



HEXAGON TRANSPORTATION CONSULTANTS, INC.

Memorandum

Date: April 24, 2023

To: Ms. Lillian Tsang, Department of Public Works, City of Sunnyvale

From: Ollie Zhou, Katie Riutta

Subject: Response to County of Santa Clara's Review Comments Regarding Intuitive Surgical's Revised Site Plan in Sunnyvale and Santa Clara, California

Hexagon Transportation Consultants, Inc. has received and responded to review comments from Santa Clara County associated with the above referenced project. Intuitive Surgical is proposing to reconfigure the parcels north of Kifer Road, next to the 945 Kifer Road site, to create a larger campus with a shared parking garage (see project description below). The County of Santa Clara has reviewed the revised site plan for Intuitive Surgical and has requested additional analyses be completed.

Project Description

The 945 Kifer Road project was studied in the *Intuitive Surgical Campus Expansion Transportation Impact Analysis (TIA)*, dated July 23, 2021. The 945 Kifer Road building that was studied in the TIA included 380,000 square feet (s.f.) of office space with 822 underground parking spaces. The project now proposes 364,000 s.f. of office space in the 945 Kifer Road building with 1,200 parking spaces in a new stand-alone parking garage and 466 parking spaces in an existing surface lot. The new parking garage and the existing surface lot are both located in the City of Santa Clara. In addition to 945 Kifer Road, the Intuitive Surgical North Campus would include 2900 Semiconductor Drive (Building B140) and 3875 Kifer Road (Building W). The project would reoccupy the existing 319,500 s.f. of R&D space in the 2900 Semiconductor Drive building and the existing 48,750 s.f. of office space in the 3875 Kifer Road building within the City of Santa Clara. For the approved 945 Kifer Road project, vehicle access would be provided via a full-access driveway on the north leg of a new signalized intersection on Kifer Road. However, the proposed changes to the project would include additional vehicle access: an existing right-in-right-out ramp intersection on Central Expressway, which has an existing gate that will be removed as part of the project, and an existing right-out-only on-ramp onto Central Expressway at Semiconductor Drive, which is located on the neighboring parcel in the City of Santa Clara. Vehicles would access the on-ramp at Semiconductor Drive from the project site via an easement agreement. The project site plan, including all ingress and egress points for the North Campus, are shown on Figure 1.



Figure 1
Site Plan for Proposed Project

Project Trip Estimates

With the changes to the vehicle access to the site, the County of Santa Clara requested AM and PM peak hour volumes at the Central Expressway driveway ramps. The magnitude of traffic produced by a new development and the locations where that traffic would appear are estimated using a three-step process: (1) trip generation, (2) trip distribution, and (3) trip assignment. In determining project trip generation, the magnitude of traffic entering and exiting the site is estimated for the AM and PM peak hours. As part of the project trip distribution, the directions to and from which the project trips would travel are estimated. In the project trip assignment, the project trips are assigned to the project driveways. These procedures are described below.

Trip Generation

Through empirical research, data have been collected that show trip generation rates for many types of land uses. The research is compiled in the ITE *Trip Generation Manual, 11th Edition*. 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 project proposes 364,000 s.f. of office space in the 945 Kifer Road building. The rates published for “General Office Building” (Land Use Code 710) were used to estimate the gross trips generated by this portion of the project site.

The project would reoccupy the existing 319,500 s.f. of R&D space in the 2900 Semiconductor Drive building. The rates published for “Research and Development Center” (Land Use Code 760) were used to estimate the gross trips generated by this portion of the project site.

The project would reoccupy the existing 48,750 s.f. of office space in the 3875 Kifer Road building. The rates published for “General Office Building” (Land Use Code 710) were used to estimate the gross trips generated by this portion of the project site.

Trip Reductions

Transportation Demand Management (TDM) is a combination of services, incentives, facilities, and actions that reduce single-occupant vehicle (SOV) trips to help relieve traffic congestion, parking demand, and air pollution problems. The project plans to implement a TDM plan that will provide financial incentives to promote alternative travel modes, including free transit passes, dedicated carpool/vanpool parking spaces, bike facilities and services, and marketing campaigns and on-site services to reduce daily trips. The project also plans to provide fully funded daily shuttles from the Intuitive Surgical campus to the Lawrence Caltrain Station, Great America Station, Fremont Civic Center Park & Ride, Fremont BART Station, and other Intuitive Surgical campus sites in the area. The VTA’s *Congestion Management Program Transportation Impact Analysis Guidelines* (October 2014) indicates that a trip reduction of up to 5% can be applied for TDM programs that include financial incentives that are offered to all employees on an ongoing basis and is greater than or equal to the monthly maximum pre-tax commuter benefit. The guidelines also indicate that a 3% trip reduction can be applied for TDM programs that provide a fully funded shuttle service to light rail, Caltrain, or BART facilities. Thus, a total trip reduction of 8% was applied to the project trip generation for all uses.

Gross Project Trips

After applying the ITE trip generation rates and the applicable trip reductions, the proposed project is estimated to generate 879 trips during the AM peak hour (756 inbound and 123 outbound) and 834 trips during the PM peak hour (139 inbound and 695 outbound). Gross project trips were

estimated since these are the volumes that would occur at the project driveways. The trip generation for the proposed project is summarized in Table 1.

**Table 1
Trip Generation Summary**

Land Use	Size	Daily		AM Peak Hour				PM Peak Hour					
		Rate	Trips	Rate	In %	In	Out	Total	Rate	In %	In	Out	Total
Proposed Use													
<u>945 Kifer Rd</u>													
Office ¹	364.0 ksf	10.84	3,946	1.52	88%	487	66	553	1.44	17%	89	435	524
- VTA TDM Reduction ²			(316)			(39)	(5)	(44)			(7)	(35)	(42)
			3,630			448	61	509			82	400	482
<u>2900 Semiconductor Dr (B140)</u>													
R & D ³	319.5 ksf	11.08	3,540	1.03	82%	270	59	329	0.98	16%	50	263	313
- VTA TDM Reduction ²			(283)			(22)	(5)	(27)			(4)	(21)	(25)
			3,257			248	54	302			46	242	288
<u>3875 Kifer Rd (Building W)</u>													
Office ¹	48.75 ksf	10.84	528	1.52	88%	65	9	74	1.44	17%	12	58	70
- VTA TDM Reduction ²			(42)			(5)	(1)	(6)			(1)	(5)	(6)
			486			60	8	68			11	53	64
Gross Project Trips	732.25 ksf		7,373			756	123	879			139	695	834
Notes:													
KSF = 1,000 square feet													
¹ General Office Building (Land Use 710) average rates published in ITE's <i>Trip Generation Manual</i> , 11th Edition, 2021.													
² As prescribed by the <i>VTA Transportation Impact Analysis Guidelines (2014)</i> an 8% standard TDM reduction was applied to the project's trip generation. A maximum trip reduction of 5% was applied for TDM programs which include financial incentives and a 3% reduction was applied for TDM programs which commit to fully funding a dedicated shuttle to light rail, Caltrain, or BART facilities.													
³ Research and Development Center (Land Use 760) average rates published in ITE's <i>Trip Generation Manual</i> , 11th Edition, 2021.													

Trip Distribution and Assignment

Trips generated by the proposed project were distributed to the study network based on the trip distribution used in the *Intuitive Surgical Campus Expansion TIA*. Likewise, the project trips were assigned to the roadway network based on the project's original TIA. However, trips were reassigned at the project-accessing driveways on Kifer Road and on Central Expressway, given the new Central Expressway driveways. The project trip distribution and location of project driveways are shown on Figure 2. Figure 3 shows the project generated trips at the driveways. It should be noted that the neighboring development, Texas Instruments, will also generate trips onto the egress driveway at Semiconductor Drive and Central Expressway, as that driveway is located on their parcel.

Intuitive Surgical Response to County Comments

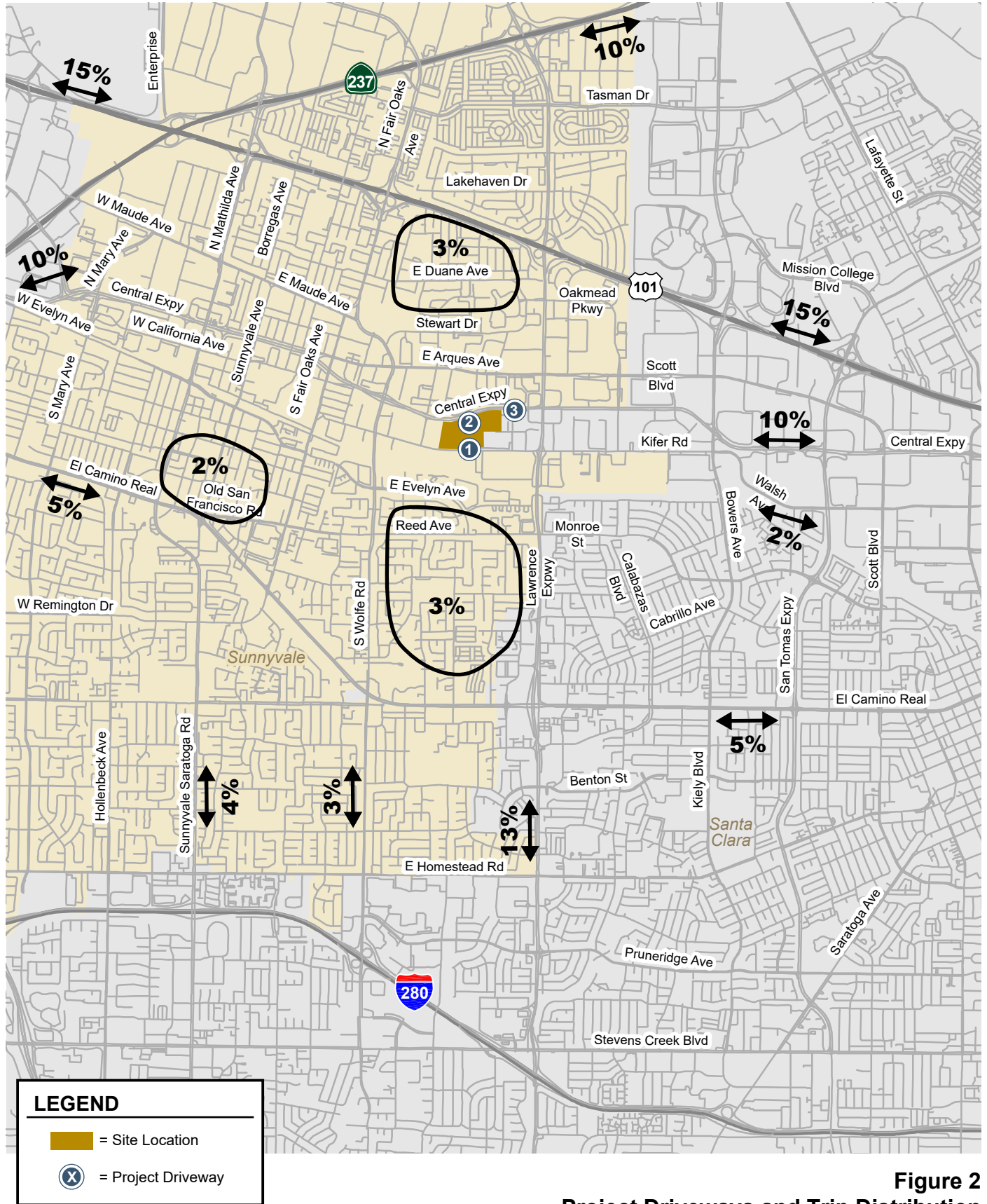


Figure 2
Project Driveways and Trip Distribution

Intuitive Surgical Response to County Comments

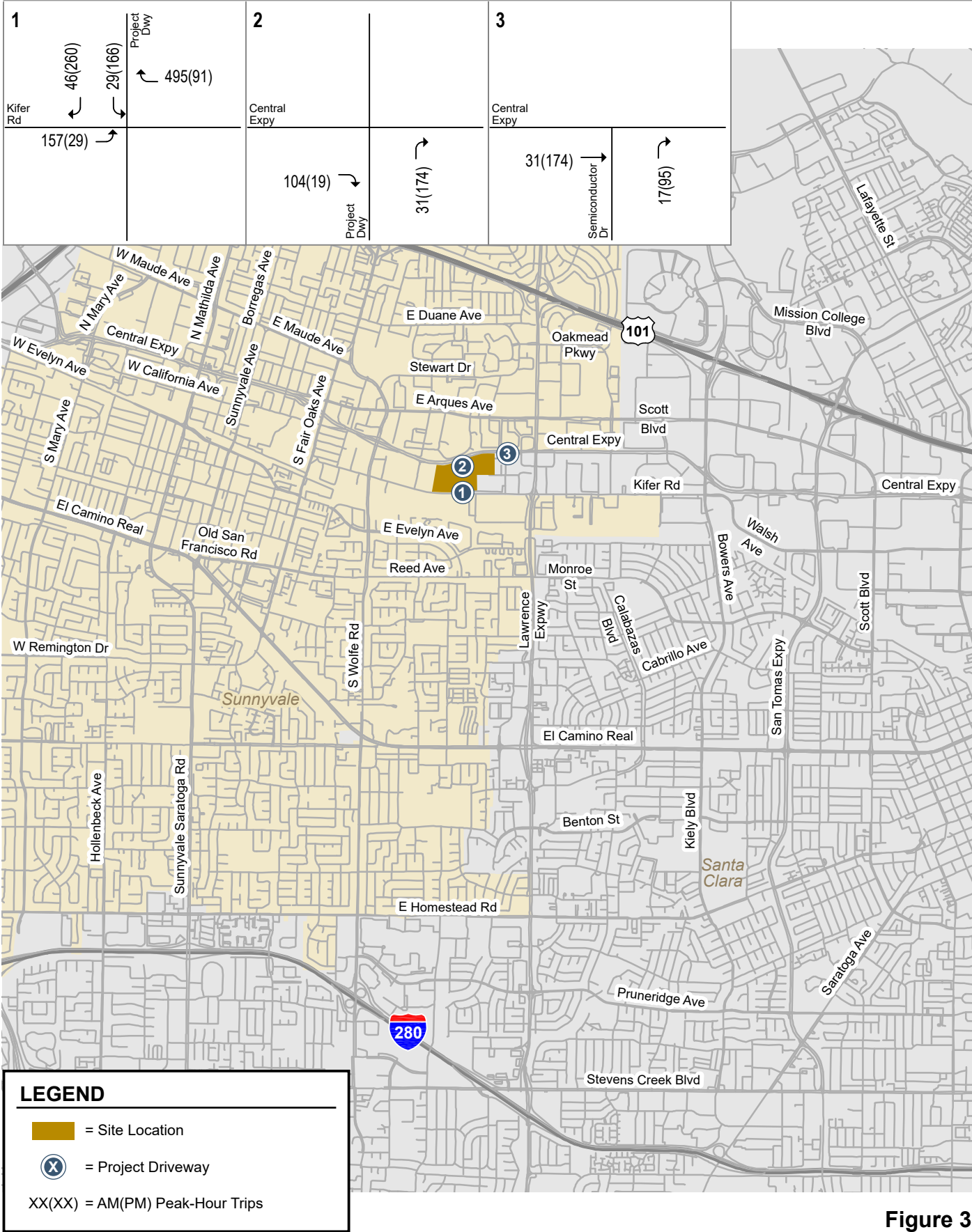


Figure 3
Project Generated Trips at Driveways

Sight Distance Analysis

The County of Santa Clara requested a sight distance analysis for the Central Expressway driveway ramps. The project driveways should be free and clear of any obstructions to optimize sight distance, thereby ensuring that exiting vehicles can see other vehicles traveling on Central Expressway. Landscaping and signage should not conflict with a driver's ability to locate a gap in traffic. Adequate sight distance (sight distance triangles) should be provided at the driveways in accordance with Caltrans standards. Sight distance triangles should be measured approximately 10 feet back from the traveled way.

According to the Caltrans *Highway Design Manual (HDM)*, 7th Edition, the minimum stopping sight distance is the distance required by the user, traveling at a given speed, to bring the vehicle to a stop after an object or another vehicle on the road becomes visible. The required stopping sight distances are based on the HDM, Table 201.1. The project driveways are located on Central Expressway, which has a posted speed limit of 50 miles per hour (mph). Typical design speeds can be assumed to be 5 mph above the posted speed limit. Therefore, a vehicle exiting the project site onto eastbound Central Expressway needs to see 500 feet (based on a design speed of 55 mph) to the west.

The project would utilize two existing driveway on-ramps on Central Expressway that are approximately 1,170 feet apart. On-street parking is not permitted on Central Expressway and there are no roadway curves, monument signs, walls, fences, or landscaping that would obstruct sight distance looking west from the western site driveway. There is a roadway curve to the west of the eastern site driveway, but it curves further than 500 feet west from the driveway. There is also an existing fence west of the eastern site driveway, but it is set far enough back and does not obstruct sight distance. Therefore, the existing sight distance at both driveways on Central Expressway is adequate for a design speed of 55 mph.

Recommendation: Hexagon recommends that any landscaping, monument signs, walls, etc. to the west of the driveways on Central Expressway be kept to a height of 3 feet or less to maintain adequate sight lines.

Acceleration/Deceleration Lane Feasibility Study

The County of Santa Clara requested a feasibility study for lengthening the deceleration and acceleration lanes at the Central Expressway driveway ramps due to project trip demands. The deceleration and acceleration lanes were examined based on relevant guidelines and with regard to the frequency of inbound/outbound vehicles.

Off-Ramp Deceleration Lane

The deceleration lane length was examined for the eastbound off-ramp entrance to the project site from Central Expressway. The County does not have standards or guidelines for the design of off-ramps on the County expressway system. Therefore, the guidelines in Caltrans' *Highway Design Manual (HDM)* were referenced. According to the HDM Section 405.2(2)(d), the deceleration lane length is based on the design speed of the roadway, which is assumed to be 55 mph on Central Expressway. The HDM guidelines also state that where partial deceleration is permitted in the through lanes, design speeds may be reduced 10 – 20 mph for a lower entry speed. In urban environments, some deceleration in the through lane is typical. For this analysis, up to 15 mph of deceleration in the through lane is assumed. At the curve at the end of the ramp, it is assumed that the design speed is 15 mph, based on the advisory speed signs at the neighboring off-ramps at Commercial Street and Enochs Street, which have similar geometries. Therefore, the speed of

vehicles at the end of the ramp, before making the turn into the project site, is assumed to be about 15 mph. However, as a conservative approach, it was assumed that vehicles will come to a complete stop at the end of the ramp. Therefore, Table 405.2B in the HDM was used to estimate an appropriate deceleration lane length. Assuming an entry speed of 40 mph, the deceleration lane length should be at least 315 feet, including the length of the bay taper. Currently, the right-turn deceleration lane is approximately 225 feet long, including the bay taper, which is about 90 feet short of the Caltrans' guideline with the given assumptions. The project frontage extends 925 feet west of the existing off-ramp, and could accommodate the 315-foot deceleration lane within the project frontage.

Recommendation: Hexagon recommends extending the deceleration lane to 315 feet, including a 90-foot bay taper, to meet the guidelines in the Caltrans' HDM.

The project-generated gross trips that are estimated to occur at the off-ramp on Central Expressway at the project site are 104 inbound trips during the AM peak hour and 19 inbound trips during the PM peak hour. The estimated 104 inbound trips during the AM peak hour calculate to about one to two vehicles every minute, and 19 inbound trips during the PM peak hour calculate to about one vehicle every three minutes. The project proposes to remove the existing gate within the drive aisle and add remote controlled gates at the entrances of the stand-alone parking garage and the surface lot on site (see Figures 4A and 4B). The distance between Central Expressway and the nearest gate located at the entrance to the surface parking lot at Building 140 would be 200 feet, which is enough space for eight vehicles to queue. It is expected that any potential gate queues would not affect eastbound traffic on Central Expressway. Therefore, there is no need to add additional space on the off-ramp for vehicle queue storage.

On-Ramp Acceleration Lanes

The acceleration lane lengths were examined for the eastbound on-ramps onto Central Expressway at the project site and at Semiconductor Drive. The County does not have standards or guidelines for the design of on-ramps on the County expressway system. The Caltrans' HDM Section 405.1(4) references AASHTO's *A Policy on Geometric Design of Highways and Streets (The Green Book)*, 7th Edition. Therefore, the analysis is based on these guidelines.

On-Ramp From Project Site

The distance between the painted nose of the existing on-ramp at the project site and the painted nose of the next on-ramp at Semiconductor Drive is approximately 1,170 feet. Based on Section 10.9.6.4.6 in the AASHTO Green Book, a minimum distance of 300 feet is recommended between the end of the taper (i.e., end of the acceleration lane) for the first on-ramp and the painted nose for the next on-ramp. Based on Section 10.9.6.5.2 in the Green Book, the taper at the end of an on-ramp with parallel design is recommended to be approximately 300 feet for design speeds up to 70 mph. Therefore, there would be enough space to accommodate an acceleration lane length of up to 570 feet, not including the length of the taper. The curve at the beginning of the on ramp is assumed to have a design speed of 15 mph. Therefore, the initial speed of vehicles on the on ramp is assumed to be 15 mph. According to Table 10-4 in the Green Book, by interpolation, an acceleration lane length of 570 feet and an initial speed of 15 mph corresponds to a merge speed of approximately 35 mph, which is about 20 mph below the design speed of the expressway. Currently, the acceleration lane is approximately 115 feet long starting from the painted nose, not including the length of the taper, which corresponds to a merge speed of 21 mph.

Intuitive Surgical Response to County Comments

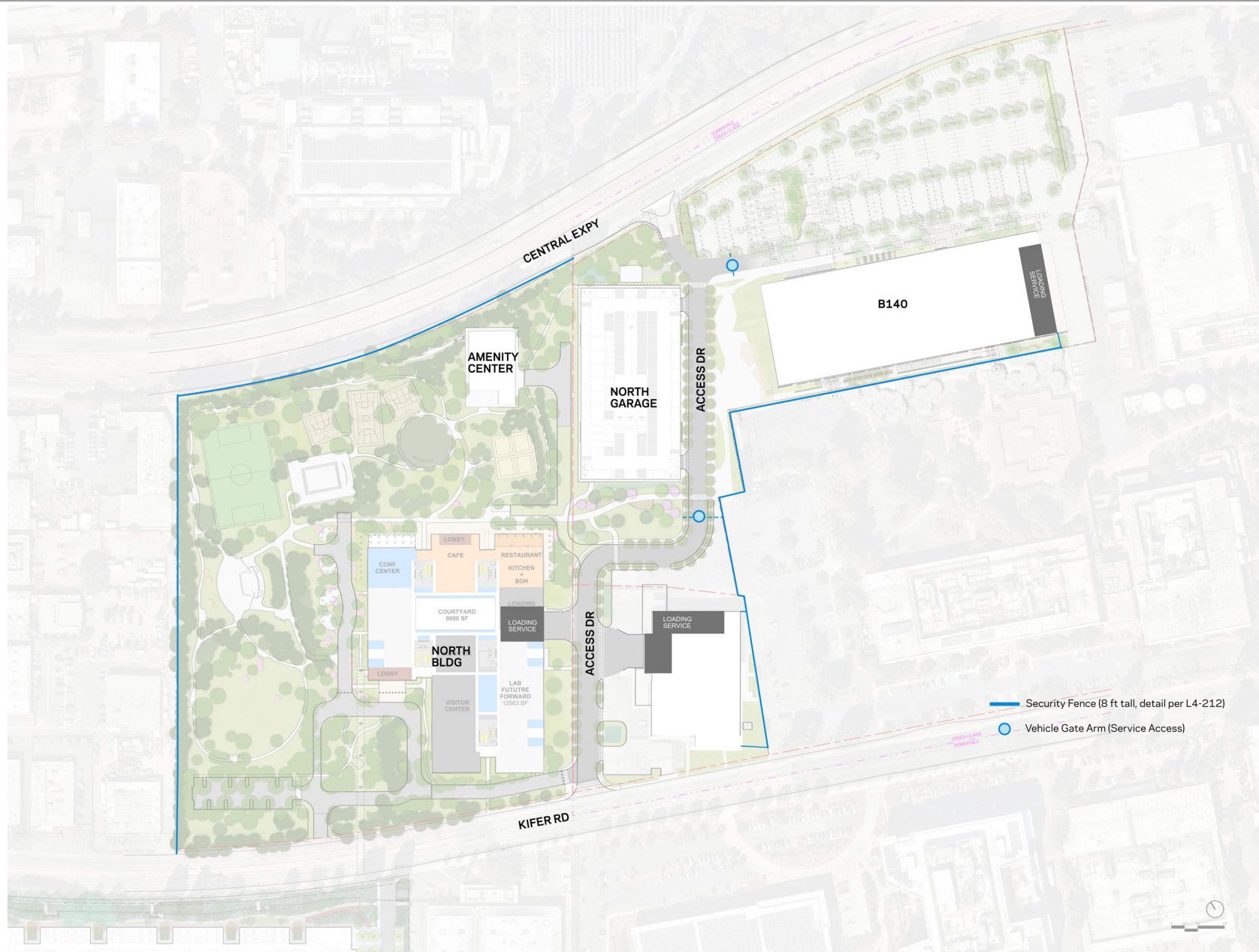


Figure 4B
Project Site Gate Locations

The project frontage extends 790 feet east of the existing on-ramp. Therefore, if the project is restricted to working within its own frontage, there would be enough space to accommodate an acceleration lane length of 490 feet plus a 300-foot taper, which corresponds to a merge speed of 33 mph.

Recommendation: Hexagon recommends modifying the project frontage, to the extent feasible, to accommodate an acceleration lane length of up to 570 feet with a 300-foot transition at the end of the lane.

The project-generated gross trips that are estimated to occur at the on-ramp on Central Expressway at the project site are 31 outbound trips during the AM peak hour and 174 outbound trips during the PM peak hour. The estimated 31 outbound trips during the AM peak hour calculate to about one vehicle every two minutes, and 174 outbound trips during the PM peak hour calculate to about three vehicles every minute.

On-Ramp From Semiconductor Drive

The existing on-ramp on Central Expressway at Semiconductor Drive connects to an auxiliary lane and the neighboring off-ramp lane at Enochs Street. The auxiliary lane is approximately 275 feet starting from the painted nose to where it transitions to the off-ramp lane for Enochs Street. The curve at the beginning of the on-ramp is assumed to have a design speed of 15 mph. According to Table 10-4 in the Green Book, by interpolation, an acceleration length of 275 feet and an initial speed of 15 mph corresponds to a merge speed of approximately 27 mph, which is about 28 mph below the design speed of the expressway. However, this existing auxiliary lane is not located along the project frontage and cannot be extended without interrupting the off-ramp at Enochs Street.

The project-generated gross trips that are estimated to occur at the on-ramp on Central Expressway at Semiconductor Drive are 17 outbound trips during the AM peak hour and 95 outbound trips during the PM peak hour. The estimated 17 outbound trips during the AM peak hour calculate to about one vehicle every 3-1/2 minutes, and 95 outbound trips during the PM peak hour calculate to about one to two vehicles every minute.

Conclusions

The revised site plan for the Intuitive Surgical North Campus is estimated to generate 879 trips during the AM peak hour (756 inbound and 123 outbound) and 834 trips during the PM peak hour (139 inbound and 695 outbound) at the three proposed driveways on Kifer Road and Central Expressway. The sight distance at both driveways on Central Expressway is expected to be adequate, assuming that any landscaping, monument signs, walls, etc. to the west of the driveways on Central Expressway be kept to a height of 3 feet or less to maintain adequate sight lines.

The existing right-turn deceleration lane on Central Expressway at the project site is approximately 225 feet long, which is 90 feet short of the Caltrans' guideline. Hexagon recommends extending the deceleration lane to 315 feet, including a 90-foot bay taper, to meet the guidelines in the Caltrans' HDM. With the available space between the neighboring on-ramps on Central Expressway, the opportunity to extend the acceleration lanes is limited. Hexagon recommends modifying the project frontage, to the extent feasible, to accommodate an acceleration lane length of up to 570 feet with a 300-foot transition at the on-ramp on Central Expressway at the project site. The on-ramp at Semiconductor Drive connects to an existing auxiliary lane that is not located along the project frontage and cannot be extended without interrupting the off-ramp at Enochs Street.



HEXAGON TRANSPORTATION CONSULTANTS, INC.

April 27, 2023

Ms. Lillian Tsang
Department of Public Works
City of Sunnyvale
456 W. Olive Avenue
Sunnyvale, CA 94086

Re: *Response to Comments from the County and City of Santa Clara on the Memo Addressing Intuitive Surgical's Revised Site Plan in Sunnyvale and Santa Clara, California*

Dear Ms. Tsang,

This letter provides our responses to the comments provided by the County and City of Santa Clara, dated April 17, 2023, on the memo addressing Intuitive Surgical's revised site plan in Sunnyvale and Santa Clara.

Comments from the County of Santa Clara:

1. **Comment:** Provide queueing analysis at Lawrence/Kifer Road. It is expected that all trips east of the project location will access the site via the project driveway on Kifer Road

Response: A queueing analysis was provided at the Lawrence Expressway and Kifer Road intersection in the Intuitive Surgical TIA dated July 23, 2021. The queueing analysis identified a deficiency in storage capacity for the eastbound left-turn movement during at least one peak hour under existing, background, and background plus project conditions. A deficiency was also identified for the northbound left-turn movement during the AM peak hour under background plus project conditions. There is no room to further extend the left-turn pockets. It is expected that the proposed Lawrence Expressway Grade Separation project at this intersection would remove the identified queueing issues.

Since vehicles would access the project site via Central Expressway and Kifer Road under the revised site plan, as opposed to only Kifer Road under the previous site plan studied in the Intuitive Surgical TIA, it is assumed that there would be no project trips at the eastbound left-turn movement of the Lawrence/Kifer intersection. All vehicles exiting the site and heading northbound were assumed to utilize the driveway on Central Expressway. Therefore, the project's effect on queueing at the eastbound left-turn movement would be reduced under the revised site plan.

In the Intuitive Surgical TIA, the project trip generation included both the north and south sites and reductions for TDM and existing uses. In the Response to Comments memo dated March 6, 2023, the project trip generation included only the north site gross trips, with standard TDM reductions, more recent trip generation rates, and the addition of the 2900 Semiconductor Drive and 3875 Kifer Road buildings. It should be noted that the additional buildings on the north site would retain their existing uses. Vehicles entering the project site from the south would continue to use the northbound left-turn movement of the



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Lawrence/Kifer intersection. The project trips under the revised site plan have the potential to be greater than the previous site plan, which could potentially worsen the project's effect on queuing at this movement. However, there is no room to further extend the turn pocket and the proposed Lawrence Expressway Grade Separation project is expected to resolve any queuing issues.

As stated in the Intuitive Surgical TIA and per LSAP requirement, the Intuitive Surgical project will contribute its fair share towards the cost of the grade separation at Lawrence Expressway and Kifer Road which would resolve any potential queuing issues caused by the project.

2. **Comment:** Provide site circulation map for review.

Response: A site circulation map was provided as a separate document.

3. **Comment:** It is recommended that the on-ramp onto Central Expy at Semiconductor Dr should remain closed if the acceleration lane cannot be extended. Vehicles may access Central Expy from the other new project driveway if recommended acceleration/deceleration lengths are met.

- a. *Acceleration/Deceleration Lane Feasibility Study at Central Expwy driveway ramps*
 - i. *Off-Ramp Deceleration Lane: Hexagon recommends extending the deceleration lane to 315 feet, including a 90-foot bay taper, to meet the guidelines in the Caltrans' HDM.*
 - ii. *On-Ramp Acceleration Lane: Hexagon recommends modifying the project frontage, to the extent feasible, to accommodate an acceleration lane length of up to 570 feet with a 300-foot transition at the end of the lane.*

Response: The on-ramp at Semiconductor Drive is an existing on-ramp located outside of the project site and is therefore outside the control of the project. At most, the project could close off access to the neighboring parcel, which would prohibit project traffic from using the on-ramp at Semiconductor Drive.

Regarding the acceleration lane and deceleration lane at the other project driveway, the memo provided a feasibility study detailing the amount of space available for the acceleration lane to be lengthened and the corresponding merge speed based on AASHTO Green Book guidelines. There are no standards or requirements for acceleration lane lengths. Since the project is restricted to working within its own frontage, there would be enough space to accommodate an acceleration lane length of 490 feet plus a 300-foot taper, which corresponds to a merge speed of 33 mph.

For the deceleration lane, the feasibility study discussed a 315-foot deceleration lane, including a 90-foot taper per AASHTO Green Book guidelines. There are no standards or requirements for deceleration lane lengths. The project restricted to working within its own frontage would have enough space to accommodate this deceleration lane length.



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4. **Comment:** Provide conceptual plans of the recommended Deceleration and Acceleration lane extensions for County review.

Response: The City of Sunnyvale will ask the applicant to draft the conceptual plans for the next submittal.

Comments from the City of Santa Clara:

1. **Comment:** Kifer Road/ Project Driveway (Intersection #1) should be a 4-leg intersection and Could you revise the map to reflect that?

Response: The figure was revised in the memo.

2. **Comment:** The trip distribution and assignment should be looked over again and modified as it seems that vehicle trips would utilize Central Expressway instead of Kifer Road to access the project site. The travel time on Kifer Road would be much slower and less attractive to vehicle trips than taking Central to access the site.

Response: Google Maps showed that the travel times and distances between the paths using the driveways on Central Expressway versus Kifer Road are similar. It would also be a conservative approach to assign trips onto the local roadway network.

3. **Comment:** Please show where the gates would be located for both parking structures on the site plan as it is mentioned in the memo that remote controlled gates would be included at the entrances to the stand-alone parking garage and the surface lot on the site.

Response: Figures showing the gate locations were added to the memo.

4. **Comment:** I am unclear of what acceleration length and taper length is required by the Green Book other than the memo stating we have a total of 790 ft to play with along the frontage east of the existing Central on-ramp. What is Hexagon's recommendation?

Response: As stated in response to the County's comment above, there are no requirements or standards provided by the jurisdictions or the literature. Therefore, the intent of the feasibility study for lengthening the acceleration and deceleration lanes was to provide information rather than recommendations. The City of Sunnyvale confirmed that the project applicant would only be able to work within its project frontage, which would mean that project applicant, at the most, would be able to accommodate a deceleration lane of 315 feet, and an acceleration lane of 790 feet, inclusive of the tapers.



Ms. Lillian Tsang
April 27, 2023
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Please do not hesitate to contact us if there are any further questions regarding this study.

Sincerely,

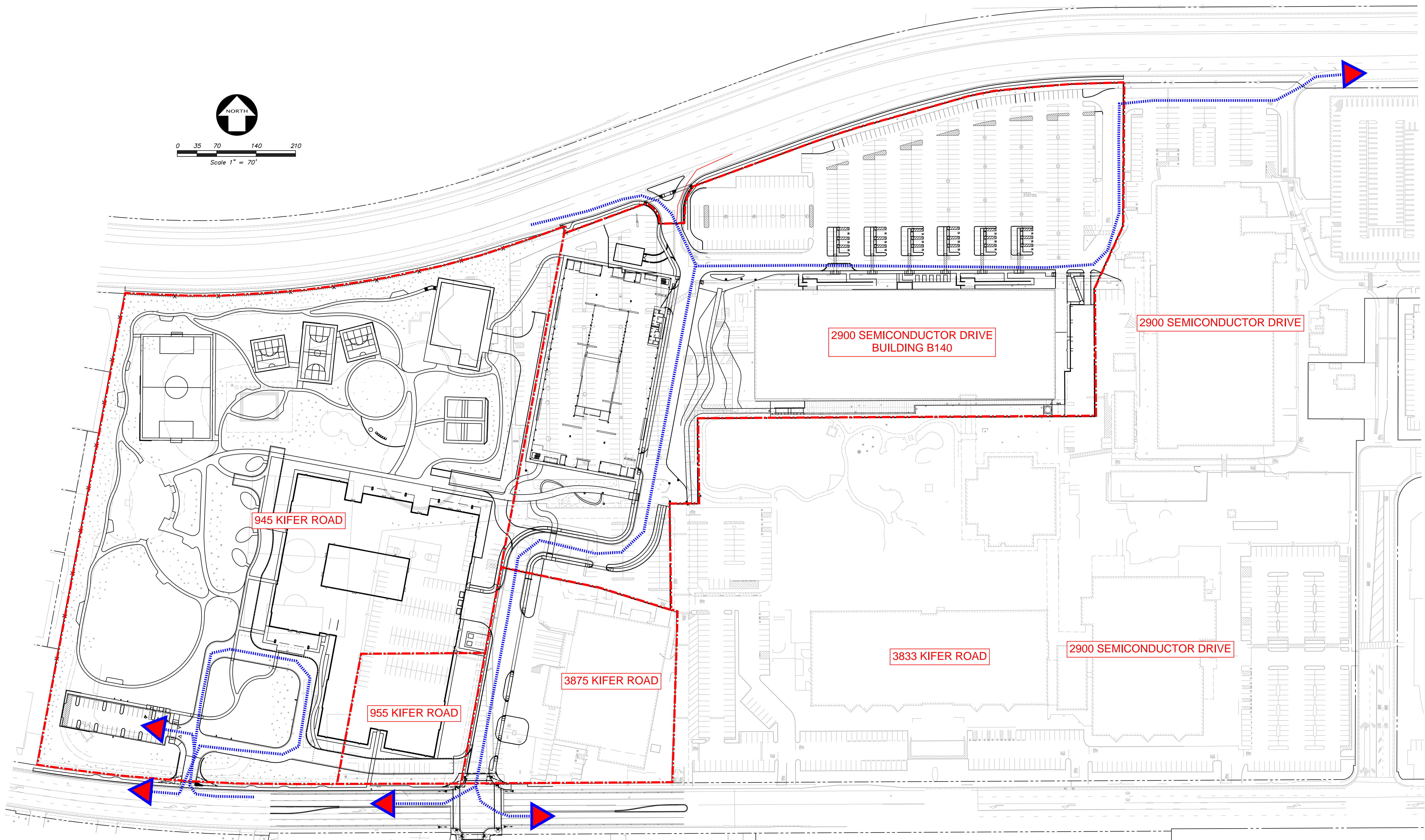
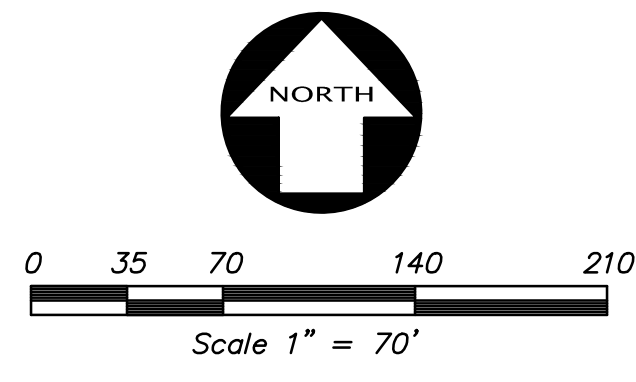
HEXAGON TRANSPORTATION CONSULTANTS, INC.

A handwritten signature in black ink, appearing to read "Ollie Zhou".

Ollie Zhou, T.E.
Principal

A handwritten signature in black ink, appearing to read "Katie Riutta".

Katie Riutta
Planner



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NO.	BY	REVISION

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ACCESS & TRIP ANALYSIS EXHIBIT
 OF
ISI NORTH DEVELOPMENT
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SUNNYVALE/SANTA CLARA, CALIFORNIA

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