

May 30, 2023

Emilie Simard
Intracorp SW, LLC
895 Dove Street, Suite 400
Newport Beach, CA 92660

LLG Reference: 2.22.4577.1

Subject: **Sight Distance Analysis for the
901 Katella Avenue Residential Project**
Orange, California

Dear Ms. Simard:

Linscott, Law & Greenspan, Engineers (LLG) is pleased to submit this Sight Distance Analysis associated with 901 Katella Avenue Residential Project (hereinafter referred to as "Project") in the City of Orange, California. The Project site is located at the northeast corner of Katella Avenue and Cambridge Street, and addressed at 901 Katella Avenue. Pursuant to the City of Orange requirements, a stopping sight distance analysis has been conducted at the proposed Project driveway located along Cambridge Street.

PROJECT LOCATION AND DESCRIPTION

The Project site is located at the northeast corner of Katella Avenue and Cambridge Street, and addressed at 901 Katella Avenue in the City of Orange, California. The subject property is currently developed with a vacant office building and surface parking. Access to the site is now provided via a gated full access unsignalized driveway on Katella Avenue and a gated left-turn in/right-turn in/right-turn out access unsignalized driveway on Cambridge Street. **Figure 1**, located at the rear of this letter report, presents a vicinity map which illustrates the general location of the project and the surrounding street system.

The proposed Project includes the construction of a 52-unit condominium/townhome residential community. Primary access to the Project site is proposed via a full access unsignalized driveway located along Cambridge Street, which would be constructed 44 feet south of the existing driveway. It is anticipated that the outbound movement would be controlled via a stop sign. All other movements would be uncontrolled. To facilitate the proposed full access at the Project's primary access, striping

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modifications would be required along Cambridge Street as a result of relocation the existing driveway to the south. These striping improvements, to allow for full access, would be subject to findings of this analysis and the review and approval of the City of Orange. Emergency vehicle only access is proposed to be provided via a driveway located on Katella Avenue along the site's easterly property line. **Figure 2** presents an existing aerial photograph of the Project site. **Figure 3** presents the proposed Project site plan prepared by Bassenian/Lagoni Architects dated June 14, 2022.

SITE ACCESS EVALUATION

Sight Distance Analysis

At intersections and/or project driveways, a substantially clear line of sight should be maintained between the driver of a vehicle waiting at the crossroad and the driver of an approaching vehicle. Adequate time must be provided for the waiting vehicle to either cross all lanes of through traffic, cross the near lanes and turn left, or turn right, without requiring through traffic to radically alter their speed. A sight distance evaluation has been performed for the proposed project driveway located along Cambridge Street.

The Sight Distance Evaluation for the project driveway utilized the criteria and procedures set forth by the California Department of Transportation (Caltrans) in the State's *Highway Design Manual (HDM)* for "Private Road Intersections" consistent with standard traffic engineering practice.

Highway Design Manual (HDM) Sight Distance Criteria

The Sight Distance Evaluation for the Project driveway to verify the adequacy of sight lines was also based on the criteria and procedures set forth by the California Department of Transportation (Caltrans) in the State's *Highway Design Manual (HDM)* for "Private Road Intersections". Stopping sight distance was utilized for the evaluation, although the Caltrans HDM, in Section 405.1(2)(c), page 400-27, indicates that for Private Road Intersections, "The minimum corner sight distance shall be equal to the stopping sight distance as given in Table 201.1...". Stopping sight distance is measured from the driver's eyes, which are assumed to be 3.5 feet above the pavement surface, to an object 0.5-foot high on the roadway.

Stopping sight distance is defined in the Caltrans HDM to be the distance required by the driver of a vehicle, traveling at a given speed, to bring the vehicle to a stop after an object ½ foot high on the road becomes visible. Stopping sight distance is measured from the driver's eyes, which is assumed to be 3 ½ feet above the pavement surface, to an object ½ foot high on the road.

The speed used in determining stopping sight distance is defined as the “critical speed” or 85th percentile speed which is the speed at which 85% of the vehicles are traveling at or less. The critical speed is the single most important factor in determining stopping sight distance. Table 201.1 in the HDM is used in determining stopping sight distance based on the critical speed of vehicles on the affected roadway. Speed count data was collected along Cambridge Street on July 12, 2022. This data identifies an 85th percentile speed of 35 miles per hour (mph). **Appendix A** presents the speed count data.

Based on Table 201.1 of the Caltrans HDM and a speed of 35 mph on Cambridge Street, a stopping sight distance of 250 feet is required for both a left-turning and right-turning vehicle at the project driveway.

Project Driveway Outbound Left-Turn Evaluation

Figure 4 presents the results of the sight distance evaluation at the project driveway for left-turning vehicles based on the application of stopping sight distance. As shown, the sight lines are expected to be adequate per the HDM standards as long as obstructions within the sight triangles are minimized. Adequate sight lines give the motorist the ability to see gaps in traffic to help with egress from the site. As a result of the driveway relocation, striping modifications are required along Cambridge Street and will be constructed as a project design feature, subject to review and approval of the City.

Project Driveway Outbound Right-Turn Evaluation

Figure 5 presents the results of the sight distance evaluation at the project driveway for right-turning vehicles based on the application of stopping sight distance. As shown, the sight lines are expected to be adequate per the HDM standards as long as obstructions within the sight triangles are minimized. Adequate sight lines give the motorist the ability to see gaps in traffic to help with egress from the site. As a result of the driveway relocation, striping modifications are required along Cambridge Street and will be constructed as a project design feature, subject to review and approval of the City.

Project Driveway inbound Left-Turn Evaluation

Figure 6 presents the results of the sight distance evaluation at the project driveway for southbound left-turning vehicles into the site based on the application of stopping sight distance. As shown, the sight lines are expected to be obstructed by vehicles queued in the southbound left-turn lane and/or southbound through lane at the intersection of Cambridge Street and Katella Avenue. As a result, the southbound left-turn movement is recommended to be restricted. Striping modifications would be needed as a result along with signage and will be constructed as a project design feature, subject to review and approval of the City.

Conceptual Improvement Plan

Based on the information identified above, it is recommended that the southbound left-turn movement along Cambridge Street be prohibited. Additionally, the striping adjacent to the bike line would require modifications due to the driveway relocation as well. As such, **Figure 7** presents the conceptual striping along Cambridge Street to help facilitate ingress and egress to the Site.

CONCLUSION

Based on the above, the sight lines at the project driveway located along Cambridge Street are expected to be adequate per the HDM standards as long as obstructions within the sight triangles are minimized for the outbound (left-turn and right-turn) movements. Given that parking is not permitted along the Project frontage on Cambridge Street, the potential obstruction of vehicles parked along the curb is minimized.

For the southbound left-turn inbound movement, there is a potential of sight lines to be obstructed due to the alignment of Cambridge and vehicular queues and hence adequate stopping sight distance is not provided. As a result, this movement is recommended to be prohibited. Striping modifications and appropriate signage shall be implemented by the Project to restrict the southbound left-turn movement along Cambridge Street. These striping improvements are subject to the review and approval of the City of Orange.

* * * * *

We appreciate the opportunity to be of service on this Project. Should you need further assistance, or have any questions regarding this analysis, please call us at (949) 825-6175.

Sincerely,

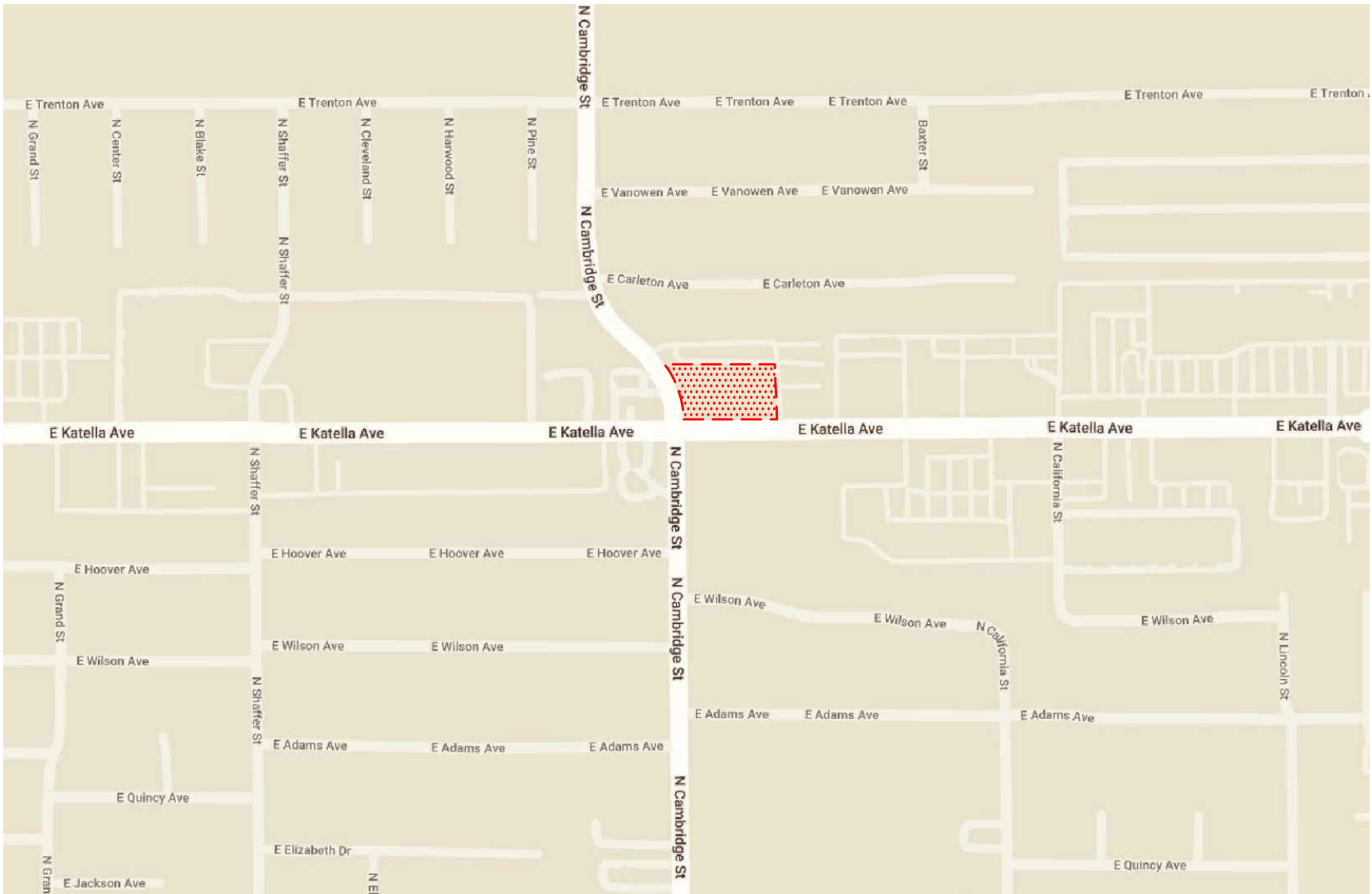
Linscott, Law & Greenspan, Engineers



Richard E. Barretto, P.E.
Principal

Cc. Shane S. Green, P.E., Senior Transportation Engineer
Attachments





n:\4500\2224577 - 901 katella avenue residential, orange\dwg\4577 f-1.dwg LDP 09-21-28 07-14-2022 aguilera



SOURCE: GOOGLE

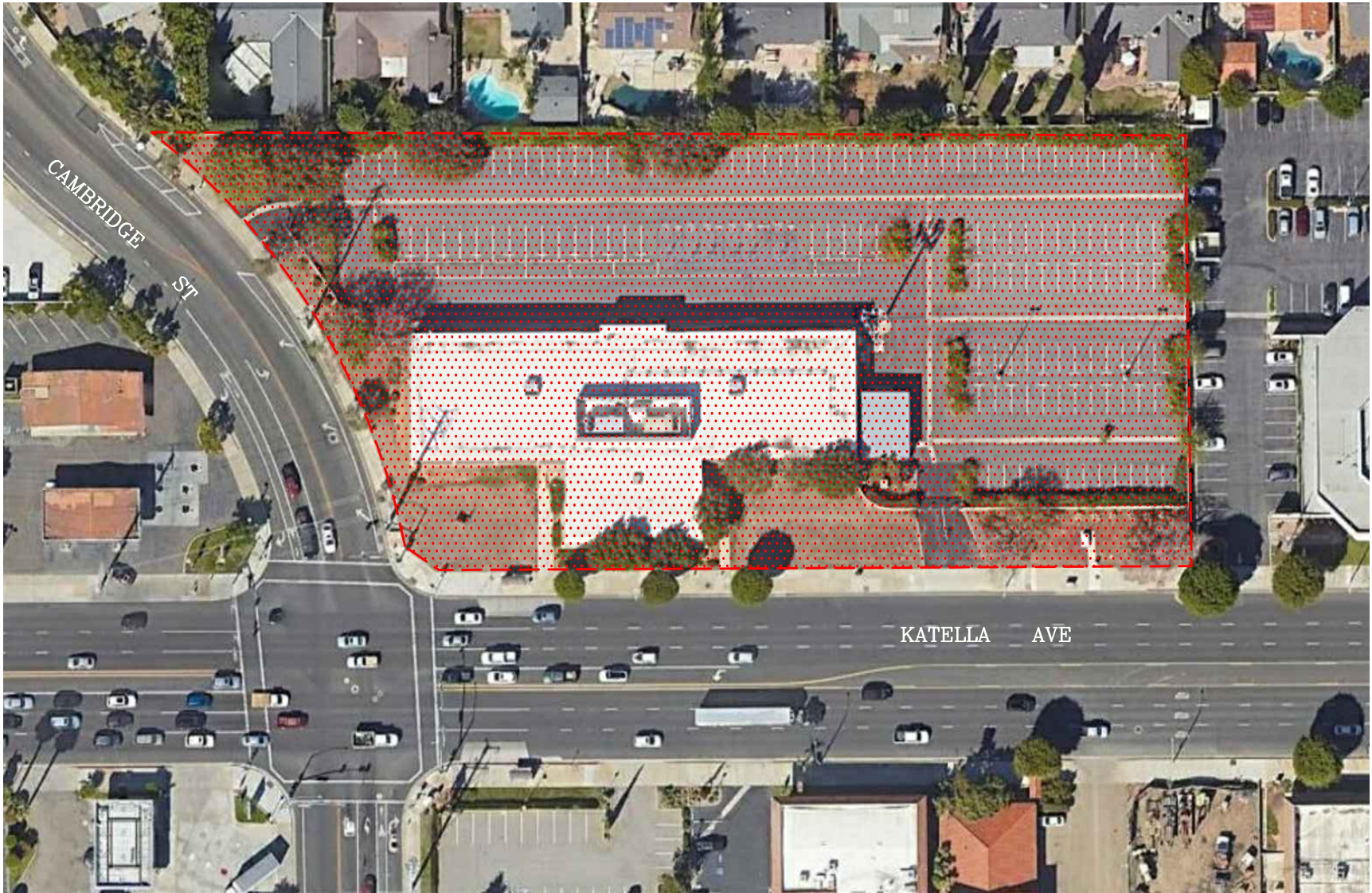
KEY

 = PROJECT SITE

FIGURE 1

VICINITY MAP

901 KATELLA AVENUE RESIDENTIAL, ORANGE



n:\4500\2224577 - 901 katella avenue residential, orange\dwg\4577 f-2.dwg LDP 09-29-24 07-14-2022 aguilar

LINSCOTT
LAW &
GREENSPAN

engineers



NO SCALE

SOURCE: GOOGLE

KEY

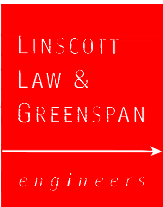
 = PROJECT SITE

FIGURE 2

EXISTING AERIAL PHOTOGRAPH
901 KATELLA AVENUE RESIDENTIAL, ORANGE



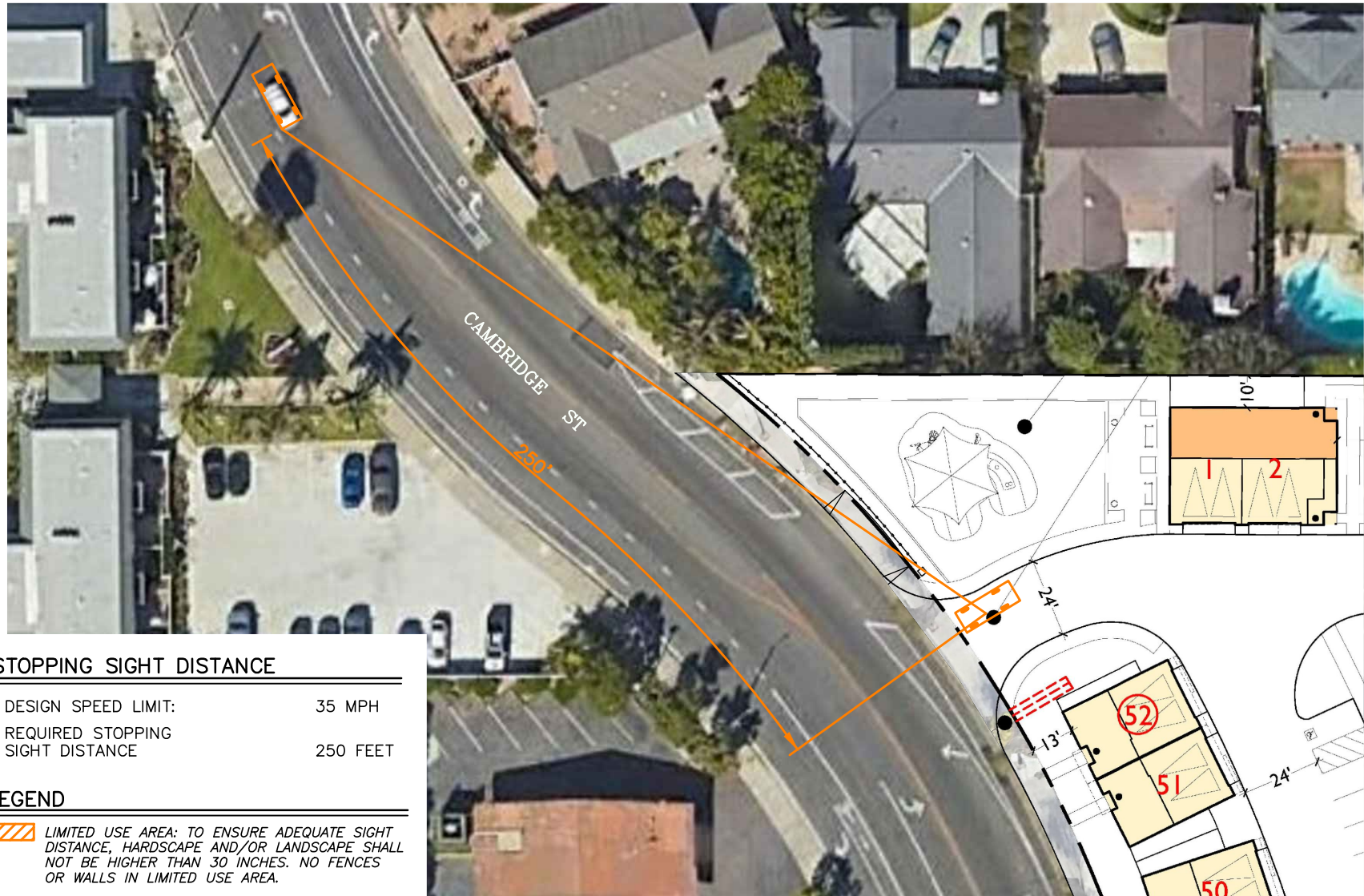
n:\4500\2224577 - 901 katella avenue residential, orange\dwg\4577 f-3.dwg LDP 13:41:48 07-18-2022 aguilera



SOURCE: BASSENIAN/LAGONI

FIGURE 3

PROPOSED SITE PLAN
901 KATELLA AVENUE RESIDENTIAL, ORANGE

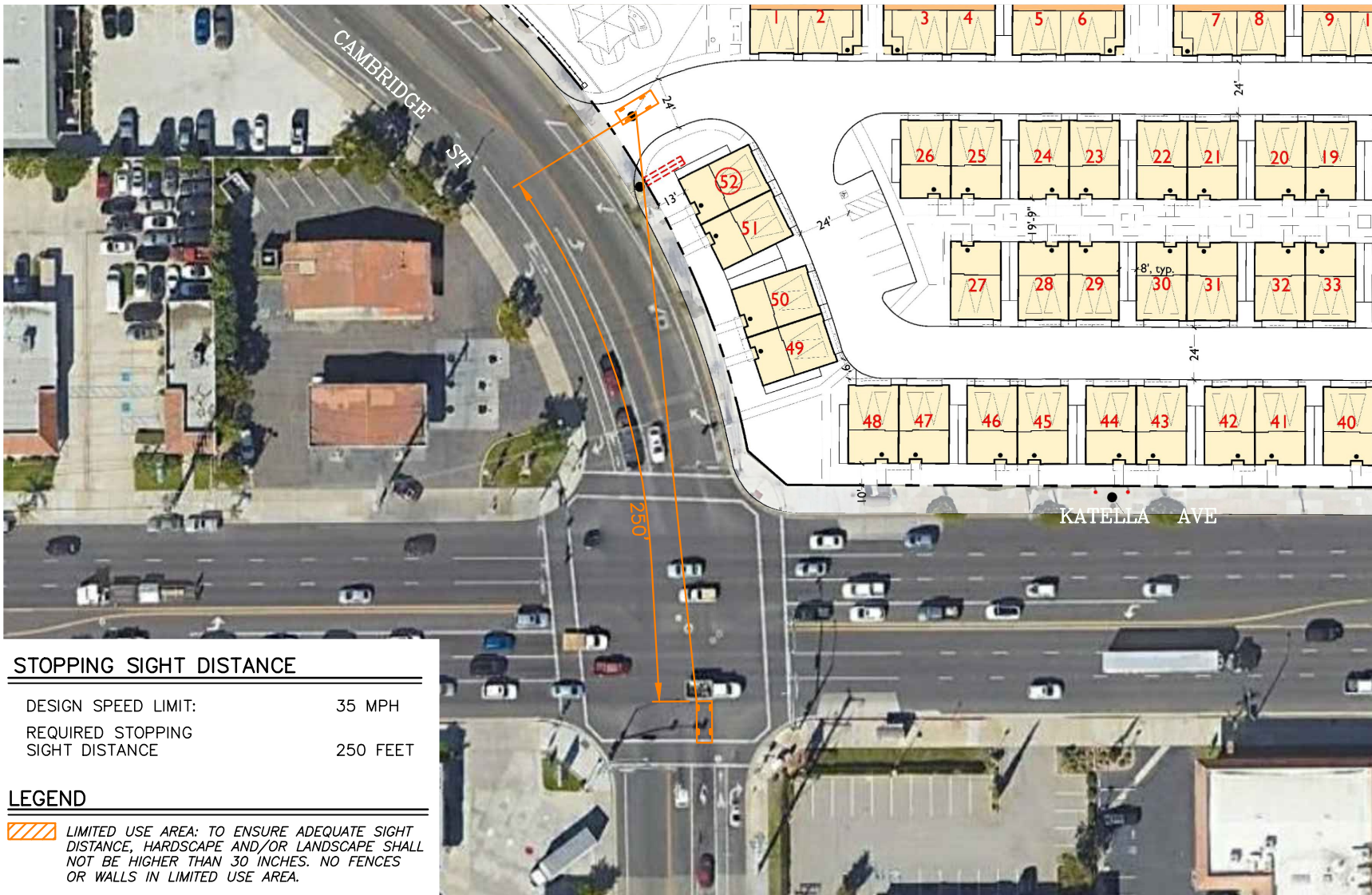


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SOURCE: BASSENIAN/LAGONI

FIGURE 4

STOPPING SIGHT DISTANCE ANALYSIS
901 KATELLA AVENUE RESIDENTIAL, ORANGE

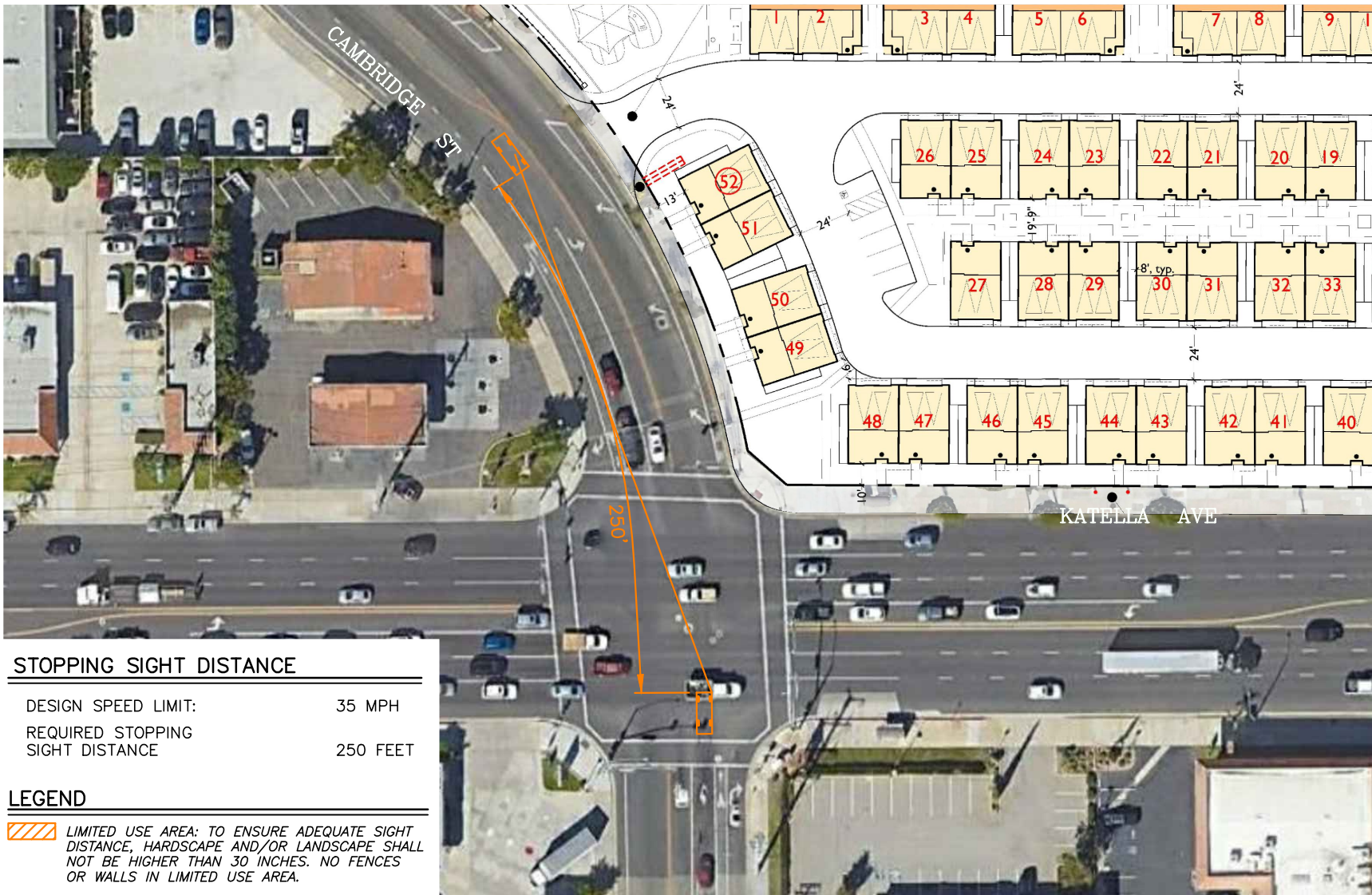


n:\4500\2224577 - 901 katella avenue residential, orange\dwg\4577 f-5.dwg LDP 10-29-20 07-22-2022 aguilera

SOURCE: BASSENIAN/LAGONI

FIGURE 5

STOPPING SIGHT DISTANCE ANALYSIS
901 KATELLA AVENUE RESIDENTIAL, ORANGE

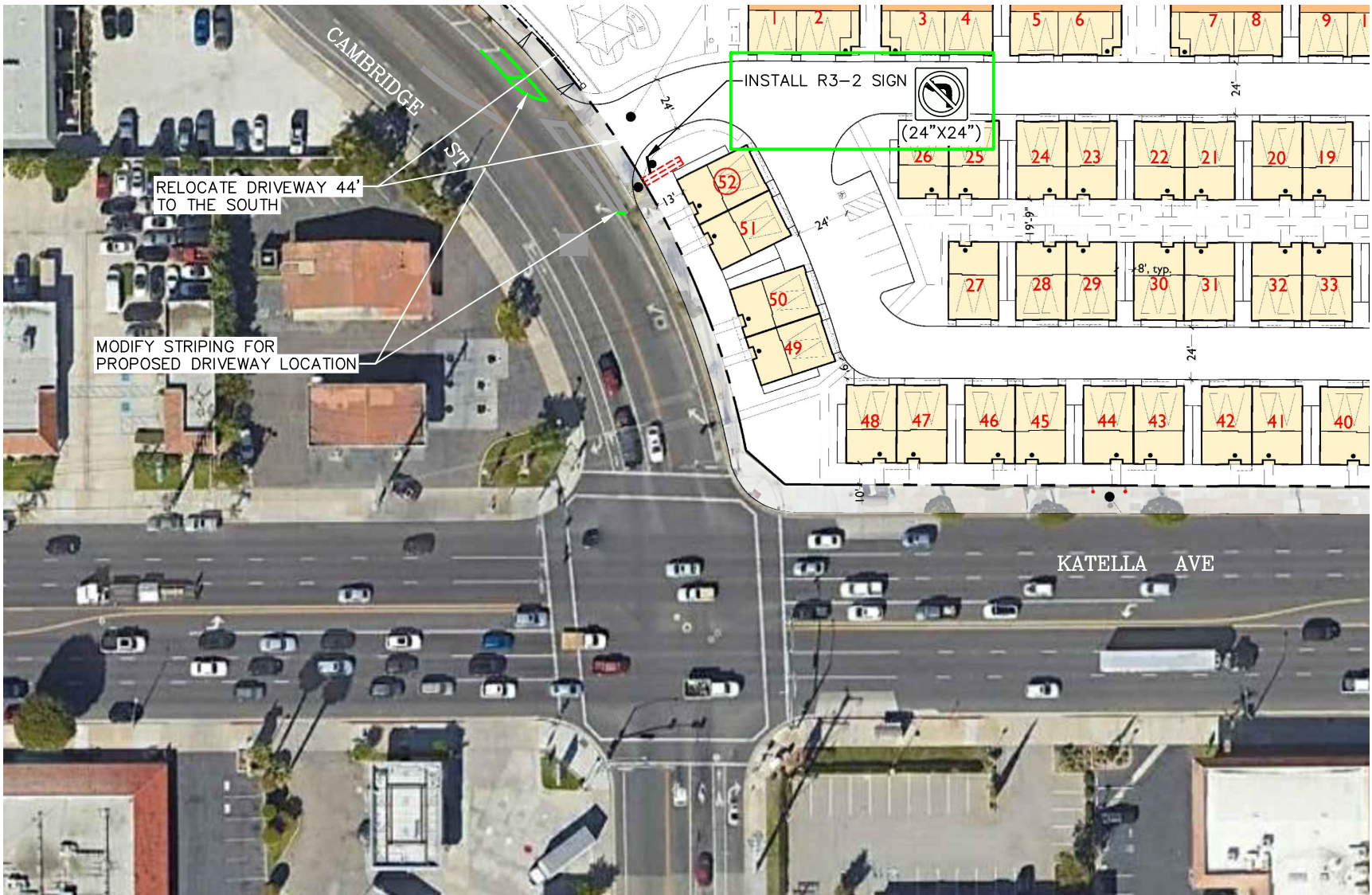


n:\4500\2224577 - 901 katella avenue residential, orange\dwg\4577 f-6.dwg LDP 15:45:40 07-21-2022 aguilera

SOURCE: BASSENIAN/LAGONI

FIGURE 6

STOPPING SIGHT DISTANCE ANALYSIS
901 KATELLA AVENUE RESIDENTIAL, ORANGE



n:\4500\2224577 - 901 katella avenue residential, orange\dwg\4577 f-7.dwg LDP 14:32:30 05-30-2023 kopulsky

LINSCOTT
LAW &
GREENSPAN



NO SCALE

engineers

SOURCE: BASSENIAN/LAGONI

FIGURE 7

CONCEPTUAL IMPROVEMENT PLAN
901 KATELLA AVENUE RESIDENTIAL, ORANGE

APPENDIX A

SPEED COUNT DATA

For Project: Orange Cambridge St
 Project Notes:
 Location/Name: Merged
 Report Generated: 7/13/2022 14:36
 Speed Intervals 1 MPH
 Time Intervals Instant
 Traffic Report From 7/12/2022 00:00:00 through 7/12/2022 23:59:59
 85th Percentile Speed 35 MPH
 85th Percentile Vehicles 6724
 Max Speed 66 MPH on 7/12/2022 13:32:03
 Total Vehicles 7911
 AADT: 7911

Volumes - weekly counts

Time	5 Day	7 Day
Average Daily	7911	7911
AM Peak	11:45 612	612
PM Peak	05:00 721	721

Speed

Speed Limit: 35
 85th Percentile Speed: 35
 50th Percentile Speed: 31
 10 MPH Pace Interval: 26.0 MPH to 36.0 MPH
 Average Speed: 30.69

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Count over limit	N/A	767	N/A	N/A	N/A	N/A	N/A
% over limit	N/A	9.7	N/A	N/A	N/A	N/A	N/A
Avg Speeder	N/A	38.0	N/A	N/A	N/A	N/A	N/A

Class Counts

	Number	%
VEH_SM	11	0.1
VEH_MED	7708	97.4
VEH_LG	192	2.4
[VEH_SM=motorcycle,	VEH_MED = sedan,	VEH_LG = truck]

Day/Time Ending	85th pctl (MPH)	85th pctl cnts	Total Cnts	Max Speed	Avg Speeder	% Speeders
7/12/2022 01:00:00 AM	33.0	20	24	38	38.0	4.2%
7/12/2022 02:00:00 AM	34.0	15	18	37	37.0	5.6%
7/12/2022 03:00:00 AM	36.0	13	15	41	38.0	20.0%
7/12/2022 04:00:00 AM	34.0	20	23	38	38.0	4.3%
7/12/2022 05:00:00 AM	34.0	20	23	38	38.0	13.0%
7/12/2022 06:00:00 AM	36.0	79	93	41	37.5	16.1%
7/12/2022 07:00:00 AM	35.0	197	232	56	39.5	11.2%
7/12/2022 08:00:00 AM	35.0	299	352	50	38.0	15.1%
7/12/2022 09:00:00 AM	35.0	355	418	46	38.0	11.0%
7/12/2022 10:00:00 AM	35.0	396	466	59	37.5	13.1%
7/12/2022 11:00:00 AM	35.0	348	410	49	38.5	11.7%
7/12/2022 12:00:00 PM	34.0	438	515	51	37.5	8.5%
7/12/2022 01:00:00 PM	34.0	513	604	53	38.2	7.6%
7/12/2022 02:00:00 PM	34.0	453	533	66	38.6	10.7%
7/12/2022 03:00:00 PM	35.0	422	496	48	37.8	10.3%
7/12/2022 04:00:00 PM	34.0	493	580	40	37.3	7.9%
7/12/2022 05:00:00 PM	35.0	564	663	49	37.9	11.0%
7/12/2022 06:00:00 PM	35.0	613	721	49	37.6	9.2%
7/12/2022 07:00:00 PM	34.0	509	599	42	37.2	8.3%
7/12/2022 08:00:00 PM	34.0	351	413	44	37.2	8.7%
7/12/2022 09:00:00 PM	33.0	261	307	51	40.0	4.9%
7/12/2022 10:00:00 PM	32.0	193	227	43	37.9	4.8%
7/12/2022 11:00:00 PM	33.0	103	121	40	37.4	8.3%
7/13/2022 12:00:00 AM	34.0	52	61	40	37.8	6.6%