Appendix E

Transportation Impact Analysis

Hexagon Transportation Consultants, Inc.

Memorandum

Date: February 15, 2024

To: Ms. Emily Foley, AICP
City of Palo Alto

From: Eric Tse, P.E., PTOE

Subject: Transportation Impact Analysis for Mixed-Use Development at 660 University Avenue in Palo Alto, CA

Introduction

Hexagon Transportation Consultants, Inc. has completed this transportation impact analysis for the proposed mixed-use development at 660 University Avenue in Palo Alto, California (see Figure 1). The project would demolish the existing buildings (9,216 SF Office) and parking lots for the construction of a new four-story building with ground floor office (9,115 SF) and multi-family residential on all floors above. There are 63 planned residential units, of which 20 percent (13 units) will be affordable and inclusionary across the three income levels. Access to the underground parking garage would be provided from Byron Street.

Scope of Study

Senate Bill (SB) 743 has changed the primary metric for identifying transportation impacts under the California Environmental Quality Act (CEQA) from vehicle level of service (LOS) to daily vehicle miles travelled (VMT). A VMT analysis was conducted to assess the potential impacts caused by the proposed project. The study also includes an analysis of site access and circulation, as well as a qualitative analysis of the project's effect on bicycle, pedestrian and transit facilities.

Because the project is expected to generate fewer than 50 net AM or PM peak hour trips, an offsite intersection level of service analysis was not required as per the City of Palo Alto's LOS Policy.

Vehicle Miles Traveled (VMT) Analysis

The evaluation of VMT for this project is based on the City's VMT Policy adopted in June 2020.

The Palo Alto VMT Policy establishes screening criteria for projects that are expected to cause a less-than-significant transportation impact under CEQA based on the land use and/or location. Projects that meet the screening criteria are not required to prepare further VMT analysis. For a project that does not meet the screening criteria, a project's VMT impact is determined by comparing the project VMT to the appropriate thresholds of significance based on the type of development.

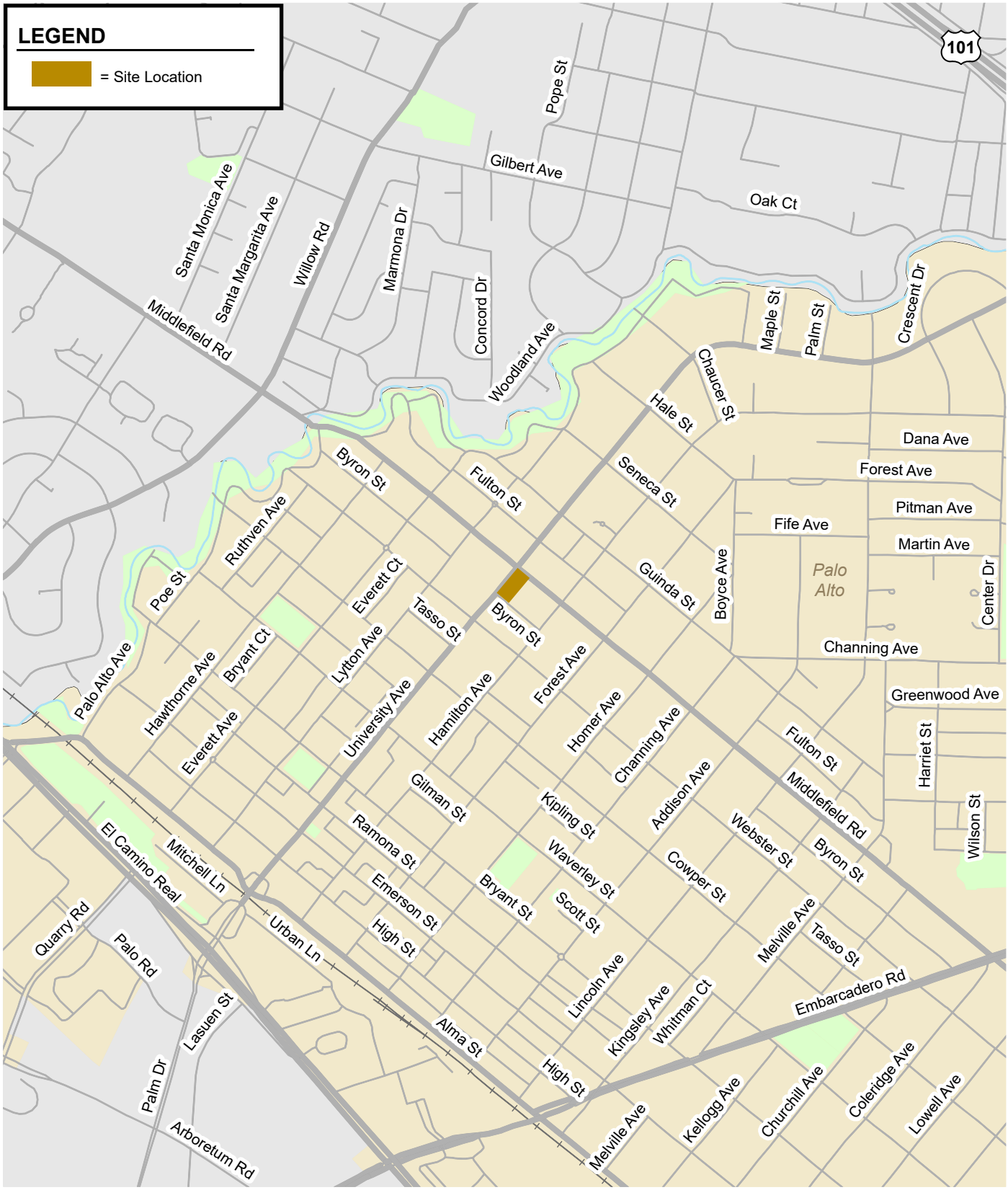


Figure 1
Site Location

NORTH
Not to Scale

The project would not meet all applicable VMT screening criteria as per the City VMT Policy for all the project components. Therefore, a VMT analysis was conducted using the Santa Clara Countywide VMT Evaluation Tool that evaluates the project's CEQA impact on VMT and is described below.

According to the City TIA Guidelines, the impact threshold for the residential project component is 15 percent below the County home-based VMT per resident. The County average daily VMT for residential uses is 13.33 per resident. Therefore, the impact threshold for residential uses is 11.33 (13.33 x 0.85) daily VMT per resident.

The project is located in a TAZ (Transportation Analysis Zone) where the daily VMT per County resident is 9.39, which is below the threshold of 11.33. Therefore, the project would have less-than-significant VMT impact for the residential component. The residential VMT calculation sheets for the proposed project from the Santa Clara Countywide VMT Evaluation Tool are included in Appendix A.

For the office component, because of a net reduction of office space from 9,216 SF to 9,115 SF under project conditions, there would be a net decrease in VMT. Therefore, the office component would have a less-than-significant VMT impact.

Existing Transportation Setting

Regional access to the project site is provided by US 101. Local access to the project site is provided via University Avenue and Middlefield Road.

For the purposes of this study, US 101 is considered to run north-south, as are the parallel streets: Middlefield Road, Byron Street, Guinda Street, and Webster Street. University Avenue is considered to run east-west.

US 101 is a north-south freeway that extends through and beyond the Bay Area, connecting San Francisco to San Jose. US 101 is ten lanes wide with three mixed-flow lanes and two high-occupancy vehicle (HOV) lanes in each direction in the vicinity of the project site. US 101 provides access to the study area via the interchange at University Avenue.

Middlefield Road is a north-south arterial that runs parallel to US 101. It begins at the intersection of Central Expressway in Mountain View and traverses through Redwood City. Within the vicinity of the project site, Middlefield Road is four lanes wide, with sidewalks on both sides of the street. It has a posted speed limit of 25 mph. There are no bike facilities on Middlefield Road, and on-street parking is prohibited on both sides of Middlefield Road in the project vicinity. Middlefield Road runs along the eastern boundary of the project site.

University Avenue is an east-west arterial that begins east at State Route 84 and extends west, passing the interchange at US 101, towards the intersection with El Camino Real, at which point it transitions to Palm Drive. University Avenue has one lane in each direction except between Fulton Street and Middlefield Road where it has two lanes in the westbound direction. In the project vicinity, sidewalks are present on both sides of the street. University Avenue has a posted speed limit of 25 mph. On-street parking is prohibited between Fulton Street and Byron Street, which includes the project frontage. There are Class II bike lanes on University Avenue to the east of Fulton Street.

Lytton Avenue is an east-west residential street that extends eastward from Alma Street and terminates at Palo Alto Avenue. Lytton Avenue has one lane in each direction in the project vicinity. Lytton Avenue has a posted speed limit of 25 mph. In the project vicinity, sidewalks are present on both sides of the street. There are no existing bike facilities on

Lytton Avenue except west of Tasso Street. On-street parking is prohibited in the project vicinity, except east of Middlefield Road.

Hamilton Avenue is an east-west residential street that extends eastward from Alma Street and terminates at Greer Road. Hamilton Avenue has one lane in each direction in the project vicinity. Hamilton Avenue has a posted speed limit of 25 mph. In the project vicinity, sidewalks are present on both sides of the street. There are no existing bike facilities on Hamilton Avenue, and on-street parking is allowed in the project vicinity.

Byron Street is a north-south street that extends between University Avenue to the north and Hamilton Avenue to the south. Byron Street has a prima facie speed limit of 25 mph. Sidewalks are present on both sides of the street. There are no existing bike facilities on Byron Street. On-street parking is permitted on both sides of the street. Byron Street runs along the western boundary of the project site and provides direct access to the site via one full access driveway.

Guinda Street is a north-south residential street that extends southward from Palo Alto Avenue to Melville Avenue. Guinda Street has a prima facie speed limit of 25 mph. In the project vicinity, sidewalks are present on both sides of the street. There are no existing bike facilities on Guinda Street. On-street parking is permitted on both sides of the street.

Webster Street is a north-south residential street that extends southward from Palo Alto Avenue to Oregon Expressway. Webster Street has a prima facie speed limit of 25 mph. In the project vicinity, sidewalks are present on both sides of the street. There are no existing bike facilities on Webster Street. On-street parking is permitted on both sides of the street.

Bicycle and Pedestrian Facilities

There are no bike lanes on University Avenue along the project frontage. Bike lanes exist east of Fulton Street. According to the City of Palo Alto Pedestrian and Bicycle Master Plan, the City envisions installing Class III bike routes on Middlefield Road, Webster Street, and on University Avenue west of Fulton Street. Class II bike lanes are also planned on Lytton Avenue between Fulton Street and Alma Street.

Existing pedestrian facilities in the project area consist of sidewalks and crosswalks found along all previously-described roadways near the site. All intersections have pedestrian crosswalks and curb ramps. All signalized intersections have pedestrian-actuated signals.

Transit service

Existing transit service in the project vicinity is provided primarily by SamTrans and the Dumbarton Express bus service. The transit services are described in Table 1. All transit services described in Table 1 stop within walking distance of the project site.

Commuter rail service between San Francisco and Gilroy is provided by Caltrain. The project site is located approximately 0.6 miles northeast of the Palo Alto Caltrain station. Caltrain provides service with approximately 20- to 30-minute headways during the weekday AM and PM commute hours and 60-minute headways midday, at nights and on weekends. Sidewalks exist on the route between the project site and the Caltrain station. All the bus routes described in Table 1 also provide connection between the project site and the Caltrain station.

Table 1
Existing Transit Facilities

Bus Route	Route Description	Bus Stop Location	Within Project Vicinity	Weekday		Weekend
				Operating Hours	Headway [1]	Service Provided?
Route 280	Stanford Shopping Center to Purdue Avenue/Fordham Street	At University Avenue and Middlefield Road	University Avenue, Webster Street, Lytton Avenue	5:40 AM - 9:25 PM	60 min	Yes 60-min headways
Route 281	Stanford Shopping Center to Onetta Harris Center	At University Avenue and Middlefield Road	University Avenue, Webster Street, Lytton Avenue	6:00 AM - 10:31 PM	30 min	Yes 30-min headways
Route 296	Redwood City Transit Center to Bayshore/Donohoe	At University Avenue and Middlefield Road	University Avenue, Webster Street, Lytton Avenue	6:30 AM - 1:30 AM	30 min	No
Route 397	San Francisco to Palo Alto Transit Center	At University Avenue and Middlefield Road	University Avenue, Webster Street, Lytton Avenue	12:46 AM - 4:54 AM	60 min	Yes 60-min headways
DumbartonExpress (DB)	Stanford University to Union City BART Station	At University Avenue and Byron Street	Unversity Avenue, Middlefield Road, Lytton Avenue	5:25 AM - 8:46 PM	30 min	No

Notes:
1. Approximate headways during peak commute periods.

Project Traffic Estimates

Through empirical research, data have been collected that quantify the amount of traffic produced by many types of land uses. This research is compiled in the *Trip Generation Manual, 11th Edition* published by the Institute of Transportation Engineers (ITE). The magnitude of traffic added to the roadway system by a particular development is estimated by multiplying the applicable trip generation rates by the size of the development. The rates published for Multi-family Housing (Mid-rise) (Land Use 221) and Small Office (Land Use 712) were used to estimate the vehicle trips generated by the proposed project (see Table 2). Mid-rise multifamily housing includes apartments and condominiums located in a building that has four to 10 floors of living space. A small office building is defined as a general office building but with less than or equal to 10,000 square feet of gross floor area. Trips generated by the current office building use were estimated using ITE trip generation rates and then subtracted from the total project trips to estimate the net new trips generated by the project. Based on ITE rates and after applying the trip credits due to existing use, the proposed project is estimated to generate a total of 284 net daily trips, with net 23 and 25 project trips occurring during the AM and PM peak hours, respectively.

Table 2
Project Trip Generation Estimates

Land Use	Size		Daily Rate	Daily Trips	AM Peak Hour Pk-Hr Rate	AM In	AM Out	AM Total	PM Peak Hour Pk-Hr Rate	PM In	PM Out	PM Total
Proposed Use												
Multi Family Housing (Mid-Rise) [1]	63	du	4.54	286	0.37	5	18	23	0.39	15	10	25
Small Office Building [2]	9,115	sf	14.39	131	1.67	12	3	15	2.16	7	13	20
Subtotal				417		17	21	38		22	23	45
Existing Use												
Small Office Building [2]	9,216	sf	14.39	-133	1.67	-12	-3	-15	2.16	-7	-13	-20
Net New Trips:				**284**		**5**	**18**	**23**		**15**	**10**	**25**

Notes:
[1] Trip generation based on average rates contained in the *ITE Trip Generation Manual, 11th Edition* , for Multifamily Housing (Mid-Rise) (Land Use Code 221). Average rates were used.
[2] Trip generation based on average rates contained in the *ITE Trip Generation Manual, 11th Edition* , for Small Office Building (Land Use Code 712). Average rates were used.

Site Access and On-Site Circulation

This section describes the site access and on-site circulation for the proposed project. This review is based on the project site plan dated December 1, 2021 (See Figures 2 through 4).

Site Access and Project Driveway

Access to the project site would be provided via one full access driveway on Byron Street, approximately 100 feet south of University Avenue. The site driveway is projected to accommodate 38 AM (17 inbound/21 outbound) and 45 PM (22 inbound/23 outbound) peak hour trips.

The width of the ramp between the driveway opening on Byron Street and the garage entrance is shown to be 22 feet, which meets the City Code Standards. Based on a turning template analysis using a standard passenger vehicle, the 90-degree turn between the driveway opening on Byron Street and the garage entrance is wide enough to accommodate simultaneous turning movements of inbound and outbound vehicles.

Per City municipal code standards, a distance of 5 feet shall be maintained at the same slope as the sidewalk from the back edge of the sidewalk to the starting point of the ramp into the garage. Its purpose is to allow exiting vehicles to be able to see approaching pedestrians on the sidewalk. The project will provide a 5-foot landing for the garage ramp approaching the sidewalk on Byron Street.

The sight distance at the project driveway was checked and determined to be adequate. On-street parking is permitted on both sides of Byron Street along the project frontage. There is an existing driveway to the immediate south of the proposed project driveway on Byron Street, which would provide adequate visibility of northbound traffic on Byron Street for vehicles exiting the project site. Vehicles leaving the project site would egress in two stages. First, vehicles would stop at back of the sidewalk to look for pedestrians on the sidewalk, and then pull forward into the parking lane to assess gaps in traffic.

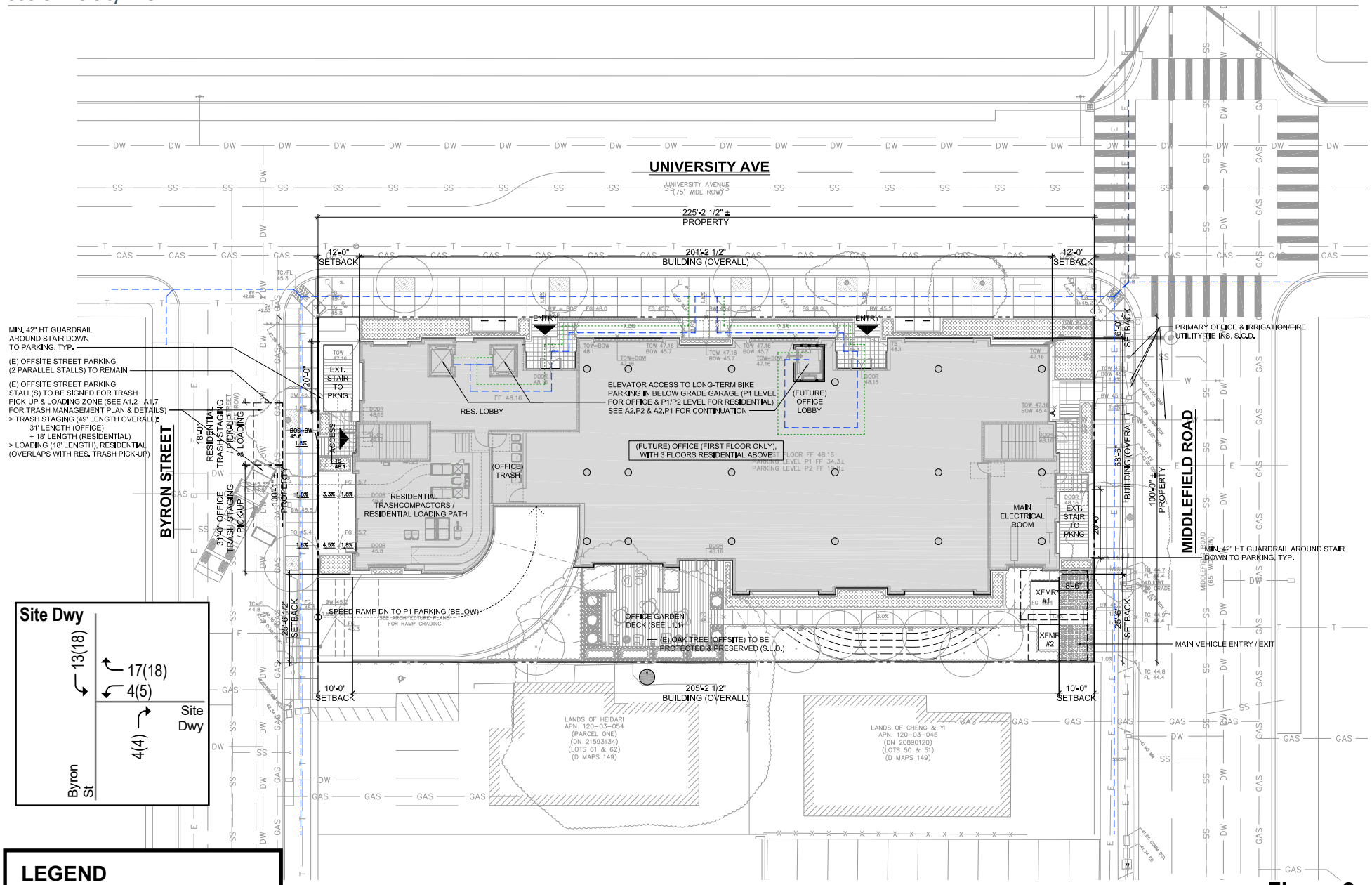


Figure 2
Project Site Plan (Ground Floor)

NORTH
Not to Scale

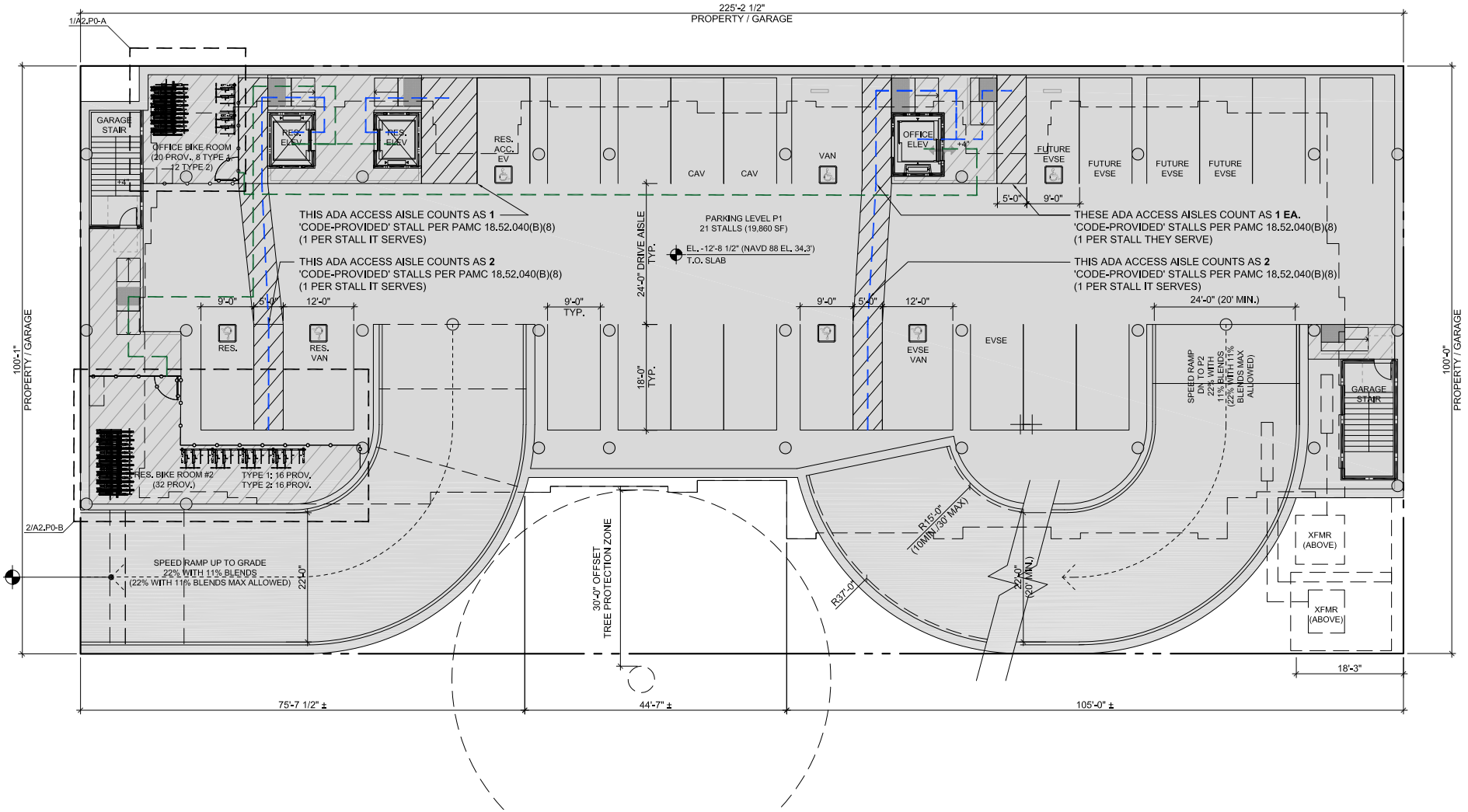


Figure 3
Project Site Plan (Below Grade Parking Level P1)

NORTH
Not to Scale

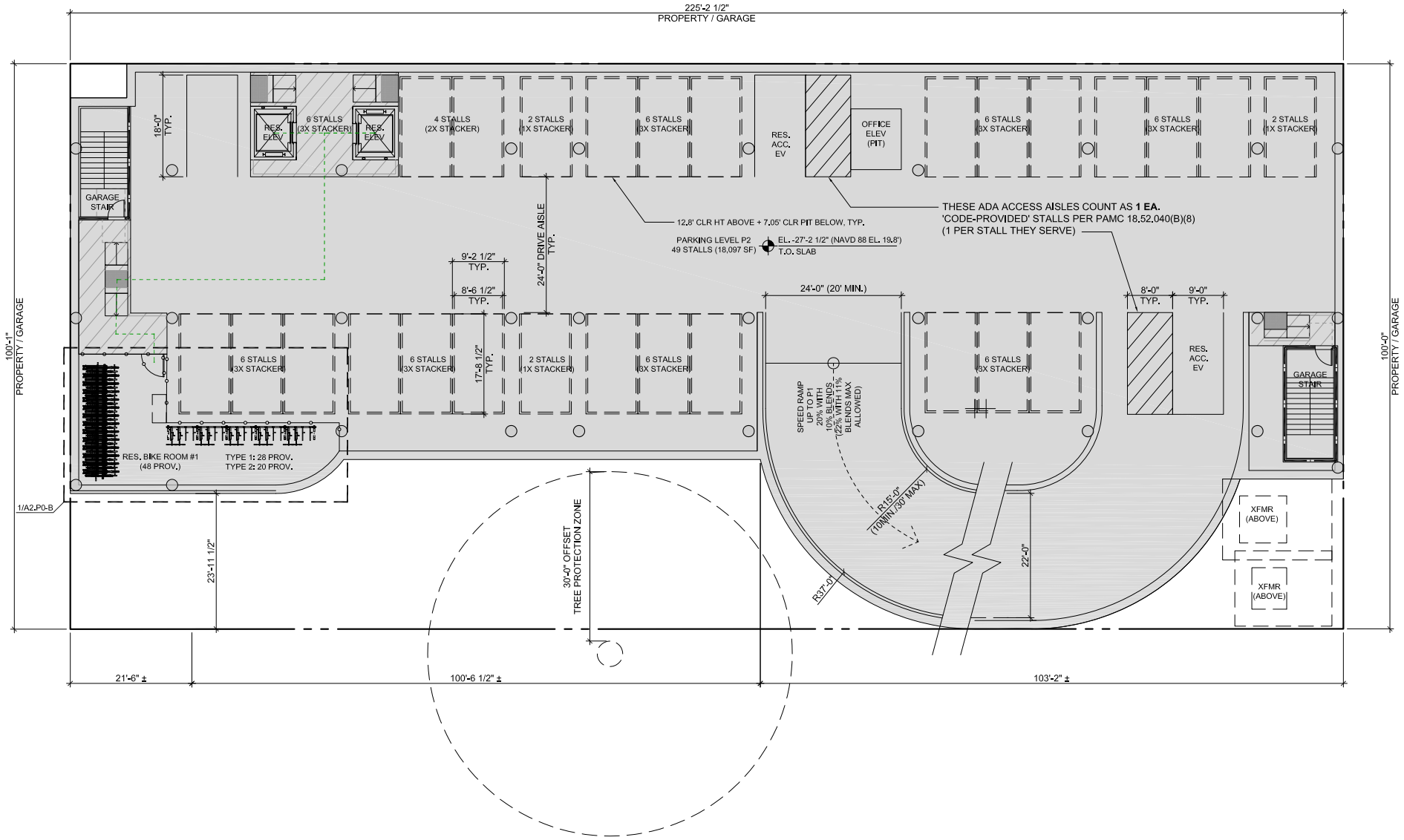


Figure 4
Project Site Plan (Below Grade Parking Level P2)

NORTH
Not to Scale

On-Site Circulation

The onsite circulation was reviewed in accordance with generally accepted traffic engineering standards.

The project site plan includes an underground parking garage with two levels (P1 and P2). The parking garage would be accessed by the driveway on Byron Street. The parking garage follows a standard 90-degree parking layout. The parking aisles are 24 feet wide, which meets the City's standard for 90-degree parking. The dimensions of the regular parking spaces are 9 feet by 18 feet, which meet the minimum City standards.

Upon entering the project property from the site driveway, vehicles would start descending into the P1 level of the parking garage along the main drive aisle and then make a 90-degree left hand turn before entering the parking garage. Parking at P1 primarily would be reserved for office use except for three ADA parking spaces reserved for residential use across from and adjacent to the residential elevators. At the P1 parking level, vehicles would park on either side of the drive aisle or continue straight along the main drive aisle and descend to the lowest level (P2 parking level). At the P1 level, the parking aisle would terminate at both ends but with a space designed for vehicle turnarounds.

Parking at P2 would be reserved for residents and would be provided by a 2-level "stacker" parking lift systems with a pit. The parking lift system would increase the capacity of onsite parking by stacking the parked vehicles vertically and would allow independent access to vehicles. The site plan shows that the parking lift system would have a clearance height of 12.8 feet above and 7.05 feet clearance pit below. The proposed dimensions would accommodate 90% of SUVs and taller SUVs can park on the top. Similar to the P1 level, the parking aisle would terminate at both ends but space would be provided for vehicle turnarounds.

The site plan shows the grades of the parking ramps would vary between 10% and 22%, which meet the maximum allowable grade of 22% as required by the City municipal code. The vertical clearance of the garage ramps is not shown.

> **Recommendation #1:** Because the site plan does not specify the vertical clearance of the garage ramps, the design and layout of the parking ramps should be reviewed by Public Works staff prior to final design.

There are altogether 78 parking spaces provided in the project parking garage: 23 spaces (15 standard office spaces, and 7 ADA parking spaces (4 spaces for office use and 3 spaces for residential use)) on the P1 level and 55 spaces (52 spaces via parking stackers and 3 regular parking spaces) on the P2 level. Accessible parking spaces would be located near the elevators on the P1 parking level with clearly marked pathways. Detailed discussion of onsite parking is included in the subsequent "Parking" section.

The site plan shows that the existing parking zone along the project frontage on Byron Street will be designated for an onsite loading area for passengers, delivery and garbage trucks. A trash collection room is shown at ground level near the Byron Street project frontage. A trash lift is shown adjacent to the trash room that would allow trash to be transported from different floors of the building. Because garbage trucks would not be able to enter the parking garage, trash bins would have to be wheeled out to the curbside along Byron Street where garbage trucks would perform their operations on the street.

Pedestrian access to the project site would be provided at locations along the frontages on University Avenue, Middlefield Road, and Byron Street. There would be a total of four entry doors for the development on the ground floor: two entry doors on the University Avenue frontage, each of which would provide dedicated access to the residential and the office lobbies, and two other entry doors that would provide access to the building staircases fronting

Middlefield Road and Byron Street. All entry doors would be connected to existing sidewalks on University Avenue, Middlefield Road, and Byron Street.

Pedestrian circulation within the site would provide adequate connectivity between the vehicle parking, off-site pedestrian facilities, and on-site amenities. There are two stairwells and three elevators shown on the site plan, with access to the front lobby and parking garage.

Parking

Parking requirements are included in the City of Palo Alto Parking Ordinance (18.52.040) as discussed below.

Multi-family Residential

- Studio – one space per unit.
- One-bedroom unit - one space per unit.
- Two-bedroom unit - two spaces per unit.

Office

- One space per 250 sq.ft. of gross floor area.

The proposed project has a total of 63 dwelling units including 48 studios, 12 one-bedroom units, and 3 two-bedroom units. Based on these requirements, the project would be required to provide 66 parking spaces. For the 9,115 sq.ft. office component, the project would be required to provide 37 parking spaces. Altogether, the project would be required to provide a total of 103 parking spaces. According to the municipal code, the number of required automobile parking spaces may be adjusted by the director in the following instances and in accordance with the prescribed limitations in Table 4, Section 18.52.050 of the municipal code.

- Housing Near Transit Facilites – Given the project's location and its proximity to bus stops (served by SamTrans Routes 280, 281 and 397 and the Dumbarton Express) and the Caltrain station (0.6 mile from the project site), it is expected that many residents would use public transportation and would not need to own a car for transportation.
- Transportation and Parking Alternatives – The project will implement a comprehensive TDM program to encourage residents to use alternative modes of transportation.
- Affordable Housing – 20% (13 units) of the 63 planned residential units will be affordable and inclusionary across three income levels (4 very-low-income, 4 low-income, and 5 moderate-income housing units).
- Combined Parking Adjustments – Parking reductions may be granted for the combination of the above circumstances (maximum 30% reduction of the total parking demand).

Based on the site plan, the proposed number of parking spaces is 78 (23 spaces in P1 level and 55 spaces in P2 level), 25% less than the required number of spaces and is within the maximum reduction allowed (30% for combined parking adjustments).

The City parking code specifies a long-term bike parking requirement of 1 space per dwelling unit and 1 space per 2,500 square feet for office space (80% for long term bike parking and 20% for short term bike parking). Therefore, 63 long term bike spaces would be needed for the residential component and 3 long term bike spaces and 1 short term bike space for the office component. The project site plan shows 80 long term bicycle spaces (60 for residential and 20 for office) in two bicycle storage rooms on the P1 and P2 parking levels and 8 short term bicycle spaces adjacent to the sidewalk near the main residential and office lobbies. Therefore, the project's long-term and short-term bicycle parking provision would meet the City's parking code standards.

Impacts to Transit, Bikes, and Pedestrians

According to the VTA Congestion Management Program (CMP) Transportation Impact Analysis Technical Guidelines, a project would create an adverse effect on pedestrian and bike circulation if: (1) its vehicle trips would present a barrier to bikes/pedestrians safely crossing roadways, or (2) it would reduce or sever existing or planned bike/pedestrian circulation in the area.

The proposed project would generate pedestrian trips to and from transit stops and commercial areas in the project vicinity. As described previously, all of the streets in the project vicinity have sidewalks and crosswalks at intersections. Existing observations on University Avenue and Middlefield Road showed light pedestrian and bicycle activity in the area. Overall, the volume of pedestrian trips generated by the project is not expected to exceed the carrying capacity of the sidewalks and crosswalks in the vicinity of the site, and the existing pedestrian and bicycle facilities provide adequate access to the project site.

The addition of the project would not remove any existing bike/pedestrian facilities, nor would it preclude any future planned improvements. The addition of project traffic would have a negligible effect on walking and biking in the project vicinity. In addition, the project would improve pedestrian safety by removing the two driveways on University Avenue and one driveway on Middlefield Road. Therefore, based on the CMP criteria, the proposed project would not create an adverse effect to bike/pedestrian circulation in the area.

According to the VTA CMP Transportation Impact Analysis Technical Guidelines, a project would create an adverse effect on transit service if it: (1) causes vehicular congestion that would significantly degrade transit operations, (2) cause a ridership increase that would exceed existing transit capacity, or (3) conflict with existing transit service plans or preclude future transit service to the project area.

Existing bus service in the project vicinity is provided by SamTrans. According to the U.S. Census data for Palo Alto, approximately five (5) percent of the proposed project's commuters could be expected to use transit to and from the project site. For the proposed project, this would equate to approximately 2 new transit trips during the AM and PM peak hours, respectively. Based on field observations, this volume of riders generated by the project would not exceed the carrying capacity of the existing bus service near the project site. No improvements to existing bus service frequencies would be necessary in conjunction with the proposed project. In addition, the project would not conflict with any existing transit facilities, create significant congestion for buses, nor preclude any future transit service to the area. Therefore, the proposed project would not cause a significant impact to transit operations in the study area.

Conclusions

The impacts of the proposed project were evaluated in accordance with the procedures and guidelines specified by the City of Palo Alto. The analysis resulted in the following key findings:

- Based on the City of Palo Alto VMT Policy, the project would have less-than-significant VMT impact for its residential and office components.
- The project would not create any impacts on pedestrian, bike, or transit facilities.

The analysis also produced the following recommendation:

1. Because the site plan does not specify the vertical clearance of the garage ramps, the design and layout of the parking ramps should be reviewed by Public Works staff prior to final design.

Appendix A

Santa Clara Countywide VMT Evaluation Tool
Residential VMT Worksheets

Santa Clara Countywide VMT Evaluation Tool - Version 2 - Report

Project Details

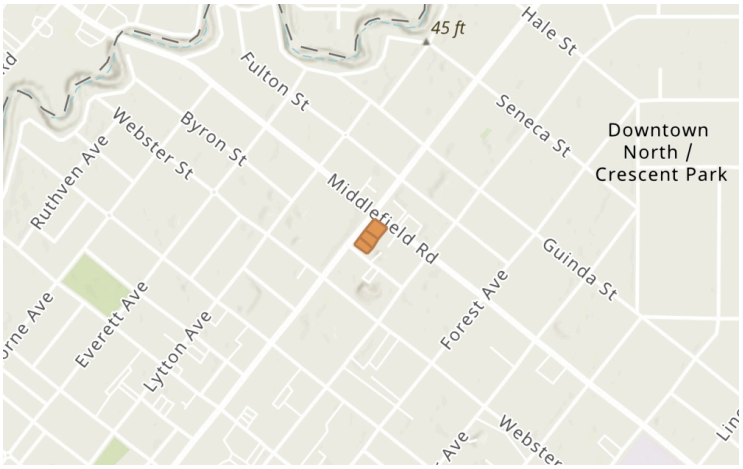
Timestamp of Analysis	April 21, 2022, 01:17:00 PM
Project Name	660 University Ave
Project Description	Proposed 70 Residential unitsRemoved 9,115 SF Office

Project Location Map

Jurisdiction:

Palo Alto

APN	TAZ
12003043	437
12003044	437
12003042	437



Analysis Details

Data Version	VTA Countywide Model December 2019
Analysis Methodology	TAZ
Baseline Year	2021

Project Land Use

Residential:

Single Family DU:

Multifamily DU:

Total DUs: 0

Non-Residential:

Office KSF:

Local Serving Retail KSF:

Industrial KSF:

Residential Affordability (percent of all units):

Extremely Low Income:	0 %
Very Low Income:	0 %
Low Income:	0 %

Parking:

Motor Vehicle Parking:

Bicycle Parking:

Proximity to Transit Screening

Inside a transit priority area? No (Fail)

Residential Vehicle Miles Traveled (VMT) Screening Results

Land Use Type 1:	Residential
VMT Metric 1:	Home-based VMT per Capita
VMT Baseline Description 1:	County Average
VMT Baseline Value 1:	13.33
VMT Threshold Description 1 / Threshold Value 1:	-15% / 11.33
Land Use 1 has been Pre-Screened by the Local Jurisdiction:	N/A

	Without Project	With Project & Tier 1-3 VMT Reductions	With Project & All VMT Reductions
Project Generated Vehicle Miles Traveled (VMT) Rate	9.39		
Low VMT Screening Analysis	Yes (Pass)