

MEMORANDUM

Date: April 19, 2012

To: Simon Vuong, Assistant Planner, City of Cupertino

From: Franziska Church, Alexandra Sweet, and Jane Bierstedt, Fehr & Peers

Subject: *Focused Transportation Study for the Apple Cafeteria in Cupertino, California*

SJ12-1326

This memorandum documents the focused transportation study for the proposed Apple cafeteria located at 20625 Alves Drive in Cupertino, California. The Apple cafeteria (project) will have a building floor area of 21,468 square feet (s.f.), with 204 seats, and 18 employees. It includes a below-grade parking garage to accommodate 70 vehicles, plus 30 Class I and 64 Class II bicycle spaces. The cafeteria will be in operation from 7:30 AM to 5:00 PM, Monday through Friday.

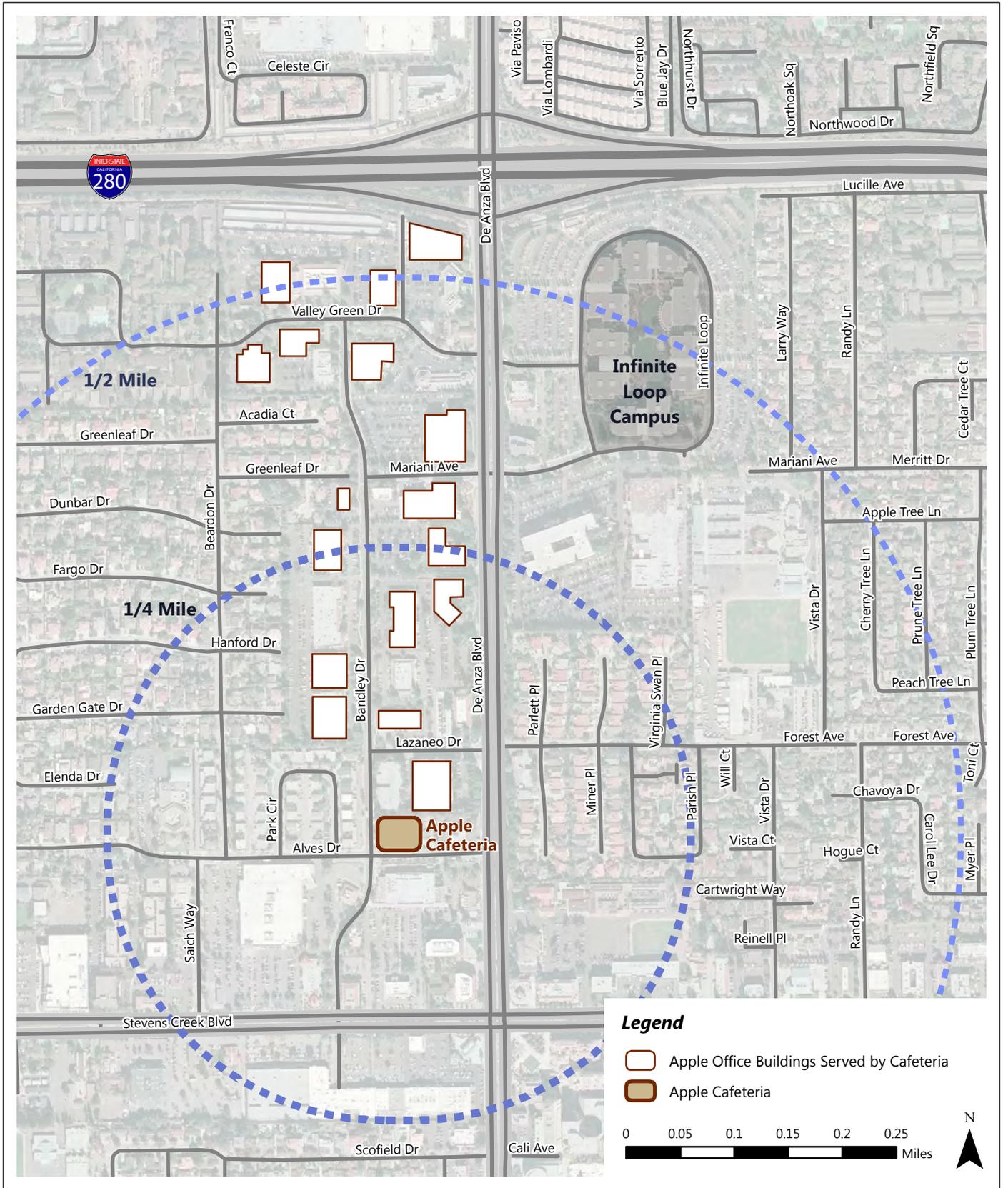
The purposes of this focused transportation analysis are to:

- 1) Prepare a trip generation analysis
- 2) Determine whether the proposed on-site parking supply is sufficient to meet the demand generated by the cafeteria
- 3) Evaluate site access for pedestrians and bicycles
- 4) Assess on-site circulation
- 5) Provide an alternatives analysis for non-apple restaurant on the site.

This memorandum summarizes our analysis approach, results, and recommendations.

PROJECT BACKGROUND

The project site is located about 0.7 miles southwest of Apple's main campus at Infinite Loop. Currently, a cafeteria in building Infinite Loop-04 serves the Apple campus, including Apple uses west of De Anza Boulevard. The proposed cafeteria will serve the approximately 2,900 Apple employees located in 17 office buildings along the half-mile stretch of Bandley Drive between Valley Green Drive to the north and Alves Drive to the south. About 30 percent of the 2,900 Apple employees are within a quarter mile, 40 percent are between a quarter mile and a half mile, and 30 percent are just over a half mile of the proposed cafeteria. See **Figure 1** for an illustration of the project site location, its surroundings, and its service area.



Although approximately 72 percent of Apple employees commute to work in an automobile, the majority are expected to walk, bike, or take a campus shuttle to travel between their buildings and the cafeteria during workdays. A local Apple shuttle system serves most of the buildings along the Bandley Drive corridor, and will also serve the proposed cafeteria. During most hours, the shuttle operates on 10-minute intervals, and has a capacity of 114 seats per hour; Apple has committed to doubling their shuttle service during the peak lunch period, and will have a capacity of 228 seats during those times. Employees also have access to the on-campus Bicycle Sharing program, which provides 140 bikes for employees to use around campus. Apple employees currently take 153 bicycle-sharing trips per day.

CAFETERIA TRIP GENERATION

The proposed Apple cafeteria will serve Apple employees exclusively. Considering the unique characteristics of the Apple cafeteria and its user-base, standard published rates would not be appropriate to use to estimate the cafeteria's trip generation; standard trip generation rates primarily assume vehicle access, which would not be congruent with the walking, biking, and shuttle travel behavior on campus. Instead, trip generation estimates were developed based on the anticipated travel characteristics of the Apple cafeteria and the surrounding transportation system and environment. Trip generation estimates using Institute of Transportation Engineers (ITE) rates are presented in the *Alternative Analysis* section of this document.

Person Trip Generation Rates

To develop vehicle trip generation estimates for the project site, the analysis first focused on person trips to capture the multi-modal access characteristics of the project. The number of person trips (the number of people who travel to the cafeteria regardless of travel mode) was estimated based on rates derived from transaction data provided by Apple in early February 2012 for the existing cafeteria at the Infinite Loop campus. A summary of the trip rates developed for this study are presented in **Table 1**.

Daily Trip Generation Rates

The daily person trip rate was developed by first dividing the average number of Infinite Loop cafeteria transactions (4,500) by the number of Infinite Loop cafeteria seats (463) or $(4,500/463 = 9.72$ daily transactions per seat). The person transaction rate is doubled to develop a trip rate; for every transaction, a person must arrive at the cafeteria and leave the cafeteria, thus creating two trips (9.72 daily transactions per seat x 2 trips = 19.44 daily person trips per seat).

Midday Peak Hour Trip Generation Rates

Based on the information provided, approximately 90 percent of Infinite Loop cafeteria transactions (4,000) occur during the lunch peak period between 11:30 AM and 2:00 PM. To be conservative, a midday lunch peak hour rate of 2,000 transactions per hour was used; thus the midday peak hour trip rates is 8.64 trips per seat (2,000 transactions x 2 trips / 463 seats = 8.64 midday trips per seat). The peak hour refers to a theoretical single hour within the 11:30 AM to 2:00 PM time frame.

AM and PM Peak Hour Trip Generation Rates

Peak hour transaction rates for the AM (6:30 AM to 9:30 AM) and PM (4:00 PM to 7:00 PM) peak periods were estimated based on remaining transactions and the cafeteria's hours of operation. Based on the information provided, only about ten percent of daily transactions (500) occur outside of the lunch period. It was assumed that approximately five percent of transactions (225) for the proposed project would occur in the AM peak hour and that two percent (90) would occur in the PM peak hour. A lower PM peak hour rate was used, since the proposed cafeteria is expected to close at 5:00 PM. Thus, the AM peak hour person trip rate is 2.20 trips per seat ($225 \text{ transactions} \times 2 \text{ trips} / 204 \text{ seats} = 2.20 \text{ trips per seat}$) and the PM peak hour rate is 0.88 trips per seat ($90 \text{ transactions} \times 2 \text{ trips} / 204 \text{ seats} = 0.88 \text{ trips per seat}$). Similar to the midday peak hour, the AM and PM peak hours refer to theoretical single hours within the respective time frames.

Person Trip Generation Estimates

The person trip generation estimates were developed based on the number of seats proposed by the project (204 seats) and the trip rates above. It was assumed that for all peak hour trips every person would arrive and leave within the same hour; or a 50-50 inbound/outbound trip split during each peak hour. Based on the analysis presented in **Table 1**, the proposed cafeteria is estimated to generate 3,966 daily trips, 449 AM peak hour trips (224 inbound and 225 outbound), 1,763 midday peak hour trips (881 inbound and outbound), and 180 PM peak hour trips (90 inbound and outbound).

Mode Split Assumptions

As discussed earlier, the majority of cafeteria patrons are expected to walk, bike, or take the shuttle from/to the surrounding Apple offices along Bandley Drive to access the cafeteria. Access mode was evaluated based on the proximity of Apple offices to the cafeteria in quarter-mile increments as illustrated on **Figure 1**. **Table 2** summarizes the mode split assumptions for employees within 0.25 miles of the cafeteria, between 0.25 and 0.50 miles, and over 0.50 miles. The percentages for each mode by distance were then averaged based on number of employees to arrive at an overall mode split for the served Apple employees. These mode split/weighted averages are listed in rows B, C, D, E, and F in **Table 1**.

The mode split assumptions outlined in **Table 2** considered the shuttle capacity, the bike share system and bike facilities, and the cafeteria's proximity to the buildings it will serve. It is assumed that the majority (14%) of driving trips would be carpool trips to the cafeteria, and with an average of three (3) employees per car. The remaining driving trips (4%) would be single occupancy vehicle trips. See **Figure 2** for an illustration of the existing bicycle facilities, and shuttle route, and shuttle stops.

Table 1: Trip Generation Estimates for Apple Cafeteria

Land Use	Units	Size	Trip Rates				Trip Estimates									
			Daily	AM Peak Hour	MID Peak Hour	PM Peak Hour	Daily	AM Peak Hour			MID Peak Hour			PM Peak Hour		
								In	Out	Total	In	Out	Total	In	Out	Total
Apple Cafeteria Person Trips																
Apple Cafeteria ¹ (A)	Seats	204	19.44	2.12	8.64	0.84	3,966	224	225	449	881	881	1,763	90	90	180
Apple Cafeteria Person Trips Mode Split																
Walking Trips (60%) (B)							-2,379	-134	-135	-269	-529	-529	-1,058	-54	-54	-108
Biking Trips (10%) (C)							-397	-22	-22	-45	-88	-88	-176	-9	-9	-18
Shuttle Trips (12%) (D)							-476	-27	-27	-54	-106	-106	-212	-11	-11	-22
Driving Trips (18%) (A-B-C-D)							714	40	40	81	159	159	317	16	16	32
Apple Employee Vehicle Carpool Trips by Vehicle (3 person/car) (14%) (E) ²							185	10	10	21	41	41	82	4	4	8
Apple Employee Single Occupancy Vehicle Trips (1 person/car) (4%) (F)							159	9	9	18	35	35	71	4	4	7
Total Vehicle Trips (E+F)							344	19	19	39	76	76	153	8	8	16
Note: 1) Trip generation estimates based on the number of transactions per seat in existing Infinite Loop 04 Caf�.																
2) Carpool trips equal 14% of Person trips (3,966 * 14% = 555) divided by 3, assuming a carpool rate of 3 persons per vehicle.																

Table 2: Mode Split Assumptions by Distance to Proposed Cafeteria

Mode	Employee Distance To Cafeteria			
	Less than 0.25 Miles	Between 0.25 and 0.50 Miles	Over 0.50 Miles	Employee Average ¹
Walk (B)	85%	60%	34%	60%
Bike (C)	5%	10%	15%	10%
Shuttle (D)	10%	10%	18%	12%
Drive	0%	20%	33%	18%
Carpool (E)	-	-	-	14%
Single Occupancy (F)	-	-	-	4%

Notes:

1. Employee Average was calculated using a weighted average based on the number of employees within each distance to the cafeteria.

Source: Fehr & Peers, April 2012.

Employee Trip Generation

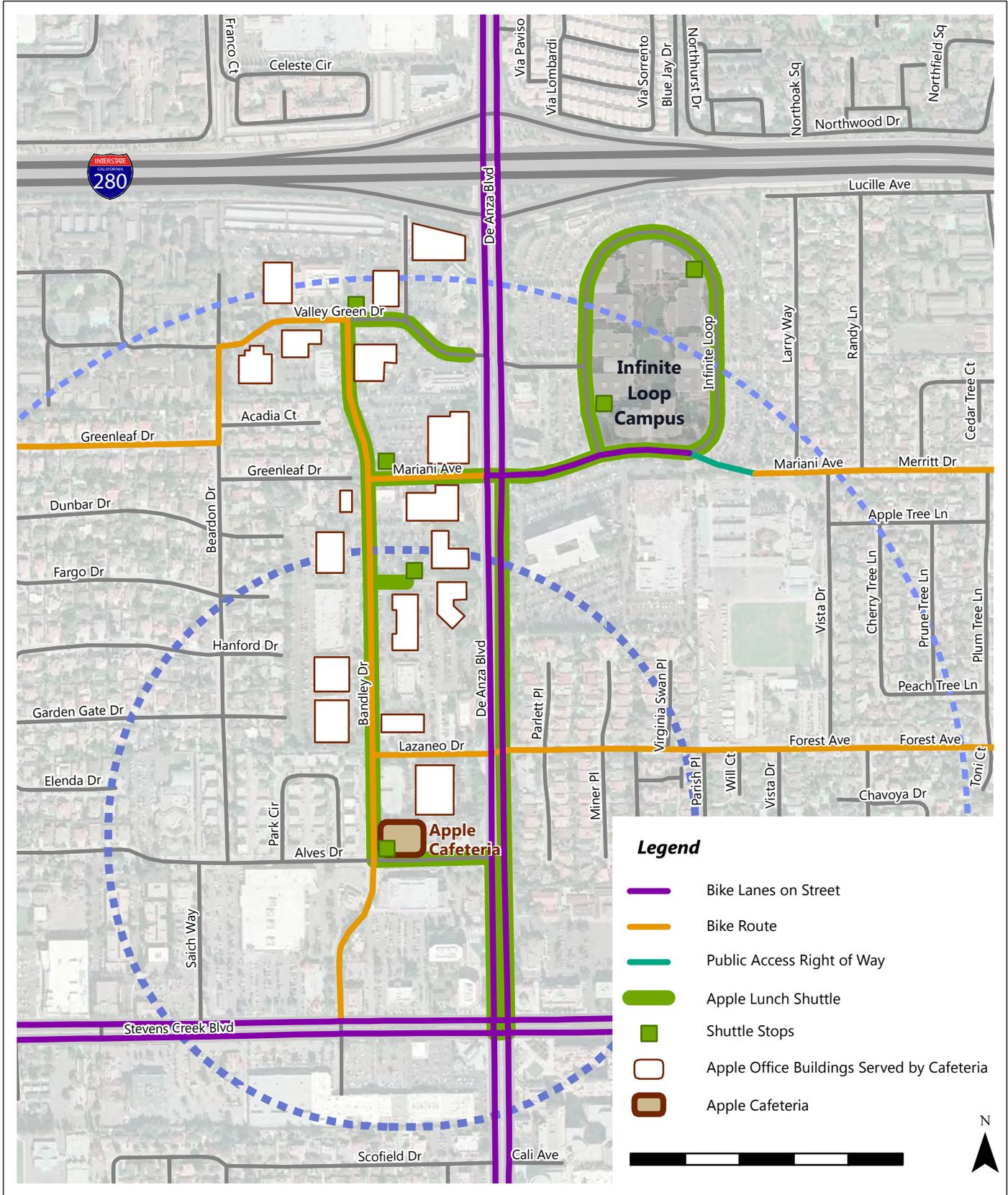
The proposed cafeteria is expected to have 18 employees in total. Based on information provided by Apple, cafeteria employees will park off-site and use the shuttle to access the site. The employees will most likely access the proposed cafeteria during the AM and PM peak hours, and shift changes would occur outside of the lunch peak period; therefore their impact on the shuttle service during the peak lunchtime hours will be negligible.

Vehicle Trip Generation Summary

After accounting for the person trip rates developed based on the existing Infinite Loop cafeteria and the mode split assumptions, the proposed cafeteria is estimated to generate 344 vehicle trips per day, including 39 AM peak hour trips, 153 lunchtime peak hour trips, and 16 PM peak hour trips.

Shuttle Trip Generation Summary

As shown in Table 2, the trip generation estimates anticipate a peak of 212 lunchtime shuttle riders. Apple has committed to providing two shuttles during the lunch peak period (11:30 AM to 2:00 PM). A second shuttle during the peak lunch period will double the hourly capacity to 228 seats, which will provide sufficient capacity for the anticipated ridership (212 riders). During non-lunch hours, the Apple circulating shuttle has an hourly capacity of 114 seats, which is sufficient to meet the cafeteria's off-peak demand.



PARKING ASSESSMENT

Vehicle Parking

The following parking assessment compares the parking proposed for the cafeteria with parking demand and supply estimates using rates provided by the City of Cupertino Municipal Code. The plan for the proposed cafeteria includes 70 parking spaces, three of which are ADA accessible spaces. **Table 3** summarizes the parking supply and requirements.

Table 3: Apple Cafeteria Parking Supply and Requirements								
Method	Land Use Type	Units	Units Size	Rate	Required Supply		Proposed Supply ²	Meet City Requirement?
City of Cupertino Municipal Code ¹	Restaurant	Seats	204	0.25	51	69	70	Yes
		Employees	18	1	18			
Notes:								
1) Cupertino Municipal Code parking estimates based on rates and equations presented in Cupertino, California Municipal Code, 19.100.040 Regulations for Off-Street Parking. Requires parking based on the number of seats provided, plus estimated number of employees.								
2) Parking proposed in the Apple Restaurant Planned Development Permit, Kier & Wright (2012)								
Source: Fehr & Peers, April 2012.								

City of Cupertino Municipal Code

The City of Cupertino Municipal Code provides parking requirements for various land uses. For the purpose of this study, the parking requirements for the proposed cafeteria were estimated using standards for a restaurant, a comparable land use for a high-turnover cafeteria. The Municipal Code requires restaurants to provide parking to accommodate 1/4 of the restaurant's seats, one parking space for each employee, and one parking space per 36 square feet of dance floor. The cafeteria will not have a dance floor so that portion is excluded from the calculations. The required parking supply was calculated by multiplying the number of proposed cafeteria seats by the seat parking rate and adding one parking space per proposed cafeteria employee ((204 cafeteria seats x 0.25 parking spaces/seat) + (18 employees * 1 parking space/employee) = 69 parking spaces). The proposed cafeteria includes 70 spaces, and therefore meets and exceeds the Municipal Code's parking requirements. Any intensification of the land use will require further traffic and parking analyses.

The City of Cupertino Municipal Code requires ADA parking to meet the requirements of the California Building Code. Section 1129B of the 2010 California Building Code requires buildings with a total number of parking spaces between 51-75 to include a minimum of three ADA accessible spaces. The proposed cafeteria includes three ADA accessible spaces closest to the elevator in the belowground parking garage, and therefore meets the city's requirements.

The majority of Apple employees are expected to walk, bike, or take the shuttle to access the cafeteria, therefore the site will have a low parking demand. The project's proposed parking supply was compared to the anticipated total vehicle trips as estimated in **Table 1**. At its lunchtime peak hour, the proposed cafeteria is expected to generate a total of 153 vehicle trips, which includes 76 inbound vehicles and 76 outbound vehicles. Since not all of the vehicles will arrive or leave at the same time, the proposed supply of 70 spaces should be sufficient to meet the parking demand. However, should the site be sold or leased to a non-Apple entity, or the seating intensity increased, the parking supply will need to be re-assessed.

Bicycle Parking

Bicycle parking is categorized as Class I or Class II. Class I facilities protect the entire bicycle from theft, vandalism, and inclement weather and are appropriate for long-term storage. Examples include bike lockers, rooms with key access, guarded parking areas, and valet/check-in parking. Class II bicycle-parking facilities include bicycle racks to which the frame and at least one wheel can be secured with a user-provided lock. Class II bicycle-parking facilities are intended for short-term parking. The facilities must be visible from within the cafeteria or at street floor level. The proposed cafeteria includes 30 Class I bicycle spaces and 64 Class II bicycle spaces. The Class I spaces are located in the below-grade garage. The Class II bicycle spaces are located at street level behind the building. The City of Cupertino Municipal Code requires restaurants to provide Class II bicycle parking facilities equal to 5 percent of the total vehicle parking supply. Accordingly, the proposed cafeteria would need 3 Class II bicycle spaces to meet requirements. The code does not require any Class I facilities for restaurant uses. The 64 proposed Class II bicycle spaces exceed the City's requirement. As discussed under trip generation, a majority of the trips accessing the site will be by walking, biking, or shuttle. Thus, the project proposes to supply bicycle-parking facilities that far exceed the City's requirements.

MULTI-MODAL SITE ACCESS

The following section summarizes the multi-modal access analysis of the Bandley Drive corridor between Valley Green Drive and Alves Drive, including the four unsignalized intersections and two mid-block crosswalks. **Figure 3** illustrates site access opportunities and constraints.

The proposed project will attract a large number of pedestrians, bicyclists, and shuttle users. Overall, Bandley Drive offers pleasant and safe conditions for both walking and biking to the proposed Apple cafeteria. Bandley Drive is a two-way, north-south street with one lane in each direction. It has a posted speed limit of 30 miles per hour (mph), with relatively low traffic volumes compared to the adjacent De Anza Boulevard. Sidewalks are provided throughout the Bandley Drive corridor and adjacent streets. There are two mid-block crosswalks on Bandley Drive, between Lazaneo Drive and Mariani Avenue. The crosswalks have high-visibility striping and pedestrian crossing signs. Bandley Drive is a designated bicycle route with posted signs. De Anza Boulevard has Class II bike lanes, which will provide sufficient access for any bicyclists coming from the Apple buildings east of De Anza Boulevard.

Considering the high volume of anticipated pedestrian traffic, a few additional geometric design treatments are recommended to improve visibility and safety for pedestrians. All of the intersections have at least one striped crosswalk; but, in anticipation of the induced pedestrian traffic, striping crosswalks on nearly all of the legs of the intersections is recommended.

High Visibility Crosswalk Treatments

Crosswalks that are uncontrolled (do not have a stop sign for yielding traffic) or anticipate a high volume of pedestrian traffic, require high-visibility crosswalk striping treatments, including Zebra or Ladder patterns, which have parallel lines and perpendicular stripes. Advanced yield lines, which are commonly called "sharks teeth," are also helpful when placed in front of high-visibility crosswalks. They indicate for cars to yield at a crosswalk when a traffic signal or stop sign is not present.

High visibility crosswalk treatments should also include a pedestrian crossing sign with an arrow indicating the location of the crosswalk. The two mid-block crosswalks on Bandle Drive (see photo on **Figure 3**) are an example high visibility striping and sign treatment.

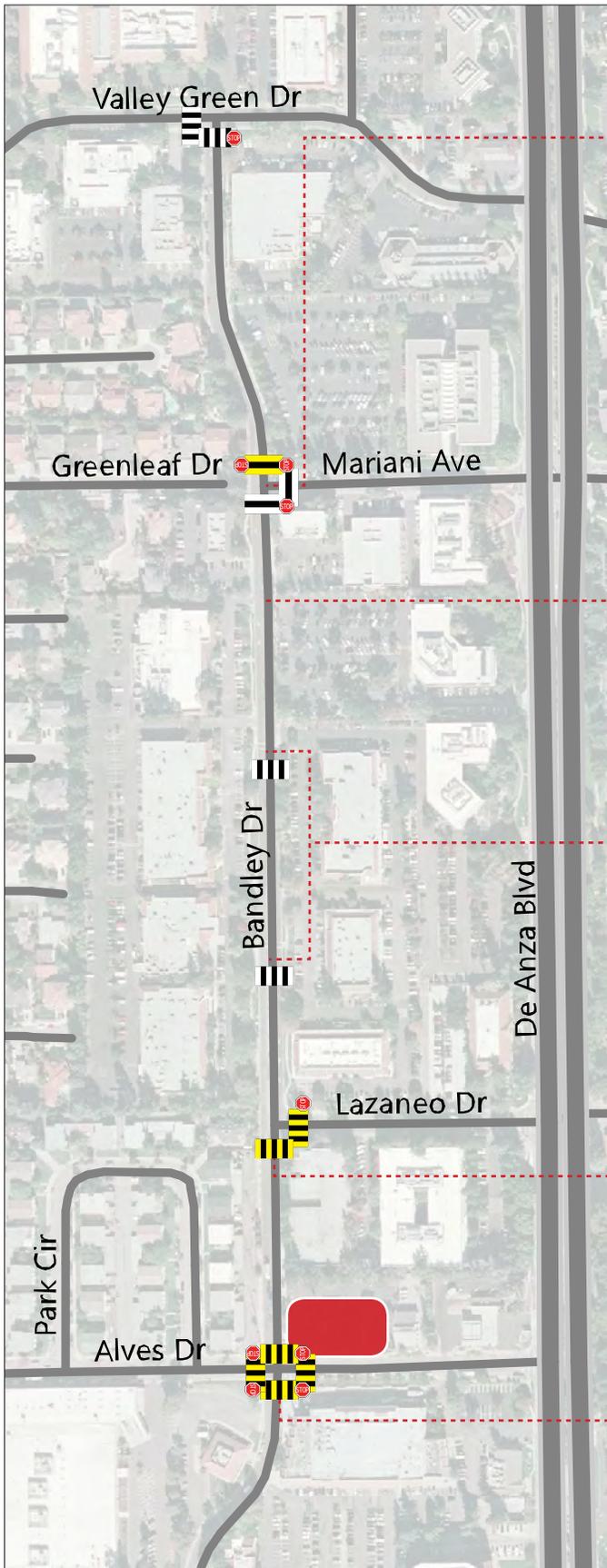
High visibility striping is recommended for all four legs of the Bandle Drive and Alves Drive intersection. High visibility striping, sharks teeth, and pedestrian crossing signs are suggested for the south side and east side of Bandle Drive and Lazaneo Drive intersection.

ON-SITE CIRCULATION ASSESSMENT

This section provides an assessment of the vehicular, pedestrian, and bicycle circulation on the cafeteria site. In general, the circulation for pedestrians is sufficient. The proposed entrances can adequately accommodate the projected pedestrian traffic. Further assessment of the vehicle and bicycle on-site circulation is described below for the belowground garage and street level.

Figure 4 illustrates on-site circulation assessment for the underground parking garage. The assessments and recommendations are listed below.

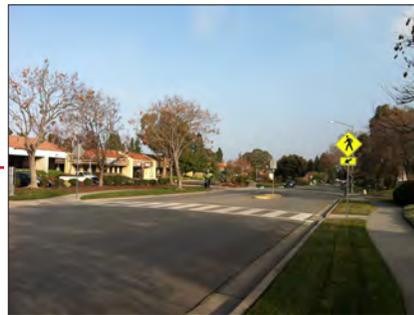
1. Add a stop bar and pavement legend to the intersection where circulating vehicles meet entering vehicles at the base of the ramp. The circulating vehicles should yield to the entering vehicles.
2. Add a stop sign, stop bar, left-turn arrow and "only" pavement legend at the base of the entrance ramp.
3. Extend the curb to the northern angled parking space and create a raised island adjacent to the exit ramp to protect it from exiting vehicles.
4. The 10'6" exit and entrance ramps may be too narrow. Consider widening the ramps by one foot, and provide a six (6) inch curb on one side and a one (1) foot curb on the other side. This design provides 10 feet of driving space and curbs, which provide a buffer between the vehicle and the concrete walls.
5. Push the northern row of parking against the garage wall to widen the circulation aisle.



Bandley Dr./Mariani Ave.
This intersection does not have a striped northside crosswalk.



Bandley Drive
Low traffic volumes and moderate travel limit (30 mph) make Bandley Drive a safe bicycle route alternative to De Anza Boulevard.



Bandley Drive
Mid-block crosswalks and yield signs provide safe crossing opportunities for pedestrians.



Bandley Dr./Lazaneo Dr.
Upgrading the southern and eastern crosswalks to high-visibility crosswalks will improve pedestrian safety.



Bandley Dr./Alves Dr.
This intersection does not have a striped northside crosswalk. All four legs should have high visibility striping treatment.

- Existing high visibility crosswalk
- Existing standard crosswalk
- Proposed high visibility crosswalk
- Proposed standard crosswalk
- Project Site
- Existing stop sign

The assessments and recommendations for the street level circulation are illustrated on **Figure 5** and listed below.

1. Post a sign at the service lane exit alert drivers of traffic exiting the garage.
2. Install a mirror adjacent to the service vehicle exit to improve visibility for drivers exiting the garage
3. Install a stop sign, STOP legend, and limit line where the service vehicle exit intersects the exit ramp.
4. Consider building a bike path along the eastern landscaped border to connect Alves Drive with the bike parking in the rear. As proposed, bicyclists may go the wrong-way down the one-way service driveway instead of biking around the block to access the bicycle parking in the rear of the building.
5. Install a sign at the garage exit that guides vehicles to the garage entrance on Bandlely Drive.
6. Consider adding a roof and additional security for the bicycle parking in the rear of the building. Hidden bike parking located a distance from the street may be more susceptible to theft. Secure and covered bicycle parking on the street level will be more attractive for long-term parking.
7. Consider adding short-term (Class II) bicycle parking near the building entrances on Bandlely Drive and Alves Drive.

ALTERNATIVES ANALYSIS

An alternatives analysis was conducted to anticipate changes should the building become a non-Apple establishment.

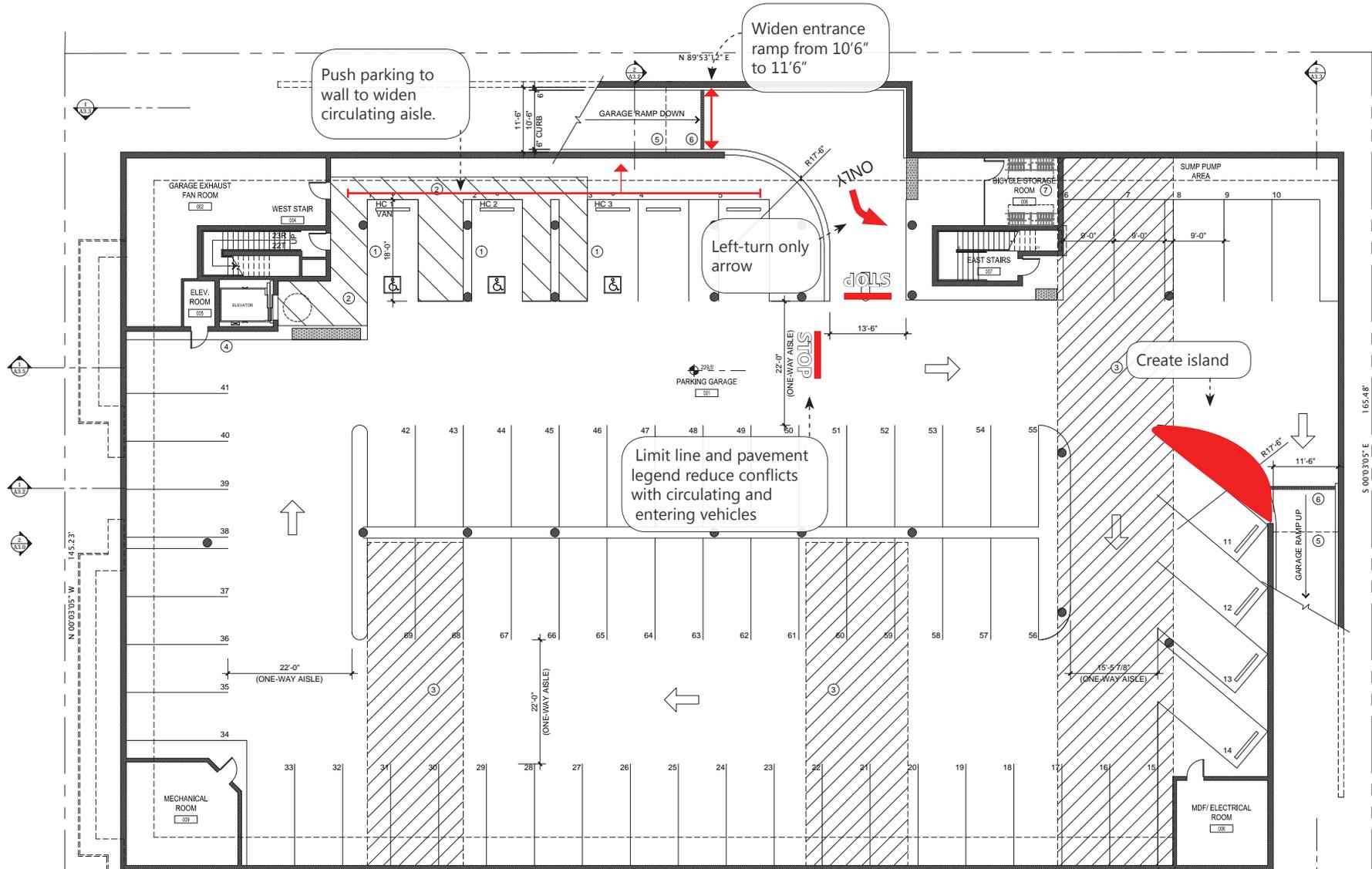
Traffic Impacts

The proposed cafeteria will not have any impacts on the surrounding traffic intersections. However, any intensification of the land use may require further traffic study.

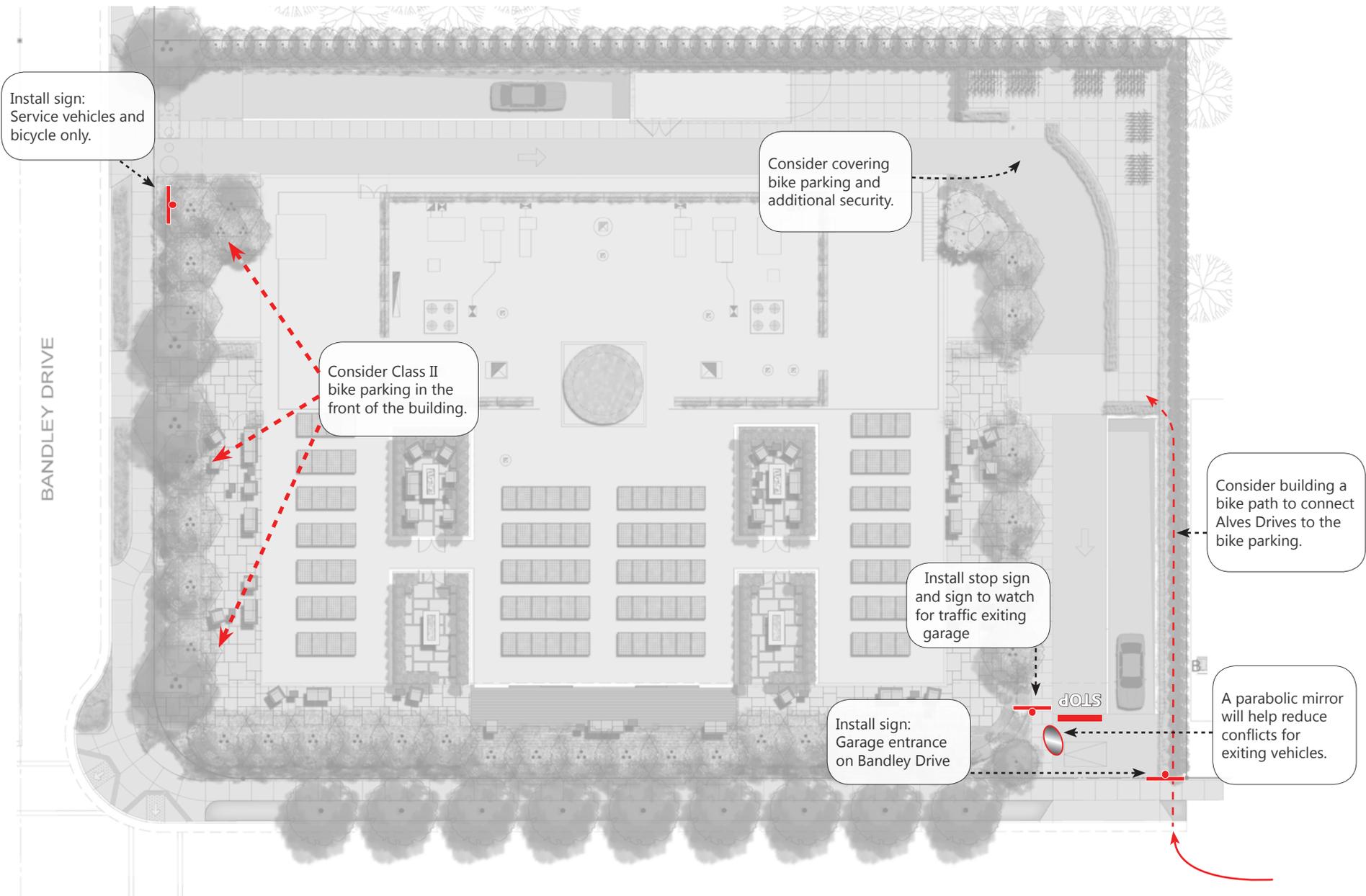
Recent data from LOS studies completed in the area indicate that the following four (4) intersections would be most heavily impacted by additional traffic in the area.

1. Stevens Creek Boulevard/Stelling Road (LOS E+)
2. Homestead Road/De Anza Boulevard/Saratoga-Sunnyvale Road (LOS E)
3. De Anza Boulevard/McClellan Road (LOS E+)
4. Stevens Creek Boulevard/De Anza Boulevard (LOS E+)

Based on the generation and distribution of trips to the proposed restaurant, the intersection of Stevens Creek Boulevard/De Anza Boulevard is the intersection most likely to be impacted by the change in land use and would need to be evaluated in the future if ownership of the project site changes.



- KEY NOTES**
- ① ACCESSIBLE PARKING STALL
 - ② ACCESSIBLE ROUTE - MAINTAIN 4'-0" MIN. CLR.
 - ③ MAINTAIN 88" MIN. CLEARANCE FOR ADA VAN ACCESS UNDER COURTYARDS ABOVE
 - ④ GARAGE EXHAUST DUCT ABOVE
 - ⑤ ROLL DOWN SECURITY GATE ABOVE
 - ⑥ TRENCH DRAIN AT BOTTOM OF RAMP
 - ⑦ CLASS I ENCLOSED CAGE BICYCLE STORAGE ROOM - 30 SPACES



Parking Assessment

The proposed cafeteria meets the City's Municipal Code parking requirements; however, any intensification of the land use will require further traffic and parking analyses.

CONCLUSIONS

This memorandum documents the focused transportation study for the proposed Apple cafeteria located at 20625 Alves Drive in Cupertino, California. The cafeteria is expected to produce 3,966 daily person trips, of which approximately 60 percent will be walking, 10 percent biking, 12 percent taken by shuttle, and 18 percent by private vehicle. Based on the trip generation analysis, the project is not expected to have significant intersection impacts at the surrounding intersections with the proposed uses.

The proposed cafeteria has 70 parking spaces, which meets the City of Cupertino's Municipal Code, and will accommodate parking for Apple employees.

The proposed cafeteria has, in general, sufficient on-site circulation. Recommendations include widening the exit ramp lane to provide additional buffer between vehicles and concrete wall, adding wayfinding signs on the street level and in the below grade parking garage for circulating vehicles, adding a bicycle entrance to the service vehicle exit, and adding additional bicycle parking at the entrances, as mentioned above.

In anticipation of the induced pedestrian activity, additional standard and high-visibility crosswalk striping should be considered at all non-striped crosswalks, including controlled and uncontrolled intersections.

In the future, if the number of seats increase or if the cafeteria becomes a restaurant open to the public, it is recommended that the project site's trip generation, as well as potential intersection and parking impacts, be re-evaluated.