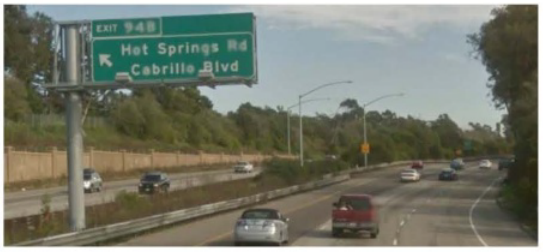
Appendix J Left-side Ramps Fact Sheet

South Coast 101 HOV Lanes Project

Fact Sheet: Highway Design Issues for Left-Side Ramps

Background – The 10.9 mile South Coast 101 HOV Lanes project proposes to add a High-Occupancy Vehicle (HOV) lane in each direction between Bailard Avenue in Carpinteria and Sycamore Creek in Santa Barbara. Two existing interchanges within the project limits currently have a mix of right-side and left-side ramps: Hot Springs/Cabrillo has left-side exit ramps in both directions, and Sheffield has left-side exit and entrance ramps in the southbound direction. Both were built in the 1950s.



Purpose of this Fact Sheet – This fact sheet will help build an understanding of left-side ramp issues and their implications for interchange configuration options for the South Coast HOV Lanes project. Due to their inherent operational and safety problems, left-side ramps are contrary to modern engineering principles for highway safety. There is no justification to overcome the negative consequences of retaining the left-side ramps with this project, due to factors which are explained in this fact sheet.

Operational Problems with Left-Side Ramps – The operational problems with left-side ramps are well known by transportation professionals nationwide. Left side ramps are increasingly rare on freeways because they do not meet driver expectations. This can be very disruptive for traffic flow, as drivers are forced to merge across all of the lanes to reach their desired exit, often swerving into the exit from a non-adjacent lane (Figure 1). This situation worsens as traffic increases and lanes are added to the freeway.

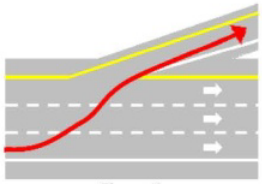


Figure 1

Another result of the left-side ramps not meeting driver expectations is that motorists can mistakenly exit the freeway by following the left yellow edge line. Often these drivers, having realized their mistake, attempt to re-enter the freeway lanes by driving across the gore area beyond the exit (Figure 2).

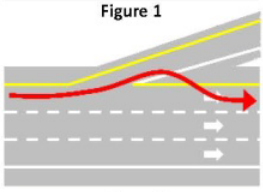


Figure 2

From 2007 to 2009, six collisions resulted from such events at the southbound Hot Springs/Cabrillo exit ramp.

Traffic flow is also disrupted when the low-speed ramps connect to the fastest lane of the freeway. Left-side exit ramps require slow-moving vehicles and trucks to transition across the through lanes and then merge with high-speed left lane traffic before exiting. Similarly, left-side entrance ramps require entering traffic to merge into the fastest lane of the freeway, disrupting the flow in that lane significantly (Figure 3). Both cases are aggravated when the left-side ramps connect to a street below the freeway level, since the descending exit ramp and ascending entrance ramp make it even more difficult for vehicles to adjust their speed. Both interchanges have this condition.

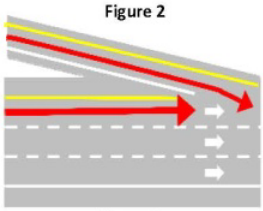
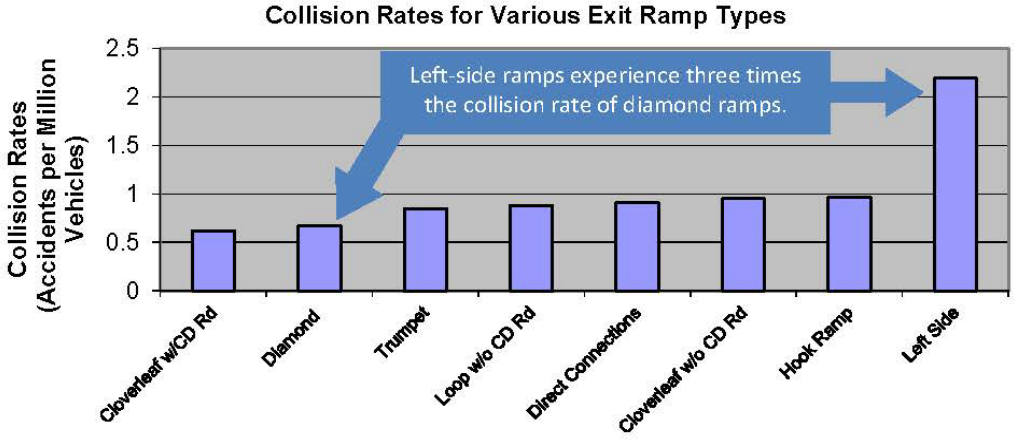


Figure 3

Left-side ramps are incompatible with High-Occupancy Vehicle lanes, because non-HOV traffic is not legally allowed to cross through an HOV lane to access the ramps.

Safety Record of Left-Side Ramps – Over decades of history with left side ramps, collision patterns have shown that they do not perform well from a safety standpoint. Compared with other types of ramps, left-side ramps have more than double the accident rates of ramps located to the right of traffic.



Local Safety Record – Similar to state and national trends, the collision rate for the northbound Cabrillo left side exit ramp is 35% higher than the statewide average for total collisions. The collision rate for the southbound Cabrillo left side exit ramp is 50% higher than average for total collisions, and over twice the average for injury accidents.

State Standards and National Policy – Due to the modern understanding of the operational problems of left-side ramps, and to ensure smooth, safe traffic flow on the freeway at interchanges, both the State of California standards and National policy strongly indicate that left side ramps are not to be used.

State Standard	National Policy
CA Department of Transportation, *Highway Design Manual*, 2012	AASHTO's *A Policy on Geometric Design of Highways and Streets*, 2011
All freeway entrances and exits shall connect to the right of through traffic. (504.2)	**Extreme care should be exercised to avoid left-hand entrances and exits in the design of interchanges.** (p.10-103)

South Coast 101 HOV Configurations Without Left-Side Ramps – The project Draft Environmental Impact Report contained five viable Hot Springs/Cabrillo interchange configurations that do not retain the left-side ramps, and rejected eight configurations that did retain left-side ramps, due to the nonstandard ramp arrangement and other factors. Similarly, the Sheffield interchange lends itself to a standard diamond ramp configuration to eliminate the nonstandard left-side southbound ramps.

Conclusion – As the owner and operator of U.S. 101, Caltrans has the responsibility to provide safe mobility for the public, in part by following established design standards. A project-specific decision process is required for nonstandard project features, based on engineering knowledge and consideration of safety, operations, and construction costs. With the well known operational and safety problems associated with left-side ramps, and with the variety of feasible options available with standard ramps to the right of traffic, there is no justification to build a configuration with this project that perpetuates the left-side ramps into the future.