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(* Denotes former staff)

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Executive Summary

The purpose of the Page Mill Road Expressway Corridor Study is to identify improvements to improve traffic flow and support active transportation modes for the Page Mill Road segment of the Oregon-Page Mill Expressway. The Page Mill Road segment extends from the I-280 interchange to Birch Street just west of the Caltrain tracks (see Figure ES-1). This report combines the results of three separate, but coordinated, planning efforts:

1. I-280/Page Mill Road Interchange Study – Funded and managed by the County of Santa Clara to study various alternatives for reconfiguring Page Mill Road through the interchange to reduce freeway ramp backups, enhance bicycle and pedestrian travel through the interchange area, and address operational and community issues with the Park-and-Ride lot. An additional component of this Study was to evaluate improvements to the Page Mill Road/Coyote Hill Road intersection in terms of corridor operations.

2. Page Mill Conceptual Plan Line Study – Funded by the City of Palo Alto and managed by the County of Santa Clara to develop concept plans for widening Page Mill Road to six lanes and providing a continuous trail from I-280 to Foothill Expressway, for improving intersections between Foothill Expressway and El Camino Real, and for developing grade separation alternatives for the Page Mill/Foothill Expressway-Junipero Serra Boulevard intersection.

3. Expressway Plan 2040 – Funded and managed by the County of Santa Clara to develop a long-range plan for improving, operating, and maintaining the County expressway system. This Plan conducted the baseline traffic analysis and traffic forecasts for the Oregon-Page Mill Expressway.

Oregon-Page Mill Expressway is approximately 4.7 miles long and extends between I-280 to the west and US-101 to the east. Oregon-Page Mill Expressway is the sixth highest volume expressway within the County, carrying over 134,000 vehicles per day within its two travel lanes in each direction. While Oregon-Page Mill Expressway does not appear to be heavily utilized as a connection roadway between I-280 and US-101, its access to both regional freeways makes it a vital connection for Los Altos Hills, Palo Alto, Stanford and the Stanford Research Park residents and employees. Oregon-Page Mill Expressway is also a heavily utilized bicycle corridor, providing connections to the numerous nearby open spaces, including Pearson-Arastradero Preserve, Foothills Park, Esther Clark Park, and the Baylands Nature Preserve.

NEED FOR TRAFFIC AND ACTIVE TRANSPORTATION IMPROVEMENTS

VEHICLE CIRCULATION

The intersection of Page Mill Road with Foothill Expressway has long been identified as a problem location within the County Expressway System. The 2003 Comprehensive County Expressway Planning Study (2003 Expressway Study) identified the intersection as deficient in both existing (Year 2001) and future (Year 2025) conditions. Since the 2003 Expressway Study, traffic volumes on Oregon-Page Mill Expressway have increased substantially.
FIGURE ES-1: CORRIDOR MAP

**LEGEND**
- Corridor Study Area
In 2013, most of the corridor operated at or above capacity. The intersection of Page Mill Road with Foothill Expressway currently ranks as the third highest average delay throughout the entire countywide expressway system. The segment between Foothill Expressway and I-280 was found to have volumes exceeding the roadway capacity, associated with Level of Service (LOS) F.\(^1\) The operating conditions are projected to worsen in the future with the proposed population and employment growth in the vicinity. Accounting for anticipated growth out to Year 2025 and without any improvements, the Expressway Plan 2040 is projecting the entire Oregon-Page Mill Expressway corridor to operate at LOS E or F. Such congestion will increase travel time along the corridor and reduce mobility.

The change in LOS between 2003 and 2013, and the projected LOS in 2025, is shown in Figure ES-2.

**FIGURE ES-2: YEAR 2003, YEAR 2013, AND YEAR 2025 LEVEL OF SERVICE ALONG OREGON-PAGE MILL EXPRESSWAY**

Most corridor traffic on Oregon-Page Mill Expressway is heading to and from Stanford Research Park and not traveling the length of the corridor. Traffic volumes are much higher on Page Mill Road west of the Stanford Research Park than on Oregon Expressway. As a result of the lower volumes and recent intersection and traffic signal improvements on Oregon Expressway, adequate capacity exists along Oregon Expressway such that it is not a factor in the traffic congestion along Page Mill Road west of El Camino Real.

\(^1\) Level of service is a traffic engineering term used to grade vehicle flows and operations on traffic facilities, and identify those in need of improvement. LOS ranges from A (best), which represents minimal delay, to F (worst), which represents heavy delay and a facility that is operating with significant congestion.
The I-280 southbound and northbound ramps to/from Page Mill Road currently experience extremely heavy congestion and queuing during the peak periods. The current configuration of the I-280 interchange is shown as Figure ES-3. The all-way stop at the intersection of the I-280 southbound off-ramp with Page Mill Road results in queuing backups that extend the full length of the southbound off-ramp onto the I-280 freeway mainline throughout much of the morning peak period. Also in the morning peak period, Page Mill Road becomes heavily congested eastbound, backing up from the Foothill Expressway intersection. Queuing on eastbound Page Mill Road was observed to extend back from the Foothill Expressway intersection to the I-280 northbound off-ramp by the end of the weekday AM peak period, a distance of 1.2 miles. On some of the most congested days, this queuing was observed to extend back along the I-280 northbound off-ramp to the I-280 northbound freeway mainline.

Caltrans has long been interested in implementing improvements at the interchange to improve circulation and reduce safety concerns associated with ramp queues backing up onto the I-280 mainline and at the ramp intersections. Caltrans has completed an I-280 Transportation Concept Report (2013) and a Traffic Operational Analysis report that have identified the circulation and safety concerns at this intersection. This Page Mill Expressway Corridor Study integrates the interchange improvement needs with the overall corridor improvement needs to develop a comprehensive and coordinated set of improvement solutions.

**CALTRANS PARK-AND-RIDE**
A Caltrans-owned park-and-ride lot is currently located in the southwest corner of the I-280 southbound off-ramp/Arastradero Road intersection with Page Mill Road. The lot provides 40 parking spaces, including two disabled parking stalls. The park-and-ride lot is not used by any public transit service, but is used by some privately operated buses and shuttles in addition to personal autos. Park-and-ride users during the week include both local and regional residents that commute to employment locations, both north towards San Francisco and south towards San Jose and Silicon Valley.

The park-and-ride lot is currently plagued by demand that exceeds available capacity, poor bus and auto circulation, and the lack of dedicated loading/unloading areas. Excess demand for the park-and-ride lot results in on-street parking along Page Mill Road west of I-280. The parking lot generally is fully occupied prior to 9:00 AM on weekdays.

**ACTIVE TRANSPORTATION**
In addition to the vehicle circulation needs, Page Mill Road is heavily utilized, particularly on weekends, by bicyclists accessing the regional trail network and rural roadways from the western portion of the corridor. Bicycle volumes on weekends are substantially higher than weekdays with over 100 bicycles per hour along Page Mill Road between 8:00 AM and 12:00 PM. The existing bicycle infrastructure is limited and requires challenging interactions with vehicles through the I-280 interchange. Of particular concern are the vehicle/bicycle ramp conflicts which occur where there are two-lane, free-flowing on-ramps which forces a bicyclist to cross more than one conflicting vehicle lane at a time.
FIGURE ES-3: EXISTING I-280 INTERCHANGE CONFIGURATION
The corridor has high pedestrian demand in some areas and only emergency/occasional use in others. Three intersections along the corridor have the highest pedestrian activity; over 100 pedestrians were observed at El Camino Real, Hanover Street and Foothill Expressway intersections. The I-280 interchange currently has very limited pedestrian facilities, discouraging pedestrian use. No pedestrians were observed at the interchange during either weekday peak traffic count period. However, on weekends, joggers have been observed to travel through the interchange area.

LOCAL ACCESS
A number of single-family dwelling units are located on the north side of Page Mill Road, east of the I-280 interchange. These residences, located in the Town of Los Altos Hills, rely exclusively on Page Mill Road for their access/egress. The approximately 19 dwellings along Christopher Lane have an unsignalized access point and a median opening on Page Mill Road immediately east of the I-280 northbound ramps. The unprotected turning movements into and out of Christopher Lane can be difficult at times, particularly during evening congestion associated with access to I-280. Gerth Lane and parallel private driveways have their only access to/from Old Page Mill Road, which has an unsignalized access point and a median opening on Page Mill Road approximately 600 feet to the east of Christopher Lane. Similar to Christopher Lane, left-turn movements to/from Old Page Mill Road can be difficult, particularly in the PM peak period. Additionally, the Old Page Mill Road access is located along a horizontal curve at the base of a vertical curve along Page Mill Road. Sight distance visibility is limited, further challenging movements from Old Page Mill Road.

DEVELOPMENT OF IMPROVEMENT CONCEPTS
Improvements are proposed as part of this Corridor Study to address the identified challenges along Page Mill Expressway. The improvements were developed as part of several individual, but coordinated, project efforts. The corridor was divided into the following segments:

- I-280 Interchange Configuration
- Page Mill Road from I-280 Interchange to El Camino Real

Improvements to the I-280 interchange configuration are focused on improving bicycle circulation, local access, traffic flow, and circulation around the park-and-ride lot through a reconfiguration of the ramps, changes to intersection control, and provision of active transportation facilities. Three distinct concepts were considered for reconfiguring the I-280 interchange in order to improve traffic, bicycle, and pedestrian circulation. The concepts included varying strategies of intersection control, ramp configuration, and bicycle facility configuration. Measures to address existing park-and-ride deficiencies were incorporated into the improvement concepts.

There are two primary traffic circulation challenges at the I-280 interchange. One is the limitation of capacity provided by the all-way stop control at the I-280 southbound off-ramp and the resulting queuing backup along the I-280 southbound off-ramp. The other is queues extending along Page Mill Road between Foothill Expressway and the interchange area. The latter challenge cannot be addressed by modifications to the interchange alone. Increasing the throughput of the interchange would merely increase the eastbound queues approaching Foothill Expressway. Therefore, any improvements to the interchange would need to be implemented in conjunction with or subsequent to improvements at the Page Mill Road/Foothill Expressway intersection and along Page Mill Road between the interchange and Foothill Expressway. All improvement concepts for the interchange thus assume widening of Page Mill Road to six lanes and accompanying improvements at the Foothill Expressway intersection.
Executive Summary

Improvements between the interchange and Foothill Expressway include roadway widening and active transportation facilities. Improvements at the intersection of Page Mill Road with Foothill Expressway are focused on grade separation configurations. Three different grade separation alternatives were analyzed to identify their cost, visual impact, and effect on circulation to/from nearby adjacent roadways. Finally, improvements between Foothill Expressway and El Camino Real include intersection improvements to improve intersection efficiency and reduce queuing impacts.

The project team worked closely with Town of Los Altos Hills, City of Palo Alto, Caltrans, and VTA staff in identifying potential improvements and in the evaluation of those improvements. The improvement concepts under consideration were presented for discussion and community feedback at three public meetings in November and December 2014. Improvement concept plans were presented for the Page Mill Road widening, Foothill Expressway grade separation and other proposed intersection improvements along Oregon-Page Mill Expressway. In addition, videos of the I-280 interchange micro-simulation models for each of the improvement concepts in future year conditions were presented and discussed with the public.

The I-280/Page Mill Road interchange area received the greatest amount of interest with overall support for widening Page Mill Road between I-280 and Foothill Expressway to relieve current congestion before any changes are made at the interchange itself. Residents on the west side of the interchange encouraged alternatives to signalizing the freeway ramps and were receptive to the roundabout concept. Residents near Foothill Expressway were open to grade separation concepts for the Page Mill Road/ Foothill Expressway intersection.

RECOMMENDED CORRIDOR CONCEPT

The improvements proposed for the Page Mill Road corridor are depicted in Figure ES-4. The description of the improvements are discussed by location: I-280 Interchange, Old Page Mill Road (west) to Foothill Expressway, and Foothill Expressway to El Camino Real.

I-280 INTERCHANGE

Figure ES-5 depicts the configuration of the recommended concept for the I-280 interchange. Key components of this concept include:

- Installation of a roundabout to serve the I-280 southbound off-ramp, Page Mill Road, Arastradero Road, and the eastbound Page Mill Road to I-280 southbound on-ramp;
- Signalization of the I-280 northbound ramps;
- Shift of the eastbound Page Mill Road to I-280 northbound on-ramp to the new northbound ramp intersection;
- Creation of a frontage road between Christopher Lane and Old Page Mill Road, shifting access between Page Mill Road and Christopher Lane, the private driveway, and Gerth Lane to Old Page Mill Road, and signalization of the Old Page Mill Road intersection;
- Provision of a dedicated westbound right-turn lane to the I-280 northbound on-ramp;
- New signalized pedestrian crossing at the I-280 northbound ramps intersection; and
- Provision of a bi-directional shared use path on the north side of Page Mill Road between the park-and-ride and frontage road connection to Old Page Mill Road. The shared use path would pass beneath the I-280 southbound on- and off-ramps.
Traffic circulation patterns would generally be consistent with current movements, except for local access to the neighborhood north of Page Mill Road, east of the interchange. Access for this neighborhood would be modified by the provision of the frontage road. This would serve to improve accessibility for the neighborhood by providing full movements at the proposed signal at Old Page Mill Road.

Bicycle circulation would be enhanced with a few geometric changes and the shared-use path. Continuous on-street striped bike lanes would be provided in both directions through the interchange area. The westbound Page Mill Road to I-280 southbound loop on-ramp would be reduced to one lane from the current two-lanes to simplify the conflict between bicycles and vehicles and allow the bike lane to shift to being adjacent to the curb. The shared-use path would provide for bicycle travel through the interchange area by less skilled cyclists. The shared use path would connect to the low-volume frontage road and provide direct access to the heavily used bike route on Old Page Mill Road. At a design speed of 25 MPH, the roundabout is also a viable option for those bicyclists choosing not to use the shared-use path.

Pedestrian circulation would be similarly enhanced with the shared-use path. In addition, sidewalk gaps on the south side of Page Mill Road would be closed to allow for pedestrian travel on both sides of the roadway.

Bicycle and pedestrian circulation features are shown in Figure ES-6.
FIGURE ES-5: INTERCHANGE CONCEPT

- **Concept 3 - Roundabout Concept**

**Improvements**

- Study
- **Modified Roadway Geometry for Bike and Pedestrian Safety**
- **Widen to Create Dedicated Right-turn Lane** (requires roadway expansion)
- **Implement Two-way Traffic Circulation along Old Page Mill Road** (requires roadway realignment)
- **Reconfigured Park-and-Ride Lot**
- **Two-way Traffic Circulation along Old Page Mill Road** (requires roadway realignment)
- **Shift Access to/from Christopher Lane to Old Page Mill Road**
- **New Traffic Signal**
- **Reconfigure NB Off-ramp to Accommodate New Traffic Signal** (requires roadway realignment)
- **Reconfigure NB On-ramp to Increase Merge Distance and Improve Bike Safety**
- **Reduce to a Single-Lane On-Ramp Approach**
- **New Roundabout**
FIGURE ES-6: INTERCHANGE CONCEPT – BICYCLE AND PEDESTRIAN FEATURES

Executive Summary

Improvements Study

Page Mill Road and Interstate 280

Christopher Lane

Gerth Lane

Concept 3 - Roundabout Concept

Bike and Pedestrian Facilities

LEGEND

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<tr>
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<tr>
<td>Blue</td>
<td>Pedestrian Facilities</td>
</tr>
<tr>
<td>Purple</td>
<td>Shared Use Path</td>
</tr>
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</table>

NOT TO SCALE

February 2015

LEGEND

- New Bi-Directional Shared Use Path
- Widen Existing Shared Use Path
- New Sidewalk
- Extend Sidewalk
- New Bi-Directional Shared Use Path in Undercrossing Beneath Ramps
- New Signalized Pedestrian and Bicycle Crossing
- New Bi-Directional Shared Use Path
- Bike Slot
- Two-Stage Left-Turn for Eastbound Cyclists to Access Shared Use Path to Old Page Mill Road
- New Shared Use Path Extends to Existing Path at Deer Creek
- Bikes OK to Travel in Shoulders
- Old Page Mill Road

Page Mill Expressway Corridor Study Report
This concept received the most popular support from stakeholders and the community. The following comment themes were received regarding this concept:

• It appeared to be the most effective at addressing the existing and future traffic flows through the interchange;

• It maintained the community’s desire for a rural environment;

• The shared-use path combined with the bike lanes provided bicycle facilities to serve the full spectrum of bicycle riders;

• Some members of the community expressed concern about the park-and-ride lot reconfiguration included in this concept to provide for on-site bus circulation; and

• Some members of the community expressed interest in considering a roundabout for the northbound ramps as well.

The concept will undergo further review and refinement as part of a detailed environmental review process and further design development. The concept will also require further vetting and analysis by Caltrans prior to design approval.

ROUNDABOUT VERSUS SIGNAL FOR I-280 NORTHBOUND RAMPS (EAST SIDE OF INTERCHANGE)

Caltrans has adopted a policy whereby both roundabouts and signalization will be considered for all locations where intersections meet the required warrants and an improvement is being implemented. A detailed evaluation process, known as an Intersection Control Evaluation (ICE), will be performed by Caltrans to identify the appropriate solution for each location. As the I-280 interchange is under Caltrans jurisdiction, an ICE will be required prior to detailed design and construction of improvements at this location. At that time, a roundabout will be further considered for the I-280 northbound ramps intersection. It should be noted, however, that a roundabout on this side of the interchange faces significantly more challenges than are present for the installation of a roundabout on the west side of the interchange.
PARK-AND-RIDE LOT
The concept identified opportunities to improve the Caltrans park-and-ride lot located at the southwest corner of the Page Mill Road and Arastradero Road intersection. By shifting the alignment of Arastradero Road to feed into the roundabout, the park-and-ride lot can be reconfigured to provide an internal circulation pattern that does not require illegal maneuvers, driveway blockages, or extensive out-of-direction travel for buses. The reconfigured lot would have roughly the same number of spaces as the existing lot.

The community has expressed concerns regarding the existing location and heavy utilization of the Caltrans park-and-ride lot. Caltrans and VTA are encouraged to identify other park-and-ride lot locations in the I-280 corridor to relieve the overcrowding at the Page Mill Road park-and-ride lot. The community has also requested that the project team consider alternative locations for the park-and-ride lot. As it is a Caltrans-owned lot, alternative areas within Caltrans jurisdiction at the interchange were reviewed. One potential location would be the Caltrans Corporation Yard, located in the triangular area between the I-280 northbound on-ramp, I-280, and Page Mill Road. This area currently houses a Caltrans maintenance facility and a number of cellular towers. The provision of a park-and-ride lot in this area would require relocation of both facilities to alternate sites. A preliminary concept was developed for the relocation of the lot to this area that would provide a greater number of parking spaces than the existing lot and would provide an efficient circulation pattern. Relocation of the park-and-ride lot to this location has not been reviewed by Caltrans staff. It can be studied further by Caltrans when funding is available to proceed into the Project Report/Environmental Document phase for the interchange improvements.

INTERIM BICYCLE IMPROVEMENTS THROUGH THE INTERCHANGE
The potential interchange improvements identified in this report will likely take years to secure funding and proceed through all the necessary Caltrans studies and approval processes. Some members of the bicycling community have requested that interim improvements similar to the bicycle treatments through the I-280/Alpine Road interchange be considered. Page Mill Road experiences much higher traffic volumes than Alpine Road, making the exact bicycle treatments used on Alpine Road not feasible. However, as indicated in Figure ES-7, a number of enhanced bicycle treatments are feasible for implementation, including:

- Provision of eastbound bike lanes;
- Striping of buffered bike lanes in both directions;
- Demarcation of bike lanes with green paint, including dashed green paint in conflict areas;
- Modifications to vehicle lane alignments to clearly define areas where vehicles would yield to bicyclists; and
- Reduction in the westbound Page Mill Road to I-280 southbound on-ramp from two lanes to one lane, reducing the number of lanes that will need to be crossed by westbound bicyclists.

While these interim improvements would not fully address many of the existing challenges faced by bicyclists traveling through the intersection, collectively they serve to increase the visibility of bicycle facilities and reduce the complexity of existing conflict points.

These improvements have not yet proceeded into the Caltrans review and approval process. Modifications to the concept may be required subsequent to Caltrans review and further design development.
FIGURE ES-7: INTERIM BICYCLE CIRCULATION IMPROVEMENT CONCEPT
OLD PAGE MILL ROAD (WEST) TO FOOTHILL EXPRESSWAY
Traffic demand on Page Mill Road between the I-280 interchange and El Camino Real was found to exceed capacity by Year 2025, with the segment between the interchange and Foothill Expressway experiencing the highest level of congestion. As a result, improvements have been identified for this section of the roadway. The improvements can be grouped into three categories with different characteristics and implementation strategies:

• Widening of Page Mill Road from four to six lanes between Old Page Mill Road and Foothill Expressway;
• Grade separation of Foothill Expressway with Page Mill Road; and
• Intersection improvements along Page Mill Road between Foothill Expressway and El Camino Real.

PAGE MILL ROAD BETWEEN OLD PAGE MILL ROAD (WEST) AND FOOTHILL EXPRESSWAY
This segment needs additional travel lanes to handle existing and future demand on the corridor. The recommended improvements along Page Mill Road in this segment were developed based on numerous design constraints and criteria including:

1. Minimize grading impacts to hillsides;
2. Limit additional right of way needs; and
3. Maintain a continuous Class I multi-use trail from I-280 to Foothill Expressway.

The eastbound direction of Page Mill Road would be widened from the current lane drop just east of Old Page Mill Road through the Foothill Expressway intersection. The westbound direction of Page Mill Road would be widened from immediately west of Foothill Expressway to the I-280 northbound on-ramp. The additional lanes would primarily be provided within the existing roadway width by replacing the existing median and reducing lane widths to 11 feet. Minimal widening would be required on the south side of the roadway.

In conjunction with the roadway widening project, a Class I multi-use trail would be provided along the south side of the roadway between the I-280 interchange and Deer Creek Road. At Deer Creek Road, it would connect to the existing Class I trail that extends to the Foothill Expressway intersection. The new trail would require grading on the south side of the roadway, but would not require any right-of-way, except for a small sliver near Deer Creek Road.

In addition, a Class I multi-use trail would be provided between the eastern terminus of Old Page Mill Road and Foothill Expressway to provide an improved connection for cyclists using Old Page Mill Road to travel between the interchange and Foothill Expressway. The multi-use trail would provide a connection to the Stanford Perimeter Trail, which runs to the north along Junipero Serra Boulevard. The existing eastern one-way vehicular connection from Page Mill Road to Old Page Mill Road would be closed to traffic except emergency vehicles.

Along with the roadway widening would be minor improvements to the approaches of the Page Mill Road and Foothill Expressway intersection. These improvements include lengthening of turn pockets on southbound Junipero Serra Boulevard and re-alignment of Page Mill Road east of the intersection to align with the widened roadway west of the intersection.

A related project along this section of Page Mill Road are improvements to the Page Mill Road and Coyote Hill Road intersection. This intersection is currently an unsignalized location with full access from Coyote Hill Road onto Page Mill Road. This is one of only a few locations along the countywide expressway system that has an unsignalized median opening. For all such locations, the County is considering either closing the median
or controlling the location by signalization. The near-term increase of traffic volumes on Coyote Hill Road, in addition to the future widening of Page Mill Road, would result in a safety and level of service issue with the current unsignalized, side-street stop-controlled configuration. Based on a circulation evaluation, the County has identified signalization as the preferred solution at Coyote Hill Road.

**PAGE MILL ROAD/FOOTHILL EXPRESSWAY GRADE SEPARATION**

The Page Mill Road/Foothill Expressway intersection currently experiences the third highest amount of delay of any intersection in the countywide expressway system. In the AM peak period, it causes backups along Page Mill Road that extend more than a mile to the west to I-280. Therefore, the County evaluated a grade separation at this intersection. In each of the grade separation concepts, the heavy through traffic on Page Mill Road would be separated from movements along and to/from Foothill Expressway-Junipero Serra Boulevard.

The recommended improvements at Page Mill/Foothill Expressway-Junipero Serra Boulevard intersection were developed based on numerous design constraints and criteria including:

- Separate and eliminate signal for Page Mill Road through traffic;
- Minimize utility conflicts with proposed improvements;
- Limit additional right of way needs;
- Maintain aesthetic value; and
- Accommodate bicycles and pedestrians approaching and through the intersection.

Three concepts were evaluated for the grade separation using different configurations in which the expressway goes over and under Foothill Expressway-Junipero Serra Boulevard. It was decided not to select a preferred grade separation concept for the Page Mill Road/ Foothill Expressway-Junipero Serra Boulevard intersection. The three grade separation concepts will be available for further study in the future when the project is ready to proceed. Given the significant cost of grade separation, this improvement is considered a long-term solution. At-grade improvements, including a third eastbound through lane, will be pursued at this intersection to improve traffic flow in the interim.

**FOOTHILL EXPRESSWAY TO EL CAMINO REAL**

While the segment of Page Mill Road between Foothill Expressway and Ramos Way is projected to operate at LOS E by Year 2025, it does not have the level of congestion experienced west of Foothill Expressway. Furthermore, this segment of Page Mill Road is highly constrained due to fronting businesses and numerous driveways. Therefore, improvements for this segment include intersection-specific improvements, developed to increase intersection capacity and throughput.

Improvements were developed at each of the signalized intersections along this segment. The primary improvements are:

- **Page Mill Road & Hanover Street Intersection** — Add a northbound and southbound left turn lane and convert the signal to an 8-phase operation. Convert Hanover Street to one-through lane in each direction and add bike lanes;

- **Page Mill Road & El Camino Real Intersection** — Modify alignment of westbound left-turn lane to provide additional left-turn storage capacity, provide a dedicated westbound right-turn lane, extend bike lanes, and possibly eliminate the eastbound right-turn pork-chop island (will require further study).
**IMPROVEMENT COST**

Table ES-1 below lists the Page Mill Corridor improvements with the opinion of probable costs for each improvement.

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<th>Improvement</th>
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<td>Interim Bicycle Improvements at the I-280 Interchange</td>
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<td>I-280 Interchange Improvements</td>
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<td>Grade Separation of Foothill Expressway intersection</td>
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<td>At-Grade Intersection Improvements between Foothill Expressway and Ramos Way</td>
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<td>Intersection Improvements at El Camino Real</td>
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<td><strong>Total</strong></td>
<td><strong>$92.2 Million to $97.3 Million</strong></td>
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*Ranges in costs reflect the three grade separation options under consideration.

**PHASED IMPROVEMENT STRATEGY**

A phasing order has been established based on the immediacy of improvement needs while ensuring the effectiveness of the transportation network at the conclusion of each phase. The phasing is shown in Figure ES-8 and the timing for each phase is listed below.

- **Interim Improvement** — Bicycle Improvements through Interchange: Implement when funding is available. Still requires further engineering design development and Caltrans review.

- **Phase 1** — Widen Page Mill Expressway: When funding becomes available. Includes at-grade improvements at Foothill Expressway-Junipero Serra Boulevard intersection. Includes trail extension from Deer Creek Road to I-280 interchange. Requires minor right-of-way acquisition.

- **Phase 2** — I-280 Interchange Improvements: Could be implemented at same time as Page Mill Road widening if enough funding is available. Otherwise, would follow Page Mill Road widening. Includes bicycle and pedestrian enhancements, including shared-used paths, sidewalks, and crosswalks. Includes park-and-ride improvements at the existing or an alternate location. The preferred intersection control strategy for the I-280 northbound ramps intersection will be determined through a Caltrans ICE.

- **Phase 3** — Grade Separation for Page Mill Road/Foothill Expressway-Junipero Serra Boulevard Intersection: Long-term project to follow other improvements. Phase 1 (widening eastbound Page Mill Road to three lanes through the intersection) will provide short term congestion relief; however, grade separation will be required in the long term as traffic demand grows.

- **Foothill Expressway to El Camino Real Intersection Improvements** — These relatively simple, low cost improvements can be implemented at any time and need not be connected to the phasing strategy for improvements west of Foothill Expressway.
**Executive Summary**

**FIGURE ES-8: PROPOSED PAGE MILL ROAD IMPROVEMENT PHASING**

- **Phase 1** - Widening of Page Mill Road to 3 lanes in each direction.

- **Phase 2** – Circulation improvements at the I-280 interchange and at Old Page Mill Road. Includes bicycle and pedestrian facilities.

- **Phase 3** - Grade Separation of Page Mill Road at Foothill Expressway.

- Interim Improvements - Striping improvements to benefit bicycle circulation.
BENEFITS OF IMPROVEMENTS
The proposed improvements were evaluated for their effectiveness in improving traffic circulation, bicycle connectivity, and pedestrian connectivity.

I-280 INTERCHANGE TO FOOTHILL EXPRESSWAY
The improvement concepts between the I-280 interchange and Foothill Expressway were evaluated using a micro-simulation tool in order to assess the overall network-wide effect of the improvements. All interchange improvements were analyzed assuming that Page Mill Road would be widened to six lanes between the I-280 interchange and Foothill Expressway. This widening includes an additional eastbound through lane on Page Mill Road through the Foothill Expressway intersection.

EXISTING VOLUMES
Table ES-2 identifies the delay and level of service for intersections between the I-280 interchange and Foothill Expressway with the roundabout improvement concept using existing traffic volumes.

TABLE ES-2: INTERSECTION LEVEL OF SERVICE WITH PAGE MILL ROAD IMPROVEMENTS – EXISTING VOLUMES

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Existing Control</th>
<th>AM Peak</th>
<th>Delay (s)</th>
<th>LOS</th>
<th>PM Peak</th>
<th>Delay (s)</th>
<th>LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arastradero Road/ I-280 SB Ramps</td>
<td>AWSC¹</td>
<td>171.9</td>
<td>F</td>
<td>15.7</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-280 NB Ramps</td>
<td>SSSC²</td>
<td>127.2</td>
<td>F</td>
<td>8.3</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Old Page Mill Road</td>
<td>SSSC²</td>
<td>5.6</td>
<td>A</td>
<td>9.1</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deer Creek Road</td>
<td>Signal</td>
<td>59.0</td>
<td>E</td>
<td>11.8</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foothill Expressway</td>
<td>Signal</td>
<td>84.4</td>
<td>F</td>
<td>108.5</td>
<td>F</td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Roundabout Concept and Page Mill Road Widening Control</th>
<th>AM Peak</th>
<th>Delay (s)</th>
<th>LOS</th>
<th>PM Peak</th>
<th>Delay (s)</th>
<th>LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arastradero Road/ I-280 SB Ramps</td>
<td>RAB³</td>
<td>25.3</td>
<td>C</td>
<td>9.7</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-280 NB Ramps</td>
<td>Signal</td>
<td>4.5</td>
<td>A</td>
<td>8.2</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Old Page Mill Road</td>
<td>Signal</td>
<td>1.3</td>
<td>A</td>
<td>4</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deer Creek Road</td>
<td>Signal</td>
<td>7.2</td>
<td>A</td>
<td>9.2</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foothill Expressway</td>
<td>Signal</td>
<td>31.1</td>
<td>C</td>
<td>43.4</td>
<td>D</td>
<td></td>
<td></td>
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</tbody>
</table>

Notes:
Delay is based on average vehicle delay for all entering vehicles at signalized, roundabout and all-way stop intersections. Delay is based on average vehicle delay for the side-street movements at side-street stop-controlled intersections.

¹ AWSC = All-way Stop Control
² SSSC = Side-street Stop Control
³ RAB = Roundabout
⁴ Assumed improvements at the Foothill Expressway intersection include a third eastbound through lane. Does not include grade separation in this scenario.

As shown in Table ES-2, the improvement concept would result in acceptable operations for all study intersections with existing volumes. The intersection of Page Mill Road and Foothill Expressway would operate at an acceptable level of service with the widening of Page Mill Road to six lanes and the third eastbound lane extending through the Foothill Expressway intersection.

The travel time during the peak periods between the interchange and Foothill Expressway was measured with the improvement concept using the micro-simulation model. Table ES-3 identifies the travel times between I-280 and Foothill Expressway.
TABLE ES-3: TRAVEL TIMES WITH PAGE MILL ROAD IMPROVEMENTS – EXISTING VOLUMES

<table>
<thead>
<tr>
<th>Segment Limits</th>
<th>Period</th>
<th>Existing Travel Time (min)</th>
<th>Roundabout Concept with Page Mill Road Widening Travel Time (min)</th>
<th>∆</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between I-280 NB and Foothill Expressway</td>
<td>AM</td>
<td>7.8</td>
<td>3.1</td>
<td>- 4.7 min</td>
<td>- 60%</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>6.9</td>
<td>3.0</td>
<td>- 3.9 min</td>
<td>- 57%</td>
</tr>
<tr>
<td>Between I-280 SB and Foothill Expressway</td>
<td>AM</td>
<td>9.1</td>
<td>3.6</td>
<td>- 5.5 min</td>
<td>- 60%</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>6.5</td>
<td>3.6</td>
<td>- 2.9 min</td>
<td>- 45%</td>
</tr>
</tbody>
</table>

Notes: Travel times are for the peak direction. AM peak direction is eastbound and PM peak direction is westbound.

As shown in the table, the concept would provide substantial travel time benefits compared to the baseline scenario.

YEAR 2025 VOLUMES

The improvement concepts were evaluated under Year 2025 conditions to ensure that they will adequately support projected future growth in the area. Future year forecasts were developed based on the regional travel demand model, which accounts for employment and population growth contained in city and County General Plans. Table ES-4 identifies the delay and level of service for intersections between the I-280 interchange and Foothill Expressway with Year 2025 volumes.

TABLE ES-4: INTERSECTION LEVEL OF SERVICE WITH PAGE MILL ROAD IMPROVEMENTS – YEAR 2025 VOLUMES

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Page Mill Road Widening Only</th>
<th>Roundabout Concept with Page Mill Road Widening¹</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM Peak Delay (s)</td>
<td>LOS</td>
</tr>
<tr>
<td>Arastradero Road/ I-280 SB Ramps</td>
<td>AWSC²</td>
<td>231.6</td>
</tr>
<tr>
<td>I-280 NB Ramps</td>
<td>SSSC³</td>
<td>66.9</td>
</tr>
<tr>
<td>Old Page Mill Road</td>
<td>SSSC³</td>
<td>5.4</td>
</tr>
<tr>
<td>Deer Creek Road</td>
<td>Signal</td>
<td>47</td>
</tr>
<tr>
<td>Foothill Expressway</td>
<td>Signal</td>
<td>131.0</td>
</tr>
</tbody>
</table>

Notes: Delay is based on average vehicle delay for all entering vehicles at signalized, roundabout and all-way stop intersections. Delay is based on average vehicle delay for the side-street movements at side-street stop-controlled intersections.

¹ Includes at-grade improvements at Foothill Expressway intersection but no grade separation
² AWSC = All-way Stop Control
³ SSSC = Side-street Stop Control
⁴ RAB = Roundabout

As shown in Table ES-4, the interchange movements operate acceptably with the roundabout concept. The roundabout reduces the morning peak period delay at the I-280 southbound ramps intersection by over 90 percent. However, without grade separation of Page Mill Road through movements at Foothill Expressway, the intersection of Foothill Expressway would operate at a deficient level of service.
The grade separation of Page Mill Road through movements at this location is sufficient to improve the operations of the intersection to an acceptable LOS C. The grade separation significantly reduces delay at the Foothill Expressway intersection but increases delay at Deer Creek Road and the I-280 interchange intersections in the PM peak period by eliminating an existing bottleneck that meters westbound Page Mill Road traffic.

The travel time during the peak periods between the interchange and Foothill Expressway with implementation of the recommended improvements was measured using the micro-simulation model. Table ES-5 identifies the travel times between I-280 and Foothill Expressway with the interchange improvement concept and Page Mill Road widening.

### TABLE ES-5: TRAVEL TIMES WITH PAGE MILL ROAD IMPROVEMENTS – YEAR 2025 VOLUMES

<table>
<thead>
<tr>
<th>Segment Limits</th>
<th>Period</th>
<th>Page Mill Road Widening Only</th>
<th>Roundabout Concept with Page Mill Road Widening¹</th>
<th>Δ</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Travel Time (min)</td>
<td>Travel Time (min)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between I-280 NB and Foothill Expressway</td>
<td>AM</td>
<td>6.7</td>
<td>4.2</td>
<td>- 2.5 min</td>
<td>- 37%</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>2.8</td>
<td>3.2</td>
<td>+ 0.4 min</td>
<td>+ 14%</td>
</tr>
<tr>
<td>Between I-280 SB and Foothill Expressway</td>
<td>AM</td>
<td>10.3</td>
<td>4.6</td>
<td>- 5.7 min</td>
<td>- 55%</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>3.2</td>
<td>3.4</td>
<td>+ 0.2 min</td>
<td>+ 6%</td>
</tr>
</tbody>
</table>

Notes:
Travel times are for the peak direction. AM peak direction is eastbound and PM peak direction is westbound.
¹ Includes at-grade improvements at Foothill Expressway intersection but no grade separation.

The improvements would result in a substantial travel time savings in the eastbound direction in the morning compared to the baseline scenario. Eastbound travel time from the I-280 southbound ramps would be reduced from 10.3 minutes in the baseline scenario to 4.6 minutes with the improvements, a reduction of 55 percent. Westbound travel times along Page Mill Expressway west of Foothill Expressway would slightly increase in the evening peak period. The increased capacity with at-grade improvements at Foothill Expressway increases the throughput of that intersection, thereby increasing the number of vehicles approaching the I-280 interchange in the PM peak period.

The grade separation of Foothill Expressway would further benefit eastbound travel time in the morning peak period and reduce intersection delay at the Foothill Expressway intersection for Page Mill Road movements. It would also increase the number of vehicles approaching the I-280 interchange by reducing vehicle queuing on Page Mill Road approaching Foothill Expressway.

**BICYCLE AND PEDESTRIAN CIRCULATION**

The improvement concept would substantially improve bicycle and pedestrian circulation from existing conditions by providing dedicated facilities and reducing conflict points.

**FOOTHILL EXPRESSWAY TO EL CAMINO REAL**

Traffic circulation with implementation of the proposed improvements along Page Mill Expressway east of Foothill Expressway were analyzed as part of the Expressway Plan 2040 effort. The roadway segment level of service with and without the improvements is shown in Table ES-6.
TABLE ES-6: ROADWAY SEGMENT LEVEL OF SERVICE – 2025 BUILD CONDITIONS

<table>
<thead>
<tr>
<th>Segment</th>
<th>Peak Hour</th>
<th>Segment Capacity</th>
<th>Link Volume</th>
<th>V/C1</th>
<th>LOS</th>
<th>Segment Capacity</th>
<th>Link Volume</th>
<th>V/C1</th>
<th>LOS</th>
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</thead>
<tbody>
<tr>
<td>I-280 to Foothill Expressway</td>
<td>AM</td>
<td>3,760</td>
<td>3,788</td>
<td>1.01</td>
<td>F</td>
<td>5,660</td>
<td>4,029</td>
<td>0.71</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>3,820</td>
<td>3,820</td>
<td>1.02</td>
<td>F</td>
<td>4,445</td>
<td>4,445</td>
<td>0.79</td>
<td>C</td>
</tr>
<tr>
<td>Foothill Expressway to Ramos Way</td>
<td>AM</td>
<td>3,400</td>
<td>3,387</td>
<td>1.00</td>
<td>E</td>
<td>3,910</td>
<td>3,438</td>
<td>0.88</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>3,300</td>
<td>3,300</td>
<td>0.94</td>
<td>E</td>
<td>3,411</td>
<td>3,411</td>
<td>0.87</td>
<td>D</td>
</tr>
<tr>
<td>Ramos Way to Birch Street</td>
<td>AM</td>
<td>3,400</td>
<td>3,647</td>
<td>1.07</td>
<td>F</td>
<td>3,910</td>
<td>3,699</td>
<td>0.95</td>
<td>E</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>3,434</td>
<td>3,434</td>
<td>1.01</td>
<td>F</td>
<td>3,719</td>
<td>3,719</td>
<td>0.95</td>
<td>E</td>
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</table>

Source: Expressway Plan 2040, Comprehensive County Expressway Planning Study Traffic Forecasting Methodology, Existing, 2025 and 2040 Traffic Conditions (URS, 2015)

1 V/C = Volume-to-Capacity Ratio

As shown in the table, the deficient LOS F segments along Page Mill Road would be improved to operate at LOS E or better with the identified improvements.

NEXT STEPS

The Page Mill Road Expressway Corridor improvements identified in this report will be incorporated into the Expressway Plan 2040 report. It is likely that all of the Page Mill Road corridor projects will be incorporated into the Tier 1 (highest priority) list of projects, with the exception of the grade separation at Foothill Expressway-Junipero Serra Boulevard, which is likely to be a Tier 3 project.

PROJECT DEVELOPMENT

The next step in project development varies by project. Projects located within Caltrans right-of-way (I-280 interchange and El Camino Real) require additional Caltrans studies and approvals prior to proceeding into design and environmental review. For a project as complex as the I-280 interchange modifications, Caltrans will require additional alternatives analysis building on the work conducted as part of this study.

Projects outside of Caltrans right-of-way (Page Mill Expressway widening and the various intersection improvements) can proceed into design and environmental review when funding is available. Community outreach will be an integral part of the design and environmental process.

FUNDING

The Expressway Plan 2040 does not provide funding for projects. It identifies and prioritizes improvement projects, setting the stage for acquiring grants and for cities to collect traffic impact fees and/or condition developers to provide improvements. Most of the Tier 1 projects have potential funding sources already identified for at least a portion of the project costs. These funding sources include city traffic impact fees and development mitigations, bicycle-improvement related grants, and Caltrans safety improvement grants. The County, working in partnership with the cities, VTA, and Caltrans, will pursue all potential funding sources to move these projects forward with implementation based on the phasing strategy.
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</tr>
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1. Introduction
The purpose of the Page Mill Road Expressway Corridor Study is to identify improvements to improve traffic flow and support active transportation modes for the Page Mill Road segment of the Oregon-Page Mill Expressway. The Page Mill Road segment extends from the I-280 interchange to Birch Street just west of the Caltrain tracks (see Figure 1). This report combines the results of three separate, but coordinated, planning efforts:

1. **I-280/Page Mill Interchange Study** – Funded and managed by the County of Santa Clara to study various alternatives for reconfiguring Page Mill Road through the interchange to reduce freeway ramp backups, enhance bicycle and pedestrian travel through the interchange area, and address operational and community issues with the park-and-ride lot. An additional component of this Study was to evaluate improvements to the Page Mill/Coyote Hill Road intersection in terms of corridor operations.

2. **Page Mill Conceptual Plan Line Study** – Funded by the City of Palo Alto and managed by the County of Santa Clara to develop concept plans for widening Page Mill Road to six lanes and providing a continuous trail from I-280 to Foothill Expressway, for improving intersections between Foothill Expressway and El Camino Real, and for developing grade separation alternatives for the Page Mill Road and Foothill Expressway/Junipero Serra Boulevard intersection.

3. **Expressway Plan 2040** – Funded and managed by the County of Santa Clara to develop a long-range plan for improving, operating, and maintaining the County expressway system. This Plan conducted the baseline traffic analysis and traffic forecasts for the Oregon-Page Mill Expressway.

The report is organized into ten chapters. The first three chapters provide background information, an overview of need for improvements, and summaries for existing and future transportation conditions. Information for the entire Oregon-Page Mill Expressway is provided in these three chapters to help develop an understanding of the needs for the Page Mill Road segment. The remaining chapters of the report focus on the Page Mill Road segment of the expressway. These include chapters providing capacity and operational analyses, descriptions and evaluations of the improvements studied and proposed, a summary of the public outreach conducted, the recommended corridor concept, a phasing/implementation plan, and next steps.

1.1. **OREGON-PAGE MILL EXPRESSWAY OVERVIEW**
Oregon-Page Mill Expressway is approximately 4.7 miles long and extends between I-280 to the west and US-101 to the east. The expressway has two travel lanes in each direction throughout its length. The far western end of the expressway borders the Town of Los Altos Hills between I-280 and Old Page Mill Road. The corridor between I-280 and Foothill Expressway is within County unincorporated area. East of Foothill Expressway, the Expressway borders or is within the City of Palo Alto.

Oregon-Page Mill Expressway is one of a limited set of roadways providing connections to both I-280 and US-101. Adjacent roadways providing that type of regional connection are located approximately five miles away (Woodside Road in San Mateo County and SR-85). While Oregon-Page Mill Expressway does not appear to be heavily utilized as a connection roadway between I-280 and US-101, its access to both regional freeways makes it a vital connection for Los Altos Hills, Palo Alto, Stanford and the Stanford Research Park residents and employees. Oregon-Page Mill Expressway is also a very heavily utilized bicycle corridor, providing connections to the numerous nearby open spaces, including Pearson-Arastradero Preserve, Foothills Park, Esther Clark Park, and the Baylands Nature Preserve.
FIGURE 1: CORRIDOR MAP
Chapter 1: Introduction

Oregon-Page Mill Expressway serves a combination of commuter traffic, residential traffic, school traffic, express buses, bicyclists (commuter and recreational), and pedestrians (school and recreational). This expressway is referred to as Page Mill Road to the west of Birch Street (near the Caltrain tracks) and as Oregon Expressway to the east. Page Mill Road serves Stanford Research Park, a major regional employment center, and connects to regional arterials such as Foothill Expressway and El Camino Real. A map of the corridor is included as Figure 1.

Note that while the expressway is generally aligned along a southwest-northeast axis, directionality is consistently referred to in this and other referenced documents as an east-west orientation given that it crosses major north-south routes such as I-280, El Camino Real, and US-101. The end of the roadway within Los Altos Hills is considered the western end of the corridor and the end within Palo Alto is considered the eastern end of the corridor. Similarly, roadways that cross Oregon-Page Mill Expressway are generally considered north-south roadways, with the northern direction towards Stanford and Palo Alto and the southern direction towards Los Altos and Mountain View.

The expressway portion of Page Mill Road ends at Arastradero Road on the west side of the I-280 interchange. At that point, Page Mill Road becomes a local city road serving residential areas located in both Los Altos Hills and Palo Alto. In addition, Page Mill Road provides access to recreation areas in the Santa Cruz Mountains and is commonly used by recreational bicyclists.

The existing land use is open space between the I-280 interchange and Foothill Expressway, industrial between Foothill Expressway and El Camino Real with some Stanford residential areas near Foothill Expressway, commercial near El Camino Real, and residential along Oregon Expressway. Speed limit varies from 35 to 50 miles per hour, with a higher speed limit along the open land uses and lower speed limits in the vicinity of industrial/commercial and residential neighborhoods, and at the I-280 interchange.

A Caltrans-owned park-and-ride lot is located adjacent to Arastradero Road along Page Mill Road, immediately west of the I-280 interchange. The 40 space park-and-ride lot is fully utilized on weekdays by commuters to jobs in San Francisco, San Mateo, and Santa Clara counties and on weekends by recreational users of the local trail and bicycle network. Vehicles and larger shuttles accessing the park-and-ride lot arrive via I-280, Page Mill Road, and Arastradero Road.
2. Need for Traffic and Active Transportation Improvements

Oregon-Page Mill Expressway carries the sixth highest volume within the County expressway system, carrying over 134,000 vehicles per day. The segment of the expressway between Foothill Expressway and I-280 has been identified as the most congested segment under existing conditions. Operating conditions are projected to worsen in the future with the proposed population and employment growth in the vicinity.

The intersection of Page Mill Road with Foothill Expressway has long been identified as a problem location. The 2003 Comprehensive County Expressway Planning Study (2003 Expressway Study) identified the intersection as deficient in both existing (Year 2001) and future (Year 2025) conditions. As shown in the Expressway Plan 2040 Study, the intersection currently ranks as the third highest average delay throughout the entire countywide expressway system.

The 2003 Expressway Study also identified a need to improve the I-280/Page Mill Road interchange for bicycle travel and traffic flow. At the I-280/Page Mill Road interchange, modifications to the ramp configuration were proposed as Tier 1A projects (highest priority), with an estimated cost of $5 Million. Improvements at Page Mill Road/El Camino Real and at Page Mill Road/Foothill Expressway-Junipero Serra Boulevard were included as Tier 2 and Tier 3 improvements, respectively.

<table>
<thead>
<tr>
<th>Level of Service</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Free flow with no delays. Users are virtually unaffected by others in the traffic stream</td>
</tr>
<tr>
<td>B</td>
<td>Stable traffic. Traffic flows smoothly with few delays.</td>
</tr>
<tr>
<td>C</td>
<td>Stable flow but the operation of individual users becomes affected by other vehicles. Modest delays.</td>
</tr>
<tr>
<td>D</td>
<td>Approaching unstable flow. Operation of individual users becomes significantly affected by other vehicles. Delays may be more than one cycle during peak hours.</td>
</tr>
<tr>
<td>E</td>
<td>Unstable flow with operating conditions at or near the capacity level. Long delays and vehicle queuing.</td>
</tr>
<tr>
<td>F</td>
<td>Forced or breakdown flow that causes reduced capacity. Stop and go traffic conditions. Excessive long delays and vehicle queuing.</td>
</tr>
</tbody>
</table>

Chapter 2: Project Need

Since the 2003 Expressway Study, traffic volumes on Oregon-Page Mill Expressway have increased substantially. In 2003, no segments of the corridor operated at Level of Service (LOS) F, and the only segments at LOS E were between I-280 and Porter Drive and between Ramos Way and Bryant Street. However, ten years later in 2013, most of the corridor operated at LOS E or F, except for between Bayshore Road and Bryant Street (Expressway Plan 2040, URS). The segment between Foothill Expressway and I-280 was found to have volumes exceeding the roadway capacity, associated with LOS F. The change in LOS between 2003 and 2013 is shown in Figure 2.

Level of service is a traffic engineering term used to grade vehicle flows and operations on traffic facilities, and identify those in need of improvement. LOS ranges from A (best), which represents minimal delay, to F (worst), which represents heavy delay and a facility that is operating with significant congestion. Table 1 provides further discussion of the different levels of service.

FIGURE 2: YEAR 2003 AND YEAR 2013 LEVEL OF SERVICE ALONG OREGON-PAGE MILL EXPRESSWAY
Chapter 2: Project Need

Accounting for anticipated growth out to Year 2025 and without any improvements, Expressway Plan 2040 is projecting the entire Oregon-Page Mill Expressway corridor to operate at LOS E or F. Such congestion will increase travel time along the corridor and reduce mobility.

I-280 southbound and northbound ramps to/from Page Mill Road currently experience extremely heavy congestion and queuing during the peak periods. Caltrans has long been interested in implementing improvements at the interchange to improve circulation and reduce safety concerns associated with ramp queues backing up at the ramp intersections and onto the I-280 mainline. Caltrans has completed an I-280 Transportation Concept Report (2013) and a Traffic Operational Analysis report that have identified the circulation and safety concerns at this interchange. This Page Mill Road Expressway Corridor Study integrates the interchange improvement needs with the overall corridor improvement needs to develop a comprehensive and coordinated set of improvement solutions.

In addition to the vehicle circulation needs, Page Mill Road is heavily utilized, particularly on weekends, by bicyclists accessing the regional trail network and rural roadways from the western portion of the corridor. The existing bicycle infrastructure is limited and requires challenging interactions with vehicles. Pedestrian infrastructure is limited or missing west of Deer Creek Road along the corridor, highly discouraging pedestrian circulation along this portion of the expressway. Given the active transportation demand along the corridor, providing bicycle and pedestrian improvements can be particularly beneficial along this corridor.
3. Existing and Future Baseline Conditions

3.1 EXISTING CORRIDOR-WIDE TRAFFIC PATTERNS
Oregon-Page Mill Expressway serves its highest volumes near I-280. Traffic patterns on Oregon-Page Mill Expressway are highly peak-direction oriented. The predominate travel pattern is from I-280 to the employment centers in the vicinity of the Stanford Research Park in the morning and the reverse pattern in the evening. There is a less predominate vehicle flow from the residential areas along the eastern areas of the corridor to both US-101 and I-280. Page Mill Road is also used by Los Altos Hills residents to access both US-101 and I-280.

In the morning peak hour, just east of I-280, approximately 79 percent of traffic volumes are in the eastbound direction. In the evening peak hour at the same location, approximately 72 percent of traffic volumes are in the westbound direction. This pattern is associated with the morning access and the evening egress to/from the Stanford Research Park. From El Camino Real to the east, volumes are more evenly split between directions. Volumes are higher going west from US-101 in the morning and east towards US-101 in the evening, but less than 60 percent of the traffic volume is in the peak direction for that segment of the corridor.

Figure 3 and Figure 4 depict general vehicle flows in the peak direction of travel in each peak period.

Figure 5 and Figure 6 depict vehicle flow into and out of the Stanford Research Park for existing and future conditions, respectively.

As shown in the figures, most corridor traffic on Oregon-Page Mill Expressway is heading to and from Stanford Research Park and not traveling the length of the corridor. Traffic volumes are much higher on Page Mill Road west of the Stanford Research Park than on Oregon Expressway. As a result of the lower volumes and recent intersection and traffic signal improvements on Oregon Expressway, adequate capacity exists along Oregon Expressway such that it is not a factor in the traffic congestion along Page Mill Road west of El Camino Real.

3.2 EXISTING TRAFFIC PATTERNS AT THE I-280 INTERCHANGE
A graphic depicting the current configuration of the I-280 interchange is included as Figure 7. In the morning peak period, Page Mill Road becomes heavily congested eastbound, backing up from the Foothill Expressway intersection. While it varies by the day, on several occasions, queuing on eastbound Page Mill Road back from the Foothill Expressway intersection was observed to extend to the I-280 northbound off-ramp by the end of the weekday AM peak period, a distance of 1.2 miles. On some of the most congested days, this queuing was observed to extend back along the I-280 northbound off-ramp to the I-280 northbound freeway mainline.

As a result of this heavy queuing on eastbound Page Mill Road, a number of vehicles exiting southbound I-280 and traveling to the Stanford Research Park utilized Arastradero Road instead of Page Mill Road. Arastradero Road is a lower speed roadway but does not experience the congestion levels similar to eastbound Page Mill Road. It is anticipated that if the congestion on Page Mill Road were reduced, traffic volumes completing the through movement from the I-280 southbound off-ramp to Arastradero Road would be reduced because Page Mill Road provides a more direct connection to the employment centers along the corridor.

Existing traffic volumes at the I-280 interchange are depicted in Figure 8. As shown in the figure, heavy volumes of traffic access Page Mill Road from both directions of I-280. In the morning peak hour, 1,197 vehicles exited southbound I-280 to Page Mill Road, while 2,178 vehicles exited northbound I-280 to Page Mill Road. Across the AM peak period as a whole, 39 percent of trips between Page Mill Road and I-280 were to/from the north. In the PM peak period, 48 percent of trips between Page Mill Road and I-280 were to/from the north.
FIGURE 3: OREGON-PAGE MILL EXPRESSWAY TRAVEL PATTERNS – EASTBOUND DIRECTION, AM PEAK HOUR

LEGEND

Peak Direction Hourly Traffic Volume Along Oregon-Page Mill Expy
Net Traffic Exiting Oregon-Page Mill Expy
Net Traffic Entering Oregon-Page Mill Expy

Note: Only net traffic flows onto and off of the corridor at major access points are shown
FIGURE 4: OREGON-PAGE MILL EXPRESSWAY TRAVEL PATTERNS – WESTBOUND DIRECTION

LEGEND

-XX- Peak Direction Hourly Traffic Volume Along Oregon-Page Mill Exp

-XX- Net Traffic Exiting Oregon-Page Mill Exp

-XX- Net Traffic Entering Oregon-Page Mill Exp

Note: Only net traffic flows onto and off of the corridor at major access points are shown
FIGURE 5: TRIP DISTRIBUTION TO/FROM STANFORD RESEARCH PARK – EXISTING CONDITIONS

**AM Peak Hour**

- Traffic Entering Stanford Research Park from Oregon-Page Mill Expwy
- Stanford Research Park

**PM Peak Hour**

- Traffic Exiting Stanford Research Park to Oregon-Page Mill Expwy
- Stanford Research Park

LEGEND

Traffic Exiting Stanford Research Park
to Oregon-Page Mill Expwy

Traffic Entering Stanford Research Park
from Oregon-Page Mill Expwy

Stanford Research Park
FIGURE 6: TRIP DISTRIBUTION TO/FROM STANFORD RESEARCH PARK – YEAR 2025 CONDITIONS

AM Peak Hour

PM Peak Hour

Legend:
- Traffic Entering Stanford Research Park from Oregon-Page Mill Expy
- Stanford Research Park
- Traffic Exiting Stanford Research Park to Oregon-Page Mill Expy
- Stanford Research Park
FIGURE 7: EXISTING I-280 INTERCHANGE CONFIGURATION
FIGURE 8: EXISTING TRAFFIC VOLUMES AT THE I-280 INTERCHANGE

Capacity limitations at the intersection of Page Mill Road & I-280 Southbound Off-Ramp restrict the number of vehicles that pass through the intersection in the AM peak hour. 1,197 vehicles were observed to exit I-280 southbound during the AM peak hour.
3.3 CALTRANS PARK-AND-RIDE

A Caltrans-owned park-and-ride lot is currently located in the southwest corner of the intersection of the I-280 southbound off-ramp/Arastradero Road intersection with Page Mill Road. The lot provides 40 parking spaces, including two disabled parking stalls. The park-and-ride lot is not used by any public transit service, but is used by some privately operated buses and shuttles in addition to personal autos. Park-and-ride users during the week include both local and regional residents that commute to employment locations, both north towards San Francisco and south towards San Jose and Silicon Valley. The parking lot generally is fully occupied prior to 9:00 AM on weekdays.

Operations of the park-and-ride lot were observed by a consultant retained by Los Altos Hills in May 2014 and observed by County staff in April 2015. The 2014 study identified five to six vans and buses associated with private employers or rideshare services that regularly used the lot in each of the weekday morning and evening periods. Vans entered the lot and used one of the stalls to pick-up and drop-off passengers. Buses generally stopped to load and unload riders on Arastradero Road, with others using eastbound Page Mill Road adjacent to the park-and-ride lot. The 2015 observations found four vans and buses utilized the lot in the afternoon/evening peak period. Buses were mostly observed to both access and egress the park-and-ride lot via I-280. A number of buses were observed to make difficult and/or illegal u-turn movements on Page Mill Road or Arastradero Road in order to return to I-280. Vans and autos were observed to access or egress the park-and-ride lot predominately via I-280 (fairly evenly split between northbound and southbound), but also to a lesser extent Page Mill Road and Arastradero Road. Buses loading/unloading on Arastradero Road were observed to block driveway movements into and out of the park-and-ride lot for the duration of their dwell. Afternoon queuing on Arastradero Road was observed to occasionally delay left-turn egress movements from the park-and-ride lot.

The park-and-ride lot is currently plagued by demand that exceeds available capacity, poor bus and car circulation, and the lack of dedicated loading/unloading areas. Excess demand for the park-and-ride lot results in on-street parking along Page Mill Road west of I-280. Previously, overflow vehicles utilized the open space between Arastradero Road and the I-280 southbound on-ramp, across from the park-and-ride lot. Recently, signage has been posted specifically prohibiting overflow parking in that area. The only access point for the park-and-ride lot is a single driveway on Arastradero Road, immediately south of Page Mill Road. Thus, all entry and exit activity occurs at the single driveway with very limited spacing to Page Mill Road.

3.4 BICYCLE TRAVEL

Bicycles are accommodated on all expressways. As a part of the 2003 Expressway Plan Study, Expressway Bicycle Accommodation Guidelines (BAG) were developed. The BAG is used to define improvement needs and guide new project construction. The 2003 Expressway Study and 2008 Update recommended improvements through the I-280 interchange to reduce vehicle/bicycle conflicts at the freeway ramps. The ramp conflicts occur where there are two-lane, free-flowing on-ramps which forces a bicyclist to cross more than one conflicting vehicle lane at a time.

Figure 9 shows bicycle crossing locations and weekday peak period counts for the Page Mill Road segment of the Expressway. In the peak periods, a moderate number (30-60) of bicyclists were observed at Hanover Street and Ramos Way intersections and generally a low number (less than 30) at other locations. A previous study
conducted by Fehr and Peers (2013) noted that near the I-280 interchange, weekday bicycle volumes are moderate (approximately 60 daily) with the peak occurring at noon. On weekends, the bicycle volumes are substantially higher with over 100 bicycles per hour (BPH) between 8:00 AM and noon. The peak hour volume was recorded at just over 300 BPH on the Saturday surveyed in October 2011.

Bicyclists were observed to most commonly use Old Page Mill Road as a connection between Los Altos Hills and Palo Alto instead of Page Mill Road due to the flatter grade on Old Page Mill Road. Eastbound bicycles were observed to use the left-turn pocket from eastbound Page Mill Road to Old Page Mill Road. This requires crossing one lane of eastbound Page Mill Road traffic between the two interchange ramps. Regardless of using Page Mill Road or Old Page Mill Road, bicycles in the westbound direction approaching the interchange currently have to transition from the shoulder of Page Mill Road to the inside of Page Mill Road just east of the I-280 northbound ramp intersection. This requires crossing two lanes of high-speed Page Mill Road traffic approaching the interchange.

### 3.5 PEDESTRIAN TRAVEL

Pedestrians use the expressways for a variety of reasons, with high pedestrian demand in some areas and only emergency/occasional use in others. The Pedestrian Element of the expressway plan focuses on two different pedestrian needs: traveling along expressways and crossing the expressways. Weekday peak period pedestrian counts at the intersection crossing locations are shown in Figure 9. Pedestrian facilities along the corridor are shown in Figure 10. Three intersections along the corridor have the highest pedestrian activity; over 100 pedestrians were observed at El Camino Real, Hanover Street, and Foothill Expressway intersections. The I-280 interchange currently has very limited pedestrian facilities, discouraging pedestrian use. No pedestrians were observed at the interchange during either weekday peak traffic count period. However, on weekends, joggers have been observed to travel through the interchange area.

### 3.6 LOCAL ACCESS

A number of single-family dwelling units are located on the north side of Page Mill Road, east of the I-280 interchange. These residences, located in the Town of Los Altos Hills, rely exclusively on Page Mill Road for their access/egress. The approximately 19 dwellings along Christopher Lane have an unsignalized access point and a median opening on Page Mill Road immediately east of the I-280 northbound ramps. Evening congestion associated with access to I-280 makes the unprotected turning movements into and out of Christopher Lane difficult at times. Gerth Lane and parallel private driveways have their only access to/from Old Page Mill Road, which has an unsignalized access point and a median opening on Page Mill Road approximately 600 feet to the east of Christopher Lane. Similar to Christopher Lane, left-turn movements to/from Old Page Mill Road can be difficult, particularly in the PM peak period. As noted in the Bicycle Travel section, this left-turn lies along a common bicycle route from Page Mill Road to Old Page Mill Road. Additionally, the Old Page Mill Road access is located along a horizontal curve at the base of a vertical curve along Page Mill Road. Sight distance visibility is limited, further
Chapter 3: Existing and Future Baseline Conditions

challenging movements from Old Page Mill Road.

Coyote Hill Road provides access to employment areas along Hillview Avenue and Arastradero Road in Palo Alto and provides parking for the Stanford Perimeter Trail and the Dish trail. Coyote Hill Road has an unsignalized access point with a median opening along Page Mill Road. The median opening lies along a horizontal curve on Page Mill Road, limiting sight distance for vehicles and bicycles turning from Coyote Hill Road to Page Mill Road. There is no acceleration lane for left-turn movements from Coyote Hill Road to Page Mill Road. With the completion of approved office developments along Hillview Avenue and the addition of the new on-street parking spaces, use of the Coyote Hill Road intersection will increase in the near future.

FIGURE 9: BICYCLE AND PEDESTRIAN CROSSING AND INTERSECTIONS

FIGURE 10: PEDESTRIAN TRAVEL ALONG EXPRESSWAY CORRIDOR
Chapter 3: Existing and Future Baseline Conditions

3.7 TRANSIT SERVICE
The Dumbarton Express provides service along almost the entire length of Oregon-Page Mill Expressway. It provides several trips each AM and PM commute period. Three VTA bus routes travel on segments of the expressway and when combined, they cover almost the entire length. Two of the routes are express peak-period only service. The California Avenue Caltrain Station is accessible from Oregon Expressway.

3.8 LAND USE PATTERNS AND GROWTH ASSUMPTIONS
Oregon-Page Mill Expressway travels through three local jurisdictions with land use decision-making authority. Figure 11 illustrates the existing land uses along the corridor. The area within Town of Los Altos Hills is low density residential. The County unincorporated area west of Foothill Express-way/Junipero Serra Boulevard is open space, including lands protected with conservation easements and agricultural lands in Williamson Act agreements. West of Foothill Expressway, the north side is Stanford residential to the east of Peter Coutts Road (County unincorporated) and the south side is industrial/office in the Stanford Research Park (City of Palo Alto). The industrial/office uses of Stanford Research Park continue to El Camino Real. East of El Camino Real, in the City of Palo Alto, the corridor transitions at Alma Avenue from commercial/mixed use (Page Mill Road segment) to low density residential through to US 101 (Oregon Expressway segment).

Figure 11: Existing Land Use

Figure 12 shows the employment and population growth expected by 2025 within one mile of Oregon-Page Mill Expressway. One mile is considered the primary origin and destination catchment area that generates travel demand along Oregon-Page Mill Expressway. The land use growth information in Figure 12 is from VTA’s travel demand model which incorporates housing and job growth based on city and County general plans and in consultation with the cities and County. Key findings for future growth are as follows:

• The projected growth along the expressway is relatively low, with the highest intensities for both new jobs and population planned in the vicinity of El Camino Real. This is consistent with regional and city plans to focus growth along El Camino Real due to its designation as a Priority Development Area along a transit line.

• Along the Oregon Expressway segment east of Alma Avenue, there is no significant growth planned. The areas indicating a little job growth (1-2 jobs/acre) are for neighborhood retail, schools, and other community services in this area.
Chapter 3: Existing and Future Baseline Conditions

• Stanford Research Park along Page Mill Road Expressway and the industrial/office area along Hillview Avenue and Arastradero Road are projected to receive relatively low job growth. The buildings currently under construction in these areas are considered existing jobs and the future job growth is for developments that have yet to be approved. Imminent near-term and project-ed future jobs are both included in the 2025 traffic projections. In addition, some of the current construction is redevelopment with no net increase in number of jobs. Sites where additional square footage (thus, jobs) is being added are using a credit given to Stanford Research Park to replace previous active industrial/office square footage that was displaced by the new Stanford housing along California Avenue.

• Stanford University is also shown to receive relatively low population and job growth. This is consistent with the Stanford University Community Plan and General Use Permit adopted by the County Board of Supervisors in 2000. The Community Plan also includes a policy for no net new commute trips for campus-related trips in the commute direction during peak hours.

• The area west of Foothill Expressway is generally expected to see no growth in population or housing due to the land use designations of open space with conservation and agricultural areas.

In general, the most significant planned growth in this corridor through Year 2025 is housing growth fo-cused in the El Camino Real area. This growth will primarily generate reverse commute traffic, reducing the directionality of peak period flow on Page Mill Road. Growth that will generate peak direction, peak period flow on Page Mill Road, including associated with Stanford Research Park and Stanford Univer-sity, is forecast to be minor, but is accounted for in the Year 2025 analysis conditions.

FIGURE 12: FUTURE EMPLOYMENT AND POPULATION GROWTH
3.9 CORRIDOR HISTORY

The 2003 Expressway Study and 2008 Update identified a variety of road, bicycle, and pedestrian improvements for Oregon-Page Mill Expressway. The County has been successful in obtaining some federal and state grants to construct a few of these improvements, mostly along the Oregon Expressway portion. In addition, Stanford University completed a trail project along the Page Mill segment. Improvements completed along the Page Mill-Oregon Expressway since 2008 include:

- Sidewalk gap closures along the south side of Oregon Expressway between Bryant Street and Bayshore Road.
- Stanford Trail segment on the south side of Page Mill Road between Foothill Expressway and Deer Creek Road.
- Bicycle detection and bicycle adaptive signal timing along Oregon-Page Mill Expressway.
- Signal, bicycle and pedestrian intersection improvements on Oregon Expressway from West Bayshore Road to Bryant Street including new pavement surfacing (known as the Oregon Expressway Improvements Project – see below for more information).

OREGON EXPRESSWAY IMPROVEMENTS PROJECT

In 2014, the County completed the Oregon Expressway Improvements Project to improve roadway conditions for vehicular traffic, bicyclists and pedestrians between US-101 and Bryant Street. This was a federally funded project and included the Expressway Signal Timing Project and Bicycle Signal Detection on Oregon Expressway. The project reconfigured several intersections to straighten the crosswalks and convert them to 8-phase signal timing to eliminate vehicle turning conflicts with crossing pedestrians and bicyclists. It also removed left-turn access onto Oregon Expressway for the three unsignalized median openings and installed a new traffic signal at the intersection of Oregon Expressway and Ross Road.

After the installation of the upgraded signal system equipment at the intersections, the County developed traffic timing plans for the seven traffic signals along Oregon Expressway between Bryant Street and West Bayshore Road. The goal was to conduct timing analysis and develop and implement new weekday signal coordination plans and traffic responsive timing at the traffic signals on Oregon Expressway.

A “before” and “after” study was conducted to compare the travel times along the corridor between Bryant Street and West Bayshore Road. On Oregon Expressway during the AM and PM peak periods there was a decrease in average travel time (reduced by 20%-45%), delay (reduced by 39%-70%), and stops (reduced by 37%-76%) in both directions. During the midday peak period, there was a decrease in average travel time, delay, and stops in the westbound direction and a decrease in average travel time and stops along with a slight increase in delay in the eastbound direction.
4 Capacity and Operational Analysis

4.1 EXISTING CONDITIONS
Expressway Plan 2040 performed a roadway segment analysis for the County’s expressway system. The roadway segment LOS for the Page Mill Road segment of the Expressway is shown in Table 2 and corresponds to the LOS shown in Figure 2.

TABLE 2: ROADWAY SEGMENT LEVEL OF SERVICE - EXISTING (2013) CONDITIONS

<table>
<thead>
<tr>
<th>Segment</th>
<th>Peak Hour</th>
<th>No. of Lanes</th>
<th>Segment Capacity</th>
<th>Link Volume</th>
<th>V/C</th>
<th>LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-280 to Deer Creek Road</td>
<td>AM</td>
<td>4.5</td>
<td>3,760</td>
<td>3,529</td>
<td>0.94</td>
<td>E</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td></td>
<td></td>
<td>3,770</td>
<td>1.00</td>
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<tr>
<td>Foothill Expressway to Ramos Way</td>
<td>AM</td>
<td>4.0</td>
<td>3,400</td>
<td>3,242</td>
<td>0.95</td>
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<td></td>
<td>PM</td>
<td></td>
<td></td>
<td>2,888</td>
<td>0.85</td>
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<tr>
<td>Ramos Way to Birch Street</td>
<td>AM</td>
<td>4.0</td>
<td>3,400</td>
<td>3,120</td>
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<td></td>
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<td></td>
<td></td>
<td>2,869</td>
<td>0.84</td>
<td>D</td>
</tr>
</tbody>
</table>

Source: Expressway Plan 2040, Comprehensive County Expressway Planning Study Traffic Forecasting Methodology, Existing, 2025 and 2040 Traffic Conditions (URS, 2015)

Operational analyses were conducted on Page Mill Road in order to identify existing deficiencies and guide the development of future improvements. The analyses were based on existing conditions traffic volume counts performed in 2013 (intersections east of Foothill Expressway) and 2014 (intersections west of Foothill Expressway, inclusive). Traffic counts were conducted on weekdays in which schools were in session.

A micro-simulation model of Page Mill Road between Arastradero Road and Foothill Expressway was developed for the Corridor Study to evaluate baseline conditions and assess the effectiveness of improvement concepts. The micro-simulation model simulates the movements of individual vehicles on the roadway network and their interactions with intersection controls and roadway geometrics. The simulated vehicle movements are utilized to quantify delay, queuing, and travel time. The micro-simulation model was utilized to determine intersection delay and LOS in this segment of Page Mill Road under existing conditions. The results are summarized in Table 3 and are provided for both signalized and stop-controlled intersections.

Expressway Plan 2040 performed analysis of all of the signalized intersections along Page Mill Expressway using the Traffix 8.0 software and methodologies described in the 2000 Highway Capacity Manual. Traffic counts for this analysis were collected in 2013. Existing conditions operations of signalized intersections east of Foothill Expressway are shown in Table 4.

As shown in Table 3, the intersection of I-280 southbound ramps/Arastradero Road with Page Mill Road operates at a very high delay in the weekday AM peak period. The delay is primarily associated with the southbound off-ramp movements. The southbound off-ramp backs up from Page Mill Road onto the southbound I-280 freeway mainline. Queues were observed to begin prior to 7:00 AM and continue well past 9:00 AM. All other movements at this all-way stop intersection have minimal delay.
The reported delay in the morning peak period at the I-280 northbound ramps intersection with Page Mill Road is representative of the delay exclusively for the northbound left-turn movement since it is a side-street stop-controlled intersection. However, delay for the northbound left-turn movement is predominately caused by queuing for the northbound off-ramp to eastbound Page Mill Road. In the latter portion of the weekday AM peak period, queues extend from Foothill Expressway back to the northbound off-ramp, resulting in queuing along the off-ramp and blocking access to the northbound left-turn movement to westbound Page Mill Road.

The intersection of Foothill Expressway with Page Mill Road operates at a deficient LOS in both peak periods. In the morning peak period, queues from this intersection extend along eastbound Page Mill Road back to the I-280 intersection. These queues directly result in reduced throughput at the Deer Creek Road intersection and increased delay at that location. In order to bypass this congested intersection, a number of vehicles utilize Arastradero Road or exit I-280 at Sand Hill Road or El Monte Avenue and use Foothill Expressway or Junipero Serra Boulevard as an alternate route to Page Mill Road and the Stanford Research Park. This results in high turning movement volumes from Foothill Expressway-Junipero Serra Boulevard to eastbound Page Mill Road. In the PM peak period, queues along westbound Page Mill Road backup from the Foothill Expressway intersection towards El Camino Real, resulting in large delays for westbound movements at that intersection.

It should be noted that the microsimulation model of the Page Mill Road corridor between the I-280 interchange and Foothill Expressway does not account for congestion along I-280 itself. In the PM peak period, congestion along I-280 was observed to occasionally backup onto the northbound on-ramp from westbound Page Mill Road. This results in some queuing and reduced travel speeds on westbound Page Mill Road that are not fully reflected in the traffic analysis results. Movements to I-280 from westbound Page Mill Road are not currently metered at the interchange (by ramp meters, signals, or stop signs); therefore, movements from Page Mill Road to I-280 are free and uncontrolled, except when heavy congestion is present on I-280.

### TABLE 3: INTERSECTION LEVEL OF SERVICE - EXISTING (2014) CONDITIONS (I-280 TO FOOTHILL EXPRESSWAY)

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Existing AM Peak</th>
<th>Existing PM Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Delay (s/veh)¹</td>
<td>LOS</td>
</tr>
<tr>
<td>I-280 SB Ramps-Arastradero</td>
<td>171.9</td>
<td>F</td>
</tr>
<tr>
<td>I-280 NB Ramps</td>
<td>127.2</td>
<td>F</td>
</tr>
<tr>
<td>Old Page Mill Road</td>
<td>5.6</td>
<td>A</td>
</tr>
<tr>
<td>Deer Creek Road</td>
<td>59.0</td>
<td>E</td>
</tr>
<tr>
<td>Foothill Expressway</td>
<td>84.4</td>
<td>F</td>
</tr>
</tbody>
</table>

Notes:
- Delay and LOS calculated based on a VISSIM micro-simulation model
- Traffic count data collected in October 2014
- Delay is based on average vehicle delay for all entering vehicles at signalized and all-way stop intersections. Delay is based on average vehicle delay for the side-street movements at side-street stop-controlled intersections.

### TABLE 4: INTERSECTION LEVEL OF SERVICE – EXISTING (2013) CONDITIONS (PORTER DRIVE TO EL CAMINO REAL)

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Existing AM Peak</th>
<th>Existing PM Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Delay (s/veh)¹</td>
<td>LOS</td>
</tr>
<tr>
<td>Porter Drive</td>
<td>6.8</td>
<td>A</td>
</tr>
<tr>
<td>Peter Coutts Road</td>
<td>9.1</td>
<td>A</td>
</tr>
<tr>
<td>Hanover Street</td>
<td>67.8</td>
<td>E</td>
</tr>
<tr>
<td>Hansen Way</td>
<td>12.2</td>
<td>B</td>
</tr>
<tr>
<td>Ramos Way</td>
<td>10.0</td>
<td>A</td>
</tr>
<tr>
<td>El Camino Real (CMP)²</td>
<td>67.7</td>
<td>E</td>
</tr>
</tbody>
</table>

Notes:
- Delay and LOS based on Traffic 8.0 using methodology described in the 2000 Highway Capacity Manual, with adjusted saturation flow rates to reflect SC County conditions
- Delay is based on average vehicle delay for all entering vehicles at signalized intersections
- (CMP) = Monitored by Congestion Management Program

Source: Expressway Plan 2040 (URS, 2015)

Notes:
- Traffic count data collected in 2013
- Delay and LOS based on Traffic 8.0 using methodology described in the 2000 Highway Capacity Manual, with adjusted saturation flow rates to reflect SC County conditions
- Delay is based on average vehicle delay for all entering vehicles at signalized intersections
- (CMP) = Monitored by Congestion Management Program
Chapter 4: Capacity and Operational Analysis

As shown in Table 4, all intersections east of Foothill Expressway operate at LOS E or better in both peak periods. The Congestion Management Plan (CMP) intersection at Page Mill Road and El Camino Real operates at LOS E in both peak periods. In addition, the intersection of Page Mill Expressway with Hanover Street operates at LOS E in the AM peak hour.

4.2 FUTURE (2025) NO BUILD CONDITIONS

Future year conditions were analyzed to evaluate conditions along Page Mill Road with the implementation of planned and near-term projects. The Expressway Plan 2040 is using Year 2025 as the horizon year for identifying countywide expressway improvements. Year 2025 traffic forecasts are based on the regional travel demand model, maintained by the Santa Clara Valley Transportation Authority. Included in the forecasts are adopted land uses for all jurisdictions throughout the County and Association of Bay Area Governments regional projections for population and employment growth.

The travel demand model was utilized to obtain roadway link volumes along Page Mill Road and surrounding streets, which in turn were utilized to forecast turning movement volumes. Model runs were prepared for both the existing and with improvement roadway network. The “with improvement roadway network” includes the expansion of roadway and intersection capacity along Page Mill Road and other County expressways. It therefore accounts for latent or currently unserved demand that would potentially utilize improved roadways.

Expressway Plan 2040 used Year 2025 forecasts in performing a roadway segment analysis of future baseline conditions within the County’s expressway system. The roadway segment LOS for Page Mill Expressway is identified in Table 5 and graphically shown in Figure 13.

Table 5: Roadway Segment Level of Service – 2025 No Build Conditions

<table>
<thead>
<tr>
<th>Segment</th>
<th>Peak Hour</th>
<th>No. of Lanes</th>
<th>Segment Capacity</th>
<th>Link Volume</th>
<th>V/C</th>
<th>LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-280 to Foothill Expressway</td>
<td>AM</td>
<td>4.0</td>
<td>3,760</td>
<td>3,788</td>
<td>1.01</td>
<td>F</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td></td>
<td></td>
<td>3,820</td>
<td>1.02</td>
<td>F</td>
</tr>
<tr>
<td>Foothill Expressway to Ramos Way</td>
<td>AM</td>
<td>4.0</td>
<td>3,400</td>
<td>3,387</td>
<td>1.00</td>
<td>E</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td></td>
<td></td>
<td>3,300</td>
<td>0.94</td>
<td>E</td>
</tr>
<tr>
<td>Ramos Way to Birch Street</td>
<td>AM</td>
<td>4.0</td>
<td>3,400</td>
<td>3,647</td>
<td>1.07</td>
<td>F</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td></td>
<td></td>
<td>3,434</td>
<td>1.01</td>
<td>F</td>
</tr>
</tbody>
</table>

Source: 2040 Comprehensive County Expressway Planning Study Traffic Forecasting Methodology, Existing, 2025 and 2040 Traffic Conditions (URS, 2015)

As shown in Table 5, Page Mill Road west of Foothill Expressway are forecast to operate at LOS F in both peak periods. Roadway widening is required in order to achieve an acceptable level of service for this segments. Without roadway widening, modifications to the interchange configuration would not be sufficient to address the identified congestion issues. Widening of Page Mill Road was incorporated into the baseline scenario for the micro-simulation model of the corridor between the I-280 interchange and Foothill Expressway. Intersection operations with forecast Year 2025 volumes west of and including Foothill Expressway, assuming widening of Page Mill Road to six lanes, is shown in Table 6.
Chapter 4: Capacity and Operational Analysis

FIGURE 13: YEAR 2025 LEVEL OF SERVICE ALONG OREGON-PAGE MILL EXPRESSWAY

TABLE 6: INTERSECTION LEVEL OF SERVICE – 2025 NO BUILD CONDITIONS WITH WIDENING OF PAGE MILL ROAD TO 6 LANES BETWEEN I-280 AND FOOTHILL

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Control</th>
<th>No Build 2025 1</th>
<th>AM Peak</th>
<th>PM Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Delay (s) 2</td>
<td>LOS</td>
<td>Delay (s) 2</td>
</tr>
<tr>
<td>Arastradero Road</td>
<td>AWSC 3</td>
<td>231.6 F</td>
<td>23.8 C</td>
<td></td>
</tr>
<tr>
<td>I-280 SB Ramps</td>
<td>SSSC 4</td>
<td>66.9 F</td>
<td>10.1 B</td>
<td></td>
</tr>
<tr>
<td>I-280 NB Ramps</td>
<td>SSSC 4</td>
<td>5.4 A</td>
<td>6.9 A</td>
<td></td>
</tr>
<tr>
<td>Old Page Mill Road</td>
<td>Signal</td>
<td>47 D</td>
<td>6.3 A</td>
<td></td>
</tr>
<tr>
<td>Deer Creek Road</td>
<td>Signal</td>
<td>131.0 F</td>
<td>102.6 F</td>
<td></td>
</tr>
<tr>
<td>Foothill Expressway</td>
<td>Signal</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1 Assumes widening of Page Mill Road between I-280 and Foothill Expressway to six lanes but no other improvements along the corridor.
2 Delay is based on average vehicle delay for all entering vehicles at signalized, roundabout and all-way stop intersections. Delay is based on average vehicle delay for the side-street movements at side-street stop-controlled intersections.
3 AWSC = All-way Stop Control
4 SSSC = Side-street Stop Control
Chapter 4: Capacity and Operational Analysis

The delay and LOS for the signalized intersections east of Foothill Expressway in Year 2025 baseline conditions are shown in Table 7, as calculated by Expressway Plan 2040.

TABLE 7: INTERSECTION LEVEL OF SERVICE - 2025 NO BUILD CONDITIONS

<table>
<thead>
<tr>
<th>Oregon-Page Mill Expressway Intersections</th>
<th>No Build 2025</th>
<th>AM Peak</th>
<th>PM Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Delay (s/veh)</td>
<td>LOS</td>
<td>Delay (s/veh)</td>
</tr>
<tr>
<td>Porter Drive</td>
<td>6.8</td>
<td>A</td>
<td>27.3</td>
</tr>
<tr>
<td>Peter Coutts Road</td>
<td>11.6</td>
<td>B+</td>
<td>40.2</td>
</tr>
<tr>
<td>Hanover Street</td>
<td>88.8</td>
<td>F</td>
<td>50.4</td>
</tr>
<tr>
<td>Hansen Way</td>
<td>16.5</td>
<td>B</td>
<td>29.5</td>
</tr>
<tr>
<td>Ramos Way</td>
<td>9.0</td>
<td>A</td>
<td>18.0</td>
</tr>
<tr>
<td>El Camino Real (CMP)²</td>
<td>72.5</td>
<td>E</td>
<td>75.3</td>
</tr>
</tbody>
</table>

Source: Expressway Plan 2040 (URS, 2015)

Notes:
¹ Delay and LOS is based on Traffix 8.0 using methodology described in the 2000 Highway Capacity Manual, with adjusted saturation flow rates to reflect SC County conditions.
² (CMP) = Monitored by Congestion Management Program
5. Proposed Improvements

As discussed in previous chapters, segments of Page Mill Road currently experience significant congestion. Congestion and vehicular delay is anticipated to continue to grow in the near-future as population and employment in the areas served by the Expressway continue to increase. This congestion limits local access and circulation, results in increased greenhouse gas emissions and fuel consumption, and reduces regional mobility. In addition, the segment of Page Mill Road near I-280 is heavily utilized by cyclists. The current roadway configuration requires challenging maneuvers for cyclists and discourages pedestrian and bicycle use.

Improvements are proposed as part of this Corridor Study to address the identified challenges along Page Mill Road. The improvements were developed as part of several individual, but coordinated, project efforts. The corridor was divided into the following segments:

- I-280 Interchange Configuration
- Page Mill Road from I-280 Interchange to El Camino Real

Improvements to the I-280 interchange configuration are focused on improving bicycle circulation, local access, traffic flow, and circulation around the park-and-ride lot through a reconfiguration of the freeway ramps, changes to intersection control, and provision of active transportation facilities.

Improvements to Page Mill Road between the interchange and El Camino Real are primarily focused on vehicle flow, but also include bicycle and pedestrian elements. Improvements between the interchange and Foothill Expressway include roadway widening and active transportation facilities. Improvements at the intersection of Page Mill Road with Foothill Expressway are focused on grade separation configurations. Finally, improvements between Foothill Expressway and El Camino Real include intersection improvements to improve intersection efficiency and reduce queuing impacts.

The project team has been working closely with Town of Los Altos Hills, City of Palo Alto, Caltrans, and VTA staff for input on the technical analysis and improvement concepts. The concepts are planning level drawings (not design level) to determine technical feasibility, potential right-of-way impacts, a cost estimate for the Expressway Plan 2040 list, and community acceptability.

**Figure 14** depicts the location of the improvements considered for Page Mill Road.
The improvements were coordinated amongst the detailed studies; however, they will be discussed separately in the sections below.

5.1 I-280 INTERCHANGE CONFIGURATION

Improvements at the I-280 interchange were focused on addressing existing congestion at the freeway ramp intersections, improving safety, and enhancing bicycle and pedestrian circulation.

As noted in Chapter 3, there are two primary traffic circulation challenges at the I-280 interchange. One is the limitation of capacity provided by the all-way stop control at the I-280 southbound off-ramp and the resulting queuing backup along the I-280 southbound off-ramp. The other is queues extending along Page Mill Road between Foothill Expressway and the interchange area. The latter challenge cannot be addressed by modifications to the interchange alone. Increasing the throughput of the interchange would merely increase the eastbound queues approaching Foothill Expressway. Therefore, any improvements to the interchange would need to be implemented in conjunction with or subsequent to improvements at the Page Mill Road/Foothill Expressway intersection and along Page Mill Road between the interchange and Foothill Expressway. All improvement concepts for the interchange thus assume widening of Page Mill Road to six lanes and accompanying improvements at the Foothill Expressway intersection.

Three distinct concepts were considered for reconfiguring the I-280 interchange in order to improve traffic, bicycle, and pedestrian circulation. The three concepts each have unique approaches to facilitate ramp movements and bicycle flow.

Measures to address existing park-and-ride deficiencies were incorporated into the improvement concepts.
CONCEPT 1 – SIGNALIZATION ALTERNATIVE

Concept 1 was initially developed by Caltrans, in conjunction with the County, and refined as part of this study. Figure 15 depicts the configuration of Concept 1.

Key components of Concept 1 include:

- Signalization of the I-280 southbound off-ramp and the I-280 northbound ramps;
- Creation of a frontage road between Christopher Lane and Old Page Mill Road, shifting access between Page Mill Road and Christopher Lane, the private driveway, and Gerth Lane to Old Page Mill Road, and signalization of the Old Page Mill Road intersection;
- Reduction in the radius of the I-280 northbound off-ramp to eastbound Page Mill and the westbound Page Mill to I-280 northbound on-ramp to reduce vehicle speeds and provide a safer pedestrian crossing;
- Provision of a two-way cycle track in the median of Page Mill Road between I-280 southbound off-ramp/Arastradero Road and Old Page Mill Road;
- Provision of a dedicated westbound right-turn lane to the I-280 northbound on-ramp; and
- New signalized pedestrian crossings of Page Mill Road at the I-280 northbound ramps and Old Page Mill Road.

Traffic circulation patterns would generally be consistent with current movements, except for local access to the neighborhood north of Page Mill Road, east of the interchange. Access for this neighborhood would be modified by the provision of the frontage road. This would serve to improve accessibility for the neighborhood by providing full movements at the proposed signal at Old Page Mill Road. Currently, Christopher Lane movements to/from Page Mill Road are unsignalized and can be challenging to complete at peak times due to heavy traffic volumes on westbound Page Mill Road.

Bicycle circulation would be modified from existing conditions. Bicyclists traveling westbound along the shoulder of Page Mill Road or along Old Page Mill Road would access a median two-way cycle track at Old Page Mill Road. A dedicated signal phase at that intersection would be provide access to/from the median cycle track. The median cycle track would extend to the I-280 southbound off-ramp/Arastradero Road intersection. The median cycle track allows bicycle traffic to avoid conflicts with the heavy volume of vehicles making free right-turn movements to/from the I-280 ramps.

Pedestrian circulation would be enhanced with new sidewalks on the north side of Page Mill Road (between the interchange and Old Page Mill Road) and the south side of Page Mill Road (between the interchange and the park-and-ride lot), as well as new signalized crossings of Page Mill Road.

Bicycle and pedestrian circulation features are shown in Figure 16. The concept would also include to-be-determined improvements to the park-and-ride lot.
FIGURE 15: PAGE MILL ROAD/I-280 INTERCHANGE CONCEPT 1 – SIGNALIZATION

- New Traffic Signal
- Remove Channelized Right-turn Lane
- Convert Lane to Share Through-right
- New Two-way Cycle Track in Median
- New Traffic Signal and Pedestrian Crosswalk
- Re-align On-ramp to Facilitate Pedestrian Crosswalk
- Re-stripe to create dedicated Right-turn Lane (requires roadway widening)
- Shift Access to/from Christopher Lane to Old Page Mill Road (requires roadway realignment)
- Implement Two-way Traffic Circulation along Old Page Mill Road (requires roadway realignment)
- Extend Turn Pocket for Thru/Left-turn Lane (requires roadway widening)
- New Two-way Cycle Track in Median
- New Traffic Signal and Pedestrian Crosswalk
- Park and Ride Improvements to be Developed
FIGURE 16: PAGE MILL ROAD/I-280 INTERCHANGE CONCEPT 1 – SIGNALIZATION, BICYCLE AND PEDESTRIAN FEATURES

Legend:
- Bike Facilities
- Pedestrian Facilities

- 2-way Cycle Track
- New Crosswalk
- New Sidewalk
- Bike-Only Phase for Entry/Exit to Cycle Track
- Bikes Travel in Shoulders
- Entry to Cycle Track
- Eastbound Cycle Track
- New Crosswalk
- Christopher Lane
- Page Mill Road
- Old Page Mill Road
- New Sidewalk
- New Crosswalk
Chapter 5: Proposed Improvements

CONCEPT 2 – SOUTHBOUND RAMP REALIGNMENT
Concept 2 was initially developed as part of the 2003 Expressway Study process, and further refined as part of this study. Figure 17 depicts the configuration of Concept 2.

Key components of Concept 2 include:

• Realignment of the I-280 southbound ramps to provide a standard diamond interchange configuration for the southbound ramps. This includes elimination of the westbound to southbound loop on-ramp and re-alignment of the I-280 southbound off-ramp to align with the I-280 southbound on-ramp instead of Arastradero Road;

• Signalization of the I-280 northbound off-ramp;

• Relocation of the westbound bicycle lane to the curb between the I-280 ramp intersections;

• Provision of a dedicated westbound right-turn lane to the I-280 northbound on-ramp; and

• New signalized pedestrian crossing of Page Mill Road at the I-280 northbound off-ramp.

The primary change to traffic circulation would be for the I-280 southbound on- and off-ramps. The southbound off-ramp would be shifted to align with the I-280 southbound on-ramp instead of Arastradero Road. This would serve in part to reduce cut-through traffic using Arastradero Road. As part of the reconfiguration, storage space along the ramp would be increased. Access to I-280 southbound would require a left-turn from Page Mill Road to the on-ramp at a signalized intersection instead of the existing free-right turn loop ramp. Dual left-turn lanes would be provided along westbound Page Mill Road to facilitate this movement. Access for the neighborhood east of I-280 and north of Page Mill Road would not be significantly modified from existing conditions, although Christopher Lane would be converted to right-turn in/out only.

The elimination of the westbound to I-280 southbound loop on-ramp would remove a major conflict point for bicycle circulation, allowing the bike lane to shift from the existing location between travel lanes to the more standard location of adjacent to the curb. Bike lane striping would be modified elsewhere in the interchange area to better delineate conflict points and improve bicycle comfort. The I-280 northbound off-ramp movement to eastbound Page Mill Road would be signalized, allowing a protected bicycle and pedestrian crossing of the currently free movement ramp.

Pedestrian circulation would be improved through a new sidewalk proposed for the north side of Page Mill Road between Old Page Mill Road and the I-280 southbound ramps. Signalized pedestrian crossings at the I-280 northbound and southbound ramps would improve accessibility across Page Mill Road.

Bicycle and pedestrian circulation features are shown in Figure 18.

The concept would also include to-be-determined improvements to the park-and-ride lot.
FIGURE 17: PAGE MILL ROAD/I-280 INTERCHANGE CONCEPT 2 – SB RAMP REALIGNMENT

- Reconfigure SB Off-ramp to Accommodate New Traffic Signal (requires re-grading and realignment)
- Reconfigure SB On-ramp to Accommodate New Traffic Signal (requires roadway widening)
- Reconfigure NB Off-ramp to Accommodate New Traffic Signal (requires roadway realignment)
- New Traffic Signal
- Re-stripe to Provide Second Left-turn Lane
- Park and Ride Improvements to be Developed
- Improvements Study

Page Mill Road and Interstate 280

Concept 2 - Southbound Ramp Realignment

November 2014

NOT TO SCALE
FIGURE 18: PAGE MILL ROAD/I-280 INTERCHANGE CONCEPT 2 – SB RAMP REALIGNMENT, BICYCLE AND PEDESTRIAN FEATURES

LEGEND
- Bike Facilities
- Pedestrian Facilities
Chapter 5: Proposed Improvements

CONCEPT 3 – ROUNDABOUT
This concept was developed as part of the current study. A roundabout was previously been considered by Caltrans for the I-280 southbound off-ramp/Arastradero Road intersection and determined to be not feasible due to high traffic volumes traveling from westbound Page Mill to the I-280 southbound on-ramp exceeding the roundabout’s capacity. The current study addressed this issue by moving the roundabout slightly to the west to keep the I-280 southbound on-ramp traffic out of the roundabout. Figure 19 depicts the configuration of Concept 3.

Key components of Concept 3 include:
• Installation of a roundabout to serve the I-280 southbound off-ramp, Page Mill Road, Arastradero Road, and the eastbound Page Mill Road to I-280 southbound on-ramp;
• Signalization of the I-280 northbound ramps;
• Shift of the eastbound Page Mill Road to I-280 northbound on-ramp to the new northbound ramp intersection;
• Creation of a frontage road between Christopher Lane and Old Page Mill Road, shifting access between Page Mill Road and Christopher Lane, the private driveway, and Gerth Lane to Old Page Mill Road, and signalization of the Old Page Mill Road intersection;
• Provision of a dedicated westbound right-turn lane to the I-280 northbound on-ramp;
• New signalized pedestrian crossing at the I-280 northbound ramps intersection; and
• Provision of a bi-directional shared use path on the north side of Page Mill Road between the park-and-ride and frontage road connection to Old Page Mill Road. The shared use path would pass beneath the I-280 southbound on- and off-ramps.

Traffic circulation patterns would generally be consistent with current movements, except for local access to the neighborhood north of Page Mill Road, east of the interchange. Access for this neighborhood would be modified by the provision of the frontage road. This would serve to improve accessibility for the neighborhood by providing full movements at the proposed signal at Old Page Mill Road. Currently, Christopher Lane movements to/from Page Mill Road are unsignalized and can be challenging to complete at peak times due to heavy traffic volumes on westbound Page Mill Road.

Bicycle circulation would be enhanced with a few geometric changes and the shared-use path. Continuous on-street striped bike lanes would be provided in both directions through the interchange area. The westbound Page Mill Road to I-280 southbound loop on-ramp would be reduced to one lane from the current two-lanes to simplify the conflict between bicycles and vehicles and allow the bike lane to shift to being adjacent to the curb. The shared-use path would provide for bicycle travel through the interchange area by less skilled cyclists. The shared use path would connect to the low-volume frontage road and provide direct access to the heavily used bike route on Old Page Mill Road, allowing eastbound cyclists to avoid having to make a left-turn across Page Mill Road. At a design speed of 25 MPH, the roundabout is also a viable option for those bicyclists choosing not to use the shared-use path.

Pedestrian circulation would be similarly enhanced with the shared-use path. In addition, sidewalk gaps on the south side of Page Mill Road would be closed to allow for pedestrian travel on both sides of the roadway.

Bicycle and pedestrian circulation features are shown in Figure 20.

The concept would also include to-be-determined improvements to the park-and-ride lot. By shifting Arastradero Road to the east near Page Mill Road, the park-and-ride lot could be enlarged to provide enhanced circulation and loading/unloading areas.
FIGURE 19: PAGE MILL ROAD/I-280 INTERCHANGE CONCEPT 3 – ROUNDABOUT

- **New Roundabout**
- **Modified Roadway Geometry for Bike and Pedestrian Safety**
- **Re-stripes to create dedicated Right-turn Lane (requires roadway expansion)**
- **Shift Access to/from Christopher Lane to Old Page Mill Road**
- **Implement Two-way Traffic Circulation along Old Page Mill Road (requires roadway realignment)**
- **New Traffic Signal**
- **Reconfigure NB Off-ramp to Accommodate New Traffic Signal (requires roadway realignment)**
- **Expanded Park and Ride Lot**
- **New Half-Signal**
FIGURE 20: PAGE MILL ROAD/I-280 INTERCHANGE CONCEPT 3 – ROUNDABOUT, BICYCLE AND PEDESTRIAN FEATURES

LEGEND

- Bike Facilities
- Pedestrian Facilities
- Shared Use Path

New Half-Signal

Bikes Travel in Shoulders

Two-Stage Left-Turn for Eastbound Cyclists to Access Shared Use Path to Old Page Mill Road

NOT TO SCALE
5.2 PAGE MILL ROAD BETWEEN OLD PAGE MILL ROAD (WEST) AND EL CAMINO REAL

Traffic demand on Page Mill Road between the I-280 interchange and El Camino Real was found to exceed capacity by Year 2025, with the segment between the interchange and Foothill Expressway experiencing the highest level of congestion. As a result, improvements have been identified for this section of the roadway. The improvements can be grouped into three categories with different characteristics and implementation strategies:

• Widening of Page Mill Road from four to six lanes between Old Page Mill Road and Foothill Expressway;
• Grade-separation of Foothill Expressway with Page Mill Road; and
• Intersection improvements along Page Mill Road between Foothill Expressway and El Camino Real.

PAGE MILL ROAD BETWEEN OLD PAGE MILL ROAD AND FOOTHILL EXPRESSWAY

This segment needs additional travel lanes to handle existing and future demand on the corridor. The recommended improvements along Page Mill Road in this segment were developed based on numerous design constraints and criteria including:

• Minimize grading impacts to hillsides;
• Limit additional right of way needs; and
• Maintain a continuous Class I multi-use trail from I-280 to Foothill Expressway.

The configuration of a widened Page Mill Road was studied in the Page Mill Expressway Plan Line and Page Mill Road Expressway Conceptual Plan – Technical Memorandum (HMH, 2015). The plan line and technical memorandum are included as Appendix A to this report.

The eastbound direction of Page Mill Road would be widened from the current lane drop just east of Old Page Mill Road through the Foothill Expressway intersection. The westbound direction of Page Mill Road would be widened from immediately west of Foothill Expressway to the I-280 northbound on-ramp. As shown in the plan line, the additional lanes would primarily be provided within the existing roadway width by replacing the existing median and reducing lane widths to 11 feet. Minimal widening would be required on the south side of the roadway.

In conjunction with the roadway widening project, a Class I multi-use trail would be provided along the south side of the roadway between the I-280 interchange and Deer Creek Road. It would connect to the existing Class I trail that extends between Deer Creek Road and the Foothill Expressway intersection. The new trail would require grading on the south side of the roadway, but would not require any right-of-way, except for a small sliver near Deer Creek Road, currently owned by the Stanford Land Trust.

In addition, a Class I multi-use trail would be provided between the eastern terminus of Old Page Mill Road and Foothill Expressway to provide an improved connection for cyclists using Old Page Mill Road to travel between the interchange and Foothill Expressway. The multi-use trail would provide a connection to the Stanford Perimeter Trail, which runs to the north along Junipero Serra Boulevard. The existing one-way connection from Page Mill Road to Old Page Mill Road (east) would be closed to traffic except emergency vehicles.

Along with the roadway widening would be minor improvements to the approaches of the Page Mill Road and Foothill Expressway intersection. These improvements include lengthening of turn pockets on southbound Junipero Serra Boulevard and re-alignment of Page Mill Road east of the intersection to align with the widened roadway west of the intersection.
Chapter 5: Proposed Improvements

A related project along this section of Page Mill Road are improvements to the Page Mill Road and Coyote Hill Road intersection. This intersection is currently an unsignalized location with full access from Coyote Hill Road onto Page Mill Road. This is one of only a few locations along the expressway system that has an unsignalized median opening. For all such locations, the County is considering either closing the median or controlling the location by signalization. The near-term increase of traffic volumes on Coyote Hill Road, in addition to the future widening of Page Mill Road, would result in a safety and level of service issue with the current unsignalized, side-street stop-controlled configuration. Two options were evaluated for this location. One option would signalize this intersection. The other would place a median barrier along Page Mill Road across the intersection, limiting Coyote Hill Road to right-turn in/right-turn out only.

PAGE MILL ROAD/FOOTHILL EXPRESSWAY GRADE SEPARATION

The Page Mill Road/Foothill Expressway intersection currently experiences the third highest amount of delay of any intersection in the countywide expressway system. In the AM peak period, it causes backups along Page Mill Road that extend more than a mile to the west to I-280. Therefore, the County is evaluating a grade separation at this intersection. The heavy through traffic on Page Mill Road would be separated from movements along and to/from Foothill Expressway-Junipero Serra Boulevard in each of the grade separation concepts.

The recommended improvements at the Page Mill Road/Foothill Expressway-Junipero Serra Boulevard intersection were developed based on numerous design constraints and criteria including:

- Separate and eliminate signal for Page Mill Road through traffic;
- Minimize utility conflicts with proposed improvements;
- Limit additional right-of-way needs;
- Maintain aesthetic value; and
- Accommodate bicycles and pedestrians approaching and through the intersection.

Three concepts were evaluated for the grade separation configuration:

1) Page Mill Road through traffic would cross over the at-grade signalized intersection with Foothill Expressway. Two lanes in each direction of Page Mill Road would be placed on an aerial structure over the intersection.
Chapter 5: Proposed Improvements

One- to two-lane ramps would provide access between the intersection and Page Mill Road. All movements would be preserved. The aerial structure would extend from just west of Coyote Hill Road to just west of Porter Drive. Coyote Hill Road would be converted to right-turn in/right-turn out.

2) Page Mill Road through traffic would cross under the at-grade signalized intersection with Foothill Expressway. Two-lanes in each direction of Page Mill Road would be placed in an underpass beneath the intersection. One- to two-lane ramps would provide access between the intersection and Page Mill Road. All movements would be preserved. The aerial structure would extend from east of Coyote Hill Road to just west of Porter Drive.

3) Page Mill Road through traffic would cross beneath an elevated signalized intersection with Foothill Expressway. The approaches along Foothill Expressway and Junipero Serra Boulevard would be raised and the existing intersection would be raised on a structure. Two lanes in each direction of Page Mill Road would be placed in an underpass beneath the intersection at a level below grade, but not as deep as the structure in the first concept. One- to two-lane ramps would provide access between the intersection and Page Mill Road. All movements would be preserved. The aerial structure would extend from east of Coyote Hill Road to west of Porter Drive.

In all three concepts, bike connectivity would be provided between Page Mill Road and Foothill Expressway.

Plan and profile views of the three concepts are depicted in Appendix A.

PAGE MILL ROAD BETWEEN FOOTHILL EXPRESSWAY AND EL CAMINO REAL

While the segment of Page Mill Road between Foothill Expressway and Ramos Way is projected to operate at LOS E by Year 2025, it does not have the level of congestion experienced west of Foothill Expressway. Furthermore, this segment of Page Mill Road is highly constrained due to fronting businesses and numerous driveways. Therefore, improvements for this segment include intersection-specific improvements, developed to increase intersection capacity and throughput.

Improvements were developed at each of the signalized intersections along this segment and include:

- Page Mill Road/Porter Drive Intersection: Add an eastbound U-turn only movement at this intersection;

- Page Mill Road/Hanover Street Intersection: Add a northbound and southbound left turn lane and convert the signal to an 8-phase operation. Convert Hanover Street to one-through lane in each direction and add bike lanes;

- Page Mill Road/Hansen Way Intersection: Extend left-turn storage capacity of eastbound Page Mill Road and Hansen Way Intersection; and

- Page Mill/El Camino Real: Modify alignment of westbound left-turn lane to provide additional left-turn storage capacity, provide a dedicated westbound right-turn lane, extend bike lanes, and possibly eliminate the eastbound right-turn pork-chop island (will require further study).
6. Improvement Evaluation

The concepts were evaluated using a range of analysis criteria. These included traffic circulation, bicycle connectivity, and pedestrian connectivity.

6.1 I-280 INTERCHANGE TO FOOTHILL EXPRESSWAY

The improvement concepts between the I-280 interchange and Foothill Expressway were evaluated using a micro-simulation tool in order to assess the overall network-wide effect of the improvements. All improvements were analyzed assuming that Page Mill Road would be widened to six lanes between the I-280 interchange and Foothill Expressway. This widening includes an additional eastbound through lane on Page Mill Road through the Foothill Expressway intersection. Each of the interchange concepts were analyzed with and without a grade separation at Foothill Expressway.

EXISTING VOLUMES

Table 8 identifies the delay and level of service for intersections between the I-280 interchange and Foothill Expressway with each of the improvement concepts using existing traffic volumes.
<table>
<thead>
<tr>
<th>Intersection</th>
<th>AM Peak Delay (s)</th>
<th>AM Peak LOS</th>
<th>PM Peak Delay (s)</th>
<th>PM Peak LOS</th>
<th>AM Peak Delay (s)</th>
<th>AM Peak LOS</th>
<th>PM Peak Delay (s)</th>
<th>PM Peak LOS</th>
<th>AM Peak Delay (s)</th>
<th>AM Peak LOS</th>
<th>PM Peak Delay (s)</th>
<th>PM Peak LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arastradero Road</td>
<td>AWSC 171.9</td>
<td>F</td>
<td>15.7</td>
<td>B</td>
<td>Signal 36.6</td>
<td>D</td>
<td>36.4</td>
<td>D</td>
<td>AWSC 9.3</td>
<td>A</td>
<td>32.8</td>
<td>C</td>
</tr>
<tr>
<td>I-280 SB Ramps</td>
<td>SSSC 127.2</td>
<td>F</td>
<td>8.3</td>
<td>A</td>
<td>Signal 5.8</td>
<td>A</td>
<td>6.7</td>
<td>A</td>
<td>RAB 25.3</td>
<td>C</td>
<td>9.7</td>
<td>A</td>
</tr>
<tr>
<td>Old Page Mill Road</td>
<td>SSSC 5.6</td>
<td>A</td>
<td>9.1</td>
<td>A</td>
<td>Signal 3.9</td>
<td>A</td>
<td>5.0</td>
<td>A</td>
<td>Signal 1.3</td>
<td>A</td>
<td>4</td>
<td>A</td>
</tr>
<tr>
<td>Deer Creek Road</td>
<td>Signal 59.0</td>
<td>E</td>
<td>11.8</td>
<td>B</td>
<td>Signal 6.4</td>
<td>A</td>
<td>8.3</td>
<td>A</td>
<td>Signal 7.2</td>
<td>A</td>
<td>9.2</td>
<td>A</td>
</tr>
<tr>
<td>Foothill Expressway</td>
<td>Signal 84.4</td>
<td>F</td>
<td>108.5</td>
<td>F</td>
<td>Signal 31.5</td>
<td>C</td>
<td>43</td>
<td>D</td>
<td>RAB 31.1</td>
<td>C</td>
<td>43.4</td>
<td>D</td>
</tr>
</tbody>
</table>

Notes:
1. Concepts 1 through 3 assume widening of Page Mill Road to 3 lanes in each direction.
2. Delay is based on average vehicle delay for all entering vehicles at signalized, roundabout and all-way stop intersections. Delay is based on average vehicle delay for the side-street movements at side-street stop-controlled intersections.
3. The Base scenario and Concepts 1 and 3 provide I-280 southbound off-ramp movements at the Arastradero Road intersection. I-280 southbound on-ramp movements have no delay.

AWSC = All-way Stop Control
SSSC = Side-street Stop Control
RAB = Roundabout
Chapter 6: Improvement Evaluation

As shown in Table 8, each of the three improvement concepts would result in acceptable operations for all study intersections with existing volumes. The intersection of Page Mill Road and Foothill Expressway would operate at an acceptable level of service with the widening of Page Mill Road to six lanes and the third eastbound lane extending through the Foothill Expressway intersection. All three concepts are effective at reducing the delay at the I-280 southbound ramps intersection to an acceptable LOS D or better, although Concept 3 performs better than Concepts 1 and 2 at improving intersection operations at this location.

The travel time during the peak periods between the interchange and Foothill Expressway was measured with each of the improvement concepts using the micro-simulation model. Table 9 identifies the travel times between I-280 and Foothill Expressway.

**TABLE 9: TRAVEL TIMES – IMPROVEMENTS WITH EXISTING VOLUMES AND NO FOOTHILL EXPRESSWAY GRADE SEPARATION**

<table>
<thead>
<tr>
<th>Segment Limits</th>
<th>Period</th>
<th>Baseline</th>
<th>Concept 1&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Concept 2&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Concept 3&lt;sup&gt;1&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Travel Time (min)</td>
<td>Travel Time (min)</td>
<td>Travel Time (min)</td>
<td>Travel Time (min)</td>
</tr>
<tr>
<td>Between I-280 NB and Foothill Expressway</td>
<td>AM</td>
<td>7.8</td>
<td>3.2</td>
<td>3.1</td>
<td>3.1</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>6.9</td>
<td>3.2</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Between I-280 SB and Foothill Expressway</td>
<td>AM</td>
<td>9.1</td>
<td>4.3</td>
<td>3.6</td>
<td>3.6</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>6.5</td>
<td>3.5</td>
<td>4.0</td>
<td>3.6</td>
</tr>
</tbody>
</table>

Notes:
1<sup>Travel times are for the peak direction. AM peak direction is eastbound and PM peak direction is westbound.</sup>

As shown in the table, all three concepts would provide substantial travel time benefits compared to the baseline scenario. Concept 3 would provide the greatest travel time benefit.

**YEAR 2025 VOLUMES**

Table 10 and Table 11 identify the delay and level of service for intersections between the I-280 interchange and Foothill Expressway with each of the improvements concepts without and with the addition of a grade separation at the Foothill Expressway intersection, respectively. Each of the grade separation configuration alternatives would function similarly from an overall traffic performance perspective.
### Table 10: Intersection Level of Service – Improvements with Year 2025 Volumes and No Foothill Expressway Grade Separation

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Base Scenario</th>
<th>Concept 1</th>
<th>Concept 2</th>
<th>Concept 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM Peak</td>
<td>PM Peak</td>
<td>AM Peak</td>
<td>PM Peak</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Delay (s)^2</td>
<td>LOS</td>
<td>Delay (s)^2</td>
<td>LOS</td>
</tr>
<tr>
<td>Arastradero Road^2</td>
<td>AWSC</td>
<td>231.6 F</td>
<td>23.8 C</td>
<td>Signal</td>
</tr>
<tr>
<td>I-280 SB Ramps</td>
<td>SSSC</td>
<td>66.9 F</td>
<td>10.1 B</td>
<td>Signal</td>
</tr>
<tr>
<td>I-280 NB Ramps</td>
<td>SSSC</td>
<td>5.4 A</td>
<td>6.9 A</td>
<td>Signal</td>
</tr>
<tr>
<td>Old Page Mill Road</td>
<td>SSSC</td>
<td>47 D</td>
<td>6.3 A</td>
<td>Signal</td>
</tr>
<tr>
<td>Deer Creek Road</td>
<td>Signal</td>
<td>131.0 F</td>
<td>102.6 F</td>
<td>Signal</td>
</tr>
<tr>
<td>Foothill Expressway</td>
<td>Signal</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Notes:
1. Concepts 1 through 3 assume widening of Page Mill Road to 3 lanes in each direction.
2. Delay is based on average vehicle delay for all entering vehicles at signalized, roundabout and all-way stop intersections. Delay is based on average vehicle delay for the side-street movements at side-street stop-controlled intersections.
3. The Base scenario and Concepts 1 and 3 provide I-280 southbound off-ramp movements at the Arastradero Road intersection. I-280 southbound on-ramp movements have no delay.

AWSC = All-way Stop Control  
SSSC = Side-street Stop Control  
RAB = Roundabout

### Table 11: Intersection Level of Service – Improvements with Year 2025 Volumes and Foothill Expressway Grade Separation

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Base Scenario</th>
<th>Concept 1</th>
<th>Concept 2</th>
<th>Concept 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM Peak</td>
<td>PM Peak</td>
<td>AM Peak</td>
<td>PM Peak</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Delay (s)^2</td>
<td>LOS</td>
<td>Delay (s)^2</td>
<td>LOS</td>
</tr>
<tr>
<td>Arastradero Road^2</td>
<td>AWSC</td>
<td>231.6 F</td>
<td>23.8 C</td>
<td>Signal</td>
</tr>
<tr>
<td>I-280 SB Ramps</td>
<td>SSSC</td>
<td>66.9 F</td>
<td>10.1 B</td>
<td>Signal</td>
</tr>
<tr>
<td>I-280 NB Ramps</td>
<td>SSSC</td>
<td>5.4 A</td>
<td>6.9 A</td>
<td>Signal</td>
</tr>
<tr>
<td>Old Page Mill Road</td>
<td>SSSC</td>
<td>47 D</td>
<td>6.3 A</td>
<td>Signal</td>
</tr>
<tr>
<td>Deer Creek Road</td>
<td>Signal</td>
<td>131.0 F</td>
<td>102.6 F</td>
<td>Signal</td>
</tr>
<tr>
<td>Foothill Expressway</td>
<td>Signal</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Notes:
1. Concepts 1 through 3 assume widening of Page Mill Road to 3 lanes in each direction and grade separation at Foothill Expressway.
2. Delay is based on average vehicle delay for all entering vehicles at signalized, roundabout and all-way stop intersections. Delay is based on average vehicle delay for the side-street movements at side-street stop-controlled intersections.
3. The Base scenario and Concepts 1 and 3 provide I-280 southbound off-ramp movements at the Arastradero Road intersection. I-280 southbound on-ramp movements have no delay.

AWSC = All-way Stop Control  
SSSC = Side-street Stop Control  
RAB = Roundabout
Chapter 6: Improvement Evaluation

As shown in Table 10, the intersection of Page Mill Road and Foothill Expressway deteriorates to an unacceptable LOS F in all scenarios with the addition of future growth out to Year 2025. In order to handle future projected volumes at this intersection, a grade separation is required. Also shown in Table 10 is that both Concepts 2 and 3 achieve an acceptable level of service for all other intersections with Year 2025 volumes. Concept 1 has two intersections (Old Page Mill Road and Deer Creek Road) operate at LOS E in the PM peak period with Year 2025 volumes. This deficiency is a result of the proposed signalized intersection at Old Page Mill Road with Concept 1. The reduction in throughput for westbound movements at this intersection results in significant queuing that also affects the upstream Deer Creek Road intersection. Concept 3 also includes a signalized intersection at Old Page Mill Road but provides more green time for the westbound Page Mill Road movement, primarily because it does not include a pedestrian crossing of Page Mill Road at this location.

As shown in Table 11, the grade separation of Page Mill Road through movements at Foothill Expressway is sufficient to improve the operations of the intersection to an acceptable LOS C. Operations at the I-280 interchange intersections are somewhat worse with the implementation of the grade separation at the Foothill Expressway intersection. The grade separation of Page Mill Road traffic eliminates an existing bottleneck that meters westbound Page Mill Road traffic. Elimination of that bottleneck allows more vehicles to access the I-280 interchange during the peak period. The decrease in level of service at the Deer Creek Road intersection is caused by higher volumes on westbound Page Mill Road approaching Deer Creek Road as a result of the grade separation.

With Concept 1 and 3 and grade separation of the Foothill Expressway intersection, all intersections except Deer Creek Road operate at LOS D or better. In Concept 1, queues from the new signalized intersection at Old Page Mill Road would occasionally spillback to Deer Creek Road due to the very high volume and the long phases required for the Page Mill Road pedestrian crossing and bicycle access to the median cycle track.

With Concept 2, the I-280 southbound ramps intersection and Deer Creek Road intersection operate at LOS E. The very heavy westbound left-turn volume to access I-280 southbound in this concept results in delay and queuing for all movements at this intersection.

Concept 2 includes an all-way stop control of Arastradero Road, immediately west of the signalized I-280 southbound ramps intersection. The proximity of the two intersections results in inefficiencies and queuing challenges. The configuration as shown would result in significant queuing on Arastradero Road and queue spillbacks on westbound Page Mill Road. It is likely that signalization of the Arastradero Road intersection would be required as well to avoid both issues.

Concept 3 operates the best of the three improvement concepts, with both ramp intersections operating at LOS C or better in both peak periods. Concept 3 reduces the westbound Page Mill Road to I-280 southbound on-ramp movement from the existing two lanes to a single lane. Analysis indicates that a single lane will be sufficient to handle Year 2025 volumes at this location, although the movement is near capacity. Some queuing will occur upstream as vehicles merge into the appropriate lane. Advance signage to the east is recommended to allow vehicles to merge into the appropriate lane as early as possible. Due to the high volume of traffic utilizing both the I-280 northbound and southbound on-ramps, some queue spillbacks will occur.

The travel time during the peak periods between the I-280 interchange and Foothill Expressway was measured with each of the improvement concepts using the micro-simulation model. Table 12 identifies the travel times between I-280 and Foothill Expressway without the Foothill Expressway grade separation.
### Chapter 6: Improvement Evaluation

#### TABLE 12: TRAVEL TIMES – IMPROVEMENTS WITH YEAR 2025 VOLUMES AND NO FOOTHILL EXPRESSWAY GRADE SEPARATION

<table>
<thead>
<tr>
<th>Segment Limits</th>
<th>Period</th>
<th>Baseline Travel Time (min)</th>
<th>Concept 1 Travel Time (min)</th>
<th>Concept 2 Travel Time (min)</th>
<th>Concept 3 Travel Time (min)</th>
<th>∆ Travel Time (min)</th>
<th>∆ Travel Time (min)</th>
<th>∆ Travel Time (min)</th>
<th>∆ Travel Time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between I-280 NB and Foothill Expressway</td>
<td>AM</td>
<td>6.7</td>
<td>5.4</td>
<td>-1.3</td>
<td>6.0</td>
<td>-0.7</td>
<td>4.2</td>
<td>-2.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>2.8</td>
<td>6.4</td>
<td>3.6</td>
<td>2.9</td>
<td>0.1</td>
<td>3.2</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>Between I-280 SB and Foothill Expressway</td>
<td>AM</td>
<td>10.3</td>
<td>6.0</td>
<td>-4.3</td>
<td>6.8</td>
<td>-3.5</td>
<td>4.6</td>
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<td></td>
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<tr>
<td></td>
<td>PM</td>
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<td>5.4</td>
<td>2.2</td>
<td>3.9</td>
<td>0.7</td>
<td>3.4</td>
<td>0.2</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- Travel times are for the peak direction. AM peak direction is eastbound and PM peak direction is westbound.
- Concepts 1 through 3 assume widening of Page Mill Road to 3 lanes in each direction.

As shown in the table, all three concepts would provide substantial travel time benefits in the morning peak period compared to the baseline scenario. Concept 3 would provide substantially the greatest travel time benefit in the morning peak period. All three concepts would result in an increase in travel times during the evening peak period, although the increase with Concepts 2 and 3 would be marginal. The increase is associated with the signalization of the westbound to I-280 northbound on-ramp in all three concepts. The signalization of that movement, and accompanying reduction in the on-ramp radius, is intended to improve pedestrian and bicycle safety. Travel time increases by a greater extent in Concept 1 in the PM peak period due to the signalization of the Old Page Mill Road intersection. The pedestrian crossing and bicycle-only phase at this location result in extensive delays to westbound traffic.

#### Table 13 identifies the travel times between I-280 and Foothill Expressway with a Foothill Expressway grade separation.

#### TABLE 13: TRAVEL TIMES – IMPROVEMENTS WITH YEAR 2025 VOLUMES AND WITH FOOTHILL EXPRESSWAY GRADE SEPARATION

<table>
<thead>
<tr>
<th>Segment Limits</th>
<th>Period</th>
<th>Baseline Travel Time (min)</th>
<th>Concept 1 Travel Time (min)</th>
<th>Concept 2 Travel Time (min)</th>
<th>Concept 3 Travel Time (min)</th>
<th>∆ Travel Time (min)</th>
<th>∆ Travel Time (min)</th>
<th>∆ Travel Time (min)</th>
<th>∆ Travel Time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between I-280 NB and Foothill Expressway</td>
<td>AM</td>
<td>6.7</td>
<td>3.0</td>
<td>-3.7</td>
<td>2.8</td>
<td>-3.9</td>
<td>2.7</td>
<td>-4.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>2.8</td>
<td>6.2</td>
<td>3.4</td>
<td>5.8</td>
<td>3.0</td>
<td>6.0</td>
<td>3.2</td>
<td></td>
</tr>
<tr>
<td>Between I-280 SB and Foothill Expressway</td>
<td>AM</td>
<td>10.3</td>
<td>3.9</td>
<td>-6.4</td>
<td>4.0</td>
<td>-6.3</td>
<td>3.2</td>
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<tr>
<td></td>
<td>PM</td>
<td>3.2</td>
<td>5.1</td>
<td>1.9</td>
<td>5.8</td>
<td>2.6</td>
<td>6.0</td>
<td>2.8</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- Travel times are for the peak direction. AM peak direction is eastbound and PM peak direction is westbound.
- Concepts 1 through 3 assume widening of Page Mill Road to 3 lanes in each direction and grade separation of the Foothill Expressway intersection.

The findings with the grade separation concept are similar to the findings without the grade separation concept. Concept 3 would result in substantial morning peak period travel time savings compared to the baseline scenario. Eastbound travel time from the I-280 southbound ramps would be reduced from 10.3 minutes in the baseline scenario to 3.2 minutes with grade separation and with Concept 3, a reduction of 69 percent.
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Other concepts would also have substantial eastbound morning peak period travel time benefits, although to a somewhat lesser extent than Concept 3. Westbound travel times along Page Mill Road west of Foothill Expressway would increase in the evening peak period by 2.0 to 3.3 minutes. The grade separation at Foothill Expressway increases the throughput of that intersection and eliminates the substantial queuing in the baseline scenario, thereby increasing the number of vehicles approaching the I-280 interchange in the PM peak period. The increased traffic volumes are forecast to result in increased congestion at the interchange with all three improvement concepts, compared to conditions today. Benefits to traffic flow approaching Foothill Expressway are not captured in this metric. Note that the micro-simulation model does not include planned ramp metering on the I-280 on-ramps. No implementation timeframe has been set for ramp metering, however all on-ramps in the County are planned to be metered in the future.

Appendix B includes graphics summarizing the findings of the micro-simulation analysis of each of the improvement concepts.

ROUNDABOUT SENSITIVITY ANALYSIS
Additional analysis was performed for Concept 3 to evaluate the sensitivity of the roundabout to additional volume increases. With the significant improvement in travel time forecast with Concept 3 for travel from the I-280 southbound ramp to Foothill Expressway, it is expected that some traffic currently using other routes to access the Stanford Research Park and other employment centers along Page Mill Road will shift to Page Mill Road. Two scenarios were analyzed for roundabout operations with a shift in traffic resulting from the Concept 3 improvements. One scenario is associated with a 10 percent increase in southbound off-ramp volumes and the second scenario is associated with a 20 percent increase in southbound off-ramp volumes. These increases are in addition to the Year 2025 forecast growth for this movement associated with additional land uses. The 10 percent increase is associated with a shift of 400 vehicles to the I-280 southbound off-ramp and the 20 percent increase is associated with a shift of 800 vehicles to the I-280 southbound off-ramp. The delay and LOS at the interchange with each of the volumes scenarios and Concept 3 is shown in Table 14.

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Baseline Conditions</th>
<th>Concept 3&lt;sup&gt;1&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Delay (s)</td>
<td>LOS</td>
</tr>
<tr>
<td>Arastradero Road</td>
<td>231.6</td>
<td>F</td>
</tr>
<tr>
<td>I-280 NB Ramps</td>
<td>35.1</td>
<td>D</td>
</tr>
</tbody>
</table>

Notes:
- Represents AM peak period conditions. PM peak period conditions are not currently saturated and thus no volume shift is anticipated.
- Concept 3 conditions assume grade separation of Foothill Expressway and widening of Page Mill Road to 3 lanes in each direction

As shown in the table, while a shift in traffic to the I-280 southbound off-ramp would increase the delay associated with the roundabout, the roundabout would still operate at an acceptable level of service, and with substantially less delay than with baseline conditions.

BICYCLE AND PEDESTRIAN CIRCULATION
The three concepts were qualitatively evaluated for their effectiveness at addressing bicycle and pedestrian circulation needs. All three concepts would substantially improve bicycle and pedestrian circulation from existing conditions by providing dedicated facilities and reducing conflict points. The Page Mill Road widening to six lanes between I-280 and Foothill Expressway includes extension of the shared-use path on the south side of the

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roadway from Deer Creek Road to the I-280 northbound ramps. Graphics summarizing the bicycle and pedestrian circulation benefits and constraints with each of the improvement concepts and included in Appendix B.

CONCEPT 1
Concept 1 provides a dedicated two-way cycle track in the median of Page Mill Road. The cycle track allows cyclists to completely avoid the high-volume ramp movements occurring for both the northbound and southbound ramps. The cycle track provides access to Old Page Mill Road via a signalized movement at the Old Page Mill Road intersection. The challenges with the two-way cycle track are at the entry and exit points on either end. On the eastern end, cyclists will need to wait for a dedicated intersection phase to access/egress the cycle track. This may require a long wait in excess of two minutes. On the western end, cyclists will be required to merge with or weave across traffic to access the cycle track. Volumes in this area will be lower since it is west of the interchange ramps.

New pedestrian facilities will allow a continuous path from the eastern portion of the corridor to the western portion. Pedestrians from the neighborhood near Old Page Mill Road will need to cross Page Mill Road at the signalized I-280 northbound ramps intersection to access the sidewalk on the south side of Page Mill Road. Pedestrians will need to cross the unsignalized eastbound Page Mill Road right-turn movements to the I-280 on-ramps.

CONCEPT 2
Concept 2 provides on-street bike lanes with fewer conflicts than the existing configuration. By eliminating the westbound loop on-ramp to southbound I-280, a major conflict point is removed. The westbound bike lane would be shifted to the curb to provide a safer facility for cyclists. A weave conflict would still remain as cyclists cross traffic accessing northbound I-280. Cyclists in the eastbound direction would have a signalized crossing of the I-280 northbound off-ramp to eastbound Page Mill Road. The concept does not modify bicycle access to Old Page Mill Road from the current configuration, requiring an uncontrolled left-turn across westbound traffic.

New sidewalk facilities would be provided in this concept on the north side of Page Mill Road. The elimination of the westbound to I-280 southbound loop on-ramp allows for a safer pedestrian movement on the north side of the street. Pedestrians would cross the westbound to I-280 northbound on-ramp at a new signalized crossing. A new sidewalk on the south side of the road west of the I-280 southbound ramps would improve pedestrian circulation to/from the park-and-ride and Arastradero Road.

CONCEPT 3
Concept 3 provides a shared-use path on the north side of Page Mill Road in addition to on-street bike lanes. The shared-use path would pass beneath the I-280 southbound on- and off-ramps to eliminate an existing multi-lane weave conflict. Advanced bicycle riders would be able to continue to use the on-street bike lanes. The shared-use path would extend to Old Page Mill Road to provide a direct connection for both directions of travel between Old Page Mill Road and Page Mill Road. A signalized crossing would be provided for cyclists and pedestrians to cross the I-280 northbound off-ramp.

A common bike route includes travel on Arastradero Road and Page Mill Road, west of the interchange. A few options are provided with this concept to facilitate those movements. One option, anticipated to be utilized by skilled cyclists, is to circulate around the roundabout in a manner similar to a vehicle. The roundabout design speed is 25 miles per hour, with the entrances at just under 20 miles per hour. Another option for cyclists is to cross the roundabout entries in a manner similar to pedestrians. This would provide the most direct access between Arastradero Road and Page Mill Road. A third option would be to utilize the existing bike path that runs behind the park-and-ride lot in the southwest corner of the intersection.
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Considering the shared-use path on the north side of the roadway and the sidewalk on the south side of the roadway, this option would include pedestrian facilities to handle every possible pedestrian movement. The eastbound to I-280 northbound on-ramp would be shifted to the east to be adjacent to the I-280 northbound off-ramp. This provides more merge distance for vehicles on eastbound Page Mill Road and also reduces the speed for vehicle movements accessing the ramp. The reduced vehicle speed reduces the severity of the conflict between vehicles and both pedestrians and cyclists at this location.

I-280 INTERCHANGE IMPROVEMENT ALTERNATIVES COMPARISON

Table 15 qualitatively compares the performance of each of the three concepts under each of the evaluation criteria.

<table>
<thead>
<tr>
<th>Category</th>
<th>Concept 1</th>
<th>Concept 2</th>
<th>Concept 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Signalization</strong></td>
<td>Signalization of Old Page Mill Road intersection forecast to cause queuing and congestion on Page Mill Road. Southbound ramp signalization addresses existing congestion.</td>
<td>Heavy queuing in westbound left-turn lane to access southbound on-ramp. Heavy queuing on Arastradero Road approaching stop controlled intersection with Page Mill Road. Existing congestion is alleviated by ramp reconfiguration.</td>
<td>Concept substantially the most effective at solving existing and forecast congestion issues throughout study area. No forecast congestion issues.</td>
</tr>
<tr>
<td><strong>Traffic Circulation</strong></td>
<td>New two-way cycle track in the median of Page Mill Road between the southbound ramps and Old Page Mill Rd. Non-standard, but eliminates bicycle conflicts with on- and off-ramp volumes.</td>
<td>Westbound bike lane shifted to adjacent to curb and striping modified to clearly define bike space approaching intersections and ramp movements. Removal of westbound loop on-ramp eliminates significant existing conflict.</td>
<td>Westbound bike lane shifted to adjacent to curb and striping modified to clearly define bike space approaching intersections and ramp movements. New shared use path on north side of roadway between west of southbound ramps and Christopher Lane allows cyclists to avoid unprotected conflicts with autos near interchange.</td>
</tr>
<tr>
<td><strong>Pedestrian Circulation</strong></td>
<td>New signalized crossings of Page Mill Road and sidewalk on north side of Page Mill Road between northbound ramps and Old Page Mill Road.</td>
<td>New signalized crossings of Page Mill Road and sidewalk on north side of Page Mill Rd between southbound ramps and Old Page Mill Road.</td>
<td>New signalized crossings of Page Mill Road and shared used path on north side of Page Mill Rd between west of southbound ramps and Christopher Lane. Shift of eastbound to northbound loop on-ramp reduces vehicle speed at conflict with pedestrians.</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Category</th>
<th>Concept 1</th>
<th>Concept 2</th>
<th>Concept 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Signalization</strong></td>
<td>Signalization</td>
<td>Southbound Ramp Realignment</td>
<td>Roundabout</td>
</tr>
<tr>
<td>Cost Factors</td>
<td>Lowest cost as it entails least amount of roadwork and re-grading.</td>
<td>Medium to high cost to realign southbound ramps and reconfigure northbound off-ramp</td>
<td>Highest cost due to re-grading associated with roundabout and realignment of Arastradero Road.</td>
</tr>
<tr>
<td>Construction Impacts</td>
<td>Shortest construction timeframe and least impactful during construction due to limited amount of roadwork and re-grading.</td>
<td>All ramp movements could be significantly affected during construction</td>
<td>Most significant and longest duration due to significant re-grading and construction of roundabout.</td>
</tr>
<tr>
<td>Other</td>
<td>Full access to/from Old Page Mill Road and Christopher Ln maintained at Old Page Mill Road. Bicycles may experience some delay accessing median cycle track at Old Page Mill Road.</td>
<td>To avoid significant queuing on Arastradero Road, would likely require signalization (instead of stop control) at Arastradero Road and Page Mill Road intersection. Precludes left-turn movements to/from Christopher Lane.</td>
<td>Safety and security concerns associated with shared use path beneath southbound ramps. Access from Christopher Lane and Old Page Mill Road to eastbound Page Mill Road requires out-of-direction travel.</td>
</tr>
</tbody>
</table>

**COYOTE HILL ROAD INTERSECTION**

An analysis was performed for the two potential configurations of the Coyote Hill Road intersection in conjunction with the planned development and modifications to Coyote Hill Road. The key findings of the analysis are as follows:

- The median closure improvement alternative is projected to result in acceptable operations for the Page Mill Road/Coyote Hill Road intersection during the PM peak hour, but the intersection is anticipated to operate at LOS E during the AM peak period, which is below the County’s established level of service target of LOS D or better. In addition, with the elimination of left-turn access to/from Coyote Hill Road, some left-turning traffic is anticipated to shift to Foothill Expressway and Deer Creek Road, which will worsen operations at the intersection of those streets with Page Mill Road. With the median closure alternative, the Page Mill Road/Deer Creek Road intersection is projected to worsen from acceptable LOS D under baseline conditions to unacceptable LOS E during the AM peak hour.

- The signalization improvement option is projected to result in acceptable LOS C or better at the Page Mill Road/Coyote Hill Road intersection during the AM and PM peak hours.

- With the signalization improvement alternative, the average peak directional corridor travel time along Page Mill Road between Deer Creek Road and Coyote Hill Road is anticipated to increase by approximately 12 seconds for the AM peak hour (eastbound is peak direction) compared to baseline conditions. During the PM peak hour, the average peak directional (westbound is peak direction) travel time remains roughly the same.

The full analysis and accompanying text is included as **Appendix C**.
FOOTHILL INTERSECTION GRADE SEPARATION OPTIONS

Table 16 provides a comparison of the grade separation improvement options considered for Page Mill Road at Foothill Expressway.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Right-of-Way Acquisition</th>
<th>Visual Impacts</th>
<th>Pedestrians and Bicycles</th>
<th>Impact to Utilities</th>
<th>Impact to Adjoining Intersections</th>
<th>Construction Staging</th>
<th>Preliminary Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Page Mill Over&quot;</td>
<td>Page Mill Road through traffic will be raised to cross above Foothill Expressway. Page Mill Road turning movements and Foothill Expwy will remain at existing grade.</td>
<td>Minimal.</td>
<td>Significant.</td>
<td>Class I facility west of Foothill Expwy/Junipero Serra Blvd with standard sidewalks east of Foothill Expwy/Junipero Serra Blvd.</td>
<td>Minimal.</td>
<td>Coyote Hill Road will be converted to a right-in, right-out movements only. Porter Drive can be maintained as a signalized intersection with all movements.</td>
<td>Maintains through traffic under bridge construction.</td>
<td>$48 M</td>
</tr>
<tr>
<td>&quot;Page Mill Under&quot;</td>
<td>Page Mill Road thru traffic will be lowered to cross underneath Foothill Expressway. Page Mill Road turning movements and Foothill Expwy will be at existing grade.</td>
<td>More than minimal.</td>
<td>Minimal.</td>
<td>Class I facility west of Foothill Expwy/Junipero Serra Blvd with standard sidewalks east of Foothill Expwy/Junipero Serra Blvd.</td>
<td>Requires relocation of PG&amp;E gas transmission main and Hetch-Hetchy water lines.</td>
<td>Porter Drive and Coyote Hill Road can be maintained as signalized intersections with all movements.</td>
<td>Maintains through traffic around bridge construction.</td>
<td>$44 M</td>
</tr>
<tr>
<td>&quot;Page Mill Split&quot;</td>
<td>Page Mill Road thru traffic will be lowered to cross underneath Foothill Expressway. Page Mill Road turning movements and Foothill Expwy will be raised at intersection.</td>
<td>More than minimal.</td>
<td>Moderate.</td>
<td>Class I facility west of Foothill Expwy/Junipero Serra Blvd with standard sidewalks east of Foothill Expwy/Junipero Serra Blvd.</td>
<td>Requires PG&amp;E gas main relocation. Hetch-Hetchy water lines may be protected in place.</td>
<td>Porter Drive and Coyote Hill Road can be maintained as signalized intersections with all movements.</td>
<td>Maintains through traffic around bridge construction.</td>
<td>$49 M</td>
</tr>
</tbody>
</table>

Notes:
Table and analysis referenced from Page Mill Road Expressway Conceptual Plan - Technical Memorandum, HMH (2015)

Cost estimates for improvements to Page Mill Road between Old Page Mill Road and Foothill Expressway were prepared by HMH as part of the Page Mill Expressway Final Plan Line and Page Mill Road Expressway Conceptual Plan. The widening of Page Mill Road between Old Page Mill Road and Foothill Expressway was estimated to cost $12.2 Million. At-grade improvements at the Page Mill Road/Foothill Expressway-Junipero Serra Boulevard intersection associated with the Page Mill Road widening were estimated to cost $4.8 Million. The addition of a shared-use trail on the south side of Page Mill Road between Deer Creek Road and the I-280 northbound ramps was estimated to cost $6.0 Million. Detailed cost estimates are provided in Appendix D.
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6.2 FOOTHILL EXPRESSWAY TO EL CAMINO REAL

Traffic circulation with implementation of the proposed improvements along Page Mill Expressway east of Foothill Expressway were analyzed as part of the Expressway Plan 2040 effort. The roadway segment level of service with and without the improvements is shown in Table 17.

### TABLE 17: ROADWAY SEGMENT LEVEL OF SERVICE – 2025 BUILD CONDITIONS

<table>
<thead>
<tr>
<th>Segment</th>
<th>No Build 2025</th>
<th>Build 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM</td>
<td>PM</td>
</tr>
<tr>
<td>I-280 to Deer Creek Road</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM Segment Capacity</td>
<td>3,760</td>
<td>5,660</td>
</tr>
<tr>
<td>Link Volume</td>
<td>3,788</td>
<td>4,029</td>
</tr>
<tr>
<td>V/C1 LOS</td>
<td>1.01 F</td>
<td>0.71 C</td>
</tr>
<tr>
<td>LOS</td>
<td>F</td>
<td>C</td>
</tr>
<tr>
<td>Foothill Expressway to Ramos Way</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM Segment Capacity</td>
<td>3,400</td>
<td>3,910</td>
</tr>
<tr>
<td>Link Volume</td>
<td>3,387</td>
<td>3,438</td>
</tr>
<tr>
<td>V/C1 LOS</td>
<td>1.00 E</td>
<td>0.88 D</td>
</tr>
<tr>
<td>LOS</td>
<td>E</td>
<td>D</td>
</tr>
<tr>
<td>Ramos Way to Birch Street</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM Segment Capacity</td>
<td>3,400</td>
<td>3,910</td>
</tr>
<tr>
<td>Link Volume</td>
<td>3,647</td>
<td>3,699</td>
</tr>
<tr>
<td>V/C1 LOS</td>
<td>1.07 F</td>
<td>0.95 E</td>
</tr>
<tr>
<td>LOS</td>
<td>F</td>
<td>E</td>
</tr>
</tbody>
</table>

Source: Expressway Plan 2040 Comprehensive County Expressway Planning Study Traffic Forecasting Methodology, Existing, 2025 and 2040 Traffic Conditions (URS, 2015)

1 V/C = Volume-to-Capacity Ratio

As shown in the table, the deficient LOS F segments along Page Mill Road would be improved to operate at LOS E or better with the identified improvements.

Intersection segment level of service with and without the improvements is shown in Table 18.

### TABLE 18: INTERSECTION LEVEL OF SERVICE – 2025 BUILD CONDITIONS

<table>
<thead>
<tr>
<th>Oregon-Page Mill Expressway Intersections</th>
<th>No Build 2025</th>
<th>Build 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM Peak Hour</td>
<td>PM Peak Hour</td>
</tr>
<tr>
<td></td>
<td>Delay (s/veh)</td>
<td>LOS</td>
</tr>
<tr>
<td>Porter Drive</td>
<td>6.8 A</td>
<td>27.3 C</td>
</tr>
<tr>
<td>Peter Coutts Road</td>
<td>11.6 B+</td>
<td>40.2 D</td>
</tr>
<tr>
<td>Hanover Street</td>
<td>88.8 F</td>
<td>50.4 D</td>
</tr>
<tr>
<td>Hansen Way</td>
<td>16.5 B</td>
<td>29.5 C</td>
</tr>
<tr>
<td>Ramos Way</td>
<td>9.0 A</td>
<td>18.0 B</td>
</tr>
<tr>
<td>El Camino Real (CMP)1</td>
<td>72.5 E</td>
<td>75.3 E-</td>
</tr>
</tbody>
</table>

Source: Expressway Plan 2040 (URS, 2015)

Notes:
Delay and LOS is based on Traffix 8.0 using methodology described in the 2000 Highway Capacity Manual, with adjusted saturation flow rates to reflect Santa Clara County conditions.

1 (CMP) = Monitored by Congestion Management Program

The Hanover Street intersection was the only intersection operating deficiency in the No Build scenario, operating at LOS F. As shown in the table, the proposed improvements would address the projected LOS F condition in the AM peak hour at Hanover Street. With the proposed improvements, this location would operate at LOS D- or better in both peak periods.
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Cost estimates for improvements to Page Mill Road between Foothill Expressway and El Camino Real were prepared by HMH as part of the Page Mill Expressway Plan Line and Page Mill Road Expressway Conceptual Plan. The intersection improvements along Page Mill Road east of Foothill Expressway to west of El Camino Real were estimated to collectively cost $2.7 Million. The intersection improvement at Page Mill Road and El Camino Real were estimated to cost $2.4 Million. Detailed cost estimates are provided in Appendix D.
7. Outreach

From October 2014 to January 2015, community outreach meetings were held throughout Santa Clara County to provide planning updates for the Expressway Plan 2040. Each meeting featured the expressway(s) located within the host city. Three community meetings were held to share updates on Oregon-Page Mill and Foothill Expressways. These meetings were at the following locations:

- November 17, 2014, SAP, Building 4 Loft, 2nd Floor, 3450 Hillview Avenue, Palo Alto
- November 19, 2014, Terman Middle School, 655 Arastradero Road, Palo Alto
- December 2, 2014, Los Altos Hills Community Center, 26379 Fremont Blvd, Los Altos Hills

The improvement concepts discussed in Chapter 5 and 6 were presented for discussion and community feedback at each of these public meetings. Improvement concept plans were presented for the Page Mill Road widening, Foothill Expressway grade separation and other proposed intersection improvements along Oregon-Page Mill Expressway. In addition, videos of the I-280 interchange micro-simulation models for each of the improvement concepts in future year conditions were presented and discussed with the public. Screenshots of the micro-simulation videos presented to the public are included as Appendix E.

The I-280/Page Mill Road interchange area received the greatest amount of interest with overall support for widening Page Mill Road between I-280 and Foothill Expressway to relieve current congestion before any changes are made at the interchange itself. Residents on the west side of the interchange continued to request alternatives to signalizing the freeway ramps and were receptive to the roundabout concept. Residents near Foothill Expressway were open to the grade separation concepts for the Page Mill Road/Foothill Expressway intersection.

Meeting summaries from the community outreach meetings are provided in Appendix F. Also included in Appendix F are comments received from members of the community and stakeholders regarding Page Mill Road corridor operations and potential improvements considered.
8. Recommended Corridor Concept

The preliminary concepts and findings of the improvement concept analysis were presented to City and County staff, Caltrans staff, and the community for feedback.

It was recommended that the six-lane widening from I-280 to Foothill Expressway and the intersection improvements between Foothill Expressway and El Camino Real be included in the Page Mill Road Corridor Plan and Expressway Plan 2040. It was decided not to select a preferred grade separation concept for the Page Mill Road/Foothill Expressway-Junipero Serra Boulevard intersection. The three grade separation concepts will be available for further study in the future when the project is ready to proceed.

Below is a discussion of the proposed final concept for the I-280 interchange along with some options for the park-and-ride lot and interim bicycle treatments, followed by the County’s determination for the Coyote Hill Road intersection.

8.1 I-280 INTERCHANGE

Based on the input provided, I-280 interchange improvement Concept 3 received the most popular support. The following comment themes were received regarding Concept 3:

• It appeared to be the most effective at addressing the existing and future traffic flows through the interchange;
• It maintained the community’s desire for a rural environment;
• The shared-use path combined with the bike lanes provided bicycle facilities to serve the full spectrum of bicycle riders;
• The neighborhood located northeast of the interchange had concerns regarding limitations to access with Old Page Mill Road limited to right-turn out only;
• Some members of the community expressed concern about the park-and-ride lot reconfiguration included in this concept to provide for on-site bus circulation; and
• Some members of the community expressed interest in considering a roundabout for the northbound ramps as well.

Based on this feedback, as well as further refinement of a conceptual layout, a refined Concept 3 was developed. This concept was designed to a roughly 10 percent design level and cost estimates were prepared.

The refined Concept 3 is shown in Figure 21. Bicycle and pedestrian features of the concept are shown in Figure 22.
FIGURE 21: PAGE MILL ROAD/I-280 INTERCHANGE Refined Concept 3 – Roundabout

- Modified Roadway Geometry for Bike and Pedestrian Safety
- Widen to Create Dedicated Right-turn Lane (requires roadway expansion)
- Implement Two-way Traffic Circulation along Old Page Mill Road (requires roadway realignment)
- Shift Access to/from Christopher Lane to Old Page Mill Road
- Reduce to a Single-Lane On-Ramp Approach
- New Traffic Signal
- Reconfigured Park-and-Ride Lot
- Reconfigure NB On-ramp to Increase Merge Distance and Improve Bike Safety
- Reconfigure NB Off-ramp to Accommodate New Traffic Signal (requires roadway realignment)
FIGURE 22: PAGE MILL ROAD/I-280 INTERCHANGE REFINED CONCEPT 3 – ROUNDABOUT, BICYCLE AND PEDESTRIAN FEATURES
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Refrainments to the concept made as a result of input received and preliminary design development included:

- Refinements to the roundabout configuration to meet roundabout design best practices and streamline traffic flow;
- Re-alignment of the I-280 southbound off-ramp approach to meet Caltrans standards;
- Modification to the Old Page Mill Road signalized intersection to allow left-turns from Old Page Mill Road to eastbound Page Mill Road; and
- Provision of a shared use-path behind the park-and-ride lot to provide an additional option for bicycle circulation between Page Mill Road to the west and Arastradero Road to the south.

The design layout of the roundabout concept is included as Appendix G. The concept does not include any profile drawings at this time. However, a preliminary assessment indicates that it may be beneficial to increase the elevation of the I-280 southbound ramps intersection with Page Mill Road. It will simplify the construction of the shared use path and reduce grade changes for users of the path. It will also reduce grade challenges along both the I-280 southbound off-ramp and Arastradero Road. Further investigation will be required to identify the potential ramifications and costs of changing the grade of the intersection.

An opinion of probable cost was prepared for Concept 3, which includes improvements from just west of Arastradero Road to Old Page Mill Road. The total cost of all improvements is estimated at $19.7 Million. The estimate is very preliminary in nature due to the very limited amount of design and data collection performed as part of this project. The probable cost of the roundabout alone was estimated to be $10.7 Million. The preliminary opinion of probable cost is included in Appendix H.

**ROUNDABOUT VERSUS SIGNAL FOR I-280 NORTHBOUND RAMPS (EAST SIDE OF INTERCHANGE)**

Caltrans has adopted a policy whereby both roundabouts and signalization will be considered for all locations where intersections meet the required warrants and an improvement is being implemented. A detailed evaluation process, known as an Intersection Control Evaluation (ICE), will be performed by Caltrans to identify the appropriate solution for each location. As the I-280 interchange is under Caltrans jurisdiction, an ICE will be required prior to detailed design and construction of improvements at this location. At that time, a roundabout will be further considered for the I-280 northbound ramps intersection. It should be noted, however, that a roundabout on this side of the interchange faces significantly more challenges including:

- Higher traffic volumes since the very high westbound Page Mill Road to I-280 southbound on-ramp volumes excluded from the Concept 3 roundabout would be required to pass through the I-280 northbound ramps intersection;
- Possible infringement on the Caltrans Corporation Yard adjacent to Page Mill Road and/or steep slopes on the south side of Page Mill Road; and
- High speeds and steep grades on westbound Page Mill Road approaching the I-280 northbound ramps.
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A range of design solutions will be evaluated for feasibility and effectiveness in addressing these challenges as part of the ICE prior to detailed design and construction of intersection improvements at the I-280 northbound ramp intersection.

8.2 PARK-AND-RIDE LOT
The refined Concept 3 included further evaluation of opportunities to improve the Caltrans park-and-ride lot located at the southwest corner of the Page Mill Road and Arastradero Road intersection. By shifting Arastradero Road to feed into the roundabout, the park-and-ride lot can be reconfigured to provide an internal circulation pattern that does not require illegal maneuvers, driveway blockages, or extensive out-of-direction travel for buses.

A conceptual layout of a reconfigured lot is shown in Figure 23. The existing driveway on Arastradero Road would be converted to an entry-only driveway. A bus loading/unloading area would be provided within the reconfigured lot. A new exit-only driveway would be provided on Page Mill Road on the western end of the lot. This allows buses to return to I-280 without traveling through the neighborhood to turn around. An additional loading area can be provided along Page Mill Road fronting the park-and-ride lot if needed. The reconfigured lot would have roughly the same number of spaces as the existing lot. The cost associated with this park-and-ride lot improvement is included in the overall Concept 3 opinion of probable cost.

The community has expressed concerns regarding the existing location and heavy utilization of the Caltrans park-and-ride lot. Caltrans and VTA are encouraged to identify other park-and-ride lot locations in the I-280 corridor to relieve the overcrowding at the Page Mill Road park-and-ride lot. The community has also requested that the project team consider alternative locations for the park-and-ride lot. As it is a Caltrans-owned lot, alternative areas within Caltrans jurisdiction at the interchange were reviewed. One potential location would be the Caltrans Corporation Yard, located in the triangular area between the I-280 northbound on-ramp, I-280, and Page Mill Road. This area currently houses a Caltrans maintenance facility and a number of cellular towers. The provision of a park-and-ride lot in this area would require relocation of both facilities to alternate sites. A conceptual park-and-ride lot configuration in this area is shown in Figure 24.

This concept was developed to see how it may work with Concept 3. It has not been reviewed by Caltrans staff and the costs are not included in the opinion of probable costs for Concept 3. It can be studied further by Caltrans when funding is available to proceed into the Project Report/Environmental Document phase for the interchange improvements.

8.3. INTERIM BICYCLE IMPROVEMENTS THROUGH THE INTERCHANGE
As noted previously in the report, the current configuration of the I-280 interchange presents significant vehicle/bicycle conflicts, especially with the dual free running right turn lanes from westbound Page Mill Road to the I-280 southbound loop on-ramp. The potential interchange improvements identified in this report will likely take years to secure funding and proceed through all the necessary Caltrans studies and approval processes. Some members of the bicycling community have requested that interim improvements similar to the bicycle treatments through the I-280/Alpine Road interchange be considered. Page Mill Road experiences much higher traffic volumes than Alpine Road, making the exact bicycle treatments used on Alpine Road not feasible. However, as indicated in Recent modifications at Alpine Road include green bike lanes and signage.
FIGURE 23: PRELIMINARY CONCEPT FOR PARK-AND-RIDE LOT RECONFIGURATION OPTION
FIGURE 24: PRELIMINARY CONCEPT FOR PARK-AND-RIDE LOT RELOCATION OPTION
Chapter 8: Recommended Corridor Project

Figure 25, a number of enhanced bicycle treatments are feasible for implementation, including:

- Provision of eastbound bike lanes;
- Striping of buffered bike lanes in both directions;
- Demarcation of bike lanes with green paint, including dashed green paint in conflict areas;
- Modifications to vehicle lane alignments to clearly define areas where vehicles would yield to bicyclists; and
- Reduction in the westbound Page Mill Road to I-280 southbound on-ramp right-turn approach from two lanes to one lane, reducing the number of lanes that will need to be crossed by westbound bicyclists.

While these interim improvements would not fully address many of the existing challenges facing bicyclists traveling through the intersection, collectively they serve to increase the visibility of bicycle facilities and reduce the complexity of existing conflict points.

8.4. COYOTE HILL INTERSECTION

Median closure and signalization alternatives were evaluated for the Coyote Hill Road intersection. Based on the findings of this evaluation, discussed further in Chapter 6.1 and Appendix C, the County has identified signalization as the preferred solution. The signalization alternative provided superior Page Mill Road corridor progression, intersection operations, and vehicular connectivity. Included in the selected signalization alternative are the provision of dual northbound left-turn lanes on Coyote Hill Road and extension of the westbound left-turn pocket on Page Mill Road.
FIGURE 25: INTERIM BICYCLE IMPROVEMENT CONCEPT
9. Funding, Implementation and Phasing Plan

Table 19 below lists the Page Mill Corridor improvements with the opinion of probable costs for each improvement.

### TABLE 19: IMPROVEMENT COST ESTIMATE SUMMARY

<table>
<thead>
<tr>
<th>Improvement</th>
<th>Opinion of Probable Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interim Bicycle Improvements at the I-280 Interchange</td>
<td>$0.2 Million</td>
</tr>
<tr>
<td>I-280 Interchange Improvements</td>
<td>$19.7 Million</td>
</tr>
<tr>
<td>Widening of Page Mill Road to 6-lanes from Old Page Mill Road to Foothill Expressway</td>
<td>$17.0 Million</td>
</tr>
<tr>
<td>Provision of a Trail on the South Side of Page Mill Road between Deer Creek Roadway and the I-280 Interchange</td>
<td>$6.0 Million</td>
</tr>
<tr>
<td>Grade Separation of Foothill Expressway intersection</td>
<td>$44.2 Million to $49.3 Million¹</td>
</tr>
<tr>
<td>At-Grade Intersection Improvements between Foothill Expressway and Ramos Way</td>
<td>$2.7 Million</td>
</tr>
<tr>
<td>Intersection Improvements at El Camino Real</td>
<td>$2.4 Million</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$92.2 Million to $97.3 Million</strong></td>
</tr>
</tbody>
</table>


9.1. I-280 TO FOOTHILL EXPRESSWAY

Given the existing heavy congestion along Page Mill Road and the interchange ramps, the order in which improvements are implemented will dictate the effectiveness of those improvements. For example, modifying the I-280 interchange configuration prior to widening Page Mill Road to six lanes will simply shift the congestion from the off-ramps to Page Mill Road, further deteriorating circulation for a number of users.

There is no dedicated funding source for the improvements identified for Page Mill/I-280 interchange through to Foothill Expressway. While Caltrans has a strong interest in improving the operations of the interchange and the County and both cities have a strong interest in improving operations on Page Mill Road, funding to implement the full set of improvements has not been identified. Therefore, it is likely that the improvement concepts are to be implemented in phases, as funding is available. A phasing order has been established based on the immediacy of improvement needs while ensuring the effectiveness of the transportation network at the conclusion of each phase. The phasing is shown in Figure 26.

9.2. FOOTHILL EXPRESSWAY TO EL CAMINO REAL

These relatively simple, low cost improvements can be implemented at any time and need not be connected to the phasing strategy for improvements west of Foothill Expressway. The primary funding source for these improvements would be traffic impact fees collected by the City of Palo Alto.
Figure 26: Proposed Page Mill Road Phasing

- **Phase 1**: Widening of Page Mill Road to 3 lanes in each direction.
- **Phase 2**: Circulation improvements at the I-280 interchange and at Old Page Mill Road. Includes bicycle and pedestrian facilities.
- **Phase 3**: Grade Separation of Page Mill Road at Foothill Expressway.

Interim Improvements - Striping improvements to benefit bicycle circulation.
Chapter 9: Funding, Implementation and Phasing Plan

**INTERIM IMPROVEMENTS – BICYCLE IMPROVEMENTS THROUGH INTERCHANGE**

**Description:** Enhance the striping and markings through the I-280 interchange area for bicycle use, similar to the I-280/Alpine Road interchange treatment. Project would include reducing the number of WB lanes from three to two at the I-280 westbound on-ramp, providing for one thru lane and one lane onto the I-280 southbound loop on-ramp. Bicyclists would cross only one lane at each freeway on-ramp.

**Timing:** Implement when funding is available. Still requires further engineering design development and Caltrans review.

**PHASE 1 – WIDEN PAGE MILL ROAD**

**Description:** This phase involves widening Page Mill Expressway to six lanes between Old Page Mill Road and the Foothill Expressway-Junipero Serra Boulevard intersection to address the peak period traffic congestion and queue spillbacks from Foothill Expressway to the interchange and onto the freeway. It includes at-grade improvements at the Foothill Expressway-Junipero Serra Boulevard intersection. It also includes extending the trail on the south side of Page Mill Road from Deer Creek to the I-280 interchange.

**Timing:** When funding becomes available.

**PHASE 2 – I-280 INTERCHANGE IMPROVEMENTS**

**Description:** Provide a roundabout in place of the stop-sign controlled I-280 southbound off-ramp and re-align Arastradero Road. Reconfigure the access to Page Mill Road for Christopher Lane, Gerth Lane, and Old Page Mill Road to a new frontage road with a signalized intersection at Page Mill Road. Provide a traffic signal or a roundabout at the I-280 northbound ramps intersection. The preferred intersection control strategy for the I-280 northbound ramps intersection will be determined through a Caltrans ICE. The improvements include bicycle and pedestrian enhancements, including shared-use paths, sidewalks, and crosswalks. Reconfigure or relocate the park-and-ride lot to facilitate safe bus/shuttle circulation, pending further study of the park-and-ride lot relocation alternative.

**Timing:** Could be implemented at same time as Page Mill Road widening if enough funding is available. Otherwise, would follow Page Mill Road widening.

**PHASE 3 – GRADE SEPARATION FOR PAGE MILL ROAD/FOOTHILL EXPRESSWAY-JUNIPERO SERRA BOULEVARD INTERSECTION**

**Description:** Construct grade separation.

**Timing:** Long-term project to follow other improvements. Phase 1 (widening eastbound Page Mill Road to three lanes through the intersection) will provide short term congestion relief; however, grade separation will be required in the long term as traffic demand grows.
10. Next Steps

The Page Mill Road Expressway Corridor improvements identified in this report will be incorporated into the Expressway Plan 2040 report. It is likely that all of the Page Mill Road corridor projects will be incorporated into the Tier 1 (highest priority) list of projects, with the exception of the grade separation at Foothill Expressway-Junipero Serra Boulevard, which is likely to be a Tier 3 project.

PROJECT DEVELOPMENT

The next steps in project development vary by project. Projects located within Caltrans right-of-way (I-280 interchange and El Camino Real) require additional Caltrans studies and approvals prior to proceeding into design and environmental review. Caltrans studies and approvals can take one to three years depending on the complexity of the project. For a project as complex as the I-280 interchange modifications, Caltrans will require additional alternatives analysis building on the work conducted as part of this study.

Projects outside of Caltrans right-of-way (Page Mill Expressway widening and the various intersection improvements) can proceed into design and environmental review when funding is available. Community outreach will be an integral part of the design and environmental process.

10.1 FUNDING

The Expressway Plan 2040 does not provide funding for projects. It identifies and prioritizes improvement projects setting the stage for acquiring grants and for cities to collect traffic impact fees and/or condition developers to provide improvements.

Most of the Tier 1 projects have potential funding sources already identified for at least a portion of the project costs as indicated in Table 20 below.

<table>
<thead>
<tr>
<th>Improvement</th>
<th>Potential Funding Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interim bicycle improvements through interchange</td>
<td>VTA Bicycle Expenditure Plan – This location is listed as a Category 1 project and may be able to be fully funded from this source.</td>
</tr>
<tr>
<td>Widening of Page Mill Expressway between Old Page Mill Road and Foothill Expressway/Junipero Serra Boulevard including pedestrian/bicycle trail on the south side from I-280 to Deer Creek Road</td>
<td>No current funding sources.</td>
</tr>
<tr>
<td>I-280 Interchange improvements (both east and west side)</td>
<td>Caltrans safety improvement funds – partial funding.</td>
</tr>
<tr>
<td>Intersection improvements between Porter Drive and north of Hansen Way</td>
<td>Palo Alto Traffic Impact Fees and Development mitigations – partial to full funding.</td>
</tr>
<tr>
<td>Intersection improvements at El Camino Real</td>
<td>Palo Alto Traffic Impact Fees and Development mitigations – partial to full funding.</td>
</tr>
</tbody>
</table>

The County, working in partnership with the cities, VTA, and Caltrans, will pursue all potential funding sources to move these projects forward with implementation based on the phasing strategy.