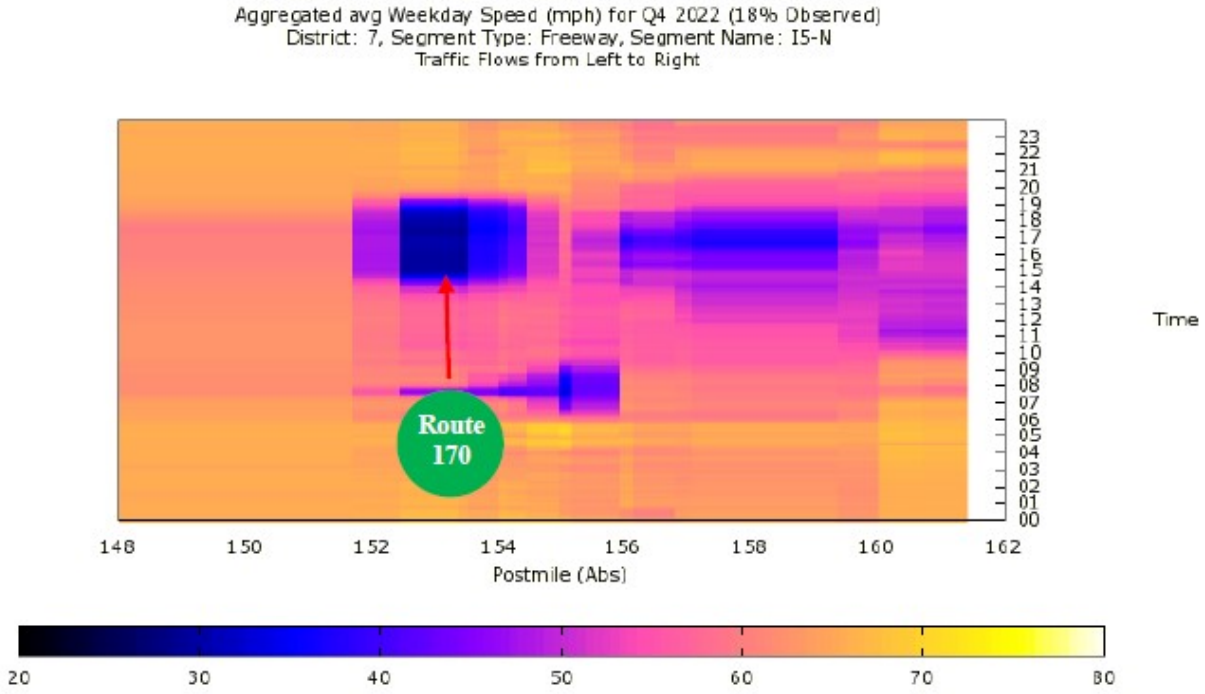


FIGURE 4.4-3. AVERAGE HOV LANE SPEEDS – SOUTHBOUND ROUTE 5, Q4 2022

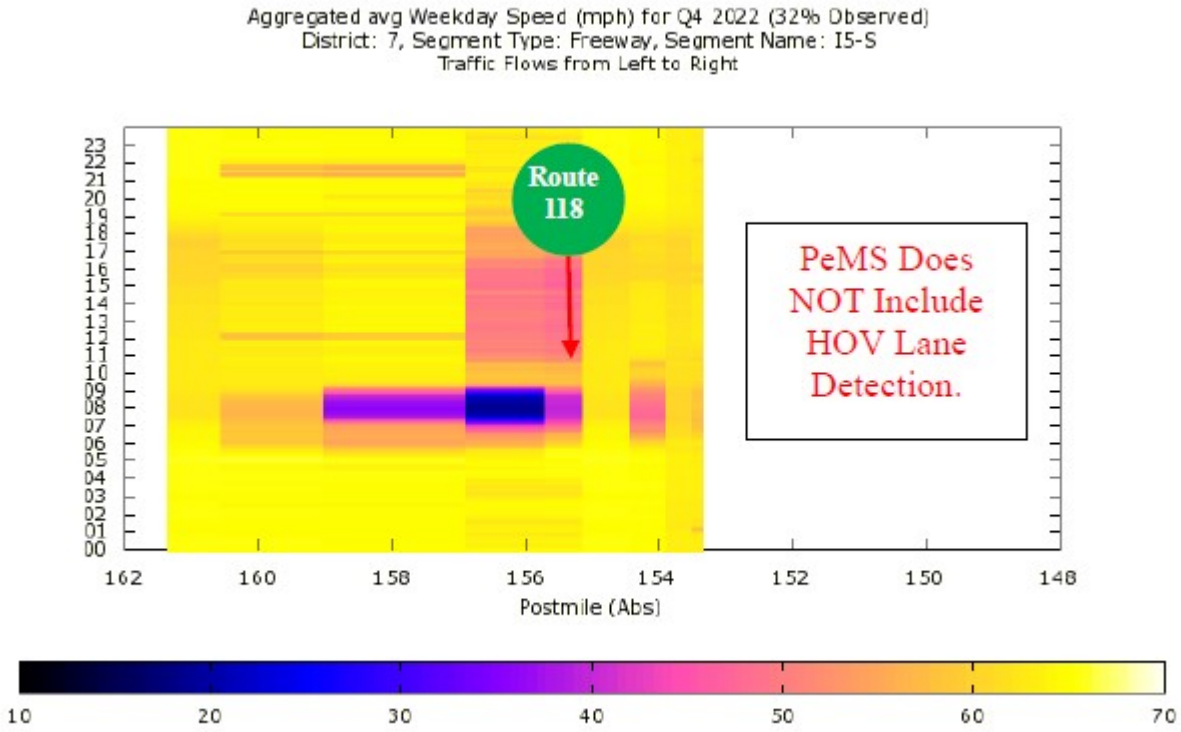
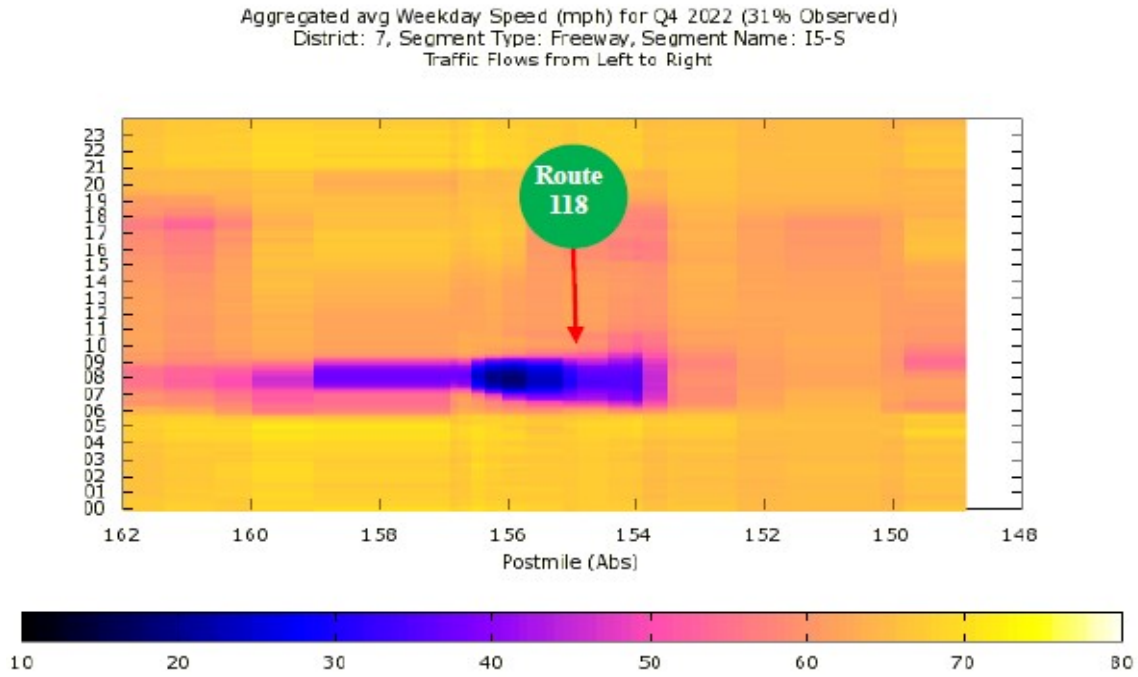


FIGURE 4.4-4. AVERAGE GP LANE SPEEDS – SOUTHBOUND ROUTE 5, Q4 2022



B. Remediation Strategies

The East San Fernando Valley Transit Corridor Project (ESFV, Los Angeles Metro) consists of a Light Rail Transit (LRT) system that will travel north of the Van Nuys Orange Line Station to the Sylmar/San Fernando Metrolink Station, a total of 9.2 miles and will operate in the median of Van Nuys Boulevard for 6.7 miles to San Fernando Road. Construction is expected to be completed in time for the 2031 $1.3 billion has been identified for the project, most coming from local Measures M and R, as well as State gas tax funds. This project is expected to reduce traffic demand on Routes 5 and 405, especially relieving congestion on southbound Route 5 between Van Nuys Blvd and Polk St (approx. PM 154-157, Fig. 4.4-3, 4.4-4). Caltrans is providing oversight work (EA 07-36990).

Project 07-2332E will extend the HOV and truck lanes between Antelope Valley Freeway (Route 14) and Parker Rd. on Route 5, which will ease traffic delays and absorb traffic growth due to increased population and surrounding communities – both residential and commercial. This project is expected to reduce the congestion on the northbound HOV lane during PM peak hours. Construction began in 2021, and completion is expected in 2026. The estimated construction cost is $527 million.

District 7 shared vehicle occupancy counts and violation data with the California Highway Patrol (CHP), so they can prioritize their enforcement efforts.

Metrolink developed the Southern California Optimized Rail Expansion (SCORE) plan in partnership with freight and intercity rail operators as a roadmap to increased rail service to accommodate expected population and job growth in advance of 2028 when Los Angeles will host the Olympics. SCORE will fund the Antelope Valley Line (AVL) Capacity and Service improvements. This project aims to improve service frequency and reliability along the 76.6-mile-long AVL commuter rail corridor between Lancaster and downtown Los Angeles and is expected to reduce traffic demand on Routes 5 and 14. SCORE projects will be completed starting in 2023, with the program complete by 2028.

California High-Speed Rail service between Bakersfield to Los Angeles Union Station is expected to be completed before the 2028 Olympics. In April 2020, the California High-Speed Rail Authority (Authority) Board of Directors approved a preliminary funding plan with Los Angeles County Metropolitan Transportation Authority (Metro) to move the Link Union Station project External Link (Link US) forward in Southern California. The funding plan details the release of $423 million in Prop 1A funds for the first phase of the Link US project featuring "run through" tracks crossing over the US-101 freeway. The HSR would provide benefits to the regional transportation system by reducing the number of vehicles operating on the regional roadway network through the diversion of intercity road trips to HSR. In 2040, implementation of the HSR would result in a net reduction in vehicle miles traveled ranging from about 931 million to 1.28 billion (an approximately 1.1 percent to 1.5 percent reduction) for the medium and high ridership scenarios, respectively, compared to the No Project Alternative. This is a net benefit to transportation and traffic operations because a reduction in vehicle miles traveled helps maintain or potentially improve the operating conditions of regional roadways. This reduction in future vehicle trips would improve the level-of-service (LOS) (i.e., operating quality) of the regional roadway system.

4.4.4 ACTION PLAN FOR EXPRESSLANE/HOV FACILITIES ON ROUTE 10

HOV facilities on Route 10 are split into two segments: Alameda Street to Route 605 as ExpressLane facilities and Route 605 to San Bernardino County Line as HOV facilities. These action plans cover the entire route.

A. Analysis

Alameda Street to Route 605 (ExpressLane)

Afternoon peak period recurrent extreme congestion between Santa Anita Ave and Durfee Ave (PM 27.3-29.2) in all lanes, reduces eastbound ExpressLane lane performance.

Morning peak period recurrent slight degradation at Durfee Rd (PM 29.2) interchange 605, reduces westbound HOT lane performance.

The existing HOV lane in each direction was converted to two HOT lanes in each direction by Metro on February 23, 2013. Vehicle volume has increased because of the addition of toll-paying vehicles and an increase in violation rates. Metro's Pricing Algorithm cannot control demand, even under "HOV Only" mode due to high occupancy violations. The occupancy violation rate with the self-declaring FasTrak flex transponder has increased over time, as SOVs set the transponder to HOV to avoid paying tolls. Approximately 30 to 60 percent of users are not setting the transponder correctly. Manual counts show over 77 percent of vehicles in the HOT lane are SOVs and only 15 percent carpools during the peak period.

Figures 4.4-5 and 4.4-6 provide plots of eastbound ExpressLane and GP lane speeds during the fourth quarter of 2022. Figures 4.4-7 and 4.4-8 provide plots of westbound ExpressLane and GP lane speeds during the same quarter.

San Gabriel River Fwy (Rte 605) to San Bernardino County Line

Afternoon peak period recurrent extreme congestion in all lanes reduces eastbound HOV lane performance between Fairplex Dr. and College Ave (PM 42.2-46.7), due to the construction of widening ExpressLanes (EA 08-0C2514) from Pomona to Ontario in District 8.

Morning peak period recurrent slight to extreme degradation in all lanes at various locations reduces westbound HOV lane performance.

Extremely high violation rates during peak 1-hour periods are observed in 2022 Route 10 HOV field counts. The violation rate is 48.8% at Frazier St. (PM 31.72), 44.4% at Barranca St. (PM 38.00), and 34.3% at Dudley St. (PM 44.19).

High truck traffic volumes (6.5 to 7.8 percent) reduce the capacity of the freeway, especially along the right two lanes; other vehicles tend to maneuver into the leftmost lanes, increasing weaving and the friction factor with the HOV lanes.

Figures 4.4-9 and 4.4-10 provide plots of eastbound HOV and GP lane speeds during the fourth quarter of 2021. Figures 4.4-11 and 4.4-12 provide plots of westbound HOV and GP lane speeds during the same time.

FIGURE 4.4-5. AVERAGE EXPRESSLANE SPEED – EASTBOUND ROUTE 10 (ALAMEDA ST TO ROUTE 605), Q4 2022

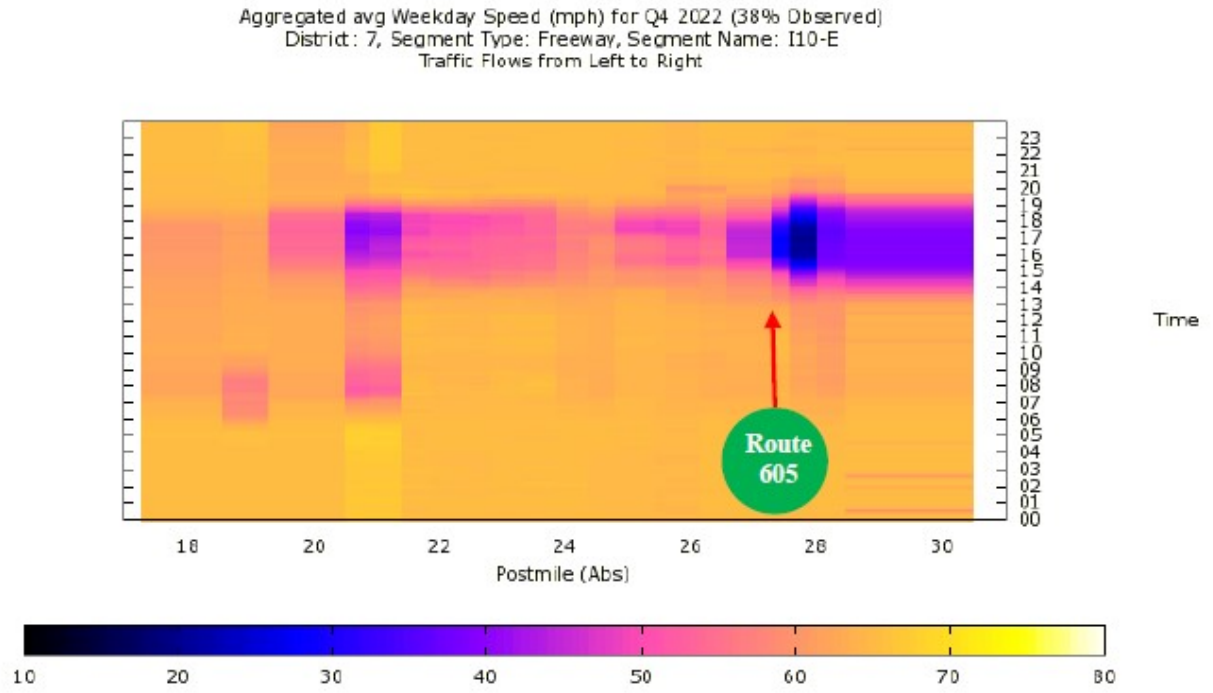


FIGURE 4.4-6. AVERAGE GP LANE SPEED – EASTBOUND ROUTE 10 (ALAMEDA ST TO ROUTE 605), Q4 2022

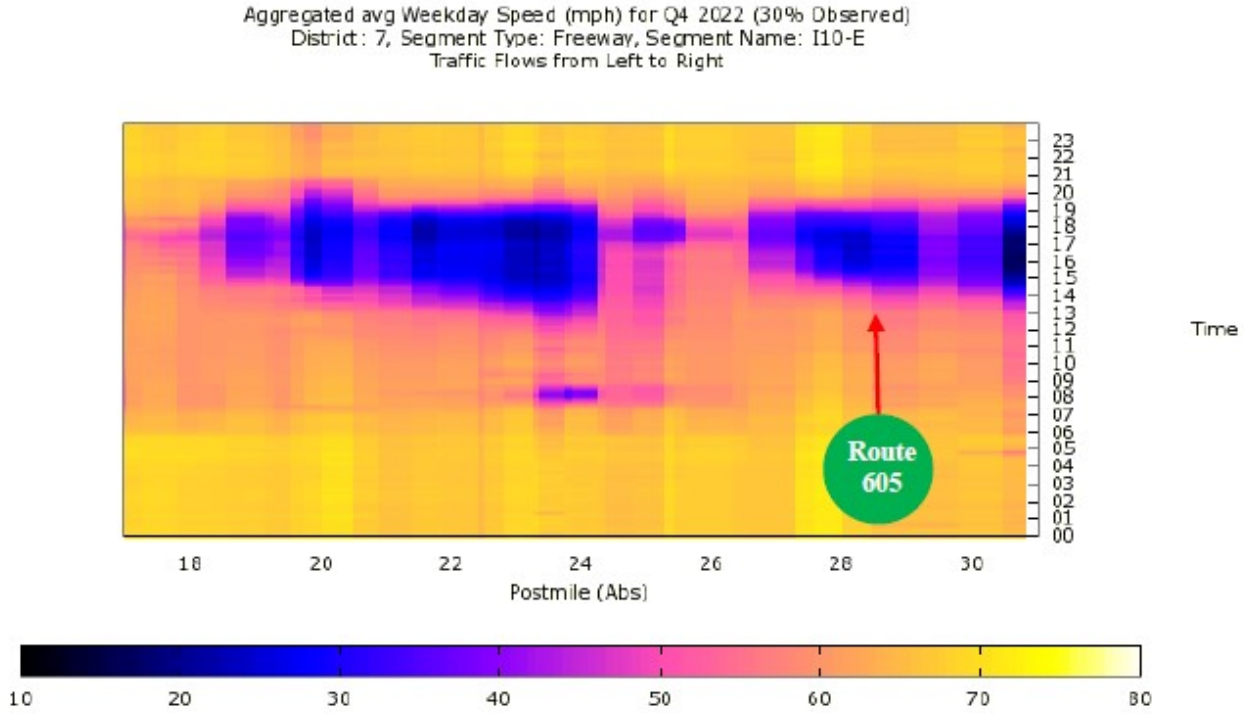


FIGURE 4.4-7. AVERAGE EXPRESSLANE SPEED – WESTBOUND ROUTE 10 (ROUTE 605 TO ALAMEDA ST), Q4 2022

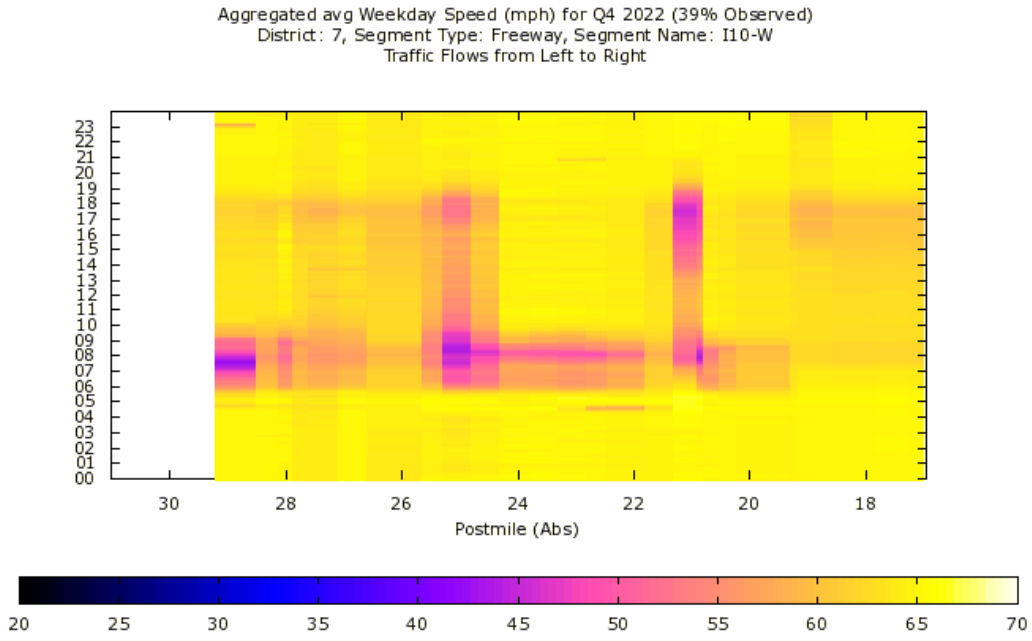


FIGURE 4.4-8. AVERAGE GP LANE SPEED – WESTBOUND ROUTE 10 (ROUTE 605 TO ALAMEDA ST), Q4 2022

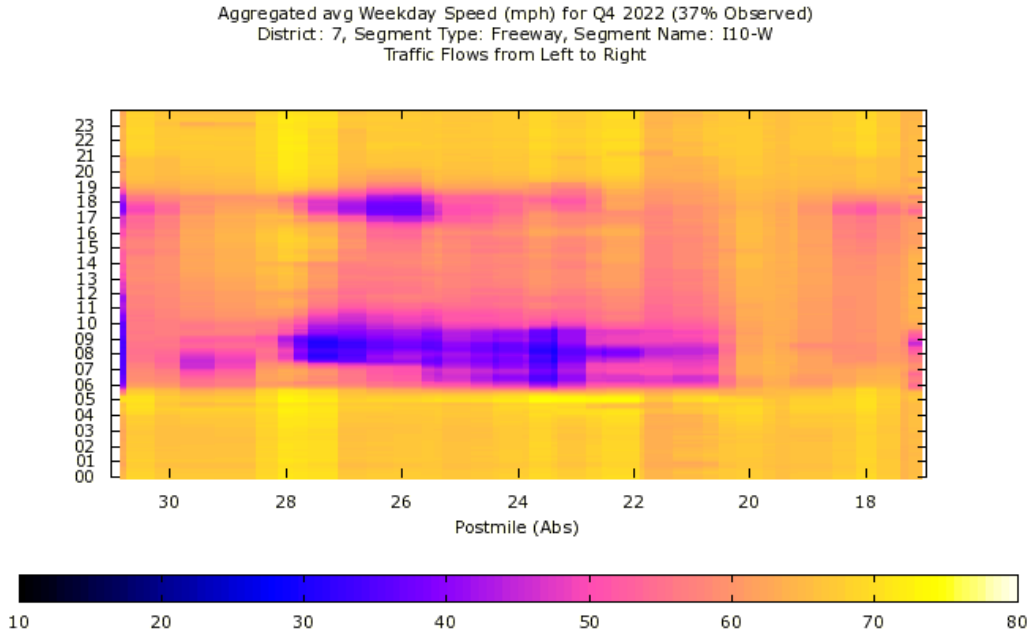


FIGURE 4.4-9. AVERAGE HOV LANE SPEED – EASTBOUND ROUTE 10 (ROUTE 605 TO SAN BERNARDINO COUNTY LINE), Q4 2022

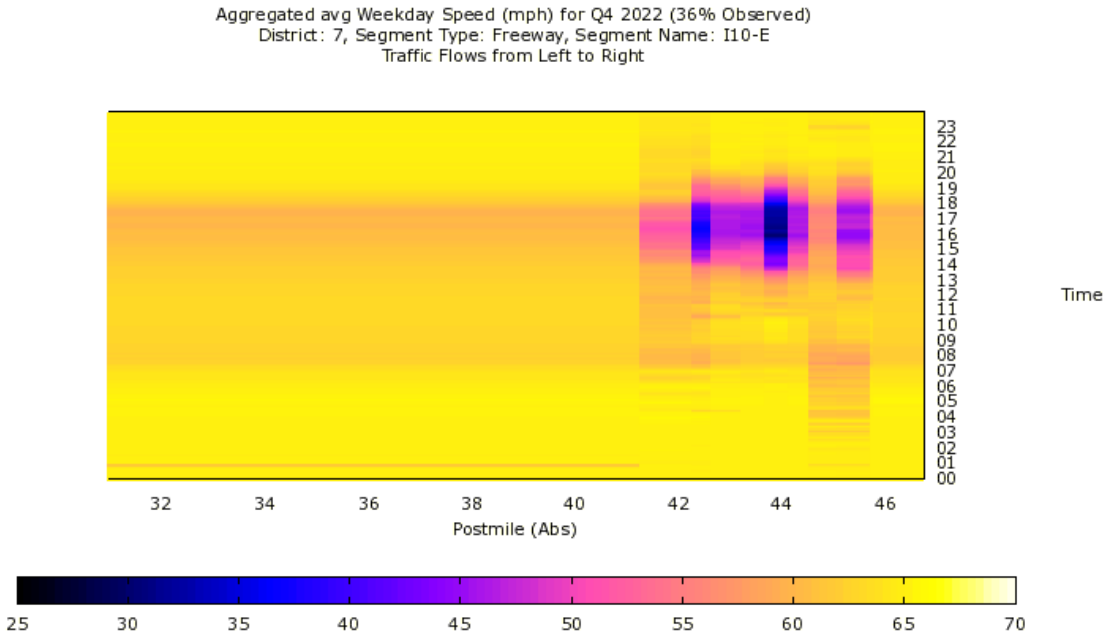


FIGURE 4.4-10. AVERAGE GP LANE SPEED – EASTBOUND ROUTE 10 (ROUTE 605 TO SAN BERNARDINO COUNTY LINE), Q4 2022

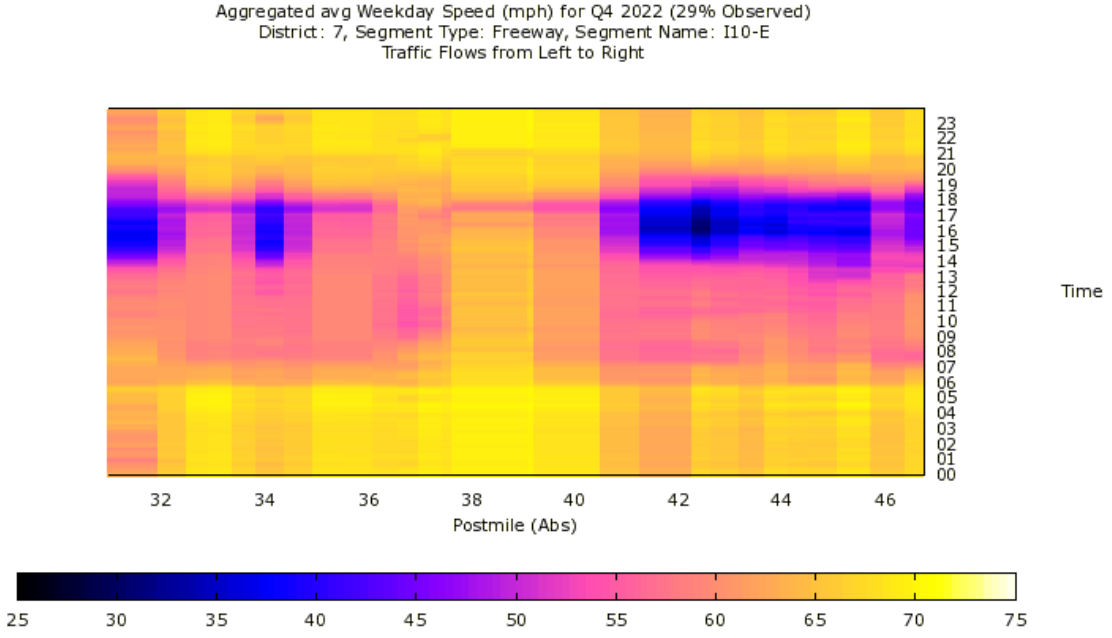


FIGURE 4.4-11. AVERAGE HOV LANE SPEED – WESTBOUND ROUTE 10 (SAN BERNARDINO COUNTY LINE TO ROUTE 605), Q4 2022

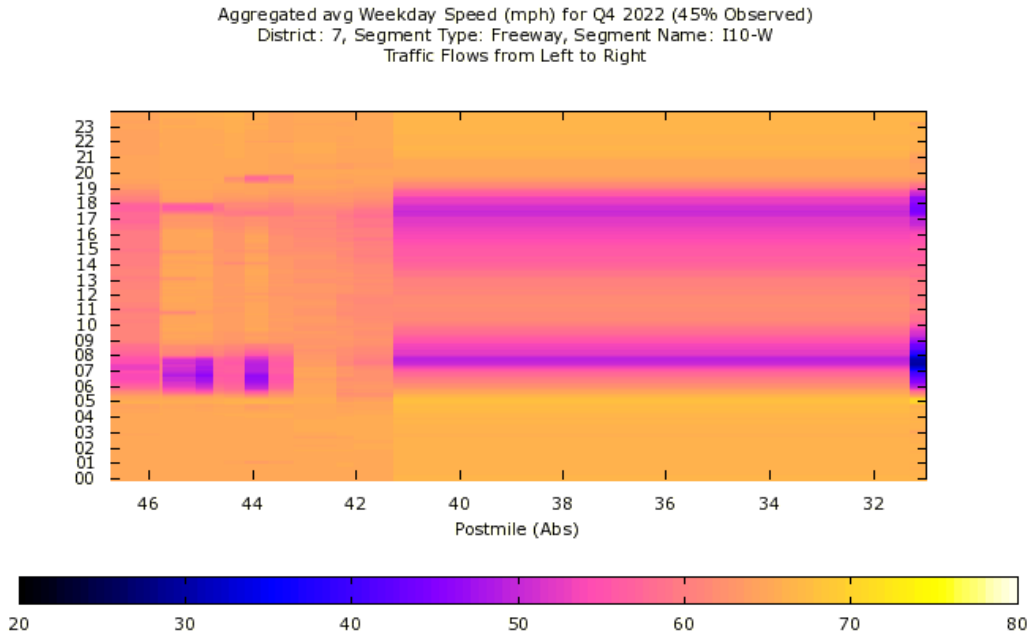
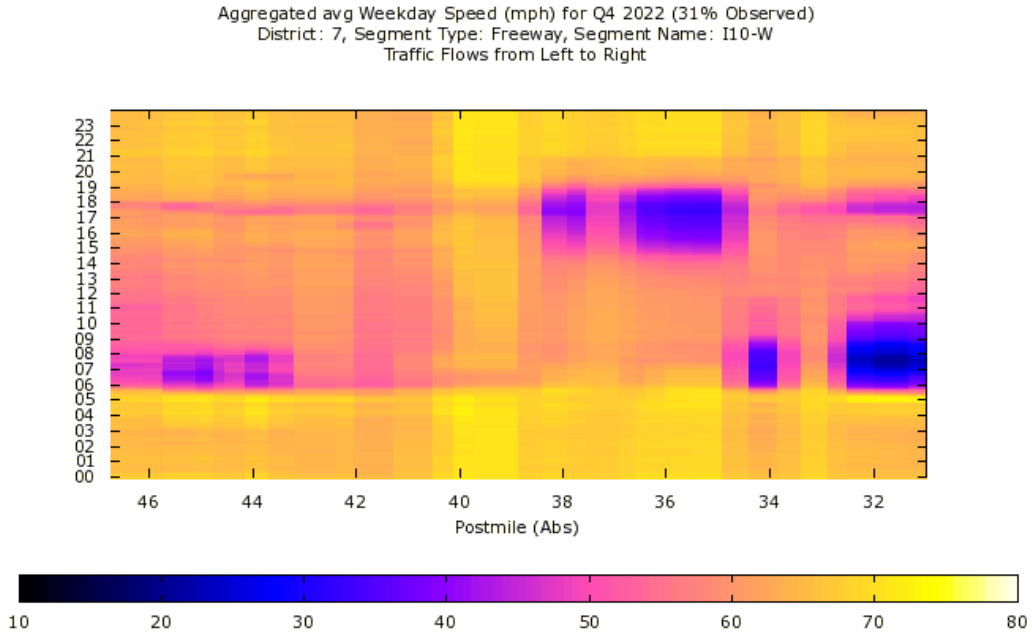


FIGURE 4.4-12. AVERAGE GP LANE SPEED – WESTBOUND ROUTE 10 (SAN BERNARDINO COUNTY LINE TO ROUTE 605), Q4 2022



B. Remediation Strategies

Alameda Street to Route 605 (ExpressLane)

Caltrans, in partnership with Metro, implemented the following strategies to improve performance:

- Work is ongoing to repair and update the detector system to improve data collection.
- LA Metro installed the Automatic Vehicle Occupancy Detection System (AVODS) in late 2019, based on Caltrans' violation data, and it has been in the testing phase since June 2020. Metro has notified the transponder holders that the new occupancy enforcement system is in place. However, due to software and back-office communication issues, etc., Metro is still not using it for enforcement, which entails sending a letter indicating that the transponder is set wrong, and in the future, the toll will be charged. According to updates in 2023, Metro is still working on tuning the system and training.
- Digital occupancy sign panels that display the transponder setting to assist CHP in enforcing vehicle occupancy or toll violations, were installed in 2019 and can be seen from both sides of the display. CHP indicates that they are very helpful and more useful than the flashing white and blue lights on the transponder readers. Metro has not performed any scientific studies to determine the effectiveness of the transponder switch setting indicators.

The ECIM project was completed, and the consultant provided all the deliverables. However, the data has not been incorporated into PeMS.

The "Pay as you go" program began in June 2023. Metro claims that this program will reduce the violation rate on ExpressLane and relieve congestion on the Route 10 and 110 freeways. Drivers without a transponder can expect to "pay as you go," plus an $8 processing fee.

Enhanced, dedicated, and targeted CHP enforcement along HOT lanes, including the use of enforcement areas where CHP can observe the transponder switch setting indicators and check passing vehicles for visual occupancy verification.

Metro Gold Line Foothill Extension to Claremont (with the ability to extend to Montclair) will be completed in 2025 and is expected to reduce traffic demand on Routes 10, 60, and 210. Carpooling has been touted as one of the first steps in encouraging people These off-system improvements could attract some of

the current HOV lane users.

Route 605 to San Bernardino County Line

District 8's project (EA 08-0C2514) is widening ExpressLanes in each direction on Route 10, from Pomona to Ontario in San Bernardino County, from LA/SBD county line to 0.2 miles west of Cherry Ave and in LA county from 0.4 miles west of White Ave to LA/SBD county line. The construction began in March 2020 and is expected to end in June 2024. Once construction is completed, speed on the eastbound HOV lane should be improved between Fairplex Dr. and College Ave (PM 42.2-46.7).

The Alameda Corridor-East (ACE) Project, funded by the San Gabriel Valley Council of Governments, will mitigate the impacts of significant increases in freight rail traffic on over 70 miles of mainline railroad in the San Gabriel Valley. The ACE Project consists of a comprehensive program of safety improvements and mobility upgrades at an estimated cost of $1.9 billion. It is anticipated to be completed by the summer of 2025. This project will relieve truck traffic from Long Beach and San Pedro to the Inland Empire region, thereby reducing truck traffic and congestion on the GP lanes; hence, reducing HOV lane degradation.

District 7 shared vehicle occupancy counts and violation data with the California Highway Patrol (CHP), so they can prioritize their enforcement efforts.

The HOV facility between Route 605 and the San Bernardino County Line will be converted to HOT lanes by December 2026 (EA 354310). If properly enforced for occupancy and toll violations, the new HOT lanes should operate at free-flow conditions using the pricing algorithm.

Brightline West High-speed Rail project between Las Vegas and southern California plans to break ground by the end of 2023. That would set the rail line up to be operational at the beginning of 2027. The diversion of people from auto and air travel to Brightline West's high-speed rail system reduces vehicle miles traveled by more than 700 million each year and the equivalent of 16,000 short haul flights annually.

4.4.5 ACTION PLAN FOR HOV FACILITIES ON ROUTE 14

A. Analysis

Afternoon peak period recurrent congestion in the GP lanes reduces HOV lane performance northbound around Newhall Ave (PM 2.2) and Sand Canyon Rd. (PM 8.66) (Fig. 4.4-13, and 4.4-14). The HOV lane is extremely or moderately degraded respectively at the two locations.

Vehicle volumes from I-5 northbound merge to northbound Route 14 in the PM and Lane drops in the GP lanes (from 5 to 3) at Newhall Avenue create a bottleneck in the northbound direction.

Lane drops in the GP lanes (from 3 to 2) at Sand Canyon Rd create a bottleneck in the northbound direction.

Morning peak period recurrent congestion in the southbound GP lanes reduces HOV lane performance between Agua Dulce Canyon Rd and Placerita Canyon Rd (PM 14.8-3.2). The HOV lane is extremely degraded between Via Princessa (PM 6.3) and Placerita Canyon Rd. The degradation is caused by several lane drops southbound close to Sand Canyon Road.

In 2019, the HOV lane buffer striping was replaced with continuous access striping for approximately 29 miles beginning 1.2 miles north of Via Princessa to Palmdale Blvd/Avenue P-8 (Technology Dr) (PM 32.06-60.7). This change increased solo violators using the continuous access portion of the HOV lane. The violation rate was 5.6 percent in 2018. After converting, it went to 8.6 percent in 2019, and 8.8 percent in 2021. The peak hour southbound/northbound flow was 1,257/1,498 vehicles/hour respectively in 2018, and 1,207/1,461 vehicles/hour respectively in 2021, with HOV degradation going from slightly/moderately to extremely degraded.

Demand exceeds capacity when three lanes drop to two, causing friction between HOV and GP lanes. During 1-hour peak hour, volumes on the two GP lanes and one HOV lane are 3,277 and 1,643 vehicles/hour, respectively.

Non-metered on-ramps allow platoons of vehicles to enter the freeway. When the opportunity occurs (local projects and/or dedicated funding), ramp metering equipment is installed.

Route 14 merging to the southbound Route 5 HOV lane causes delays in the southbound direction during morning peak traffic hours.

District 7 conducted 2022 manual counts showing that the CAV decal rate is up to 4.2 percent during peak hours; the solo violation rate is up to 6.7 percent; the truck rate is up to 6.8 percent.

Figures 4.4-13 and 4.4-14 provide plots of Northbound HOV and GP lane speeds during the fourth quarter of 2022. Figures 4.4-15 and 4.4-16 provide plots of southbound HOV and GP lane speeds during the same time.

FIGURE 4.4-13. AVERAGE HOV LANE SPEED – NORTHBOUND ROUTE 14, Q4 2022

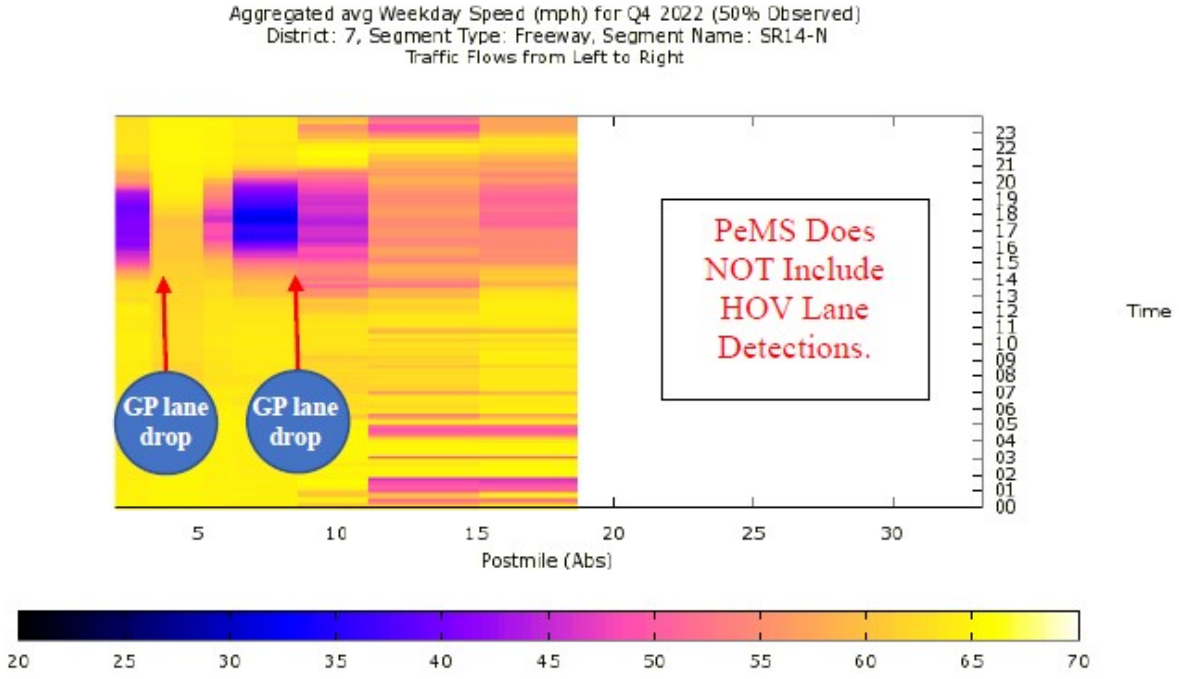


FIGURE 4.4-14. AVERAGE GP LANE SPEED – NORTHBOUND ROUTE 14, Q4 2022

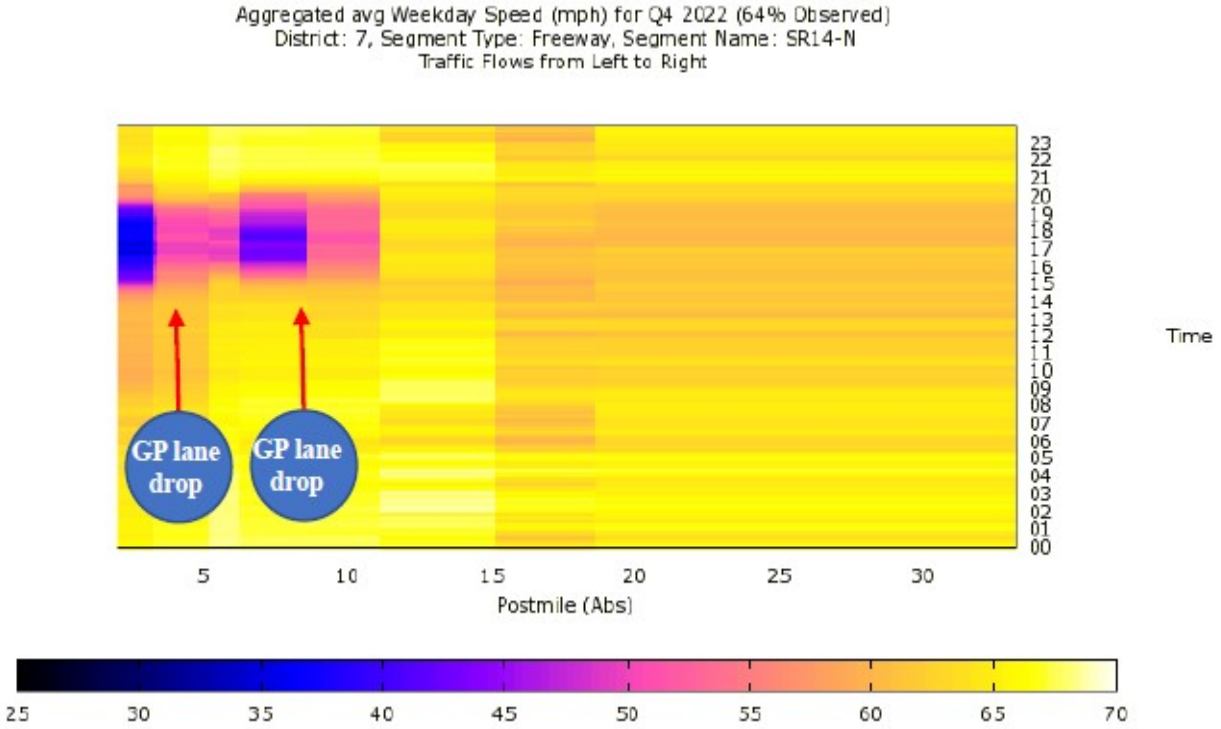


FIGURE 4.4-15. AVERAGE HOV LANE SPEED – SOUTHBOUND ROUTE 14, Q3 2022

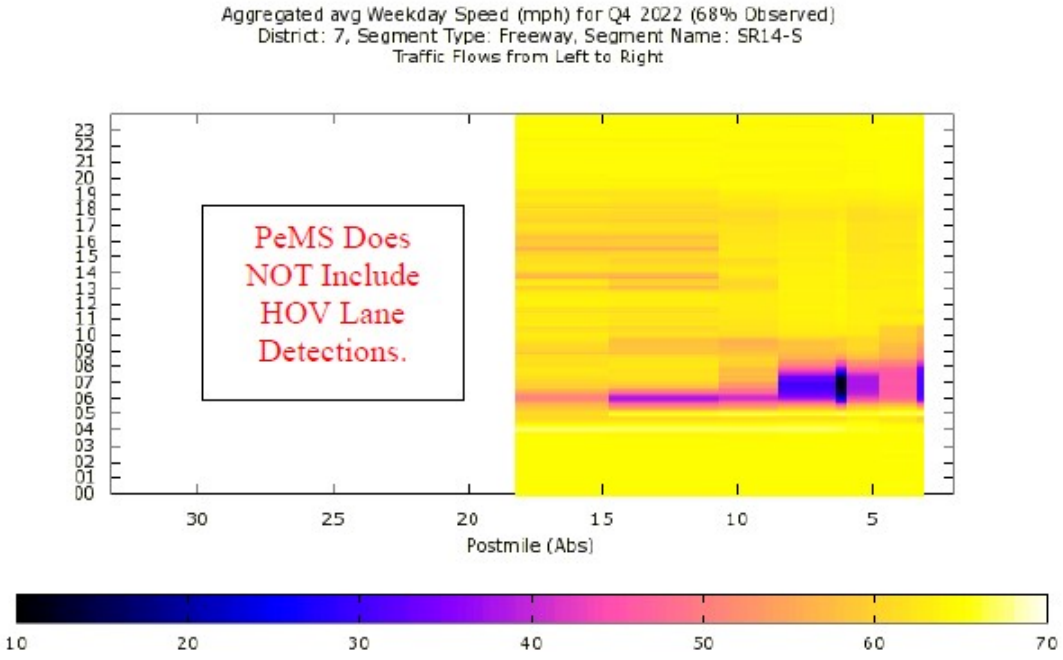
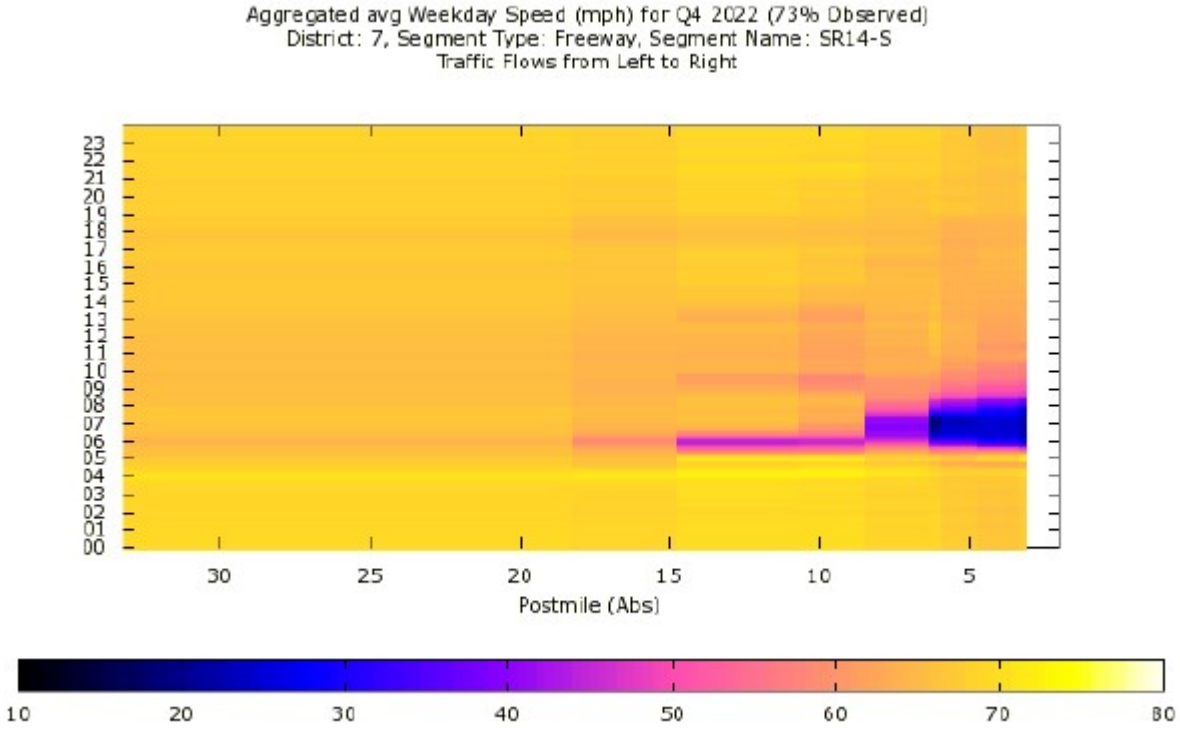


FIGURE 4.4-16. AVERAGE GP LANE SPEED – SOUTHBOUND ROUTE 14, Q3 2022



B. Remediation Strategies

Revert HOV striping to a limited access buffer, which existed before July 2019. Before being converted to continuous access, the limited access facility generated free flow "green" speeds throughout the northern segment. The SR-14 HOV lane operations before (with a limited access buffer) and after (with continuous access/no buffer) traffic analysis indicates that if the HOV limited access buffer is restored onto SR-14, it will result in at least 94 DVHD savings (14%) in the NB HOV Lane, and 209 DVHD savings (37%) in the southbound HOV lane. The SR-14 buffer reinstatement project has been entered into the Asset Management Tool for the 2024 State Highway Operation and Protection Program (SHOPP), and the DVHD calculations have been approved by Caltrans HQ. Project 07-39060 was initiated in June 2022, and it will convert continuous HOV access buffers to limited access buffers, between I-5 and Rancho Vista Blvd. The project initiation document (PID) was completed by June 2023.

Increase public awareness. Update HOV violation fine amount on the existing signs to the current amount. Improve HOV signage (regulatory and enforcement signs) and pavement marking on SR-14. Additional or enhanced signing and markings at the beginning and along the HOV lanes need to be installed, if the HOV buffer is not re-instated. (Note, the SR-14 Buffer reinstatement project has been entered into the Asset Management Tool for the 2024 SHOPP, and the DVHD calculations have been approved by Caltrans HQ.)

District 7 evaluated possible pavement delineation restriping to eliminate the lane-drop configuration. Unfortunately, this was found to be not feasible at this time.

Project 07-29890 includes widening the Route 14 mainline from Technology Drive to Palmdale Boulevard and widening northbound Rancho Vista Boulevard off-ramp after the deceleration segment. The project plans also include realigning the off-ramp terminus, replacing signals at the ramp terminus, and synchronizing signal timing. The project is in the construction phase and is led by the City of Palmdale. Construction completion is expected in October 2025. This should reduce congestion in the GP lanes, thereby reducing HOV degradation caused by the friction factor between HOV and GP lanes.

Metrolink developed the Southern California Optimized Rail Expansion (SCORE) plan in partnership with freight and intercity rail operators as a roadmap to increase rail service to accommodate expected population and job growth in advance of 2028, when Los Angeles will host the Olympics. SCORE will fund the construction of a new station in Santa Clarita. This should reduce demand for the SR-14 freeway, thereby reducing congestion in the GP lanes, and hence

reducing HOV degradation.

Meter HOV preferential lanes at on-ramps. Work is in progress. Various routes are in different stages subject to project funding within the corridor. District 7 will receive approximately $8 million in the 2024 State Highway System Management Plan (SHSMP)/SHOPP funding. District 7 has been entering HOV Degradation Mitigation into the Asset Management Tool for existing projects involving ramp work and estimates that about 15 percent of the total DVHD reduction would come from metering the HOV preferential lanes.

Construction of HOV and truck lanes on Route 5 from Route 14 to Parker Road (07-2332E4) will ease traffic delays and absorb the growth of traffic due to increased population and surrounding communities – both residential and commercial. Construction began in 2020; construction completion is expected in early 2025. The estimated construction cost is $525 million.

California High Speed Rail service between Bakersfield/Palmdale to Los Angeles Union Station is expected to be complete prior to the 2028 Olympics. In April 2020, the California High-Speed Rail Authority (Authority) Board of Directors approved a preliminary funding plan with Los Angeles County Metropolitan Transportation Authority (Metro) to move the Link Union Station (Link US) project forward in Southern California. The funding plan details the release of $423 million in Prop 1A funds for the first phase of the Link US project featuring "run through" tracks crossing over the US-101 freeway. The HSR would provide benefits to the regional transportation system by reducing the number of vehicles operating on the regional roadway network through diversion of intercity road trips to HSR. In 2040, implementation of the HSR would result in a net reduction in vehicle miles traveled ranging from about 931 million to 1.28 billion (an approximately 1.1 percent to 1.5 percent reduction) for the medium and high ridership scenarios, respectively, compared to the No Project Alternative. This is a net benefit to transportation and traffic operations because a reduction in vehicle miles traveled helps maintain or potentially improve the operating conditions of regional roadways. This reduction in future vehicle trips would improve the level-of-service (LOS) (i.e., operating quality) of the regional roadway system.

District 7 shared vehicle occupancy counts and violation data with the California Highway Patrol (CHP), so they can prioritize their enforcement efforts.

4.4.6 ACTION PLAN FOR HOV FACILITIES ON ROUTE 57

Project Updates

Route 57 did not appear as a degraded facility in the 2022 degradation report due to insufficient data for analysis. However, as the HOV facility on Route 57 experienced degradation in 2021, this report includes project updates for Route 57.

- No data was available for Route 57 due to an ongoing major construction project (EA 07-30450). HOV lanes on Route 57 were temporary decommissioned during construction to accommodate lane reduction and lateral shift. EA 07-30450 will rehabilitate Route 57 pavement from Orange County Line to Route 60/57 Separation. This Capital Preventive Maintenance Project will replace distressed individual slabs along all lanes for both Northbound (NB) and Southbound (SB) directions. The project will also apply Lane Replacement Strategy (lanes 3 and 4) for SB, and NB from Cold Spring Lane to Pathfinder Road (approximately 3,400 feet) with Jointed Plain Concrete Pavement-Rapid Set Concrete. Construction started in October 2022 and is expected to be completed by March 2025. This project will replace all loop detectors and install ramp meters for the on-ramp HOV lanes. Repairing the vehicle detector systems will improve data collection and traffic monitoring.

4.4.7 ACTION PLAN FOR HOV FACILITIES ON ROUTE 60

A. Analysis

Afternoon peak period recurrent congestion in all lanes reduces both eastbound and westbound HOV lane performance and speed.

On eastbound, The HOV lane is slightly degraded between Crossroads Pkwy (12.85) and Azusa Ave (18.29), and extremely/moderately/slightly degraded between Fairway Dr. (PM 21.14) and Reservoir St (PM 30.512).

On westbound, the HOV lane is extremely degraded at West of Grand Ave (PM 24.34) and a few other locations are slightly degraded.

Morning peak period recurrent congestion in all lanes reduces both direction HOV lanes' performance and operating speeds which causes slight degradation (in a few locations) on the eastbound HOV lane and moderate degradation on the westbound HOV lane between Philips Ranch Rd (PM28.14) and Reservoir St (PM 30.34).

High truck volume (12.2 percent average, 22 percent at Nogales Street (PM 20.4)) affecting HOV due to reduced freeway operating speeds and friction factor in

both directions; truck congestion on uphill grades on eastbound.

High volume due to the merging of Route 57 and Route 60 together. Field occupancy counts provide visual observations of traffic patterns, whereby the right two lanes are congested with two continuous lanes of trucks, leaving other vehicles with only the two left lanes to use. This results in increased violation rates in the HOV lane.

Demand exceeds capacity. The average flow on the eastbound HOV lane at Phillips Ranch Rd is 1,700 vehicles/hour during a 1-hour peak period).

The CAV decal rate is up to 8.9 percent during peak hours and the solo violation rate is up to 15.1 percent.

Figures 4.4-17 and 4.4-18 provide plots of eastbound HOV and GP lane speeds on Route 60 during the fourth quarter of 2022. Figures 4.4-19 and 4.4-20 provide plots of westbound HOV and GP lane speeds on Route 60 during the third quarter of 2022.

FIGURE 4.4-17. AVERAGE HOV LANE SPEED – EASTBOUND ROUTE 60, Q4 2021

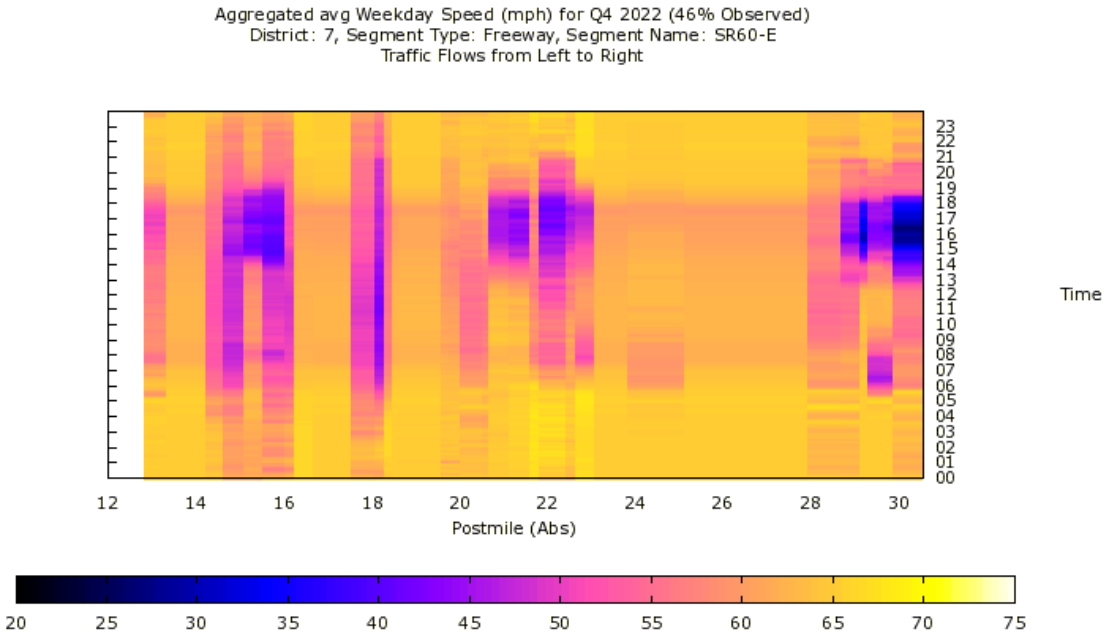


FIGURE 4.4-18. AVERAGE GP LANE SPEED – EASTBOUND ROUTE 60, Q4 2021

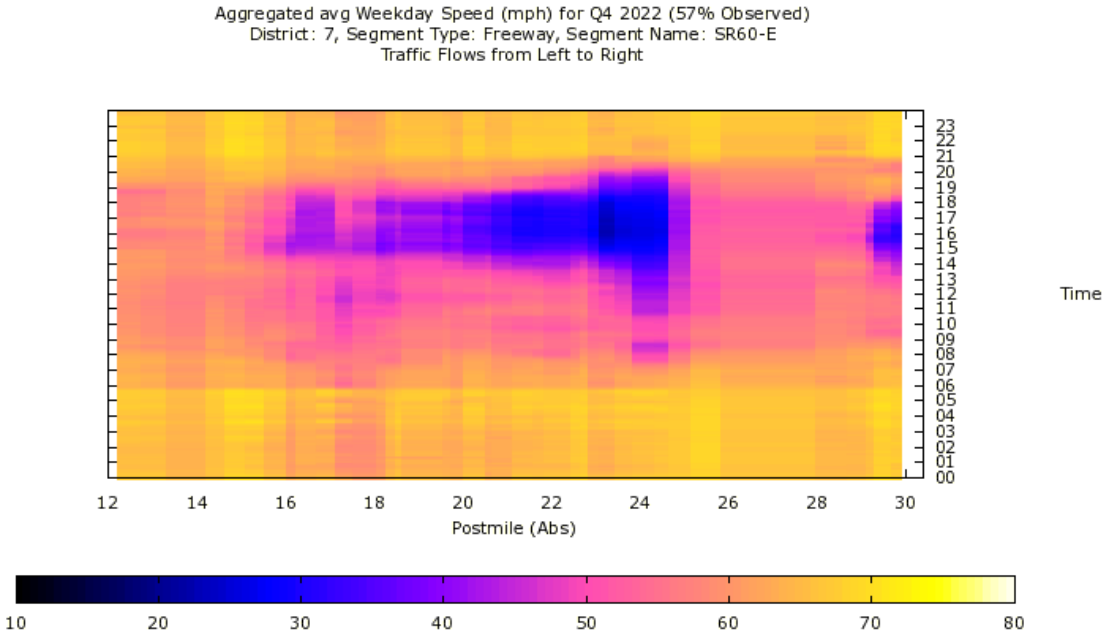


FIGURE 4.4-19. AVERAGE HOV LANE SPEED – WESTBOUND ROUTE 60, Q4 2021

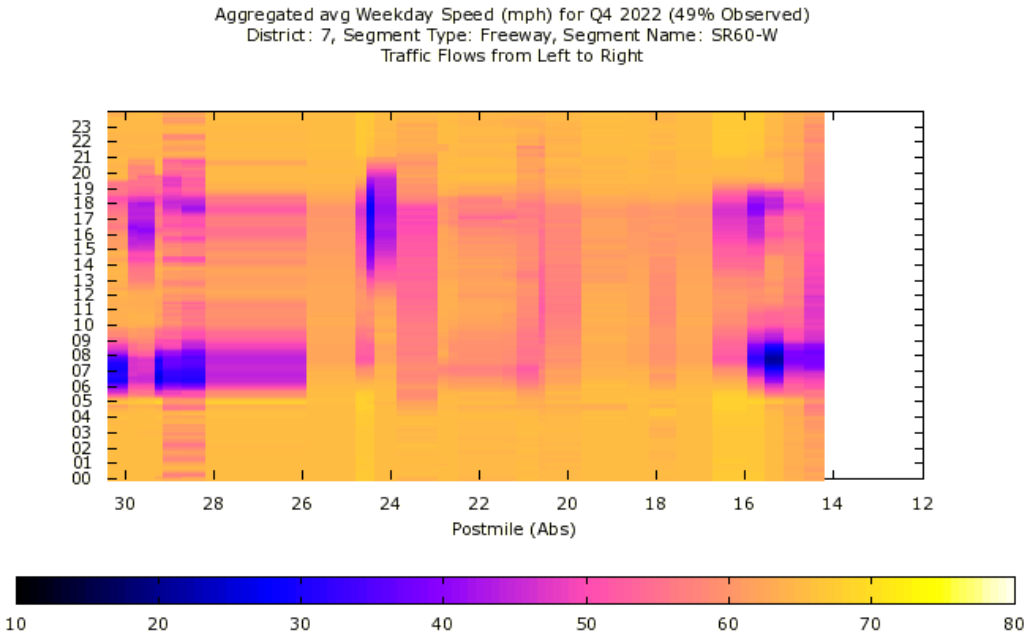
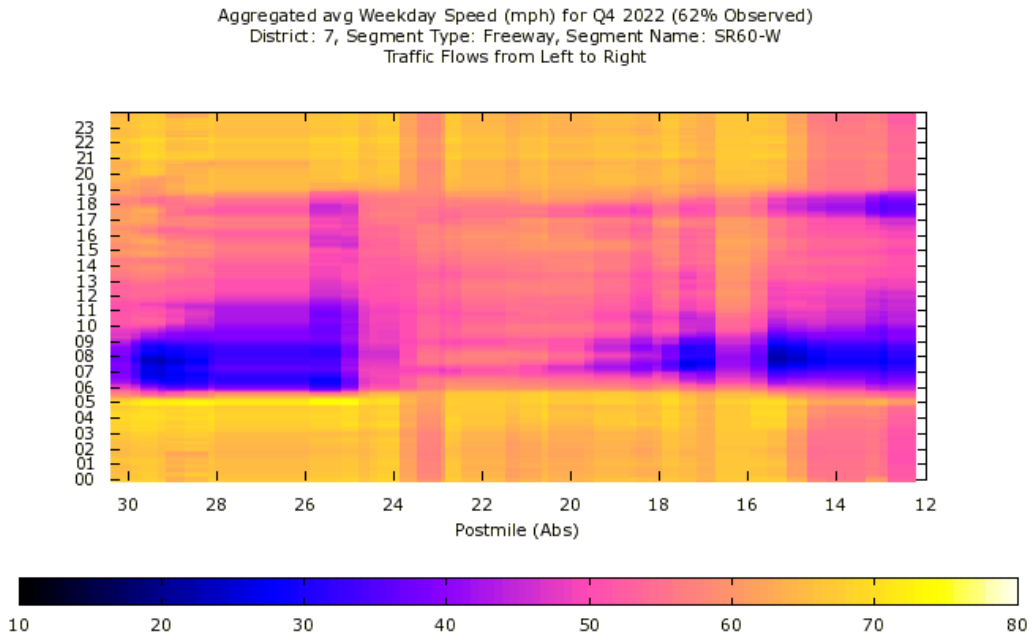


FIGURE 4.4-20. AVERAGE GP LANE SPEED – WESTBOUND ROUTE 60, Q4 2021



B. Remediation Strategies

Project 07-3101U, Route 605/Route60 Corridor Improvement Project (CIP), will make the following improvements:

- Add through-lane at Route 605/Route 60 interchange on Route 60, add through-lane within the Route 605/Route 60 system interchange on Route 60 in the westbound direction.
- Add eastbound Route 60 auxiliary for Route 605 northbound and southbound connectors.
- Add eastbound Route 60 auxiliary lane from northbound Route 605 connector to the Crossroads Parkway off-ramp.
- The existing eastbound Route 60 auxiliary lane from northbound Route 605 connector will be extended through the Crossroads Parkway interchange to 7th Avenue off-ramp.
- An additional westbound Route 60 auxiliary lane is proposed from Hacienda Boulevard to 7th Avenue interchange where it joins an existing auxiliary lane (previously from 7th Avenue to Crossroads Parkway).
- An additional westbound Route 60 auxiliary lane is proposed through Crossroads Parkway interchange until it reaches the northbound and southbound Route 605 connectors.

Dates for this project: RTL 2025, construction to begin 2028, and completion 2031. The estimated construction cost is $2.8 billion. This project will reduce congestion on GP lanes, and increase connectivity with the 605 freeway, thereby reducing HOV degradation.

- Project 07-27912 proposes freeway improvements to the Route 57/60 confluence at the Grand Avenue interchange in Los Angeles County. During peak periods, demand exceeds the capacity for both routes in the vicinity of the interchange, resulting in delays with the Level of Service (LOS) at 'F' for many hours. This project is led by Metro and began construction in June 2023. The estimated construction cost is $274 million. Construction completion is expected in 2030. The project plans to significantly modify the GP lanes for Northbound SR-57 and Eastbound SR-60 to ease congestion and delays on the mainline, reduce weaving at the Grand Avenue interchange, and improve HOV speed due to reduced GP freeway operating speeds and friction factors.
- Project 07-30110 (PM 2.8R/11.8) includes pavement rehabilitation and stormwater treatment facilities that the Route 605 CIP team has been coordinating. Anticipated completion in 2025. The estimated construction cost is $135 million. This project should improve the detector systems for Route 60 GP and HOV monitoring.
- Project 07-32780 proposes two dedicated truck lanes along the median of Route 60, freeway widening, interchange re-configurations, intersection re- configurations, ramp realignments, structure widening and replacement, retaining wall construction, and Right of Way acquisition. Anticipated completion in 2031. This project should reduce truck traffic and congestion on the GP lanes, and hence reduce HOV degradation.
- The Alameda Corridor-East (ACE) Project, funded by the San Gabriel Valley Council of Governments, will mitigate the impacts of significant increases in freight rail traffic on over 70 miles of mainline railroad in the San Gabriel Valley. The ACE Project consists of a comprehensive program of safety improvements and mobility upgrades at an estimated cost of $1.9 billion. This project will relieve truck traffic from Long Beach and San Pedro to the Inland Empire region. It is anticipated to be completed by the summer of 2025. This project should reduce truck traffic and congestion on the GP lanes, and hence reduce HOV degradation.
- Brightline West High-speed Rail project between Las Vegas and southern California plans to break ground by the end of 2023. That would set the

rail line up to be operational at the beginning of 2027. The diversion of people from auto and air travel to Brightline West's high-speed rail system reduces vehicle miles traveled by more than 700 million each year and the equivalent of 16,000 short haul flights annually.

- District 7 shared vehicle occupancy counts and violation data with the California Highway Patrol (CHP), so they can prioritize their enforcement efforts.
- District 7 plans to initiate a pilot project to study real-time occupancy using Automated Vehicle Occupancy Detection (AVOD). Occupancy detector cameras and special signs (to remind drivers about the AVOD cameras) will be installed at locations with high violation rate. District 7 will coordinate with District 3 and District 12 for funding and the best camera option to capture images without revealing commuters' identity will be selected.

4.4.8 ACTION PLAN FOR HOV FACILITIES ON ROUTE 91

Analysis

Afternoon period recurrent congestion in all lanes reduces HOV lane performance and speed on eastbound. The HOV lane is extremely degraded at Wilmington Ave (PM 3.1), Long Beach Blvd (PM 5.0), Downey Ave (PM 8.2) and Studebaker Rd (PM 11.4). The rest of the eastbound HOV facilities are slightly/very degraded during PM peak hours.

During Morning peak hours, there is a slight degradation at Norwalk Blvd (PM 12.8) on the eastbound HOV facility.

Morning and afternoon peak period recurrent congestion in all lanes reduces HOV lane performance and speed on westbound. During AM and PM peak hours, most of the westbound HOV lane is slightly/very degraded. During PM peak hours, the extremely degraded segment is between Norwalk Blvd. and 183rd St. (PM 12.7-14.1).

Demand exceeds capacity with an average volume of 1,400 vehicles/hour during the 1-hour peak period in the HOV lane.

The average truck rate is 7.3 percent, up to 9.1 percent at Carson, Avalon Boulevard Interchange (PM R7.426).

GP lane drops at the Route 710 interchange and Route 605 interchange reduce capacity resulting in a bottleneck.

Vehicle weaving conflicts at ingress/egress locations due to congestion in the

GP lanes.

High solo violation rates in the westbound direction, at Bloomfield Ave (PM 19.17), are up to 19.2 percent. The CAV decal rate is up to 10.3 percent.

Figures 4.4-21 and 4.4-22 provide plots of eastbound HOV and GP lane speeds on Route 91 during the fourth quarter of 2022. Figures 4.4-23 and 4.4-24 provide plots of westbound HOV and GP lane speeds on Route 91 during the fourth quarter of 2022.

FIGURE4.4-21. AVERAGE HOV LANE SPEED – EASTBOUND ROUTE 91, Q4 2021

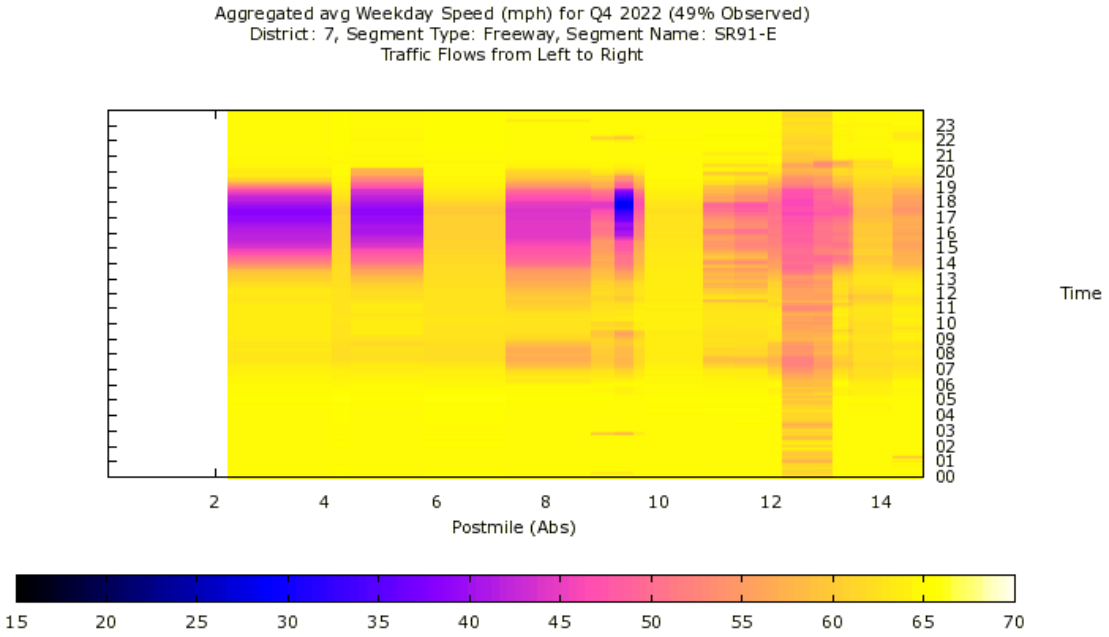


FIGURE 4.4-22. AVERAGE GP LANE SPEED – EASTBOUND ROUTE 91, Q4 2021

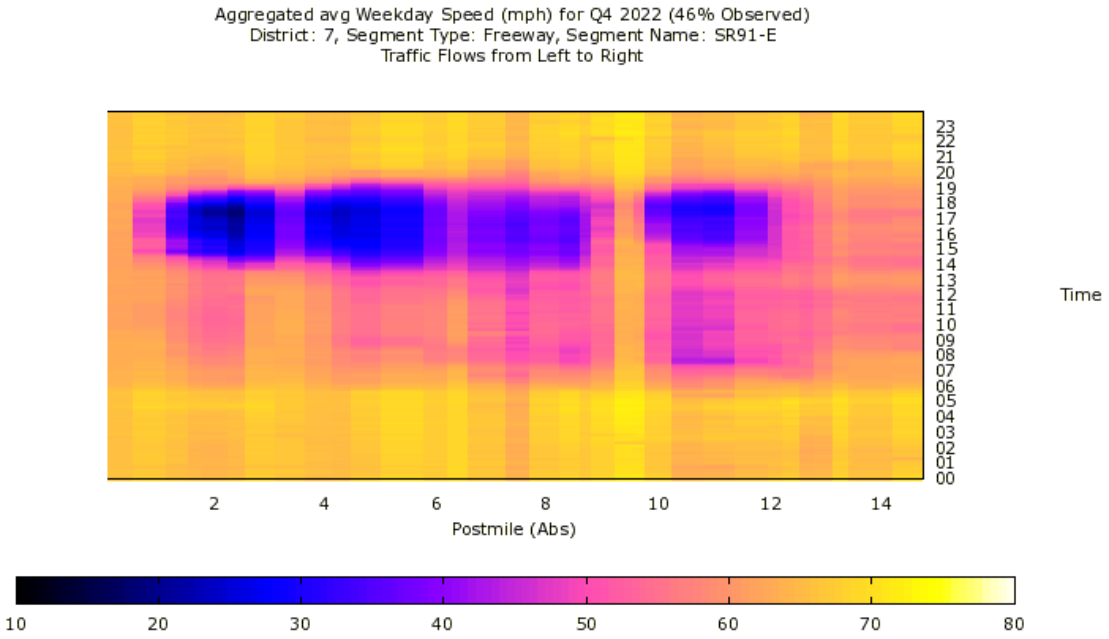


FIGURE 4.4-23. AVERAGE HOV LANE SPEED – WESTBOUND ROUTE 91, Q4 2021

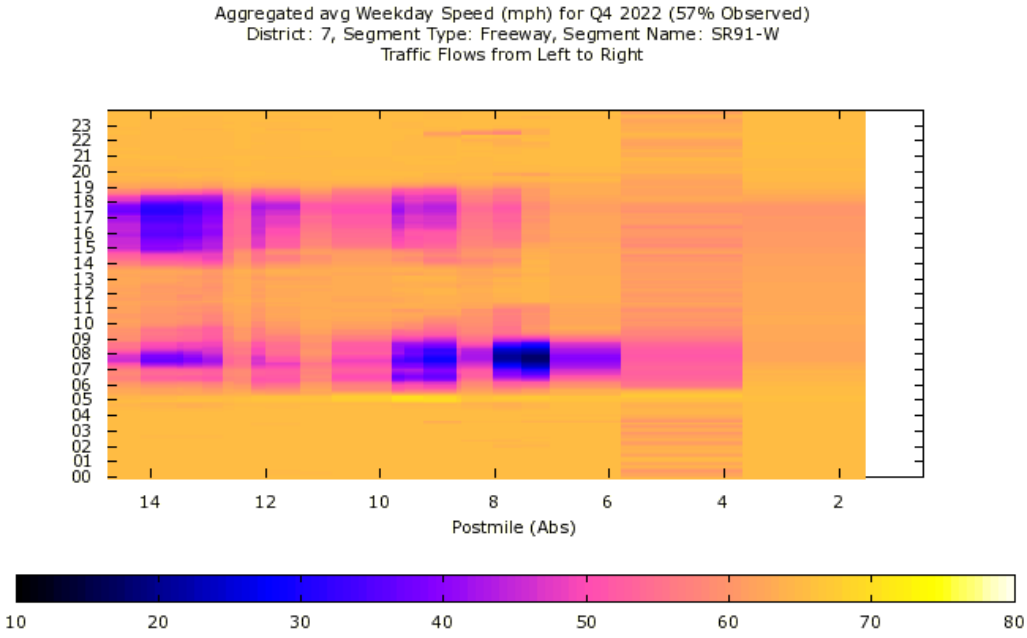
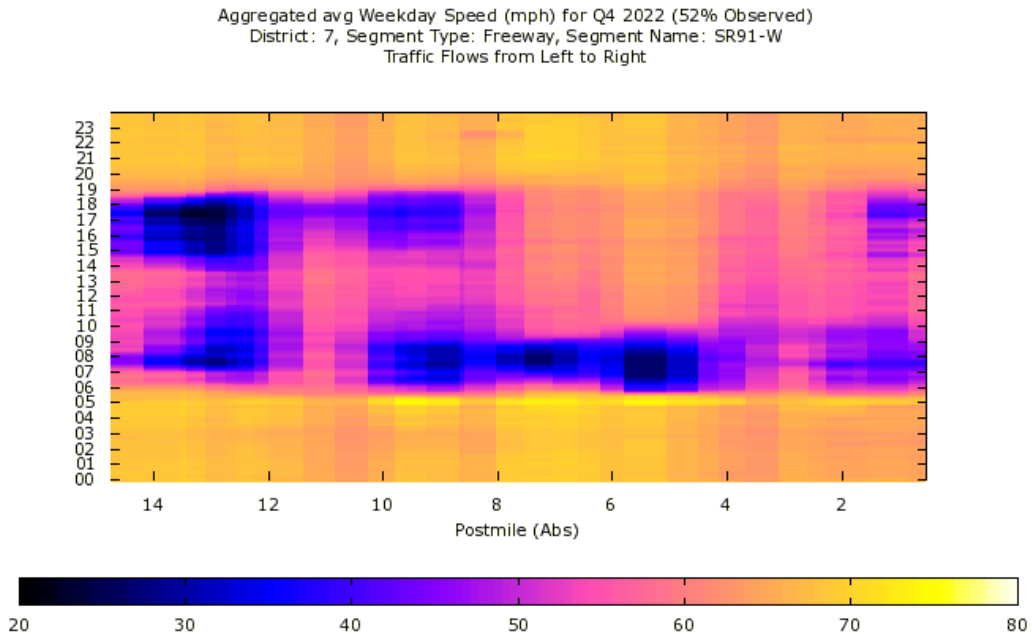


FIGURE 4.4-24. AVERAGE GP LANE SPEED – WESTBOUND ROUTE 91, Q4 2021



A. Remediation Strategies

The Metro West Santa Ana Branch Transit Corridor (WSAB) light rail transit (LRT) line will connect southeast LA County to downtown Los Angeles, serving the cities and communities along Route 5. The WSAB Project is a 19-mile corridor. Undergoing an Environmental Impact Statement (EIS)/Environmental Impact Report (EIR) process is expected for Metro Board certification in 2024. The current project cost is estimated to be $6.5-$6.6B (in 2018 dollars). Opening is expected in 2035. This project should reduce demand and congestion on the GP lanes, and hence reduce HOV degradation.

The future GP lane projects (07-29810, 07-35460, and 07-35920) create collector road arterials, eliminating multiple on/off ramps within close proximity of one another, which will reduce the weaving maneuvers between the HOV and GP lanes and reduce HOV degradation caused by the friction factor.

- Project 07-29810 will widen the freeway by adding one to two lanes along Route 91 from Paramount Boulevard to Shoemaker Avenue. Construction began in April 2023, with anticipated completion in 2027. The estimated project cost is $450 million. This project should reduce congestion on the GP lanes, and hence reduce HOV degradation caused by the friction factor.

- Project 07-35460 will add one auxiliary lane in the eastbound direction, extending the outside #5 lane beyond the Atlantic Avenue eastbound off-ramp to Cherry Avenue then dropping it before the Cherry Avenue undercrossing, and widening the Orange Avenue and Walnut Avenue The estimated project cost is $6.7 million. Construction will begin in April 2023, with anticipated completion in 2026. This project should reduce congestion on the GP lanes, and hence reduce HOV degradation caused by the friction factor.
- Project 07-35920 proposes to add two frontage road lanes mainly for trucks. This project will address the weaving issues caused by a closely spaced on/off-ramp near the system interchange. Closely spaced ramps have created vehicle weaving conflict at ingress/egress locations due to congestion on the GP lanes and frontage road. The estimated project cost is $120 million. Construction will begin in 2024, with anticipated completion in 2025. This project should reduce truck traffic and congestion on the GP lanes, and hence reduce HOV degradation caused by the friction factor.
- District 7 shared vehicle occupancy counts and violation data with the California Highway Patrol (CHP), so they can prioritize their enforcement efforts.
- District 7 plans to initiate a pilot project to study real-time occupancy using Automated Vehicle Occupancy Detection (AVOD). Occupancy detector cameras and special signs (to remind drivers about the AVOD cameras) will be installed at locations with high violation rates. District 7 will coordinate with District 3 and District 12 for funding and the best camera option to capture images without revealing commuters' identity will be selected.
- Brightline West High-speed Rail project between Las Vegas and southern California plans to break ground by the end of 2023. That would set the rail line up to be operational at the beginning of 2027. The diversion of people from auto and air travel to Brightline West's high-speed rail system reduces vehicle miles traveled by more than 700 million each year and the equivalent of 16,000 short-haul flights annually.

4.4.9 ACTION PLAN FOR HOV FACILITIES ON ROUTE 105

Project Updates

Route 105 did not appear as a degraded facility in the 2022 degradation report

due to insufficient data for analysis. However, as the HOV facility on Route 105 experienced degradation in 2021, this report includes project updates for Route 105.

Project 07-31450 will convert the existing HOV lanes to HOT lanes and add a second HOT lane in each direction. The project improvement limits include Route 105 from Imperial Highway/Sepulveda Boulevard Intersection (west of Route 405) in the City of Los Angeles, to Studebaker Road (east of Route 605) in the City of Norwalk, in Los Angeles County. The scope of work includes converting the existing HOV lane to one ExpressLane and add a second ExpressLane in each direction (total of two Tolled ExpressLanes in each direction with discounts for HOV). The scope of project will also include HOV bypass lanes ramp metering to all on-ramps not currently metered and replace all loop detectors. This project will enhance operations and improve trip reliability, travel times, traffic flow, and manage mobility within the Route 105 corridor. Construction is expected to begin in 2024, with anticipated completion in 2028. The estimated construction cost is $741 million.

4.4.10 ACTION PLAN FOR EXPRESSLANE/HOV FACILITIES ON ROUTE 110

Project Updates

- Route 110 did not appear as a degraded facility in the 2022 degradation report due to insufficient data for analysis. However, as the HOV facility on Route 110 experienced degradation in 2021, this report includes project updates for Route 110.
- The "Pay as you go" program began in June 2023. Drivers without a transponder can expect to pay $8 plus the posted toll rate.
- Metro reports that ECIM (ExpressLane data) is still not flowing into TMC (ATMS/PEMS).
- The “Pay as you go” program began in June 2023. Metro claims that this program will reduce the violation rate on ExpressLane and relieve congestion on the Route 10 and 110 freeways.

No data is available for 2022 due to a construction project (EA 07-31200) to replace Vehicle Detection Stations (VDS). Project 07-31200 is currently under construction since 2020. This Congestion Relief project will replace existing copper cables with fiber optic cables at all Ramp Metering Systems (RMS) and Vehicle Detection Stations (VDS) along the entire length of HOT lanes in both directions. The expected completion of this project is in March 2024.

4.4.11 ACTION PLAN FOR HOV FACILITIES ON ROUTE 118

A. Analysis

- Afternoon peak period recurrent congestion in all lanes reduces HOV lane performance and speed on two eastbound segments (Fig. 4.4-25 and 4.4-26).
    - The segment between De Soto Ave. (PM 36.33) and Chimineas Ave. (PM 39.931) has only four GP lanes. The congestion on GP lanes (Fig. 26) causes the friction factor between an HOV lane and GP lanes (Fig. 25 and 26), hence the HOV lane is degraded.
    - High solo violation rates at Porter Ranch Rd (PM 35.8). District 7's 2021 Manual Occupancy Data indicates that the HOV violation rate is up to 11.2 percent.
    - The segment between Hayvenhurst Ave (PM 42.04) and Columbus Ave (PM 43.83) is slightly degraded because the HOV lane ends, the added demand from Route 405, and the motorists transitioning to Route 5 and/or continuing to Route 210 causes multiple weaving maneuvers across the freeway.
- Morning peak period slight degradation, at Route 118 merging to Route 5 (PM 42.5,) is observed on the westbound HOV lane.
- Two lane drops on GP lanes (on southbound Route 5) contribute to congestion on GP lanes and then cause the friction factor for the HOV lane.
- Route 118 HOV lane ends and merges into the GP lane before Route 5.
- High weaving volumes from Route 405.
- The solo violation rate is up to 11.2 percent at Porter Ranch Dr. (PM 35.8) in both directions during peak hours.

Figures 4.4-25 and 4.4-26 provide plots of eastbound HOV and GP lane speeds along the length of the HOV facility on Route 118 during the fourth quarter of 2022. Figures 4.4-27 and 4.4-28 provide plots of westbound HOV and GP lane speeds on Route 118 during the fourth quarter of 2022.

FIGURE 4.4-25. AVERAGE HOV LANE SPEED – EASTBOUND ROUTE 118, Q4 2022

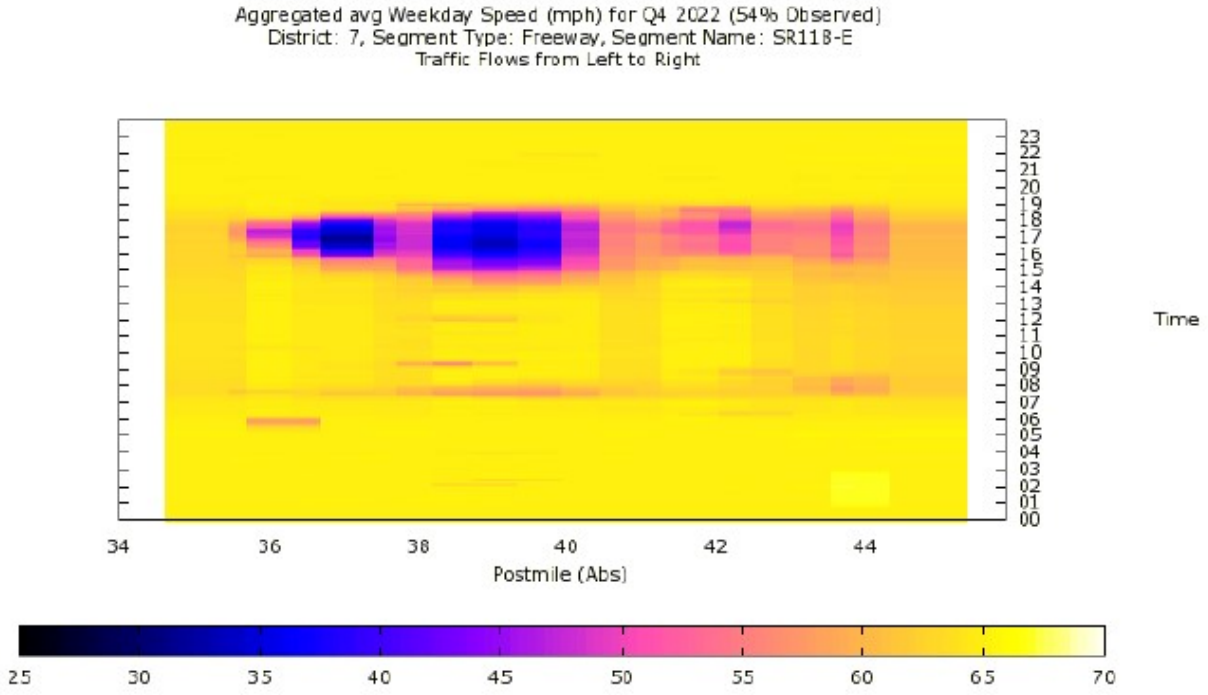


FIGURE 4.4-26. AVERAGE GP LANE SPEED – EASTBOUND ROUTE 118, Q4 2022

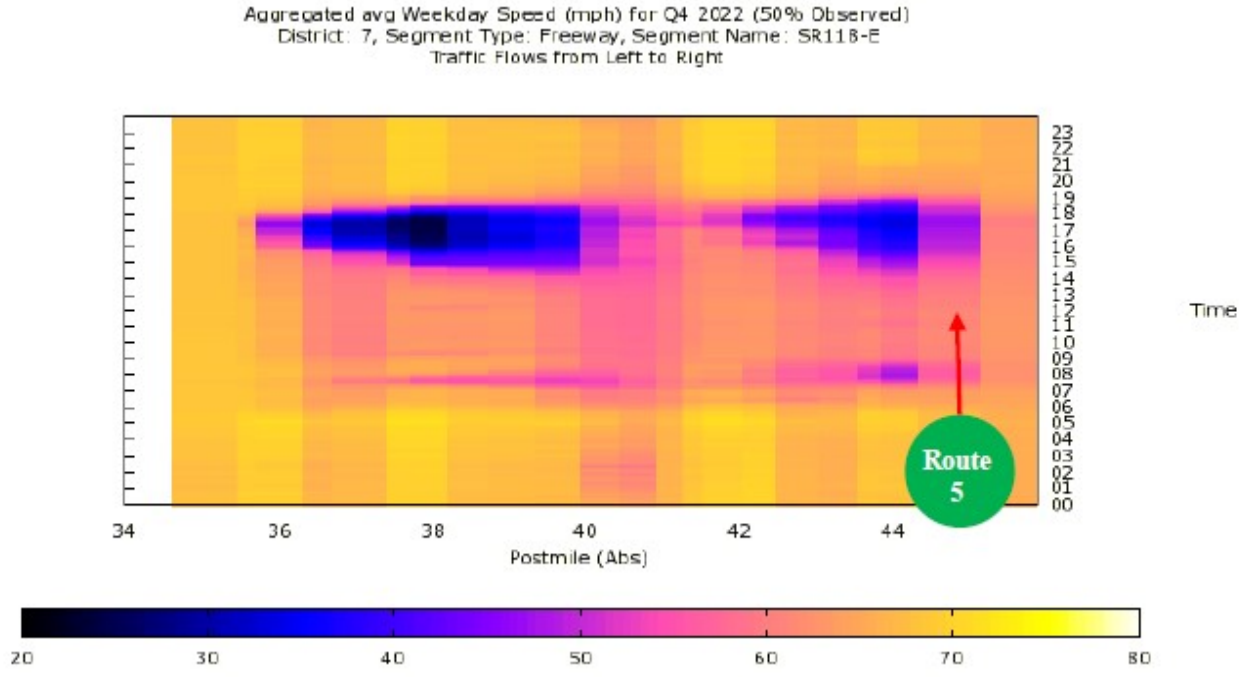


FIGURE 4.4-27. AVERAGE HOV LANE SPEED – WESTBOUND ROUTE 118, Q4 2022

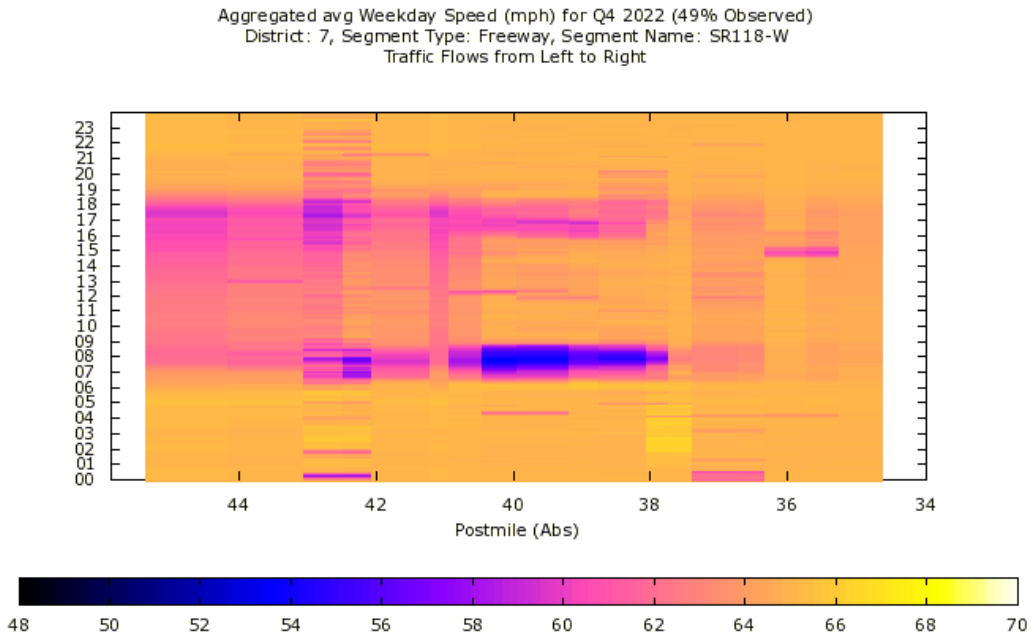
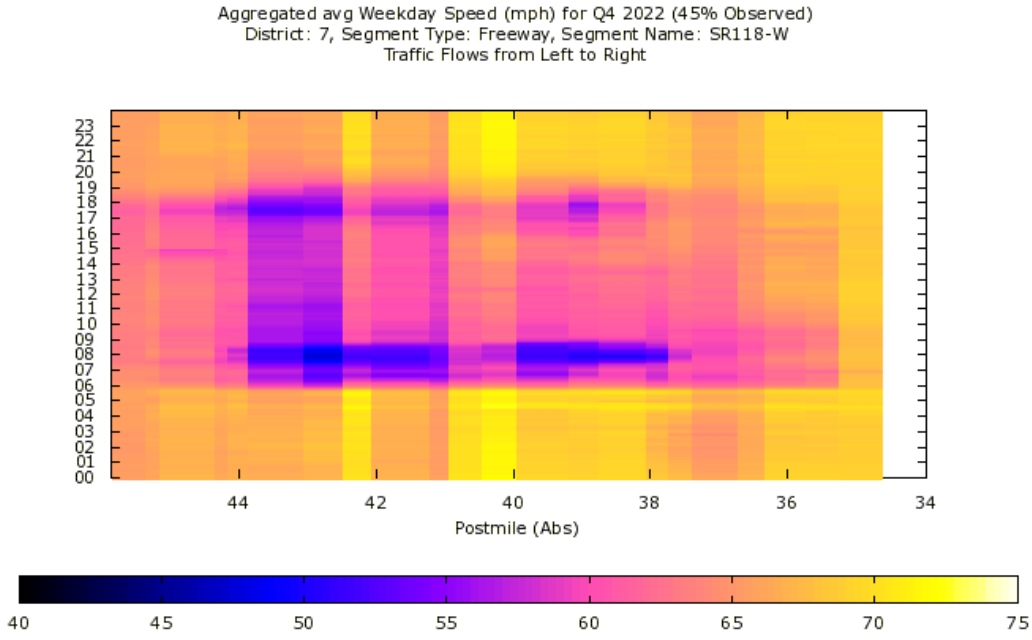


FIGURE 4.4-28. AVERAGE GP LANE SPEED – WESTBOUND ROUTE 118, Q4 2022



Remediation Strategies

Metro is implementing the North Hollywood to Pasadena Bus Rapid Transit (BRT) Corridor, an 18-mile-long BRT project which will be a key regional connection between the San Fernando and San Gabriel Valleys with connections to the Metro Red, Orange, and Gold Lines, as well as Metrolink and other municipal bus lines. Metro has added a Route 134 route option in the Eagle Rock portion of the study area. This project is funded by Measure M and Senate Bill 1, which provide $267 million in funding. The Project has an anticipated opening date in 2024. This project is expected to relieve traffic congestion on Route 118, hence reducing HOV degradation.

Route Shield Pavement Markers (RSPM) will be installed between Sepulveda Blvd and Route 5 eastbound, where 118 HOV lane ends and merges into the GP lane before Route 5. The RSPM will reduce the congestion due to the drivers' confusion of multiple weaving maneuvers across the freeway.

Meter HOV preferential lanes at on-ramps between De Soto Ave. (PM 36.3 and Chimineas Ave. (PM 39.9), if the number of vehicles meets the criteria of the Ramp Metering Design Manual during peak hours.

District 7 shared vehicle occupancy counts and violation data with the California Highway Patrol (CHP), so they can prioritize their enforcement efforts.

District 7 will review the existing lane configuration of the Route 118 eastbound to Route 5 southbound connector ramp, to possibly eliminate the lane drops on the connector, through re-striping of the pavement delineation.

4.4.12 ACTION PLAN FOR HOV FACILITIES ON ROUTE 134

Project Updates

Route 134 did not appear as a degraded facility in the 2022 degradation report due to insufficient data for analysis. However, as the HOV facility on Route 134 experienced degradation in 2021, this report includes project updates for Route 134.

- HOV facilities on Route 134 are split in two at the interchange with Route 5. These action plans cover the entire route. In 2022 no data was collected due to Rehab project (EA 07-31170) to replace 222 traffic loop detectors.
- A Capital Preventive Maintenance Project (EA 07- 31170) on Route 134 from Route 101 to Route 210 will rehabilitate 112 lane miles of existing pavement and grind HOV lanes. This project will also replace 222 traffic loop detectors. Construction began in May 2020, with anticipated completion

in March 2024.

Metro is implementing the North Hollywood to Pasadena Bus Rapid Transit (BRT) Corridor, a 19-mile-long BRT project which will be a key regional connection between the San Fernando and San Gabriel Valleys with connections to the Metro Red, Orange, and Gold Lines, as well as Metrolink and other municipal bus lines. Metro has added a Route 134 route option in the Eagle Rock portion of the study area. This project is funded by Measure M and Senate Bill 1, which provide $267 million in funding. The Project has an anticipated opening date in 2024. This project is expected to relieve traffic congestion on Route 134. No traffic analysis was done on Route 134 from Final Environmental Impact Report (FEIR) published on April 28, 2022.

District 7 shared vehicle occupancy counts and violation data with the California Highway Patrol (CHP) to prioritize enforcement efforts.

4.4.13 ACTION PLAN FOR HOV FACILITIES ON ROUTE 210

Analysis

Afternoon peak period recurrent congestion in all lanes reduces HOV lane performance and speed in both directions and morning peak period recurrent congestion in all lanes reduces HOV lane performance and speed on westbound (Fig. 4.4-29-32). The eastbound HOV lane is extremely degraded during PM peak hours.

Demand exceeds capacity. During the peak period, the average volume of the HOV lane is 1,630 vehicles/hour in congested locations.

Eastbound GP lane drops at El Molino Avenue, Rosemead Boulevard, and San Dimas Avenue cause bottlenecks.

Vehicle weaving conflicts at ingress/egress locations due to congestion in the GP lanes.

High CAV decal rates. District 7's 2022 Manual Occupancy Data shows the decal rate is up to 8.7 percent in both directions during peak hours. The solo violation rate is up to 29.5 percent at Wilson (PM 26.6) westbound during PM peak hours.

Route 210 also has a very high truck volume (approximately 6.8 percent) that connects the Port of Los Angeles to northern Los Angeles County.

Figures 4.4-29 and 4.4-30 provide plots of eastbound HOV and GP lane speeds on Route 210 during the fourth quarter of 2022. Figures 4.4-31 and 4.4-32 provide

plots of westbound HOV and GP lane speeds on Route 210 during the fourth quarter of 2022.

FIGURE 4.4-29. AVERAGE HOV LANE SPEED – EASTBOUND ROUTE 210, Q4 2022

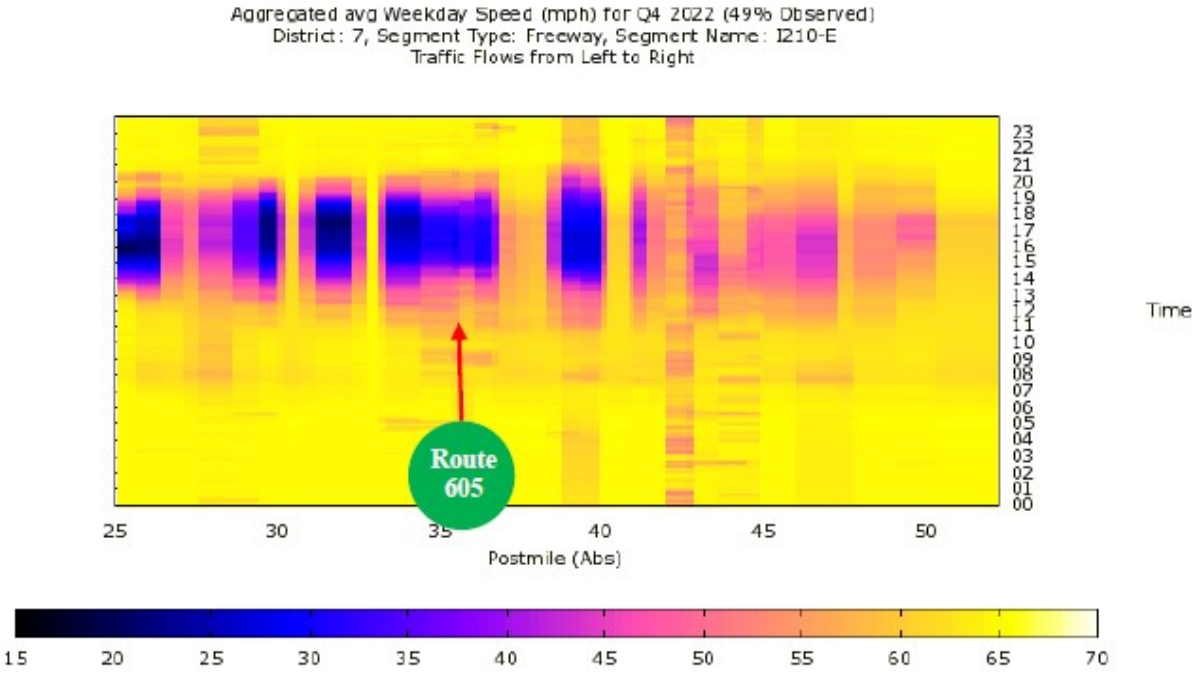


FIGURE 4.4-30. AVERAGE GP LANE SPEED – EASTBOUND ROUTE 210, Q4 2022

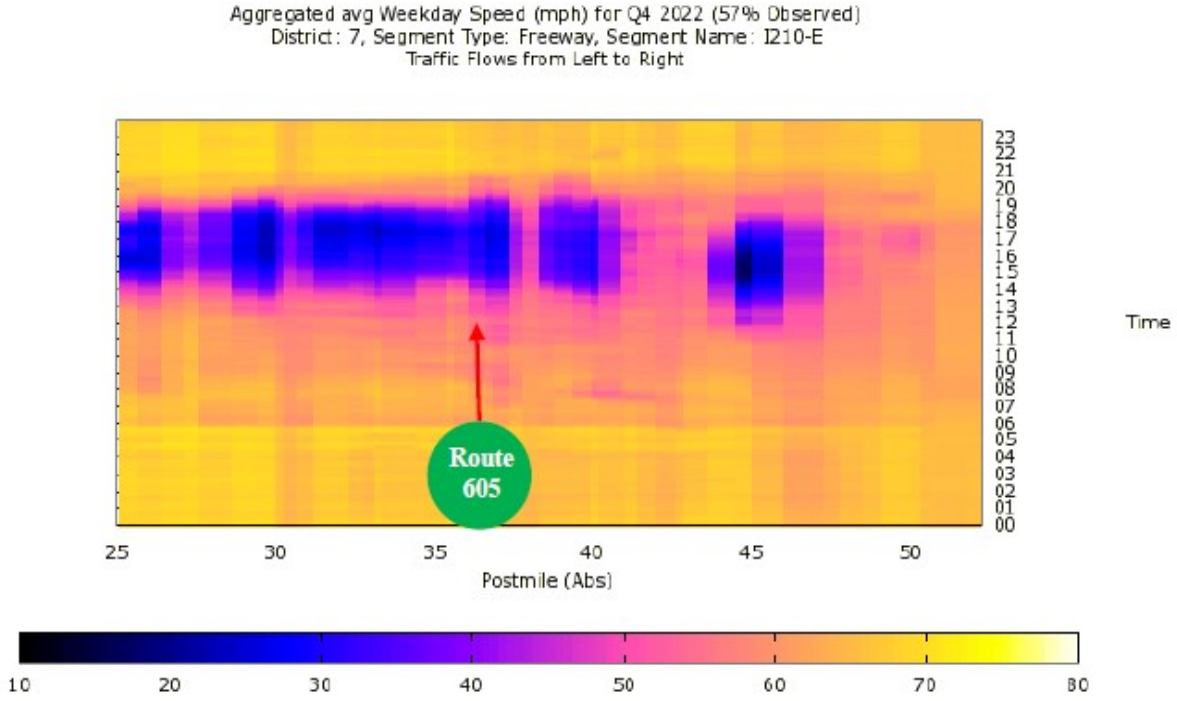


FIGURE 4.4-31. AVERAGE HOV LANE SPEED – WESTBOUND ROUTE 210, Q4 2022

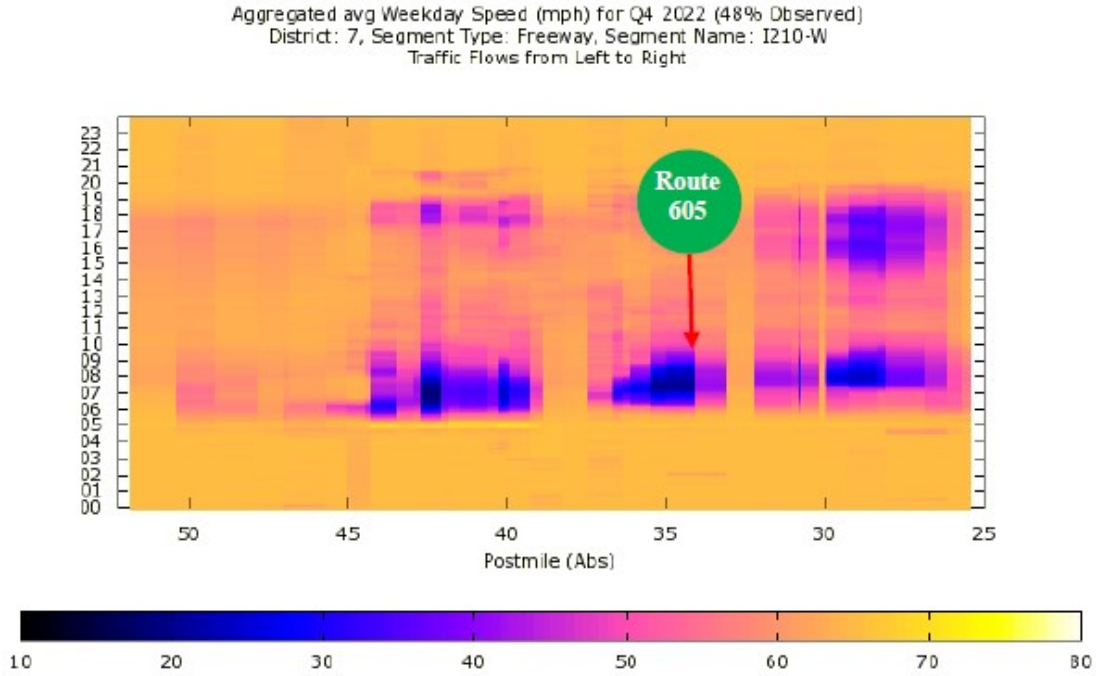
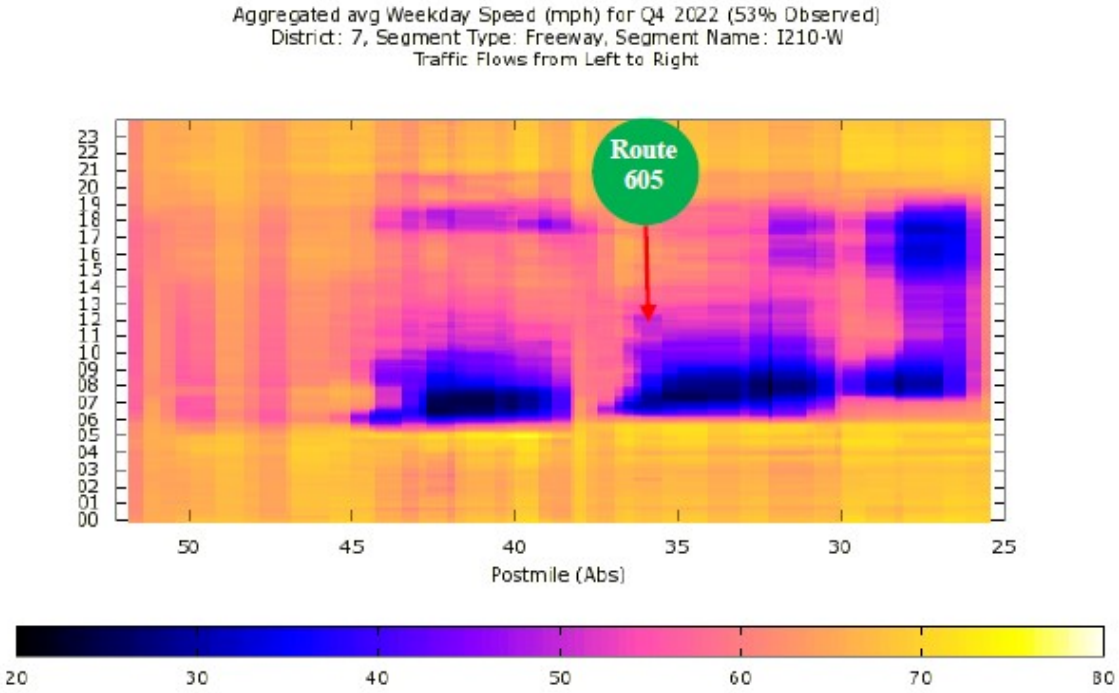


FIGURE 4.4-32. AVERAGE GP LANE SPEED – WESTBOUND ROUTE 210, Q4 2022



A. Remediation Strategies

Degraded segments have been entered into the TIRTS for "TH" investigations, to investigate, evaluate and make any recommendations to mitigate HOV degradation.

District 7 has established a Connected Corridor Integrated Corridor Management on I-210 (EA32910). This will involve the coordination between Caltrans, local agencies, CHP, and first responders for incident management, construction activities, and special events. The project includes ramp metering synchronization, traffic signal synchronization, Transportation Management Systems, and Intelligent Transportation Systems. Completion is expected in September 2023. This project will allow the proactive traffic and transportation management of the Corridor, hence reducing traffic congestion due to incidents and events.

Increase public awareness. Update the HOV violation fine amount on the existing signs to the current amount.

District 7 shared vehicle occupancy counts and violation data with the California Highway Patrol (CHP), so they can prioritize their enforcement efforts.

The Foothill Gold Line project from Glendora to Montclair will extend the Metro Gold Line 12.3 miles and add stations in the cities along LA-210. Major construction began in mid-July 2020 and is expected to be completed to Pomona in 2025 (and to Montclair in 2028, if funding is secured in time to move forward with the contract option). Completion of the Glendora to Montclair segment is now estimated to cost $2.1 billion. Gold Line Foothill Extension's (LA-210-36/53 (07-33120)) expanded transit service along the Interstate 210 corridor will address transportation problems, and deficiencies and help relieve traffic congestion.

Implement access strategies, including increasing the length of access area or frequency of access, continuous access, or modification/elimination of bottlenecks such as ingress/egress locations. These improvements have been incorporated into Metro's design plans for the 210 Median Barrier Replacement Project (EA 07-33560 and EA 07-33561, PM 29.8R/31.5R). Project PS&E is expected in December 2023.

Alameda Corridor-East (ACE) Project founded by The San Gabriel Valley Council of Governments (SGVCOG) will mitigate the impacts of significant increases in freight rail traffic on over 70 miles of mainline railroad in the San Gabriel Valley. The ACE Project consists of a comprehensive program of safety improvements and mobility upgrades at an estimated cost of $1.9 billion. The project will

mitigate the impacts of growth in trade transported by train along the Alameda Corridor-East Trade Corridor transcontinental rail network in Southern California, which carries about 16% of all oceangoing containers in the United States. This project will also relieve truck traffic from Long Beach and San Pedro to the Inland Empire region, which will reduce congestion on GP lanes and HOV lanes. For more details on construction completion, please visit the website at https://www.theaceproject.org/.

Perform continuous analysis, keeping a record of sensors repeatedly detected as erroneous. Perform ongoing monitoring to detect misconfigurations before they are used in performance reporting. Explore a second data source to determine HOV speeds/degradation. In addition, District 7 will evaluate defective sensors, and begin initiating projects to repair defective sensors.

Brightline West High-speed Rail project between Las Vegas and southern California plans to break ground by the end of 2023. That would set the rail line up to be operational at the beginning of 2027. The diversion of people from auto and air travel to Brightline West's high-speed rail system reduces vehicle miles traveled by more than 700 million each year and the equivalent of 16,000 short haul flights annually.

4.4.14 ACTION PLAN FOR HOV FACILITIES ON ROUTE 405

HOV facilities on Route 405 are split into four segments: Route 605 to Route 110, Route 110 to Route 10, Route 10 to Route 101, and Route 101 to Route 5. The action plans cover the entire route.

A. Analysis

Route 605 to Route 110 (PM23.8-36.7)

The southbound HOV facilities on a whole segment are extremely degraded during PM peak hours. The northbound HOV facilities are slightly degraded at both AM and PM peak hours.

The CAV decal rate is up to 10.2 percent and the violation rate is up to 24.4 percent at Del Amo Blvd (PM 35.6).

Demand exceeds capacity. During the 1-hour peak period, the average HOV lane volume is 1,500 vehicles/hour in congested locations. In some locations, the maximum HOV lane volume is 1,800-2,000 vehicles/hour.

Route 110 to Route 10 (PM36.7-53.3)

The northbound HOV lane is extremely degraded during the AM peak hours between La Cienega Blvd (PM 47.4) and Route 10 (PM 53.0):

- There are only four GP lanes at the Route 90 interchange and the segment between W Century Ave and La Cienega Blvd, causing a bottleneck.
- Due to the vehicle volume from Route 105, Route 90, and Route 10.
- The southbound HOV lane is extremely degraded during PM peak hours. The maximum HOV lane volume is 1574 vehicles/hour.
- GP lane drops when approaching (from 4 to 3) the Route 110 interchange, causing a bottleneck southbound.

Route 10 to Route101(PM 53.3-63.2)

Peak period recurrent congestion in all lanes reduces HOV lane performance and speed (Fig. 4.4-31-34). The northbound HOV lane is extremely degraded during PM peak hours and the southbound HOV lane is extremely degraded during AM peak hours.

Route 405 northbound and southbound through the Sepulveda Pass is uphill with a 5% grade affecting vehicle speeds in all lanes, especially trucks.

With narrow buffers between HOV and GP lanes, congestion or slow-down in GP lanes causes friction on HOV lanes. During the afternoon peak hour period, the average GP and HOV speeds northbound are 25.4 mph and 31.9 mph respectively (PM 53-63).

Non-metered on-ramps allow platoons of vehicles to enter the freeway. When the opportunity occurs (local projects and/or dedicated funding), ramp metering equipment is installed.

Route 101 to Route 5 (63.2-72.2)

Peak period recurrent congestion in all lanes reduces HOV lane performance and speed (Fig. 33-36). The northbound HOV lane is extremely degraded between Burbank Blvd (PM 64.1) and Roscoe Blvd (PM 67.6) during the PM peak period. The southbound HOV lane is extremely degraded between Victory Blvd (PM 65.1) and Sherman Way (PM 66.2) during the AM peak period.

Route 405 NB (at the northern termini) experiences degraded conditions due to the following factors: 1. A lane drop at San Fernando Mission Blvd. (freeway capacity decreases to 3+1); 2. The end of the HOV lane which becomes the #1 general purpose lane before entering the tunnel; 3. Another lane drop occurs after the freeway exits the tunnel at the joining of I-405 and I-5 freeway merge. The current pavement delineation utilizes full width through the tunnel; therefore, reconstruction would need to occur for the possibility of added capacity.

Demand exceeds capacity. During the 1-hour peak period, the average HOV

lane volume is 1,500 vehicles/hour in congested locations in both directions. In some locations, the maximum HOV lane volume is 1,800-2,000 vehicles/hour.

Vehicle weaving conflicts at ingress/egress locations due to congestion in the GP lanes southbound.

Non-metered on-ramps allow platoons of vehicles to enter the freeway. When the opportunity occurs (local projects and/or dedicated funding), ramp metering equipment is installed.

Figures 4.4-33 and 4.4-34 provide plots of northbound HOV and GP lane speeds on Route 405 during the fourth quarter of 2022. Figures 4.4-35 and 4.4-36 provide plots of southbound HOV and GP lane speeds on Route 405 during the fourth quarter of 2022.

FIGURE 4.4-33. AVERAGE HOV LANE SPEED – NORTHBOUND ROUTE 405, Q4 2022

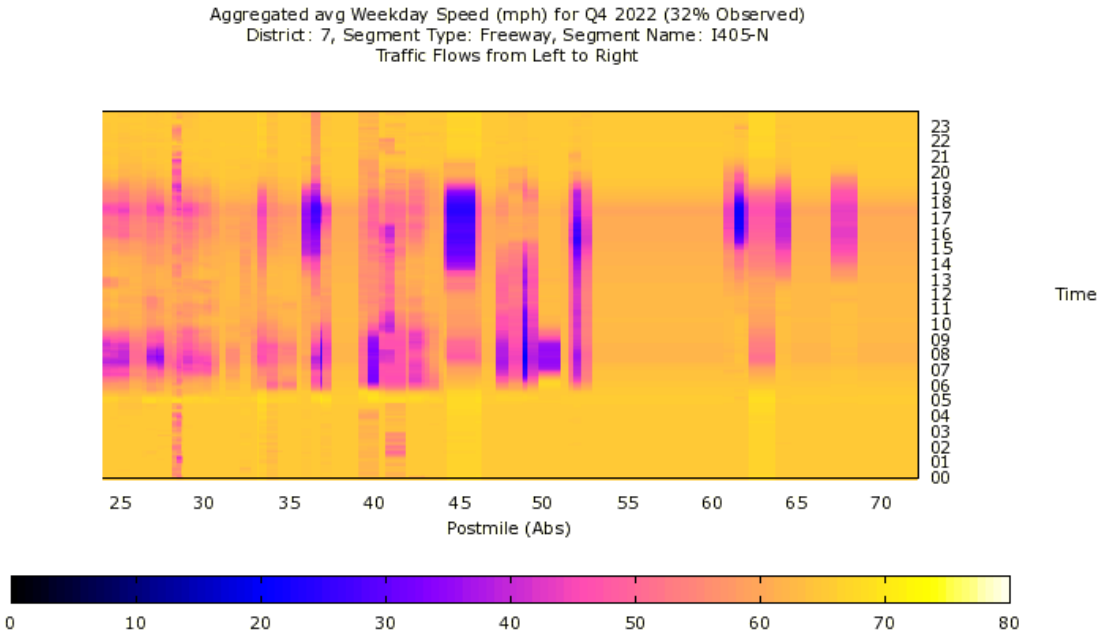


FIGURE 4.4-34. AVERAGE GP LANE SPEED – NORTHBOUND ROUTE 405, Q4 2021

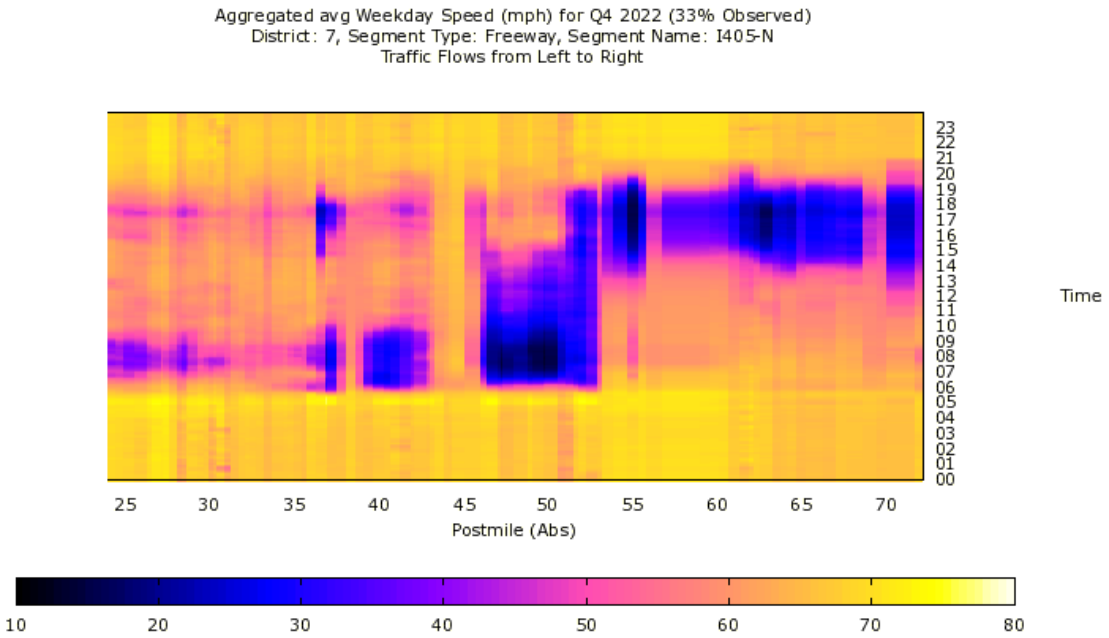


FIGURE 4.4-35. AVERAGE HOV LANE SPEED – SOUTHBOUND ROUTE 405, Q4 2021

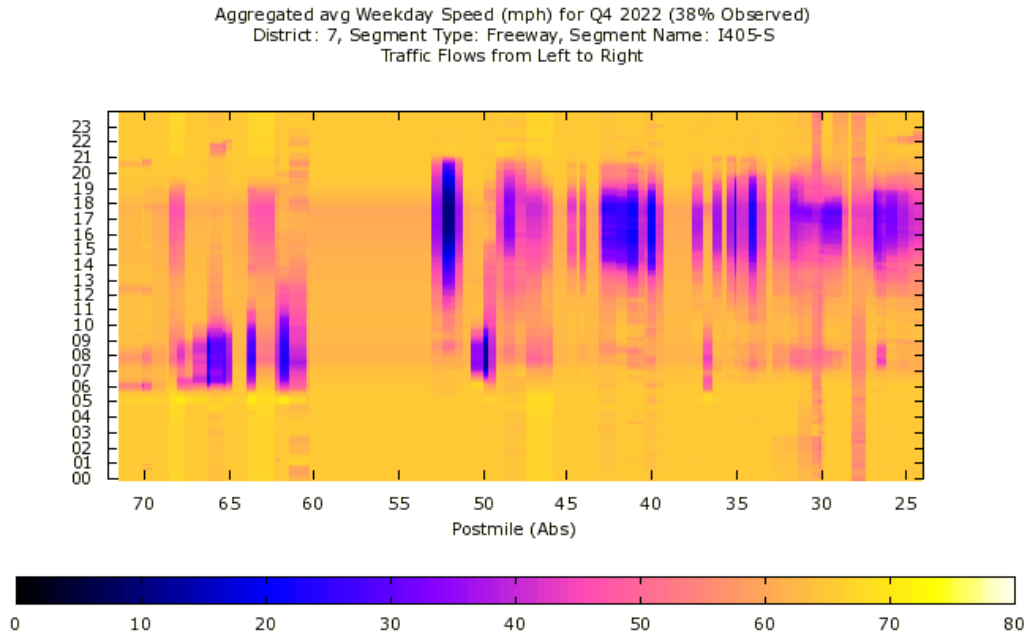
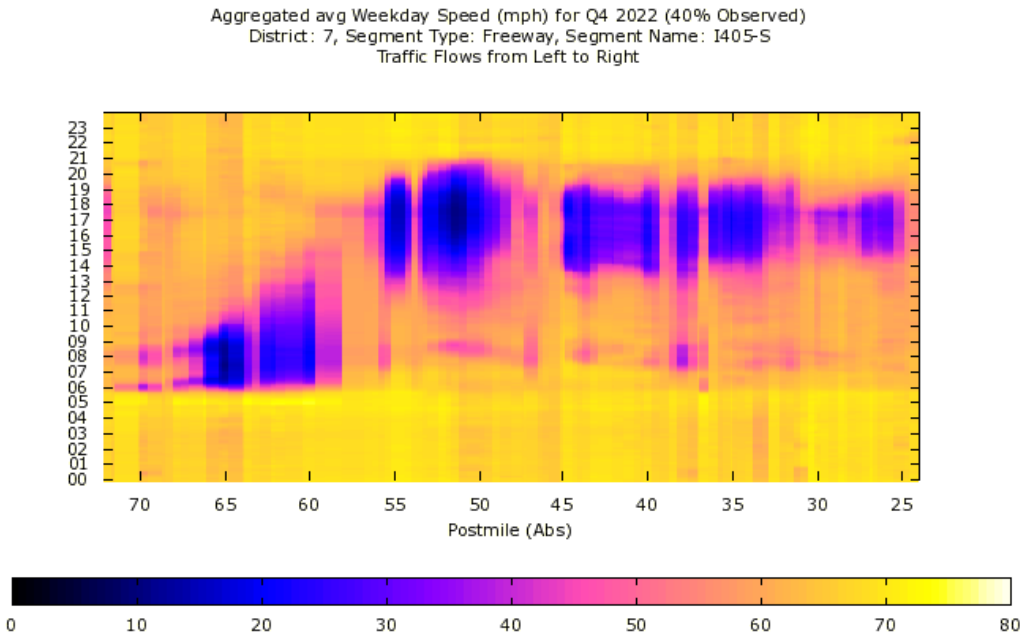


FIGURE 4.4-36. AVERAGE GP LANE SPEED – SOUTHBOUND ROUTE 405, Q4 2021



B. Remediation Strategies

Project 07-35310 adds auxiliary lanes in both directions of Route 405 between the interchanges of Redondo Beach and Hawthorne Boulevard, Hawthorne Boulevard, and Inglewood Avenue, and Inglewood Avenue and Rosecrans Avenue to improve traffic operations and enhance safety through the corridor. The project will be developed by Metro. Construction is expected to begin in late 2025; expected to end in 2027. The estimated construction cost is $120 million. This project will reduce congestion on the GP lanes, and hence reduce HOV degradation caused by the friction factor.

Project 07-29360 will improve the Route 405/Crenshaw interchange. The northbound off-ramp backs up onto the mainline. The project will include improvements to on/off ramps plus widening and adding an auxiliary lane. Construction began in 2021; expected to end in 2025. The estimated construction cost is $70 million. This project will reduce congestion on the GP lanes, and hence reduce HOV degradation caused by the friction factor.

Project 07-23400 will widen Route 405 at the Dominguez Channel (addition of auxiliary lane), including the new addition of northbound Route 405 on-ramp at Wilmington Avenue, ramp modifications and widening of Wilmington Avenue from East 223rd Street to East 220th Street, a bridge retrofit over Dominguez Channel and traffic signal synchronization. Begin construction 2014; end

construction in December 2023. The estimated construction cost is $20 million.

Project 07-20490 will widen the Ventura Boulevard on-ramp to two lanes plus a HOV lane at the westbound Ventura Boulevard entrance. The increased ramp storage will alleviate congestion on Ventura Boulevard. The construction began in December 2022 and is expected to end in 2025.

Project 07-35070 provides active traffic management and related traffic management system upgrades along Route 405 near LAX/Route 105. The construction is projected for September 2024, and contract completion is anticipated by August 2026.

Improvements along Route 405 South Bay Curve: Metro plans new auxiliary lanes to improve traffic flow at on- and off-ramps. Completion would be accelerated from 2028 to 2027.

Metro plans to extend service on the Green and Crenshaw/LAX Lines 4.6 miles southward to a new transit center in Torrance. This South Bay Light Rail Extension project is part of the "28 by 28" initiative. A forecasted opening is between 2030-2033. This project will relieve the congestion on Route 405.

Project 07-35432 will convert the HOV lanes on Route 405 between the LA/Orange County Line and Route 10 to HOT lanes. Target completion 2035. If properly enforced for occupancy and toll violations, the new HOT lanes should operate at free-flow conditions using the pricing algorithm.

Project 07-35433 will convert the one HOV lane on Route 405 between Route 10 and Route 101 to two HOT lanes. Target completion 2028. If properly enforced for occupancy and toll violations, the new HOT lanes should operate at free-flow conditions using the pricing algorithm.

District 7 is monitoring the impact that the decal program has on the level of degradation.

District 7 completed the study of possible pavement delineation re-striping to eliminate lane-drop configurations. The study concluded that this is not recommended, due to on-ramp to mainline merging concerns.

Perform continuous analysis, keeping a record of sensors repeatedly detected as erroneous. Perform ongoing monitoring to detect misconfigurations before they are used in performance reporting. Explore a second data source to determine HOV speeds/degradation. In addition, District 7 will evaluate defective sensors, and begin initiating projects to repair defective sensors.

4.4.15 ACTION PLAN FOR HOV FACILITIES ON ROUTE 605

Analysis

Morning and afternoon peak period recurrent congestion in all lanes reduces northbound and southbound HOV lane performance and speed between Rosecrans Avenue and Valley Blvd (PM 9.0-20.0). Both directions in this segment (approximately PM 14.0-17.0) are extremely degraded during the PM peak period.

Demand exceeds capacity. During the peak period, the average HOV lane volume is above 1,450 vehicles/hour in congested locations.

GP lane drops northbound (PM 11.1) and southbound (PM 11.9) (from 4 lanes to 3 lanes) around the Route 5 interchange causing a bottleneck (Fig. 36 and 38).

High vehicle volumes from Route 5 cause congestion in the northbound GP lanes.

Vehicle weaving conflicts at ingress/egress locations due to congestion in the GP lanes.

When there is a narrow buffer between the HOV and GP lanes, congestion or slow-down in GP lanes causes friction in HOV lanes. During the morning peak period, between Rosecrans Avenue and Valley Boulevard (PM 9.0-20.8), the average GP and HOV speeds southbound are 37.9 and 40.0 mph respectively. During the afternoon peak period for the same location and direction, the average GP and HOV speeds southbound are 23.8 and 27.6 mph respectively.

High solo violation rates. District 7's 2022 Manual Occupancy Data indicates that the HOV violation rate is between 10.9 and 28.9 percent during AM/PM peak hours at Beverly Blvd. (PM 16.5) and Gridley Rd. (PM 4.6) in both directions.

The high CAV decal rate and high truck rate contribute to congestion on I-605. District 7's 2022 Manual Occupancy Data shows the truck rate is up to 12.2 percent and the CAV decal rate is up to 13.2 percent (9.8 percent in 2021) during peak hours in both directions.

There are many defective sensors, which cause no data coverage on some segments, especially southbound. Two big gaps have been found. One is between Noyes Street and south of Route 60 (PM 16.9-19.1); the other is between Artesia Boulevard and Placia PI (PM 7.0-13).

Figures 4.4-35 and 4.4-37 provide plots of northbound HOV and GP lane speeds on Route 605 during the fourth quarter of 2022. Figures 4.4-36 and 4.4-38 provide plots of southbound HOV and GP lane speeds on Route 605 during the fourth quarter of 2022.

FIGURE 4.4-37. AVERAGE HOV LANE SPEED – NORTHBOUND ROUTE 605, Q4 2022

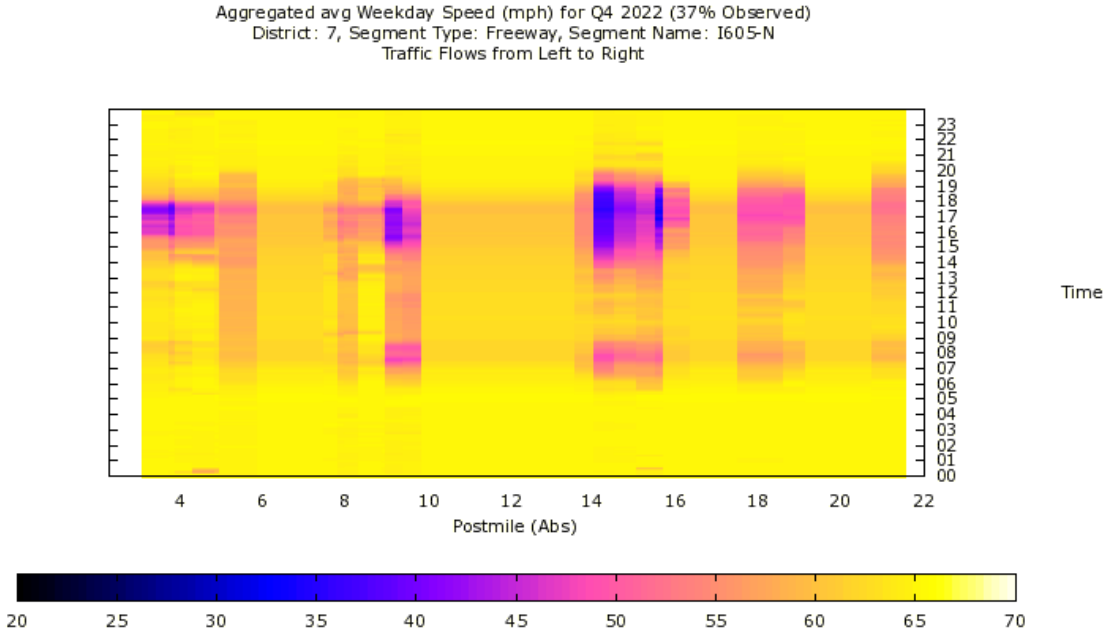


FIGURE 4.4-38. AVERAGE GP LANE SPEED – NORTHBOUND ROUTE 605, Q4 2022

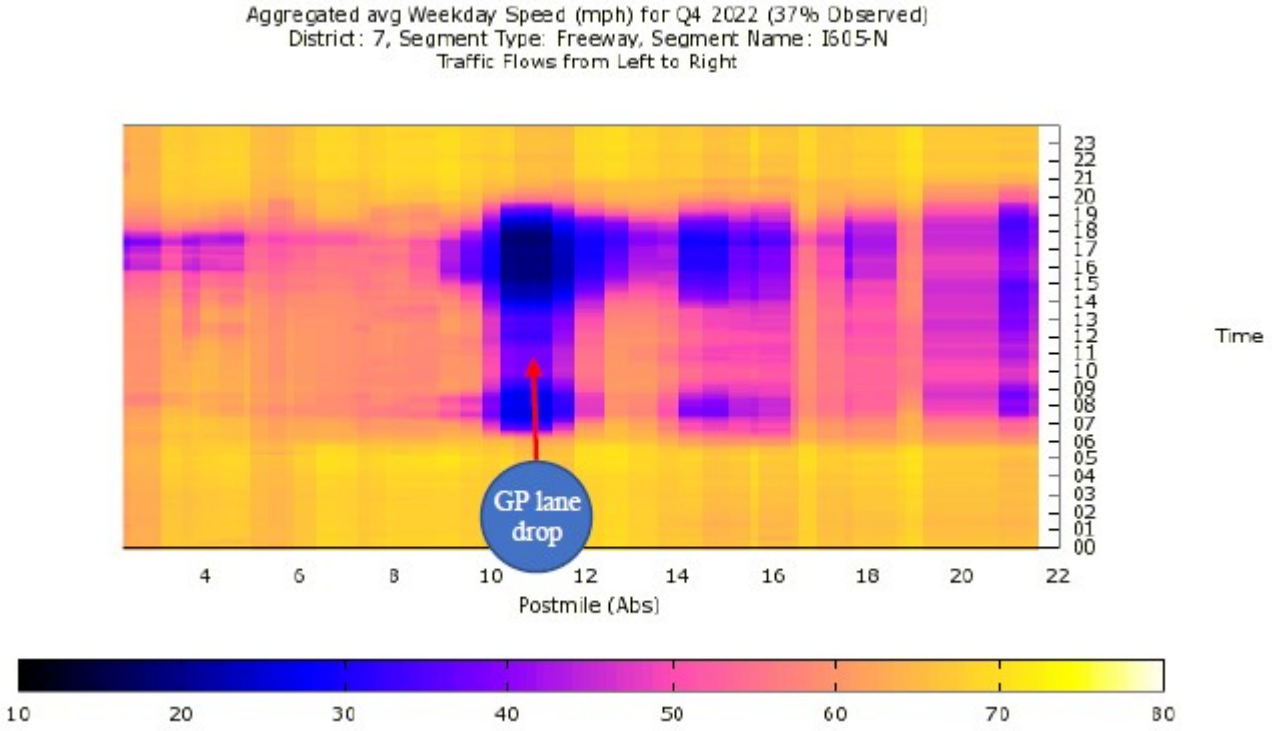


FIGURE 4.4-39. AVERAGE HOV LANE SPEED – SOUTHBOUND ROUTE 605, Q4 2022

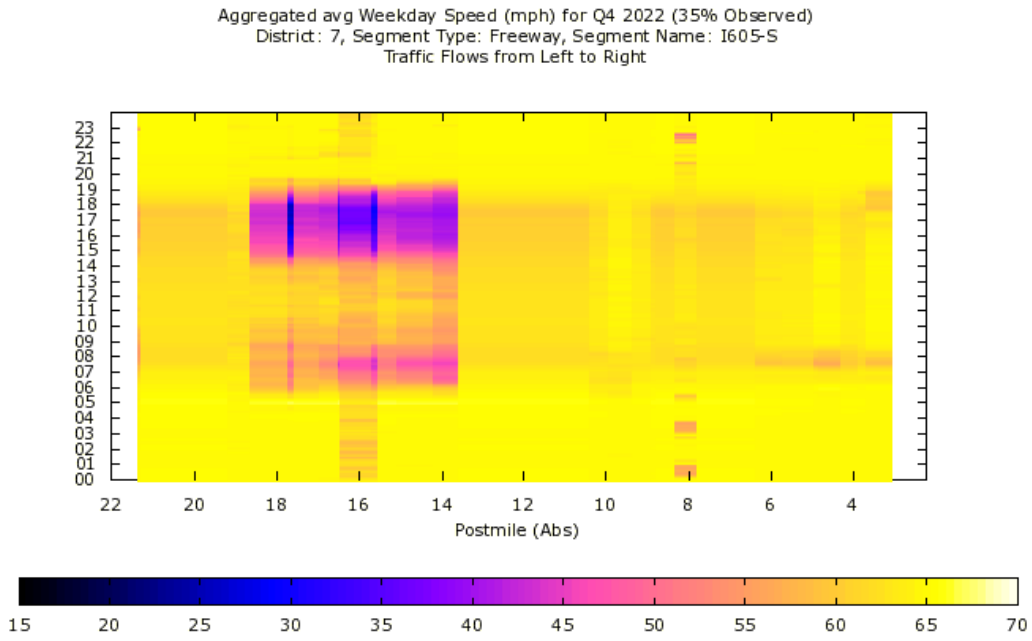
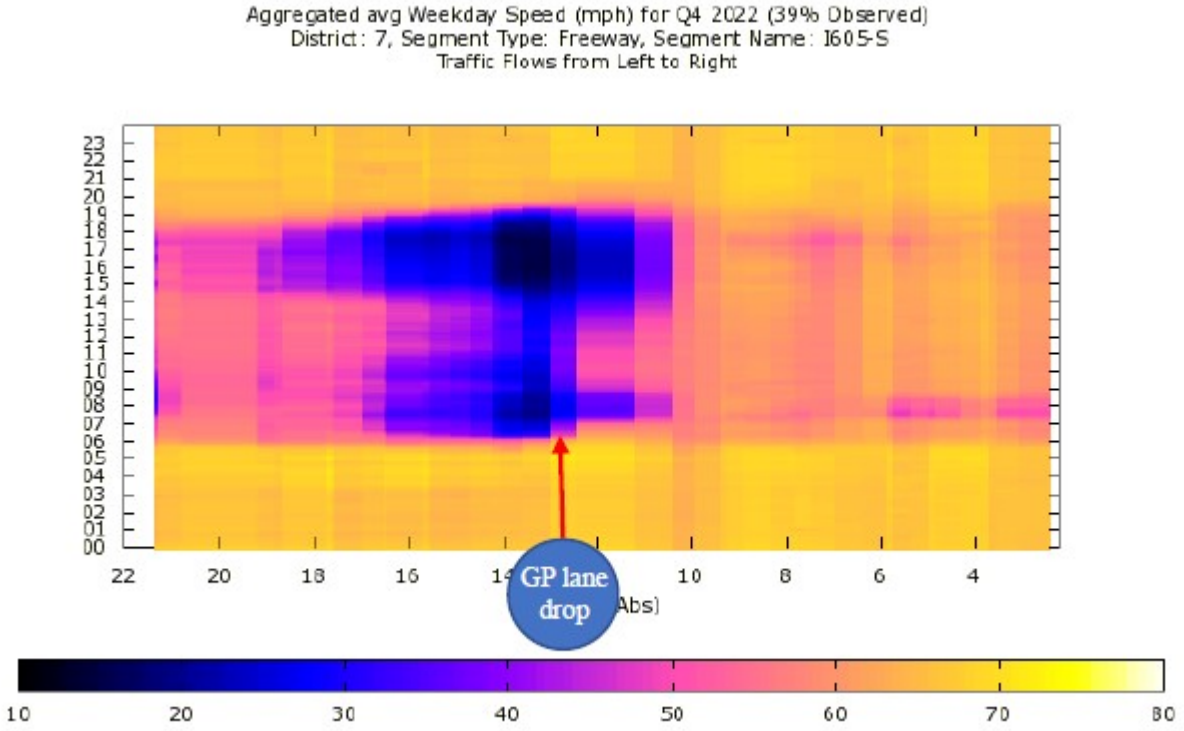


FIGURE 4.4-40. AVERAGE GP LANE SPEED – SOUTHBOUND ROUTE 605, Q4 2022



A. Remediation Strategies

District 7 shared vehicle occupancy counts and violation data with the California Highway Patrol (CHP), so they can prioritize their enforcement efforts.

HOT lanes are proposed for Route 605 between the Orange County line and Route 10. Construction will be funded by Measure R funds and the forthcoming Transportation Strategic Plan-Phase II. The project would also be eligible for federal-aid funding. This project would be implemented in several stages:

- Project 07-29821 will add one or two HOV or HOT lanes in each direction on Route 605 from Rosecrans Avenue to Slauson Avenue in the cities of Downey, Norwalk, and Santa Fe Springs. This project also includes the construction of new HOV or HOT direct connectors between the HOV/HOT lanes on Route 605 and Route 105. Begin construction in February 2028; end construction January 2031. Construction cost estimate is $ 2.1billion. If properly enforced for occupancy and toll violations, the new HOT lanes should operate at free-flow conditions using the pricing algorithm.
- Project 07-3101U will widen Route 605 to add one GP lane and one HOV or HOT lane in each direction between Slauson Avenue and Route 10. Begin construction February 2028; end construction January 2031. The construction cost estimate is $ 2.8 billion. If properly enforced for occupancy and toll violations, the new HOT lanes should operate at free-flow conditions using the pricing algorithm.
- Project 07-29810 will widen Route 91 by adding one to two lanes along Route 91 from Paramount Boulevard to Shoemaker Avenue. The project also includes capacity enhancement on Route 605 between Centralia Street to Rosecrans Avenue. The construction began in April 2023, with anticipated completion in 2027. The project cost is estimated at $450 million. This project should reduce congestion on GP lanes and HOV lanes.

Implement access strategies, including increasing the length of access area or frequency of access, continuous access, or modification/elimination of bottlenecks such as ingress/egress locations. These improvements have already been incorporated into the pavement rehabilitation project in the design stage at this time. The pavement rehabilitation project (EA 07-35660) will implement access strategies on Route 605, between Telegraph Road Undercrossing and I-605/I-10 Separation including increasing the length of access area or frequency of access and modification/elimination of bottlenecks such as ingress/egress locations. Construction is expected to begin in 2024 and end in 2029.

Alameda Corridor-East (ACE) Project founded by The San Gabriel Valley Council

of Governments (SGVCOG) will mitigate the impacts of significant increases in freight rail traffic on over 70 miles of mainline railroad in the San Gabriel Valley. The ACE Project consists of a comprehensive program of safety improvements and mobility upgrades at an estimated cost of $1.7 billion. This project will relieve truck traffic from Long Beach and San Pedro to the Inland Empire region, thereby reducing congestion on GP and HOV lanes.

District 7 has completed the study on the possible pavement delineation re-striping to eliminate lane-drop configurations on Route 605. There are two proposed projects (EAs 29821 and 3101U) that will include the construction of some auxiliary lanes at locations where the roadway will be widened. These proposed improvements would eliminate some of the lane-drop configurations.

Perform continuous analysis, keeping a record of sensors repeatedly detected as erroneous. Perform ongoing monitoring to detect misconfigurations before they are used in performance reporting. Explore a second data source to determine HOV speeds/degradation. In addition, district 7 will evaluate defective sensors, and begin initiating projects to repair defective sensors.

4.5. DISTRICT 8 2022 DEGRADATION ACTION PLANS

4.5.1 SUMMARY OF DEGRADATION ON HOV FACILITIES IN DISTRICT 8

APPENDIX A provides the list of degraded facilities in District 8 that were identified in the 2021 California High Occupancy Vehicle Facilities Degradation Report and Action Plan. The speed and degradation profiles for each degraded facility are provided in ATTACHMENT A.

4.5.2 ACTION PLAN FOR HOV FACILITIES ON ROUTE 10

This 8.5-mile corridor begins in the City of Montclair at the LA county line and ends in the in the City of Ontario west of I-15 is an arterial multilane urban freeway with one-lane continues access HOV lane in each direction. The HOV-lane is bordered by various width of treated shoulder adjacent to median concrete barrier on the left and separated with General Purpose Lane with Detail 42 on the right.

A. Analysis:

D8 – Route 10 Eastbound and Westbound (AM & PM)

No analysis was performed on this section of I-10 because of the current SBCTA sponsored project (08-0C251) to convert the existing the one lane HOV 2+ per direction to two toll lanes with HOV 3+ per direction.

The AM and PM peak hour volume on WB: 1598 and 1507 (2018-Counting).

The AM and PM peak hour volume on EB: 1417 and 1678 (2018-Counting).

The 2019 violation rate on I-10 HOV was 23.3%.

B. Remediation Strategies:

08-0C251 (phase 1), LA PM 44.9-48.3 & SBD PM 0.00-13.20 to convert from a single HOV-2+ lane in each direction to two HOT-3+ lanes in each direction from East of Dudley Street in Los Angeles County to Route 15 in San Bernardino County will increase the existing capacity of the HOV facility. This project will improve the minimum operating speed as mandated by FHWA. Project cost estimate is $625.4 million. Construction to begin in September 2018 until August 2024.

Desired Outcome: This project is anticipated to increase the freeway capacity and thereby eliminating recurrent congestion both in HOV and GP lane.

District 8 Traffic Operations is in the process of installing Route Shield Pavement Markings (RSPMs) near freeway-to freeway interchanges. Strategically located RSPMs will supplement the information provided by overhead or roadside signs that depict upcoming freeway interchange approaches. When motorist receive information of interchange approaches early, and in multiple ways, they are likely to make better driving decisions and change lanes farther upstream. The installation will be completed in 12/2023.

Desired Outcome: Improving traffic flow by reducing late lane changes and sudden weaving movement, thereby, improving safety and reducing sudden weaving conflict. District 8 will conduct the before and after analysis using data collected during the last six months in 2024. The report will be included in 2024-Degradation Action Plan.

4.5.3 ACTION PLAN FOR HOT FACILITIES ON ROUTE 15

A. Analysis:

Traffic in AM & PM were not degraded except slightly degraded at two locations: 0.3 mile north of Second St OC & 1 mile south off IC 15/60 where the HOT lane merged to mix flow lane traffic at about Abs. Postmile 105.00.

The direct HOT lanes connector between north and west leg of this 15-91 freeway to freeway (F2F) interchange will reduce the typical traffic turbulence caused by an F2F interchange. The HOT traffic from the north leg does not need to merge to General Purpose traffic before merging back to the next HOT traffic on the west leg, and the same for the HOT traffic from west to north leg.

There were 150 collisions reported on this segment during of 6 months period from 07/01/2022 to 12/31/2022. In these 150, there were 41 collisions happened

on HOV and left lanes. In these 41, 13 collisions were happened during peak hour (6-9 AM & 3-6 pm). These reported collisions would be the caused adding to the degradation on HOV lane.

The 109 collisions on left lanes and interior lanes might be not directly impact to the degradation. However, it would make drivers distracted and slow down driving. The collisions happened on opposite direction also an additional cause to the degradation. By excluding all reported collisions from data base, it will improve degradation on HOV lane.

B. Remediation Strategies:

SBCTA is in the project development phase for a widening and extension of the 15 Express Lanes farther north which should resolve this degradation. Project 08-0R801 is scheduled to begin and end construction in June 2024 and November 2027, respectively.

Southbound traffic:

Traffic in AM was slightly degraded at Hidden Valley. In the PM, traffic was slightly degraded at Hidden Valley and from Ontario southbound on-ramp to all the way south approaching the south end of the HOT lane where the HOT lane merged to mix flow lane traffic at about Abs. Postmile 93.00

There were 129 collisions reported on this segment during of 6 months period from 07/01/2022 to 12/31/2022. In these 129, there were 68 collisions happened on HOV and left lanes. In these 68, 24 collisions were happened during peak hour (6-9 AM & 3-6 pm). These reported collisions would be the caused adding to the degradation on HOV lane.

The 61 collisions on left lanes and interior lanes might be not directly impact to the degradation. However, it would make drivers distracted and slow down driving. The collisions happened on opposite direction also an additional cause to the degradation. By excluding all reported collisions from data base, it will improve degradation on HOV lane.

C. Remediation Strategies:

RCTC has worked with Caltrans on the operation of nearby ramp meters, the paving of shoulders, and toll rate increases.

Caltrans has initiated the 08-1N690, an I-15 SB Cajalco On-Ramp project which is an interim project to extend the SB GP#4 lane to connect to the recently constructed I-15 ICOP aux lane between Cajalco and Weirick and trap that GP#4 into the Weirick exit ramp. The project is currently in design with a stated goal to be constructed from June 2024 to November 2024.

RCTC is in the planning phase for an extension of the 15 Express Lanes which is scheduled to complete construction in 2028. As a part of the project, there will

be a phased delivery with some widening and relief as early as 2027. Project 08-0J081 is scheduled to begin and end construction in June 2025 and July 2025, respectively.

The interregional traffic between the State of Nevada through the county of San Bernardino and Riverside to the county of Orange and Los Angeles, and the accelerated growth and development of cities and communities along I-15 is contributing to congestion along the corridor. In addition, re-authorization of measure "A" calls for the widening of I-15 to reduce congestion and improve regional mobility. SANDBAG contacted Caltrans District 8, by a letter dated September 9, 2011, to study feasibility of implementing HOT lanes along I-15 from Riverside County Line to US-395. (Ref.: EA 0J080G & EA 0R800G)

4.5.4 ACTION PLAN FOR HOV FACILITIES ON ROUTE 60

HOV lanes in Route 60 are covered in two segments. The first segment is from the Los Angeles/San Bernardino County Line to IC 60/91/215 in Riverside County. The second segment is from IC 60/215 to Redlands Blvd in City of Moreno Valley. There was no data for the portion between Route 15 and the 60/91/215 due to construction.

A. Analysis:

D8 – Route 60 Eastbound from LA County to Rte. 215 (AM & PM)

Please refer to Figure 4.4-1 & 4.4-2. This Plot shows the degradation along the corridor in the last three years. Gaps on the graphs show that no data is available along the pertaining gaps either in 2020, 2021 or 2022.

In 2020 no data was collected from about I-15 to Main St. due to Rehab project (EA 08-0Q75U and 08-1C640).

Unfortunately, within this corridor with the length of about 20 miles, we have only minimal amount of data. Therefore, we could not conclude the trend of the degradation along this corridor. We are continuously working with D8 TMS unit to get updated information about the status of detectors.

However, in 2020, 2021, and 2022 during AM & PM Peak, a degradation occurred between Archibald Av. & Haven Av. (about Abs. PM 39.000) due to traffic from/to Ontario International Airport.

The AM and PM peak hour volume: 1417 and 1678 (2018-Counting).

There were 342 collisions reported on this segment during of 6 months period from 07/01/2022 to 12/31/2022. In these 342, there were 125 collisions happened on HOV and left lanes. In these 125, 64 collisions happened during peak hour (6-

9 AM & 3-6 pm). These reported collisions would be the caused adding to the degradation on HOV lane.

The 217 collisions on left lanes and interior lanes might be not directly impact to the degradation. However, it would make drivers distracted and slow down driving. The collisions happened on opposite direction also an additional cause to the degradation. By excluding all reported collisions from data base, it will improve degradation on HOV lane.

The 2019 violation rate on SR-60 HOV was 14.6%.

D8 – Route 60 Westbound from LA County to Rte. 215 (AM & PM)

Please refer to Figure 4.4-3 & 4.4-4. This Plot shows the degradation along the corridor in the last three years. Gaps on the graphs show that no data is available along the pertaining gaps either in 2020, 2021 or 2022.

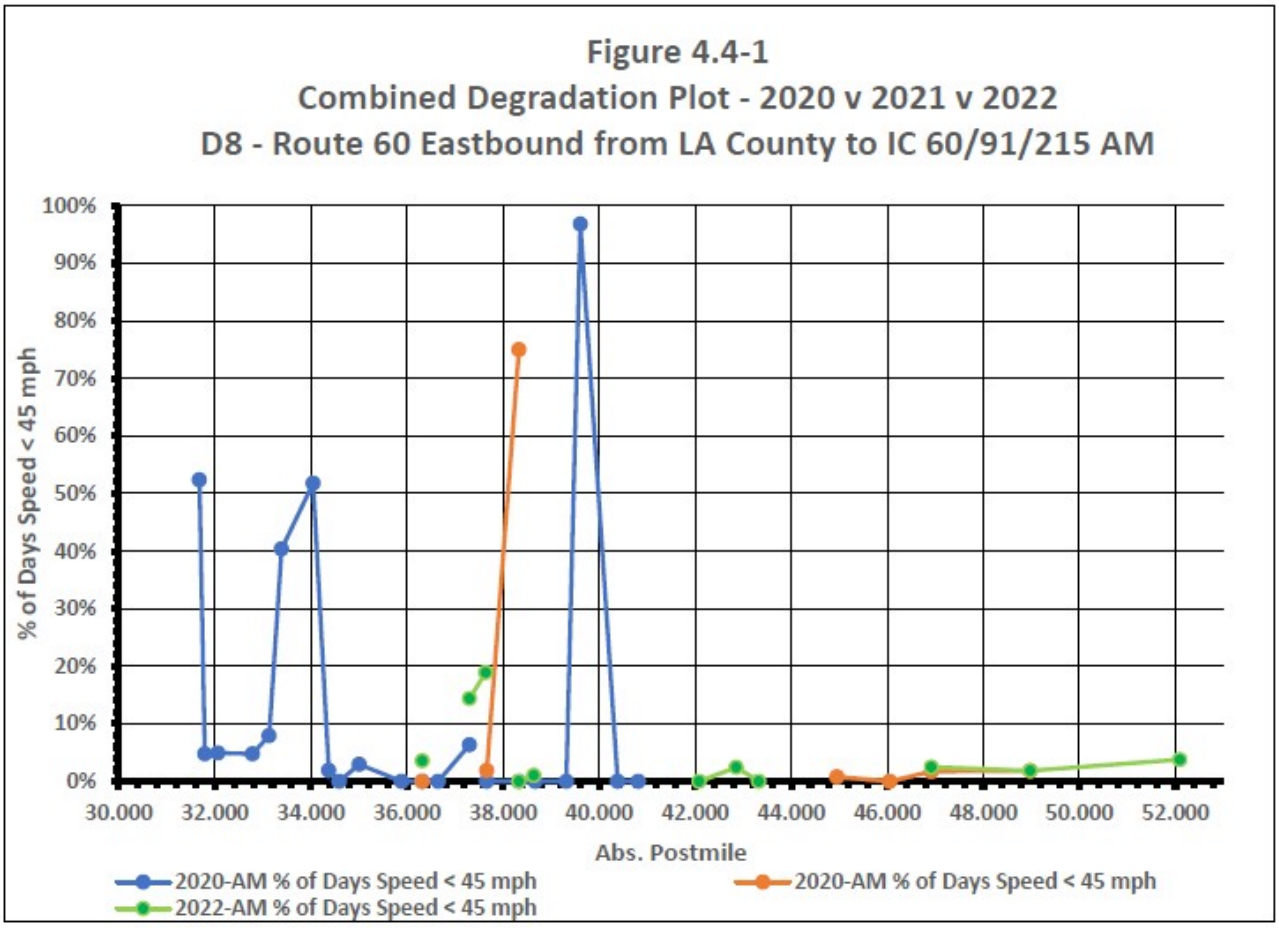
In 2020 no data was collected from about I-15 to Main St. due to Rehab project (EA 08-0Q75U and 08-1C640).

The data collected along this corridor was unfortunately scarce. Therefore, we could not conclude the trend of the degradation along this corridor. We are continuously working with D8 TMS unit to get updated information about the status of detectors. However, during AM & PM Peak, degradation was identified between Archibald Av. & Haven Av. (about Abs. PM 39.000) due to Ontario International Airport' traffic.

The AM and PM peak hour volume: 1631 and 1173 (2018-Counting).

There were 110 collisions reported on this segment during of 6 months period from 07/01/2022 to 12/31/2022. In these 110, there were 36 collisions happened on HOV and left lanes. In these 36, 20 collisions happened during peak hour (6-9 AM & 3-6 pm). These reported collisions would be the caused adding to the degradation on HOV lane.

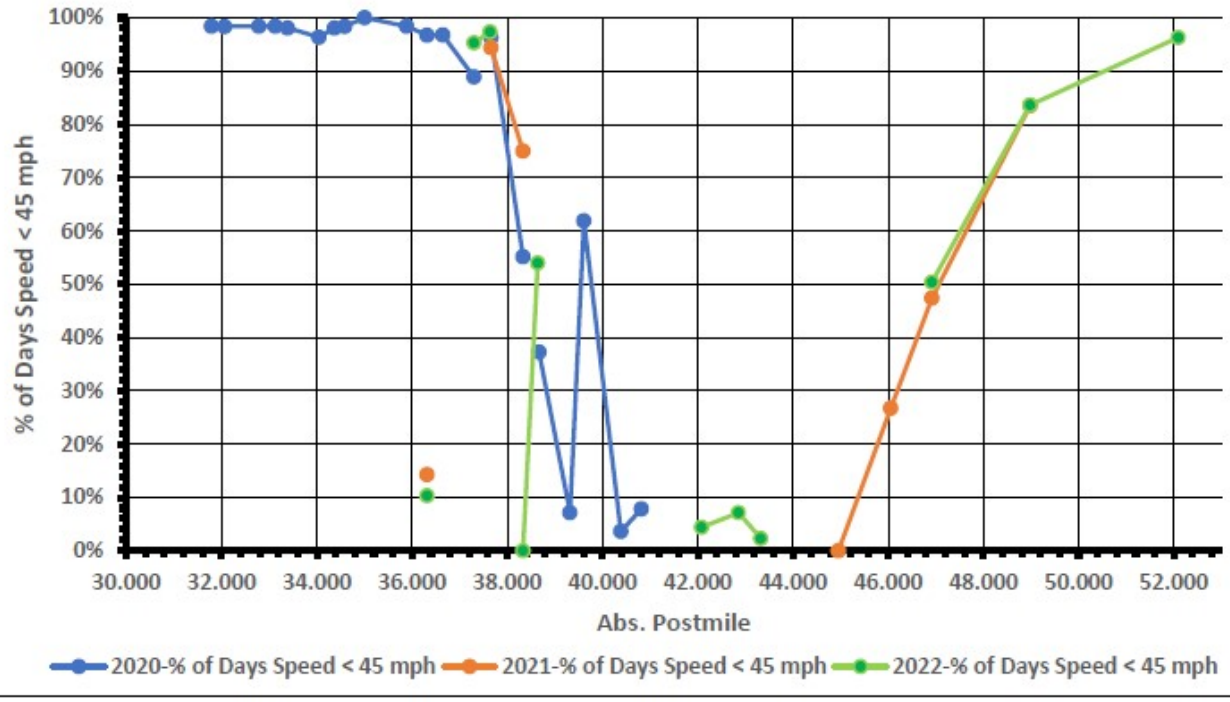
The 74 collisions on left lanes and interior lanes might be not directly impact to the degradation. However, it would make drivers distracted and slow down driving. The collisions happened on opposite direction also an additional cause to the degradation. By excluding all reported collisions from data base, it will improve degradation on HOV lane.



CROSSED STREET	Abs PM
Pipeline & Ramona	31.677
Pipeline & Ramona	31.789
Ramona & Mante Vista Av	32.064
Monte Vista & Central	32.783
Central & Benson	33.128
Central & Benson	33.387
WO Mountain Ave	34.045
Maountain & San Antonio	34.370
Maountain & San Antonio	34.587
San Antonio & Euclid Av.	35.005
EO Campus Av	35.887
Campus & Grove	36.318
EO Grove	36.647
WO Vineyard Ave.	37.301
VINEYARD	37.639

CROSSED STREET	Abs PM
EO Vineyard Ave.	37.660
WO Archibald	38.330
ARCHIBALD	38.64
EO Archibald	38.668
WO Haven Av.	39.317
EO Haven Av.	39.610
WO Milliken	40.386
I-15	40.817
Mission Blvd	42.081
Etiwanda Ave	42.857
County Village Rd	43.325
PEDLEY RD	44.955
PYRITE AVE	46.055
0.8 MI E/O Pyrite	46.920
W/O RUBIDOUX	48.980
MAIN ST	52.095

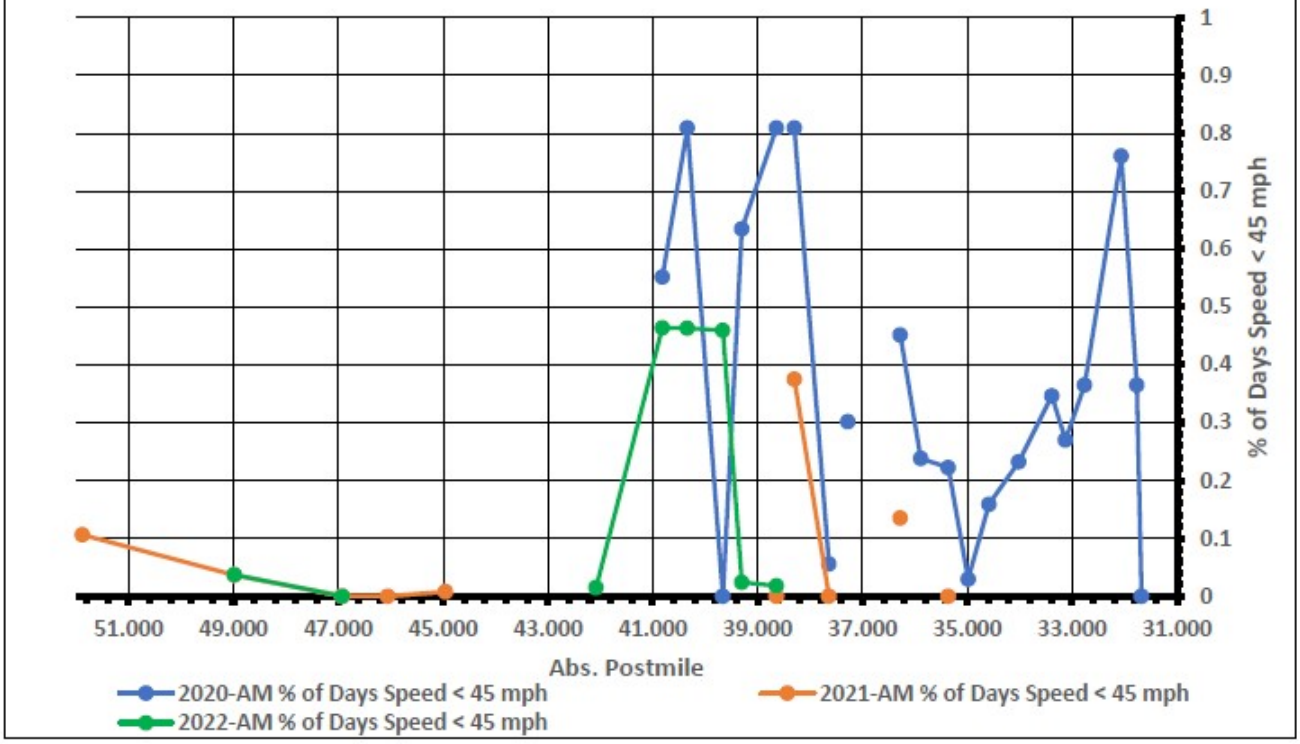
Figure 4.4-2
Combined Degradation Plot - 2020 v 2021 v 2022
D8 - Route 60 Eastbound from LA County to IC 60/91/215 PM



CROSSED STREET	Abs PM
Pipeline & Ramona	31.677
Pipeline & Ramona	31.789
Ramona & Mante Vista Av	32.064
Monte Vista & Central	32.783
Central & Benson	33.128
Central & Benson	33.387
WO Mountain Ave	34.045
Maountain & San Antonio	34.370
Maountain & San Antonio	34.587
San Antonio & Euclid Av.	35.005
EO Campus Av	35.887
Campus & Grove	36.318
EO Grove	36.647
WO Vineyard Ave.	37.301
VINEYARD	37.639

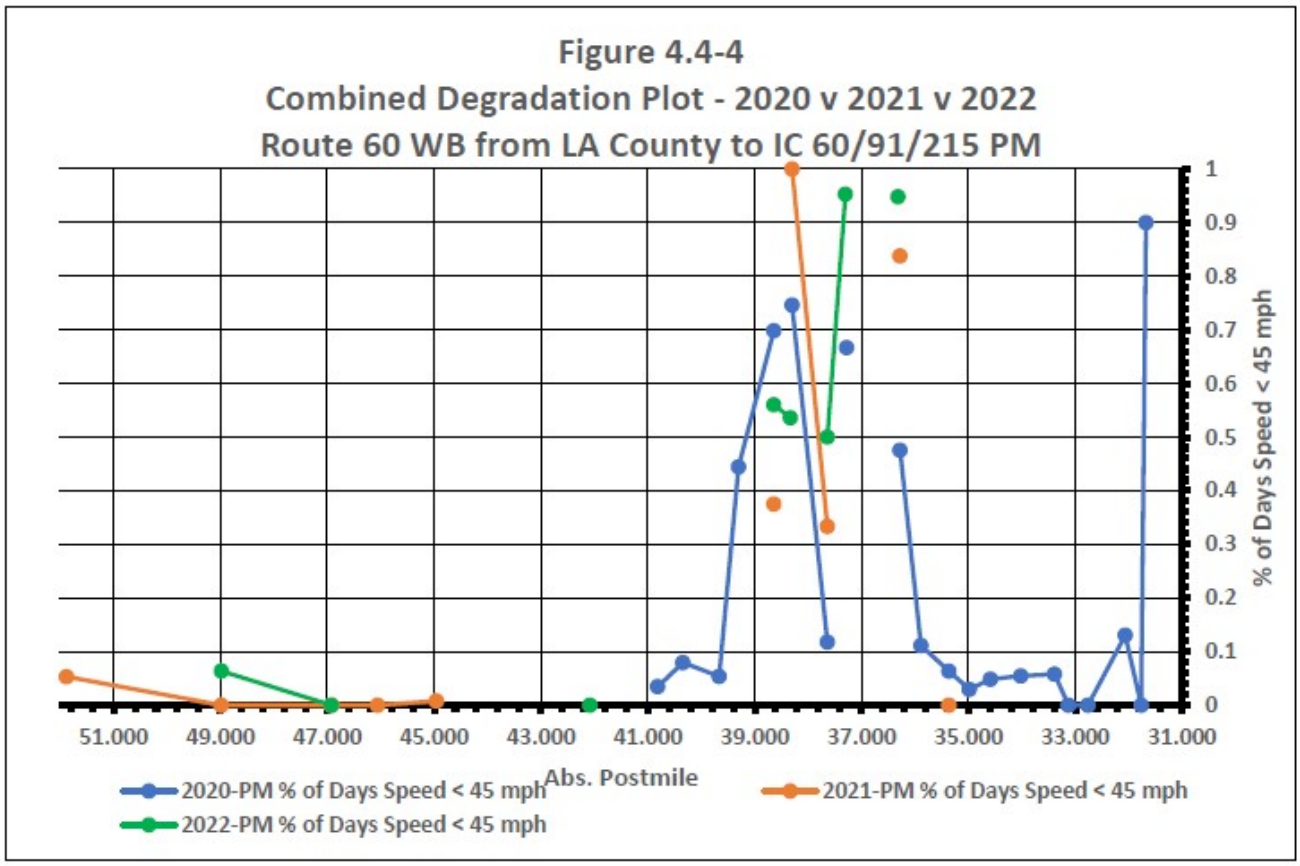
CROSSED STREET	Abs PM
EO Vineyard Ave.	37.660
WO Archibald	38.330
ARCHIBALD	38.64
EO Archibald	38.668
WO Haven Av.	39.317
EO Haven Av.	39.610
WO Milliken	40.386
I-15	40.817
Mission Blvd	42.081
Etiwanda Ave	42.857
County Village Rd	43.325
PEDLEY RD	44.955
PYRITE AVE	46.055
0.8 MI E/O Pyrite	46.920
W/O RUBIDOUX	48.980
MAIN ST	52.095

FIGURE 4.4-3
Combined Degradation Plot - 2020 v 2021 v 2022
D8 - Route 60 WB from LA County to IC 60/91/215 AM



CROSSED STREET	Abs PM
Pipeline & Ramona	31.677
Pipeline & Ramona	31.789
Ramona & Mante Vista Av	32.064
Monte Vista & Central	32.783
Central & Benson	33.128
Central & Benson	33.387
WO Mountain Ave	34.045
Maountain & San Antonio	34.370
Maountain & San Antonio	34.587
San Antonio & Euclid Av.	35.005
EO Campus Av	35.887
Campus & Grove	36.318
EO Grove	36.647
WO Vineyard Ave.	37.301
VINEYARD	37.639

CROSSED STREET	Abs PM
EO Vineyard Ave.	37.660
WO Archibald	38.330
ARCHIBALD	38.64
EO Archibald	38.668
WO Haven Av.	39.317
EO Haven Av.	39.610
WO Milliken	40.386
I-15	40.817
Mission Blvd	42.081
Etiwanda Ave	42.857
County Village Rd	43.325
PEDLEY RD	44.955
PYRITE AVE	46.055
0.8 MI E/O Pyrite	46.920
W/O RUBIDOUX	48.980
MAIN ST	52.095



CROSSED STREET	Abs PM
Pipeline & Ramona	31.677
Pipeline & Ramona	31.789
Ramona & Mante Vista Av	32.064
Monte Vista & Central	32.783
Central & Benson	33.128
Central & Benson	33.387
WO Mountain Ave	34.045
Maountain & San Antonio	34.370
Maountain & San Antonio	34.587
San Antonio & Euclid Av.	35.005
EO Campus Av	35.887
Campus & Grove	36.318
EO Grove	36.647
WO Vineyard Ave.	37.301
VINEYARD	37.639

CROSSED STREET	Abs PM
EO Vineyard Ave.	37.660
WO Archibald	38.330
ARCHIBALD	38.64
EO Archibald	38.668
WO Haven Av.	39.317
EO Haven Av.	39.610
WO Milliken	40.386
I-15	40.817
Mission Blvd	42.081
Etiwanda Ave	42.857
County Village Rd	43.325
PEDLEY RD	44.955
PYRITE AVE	46.055
0.8 MI E/O Pyrite	46.920
W/O RUBIDOUX	48.980
MAIN ST	52.095

B. Remediation Strategies:

Project 08-1F260, SBD PM R7.8/R7.9 to widen Archibald Avenue interchange. The project was under construction from May 2021 to May 2023. This project should improve the traffic mobility on all lanes in the vicinity of Archibald Avenue Interchange.

Project 08-0E33U, SBD R7.3/R10.0 to add westbound auxiliary lane and eastbound deceleration lane. Construction began in May 2021 and will end in January 2025. Current estimate is $43 million funded by SHOPP. This project should improve the traffic mobility on all lanes in the vicinity of Archibald, Haven, Milliken, and Vineyard Interchanges.

Project 08-0C870 SBD PM R2.1/R2.6 to widen eastbound & westbound on- ramps & Central Avenue Construction was started in the April 2021 and was completed in 8/2023. This project should improve the traffic mobility on all lanes in the vicinity of Central Avenue Interchange.

08-1M790 RIV PM R0.00/20.1 to restripe, adding pavement marking, and replacing sign panels on HOV lane. Construction is scheduled to begin in July 2027 and end in January 2028. Signing, pavement markings, and refreshing stripping will help drivers to take the decisions on time rather than slowing down and impact traffic flow.

District 8 Traffic Operations is in the process of installing Route Shield Pavement Markings (RSPMs) near freeway-to freeway interchanges. Strategically located RSPMs will supplement the information provided by overhead or roadside signs that depict upcoming freeway interchange approaches. When motorist receive information of interchange approaches early, and in multiple ways, they are likely to make better driving decisions and change lanes farther upstream. The installation was in 12/2023.

Desired Outcome: Improving traffic flow by reducing late lane changes and sudden weaving movement, thereby, improving safety and reducing sudden weaving conflict. District 8 will conduct the before and after analysis using data collected during the last six months in 2024. The report will be included in 2024-Degradation Action Plan.

C. Analysis:

D8 – Route 60 Eastbound in Moreno Valley (AM & PM)

Please refer to Figure 4.4-5 & 4.4-6. This Plot shows the degradation along the corridor in the last three years. Gaps on the graphs show that no data is available along the pertaining gaps either in 2020, 2021 or 2022.

In the AM Peak the corridor had no degradation, except as the traffic leaving 60-215 JCT it was slightly degraded. In the PM Peak, at the same location the traffic was extremely degraded.

The degradation pattern in the AM and PM Peak were consistent throughout these three years related to their locations and intensities. This congestion caused by commercial and commuter traffic eastward from all the counties in the east region including Orange County, Los Angeles County, Riverside County and San Bernardino County. The demand exceeds the capacity.

The AM and PM peak hour volume: 657 and 1351 (2018-Counting).

There were 87 collisions reported on this segment during of 6 months period from 07/01/2022 to 12/31/2022. In these 87, there were 28 collisions happened on HOV and left lanes. In these 28, 14 collisions were happened during peak hour (6-9 AM & 3-6 pm). These reported collisions would be the caused adding to the degradation on HOV lane.

The 59 collisions on left lanes and interior lanes might be not directly impact to the degradation. However, it would make drivers distracted and slow down driving. The collisions happened on opposite direction also an additional cause to the degradation. By excluding all reported collisions from data base, it will improve degradation on HOV lane.

D8 – Route 60 Westbound in Moreno Valley (AM & PM)

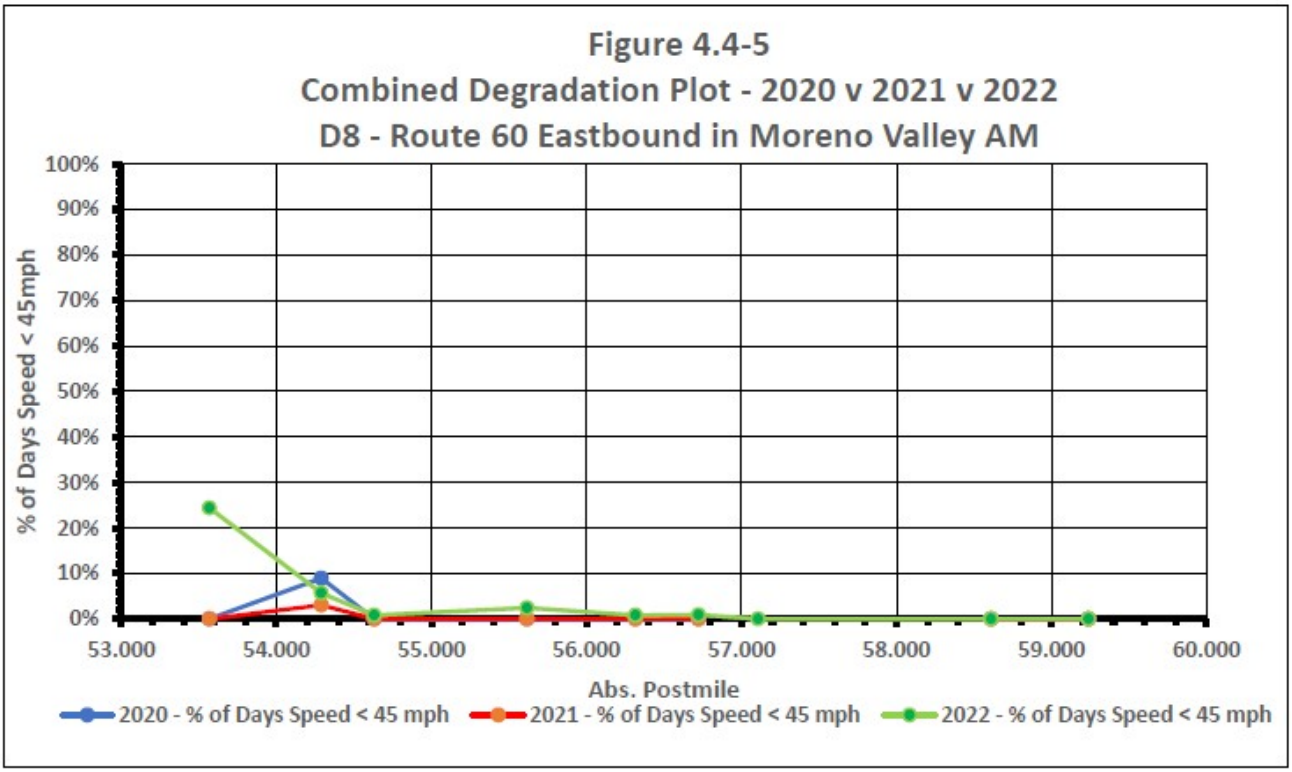
Please refer to Figure 4.4-7 & 4.4-8. This Plot shows the degradation along the corridor in the last three years. Gaps on the graphs show that no data is available along the pertaining gaps either in 2020, 2021 or 2022.

In those 3 years, the degradation patterns were consistent in AM and PM Peaks. Traffic slightly degraded from Perris Boulevard IC and increased to very degraded when getting closer to IC 60/215. This congestion caused by commercial and commuter traffic westward from Arizona, San Diego and surrounding as well as cities located along the freeway. Moreno Valley Mall created a lot of traffic at the Southeast quadrant of Day Street IC that contributes additional congestion too. The demand exceeds the capacity.

The AM and PM peak hour volume: 1055 and 877 (2018-Counting).

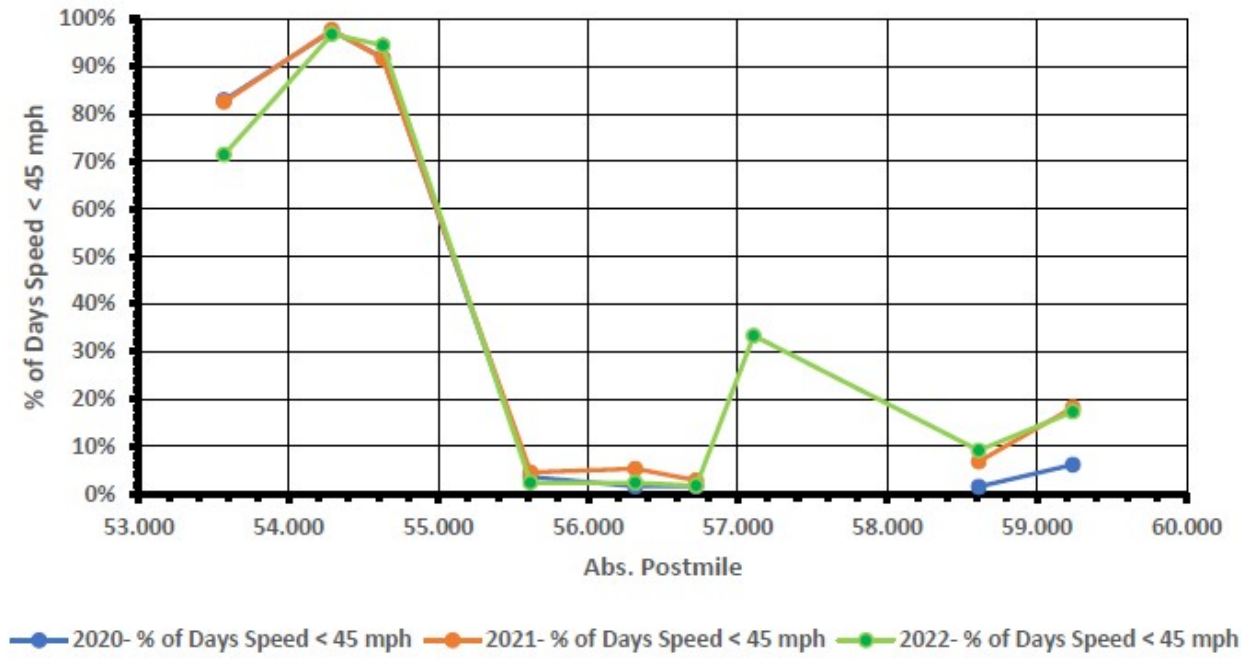
There were 81 collisions reported on this segment during of 6 months period from 07/01/2022 to 12/31/2022. In these 81, there were 39 collisions happened on HOV and left lanes. In these 39, 23 collisions were happened during peak hour (6-9 AM & 3-6 pm). These reported collisions would be the caused adding to the degradation on HOV lane.

The 42 collisions on left lanes and interior lanes might be not directly impact to the degradation. However, it would make drivers distracted and slow down driving. The collisions happened on opposite direction also an additional cause to the degradation. By excluding all reported collisions from data base, it will improve degradation on HOV lane.

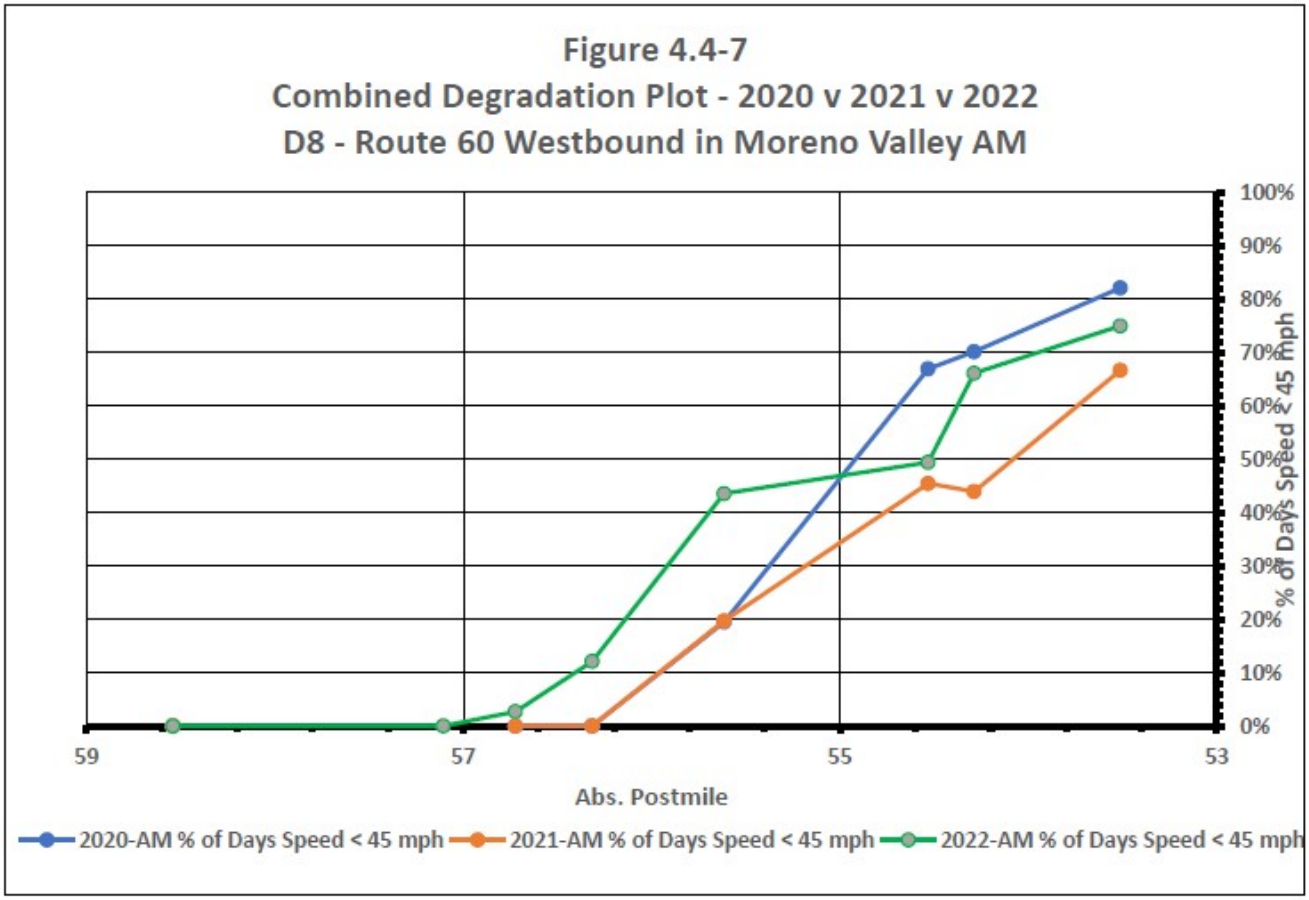


Name	Abs. Postmile
DAY ST E/B ON	53.568
PIGEON PASS	54.289
PIGEON PASS	54.630
HEACOCK	55.616
PERRIS WB ON	56.316
PERRIS EB ONR	56.723
W/O VALLEY WAY	57.107
NASON ST	58.611
MORENO BEACH DR	59.239

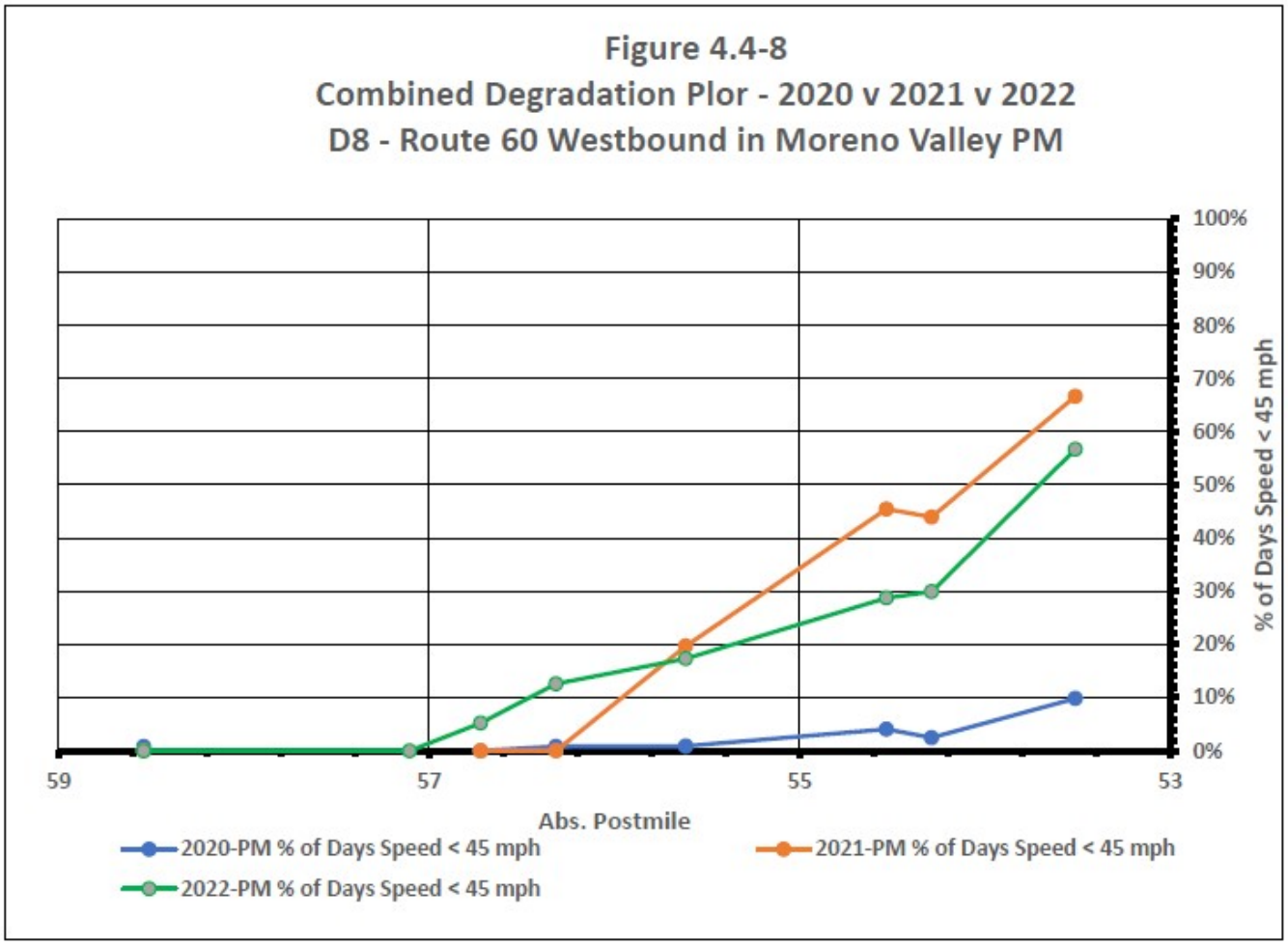
Figure 4.4-6
Combined Degradation Plot - 2020 v 2021 v 2022
D8 - Route 60 Eastbound in Moreno Valley PM



Name	Abs. Postmile
DAY ST E/B ON	53.568
PIGEON PASS	54.289
PIGEON PASS	54.630
HEACOCK	55.616
PERRIS WB ON	56.316
PERRIS EB ONR	56.723
W/O VALLEY WAY	57.107
NASON ST	58.611
MORENO BEACH DR	59.239



Name	Abs. Postmile
DAY ST E/B ON	53.568
PIGEON PASS	54.289
PIGEON PASS	54.630
HEACOCK	55.616
PERRIS WB ON	56.316
PERRIS EB ONR	56.723
W/O VALLEY WAY	57.107
NASON ST	58.611
MORENO BEACH DR	59.239



Name	Abs. Postmile
DAY ST E/B ON	53.568
PIGEON PASS	54.289
PIGEON PASS	54.630
HEACOCK	55.616
PERRIS WB ON	56.316
PERRIS EB ONR	56.723
W/O VALLEY WAY	57.107
NASON ST	58.611
MORENO BEACH DR	59.239

D. Remediation Strategies:

08-1M790 RIV PM R0.00/20.1 to restripe, adding pavement marking, and replacing sign panels on HOV lane. Construction is scheduled to begin in July 2027 and end in January 2028. Signing, pavement markings, and refreshing

stripping will help drivers to take the decisions on time rather than slowing down and impact traffic flow.

District 8 Traffic Operations is in the process of installing Route Shield Pavement Markings (RSPMs) near freeway-to freeway interchanges. Strategically located RSPMs will supplement the information provided by overhead or roadside signs that depict upcoming freeway interchange approaches. When motorist receive information of interchange approaches early, and in multiple ways, they are likely to make better driving decisions and change lanes farther upstream. The installation will be completed in 12/2023.

Desired Outcome: Improving traffic flow by reducing late lane changes and sudden weaving movement, thereby, improving safety and reducing sudden weaving conflict. District 8 will conduct the before and after analysis using data collected during the last six months in 2024. The report will be included in 2024-Degradation Action Plan.

4.5.5 ACTION PLAN FOR HOT FACILITIES ON ROUTE 71

PROJECT UPDATES:

Route 71 didn't appear as a degraded facility in the 2022 degradation report due to insufficient data for analysis. However, as the HOV facility on Route 71 experienced degradation in 2021, this report includes project updates for Route 71. Project EA 0G-790 was completed in 8/2023. The scope of the project was to install RMS, CCTV, CMS, VDS, and Fiber Optic Communication System. HQ can collect new data for 2024 and send to D8 for next 2024 Action Plan.

4.5.6 ACTION PLAN FOR HOT FACILITIES ON ROUTE 91

A. Analysis:

This Managed Lanes on SR-91 between the Orange County Line and I-15 is a HOT lanes facility.

Eastbound traffic:

In the AM, traffic slightly degraded at Serfas Club Dr. In the PM, traffic slightly degraded from Serfas Club Dr. to east of Smith Ave, very degraded at Lincoln Ave, and extreme degraded at Main St.

There were 191 collisions reported on this segment during of 6 months period from 07/01/2022 to 12/31/2022. In these of 191, 66 collisions were happened on HOV and left lanes. In these 66, 31 collisions were happened during peak hour (6-9 AM & 3-6 PM). These reported collisions would be the caused adding to the degradation on HOV lane.

The 125 collisions on left lanes and interior lanes might be not directly impact to the degradation. However, it would make drivers distracted and slow down driving. The collisions happened on opposite direction also an additional cause to the degradation. By excluding all reported collisions from data base, it will improve degradation on HOV lane.

Westbound traffic:

In the AM, traffic slightly degraded at Green River and Main St.

Not degraded in westbound PM.

There were 127 collisions reported on this segment during of 6 months period from 07/01/2022 to 12/31/2022. In these of 127, 45 collisions were happened on HOV and left lanes. In these 45, 27 collisions were happened during peak hour (6-9 AM & 3-6 PM). These reported collisions would be the caused adding to the degradation on HOV lane.

The 82 collisions on left lanes and interior lanes might be not directly impact to the degradation. However, it would make drivers distracted and slow down driving. The collisions happened on opposite direction also an additional cause to the degradation. By excluding all reported collisions from data base, it will improve degradation on HOV lane.

B. Remediation Strategies:

08-0F543, RIV. PM 6.600-8.100 will construct Express Lanes North Direct Connector. The cost estimate is $180,000,000 million. Construction was to begin in April 2020 and will be completed in April 2027. Desired Outcome: Improving traffic operation at this segment.

4.5.7 ACTION PLAN FOR HOV FACILITIES ON ROUTE 91

A. Analysis:

D8 – Route 91 Eastbound from IC 91/15 to IC 60/91/215 (AM & PM)

Please refer to Figure 4.4-9 & 4.4-10.

In the last three years, within the corridor the congestions occurred on the same segments. The fluctuation of the degradation degree was less than 25% at most of the locations along the corridor.

During AM Peak, "no" to "slightly" degradation occurred from the beginning (15-91 JCT) to La Sierra Av. (about Abs. PM 49.500). The degradation started from hereon to Central Av. (about Abs. PM 56.000) due to commuter traffic from

Orange County, Los Angeles County, and their surroundings to downtown of the City of Riverside.

During PM Peak the "extremely" degradation started from the beginning (15-91 JCT) to Adams St. (about Abs. PM 53.000) due to commuter traffic from west (Orange County, Los Angeles County, and their surroundings) to east of the City of Corona and City of Riverside. From here-on to the end of the corridor, there were "no" to "slightly" degradation.

The AM and PM peak hour volume: 1303 and 1677 (2018-Counting).

There were 234 collisions reported on this segment during of 6 months period from 07/01/2022 to 12/31/2022. In these 234, there were 79 collisions happened on HOV and left lanes. In these 79, 42 collisions were happened during peak hour (6-9 AM & 3-6 pm). These reported collisions would be the caused adding to the degradation on HOV lane.

The 155 collisions on left lanes and interior lanes might be not directly impact to the degradation. However, it would make drivers distracted and slow down driving. By excluding all reported collisions from data base, it will improve degradation on HOV lane.

D8 – Route 91 Westbound from IC 60/91/215 to IC 91/15 (AM & PM)

Please refer to Figure 4.4-11 & 4.4-12.

In the last three years, within the corridor the congestions occurred on the same segments. The fluctuation of the degradation degree was less than 25% at most of the locations along the corridor with the exception along Rte. 91 WB (AM) between Tyler St. (about Abs. PM 50.000) and Pierce St. (Abs. PM 48.000).

During AM Peak, "no" degradation existed from the beginning (the downtown of Riverside) to Van Buren Blvd. (about Abs. PM 51.500). The degradation started from hereon to west of McKinley St. (about Abs.PM 46.500) as the traffic approaching the 15-91 JCT due to commuter traffic from Riverside County, San Bernardino County, and their surroundings to the City of Corona and cities located along Rte. 15.

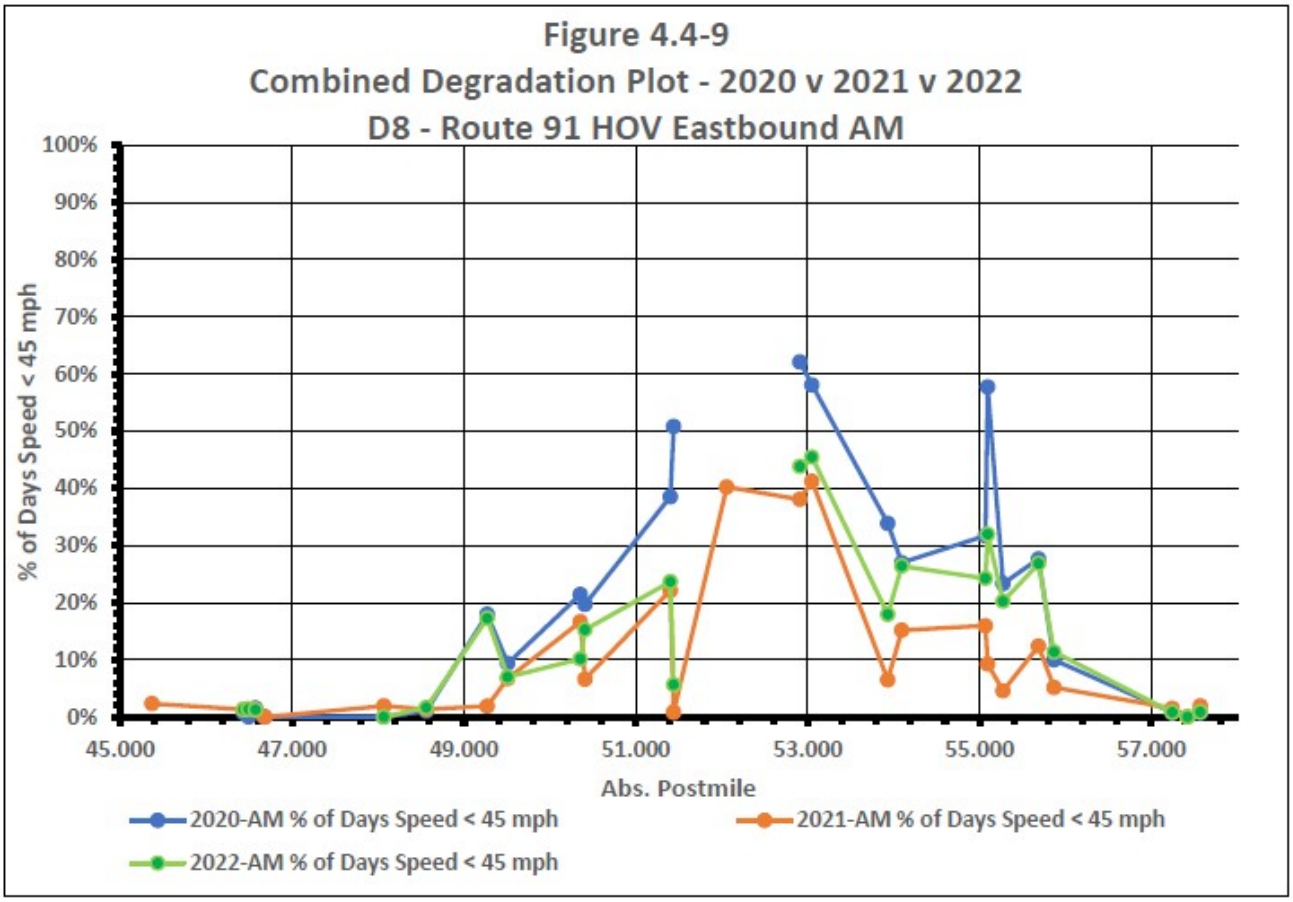
During PM Peak, "slightly" to "extremely" degradation started from the beginning (the downtown of Riverside) to the 15-91 JCT where the traffic entering 91-HOT lanes. This traffic was commuter traffic from Riverside County, San Bernardino County, and their surroundings to the City of Corona and cities located along Rte. 15.

The AM and PM peak hour volume: 1126 and 1264 (2018-Counting).

There were 255 collisions reported on this segment during of 6 months period from 07/01/2022 to 12/31/2022. In these 255, there were 97 collisions happened on HOV and left lanes. In these 97, 46 collisions were happened during peak hour (6-9 AM & 3-6 pm). These reported collisions would be the caused adding to the degradation on HOV lane.

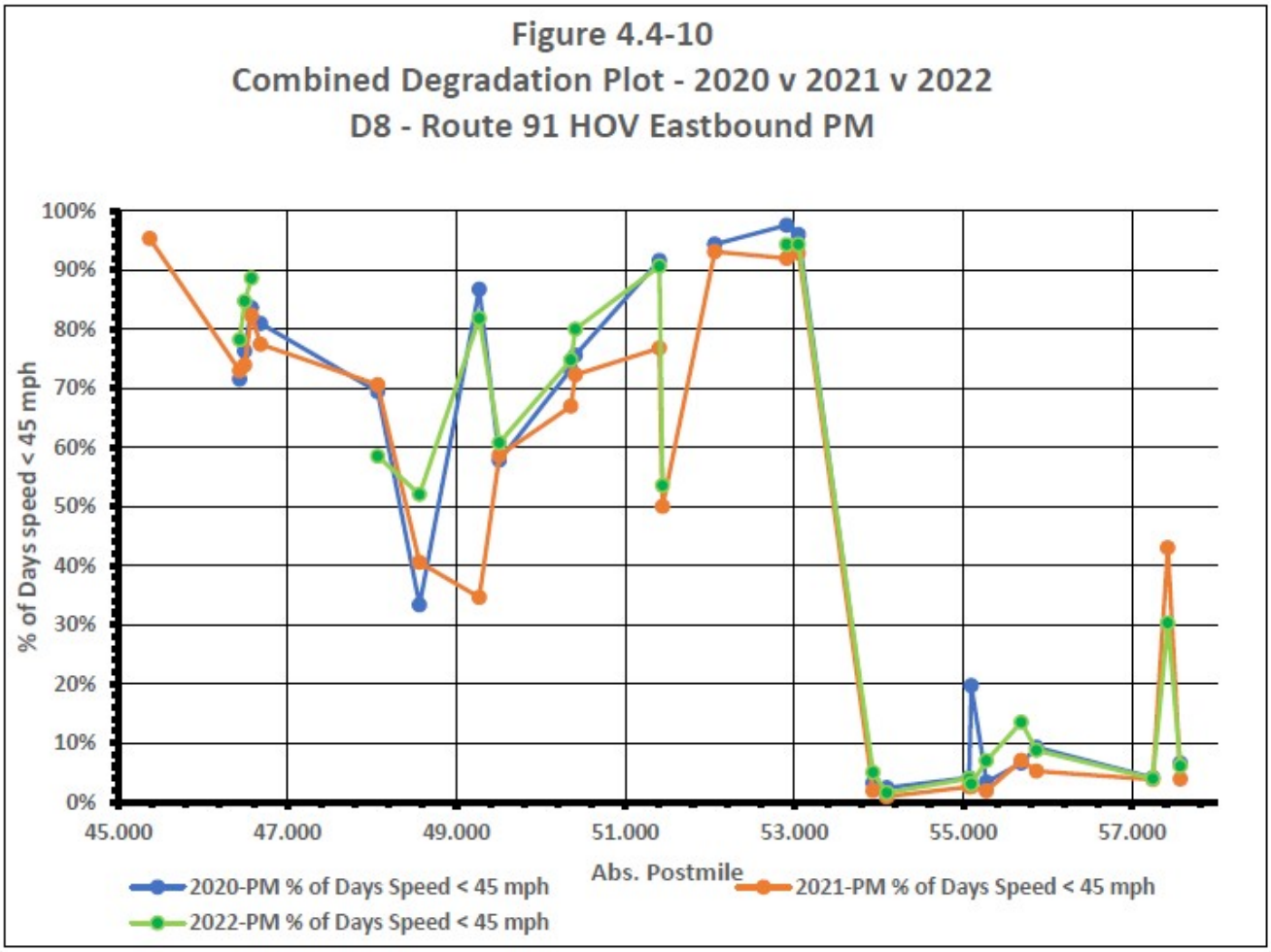
The 158 collisions on left lanes and interior lanes might be not directly impact to the degradation. However, it would make drivers distracted and slow down driving. The collisions happened on opposite direction also an additional cause to the degradation. By excluding all reported collisions from data base, it will improve degradation on HOV lane.

The 2019 violation rate on SR-91 was 37.4%.



Name	Abs Postmile
0.1 W/O PROMENADE	45.371
MCKINLEY	46.434
MCKINLEY LOOP ON	46.494
MCKINLEY	46.574
E/O MCKINLEY St.	46.681
PIERCE	48.068
MAGNOLIA	48.563
LA SIERRA	49.271
LA SIERRA	49.509
TYLER	50.355
TYLER	50.408
Van Buren Loop EB on	51.402
VAN BUREN	51.440

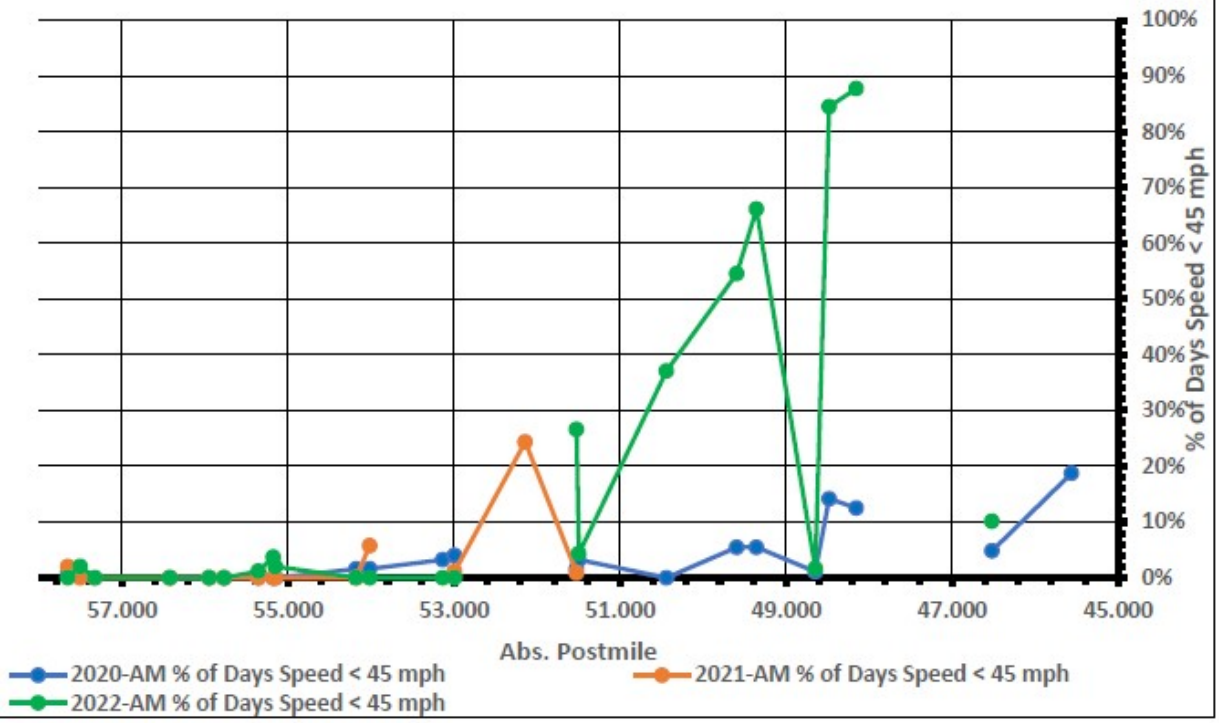
Name	Abs Postmile
600 FT E/O JACKSON	52.058
ADAMS	52.909
ADAMS	53.050
MADISON	53.932
MADISON	54.095
ARLINGTON WB ON	55.068
Jane St	55.094
ARLINGTON AVE	55.273
CENTRAL WB ON	55.686
CENTRAL EB ON	55.866
FOURTEENTH ST	57.243
FOURTEENTH ST	57.420
TENTH ST	57.569



Name	Abs Postmile
0.1 W/O PROMENADE	45.371
MCKINLEY	46.434
MCKINLEY LOOP ON	46.494
MCKINLEY	46.574
E/O MCKINLEY St.	46.681
PIERCE	48.068
MAGNOLIA	48.563
LA SIERRA	49.271
LA SIERRA	49.509
TYLER	50.355
TYLER	50.408
Van Buren Loop EB on	51.402
VAN BUREN	51.440

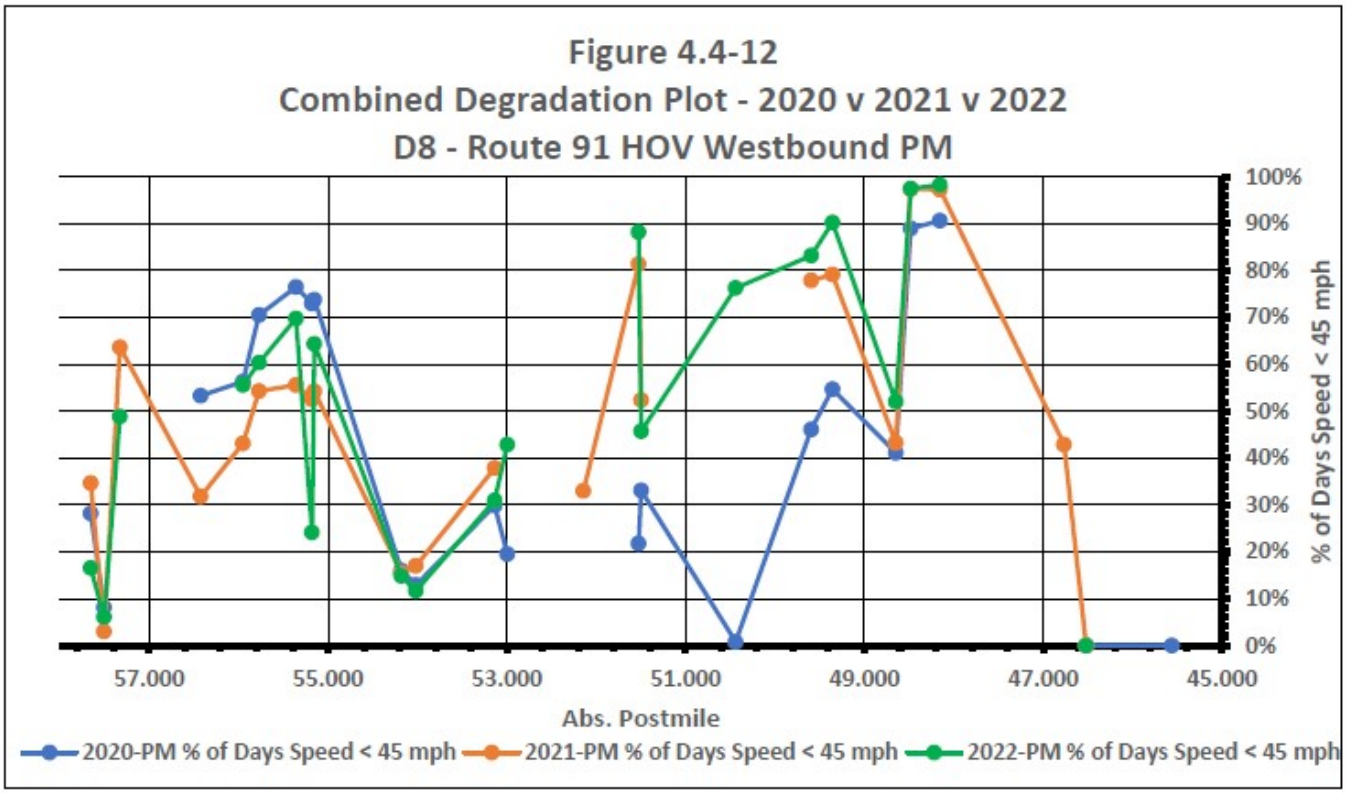
Name	Abs Postmile
600 FT E/O JACKSON	52.058
ADAMS	52.909
ADAMS	53.050
MADISON	53.932
MADISON	54.095
ARLINGTON WB ON	55.068
Jane St	55.094
ARLINGTON AVE	55.273
CENTRAL WB ON	55.686
CENTRAL EB ON	55.866
FOURTEENTH ST	57.243
FOURTEENTH ST	57.420
TENTH ST	57.569

Figure 4.4-11
Combined Degradation Plot - 2020 v 2021 v 2022
D8 - Route 91 HOV Westbound AM



Name	Abs. Postmile
TENTH ST	57.655
FOURTEENTH ST	57.506
FOURTEENTH ST	57.329
IVY OC 100 FT E/O	56.425
CENTRAL EB ON	55.952
CENTRAL WB ON	55.772
ARLINGTON AVE	55.359
Jane St	55.180
ARLINGTON WB ON	55.154
MADISON	54.181
MADISON	54.018
ADAMS	53.136
ADAMS	52.995

Name	Abs. Postmile
JACKSON ST	52.144
VAN BUREN	51.526
VAN BUREN	51.497
TYLER	50.441
LA SIERRA	49.595
LA SIERRA	49.357
MAGNOLIA	48.649
MAGNOLIA	48.482
PIERCE	48.154
E/O MCKINLEY ST	46.767
MCKINLEY ST	46.520
E/O PROMENADE AV	45.560



Name	Abs. Postmile
TENTH ST	57.655
FOURTEENTH ST	57.506
FOURTEENTH ST	57.329
IVY OC 100 FT E/O	56.425
CENTRAL EB ON	55.952
CENTRAL WB ON	55.772
ARLINGTON AVE	55.359
Jane St	55.180
ARLINGTON WB ON	55.154
MADISON	54.181
MADISON	54.018
ADAMS	53.136
ADAMS	52.995

Name	Abs. Postmile
JACKSON ST	52.144
VAN BUREN	51.526
VAN BUREN	51.497
TYLER	50.441
LA SIERRA	49.595
LA SIERRA	49.357
MAGNOLIA	48.649
MAGNOLIA	48.482
PIERCE	48.154
E/O MCKINLEY ST	46.767
MCKINLEY ST	46.520
E/O PROMENADE AV	45.560

B. Remediation Strategies:

08-1M790 RIV-91 PM 7.50/21.8 to restripe, adding pavement marking, and replacing sign panels on HOV lane. Construction is scheduled to begin in July 2027 and end in January 2028. Signing, pavement markings, and refreshing stripping will help drivers to take the decisions on time rather than slowing down and impact traffic flow.

District 8 Traffic Operations is in the process of installing Route Shield Pavement Markings (RSPMs) near freeway-to freeway interchanges. Strategically located RSPMs will supplement the information provided by overhead or roadside signs that depict upcoming freeway interchange approaches. When motorist receive information of interchange approaches early, and in multiple ways, they are likely to make better driving decisions and change lanes farther upstream. The installation will be completed in 12/2023.

Desired Outcome: Improving traffic flow by reducing late lane changes and sudden weaving movement, thereby, improving safety and reducing sudden weaving conflict. District 8 will conduct the before and after analysis using data collected during the last six months in 2024. The report will be included in 2024-Degradation Action Plan.

4.5.8 ACTION PLAN FOR HOV FACILITIES ON ROUTE 210

A. Analysis:

D8 – Route 210 Eastbound from LA County to IC 210/215 (AM & PM)

Please refer to Figure 4.4-13 & 4.4-14.

During AM Peak there was "no" degradation.

During PM Peak, in the last three years, within the corridor the congestions occurred on the same segments. The fluctuation of the degradation degree was less than 25% at most of the locations along the corridor. The traffic extremely degraded started from LA County line and diminished farther east as it approached 15-210 JCT. These commercial and commuter traffic came from Los Angeles County going East to San Bernadino County as well as North and South through I-15.

The degradation started right after I-15 JCT and diminished farther east where SR-210 meet I-215. The degradation caused by traffic coming from I-15 north and I-15 south travelling to San Bernadino County and beyond.

The AM and PM peak hour volume: 606 and 1328 (2018-Counting).

There were 184 collisions reported on this segment during of 6 months period from 07/01/2022 to 12/31/2022. In these 184, there were 83 collisions happened on HOV and left lanes. In these 83, 31 collisions were happened during peak hour (6-9 AM & 3-6 pm). These reported collisions would be the caused adding to the degradation on HOV lane.

The 101 collisions on left lanes and interior lanes might be not directly impact to the degradation. However, it would make drivers distracted and slow down driving. The collisions happened on opposite direction also an additional cause to the degradation.

By excluding all reported collisions from data base, it will improve degradation on HOV lane.

D8 – Route 210 Westbound from LA County to IC 210/215 (AM & PM)

Please refer to Figure 4.4-15 & 4.4-16.

During AM Peak there was "no" degradation from I-215 all the way to I-15. The degradation started after I-15 and continued to Los Angeles County Line. The commercial and commuter traffic came from north and south through I-15 to Los Angeles County. However, the fluctuation of the degradation degree was less than 25% at most of the locations along the corridor.

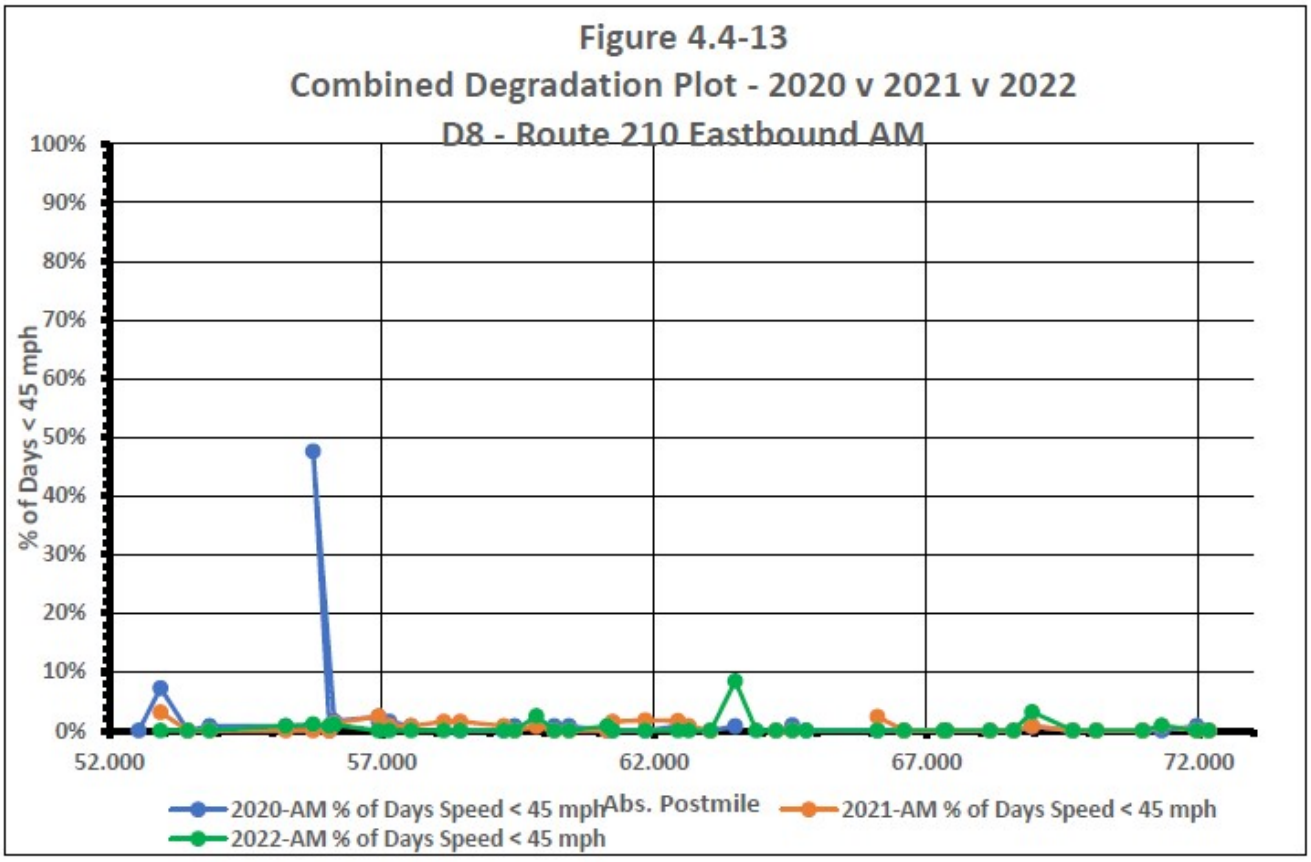
The AM and PM peak hour volume: 1787 and 1467 (2018-Counting).

During PM Peak in the last three years, there was "no" to "slightly" degradation along the entire corridor.

There were 184 collisions reported on this segment during of 6 months period from 07/01/2022 to 12/31/2022. In these 184, there were 83 collisions happened on HOV and left lanes. In these 83, 31 collisions were happened during peak hour (6-9 AM & 3-6 pm). These reported collisions would be the caused adding to the degradation on HOV lane.

The 101 collisions on left lanes and interior lanes might be not directly impact to the degradation. However, it would make drivers distracted and slow down driving. The collisions happened on opposite direction also an additional cause to the degradation. By excluding all reported collisions from data base, it will improve degradation on HOV lane.

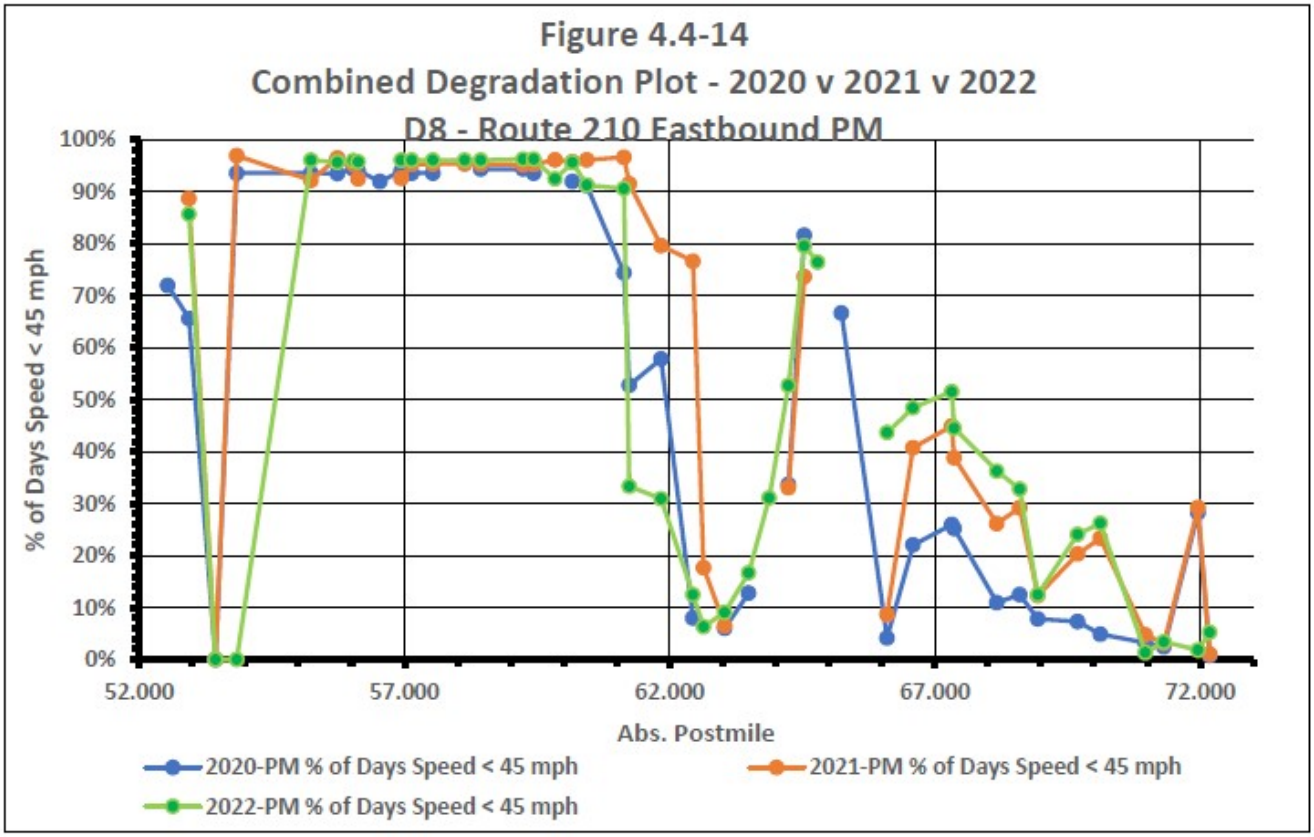
The 2019 violation rate on SR-210 was 23.5%.



Name	Abs Postmile
STATE EB/ON @ 210	73.199
STATE WB/ON @ 210	72.979
Pepper Ave	72.111
RIVERSIDE EB/ON@210	71.319
RIVERSIDE WB/ON@210	70.969
AYALA EB ON @ 210	70.119
210 @ AYALA ON	69.689
ALDER EB/ON @ 210	68.599
ALDER WB/ON	68.169
SIERRA WB LOOP	67.339
SIERRA EB LOOP	67.319
SIERRA WB ON	67.189
CITRUS EB ON	66.589
CITRUS WB ON	66.099
1 MI W/O CITRUS AVE	65.239
210 EB from 15 SB	64.792
CHERRY AVE	64.539
CHERRY AVE	64.239
210 WB from 15 NB	63.877
210 WB from 15 SB	63.489

Name	Abs Postmile
.9 MI W/O JCT 210/15	63.039
1.3MI W/O JCT 210/15	62.639
.8M E/O DAY CREEK	62.439
DAY CREEK EB ON (OS)	61.839
DAY CREEK WB ON	61.239
.75 M E/O MILLIKEN	61.139
MILLIKEN EB ON	60.439
W/B MILLIKEN ONR	60.169
MILLIKEN AVE	59.839
HAVEN EB ON	59.439
W/B HAVEN ONR	59.239
E/B ARCHIBALD ONR	58.439
W/B ARCHIBALD ONR	58.139
.4M E/O CARNELIAN	57.539
CARNELIAN EB ON	57.139
W/B CARNELIAN	56.939
CAMPUS EB ON	56.129

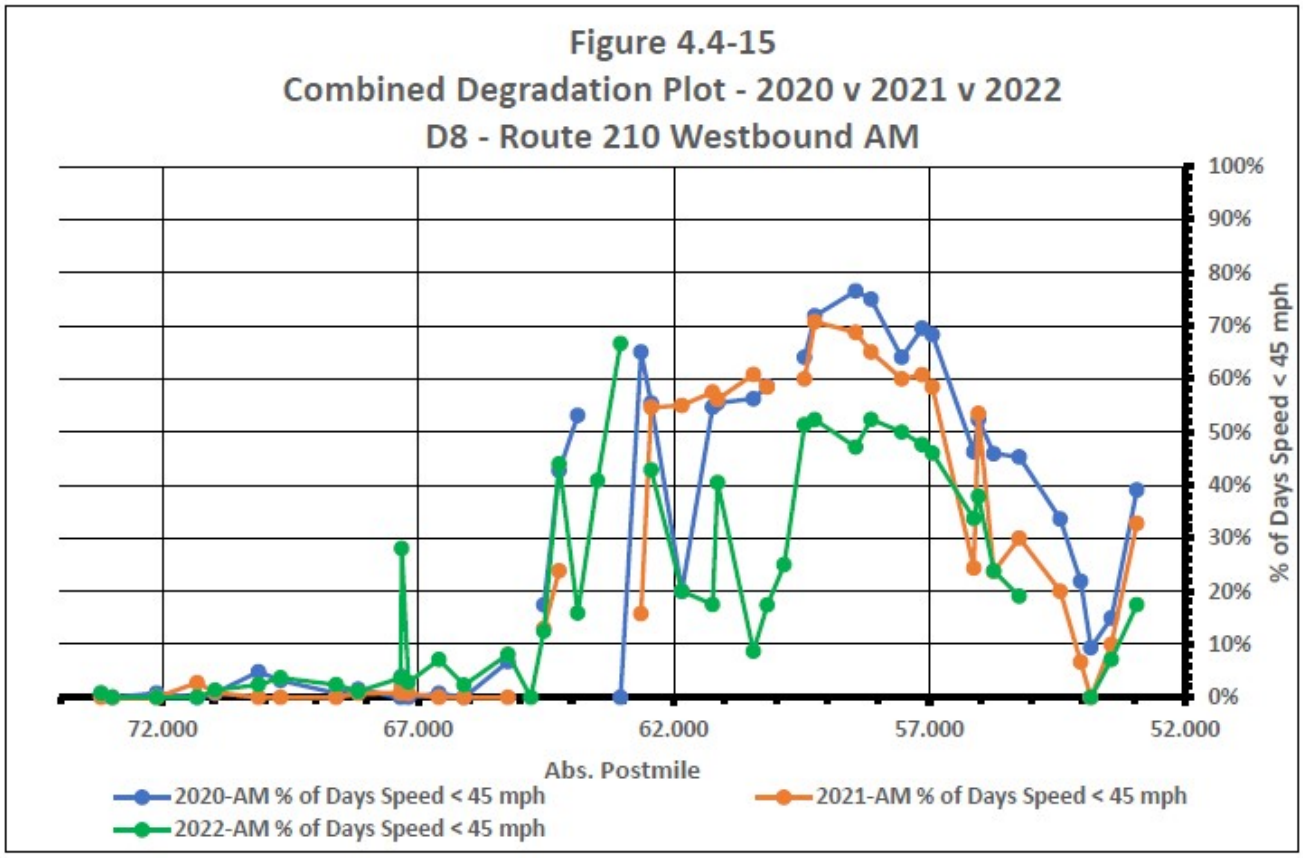
Name	Abs Postmile
CAMPUS AVE .5 M E/O	56.039
CAMPUS W/B ON	55.739
CAMPUS AVE .5 M W/O	55.239
San Antonio A. OC	54.439
EO MOUNTAIN AVE	54.039
WO MOUNTAIN AVE	53.839
COUNTY LINE 1 M E/O	53.439
COUNTY LINE .5 M E/O	52.939



Name	Abs Postmile
STATE EB/ON @ 210	73.199
STATE WB/ON @ 210	72.979
Pepper Ave	72.111
RIVERSIDE EB/ON@210	71.319
RIVERSIDE WB/ON@210	70.969
AYALA EB ON @ 210	70.119
210 @ AYALA ON	69.689
ALDER EB/ON @ 210	68.599
ALDER WB/ON	68.169
SIERRA WB LOOP	67.339
SIERRA EB LOOP	67.319
SIERRA WB ON	67.189
CITRUS EB ON	66.589
CITRUS WB ON	66.099
1 MI W/O CITRUS AVE	65.239
210 EB from 15 SB	64.792
CHERRY AVE	64.539
CHERRY AVE	64.239
210 WB from 15 NB	63.877
210 WB from 15 SB	63.489

Name	Abs Postmile
.9 MI W/O JCT 210/15	63.039
1.3MI W/O JCT 210/15	62.639
.8M E/O DAY CREEK	62.439
DAY CREEK EB ON (OS)	61.839
DAY CREEK WB ON	61.239
.75 M E/O MILLIKEN	61.139
MILLIKEN EB ON	60.439
W/B MILLIKEN ONR	60.169
MILLIKEN AVE	59.839
HAVEN EB ON	59.439
W/B HAVEN ONR	59.239
E/B ARCHIBALD ONR	58.439
W/B ARCHIBALD ONR	58.139
.4M E/O CARNELIAN	57.539
CARNELIAN EB ON	57.139
W/B CARNELIAN	56.939
CAMPUS EB ON	56.129

Name	Abs Postmile
CAMPUS AVE .5 M E/O	56.039
CAMPUS W/B ON	55.739
CAMPUS AVE .5 M W/O	55.239
San Antonio A. OC	54.439
EO MOUNTAIN AVE	54.039
WO MOUNTAIN AVE	53.839
COUNTY LINE 1 M E/O	53.439
COUNTY LINE .5 M E/O	52.939



Name	Abs. Postmile
STATE EB/ON @ 210	73.199
STATE WB/ON @ 210	72.979
Pepper Ave	72.111
RIVERSIDE EB/ON@210	71.319
RIVERSIDE WB/ON@210	70.969
AYALA EB ON @ 210	70.119
210 @ AYALA ON	69.689
ALDER EB/ON @ 210	68.599
ALDER WB/ON	68.169
SIERRA WB LOOP	67.339
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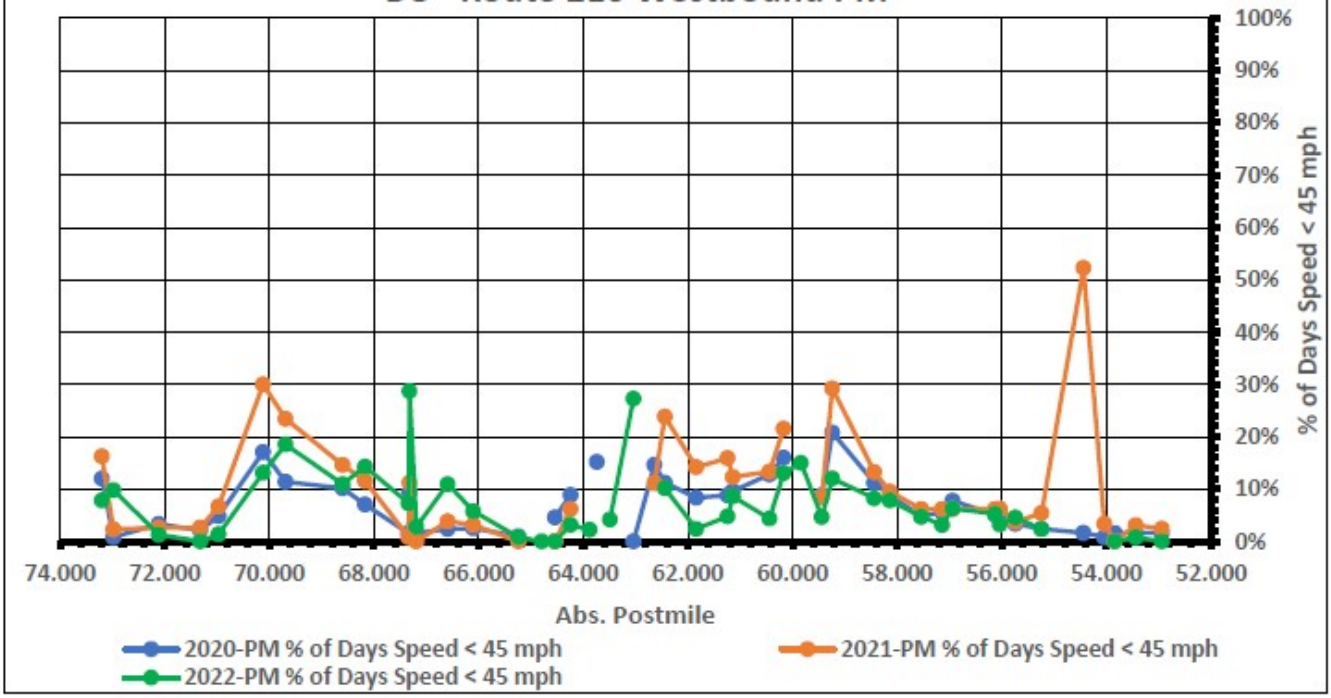
SIERRA WB ON	67.189
CITRUS EB ON	66.589
CITRUS WB ON	66.099
1 MI W/O CITRUS AVE	65.239
210 EB from 15 SB	64.792
CHERRY AVE	64.539
CHERRY AVE	64.239
210 WB from 15 NB	63.877
210 WB from 15 SB	63.739
.9 MI W/O JCT 210/15	63.489
.8M E/O DAY CREEK	63.039
DAY CREEK EB ON (OS)	62.639
DAY CREEK WB ON	62.439
.75 M E/O MILLIKEN	61.839
MILLIKEN EB ON	61.239
W/B MILLIKEN ONR	61.139
MILLIKEN AVE	60.439
HAVEN EB ON	60.169
W/B HAVEN ONR	59.839
E/B ARCHIBALD ONR	59.439
W/B ARCHIBALD ONR	59.239
.4M E/O CARNELIAN	58.439
CARNELIAN EB ON	58.139
W/B CARNELIAN	57.539
CAMPUS EB ON	57.139
CAMPUS AVE .5 M E/O	56.939
CAMPUS W/B ON	56.129
CAMPUS AVE .5 M W/O	56.039
W/B MOUNTAIN AVE	55.739
COUNTY LINE 1 M E/O	55.239
COUNTY LINE .5 M E/O	54.439
EO MOUNTAIN AVE	54.039
WO MOUNTAIN AVE	53.839
COUNTY LINE 1 M E/O	53.439
COUNTY LINE .5 M E/O	52.939

Figure 4.4-16
Combined Degradation Plot - 2020 v 2021 v 2022
D8 - Route 210 Westbound PM



Name	Abs. Postmile
STATE EB/ON @ 210	73.199
STATE WB/ON @ 210	72.979
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CITRUS EB ON	66.589
CITRUS WB ON	66.099
1 MI W/O CITRUS AVE	65.239
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DAY CREEK WB ON	62.439
.75 M E/O MILLIKEN	61.839
MILLIKEN EB ON	61.239
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MILLIKEN AVE	60.439
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CARNELIAN EB ON	58.139
W/B CARNELIAN	57.539
CAMPUS EB ON	57.139
CAMPUS AVE .5 M E/O	56.939
CAMPUS W/B ON	56.129
CAMPUS AVE .5 M W/O	56.039
W/B MOUNTAIN AVE	55.739
COUNTY LINE 1 M E/O	55.239
COUNTY LINE .5 M E/O	54.439
EO MOUNTAIN AVE	54.039
WO MOUNTAIN AVE	53.839
COUNTY LINE 1 M E/O	53.439
COUNTY LINE .5 M E/O	52.939

B. Remediation Strategies:

08-1P530 SBD PM 1.90/3.10 to add EB & WB auxiliary lanes and retaining wall. Construction is scheduled to begin in June 2029 and end in June 2030. This project should improve the traffic mobility on all lanes in the vicinity between Campus Ave and Mountain Ave.

District 8 Traffic Operations is in the process of installing Route Shield Pavement Markings (RSPMs) near freeway-to freeway interchanges. Strategically located RSPMs will supplement the information provided by overhead or roadside signs that depict upcoming freeway interchange approaches. When motorist receive information of interchange approaches early, and in multiple ways, they are likely to make better driving decisions and change lanes farther upstream. The installation will be completed in 12/2023.

Desired Outcome: Improving traffic flow by reducing late lane changes and sudden weaving movement, thereby, improving safety and reducing sudden weaving conflict. District 8 will conduct the before and after analysis using data collected during the last six months in 2024. The report will be included in 2024-Degradation Action Plan.

4.5.9 ACTION PLAN FOR HOV FACILITIES ON ROUTE 215

I-215 between postmile RIV. 38.78 and SBD. 10.03 (16.5 mile long) is an arterial multilane urban freeway with one-lane continuous access HOV lane. The I-215 freeway is designated as a North-South Freeway.

The 60-91-215 JCT in the City of Riverside at about Abs. Postmile 58.987 is a four-legged Junction (JCT).

The north and east leg are I-215, the south leg is SR-91, and the west leg is SR-60. TSR-60 (designated as East-West freeway) is the west leg of the JCT. SR-91(designated as East-West freeway) is the south leg of the JCT, and its orientation is in the North-South Cardinal direction. I-215 (designated as North-South freeway) is the east and north leg of the JCT. Since there are no direct HOV connectors between the HOV lanes, the HOV traffic must merge to mixed flow lanes first to enter HOV lane at the other leg of the JCT.

Example: If the northbound HOV lane traffic on northbound I-215 (east leg) plans to continue to stay on northbound I-215 HOV lane, it must exit and merge into mixed flow lanes before the JCT and take the connector to northbound I-215 (north leg) first before entering the northbound HOV lane on the north leg. This movement creates congestion as the traffic approaching the junction. The northbound HOV traffic on east leg (I-215) will continue as westbound HOV traffic on west leg (SR-60) if it still wants to stay as a HOV traffic.

The HOV-lane is bordered by a various width of treated shoulder adjacent to median concrete barrier on the left and separated with General Purpose with Detail 42 on the right. In general, the signing and striping of the HOV-lane is proper and in a good condition. This arterial freeway has closely spaced interchanges and relatively flat terrain throughout, except the first 5-mile segment at the south end between 60-215 JCT in City of Moreno Valley and 60-91-215 JCT in the City of Riverside.

This freeway corridor traverses through the UCR campus area and two downtowns – downtown of the City of Riverside and the City of San Bernardino. SR-60 from the west (Los Angeles County) and SR-91 from the south (Orange County) meet I-215 as 60-91-215 junction in the city of Riverside. SR-60 from the east as far as the State of Arizona and I-215 from the south as far as San Diego County, and Mexico meet I-215 as 60-215 JCT in the City of Moreno Valley. I-10, SR-66 and I-210/I-259 which are E-W direction facilities cut through I-215 at different locations along the northern part of the corridor.

The 5-mile-long segment is located between 60-215 JCT in the City of Moreno valley and 60-91-215 JCT in the City of Riverside. At south end of this segment is 60-215 JCT in City of Moreno Valley where SR-60 and I-215 meets. SR-60 continues easterly and ends at I-10 which continues farther east to the State of Arizona. I-215 continues south to San Diego County and Mexico. The north end of the segment is 60-91-215 JCT in the City of Riverside. I-215 (north leg) continues northerly to join I-15 to northern California towards the State of Nevada. SR-91 (south leg) crosses the Riverside County and Orange County. SR-60 (west leg) crosses the Riverside, San Bernardino, and Los Angeles County. This segment not only has closely spaced interchanges with auxiliary lane but also has an up and down grade with large radius curve alignments. This segment is heavily transverse by commercial and commuter traffic.

On September 25, 2023, Caltrans D8 Operations in partnership with Caltrans HQ met with Lindsay Corporation to conduct a study to install Moveable Barrier on a 5-mile segment of SR-215 HOV Lane near University of California Riverside. The study on this most degraded HOV Lane in D8 is expected to be completed on/or before September 2024.

The traffic demand exceeds the capacity especially during AM and PM Peak.

A. Analysis:

D8 – Route 215 Northbound (AM & PM)

Please refer to Figure 4.4-17 and 4.4-18.

During AM & PM Peak, in the last three years, within the corridor the congestions occurred on the same segments. The fluctuation of the degradation degree was less than 25% at most of the locations along the corridor.

During AM peak, extremely degraded started from Box Springs Rd (W/O 60-215 JCT in the City of Moreno Valley) and diminished as it approached 60-91-215 JCT in the City of Riverside due to commercial & commuter traffic from the State of Nevada and San Diego County and surrounding. At the junction, due to no HOV direct connectors, the HOV traffic lane on northbound I-215 (east leg) would continue as westbound HOV lane on SR-60. The north bound HOV lane on I-215 (north leg) after 60-91-215 JCT is the continuation of eastbound 91 HOV lane (south leg). This commercial & commuter traffic came from Riverside and Orange County travelling north to San Bernardino County and the State of Nevada through I-15. The north segment of the corridor was not degraded, except at around Barton Rd. (about Abs. PM 39.000) due to construction activities of EA 08-0J070.

During PM Peak, extremely degraded throughout the corridor from the 60-215 JCT (in the City of Moreno Valley) through 60-91-215 JCT (in the City of Riverside) and continue to 210-215 JCT (in the City of San Bernardino). The traffic on the mixed flow lanes were extremely congested and due to friction effect the adjacent traffic on the HOV lane was adversely affected. The affect was exacerbated by the continuous access HOV lane striping (Detail 42).

The traffic demand was over the capacity, especially during AM & PM Peak.

The AM and PM peak hour volume: 1682 and 1839 (2018-Counting).

There were 353 collisions reported on this segment during of 6 months period from 07/01/2022 to 12/31/2022. In these 353, there were 114 collisions happened on HOV and left lanes. In these 114, 50 collisions were happened during peak hour (6-9 AM & 3-6 pm). These reported collisions would be the caused adding to the degradation on HOV lane.

The 239 collisions on left lanes and interior lanes might be not directly impact to the degradation. However, it would make drivers distracted and slow down driving. The collisions happened on opposite direction also an additional cause to the degradation. By excluding all reported collisions from data base, it will improve degradation on HOV lane.

D8 – Route 215 Southbound (AM & PM)

Please refer to Figure 4.4-19 & 4.4-20.

During AM & PM Peak, in the last three years, within the corridor the congestions occurred on the same segments. The fluctuation of the degradation degree was less than 25% at most of the locations along the corridor.

During AM & PM Peak, No degradation up to Iowa Av. (about Abs. PM 37.500), except around Barton Rd (about Abs. PM 39.000) due to construction activities of EA 08-0J070 and 08-1F730. Construction activities required shifting lanes and reducing lane width, thereby creating congestion. The traffic was very

degraded as it approached 60-91-215 JCT. The southbound HOV lane on I-215 (east leg) after 60-91-215 JCT is the continuation of eastbound SR-60 HOV lane (west leg). The traffic was extremely degraded up to 60-215 JCT in the City of Moreno Valley due to closely spaced interchanges and an up and down grade with large radius curve alignments (the 5-mile segment across UCR Campus and the City of Riverside).

The traffic on the mixed flow lanes were extremely congested and due to friction effect the adjacent traffic on the HOV lane was adversely affected. The affect was exacerbated by the continuous access HOV lane striping (Detail 42).

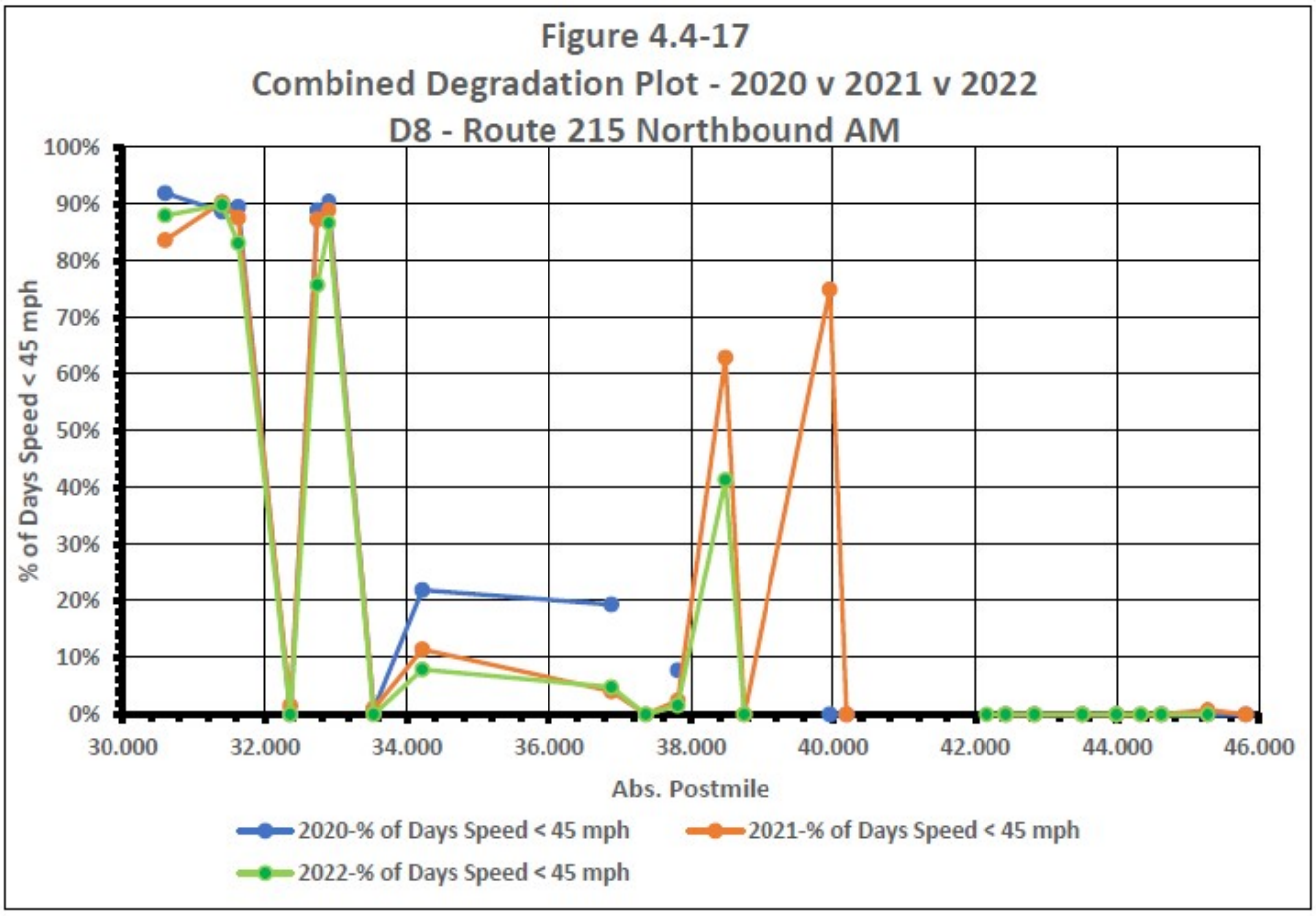
The demand was over the capacity.

The AM and PM peak hour volume: 1486 and 1663 (2018-Counting).

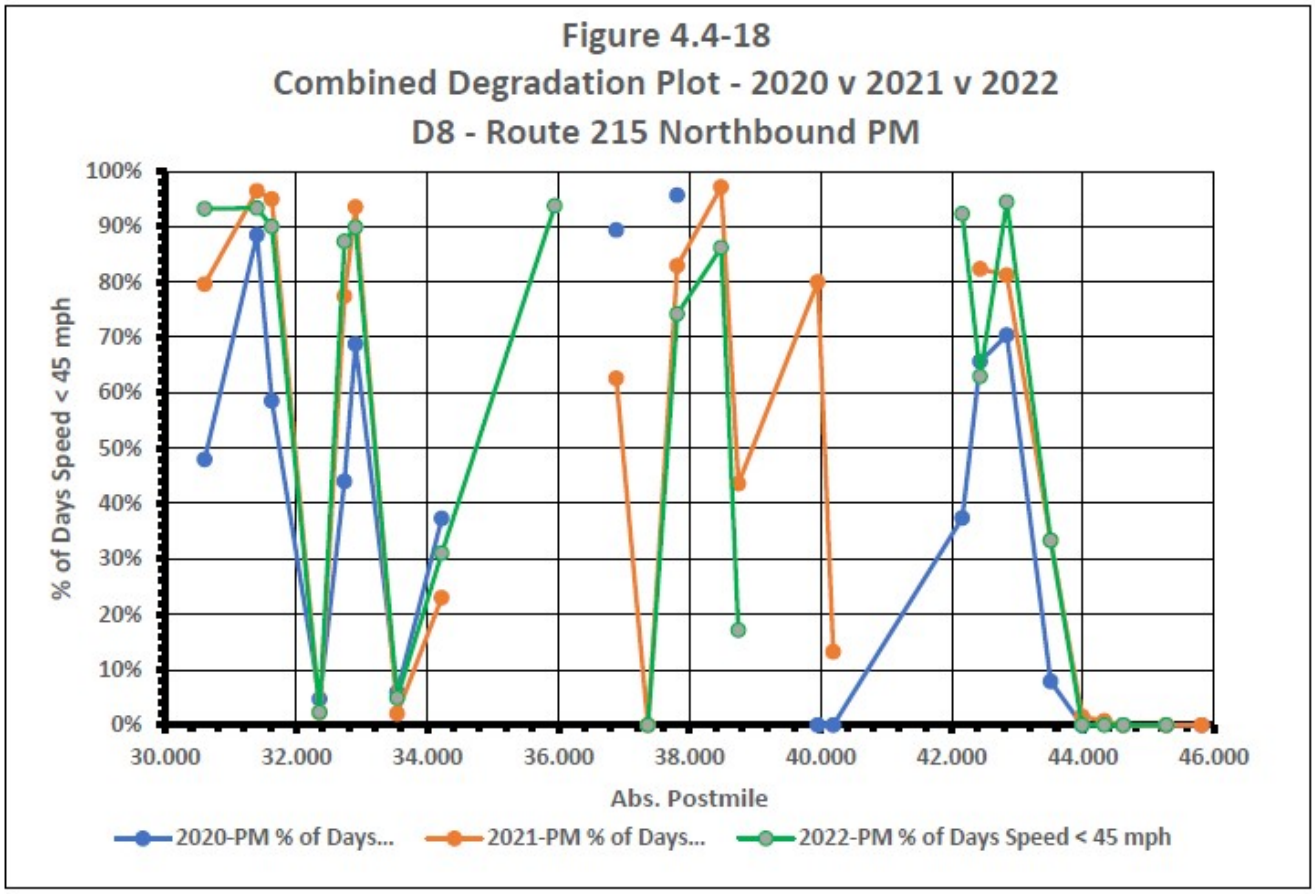
There were 415 collisions reported on this segment during of 6 months period from 07/01/2022 to 12/31/2022. In these 415, there were 132 collisions happened on HOV and left lanes. In these 142, 59 collisions were happened during peak hour (6-9 AM & 3-6 pm). These reported collisions would be the caused adding to the degradation on HOV lane.

The 283 collisions on left lanes and interior lanes might be not directly impact to the degradation. However, it would make drivers distracted and slow down driving. The collisions happened on opposite direction also an additional cause to the degradation. By excluding all reported collisions from data base, it will improve degradation on HOV lane.

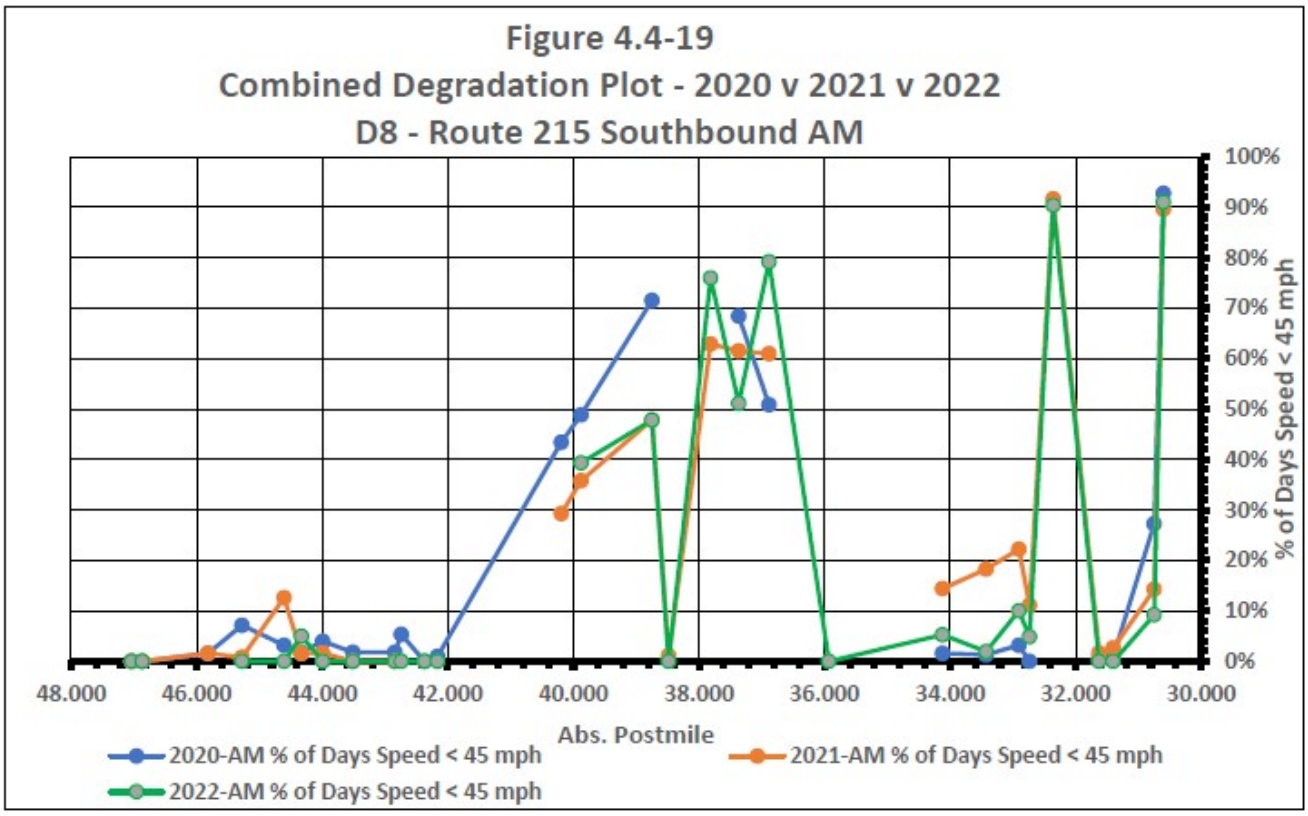
The 2019 violation rate on SR-215 was 26.9%.



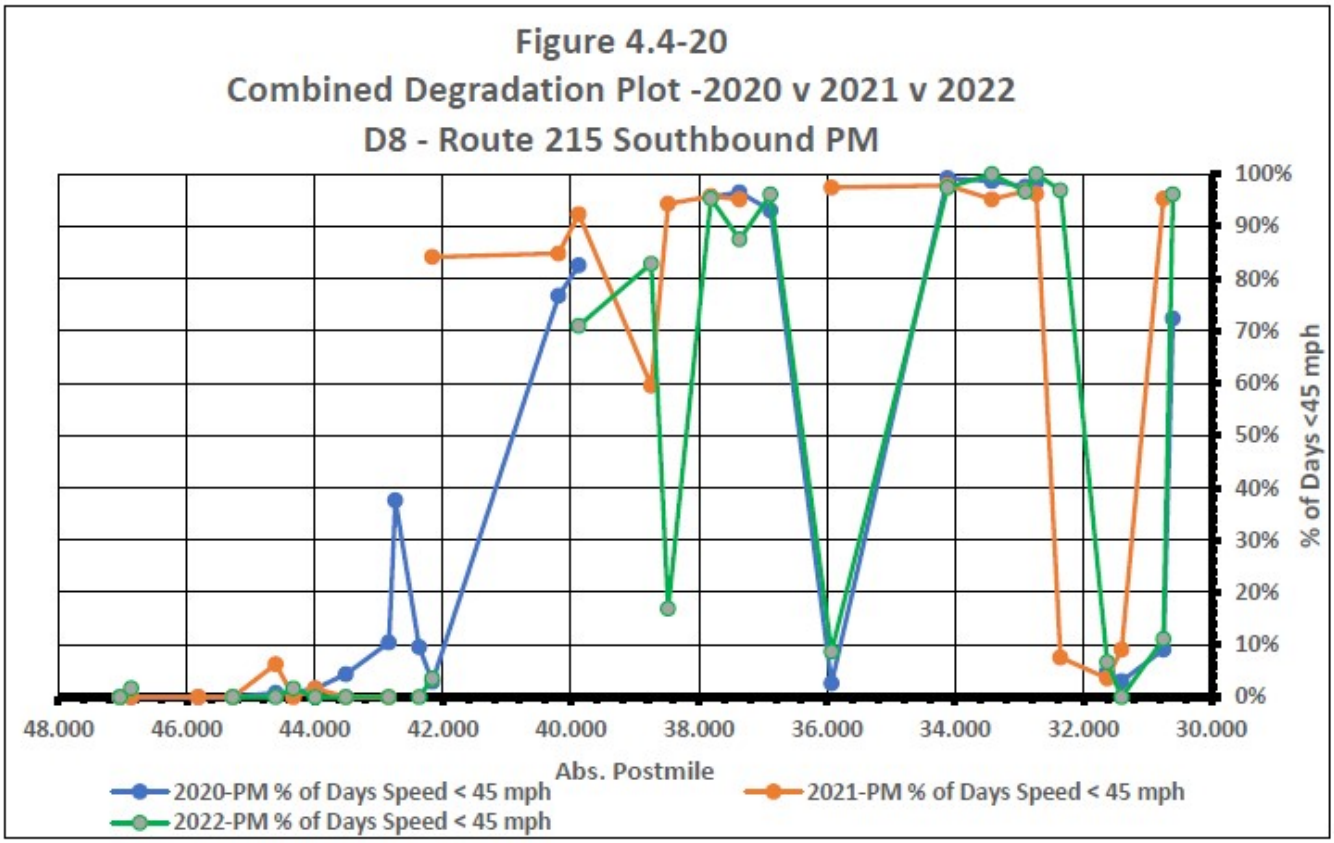
NAME	Abs Postmile
BOX SPRINGS	30.601
CENTRAL AVE SB ON	31.400
CENTRAL/WATKINS	31.626
BOX SPRINGS RD	32.356
MLK SB ON	32.734
MARTIN LUTHER KING	32.903
UNIVERSITY	33.538
BLAINE	34.219
COLUMBIA NB ON	36.882
LACADENA DR SB	37.365
IOWA AVE NB ON	37.813
BARTON RD SB ON	38.481
BARTON RD NB ON	38.746
WASHINGTON NB LP ON	39.957
WASHINGTON NB TG ON	40.192
ORANGE SHOW SB T ON	42.162
ORANGE SHOW NB ON	42.435
INLAND CENTER NB ON	42.841
MILL ST NB ON	43.511
2nd St	43.990
Third St	44.331
5th Street	44.619
Baseline Rd	45.276
Baseline Rd	45.817



NAME	Abs Postmile
BOX SPRINGS	30.601
CENTRAL AVE SB ON	31.400
CENTRAL/WATKINS	31.626
BOX SPRINGS RD	32.356
MLK SB ON	32.734
MARTIN LUTHER KING	32.903
UNIVERSITY	33.538
BLAINE	34.219
COLUMBIA NB ON	36.882
LACADENA DR SB	37.365
IOWA AVE NB ON	37.813
BARTON RD SB ON	38.481
BARTON RD NB ON	38.746
WASHINGTON NB LP ON	39.957
WASHINGTON NB TG ON	40.192
ORANGE SHOW SB T ON	42.162
ORANGE SHOW NB ON	42.435
INLAND CENTER NB ON	42.841
MILL ST NB ON	43.511
2nd St	43.990
Third St	44.331
5th Street	44.619
Baseline Rd	45.276
Baseline Rd	45.817



Name	Abs PM
210 EB TO 215 SB	47.035
27th Street	46.865
Mid of 210/215 JCT & Baselaine St.	45.817
Baseline Rd	45.276
5th St	44.607
Third St	44.331
2nd St	43.990
MILL ST NB ON	43.511
INLAND CENTER NB ON	42.841
INLAND CENTER SB ON	42.740
ORANGE SHOW SB L ON	42.368
ORANGE SHOW SB T ON	42.162
NO Washington St.	40.192
MT VERNON/WASH SB ON	39.876
BARTON RD NB ON	38.746
BARTON RD SB ON	38.481
IOWA AVE NB ON	37.813
LACADENA DR SB	37.365
Center St	36.882
Columbia Ave	35.929
BLAINE ST SB ON	34.118
UNIVERSITY AVE SB ON	33.425
MARTIN LUTHER KING	32.903
MLK SB ON	32.734
N/O BOX SPRINGS RD	**32.356**
CENTRAL/WATKINS	31.626
CENTRAL AVE SB ON	31.400
BOX SPRINGS SB ON	30.748
BOX SPRINGS	**30.601**



Name	Abs PM
210 EB TO 215 SB	47.035
27th Street	46.865
Mid of 210/215 JCT & Baselaine St.	45.817
Baseline Rd	45.276
5th St	44.607
Third St	44.331
2nd St	43.990
MILL ST NB ON	43.511
INLAND CENTER NB ON	42.841
INLAND CENTER SB ON	42.740
ORANGE SHOW SB L ON	42.368
ORANGE SHOW SB T ON	42.162
NO Washington St.	40.192
MT VERNON/WASH SB ON	39.876
BARTON RD NB ON	38.746
BARTON RD SB ON	38.481
IOWA AVE NB ON	37.813
LACADENA DR SB	37.365
Center St	36.882
Columbia Ave	35.929
BLAINE ST SB ON	34.118
UNIVERSITY AVE SB ON	33.425
MARTIN LUTHER KING	32.903
MLK SB ON	32.734
N/O BOX SPRINGS RD	**32.356**
CENTRAL/WATKINS	31.626
CENTRAL AVE SB ON	31.400
BOX SPRINGS SB ON	30.748
BOX SPRINGS	**30.601**

B. Remediation Strategies:

Project 08-1F730 is to reconstruct the overcrossing at Washington St/Mount Vernon Ave on I-215 in city of Colton (CCA in December 2023). The current vertical clearance of Washington Street OC is 14 ft.-8 in. (non-standard).

Desire Outcome: By providing standard vertical clearance, the project will address current and future operational deficiencies, thereby improving the safety of the traveling public.

08-1M790 RIV PM R0.00/20.1 to restripe, adding pavement marking, and replacing sign panels on HOV lane. Construction is scheduled to begin in July 2027 and end in January 2028. Signing, pavement markings, and refreshing stripping will help drivers to take the decisions on time rather than slowing down and impact traffic flow.

District 8 Traffic Operations is in the process of installing Route Shield Pavement Markings (RSPMs) near freeway-to freeway interchanges. Strategically located RSPMs will supplement the information provided by overhead or roadside signs that depict upcoming freeway interchange approaches. When motorist receive information of interchange approaches early, and in multiple ways, they are likely to make better driving decisions and change lanes farther upstream. The installation will be completed in 12/2023.

Desired Outcome: Improving traffic flow by reducing late lane changes and sudden weaving movement, thereby, improving safety and reducing sudden weaving conflict. District 8 will conduct the before and after analysis using data collected during the last six months in 2024. The report will be included in 2024-Degradation Action Plan.

District 8 will conduct the before and after analysis using data collected during the last six months in 2024. The report will be included in 2024-Degradation Action Plan.

The 5-mile-long segment is located between 60-215 JCT in the City of Moreno valley and 60-91-215 JCT in the City of Riverside. District 8 is investigating a possibility to construct a Full or Partial contraflow HOV lane in the median to increase the capacity of the existing HOV lanes in both directions. In addition, on this segment District 8 is also investigating a possibility to stripe an additional northbound HOV lane on the left shoulder.

Desired Outcome: Increasing HOV lane capacity.

4.6. DISTRICT 11 2022 DEGRADATION ACTION PLANS

4.6.1 SUMMARY OF DEGRADATION ON HOV FACILITIES IN DISTRICT 11

APPENDIX A provides the list of degraded facilities in District 11 that were identified in the 2021 California High Occupancy Vehicle Facilities Degradation Report. The speed and degradation profiles for each degraded facility are provided in ATTACHMENT A.

4.6.2 ACTION PLAN FOR HOV FACILITIES ON ROUTE 5

A. Analysis

Route 5 is a major north-south artery serving the San Diego metropolitan area and numerous surrounding cities. In the past, northbound Route 5 would only experience degradation in the afternoon peak period. No degradation was observed on southbound Route 5 during either peak period.

Before February of 2022, the northbound Route 5 HOV lane was an open access HOV lane from Route 56 to Via De La Valle where it converts to a limited access HOV lane ending at Manchester Avenue. Due to the congestion at the end of the northbound HOV lane during the afternoon peak period, the experienced degradation ranged from slightly degraded to extremely degraded. The degradation occurred approximately 7 miles from Carmel Mountain Road to Manchester Avenue.

In February 2022, the North Coast Corridor (NCC) project, a $6.5 billion project which involves numerous rail and highway improvements stretching between the cities of La Jolla and Oceanside was opened to traffic. Construction activities for the NCC greatly contributed to congestion in the GP lanes and this congestion would extend into the HOV lane at the terminus. As a part of the NCC Project, the HOV lanes were extended an additional nine miles to the north to the major interchange at Palomar Airport Road, eliminating the terminus of the HOV lane at Manchester Avenue and has reduced degradation in this segment to slightly degraded since construction is still ongoing. The sensors in the new NCC segment are currently being configured.

B. Remediation Strategies

The NCC's new northbound and southbound HOV lanes from Manchester Avenue to Palomar Airport Road (9 miles) were opened to traffic in February 2022 and have minimized degradation at Manchester Avenue as construction is still ongoing.

Due to NCC construction and sensor calibration not at 100% the northbound 5 HOV lane reports 7.84 miles of slight degradation. As construction ends work is ongoing to calibrate all the sensors in the new NCC segment to improve data collection. Degradation is expected to be reduced or eliminated in the segment.

District 11 collected speed data from July 2022 to December 2022 and compared degradation data with data collected from July 2021 to December 2021, see Table 4.6-1. With the intent to verify that degradation was reduced or eliminated in the northbound HOV lane from Carmel Mountain Road to Manchester Avenue during the afternoon peak period.

Table 4.6-1: Degradation Comparison on Route 5

		2021		2022	
Location	PM	%Days<45mph	Deg. Level	%Days<45mph	Deg. Level
5 NB HOV N/O Carmel Mtn Rd	31.994	0.0	Not Degraded	10.7%	slightly degraded
5 NB HOV S/O 56	32.468	3.0%	Not Degraded	14.5%	slightly degraded
5 NB HOV @ Carmel Valley Rd	32.905	10.6%	Slightly Degraded		No data
5 NB HOV N/O 56	33.684	22.8%	Slightly Degraded		No data
5 NB HOV N/O Del Mar Hts	35.001	62.0%	Very Degraded		No data
5 NB HOV San Dieguito River	35.485	64.1%	Very Degraded		No data
5 NB HOV Via De La Valle	36.278	62.9%	Very Degraded	49.5%	slightly degraded
5 NB HOV N/O Via De La Valle	36.830	70.4%	Very Degraded	37.0%	slightly degraded
5 NB HOV Lomas Santa Fe Dr	37.400	73.5%	Very Degraded	37.4%	slightly degraded
5 NB HOV S/O Manchester	38.081	74.2%	Very Degraded	0.0%	not degraded
5 NB HOV N/O Vista View Point	39.200			1.3%	not degraded
Birmingham Dr to 5 NB	39.902			7.6%	not degraded
HOV 5 NB N/O Encinitas Blvd	42.031			12.9%	slightly degraded
Leucadia Blvd to 5 NB	42.680			18.4%	slightly degraded
5 NB HOV N/O Leucadia	43.301			18.3%	slightly degraded
La Costa Ave to 5 NB	44.210			31.3%	slightly degraded
5 NB HOV N/O Batiquitos Lagoon	44.700			43.5%	slightly degraded
5 NB HOV N/O Poinsettia Lane	46.546			0.0%	not degraded

North Coast Corridor

4.6.3 ACTION PLAN FOR HOV FACILITIES ON ROUTE 15

A. Analysis

Route 15 is the primary inland north-south transportation connector serving interregional travelers between Riverside County and downtown San Diego. It also is part of a major interregional goods movement corridor, connecting Mexico with Riverside, San Bernardino counties, and Las Vegas, Nevada. HOT lanes are operated by the San Diego Association of Governments (SANDAG) on Route 15 between Route 163 and Route 78.

Degradation was observed at the end of the HOT lanes in the northbound direction during the afternoon peak period. The experienced degradation is classified as slightly degraded. This slight degradation is caused by weaving in the HOT lanes by users deciding to exit at the DAR or continue through to merge into GP traffic. There is also a speed reduction caused by the friction between the general purpose lanes and HOT lanes.

The Route 15 HOT lanes have a regular recurring challenge affecting the facility. Surveys conducted by SANDAG over the past couple of years have indicated that 25-30 percent of users of the HOT lanes are violators, meaning single-occupant vehicles driving through the HOT lanes without a transponder.

B. Remediation Strategies

The slight degradation observed at the north end of the HOT lane is due to the unique circumstances at that terminus.

Currently a new interchange project at I-15 and SR-78 is in the early design phase (EA 11-2T240) and is expected to start construction in 2026-2027 and open to traffic by April 2030. This project along with the new sign and striping package will alleviate weaving issues in the HOT lanes, reduce congestion in the main lanes during peak hours and decrease the friction between the GP and the HOT lane. This new interchange is expected to eliminate degradation in this segment.

4.6.4 ACTION PLAN FOR HOV FACILITIES ON ROUTE 805

A. Analysis

Route 805 is a heavily traveled route serving the inland communities within the cities of San Diego, National City, and Chula Vista in San Diego County. The commuter freeway connects the Mexico border zone with the light industry of Sorrento Valley. There are two separate segments of Route 805 with HOV facilities; the south segment is from Palomar Street to Route 94 and the north segment is from Route 52 to the Route 5/Route 805 junction.

Palomar Street to Route 94 (South segment)

On the South segment, both the northbound and southbound HOV lanes are open access. The GP lanes in the northbound and southbound direction experience heavy congestion during the morning peak period. The southbound direction is considered as slightly degraded just south of Plaza Blvd as congestion from the GP lanes weave in and out of the southbound HOV lane. In the northbound direction the heavy congestion spills into the HOV lanes from Route 54 to Imperial Avenue. The degradation in this northbound direction is considered as slightly degraded and is due to the presence of the high

percentage of HOV lane violators (35% - 40% based on HOV occupancy counts) plus the heavy traffic on the GP lanes (1,773 veh/lane/hr) causing friction to HOV users as vehicles from GP lanes weave in and out of the HOV lane using it as a passing lane.

Route 52 to Route 5 (North segment)

Both the northbound and southbound HOV lanes are open access on this segment. The southbound direction presents degradation ranging from slightly degraded to extremely degraded in the afternoon peak period for approximately 1.6 miles between Nobel Dr and Sorrento Valley Road exit ramp. The cause of degradation is due to several factors, occupancy violation rates range from 20% - 25%, heavy traffic (1,813 veh/lane/hr) in the general-purpose lanes causing friction for HOV users, GP traffic weaving in and out of the HOV lane using it as a passing lane, this section of the HOV lane is on an incline grade and the merging of HOV traffic with DAR vehicles coming in form Carroll Canyon Road.

Northbound Route 805 does not experience degradation during either peak period.

B. Remediation Strategies

Palomar Street to Route 94 (South segment)

A Transit Only Lane (MTS bus on shoulder) project is a 3-year pilot project. It began operations in the south segment on June 21, 2022, and will be operational during the commute hours from 6:00 am to 9:00 am. During these hours, the project provides enhanced CHP (2 patrol vehicles) to support the buses when traveling from the HOV lanes to the outside shoulder.

District 11 collected speed data from July 1st, 2022, to December 31st, 2022, along the northbound direction in this segment, from south of Plaza Blvd. to Imperial Ave. to evaluate how the presence of CHP would affect and/or discourage GP vehicles using the HOV lane as a passing lane and violators on the HOV facility.

Table 4.6-2: Degradation Comparison on Route 805

		2019		2022	
Location	PM	%Days<45mph	Deg. Level	%Days<45mph	Deg. Level
805 NB HOV S/O Plaza	9.978	30.6%	Slightly Degraded	16.9%	Slightly Degraded
805 NB HOV @ Plaza Blvd	10.362	38.3%	Slightly Degraded	32.1%	Slightly Degraded
805 NB HOV @ Division St	11.096	47.0%	Slightly Degraded	41.2%	Slightly Degraded
805 NB HOV @ 47th St	11.444	51.5%	Very Degraded	39.7%	Slightly Degraded
805 NB HOV @ Imperial Ave	12.498	50.8%	Very Degraded	45.0%	Slightly Degraded

As shown on the Table 4.6-2, the data collected shows a significant improvement in degradation, even though a slight degradation is still present, the percentage of days with speeds under 45 mph has decreased significantly.

This northbound degraded segment and the southbound degraded location have been entered into the TIRTS (S233-0017TH and S233-0018TH) to be investigated, evaluated, and make any recommendations to mitigate HOV degradation.

Route 52 to Route 5 (North segment)

District 11 Traffic Operations Congestion Monitoring and Mobility Performance Branch recommended to pursue reducing degradation in this segment by limiting access with channelizers from the end of the SB Carroll Canyon Road DAR to La Jolla Village Drive exit ramp (approximately 870 feet). The installation of channelizers will also deter HOV violators using the DAR and trying to merge in to congested GP lanes impacting HOV lane speeds.

However, there is a project EA 11-2T367 (PID 1122000082) that plans to convert the existing HOV lanes to HOT lanes in the 2026/2027 fiscal year and further coordination is needed for implementation of the channelizers.

4.7. DISTRICT 12 2022 DEGRADATION ACTION PLANS

4.7.1 SUMMARY OF DEGRADATION ON HOV FACILITIES IN DISTRICT 12

APPENDIX A provides the list of degraded facilities in District 12 that were identified in the 2021 California High Occupancy Vehicle Facilities Degradation Report. The speed and degradation profiles for each degraded facility are provided in ATTACHMENT A.

4.7.2 DISTRICT-WIDE ACTIONS RELATED TO DEGRADATION

To manage congestion, resolve HOV speed degradation, improve travel reliability, and offer enhanced mobility options, Caltrans District 12 has increasingly turned to Priced Managed Lanes (PML) as a viable solution. PMLs maximize system efficiency, increase mobility choices, improve the environment, and contribute financially to freeway corridor maintenance, operations, and improvements.

Caltrans District 12 has conducted two Managed Lanes studies to implement Caltrans' mission, vision, goals, and values. These two studies and their goals are listed as follows:

Managed Lanes Feasibility Study (MLFS) to replace the HOV lane network with the HOT lane network.

Orange County Managed Lanes Network Study (MLNS) to analyze the operational benefits of PMLs with planning-level traffic analysis.

The District Systems Management Plan (DSMP) also indicates in section 3.1D that "congestion pricing is a most powerful policy available to reduce unnecessary driving and finance improvements to our aging infrastructure. This policy has proven effective in cities around the world, allowing local governments to reduce automobiles in highly congested areas while generating revenue for transportation projects."

4.7.3 ACTION PLAN FOR I-5 HOV FACILITIES

A. Analysis

Interstate 5 in District 12 boundary is 44.4 mile long and it is the longest freeway in district. There are several projects either in Construction or in Design phase to add HOV lanes or converting HOV lanes to HOT lanes. Below information is the segments that will be changed in the next several years.

- One HOV lane will be added from San Diego County line to Avenida Pico Interchange (PM 0.0 - 3.4).
- Between Red Hill and SR-55, existing HOV lane will be converted to Price Managed Lanes- PML (HOT).
- From SR-55 and SR-22/SR-57, there are now 2 HOV lanes, and they will be converted to PMLs (HOT).
- Between SR-55 and SR-57, two HOV lanes will be converted to two PMLs (HOT).
- From SR-57 to Orange/ Los Angeles County Line, one additional PML will be added between SR-57 and SR-91.
- All HOV lanes will be continuous access.

According to AM summary and Speed Plot for I-5 northbound during AM peak hours (6 – 9 AM), HOV degradation occurred at Oso Parkway (PM 87.649) due to construction. This recurrent degradation will be resolved when construction is completed.

According to PM summary and Speed Plot for I-5 northbound during PM peak hours (3 – 6 PM), HOV degradation occurred at Oso Parkway (PM 87.649) and

from South of SR-133 (PM 95.308) to Ball (PM 109.51). The degradation at Oso Parkway is caused by on-going construction in the area.

According to AM summary and Speed Plot for I-5 southbound during AM peak hours (6 – 9 AM), HOV degradation occurred from North of Orangethorpe (PM 114.888) to Lincoln (PM 111.188) and from 17th Street (PM 104.438) to South of SR55 (PM 102.388). Compared to year 2021 data, the HOV degradation has improved significantly. The degradation has been reduced from 15.11 continuously mile long to 2 segments that have lengths of 2 miles and 3.6 miles.

According to PM summary and Speed Plot for I-5 southbound during PM peak hours (3 – 6 PM), there is several pocket HOV degradation locations:

- From Magnolia to Euclid (PM 41.8 – 39.3)
- At Santiago (PM 33.6)
- At 17th Street (PM 32.25)
- At North of SR-133 (PM 23.1)
- At Lake Forest (PM 19.8)

After extensive review of traffic data and field investigations, the causes of the degradation on I-5 are as follows:

- Vehicles slowing down at major freeway interchanges at I-405, SR-133, SR-55, SR-57, SR-22, and SR-91.
- Slightly degradation happens when commuters slowing down to enter freeway curves or major interchanges such as 17th street which is geometric constrain, major interchanges at SR-55 and 2 HOV lanes merging to 1 HOV lane. Major interchanges at North of 133 and Magnolia at SR-91 caused degradation.
- High volumes of low or zero emission vehicles in HOV lanes – 11.96% at I-5 NB Broadway (AM), 18.52% at I-5 NB Main Street (AM), and 11.80 % at I-5 NB Yale Avenue (AM) per 2022 HOV Count data.
- There are several construction projects on I-5 causing HOV speed reduction.

B. Remediation Strategies

Three projects (12-0K021, 12-0K022, and 12-0K023) are currently under construction to add one lane in both directions between El Toro (PM 18.9) and SR-73 (PM 12.4). The proposed projects will add GP lanes in each direction on I-5 between Avery and Alicia, extend the 2nd HOV lane from Alicia to El Toro,

reestablish existing auxiliary lanes/construct new auxiliary lanes, and improve several existing on- and off-ramps. Additionally, the projects propose no HOV buffer, meaning the HOV lane will accommodate continuous access throughout the project limits. Construction began in October 2020 and anticipated to be completed in June 2025. Project costs for the three segments are funded by Measure M2, STBG, and STIP/SB-1, and are estimated at $445.8 million including Right of Way.

Project 12-0P550 proposes the addition of an HOV lane to reduce delay along I-5 between the San Diego/Orange County line and the I-5/Avenida Pico interchange. This project would extend the recently completed HOV lane between San Juan Creek Bridge and Avenida Pico to the Orange/San Diego County line. The project limits are from approximately 1.4 miles south of the San Diego/Orange County line interchange (PM R71.0) to 3.5 miles north at Avenida Pico in the City of San Clemente (PM 3.4). The project is in PS&E phase now, anticipated to Ready-to-List in 2028 and the estimated cost is at $187 million.

Project 12-0Q950 proposes 4 alternatives from Red Hill (PM 28.9) to the Orange/Los Angeles County line (PM 44.4). The project limit is currently designated as urban with mixed land uses (commercial, industrial, and residential). Alternative No. 4 will convert existing HOV lanes to PMLs in each direction. Between Red Hill and SR-55, it will convert existing HOV lane to PML. Between SR-55 and SR-57, it will convert two HOV lanes to two PMLs. From SR-57 to Orange/ Los Angeles County Line it will add one additional PML between SR-57 and SR-91. The estimated cost for this project will be $427 million. This project is in PS&E phase now and anticipated to Ready-to-List in 2024.

Project 12-0T950 converts to HOV 3+ from the I-5/I-405 interchange to Red Hill Boulevard. The PID was approved in June 2022 and started PA&ED phase as of August 2023. The estimated cost is $11.2 million and anticipated Ready-to-List in April 2028.

Project 12-0M980 is to improve El Toro Interchanges and at the end of PA&ED phase (Approved Draft Project Report). The estimated cost is funded by OCTA and is estimated $579.7 million including Right of Way (R/W $515.5 million). The contract is anticipated Ready-to-List in 2029.

Project 12-0P42U, Integrated Corridor Management (ICM) will integrate and upgrade, as necessary, real-time traveler information and intelligent transportation system (ITS) technologies. Cities and Caltrans will manage along the triangle of I-5, SR-91, and SR-57, into an integrated corridor management (ICM) system. The ICM system will actively manage traffic during recurring and

non-recurring congestion to benefit both trucks and passenger vehicles. This project will help reduce the HOV degradation on entire triangle and is currently in construction. The contract acceptance is anticipated in 2025.

4.7.4 ACTION PLAN FOR SR-22 HOV FACILITIES

A. Analysis

According to AM summary and Speed Plot on SR-22 eastbound during AM peak hours (6 – 9 AM), HOV degradation occurred from Brookhurst (PM 7.227) to Garden Grove (PM 10.497). The degraded section was similar to year 2021 degradation, but the length was reduced 2 miles.

According to PM summary and Speed Plot on SR-22 eastbound during PM peak hours (3 – 6 PM), HOV degradation occurred from Hope Street (PM 7.507) to City Drive (PM 11.261). The degraded section was similar to year 2021 degradation, but the length was shorter than last year by1 mile.

According to AM summary and Speed Plot on SR-22 westbound during AM peak hours (6 – 9 AM), HOV degradation occurred at 2 locations:

- At Harbor (PM 9.17)
- At Knott (PM 3.94)

According to PM summary and Speed Plot on SR-22 westbound during PM peak hours (3 – 6 PM), HOV degradation occurred from Bristol (PM 11.701) to Harbor (PM 9.4). It is same as 2021 degradation data.

After extensive traffic data review and field investigations, the causes of the degradation on SR-22 are as follows:

- Peak period recurrent congestion in all lanes reducing HOV lane performance and speed.
- Geometric constrain at Harbor, it is the curve. At Knott, traffic slowing down because HOV prepare to merge to 405 NB, average speed was 47.7mph.
- High HOV violation rates – based on Peak Period Violation Rate- at 16.41% Springdale Street- eastbound (AM), 14.63% Springdale Street- westbound (PM), 13.95% at Pearce Street POC- eastbound (PM) during Fall of 2022. It has been reduced significantly compared to 2019 data which is 30% violation rate at Pearce Street.

- The degradation on westbound direction at PM hours from Bristol to Harbor due to sunlight glare at the curve causing the drivers slowing down. After that curve, the HOV speed was back to normal speed.

B. Remediation Strategies

District 12 is working with vendors to initiate a pilot project for Automated Vehicle Occupancy Detection (AVOD) to monitor HOV violation at Springdale Street which has a high violation rate location. The project is seeking for funding and the best camera option to capture images without revealing commuters' identity and driving distraction.

Caltrans is working with CHP to increase CHP presentation to minimize the HOV violation.

According to Orange County Managed Lane Feasibility Study, there is a plan for a second HOV lane and to convert to Dual HOT lanes from I-405 to Grand Avenue. The project will be Ready-to-List in 2040/2041.

4.7.5 ACTION PLAN FOR SR-55 HOV FACILITIES

A. Analysis

According to AM summary and Speed Plot on SR-55 northbound during AM peak hours (6 – 9 AM), HOV degradation occurred at only one location which is Collins (PM 14.58). It was the same as year 2021 data.

According to PM summary and Speed Plot on SR-55 northbound during PM peak hours (3 – 6 PM), HOV degradation occurred from Paularino (PM 5.8) to Taft (PM 15.782). HOV Degradation happened for the entire freeway segment and data was the same as year 2021 data.

According to AM summary and Speed Plot on SR-55 southbound during AM peak hours (6 – 9 AM), HOV degradation occurred from Katella (PM 15.202) to I-5 Interchange (PM 10.382). The degradation was extended on the entire corridor from SR-91 to I-5 Interchange.

According to PM summary and Speed Plot on SR-55 southbound during PM peak hours (3 – 6 PM), HOV degradation occurred at 2 locations which were Warner Street (PM 8.6) and Dyer Street (PM 7.62) and the and the average speeds at these locations were 53 mph. The data was the same as year 2021 data.

After extensive traffic data review and field investigations, the causes of the degradation on SR-55 are as follows:

- Demand exceeding capacity – Peak period recurrent congestion in all lanes reduces HOV lane performance and speed. These are locations that reach to more than a 1,700 veh/ln/hr threshold based on 2020 – 2021 PeMS data: SR-55 northbound at Mac Fadden, La Veta, Main, and MacArthur; SR-55 southbound at Main, MacArthur, Walnut, Mac Fadden, Dyer, and La Veta.
- Bottlenecks at SR-55/I-405 HOV direct connector in the afternoon hours and I-5 HOV direct connector in the morning hours.
- Mainline bottlenecks at SR-55/SR-22 interchange and SR-55/SR-91 interchange.
- Northbound HOV lane transitioning to a GP lane prior to joining the SR-91 express lane. At this location, several vehicles exit the HOV lane and merge to GP lanes to avoid the toll charge. This causes slowdowns on both the HOV and GP lanes. The weaving creates an extreme backlog at the SR-55/SR-91 interchange, especially during peak hours.

B. Remediation Strategies

Project 12-0J340 is adding HOV, GP and auxiliary lanes from PM 6.2 to 10.3 (0.4 north of SR-55/I-405 Interchange to 0.2 south of I-5/SR-55 separation). The contract was approved (M500) in June 2022. Construction contracts accept (M600) will be in June 2027. The cost of contract is $372.2 million including Right of Way cost ($156.6 million R/W).

Project 12-0K720 from PM 10.5 to 17.8 (I-5 interchange to SR-91 interchange) to add additional GP lanes to increase capacity and improve freeway operation funded by OCTA/OCGO. Project is in PS&E phase. Project Ready-to-List is to be in May 2025. The road way estimated cost of project is $111 million. The Right of Way cost is expected to be $5 billion dollars.

Project 12-0K970 adding an Express Connector between the SR-241and SR-91 express lanes. This connector may provide relief to SR-55 HOV lanes in both directions at the SR-91 interchange. The project is in PS&E phase to acquire R/W. Project Ready-to-List will be in September 2023. The project cost is estimated at $273 million and funded by OCTA.

4.7.6 ACTION PLAN FOR SR-57 HOV FACILITIES

A. Analysis

According to AM summary and Speed Plot on SR-57 northbound during AM peak hours (6 – 9 AM), HOV degradation occurred at Chapman (PM 0.46) and Douglass (PM 2.16). The data was same as last year 2021.

According to PM summary and Speed Plot on SR-57 northbound during PM peak hours (3 – 6 PM), HOV degradation occurred from Chapman (PM 0.466) to Tonner (PM 11.266). The data was the same as year 2021 data.

According to AM summary and Speed Plot on SR-57 southbound during AM peak hours (6 – 9 AM), HOV degradation occurred from Imperial (PM 9.291) Chapman 3 (PM 6.531) and from La Palma (PM 4.751) to Ball (PM 2.621). This year the data showed there was a relief at SR-91/SR-57 Interchange.

According to PM summary and Speed Plot on SR-57 southbound during PM peak hours (3 – 6 PM), HOV degradation occurred from Imperial (PM 9.921) to Placentia (PM 6.351) and from Underhill (PM 4.451) to Orangewood (PM 0.901). The data as the same as year 2021 data.

After extensive traffic data review and field investigations, the causes of the degradation on SR-57 are as follows:

- Major bottlenecks at SR-91 interchange and I-5 interchange.
- SR-57 is one of the busy truck routes that connects Los Angeles County, Orange County and Riverside County to SR-91. According to Caltrans Traffic Census Program, the 2021 Annual Average Daily Traffic (AADT) showed 10 percent of trucks on SR-57.
- Termination of SR-57 at the I-5/SR-22 interchange – the HOV lane keeps connecting to I-5, but the number of GP lanes reduces from 4 to 2, resulting in major braking, slowing, and weaving.
- Chapman Street (PM 0.46) is at I-5 HOV drop ramp from I-5 connecting to SR-57 NB HOV Lane between I-5 and SR-57 causing weaving problems between HOV and GP lanes.
- Queuing of vehicles from the southbound SR-57 HOV lane onto southbound I-5 at the interchange.

B. Remediation Strategies

Project 12-0M970 proposes geometric improvements to increase capacity and improve congestion on northbound from Orangewood Avenue to Katella

Avenue in the City of Anaheim. The project is now in PS&E phase. Construction will begin in March 2025. The contract accept (M600) will be in November 2027 and is scheduled to be final project closeout by August 2028. This is an OCTA project with a cost of approximately $30 million.

Project 12-0P42U, Integrated Corridor Management (ICM) will integrate and upgrade, as necessary, real-time traveler information and intelligent transportation system (ITS) technologies. Cities and Caltrans will manage along the triangle of I-5, SR-91, and SR-57, into an integrated corridor management (ICM) system. The ICM system will actively manage traffic during recurring and non-recurring congestion to benefit both trucks and passenger vehicles. This project will help reduce the HOV degradation on entire triangle and is currently in construction. The contract acceptance is anticipated in 2025.

District 12 completed the TH investigation for SR-57 HOV and found several reasons that made HOV lanes degraded. SR-57 is one of the freeways that connects Los Angeles County and Orange County which are the housing and job hubs. Also, it is the freeway connecting San Bernadino County, Los Angeles County and Orange County through SR-91 for truck routes. The Demand-Over-Capacity is the main reason why the recurrent congestion for SR-57 is so severed even District 12 has made the improvement of freeway capacity and converted HOV buffer-separated to continuous striping to reduce friction between HOV and GP lanes. There is no action taken at this time until district has fundings to convert HOV to HOT lane or change from HOV 2+ to HOV 3+ to increase HOV traffic throughput.

4.7.7 ACTION PLAN FOR SR-91 HOV FACILITIES (FROM LOS ANGELES COUNTY LINE TO 91 EXPRESS LANES AT SR-55 CONNECTOR ONLY, PM 0.6 TO PM 8.8)

A. Analysis

According to AM summary and Speed Plot on SR-91 eastbound during AM peak hours (6 – 9AM), HOV degradation occurred from Holder (PM 16.059) to East/Raymond (PM 22.723).

According to PM summary and Speed Plot on SR-91 eastbound during PM peak hours (3 – 6 PM), HOV degradation occurred from Orangethorpe (PM 15.339) to Tustin (PM 26.23).

According to AM summary and Speed Plot on SR-91 westbound during AM peak hours (6 – 9 AM), a pocket of HOV degradation with lengths of less than one

mile occurred at Orangethorpe (PM 15.139), east of Stanton (PM 17.739) and State College (PM 23.553).

According to PM summary and Speed Plot on SR-91westbound during PM peak hours (3 – 6 PM), HOV degradation occurred from Orangethorpe (PM 15.139) to Kraemer (PM 25.813).

After extensive traffic data reviewing and field investigations, the causes of the degradation on SR-91 are as follows:

- Peak period recurrent congestion in all lanes reducing HOV lane performance and speed.
- Major bottlenecks at the I-5 and SR-57 interchanges contributing to congestion due to lane changing/merging problems when drivers compete for available gaps in the traffic stream.
- Weaving conflicts occurring where the eastbound SR-91 HOV lane transitions to an express lane near Tustin Avenue in the City of Anaheim. A primary cause of the congestion is the existing demand to access the Express Toll Lane facility, which exceeds capacity during afternoon peak periods.
- High HOV violation rate – AM violation was 26.6% and PM violation was 31.66% on westbound SR-91 at Kraemer Boulevard (PM 25.813).

B. Remediation Strategies

Based on the analysis in the previous section, the following remediation strategies for SR-91 in both directions will be implemented for the studied facilities:

- Project 12-0P410, Integrated Corridor Management (ICM) will integrate and upgrade, as necessary, real-time traveler information and intelligent transportation system (ITS) technologies. Cities and Caltrans will manage along the triangle of I-5, SR-91, and SR-57, into an integrated corridor management (ICM) system. The ICM system will actively manage traffic during non-recurring congestion to benefit both trucks and passenger vehicles. This project will help reduce the HOV degradation on entire triangle and is currently in construction. The contract acceptance is anticipated in 2025.
- Project 12-0K970 adding an Express Connector between the SR-241and SR-91 express lanes. This connector may provide relief to SR-55 HOV lanes in both directions at the SR-91 interchange. The project is in PS&E phase

to acquire R/W. Project Ready-to-List will be in September 2023. The project cost is estimated at $273 million and funded by OCTA.

- District completed the TH investigation on SR-91 and the conclusion is not to take any actions now for SR-91since these above projects is serving the purposes to mitigate HOV degradation of this freeway.
- Looking for future expansion, it is suggested to add a second HOV lane from Los Angeles County line to existing express lanes at SR-91 and SR-57 to ensure traffic flow for all SR-91 express lanes. This will reduce traffic jams and weaving at the current express lane entrances.

4.7.8 ACTION PLAN FOR I-405 HOV FACILITIES

A. Analysis

According to AM summary and Speed Plot on I-405 northbound during AM peak hours (6 – 9 AM), HOV degradation occurred from TMS 2542 (PM 23.699) to TMS 2218 (PM 23.411). This is a transitional area between I-605 and SR-22 to I-405.

According to PM summary and Speed Plot on the I-405 northbound during PM peak hours (3 – 6 PM), HOV degradation occurred from south of SR-133 (PM. 1.34) to TMS 2542 (PM 23.699).

According to AM summary and Speed Plot on the I-405 southbound during PM peak hours (3 – 6 PM), HOV degradation occurred from TMS 2240 (PM 20.106) to TMS 5014 (PM. 14.309).

According to PM summary and Speed Plot on the I-405 southbound during PM peak hours (3 – 6 PM), HOV degradation occurred from Jamboree (PM 6.78) to Sand Canyon (PM 2.65).

After extensive traffic data review and field investigations, the causes of the degradation on I-405 are as follows:

- Peak period recurrent congestion in all lanes reducing HOV lane performance and speed.
- Vehicle weaving conflicts at ingress/egress locations.
- Congestion in the GP lanes at the SR-55 interchange and SR-22 interchange, and through Irvine.
- High traffic volume and demand from John Wayne Airport and South Coast Metro Center.
- Bottleneck at I-405/SR-55 HOV direct connector (PM. 8.12).

- High volumes of low or zero emission vehicles in HOV lanes, 27.75% during AM Peak Period Hour at Jeffrey POC northbound and 23.43% at AM Peak Period Hour at Jamboree northbound according to 2022 HOV Count data.
- High HOV violation rate – AM violation was 23.77% and PM violation was 12.58% on southbound I-405 at Jeffrey Road POC (Fall 2021 data).

B. Remediation Strategies

Based on the analysis in the previous section, the following remediation strategies for I-405 in both directions will be implemented for the studied facilities:

- Design-Build Widening Project 0H-100 on I-405 between SR-73 and I-605 is currently in construction to convert the existing HOV lane to an express lane and add another HOT lane to create dual HOT lanes in each direction. The project also adds one GP lane in each direction to increase freeway capacity. The project is scheduled for completion February 28, 2024.
- CCTV cameras to monitor the express lanes and toll equipment will be installed for I-405 from SR-73 to I-605. The cameras will have pan, tilt, and zoom (PTZ) capabilities to allow the TOP and Caltrans to monitor freeway incidents and the toll facilities.
- Project 0Q-970 will convert the buffered/separated HOV lane to Continuous Access from I-5 to Jamboree Boulevard. This facility will convert to a HOT facility after the HOT lane project 0H-100 is completed. Project reached to Ready-to-List in June 2022. This is SHOPP project and SB1 funding with the estimated cost is $179.5 million for roadway and $652 million for Right of Way.

5. APPENDIX A

LIST OF THE 2022 DEGRADED HOV FACILITIES

District	Route	Facility Type	Direction	Limits	Facility Length	Occupancy Requirement	Time Period	Lane Miles Monitored	Not Degraded	Slightly Degraded	Very Degraded	Extremely Degraded
03	80	HOV	EB	West El Camino Ave to SR-65	21.55	2+	PM	18.65	17.28	1.37	0.00	0.00
03	80	HOV	WB	SR-65 to West El Camino Ave	21.46	2+	PM	19.42	14.77	3.55	0.41	0.69
03	99/51	HOV	NB	Elk Grove Blvd to to N Street	13.10	2+	AM	11.41	7.22	4.18	0.00	0.00
03	99/51	HOV	NB	Elk Grove Blvd to to N Street	13.10	2+	PM	11.41	10.41	0.99	0.00	0.00
03	99/51	HOV	SB	B Street to Elk Grove Blvd	13.63	2+	AM	12.67	12.24	0.43	0.00	0.00
03	99/51	HOV	SB	B Street to Elk Grove Blvd	13.63	2+	PM	12.67	5.31	3.97	1.99	1.41
04	4	HOV	EB	Port Chicago Hwy to Hillcrest Ave	15.34	2+	PM	8.98	7.60	0.98	0.00	0.40
04	4	HOV	WB	Hillcrest Ave to Port Chicago Hwy	11.87	2+	AM	7.98	2.64	1.93	1.05	2.36
04	80	HOV	EB	I-880 to Cummings Skyway	18.62	3+	AM	14.99	14.20	0.00	0.79	0.00
04	80	HOV	EB	I-880 to Cummings Skyway	18.62	3+	PM	14.99	3.70	1.93	4.74	4.62
04	80	HOV	WB	SR-29 to Powell Street	19.00	3+	AM	15.61	6.56	3.27	3.91	1.87
04	80	HOV	WB	SR-29 to Powell Street	19.00	3+	PM	15.61	13.38	0.55	0.00	1.68
04	80	HOV	EB	Red Top Rd to Air Base Pkwy	8.12	2+	PM	3.82	1.22	1.20	0.80	0.61
04	85	HOV	NB	US-101 (South San Jose) to S/O Moffett Blvd.	24.56	2+	AM	13.56	8.26	4.96	0.35	0.00
04	85	HOV	SB	Central Expwy. to US-101 (South San Jose)	23.92	2+	PM	15.27	7.69	1.86	4.36	1.37
04	87	HOV	NB	SR-85 to US-101	9.70	2+	AM	6.13	4.20	0.66	1.28	0.00
04	87	HOV	NB	SR-85 to US-101	9.70	2+	PM	6.13	5.72	0.41	0.00	0.00
04	87	HOV	SB	US-101 to SR-85	9.12	2+	PM	5.40	1.50	3.90	0.00	0.00
04	92	HOV	WB	Hesperian Blvd to San Mateo Bridge Toll Plaza	3.28	2+	AM	1.11	0.88	0.23	0.00	0.00

District	Route	Facility Type	Direction	Limits	Facility Length	Occupancy Requirement	Time Period	Lane Miles Monitored	Not Degraded	Slightly Degraded	Very Degraded	Extremely Degraded
04	101	HOT	SB	Whipple Ave. to N/O SR 237	16.45	*3+	PM	7.90	4.80	3.10	0.00	0.00
04	101	HOV	NB	Cochrane Rd to S/O Ellis St.	29.39	2+	AM	17.44	10.65	5.39	1.41	0.00
04	101	HOV	SB	N/O SR 237 to Cochrane Rd	27.53	2+	PM	12.60	5.90	2.36	0.96	3.39
04	101	HOV	NB	Richardson Bay Bridge to Windsor River Rd	49.80	2+	PM	21.73	16.11	3.07	1.33	1.23
04	101	HOV	SB	Richardson Bay Bridge to Windsor River Rd	37.47	2+	AM	20.61	17.56	1.52	1.54	0.00
04	101	HOV	SB	Windsor River Rd. to Petaluma Blvd.	21.29	2+	PM	14.57	11.50	2.18	0.89	0.00
04	237	HOT	EB	Mathilda Avenue to I-880	7.32	*3+	AM	3.85	3.41	0.44	0.00	0.00
04	237	HOT	EB	Mathilda Avenue to I-880	7.32	*3+	PM	3.85	1.76	2.09	0.00	0.00
04	280	HOV	NB	Leland Ave to Magdalena Ave	10.69	2+	AM	7.43	5.56	0.70	1.18	0.00
04	280	HOV	SB	N/O Magdalena Ave. to Leland Ave.	11.03	2+	PM	7.21	0.00	4.52	2.69	0.00
04	680	HOT	NB	South Grimmer to Livorna Rd. On-ramp	19.66	**2+	PM	9.79	6.37	3.42	0.00	0.00
04	680	HOT	SB	SR-84 to Alcosta Blvd, onramp	37.19	2+	AM	20.66	20.19	0.47	0.00	0.00
04	880	HOT	NB	S/O SR 262 to S/O SR-238	17.89	*3+	PM	9.35	6.66	1.54	0.60	0.56
04	880	HOT	SB	Hegenberger Rd to Rte 237	27.08	*3+	AM	17.97	12.80	4.82	0.36	0.00
04	880	HOT	SB	Hegenberger Rd to Rte 237	27.08	*3+	PM	17.97	17.27	0.24	0.47	0.00
04	880	HOV	SB	SR 237 to US-101	4.30	2+	AM	3.18	2.64	0.55	0.00	0.00
04	880	HOV	SB	SR 237 to US-101	4.30	2+	PM	3.18	1.44	0.65	1.10	0.00
05	101	HOV	NB	Ventura Co. Line to 0.51 miles N/O Santa Monica Creek	4.14	2+	AM	4.09	3.46	0.63	0.00	0.00
05	101	HOV	SB	Bailard Avenue to to 0.56 miles N/O Santa Monica Creek	4.19	2+	PM	4.06	2.80	1.26	0.00	0.00
07	5	HOV	NB	Hollywood Way to SR-14	14.48	2+	PM	5.90	0.00	1.71	1.29	2.90
07	5	HOV	SB	SR-14 to Hollywood Way	14.82	2+	AM	7.21	4.42	1.65	1.15	0.00

District	Route	Facility Type	Direction	Limits	Facility Length	Occupancy Requirement	Time Period	Lane Miles Monitored	Not Degraded	Slightly Degraded	Very Degraded	Extremely Degraded
07	10	HOT	EB	Baldwin Ave to I-605	5.27	***3+	PM	4.60	0.00	0.97	1.74	1.89
07	10	HOT	WB	Garvey Ave to Temple City Blvd	5.32	***3+	AM	3.41	2.15	1.26	0.00	0.00
07	10	HOV	EB	I-605 to San Bernardino Co. Line	17.27	2+	PM	3.70	0.25	0.69	0.34	2.43
07	10	HOV	WB	San Bernardino Co. Line to I-605	16.97	2+	AM	7.28	1.89	1.71	0.00	3.68
07	14	HOV	NB	I-5 to 0.3 miles N/O Palmdale Blvd	35.84	2+	PM	18.78	11.25	2.45	2.42	2.66
07	14	HOV	SB	Avenue P-8 to I-5	36.45	2+	AM	18.77	4.20	9.07	1.27	4.24
07	60	HOV	EB	I-605 to San Bernardino Co. Line	18.67	2+	AM	11.36	6.52	4.55	0.29	0.00
07	60	HOV	EB	I-605 to San Bernardino Co. Line	18.67	2+	PM	11.36	2.68	6.50	0.90	1.28
07	60	HOV	WB	San Bernardino Co. Line to 0.4 miles W/O 7th Ave	16.64	2+	AM	11.80	4.15	0.79	6.38	0.49
07	60	HOV	WB	San Bernardino Co. Line to 0.4 miles W/O 7th Ave	16.64	2+	PM	11.80	4.84	6.34	0.29	0.33
07	91	HOV	EB	I-110 to Orange Co. Line	14.18	2+	AM	8.45	8.00	0.45	0.00	0.00
07	91	HOV	EB	I-110 to Orange Co. Line	14.18	2+	PM	8.45	3.26	1.20	1.06	2.93
07	91	HOV	WB	Orange Co. Line to Central Avenue	12.21	2+	AM	9.77	0.63	5.25	3.90	0.00
07	91	HOV	WB	Orange Co. Line to Central Avenue	12.21	2+	PM	9.77	4.62	2.68	0.65	1.82
07	118	HOV	EB	0.1 mile E/O Ventura Co. Line to I-5	10.40	2+	PM	9.14	3.62	3.85	1.08	0.60
07	210	HOV	EB	SR-134 to San Bernardino Co. Line	27.42	2+	PM	23.05	1.93	4.46	1.85	14.81
07	210	HOV	WB	San Bernardino Co. Line to SR-134	27.22	2+	AM	22.58	7.98	2.68	6.27	5.66
07	210	HOV	WB	San Bernardino Co. Line to SR-134	27.22	2+	PM	22.58	14.59	5.73	2.26	0.00
07	405	HOV	NB	Orange Co. Line to I-5	48.41	2+	AM	22.25	7.22	8.44	2.50	4.09
07	405	HOV	NB	Orange Co. Line to I-5	48.41	2+	PM	22.25	7.28	8.95	1.21	4.81
07	405	HOV	SB	I-5 to Orange Co. Line	47.68	2+	AM	25.13	18.37	1.58	1.08	4.11
07	405	HOV	SB	I-5 to Orange Co. Line	47.68	2+	PM	25.13	6.93	2.24	2.50	13.46

District	Route	Facility Type	Direction	Limits	Facility Length	Occupancy Requirement	Time Period	Lane Miles Monitored	Not Degraded	Slightly Degraded	Very Degraded	Extremely Degraded
07	605	HOV	NB	Orange Co. Line to I-10	19.84	2+	AM	8.97	7.30	1.68	0.00	0.00
07	605	HOV	NB	Orange Co. Line to I-10	19.84	2+	PM	8.97	3.87	1.97	1.33	1.80
07	605	HOV	SB	I-10 to Orange Co. Line	20.71	2+	AM	9.78	6.68	1.91	0.89	0.31
07	605	HOV	SB	I-10 to Orange Co. Line	20.71	2+	PM	9.78	6.29	0.39	0.00	3.10
08	10	HOV	EB	Los Angeles Co. Line to Haven Ave	8.27	2+	AM	7.82	1.58	5.43	0.00	0.81
08	10	HOV	EB	Los Angeles Co. Line to Haven Ave	8.27	2+	PM	7.82	0.85	1.66	0.51	4.80
08	10	HOV	WB	Haven Ave to Los Angeles Co. Line	8.52	2+	AM	7.04	0.83	2.84	3.37	0.00
08	10	HOV	WB	Haven Ave to Los Angeles Co. Line	8.52	2+	PM	7.04	2.01	3.75	1.07	0.22
08	15	HOT	NB	Cajalco Rd to Route 60	29.20	****3+	AM	23.29	18.83	4.46	0.00	0.00
08	15	HOT	NB	Cajalco Rd to Route 60	29.20	****3+	PM	23.29	18.83	4.46	0.00	0.00
08	15	HOT	SB	Route 60 to Cajalco Rd	29.20	****3+	AM	18.93	18.19	0.74	0.00	0.00
08	15	HOT	SB	Route 60 to Cajalco Rd	29.20	****3+	PM	18.93	15.42	3.51	0.00	0.00
08	60	HOV	EB	Los Angeles Co. Line to West Jct I-215	22.37	2+	AM	13.57	12.55	1.02	0.00	0.00
08	60	HOV	EB	Los Angeles Co. Line to West Jct I-215	22.37	2+	PM	13.57	4.17	0.37	3.13	5.90
08	60	HOV	WB	West Jct I-215 To Los Angeles Co. Line	22.11	2+	AM	11.99	10.67	1.31	0.00	0.00
08	60	HOV	WB	West Jct I-215 To Los Angeles Co. Line	22.11	2+	PM	11.99	9.80	0.00	1.31	0.87
08	60	HOV	EB	East Jct I-215 to Redlands Blvd	7.26	2+	AM	6.41	5.31	1.10	0.00	0.00
08	60	HOV	EB	East Jct I-215 to Redlands Blvd	7.26	2+	PM	6.41	2.86	1.26	1.10	1.19
08	60	HOV	WB	Redlands Blvd to East Jct I-215	8.08	2+	AM	4.25	2.02	1.57	0.51	0.15
08	60	HOV	WB	Redlands Blvd to East Jct I-215	8.08	2+	PM	4.25	2.02	2.08	0.15	0.00

District	Route	Facility Type	Direction	Limits	Facility Length	Occupancy Requirement	Time Period	Lane Miles Monitored	Not Degraded	Slightly Degraded	Very Degraded	Extremely Degraded
08	91	HOT	EB	Orange Co. Line to I-15	16.52	****3+	AM	9.15	7.96	1.19	0.00	0.00
08	91	HOT	EB	Orange Co. Line to I-15	16.52	****3+	PM	9.15	3.62	2.67	1.73	1.13
08	91	HOT	WB	I-15 to Orange Co. Line	16.43	3+	AM	10.34	9.30	1.04	0.00	0.00
08	91	HOV	EB	1 mile E/O I-15 to I-215	13.42	2+	AM	12.60	7.06	5.55	0.00	0.00
08	91	HOV	EB	1 mile E/O I-15 to I-215	13.42	2+	PM	12.60	4.65	0.46	2.92	4.57
08	91	HOV	WB	I-215 to 0.7 mi E/O I-15	13.97	2+	AM	12.54	7.47	2.83	1.02	1.23
08	91	HOV	WB	I-215 to 0.7 mi E/O I-15	13.97	2+	PM	12.54	2.22	5.00	2.31	3.02
08	210	HOV	EB	Los Angeles Co. Line to I-215	21.29	2+	PM	17.33	3.11	6.37	0.42	7.43
08	210	HOV	WB	I-215 to Los Angeles Co. Line	21.48	2+	AM	19.07	9.69	7.20	2.18	0.00
08	210	HOV	WB	I-215 to Los Angeles Co. Line	21.48	2+	PM	19.07	13.67	5.40	0.00	0.00
08	215	HOV	NB	South Jct SR-60 to SR-210	16.32	2+	AM	11.98	9.45	0.47	0.00	2.07
08	215	HOV	NB	South Jct SR-60 to SR-210	16.32	2+	PM	11.98	3.00	2.52	0.99	5.48
08	215	HOV	SB	SR-210 to South Jct SR-60	16.30	2+	AM	16.09	11.57	1.77	0.26	2.50
08	215	HOV	SB	SR-210 to South Jct SR-60	16.30	2+	PM	15.85	8.33	0.87	0.72	5.93
11	5	HOV	NB	I-805 to Palomar Airport Rd.	16.30	2+	PM	13.41	5.58	7.84	0.00	0.00
11	15s	HOT	NB	SR-163 to SR-78	39.68	2+	PM	33.71	28.50	5.21	0.00	0.00
11	805	HOV	NB	Telegraph Canyon Rd to Market Street	7.89	2+	AM	7.71	1.87	5.84	0.00	0.00
11	805	HOV	SB	SR-94 to Telegraph Canyon Rd	8.28	2+	PM	8.11	7.90	0.22	0.00	0.00
11	805	HOV	SB	I-5 to SR-52	4.33	2+	PM	3.63	0.93	0.60	1.26	0.85
12	5	HOV	NB	Ave Pico to Beach Blvd	42.04	2+	AM	35.91	30.67	4.89	0.35	0.00
12	5	HOV	NB	Ave Pico to Beach Blvd	42.04	2+	PM	35.91	19.71	5.85	2.56	7.78
12	5	HOV	SB	Artesia Blvd to Ave Pico	43.33	2+	AM	34.82	19.54	9.21	2.80	3.27
12	5	HOV	SB	Artesia Blvd to Ave Pico	43.33	2+	PM	34.82	29.24	4.60	0.48	0.50

District	Route	Facility Type	Direction	Limits	Facility Length	Occupancy Requirement	Time Period	Lane Miles Monitored	Not Degraded	Slightly Degraded	Very Degraded	Extremely Degraded
12	22	HOV	EB	I-405 to Grand Ave	11.65	2+	AM	11.23	5.71	5.31	0.20	0.00
12	22	HOV	EB	I-405 to Grand Ave	11.65	2+	PM	11.23	5.34	2.25	1.60	2.03
12	22	HOV	WB	0.8 mi w/of SR-55 to I-405	12.39	2+	AM	11.79	11.15	0.64	0.00	0.00
12	22	HOV	WB	0.8 mi w/of SR-55 to I-405	12.39	2+	PM	11.79	8.15	1.92	0.84	0.89
12	55	HOV	NB	I-405 to 0.7 mi s/of Lincoln Ave	10.67	2+	AM	10.25	10.15	0.10	0.00	0.00
12	55	HOV	NB	I-405 to 0.7 mi s/of Lincoln Ave	10.67	2+	PM	10.25	1.18	2.12	0.80	6.15
12	55	HOV	SB	0.4 mi s/of Lincoln Ave to I-405	10.29	2+	AM	9.33	3.76	2.94	0.72	1.92
12	55	HOV	SB	0.4 mi s/of Lincoln Ave to I-405	10.29	2+	PM	9.33	8.25	1.08	0.00	0.00
12	57	HOV	NB	I-5 to Los Angeles Co. Line	11.78	2+	AM	10.65	10.25	0.40	0.00	0.00
12	57	HOV	NB	I-5 to Los Angeles Co. Line	11.78	2+	PM	10.65	1.94	4.72	1.35	2.65
12	57	HOV	SB	Los Angeles Co. Line to I-5	11.85	2+	AM	10.65	4.24	1.58	2.04	2.79
12	57	HOV	SB	Los Angeles Co. Line to I-5	11.85	2+	PM	10.65	3.68	4.30	1.60	1.07
12	91	HOV	EB	Los Angeles Co. Line to Tustin Avenue	11.78	2+	AM	10.57	2.75	6.05	1.32	0.46
12	91	HOV	EB	Los Angeles Co. Line to Tustin Avenue	11.78	2+	PM	10.57	0.00	5.11	2.88	2.59
12	91	HOV	WB	Tustin Ave to Los Angeles Co. Line	11.76	2+	AM	11.29	8.83	2.46	0.00	0.00
12	91	HOV	WB	Tustin Ave to Los Angeles Co. Line	11.76	2+	PM	11.29	3.72	3.23	1.38	2.96
12	405	HOV	NB	I-5 to Los Angeles Co. Line	26.54	2+	AM	16.56	15.04	1.52	0.00	0.00
12	405	HOV	NB	I-5 to Los Angeles Co. Line	26.54	2+	PM	16.56	7.03	4.80	2.30	2.42
12	405	HOV	SB	Los Angeles Co. Line to I-5	26.35	2+	AM	13.52	12.73	0.34	0.45	0.00
12	405	HOV	SB	Los Angeles Co. Line to I-5	26.35	2+	PM	13.52	7.10	3.10	2.26	1.06
12	605	HOV	NB	I-405 to Los Angeles Co. Line	2.36	2+	PM	2.10	1.81	0.00	0.29	0.00

EB = Eastbound, WB = Westbound, NB = Northbound, SB = Southbound Lane-miles may not add up exactly due to rounding
* HOV 2 & CAV pay 50% of posted toll
** SB 680, Rudgear Rd. to north of Alcosta Blvd. On-ramp, HOV 2+ pay 50% of posted toll, and other 680 is toll-free
*** CAV pay 85% of the posted toll
**** HOV 3+ pay 50% of posted toll and CAV pay discounted toll

6. ATTACHMENT A

Attachment A: 2022 CA HOV Speeds and Degradation Profiles